

OS/390



Introduction and Release Guide

Release 10

OS/390



Introduction and Release Guide

Release 10

Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 121.

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This is a major revision of GC28-1725-09.

This edition applies to Version 2 Release 10 of OS/390 (5647-A01) and to all subsequent releases and modifications until otherwise indicated in new editions.

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2455 South Road
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United States of America

FAX (United States & Canada): 1+845+432-9405

FAX (Other Countries):

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About this Book

This book is an introduction to OS/390, an integrated server operating system. It explains the concept of OS/390 and what it means to your business. It also lists and describes the functional elements and features that together make up OS/390.

This book is also a release guide. That is, it explains the new functional content of each succeeding release of OS/390.

Who Should Read this Book

This book is for people who are interested in using an advanced-technology, enterprise-wide server operating system environment that is completely dedicated to supporting business goals. It helps anyone who needs a quick overview of OS/390 to understand what it is and what value and function it delivers.

Additional Information

Additional information, provided at the general availability of the product, includes:

- *OS/390 Planning for Installation*, GC28-1726

This book describes how to plan for and install OS/390. The manual includes pointers to migration information for OS/390. It includes software and hardware requirements for the functional elements and features that make up OS/390.

- *OS/390 Information Roadmap*, GC28-1727

This book provides lists and descriptions of all the books that support OS/390. It also contains mappings of previous order numbers to the new order numbers.

- *OS/390 Summary of Message Changes*

This is a softcopy-only publication that contains the numbers and brief explanations of all new and changed messages for each release of OS/390.

- *OS/390 Printing Softcopy BOOKs*, S544-5354

This book explains how to print BookManager books on AFP printers.

Summary of Changes

Summary of Changes for GC28-1725-10 as updated December, 2000

This book contains information previously presented in *OS/390 Introduction and Release Guide*, GC28-1725-09, which supports OS/390 Release 10.

The following summarizes the changes to that information.

New Information

- This book contains descriptions of new enhancements to the elements and features of OS/390 for Version 2 Release 10.

This book includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Summary of Changes for GC28-1725-09 OS/390 Version 2 Release 10

This book contains information previously presented in *OS/390 Introduction and Release Guide*, GC28-1725-08, which supports OS/390 Release 9.

The following summarizes the changes to that information.

New Information

- This book contains descriptions of new enhancements to the elements and features of OS/390 for Version 2 Release 10.

This book includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Summary of Changes for GC28-1725-08 OS/390 Version 2 Release 9

This book contains information previously presented in *OS/390 An Introduction and Release Guide*, GC28-1725-07, which supports OS/390 Release 8.

The following summarizes the changes to that information.

New Information

- This book contains descriptions of new enhancements to the elements and features of OS/390 for Version 2 Release 9.

This book includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

**Summary of Changes
for GC28-1725-07
OS/390 Version 2 Release 8**

This book contains information previously presented in *OS/390 An Introduction and Release Guide*, GC28-1725-06, which supports OS/390 Release 7.

The following summarizes the changes to that information.

New Information

- This book contains descriptions of new enhancements to the elements and features of OS/390 for Version 2 Release 8.

This book includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

OS/390 -- A New Concept in Enterprise Computing

The challenges in today's business environment are unprecedented. The computerization and globalization of the marketplace have completely changed the ways we design, produce, market, and use products. The pace is faster, the reach for markets broader, the focus on customer satisfaction more intense. Advances in computer technology have been both agents for change in the ways we conduct business and responses to market trends. Throughout its history, IBM has both driven change and responded to forces that demanded change.

In recent years, one of the major breakthroughs in enterprise operating system software has been OS/390. When it was previewed in the autumn of 1995, OS/390 represented a new concept in large-system, large-enterprise operating system software. The keywords were **integration, functionality, and investment protection**.

Integrated Elements and Features

Integration of MVS related functions and features meant reduced complexity. Reduced complexity made OS/390 easier to plan for, install, use, and maintain. And for that reason, more and more system and people resources could be diverted from 'the care and feeding of the system' to the much more useful task of **using** information technology to answer real business needs.

Rich Functionality

OS/390 also represented a broad and rich base of functionality, probably richer than any other computing environment. For example, OS/390 integrated a set of products that made OS/390 the platform of choice to develop and run applications, including open UNIX applications and object-oriented applications. It also provided a set of distributed computing and LAN services. Also integrated were communication and security servers that manage secure communications among workstations and enterprise servers.

Investment Protection

At the same time, your huge investment in applications and data could be leveraged, with OS/390, to deliver even more value in an open, distributed, shared, and networked world. Additionally, OS/390 enhanced the classic strengths of MVS: security, scalability, nearly outage-free availability.

OS/390 -- Truly an Enterprise Server

In short, Version 1 represented a leading-edge, open, object-enabled, **server** operating system. Its vision and its promise were to serve the world's most successful enterprises with unprecedented levels of function, capacity, throughput, security, availability, and transparent access to data, through transparent networks, to any and all users and applications.

Today's fast-paced, global, and intricately interconnected world demands an information technology environment that not only fulfills that promise but also supports secure electronic business on the Internet, server integration and consolidation, support for business intelligence, and continued and enhanced application enablement with leading-edge technology.

The Next Step is Version 2

Version 2, and its family of releases, inheriting all the value that Version 1 offered, builds on that value with timely and appropriate responses to new market challenges and gives you the power and functionality to transform those challenges into opportunities. The new version takes the next step in delivering on the initiatives of network computing, application enablement, server integration, business intelligence, and technology leadership.

Today's Challenges

Today's extremely fast-paced and competitive business environments demand comprehensive end-to-end solutions. Enterprise servers must be able to scale up to support explosive growth in the number of Internet and intranet users. They must serve multiple applications across distributed and heterogeneous clients and servers, support the integration of multiple UNIX server application workloads and provide data capacity in the terabytes range, and beyond. They must deliver mission-critical information when and where it is needed, while ensuring extraordinary network and system-wide security and throughput. All this must be provided at a low incremental cost. The promise of OS/390 Version 2 is that it will integrate over 70 leading edge elements and features to address these key customer requirements in the most cost-effective way.

Addressing the Challenges

Several initiatives characterize the ways Version 2 is meeting the challenges. OS/390 allows you to:

- Conduct secure business over the Internet, also called e-Business
- Model and implement business processes across systems and networks as business objects and use them transactionally, locally or remotely
- Use Java, a language that can be used to build both Internet and general business applications.
- Consolidate separate servers onto OS/390, allowing you take take advantage of the synergistic value of integrated server processing and resultant reduced systems management costs

- Mine data intelligently, giving you the chance to transform your huge stores of raw data into meaningful information that can translate into new market opportunities
- Span both large and smaller enterprises with OS/390 technology

The next sections provide a closer look at these strategies for the future.

Network Computing

OS/390 Version 2 provides the technologies and services required to conduct true and secured e-Business. OS/390 connects organizations, customers and business partners so that they will be able to communicate and carry out e-Business transactions. Version 2 provides this robust capability using WebSphere Application Server for OS/390. WebSphere Application Server for OS/390 (previously delivered as Domino Go Webserver) was integrated as a base element in Version 2 Release 7. OS/390 also delivers an enhanced Communications Server and the integrated support for the IBM Network Station.

OS/390 Version 2 offers maximum security for conducting e-Business over the Web. Version 2 provides access control, including an auditing mechanism and authentication (SSL Version 3), encryption (ICSF - Integrated Cryptographic Service Facility), a Security Server, and integrated Firewall technology.

OS/390 Version 2 software technology delivers the most scalable web server in the industry that can easily grow to meet an organization's expanding e-Business needs. Version 2 contains full web-serving support for Parallel Sysplex and an enhanced Workload Manager (WLM) domain name support (DNS) for improved web-based workload balancing across the parallel sysplex environment.

OS/390 Version 2 offers the most extensive information management tools in the industry, enabling companies to effectively manage their enterprise-wide Internet and intranet information. The NetQuestion Solution, delivered as part of OS/390 Text Search, allows you to create Web search services for both your Internet and intranet information. Version 2 enables customers to easily access, store and search softcopy publications using OS/390's BookServer. And Infoprint Server for OS/390 allows you to manage host and LAN-based printing.

Applications

OS/390 Version 2 provides a rich base on which an organization can develop and run their business solution applications, taking full advantage of the latest industry software technologies. Version 2 is a flexible, open environment which leverages S/390 strengths for the execution of a wide range of applications. The following software application development and execution technologies and functions are supported:

- UNIX 95 branding
- C and C++ languages
- Java language and Java development kit (available for downloading using an IBM FTP site)
- Distributed Computing Environment (DCE)
- DCE-AS (Application Support)

- GUI offered via VisualLift and ISPF (Interactive System Productivity Facility)
- Encina ToolKit Executive
- WLM JES2 batch management
- Existing business and scientific language development tools and run-time libraries

Customer application decisions, based on business value and function, are driving requirements in the underlying operating system to enable and scale the industry's hottest applications. OS/390 Version 2 will enable Enterprise Resource Planning and Business Management System (ERP/BMS) enterprise-wide applications, such as Lotus Domino, SAP R/3, PeopleSoft, Oracle applications, One World, plus hundreds more third party applications that not only exploit integrated OS/390 technology but will bring immediate value to your business solution needs.

Server Consolidation

Rising systems and operations management costs of alternate platform servers in many enterprises are becoming prohibitive and a serious concern to many business unit and IT executives. The need to integrate and consolidate these multiple, mixed servers is important for obtaining and preserving a competitive business advantage. OS/390 Version 2 delivers the necessary technology, function and performance to integrate and consolidate on S/390 multiple LAN servers, alternate platform UNIX servers and Multimedia servers. This means that OS/390 Version 2 provides customers substantial reduction in costs and simplification of systems management tasks as they migrate their business solution data and applications to OS/390. In addition:

- OS/390 Version 2 handles more work than any other commercial operating system.
- As alternate platform servers are integrated and consolidated, fewer IT systems management resources are required, potentially lowering the overall cost of computing.
- Version 2 robustness can handle all of an organization's data. Having all data reside on OS/390 provides customers with optimum and direct access to data.
- Version 2 represents software integration and consolidation at its best. Such integration means fewer hardware components are required, resulting in environmental cost savings.
- Version 2 offers an enhanced Communications Server that fully enables and encourages server consolidation.
- Tivoli Management Framework is integrated into Version 2, simplifying systems management of OS/390 and distributed applications.

Business Intelligence

OS/390 Version 2 provides new ways of using existing corporate data to achieve a competitive advantage. Customers are able to explore existing corporate data to locate patterns and structures that provide answers to real-world business questions or new business opportunities. OS/390 Version 2 with DB2 for OS/390 has the best capability for handling the largest databases as a single image.

All of this means that OS/390 Version 2 provides the ideal underlying technology to exploit data warehousing, data mining and decision support disciplines. Version 2 supports Intelligent Miner exploitation of an integrated search engine. DB2 will provide parallel query capability with OS/390 as prerequisite software.

Technology Leadership

These strategic directions are launched from a foundation we call 'technology leadership.' OS/390 Version 2 represents one of the strategic pillars of technology leadership.

Version 2 will extend OS/390 technology leadership over multiple releases by continuing to add value. Specifically:

- As a Business Object Server, OS/390 will provide a new business object-oriented programming model that will be enabled for parallel sysplex, supports two-phase commitment and provides a new application execution and development environment that inherits the robustness and classic strengths of S/390.
- As a Secure Network Server for application development, its extensions to IBM HTTP Serve will provide client authentication which allows the server to determine that clients are who they say they are. It will have the ability to detect the presence of crypto hardware on the S/390 system and, if present, hand off the encryption and decryption function to the hardware instead of the software, thereby improving overall performance, throughput and security. Triple DES capabilities are provided.
- As a Communications Server, its enhanced TCP/IP protocol stack will provide improved performance for OS/390 Version 2 UNIX and MVS application environments. It can provide nearly four times more Web server connections per second than previous stacks. TCP/IP's dynamic stack configuration capability will provide higher availability and greater ease of use.
- As a Security Server, the addition of Firewall technology and ICSF will provide enhancements which improve OS/390's overall system and network security capabilities.
- For Systems Management, the integration of Tivoli Management Framework into OS/390 will enable applications to provide network computing management from OS/390. Tivoli Management Framework is IBM's strategic distributed computing management solution and replaces SystemView. It is based on an open, architected, object-oriented framework and provides end-to-end, cross system solutions for managing distributed computing environments.
- For Distributed Computing, the addition of the Encina Toolkit Executive, DCE Application Support and enhancements to DCE Base Services, and Distributed File Service further extends OS/390 distributed computing. Encina Toolkit Executive and DCE Application Support will provide transactional RPC to enable the building of reliable, distributed, transactional applications using two-phase commit for IMS transaction applications. One of the many DCE Base Services enhancements in Version 2 will provide a Cell Directory Server. Customers will then have a complete set of DCE services on OS/390 and will not have to rely on another platform for DCE directory services.
- For System Services, OS/390 Version 2 includes enhancements to Workload Manager (WLM). WLM algorithmic decision making, using real time, state and

topology information, will represent a major positive step in the evolution of OS/390 and the Parallel Sysplex strategy. The existing Workload Manager algorithmic management actions, driven by customer business objectives, will be directly applied to JES2 batch job pre-execution scheduling.

- For S/390 I/O Configuration Management, the OS/390 Hardware Configuration Manager (HCM) will be available. The combination of HCM and Hardware Configuration Definition (HCD) provides the configuration solution for OS/390, allowing both the physical and logical configuration of your enterprise.

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e-business

SecureWay Security Server for OS/390 (RACF)

SecureWay Security Server (RACF) has the following enhancements:

Certificate Name Filtering Support

Certificate name filtering support associates many certificates to a single, shared RACF user ID without having to install each certificate into the RACF database. Certificate filters substantially decrease the amount of database storage and the system administration requirements associated with processing large numbers of certificates. In addition, with certificate name filtering support you can restrict the access a user ID has to global resources. Assigning restricted user IDs is an effective way to manage public or anonymous IDs, or IDs created for use with RACF's certificate filters. You can assign the RESTRICTED attribute by issuing either the ADDUSER or ALTUSER command with the RESTRICTED attribute. Once this attribute is assigned and access checking is performed, global access checking is bypassed for those restricted users, ID(*) and UACC are not used to grant access.

Other highlights of certificate name filtering support include:

- Enhancements to the Remove ID utility and the RACDCERT command to remove orphan profiles (where the user ID associated with the profiles no longer exist) in the DIGTCERT and DIGTRING classes, as well as in the new DIGTNMAP class.
- Two new audit records are written by the initACEE callable service when the following occurs:
 - A certificate does not correspond to a RACF user ID
 - A certificate is not trusted.

Network Authentication and Privacy Service Support

This support allows OS/390 SecureWay Security Server Network Authentication and Privacy Service principal and realm information to be stored and administered in a RACF database. The new principal and realm information is processed using a new KERB segment in the RACF user profiles and general resource profiles. Two new callable services, R_kerbinfo (IRRSMK00) and R_ticketserv (IRRSPK00) were created to support the Network and Authentication and Privacy Service. R_kerbinfo retrieves the principal and realm information stored in RACF, and R_ticketserv enables OS/390 application servers to parse and extract principal names from Network and Authentication and Privacy Service tickets. Centralizing information into one RACF database reduces administrative and ownership costs since authentication management is not required on two different servers.

PADS Enhancements

These RACF program control enhancements were created to provide better security and integrity for OS/390 UNIX server and daemon programs. This is accomplished by providing more control over the execution environment and preventing uncontrolled programs from entering into a controlled environment. Environment control is accomplished through a new service, IRRENS00, which marks an environment as either controlled (clean) or uncontrolled (dirty), it also allows the keep-controlled indicator to be reset.

New messages have been added to assist the security administrator with diagnosing which PROGRAM definitions or WHEN(PROGRAM(...)) conditional access list entries need modification.

Application Identity Mapping

Application identity mapping provides an improved method for associating identities defined by OS/390 UNIX, Lotus Notes for OS/390, and Novell Directory Services for OS/390 applications to RACF user IDs. Updates to the ADDUSER, ALTUSER, and DELUSER commands allow you to associate a RACF user ID with an application user identity. Each application user identity should map to only one RACF user ID; each RACF user ID should map to only one application identity.

Public Key Certificate Enhancements

These updates expand RACF's support of digital certificates. Updates to the initACEE (IRRSIA00) and R_datalib (IRRSDL00) callable services enable RACF to perform additional functions, including:

- Registering and deregistering user certificates
- Replacing certificate-authority certificates
- Extracting private keys
- Managing certificate serial numbers
- Using hostIDMapping extensions

The RACDCERT GENCERT, GENREQ and ADD commands have been updated to support the new hostIDMapping extension.

Enhanced OS/390 UNIX Superuser Granularity Support

This enhanced support verifies that a user has the necessary privilege to perform a chmount. OS/390 UNIX checks the authority information by calling the check privilege (ck_priv) callable service (IRRSKP00) which determines if the user requesting the chmount is a superuser or has the authority to the appropriate resource in the UNIXPRIV class. As a result of using UNIXPRIV class profiles to grant chmount authority, system security increases because the number of superusers is kept to a minimum.

Release FMID Updates

The RACF and SAF mapping macros have been updated with constants to indicate the new FMID. For compatibility with previous releases, the FMID HRF7703 used as the RACF level, and is represented by the value 7703. The RACROUTE, ICHEINTY, ICHETEST and ICHEACTN macros have also been updated to accept the RELEASE=7703 parameter.

Firewall Technologies (part of SecureWay Security Server)

In Version 2 Release 10, OS/390 Firewall Technologies has added support for On-Demand Dynamic Virtual Private Networks (VPNs). On-Demand VPNs allow an outbound Security Association (SA) to be set up automatically when the designated network traffic requires that it be transmitted securely through a VPN. Prior to Version 2 Release 10, a Dynamic VPN required manual activation to create the Security Association (SA). The On-Demand enhancement provides an easier to use IKE implementation for the case where the OS/390 host is initiating the communication with another host.

Also in Release 10, the OS/390 Firewall Technologies syslog server has been removed. The SecureWay Communication Server syslog daemon is being used. The change to use the SecureWay syslog daemon will allow Firewall Administrators to utilize future enhancements made to the central syslog daemon as well as a single syslog daemon for all applications on the system.

LDAP Server (part of SecureWay Security Server)

The OS/390 SecureWay Security Server LDAP Server significantly extends its support of the LDAP Version 3 (V3) protocol by providing the ability to dynamically view and update the schema that applies to entries within an LDAP server. The LDAP server also supports a new DB2 backend, TDBM, which increases the number of entries that the LDAP server can store and manage, and also increases performance and scalability. Included with this support are two utilities, **ldif2tdbm** and **tdbm2ldif**, which exchange data between LDIF format text and a TDBM database. Enhanced ACL support, which reduces DB2 operations required for performing ACL checks of all operations, is also part of the TDBM backend.

Network Authentication and Privacy Service (part of SecureWay Security Server)

OS/390 SecureWay Security Server Network Authentication and Privacy Service is based on Kerberos Version 5 from MIT. It provides security services without requiring Distributed Computing Environment (DCE). This includes native Kerberos API functions as well as the GSS-API Kerberos security mechanism. Administration uses RACF commands.

The security client locates the security server through one of three methods:

- Using Lightweight Directory Access Protocol (LDAP), when the LDAP server is specified in the Kerberos configuration file.
- Using the Domain Name Service (DNS), when DNS lookup is specified in the Kerberos configuration file.
- Using static information contained in the Kerberos configuration file, when the LDAP or DNS server is not available or the target realm is not defined in the directory.

Secure Sockets Layer (SSL) (part of Cryptographic Services)

New to OS/390 Release 10 System SSL is the Java Interface. The Java Interface provides a System SSL front end for the Java environment. SSL functionality is provided "transparently" to the user by the use of a new set of Java classes which are modeled after the standard Java sockets.

Open Cryptographic Services Facility (part of Cryptographic Services)

Open Cryptographic Services Facility (OCSF) in OS/390 Version 2 Release 10 has been enhanced to include a Data Library Service Module that provides access to generic and security-related objects (i.e. certificates, certificate revocation lists) stored in LDAP-compliant directory servers. The OCSF CCS Cryptographic Module has also been enhanced to support the 4758 cryptographic card.

Communications Server for OS/390

Communications Server for OS/390 V2R10 delivers a robust set of client/server solutions that reduce costs, simplify administration, tighten security, optimize performance and enable growth that you exploit the e-business opportunities that present themselves. These solutions include significant enhancements to the TN3270 and FTP servers, which make them best of breed as well as exciting new features in the area of Security, Policy, Quality of Service and Parallel Sysplex exploitation to better address the needs of today's complex networks.

Enhancements include:

Sysplex Distributor

The Sysplex Distributor function routes client connection requests using a single IP address to servers on different S/390 hosts. Routing to the server takes place over XCF; therefore connectivity of the server hosts to a single router is not required. Previously, if XCF or OSA Express were in the sysplex, workload distribution was not allowed. With Sysplex Distributor, these configuration limitations are removed. The Sysplex Distributor function provides backup capability via an enhancement to Dynamic VIPA Support (introduced in V2R8) in case of failure of the routing TCP/IP so that existing connections to other TCP/IPs in the sysplex are not disrupted.

Security Enhancements

The TN3270 SSL Enhancement function is an enhancement to Secure Sockets Layer (SSL), which was introduced in V2R6. Previously, SSL connections and basic connections had to be supported by separate ports. With this enhancement, a single port can support both secure and basic connections. Based on the client's IP address, host name, or linkname, the server can specify whether or not a connection will use SSL protocols.

V2R10 enhances the Internet Key Exchange (IKE) function that was introduced in V2R8. In V2R8, dynamic tunnels had to be started manually before any traffic could flow across the tunnel. With the On-Demand enhancement, the flow of data starts a negotiation, thus alleviating the need to start it manually.

V2R10 provides new port, stack and network security enhancements. Control of an application's ability to bind to specific TCP and UDP ports or port ranges; and access to the TCP/IP stack can be controlled using a security product, such as the OS/390 Security Server (RACF). Network access is enhanced to enable system administrators to assign permission for users to access certain networks and resources.

FTP Enhancements

The IBM Communications Server FTP server function is enhanced to fully support a Web browser FTP client. These new enhancements include:

- UNIX appearance from Web browsers
- Anonymous FTP server operations
 - Limits HFS visibility for anonymous user
 - Prompts for E-mail address as anonymous password and logs connections
 - Extensive configuration controls for scope of anonymous access
- Optional Welcome, Login, and directory information message support
- MVS dataset FTP URL support

The FTP/JES interface is enhanced in V2R10 to allow users to select the userid, jobname, and type of output to receive. This enhancement removes the restriction of FTP clients only being able to receive jobs that match their userid plus one character.

Telnet Enhancements

The TN3270 Enhanced SLU Simulation function enhances Telnet's simulation of SNA Secondary LUs (SLUs). Previously, when the SLU requested a session with an unavailable Primary LU (PLU), the session request was rejected and the SLU was inactivated. Depending on Telnet profile setup, the end user either received a USSMSG07 error or the connection was dropped. With the addition of new functions allows Telnet to keep the SLU LU ACB open instead of closing it after a failed request session attempt, and allows clients to request a session with a PLU and then wait for the PLU if it is currently inactive. When the PLU becomes active, it will initiate a session with the waiting client.

The TN3270 Client Reconnect to TN3270E Server function is an enhancement to the TN3270 - Takeover function that was introduced in V2R8. With the V2R8 TN3270 - Takeover, the old session and old connection were dropped, allowing for the recreation of the session from the beginning. This enhancement maintains the SNA session and allows the reconnection to be less disruptive.

The TN3270 Address Visibility function allows SNA applications to use IP characteristics to determine the identity of a TN3270 Client (LU). In addition, you can use the VTAM DISPLAY command on the PLU's host to display the IP characteristics of a TN3270 Client. Previously, this capability was available only on the SLU's host.

Various usability, serviceability, display enhancements and command options in the areas of HPR, Extended Border Node, network automation, and command usability.

Policy Agent Enhancement in V2R10 provides support for the latest version of LDAP policy definitions, known as the schema. This version provides enhanced functionality for grouping policy definitions and specifying their conditions for activation, actions to be performed, and time periods during which they are active.

Support for Service Level Policy and quality of Service (QoS) was provided in V2R7 for regulation of IP traffic and for service differentiation, and was enhanced in V2R8. In V2R10, Service Level Policy and QoS are further enhanced to allow better control of traffic flow within networks.

Application Enablement

Distributed File Service (DFS/SMB)

In Release 10, in addition to its support for workstation access to OS/390 data stored in HFS using SMB protocols, the OS/390 DFS/SMB Server now supports workstation access to OS/390 data stored in SAM, PDS(E), and VSAM files to further expand the S/390 support for application development. Also, the DFS/SMB Server now supports the LM 0.12 level of the SMB protocol used by the Windows NT networking, thereby providing additional password encryption; file sizes greater than 32 bits (4 gigabytes); and other capabilities allowed by this level of the SMB protocol. Besides these SMB support enhancements, Release 10 delivers incremental performance and RAS improvements that apply for customers that use the SMB File/Print server, the DFS client, or the DFS server support.

Language Environment

Enhancements for OS/390 Version 2 Release 10 Language Environment include the following:

- **Extra Performance Linkage (XPLINK)**

Language Environment provides greater flexibility in application development on OS/390 with XPLINK support. XPLINK is an enhanced linkage between programs that can significantly improve the performance of your C and C++ programs. This new linkage addresses many issues that you may face in application environments that have frequent calls between small programs.

XPLINK offers the following benefits to your application environment:

- Improved performance for C and C++ subroutine linkage
- Improved performance through reduction in function size
- Increased ease in porting new applications to S/390
- XPLINK versions of the compiled locale objects and of the code set converter programs
- XPLINK versions of the C curses archive file, `libcursesxp.a`

The primary goal of XPLINK is to make subroutine calls as fast and efficient as possible by removing nonessential instructions from the main program path.

XPLINK can significantly speed up the linkage for C and C++ routines by using a negatively growing stack and by passing parameters in registers. It includes support for calls to functions in Dynamic Link Libraries (DLLs) and compatibility with old code.

XPLINK can also reduce the size of the program that is loaded into memory, allowing your system programmers to fit more functions into memory. This is especially effective for the typically small functions in C++. XPLINK reduces the function footprint as much as possible.

XPLINK introduces a common linkage for C and C++. When all functions are compiled with XPLINK, you can use function pointers without restriction. Casting of integers to function pointers will work as on other platforms. This can ease the porting of new applications to S/390.

Debug Tool supports the debugging of applications that use the XPLINK linkage convention.

For more detailed information on XPLINK, see *OS/390 Language Environment Programming Guide*.

- **Downward Compatibility**

OS/390 Release 10 Language Environment provides downward compatibility support. Assuming that you have met the required programming guidelines and restrictions, described in *OS/390 Language Environment Programming Guide*, this support enables you to develop applications on higher release levels of OS/390 for use on platforms that are running lower release levels of OS/390.

For example, a company may use OS/390 Release 10 with Language Environment on a development system where applications are coded, link-edited, and tested, while using any supported lower release of OS/390 Language Environment on their production systems where the finished application modules are used.

