

End-to-End Planning for Availability and Performance Monitoring

Planning Tivoli performance and
availability solution

Product selection and
integration guide

ITIL-based management
approach



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International Technical Support Organization

**End-to-End Planning for Availability and
Performance Monitoring**

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Note: Before using this information and the product it supports, read the information in “Notices” on page vii.

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Preface

This IBM® Redpaper discusses an overall planning for availability and performance monitoring solution using the IBM Tivoli® suite of products. The intended audience for this paper includes IT architects and solution developers who need an overview of the IBM Tivoli solution.

The Tivoli availability and performance monitoring portfolio has grown significantly in since 2003 because of the strategic acquisition that enhanced the Tivoli product line. These acquisitions also expanded the product coverage.

The broad spectrum of the product solution usually left the IT architect to understand only a part of it. Some solutions might be accommodated with a newly integrated product, but because the designer might not be aware of other products, other more strategic options might be missed.

In this paper, we provide an overview of the Tivoli product line that has interaction with availability and performance monitoring solution. An additional service management approach is taken by adding Information Technology Infrastructure Library (ITIL®) consideration to the solution.

The team that wrote this paper

This paper was produced by a team of specialists from around the world working at the International Technical Support Organization (ITSO), Austin Center.

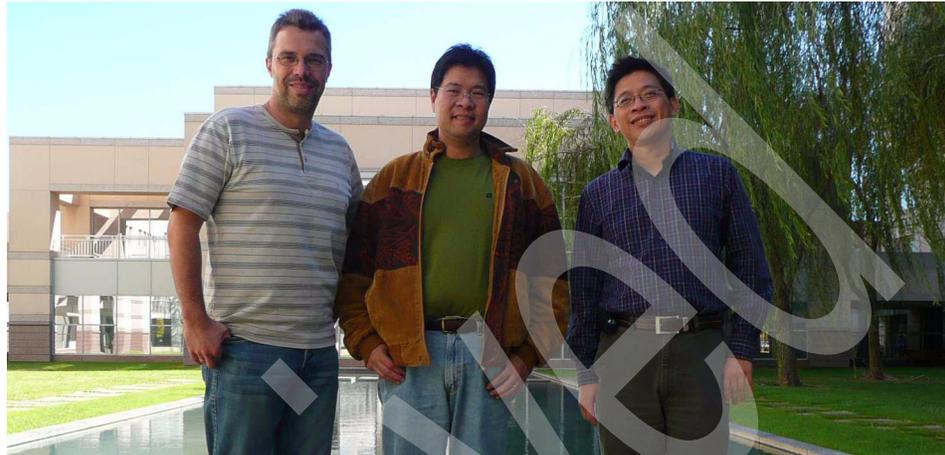


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ITIL overview and Availability and Capacity Management

Availability and performance are important topics in today's IT environment. In addition, they are the basic requirements for any IT system in order to support the business operations smoothly. To meet the business requirements for availability and performance, IT administration must have related management processes to follow to ensure the availability and performance of the business systems. Information Technology Infrastructure Library (ITIL) is a good approach. ITIL provides the best practice for IT service management, and the most relevant ITIL processes for availability and performance are the *Availability Management* and *Capacity Management*.

In this chapter, we begin with an ITIL overview and then describe the two important processes: Availability Management and Capacity Management.

This chapter includes the following sections:

- ▶ 1.1 "ITIL overview" on page 2
- ▶ 1.2 "Availability management" on page 7
- ▶ 1.3 "Capacity management" on page 11

1.1 ITIL overview

Information Technology Infrastructure Library (ITIL) is a collection of IT best practices that are designed to help organizations to have better service management. Originally created by the U.K. Office of Government Commerce, ITIL is the result of years of experience contributed by major IT organizations and companies, including IBM.

In today's environment, businesses have an increasing dependence on IT. In addition, the IT environment is becoming more complex with an increasing rate of change and cost. IT managers need a way to better align IT services with business objectives, to make the long-term costs of IT services lower, and to improve the quality of IT services. ITIL is an option to help with these issues.

ITIL consists of a library of books that document industry-accepted best practices for IT services, infrastructure, and application management. ITIL is an excellent starting point from which to adopt and to adapt best practices for implementation in any IT environment.

ITIL's models show the goals, general activities, inputs, and outputs of the various processes. It helps an organization to address the most common questions asked by IT managers worldwide, such as:

- ▶ How do I align IT services with business objectives?
- ▶ How do I lower the long-term costs of IT services?
- ▶ How do I improve the quality of IT services?

ITIL can help to align IT services with the current and future needs of the business and its customers, to improve the quality of the IT service delivered, and to reduce the long-term cost of service provision.

1.1.1 ITIL content

The current release of ITIL is V3, which was released in May 2007. ITIL V3 is an important milestone in the evolution of service management, because it introduces the service life cycle into service management.

The five core books for ITIL V3 include:

- ▶ **Service Strategy**
Provides guidance on how to design, develop, and implement IT services as strategic assets.
- ▶ **Service Design**
Provides guidance for the design and development of services and service management processes.
- ▶ **Service Transition**
Provides guidance for the improvement of capabilities and transitioning services into operations.
- ▶ **Service Operation**
Provides guidance on service delivery to ensure value for the customer and service provider, which also supports service outsourcing.
- ▶ **Continual Service Improvement**
Provides guidance on creating value for customers through better service management.

Figure 1-1 illustrates the focus of ITIL V3 on service life cycle of service management.

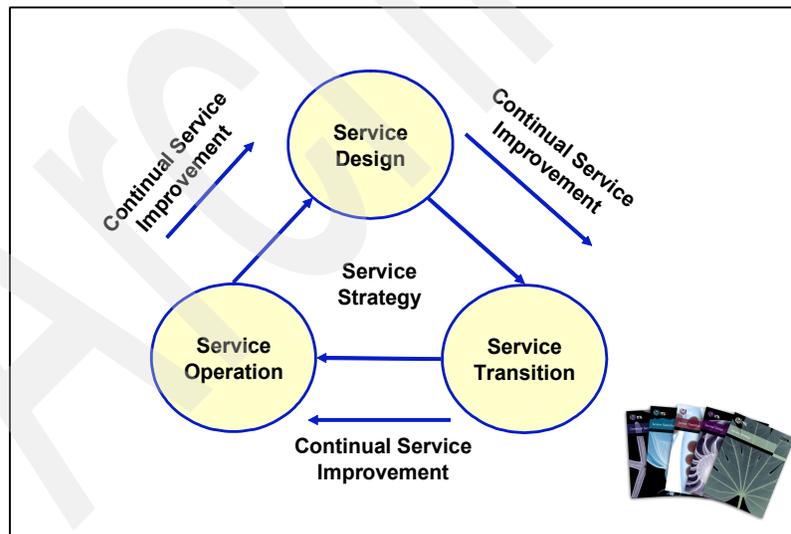


Figure 1-1 ITIL V3 core processes

Previously, ITIL V2 emphasized individual service management process architecture. ITIL V2 has the following books for IT processes for service management:

- ▶ **Service Support**
Focuses on user support, fixing faults in the infrastructure, and managing changes to the infrastructure. Service Support and Service Delivery make up ITIL Service Management.
- ▶ **Services Delivery**
Focuses on providing services to IT customers.
- ▶ **Information and Communication Technology (ICT) Infrastructure Management**
Provides the foundation for Service Delivery and Service Support. Provides a stable IT and communications technology infrastructure upon which Service Delivery and Service Support provide services.
- ▶ **The Business Perspective**
Describes the important aspect of meeting business needs using IT services. Involves understanding the needs of the business and aligning IT objectives to meet business needs.
- ▶ **Applications Management**
Describes the application life cycle from requirements, through design, implementation, testing, deployment, operation, and optimization.
- ▶ **Security Management**
Manages a defined level of security on information and IT services.
- ▶ **Software Asset Management**
Describes the activities that are involved in acquiring, providing, and maintaining IT assets. This includes everything from obtaining or building an asset until its final retirement from the infrastructure as well as many other activities in that life cycle, including rolling it out, operation and optimization, licensing and security compliance, and controlling of assets.

Figure 1-2 shows the books interrelationships in ITIL V2.

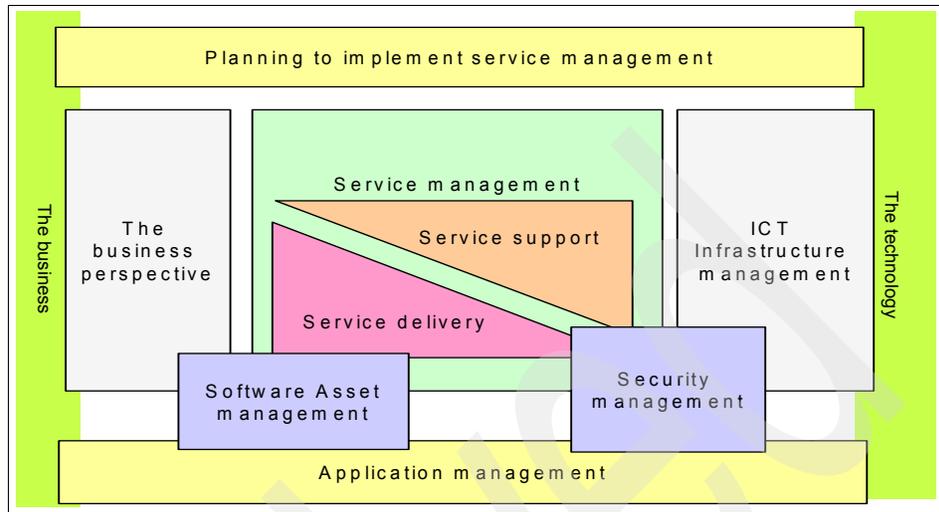


Figure 1-2 The books content in ITIL V2

ITIL V2 is still a valid version. The core ITIL V2 service management processes remain in ITIL V3. ITIL V3 includes the service life cycle to show integration of processes for service. Because ITIL V2 has a clearer structure for individual service management processes, we use ITIL V2 for our discussion in the following sections.

1.1.2 Service management

ITIL service management is composed of service delivery and service support processes. The focus of service delivery is on providing services to IT customers. And the focus for service support is on providing user support, fixing faults in the infrastructure, and managing changes to the infrastructure. Both are key processes to service management. In this section, we describe the processes in service delivery and service support.

Service delivery

Services delivery is the processes for delivering IT services, which include the following processes:

- ▶ Availability management

Provides a cost effective and defined level of availability of the IT services that enable the business to reach its objectives.

- ▶ Capacity management
Aims to provide the required capacity for data processing and storage, at the right time and in a cost effective way.
- ▶ Financial Management
Aims to assist the internal IT organization with the cost effective management of the IT resources that are required for the provision of IT services.
- ▶ IT Service Continuity Management
Supports overall business continuity management (BCM) by ensuring that required IT infrastructure and IT services, including support and the service desk, can be restored within specified time limits after a disaster.
- ▶ Service Level Management
The process of negotiating, defining, measuring, managing, and improving the quality of IT services at an acceptable cost.

Service support

Service support is the processes for supporting IT services, which include the following processes.

- ▶ Incident management
Provides rapid response to possible service disruptions and restores normal service operations as quickly as possible. This function is typically performed by a Service Desk. It is a central point of contact between users and the IT service organization. It will be used to manage each user contact and interaction with the provider of IT service throughout its life cycle.
- ▶ Problem management
Identifies and resolves the root causes of service disruptions.
- ▶ Change management
Receives a request for change (RFC) and either approves or rejects the RFC.
- ▶ Release management
The controlled deployment of approved changes within the IT infrastructure.
- ▶ Configuration management
Identifies, controls, and maintains all elements in the IT infrastructure.

1.1.3 ITIL implementation

ITIL describes the best practices for IT service management. It include goals, activities, inputs, and outputs of various processes. However, it does not tell us how to implement those best practices. The real implementation can vary from

organization to organization. Seeking help from vendors such as IBM can help with the best practice project implementation experiences and methodology.

We describe two software tools for ITIL implementation from IBM:

- ▶ IBM Process Reference Model for IT (PRM-IT)

PRM-IT is a comprehensive and rigorously engineered process model that describes the inner workings of and relationship between all these processes as an essential foundation for service management.

PRM-IT was developed by experienced process experts based on experience from hundreds of customer engagements. The model incorporates industry best practices, and can be aligned and mapped to other leading industry reference models, such as ITIL.

For more information about PRM-IT, see:

http://www-306.ibm.com/software/tivoli/governance/servicemanagement/welcome/process_reference.html

- ▶ IBM Tivoli Unified Process

IBM Tivoli Unified Process provides detailed documentation of IT Service Management processes based on industry best practices. It is also an integral part of the IBM Service Management solution family. Tivoli Unified Process gives you the ability to significantly improve your organization's efficiency and effectiveness. It enables you to easily understand processes, the relationships between processes, and the roles and tools involved in an efficient process implementation.

For more information about IBM Tivoli Unified Process, see:

<http://www-306.ibm.com/software/tivoli/governance/servicemanagement/itup/tool.html>

1.2 Availability management

Availability management is a process inside ITIL service delivery processes. The goal of availability management is to ensure the cost effective operation for delivering a defined level of availability of IT services to meet the business requirements.

In today's environment, businesses require IT to provide services for operation in a timely way. Any service interruption causes business loss and impacts customer satisfaction. Availability normally is the first priority consideration for IT services operation.

Availability management understands the IT service requirements of the business. It plans, measures, monitors, and strives continuously to improve the availability of the IT infrastructure to ensure the agreed requirements are consistently met.

There are several indications that are important in availability management. These are the key items that we need to consider and manage in availability management processes. They are:

- ▶ **Availability**
Ability to perform the expected functionality over a specified time.
- ▶ **Reliability**
Ability to perform the expected functionality, over a certain period of time, under prescribed circumstances.
- ▶ **Maintainability**
Indicates the ease of the maintenance of the IT service.
- ▶ **Serviceability**
Has all relevant contract conditions of external suppliers to maintain the IT service.
- ▶ **Resilience**
Ability of an IT service to function correctly in spite of the incorrect operation of one or more subsystems

In this section, we discuss the key activities and tools requirements for availability management.

1.2.1 Key activities in availability management

The availability management process consists of eight activities, as follows:

- ▶ **Establish availability management framework**
Used to develop guidelines and a framework for availability management. The following tasks belong to this activity:
 - Understanding the requirements and specifications for availability management
 - Defining the strategy for availability management tools and capabilities, and how they should be sourced, should they be developed in-house or rely more on vendor capabilities
 - Defining evaluation criteria for availability management solutions and services

- Establishing the framework for availability management by defining and implementing practices and systems that support process activities
- Determining skill requirements for the staff and assigning staff, based on these systems

Finally, the structure and process of availability management, including escalation responsibilities, have to be communicated to the process users.

The establishment of the process framework also includes the continuous improvement of availability management, that is the consideration of the availability management process evaluation and the implementation of recommended improvement actions.

▶ Determine availability requirements

Addresses the translation of business user and IT stakeholder requirements into quantifiable availability terms, conditions, and targets, and then into availability specific requirements that eventually contribute to the Availability Plan.

▶ Formulate availability design criteria

Endeavors to understand the vulnerabilities to failure of a given IT infrastructure design and to present design criteria that optimize the availability characteristics of solutions in the IT environment, including recovery capabilities.

▶ Define availability targets and related measures

Responsible for the negotiation of achievable availability targets with the business, based on business needs and priorities balanced with current IT capabilities and capacity.

Both business application and IT infrastructure elements should be taken into consideration as targets are set.

▶ Monitor, analyze, and report availability

Supports the continuous monitoring and analysis of operational results data and comparison with service achievement reporting to identify availability trends and issues.

▶ Investigate unavailability

Investigates to identify the underlying causes of any single incident, or set of incidents, that have resulted in significant service unavailability.

▶ Produce availability plan

Generates the consolidated availability plan that summarizes resource availability optimization decisions and commitments for the planning period. It includes availability profiles, availability targets, availability issues descriptions, historical analyses of achievements with regard to targets

summaries, and documentation of useful lessons learned. The availability plan is a comprehensive record of IT's approach and success in meeting user expectations for IT resource availability.

- ▶ Evaluate availability management performance

Identifies areas that need improvement, such as the foundation and interfaces of the process, activity definitions, key performance metrics, the state of supporting automation, as well as the roles and responsibilities and skills required. Insights and lessons learned gained from direct observation and data collected on process performance are the basis for improvement recommendations.

1.2.2 Tools requirements for availability management

To support the availability management process effectively, a range of monitoring and management tools are required to help in activities such as measurement, monitoring, analyzing, and reporting. The tools that are required depends on the availability and automation requirements for daily availability management operations.

The tools chosen need to provide the following functions:

- ▶ Monitoring for the specified target of IT resource or service
- ▶ Alerting for errors or threshold violation
- ▶ Reporting facility for generating the required management reports
- ▶ Centralized system management for reducing man made errors and enhance quality of system management

As for the monitoring, consider several different views to set the monitoring target. You can have three monitoring views:

- ▶ Individual IT component view
- ▶ Application view
- ▶ IT service view

The reason to have the different views is that you have a different measurement focus for the different aspects. From the IT services view, the concern is on service availability. From the application view, the concern is on application availability, and from the IT component view, the concern is on IT component availability. The three views have a *layered* relationship. That is, the IT service view is on the top, the application view is in the middle, and the IT component view is at the bottom. With the three different monitoring views, you can have better control for service management for availability.

The IT component view focuses on the resources monitoring for IT components. We want to know the status for each IT component and like to know whether any error exists for the IT component.

The application view focuses on the composite application monitoring. We want to know the running status for middleware and applications. The applications transaction might traverse multiple servers and is working correctly depending on all the underlining IT components that are running.

The service view focuses on the IT services. We want to know that the required IT services are available for business operation.

1.3 Capacity management

Capacity management is a process inside ITIL service delivery processes. The goal of capacity management is to ensure that the capacity of IT resources can be provided to match the demands of business for IT services in a timely and cost effective way. From this goal, the important tasks that need to be considered in capacity management include:

- ▶ Matching the capacity of the IT services and infrastructure to the current and future identified needs of the business and to have a scalable plan for IT infrastructure.
- ▶ Knowing the usage trend of IT capacity and to avoid incidents caused by lack of capacity.
- ▶ Tuning the IT components to have efficient operation and better utilization.

In this section, we discuss the key activities and tools requirements for capacity management.

1.3.1 Key activities in capacity management

The capacity management process consists of the following key activities:

- ▶ Establish capacity management framework

Develop guidelines and a framework for capacity management. The following tasks belong to this activity:

- Identifying the IT resources that will provide the performance and capacity services.
- Training to establish performance and capacity services due to constant technology change, key linkages with business directions, and the need for good communication and project management skills.

- Monitoring and setup of the Capacity Database with business, technical, services, and resource information.
- Determining appropriate service level agreement (SLA) and service level requirements (SLR) with the business is required.
- Establishing the process framework also includes the continuous improvement of capacity management, that is the consideration of the capacity management process evaluation and the implementation of recommended improvement actions.
- ▶ **Model and size capacity requirements**

Involves performance and capacity prediction through estimation, trend analysis, analytical modeling, simulation modeling and benchmarking. Modeling can be performed for all or any layer of the IT solution including the business, application or technology infrastructure.

Application sizing predicts the service level requirements for response times, throughput and batch elapsed times. It also predicts resource consumption and cost implications for new or changed applications. It predicts the effect on other interfacing applications. It is performed at the beginning of the solution life cycle and continues through the development, testing and implementation phases. Application sizing has a strong correlation with performance engineering.
- ▶ **Monitor, analyze, and report capacity usage**

Monitors need to be established on all the components and for each of the services. The data should be analyzed, using, wherever possible, expert systems to compare usage levels against thresholds. The results of the analysis should be included in reports, and recommendations made as appropriate.

There is a fundamental level of data collection and reporting required within any environment before any capacity or performance services can be undertaken. Monitors and data collection/reporting suites might be required at many levels, including but not limited to, the operating system, the database, the transaction processor, middleware, network, Web services, and end-to-end (user experience).
- ▶ **Plan and initiate service and resource tuning**

The recommendations from the monitoring, analyzing, and reporting activities are planned and initiated through incident, problem, change, or release management.

Service and resource tuning enables effective utilization of IT resources by identifying inefficient performance, excess or insufficient capacity and the making of recommendations for optimization. It can balance the need to

maintain service while reducing capacity capability to reduce the cost of service.

► Manage resource demand

Involves monitoring of workload demand for servers, middleware, and applications under management.

This activity can be reactive in response to unpredicted business activity whereby the existing infrastructure provisioning is inadequate relative to increased demand.

This activity can be performed proactively whereby workload policies are enforced to limit or increase the amount of resources consumed by a particular application or business function.

Make decisions and perform or request actions that will result in a better match between resource supply and demand.

► Produce and maintain capacity plan

Develop, maintain, test, and revise alternative approaches in satisfying various enterprise-shared resource requirements. It delivers the capacity plan that addresses the customer's resource requirements. This plan is configurable, meets performance expectations, and has the required commitment to implement.

The inputs to this activity are forecast assumptions, forecast projections, and subject matter expert recommendations. The controls for this activity are financial constraints, hardware constraints, performance policies, resource standards and definitions and strategy and direction. The deliverables from this activity are the agreed capacity plan, alternative solutions and an optimized resource solution.

► Evaluate capacity management performance

Measurements include the definition, collection of measurements, the analysis, and the review and reporting for capacity management. Primarily, the data provides a mechanism to identify and reduce process incidents and problems, propagate best practices as a means for continuous improvement, and to maintain or improve customer satisfaction. Measurement data is also commonly used to evaluate performance against service level agreement (SLA) objectives and to provide billing / credit information.

1.3.2 Tools requirements for capacity management

To facilitate and make it more effective and efficient, the organization needs automation tools to help in activities such as modeling, monitoring, analyzing, reporting, and tuning in capacity management.

To support the capacity management process effectively, a range of monitoring and management tools are required. The requirements of tools depend on the capacity requirements and the level of automation that is required for daily capacity management operations. Normally, the tools in availability management also provide the required functions for capacity management.

The tools need the following functions:

- ▶ Collect performance data from IT components, composite applications and services.
- ▶ Provide central repository for the historical performance data. Then it further can produce the statistic performance information report.
- ▶ Provide trend analysis, simulation modeling for future requirement estimation.

The tools consideration for capacity management can be from three aspects: business capacity management, service capacity management, and resource capacity management. Due to different focus and view in these three views, the tools requirements will be different.

- ▶ Business capacity management
Need tools to support trend analysis, modeling, prototyping, and sizing to forecast future business requirements.
- ▶ Service capacity management
Need tools to support monitoring, analyzing, tuning, and reporting on service performance.
- ▶ Resource capacity management
Need tools to support monitoring, analyzing, reporting on the utilization, and performance of IT components.

Introducing the service management concept from IBM

In this chapter, we describe aspects of infrastructure management through a management maturity model. This model can be used to illustrate the different evolution phases that lead from a resource management focused approach to a service management centric approach. We also introduce the IBM service management concept, its content, and the alignment with ITIL recommendations.

This chapter includes the following sections:

- ▶ 2.1, “Introduction” on page 16
- ▶ 2.2, “Maturity levels in the infrastructure management” on page 16
- ▶ 2.3, “Managing services with IBM service management blueprint” on page 22

2.1 Introduction

This book describes two areas of infrastructure management: availability and performance management. These two areas are linked tightly to two of the processes that are described by ITIL, namely availability management and capacity management. However, to fully understand the dependencies between the solution components, as well as the opportunities of extending the availability and performance management environment to more advanced and complex management architectures, it is important to describe the entire management domain.

Therefore, in this chapter, we introduce the *service management blueprint* from IBM that provides an overview of the different management layers. This service management blueprint gives from a broader perspective and sets a clear logical structure, positioning the solution components that build up from the blueprint.

We use the service management blueprint as a reference throughout this book and refer back to it as necessary.

2.2 Maturity levels in the infrastructure management

Today, commercial and government organizations are dependent on electronic information processing through computer networks, and especially through the Internet. Organizations run mission-critical applications at any time and place in the world. Business processes, activity, and infrastructure—and thus our global society—are dependent on this IT *layer* of organizations.

Organizations need to know what is happening with their business at all times. For example, they need to know whether mission-critical applications are available and working properly and how to detect and prevent a potential crisis in business processes, activity, or infrastructure. If a crisis occurs, they need to understand immediately the business impact, the root cause, the problem, and how to correct the problem.

Organizations typically have an IT environment that includes resources from multiple vendors that are running on multiple platforms and are possibly spread across multiple locations. In this IT environment, understanding the status of a particular IT resource is only a small part of the big picture. To maximize the business value of IT investments, organizations must also understand how each resource affects the applications, business services, and business processes that it supports.

The ultimate goal in any IT environment is to keep the IT environment running efficiently and effectively and, when multiple problems occur, to prioritize the workload effectively.

To support this goal, organizations implement infrastructure management environments that monitor and manage their IT environment from multiple perspectives. The solution scope ranges from the simple resource monitoring up to the advanced business-focused service management. Alternatively, in terms of the corresponding operation processes, they want to move further and further from an ad hoc, reactive mode of monitoring IT to a process-based, proactive model of managing IT as a business according to best practices.

Considering this, the different management environments consist of a lot of factors that do not include only technology or tooling aspects. The integration of the information, people, and processes that are involved in the management this technology and tooling has more and more emphasis, especially if when moving from ad hoc to proactive.