Downward compatibility support is not the roll-back of new function to prior releases of OS/390. Applications developed that exploit the downward compatibility support must not use any Language Environment function that is unavailable on the lower release of OS/390 where the application will be used.

The downward compatibility support includes toleration PTFs for lower releases of OS/390 to assist in diagnosing applications that do not meet the programming requirements for this support. (Specific PTF numbers can be found in the PSP buckets.)

The downward compatibility support provided by OS/390 Release 10 and by the toleration PTFs does not change Language Environment's upward compatibility. That is, applications coded and link-edited with one release of OS/390 Language Environment will continue to run on later releases of OS/390 Language Environment without the need to recompile or re-link edit the application, independent of the downward compatibility support.

- **Large File Support**

Language Environment provides large file support for 31-bit applications that will improve porting capabilities of C/C++ applications accessing HFS and NFS files larger than 2GB. This is done by changing some C run-time library I/O functions to support file offsets recorded using the long long data type.

- **CEEGPID Improvement**

The CEEGPID callable service now provides a fully programmable byte-oriented interface, mapping the Language Environment product ID, version, release, and modification levels in the fullword value returned as CEE_Version_ID.

- **semop with Timeout Transform**

Language Environment provides a timer parameter to control the performance of signals based on `semop()` and `msgrcv()` functions.

- **Additional National Language Support**

Language Environment provides code pages for:

- IBM-1390 Japanese
- IBM-1399 Japanese
- IBM-1364 Korean

- **sysconf performance**

Language Environment provides sysconf functions to allow for more data to be collected and to improve sysconf performance.

- **Retrieval of Machine ID**

Language Environment provides a C function to retrieve the CPUID of the current system.

- **Changed ABTERMENC Run-Time Option Default**

The default value for the ABTERMENC run-time option is changed from RETCODE to ABEND. in OS/390 V2R10. This support was also optionally provided in OS/390 V2R9. Please note that if the same default behavior is expected as in previous releases, the default for the ABTERMENC run-time option must be set to RETCODE.

C/C++

Extra Performance Linkage (XPLINK)

The primary goal of XPLINK is to make subroutine calls as fast and efficient as possible by removing non-essential instructions from the main path. See the section on Language Environment for more detail.

Server Consolidation

Infoprint Server for OS/390

Infoprint Server lets you use OS/390 as an enterprise print server to manage host and LAN-based printing. Infoprint Server provides the following additional print capabilities in OS/390 V2R10:

- Data stream transform support

Infoprint Server adds support for the following new data stream transforms provided by new features of Infoprint Server Transforms for OS/390 (5697-F51):

- AFP to PostScript
- AFP to PCL
- AFP to PDF

This new support lets you:

- Distribute AFP application output anywhere in your enterprise to printers that support PCL and PostScript.
- Distribute AFP application output over the internet to your business partners and suppliers, without requiring them to have IPDS printers.
- Present the output from AFP applications on the Web as PDF documents.

- IP PrintWay support for transforming data

The IP PrintWay component of Infoprint Server adds support for automatic transformation of data using transforms provided by the Infoprint Server Transforms product, such as the new AFP to PostScript, PCL, and PDF transforms. This new support lets batch users, without changing their JCL, print AFP documents to PCL or PostScript printers in their TCP/IP network.

- SAP R/3 Output Management System

Infoprint Server adds a new SAP R/3 Output Management System (OMS), which, in conjunction with the OS/390 SAP application server, lets SAP users print SAP R/3 ABAP and OTF documents on OS/390 printers defined in the Infoprint Server Printer Inventory. SAP users can print documents, cancel jobs, obtain job status, and receive notification when their documents have completed.

RMF

- VSAM RLS Support

RMF provides online support for VSAM RLS performance analysis and problem determination. Online monitoring is necessary if several applications (for example, online CICS or batch programs) access the same set of files and can impact CICS transactions and batch throughput.

Monitor III offers some new reports to support monitoring of VSAM RLS measurements like buffering and locking activities, cache structure effectiveness, and resource contention.

This support specifically addresses customers planning to exploit Transactional VSAM Services.

- Multi-system Enclave Support

Multi-system enclaves are transactions that originate on any system and continue (in paralleled) on other systems in the parallel sysplex.

The Monitor III Enclave report has been enhanced to identify multi-system enclaves and their owners in a sysplex. This will improve performance management for all applications using this new technology.

The Postprocessor Workload Activity reports will now present enclave transactions separate from address space transactions and will show the amount of parallelism for multi-system enclaves.

- UNIX System Services Support

Monitor III has been enhanced to include performance measurements for OS/390 UNIX processes (OS/390 UNIX System Services address spaces) and thus improve the ability of the OS/390 platform to manage the growing UNIX workloads.

The data provided by the OMVS command will be accessible via a callable interface. It includes CPU information about the different processes owned by a TSO user, process threads and their state, as well as global settings of the kernel address space itself. RMF provides this information in the Monitor III OMVS Process Data report and thus improves problem determination as well as performance management for UNIX workloads.

- Parallel Access Volume (PAV) Support

The new **Enterprise Storage Server (ESS)**, known under its codename Shark, provides a feature that allows concurrent I/O to the same logical volume from an S/390 system. Such logical volume is called **parallel access volume (PAV)** and is defined as a set of devices consisting of one base device plus a variable number of alias devices. The workload manager can instruct the system to dynamically add alias devices in order to reduce I/O queue times caused by

increasing I/O requests to one volume and based on goals and importance for the workloads affected by such delays.

The maximum number of alias devices for a PAV is shown on the Device Activity reports, for example, the Monitor II Device Activity report. Device performance statistics are provided for the entire PAV.

- **WebServer Performance Reporting**

The WebServer is one of the strategic applications in IBM's e-business portfolio. Therefore, sufficient support is required on the S/390 platform for tuning and capacity planning.

RMF has enhanced the Postprocessor to accept the SMF record type 103 subtype 1 and 2 written by the WebServer, and offers the new HTTP Server report that provides usage statistics as well as performance information about the WebServer.

- **Lotus Domino Support**

One strategic application for e-business is Lotus Domino. To help customers improving the performance of Domino servers on S/390 as well as to plan for future growth, extensive performance reporting is required.

RMF has enhanced the Postprocessor to accept the SMF record type 108 subtype 1 written by the Lotus Domino, and offers the new Domino Server report that provides feedback on server load as well as the number and type of messages that the server handled.

- **Dynamic Central Processor Upgrade**

Processor reporting will support the concurrent model upgrade function becoming available with new processor models (G5 and G6). Concurrent Central Processor upgrade is the capability to increase the capacity of the processor non-disruptively.

The additional information returned by the system is reflected in the Monitor III System Information report, and in the Postprocessor CPU Activity report.

- **PM of OS/390 Java Edition**

The PM of OS/390 Java Edition provides the workstation client access to sysplex-wide OS/390 performance data from Windows 95 or NT as well as OS/2 platforms. It is a part of the PM Common Functions framework and the exploiting PM of OS/390 application.

With the availability of the Java Edition for PM of OS/390, the OS/2 version will be withdrawn from service.

- **Spreadsheet Reporter**

One new spreadsheet macro and several enhancements to existing macros are now available.

OS/390 UNIX System Services

With OS/390 Version 2 Release 10, OS/390 UNIX System Services offers support for C/C++ applications, RAS enhancements, and overall performance improvements.

Support for C/C++ Applications

- **Large File Support**

Support is added to utilities that perform file operations for large (2GB or larger) HFS files.

- **Kernel Support for LE XPLink**

OS/390 UNIX provides support for LE XPLink (eXtra Performance Linkage), which improves the execution performance and compile times of OS/390 applications written in C/C++.

- **Shell and Utilities Support for New Long Long Data Types**

Long long support eases the task of porting programs that use 64-bit integers (such as JAVA Virtual Machine).

- **Support for 64-bit Real Addressing**

Support is added for 64-bit real addressing, which improves the performance and response time of applications that have very large memory and DASD storage demands, use Data in Memory, or need to access very large databases. New functions are added to the ptrace callable service (BPX1PTR) to support callers using the new general-purpose "high" registers.

RAS Enhancements

Diagnostics and serviceability of the OS/390 UNIX environment are improved with tools that identify problems in setup, enable you to gather better dumps, and improve the analysis of dumps. These improvements include:

- **Security Enhancements to AF_UNIX PFS**

These enhancements allow an AF_UNIX datagram server to receive the identity of the sender of each message it receives, providing for better troubleshooting of data passed from the syslog daemon to the joblog.

- **sysconf() Performance Enhancement**

The performance of sysconf(), a valuable tool that allows application programs to retrieve data from the system, is improved, and new flags are added to meet UNIX98 standards.

- **Relative Addressing Exploitation (USS RAS)**

The performance of heavily used kernel modules is improved through conversion to compiler/assembler relative addressing support, which reduces the size of the kernel modules in LPA.

- **dbx Support of Long Long Compiler Symbolic and Arithmetic**

dbx supports the debugging of C/C++ applications that include long long and unsigned long long data types.

- **dbx Support of XPLink**

dbx supports the debugging of new code associated with XPLink.

- **Descriptions for Shell and Utilities Messages**

Descriptions have been added for over 150 Shell and Utilities messages.

- **Shell Script for Removing Old Files**

The *skulker* shell script removes files over a certain age from user-specified directories, based on the date the file was last accessed.

- **UNIX System Services Parmlib Limits Checking**

This support provides enhancements for monitoring and managing UNIX System Services parmlib limits, including:

- Console messages that indicate the status of USS parmlib limits, allowing an installation to react quickly when limits are reaching critical levels.
- A new BPXPRMxx parmlib statement, LIMMSG(NONEISYSTEMIAL), which controls the displaying of these console message.
- A new SETOMVS operand, PID=, which dynamically changes a parmlib limit for a process.
- A new keyword, LIMITS, on the DISPLAY OMVS command, which displays information about USS parmlib limits and current system usage. With the PID= keyword, LIMITS displays information for an individual process. With the RESET keyword, LIMITS resets the high-water marks for system limits to 0.

- **Debugging Support for Byte-Range Lock Waits**

DISPLAY OMVS has a new operand, BRL, which displays thread-level information for any thread that is in a byte-range lock wait.

- **Support for MVS Dump Debugging**

Post-mortem analysis is now possible on MVS dumps. A new dbx command line option, -C, puts dbx in full source-level debug mode.

- **Sysplex CDS Repair Tool**

Corruption of the Couple Data Set (CDS) can prevent the USS file system from performing key sysplex operations. The Sysplex CDS Repair Tool, used under the direction of an IBM service representative, makes it possible to correct or isolate the scope of a defect in the CDS, reducing the need for a sysplex-wide IPL. The MODIFY operator command is enhanced to support these shared HFS diagnostic and repair functions.

Performance Improvements

- **Enhanced Reporter Support**

This support allows more kernel-related data to be made available to report applications like RMF, improving the ability of the OS/390 UNIX platform to manage UNIX workloads.

- **Kernel Generic Timeout Service**

This new time-out function enhances the performance of Lotus and other UNIX-based applications, greatly increasing the number of Notes clients that can be supported on a single server

- **make/c89 integration**

make, c89, and the Binder are integrated to make the build process run faster on larger applications.

- **Application Notification of Stack Recycle**

Common Inet is enhanced to notify servers when a new transport provider stack is initialized, so that servers do not have to be manually recycled.

- **Fast pthread quiesce and get**

A new pthread_quiesce interface, BPX1PQG, is introduced, which freezes or unfreezes a set of threads and returns state information for them, without

requiring that signals be sent to the target threads. This improves the performance and reliability of applications, such as JAVA, that use pthread_quiesce or signalling to stop threads.

Miscellaneous Enhancements

- **Message Routing Capability for the __console() Service**

Routing and descriptor codes can be specified for messages issued with the __console() service. A DOM (delete operator message) capability is added to delete held messages from the console.

- **New Features for Binary Semaphores**

- The UNDO feature is provided for binary semaphores, allowing binary semaphores to be freed when they are not freed by the exiting process.
- The short semaphore feature allows semaphores to be held for very short intervals of time. Short-duration requesters can bypass the default first-in-first-out ordering of semaphore obtain requesters and cut to the front of the wait chain.

Technology Leadership

BCP

Allowing a Coupling Facility Structure to Be Altered Automatically

Starting with OS/390 Release 10, you can specify whether you want the system to automatically alter a structure when it reaches a installation-defined percent full threshold as determined by structure full monitoring. The alter process may increase or decrease the size of the structure, the reapportionment of objects within the structure, or both. The ability to have the system automatically alter a structure assumes that:

- The structure application has specified that the structure is allowed to be altered.
- The installation has specified ALLOWAUTOALT(YES) in its active CFRM policy.
- There is available coupling facility storage to accommodate the changed size or apportionment of the structure.

Automatic structure altering reduces the complexities involved in calculating coupling facility structure size and object ratios. Automatic altering also helps avoid structure full conditions and frees up coupling facility resources that are not being used productively when coupling facility storage is constrained.

Tape block sizes larger than 32760 bytes

Significantly improved elapsed times can be realized with BSAM and QSAM with block sizes up to 256KB for 3590 and 64KB -1 for other tape cartridge devices. The maximum block size supported for DASD remains unchanged.

Unit Affinity - SMS Tape

When UNIT=AFF is used to reduce the number of devices used in a job but not for data set stacking, the ACS routines while processing the referencing DD can determine the storage residency (SMS-managed DASD, SMS-managed tape, or unmanaged devices) of the referenced DD. This was available with DFSMS/MVS 1.3 for allocations that used data set stacking.

Unicode (BCP support)

The CSRUNIC macro provides support for processing hardware instructions related to unicode data. Unicode data uses the binary codes of the Unicode Worldwide Character Standard; these codes support the characters of most the world's written languages

System Logger -- Multiblock Support for Browse

With the introduction of the MULTIBLOCK keyword, the IXGBRWSE service has been enhanced to return multiple log blocks with a single request. When MULTIBLOCK(YES) is specified, system logger will return as many log blocks in a single request as can fit in the invoker's buffer. The need for repetitive calls to the IXGBRWSE service to obtain consecutive log blocks will be greatly reduced.

Several APARs improve processing. With the OW35225, OW39582 logstream latch contention reduction APARs, Logger now uses a shared logstream latch to reduce contention between logger browse and delete services and other logger operations. And the OW40811 Logger rebuild ENQ contention reduction APAR reduces unnecessary ENQ contention between logger systems participating in a rebuild. As a result you will see a significant improvement when a number of systems are connected to a set of logstreams in the structure being rebuilt.

RRS

The following enhancements are made to RRS:

- Query Context Authorization

The Retrieve_Context_Data service is enhanced to allow callers to retrieve information about the type and authorization of a specific context.

- Delegate Commit Agent UR

Delegate_Commit_Agent_UR is a new resource recovery service. It allows a resource manager that has taken the server distributed syncpoint manager (SDSRM) role to tell RRS to initiate and complete a syncpoint operation for the unit of recovery (UR) associated with a specified UR interest. This single call replaces a call to the Prepare_Agent_UR service that might need to be followed by an additional call to either the Commit_Agent_UR or Backout_Agent_UR service.

64-bit Real Addressing and Arithmetic

On a 64-bit S/390 system, OS/390 includes enhancements that allow it to take advantage of greatly increased central storage and perform faster calculations involving very large integers. Under the new architecture, OS/390 supports up to 128 gigabytes of central storage, and allows programs to use 64-bit General Purpose Registers.

DFSMS

VSAM Striping Enhancements

The enhancements will provide the capability to define any VSAM data set in extended format (EF) as a striped data set. VSAM striped data sets cannot be accessed with VSAM RLS. Any VSAM data set in extended format may be defined in a manner which allows control intervals (CIs) to be interspersed among a group of DASD volumes to enable the CIs to be retrieved simultaneously from all volumes (or stripes).

Tape Library Support

With this device support, two VTS subsystems can be coupled together with the necessary hardware (virtual tape controllers, etc.), creating a clustered VTS subsystem that is one library image to the attached hosts. By dual copying data from distributed libraries, in a clustered VTS environment, the clustered VTS provides high availability to critical customer data and there are no restrictions built into the software support that will limit the number of connected VTS libraries to two.

DFSMShsm

DFSMShsm Data Set Backup Enhancements

Storage administrators and end-users can issue DFSMShsm commands to perform backups of individual data sets. Four methods are currently available: BACKDS, HBACKDS, ARCINBAK, and ARCHBACK.

Previously the following limitations existed with the data set backup function:

- The data set backup function was single threaded. For each OS/390 image, only one data set at a time was backed up.
- Backups went only to ML1 DASD and were then moved to tape during Automatic Incremental Backup on the DFSMShsm primary host or with a FREEVOL command. The backups never went directly to tape.
- DFSMShsm did not support the concurrent copy function fully. When the management class specified concurrent copy, DFSMSdss used concurrent copy to perform the data movement. The issuer of the backup was not notified of completion until physical complete was received from DFSMSdss.

Now this data set backup enhancement addresses these limitations:

- Per DFSMShsm host, up to sixty-four backup tasks are supported.
- Data sets can be backed up directly to tape.
- When you use the new Concurrent Copy keyword, DFSMShsm notifies you, if requested, when logical end is received from DFSMSdss. In addition, concurrent copy supports non-SMS data sets and, if specified on the command for an SMS data set, overrides the management class.

In addition, installations that decide to have continuously mounted backup tapes now have a simple way to demount those tapes and deallocate those drives in preparation for disaster backup or introduction of new tape devices.

Fast Subsequent Migration

Previously, when a data set was recalled from ML2 tape, the copy remained on the tape, but was indicated in DFSMSHsm's CDS records as no longer being a valid migration copy. When the data set that is recalled is re-migrated, it is copied to a new tape. Eventually, tapes that have their data sets invalidated are recycled, so that any data that is still valid gets consolidated onto new tapes.

With this enhancement, data sets that are recalled from ML2 tape, but not changed or recreated, can be reconnected back to the original ML2 tape. This reconnection eliminates unnecessary data movement and reduces the need to recycle these tapes. Reconnection can take place during individual data set migration or during volume migration. This is supported for both SMS and non-SMS data sets.

Because a number of products can turn off the Format 1 DSCB change indicator and leave DFSMSHsm unaware that the recalled data set has changed, you must request reconnection with a new SETSYS TAPEMIGRATION parameter. You are effectively assuring DFSMSHsm that the reconnection eligibility criteria is sufficient to determine if the old migration copy remains valid.

Reconnection is only supported in a SETSYS USERDATASETSERIALIZATION environment. This simplifies the serialization performed during reconnection and is consistent with restrictions that are placed on other recent functions in DFSMS/MVS V1R5.

DFSMSHsm ABARS Support for Data Sets with Greater Than 32KB Tape Blocksize

DFSMSHsm now includes support of user tape data sets (UTDS) with a block size greater than 32KB. The ABARS function supports all block sizes supported by 3590 tape devices to a block size of 256KB-1. The previously supported block size was 32KB-1. ABARS supports a block size of 64KB bytes on all non-3590 cartridge-type tape devices.

The ABARS function continues to create ABACKUP tapes with a 32KB-1 block size. The only difference is that data sets residing on user tapes with a block size 32KB or greater can now be backed up using ABACKUP and recovered using ARECOVER. No other DFSMSHsm function supports the greater than 32KB tape block size item.

Serviceability Improvement

This serviceability item introduces conditional tracing. Conditional tracing allows users to turn off some of the problem determination aid (PDA) tracing that is normally performed. If conditional tracing is turned OFF performance improves. If conditional tracing is turned ON, serviceability improves. Users must be aware, however, that if any tracing is turned off, then data capture on the first failure may be compromised, and a problem recreation may be required. The default for tracing is to trace everything.

Three tracing functions can be turned off with the following PATCH commands:

- PATCH .MCVT.+558 BITS (0.....) /* OFF=Do not trace CPOOL calls (GETCELL or FREECELL)*/
- PATCH .MCVT.+558 BITS (.0.....) /* OFF=Do not trace entries with CONDitional specified*/

- PATCH .MCVT.+558 BITS (..0.....) /* OFF=Do not trace entries of REJECTION during volume selection*/

There is also a new keyword on the ARCTRACE macro, COND. This keyword allows the programmer to add a trace entry that is controllable by the conditional trace facility. If you specify COND, then ARCTRACE generates code that tests the value of MCVTFPDA_COND. If the bit is OFF, then no call is made to ARCPDA.

Multiple Address Spaces for DFSMSHsm

Today, only a single instance of DFSMSHsm can be started in an MVS image. This line item will provide "Multiple Address Spaces for HSM". This allows a customer to start multiple hosts in a single MVS image. The advantages of this are:

- Performance measurements in the past have shown that SYSZTIOT is a significant bottleneck for DFSMSHsm. Using this function means that less work per address space is performed and there is less contention between functions since each SYSZTIOT resource serializes only functions within its address space.
- Increased DFSMSHsm tasking levels for a single MVS image. Currently, most of the DFSMSHsm functions have a limit of 15 tasks. Some customers want to start more tasks. With this function, they can essentially increase the tasking level for a given function if they bring up multiple DFSMSHsms (for instance, 2 hosts in a image would allow a total of 30 migration tasks).
- Only one host will perform implicit recalls, recalls issued from batch jobs, etc.; all recalls except those issued via the MVS modify command. Customers can change the dispatching priority of that recall host, thus changing, from an MVS image viewpoint, the priority of recall activity.

To expand on this, each instance of DFSMSHsm can be assigned specific work. And, each host can be given a dispatching priority appropriate for the work they are to perform.

DFSMSdss

Moving Volumes with FlashCopy

DFSMSdss now uses the FlashCopy feature of the Enterprise Storage Server (ESS) to quickly move the data from the source to the target location.

DFSMSdss attempts to use FlashCopy during full volume copy if the source and target devices both support FlashCopy, and the volumes are in the same logical subsystem of the ESS. FlashCopy is much faster than traditional methods of data movement, especially when moving large amounts of data.

DFSMSdss automatically uses FlashCopy if possible, even if you specify the CONCURRENT keyword. If FlashCopy is attempted but is unsuccessful, DFSMSdss will retry the operation using concurrent copy, if CONCURRENT is specified. If CONCURRENT is not specified, DFSMSdss uses traditional data movement methods.

JES2

General performance improvements enhance the efficiency of JES2 SPOOL I/O processing and provides JES2 installations with better overall resource usage. These improvements include:

- Improved SYSOUT work selection performance
- Better storage utilization during I/O operations.
- More efficient device fencing algorithms.
- Optimal management of the BLOB (the JES2 cache of available SPOOL space)
- JES2 SNA and checkpoint efficiencies.
- Added serviceability data.

JES3

Unit Affinity

OS/390 Release 10 JES3 provides a way for users' ACS routines to be passed information about the status of data sets referred to by a UNIT=AFF parameter on another DD statement of a job. The information passed tells the ACS routine whether such a data set is SMS, SMS managed mountable, or neither. APAR OW43086 is required on any JES3 releases lower than OS/390 Release 10 that are to coexist with OS/390 Release 10 JES3.

Key 9 Processing

JES3 allows subtasks of user programs attached to run in key 9 to write SYSOUT data sets concurrently with other tasks in the job. Subsystems (such as CICS) can take advantage of this JES3 support to ensure that the differing tasks that create SYSOUT data sets will perform successfully.

Support for New WLM Classification Parameters JES3 supports the new workload manager (WLM) classification parameters SCHEDENV (scheduling environment), SUBCOLN (subsystem collection name), which contains the XCF group name of the JES3 complex, and SRMTOKEN, which contains internal information used by the system resource manager (SRM). These classification parameters provide an installation with greater flexibility when moving to WLM goal mode and when using JES3 support of WLM-managed initiators.

ISPF

ISPF contains the following changes and enhancements:

- ISPF Product and Library Changes
- ISPF Dialog Manager Component Changes
- ISPF PDF Component Changes
- ISPF SCLM Component Changes
- ISPF Client/Server Component Changes

ISPF Product Changes

Changes to the ZENVIR variable. Characters 1 through 8 contain the product name and sequence number in the format *ISPF x.y*, where x.y indicates:

- = 4.2 means the version.release of ISPF
- = 4.3 means ISPF for OS/390 release 2
- = 4.4 means ISPF 4.2.1 and ISPF for OS/390 release 3
- = 4.5 means ISPF for OS/390 Version 2 Release 5.0
- = 4.8 means ISPF for OS/390 Version 2 Release 8.0
- = 5.0 means ISPF for OS/390 Version 2 Release 10.

The ZENVIR variable is used by IBM personnel for internal purposes. The x.y numbers DO NOT directly correlate to an ISPF release number in all cases. For example, as shown above, a ZENVIR value of 4.3 DOES NOT mean ISPF Version 4 Release 3. NO stand-alone version of ISPF exists above ISPF Version 4 Release 2 Modification 1.

The ZOS390RL variable contains the OS/390 release on your system.

The ZISPFOS system variable contains the level of ISPF code that is running as part of the OS/390 release on your system. This might or might not match ZOS390RL. For this release, the variable contains **ISPF for OS/390 Version 2 Release 10.0**.

New system variables:

ZBDMAX BDISPMAX value

ZBDMXCNT Count of current displays in batch mode session

ZPANELID Name of currently displayed panel

ZSCREENI Logical screen data

ZSCREENC Cursor position within the logical screen data

The ISRDDN utility is now documented in the ISPF User's Guide.

ISPF DM Component Changes

The DM component of ISPF includes the following new functions and enhancements:

- Support added for "VER(&variable, DSNAMEF)".
- Support added for "VER(&variable, DSNAMEFM)".
- Support added for "VER(&variable, DSNAMEPQ)".
- Support added for "VER(&variable, NAMEF)".
- Support added for "VER(&variable, PICTCN, string)".
- Support added for "VER(&variable, IDATE)".
- Support added for "VER(&variable, STDDATE)".
- Support added for "VER(&variable, JDATE)".
- Support added for "VER(&variable, JSTD)".

- Support added for "VER(&variable, ITIME)".
- Support added for "VER(&variable, STDTIME)".
- Support added for STKADD keyword on LIBDEF service.
- Support added for QBASELIB service to query base libraries.
- Support added for NOJUMP attribute keyword.
- Support added to allow INTENS(NON) on LI, LID, VOI and LEF attribute types.
- Add Panel Id to CUAATTR utility.
- Add support for starting a new screen or application from the ISPF Task List panel.
- Add support for command CMDE which provides ability to expand command line if more room is required for the command.
- Add support to allow ISPF panel exits to be written in REXX.
- Add support for ZSCREENI and ZSCREENC variables to retrieve data from the logical screen at the cursor position.
- Add a field to the ISPF configuration table for the default language.
- Add fields to the ISPF configuration table to allow customization of the ISPF temporary datasets.
- Add a field to the ISPF configuration table for the default ISPF panel used when invoking ISPF.
- Pass the screen name to the SELECT Service Start and End and DISPLAY Installation exits.
- Update various ISPF messages with additional information. For example, a better message will be displayed when the user's profile is out of space, and the dataset name and abend code will be added to the error message displayed as a result of an abend when opening a dataset.
- Update)HELP section processing to support variables for keyword values and two new keywords MSG(message-name) and PASSTHRU.

ISPDTLC enhancements:

ISPDTLC changes include new invocation options, new tags, and new tag attributes as ISPF extensions to the Dialog Tag Language.

General improvements:

- A new option has been added to the interactive invocation panel, the DISPLAY(W) option check interval. This option controls the display frequency of a control panel for the DISPLAY and DISPLAYW options. The control panel choices are to continue, cancel the DISPLAY(W) option, or change the interval for the display of the control panel.
- New tags:
 - GENERATE
 - TEXTLINE
 - TEXTSEG

- Remove obsolete OS/2 DM compatibility and ISPF DTL extension messages for OS/390 V3.
- Add support for Tutorial selection panel ZSEL generation via ACTION tags.
- Revise member list processing to behave more like SUPERC by leaving the "S" code in the member selection field. Members can be selected by leaving the "S" code in the member selection field. Members can be deselected by removing the "S" before using PF3 to run the requested members.
- REQ70311 - Provide a user cancel/reset for the DISPLAY and DISPLAYW invoke options. A new panel - ISPCP08 - will display every nn (1 default) panels to allow the user to cancel or continue the display processing.
- Expand the interactive panel to 16 DTL source files.
- Expand the HELP attribute on tags for field level help to support the ISPF enhancement for MSG(message-ID) and PASSTHRU. HELP values can be: NO, YES, help-panel-name, *message-id, %varname, or *%varname. The "*" prefix defines a message-id.

ISPF PDF Component Changes

The ISPF PDF component contains the following new functions and enhancements:

- An Edit settings dialog is now available through the EDSET and EDITSET primary commands as well as from the Edit_Setting pulldown choice when editing data. This enables the user to change:
 - the line that Edit positions the target of a FIND, CHANGE or EXCLUDE command.
 - whether or not the Editor always scrolls the target of a FIND, CHANGE, or EXCLUDE command to the target line specified.
 - the user session initial macro, a macro to be run whenever an edit session is started.
 - the maximum storage allowed for Edit.
 - Confirm Cancel/Move/Replace.
 - Preserve VB record length.
- The Edit COMPARE command will now compare your current Edit session against another data set without requiring a SAVE.
- The Edit COMPARE parameter SESSION or * will compare your current Edit data against the data saved on disk.
- The Edit COMPARE command can be issued while editing an uncataloged data set to compare members within the same data set.
- The new MEMLIST service provides an interface into ISPF option 3.1, providing all the built-in commands available from option 3.1.
- A new option in the ISPF Configuration Table dialog provides the automatic creation of a ++USERMOD for the configuration data.
- The new DSINFO service will return information about a specified data set in dialog variables.
- The Editor will no longer append a 1 character blank to variable length records that are 8 bytes in length.

- An ISPF Configuration option was added to disallow wildcards in the high level qualifier of option 3.4.
- The SuperC utility now supports an ALLMEMS option to enable compares of all members including alias entries without member selection.
- The primary and secondary quantity for the SuperC LIST and UPDATE data sets can be configured.
- Allow use of the SYSOUT field when doing a local print from option 3.6.
- Add an OPTION(DELETE) to the LMMDISP service to delete a member of the displayed list.
- Update the edit macro command DATASET to also return the data set from which the member being edited was found.
- Add a new dialog service called VIIF (View Interface service) which provides View function for the EDIF environment.
- Add an edit macro command LINE_STATUS which indicates whether a line of data has been changed during the edit session, and if so, how.
- Add additional keywords that can be specified in the expiration date field when creating a data set to indicate permanent retention: 9999, NEVER, NOLIMIT and PERM.
- Add a new option in the ISPF Configuration Table dialog to allow disabling all ENQ displays. This option indicates whether or not users should be able to see who has existing data set ENQs when they press the help key or when they use the ISRDDN utility.
- Allow up to 16 concatenated data sets for services using the DATAID parameter. For example, if a DDname is allocated to more than four data sets, an LMINIT by DDNAME done, and a browse, edit, etc. by DATAID used, the referenced member will be found or a member list displayed.

ISPF SCLM Component Changes

The ISPF SCLM component contains the following new functions and enhancements:

- Additional/modified SCLM Services:
 - An AUTHCODE service to update authorization codes has been added.
 - A NEXTGRP service to return the promote target for a given group.
 - The MIGRATE service will now allow the DATE/TIME of the member to be set by the caller.
 - The MIGRATE service will now be supported via the FLMLNK interface.
- Additional exit points have been added:
 - At edit start and when the SPROF command is invoked.
 - When data is saved (Edit SAVE, Migrate, etc.).
 - After the NOTIFY step of a DELETE.
 - After the VERIFY step of a DELETE.
 - After the VERIFY step of a BUILD.
- The versioning Utility will now allow a SuperC COMPARE of versions to be done.

- Change codes associated with a version can now be listed in the Versioning Utility.
- Workstation commands can now be used from translators running during a PROMOTE in batch mode.
- SCLM will now display dates in 4-character year format.
- The NRETRIEV command is now supported for SCLM.
- Added 1-level backout support for load modules.
- Added the ability to specify separate VERCOUNT values for each group/type combination.
- Additional edit samples:
 - A sample interface into ServiceDesk for OS/390 to show how a change management system can be integrated into SCLM.
 - An Edit autoflagger to automatically flag changed lines.

ISPF Client/Server Component Changes

The ISPF Client/Server Component enables a panel to be displayed unchanged (except for panels with graphic areas) at a workstation using the native display function of the operating system of the workstation. ISPF manuals call this "running in GUI mode."

SDSF

SDSF provides several enhancements to simplify system management in a sysplex environment:

- The SDSF Initiator and Printer panels can now display a device defined to any JES in the MAS, regardless of the system the user is logged on to.
- When browsing the SYSLOG or an active job, users now always see the most recent data, regardless of the system they are logged on to.
- The new System Requests panel displays outstanding operator messages (WTORs) and eventual action messages in an easy-to-use format. Action characters simplify replying to messages. Users can filter, sort and arrange the panel to suit their needs.
- Users can now filter, by system, the outstanding operator messages displayed on the SDSF SYSLOG and Operlog panels.

The OS/390 SDSF Configuration Assistant simplifies the migration to SDSF's sysplex support in Release 10. This Web-based wizard collects user input and generates results (such as JCL or RACF commands) that can be uploaded (or cut and pasted) and used on OS/390. Graphics and hypertext links also make it easier to find specific information, such as SAF resources that protect an SDSF function.

Other improvements to SDSF include support for new function in OS/390 JES2, additional columns on the Printer panel, support for mixed-case system commands, and new codepages.

The new sysplex function on the Initiator, Printer, Output Data Set, and SYSLOG panels requires the installation of MQSeries for OS/390 Version 2 Release 1. If MQSeries is not installed or available, the panels operate as they did in prior releases.

| **Open System Adapter/Support Facility (OSA/SF)**

| OSA/SF for OS/390 R10 adds support for Queued Direct I/O (QDIO) configuration
| of the OSA-Express ATM and Fast Ethernet features. Now all three OSA-Express
| features can take advantage of QDIO architecture. (The ATM and FENET can still
| be configured to run non-QDIO; Gigabit Ethernet only runs QDIO.) QDIO improves
| communication performance and reduces I/O overhead. Support has also been
| added for Simple Network Management Protocol (SNMP) applications, such as
| NetView. Any OSA-Express feature running in QDIO mode, and any OSA-Express
| (or OSA-2) ATM feature, can provide data for an SNMP agent.

| **SMP/E**

| **SMPPTS Spill Data Sets:** If the required PTF for APAR IR42960 is installed,
| SMP/E RECEIVE processing can use SMPPTS spill data sets, if defined, to store
| SYSMODs when the primary SMPPTS data set is full. Up to 99 spill data sets,
| named SMPPTS1 through SMPPTS99, can be defined with DD statements or
| DDDEFS.

Guide to Version 2 Release 9

e-Business

OS/390 Open Cryptographic Services Facility

Because of changes in cryptographic regulations, for Release 9 of the OS/390 Open Cryptographic Services Facility, there are only two features: the OCSF base and OCSF Security Level 3. The functions that were in the earlier features (OCSF France, OCSF Security Level 1, and OCSF Security Level 2) are now included in the OCSF base. Release 9 of the OS/390 Open Cryptographic Services Facility also contains performance enhancements in the handling of OCSF Cryptographic Contexts.

System Secure Sockets Layer

System SSL (part of the Security Server) for OS/390 Release 9 includes two new application interfaces, `gsk_uninitialize` and `gsk_secure_soc_reset`, and SRB mode capable versions of the `gsk_secure_soc_read` and `gsk_secure_soc_write` application interfaces.

The `gsk_uninitialize` interface removes the current settings for the System SSL environment. These settings include the current key database file or RACF key ring, session timeout values, and SSL protocols supported. The `gsk_secure_soc_reset` interface refreshes security parameters for your current SSL session, such as encryption keys. You will want to use this interface when resuming or restarting a connection for an SSL session that was cached and when resetting the keys used for this connection.

The SRB mode capable versions of the `gsk_secure_soc_read` and `gsk_secure_soc_write` interfaces now allow encryption and decryption to take place in SRB mode.

WebSphere Application Server and IBM HTTP Server

WebSphere Application Server and the IBM HTTP Server give you a reliable foundation for building a presence on the Internet which exploits the S/390's hallmark qualities of service such as availability, scalability, and security. Through the incorporation of open industry standards (such as HTML, HTTP, IIOP, Java, Servlets, Java Server Pages, Enterprise JavaBeans and CORBA) into OS/390, new e-business applications and transactions can now be scaled-up for global deployment on the server of choice regardless of the development platform. Furthermore, new applications can be integrated with the extensive inventory of existing S/390 applications. The result is the rapid creation of production-ready e-business applications, along with the ability to evolve to the Enterprise JavaBeans deployment model of choice.

WebSphere Application Server and HTTP Server enhancements for Release 9 include an improved Java servlet-based execution environment, continued reliability, availability, and serviceability (RAS) improvements, enhanced problem determination and systems management support, and performance enhancements.

Application Enablement

Language Environment for OS/390

Enhancements for OS/390 Version 2 Release 9 Language Environment include the following:

- **Reliability, Availability, and Serviceability**

- Language Environment provides a super error handler. You can use the USRHDLR Language Environment run-time option to specify, or register, a super error handler routine. This error handler receives control before any other user error handler when a condition is processed, or handled. Although this is a general-purpose error handler, it can be used, for example, to let a user (especially an IMS user) generate a mini-trace of diagnostic failure data to assist in problem resolution, resulting in less downtime.
- Access to Language Environment "message inserts" in condition messages printed to SYSOUT is provided through support of the Abend-AID product. This program provides the algorithm to obtain these message inserts for improved error handling support within external tools.

- **64-bit Integer Support for printf() and scanf()**

Language Environment supports **printf()** and **scanf()** formatting of 64-bit integers (the C/C++ long long data type).

- **Storage Tuning Exit**

Language Environment provides a storage tuning user exit to improve the performance of CICS applications running under Language Environment.

- **OpenEdition Name Change**

Language Environment messages that include the element name, OpenEdition, are updated to refer to OS/390 UNIX System Services, or OS/390 UNIX.

- **ISO646.h Header File**

Language Environment adds header file ISO646.h to the C/C++ run-time library. This provides data translation capability needed by the C/C++ compiler.

- **Changed ABTERMENC Run-Time Option Default**

The default value for the ABTERMENC run-time option is changed from RETCODE to ABEND. Please note that if the same default behavior is expected as in previous releases, the default for the ABTERMENC run-time option must be set to RETCODE.

- **UCS-2 and UTF-8 Converters**

C/C++ support is added for UCS-2 and UTF-8 converters. These are direct conversions that no longer use the tables built by the uconvdef utility processing of UCMAPS.

OS/390 C/C++

OS/390 C/C++ has made the following performance and usability enhancements for this release.

It has introduced the following compiler options and sub-options:

AGGRCOPY	Instructs the compiler whether the source and destination assignments of structures can possibly overlap. (They cannot overlap in accordance with ANSI Standard C rules.) The compiler can generate faster code if source and destination can never overlap.
CHECKOUT(CAST)	The CHECKOUT option (C-only) has been enhanced to include a CAST sub-option. This sub-option checks for the potential violation of ANSI type-based aliasing rules in explicit pointer type castings.
COMPRESS	Suppresses the generation of function names in the function control block, thereby reducing the size of your application's load module.
CVFT	The CVFT option preserves the ANSI C++ behavior of constructors that call virtual functions within a class hierarchy that uses virtual inheritance. The NOCVFT option benefits your application's performance by shrinking the size of the writeable static area (WSA). It may reduce the size of construction virtual function tables (CVFT), which in turn reduces the load module size.
DIGRAPH	The DIGRAPH option is now supported for C as well as C++.
IGNERRNO	Informs the compiler that your application is not using errno to return error conditions. Specifying this option allows the compiler to explore additional optimization opportunities for certain library functions.
INITAUTO	Directs the compiler to generate code to initialize automatic variables. Automatic variables are ones that require storage only while the functions in which they are declared are active. This option is intended as a debugging aid for cases when you suspect that an uninitialized automatic variable is causing problems. You should not specify INITAUTO in production code, because it would almost certainly reduce performance.
PHASEID	Specifies that each compiler component (phase) issues an informational message as the phase begins execution. Use the PHASEID option to assist you with determining the maintenance level of each compiler component (phase).
ROCONST	Informs the compiler that the const qualifier is respected by the program. Variables defined with the const keyword will not be overridden by a casting operation.
ROSTRING	Allows the compiler to place string literals into read-only memory. When you compile the program with the RENT option, such string literals are not placed into the Writeable Static Area (WSA). This reduces the memory requirement for DLLs. This option has the same effect as the #pragma strings (readonly) directive.
STRICT_INDUCTION	The STRICT_INDUCTION option tells the compiler that induction variables may overflow during normal program operation. NOSTRICT_INDUCTION enables some additional optimization of

induction variables smaller than machine registers, by stating that overflow will not occur.

TARGET The **TARGET** option has been extended so you can specify selected OS/390 releases as the target for your program's object module. This enables you to generate code that is backward compatible with earlier levels of the operating system. You can compile and link an application on this level system, and run the application on a lower level system. This facility is also available on OS/390 V2R6 through PTF UQ90002 and UQ90003.

For details on how to use these compiler options, see the chapter *Compiler Options* in *OS/390 C/C++ User's Guide*.

OS/390 C/C++ has also introduced the following `#pragma` directives:

<code>leaves</code>	Specifies that a named function never returns to the instruction following the call to that function. This pragma provides information to the compiler that enables it to explore additional opportunities for optimization.
<code>option_override</code>	Directs the compiler to optimize functions at different optimization levels than the one specified on the command line by the <code>OPTIMIZE</code> option. With this pragma directive, you can leave specified functions unoptimized, while optimizing the rest of your application.
<code>reachable</code>	Specifies that you can reach the instruction after a specified function from a point in the program other than the return statement in the named function. This pragma provides information to the compiler that enables it to explore additional opportunities for optimization.

For details on how to use these `#pragma` directives, see the chapter on *Preprocessor Directives* in *OS/390 C/C++ Language Reference*.

OS/390 UNIX System Services

Improvements in OS/390 UNIX System Services (OS/390 UNIX) include enhanced systems management capabilities, improved debugging tools, and additional common UNIX functions that facilitate the porting of applications from other platforms. Highlights include:

- **Shared HFS Support**

Shared HFS support extends the ability for users in a sysplex to access HFS data. Specifically, it gives users read/write capability to data in files associated with systems other than their own. Without this support, users logged onto one system can read data in files associated with other systems, but they cannot write to those files. Shared HFS requires that systems be at R9 or later. Systems using earlier releases can coexist with systems using the shared HFS capability, but they cannot write to files associated with other systems.

This capability is available in the R9 timeframe. For information about its availability, see <http://www.s390.ibm.com/oe/>

- **Support for WLM Multi-System Enclaves**

This support simplifies tasks related to the management of multi-system transactions in a parallel sysplex. It provides the capability for managing and

reporting on work requests that are executed in parallel on multiple MVS images as single entities.

- **More UNIX functions for Easier Porting**

- **An additional UNIX shell: tcsh**

- The new shell, **tcsh**, is an enhanced version of the Berkeley UNIX C-shell, a command interpreter that is commonly available on other UNIX systems.

- **Shared Library Support**

- Support is added for shared object libraries. Shared object libraries contain subroutines that can be shared by multiple processes. Programs using shared libraries contain references to the library routines that are resolved by the loader at run time. Shared library modules reside in the shared library region in memory.

- **UNIX 98 fuser utility**

- The **fuser** utility lists the process IDs of all processes running on the local system that have one or more named files opened. It is used primarily as a tool to determine which processes have files open; for instance, so that a file system can be unmounted.

- **Systems Management Features**

- **Access to System Variables from the Shell**

- The new **sysvar** command allows users to obtain substitution text for system variables that are defined in the IEASYMxx parmlib member or in the system IPL parameters. Shell scripts that run on multiple systems can use variable names such as SYSNAME.

- **File System Enhancements to D OMVS**

- The new PFS operand displays information about the current configuration of the physical file system.
 - The new CINET operand displays routing information in effect for active transport providers using the Common INET Pre-Router.

- **BPXBATCH Entry Point for Local Spawn**

- An alternate entry point, BPXBATSL, is provided for BPXBATCH. BPXBATSL, which is an alias for BPXBATCH, behaves exactly like BPXBATCH, except that it does not require resetting of environment variables. This allows for more accurate measurement and analysis of the system.

- **pax Support for Long Link Names**

- The **pax** utility now supports hard link and symbolic link names that are over 100 characters in length.

- **PFS Recycle for TCP/IP Maintenance**

- PFS Recycle provides a controlled way for a PFS to terminate and restart so that its kernel-resident load module can be deleted and reloaded for APAR service without a re-IPL. This support benefits all users of TCP/IP.

- **Debugging Improvements**

- **BPXPRMxx Parmlib Member Syntax Checker**

A new SETOMVS command parameter, SYNTAXCHECK=(XX), allows users to check the syntax of a BPXPRMxx parmlib member before using it to IPL. Any syntax errors are sent to the hardcopy log.

– **JOBLOG to STDERR**

This support provides allows WTO messages normally targeted to the JES JESYSMSG file to be redirected to a joblog in the HFS.

– **dbx Support for Long Long Data Type**

Support is added to **dbx** to enable programmers to debug C/C++ programs that use the long long and unsigned long long data types.

– **dbx Support for Read/Write Locks and Shared Memory Mutexes**

dbx is enhanced to support Language Environment debug events for read/write locks and shared mutexes (LE CEEVDBG).

OS/390 UNIX System Services Parallel Environment

The Parallel Environment for OS/390 provides the infrastructure for distributed parallel programming under OS/390 UNIX System Services on a network of OS/390 systems (Sysplex). The core of Parallel Environment is an implementation of the industry standard Message Passing Interface (MPI). It provides the C and C++ APIs or MPI 1.2 and major functionality of MPI 2. The Parallel Operating Environment (POE) provides a single point of control for managing parallel programs. Development tools for parallel software like tailored compile scripts and parallel debuggers are also part of Parallel Environment.

Server Consolidation

Distributed File Service

For Release 9 the Distributed File Service continues to provide both DCE DFS; SMB file support for Windows and OS/2 clients; and SMB print support for Windows clients. Improvements include performance and RAS enhancements for both DFS and SMB. The SMB support is enhanced to provide support for a Windows NT compatible challenge/response protocol to affect SMB password encryption. .p. The SMB support, introduced in Release 8, enables a basic workgroup distributed file sharing infrastructure for OS/390 HFS files and Windows workstations to facilitate the development and deployment of applications for OS/390. It is intended as a vehicle for supporting shared access to data that has a natural affinity to OS/390 application environments. It is not intended to replace PC server functionality for managing a local area network for security or local file access. The SMB server also provides print serving support for Window clients, allowing the SMB protocol to be used to send print requests to the InfoPrint Server, thus removing the need for additional print client code or unique printer setup steps on the user workstation. The SMB server support does not require DCE but the DFS server support for DCE clients can coexist with and can be provided by the same DFS server running on OS/390.

HCD

HCD provides the following enhancements:

- LDAP Exploitation

HCD provides a back-end for the LDAP server that allows the retrieval and update of data stored in an IODF. User authentication is performed using the RACF back-end.

- Generation of an ESCON Director Matrix

A function is provided that allows you to generate a switch configuration based on the connections of the switch ports to channel paths and control units.

- Other Enhancements

HCD provides the following additional enhancements:

- A profile option has been introduced that allows you to specify the maximum number of lines per page for HCD reports.
- A profile option is provided to force all HCD reports to have only uppercase output.

HCM

HCM provides the following enhancements:

- Integration of System Automation for OS/390 I/O Operations GUI functionality

HCM provides tasks which can be currently done with the GUI of ESCON Manager or I/O Operations of System Automation for OS/390. This functionality uses the I/O Operations API on the host. In particular, the following functions are provided:

- Viewing graphically the hardware configuration of the active systems (of the sysplex) and its status
- Sensing of configuration data of the active systems
- Manipulating the active switch matrix and the matrices saved in a director
- Performing operations on the switch matrix
- Issuing commands to I/O Operations of System Automation for OS/390

- Physical Connectivity Enhancements

These enhancements allow the user to create and maintain permanent connections between patchports and other appropriate objects, such as ports on ESCON directors. The user is able to make connection changes without having to rebuild all or most of the ESCON link information. In addition, the Cabinet dialog has been improved.

- Other Enhancements

The following additional enhancements have been made to HCM:

- HCM exploits the Generate Matrix function introduced into HCD.
- The user can now delete multiple selected objects in one step.
- HCM provides the capability to make a colored printout of the configuration diagram.
- A 32 character comment field on cables is introduced.
- The minimum screen resolution has been changed to 800 x 600.
- The diagram text is made more readable on the screen by zooming in farther.
- The IODF description is now shown in hardcopy reports.

- HCM provides the capability to include unused cables in its reports.

DCE

For DCE Release 9 the cross-memory credentials support has been added. This is an alternative to Kerberos credentials cache file support that is available only to DCE applications (not to native Kerberos applications). This enhancement eliminates a potential bottleneck by removing the need for HFS credentials cache file I/O and allows the credentials cache to be shared within the same sysplex. The applications that will benefit from this support are server applications that use delegation or impersonation to make outbound requests on behalf of a client. This support is available only through DCE interfaces and requires the DCE Security Server to be running on each system in the sysplex.

Technology Leadership

Workload Management

An **enclave** is an anchor for a transaction that can be spread across multiple dispatchable units in multiple address spaces. Even though the work is being processed on more than one address space, as part of an enclave it can be reported on and managed as a single unit. The resources used to process the work can therefore be accounted to the work itself, rather than to the address spaces on which the work is running. And if the work in the enclave is managed to a performance goal, you can ensure that the work receives the appropriate resources no matter where it is running.

With the introduction of **multisystem enclaves** in OS/390 Release 9, enclaves can now run in address spaces on multiple systems within a sysplex. Work begun on one system, for instance, can be split into parallel tasks that can then be exported to other systems for parallel processing. As in a single system enclave, the work will still be reported on and managed as a single unit.

JES3

Enhancements for OS/390 Version 2 Release 9 JES3 provide the ability to:

- Define aliases to the NJE home node
- Define a range of devices with one DEVICE statement
- Specify that a device is attached to all systems in the complex without listing the system names
- Add, delete, and change DEVICE, SETNAME, and DYNALDSN statements during a hot start with refresh without requiring an IPL.
- Change all parameters on the SETPARAM statement, except SMSSETUP, during a hotstart with refresh without requiring an IPL.
- Make HCD configuration changes that affect devices defined to JES3.

BCP

Structure Full Monitoring

Structure Full Monitoring makes an installation aware of the structures that are approaching a full threshold percent of 80%, so that the appropriate diagnostic or tuning actions can be taken to avoid a structure full condition.

The following new messages may be issued in association with Structure Full Monitoring:

- IXC585E indicates a structure is at or above its structure full percent in terms of one or more of the monitored objects the structure contains.
- IXC586I is issued when the structure full condition is relieved.
- IXC587I indicates that Structure Full Monitoring has been discontinued for a particular structure.

Transaction Trace

Transaction Trace provides a consolidated trace of key events for the execution path of applications or transaction work units. It helps system programmers trace the high level, cross server, and cross system path of a sysplex transaction. Before transactions can be traced, they must be processed through WLM Classify.

Transaction Trace introduces two new macros, ITZQUERY and ITZEVENT. ITZQUERY is the Transaction Trace Query macro. It is used to determine if a particular transaction or work unit should be traced. ITZEVENT is the Transaction Trace EVENT Record macro. It builds and records a transaction trace record and can perform the same query function as ITZQUERY. If the ITZEVENT query function is used, it is not necessary to use the ITZQUERY macro.

Transaction Trace adds a new keyword, TT, to the MVS TRACE and DISPLAY TRACE commands. The TT keyword on the TRACE command is used to start the trace and set the trace filters. The trace is activated for selected transactions that are specified by work qualifiers on the TRACE TT command. The TT keyword on the DISPLAY TRACE command is used to view the Transaction Trace settings.

Transaction Trace also adds the COMP(SYSTTRC) parameter to the IPCS CTRACE subcommand, which is used to view the trace records, and adds several new ITZxxxxl informational messages.

DFSMS

Optional SMS management of PDSEs and HFS data sets

This support provides more consistency in the way that PDSs, PDSEs, and HFS data sets are managed. This greatly reduces the complexity of activities such as maintenance, cloning a system, or migration. DFSMS with PTFs lets you allocate and use PDSE and HFS data sets on non-SMS managed volumes. This new enhancement provides the ability to have more than one PDSE with the same name (on different volumes), uncataloged PDSEs, and concurrent access to multiple PDSEs with the same data set names.

Refer to *OS/390 Planning for Installation* for a list of the PTFs required for DFSMSdfp, DFSMSdss, TSO/E, ISPF and the BCP.

This function allows easier maintenance of multiple OS/390 images.

- Non-managed PDSEs need not be cataloged.
- Makes it easier for PDSEs to reside on SYSRES, can clone the volume now since the catalog requirement is removed.
- Allows indirect cataloging "volume(*****)" and extended indirect cataloging
- You can have more than one PDSE with the same name.
- You can concurrently access multiple PDSEs with the same dataset name.
- You can manipulate uncataloged PDSEs.
- DFSMSdss can logically dump and restore the SYSRES volume containing PDSEs. All functions are supported.

Guide to Version 2 Release 8

e-Business

Firewall Enhancements

In OS/390 Version 2 Release 8, the OS/390 Firewall Technologies Virtual Private Network (VPN) capabilities are being enhanced to support the ISAKMP/Oakley (Internet Security Association Key Management Protocol) key management protocols. The ISAKMP/Oakley protocols are a set of open standards defined by the IETF's (Internet Engineering Task Force) IP Security (IPSec) working group which define a method for the dynamic negotiation of keys and algorithms used to create IPSec Security Associations (SAs) between systems in a virtual Private Network.

Secure Sockets Layer (SSL)

This support is being provided by a joint offering between the Communications and Security Servers for OS/390. System SSL support for OS/390 Release 8 includes the exploitation of RACF Certificate Support, allowing for the consolidation and sharing of digital certificates among System SSL applications and other products, and a new orderable FMID, providing additional encryption capabilities available outside the US and Canada.