Figure 2-1 shows how IT management can evolve from being technology-focused environment to an on-demand, autonomic, and business-focused environment. In Figure 2-1, the horizontal axis represent the focus shift from technology to business, and the vertical axis shows the evolution towards an on demand environment.

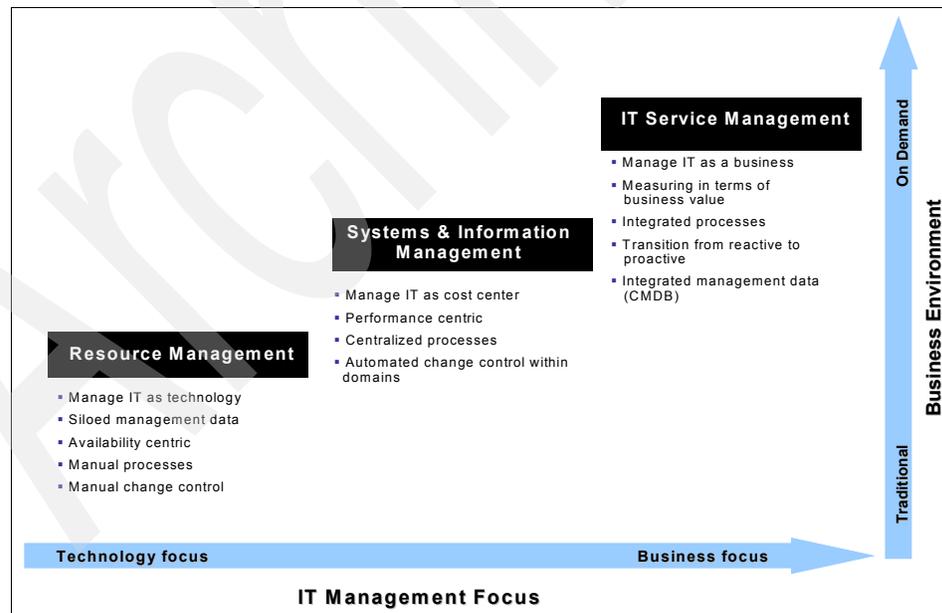


Figure 2-1 Evolution of management focus

In the following sections, we discuss these three levels of maturity.

2.2.1 Resource management

Resource management is characterized by an ad hoc, reactive mode of resolving infrastructure problems. A centralized management tool does not exist. Instead, the IT organization relies on internal procedures, custom scripts, or siloed applications that are designed only to check problems with specific systems and resources. These tools usually do not reach any farther than just the technology component that is monitored.

While this approach prevents some problems, systems administrators spend much of their time investigating performance problems and failures after they occur. System outages or access failures are typically reported by employees, field personnel, or customers. The process from problem discovery to problem resolution or that of handling change requests is often human-intensive and time-consuming.

Custom scripts and management products targeted to specific IT resources are inefficient in helping to prevent or resolve problems because they do not work well together. Isolating potential or existing problems are time-consuming because humans must correlate data from different applications. There is no single, consistent user interface from which to view the resources that make up the managed IT environment, the dependencies among them, and their performance metrics. In fact, except in the smallest organizations, the IT staff might not know exactly which resources exist or which scripts or applications are available for troubleshooting.

This ad hoc approach is highly dependent on the application knowledge and programming skill of the IT staff. Any correlation or setting priorities for intervention are not supported by automated tools. It is left to the best knowledge and efforts of the personnel.

When organizations that are at this level expand their customer base or offer more services, the inadequacy of the ad hoc approach is magnified. The IT staff finds it increasingly difficult to handle the growing complexity of the IT environment. Without a consolidated view of operations, managers cannot effectively evaluate the performance of current business processes and plan for growth. The siloed model results in the failure to maintain the availability of critical applications, which can result in loss of customers and threaten the company's market position.

2.2.2 Systems and information management

The *systems and information management* environment at the next level already relies on more automation and centralization.

With this level, the administrators can oversee the whole infrastructure using a unified view that shows, in a single user interface, all of the IT components or resources that are managed: servers, applications, operating systems, databases, clients, and so on. It also shows the relationships among resources, for example, which applications are running on which servers, which servers are connected in which portions of the network, and the ability of clients to connect to those resources. With a unified view, the IT administrators can navigate among related resources and perform basic health analysis on consolidated management data.

Centralizing the management information also means that advanced correlation can be done using events or monitoring data coming from different parts of the infrastructure. To make the most appropriate and timely actions, administrators can count on correlation features that help isolate the roots of problem.

There is a centralized data repository or warehouse that stores consolidated historical data from throughout the managed environment. Administrators can study the data in a single view to make proactive planning decisions based on observed trends in resource usage.

The data collected from the different management products is presented in a consistent way within the same user interface. For example, the manner of presenting threshold alerts, table data, and graphical data is consistent.

Using the central management interface, administrators can even automate many of their manual tasks, such as running scripts or predefined actions in response of component faults. The operation processes are centralized and documented, which helps significantly in reaching a predictable and repeatable way of management.

2.2.3 Service management

IT organizations at the first two levels are only able to handle availability and performance from a technology point of view. Systems and information management provides only the possibility to do correlation at the technology domain level, no information is available on how certain technology elements (servers, networking devices, applications, and so on) contribute to the smooth running of business operations. From another perspective, no data is present that could tell which business function will fail in case of the failure of certain technology components in the infrastructure.

The next level, *IT service management*, is a key leap towards business centric management. It adds the additional layer that can be used to build the link between technology and business functions.

At this level, the organization moves from viewing collections of resources and applications to understanding the business service that is delivered by these resources and applications. To help in prioritizing problems according to their business impact, administrators aggregate resources and applications (especially composite applications) into business service views that reflect the way that the IT environment supports the business. So, they are no longer limited to infrastructure or technology level information. All of these can be related to business relevant metrics and priorities.

At this level, we need to introduce the following new terms:

- ▶ *Business service management* is the planning, monitoring, measurement, and maintenance of the level of service that is necessary for the business to operate optimally. The goal of business service management is to ensure that business processes are available when they are needed. Proper business service management is critical for relating IT performance to business performance.
- ▶ A *business service* is a meaningful activity that provides business value and is done for others. It is supported by one or more resources or applications and has a defined interface. A business process is a set of related activities that collectively produce value to an organization, its customers, or its stakeholders. An insurance claim process is an example of a business process. An online claim filing system is an example of a business service that is part of an insurance claim process.
- ▶ A *business system* is a set of IT resources that collectively support one or more business services. The terms business service and business system are sometimes used interchangeably.

IT service management also means that IT is managed as an individual business unit that provides services to other units within or outside of the organization. These services are usually measured against service level agreements.

To meet the service level requirements, organizations aiming at the level of IT service management need to have integrated processes that are able to consistently control IT operations end to end. They need to integrate and automate IT processes across organizational silos, with the ultimate goal of creating a process-based, proactive model for managing IT according to best practices.

To become more efficient and effective at determining root cause and business impact and ensuring compliance with service level agreements, IT organizations must give people from all domains of expertise a consolidated view of the IT processes and information that can help them. They must also automate as many processes as possible.

This is the level that ITIL best practices discuss. In terms of the ITIL recommendations, the key component within the management architecture is the configuration management database (CMDB). It supports the collection of IT resources and the mapping of business services to IT equipment. IT operation processes, such as incident, problem, change, or configuration management, rely on CMDB and on the integrated management data (configuration and topology information) that is stored in that.

In the next section, we provide an overview of the IBM service management blueprint, which breaks down the management infrastructure components into clearly defined layers. These layers can be aligned logically with the management environments at different maturity levels.

2.3 Managing services with IBM service management blueprint

This section provides a short overview of IT service management and how it relates to the IBM blueprint.

2.3.1 Business perception of services

IT service management is the management of IT systems with a primary focus on the business perception of IT contribution and value to the business. IT service management has the following primary objectives:

- ▶ To align IT services with the current and future needs of the business and its customers.
- ▶ To improve the quality of IT services.
- ▶ To reduce the long-term cost of providing IT services based on a service level agreement (SLA).

The providers of IT services measure, manage, and report on the business impact of the IT environment.

IT service management is used to streamline business processes, optimize resources to manage costs, manage productivity efficiently, and increase revenue, which in turn, helps to ensure that the business meets its objectives. IT service management innovation can bring more efficiency and effectiveness to the management of IT.

In today's environment, large IT organizations are challenged by

- ▶ Greatly increasing complexity, such as composite applications and Web services that cross multiple systems
- ▶ Strong requirements of compliance with internal policies and government regulations
- ▶ Increasing demands for IT services

In this environment, IT organizations must move beyond having topical experts (such as for databases, UNIX® servers, mainframes, or storage) who use specialized tools within an organizational silo. IT organizations must greatly improve communication and responsiveness among IT specialists by implementing and enforcing consistent cross-organization IT management processes.

2.3.2 The IBM service management blueprint

The business problem that is addressed by the IBM service management blueprint is how to fill the management gap between the infrastructure elements and the (business) services supported by those elements (see Figure 2-2).

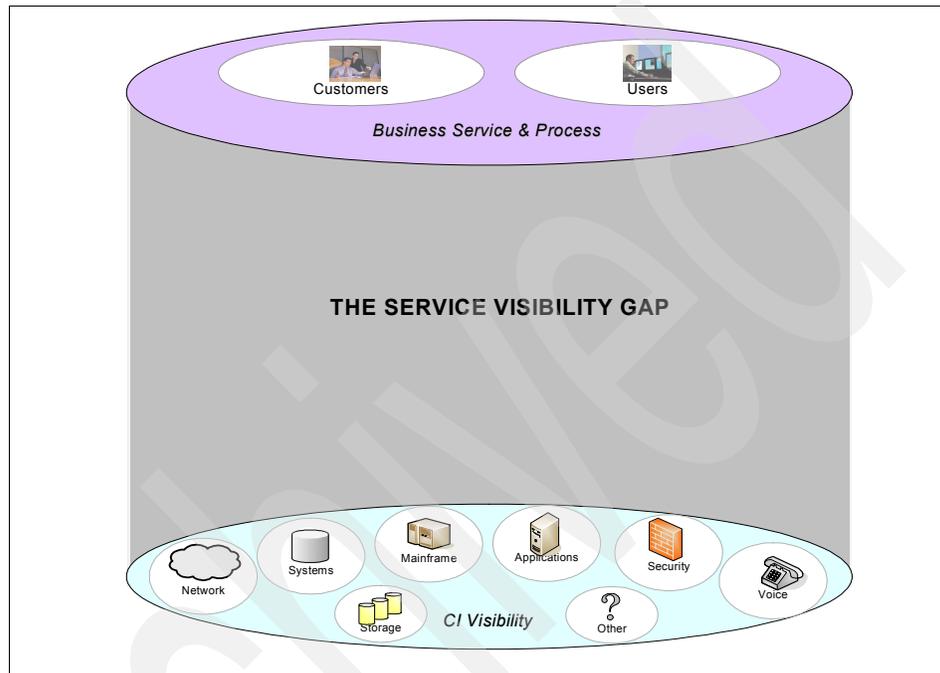


Figure 2-2 Business problem addressed by the blueprint

The bottom layer of the figure illustrates the infrastructure components that IT organizations need to manage. This layer presents a challenging and complex task because of the following facts:

- ▶ The infrastructure can contain a large number of components from different vendors at distributed locations and from different technology domains (IP networking, servers, applications, telecommunications equipment, and so on).
- ▶ IT organizations need to collect availability (fault and event) as well as performance data from the infrastructure and feed that data into a consolidated and normalized management view while handling the heterogeneity of the infrastructure at the same time.
- ▶ Operators need to be able to get an integrated and unified interface showing the management overview information but they also need to have drill-down tooling when it comes to a detailed analysis of measured data.

The objective is to deliver high quality customer, partner, and employee facing services and processes to support revenue generation.

The topmost layer on Figure 2-2 shows the services and processes that are relevant to the business users of the infrastructure. These services and processes are supported by the underlying IT infrastructure. Each service typically consists of several networking and network security devices, servers, applications, databases, and other components such as integration middleware and depends on the availability and performance of that complex.

Now, you face the following issues:

- ▶ How to connect the two layers.
- ▶ How to map the IT infrastructure to the business services that the IT organization needs to support at the end.

The first challenge is to disconnect the complex infrastructure and the services and processes that you need to deliver, which is called *a service visibility gap*. In other words, you have no way to currently visualize those services and processes and to assure their availability, performance, and integrity as well as to manage the business performance for those services and processes.

What you need here is a way to *bridge* this visibility gap. To do so, you need to understand the many dependencies and the health of the individual configuration items that make up a service. To gain this visibility requires key capabilities from end to end: discovery to detect the dependencies as they occur in real-time and monitoring to understand the actual health of those infrastructure components. In ITIL terms, these capabilities are called configuration items (CIs).

Furthermore, you need to be able to take this information and to consolidate it into a service management platform that is capable of delivering *service intelligence* to your potential customers: lines of business, IT operations, and users within or outside of your organization. Achieving service intelligence requires the following key capabilities:

- ▶ A means of consolidating event or status information from throughout the many event sources to understand the real-time health of all CIs that can potentially impact service health.
- ▶ The ability to consolidate all relevant configuration, or dependency information, from the many sources in a single trusted data store.
- ▶ The ability to merge individual status information with the dependency information to perform automated analysis. This automated analysis allows the management of service quality across the various audiences and provides the targeted information that users need to manage services effectively.

Last but not least, to bridge the service visibility gap, improve operational efficiency, and guarantee service quality, you need to implement and automate the many service delivery, service support, and other operational processes that can impact service performance.

Figure 2-3 illustrates these capabilities.

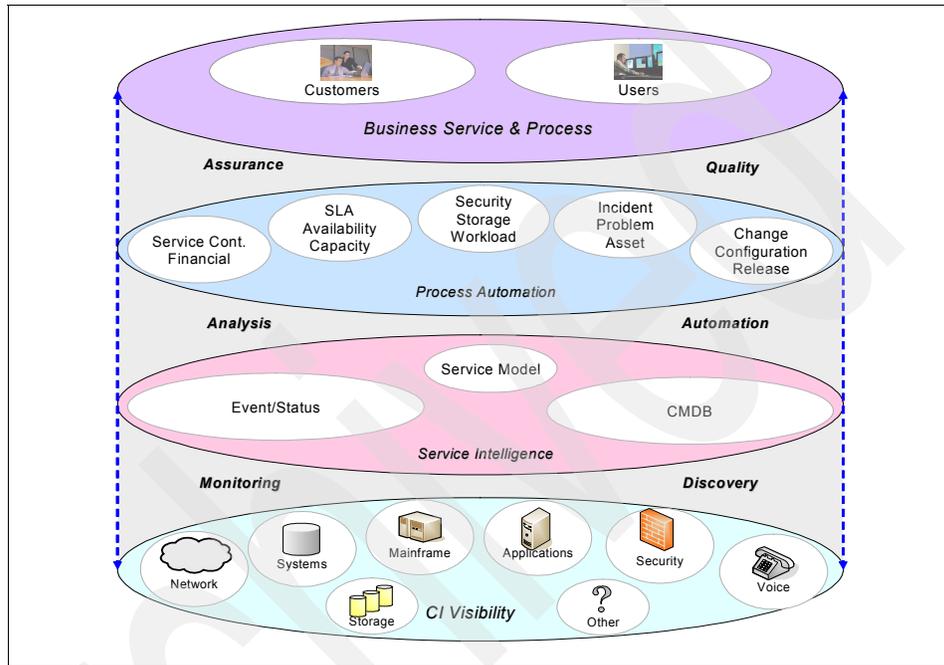


Figure 2-3 Bridging the service visibility gap

Now, we introduce the IBM *service management blueprint*. The IBM service management blueprint is based on a service-oriented architecture (SOA) and best practices, including ITIL. Figure 2-4 illustrates matching the blueprint with the problem that we just described.

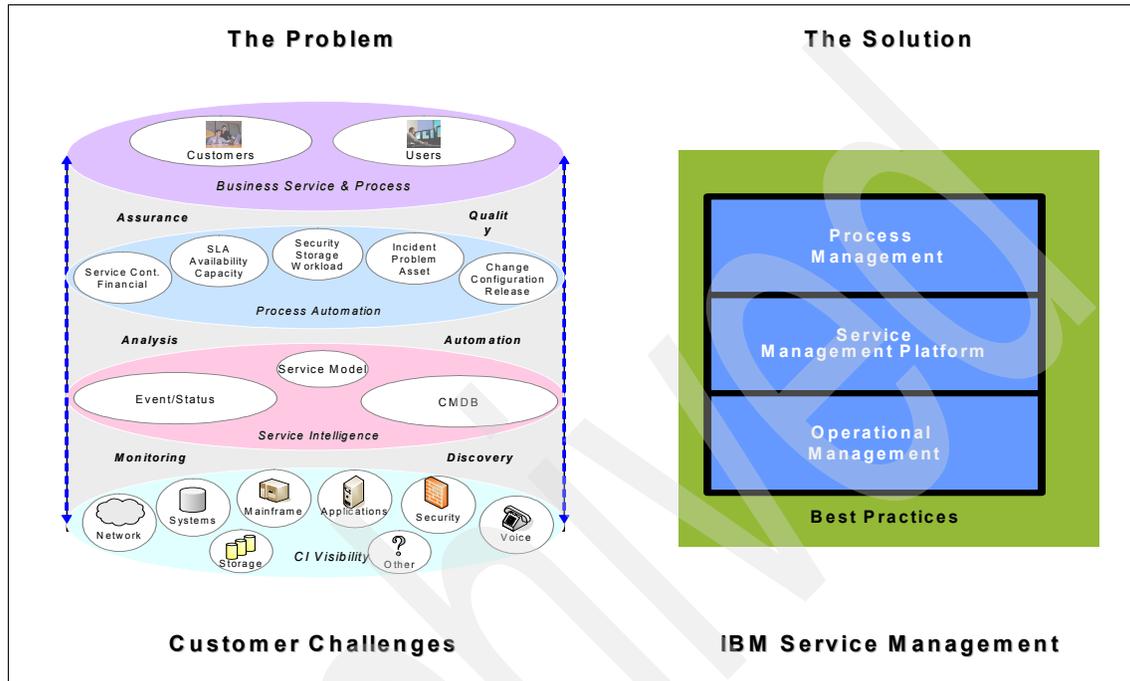


Figure 2-4 IBM service management blueprint, responding to service visibility questions

With this solution, IT organizations can implement ITIL best practices, view their IT environment holistically and manage it as a business, and gain real business results. The blueprint helps IT organizations assess and automate key IT processes, understand availability issues, resolve incidents more quickly, implement changes with minimal disruption, satisfy service level agreements, and ensure security.

The IBM service management blueprint is divided into three layers:

- ▶ Operational management
- ▶ Service management platform
- ▶ Process management

A fourth layer that complements these three layers is the best practices.

Starting from the bottom, we now describe briefly what is positioned in each of the layers. Figure 2-5 illustrates an extended version of the blueprint.

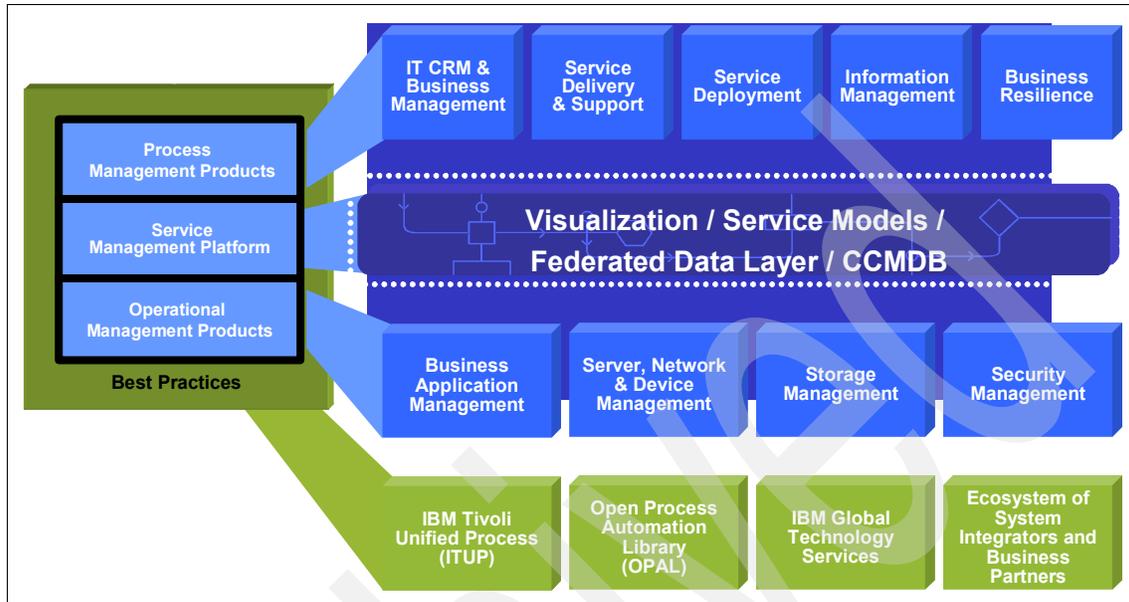


Figure 2-5 IBM service management blueprint detailed

Operational management products

IBM IT operational management products help IT organizations deliver services efficiently and effectively. You can use this product set to implement the management environment at maturity levels 1 and 2 described in 2.2, “Maturity levels in the infrastructure management” on page 16. These products cover the management of all the different IT infrastructure components, such as:

- ▶ Networking devices, such as routers and switches or security devices (VPN gateways or firewalls)
- ▶ Servers and base operating system platforms, ranging from Intel® through UNIX to mainframe and from Windows® and Linux® to z/OS®
- ▶ Applications, including packaged applications as well as application servers with custom developed applications
- ▶ Databases
- ▶ Storage area network (SAN) elements and storage devices

In terms of functionality, operational management products help you monitor essential system resources proactively, which can range from basic metrics to complex measurements. For example, you can monitor:

- ▶ Low-level system resources, such as CPU, memory or disk utilization on a server
- ▶ Application specific resources, such as outgoing mail queue length on a mail server or database table space allocation
- ▶ User response time using simulated transactions from a GUI or Java client in a complex environment

Based on what you measure, you can react to important system events and run automatic responses that you predefine for such cases. All the data that you collect from your infrastructure is displayed on a consolidated graphical interface with real-time and historic details on your systems. System administrators can then customize the portal view to display what is of most relevance for them. This method helps you optimize efficiency in your IT department.

IBM operational management products include, but are not limited to:

- ▶ Tivoli server, network, and device management products, such as:
 - IBM Tivoli Enterprise Console®
 - IBM Tivoli Monitoring
 - IBM Tivoli OMEGAMON®
 - IBM Tivoli Network Manager
- ▶ Tivoli business application management products, such as:
 - IBM Tivoli Composite Application Manager for SOA
 - IBM Tivoli Composite Application Manager for Response Time Tracking
- ▶ Tivoli storage management products
 - IBM Tivoli Storage Manager for data backup, restore and archiving
 - IBM Tivoli TotalStorage® Productivity Center family for storage area network and data volume management
- ▶ Tivoli security management products
 - IBM Tivoli Access Manager family for active runtime access control
 - IBM Tivoli Identity Manager for administrative access control and user provisioning
 - IBM Tivoli Compliance Insight Manager and IBM Tivoli Security Operations Manager for security integrity and event management
- ▶ Tivoli business management products
 - IBM Tivoli Business Service Manager
 - IBM Tivoli Service Level Advisor

Service management platform

The core of the service management platform layer is the Configuration Management Database (CMDB). The CMDB standardizes and consolidates information from IBM IT operational management products to help IT organizations align operations with business context and manage change.

Each of the IBM IT process management products is integrated tightly with CMDB and provides ITIL-aligned process flows that can help IT organizations integrate and automate their IT processes across organizational silos and manage IT as a business.

The complexity of IT environments makes it difficult for IT organizations to anticipate the impact of a system change. Clients tell IBM that as much as 85% of the system failure incidents that users report are caused by IT changes. Frequently, these change-induced incidents are due to a lack of understanding in the IT organization about the effect that a particular change can have on other IT resources.

Effective change management can help IT organizations make informed decisions regarding change and prevent them from making changes without considering all the dependencies. For change and configuration management processes, the CMDB includes automated, customizable workflows that are based on ITIL best practices. In addition, it can interface with the operational management products that organizations use today.

A further important component in the middle layer of the blueprint is responsible for visualizing the dependencies between IT infrastructure components and the business services being supported by them.

Visualization can be done by composing service models. These consist of nodes represented by actual devices or application infrastructure elements (such as application servers or databases). These are the elements that you can monitor using the products in the Operational Management Products group.

The nodes of the service models are dynamic in terms that they can receive live status information from the underlying monitoring infrastructure. For example, when a central router or switch fails, this event gets fed into the corresponding node of the service model as a status change.

While it is important to know the actual status of the underlying infrastructure nodes, the ultimate goal is to calculate the service status from those data.

The service models, therefore, contain their embedded logic that describes what dependencies are present and how to propagate the different status changes towards the topmost level that is the business service as a logical entity itself.

When setting up the logical model of the service, you define the propagation rules. So, you can decide and define how your business service depends on the different parts of the infrastructure. For example, you could set up rules that will mark your service as not available if the core LAN switch in the server room fails, while only marking it as *status yellow* (having problems but still working) in case one of the clustered database server nodes crashes.

Organizations also need support to be able to define service levels and track the availability of services that are provided to their customer against those. That support comes in the form of service level agreement (SLA) management that makes it easier for organizations to collect SLA data from their infrastructure and to produce reports on how the service availability requirements were met.

The products in the Service Management layer include the following:

- ▶ Tivoli Change and Configuration Management Database
- ▶ Tivoli Service Request Manager
- ▶ Tivoli Asset Manager

Process management products

Organizations can use IBM Tivoli Process Management products to use consistent, predictable, and repeatable management processes. These products are predefined workflows based on years of experience derived from customer engagements.

Tivoli Process Management products are also highly configurable and dynamic: they integrate with both IBM and non-IBM products and can be customized to the unique environment of your organization.

The IBM IT process management products work in tight integration with CCMDB and integrate and automate service management processes across organizational silos to increase operational efficiency and effectiveness. They are developed to provide process automation support according to ITIL recommendations.

Process management products include the following products that address aspects of ITIL availability, release, and storage management:

- ▶ IBM Tivoli Availability Process Manager
- ▶ IBM Tivoli Release Process Manager
- ▶ IBM Tivoli Storage Process Manager

IBM also delivers other ITIL-compliant process managers bundled with products, such as:

- ▶ Change and configuration management processes, which are shipped with Tivoli Change and Configuration Management Database
- ▶ Incident and problem management processes, supported by Tivoli Service Request Manager

Best practices

The IBM IT service management solution is based on IBM and industry best practices. You can take advantage of the worldwide practical experience of IBM from proven consulting services to maximize your current investments and implement IT service management.

IBM has extensive experience helping customers implement solutions by applying best practices from ITIL, enhanced Telecomm Operations Map (eTOM), Control Objectives for Information and related Technology (CoBIT), and Capacity Maturity Model Integrated (CMMI) in customer environments.

IBM can help you automate at the pace right for your organization. You can choose to start with your most labor intensive IT tasks, such as backup and recovery, provisioning, deployment, and configuration of resources. You can maximize your current investments by relying on the worldwide practical experience, technical skills, and proven consulting services gained from successful engagements that offered by IBM and our Business Partner community.

IBM Tivoli Unified Process

IBM Tivoli Unified Process is a free, read-only knowledgebase that provides detailed documentation of IT Service Management processes based on industry best practices. Tivoli Unified Process provides the ability to improve your organization's efficiency and effectiveness. It enables you to understand processes, the relationships between processes, and the roles and tools involved in an efficient process implementation.

Each process is defined by:

- ▶ An overall introduction describing goals, mission, scope, and key performance indicators (KPIs)
- ▶ A workflow
- ▶ People (roles)
- ▶ Information (work products)
- ▶ Products (tools) that help implement aspects of the process

Tivoli Unified Process is available for download at:
<http://www.ibm.com/software/tivoli/itservices/>

IBM Tivoli Unified Process Composer

The IBM Tivoli Unified Process Composer provides detailed documentation of IT service management processes based on industry best practices, which can help users to improve the efficiency and effectiveness of their organization.

Tivoli Unified Process Composer is the product version of Tivoli Unified Process, the free process knowledgebase. Tivoli Unified Process Composer contains a content library that can be customized, extended, and then published with the tools included in the product.

Table 2-1 summarizes the differences between Tivoli Unified Process and Tivoli Unified Process Composer.

Table 2-1 Differences—Tivoli Unified Process and Tivoli Unified Process Composer

Feature	Tivoli Unified Process	Tivoli Unified Process Composer
Industry best practices	Yes	Yes
Process-level information	Yes	Yes
Activity-level information	Yes	Yes
Tool use guidance (tool mentors)	Yes	Yes
Task-level information	Yes	Yes
Content customization	No	Yes
Content creation	No	Yes
Content publishing	No	Yes

Open Process Automation Library

The Open Process Automation Library (OPAL) is an online community for sharing best practices and new capabilities. It contains over 400 IBM Tivoli and Business Partner Product Extensions including automation packages, integration adapters, agents, documentation and supporting information. OPAL helps speed your time to value by offering a wide array of predefined, technically validated product extensions that are based on best practices for IT Service Management and Infrastructure Management and are readily available to integrate into your IT Service Management portfolio.

You can access OPAL at:

<http://www.ibm.com/software/tivoli/opal/>

IBM Global Technology Services and IBM Business Partners

IBM Global Services and a community of worldwide IBM System Integrators and Business Partners can help you plan for and deploy IT service management solutions to solve specific business problems by combining software code, intellectual property, and best practices that they have accumulated in their work with customers.

The following services are examples of the types of services that IBM Global Services provides:

- ▶ Innovation workshops
- ▶ Infrastructure services readiness engagement
- ▶ IT service management design
- ▶ Implementation services

Archived

Tivoli portfolio overview

In the previous chapters, we described the logical structure of the systems management solution set. We also showed how to position that systems management solution set to build a comprehensive blueprint.

In this chapter, we provide a more detailed discussion of the Tivoli solutions. It provides a structured approach to the broad set of Tivoli solutions in the availability and performance management area. You can find descriptions of key offerings at these areas, summaries of product functionalities, as well as links to further information and publication on IBM Web pages. This product information can help you determine the proper solution components when designing availability and performance management environments.

This chapter includes the following sections:

- ▶ 3.1, “Introduction to this chapter” on page 36
- ▶ 3.2, “Resource monitoring” on page 37
- ▶ 3.3, “Composite application management” on page 66
- ▶ 3.4, “Event correlation and automation” on page 78
- ▶ 3.5, “Business service management” on page 86
- ▶ 3.6, “Mainframe management” on page 94
- ▶ 3.7, “Process management solutions” on page 96

3.1 Introduction to this chapter

The service management blueprint from IBM covers different management domains from servers and network management through storage management to security management. It is not our goal in this book to go into details of security or storage management any further than it is necessary from the availability and performance management perspective. We limit our scope of discussion to those solutions that are relevant from the availability and performance management perspective.

We do not want to provide exhaustive details of each and every product that we discuss. Rather, our intent is to give you the functional highlights of them. After reading the summaries, you should be able to do a basic positioning of the products. In case you need more information and details, you can refer to the links or publications that we provide at the end of each product section.

The bottom layer of IBM service management blueprint that we introduced in 2.3.2, “The IBM service management blueprint” on page 23 contains operational management products. In this chapter, we follow a more detailed structure as shown in Figure 3-1. This breakdown helps you to group the members of the Tivoli availability solution family logically.

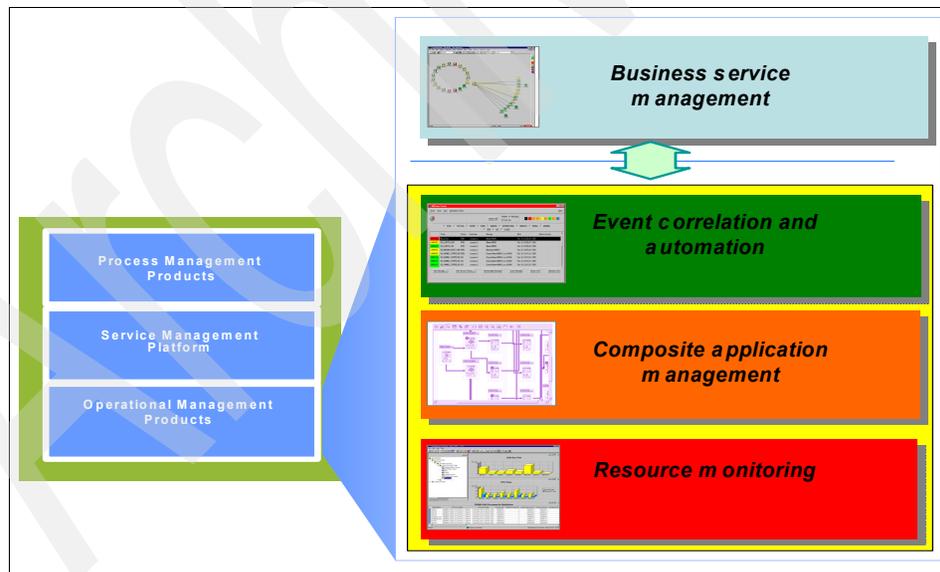


Figure 3-1 Breakdown of operational management products

In the next sections, we follow the structure defined by Figure 3-1, starting from the bottom layer, to describe Tivoli solution components. In addition, we also discuss separately mainframe management and process management products.

3.2 Resource monitoring

In this session, we discuss the Tivoli products portfolios for *resource monitoring*. Resource monitoring focuses on servers monitoring, storage area network (SAN) monitoring, and network monitoring. The network monitoring includes testing Internet services. Figure 3-2 illustrates for the scope of resource monitoring.

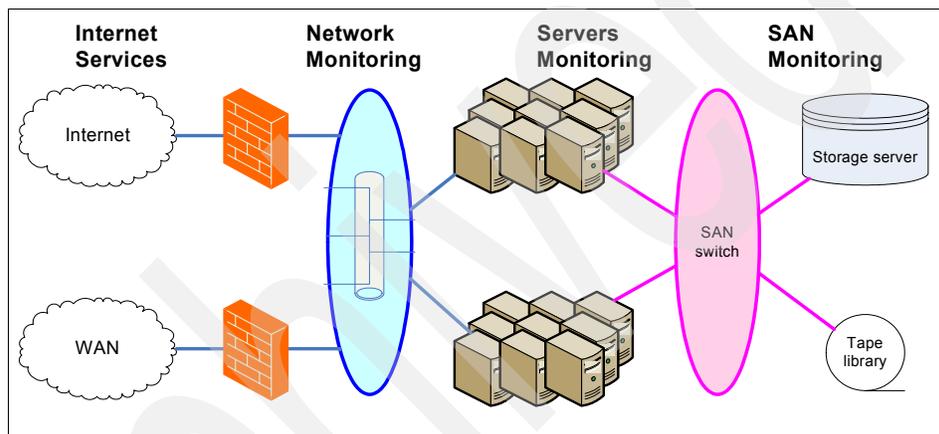


Figure 3-2 The scope of resource monitoring

The target of servers monitoring are servers, and the focus is on *availability* and *performance monitoring* for system level resources. For example, we might monitor system errors for software and hardware, CPU utilization, memory utilization, I/O performance, and so on. We discuss the following products for this topic:

- ▶ 3.2.1, “IBM Tivoli Monitoring” on page 40
- ▶ 3.2.2, “IBM Tivoli Performance Analyzer” on page 42
- ▶ 3.2.3, “IBM Tivoli Monitoring System Edition for System p” on page 44
- ▶ 3.2.4, “IBM Tivoli Monitoring for Virtual Servers” on page 45
- ▶ 3.2.5, “IBM Tivoli Monitoring for Databases” on page 47
- ▶ 3.2.6, “IBM Tivoli Monitoring for Applications” on page 47
- ▶ 3.2.7, “IBM Tivoli Monitoring for Cluster Managers” on page 49
- ▶ 3.2.8, “IBM Tivoli Monitoring for Messaging and Collaboration” on page 49
- ▶ 3.2.9, “IBM Tivoli Monitoring for Microsoft .NET” on page 51
- ▶ 3.2.10, “IBM Tivoli OMEGAMON XE for Messaging” on page 52

The target of SAN monitoring are the SAN attached storage systems and storage area network fabric such as SAN switches, SAN connection. SAN monitoring is important for SAN management just like network monitoring is important for network management. The focus is on the *health* of SAN fabric and on *availability* and *performance monitoring* for storage systems. For example, we might monitor the status of connection link within SAN, I/O performance of storage systems, the status of data replication service, file systems and disk utilization, and so on. We discuss the following products for this topic:

- ▶ 3.2.11, “IBM TotalStorage Productivity Center for Fabric” on page 54
- ▶ 3.2.12, “IBM TotalStorage Productivity Center for Disk” on page 56
- ▶ 3.2.13, “IBM TotalStorage Productivity Center for Data” on page 56
- ▶ 3.2.14, “IBM TotalStorage Productivity Center for Replication” on page 57

The target of network monitoring is the network, and the focus is *availability* and *performance monitoring* for the local network, WAN connection, network devices, and Internet services. For example, we might monitor the status of network connection, network device error, network traffic, response time of Internet services, and so on. We discuss the following products for this topic:

- ▶ 3.2.15, “IBM Tivoli Network Manager” on page 58
- ▶ 3.2.16, “IBM Tivoli Composite Application Manager for Internet Service Monitoring” on page 61
- ▶ 3.2.17, “IBM Tivoli Netcool/Proviso” on page 62
- ▶ 3.2.18, “IBM Tivoli Netcool Performance Manager for Wireless” on page 64

It is important to note the distinction between fault and trend management in a performance and availability solution. *Fault management* focuses on managing the infrastructure from an availability perspective. It, therefore, primarily collects events, status and failure information, or traps from the servers, networking, and other equipment.

In contrast, *performance management* is responsible for gathering counters and other periodic metrics (traffic volumes, usage, or error rates) that can characterize the behavior of the network from the performance point of view.

Figure 3-3 illustrates the difference and how those two areas can complement each other.

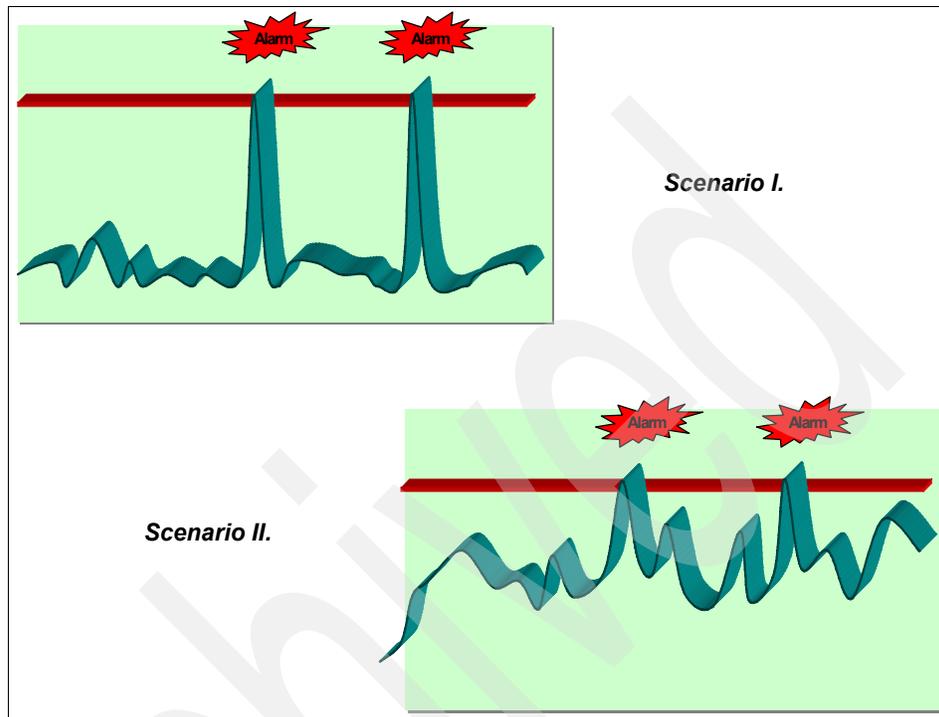


Figure 3-3 Two scenarios, same traps received, are these of equal importance

In both scenarios, traps are received to indicate threshold violations. In a fault management system, both these scenarios are reported in the same manner (two threshold violations over the same period of time, as depicted by the red Alarm indicators in Figure 3-3). However, the underlying situations are quite different. In Scenario I, the situation can be described as infrequent spikes, while Scenario II indicates a frequently near threshold situation.

A performance management system can distinguish these two scenarios clearly and can also alert you to the second type of chronic situation. So, you can be more proactive and prevent issues, rather than just reacting to alarms after the fact. These capabilities exist in the IBM Tivoli Netcool/Proviso and IBM Tivoli Netcool Performance Manager for Wireless products.

3.2.1 IBM Tivoli Monitoring

IBM Tivoli Monitoring is for system hardware and software resources monitoring and management. It provides a management framework to monitor and manage critical operation system resources across disparate platforms from a single console. The monitoring server platform includes AIX®, Solaris™, HP-UX, Windows, z/OS, Linux (Red Hat, SUSE for Intel, System z™, IBM System p™) and IBM i5/OS®.

Together with the addition of other database and application agents, Tivoli Monitoring can monitor and manage operating systems, databases, and applications in distributed environments. Figure 3-4 shows the following key components in the Tivoli Monitoring architecture:

- ▶ Tivoli Enterprise Monitoring Server collects the availability and performance information and events from various agents.
- ▶ Tivoli Enterprise Portal Server provides the user interface for the data that is collected under the Tivoli Monitoring environment for Tivoli Enterprise Portal clients to view and manage.
- ▶ Tivoli Data Warehouse is the repository and central data store for all historical management data. Tivoli Data Warehouse is the basis for the Tivoli reporting solutions.

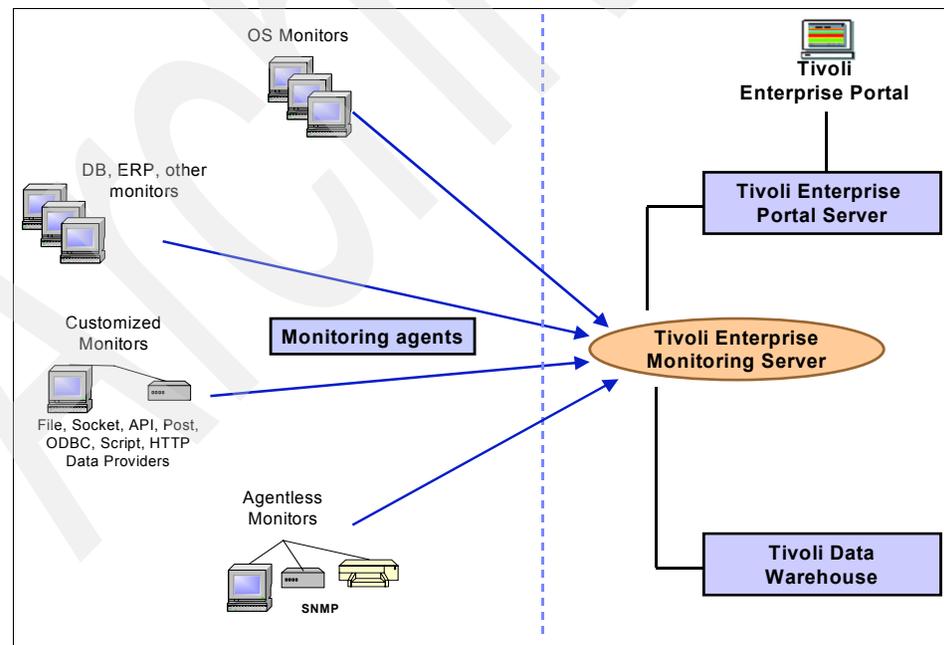


Figure 3-4 Tivoli Monitoring architecture

Tivoli Enterprise Portal is a GUI interface for viewing and monitoring the end-to-end enterprise. It comes as a desktop application or a browser client. The monitoring agents collect monitoring data about applications and resources of systems and pass the data to the Tivoli Enterprise Monitoring Server. Tivoli Enterprise Monitoring Server is responsible for data collection and event generation. Because information flow for all monitoring agent types is standardized, you can monitor all your resources from a single interface—the Tivoli Enterprise Portal.

Tivoli Monitoring works with a centralized event center for advanced event management capabilities such as filtering and correlation. Together with other sources of events, you can isolate failing components quickly and then diagnose and resolve the incident more efficiently and effectively.

Tivoli Monitoring is the basic architecture that can be extended for monitoring operating systems, databases, and applications in distributed environments, which we describe in the following sections:

- ▶ 3.2.4, “IBM Tivoli Monitoring for Virtual Servers” on page 45
- ▶ 3.2.5, “IBM Tivoli Monitoring for Databases” on page 47
- ▶ 3.2.6, “IBM Tivoli Monitoring for Applications” on page 47
- ▶ 3.2.7, “IBM Tivoli Monitoring for Cluster Managers” on page 49
- ▶ 3.2.8, “IBM Tivoli Monitoring for Messaging and Collaboration” on page 49
- ▶ 3.2.9, “IBM Tivoli Monitoring for Microsoft .NET” on page 51
- ▶ 3.2.10, “IBM Tivoli OMEGAMON XE for Messaging” on page 52
- ▶ 3.3.3, “IBM Tivoli Composite Application Manager for Web Resources” on page 71
- ▶ 3.3.4, “IBM Tivoli Composite Application Manager for SOA” on page 73
- ▶ 3.3.6, “IBM Tivoli Composite Application Manager for Response Time” on page 76

Tivoli Monitoring is also an important management framework that is required for the following products to operate. In addition the framework helps these products for centralized monitoring and management:

- ▶ 3.2.16, “IBM Tivoli Composite Application Manager for Internet Service Monitoring” on page 61
- ▶ 3.3.1, “IBM Tivoli Composite Application Manager for WebSphere” on page 68
- ▶ 3.3.2, “IBM Tivoli Composite Application Manager for J2EE” on page 70
- ▶ 3.3.5, “IBM Tivoli Composite Application Manager for Response Time Tracking” on page 74

With Tivoli Monitoring, you can perform the following functions:

- ▶ Monitor system resources for certain conditions, such as high CPU or an unavailable application.
- ▶ Establish performance thresholds and raise alerts when thresholds are exceeded or values are matched.
- ▶ Trace the causes leading up to an alert.
- ▶ Create and send commands to systems in your managed enterprise by means of the **Take Action** feature.
- ▶ Use integrating reporting to create comprehensive reports about system conditions.
- ▶ Monitor conditions of particular interest by defining custom queries using the attributes from an installed agent or from an ODBC-compliant data source.
- ▶ Provide the common infrastructure and operational interface for resources and applications monitoring and management.

For more information about Tivoli Monitoring, see:

<http://www-306.ibm.com/software/tivoli/products/monitor/>

For more information related to Tivoli Monitoring, refer to the following:

- ▶ *Getting Started with IBM Tivoli Monitoring 6.1 on Distributed Environments*, SG24-7143
- ▶ *Certification Guide Series: IBM Tivoli Monitoring V 6.1*, SG24-7187
- ▶ *IBM Tivoli Monitoring: Implementation and Performance Optimization for Large Scale Environments*, SG24-7443

3.2.2 IBM Tivoli Performance Analyzer

IBM Tivoli Performance Analyzer is a software component that complements Tivoli Monitoring. It helps system administrators to identify problem trends, resolve existing incident faster, and predict future problems to avoid them.

It plugs into Tivoli Monitoring and Tivoli Enterprise Portal and has built-in domain knowledge of distributed systems, so users can immediately be more effective without having to turn to other specialists for capacity modeling tools. It takes advantage of the long-term historical and real time data in Tivoli Data Warehouse.

Tivoli Performance Analyzer can monitor server capacity issues (see Figure 3-5). Machine level statistics, such as CPU, disk and network traffic capacity, for a particular critical server can be investigated. To support that, real-time and historical data can be used that is collected by standard Tivoli Monitoring modules or Universal Agent for customized monitoring. There is no need to deploy additional performance management agents.

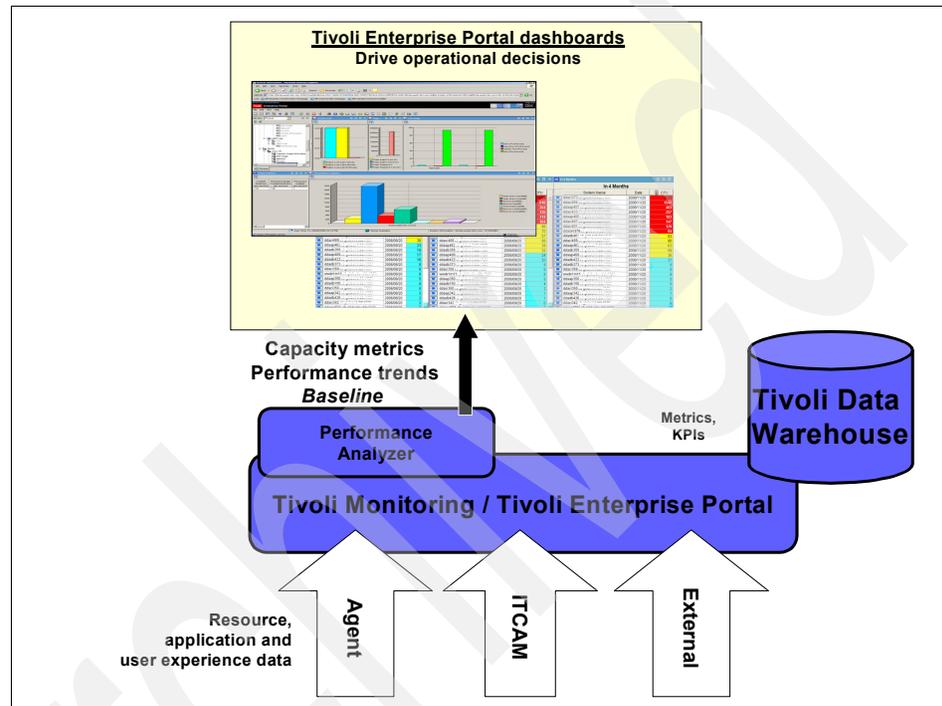


Figure 3-5 Tivoli Performance Analyzer

Tivoli Performance Analyzer offers predictive trend on key operational metrics that enables you to estimate how system performance and capacity will evolve over time. You can also use trends in situations for proactive notification of impending system capacity issues. It helps you to understand resource consumption trends, identify problems, resolve problems more quickly, and predict and avoid future problems.

Performance analysis and trending information is displayed in both graphical and table format on Tivoli Enterprise Portal. Users can get an overview quickly of how the monitored parameters are changing, for example having an upward, steady or downward trend. A trend prediction shows the estimated time to threshold violation and forecasted values in different time frames.