LDAP

The Release 8 OS/390 Security Server provides support in the LDAP Server for handling the LDAP Version 3 (V3) protocol. This includes implicit bind, SASL bind, V3 referrals, handling of controls, and rootDSE support. The LDAP Server also provides internationalization support which involves handling data from clients that may be in either UTF-8 or local code page format, maintaining the data throughout operations, and conversion and storage of the data in the server backends. The LDAP client and server are both packaged in the OS/390 Security Server and are always enabled.

OS/390 Security Server Open Cryptographic Enhanced Plug-ins (OCEP)

OS/390 Version 2 Release 8 introduces Open Cryptographic Enhanced Plug-ins (OCEP), which is a new component to the OS/390 Security Server. OCEP is intended to be used with the framework provided by the Open Cryptographic Services Facility (OCSF). OCEP provides two service provider modules; one for data library services and the other for a trust policy manager. These service provider modules enable applications to use OS/390 Security Server (RACF), or equivalent product, to provide security functions for digital certificates and key rings.

WebSphere Application Server

WebSphere Application Server Enterprise Edition for OS/390 expands to fit your Web application server needs. It ranges from simple Web page serving to complex Web transaction processing. Enhancements for Release 8 include:

- Continued HTTP standards compliance
- Persistent Connections support—one 'browser to server' connection is provided per server
- Enhanced problem determination and debugging support for DUMP processing, logging, reporting, and diagnostic messages
- More integration with OS/390's Workload Manager, providing classification at the request level (versus connection level)

OS/390 Security Server (RACF)

For Version 2 Release 8, OS/390 Security Server (RACF) features the following enhancements:

- Class Descriptor Table Enhancements

The RACF class descriptor table (CDT) has been updated to provide additional support for the following products:

- CICS Transaction Server

The SCICSTST and UCICSTST classes can now support resource names that contain 25 characters. This support enables CICS to enhance its support of temporary storage queues in a sysplex; customers can specify longer and more meaningful resources names to their CICS regions.

- OS/390 SecureWay Communication Server

The new SERVAUTH class has been created to provide improved security for TN3270 access to OS/390 systems. The OS/390 SecureWay Communication Server can use SERVAUTH to perform authorization checks and determine which users can connect to which servers using specific communication ports.

- Java for OS/390

The new JAVA class has been created to enable Java for OS/390 applications to define and check access to application-specific resources.

- DB2 Support

In Release 8, RACF introduces eight new classes, which support the following DB2 Version 6 objects:

- "User-defined" distinct types
- "User-defined" functions
- Schemas
- Stored procedures

The RACF/DB2 external security module (IRR@XACS) has also been updated to map access requests for these DB2 objects and privileges into the new RACF classes.

In addition, implicit ownership of PLAN or PACKAGE (which are objects that were included in the RACF support for DB2 Version 5) now allows a user

some, but not all, of the privileges that are associated with these objects. A list of the objects and associated privileges follows:

Object	Privilege Required
PLAN	BINDAUT
PACKAGE	BINDAUT and COPYAUT

The RACF/DB2 external security module also supports TRIGGER, which is a new DB2 privilege to control the ability to create a trigger on a table.

- **ICETOOL Support**

The DFSORT program product provides a reporting facility called ICETOOL. With this support, you can now create ICETOOL reports, based on the output files from the RACF database unload utility (IRRDBU00) or the SMF data unload utility (IRRADU00). The SYS1.SAMPLIB member IRRICE contains the DFSORT statements that are needed to select records. It also contains the ICETOOL statements to produce and format a variety of reports.

- **Lotus Notes for OS/390 and Novell Directory Services for OS/390 Support**

This enhancement enables RACF to map a user identity from a Lotus Notes for OS/390 or Novell Directory Services for OS/390 application to a RACF user ID. The R_usermap callable service provides user identity mapping functions. After an application has determined a user's RACF user ID, it may choose to use this user ID when accessing MVS resources, such as data sets, and OS/390 UNIX System Services (OS/390 UNIX) files. As such, existing OS/390 UNIX functions, resources, and operating system security can be maintained while application servers are consolidated.

- **OS/390 UNIX System Services: Superuser Granularity**

This support introduces the new UNIXPRIV class, which enables customers to define profiles that grant RACF authorization for certain OS/390 UNIX privileges. These privileges are automatically defined for all users that are defined with OS/390 UNIX superuser authority. Now, by defining profiles in the UNIXPRIV class, you can specifically grant certain superuser privileges, with a high degree of granularity, to users who do not have superuser authority. With this approach, you can reduce the number of users who have superuser authority at your installation.

- **OS/390 UNIX System Services: User Limits**

With this support, you can control the amount of resources that are consumed by individual OS/390 UNIX users. Resource limits for most OS/390 UNIX users are determined by the BPXPRMxx member of the PARMLIB. Using the ADDUSER and ALTUSER commands, you can specify and adjust the following limits, which are stored in the OMVS segment of the user profile:

- CPUTIMEMAX
- ASSIZEMAX
- FILEPROCMAx
- PROCUSERMAX
- THREADSMAX
- MMAPAREAMAX

- **Protected User ID**

This support allows customers to define RACF user IDs that cannot be used for activities such as logging on to TSO or signing on to CICS. A user ID becomes a protected user ID when it is given the NOPASSWORD and NOOIDCARD

attributes by an ADDUSER or ALTUSER command. As such, the user IDs that are defined for OS/390 UNIX, UNIX daemons, and other important subsystems or started tasks can be protected from being used for other purposes and from being revoked after several unsuccessful attempts to enter a password. This support also protects these user IDs from being misused if the RACF administrator does not change the password of the user ID to from the default group to a more secure value.

- Public Key Certificate Enhancements

These updates expand RACF's support of digital certificates and Open Cryptographic Enhanced Plug-ins, which is a new component of the OS/390 Security Server. Updates to the RACDCERT command and new functions (DIGTTING class, IRRSDL00 callable service) enable RACF to perform additional functions, including:

- Generating certificates and private keys for server applications
- Processing certificate requests that were generated elsewhere
- Providing support for the OCEP Data Storage Library and Trust Policy service provider modules, which are designed to be used with OCSF.

Combined, these enhancements enable RACF to function as a limited certificate authority. RACF can accept certificate requests and sign those certificate requests with a certificate authority that is managed by RACF.

- R_admin SETROPTS Support

With this enhancement, the R_admin callable service can be used to set (alter) and retrieve RACF SETROPTS information. (The R_admin callable service can be used by any application that is running in supervisor state and key 0.) Information can be retrieved in two formats. One format is equivalent to the format of the data supplied on the alter request; the other format returns the data as a series of SMF data unload output records.

SecureWay Communications Server for OS/390

IBM continues to deliver on its commitment to provide enterprise-class universal connectivity and information access for cost effective network computing in the S/390 e-business environment. Release 8 will include the following enhancements:

- Enhanced Multipath Load Balancing improves the ability to optimally utilize IP network resources by balancing IP network traffic loads across routers, OSA adapters and gateways attached to a S/390 to achieve increased network throughput.
- Service Policy Enhancements improve the capability to monitor and manage Service Level Agreements (SLA) for network performance. Additionally, service policies can be dynamically updated without impacting network availability. In this manner, the new service policies can be implemented anytime to meet the changing needs of the enterprise network.
- Virtual Addressing (VIPA) Takeover provides a dramatic new solution for high availability in a Parallel Sysplex environment employing TCP/IP networking with CS for OS/390. VIPA takeover allows real IP addresses for network connections to be associated with a pseudo address, or VIPA, assigned to an end point in the S/390 server. If a connection fails, traffic is automatically and transparently routed over an alternate connection associated with the same VIPA. VIPA takeover further enhances the high availability attributes of CS for

OS/390's TCP/IP Services when the VIPA is located in a Parallel Sysplex image. When there is a system software failure impacting the VPA endpoint, this VIPA takeover function allows the VIPA end-point to be moved non-disruptively to an available alternate image in the sysplex. Availability is therefore greatly improved while providing the flexibility to reduce or eliminate the need to reserve spare processing capacity to cope with such failure

- Security Improvements
 - Internet Key Exchange (IKE) is an Internet Engineering Task Force (IETF) endorsed key and security association management protocol for IPsec. CS for OS/390 can use the IKE support that is available in the optional Security Server to automatically create and securely distribute encryption keys for dynamic IP clients. In this way, the manual effort and time involved in managing and distributing encryption keys for IPsec secured networks is substantially reduced. These enhancements also support the non-disruptive refresh of keys. Utilizing the capabilities of this function, it is more practical to change keys more often to enhance protection against brute force attacks on the network.
 - SNA users can take advantage of Triple DES session level encryption, which provides dramatically improved encryption capability. Triple DES is export controlled and restricted to certain industries outside of North America. This capability can be exported only pursuant to an appropriate license.
 - Security against unauthorized access to S/390 SNA applications from TCP/IP clients is made more robust by the addition of Secure Sockets Layer (SSL) client authentication to the TN3270e server. An end user must present a certificate from a trusted certificate authority.
- Improved interoperability further enhances the capability of CS OS/390 to easily operate and manage mixed TCP/IP and SNA network environments from the S/390 enterprise server. A VTAM display will allow network personnel to be able to identify the DNS name of a connecting TN3270 client, its IP address and its SNA LU resources status. This will enable network operators to quickly and easily resolve end-user requests for assistance.
- TN3270e Exploitation of RACF Certificate Support uses the RACF certificate registration capability that adds additional security checking mechanisms to ensure that an end-user is an authorized user of the TN3270e server prior to the user receiving a log-on screen.

Note: eNetwork Host on Demand (HOD) Version 1 will no longer be distributed as part of the SecureWay Communications Server for OS/390, beginning with OS/390 Release 8. OS/390 customers utilizing the HOD Version 1 function will be provided with the HOD-Entry product, including ongoing maintenance, at no additional charge.

Application Enablement

Language Environment

Highlights for Version 2 Release 8 of Language Environment include:

- **New RAS Item:** The addition of the version, release, and modification levels to the Language Environment Storage and Options Report will aid you in troubleshooting, thus improving serviceability.
- **Debugging Support:** Greater debugging support will be provided through detecting and externalizing multiple enclaves within the run-time option POSIX(ON) in a Language Environment process.
- **Run-Time Options Support:** An additional suboption will be added on the MSGFILE run-time option to inform Language Environment to serialize the message file using ENQ/DEQ services. You will be able to avoid conflicts while writing to the shared MSGFILE destination by using the ENQ suboption for each MSGFILE destination that will be shared.
- **Porting Simplifications:** Libascii has been placed into the base of OS/390 Language Environment. This will simplify the porting of ASCII-based UNIX applications to OS/390. Previously, libascii support was only available from the Web. This enhancement will provide ASCII translation support to C/C++ applications. Native support of **sprintf()** and **vsprintf()** functions will improve your performance in ASCII-based UNIX applications.
- **Language Environment Support for Unicode through UTF-8:** Interoperability of ASCII and EBCDIC data will be supported through data converters to and from UTF-8 and UCS-2, so that more applications can access the data. Note that this support is provided for IMS only and not for DB2 and CICS on Release 8.
- **VSAM Record Level Sharing (RLS):** Support is added in C/C++ for VSAM RLS, which provides for the sharing of VSAM data at the record level, using the locking and caching functions of the coupling facility hardware.
- **VisualAge PL/I for OS/390:**

A new PL/I compiler, VisualAge PL/I for OS/390, is supported with Language Environment. Although it is similar to the PL/I compiler, there are many improvements compared to that compiler, such as the elimination of restrictions when using the FETCH macro.

Text Search

Text Search is new in Release 8. It consists of two components: the IBM Text Search Engine and the NetQuestion Solution.

The Text Search Engine provides high-quality information retrieval systems for large collections of documents. It can index and search in any one of the supported 25 languages; these include two bi-directional languages and four double-byte character set languages. It supports several different index types and both free-text and Boolean queries. The Text Search Engine includes a set of APIs for building applications that require powerful search capabilities. It also enables your e-business customers to quickly find the information they are looking for on your internet site.

The NetQuestion solution is a ready-to-use Web search solution based on the Text Search Engine. It is suitable for both intranet search services and e-business solutions. Documents stored on the OS/390 domain are indexed and searched

using the Text Search Engine. The NetQuestion Solution uses the Web server provided by the OS/390 operating system. This is accessed through TCP/IP-connected workstations using a Web browser.

The IBM Text Search Engine is also exploited by the DB2 OS/390 Text Extender and is thus tightly integrated into DB2 OS/390.

OS/390 UNIX System Services

Highlights for OS/390 Version 2 Release 8 UNIX System Services include:

- **Support magic number (#!)** processing on spawn and exec.
- **The cp and mv commands enhanced** to now copy and move data between HFS files and MVS partitioned data sets.
- **Addition of shell support for double-square bracket** conditional testing, and autoloading functions to make the porting of shell scripts from other platforms easier.
- **Support FILESYSTYPE, SUBFILESYSTYPE, and NETWORK** on the SETOMVS command eliminating the current method of adding the statement to BPXPRMxx and issuing a re-IPL.
- **BPX1CTX** - Get/Set Context for improved security processing within the Java environment.
- **Addition of surrogate userid** for su and setuid so that programmers can act as system administrators without granting them all superuser authority.
- **Debugger improvements** including new onload feature and several performance improvements
- **Baan enhanced** to work within a Multi Process/ Multi User environment.
- **Commserver IOCTL for VIPA** support added.
- **Security Enhancements** including superuser granularity and protected user ID.
- **Performance improvements** including conformance with the UNIX 98 Async I/O Syscalls.

Server Consolidation

Infoprint Server for OS/390

OS/390 Print Server was introduced in Release 5 to enable OS/390 as an enterprise print server to manage host and LAN-based printing. In Release 8, OS/390 Print Server is renamed to Infoprint Server for OS/390 and provides the following additional print and print management capabilities:

- **Consolidated Printer Inventory:** A new consolidated printer inventory allows all printers used with the Print Interface, NetSpool, and IP PrintWay components of Infoprint Server to be defined and modified from a single interface, using ISPF panels. This single printer inventory can be used for job validation, assignment of default print attributes, and routing for all OS/390 print.
- **Improved NetSpool Usability:** Because all printer information is now contained in the consolidated printer inventory, NetSpool users no longer need to specify OUTPUT JCL statements in the NetSpool startup procedure.

- **Printer Management Support:** Printer management using the industry-standard TCP/IP Simple Network Management Protocol (SNMP) is supported for printers driven by Print Services Facility for OS/390.
- **Internet Printing:** Internet Printing Protocol (IPP) is emerging as the standard for printing from any computer to any printer via the Internet. A new IPP server in Infoprint Server enables seamless printing from IPP-capable clients. IP PrintWay includes an IPP client for submitting jobs either to printers that contain an IPP server or to other IPP servers.
- **Windows Printing:** New server support lets Windows clients submit print jobs, query job and printer attributes, and cancel jobs without requiring special software to be installed on each Windows client.
- **Batch Printing:** The new AOPPRINT JCL procedure provides simplified batch printing. Users can print to printers defined in the printer inventory, thereby eliminating the need to specify JCL output parameters. Batch users can also use AOPPRINT to access other Infoprint Server functions. .
- **Application Programming Interface (API):** A new API lets customers write programs to use the job spooling, query, and cancel functions of Infoprint Server.

Technology Leadership

Base Control Program

Enhancements to the base control program (BCP) include:

- **XCF/XES**
 - **IXLCACHE Enhancements**

The IXLCACHE programming interface used to delete entry names from a cache structure allocated in a coupling facility of CFLEVEL=7 or higher is enhanced to improve its performance. DB2 will exploit and benefit from this enhancement.
 - **Monitoring for Hang Conditions**

XES provides support for monitoring certain XES processes that require a response from all active structure connectors. When an expected response from one or more of the connectors is not received in a timely manner, XES issues a message for each non-responding connector to the operators to alert them of a potential hang condition. The operator or automation can then take the appropriate actions to diagnose or alleviate the hang condition.
 - **XCF Signalling Enhancements**

The XCF signalling service is extended to support messages as large as 128M bytes in length. Prior to the XCF Large Message Support, messages could be at most 61K bytes long.
 - **System-Managed Rebuild**

System-managed rebuild provides a simplified protocol for structure rebuild in planned reconfiguration scenarios. The system performs all the significant steps in the rebuild process with minimal participation by the

connectors, although the connectors are aware that the structure is temporarily unavailable. This function requires the following:

- The structure to be rebuilt must reside in a coupling facility at CFLEVEL=8 or higher and the preference list in the CFRM policy must contain two or more coupling facilities at CFLEVEL=8 or higher.
- All systems in the sysplex must be at OS/390 Release 8 or above for a system-managed rebuild to be initiated. Lower-level systems can be in the sysplex, but cannot use the CFRM couple data set or the coupling facilities.
- The CFRM couple data set must be reformatted with a new ITEM NAME(SMREBLD) NUMBER(1) statement and can be activated as the primary CFRM couple data set.

Note: Only systems at OS/390 Release 8 or higher support using a couple data set formatted with this new statement.

– Structure Computation Service (IXLCSP)

The new IXLCSP service provides the ability to compute either a structure size, given structure attributes and object counts, or structure object counts, given structure size and attributes. The calculations do not result in the actual allocation of a structure in the coupling facility, nor do they affect the current contents of the target coupling facility in which the results are determined. IXLCSP requires that the coupling facility for which the calculations are to be performed be defined in the active CFRM policy, be connected to the system from which IXLCSP is issued, and be at CFLEVEL=8 or higher.

– Unique Sysplex Clock Value

XCF provides support for the new architected 128-bit extended time-of-day (ETOD) clock that is available on S/390 Parallel Enterprise G5 Servers. The extended architecture ensures that XCF will return a clock value that is unique across the sysplex.

– LPAR Sysplex Timer

XCF provides support for a logical time offset relative to the Sysplex Timer time that can be set for a group of LPARs that make up a sysplex running on multiple CECs. This allows multiple sysplexes with different time settings to run on the same CECs with the same Sysplex Timer.

• Timer Services

Several macros are updated to support the new architected 128-bit extended time-of-day (ETOD) clock that is available on S/390 Parallel Enterprise G5 Servers. The CONVTOD, STCKCONV, STCKSYNC, and TIME macros are updated to process the 128-bit ETOD clock value or to simulate its contents if the ETOD clock is not available.

TSO/E

Enhancement to REXX Replaceable Load routine interface--allows a caller to specify an "extended execname," which can be greater than 8 characters in length, or can be case sensitive, or both. Previously, TSO/E REXX would only support a default name of 8 characters or less. The enhancement is available for OS/390 V2R4 TSO/E and later with the fix for APAR OW28404 (UW54375 PUT9812) installed.

As part of this support, the TSO/E REXX Function call interface and the MVS REXX Host command interface have been enhanced to allow a Replaceable Load Routine to load and return an In-Storage Block for an "extended name" exec. The REXX PARSE SOURCE token has been expanded to support extended execnames, and new messages IRX01051 and IRX01061 have been created.

To utilize this new support, the user must code a replaceable LOAD routine that can handle loads of execs with names that are greater than 8 characters in length; otherwise, TSO/E REXX will continue to behave as it did prior to this new function APAR support.

ISPF

ISPF DM Component Changes

The DM component of ISPF includes the following new functions and enhancements:

- Support added for "VER(variable, DSNAMEQ)".
- Support added for four-digit year on TBSTATS command and Option 7.4.
- Support added for four-digit year on TBSORT command.
- Message numbers were added to ISPF Line Mode messages.
- Support added for date format in Configuration table.
- Support added for a print utility exit for ISPF termination and Log/List commands.
- Support added for NEXT and PREV commands for Dialog Test Tables.
- The ZSCRNAME modifiable shared variable, containing the current screen name, was added.
- The ZPFKEY variable, which returns the name of the PFKey on exit from a panel, was added.
- The TPUT buffer size variable was added to the configuration table.
- The ISPSPROF system variables were moved to the configuration table.
- Support was added for commands chained after the START command.
- ISPDTLC enhancements:
 - New invocation options: NOPLEB / PLEB, NOMCOMMENT / MCOMMENT.
 - New tags: ATTENTION.
 - Added "German to Swiss German" character transform to create Swiss German panels from German DTL source files.
 - Expanded number of DTL source files for interactive processing from 4 to 12.
 - Allow DTL type comments (<: -;-; or <!-;-;) in MVS profile data stream.
 - Allow SOURCE tag within ABC, AREA, PANEL, and REGION tags.
 - Added "Options" to action bar of interactive panel as an alternate method of setting conversion options.
 - Added support for macro tags.

ISPF PDF Component Changes

The ISPF PDF component contains the following new functions and enhancements:

- Conversion of the ISPF configuration table to a keyword format.
- Introduction of an interactive tool to create and update the keyword file and to build the needed load module from the keyword file.
- Edit CUT and PASTE commands. Data is saved in data spaces with multiple clipboards available.
- The Edit MOVE, COPY, CREATE, and REPLACE commands now accept a data set name or data set name and member name as a parameter.
- A VSAM editor or browser can be specified in the configuration table and is invoked automatically when a VSAM data set is specified in Options 1, 2, 3, or 11.
- Through the EPDF command, Edit, View, and Browse functions are available from any command line.
- A new edit macro VOLUME command to retrieve the volume of the data set being edited.
- The edit macro RECFM has been enhanced to return the full record format rather than just F or V.
- The new edit macro SESSION command returns EDIT, EDIF, or VIEW, as well as indicating whether the session was initiated from SCLM.
- Edit STATS mode is no longer forced to OFF if a sequential data set is edited. The STATS mode is simply ignored.
- The target data set for the Move/Copy utility or the Edit CREATE and REPLACE commands can be allocated automatically if it does not exist.
- Edit highlighting of FIND strings and the cursor phrase is enabled for data wider than 256 bytes.
- When the View REPLACE command is used to update the member being viewed, the confirmation panel shows whether the member has been updated by someone else during the View session.
- LMMDISP, LMMFIND, and LMMLIST return individual variables for load module statistics when STATS(YES) is specified.
- The COBOL and PL/I options in Foreground and Batch have been consolidated into 1 COBOL option and 1 PL/I option.
- Data set information processes multivolume data sets with more than 20 volumes.
- Member list REFRESH command added.
- Member list SORT and LOCATE honor the collating sequence table in the PDF translate tables.
- The creation date is displayed on the Confirm Delete panel for VSAM data sets.
- AIX paths are identified in Option 3.4 with *PATH* in the volume column.
- REFLIST function improved.
- A warning message displays on the first data change made while in View.

- RIGHT and LEFT commands are supported in member list to enable the presentation of additional data such as full 4-character year dates.
- The LMMDISP service allows the selection of members that do not exist in the data set being processed.
- SuperC supports VSAM files.
- SuperC supports the FMSTOP performance option which stops on the first mismatch for file compare. FMSTOP is also supported for string searches.

ISPF SCLM Component Changes

The ISPF SCLM component contains the following new functions and enhancements:

- When a language that is not valid is specified on the SPROF panel, a scrollable table display of the valid languages is presented so the user can choose the desired language.
- ISPLNK is a valid CALLMETH for non-BUILD translators.
- A sample DTL parser and translator are available.
- Additional samples added to SAMPLIB.
- An AUDITDEL service was added to enable audit records to be deleted through an API.
- An SCLM EDIT service was added to enable editing of SCLM controlled parts from a dialog.
- The data set name and member is added to the SPROF panel (FLMEINFO) to assist users when selecting a language for a part.
- The ability to specify that SCLM temporary load libraries should be allocated as PDSEs has been added.
- Two new exit points added.
- The outputs from a build step done with change codes are available as inputs to subsequent build steps.
- SCLM warning messages issued by the PDF editor when an SCLM controlled member is edited are only issued if the member's directory entry indicates the member is SCLM controlled.
- SCLM Versioning can be directed to ignore sequence number differences.

ISPF Client/Server Component Changes

The ISPF Client/Server Component enables a panel to be displayed unchanged (except for panels with graphic areas) at a workstation using the native display function of the operating system of the workstation. ISPF manuals call this "running in GUI mode."

The ISPF Client/Server component changes are:

- Support added to provide for an automatic download of the Client/Server component.
- Enhanced usability and function of the Client/Server component download panel.

- Support added to enable initiation of a workstation connection (without GUI display) while in split screen mode.
- New WSCON and WSDISCON commands to improve entry to the ISPF C/S interface.
- Enable one or more ISPF screens to *Switch* back and forth between GUI and 3270 modes by using the new Switch commands.

JES2

With the addition of System Managed Rebuild, the management of JES2 checkpoint structures is simpler. Previously, if a coupling facility was taken offline for service, actions were performed using the JES2 reconfiguration dialog to ensure the JES2 checkpoint was moved off the coupling facility. With JES2's exploitation of System Managed Rebuild, the same command (SETXCF START,REBUILD) that moves other structures off the coupling facility will also move the JES2 checkpoint off the device. No special procedure is needed for JES2. However, if you move the checkpoint from a coupling facility to DASD, the JES2 reconfiguration process must still be used.

JES3

In release 8, JES3 continues to select jobs for execution but gives you options in managing the initiators that run these jobs. A new parameter, MODE, on the JES3 GROUP initialization statement allows you to specify whether the jobs defined by the GROUP should be run by JES3-managed initiators (MODE=JES) or WLM-managed initiators (MODE=WLM). In this way, JES3 provides additional efficiencies in processing your workload.

OSA/SF

OSA/SF V2 for OS/390 V2R8 is enhanced to provide:

- A Windows-based GUI for monitoring and controlling OSA-2 and OSA-Express features
- OSA/SF also supports the OSA-Express Gigabit Ethernet, Fast Ethernet, and ATM hardware features, as well as the OSA-2 hardware features.

Guide to Version 2 Release 7

e-Business

Firewall Enhancements

IPSec (Communication Server) and FWTUNNL (Security Server)

Upgrades have been made to the current Firewall Communication Server IPSec code to support both the RFC and IETF draft level function. This involves supporting the HMAC_MD5 and HMAC_SHA authentication algorithms, the Triple DES encryption algorithm, replay prevention and a new transform that allows authentication and encryption to be performed using a single ESP header. The Security Server FWTUNNL configuration command is being enhanced to support several new parameters required by the upgrade. These parameters included RFC/draft indicator, replay prevention and new transform support. The command is also being updated to allow administrators to specify different AH/ESP SPI values, encryption/authentication keys and source and destination policy information.

Multi Stack Support

For those environments with more than 1 stack on an OS/390 image, each internet connected stack will have the capability of being protected by the OS/390 Firewall Technologies. Updates include the ability to target a stack to the FWNAT and FWDNS command and GUI requests. A new command FWSTACK is also being added to allow an administrator to identify which TCP/IP stacks are to be protected by the Firewall Technologies.

System Management (GUI/Server)

A user-friendly GUI to administer and configure the OS/390 Firewall Technologies (similar to the AIX and NT Firewall GUI) has been provided. This implementation will require a partner configuration server to reside on the OS/390 Firewall. The communication between the client GUI and the configuration server will be protected through SSL and RACF.