To track performance of your systems, Tivoli Performance Analyzer comes with predefined metrics, or you can define your own using a combination of existing attributes and arithmetic expressions. Both predefined and custom metrics can then be used on workspaces of Tivoli Enterprise Portal to display reports or trending information. The predefined reports show current and future system performance and capacity. You can even set up specific Tivoli Monitoring situations to handle performance issues.

If you need more details about Tivoli Performance Analyzer, visit:

<http://www.ibm.com/software/tivoli/products/performance-analyzer/>

For more information about Tivoli Performance Analyzer, refer to *Getting Started with IBM Tivoli Performance Analyzer Version 6.1*, SG24-7478.

3.2.3 IBM Tivoli Monitoring System Edition for System p

IBM Tivoli Monitoring System Edition for System p V6.1 is a new offering of the popular IBM Tivoli Monitoring product that is designed specifically for IBM System p AIX customers. This offering contains a subset of the Tivoli Monitoring V6.1 functionality. The product is available for System p customers at no charge. System p AIX customers can obtain this offering at no charge from Web download. The premium Tivoli Monitoring System p monitors were added to the Tivoli Monitoring product on May 2007.

Tivoli Monitoring SE for System p V6.1 monitors the health and availability of System p servers, providing rich graphical views of your AIX, LPAR, and Virtual I/O Server (VIOS) resources in a single console, delivering robust monitoring and quick time to value.

With Tivoli Monitoring SE for System p V6.1, you can perform the following functions:

- ▶ Visualize and manage the health and availability of System p AIX, LPAR (logical partitions), and VIOS resources
- ▶ See how virtual resources map to physical ones
- ▶ Access expert advice to help accelerate problem resolution
- ▶ Upgrade to the enterprise level version of IBM Tivoli Monitoring seamlessly, because Tivoli Monitoring SE for System p uses the same technology as Tivoli Monitoring

Figure 3-6 illustrates the Tivoli Monitoring System Edition for System p architecture. The monitoring agent collects the availability and performance data, then sends it to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management.

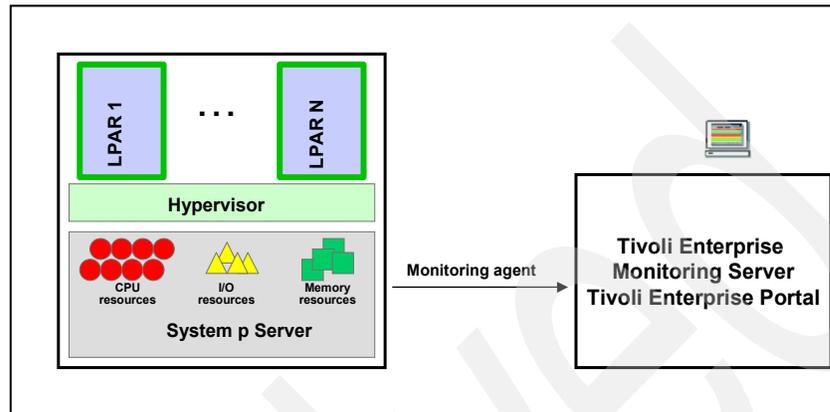


Figure 3-6 Tivoli Monitoring System Edition for System p architecture

For more information about IBM Tivoli Monitoring System Edition for System p, see:

<http://www-306.ibm.com/software/tivoli/products/monitor-systemp/>

3.2.4 IBM Tivoli Monitoring for Virtual Servers

IBM Tivoli Monitoring for Virtual Servers centrally monitors server virtualization, resource performance, and availability for Citrix Access Suite, VMware ESX, and Microsoft® Virtual Server for efficient and cost-effective IT operations.

Citrix Access Suite lets users access applications from nearly any device over almost any type of connection while still allowing these applications to be centrally managed. Citrix is frequently a mission-critical infrastructure component, because it might offer applications to business users. Therefore, it is critical that availability and performance issues be identified and resolved quickly.

IT operations and Citrix administrators can help identify and resolve those issues quickly because IBM Tivoli Monitoring for Virtual Servers helps maintain peak performance of Citrix server farms by:

- ▶ Identifying predefined situations
- ▶ Identifying issues and notifying appropriate IT personnel
- ▶ Offering expert advice that describes the likely causes and suggesting resolution actions

VMware ESX and Microsoft Virtual Server let IT organizations consolidate servers, increasing the efficiency of resource usage and reducing administration costs. This is done by allowing multiple virtual machines to run on a single physical server. In virtual environments, the virtual machines, the physical system, and the virtualization manager must be monitored to ensure appropriate levels of performance and availability.

IBM Tivoli Monitoring V6.1 delivers the capability to manage virtual servers, and IBM Tivoli Monitoring for Virtual Servers V6.1 extends this capability to include the physical and virtualization layers. In doing so, IT operations and administrators are better equipped to determine appropriate workload levels and can resolve issues with virtual servers more quickly.

In Figure 3-7, the monitoring agent in each virtualization environment collects the availability and performance information, then sends it to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management.

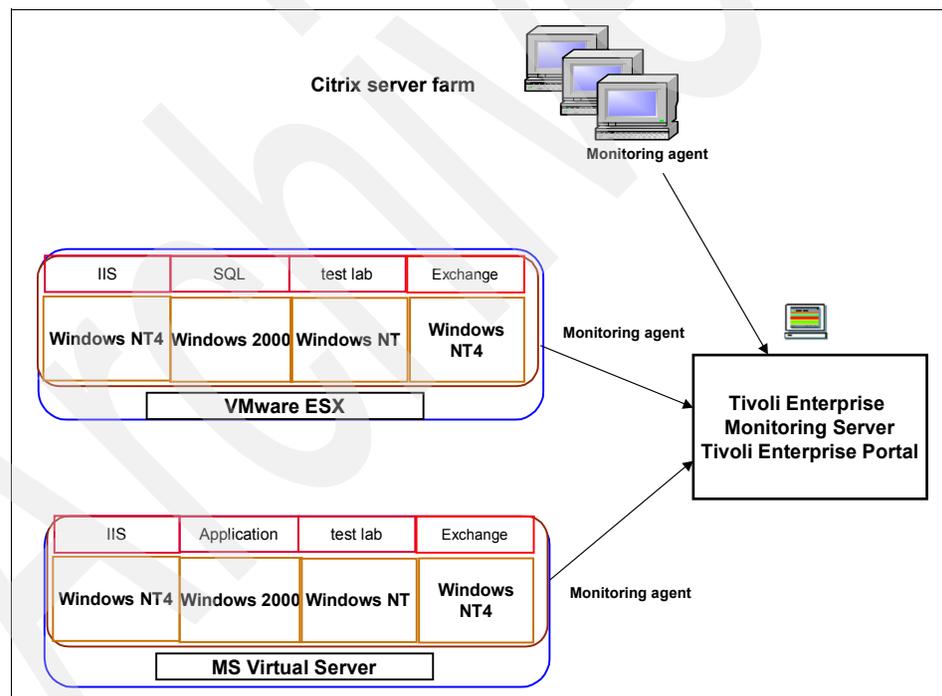


Figure 3-7 Tivoli Monitoring for Virtual Servers architecture

For more information about Tivoli Monitoring for Virtual Servers, see:

<http://www-306.ibm.com/software/tivoli/products/monitor-virtual-servers/>

3.2.5 IBM Tivoli Monitoring for Databases

IBM Tivoli Monitoring for Databases helps monitors the availability and performance of DB2®, Oracle®, Informix®, Sybase, and Microsoft SQL Server® database servers. It provides routine, consistent monitoring that anticipates and corrects problems before database performance is degraded.

Tivoli Monitoring for Databases includes proactive analysis components for monitoring multiple types of database software, including IBM DB2, IBM Informix, Oracle, and Microsoft SQL Server and Sybase. By providing a consistent management architecture and administrative console, Tivoli Monitoring for Databases helps reduce training time and allows IT administrators to focus on more complex, value-creating tasks.

Figure 3-8 shows how the product uses Tivoli Monitoring framework to monitor and manage database resources. The monitoring information is collected from the agent and sent to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management. It displays trends for resource consumption over recent and long-term historical intervals. It also provides access to expert advice.

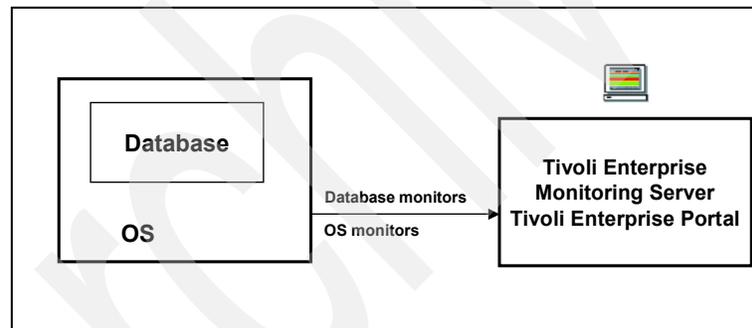


Figure 3-8 Tivoli Monitoring for Databases architecture

For more information about Tivoli Monitoring for Database, see:

<http://www-306.ibm.com/software/tivoli/products/monitor-db/>

3.2.6 IBM Tivoli Monitoring for Applications

IBM Tivoli Monitoring for Applications monitors application performance and availability for SAP®. It includes agents that contain best practice situations and expert advice for quick problem identification, notification and correction.

The success of SAP solutions relies not only on the SAP application itself, but also on the larger infrastructure on which the SAP solution runs. Tivoli Monitoring for Applications offers a single management portal from which system administrators can monitor the performance and manage the availability of the entire SAP ecosystem.

Tivoli Monitoring for Applications extends the end-to-end monitoring and management capability of IBM Tivoli Monitoring to include management and monitoring of SAP. In addition, it takes advantage of Tivoli Enterprise Portal visualization capabilities to include best practice situations, expert advice, customized workspaces, and historical data gathering.

With Tivoli Monitoring for Applications, you can perform the following functions:

- ▶ Monitor all SAP components, including the underlying resources upon which they rely, in an end-to-end fashion.
- ▶ Discover new components and the interrelationships between components automatically.
- ▶ Understand SAP performance from the user perspective.
- ▶ Detect, analyze, and repair SAP performance issues with advanced root cause analysis capabilities.
- ▶ Obtain greater insight into SAP performance by monitoring key business metrics.
- ▶ Centralize management tools using IBM Tivoli Enterprise Portal.

Figure 3-9 shows how the product uses Tivoli Monitoring framework to monitor and manage SAP application resources. The monitoring information is collected from agent and sent to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management. It displays trends for resource consumption over recent and long-term historical intervals. It also provides access to expert advice.

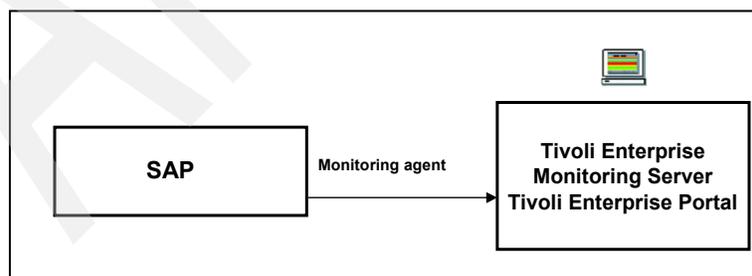


Figure 3-9 Tivoli Monitoring for Applications architecture

For more information about Tivoli Monitoring for Applications, see:
<http://www-306.ibm.com/software/tivoli/products/monitor-apps/>

3.2.7 IBM Tivoli Monitoring for Cluster Managers

IBM Tivoli Monitoring for Cluster Managers monitors Microsoft cluster manager resource performance and availability. The product extends the monitoring and management capabilities of Tivoli Monitoring to include Microsoft Cluster Server on Windows 2003. It includes agents that contain best practice situations and expert advice for quick problem identification, notification and correction.

It monitors availability of the clussvc.exe cluster process and provides availability information pertaining to a cluster, including nodes, resource groups, resources, networks and network interfaces.

Figure 3-10 shows how the product uses Tivoli Monitoring framework to monitor and manage the Cluster Managers resources. The monitoring information is collected from agent and send to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management. It displays trends for resource consumption over recent and long-term historical intervals. It also provides access to expert advice.

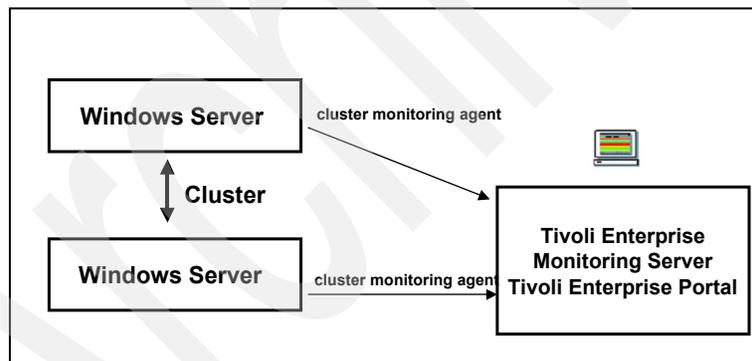


Figure 3-10 Tivoli Monitoring for Cluster Managers architecture

For more information about Tivoli Monitoring for Cluster Managers, see:
<http://www-306.ibm.com/software/tivoli/products/monitor-cluster/>

3.2.8 IBM Tivoli Monitoring for Messaging and Collaboration

IBM Tivoli Monitoring for Messaging and Collaboration is used to ensure the availability and optimal performance of Microsoft Exchange and Lotus®

Domino® servers. It monitors the status of servers, identifies server and system problems in real time, notifies administrators, and takes automated actions to resolve server problems. The product also collects monitoring data to help analyze performance and trends and helps address problems before they affect users.

Tivoli Monitoring for Messaging and Collaboration deploys best practices resource models to monitor and cure problems that arise in a messaging and collaboration environment for Lotus Domino servers and Microsoft Exchange servers.

Figure 3-11 shows how the product uses Tivoli Monitoring framework to monitor and manage the Microsoft Exchange or Lotus Domino servers resources. The monitoring information is collected from agent and send to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management. It displays trends for resource consumption over recent and long-term historical intervals. It also provides access to expert advice.

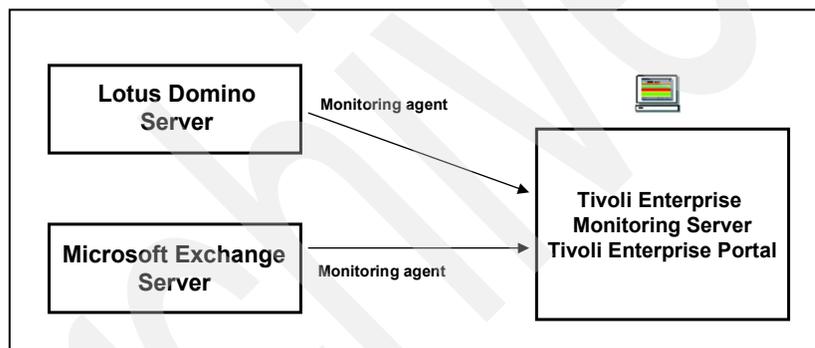


Figure 3-11 Tivoli Monitoring for Messaging and Collaboration architecture

For more information about Tivoli Monitoring for Messaging and Collaboration for Lotus Domino servers, see:

<http://www-306.ibm.com/software/tivoli/products/monitor-messaging/>

For more information about Tivoli Monitoring for Messaging and Collaboration for Microsoft Exchange servers, see:

<http://www-306.ibm.com/software/tivoli/products/monitor-messaging-exchange/>

3.2.9 IBM Tivoli Monitoring for Microsoft .NET

IBM Tivoli Monitoring for Microsoft .NET monitors essential resources and detects potential problems for Microsoft .NET environment.

By taking advantage of extensive research to identify common problems and weaknesses in the applications being monitored, Tivoli has created a set of *problem signatures*—a combination of metrics and thresholds that identify, notify, and solve issues in the Microsoft .NET environment. It provides predefined, automated best practices for monitoring the critical components of the Microsoft .NET environment, including:

- ▶ Biz Talk Server
- ▶ Commerce Server
- ▶ Content Management Server
- ▶ Host Integration Server
- ▶ Internet Security and Acceleration Server
- ▶ Sharepoint Portal Server
- ▶ UDDI Services

Tivoli Monitoring for Microsoft.NET provides monitoring for key servers and services associated with the operation of Microsoft .NET. Monitoring can be performed against all supported servers and services or a subset of them. For each monitored product, the following functions are provided:

- ▶ Discovery of the monitored product
- ▶ Monitoring of the availability, CPU, and memory utilization by the services and processes that are associated with the product
- ▶ Tasks to start, stop, and check status of the elements of the server or service
- ▶ Viewing of monitoring data at the Web Health Console in Tivoli Enterprise Portal

All of the monitoring uses native Windows methods and interfaces to collect the data necessary for monitoring and reporting.

Figure 3-12 shows how the product uses Tivoli Monitoring framework to monitor and manage the Microsoft .NET resources. The monitoring information is collected from the agent and sent to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management. It displays trends for resource consumption over recent and long term historical intervals. It also provides access to expert advice.

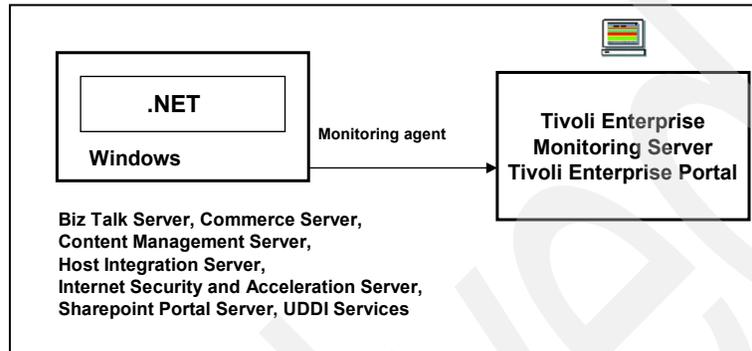


Figure 3-12 Tivoli Monitoring for Microsoft .NET architecture

For more information about Tivoli Monitoring for Microsoft .NET, see:

<http://www-306.ibm.com/software/tivoli/products/monitor-net/>

3.2.10 IBM Tivoli OMEGAMON XE for Messaging

IBM Tivoli OMEGAMON XE for Messaging for Distributed Systems helps to manage IBM WebSphere® MQ, IBM WebSphere Message Broker, and IBM WebSphere InterChange Server environments.

The predefined capabilities of IBM Tivoli OMEGAMON XE for Messaging provide auto-discovery and monitoring of these complex environments, providing rapid time to value, ease of use, and improved product quality. Additionally, it identifies common problems and automates corrective actions by monitoring key WebSphere MQ, WebSphere Message Broker, and WebSphere InterChange Server metrics. It sends event notification and provides data collection for real-time and historical data analysis, thus reducing administration costs and maximizing return on investment with increased efficiency of the IT staff.

It can identify common problems and automate corrective actions using predefined industry best-practice situations, while monitoring key WebSphere MQ and WebSphere Message Broker metrics.

Tivoli OMEGAMON XE for Messaging helps improve service level management by monitoring availability and capacity using real-time and historical data analysis. Predefined capabilities, such as auto-discovery and monitoring of complex WebSphere environments, can improve IT staff productivity and reduce administration costs.

Figure 3-13 shows that the monitoring information is collected from the agent and sent to Tivoli Enterprise Portal for centralized monitoring and management. From the Tivoli Enterprise Portal, you can monitor information such as MQ channel performance, message rate and queue depth, and so on.

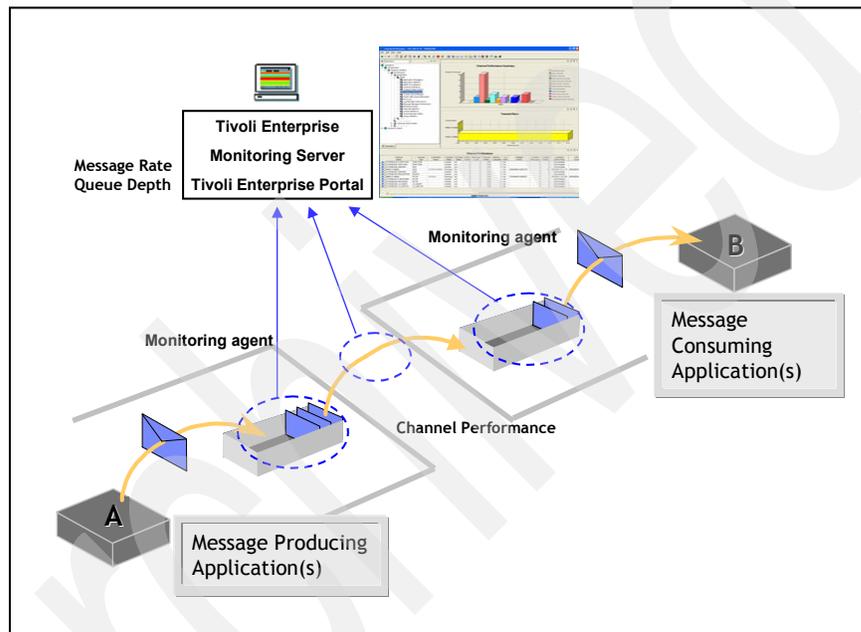


Figure 3-13 Tivoli OMEGAMON XE for Messaging architecture

Tivoli OMEGAMON XE for Messaging includes the following features:

- ▶ Visibility to monitor and manage the health of crucial WMQ components
- ▶ Easily manage WebSphere MQ, WebSphere Message Broker, and WebSphere InterChange Server from a single user interface
- ▶ Speed problem identification and resolution with Situation Editor, Expert Advice, Take Action, automated alert notification, and customized workspaces
- ▶ Protects performance and availability of key middleware components
- ▶ Ability to configure the entire WebSphere MQ, network from a single point

- ▶ Ability to maintain a secure, managed central database of WebSphere MQ, configurations
- ▶ Rapid and accurate deployment of WebSphere MQ, configurations through simple drag-and-drop functionality
- ▶ Detailed view of channels, queues, managers, and other resources, helps ensure that critical middleware resources are performing well
- ▶ Common look and feel with other Tivoli OMEGAMON XE and Tivoli Monitoring products to simplify systems management

For more information about Tivoli OMEGAMON XE for Messaging for Distributed Systems, see:

<http://www-306.ibm.com/software/tivoli/products/omegamon-xe-messaging-dist-sys/>

See also *Implementing OMEGAMON XE for Messaging V6.0*, SG24-7357.

3.2.11 IBM TotalStorage Productivity Center for Fabric

IBM TotalStorage Productivity Center for Fabric is a component of the IBM TotalStorage Productivity Center. It is used to simplify the administration for the storage area network (SAN) fabric with performance and availability monitoring.

The storage area network fabric include SAN switches or directors, SAN attached servers and SAN attached devices like storage systems and tape systems, and so on. The IBM TotalStorage Productivity Center for Fabric includes many advanced features to help simplify SAN management:

- ▶ Automatic device discovery function is to enable you to see the data path from the servers to the SAN switches and storage systems.
- ▶ Administrators can manage the SANs from a single console easily.
- ▶ Real time monitoring and alerts functions are designed to monitor SAN events, and it helps administrators to discover the problem for maintenance.
- ▶ *Zone Control* is designed to give you comprehensive fabric management from a single console by giving you the ability to add and remove devices from zones.
- ▶ End-to-end SAN performance reporting provides diagnostic and performance reporting including threshold reporting at the switch and port levels and displays this information in the common topology viewer to help you maintain high SAN availability.

Figure 3-14 shows the components of IBM TotalStorage Productivity Center and the area that each component helps to monitor and manage:

- ▶ TotalStorage Productivity Center for Fabric monitors the availability and performance for SAN fabric. This component is discussed in this session.
- ▶ TotalStorage Productivity Center for Disk monitors the availability and performance for storage systems. See 3.2.12, “IBM TotalStorage Productivity Center for Disk” on page 56 for more information.
- ▶ TotalStorage Productivity Center for Data monitors the space usage for file systems and databases in the hosting servers. See 3.2.13, “IBM TotalStorage Productivity Center for Data” on page 56 for more information.
- ▶ TotalStorage Productivity Center for Replication monitors the data replication and copy services between two storage systems in two centers, one primary production center and one DR backup center. See 3.2.14, “IBM TotalStorage Productivity Center for Replication” on page 57 for more information.

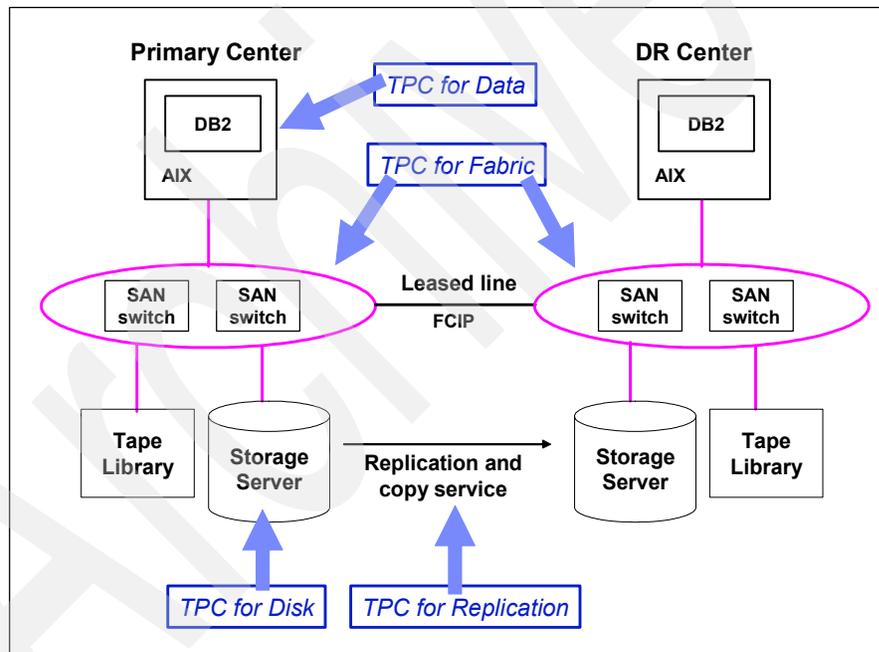


Figure 3-14 IBM TotalStorage Productivity Center components family

For more information about IBM TotalStorage Productivity Center for Fabric, see:
<http://www-03.ibm.com/systems/storage/software/center/fabric/index.html>

3.2.12 IBM TotalStorage Productivity Center for Disk

IBM TotalStorage Productivity Center for Disk is a component of the IBM TotalStorage Productivity Center. It is used to consolidate and centralize administration of your SAN storage systems. (See Figure 3-14.)

The IBM TotalStorage Productivity Center for Disk includes the following advanced features to help simplify and streamline the storage system device management:

- ▶ A single, integrated administrative console designed to simplify the management of multiple storage systems by allowing you to perform administrative tasks, such as aggregation, grouping of devices, and policy based actions.
- ▶ Performance management capabilities designed to help you optimize and intelligently tune your SAN devices by offering performance monitoring and alerts.
- ▶ Volume performance advisor is provided to optimize storage allocations by analyzing workload profiles and providing advice on the best location to choose or create volumes in an IBM TotalStorage Enterprise Storage Server®.
- ▶ Reporting capability helps resources utilization reporting, such as I/O rates and cache utilization, to help optimize storage utilization by identifying the best available LUNs.

For more information about IBM TotalStorage Productivity Center for Disk, see:

<http://www-03.ibm.com/systems/storage/software/center/disk/index.html>

3.2.13 IBM TotalStorage Productivity Center for Data

IBM TotalStorage Productivity Center for Data is a component of the IBM TotalStorage Productivity Center. It is used to manage the capacity utilization of your file systems and databases. (See Figure 3-14.)

IBM TotalStorage Productivity Center for Data is a premier Java- and Web-based solution designed to help you identify, evaluate, control, and predict your enterprise storage management needs. TotalStorage Productivity Center for Data supports today's complex heterogeneous environment, including direct access storage (DAS), network attached storage (NAS), and storage area network (SAN) storage. TotalStorage Productivity Center for Data supports leading databases and provides chargeback capabilities based on storage usage.

The IBM TotalStorage Productivity Center for Data includes the following advanced features to help manage and automate capacity utilization of file systems and databases:

- ▶ Enterprise reporting with over 300 comprehensive, enterprise-wide reports that are designed to help administrators make intelligent capacity management decisions based on current and trended historical data.
- ▶ Policy-based management enables administrators to set thresholds so, when thresholds have been exceeded, an alert can be issued or a predefined action can be initiated.
- ▶ Automated file system extension enables administrators to ensure application availability by providing storage on demand for file systems.
- ▶ Direct Tivoli Storage Manager integration allows administrators to initiate a Tivoli Storage Manager archive or backup through a constraint or directly from a file report simplifying policy based actions.
- ▶ The database capacity reporting feature is designed to enable administrators to see how much storage is being consumed by users, groups of users and operating system within the database application.
- ▶ Chargeback capabilities are designed to provide usage information by department, group, or user, making data owners aware of and accountable for their data usage.

For more information about IBM TotalStorage Productivity Center for Data, see:

<http://www-03.ibm.com/systems/storage/software/center/data/index.html>

3.2.14 IBM TotalStorage Productivity Center for Replication

IBM TotalStorage Productivity Center for Replication is a component of the IBM TotalStorage Productivity Center offering. This component can help to configure and manage advanced copy services of for multiple IBM enterprise storage servers and IBM DS4000™ storage servers.

TotalStorage Productivity Center for Replication is designed to simplify and improve the configuration and management of replication over network on storage systems. (See Figure 3-14 on page 55.)

Features of this product include:

- ▶ Helps simplify and improve the configuration and management of replication on your network storage systems by performing advanced copy operations in a single action
- ▶ Manages advanced storage replication services, Metro Mirror (synchronous point-to-point remote copy) and FlashCopy®, and monitors copy services

- ▶ Configures and stores user defined volume groups
- ▶ Enables multiple pairing options for source and target volumes in managing replication definitions
- ▶ Defines session pairs using target and source volume groups, ensures path definitions and creates consistency sets for replication operations

For more information about TotalStorage Productivity Center for Replication, see:
<http://www-306.ibm.com/software/tivoli/products/totalstorage-replication/>

3.2.15 IBM Tivoli Network Manager

IBM Tivoli Network Manager is for network management. It can discover network topology and monitor network for availability and performance. It provides root cause analysis whenever there have network events for errors.

Tivoli Network Manager includes three editions:

- ▶ Entry Edition
- ▶ IP Edition
- ▶ Transmission Edition

Figure 3-15 illustrates the difference between and the target customers for these three editions.

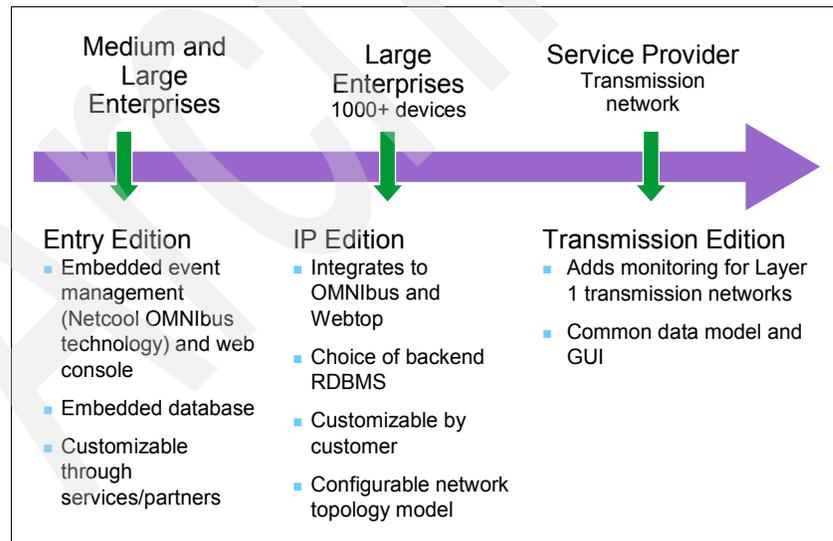


Figure 3-15 IBM Tivoli Network Manager family

Tivoli Network Manager Entry Edition has an embedded event management (IBM Tivoli Netcool/OMNIBUS™ technology), a Web console, and a database. It is suitable for network that have less than 1000 devices.

Tivoli Network Manager IP edition (formerly *Netcool/Precision IP*) can choose the back-end database and can be integrated to OMNIBUS and Webtop. It is also customizable and can configure network topology model. It is suitable for large enterprises with over 1000 network devices.

Tivoli Network Management Transmission Edition (formerly *Netcool/Precision TN*) is for service providers. It adds monitoring functions for layer 1 transmission networks.

Tivoli Network Manager software can collect and distribute layers 2 through 3 network data and, thereby, build and maintain knowledge about physical and logical network connectivity. With accurate network visibility, you can visualize and manage complex networks efficiently and effectively.

Tivoli Network Manager discovers IP networks automatically and then gathers and maps topology data to deliver a complete picture of layer 2 and layer 3 devices. It captures the overall inventory and also the physical, port-to-port connectivity between devices. Tivoli Network Manager captures logical connectivity information, including virtual private network (VPN), virtual local area network (VLAN), asynchronous transfer mode (ATM), frame relay, and multiprotocol label switching (MPLS) services. This discovery engine monitors network resources for real-time status and continually updates its database with new information as the network changes. Automatic network discovery provides an ideal alternative to manual processes because it helps minimize the time and cost that is associated with maintaining accurate asset knowledge.

The product also provides valuable advanced fault correlation and diagnosis capabilities. Real time root cause analysis helps operations personnel identify the source of network faults and speed problem resolution quickly.

Furthermore, the software's asset control capabilities help organizations optimize utilization to realize greater return from network resources. It delivers highly accurate, real-time information about network connectivity, availability, performance, usage, and inventory.

This product provides the following functions:

- ▶ Scalable network discovery functions and has a centralized data repository.
- ▶ Real time network visualization and topology modeling functions.
- ▶ Accurate monitoring and root cause analysis functions when there have error events from the network.

Figure 3-16 shows the structure of Tivoli Network Manager. The discovery agent is used to discover the network, then puts the results into the centralized database for network asset and topology repository. The polling agents are used to monitor the network and, if an error happens, the root cause analysis (RCA) engine discovers the root cause for the errors. The event gateway is used to integrate with OMNibus solutions for event management and reporting.

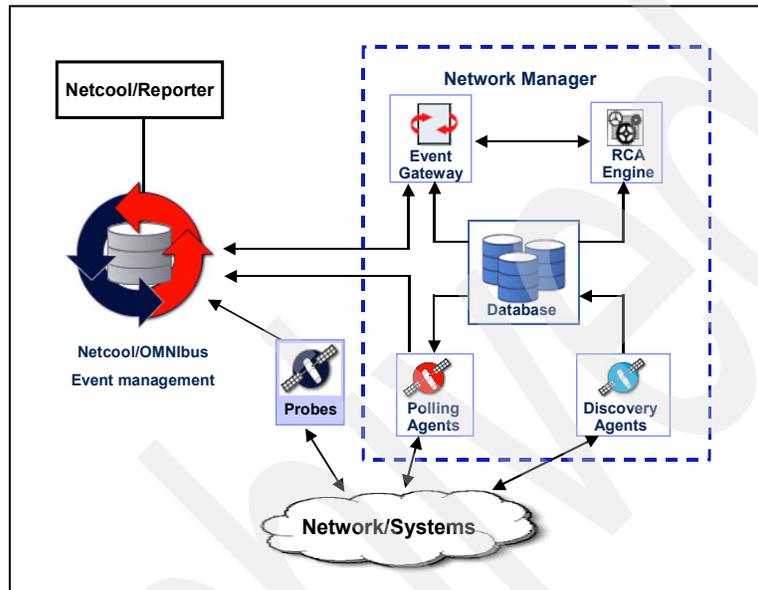


Figure 3-16 IBM Tivoli Network Manager architecture

For more information about IBM Tivoli Network Manager Entry Edition, see:

<http://www-306.ibm.com/software/tivoli/products/network-mgr-entry-edition/>

For more information about IBM Tivoli Network Manager IP Edition, see:

<http://www-306.ibm.com/software/tivoli/products/netcool-precision-ip/>

For more information about IBM Tivoli Network Manager Transmission Edition, see:

<http://www-306.ibm.com/software/tivoli/products/netcool-precision-tn/>

3.2.16 IBM Tivoli Composite Application Manager for Internet Service Monitoring

IBM Tivoli Composite Application Manager for Internet Service Monitoring (ITCAM for ISM) tests Internet services from the user's perspective. Features for this product include:

- ▶ Highly scalable 23 monitors that are designed to test Internet services from the user's perspective.
- ▶ Directly measures the availability, performance, and content of these services through periodic polling from strategically distributed points of presence.
- ▶ Produces both real-time alerts on service response and Web-based reports of historical service performance. These reports are relative to a flexibly definable SLA.
- ▶ These Web-based reports and analysis tools can be provided to customers to prove SLA adherence and to operations staff to plan changes intelligently to the infrastructure and to prove the resulting effect on service performance.

Figure 3-17 shows the architecture of ITCAM for ISM. ITCAM for ISM tests the Internet services and passes the monitoring results to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal.

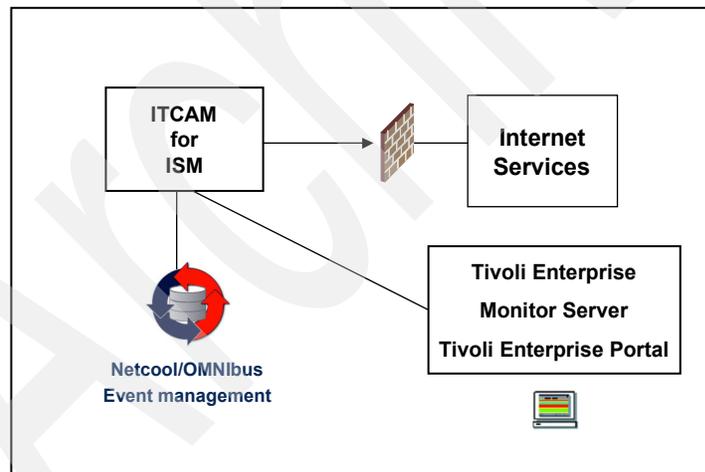


Figure 3-17 ITCAM for ISM architecture

For more information about ITCAM for ISM, see:

<http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-ism/>

3.2.17 IBM Tivoli Netcool/Proviso

IBM Tivoli Netcool/Proviso® provides a complete view of service quality and usage for both operations and customers, enabling them to proactively avoid, detect, and rapidly resolve problems. Informative help operations and engineering to improve service quality and reduce operating costs.

The consolidated, service-centric reports that Tivoli Netcool/Proviso provides of network resource, server, and application performance show the business and service impact of problems, while making it easy to drill down to individual resources and service paths for troubleshooting. On-demand detailed trend reports, second-by-second real-time monitoring, and proactive forecast reports provide the context needed to make informed decisions quickly. Refer to Figure 3-18.

Tivoli Netcool/Proviso includes flexible data collection and modeling capabilities (so called *data collectors*) that allow you to pull performance and usage information from a variety of sources, including:

- ▶ Simple network management protocol (SNMP) agents embedded in resources
- ▶ Bulk statistics from network management systems (NMS) and element management systems (EMS)
- ▶ Call detail records (CDRs) from softswitches

Tivoli Netcool/Proviso provides a library of monitoring support from leading networking equipment vendors, such as Alcatel, Cisco, Huawei, and Juniper® Networks and can cover different technology domains, including IP virtual private networking (VPNs) or voice over IP (VoIP) environments.

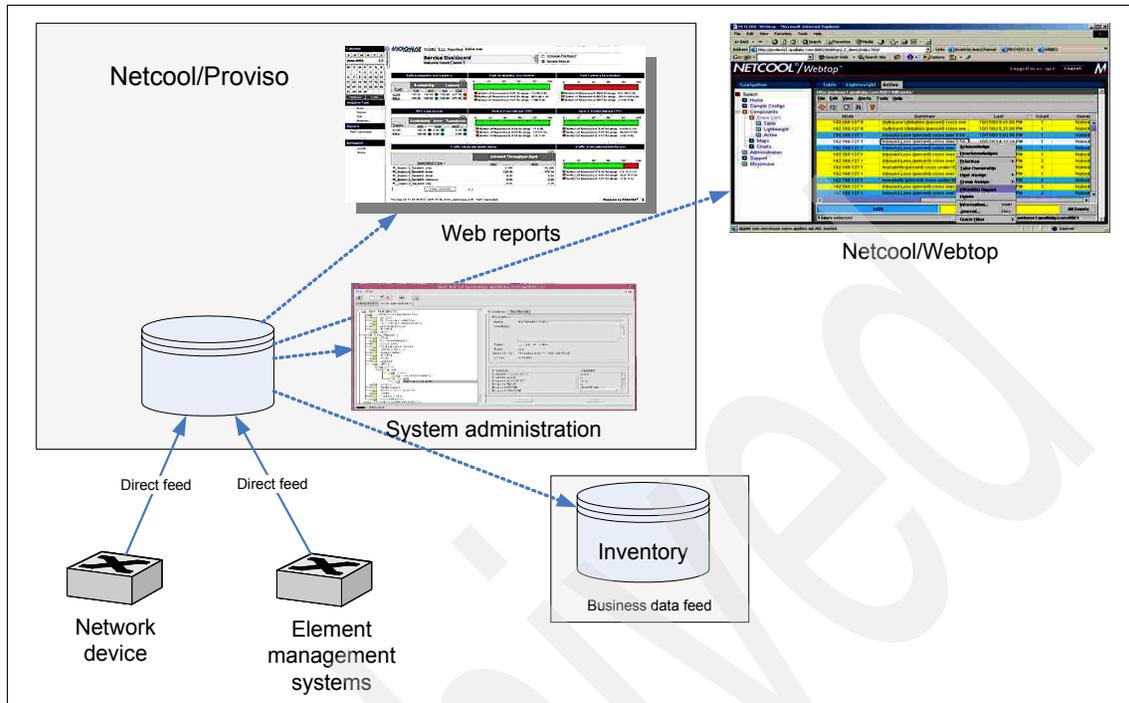


Figure 3-18 Tivoli Netcool/Proviso

Raw data collected from the data sources is aggregated by time and group and then sent to Tivoli Netcool/Proviso's database. The system can also be configured to send traps for threshold violations (including custom, customer-specific metrics) to the fault management system, such as Tivoli Netcool/OMNIBus. Database feeds from provisioning and billing systems can also be used to get additional data that is necessary for resource identification (for example, determining customer ownership of an interface).

Tivoli Netcool/Proviso has dynamic data aggregation and reporting capabilities that enable you to correlate data across domains to provide a service-centric view. You can organize KPI data to model the service, create service-centric views and manage that data against SLA thresholds, by customer or by service.

A Web portal is available within Tivoli Netcool/Proviso for reporting across multiple services and technologies. allows you to gain a comprehensive overview of your infrastructure, aid in troubleshooting and even get warnings about potential problems, as well as use this information to prevent future problems.

Tivoli Netcool/Proviso usually provides dynamic reporting, which means that reports are not run overnight but calculated on the fly using the latest database

metrics, even for long time periods such as monthly reports. So you can get reports that are fresh and based on near real time data.

Should you need it, scheduled reports can also be developed, which can be e-mail directly to your customer or account team for review. So, you can react to quality issues before they become customer satisfaction issues.

For more information visit:

<http://www.ibm.com/software/tivoli/products/netcool-proviso/>

3.2.18 IBM Tivoli Netcool Performance Manager for Wireless

IBM Tivoli Netcool® Performance Manager for Wireless (formerly *Valent®'s NetworkAssure*) gives you a complete, real-time view of critical performance metrics to help you deliver better overall quality of service to your subscribers while you manage your network infrastructure proactively. It offers a comprehensive and flexible performance management feature set and a large library of ready available network interfaces for telco environments.

It has comprehensive data collection capabilities. Domain specific knowledge of wireless network technologies, such as that for GSM, GPRS, SMS, or MMS, is provided by prepackaged integration modules, called the *Technology packs*. The Technology packs contain:

- ▶ Definitions of what and how shall be collected (both native and computed performance metrics)
- ▶ Best practice alarm definitions that can be customized
- ▶ Comprehensive data model with configuration attributes that describes the environment
- ▶ Predefined service reports that specify which data is to be visualized as well as the format to use for visualization

Figure 3-19 on page 65 shows the structure of the Tivoli Netcool Performance Manager for Wireless. The data collection is first of all about reading native counters from the network equipment. Counters contain raw performance data and can indicate, for example, dropped calls or transferred number of text messages in a GSM network. Collected raw data is then aggregated to be converted to a format that can support analysis and trending.

Key performance indicators (KPIs) are reportable measurements that are based on collected metrics from different technology counters and can use various aggregation or mathematical functions. These provide the metrics that are really relevant to your business. Tivoli Netcool Performance Manager for Wireless offers full KPI mapping and reporting along with root-cause and impact analysis.

You can take advantage of KPIs that come prepackaged with the product, or you can define your own.

In addition to collecting data and converting them into KPIs, you need tooling to automate performance alerting. Tivoli Netcool Performance Manager for Wireless provides the ability to apply thresholds to resource performance measurements and to generate performance alarms in the form of event messages when these thresholds are crossed.

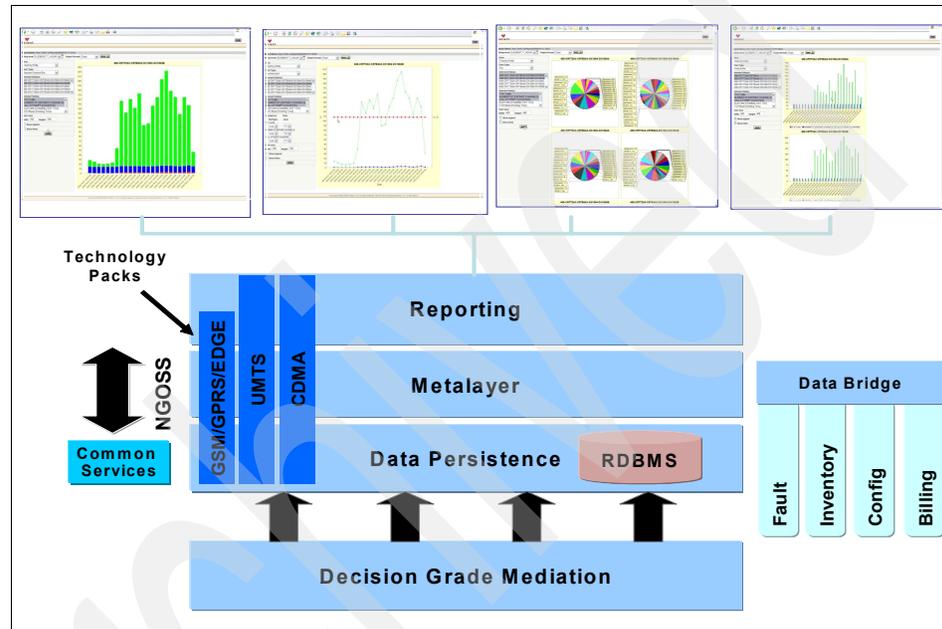


Figure 3-19 Tivoli Netcool Performance Manager for Wireless overview

These alarms can be viewed locally using the alarm display of the product or can be forwarded to fault management event engines, such as Tivoli Netcool/OMNIBus, for further processing and correlation.

All data that is collected by the system can be visualized using graphical reports. Both high-level, management style reports and detailed low-level network and transmission layer reports can be produced and distributed to authorized users using report vaults.

For more information about Tivoli Netcool Performance Manager for Wireless, see:

<http://www.ibm.com/software/tivoli/products/netcool-performance-mgr-wireless/>

3.3 Composite application management

In this section, we discuss the Tivoli products portfolios for application monitoring. Application monitoring provides a transactional view of the availability and performance of the applications infrastructure. The applications infrastructure can refer to middleware, applications, or composite applications.

A typical e-business distributed application can have the components spread throughout several clustered application servers that are interconnected using several different mechanisms. These distributed interconnected applications are referred collectively as *composite applications*. A composite application requires transactions to traverse multiple host or server platforms to complete its function.

For a composite application environment management approach, the following five-step method works well. In addition using suitable tools, you can make this overall method faster, more effective, and efficient.

- ▶ *Sense*: Know the problem as early as possible to reduce the impact time to services and users.
- ▶ *Isolate*: Determine the problem and the root cause in the composite application environment.
- ▶ *Diagnose*: Determine the cause of problem.
- ▶ *Take action*: Fix the problem.
- ▶ *Evaluate*: Monitor the correction results.

To have an effective and efficient way to monitor application infrastructure, you can have four aspects for application monitoring and management as shown in Figure 3-20.

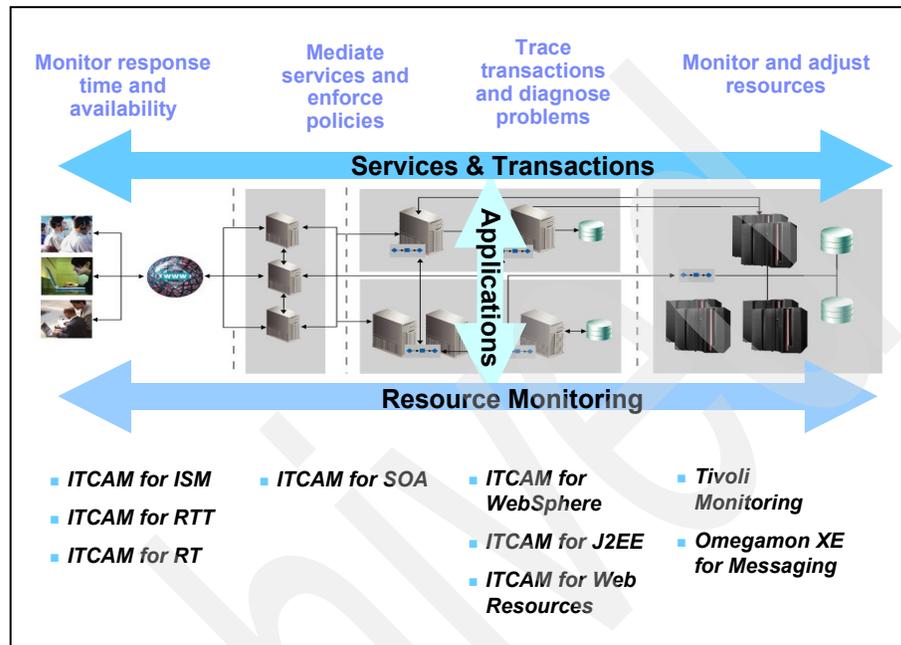


Figure 3-20 Aspects for application management

In this section, we discuss the following aspects of monitoring:

- ▶ Monitor and adjust resources for applications, which is provided by resource monitoring, analysis, and management. We discuss this approach in 3.2, “Resource monitoring” on page 37.
- ▶ Trace transactions and diagnose problems for applications that focus on detailed transaction tracing for application problems. We discuss this approach with the following products:
 - 3.3.1, “IBM Tivoli Composite Application Manager for WebSphere” on page 68
 - 3.3.2, “IBM Tivoli Composite Application Manager for J2EE” on page 70
 - 3.3.3, “IBM Tivoli Composite Application Manager for Web Resources” on page 71
- ▶ Mediate services and enforce policies for applications, typically for Web services monitoring and mediation. We discuss this approach in 3.3.4, “IBM Tivoli Composite Application Manager for SOA” on page 73.