Server Scalability Support

Scalability of Firewall FTP and SOCKS daemons was enhanced to allow a greater volume of concurrent user connections with more efficient utilization of system resources.

eNetwork Communication Server for OS/390

IBM will continue to deliver on its commitment to provide world-class TCP/IP solutions for e-business networks while increasing the integration of SNA/APPN and TCP/IP networking services. Release 7 will include the following enhancements:

- **Further improvements to TCP/IP Parallel Sysplex support to increase usability, availability and performance**

Parallel Sysplex Sockets will help reduce overhead and improve performance. Socket applications will learn when a vendor application is in the same MVS image or Parallel Sysplex cluster. This will enable applications to:

- Share information so that each application need not incur overhead to generate it when in the Parallel Sysplex cluster
- Achieve secure communications without the overhead of encryption

System-wide benefits include: reduced CPU cycles, improved overall performance, and reduced application overhead.

XCF Dynamics will offer nondisruptive horizontal growth for TCP/IP in a Parallel Sysplex environment. XCF Dynamics will make it possible to add new TCP/IP images without requiring coordinated definitions for existing Parallel Sysplex members. Only a single definition will be needed for each new TCP/IP image. This will make it easier to nondisruptively scale up to handle increased workloads without impacting the existing systems and their users.

System Symbolics for TCP/IP will reduce definition workload. This usability enhancement will reduce the number of definitions required for a TCP/IP stack in a Parallel Sysplex cluster through the use of system symbolics in the PROFILE.TCPIP and TCP.DATA configuration files.

- **Fast Response Cache Accelerator** will extend S/390's lead as enterprise server of choice.

Fast Response Cache Accelerator is expected to provide two times performance improvement. Customer requirements for even higher-speed Web performance will be addressed by this IBM-unique new technology. It will cache Web pages within the TCP/IP services stack enabling significantly faster processing of requests for Web pages.

- **Service Policy Agent** will offer Priority Networking for TCP/IP. The Service Policy Agent will enable a network administrator to control the performance characteristics of IP data packets as they travel the network by enabling the setting of the Type-Of-Service byte. This byte will be utilized by CS OS/390 and by IP routers for queueing and discarding algorithms to help ensure proper prioritization of IP data traffic. This enhancement will also enable differentiation of services based on administrative controls and service requirements. For example, differentiation can be made based upon:

- Service Level Agreements
- Classes of users
- Application needs (for example, high bandwidth)
- Mission-critical applications
- Time of day

- **Internet Security**

Firewall Technologies will be enhanced. Performance and RAS improvements will help minimize the overhead of critical network security technologies while helping to maximizing their RAS so that they are always on guard. Virtual Private Network (VPN) support will be upgraded to the latest draft level of IPSec for secure S/390 connectivity to servers that may have also upgraded to the latest draft level. This VPN enhancement will include the addition of HMAC-MD5 and HMAC-SHA authentication algorithms as well as replay

protection. Triple DES support will be added and will use S/390's triple DES encryption hardware if present.

Simple Network Management Protocol Version 3 (SNMPv3): This CS OS/390 Release 7 enhancement will deliver compliance and currency with Internet Engineering Task Force (IETF) standards and RFCs along with interoperability with other products desiring secure SNMP exchanges. These new capabilities will include message security, user-based security, and view-based access control.

- **Enhanced Addressing for TN3270 Server**

Enhanced addressing will be used by the CS OS/390 TN3270 Server in an APPN/HPR environment to significantly reduce the consumption of network resources and at the same time increase server capacity. Other session managers, such as TSO/VTAM, will also benefit from this improvement.

Cryptographic Services

Cryptographic Services includes ICSF (no new enhancements), Open CSF, and SSL.

Open Cryptographic Services Facility (OCSF)

The Open Cryptographic Services Facility (OCSF) is a derivative of the IBM Keyworks technology which is an implementation of the Common Data Security Architecture (CDSA) for applications running in the UNIX Services environment. The security services available in OCSF as defined by the architecture are cryptographic, key recovery, and digital certificate functions including trust, certificate manipulation, and data storage. OCSF is intended to be used by middleware, such as protocol providers, and applications that are running in a UNIX services environment.

System Secure Sockets Layer (SSL) Crypto

System SSL support provides a set of C/C++ callable programming interfaces for implementing Secure Sockets Layer (SSL) protected communications over a TCP/IP socket communications path. SSL is a communications layer that provides data privacy and integrity as well as server and client authentication based on public key certificates. Once a SSL connection is established between a client encryption and integrity added by the SSL protocol, with some performance degradation due to the addition of this security.

WebSphere Application Server

Enhancements to WebSphere Application Server for OS/390 (previously delivered as Domino Go Webserver 5.0) continue to build on the product's industry leadership position in support of critical applications. They provide additional performance, security, and Workload Manager (WLM) capability in concert with expanded user install options and configuration enhancements.

- **Security**

- Public Key Infrastructure (PKI) allows the server to exploit public key architecture
- Crypto keysize selection enables the server administrator to specify the level of encryption to be used
- Less complex and more secure key and certificate Management
- 128-bit encryption support for export (outside North America) browsers
- Triple DES exploitation of crypto hardware

- Multiple-IP SSL use of different certificates from each IP
- Lightweight Directory Access Protocol (LDAP) for client authentication and plug-in use
- **Workload Manager Exploitation**
 - Enables Secure Sockets Layer (SSL) requests to participate in Workload Manager (WLM) application environment queuing
 - Encourages efficient utilization of system resources by controlling into which application environments specific plug-ins are loaded
- **Systems Management**
 - User-defined install path allows multiple installations of a Webserver on the same MVS image
 - Configuration enhancements:
 - Frames based interface
 - Continued reliability, availability, and serviceability (RAS) improvements
- **Performance Improvements**

These include enhanced caching algorithms and override of page caching information

- **Java Servlet Support**

WebSphere Application Server is a portable, Java servlet-based execution environment that extends existing Web servers into Java Web Application Servers. It's a state-of-the-art, easy-to-use, and extensible way of deploying and managing Web applications across your enterprise networks. It is the nucleus of a scalable Web application platform.

WebSphere Application Server provides Java Servlet internal process support for OS/390 based on the latest JDK and JavaSoft kit.

Application Enablement

DFSORT

DFSORT is IBM's high performance sort, merge, copy, analysis and reporting product for OS/390 and MVS/ESA.

DFSORT is designed to optimize the efficiency and speed with which operations are completed through synergy with processor, device, and system features (for example, hiperspace, data space, striping, compression, extended addressing, DASD and tape device architecture, processor memory, processor cache, and so on) and other products (for example, The SAS System, COBOL, PL/I, IDCAMS BLDINDEX, and so on).

DFSORT includes Year 2000 features, the high-performance ICEGENER facility, the versatile ICETOOL utility, and multiple output capability with the powerful OUTFIL feature.

Release 14 provides important enhancements to DFSORT's productivity, performance, capacity and storage usage:

- Symbols for fields and constants in DFSORT and ICETOOL statements. Create and use symbols for your own data. Obtain and use symbols from IBM for data associated with RACF, DFSMSrmm and DCOLLECT.
- Time-of-Day installation options control. Adjust the resources available for DFSORT applications according to the day and time they run.

- More work and merge data sets. Sort and merge larger amounts of data.
- Simplified installation and customization. Deal with fewer FMIDs and libraries. Replace IEBGENER with ICEGENER quickly and easily.
- Improved performance, storage usage and virtual storage constraint relief for copy, merge and ICEGENER applications.
- More INCLUDE/OMIT conditions and SUM fields. Write more complex filtering and totalling applications.
- New OUTFIL features. Build multiple output records using the fields of each input record. Split records into pieces. Double and triple space in reports. Pad short fields.
- A new ICETOOL SELECT feature. In one pass, create separate data sets with records that meet and fail your specified criteria.
- Incomplete spanned records option. Set the return code (0, 4 or 16) and action (recover valid records or terminate) you want.
- SUM overflow option. Set the return code (0, 4 or 16) and action (continue or terminate) you want.
- LRECL padding and truncation option. Set the return code (0, 4 or 16) and action (continue or terminate) you want.

For more information, visit the DFSORT Web site at:

<http://www.ibm.com/storage/dfsor/>

Language Environment for OS/390

Enhancements for OS/390 Version 2 Release 7 Language Environment include the following:

- Region-wide installation default options
To set region-wide run-time options in CICS and IMS environments, installations can now use CEEROPT, a stand-alone run-time options module. Use of CEEROPT eliminates the need to reinstall the installation default options for every Language Environment release and maintenance fix.
- Performance enhancements in this release:
 - Provide a reduction in the EXEC CICS LINK path length.
 - Use less below-the-line storage.
 - Provide new default storage settings under CICS, reducing CPU time.
- Reliability, availability, and serviceability improvements
Installations currently using system dumps can now request that Language Environment take a system-only dump without a Language Environment-formatted CEEDUMP.
Installations can now obtain a system dump on first failure data capture prior to the Language Environment's error recovery process, using the run-time option TERMTHDACT with the UAIMM suboption
You can use an environment variable to add errno2 to perror() or strerror() messages.
- Eurocurrency support

Support is provided in Language Environment for the euro, the monetary unit of the European Monetary Union (EMU) that will be introduced alongside national currencies on the first of January 1999.

- Asynchronous I/O

Support is added for certain real-time signal services required to support asynchronous I/O)

- Shared mutexes and read-write locks

Compiler—writer interfaces are added to support shared mutexes and read-write locks. C function calls are also added.

- Version and release match

The Language Environment for OS/390 version and release numbers now match the version and release numbers of OS/390.

Application Enabling Technology

For Release 7, the following improvements have been made:

- For Release 7, OS/390 AET now supports Baan IVc applications
- It supports MQSeries for connectivity to VSE/ESA and VM/ESA systems.
- Various DB2 enhancements have been made, including support for multiple DB2 systems
- Print support has been added, which uses the OS/390 Print Server functions for printing on LAN—attached printers.

OS/390 UNIX System Services Kernel (OS/390 UNIX)

- Performance

This element has faster access to sockets through Asynch I/O Real Time Signal Extensions. A dynamic reduction in the path length of file name lookups should be achieved through selective bypass of SAF calls on pathname lookups.

- Reliability, Availability, and Serviceability

Full text will provide kernel error codes. IPCS support is improved for UNIX environments. The ability to diagnose problems in Lotus, the WEB, and DCE is improved with the addition of a modified ps command that enables the caller to display information for threads in a multi-threaded server

- User Dump Support

Support is added to obtain user dumps and system dumps in all environments

- Auto Installation OD SSL Certification Support

Support is added to provide automatic installation of client certificates. This removes the need to involve the security administrator when Internet users need to access OS/390 system resources.

- Shell and Utilities

Improvements within the shell and utilities further enhance recognition among UNIX users of the functions and features of OS/390 UNIX System Services. The standard shell commands of link, unlink, and chroot are provided, and pax and tar will now support all file system attributes.

- Debugger

Improvements to the debugger include new dbx commands, dbx flags, and dbx message numbers.

- Installation Improvements

Numerous installation improvements are made across file system and utilities. File system support helps simplify installation setup and maintenance.

Automated UNIX System Option for VM, VSE, and OS/390 (Auto UNIX System)

This delivery option of OS/390 provides an automated UNIX application platform that is cost-effective, easily installed and designed to require no OS/390 (MVS) system programming skills for management or maintenance. It can provide a low total-cost-of-computing solution for VM/ESA and VSE/ESA users wishing to exploit UNIX applications that are only available on OS/390, but do not want to invest in the skills required to install, tailor and maintain a native OS/390 system. It can also be a cost-effective solution for small, remote or departmental solutions in large enterprises.

Three optional features, Auto UNIX System C/C++ (C/C++ Compiler with Debugger), Auto UNIX System DB2 (DB2 for OS/390), and Auto UNIX System MQSeries (MQSeries for MVS/ESA Version 1 Release 2) are available. Typical OS/390 UNIX-based applications and enablers include webserver facilities, secure network computing applications, e-business applications, Lotus Domino for S/390, and Java applications.

HLASM

IBM High Level Assembler Release 3 supersedes all previous System/370(TM) and System/390(TM) assemblers. The assembler and its optional Toolkit feature provide powerful and flexible tools for developing and maintaining all Assembler Language applications, converting symbolic source statements to machine language object code with extensive checks for common coding errors. The assembler and its Toolkit feature enhance programmer accuracy, productivity, and application reliability, maintainability, and serviceability.

High Level Assembler Release 3 supports the recently announced ESA/390 IEEE binary floating-point instructions, data, and additional floating point registers; new diagnostic and cross-reference features; and numerous language enhancements. These enhancements include:

- Support for the new binary floating-point instructions and data formats includes:
 - Accurate conversion of decimal values to binary floating-point representations, with selectable rounding modes.
 - Special values such as infinities and NaNs may be requested with symbolic forms.
 - All new binary and hexadecimal floating-point instructions are supported.
- As a byproduct of the binary floating-point support, new and more accurate hexadecimal floating point conversions are provided.
- The USING statement has been enhanced to allow specifying a limit to the resolution range.

- A new ACONTROL statement allows fine-grained controls over certain options within the source program, and its status may be saved and restored with the PUSH and POP instructions.
- A new INFO option provides details of the current service status of each customer's assembler.
- A full cross reference of general purpose register usage includes tags to indicate types of use.
- New diagnostics can detect inadvertent programming errors, and several diagnostics have been enhanced to provide more information about the specific causes of errors.
- New sub-options of the FLAG option control new forms of error checking.
- A new COMPAT(LITTYPE) option provides type-attribute compatibility for literal operands of macros.
- More detailed and precise information is provided in the source listing, with improved readability in many areas.
- SYSADATA records have been enhanced to provide:
 - An expanded header field that includes the length of the data portion of the record, to simplify downloading and processing
 - Register cross-reference records
 - The settings of the current PRINT status flags.
- Program readability is enhanced by allowing blanks among the digits of nominal values in most constant types.
- A new J-type address constant supplies the length of a class or DXD.
- The external-function interface is enhanced to support messages and function-requested closure.
- A zero duplication factor on a constant does not require that a nominal value be supplied.
- Enhancements to the conditional assembly language include:
 - A new AINSERT statement allows creation of records to be inserted into the assembler's input stream.
 - The BYTE and SIGNED internal functions simplify conditional assembly expressions.
 - Five new system variable symbols are provided: &SYSCLOCK provides detailed date/time information; &SYSMAC provides the name of the macro in which it is used and the names of all macros in the call chain; &SYSOPT_XOBJECT indicates that the XOBJECT option was specified; and &SYSM_SEV and &SYSM_MSEV provide the highest severity codes from MNOTE statements in the most recently called macro and in the entire assembly, respectively.
 - Macro debugging is simplified by improvements to the MHELP facility.
- A single set of product publications is provided for MVS, VM, and VSE.

The Toolkit feature of High Level Assembler Release 3 has been enhanced in several areas:

- The Interactive Debug Facility has been enhanced to support the additional floating-point and floating-point control registers of the G5 processor family.
 - An enhanced common instruction-disassembly routine is used by both the disassembler and the Interactive Debug Facility, and includes all currently supported machine instructions.
 - The Cross-Reference Facility has been enhanced to support two new reports: Lines of Code and Control Flow, and many new languages are supported.
 - The disassembler and the Interactive Debug Facility support debugging and disassembly of modules contained in PDSE's.
 - The disassembler is enhanced to accept CMS modules.
 - The Program Understanding tool has been enhanced to support all current machine instructions, and to run on Windows 95 and Windows NT.
- Note:** Windows support for the Program Understanding tool will be made available in 4Q1998.

Server Consolidation

SMP/E

SMP/E has the following enhancements:

- SMP/E Planning and Migration Assistant. OS/390 V2R7 SMP/E provides a Planning and Migration Assistant to assist users in managing their existing system and planning to migrate to a new OS/390 system.
- Pre-built Load Module Support. OS/390 V2R7 SMP/E can add, replace, or delete pre-built load modules and program objects in PDS and PDSE data sets as complete entities in functions and PTFs. This can simplify shipment, because the individual parts making up a load module or program object would not have to be shipped. Additionally, shipping the executable ensures that the customer is running exactly what was tested, since additional parts provided in compiler libraries are built into the load module or program object.
- Product Data. OS/390 V2R7 SMP/E enables product developers and packagers to supply additional product data to be processed by SMP/E. This may consist of the product name (in text), the model, type, and feature description. This additional SMP/E information assists customers in easily obtaining an inventory of the software installed on their systems, provides an association of products and features with FMIDs, and enables the presentation of products in an easier to use format. Furthermore, the Planning and Migration Assistant provided with SMP/E uses this data to create reports that help customers to install or migrate to OS/390.
- Reformatting of Data Elements. OS/390 V2R7 SMP/E can install data elements during APPLY, ACCEPT, RESTORE, and GENERATE into the output data sets based on their physical attributes.
- Sequential Data Set Support. OS/390 V2R7 SMP/E can now install data elements into sequential data sets.
- SYSMOD Description. OS/390 V2R7 SMP/E enables product developers and packagers to include additional descriptive information in the SYSMOD header

MCS (that is, in a ++APAR, ++FUNCTION, ++PTF, or ++USERMOD statement).

- **Symbolic Link Support.** OS/390 V2R7 SMP/E adds support for symbolic links. This support is similar to the support SMP/E provides for hard links for hierarchical file system elements using the LINK operand on the hierarchical file system element MCS, and for aliases for load modules. Symbolic links can be associated with specific SMP/E-managed hierarchical file system files, enabling SMP/E to automatically establish and correctly maintain these symbolic links, in conjunction with the hierarchical file system copy utility and the Binder.

Symbolic links allow a user to refer to a file by a more familiar name than might be possible through the use of the real file name or hard links to it. The use by packagers of the symbolic link support supplied by SMP/E, BPXCOPY, and the Binder can reduce the number of required pre-installation and post-installation jobs.

- **Improved Protection for Hierarchical File System Files.** OS/390 V2R7 SMP/E enables customers to use the OS/390 Unix System Service BPX.SUPERUSER security facility to protect files in the hierarchical file system from accidental erasure or alteration. Before manipulating files in the hierarchical file system, SMP/E temporarily switches the SMP/E user to superuser authority (UID=0) when manipulating files in the hierarchical file system and restores the user to the previous level of authority when the SMP/E updates are done. This means that the SMP/E user doesn't have to have UID=0 (superuser) authority all the time, which reduces the chance of such users accidentally erasing or damaging files in the hierarchical file system while performing non-SMP/E work. The SMP/E user must be defined to the security class BPX.SUPERUSER for this process to work properly.
- **Shell Script Support.** OS/390 V2R7 SMP/E enables the execution of UNIX shell scripts and commands during SMP/E installation of code into the OS/390 UNIX Services environment. This support is a generic interface to enable a packager to deliver a shell script that can be executed during SMP/E installation, thus reducing the pre-install and post-install requirements of OS/390 UNIX Services application programs.
- **Sample Assembler Program for GIMAPI.** OS/390 V2R7 SMP/E now supplies a macro and sample application program for GIMAPI in assembler.

DCE Base Services

A distributed computing environment (DCE) allows several individual systems to share data, processors, applications, and devices and to operate as a single unit. It also allows the individual units that comprise the distributed environment to be on different vendor platforms and running different operating systems. The participating machines can range from personal computers to supercomputers; the network can connect machines in one building or on different continents.

DCE Login Using RACF Identity

A new DCE API allows an application to perform a DCE login based on the current RACF identity without requiring the DCE password.

Export/Import Support for DCE Credential Data

Four new APIs allow the creation of an exported byte stream containing all of the data required to recreate the GSSAPI credential and the associated DCE login context and Kerberos credentials cache.

OSF DCE 1.2.2 Interoperability

Starting with Release 7, client workstations that run a version of DCE that is based on OSF Version 1.2.2, are able to interoperate with OS/390 DCE.

DCE Use of HSAS Fast AF_INET TCP Sockets

High Speed Access Services (HSAS) is a TCP/IP implementation that is tightly coupled with the OS/390 UNIX System Services kernel. It can achieve higher performance and reduce CPU utilization when compared to earlier OS/390 TCP/IP implementations.

Use of TFS for Security Directions to Improve DCE Login Performance

If an installation has many DCE clients logging into DCE from OS/390, the performance of these logins can be improved by using Temporary File Systems (TFS). A TFS is an in-memory hierarchical file system that delivers high-speed I/O.

Improve DCE Configuration

The DCE configuration process has undergone a number of small improvements, mostly having to do with messages.

Improve DCE Platform

The amount of data captured in CEEDUMPS can now be controlled by means of new environment variable.

DCE Application Support

OS/390 DCE Application Support facilitates the interaction between DCE clients and the CICS or IMS regions. On request flows, it transforms requests from DCE clients into a form the CICS and IMS regions can interpret. On response flows, it makes transactions in CICS or IMS regions appear like regular Remote Procedure Call (RPC) based servers to DCE clients.

OS/390 DCE Application Support consists of:

- The Application Support server with CICS feature
- The Application Support server with IMS feature Administrative utilities.

OS/390 DCE Application Support server is based on a familiar client/server model.

Transactional RPC for CICS

This provides transactional RPC support for CICS transactions. This prereqs CICS Transaction Server 1.3. Application Support (AS) transactional support lets AS CICS servers participate in Encina distributed transaction processing applications by letting the client application include CICS transactions within the scope of an Encina transaction. It ensures data integrity across all servers (or participants) because if any participant - including AS CICS - is unable to perform the required operations, all of the work is undone. Updates to recoverable data are committed only if all participants can successfully perform their work. Once committed, updates are not lost in subsequent system failures.

Outbound Transactional RPC

Outbound Transactional RPC for IMS consists of system and application support necessary for a C language IMS transaction to:

- Update IMS controlled data
- Issue one or more Encina transactional RPC calls in the same unit of work to update data on remote Encina servers (OS/390 UNIX DCE servers)
- Ensure updates to Encina and IMS resources are consistent, with all updates either committed or aborted

Encina extensions to IMS will allow IMS to initiate a transactional RPC when AS IMS with OTMA initiates a transactional RPC to start an IMS transaction which, in turn, accesses a remote Encina server.

RMF

RMF has the following enhancements:

- Online Reporting for Cache Subsystems
New Monitor III reports provide high-level health indicators for the cache subsystems as well as detailed information about the I/O activities. This extends the Monitor III capabilities of monitoring the entire I/O subsystem in the sysplex in an optimal way.
- Enhanced Enclave Support
The enclave support in Monitor III has been enhanced to assist customers in managing business units of work in their sysplex. Many new types of applications (for example, DDF, SAP R/3, DSOM) create enclave transactions executing in several address spaces but they need to be managed as own single business units of work. Therefore, a report showing resource consumption and delays by enclave will improve significantly performance management for these new applications.
- Dynamic ICF Expansion
To support the new dynamic ICF expansion function, the Partition Data report has been enhanced by new information showing separately the utilization of dedicated and shared partitions for the Integrated Coupling Facility (ICF) feature.
- Support for OS/390 UNIX System Services
Two new reports (Monitor II and Postprocessor) provide performance information on the Hierarchical File System (HFS). This will enable customers to tune their system with regards to the HFS resources. Based on the storage information and utilization statistics in the new reports, customers can size the HFS buffers optimally.
- Enhancements for the I/O Subsystem Support
With the availability of new fiber channels, RMF extends the information for these channel types through reporting about data transfer rates and bus utilization values.

HCM

HCM has the following enhancements:

- Operating System Support

HCM now runs as a native 32 bit application under Windows NT Version 4.0 and Windows 95 or higher. HCM will no longer run under WIN-OS/2 or Windows 3.n.

- TCP/IP Support

Besides APPC, you can now also use TCP/IP as network protocol to communicate with the HCD server on the OS/390 host.

- Navigation Improvements

HCM now offers you improved filter and locate capabilities for viewing and navigating through your configuration diagram.

- Visualizing ESCON Director Matrix Information

HCM can now visualize information from ESCON director or crossbar switch configurations. The diagram shows information like dedicated connections or blocked ports. In addition, when highlighting objects in a diagram, HCM can now use the director configuration data to show what particular route is used for CHPID-to-control-unit definitions. This is especially important when there are definitions in the configuration that have more than one possible physical route from the CHPID to the control unit, for example, when chained directors are involved.

- Enhancements to Editing Director Configurations

The presentation of director configurations as a matrix has been significantly improved. The enhancements allow you to filter and rearrange ports within the matrix according to your needs.

- New Utilities

HCM offers you new utilities that make complex and time-consuming tasks easier:

The **Move Port Connections** wizard allows moving CHPID-to-control-unit connections that have a path through an ESCON director from one director to another, or rearranging such connections on a single director. The advantage is that you no longer have to manually disconnect and connect the individual involved objects.

The **Aggregate CHPIDs** wizard allows to combine attachments of several CHPIDs onto a single CHPID. That is, all control units connected to the source CHPIDs will be disconnected from the source CHPIDs and connected to a target CHPID. This is possible for CHPIDs connected to the same director.

The **Convert ESCON Port to FC port** wizard supports you in making the necessary I/O configuration changes, if a new FICON bridge card is installed on an ESCON director. HCM helps you if CHPID-to-control-unit-connections have to be moved from one port to another port, or if CHPID-to-control-unit definitions have to be aggregated from several CHPIDs to a new FICON CHPID.

- Tivoli Inventory Support

HCM provides support for storing configuration data of S/390 processor configurations in the Tivoli Inventory data base.

OS/390 Print Server

The IP PrintWay component of the OS/390 Print Server contains some performance enhancements.

Security Server (including DCE, LDAP, Firewall)

The DCE Security Server for OS/390, part of the OS/390 optional Security Server feature along with RACF, provides a fully functional security server for OS/390. Customers can now configure their DCE cell with a security server on the mainframe. Availability of this critical DCE technology component on OS/390 addresses a key customer requirement supporting use of DCE in production environments.

DCE provides directory access from OS/390 applications by means of an LDAP client. The functions of the client will include caching, user friendly naming, sorting, search filters, and display templates. It will also communicate with Netscape servers at the level of functionality equal to that of Netscape's client. The LDAP server allows LDAP directory storage from an OS/390 system and will also serve as a back-end to RACF. RACF data represents a large set of user and group definitions that will now be easily available to programs on and off OS/390.

LDAP Enhancements

LDAP supports a back-end for the LDAP server that accesses the information stored in RACF. The LDAP Server adds a new back-end that allows retrieval and update of the user and group information kept in RACF.

LDAP supports JNDI, a Java language programming interface for directory services. LDAP now provides an industry standard Java programming language interface to the LDAP Server directory services via JNDI.

Multi-server support provides the elimination of RDBM global lock, registering with WLM to participate in the sysplex environment, and allows you to run multiple servers against the same back-end DB2 tables. Availability and throughput of the LDAP server are improved with the addition of multi-server support and sysplex support. Multi-server support allows two LDAP servers running on the same MVS system to update the same portion of the namespace, stored in a single set of DB2 tables. Sysplex support allows similar capabilities for LDAP servers running on multiple systems within a sysplex.

OS/390 Firewall Technologies is integrated into both the eNetwork Communications Server for OS/390 (TCP/IP) and the OS/390 Security Server. This is a security technology built upon existing S/390 security capabilities and offers customers additional protection for network applications by controlling user access to specific servers inside and outside a network. A separate firewall component also screens every piece of data to determine whether the data is permitted to enter or leave a protected network.