- ▶ Monitor response time and availability, for monitoring and service level attainment. We discuss this approach with the following products:
 - 3.3.5, “IBM Tivoli Composite Application Manager for Response Time Tracking” on page 74
 - 3.3.6, “IBM Tivoli Composite Application Manager for Response Time” on page 76

3.3.1 IBM Tivoli Composite Application Manager for WebSphere

IBM Tivoli Composite Application Manager for WebSphere (ITCAM for WebSphere) is used for monitoring and analyzing the health of WebSphere Application Server and transactions that are running in it. It can trace transaction execution up to detailed method-level information and connects transactions that spawn from one application server and invokes services from other application servers, including mainframe applications in IMS™ or CICS®.

ITCAM for WebSphere provides a flexible level of monitoring, from an non-intrusive production ready monitor, to a detailed deep-dive tracing for problems of locking or even memory leaks. ITCAM for WebSphere provides a separate interactive Web console and also allows monitoring data to be displayed on Tivoli Enterprise Portal.

ITCAM for WebSphere Version 6.1 provides the following functions:

- ▶ View all in-flight WebSphere transactions, including composite transactions.
- ▶ Evaluate common performance bottlenecks and contributing factors with an automated problem finder to help detect, categorize, and analyze root causes easily.
- ▶ Analyze problematic transactions both historically and in real time, drill down into the details and share the information with other stakeholders using built-in, interactive reporting tools that preserve some problem context.
- ▶ Correlate and profile transactions across multiple subsystems to determine the precise location and root causes of application failures.
- ▶ Set traps and alerts to detect and fix potentially troublesome situations before they can affect users.
- ▶ Analyze resource consumption patterns, perform trends or historical analysis, and plan for future growth.

ITCAM for WebSphere is for the WebSphere Application Server environment. For non-WebSphere J2EE™ application, we use IBM Tivoli Composite Application Manager for J2EE (ITCAM for J2EE) which we describe in 3.3.2, “IBM Tivoli Composite Application Manager for J2EE” on page 70.

ITCAM for WebSphere and ITCAM for J2EE share the same interface and architecture, as shown in Figure 3-21. The data collector in WebSphere Application Server and in the J2EE application server, collect the monitoring information and send it to the ITCAM for WebSphere management server and Tivoli Enterprise Monitoring Server for centralized monitoring and management for the J2EE application.

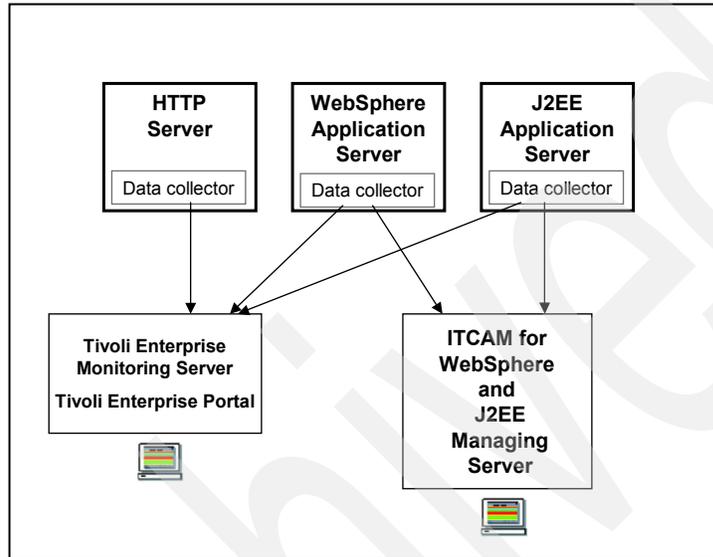


Figure 3-21 ITCAM for WebSphere and J2EE architecture

For more information about ITCAM for WebSphere, see:

<http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-websphere/>

For more information about ITCAM for WebSphere, you can also refer to:

- ▶ *IBM Tivoli Composite Application Manager Family Installation, Configuration, and Basic Usage*, SG24-7151
- ▶ *Deployment Guide Series: IBM Tivoli Composite Application Manager for WebSphere V6.0*, SG24-7252
- ▶ *Large-Scale Implementation of IBM Tivoli Composite Application Manager for WebSphere and Response Time Tracking*, REDP-4162

3.3.2 IBM Tivoli Composite Application Manager for J2EE

IBM Tivoli Composite Application Manager for J2EE (ITCAM for J2EE) is a solution for monitoring and analyzing applications on a non-WebSphere Application Server based J2EE environment and the transactions that are invoked in it.

ITCAM for J2EE helps pinpoint the source of bottlenecks or other defects in application code, server resources, or external system dependencies quickly. It provides valuable management capabilities in both distributed and IBM z/OS environments. ITCAM for J2EE can integrate tightly with ITCAM for WebSphere. Together, these products provide a consistent way to manage composite applications throughout WebSphere, BEA WebLogic, JBoss, Oracle, SAP NetWeaver®, and Tomcat environments.

ITCAM for J2EE enables you to:

- ▶ View all in-flight J2EE transactions, including composite transactions.
- ▶ Evaluate common performance bottlenecks and contributing factors with an automated problem finder to help detect, categorize, and analyze root causes easily.
- ▶ Analyze problematic transactions both historically and in real time, drill down in to the details and share the information with other stakeholders using built-in, interactive reporting tools that preserve some problem context.
- ▶ Correlate and profile transactions across multiple subsystems to determine the precise location and root causes of application failures.
- ▶ Set traps and alerts to detect and fix potentially troublesome situations before they affect users.
- ▶ Analyze resource consumption patterns, perform trends or historical analysis, and plan for future growth.

ITCAM for J2EE shares the same interface and architecture with ITCAM for WebSphere, as shown in Figure 3-21 on page 69. The data collector in WebSphere Application Server and in J2EE application server collect the monitoring information and send it to the ITCAM for WebSphere management server and Tivoli Enterprise Monitoring Server for centralized monitoring and management for J2EE application.

For more information about ITCAM for J2EE, see:

<http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-itcam-j2ee/>

For more information about IBM Tivoli Composite Application Manager for WebSphere, also refer to *IBM Tivoli Composite Application Manager Family Installation, Configuration, and Basic Usage*, SG24-7151.

3.3.3 IBM Tivoli Composite Application Manager for Web Resources

IBM Tivoli Composite Application Manager for Web Resources (ITCAM for Web Resources) is a solution to monitor and manage the health and availability of applications running on commonly available application servers and Web servers. The application server platforms include IBM WebSphere, WebLogic, SAP, Oracle, JBoss, Tomcat, J2SE™, and IBM WebSphere Application Server Community Edition. The Web servers supported are Microsoft IIS, SUN, and Apache Web Servers.

ITCAM for Web Resources allows a simple monitoring of Web application's resources, including Web servers, WebSphere Application Server, and other J2EE application server. Compared to ITCAM for WebSphere, ITCAM for Web Resources does not provide the transaction tracing function. It proactively monitors health and availability of Web servers, application servers, and J2EE applications.

The J2EE application problems are viewed in context of the application that allow a quick drill down to determine where the problem is located. This allows you a quick identification and to fix the problem before it actually impacts users.

ITCAM for Web Resources has the ability to learn of the monitoring threshold dynamically. This function allows you to set a threshold baseline for normal behavior of the application. The set baseline allows fewer situations fired because the situations settings is set from the application itself.

In Figure 3-22, the data collector in HTTP server, WebSphere Application Server, or J2EE application server collect the availability and performance data and then send it to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management.

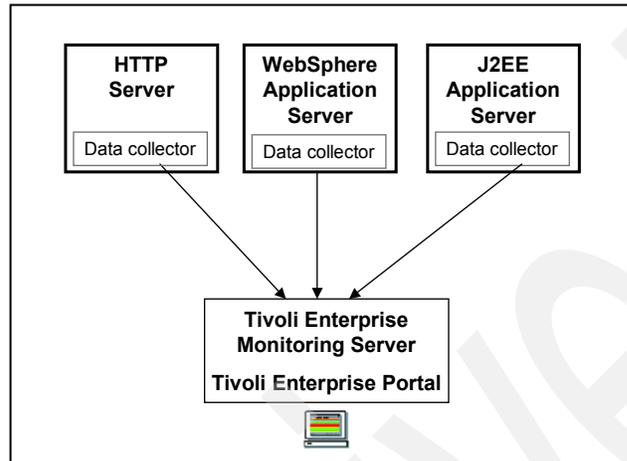


Figure 3-22 ITCAM for Web Resources architecture

With the IBM Tivoli Monitoring integrated environment, ITCAM for Web Resources allows correlation of situations from various resources, with automated actions and expert advice. This capability provides quicker resolution of problems and reduces event storms.

ITCAM for Web Resources uses Tivoli Enterprise Portal as its primary interface, which allows a common user interface that allows data and events integration with other Tivoli Enterprise Portal based solutions from ITCAM, IBM Tivoli Monitoring, and IBM Tivoli OMEGAMON to provide a comprehensive management of customer business applications.

For more information about ITCAM for Web Resources, see:

<http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-web-resources/>

For more information about ITCAM for Web Resources, also refer to:

- ▶ *IBM Tivoli Composite Application Manager Family Installation, Configuration, and Basic Usage*, SG24-7151
- ▶ *Deployment Guide Series: IBM Tivoli Composite Application Manager for Web Resources V6.2*, SG24-7485

3.3.4 IBM Tivoli Composite Application Manager for SOA

IBM Tivoli Composite Application Manager for SOA (ITCAM for SOA) is a monitoring and management solution for SOA applications based on Web services and the Enterprise Service Bus. It monitors and controls message traffic between services in the SOA environment.

Customers implementing SOA and Web services need a management solution that treats services as first class resources to ensure that their key business applications are governed effectively and that they are meeting service levels. ITCAM for SOA V6.1 delivers a comprehensive management solution for customers who are deploying SOA applications based on Web services and the Enterprise Service Bus.

ITCAM for SOA helps to:

- ▶ Recognize and isolate quickly Web service performance problems, receive alerts when Web service performance is degraded, and report results against committed service levels
- ▶ Provide an integrated, easy-to-use console that visualizes the flows of Web services in their entirety
- ▶ Monitor services where you want them with heterogeneous platform support
- ▶ Support views by service requestor, reports on number of requests, or response time by requestor

ITCAM for SOA includes the Web Services Navigator, a plug-in to IBM Rational® and other Eclipse-based tools, which provides a deep understanding of service flows, patterns, and relationships to developers and architects using operational data from Tivoli Data Warehouse or monitoring log files.

ITCAM for SOA is a core component of the IBM SOA Foundation Management Essentials, an integrated and open set of software, best practices, patterns, and skills resources to get you started with SOA.

Figure 3-23 illustrates how the data collectors in an SOA environment collect the message traffic and send it to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management.

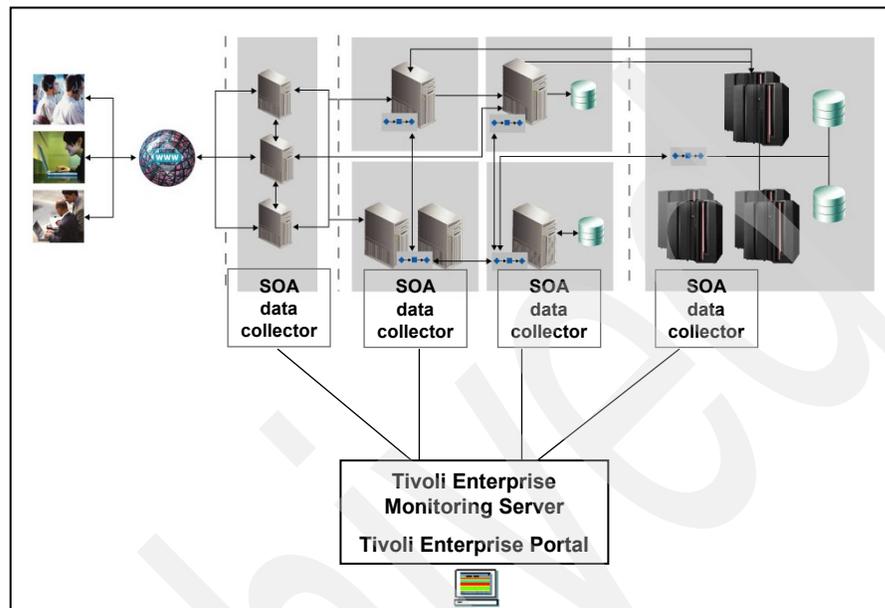


Figure 3-23 ITCAM for SOA architecture

For more information about ITCAM for SOA, see:

<http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-soa/>

For more information about ITCAM for SOA, also refer to:

- ▶ *IBM Tivoli Composite Application Manager Family Installation, Configuration, and Basic Usage*, SG24-7151
- ▶ *Managing SOA Environment with Tivoli*, REDP-4318

3.3.5 IBM Tivoli Composite Application Manager for Response Time Tracking

IBM Tivoli Composite Application Manager for Response Time Tracking (ITCAM for Response Time Tracking) allows monitoring and analysis of application transaction response time. It provides statistics of response times for application transaction. ITCAM for Response Time Tracking enables you to analyze and

break down response time into individual components to quickly pinpoint a response time problem.

Typically in a complex Web application environment, it takes a long time to discover where the problems lie within Web application servers. ITCAM for Response Time Tracking provides a monitoring capability for the transactions running within Web application servers through J2EE transaction decomposition. ITCAM for Response Time Tracking can identify quickly the problem component within Web application servers for the transactions of interest. ITCAM for Response Time Tracking provides an easy to use transaction topology that IT operators can use to identify the problem component. This topology enables the operators to assign the right problem to the right subject matter expert for fast resolution and recovery.

ITCAM for Response Time Tracking can decompose transactions tracking its execution in J2EE application servers all the way to the back end system. The response time information is presented on the Web management console or Tivoli Enterprise Portal.

ITCAM for Response Time Tracking provides the following functions:

- ▶ Proactively recognizes, isolates, and resolves transaction performance problems using robotic and real-time techniques.
- ▶ Enables you to drill down each of the transaction's steps across multiple systems and measure each transaction component's contribution to overall response time.
- ▶ Integrates Web response monitor for real user response-time analysis.
- ▶ Provides custom reporting using Tivoli Enterprise Portal or direct SQL queries of database views, and organizes reports by application, customer, and location.

Figure 3-24 shows the ITCAM for Response Time Tracking architecture. The Response Time Tracking agents collect response time information and send it to Response Time Tracking management server through the Response Time Tracking store and forward agent. Then, the response time information is sent to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal for centralized monitoring and management.

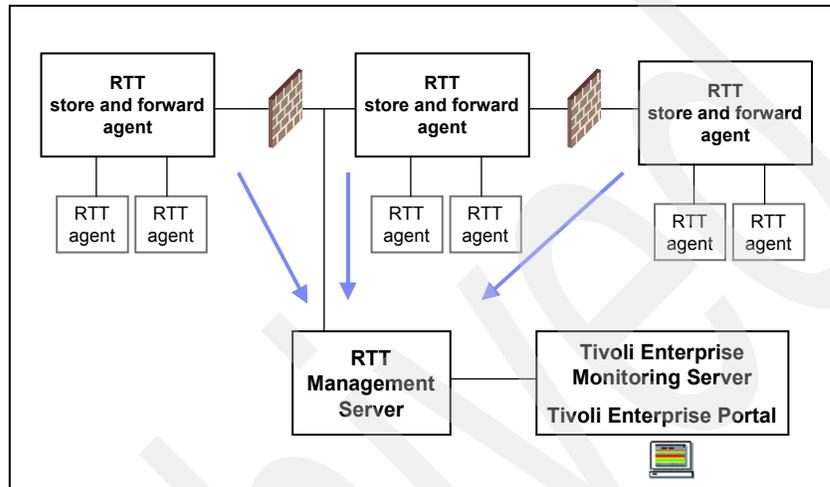


Figure 3-24 ITCAM for Response Time Tracking architecture

For more information about Tivoli Composite Application Manager for Response Time Tracking, see:

[http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-Response Time Tracking/](http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-Response%20Time%20Tracking/)

For more information about Tivoli Composite Application Manager for Response Time Tracking, also refer to:

- ▶ *IBM Tivoli Composite Application Manager Family Installation, Configuration, and Basic Usage*, SG24-7151
- ▶ *Large-Scale Implementation of IBM Tivoli Composite Application Manager for WebSphere and Response Time Tracking*, REDP-4162

3.3.6 IBM Tivoli Composite Application Manager for Response Time

IBM Tivoli Composite Application Manager for Response Time V6.2 (ITCAM for Response Time) is an application monitoring tool that is designed to comprehensively monitor, alert, and report on the availability and response time

of your business applications. It helps to monitor real response times of Web-based and Microsoft Windows applications.

When your preset threshold is exceeded, the monitor generates an alert and the alert event can be sent to Tivoli Enterprise Portal. Tivoli Composite Application Manager for Response Time can measure the performance of HTTP and HTTPS requests including performance information for embedded objects in a Web page in a number of dimensions, including total response time, client time, network time, server time, load time, and resolve time.

It also can record and playback the transaction. By recording and playing back synthetic transactions, you can measure response times under controlled circumstances to help identify and correct problems before users experience them. ITCAM for Response Time robotic simulation capabilities include both availability and response time monitoring, which are useful for comparing the performance of different locations and different service providers.

Figure 3-25 shows the ITCAM for Response Time architecture. The Web response time agent, robotic response time agent, and client response time agent connects to the application and retrieves response time information. Response time data is then sent to Tivoli Enterprise Monitoring Server and Tivoli Enterprise Portal and stored in the Tivoli Data Warehouse. The user response time dashboard agent provides a comprehensive response time interface for all applications and agents on a specified IBM Tivoli Monitoring instance. The user response time dashboard also acts as robotic file depot. It stores the robotic scripts from either the Rational Robot or the Rational Performance Tester. These scripts are loaded by the robotic response time agent for execution.

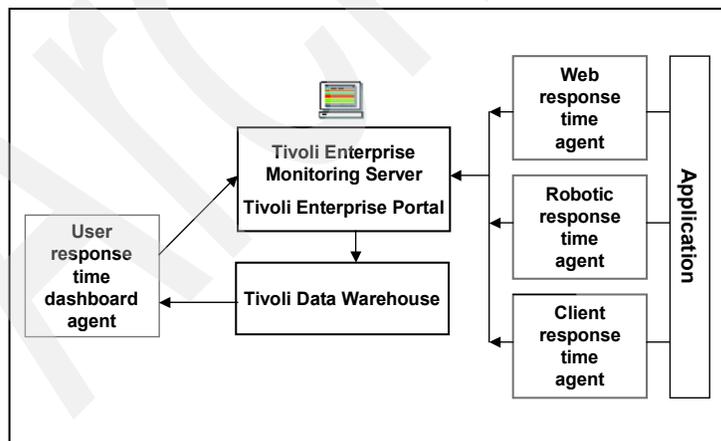


Figure 3-25 ITCAM for Response Time architecture

ITCAM for Response Time is an IBM Tivoli Enterprise Portal based solution. It enables you to integrate response time information with a wide variety of management tools to further improve the effectiveness and efficiency of service management.

For more information about ITCAM for Response Time see:

<http://www-306.ibm.com/software/tivoli/products/composite-application-mgr-response-time/>

For more information about ITCAM for Response Time, also refer to:

- ▶ *IBM Tivoli Composite Application Manager Family Installation, Configuration, and Basic Usage*, SG24-7151
- ▶ *Deployment Guide Series: ITCAM for Response Time V6.2*, SG24-7484
- ▶ *Certification Guide Series: IBM Tivoli Composite Application Manager for Response Time V6.2 Implementation*, SG24-7572

3.4 Event correlation and automation

This section focuses on the event correlation layer within the operational management product breakdown shown in Figure 3-1 on page 36.

The products that are part of this layer are responsible for collecting and processing management information (for example events or alarms) from all over the managed infrastructure. These collect and consolidate information from a wide variety of infrastructure elements in real-time and can include servers, mainframes, Windows or Linux systems, UNIX boxes, packaged or custom applications, IP routers and switches, generic SNMP devices, as well as network and system management applications and frameworks, among many others. By working in conjunction with different existing management systems and applications, event correlation and automation components can present consolidated information in a meaningful and intuitive format.

Using these products, you can take advantage of predefined automated actions to address problems before they cause disruptions in service. You can, thereby, support continuity of business operations with architectures that are responsive and highly available.

In this section, we discuss the following products:

- ▶ 3.4.1, “IBM Tivoli Netcool/OMNibus” on page 79,
- ▶ 3.4.2, “IBM Tivoli Netcool/Impact” on page 81,
- ▶ 3.4.3, “IBM Tivoli Netcool/Webtop and IBM Tivoli Netcool/Portal” on page 84
- ▶ 3.4.4, “IBM Tivoli Netcool/Reporter” on page 85.

3.4.1 IBM Tivoli Netcool/OMNIBus

IBM Tivoli Netcool/OMNIBus provides high-capacity real-time event consolidation for different infrastructure domains. It delivers real-time, centralized monitoring of complex networks. It takes advantage of Netcool probes and Netcool monitors to interface with event sources, such as networking devices, element managers, servers, or applications. Tivoli Netcool/OMNIBus is optimized to handle large volumes of faults.

Environments supported by Tivoli Netcool/OMNIBus include a broad range of network devices, Internet protocols, systems, business applications, and security devices. Because the software offers breadth of coverage, rapid deployment, ease of use, high level scalability, and performance, large enterprises and service providers can take advantage of the Tivoli Netcool/OMNIBus suite to manage large, complex environments.

To collect business and technology events actively from different sources in real time, you can use Tivoli Netcool/OMNIBus *probes*. These lightweight agents and applications look for events and traps and monitor network devices across the network. You can also develop and customize Tivoli Netcool/OMNIBus probes to support virtually any kind of event, such as those generated by proprietary business applications.

When Tivoli Netcool/OMNIBus detects faults, the faults are processed in the *ObjectServer*, a high-speed database that collects events from across the infrastructure in real time. Tivoli Netcool/OMNIBus then eliminates those events that are duplicated, but that are related to the same event source, and filters events through an advanced problem escalation engine. The software enables your staff to focus on the most critical problems and even automate the isolation and resolution of those problems.

Tivoli Netcool/OMNIBus allows you to prioritize events according to the business services they could potentially impact. You can see events in color-coded severity through event lists, or monitor the availability of business services using service-level histogram summaries.

In addition to the Netcool probes, Tivoli Netcool/OMNIBus can also collect events from the Tivoli Monitoring family, which proactively measures user experiences and performance across applications. It can also generate alarms based on thresholds that you establish.

To achieve scalability and high availability, Tivoli Netcool/OMNIBus supports deployments with more than one ObjectServers that are organized in a parallel or hierarchical architecture.

Figure 3-26 provides a brief overview of the product architecture.

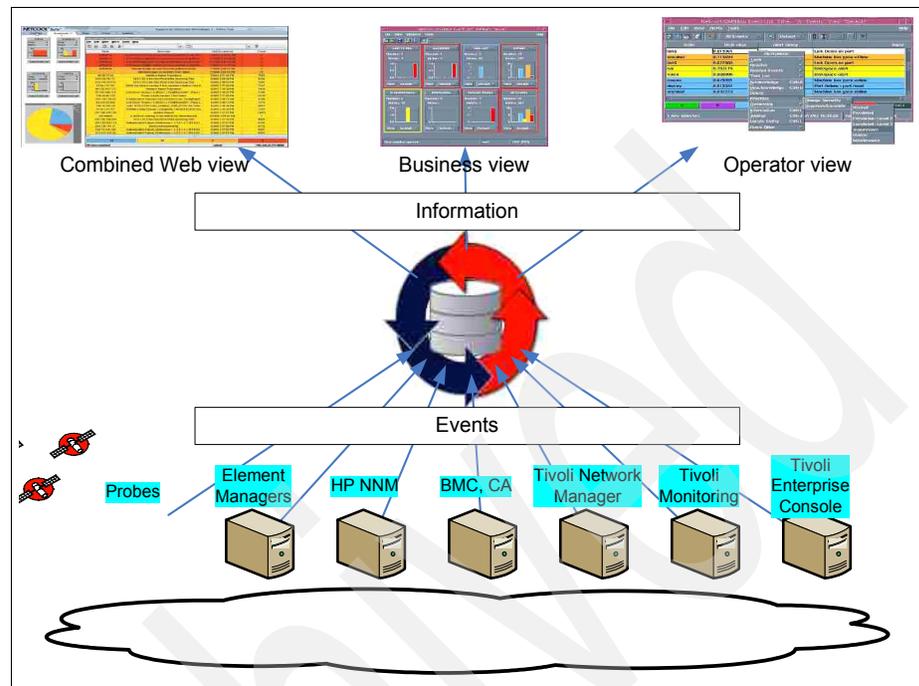


Figure 3-26 Tivoli Netcool/OMNIBus overview

As shown in the figure, Tivoli Netcool/OMNIBus can receive events from a broad range of event sources. It can use:

- ▶ Native device probes that are available for an extensive set of devices
- ▶ Probes that interface with Tivoli or third-party element managers and network managers.

Events received by Tivoli Netcool/OMNIBus are processed (filtered, correlated, and automated) within ObjectServer, and the information is displayed to the operators using a browser-based GUI.

Tivoli Netcool/OMNIBus has various bi-directional interfaces that allow Netcool/ObjectServer data to be shared with other ObjectServers (for scalability reasons or in a distributed environment) or RDBMS archives (for example Oracle or Sybase).

You can also interface with trouble ticketing applications using gateways, which allows trouble-tickets to be created with full control from the Netcool environment. Faults can be consolidated, filtered, correlated, and isolated, and then created as trouble-tickets that are sent to the help desk system, such as Tivoli Service

Request Manager. The Netcool Gateway creates records within the help desk system and adds the ticket number to the event record. The help desk system can then act upon the event starting predefined processes such as incident or problem management. Throughout the life cycle of the ticket, its status can be updated in the Tivoli Netcool/OMNIBus application. When the fault is closed in either the help desk system or the Tivoli Netcool/OMNIBus application, it gets closed in both databases.

To support service management with live availability information, Tivoli Netcool/OMNIBus works in tight integration with Tivoli Business Service Manager. Filtered and correlated events that are related to critical infrastructure components can be forwarded to Tivoli Business Service Manager. Using these data real-time service availability can be calculated and displayed on a business dashboard. You can read more about this product in 3.5.1, “IBM Tivoli Business Service Manager” on page 86.

For more information about Tivoli Netcool/OMNIBus visit:

<http://www-306.ibm.com/software/tivoli/products/netcool-omnibus/>

3.4.2 IBM Tivoli Netcool/Impact

IBM Tivoli Netcool/Impact correlates and prioritizes infrastructure management event responses automatically according to business impact using its advanced policy engine. Rather than have to go to disparate sources, Impact users can see the relevant event management issues associated with different kinds of events in a single view.

Tivoli Netcool/Impact extends IT infrastructure management to the business process level by determining rapidly how faults and events collected by Tivoli Netcool/OMNIBus or Tivoli Monitoring will affect business processes, services, and customers. This means that Tivoli Netcool/Impact complements Tivoli Netcool/OMNIBus, Tivoli Enterprise Console, and Tivoli Monitoring, and you can use Tivoli Netcool/Impact in tight integration with these products.

Figure 3-27 provides a brief overview of the product architecture.

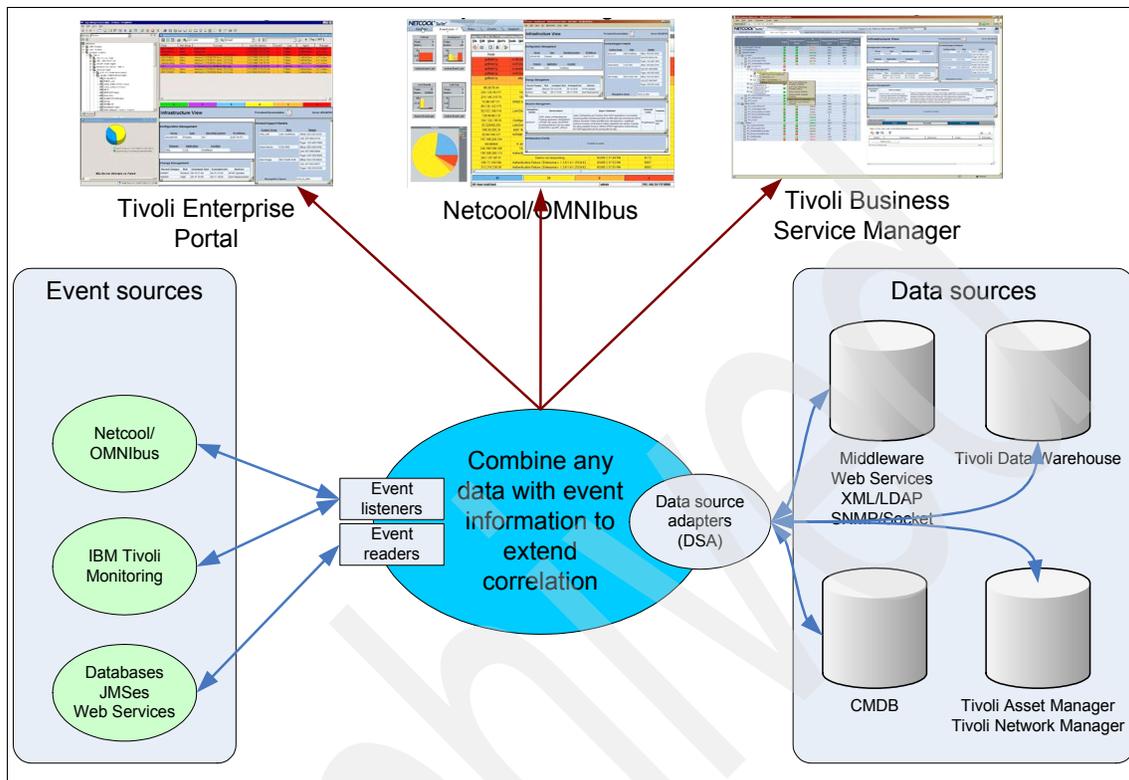


Figure 3-27 Tivoli Netcool/Impact architecture overview

Tivoli Netcool/Impact provides immediate answers to the following key questions:

- ▶ **Impact Analysis:** What customers and business processes are impacted by problems in the IT infrastructure?

The Tivoli Netcool/Impact application shows operators which network users, customers, or business processes are affected by a single fault. It can also warn users automatically before an application or service is interrupted, so they can plan accordingly. Results on customer and business impact are shown in the Tivoli Netcool/OMNibus event display.

- ▶ **Event Resolution:** How should I prioritize problem resolution and assign responsibility?

The Tivoli Netcool/Impact application can track the time it takes for a technician to acknowledge a fault and resolve the problem. When a fault occurs, Tivoli Netcool/Impact can notify the responsible technician using e-mail, paging, and so on. If the technician does not respond, the system will

escalate the event through the organization. Tivoli Netcool/Impact can also forward resolution history during escalation and it automatically halts escalation once the event is resolved.

For example, when an event arrives indicating that a router port is down, the Tivoli Netcool/Impact application determines the business unit using this port and locates the people responsible for administering the router. It then determines the correct person to call and pages the person with a description of the event. If it does not receive a response within a designated time frame, the Tivoli Netcool/Impact system escalates the event up the organization.

- ▶ **Event Enrichment:** How can I link my events with information contained in other operational support systems (OSS) to provide additional context?

Tivoli Netcool/Impact collects business contextual information from existing data stores (applications or databases) and injects it directly into events. Contextual information includes

- Service, customer or business impacted
- Device location and support contact information
- Application owner
- SLA or maintenance details

After events have been enriched, operations staff can automate a variety of labor-intensive tasks, including custom correlation, prioritization, notification and escalation, according to the true impact on the business.

- ▶ **Policy Management:** What problem resolution policies should I follow?

Tivoli Netcool/Impact provides some predefined policies for handling events and also lets operators define customized ones. A policy can be as simple as e-mailing a specific administrator and updating a journal field. However, Tivoli Netcool/Impact can also handle very complex policies comprised of a series of inter-related decisions. Policies can automate the following functions:

- Event enrichment, to gather additional information and aid in decision making
- Correlation of events to business functions, escalation of those that are critical to the business, users notification
- Filtering and suppression of extraneous events (devices in maintenance mode)

To get more information about Tivoli Netcool/Impact, visit:

<http://www-306.ibm.com/software/tivoli/products/netcool-impact/>

3.4.3 IBM Tivoli Netcool/Webtop and IBM Tivoli Netcool/Portal

IBM Tivoli Netcool/Webtop provides access to fault management and service assurance capabilities from Netcool using a Web browser interface. Users can access the real-time status of systems and services through a standard Web browser. Webtop provides the information through graphical maps, tables and event lists. These are delivered using HTML and Java. The Tivoli Netcool/Webtop application retrieves and displays real-time event data from the Netcool/ObjectServer.

Tivoli Netcool/Webtop delivers graphical maps, tables, and event lists to the remote operator using HTML and Java. Netcool users can also manage Netcool alerts with the Tivoli Netcool/Webtop flexible interface and advanced management capabilities.

Tivoli Netcool/Webtop application extends Tivoli Netcool/OMNIBus capabilities by adding a new set of graphical views as well as flexible management and administrative functions. This Web-enabled interface allows monitoring and viewing of high volumes of management data from Tivoli Netcool/OMNIBus.

Accessible from any Java-enabled Web browser, Tivoli Netcool/Webtop provides operations staff and executives with flexible access to service status and actionable information.

Administrators can restrict access to views (for example, event lists and maps) presented by Tivoli Netcool/Webtop to certain users or groups so they retain control of the data and can prevent publication of incorrect information. It is also possible for them to profile users and groups, to configure access to data, as well as to individualize look and feel for all users.

Tivoli Netcool/Portal is designed to integrate and consolidate different business applications and management tools, to provide a single, real-time Web-based console for visualization and centralized management.

To integrate diverse applications it can act as Web page proxy for those as well as other Web sites. Tivoli Netcool/Portal can be used to implement single sign-on (SSO) for the applications integrated and to centrally coordinate user access management.

You can find more information about Tivoli Netcool/Webtop at:

<http://www-306.ibm.com/software/tivoli/products/netcool-webtop/>

You can find more information about Tivoli Netcool/Portal at:

<http://www.ibm.com/software/tivoli/products/netcool-portal/>

3.4.4 IBM Tivoli Netcool/Reporter

IBM Tivoli Netcool/Reporter complements the Tivoli Netcool/OMNIBus application by capturing, analyzing, and presenting event data generated over various time frames. Tivoli Netcool/Reporter supplements the real time information provided by Tivoli Netcool/Webtop with historical and trend information by capturing, analyzing, and presenting data that is generated over time into meaningful reports.

The Tivoli Netcool/Reporter application efficiently captures, stores, analyzes, and displays event data from the Tivoli Netcool/OMNIBus infrastructure to help IT managers and operators understand and enhance network behavior.

Tivoli Netcool/Reporter reads network events from Tivoli Netcool/OMNIBus and writes them into an RDBMS, immediately capturing and forwarding every new event or state change to an existing event.

Tivoli Netcool/Reporter is Web- and Java-based, which simplifies deployment and use throughout a distributed network. Users log on to the application and use all reporting functions through an intuitive HTML interface. Users can navigate quickly and easily to the appropriate task whether it is administering, building, or viewing reports.

Tivoli Netcool/Reporter ships with a comprehensive set of predefined reports:

- ▶ Event summaries that provide rapid snapshots of events and alarms throughout the network. By aggregating and summarizing event data along key dimensions, such as location, node, or object class, these reports let users pinpoint hot spots and high-event areas throughout the network.
- ▶ Fault diagnosis reports facilitate deeper diagnostic and problem solving. These reports help users understand alarm trends and patterns by providing detailed alarm and response information. The reports also let viewers focus on a specific network segment or application by answering queries on specified events or nodes.
- ▶ Operational performance reports assist network managers in evaluating and adjusting the performance levels of vendors or device types. By displaying key measures such as alarms by vendor or alarms by device type, these reports allow network managers to pinpoint operational inefficiencies and performance problems throughout a distributed network.

In addition to the predefined reports, users can design custom reports easily using a drag-and-drop interface and then preview and save these reports when finished. Tivoli Netcool/Reporter makes it easy to schedule, publish, and distribute reports to a large, distributed audience. Reports can be run on either a scheduled or ad hoc basis and published automatically. Reports can also be

distributed to individual users and groups, for more finite control over report access.

For more information about Tivoli Netcool/Reporter, visit:

<http://www.ibm.com/software/tivoli/products/netcool-reporter>

3.5 Business service management

Business service management is the link between operational and business focused IT infrastructure management. It contains solutions that visualize your business services and let you measure service performance in terms of service level achievements.

We discuss the following products in this section:

- ▶ 3.5.1, “IBM Tivoli Business Service Manager” on page 86
- ▶ 3.5.2, “IBM Tivoli Service Level Advisor” on page 89
- ▶ 3.5.3, “IBM Tivoli Netcool Service Quality Manager” on page 91

3.5.1 IBM Tivoli Business Service Manager

IBM Tivoli Business Service Manager (formerly *Micromuse® Realtime Active Dashboard*) helps business and operations staff understand the complex relationships between business services and supporting technology components.

When service problems occur, operations staff frequently must utilize siloed management tools and manual correlation to identify the cross-domain service impact and root cause. This method causes longer resolution times, higher costs, and very often lost revenue. Service modeling and measurement tools can help organizations overcome these challenges by providing greater visibility into service status and dependencies.

Tivoli Business Service Manager as a service modeling tool provides organizations with advanced, real-time visualization of services and processes within comprehensive service dependency models. It incorporates data from a broad array of IT resources and business support systems that contribute to running a service, including applications, network assets, and business-related assets that track for example transactions, revenue or operational indicators. This information is populated into a real-time, federated service model for automated service impact analysis, root cause analysis and tracking of service level agreement (SLA) and key performance indicator (KPI).

Tivoli Business Service Manager provides a graphical console that allows you to logically link services and business requirements within the service model. The service model provides an operator with a dynamic view of how an enterprise is performing at any given time or how the enterprise has performed over a given period of time.

You can use Tivoli Business Service Manager to:

- ▶ Understand the cross domain dependencies as they exist, in real time
- ▶ Align business and operational requirements strategically
- ▶ Track operational, business, and customer SLAs and KPIs dynamically
- ▶ Assess automatically the impact of availability, performance, security, and business events on service health
- ▶ Implement service quality improvements and mitigate business risk

Tivoli Business Service Manager gathers more than just traditional events. It also takes advantage of business and operational support data from virtually any source, across distributed and mainframe environments. It can use these sources for both real-time and historical information when calculating KPIs. Consequently, the software enables you to track operational activity and also business activity in real time—a key requirement for helping improve service quality and mitigating risk.

Figure 3-28 provides a high-level overview of the product architecture.

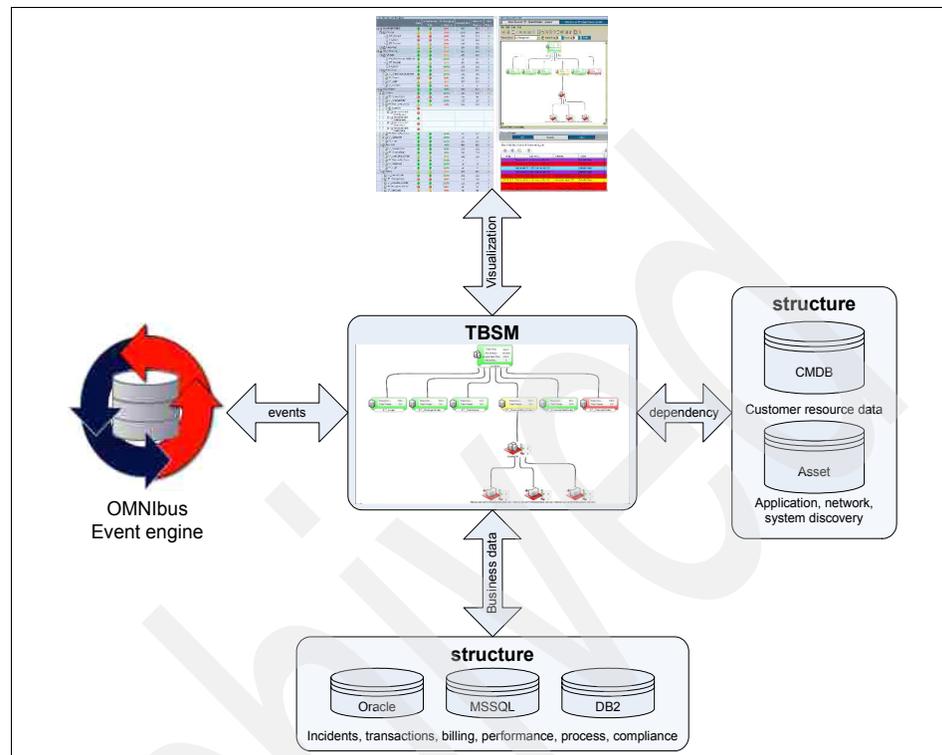


Figure 3-28 High-level Tivoli Business Service Manager architecture

To measure service impact and perform service quality analysis accurately, you need an accurate service model, one that is dynamically updated. Tivoli Business Service Manager can collect dependency information through direct, out-of-the-box integration and dynamic modeling support from external data sources such as IBM Tivoli Change and Configuration Management Database (CCMDB).

For more information about Tivoli Business Service Manager, visit:

<http://www.ibm.com/software/tivoli/products/bus-srv-mgr/>

You can also refer to *IBM Tivoli Business Service Manager V4.1*, REDP-4288.

3.5.2 IBM Tivoli Service Level Advisor

IT managers tend to be interested more and more in meeting business-relevant objectives. They think of statements such as:

- ▶ My Web service should be available 99.5% of time during business hours.
- ▶ My user response time should never exceed 500 ms during my peak hours.
- ▶ My trading application cannot be out for more than 5 minutes during any trading month.

Responding to these kind of needs, IBM Tivoli Service Level Advisor allows organizations to align service delivery with the needs of their customers. It helps simplify the process of defining service level objectives and helps automate the process of evaluating service level agreements.

IBM Tivoli Service Level Advisor (primarily targeted for non-telco customers) is designed to provide predictive service level management capabilities and to enable IT operations staff to proactively predict when SLA violations are likely to occur and then take corrective actions to avoid an SLA breach.

Tivoli Service Level Advisor complements the capabilities that are delivered by Tivoli Business Systems Manager. Tivoli Business Systems Manager is for real-time availability management for services while Service Level Advisor allows for defining, tracking and reporting service level agreements. By sharing service definition data, these two components make up a service delivery solution that enables executives to manage IT based on business priorities.

As the first step when setting up the scenes for an SLA management environment Tivoli Service Level Advisor allows you to create service offerings and define related service level agreements. You can take advantage of the integration between Tivoli Business Systems Manager and Service Level Advisor to keep the structure of the business service models that you created within Tivoli Business Systems Manager: service definitions are synchronized between the two components.

Your SLAs can include data collected from a wide range of information sources and types, from distributed and mainframe data to information about resource utilization and from the service desk. All of the extensive systems management data that is available in IBM Tivoli Data Warehouse (a component of Tivoli Monitoring) can be utilized in SLA creation. Thus, you can capture SLA performance information from a broad range of monitoring components, such as Tivoli Monitoring, OMEGAMON solutions, or Tivoli Composite Application Monitor. Service Level Advisor even offers best practice metrics for availability, MTTR, MTBF, and outages.

Figure 3-29 provides a brief overview of the product architecture.

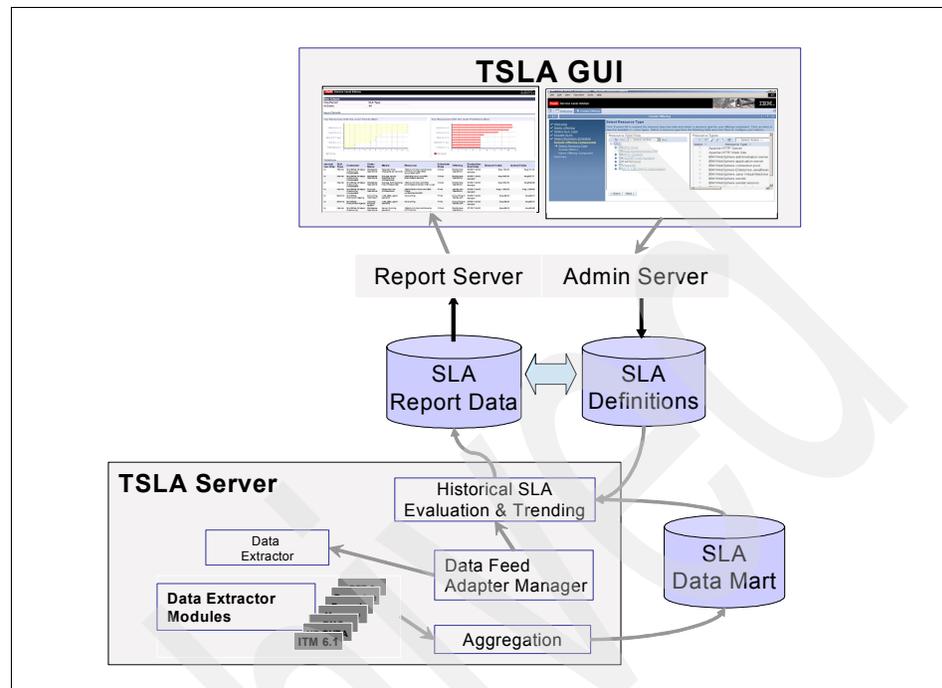


Figure 3-29 Tivoli Service Level Advisor overview

SLA evaluations can be run with a frequency of up to 60 minutes. To predict risk of potential SLA violations, Tivoli Service Level Advisor ships with a trend analysis algorithm that can help take a proactive approach to service level management.

To report on service achievements and visualize service performance, you can use Service Level Advisor's rich graphic reporting capabilities. Web-based, graphical SLA reports can be generated automatically that meet reporting requirements.

You can find more details about Service Level Advisor at:

<http://www.ibm.com/software/tivoli/products/service-level-advisor/>

For more information, refer also to the following publications:

- ▶ *Introducing IBM Tivoli Service Level Advisor*, SG24-6611
- ▶ *Service Level Management Using IBM Tivoli Service Level Advisor and Tivoli Business Systems Manager*, SG24-6464

3.5.3 IBM Tivoli Netcool Service Quality Manager

Tivoli Netcool Service Quality Manager (formerly Vallent's *ServiceAssure*) helps you see your service through the customer's experience.

Whereas Tivoli Service Level Advisor is primarily positioned as an enterprise solution, Tivoli Netcool Service Quality Manager has a strong focus on telco environments. It combines service quality management (SQM) and service level management (SLM) to manage and improve telecommunications service quality. SQM is responsible for analyzing network and operations, for processing quality data and mapping it to delivered services.

By implementing SQM, you can support your service problem management processes with events, alarms or reports. Alternatively, the goal of SLM is management of service quality delivery to individual committed specifications. You define your commitments—service level objectives (SLOs) internally and SLAs externally—and you can support your customer problem handling processes SLM.

Tivoli Netcool Service Quality Manager provides a real-time, end-to-end view of a service to enable Service Providers understand service quality from the customer's perspective. Tivoli Netcool Service Quality Manager does this by discovering and analyzing the root cause of quality issues throughout the service path. It also compares current and historical quality levels to established targets for internal, external and third-party SLAs written against these quality targets.

It provides a dynamic views that ensures that each service (for example Blackberry, VoIP, iMode, or GPRS) is functioning correctly for the subscriber groups in the network. It reports on various aspects of network operations, manages the data and displays it in visual representations within a Web browser environment. With the key performance metrics that they can monitor, service providers can make well informed operational, and, ultimately, business decisions.

Tivoli Netcool Service Quality Manager supports the following main processes (see Figure 3-30 on page 93):

▶ Collecting and calculating service quality data

In terms of collecting service quality data, Tivoli Netcool Service Quality Manager interfaces with various data sources and collects input information, such as:

- Fault management events
- Performance management statistics (such as those collected by Tivoli Netcool Performance Manager for Wireless or Tivoli Netcool/Proviso)
- Transaction information
- Service usage information (such as call detail records, CDRs)
- Trouble ticket data

At the next step, raw input data is filtered and transformed into higher level aggregated metrics, key performance indicators (KPIs) and key quality indicators (KQIs). KQIs are business relevant metrics that are formed by combining KPIs or other KQIs. KQIs can be used for SLA evaluation purposes.

▶ Defining and maintenance of service configuration data

In terms of defining service configuration data, Tivoli Netcool Service Quality Manager can support you in defining and describing your business commitments and service quality objectives in form of SLOs and SLAs (for your internal and external customers).

You also keep track of customer details, the properties and dependencies of your services, and finally the mapping between customers and services. The latter is of course the set of contracts and SLAs you maintain.

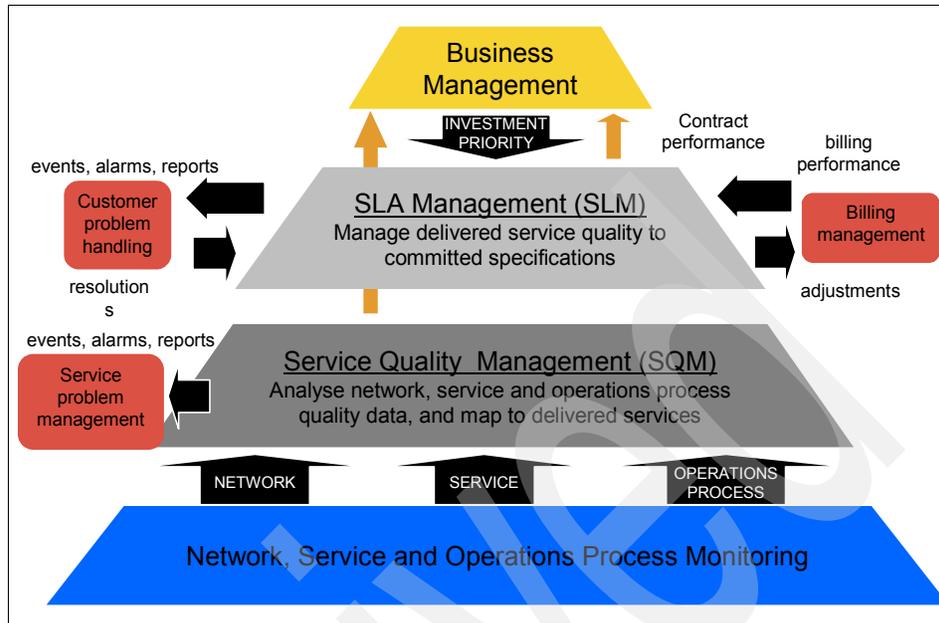


Figure 3-30 Tivoli Netcool Service Quality Manager, with service quality management

Incoming collected data gets finally “filtered through” the definitions of your service configuration data by Tivoli Netcool Service Quality Manager. Thus, you can relate data to your services, aggregate information to build service quality views, and present that information in context of service quality and service levels. You can:

- ▶ Produce warnings that can help operations staff to set priorities on different network events.
- ▶ Send alerts to other management components (such as a trouble ticketing system or billing application) to start and track corresponding processes.
- ▶ Produce reports that prove your service excellence.