Distributed File Service

The Distributed File Service provides support for the client/server model common to distributed file systems.

The Distributed File Service provides DFS support which is the Distributing Computing Environment (DCE) distributed file service component. As developed by the Open Group Open Systems Foundation (OSF), DCE and DFS join heterogeneous systems to provide secure read/write access to file data stored on the system or on another DCE system. DFS joins file systems on different systems into a single, global file system accessible by a large number of users. DFS file servers export file data for access by DFS clients running on the same or remote DCE system. DFS clients and servers communication uses DCE RPC protocols and DCE security. DFS provides a uniform file name space for users on heterogeneous systems; client caching for improved performance; transparent file locations to enable file data replication and movement between DCE systems which result in high availability and scalability.

This section discusses the key improvements and functions that are being added to the previous release of the DFS documentation.

DFS Server Multi-Home Support

DFS currently assumes DFS servers are reachable by a single network interface. The OS/390 client will now recognize and exploit multiple network interfaces for a DFS server host.

Use of Protected RPC

This support provides the OSF DCE 1.2.2 support to allow an administrator to specify a range of DCE protections that can be used for most client-server communication. Also, use of unauthenticated RPCs for DFS server to server communication is eliminated by this support.

OSF/Transarc Compatibility

Server Support for file level translation controlled at the file extension (filetype) for HFS files. Support aggregates of 64-bit bytes (2^{64} bytes) or at least 8 tera-bytes ($4K^{2^{31}}$).

Tivoli Management Framework

The Tivoli Management Framework for OS/390 Release 7 contains the Tivoli Management Agent for OS/390, which enables OS/390 to be managed by the Tivoli Framework-based applications that support OS/390 such as Tivoli User Administration for OS/390 and Tivoli Security Management for OS/390.

Technology Leadership

DFSMS/MVS Version 1 Release 5

DFSMS/MVS introduces enhancements to VSAM, catalog, OAM, NaviQuest, DFSMSrmm, and DFSMSshm. Release 5 also removes the current limit of 8191 open data sets for IMS DB and CICS VSAM. Support for ISO/ANSI Version 4 tapes has also been added. These and additional enhancements are briefly described here.

VSAM Extended Format Data Set Enhancements

The VSAM extended format data set enhancements include:

- **System-Managed Buffering**

Provides the system-managed buffering function for ESDSs, RRDSs, VRRDSs, and LDSs when accessed by batch programs in NSR mode.
- **Partial Release**

Provides the capability of releasing allocated but unused space in ESDSs, RRDSs, VRRDSs, and LDSs. It is supported with a management class parameter and JCL.
- **Candidate Volume Space Amount**

Provides the user with the choice of using either the primary space quantity or the secondary space quantity when a data set extends to a new volume.
- **Extended Addressability**

Provides the ability for ESDSs, RRDSs, VRRDSs, and LDSs to grow to more than 4 GB in size.

Enhanced Catalog Sharing

Catalog sharing enhancements include:

- **Catalog Sharing Performance**

Performance of shared ICF catalogs is improved in a sysplex environment by keeping the catalog control record in the S/390 Coupling Facility cache structure, rather than on DASD.
- **Sysplex Catalog Alias**

Symbolic substitution of alias names for user catalogs and non-VSAM data sets is now possible. A symbolic substitution allows a different user catalog name to be resolved on each system. For example, it allows an alias name of IMSCAT to resolve to IMS.PRODCAT on System A and IMS.TESTCAT on System B. Symbolic substitution for user catalog names is done at IPL, catalog address space restart, or when the master catalog is updated by another shared system. For non-VSAM data sets, a symbolic substitution allows you to use a single alias name to refer to different data set names on different systems. For example, an alias name of SYS1.PL1LIB can resolve to SYS1.R4PL1LIB on System A and SYS1.R5PL1LIB on System B. Symbolic substitution for non-VSAM data sets is done at time of use.
- **ISO ANSI V4 Tape Support**

Provides support for ISO/ANSI V4 tapes, making data interchange with non-S/390 platforms possible. Data conversion is supported for a wide range of code pages, for both tape read and write access. The 2K blocksize limit for data has also been removed.

NaviQuest Enhancements

Enhancements to the NaviQuest function of DFSMSdfp allow users to:

- Define, alter, or display
 - A data class
 - A storage class

- A VIO, Dummy, Object, or Object Backup storage group
- An aggregate group
- A SMS base configuration
- Display a management class or Pool storage group.

Support for up to 10,000 DDs for IMS DB and CICS VSAM

Allows full exploitation of the IMS 6.1 and CICS Transaction Server 10,000 DD limit by expanding the number of data sets that can be opened and allocated to more than 10,000.

Virtual Tape Server (VTS) Import/Export Support

DFSMS/MVS supports the importing and exporting of VTS tape data removing the "closed store" limitation of the VTS.

BCP

DISPLAY EMCS

A new DISPLAY EMCS Command can be used instead of DISPLAY CONSOLES to display information about extended-MCS (EMCS) consoles. This command provides greater flexibility and more information than D C, when EMCS consoles are displayed.

The IEEQEMCS (Query EMCS) macro and service can be used by a program to obtain information about EMCS consoles. The type of information is similar to that displayed by the new DISPLAY EMCS command. This macro returns the state of any EMCS consoles in the sysplex.

Program Properties Table (PPT)

The PPT allows an installation to specify a list of programs that require special attributes. The system scans the PPT to determine which, if any, special attributes apply to the program being initiated.

IBM supplies default entries in the PPT. The following new entries are added in Version 2, Release 7 to eliminate the need for the user to add these programs to the PPT:

- EPWINIT (FFST program)
- EZAPPAAA (NPF program)
- EZAPPFS (NPF program)
- EZBTCPIP (TCP/IP Address Space)
- MVPTNF (TNF Address Space)
- MVPXVMCF (VMCF Address Space)
- SNALINK (SNALINK Address Space)

Note: Programs should not be added to or changed in the PPT unless the instructions for installing a program specify to do so. Improper changes to the PPT could cause a program to not run or run incorrectly.

CTRACE by message id

The new CTRACE by message ID support can be used as a filter to create CTRACE entries for a specific message and reduce the frequency of the trace table wrapping.

This support can be invoked in one of three ways:

- via the CTIOPSxx member of parmlib during MVD initialization.
- as an option on the operator TRACE CT command when starting component trace.
- as an IPCS CTRACE subcommand for the operation's component SYSOPS.

SMF ServerPac Exit Support

Samples of six SMF exits that have been well-accepted and heavily used by customers will be provided in SYS1.SAMPLIB. The exits are names

- IEFACTRT - Termination Exit
- IEFUJV - Converter/Interpreter SMF User Exit
- IEFUSI - User Step Initiation Exit
- IEFUTL - User Time Limit Exit
- IEFU29 - SMF Dump Exit
- IEFU83 - SMF Record Exit (SVC)

The coded examples of the exit routines are provided in SYS1.SAMPLIB in members IEEACTRT, IEEUJV, IEEUSI, IEEUTL, IEEU29, and IEEU83 respectively.

Allocation Enhancements

These enhancements remove the need for customers to modify their JCL or change their operational habits relative to DCB=OPTCD=B processing. Allocation now supports volumes created on different device types and in different tape libraries by converting the single DD statement into a concatenation of DD statements. Each of the DD statements will contain one of the volume serial numbers from the original DD statement, concatenated in the order the volume serial numbers were specified on the original DD statement and each having affinity with the first DD statement.

Tailored SVC Dump

SVC Dump processing now allows operators and client components to modify the contents of the dump by providing additional problem determination data. This support is directed at servers which contain client-related data in address and data spaces other than the client's which would not otherwise appear in the dump. The tailoring of SVC Dumps should help lower service costs by decreasing the number of times dump data is analyzed before determining that the data is insufficient.

New component exits can be created to identify storage to be dumped. Transaction Dump now allows the data space to be specified for output and the DUMP command allows symbols used within dump command parmlib members to be specified on the DUMP command line.

System Logger IPCS Support

Service Aids are upgraded to support new I/O devices, improve diagnosis of problems in components supporting a sysplex, and provide the ability to work with dumps where data areas have been overlaid.

Two new general-purpose IPCS subcommands, RUNARRAY and RUNCPPOOL can reduce the analysis effort associated with the components directly involved with support of the sysplex. These subcommands should also help to reduce service costs in areas outside those directly targeted. They are described in *IPCS Commands*.

Periodically, a situation arises where a key data area had been altered in such a way that IPCS report generators detect a problem and reject the use of that data area from an OS/390 dump for reporting purposes. The user is often able to identify the problem and is now able to use the PATCH subcommand to identify the repairs necessary to IPCS.

JES2

Enhancements for OS/390 Release 7 JES2 include:

- Fiber Channel Support

JES2 I/O processing for spool and checkpoint has been updated to take advantage of the changes made in FICON (Fiber channels).

- Checkpoint Performance

JES2 checkpoint performance has been improved by reducing the number of I/O to the checkpoint data sets under certain conditions. These changes include:

- Elimination of a Read to CKPT2 during checkpoint locking operations (READ1) if at least one checkpoint is on a coupling facility.
- Reduction of the number of writes to CKPT2 when checkpoint is in duplex mode.

- Self Tuning Checkpoint Design - New Record for Trace ID 17

Trace ID 17 has been updated to contain new measurements (total PCE wait time, number of \$CKPTs issued, MVS wait time, \$QSUSE time) that JES2 gathers during different phases of checkpoint processing. A new record 3 has been added to the READ2, PRIMARY WRITE, IMMEDIATE WRITE and FINAL WRITE checkpoint cycles that contains these measurements.

ICKDSF

The following device support is added:

- Internal Disk Feature of the S/390 Multiprise 2000
- 9393 (RAMA Virtual Array), 9396 (RAMAC Scalable Array), 9397 (RAMAC Electronic Array)
- Formatting volumes for use with 9399 IBM Cross Platform Extension
- PPRC on RVA (9393)

Guide to Version 2 Release 6

The following section describes the enhancements made to elements and features for Version 2 Release 6 of OS/390, categorized by the Version 2 initiatives discussed in the previous section.

Network Computing

Firewall Technologies

Enhancements are in the Security Server:

- Performance

Performance is improved for the socks daemon, the ftp proxy, the syslog daemon, and configuration and administration. In addition, the security server code has been moved to the OPT(2) level of the compiler.

- RAS

Tracing support is added to the admin commands. Through the addition of debug statements to the admin component, the service support team can request data about a problem once and have enough information to solve the problem.

- VPN - transport mode -

Enhancements to the fwtnnl configuration command supports both tunnel and transport mode tunnels. This involves the addition of a new parameter to the fwtnnl command to allow a choice between tunnel and transport mode. This means that a customer now has the ability to support both firewall to firewall as well as client to server VPN environments.

Network File System

OS/390 Network File System (OS/390 NFS), formerly named DFSMS/MVS Network File System, is enhanced with the following:

- SUN NFS Version 3 Protocol Support for Client and Server

In addition to supporting the SUN NFS Version 2 protocols, the OS/390 NFS client and server have been enhanced to now support the SUN NFS Version 3 protocol specification, RFC 1813.

- Support of larger than 4 gigabyte files and file systems by extension of 64-bit file sizes and offsets.
- Performance modifications resulting in more efficient use of the network.

- TCP Transport Support for the Server

Support for TCP(Transmission Control Protocol) as a transport, in addition to UDP (User Datagram Protocol) for the server for both NFS Version 2 and Version 3 protocols.

- WebNFS Server Support

The WebNFS protocol is an extension of the SUN NFS Version 2 and Version 3 protocols, RFS 2054 and 2055. This enhancements allows Java applications to exploit the NFS file sharing capabilities.

- Filename Extension Support for PDS/PDSE

The OS/390 NFS server now allows an NFS client to specify default OS/2 filename extensions for MVS PDSs and PDSEs members mounted by any client workstation that supports the NFS protocol, such as OS/2.

- NFS Server Support for NLM/NSM Locking Protocols (LOCKD/STATD)

The Network Lock Manager (NLM) and the Network Status Monitor (NSM) provide stateful services such as file locking and access control synchronization. NLM and NSM are RPC-based servers which normally execute as autonomous “daemon” servers on NFS client and server systems.

- NLM PROTOCOL (LOCKD): The NLM is a service that provides advisory byte-range file and record locking, and DOS-compatible file sharing and locking in and NFS environment.
- NSM PROTOCOLS (STATD): The NSM is a service that provides applications with information on the status of network hosts. The NSM keeps track of its own ‘state’ and notifies any interested party of a change in this state.

Integrated Cryptographic Service Facility (ICSF)

OS/390 V2R6 ICSF includes support for the following:

- Secure Sockets Layer protocol

Secure Sockets Layer (SSL) is an industry-standard protocol designed by Netscape Development Corporation to provide a data security layer between application protocols and IP. The SSL security protocol is widely deployed in both Internet and intranet applications. SSL defines methods for data encryption, server authentication, message integrity, and client authentication for a IP connection. SSL uses public key and symmetric techniques to protect information.

ICSF provides two new callable services to support the SSL protocol. The PKA encrypt callable service encrypts a supplied clear SSL seed key under an RSA public key. The PKA decrypt callable service unwraps the RSA-encrypted SSL seed and returns it to the caller in the clear. SSL can then use this clear key to generate session encryption keys. Prior to the support provided with OS/390 R6, the Common Cryptographic Architecture (CCA) did not permit even privacy session keys to appear in the clear in host storage. These new services add the flexibility needed for ICSF to be part of an SSL application.

- Enhancements to Double-Key MAC Support

Support for the X9.19 Optional Double MAC procedure was added with OS/390 R4. With OS/390 R6, this support has been expanded to include a double-length MAC verification key in addition to the double-length MAC generation key that was introduced with OS/390 R4. The use of double-length MAC verification keys requires an S/390 G5 Enterprise Server.

- Simplified CKDS Initialization

The procedure to initialize a cryptographic key data set (CKDS) has been simplified in OS/390 R6. The new procedure combines the steps of creating a CKDS header record, setting the DES master key, creating the required system keys, and refreshing the CKDS into one simple operation. This makes it easier to get your ICSF system up and running.

eNetwork Communication Server

In Version 2 Release 6, IBM continues to deliver on its commitment to provide world-class IP solutions for e-business networks while increasing the integration of SNA/APPN and IP networking services. Key enhancements are:

- Open Shortest Path First

A link-state routing protocol supports customers by providing IP networks improved routing efficiency, flexibility and security.

- Long Fat Pipes

Networks with either a large bandwidth-delay or a long delay, which are called Long Fat Pipes, require a larger window size for maximum throughput. OS/390 implements the window scale option, defined in RFC 1323. It avoids the limitation of a 16-bit window size field in the TCP header.

- IP Multicast Support

The OSA-2 and OSA-Express features, in combination with OS/390, implement IP Multicast support as defined in RFC 1112 as well as RFC 2236. Therefore, Internet Group Management Protocol (IGMP) Version 1 and Version 2 are supported.

- SLL Enabled TN3270 Server

OS/390 provides for secure communications between the TN3270 server and an SSL-enabled client, such as Host On-Demand Version 2.

- High Performance Data Transfer (HPDT) support for OS/390 UNIX Applications and FTP Exploitation of HPDT Services

One of the major performance costs in the transfer of large data objects is the movement of data. The HPDT support, introduced in OS/390 Version 1 Release 3 for SNA applications, is extended to support authorized OS/390 UNIX System Services written to the assembler application programming interface. In OS/390 Version 2 Release 6, File Transfer Program (FTP) exploits HPDT services for outbound data moves and provides improved throughput and CPU utilization for large data moves.

- Sendmail (including POP3)

Sendmail is the current leading mail server found on UNIX systems. While Domino provides rich collaborative workflow processing, Sendmail (based on industry standard Berkeley 8.7.7 code) offers basic mail transport services. Customer cost savings can be achieved through consolidation of mail administration and mail server functions onto OS/390. Sendmail provides the support needed to conduct business over the Internet based upon the SMTP protocol, which includes IBM's commitment to service OS/390, security based on OS/390 Security Services, and space management with OS/390 DFSMS services.

- MultiNode Persistent Sessions (MNPS) Dependent LU Server Support

This function extends the MNPS Support that was delivered in OS/390 Version 2 Release 5. It enables customers to include recovery of sessions between MNPS applications and dependent LU Requester (DLUR)-owned dependent LUs.

- Client/Server Affinity

This function provides improved availability for applications that implement synch point (multi-phase commit). Client/Server affinity is a mechanism for multistaging Client/Server applications to reestablish connections and ensure the correct Client/Server instance are reconnected

- APPN Dynamic Network Node Server Switching

Enhanced Systems management for Network Node server selection provides the ability to dynamically change the preferred Network Node Server specified for a VTAM End Node.

- Simple Network Management Protocol (SNMP) Distributed Protocol Interface (DPI) Instance Level Registration

This new capability in OS/390 offers the opportunity to improve subagent performance by allowing subagents to register for management information base (MIB) objects for which they provide support at a more granular level.

- X-Motif Data Link Libraries (DLL)

DLL support for OSF/Motif applications is provided in OS/390 for the first time. Customers should see an appreciable reduction in the amount of DASD space required for each of these applications.

- IP Services use of Cross System Coupling Facility (XCF)

The use of XCF facilities by the IP stack was introduced in OS/390 Release 5. That capability was implemented by queueing the IP data to the APPN/SNA Service's address space. This extra step of queueing to the other address space is removed in OS/390 Release 6. This improvement should significantly increase the performance of IP over XCF.

Application Enablement

IEEE Floating-Point Registers

S/390 hardware implementation of IEEE floating-point arithmetic now supports the common IEEE industry standard (ANSI/IEEE Standard 754-1985) with 16 floating point registers, compared to 4 registers. In conjunction with OS/390 Version 2, Release 6, customers may observe the following benefits:

- Improved performance for Java (TM) floating-point operations.
- Improved performance for C++ programs that are recompiled to use the additional floating-point registers. This includes programs using current S/390 floating point registers.
- Simplified porting of C/C++ applications from other platforms to OS/390.
- Simplified porting of DOMINO (TM) Companion Products to OS/390.
- Enhanced S/390 support for OPEN Standards.

Java floating-point performance will be improved by the use of the new architecture instructions in new releases of the Java Virtual Machine and "JUST IN TIME" (JIT) Compiler available later in 1999.

The OS/390 elements that support this S/390 hardware enhancement are:

- BCP
- IPCS
- WLM resource affinity scheduling
- Language Environment (CEEDUMP, messages, macros, linkages, OS/390 UNIX System Services)
- C/C++ functions

C/C++

OS/390 C/C++ has made the following enhancements for Version 2 Release 6:

- Added support for the IEEE binary floating-point data type in conformance with a subset of the IEEE 754 standard, as applicable to the S/390 environment. As part of this support, OS/390 C/C++ has added a new FLOAT compiler option, as well as two related compiler suboptions, ARCH(3) and TUNE(3).
- Improvements to the performance of the Binary Coded Decimal (BCD) class library.
- Support for the long long integer data type.
- Improvements to the compile time for C++ class templates using the FASTTEMPINC compile option.
- Retroactive to OS/390 Version 1 Release 3, the C++ IBM Open Class Library is licensed with the base operating system, which enables applications to access this library at execution time. This eliminates the need to license the OS/390 C/C++ compiler feature(s) or to use the DLL Rename Utility.
- The level of optimization you get when you specify the OPT(1) or OPT compiler option is the same as when you specify OPT(2).
- Added a new PORT compiler option which enables you to increase syntax checking for the #pragma pack directive in your code. This option is helpful when porting code that contains #pragma pack directives or packed data from other platforms.

Language Environment

- Language Environment Performance:

HEAPOOLS is a Language Environment run-time option that enables the use of a new heap storage management algorithm. This algorithm not only has a shorter path length for most storage requests, but also virtually eliminates contention for storage latches in a multi-threaded environment. These two features can significantly help improve the performance of applications that use heap storage.

Currently, only C/C++ applications that use malloc(), calloc(), realloc(), and free() can take advantage of this algorithm. Multi-threaded C/C++ applications, and C/C++ applications that extensively use malloc() and free(), are the target for this performance enhancement.

Various enhancements are made to improve the overall performance of Language Environment. These enhancements include adjustments to path lengths for fopen(), fclose(), stcoll(), wcscoll(), fork(), exec(), spawn(), bcopy(), sprintf(), and vsprintf().

INFOMSGFILTER is a new run-time option that allows users to filter out informational messages from the MSGFILE. This is useful for users who are migrating their application programs to run under Language Environment.

INFMSGFILTER reduces the number of messages received and improves performance.

- Language Environment RAS:

Various enhancements are made to IPCS and CEEDUMP formatting to better enable complete first failure data capture. Updated 408x abend messages include additional failure data. Also, customers have the option to suppress Language Environment informational messages and have CEEDUMPs written to a user-specified directory.

A new environment variable, `_CEE_DMPTARG`, is available to determine the location of CEEDUMP. This helps application programmers debug their application programs.

Application Enabling Technology

- OS/390 AET now supports access to DB2 from the OS/390 UNIX System Services command shell.
- It provides the capability to add or delete modules or DLLs from the dynamic link pack area (LPA) directly from the OS/390 UNIX System Services command shell.
- It provides a Web-based, intuitive, graphical user interface for IP.
- It provides an enhanced control center, able to detect when the OS/390 system enters a non-operational state, and automatically restarts the system.
- It introduces support for client access to directory services that accept the LDAP protocol.

OS/390 UNIX System Services (OS/390 UNIX)

Multiple performance improvements are made in OS/390 UNIX. Key areas of improvement are:

- Multiple process Multiple User Support: Kernel support for multiple processes, that have multiple users identities in a single address space, is designed to help reduce the number of new address spaces that are created. This results in faster process creation and reduced storage usage for servers that exploit this capability. The `__login` syscall enables a server to establish the identity of a user on a process in a multiple process address space.
- Shared Memory: This support enables large quantities of shared memory without a high-level of extended systems queue area (ESQA) overhead. More users are now able to share large segments of shared memory without any increase in system resource usage.
- MMAP: A reduction in storage requirements, when memory mapping large files, is achieved through new segment-level paging support where megabyte multiples on megabyte boundaries are shared. This eliminates the real storage (ESQA) needed for RSM Control structures.
- Condition Timed Wait: The overall path length of `cond_time_wait()` is reduced to improve performance.
- Binary Semaphore using Performed Locked Operation (PLO): A high-performance implementation of binary semaphores is now available. This implementation exploits the PLO hardware instruction and eliminates latching in semaphore processing. Full performance benefits of Binary Semaphores using

PLO, is only available on CMOS machines because this is the single location for the PLO hardware.

- LFS (Logical File System) optimized: Performance improvements are made in file system interfaces by allowing a prebuild environment to persist across multiple file system requests. NFS, in particular, achieves path length savings because this new support.
- OS/390 Shell and Utilities: The OS/390 Shell and Utilities now have improved performance because they have been recompiled with IPA optimization. Internal path length improvements also lead to performance improvements to the following utilities: vi, find, sh, pax/tar/cpio, compress/uncompress/zcat, grep, and ar.
- __pidaffinity: The __pidaffinity service enables callers to dynamically create or delete a parent/child-type affinity between processes that are unrelated. Some applications have a requirement to have a process notified when another, but unrelated (no parent/child relationship), process terminates. The __pidaffinity service adds or deletes an entry in a process affinity list. When a process terminates, each process in its affinity list is notified - sent a termination signal.
- Socket Functions: Several new socket functions are being introduced to help improve the performance of major OS/390 UNIX products:
 - accept_and_recv() - Combined accept() and first receive()
 - receive with timer - Receive() with a timeout capability
 - open_stat() - Combined open() and fstat()

Socket support for Communications Storage Manager (CSM) buffers provides a facility for programs to avoid data moves in a communications session. Buffer ownership is transferred instead of copying the buffer contents. The srx_np(BPX1SRX) Callable Service enables CSM buffers to be used to send and receive data on a socket.

Server Consolidation

DCE

DCE has the following enhancements:

- Availability - Platform

A number of small enhancements have been made to OS/390 DCE in order to improve the availability and reliability of DCE Base Services. This should result in fewer system outages and improved system stability. One enhancement allows the DCE administrator to control the monitoring interval for detecting file-system-full conditions for the Hierarchical File Systems used by DCE.

- System management - Remote Configuration

In addition to using the panel interface for configuring DCE, customers will now be able to configure DCE from the TSO command line, which in turn can be used from batch or the OS/390 shell, making it possible to automate DCE configuration tasks. Command-line or batch configuration can also be exploited by third parties such as Independent Software Vendors as part of larger tools for configuring and getting started with DCE and for managing DCE systems.

- Parallel Sysplex DCE

DCE now allows customers to take advantage of their Parallel Sysplex hardware through the use of the DCE Workload Manager facilities. Parallel Sysplex DCE is a routing mechanism in which the system chooses the best server instance to run a DCE remote procedure call. Servers that support multiple instances can use this mechanism to route client requests.

RMF

- Online Reporting for the Coupling Facility

Three new Monitor III reports enable the customers to analyze bottlenecks or problems in the coupling facility area that might result in a performance degradation in the parallel sysplex. To avoid critical situations for production data bases and transaction processing systems, customers can see the immediate state of the coupling facility and the structures, and they have all relevant data at a glance in a granularity they can choose. In addition, they can see the results of tuning actions in this area, for example after having removed a coupling structure from an overloaded coupling facility to another one.

This new function within RMF has been requested by many customers already exploiting the parallel sysplex.

- Sysplex Overview and Spreadsheet Reporting

Overview data will be available for the three Postprocessor sysplex reports (Workload activity in goal mode, coupling facility activity, and shared DASD activity), based on the same technology as currently used for overview and exception data for single-system reports. This is a major step towards an integrated Spreadsheet Reporter solution that is not restricted to spreadsheet data from Postprocessor single-system reports.

Customers can choose from a variety of overview criteria to tailor the appearance of an overview report or the contents of overview records. Especially when using sysplex overview criteria, the Postprocessor provides a sysplex and a single-system view to shared resources, for example, service classes, devices or coupling facility structures.

In addition, a new Collector function is available in the Spreadsheet Reporter application to start Postprocessor jobs from the workstation, requiring no explicit host logon. This is a significant usability enhancement.

- Enhancements for the I/O Subsystem Support

The Postprocessor Cache Subsystem Activity report has been enhanced by providing the hardware type and model for control units as additional information.

With the availability of storage subsystems that can be defined with more than 128 devices, RMF supports this new capability in all relevant reports.

The new IOS CHPID Description Service gives the acronym of an installed channel path type. RMF supports this new function resulting in a smoother integration of future channel types, mainly due to the avoidance of SPEs for their support. This will be a further step of integrating all OS/390 elements and features through using the same terminology.

Distributed File Service

- DCE Compatibility

DFS can now operate under the OS/390 Release 6 DCE BaseServices

- OSF 1.2.2 Code Enhancements

This support provides the ability to OS/390 DFS clients to handle 32-bit or 64-bit DFS file servers. It also enable DFS file servers to export large HFS data sets with size greater than 32 bits.

- Performance and RAS Enhancements

- File Basis Translation

This support allows the DFS client to access filesets that include both binary and text files.

Security Server (RACF)

For Version 2 Release 6, OS/390 Security Server (RACF) features the following enhancements:

- Network Qualified Names Support

With network qualified names support, customers no longer need to rename LUs when they add networks that contain MVS systems to their installation. The network name of a system can be added to the APPCPORT class profile name, which may now contain up to 17 characters. Support for network qualified names is provided through additional parameters of the APPC LUADD statement and the ICHERCDE and RACROUTE macros.

- OS/390 UNIX System Services MultiProcess/MultiUser

OS/390 Security Server (RACF) supports OS/390 UNIX System Services by allowing multiple processes and multiple users in a single address space. This support allows customers to more easily port their existing applications, which are successfully running on other platforms, to the OS/390 environment.

This support is provided through enhancements to several RACF callable services, including: initACEE, ck_IPC_access, ck_process_owner, makeISP, R_exec, R_fork, R_IPC_ctl, and R_ptrace. In addition, a new audit event code has been added for SMF TYPE80 records.

- Tivoli Management Framework Support

For Version 2 Release 6, OS/390 Security Server (RACF) provides additional updates for the Tivoli Management Framework . RACF enhancements, which include the new ROLE general resource class, new command parameters, and updates to the R_admin callable service, provide the following support:

- Partial support of the Tivoli Security Management group and resource records
- Full support of the Tivoli Security Management role record
- Ability to manage RACF passwords and all USER profile segments from Tivoli User Administration

- Password Management Enhancements

These enhancements enable an administrator to reset a user's password without marking the new password as being expired the first time it is used. RACF also provides the ability to authorize password resets through the

FACILITY class. This means that customers can avoid the need for helpdesk personnel to require the system SPECIAL, group SPECIAL, or user OWNER attributes.

- Transportable Security Environment Enhancements

The transportable security environment enhancements provided in RACF allow a user's security environment to be easily retrieved and transported to another address space or to another system in a sysplex. These functions are provided through enhancements to the RACROUTE REQUEST=EXTRACT macro and the initACEE callable service.

LDAP

The OS/390 LDAP Client is upgraded to support Version 3 of the LDAP protocol, allowing users of the OS/390 LDAP Client to contact servers supporting either Version 2 or Version 3 of the LDAP Protocol.

An additional enhancement enables customers to run and administer ACLs for more than one instance of an LDAP Server on a single machine.

HCM

In addition to using APPC as the communication protocol to exchange data between HCD and HCM, you can now also use IP.

Print Server

The OS/390 Print Server ISPF panels (including the IP PrintWay and Print Interface panels), Windows panels, and messages are now available in English, Japanese, and Spanish.

The IP PrintWay component of the OS/390 Print Server contains the following additional enhancements:

- An improved internal queue search, which can reduce CPU usage.
- The ability to process more than one data set at the same time in a JES3 environment; this function was previously available only in a JES2 environment. It allows an installation to extend the time period between retries of failed transmissions and to retain data sets on the JES spool after failed transmissions without affecting the transmission of other data sets.
- Support for the FCB parameter on the OUTPUT JCL statement. IP PrintWay formats data according to the selected forms control buffer (FCB).

The NetSpool component of the OS/390 Print Server contains the following additional enhancements:

- An improved operator interface. The operator can choose to enter operator commands directly instead of replying to an outstanding WTOR.
- Support for processing binary types of print data from VTAM applications, such as PCL and PostScript data. NetSpool places the "binary" data on the JES spool without change so that it can be printed on printers that support the data stream.

Technology Leadership

Base Control Program

Enhancements to the base control program (BCP) include:

- DUMP Command PARMLIB Support

A new parameter of the DUMP command accepts as input the name of one or more PARMLIB members containing pre-coded DUMP command syntax. This new option makes the DUMP command easier to use and allows complex dump parameters to be coded in advance and specified quickly for sysplex problem determination purposes. With this support, users no longer need to provide dump parameters dynamically, in response to WTOR messages. Symbol substitution (cloning) is supported within the parmlib members.

- IOS Channel Path Recovery Enhancements

These enhancements improve system availability in a sysplex when channel path recovery is required for certain device errors. Previously, a processor could be put into a wait state if it was the last path to reserved or assigned devices, and channel path recovery was specified by PARMLIB or by default. New recovery options are provided that allow specifying a different default recovery action for the devices on a channel path, when it is the last path to them. The IOACTION command is enhanced to stop I/O activity to shared tape devices, allowing recovery without having to stop all processors that share the tape device.

- IEEE Floating Point Support

OS/390 IEEE floating point support allows applications for JAVA, Lotus Notes and other application environments to use IEEE binary floating point data in programs on OS/390. The support includes additional floating point registers, comprised of 12 new floating point registers, and a floating point control register. A new IEAFP macro allows server tasks that dispatch unrelated units of work to manage the floating point registers, turning off register saving for applications that don't use floating point arithmetic after having dispatched an application that did use floating point arithmetic.

- Display Logger Command

A new DISPLAY LOGGER command displays information about the logger address space and log stream connections in a sysplex. The information includes:

- The operational status of the system logger
- The status of individual logstreams and logstreams from a sysplex view
- The utilization of list structures assigned to logstreams.

Customers can use this logger information for problem determination purposes.

- APPC Network-Qualified Names

OS/390 Release 6 removes previous restrictions on the security of APPC conversations using network-qualified LU names.

- LU names no longer need to be unique across networks to ensure conversation security, because the network name can be added to a partner LU name in RACF APPCPORT and APPL security profiles.

- A network name can be added to the LU name in persistent verification requests. Programs using persistent verification can now verify the network name as well as the LU name before accepting conversations from a calling program.
- Resource Recovery Service
 - The following enhancements are made to RRS:
 - Usability Enhancements

RRS System Management panels and programmable interfaces are given enhanced functionality in two key areas: selection and sorting. Selection enhancements include the ability to use wildcard strings for certain fields, the ability to track work manager names, and the ability to track UR state duration and exit times. Sorting enhancements offer users the ability to organize query output based on a variety of sort keys and options.
 - Unauthorized Context Switching

Currently, Context Services are only enabled for authorized, key 0-7 or supervisor state callers. To enable work context switching, some of these services are enabled for "semiauthorized" callers -- programs running in address spaces specifically authorized by an installation through RACF or another security product to use these services.
- XES
 - New Hardware Support

MVS provides support for new types of coupling facility connectivity. The DISPLAY CF and DISPLAY M=CHP(xx) will be enhanced to display the new CHPID types.
 - Turbo subchannels

The Turbo CF Subchannels support provides for XES to recycle subchannels used for asynchronous operations sooner than happens today. Beneficial effects include reducing perceived coupling facility operation service time, improving subchannel utilization, and improving link utilization.
 - IXLMG Enhancements

The IXLMG programming interface used to gather coupling facility statistics has a new keyword that can be used to collect only coupling facility information, without specific structure data. The performance of RMF will benefit from this enhancement.
 - Rebuild for Coupling Facility Maintenance

This provides installations with an automated method of populating a coupling facility after one or more coupling facilities have been removed for maintenance and then returned to the configuration. The automated method allows the installation to designate the coupling facility to be populated with structures for which this coupling facility is the more preferred location based on the XCF allocation rules.

The SETXCF REBUILD command is enhanced to cause the initiation of structure rebuilds, one at a time, into the coupling facility to be populated. Because the rebuilds are processed serially, XCF signalling structures can also be candidates for populating the designated coupling facility.
- Work Load Manager
 - Descriptions on Classification Rules

When defining classification rules, the WLM ISPF application will now have an additional 32-character description field for each rule.

- Discretionary Goal Management

When other workloads are overachieving on their performance goals, resources will now be diverted so that work with a discretionary goal can be run.

- Scheduling Environment Support for JES3

Scheduling environments, which help ensure that units of work are sent to systems that have the appropriate resources to handle them, can now be used by JES3. (Previously, only JES2 could use scheduling environments.)

JES3

JCT Expansion Tool

The JCT Expansion Tool allows you to dynamically change the size of the job control table (JCT) data set and avoid a cold start when migrating to the JES3 element of OS/390 Version 2 Release 6. The tool is designed to run when the JES3 globals and locals are down prior to your Release 6 migration. The JCT expansion tool creates a new, Release 6-compatible version of the JCT data set that is also downward compatible (with a compatibility APAR installed) with prior releases of JES3.

You can use the tool to increase the size of the JCT or move the JCT to a new volume without performing a cold start.

Dump Job Enhancements

The current JES3 Dump Job facility requires that you first define a tape device in the JES3 initialization stream. Minimally, a JES3 warm start is required if this tape device was not previously defined. Dump Job Enhancements allow you to use any tape drive in the system without disrupting system availability with a warm start.

JES3 catalogs a data set which contains the list of volumes that are used to dump the jobs to tape. When you need to restore these jobs from tape, JES3 uses this catalog to identify what tape volumes are needed.

Resource Affinity

JES3 exploits the resource affinity support introduced by Workload Manager (WLM) in OS/390 Version 2 Release 4. To use this JES3 function, you define a set of (abstract) resources and group one or more of these resources into scheduling environments. If a job is associated with a scheduling environment, JES3 only schedules the job to those systems where the scheduling environment is available.

OSA/SF

OSA/SF supports the following enhancement for OS/390 V2R6:

- Fast Ethernet (FENET) OSA-2 I
 - The Fast Ethernet (FENET) OSA-2 allows direct attachment to either a 100 Mbps or 10 Mbps Ethernet LAN in either full- or half-duplex mode.

- A FENET OSA-2 can be set up for IP Passthru, HPDT MPC, and SNA modes.

In Addition

ServerPac continues to be enhanced to improve the installation of OS/390 Version 2 Release 6. A new function, Data Set Merge, enables you to combine similar data sets (all panel libraries, for example) using the Installation Dialogs. Two new commands, MERGE and UNMERGE, have been added to these dialogs to support the function.

ServerPac further streamlines installation by reducing the number of tasks needed to establish OS/390 UNIX System Services. You can use the Installation Dialogs to tailor jobs that install OS/390 UNIX System Services and to set up its Parmlib member. Also, a new CLIST is provided to make it easier to set up OS/390 UNIX System Services administration.

OS/390 - List of Base Elements

OS/390 provides function equivalent to the following elements. For the version and release numbers of those elements that also exist as separately orderable products, see *OS/390 Planning for Installation*. An additional set of integrated features is available on an optional basis. (See the next section.)

System Services

- DFSMSdfp
- EREP
- ESCON Director Support
- High Level Assembler (HLASM)
- ICKDSF
- ISPF
- JES2
- MICR/OCR Support
- Bulk Data Transfer (BDT)
- Base Control Program (BCP)
- TSO/E
- 3270 PC File Transfer Program
- FFST
- TIOC

Systems Management Services

- HCD
- Cryptographic Services (includes ICSF)
- SMP/E
- Tivoli Management Framework

Application Enablement Services

- DCE Application Support
- Encina Toolkit Executive
- GDDM (includes PCLK and OS/2 Link)
- Language Environment
- SOMobjects Runtime Library
- VisualLift Runtime Library
- C/C++ IBM Open Class Library
- Text Search

UNIX System Services (X/Open UNIX 95 functions)

- OS/390 UNIX System Services Application Services (Shell, Utilities, and Debugger)
- OS/390 UNIX System Services (included in the BCP)

Distributed Computing Services

- DCE Base Services (OSF DCE level 1.1)
- Distributed File Service (OSF DCE 1.2.2 level)
- Network File System

SecureWay Communications Server

- IP (formerly TCP/IP)
- SNA (includes AnyNet) (formerly VTAM)

LAN Services

- LANRES
- LAN Server
- OSA Support Facility

Network Computing Services

- BookManager BookServer
- WebSphere Application Server
- IBM HTTP Server

Softcopy Services

- BookManager READ

OS/390 - List of Optional Features

Some optional features are not priced, but priced as well as unpriced features are included in OS/390 integration-testing. All priced, host-based features are capable of being dynamically enabled or disabled. The only exception is VisualLift for MVS, VSE, VM, which is shipped on a diskette. For the version and release levels of those features that also exist independently, see *OS/390 Planning for Installation*.

System Services

- JES3
- Bulk Data Transfer (BDT) File-to-File
- Bulk Data Transfer (BDT) SNA NJE

Security Server

- Security Server (RACF, DCE Security Server at OSF DCE level 1.1, LDAP Server, Firewall Technologies, and OCEP)
- Security Server LDAP Server DES

Systems Management Services

- DFSMSdss
- DFSMSrmm
- DFSMShsm
- HCM
- Open Cryptographic Services Facility (OCSF France) (new)
- OCSF Security Level 1
- OCSF Security Level 2
- OCSF Security Level 3
- RMF
- SDSF
- System Secure Sockets Layer (SSL) Crypto

Application Enablement Services

- C/C++ with Debug Tool
- C/C++ without Debug Tool
- DFSORT
- GDDM-PGF
- GDDM-REXX
- High Level Assembler (HLASM) Toolkit
- Language Environment Data Decryption
- SOMobjects Application Development Environment
- VisualLift Application Development Environment for MVS, VSE, VM

Distributed Computing Services

- DCE User Data Privacy (DES and CDMF) - OSF DCE 1.1 level
- DCE User Data Privacy (CDMF) - OSF DCE 1.1 level
- Infoprint Server for OS/390 (includes OS/390 Print Interface, Windows 95/NT client, IP PrintWay, NetSpool)

SecureWay Communications Server

- SecureWay Communications Server Security Level 1
- SecureWay Communications Server Security Level 2
- SecureWay Communications Server Security Level 3
- SecureWay Communications Server Network Print Facility (NPF)

Network Computing Services

- IBM HTTP Server Export Secure
- IBM HTTP Server France Secure
- IBM HTTP Server NA Secure

Softcopy Services

- BookManager BUILD

OS/390 - Description of Base Elements

To help you understand the general function of an element or feature, these descriptions are categorized by functional groups.

System Services

DFSMSdfp

DFSMSdfp provides the foundation for:

Storage management

DFSMSdfp includes ISMF, an interactive facility that lets you define and maintain policies to manage your storage resources. These policies help to improve the use of storage devices, and to increase levels of service for user data, with minimal effort required from users. SMS manages these policies for the operating system. You can also use the NaviQuest tool under ISMF to help you migrate to SMS, maintain your SMS configuration, and perform many testing, implementation, and reporting tasks in batch.

Tape mount management

SMS provides a means for implementing tape mount management, a methodology for improving tape usage and reducing tape costs. This methodology involves intercepting selected tape data set allocations through the SMS automatic class selection (ACS) process, and redirecting them to a DASD buffer. Once on DASD, these data sets can be migrated to a single tape or small set of tapes, thereby reducing the overhead associated with multiple tape mounts.

Data management

DFSMSdfp helps you store and catalog information on DASD, optical, and tape resources, so that it can be quickly identified and retrieved from the system. You can use the catalog search interface, now part of DFSMSdfp, to access the catalog.

Program management

DFSMSdfp combines programs into executable modules, prepares them to run on the operating system, stores them in libraries, and reads them into storage for execution.

Device management

DFSMSdfp is involved in defining your input and output devices to the system, and in controlling the operation of those devices in the MVS/ESA environment.

Distributed data access

Distributed data access allows all authorized systems and users in a network to exploit the powerful features of system-managed storage, or automated storage management provided by DFSMS/MVS. DFSMSdfp uses the Distributed FileManager (DFM) to support remote access of MVS data and storage resources from workstations, personal computers, or any other system on a SNA LU 6.2 network.

The OS/390 UNIX System Services (OS/390 UNIX) file system works in conjunction with OS/390 UNIX to provide a full UNIX environment within the MVS system. MVS becomes a full-feature UNIX client or server when coupled with the OS/390 Network File System (OS/390 NFS). With the OS/390 UNIX file system, MVS programs can directly access UNIX data. When the OS/390 NFS client and OS/390 UNIX are used together, MVS can act as a client and access data from any remote system, including another MVS or UNIX system that is connected using a TCP/IP network served by a Network File System server.

Environmental Record Editing and Printing Program MVS (EREP MVS) R3.5

EREP edits and prints reports for the records placed in the error recording data set (ERDS) by the error recovery program (ERP) of the operating system. It helps IBM service representatives maintain customer data processing installations, because the service representative can analyze information in the EREP reports to determine if a problem exists, what the problem is, and where the problem is located.

ESCON Director Support

When your installation uses ESCON directors, the ESCON Director Device Support feature enables reporting of ESCON director device errors to OS/390.

High Level Assembler (HLASM)

High Level Assembler integrates almost all functions of past assemblers. It also provides extensions and improvements including:

- Many new and expanded cross reference facilities and diagnostics that enable substantial savings in time and in human and machine resources, and support integration of HLASM into tool and development environments.
- Numerous language enhancements that improve the speed and accuracy of application development and the quality and reliability of the resulting code.
- Assembly-time options extensions and enhancements that allow increased flexibility and precision in controlling the processes you use to manage application development.

HLASM helps to maximize the productivity of application programmers by relieving them of many tedious and unproductive tasks that can now be done by the assembler itself and helps organizations avoid the necessity for converting existing -- and working -- applications from Assembler Language to other languages.

Device Support Facility (ICKDSF)

ICKDSF enables you to perform functions needed for the installation and use of IBM DASD. You can also use it to perform service functions, error detection, and media maintenance.

ISPF

ISPF consists of four major components; Dialog Manager (DM), Program Development Facility (PDF), Software Configuration Library Manager (SCLM), and Client/Server (C/S).

- DM -- Provides services to dialogs and end-users for creating and using elements, such as functions, panel definitions, message definitions, tables, file-tailoring skeletons, and dialog variables.
- PDF -- Provides editing, compiling, and library management services to assist the dialog or application developer.
- SCLM -- Provides services to application developers to manage their application development libraries.
- C/S -- Allows you to run ISPF on a programmable workstation, and to display the panels using the display function of your workstation operating system.

JES2

(See “JES3” on page 109 for more about JES3)

JES2 accepts the submission of work for the BCP. Major JES2 functions and design features include:

- The interpretation of job control language (JCL) statements
- The disposition of output
- A single-system image
- The ability to run multiple copies of JES2 (poly-JES)
- JES2 WLM for Sysplex

JES2 differs from JES3 in two main processing areas:

- JES2 exercises independent control over its job processing functions. JES3 exercises centralized control. Each JES2 processor in a multi-processor environment controls its own job input, job scheduling, and job output processing.
- JES3 does pre-execution of job setup. JES2 does not do this.

MICR/OCR Support

MICR/OCR provides the device support code for the following devices:

- 1287/1288 - IBM Optical reader and page reader respectively
- 3540 - IBM Disk device
- 3886 - IBM Optical Character reader
- 3890 - IBM Magnetic Ink Reader
- 3895 - IBM Printer device

Bulk Data Transfer (BDT)

Bulk Data Transfer (BDT) provides the base services that BDT File-to-File and BDT SNA NJE need to transfer data from one computer system to another.

Base Control Program (BCP)

The backbone of the OS/390 system is the MVS Basic Control Program with JES2 or JES3. These provide the essential services that make OS/390 the system of choice when you need to process your workloads reliably, securely, with complete data integrity and without interruption.

Time Sharing Option/Extensions (TSO/E)

TSO Extensions is a base interactive interface that provides non-DP professionals, end users, system and application programmers, and administrators with an extensive set of commands, services, facilities and programming languages to do productive work on OS/390, and helps to ease systems management. TSO/E is an integral part of OS/390, and serves as a platform for other elements, such as BookManager READ/MVS, HCD, and ISPF.

The 3270 PC File Transfer Program

This program transfers files from the host to the workstation for off-line data manipulation or transfers local data for storage on the host.

First Failure Support Technology/MVS (FFST/MVS)

FFST/MVS provides immediate notification and first failure data capture for software events. FFST/MVS also incorporates its own technology by including software probes in its own code. When one of these probes is triggered, FFST/MVS issues a symptom string that describes the event.

FFST/MVS provides the following services for IBM products:

- Customized dumps
- Symptom strings
- Symptom records
- Messages
- Network notification

Terminal Input Output Controller (TIOC)

TIOC is the interface between TSO and VTAM. It allows TSO to communicate with the terminal hardware.

Systems Management Services

Hardware Configuration Definition (HCD)

HCD is used to define both the operating system configuration and the processor hardware configuration for a system. Because HCD validates data when it is defined rather than when a device is accessed, inconsistencies can be corrected right away and unplanned system outages resulting from inconsistent definitions avoided. The defined configuration can be used to POR/IPL or dynamically reconfigure your system.

Cryptographic Services (includes ICSF)

Cryptographic Services provide cryptographic functions for data secrecy, data integrity, personal identification, digital signatures, and the management of cryptographic keys. It includes ICSF. These functions are provided through the combination of secure cryptographic hardware, the ICSF cryptographic API, and the ICSF administration interface. The cryptographic services support a wide variety of applications with high performance, security, and availability. ICSF supports the Common Cryptographic Architecture (CCA), as well as the DES algorithm, RSA public key cryptography, and the Digital Signature Standard.

Additional functions are:

- Trusted Key Entry

The key entry unit for master keys has been replaced by a secure channel version implemented on a workstation known as the Trusted Key Entry Workstation. The unit is an optional cost feature.

- Commercial Data Masking Facility

This supports privacy functions.

- Public Key API (PKA Support)

This support provides additional formatting or message digest standards.

SMP/E

SMP/E is a tool for installing and maintaining software, and for managing the inventory of software that has been installed. SMP/E provides a consistent and reliable method for installing and upgrading the software in an OS/390 system.

Tivoli Management Framework

The Tivoli Management Framework contains the Tivoli Management Agent for OS/390, which enables OS/390 to be managed by the Tivoli Framework-based applications that support OS/390, such as Tivoli User Administration for OS/390 and Tivoli Security Management for OS/390.

Application Enablement Services

DCE Application Support

This function of OS/390 provides distributed application support.

- Inbound transactional RPC

This support allows customers to develop and run DCE-based distributed transaction processing applications, which include IMS, on the OS/390 platform. This support interfaces with Encina Toolkit Executive for two-phase commit, IMS OTMA for IMS support, and RRS for OS/390 recovery services. TRPC promotes use of network computing by supporting Encina clients on a variety of platforms, including the internet.

- C Data Type Support

This provides IDL compiler support for certain C Data types, in addition to the current COBOL data type support. This item expands the Application Support capabilities of DCE to include additional data types.

Encina Toolkit Executive

Provides a set of tools for developing client components of distributed transactional applications. It also allows ephemeral (non-recoverable) client applications to be written.

GDDM (includes PCLK and OS/2 LINK)

GDDM provides presentation services and device-driving capability. GDDM has a powerful application-programming interface for creating, displaying, and storing vector graphics, images and alphanumerics. GDDM drives displays, printers and plotters, and includes several utilities for end users. GDDM's excellence as a graphics program and device driver is recognized worldwide, and as a result it is used extensively as a graphics enabler by other licensed programs, including other elements of OS/390, such as BookManager.

Language Environment

Language Environment provides common services and language-specific routines in a single run-time environment. It ensures consistent and predictable results for your language applications, independent of the language they are written in.

Language Environment is the prerequisite run-time environment for applications generated with the following IBM compiler products:

- OS/390 C/C++
- COBOL for MVS and VM
- C/C++ for MVS/ESA
- COBOL for OS/390 and VM
- AD/Cycle C/370
- PL/I for MVS and VM
- SAA AD/Cycle PL/I MVS and VM
- IBM VisualAge for Java, Enterprise Edition for OS/390
- VS FORTRAN and FORTRAN IV (in compatibility mode)

Language Environment supports the VS Fortran and Fortran IV Compilers' object/load module compatibility, which means Fortran load modules can be run under Language Environment and object code can be link-edited with Language Environment and run under it. Language Environment also provides a set of assembler macros for running assembler language routines, and supports debugging of applications using the IBM Debug Tool stand-alone or in conjunction with the IBM VisualAge remote debugger.

Some benefits are that you can:

- Mix old code with new code.
- Handle conditions, such as program checks or abends, in your COBOL programs without having to use assembler.
- Share common run-time services.
- Run applications that conform to the POSIX 1003.1 standard or the X/Open Single UNIX Specification, also known as UNIX 95 or XPG4.2.

- Access CICS and IMS transactions and data through a C, COBOL, or PL/I server from any client in your network.
- Perform interlanguage communication more efficiently.
- Manage storage dynamically for your C/C++, COBOL, and PL/I routines with a common storage manager.
- Access a rich set of math services.

And Language Environment has support for Year 2000 using a 'sliding window' approach.

SOMobjects Runtime Library (RTL)

The SOMobjects runtime library is a set of functions for creating objects and invoking methods on them. SOMobjects applications can use the same object-oriented classes even when the applications are written in different programming languages. SOMobjects applications require the SOMobjects runtime library.

VisualLift for MVS, VSE, VM, and OS/390 Runtime Environment (RTE)

VisualLift (Runtime Environment and Application Development Environment) is a tool to modernize the interface of existing host applications. The new user interface is located on the workstation - either OS/2 or Windows. The host application remains untouched. VisualLifting a host application is performed in the application development environment (available for OS/2). To run a VisualLifted host application the run-time environment is used (available for OS/2 or Windows). VisualLift is the tool to modernize the user interface for OS/390 applications.

C/C++ IBM Open Class Library

C/C++ IBM Open Class Library is a comprehensive set of C/C++ class libraries that is used to develop applications. Retroactive to OS/390 Version 1 Release 3, this component of the C/C++ optional feature is licensed with the base operating system and can be used without enabling the C/C++ feature (C/C++ with Debug Tool or C/C++ without Debug Tool). Applications are not required to license the C/C++ feature of OS/390 for access to the dynamic link libraries (DLLs), and you are not required to use the DLL Rename Utility to package and redistribute DLLs with the applications.

Text Search

Text Search consists of two components: the IBM Text Search Engine and the NetQuestion Solution for a single Web server.

The Text Search Engine is an advanced search engine. The most important components are client/server handling, linguistic support for different languages, and queue mechanisms. Free-text searching, Boolean logic, and fuzzy searches are supported. The search results can be ranked by relevance.

The NetQuestion Solution is a ready-to-run text search solution based on the Text Search Engine. It provides a full-text search service for documents stored on the OS/390 operating system. The search service can be accessed through TCP/IP-connected workstations using an HTML browser.

OS/390 UNIX System Services (X/Open UNIX 95 functions)

OS/390 UNIX System Services Application Services (Shell, Utilities, and Debugger)

Shell and Utilities provides the standard command interface familiar to interactive UNIX users. OS/390 includes all of the commands and utilities specified in the X/Open Company's Single UNIX Specification, also known as UNIX 95 or XPG4.2. This feature will allow your UNIX programmers and other users to interact with OS/390 as a UNIX system without necessarily having to learn the OS/390 command language or other interactive interfaces. The OS/390 UNIX Services Debugger provides a set of commands that allow a C language program to be debugged interactively. The command set is familiar to many UNIX users.

OS/390 UNIX System Services Kernel

These services add the world of open UNIX-based computing to the OS/390 operating system. With Language Environment, they support industry standards for C programming, shell and utilities, client/server applications, and the majority of the standards for thread management and the X/Open Single UNIX Specification. Application developers and interactive users using these interfaces can exploit the capabilities of OS/390 without having to understand OS/390 itself. The combination of open computing and OS/390 allows the transparent exchange of data, easy portability of applications, cross-network management of data and applications, and the exploitation of traditional MVS system strengths in an open environment.

Distributed Computing Services

Distributed Computing Environment (DCE) Base Services (OSF DCE Level 1.1)

The DCE Services provides the strengths of a distributed computing environment:

- Transparency of data and logic
- Distributed, consistent directory service
- Security for both clients and servers integrated in execution path
- Scalability of distributed applications
- Interoperability and portability.

DCE Services supports the following:

- **Remote Procedure Call (RPC)** lets calls between programs running on different platforms appear as local procedure calls to the programmer.
- **Directory Services** allows resources to be found anywhere in an enterprise without the need to know local names.
- **Security Services** solves security problems common in a distributed environment by handling identification and certification of users, clients, servers, and systems.
- **Distributed Time Services** synchronizes clocks running on different nodes.

All components supported are based on the Open Software Foundation (OSF) DCE level 1.2.1. The DCE Base Services support clients and servers that run on IP and SNA networks.

Distributed File Service

The Distributed File Service provides DFS support which is the Distributing Computing Environment (DCE) distributed file service component. As developed by the Open Group Open Systems Foundation (OSF), DCE and DFS join heterogeneous systems to provide secure read/write access to file data stored on the system or on another DCE system. DFS joins file systems on different systems into a single, global file system accessible by a large number of users. DFS file servers export file data for access by DFS clients running on the same or remote DCE system. DFS clients and servers communication uses DCE RPC protocols and DCE security. DFS provides a uniform file name space for users on heterogeneous systems; client caching for improved performance; transparent file locations to enable file data replication and movement between DCE systems which result in high availability and scalability. A DFS server on OS/390 can export DFS LFS, HFS, Sequential, VSAM and PDS(/E) data for access by DFS clients. HFS, Sequential, VSAM and PDS(/E) data exported by a DFS server can be shared with local OS/390 users and applications.

Network File System (NFS)

OS/390 NFS acts as a file server to workstations, personal computers, or other authorized systems in a IP network. It also provides an MVS client. It enables client users to remotely access MVS data sets or OS/390 UNIX Services files from any system on a IP network that uses client software for the SUN Network File System protocol. The remote data sets or files are mounted from the mainframe to appear as local directories and files on the client system.

SecureWay Communications Server

IP

IP (formerly known as IBM TCP/IP) is a set of industry standard protocols and applications that allow you to share data and computing resources with other computers, both IBM and non-IBM. By using IP commands at your workstation, you can perform tasks and communicate easily with a variety of other systems and workstations. IP allows you to perform tasks independent of the computer type. UNIX applications use IP. Some common uses of IP include:

- Electronic Mail
- File Transfer
- Remote Logon
- Internet

IP CICS Sockets

IP CICS Sockets (integrated into the base TCP/IP stack) provides the ability to use the generalized Application Programming Interface (API) and socket applications in COBOL, PL/I, and assembler.

IP IMS Sockets

IMS IP support (integrated into the base TCP/IP stack) allows the development of peer-to-peer applications in which IMS and a IP-connected peer form a client/server relationship. Using this support, IMS can be either client or server.

This element consists of three parts:

1. The Sockets Extended Application Programming Interface. Using this API, IMS message processing programs can communicate with remote IP-connected hosts using socket protocol.
2. If IMS is acting as the server, the IMS Listener can be used to collect incoming transaction requests from remote IP-connected hosts and schedule IMS message processing programs to service these requests.
3. The IBM Assist module provides support for the IMS application programmer who wishes to code IP client/server application programs using the IMS API. When used, this optional function intercepts IMS message queue calls and replaces them with socket calls.

SNA (includes AnyNet)

Formerly known as VTAM, SNA is a network communication access method (Systems Network Architecture) and Advanced Peer-to-Peer Networking (APPN). It provides the interface between application programs in a host processor and other resources in an SNA network, and links peer users of the network. It establishes and terminates sessions between users of the network, forwarding session data to and from each session partner.

In addition to establishing and terminating sessions, it activates and deactivates resources under its control, including application programs, Network Control Programs (NCPs) and the devices they control, and devices to which SNA is directly attached. SNA also maintains information on the network configuration, active sessions, and network conditions.

To help users control a network, SNA receives commands from an operator to perform network services. It keeps the operator informed about those services, as well as about network conditions, through operator messages.

AnyNet

AnyNet implements the multiprotocol transport networking (MPTN) architecture. AnyNet enables application program types to communicate without change over different transport networks and across interconnected networks.

The AnyNet SNA over IP function enables SNA application programs to communicate over a IP network. SNA over IP provides support for dependent logical unit communications, such as printers and emulators, if the host is defined as a dependent LU server and dependent LU requester support is enabled at the workstation. In addition, SNA over IP supports all LU types, including LU 6.2, and supports concurrent sessions over the IP network to LUs in different SNA networks.

The AnyNet Sockets over SNA function enables application programs that use the C socket API to communicate over SNA networks with other application programs that also use the C socket interface.

AnyNet provides the UNIX application environment quick and easy access to the vast resources of the SNA/APPN network and all of the security and reliability that goes along with SNA/APPN. This support means that applications written to the sockets interface can dynamically and simultaneously communicate across either SNA/APPN, IP or both networks.

LAN Services

LANRES

LANRES integrates NetWare LANs and System/390 environments. LANRES extends and expands data availability. NetWare workstation users benefit from workstation response and interworkstation communication on the LAN and from a powerful System/390 computing environment. With LANRES a single NetWare server can communicate with a VM, MVS, and OS/400 host processor at the same time.

LANRES lets:

- Host users administer multiple NetWare servers
- Host users and NetWare workstation users print documents or data on printers located anywhere in your site
- Host users manage NetWare files and directories
- NetWare workstation users store data on host direct access storage devices (DASD)

LAN Server

LAN Server for MVS enables LAN workstation users to store and share data and applications in a central location on a System/390 which allows the large storage capacity of a System/390 to relieve the capacity constraints of workstation-based servers.

LAN Server uses host disk storage to provide file sharing services to workstation users on local area networks (LANs). The LANs can be either OS/2 LAN Server environments or IP environments using Network File System (DFSMS/MVS NFS) services.

Some benefits are:

- LAN Server provides complete workstation file system services on a host system.
- Workstation users accustomed to working with file servers do not need to learn new interfaces to use LAN Server.
- LAN Server allows file sharing across multiple LANs. Workstation users on widely scattered LANs can share files on a host.
- Workstation users on OS/2 LANs can share files with DFSMS/MVS Network File System users on IP networks, and vice versa.
- LAN Server supports multiple connectivity options (including ESCON), so it can be used in a wide variety of application environments.

- While LAN Server is running, administrators can control and monitor access to the workstation files stored on the host.
- Administrators can back up and restore workstation-format files using an ADSTAR Distributed Storage Manager (ADSM) server. Administrators can copy selected files, directories, or disks to backup storage managed by one of these servers.

Open Systems Adapter Support Facility (OSA/SF)

OSA/SF is a base, non-exclusive element that supports S/390 Open System Adapter (OSA-Express and OSA-2) hardware features to deliver connectivity via directly-attached local area clients using:

- Transmission Control Protocol/Internet Protocol (IP) network protocol
- Systems Network Architecture Application Peer-to-Peer Networking (SNA/APPN) and SNA subarea networking protocol
- Internet Packet Exchange (IPX)

The OSA-2 and OSA Express features connect to Ethernet, Fast Ethernet (FENET), and Asynchronous Transfer Mode (ATM) networks. OSA-Express also connects to Gigabit Ethernet, while OSA-2 supports Fiber Distributed Data Interface (FDDI) and token-ring connection.

OSA/SF provides a user-friendly interface for monitoring and controlling the OSA features. OSA/SF Version 2 introduces support for a new Windows-based GUI interface as well as support for the new OSA-Express features. OSA/SF Version 2 continues support for the OSA-2 features and continues to provide the OS/2-based GUI.

Network Computing Services

WebSphere Application Server

The Websphere Application Server is OS/390's Web applications server, supporting Java-based applications (servlets; java server pages). Prior to OS/390 Release Version 2 Release 7, it was known as ServletExpress. V1.2 ships with OS/390 Version 2 Release 9. V1.2 was previously made available via ftp download for OS/390 Version 2 Release 5, 6, 7 and 8 customers. OS/390 Version 2 Release 9 ships the same functionality that exists on the ftp site, at a higher service level.

IBM HTTP Server

The IBM HTTP Server provides for scaleable, high performance web-serving for critical e-business applications. It is exclusive to OS/390. This element was previously known as a base element of OS/390 under the names Lotus Domino Go, the Internet Connection Secure Server (ICSS) and the Internet Connection Server (ICS). In order to have secure communication, one of the following optional features must be installed: IBM HTTP Server Export Secure, IBM HTTP Server France Secure, IBM HTTP Server NA Secure.

BookManager BookServer

BookManager BookServer for the World Wide Web enables customers to provide entire libraries of documents via the World Wide Web. This element is an OS/390 version of the BookServer product available on OS/2. Customers are able to serve BookManager books to HTML browsers connected to either the Internet or an intranet. The information is stored in a virtual library, which is composed of books, bookshelves, and collections.

Softcopy Services

BookManager READ

BookManager READ allows you to use any online BookManager book that you can access. Using the BookManager panels, windows, and function keys, you can manage, display, and search online books quickly and easily.

OS/390 - Description of Optional Features

For descriptions of new features of Version 2 Release 6, see 'Guide to Version 2 Release 6.' To help you understand the general function of an element or features, these descriptions are categorized by a functional group.

System Services

JES3

You might choose to enable JES3 as an alternative to the base JES2 element. It also accepts the submission of work for the BCP. Major JES3 functions and design features include:

- The interpretation of job control language (JCL) statements
- The disposition of output
- A single system image
- Workload balancing
- Deadline scheduling
- Dependent job control
- Control flexibility

JES3 differs from JES2 in two main processing areas:

- JES3 exercises centralized control over its job processing functions. JES2 exercises independent control. With JES3, a single, global processor controls job, device, and workflow for all processors in a multi-processor environment.
- JES3 does pre-execution of job setup. JES2 does not do this.

Bulk Data Transfer (BDT) File-to-File

The BDT File-to-File element allows users at one OS/390 system in a SNA network to copy data sets to or from another OS/390 system in the network.

Bulk Data Transfer (BDT) SNA NJE

The BDT JES3 SNA NJE element allows users with the JES3 element to transmit jobs, output (SYSOUT), commands, and messages from one computer system to another within a SNA network.

Security Server

Security Server (RACF, DCE Security Server at the OSF DCE level 1.1, LDAP Server, Firewall Technologies, OCEP)

The Security Server combines the traditional benefits of RACF with the Open Software Foundation DCE level 1.1. This means that you get:

- Flexible control of access to protected resources
- Protection of installation-defined resources
- Ability to store information for other products
- Choice of centralized or decentralized control of security profiles

- An ISPF panel interface
- Transparency to end users
- Exits for installation-written security routines

The DCE feature integrates the Open Software Foundation Distributed Computing Environment technologies with the base MVS/ESA operating system.

The interoperation of OSF DCE and RACF enables DCE application servers in an MVS/ESA environment to use the RACF security functions when called from DCE-based server applications. These functions include the access control and auditing mechanisms provided by RACF.

OS/390 Version 2 Release 8 introduces Open Cryptographic Enhanced Plug-ins (OCEP), which is a new component to the OS/390 Security Server. OCEP is intended to be used with the framework provided by the Open Cryptographic Services Facility (OCSF). OCEP provides two service provider modules; one for data library services and the other for a trust policy manager. These service provider modules enable applications to use OS/390 Security Server (RACF), or an equivalent product, to provide security functions for digital certificates and key rings.

Security Server LDAP Server DES

This feature provides cryptographic protection above what is provided by the LDAP Server in the Security Server. It contains DES/TDES function.

Systems Management Services

Open Cryptographic Services Facility (OCSF France)

In conjunction with the base element Cryptographic Services, the feature provides weak (40-bit) software cryptographic services, a data library service provider, certificate library service providers, trust policy service providers, and 40-bit hardware cryptographic services, and may be used in France.

OCSF Security (Level 1, 2, and 3)

Security Level 1 provides weak (40-bit) cryptographic services, a data library service provider, certificate library service providers, trust policy service providers, and hardware cryptographic services. It is subject to United States export regulations and may be exported to countries eligible to receive general purpose encryption software under license exception. Security Level 2 provides weak (40-bit) and strong (56-bit) software cryptographic services, a data library service provider, certificate library service providers, trust policy service providers, and hardware cryptographic services. This feature is subject to United States export regulations, which are in the process of changing. It is expected that 56-bit encryption software will receive the same treatment as 40-bit encryption. Security Level 3 provides weak (40-bit) and strong (56-bit and greater) software cryptographic services, data library, certificate library, and trust policy service providers, and hardware cryptographic services. This feature may not be exported from the United States and Canada (with limited exceptions).

For more information about Cryptographic Services, see the section on Release 7 enhancements.

System Secure Sockets Layer (SSL) Crypto

System SSL support provides privacy between a client and a server through use of the SSL protocol and greater—than—40—bit user data cryptography. The base element Cryptographic Services alone, without this feature, provides only 40—bit user data cryptography. With limited exceptions, this feature may not be exported from the United States and Canada.

Resource Measurement Facility (RMF)

Resource Measurement Facility (RMF) is the window on OS/390 resource usage. It gathers information at sysplex, single-system or address-space level, and provides reports at any system in a sysplex. The user can choose between reports about activities and delays, and can focus on storage, I/O or processor data. A wide range of options allows selection of the relevant information, including the attainment of Workload Manager goals.

The RMF monitors present snap-shot and short-term reports real-time in ISPF dialogs with on-line help, and you can have the results printed if you wish. The RMF Postprocessor provides long-term reports for detailed analysis of historical data gathered by RMF. These reports can be printed or displayed.

With the RMF Spreadsheet Converter, you can download reports from the screen, or from RMF data sets in MVS, to spreadsheets at a workstation, and perform your own detailed analyses, using one of several familiar spreadsheet products.

In addition to host-based reporting functions in RMF, there are other components available that offer reporting capabilities at the workstation. **Performance Monitoring of OS/390 (PM of OS/390)** provides an interface between the OS/2 workstation and the OS/390 sysplex that gives you the flexibility to create unique scenarios to monitor the performance of your system. You can collect real-time data in graphic and text mode, combine data from different collection types, or even from different applications, and group resources together. The **RMF Spreadsheet Reporter** is a workstation interface based on Windows 95 or Windows NT for analyzing RMF data with Lotus 1-2-3 and Excel spreadsheets. This function enables you to integrate RMF data into your business processes. It also means you can easily produce presentation graphics which illustrate performance analysis results.

HCM

The OS/390 Hardware Configuration Manager is a PWS-based client/server interface to OS/390 Hardware Configuration Definition (HCD). It combines the logical and physical aspects of OS/390 hardware configuration management. In addition to defining the logical connections (accomplished via HCD), you can also manage the physical aspects of your configuration. For example, you can effectively manage the flexibility offered by the ESCON infrastructure.

All updates are done with HCM's intuitive graphical user interface, and all changes are written into the IODF and fully validated for accuracy and completeness by HCD, avoiding unplanned system outages that are due to incorrect definitions.

DFSMS Features (DFSMSdss, DFSMShsm, DFSMSrmm)

DFSMSdss is a DASD data and space management tool. DFSMSdss can be used to copy and move data sets between volumes; dump and restore data sets, entire volumes, or tracks; convert data sets and volumes to and from SMS management; compress partitioned data sets; release unused space in data sets; and consolidate free space on volumes. **DFSMShsm** is a DASD storage management and productivity tool for managing low-activity and inactive data. It improves DASD use by automatically managing space and data availability in a storage hierarchy. Working with SMS, DFSMShsm performs space management and availability management of data sets as directed by their management class attributes. With **DFSMSrmm**, you can manage your removable media as one enterprise-wide library across systems that can share DASD. DFSMSrmm manages your installation's tape volumes and the data sets on those volumes. DFSMSrmm manages all tape media, such as cartridge system tapes and 3420 reels, as well as other removable media you define to it. For example, DFSMSrmm can record the shelf location for optical disks and track their vital record status; it does not manage the objects on optical disks.

SDSF

System Display and Search Facility (SDSF) provides you with information to monitor, manage and control your OS/390 system.

SDSF provides an easy and efficient way to control job processing (hold, release, cancel and purge jobs) and to control devices (such as printers, lines and initiators). It allows you to monitor jobs while they are running and browse output without printing it. You can also browse the system log, including the sysplex-wide operations log.

SDSF provides sort, filter, arrange, search, and print functions to help you locate and organize information. Single-character commands eliminate the need to learn and remember complex system commands. You can easily change characteristics of an object, such as a job or node, by typing over a displayed value. An optional action bar and pop-up windows make it easy to find and use SDSF functions.

You can establish security for SDSF using SDSF's own security parameters, or with IBM's standard interface, SAF (System Authorization Facility).

SDSF provides complete online help and an interactive tutorial. In addition, ISPF users can view online documentation directly from SDSF, using the BookManager Read/MVS product.

Application Enablement Services

DFSORT

DFSORT is IBM's world class sorting product and an optional feature of OS/390. It provides you with the ability to do faster and easier sorting, merging, copying, reporting and analysis of your business information, as well as versatile data handling at the record, field and bit level. DFSORT R13 exploits both hardware functions and software features to optimize overall performance. Designed for speed and efficiency, DFSORT R13 includes numerous performance, data reporting and analysis, National Language Support, and YEAR 2000 features.

Performance features are

- Dynamic Hipersorting which manages the use of expanded storage by all of the DFSORT R13 Hipersorting applications in the system.
- Dataspace sorting which can reduce CPU time, elapsed time, and EXCP counts for sorting applications.
- DFSORT's Performance Booster for the SAS System** which can help you reduce your CPU time for your SAS sorting applications.
- Dynamic Storage Adjustment (DSA) which allows DFSORT to automatically use more storage when doing so will improve performance.
- Large storage limits (2000MB) and large work data set limits (100) which can increase the amount of data that DFSORT can sort at one time, as well as improve performance.
- UTFIL which can:
 - Slash your CPU time, elapsed time, and EXCP counts by doing multiple output from a single pass over the input data set
 - Allow you to partition your data, enabling you to take advantage of the parallel processing and data in memory capabilities of BatchPipes/MVS

Data Reporting and Analysis

DFSORT's ICETOOL utility provides flexible and easy to use data reporting and analysis features. You can create reports quickly with ICETOOL. ICETOOL does most of the work for you like calculating column widths and spacing, and determining the placement of titles, section headings, statistics and so on.

UTFIL provides powerful productivity aids and reporting features that allow you to produce complex reports where you control the exact placement of titles, section headings, statistics and so on.

National Language Support

DFSORT's National Language Support provides the ability to sort and merge data according to a defined country or cultural specification, with DFSORT correctly collating and comparing your data according to your national and cultural needs.

YEAR 2000

DFSORT's YEAR 2000 capabilities provide the ability to sort, merge and transform character and packed dates with two-digit years, using new formats, according to a specified sliding or fixed century window. These DFSORT features allow you to continue to use two-digit year dates for sorting and merging, and help you to change from using two-digit year dates to using four-digit year dates as appropriate. Thus, DFSORT can help you correctly process a wide variety of dates for this century and the coming ones.

GDDM-PGF

GDDM-PGF is an optional feature of OS/390. GDDM-PGF (Presentation Graphics Facility) is a set of programs for creating presentation material in a variety of styles. It provides:

- The Interactive Chart Utility (ICU), an easy-to-use end-user program for creating business charts

- The Vector Symbol Editor (VSE), a means of creating and modifying symbols for use with the ICU or other GDDM functions
- An application programming interface that enables programs to call either the ICU or a set of presentation-graphics routines for chart creation.
- GDDM-PGF now incorporates an enhanced presentation-producing capability, Online Presentation Services (OPS). GDDM-OPS provides a command interface, which is simple and easy to use, yet which is also powerful enough to allow the very concise creation of high-quality presentations. These can then be used from displays (perhaps using the built-in automatic scrolling feature), or can be saved for printing or plotting.

Typical applications of GDDM-OPS are:

- Public presentations using a video monitor or projector
- Educational sessions for private or public display
- Scrollable interactive presentations of business charts
- Production of high-quality foils.

GDDM-REXX

GDDM-REXX/MVS is a productivity tool that enables programmers to prototype GDDM applications and to create small routines and utility programs quickly and easily.

C/C++ with/without Debug Tool

This language-centered C/C++ application development environment on the OS/390 platform includes a C compiler, a C++ compiler, class libraries, and some C/C++ application development utilities. This feature exploits the C/C++ runtime environment and library of runtime services available with the Language Environment element of OS/390. There are actually two features. One includes a debug tool and one does not.

Retroactive to OS/390 Version 1 Release 3, the C/C++ IBM Open Class Library component of the C/C++ optional feature is licensed with the OS/390 base operating system and can be used without enabling the optional feature.

High Level Assembler Toolkit

This toolkit provides a powerful set of capabilities to improve application development, debugging, and recovery.

Language Environment Data Decryption

Provides decryption of data using the DES algorithm for use with certain C functions.

SOMobjects Application Development Environment (ADE)

SOMobjects is a technology that allows applications written in different programming languages to use the same object-oriented class libraries. Installations that use SOMobjects can extend or replace those class libraries without requiring changes to, or recompiling of, existing applications. The ADE provides a SOM compiler and source code for the SOM kernel (root) classes, Interface Repository Framework, and Emitter Framework. Distributed SOMobjects

provides the ability to distribute objects and object processing to other systems in your enterprise. SOMobjects is CORBA 2.0 compliant.

VisualLift for MVS, VSE, VM, and OS/390 Application Development Environment (ADE)

VisualLift (Runtime Environment and Application Development Environment) is a tool to modernize the interface of existing host applications. The new user interface is located on the workstation - either OS/2 or Windows. The host application remains untouched. VisualLifting a host application is performed in the application development environment (available for OS/2). To run a VisualLifted host application the run-time environment is used (available for OS/2 or Windows). VisualLift is the tool to modernize the user interface for OS/390 applications.

Distributed Computing Services

DCE User Data Privacy (OSF DCE 1.1 Level)

The DCE user-data privacy features enable data encryption using the data encryption standard (DES) algorithm and the commercial data masking facility (CDMF) algorithm. One feature supports the DES and CDMF algorithms and; the other feature supports the CDMF algorithm. The availability of the DES and CDMF algorithms outside of the United States is subject to US export regulations.

Infoprint Server for OS/390

The Infoprint Server for OS/390 consists of several components that support printing on an OS/390 system:

- OS/390 Print Interface

This component accepts print requests from OS/390 UNIX System Services and from remote systems in your IP network. It allocates output data sets on the JES2 or JES3 spool for printing on local or remote printers.

- Windows 95/NT Client

This component contains an Advanced Function Presentation (AFP) printer driver, an AFP Viewer plug-in, and an OS/390 Port Monitor.

- IP Printway

This component transmits output data sets from the JES2 or JES3 spool to remote printers in a IP network.

- NetSpool

This component intercepts print output from VTAM applications and allocates output data sets on the JES2 or JES3 spool for printing on local or remote printers.

SecureWay Communications Server

SecureWay Communications Server Security Level 1, 2, and 3

The three levels of this feature provide authentication and security services in an IP network environment. It provides support for packet filtering, tunnels, and network address translation (NAT), which enables secure communication over private and public networks. Level 1 provides the least stringent security. It provides SLL RC2/RC4, and includes function previously found in IP Security-CDMF and TCP/IP Kerberos Non-DES. Level 2 provides the next level of security, using the DES algorithm, and including SSL DES and SNMPv3 56-bit. It includes function previously provided in IP Security-DES/CDMF and TCP/IP Kerberos DES. The highest level of security is provided by Level 3. It uses the DES algorithm and it includes SSL triple DES (TDES), SNMPv3 56-bit, and IPSec TDES.

SecureWay Communications Server Network Print Facility (NPF)

The Network Print Facility (NPF) provides an enhanced printing function that reroutes print data to the IP network.

Network Computing Services

IBM HTTP Server Export Secure

or

IBM HTTP Server France Secure

or

IBM HTTP Server NA Secure

These features were formerly called Internet Connection Secure Server (ICSS) and Lotus Domino Go Webserver for OS/390 Export Security Feature, France Secure Feature, and North American Secure Feature.

Selection of any of these features gives you an integrated Web Application Server, which:

- Provides a repository of home pages
- Serves requests from Web browsers
- Stores text created with HTML
- Stores images, sound, and video clips
- Uses the OS/390 Security Server for robust security, including Secure Sockets Layer (SSL) and Proxy Authentication
- Acts as a proxy server
- Provides interface to other OS/390 applications
- Provides a Common Gateway Interface (CGI), allowing access to DB2, IMS, and CIC transactions and data
- Offers secure sockets layer (SSL) and secure hypertext transfer protocol (S-HTTP) functions

Softcopy Services

BookManager BUILD

BookManager BUILD lets you create your own online books from files marked up with:

- GML (Generalized Markup Language) Starter Set
- IBM Publishing Systems BookMaster

Instead of preparing the files for a printer, BookManager BUILD takes the files and produces a single file that contains the text and artwork for an online book.

Books built with BookManager BUILD can be read with any of the BookManager READ or BookServer products, such as:

- BookManager READ/MVS, which is part of the OS/390 base
- BookManager READ/VM
- BookManager READ/2
- BookManager READ/6000
- BookManager READ for Windows
- BookManager READ/DOS
- BookManager BookServer

In Summary

The S/390 platform promise is to serve the world's most successful enterprises by providing extraordinary security, throughput, and capacity, so that mission-critical information can be delivered when and where it is needed.

The current and future releases of OS/390 are dedicated to the fulfillment of this promise. For example, in Version 2, we're taking the ability to access and surf networks that we provided in earlier releases, and moving it to a level of access and security that will allow you to transact real electronic business. Version 2 will also be the consummate network application server. It will provide everything needed to create bet-your-business applications and run them on the networks of choice. Over the next several releases we will deliver on the application development, collaboration and content management capabilities. Version 2 will also allow you to integrate other servers you may currently have, and take advantage of the benefits of server integration and consolidation. At the same time, you will be able to derive full benefit from all the data you own by using Version 2 as a way to transform raw data into real business intelligence. And OS/390 will grow more attractive to those with less complex computing needs because it supports the full range of S/390 hardware, from the smallest processor to the largest. And, of course, the classic platform strengths of availability, security and scalability, along with a commitment to continually improving ease of use and installability, will always be a focus of OS/390 development.

OS/390 continues its evolution to fulfill the promise of transforming MVS into a total enterprise server solution, meeting its customers' current and future enterprise computing needs. The time is right for our renewed commitment to fulfill the promises of the vision, while maintaining an easy release-to-release transition. Customers who have moved to the latest version of MVS/ESA and related products can be assured that those efforts have correctly positioned them for the OS/390 platform. Existing OS/390 customers can readily move to OS/390 Version 2 as their next logical release. Indeed, the time is right.

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- BookMaster
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