For more information about Tivoli Netcool Service Quality Manager, visit:

<http://www.ibm.com/software/tivoli/products/netcool-service-quality-mgr/>

3.6 Mainframe management

Management of performance and availability on the mainframe environment is typically using a different set of solution. Some specialized solution are available to manage z/OS specific performance and availability. We discuss the following tools:

- ▶ 3.6.1, “IBM Tivoli OMEGAMON XE family” on page 94
- ▶ 3.6.2, “IBM OMEGAMON z/OS Management Console V4.1” on page 95
- ▶ 3.6.3, “IBM Tivoli NetView for z/OS V5.2” on page 95

3.6.1 IBM Tivoli OMEGAMON XE family

This family of products includes:

- ▶ IBM Tivoli OMEGAMON XE on z/OS v4.2
- ▶ IBM Tivoli OMEGAMON XE on z/VM® and Linux v4.2
- ▶ IBM Tivoli OMEGAMON XE for CICS on z/OS v4.2
- ▶ IBM Tivoli OMEGAMON XE for CICS TG on z/OS v4.1
- ▶ IBM Tivoli OMEGAMON XE for IMS on z/OS v4.2
- ▶ IBM Tivoli OMEGAMON XE for Mainframe Networks v4.2
- ▶ IBM Tivoli OMEGAMON XE for Storage on z/OS v4.2

OMEGAMON provides a resource monitoring solution on System z and z/OS platform. It has the same functionality and architecture as the Tivoli Monitoring solution discussed in 3.2.1, “IBM Tivoli Monitoring” on page 40. Each components of the z/OS monitoring tools manages and monitors a specific subsystem. Having the same architecture and Tivoli Monitoring products allows OMEGAMON to integrate seamlessly with the distributed monitoring capability provided by the Tivoli Monitoring tools.

For more information, refer to the following Web sites:

- ▶ <http://www-306.ibm.com/software/tivoli/products/omegamon-xe-cics/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-databases/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-db2-peex-zos/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-db2-pemon-zos/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-ims/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-linux-zseries/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-mainframe/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-messaging-zos/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-storage/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-sysplex/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-uss/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-zos/>
- ▶ <http://www.ibm.com/software/tivoli/products/omegamon-xe-zvm-linux/>

Refer also to *IBM Tivoli OMEGAMON XE V3.1.0 Deep Dive on z/OS*, SG24-7155.

3.6.2 IBM OMEGAMON z/OS Management Console V4.1

The IBM OMEGAMON z/OS Management Console V4.1 is a new, no-charge availability monitoring product designed to help the new generation of IT professionals.

The console's graphical user interface (GUI) delivers real-time health-check information provided by the IBM Health Checker for z/OS, and configuration status information for z/OS systems and sysplex resources.

The IBM OMEGAMON z/OS Management Console has built-in alerting and expert advice capabilities that can offer detailed contextual information about alerts and corrective actions.

- ▶ Delivers a new easy to use GUI for reporting on IBM Health Checker data and z/OS availability management data
- ▶ Uses Tivoli Enterprise Portal as the GUI
- ▶ Includes OMEGAMON features such as Expert Advice and Take Action
- ▶ Includes the Health Checker information in real-time Tivoli Enterprise Portal reporting

For more information, refer to:

<http://www-03.ibm.com/servers/eserver/zseries/zos/zmc/>

3.6.3 IBM Tivoli NetView for z/OS V5.2

IBM Tivoli NetView® for z/OS V5.2 offers an extensive set of tools for managing and maintaining complex, multivendor, multiplatform networks and systems from a single point of control:

- ▶ Provides key capabilities and advanced functions related to networking and automation, enhanced enterprise integration, customer time-to-value and ease of use, as well as management functions that work in cooperation with other products
- ▶ Improves network efficiency and increases system availability
- ▶ Extends centralized management for mainframe TCP/IP and SNA network environments, and offers advanced automation and a set of interfaces to meet every user's need

- ▶ Reduces or eliminates the need for operator intervention to deal with system messages, and manages larger networks, more resources and more systems with fewer resources and personnel, even from a single console
- ▶ The newest release, NetView for z/OS V5.3 provides:
 - Strengthens integration with the Tivoli Enterprise Portal through the use of a z/OS-based Enterprise Management Agent, new and expanded workspaces and views, out-of-the-box situations and expert advice, and broader cross-product integration with the OMEGAMON XE product suite
 - Additional support for IPv6, enhancements for managing SNA over IP, expanded IP connection management capabilities, and more granular packet trace control
 - Expands NetView's sysplex management capabilities, gathering additional Dynamic Virtual IP Addressing (DVIPA) information and associating it with the topology of the IP stacks within the sysplex

For more information, refer to:

<http://www-306.ibm.com/software/tivoli/products/netview-zos/>

3.7 Process management solutions

IT service management helps organizations improve service quality by using deterministic internal processes as well as be compliant with many regulatory compliance requirements.

There are two major challenges that organizations can face when trying to do process automation:

- ▶ How do we actually implement our processes?

When organizations begin to work with their processes, they usually look at existing industry frameworks such as ITIL to get guidance. Although ITIL is good at describing what should be done, it does not provide detailed explanations about how to actually do it. This often results in uncertainty in terms of actual implementation questions.

- ▶ We have documented our processes and we are ready to implement those. But how to link them with the actual management tooling already implemented?

From the perspective of ITIL-compliant IT operations it is essential to implement and maintain a consistent and central federated database, the CMDB (Change and Configuration Database). Service support and service delivery processes must take advantage of CMDB, meaning that these

processes need to work in tight integration with CMDB and what is stored in it. This includes the configuration properties of all your equipment and devices, servers and applications, as represented by so called configuration items (CIs) as well as their relationships, also described by CMDB.

IT operations processes, however, are not only bound to CMDB, it is advisable as well to set up those so that they can interface with operation management tooling that your IT staff can use day by day. That can help you automate many of those tasks that are described by the ITIL processes and otherwise would need to be performed manually.

3.7.1 Overview of IBM Process Managers

As a response to the questions described in 3.7, “Process management solutions” on page 96, IBM has introduced a collection of IT process automation tools, called *IBM Tivoli Process Managers*.

Thus far, we have shown a portion of the operational management product portfolio from IBM, the bottom layer of IBM service management blueprint. We described their functionalities as well as how these can help you make your daily IT operations more effective. Now, we continue with the mid- and top-layer of the blueprint and describe Process Managers.

Figure 3-31 illustrates the general structure of IBM process managers.

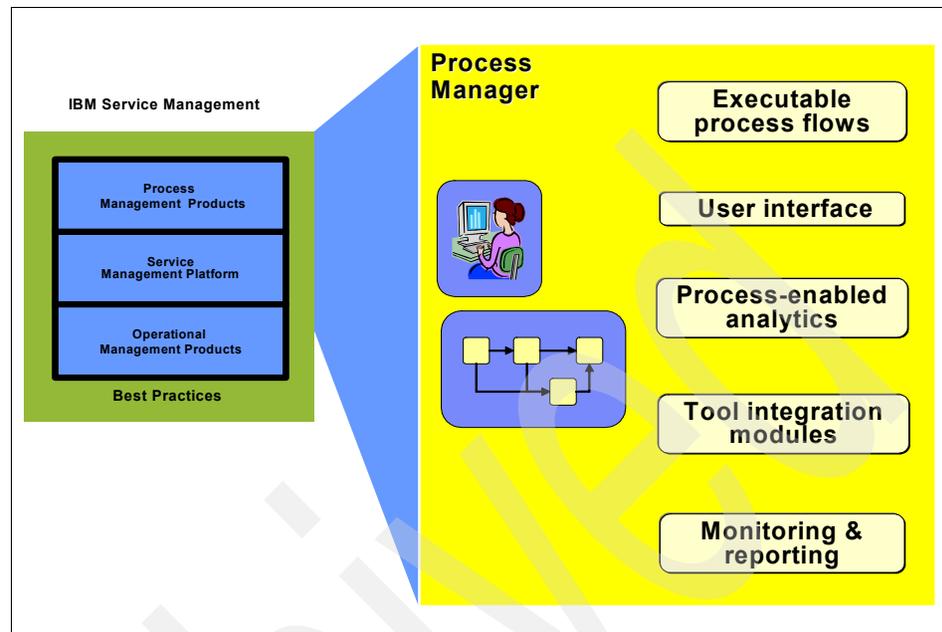


Figure 3-31 General structure of IBM process managers

IBM Tivoli Process Managers are Web applications that provide automated process workflows that are customizable and are even reusable as saved templates. For example, you can implement simple flows for desktop changes and more complex ones for changes to critical applications or servers within your organization. Through the use of integration modules, you can utilize the operational management products (OMPs) to support and to automate tasks within the process managers. The integration modules provide two-way communication between the process and the OMP. This means that invoking the OMP from within a process step and receiving the return status from it can be automated.

In terms of product packaging, IBM Tivoli Process Managers are available either as standalone or packaged (bundled) offerings. Table 3-1 gives an overview of the mapping between different processes and the corresponding IBM products.

Table 3-1 Mapping between operation processes and IBM Tivoli solutions

Process	IBM product name
Change management	Tivoli Change and Configuration Management Database
Configuration management	Tivoli Change and Configuration Management Database
Incident management	Tivoli Service Request Manager
Problem management	Tivoli Service Request Manager
Release management	Tivoli Release Process Manager
Storage management	Tivoli Storage Process Manager
Availability management	Tivoli Availability Process Manager
Capacity management	Tivoli Capacity Process Manager

In the next sections, we provide brief descriptions of the following solutions:

- ▶ 3.7.2, “Change and configuration management” on page 99,
- ▶ 3.7.3, “Service desk: Incident and problem management” on page 102,
- ▶ 3.7.4, “Release management” on page 105,
- ▶ 3.7.5, “Storage process management” on page 107,
- ▶ 3.7.6, “Availability process management” on page 108 and
- ▶ 3.7.7, “Capacity process management” on page 111.

3.7.2 Change and configuration management

Change management and configuration management are at the core of any service management strategy.

The solution at this area is IBM Tivoli Change and Configuration Management Database. It provides a platform for storing deep, standardized data on configurations and change histories to help integrate people, processes, information and technology. It introduces a common platform providing a common data model (often referred to as *CDM*), common process support and tooling, and common process managers.

Tivoli Change and Configuration Management Database ships with two integrated process managers: *change management* and *configuration management*.

Tivoli Change and Configuration Management Database includes a broad range of features:

▶ Discovery

The native discovery capability of Tivoli Change and Configuration Management Database provides detailed topology maps of business applications and the supporting infrastructure beneath, including hardware, software, networks, dependencies and a complete history. These application maps can help you understand the impact of incidents or changes to the IT environment.

▶ Data integration

Tivoli Change and Configuration Management Database can import data from various operational management products (OMPs). In this case, data is not collected by native discovery but it is pulled over from other components using an XML-based data interface.

▶ Data reconciliation

Data stored in the Tivoli Change and Configuration Management Database can come from a variety of sources. Some of these might use their own unique identities for the same configuration item (CI). The Tivoli Change and Configuration Management Database has a built-in reconciliation engine that applies identification rules to detect duplicate identities and stores only one copy of the CI in the Tivoli Change and Configuration Management Database. That helps you maintain configuration database consistency.

▶ Data federation

It is not necessary to store all information of CIs in the Tivoli Change and Configuration Management Database, it might be enough to know where those non-critical attributes of a CI can be accessed. For such cases, Tivoli Change and Configuration Management Database provides federation capabilities to fetch the data “on demand” from various external sources.

▶ Audit and control

CIs stored in the Tivoli Change and Configuration Management Database can be compared against their historical values or against other CIs. This capability enables you to enforce configuration policies and easily detect violations against those policies.

▶ Change and configuration management process

Tivoli Change and Configuration Management Database ships with best-practice workflows for the configuration and change management

processes. The configuration management process builds on the auto-discovery capabilities to provide a richer set of control over CIs by enabling manual creation, updates and deletion.

You can enforce change control over CIs by taking advantage of the built-in change management process. Using it, your customers or employees can create requests for change (RFCs). In addition, your change management team can:

- Accept and categorize the changes
 - Assess the impacts of RFCs on the infrastructure using the standardized data available in the CMDB
 - Approve, schedule, and coordinate implementation of the RFC
- ▶ Workflow customization

Tivoli Change and Configuration Management Database process workflows are easy to configure at a variety of levels. Administrators can create new workflow templates for specific RFC types by adding or deleting activities and tasks from an existing workflow template. In addition, to support certain exception use cases, the workflow engine even allows a specific instance of a RFC workflow to be modified for “just once” type execution.

Figure 3-32 shows sample change management workflows.

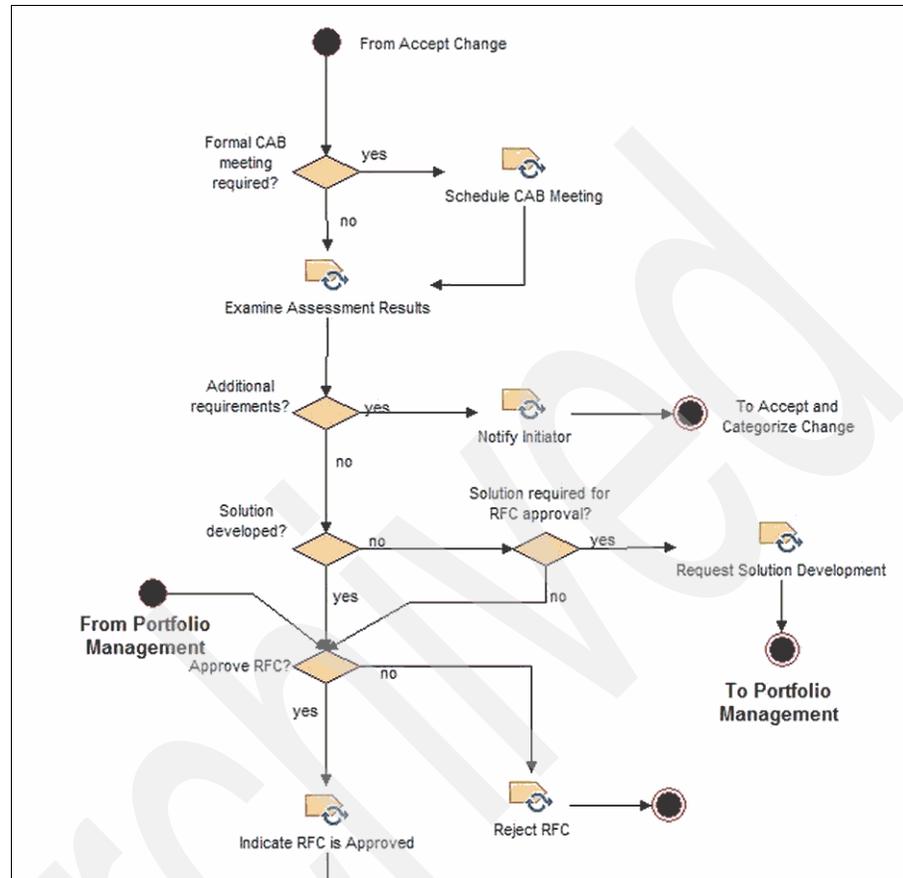


Figure 3-32 Sample change management workflows

For more information about Tivoli Change and Configuration Management Database, visit:

<http://www.ibm.com/software/tivoli/products/ccmdb/>

3.7.3 Service desk: Incident and problem management

As described in ITIL recommendations, organizations need to have a single point of contact to help manage incidents and problems. This function is called *Service Desk* in ITIL terms and can act as the primary interface between the users within the organization and the IT staff that is responsible for operating the infrastructure.

From the IBM portfolio, you can pick IBM Tivoli Service Request Manager to implement an integrated environment that corresponds with the ITIL service desk function. Tivoli Service Request Manager is PinkVerify certified at the highest level, which means that it is fully compliant with ITIL recommendations.

Tivoli Service Request Manager provides full support for incident and problem management, it is a part of a single platform that combines asset and service management and that is integrated with Tivoli Change and Configuration Manager (CCMDB).

Tivoli Service Request Manager has many features that help increase productivity and it supports key activities, including:

- ▶ Service request creation

When it comes to recording new requests, help desk agents can use an intuitive Web-based interface to open tickets. Ticket templates are provided to save time by pre-populating certain fields with information. An embedded searchable solutions database enables service desk agents to resolve issues faster, improving first call resolution rates.

Tivoli Service Request Manager provides a self-service interface as well that your users can use to enter information and to proactively address their own issues. They can submit tickets, view updates on their tickets later on and search solutions in the solutions database.

Tivoli Service Request Manager can interface with fault management systems to automate ticket creation based on the data that is available in the event or fault records.

- ▶ Customizable workflows

When tickets are created, you can use powerful visual workflows and escalations to facilitate quick problem resolution or integrate incident, problem and change management processes.

Workflows can be customized to meet the needs of the organization. You could, for example, create a custom workflow to automatically respond by ticket type or event classification. The interactive action based workflows can guide help desk users through a process or activity based on the context of data entered.

Change management can be invoked from any service request. Changes are updated automatically, and notifications of scheduled changes make support staff aware of actions that can increase the number of incidents.

Figure 3-33 illustrates a sample service request process.

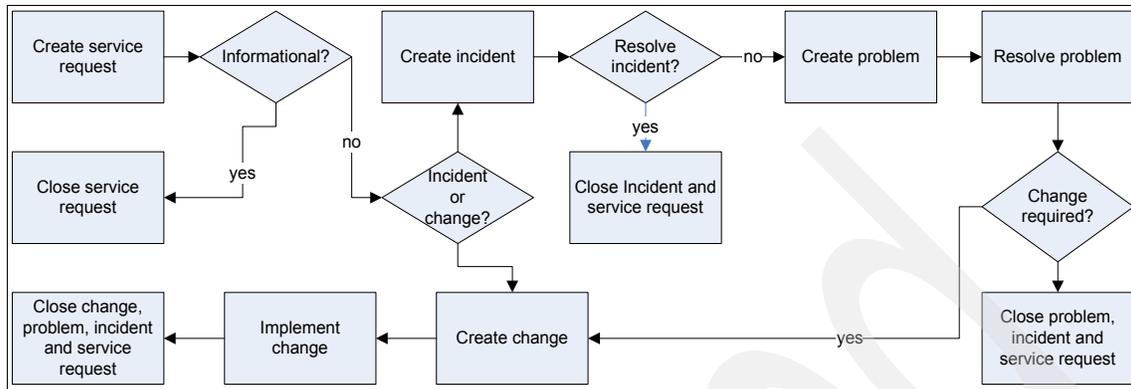


Figure 3-33 A sample service request process

► Escalation management

The primary goal of escalation management is to ensure proper management of resources and to achieve service levels. Escalations can be attached to multiple points in workflows to proactively monitor conditions and send notifications from prompt action if required.

Figure 3-34 shows the graphical workflow editor in Tivoli Service Request Manager.

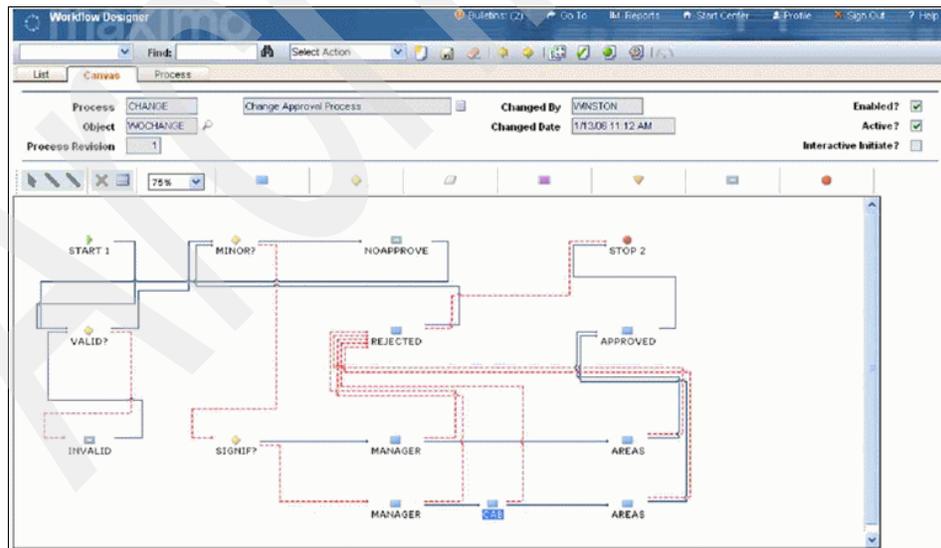


Figure 3-34 Graphical workflow editor in Tivoli Service Request Manager

- ▶ **Work management**

Throughout the life cycle of the tickets, you need to ensure that you deploy the right personnel with the right skills at the right time. It is essential from the service support perspective to integrate your incident, problem and change management processes with the people that work on these.

Tivoli Service Desk, as part of the unified Maximo® platform, offers work management and job scheduling capabilities. You can see who is available to do the work, prepare a job plan, and have this appear in the work basket for the person responsible for doing the work. You can even use job plans templates that can be predefined and applied to repetitive activities.

- ▶ **Role-based KPIs and dashboards: reporting**

Support staff or managers can monitor tailored reports of KPIs (key performance indicators, relevant metrics of different levels of service desk operations) in a graphical display. Dashboards can be used to identify potential problem areas, enabling your support staff to take appropriate corrective actions before critical services are adversely affected. Both KPIs and dashboards are configurable so users can customize these to fit their role.

- ▶ **Flexible configuration tools**

Configuration tools can be used that help in database configuration and even applications design. You can configure the user interface, dashboards, KPIs or reports dynamically.

You can find more information about Tivoli Service Request Manager at:

<http://www.ibm.com/software/tivoli/products/service-request-mgr/>

3.7.4 Release management

Before actually deploying new releases, you must perform careful planning and assessment to avoid any negative impact on any infrastructure component or business function.

IBM Tivoli Release Process Manager provides a process-based solution to address release management as defined by ITIL and can help you automate release management. Just like other IBM process management products, it is fully integrated with Tivoli Change and Configuration Management Database (CCMDB), which tracks resource relationships and changes across your IT infrastructure. All changes to your IT systems are recorded in CCMDB and master copies of release packages are stored in a Definitive Software Library (DSL).

Main features of the solution include:

▶ Flexible workflows

Tivoli Release Process Manager has built-in, automated workflows that are based on ITIL best practices.

The product comes with predefined workflows that can be used as customizable templates. Workflows support all major steps in release management, including

- Planning
- Design
- Build
- Testing and acceptance
- Rollout planning
- Communication, preparation, and training
- Distribution and installation
- Release validation
- Closing the request for change

You can customize these workflows to meet your objectives. You can, for example, decide not to use all these steps for a simple version upgrade, while fully using all of them when performing a complex company-wide roll-out of your core business application.

▶ Advanced scheduling

Tivoli Release Process Manager lets you plan and keep track of release timing. You can plan timing that is based on deadlines set by business priorities or the impact of your release rollout. Role-based assignment of activities and tasks ensure that the right person will manage the tasks just as you wanted, according to your schedule.

▶ Integration with OMPs

Tivoli Release Process Manager integrates with operational management products, such as Tivoli Configuration Manager for automating patch and application deployments and Tivoli Provisioning Manager for automating complex deployments across multiple servers. It can help you automate your release deployment steps using your existing management tooling.

▶ Reporting

Tivoli Release Process Manager delivers predefined reports on key performance indicators (KPIs), to help align releases with your business objectives. You can keep control over your release processes by checking real-time views on release status and pending tasks.

To learn more about Tivoli Release Process Manager, visit:

<http://www.ibm.com/software/tivoli/products/release-process-mgr/>

3.7.5 Storage process management

IBM Tivoli Storage Process Manager is designed to support daily operations processes, such as:

- ▶ Managing critical data and the storage infrastructure underneath effectively and efficiently
- ▶ Complying with various regulations that set expectations on data retention

Any changes to the storage infrastructure might also have an impact on the business. Therefore, understanding the storage management processes are important to understanding the dependencies between your storage infrastructure and the business services that your IT staff ultimately needs to support. The processes need to be repeatable and auditable, which is what using Tivoli Storage Process Manager provides.

Tivoli Storage Process Manager processes are aligned with ITIL and cover topics such as optimizing storage utilization, prioritizing change requests or storage related incidents, or managing costs of storage system.

IBM Tivoli Storage Process Manager is a member of the process manager product family, and as such, it is integrated with Tivoli Change and Configuration Management Database (CCMDB). It relies on CCMDB as the authoritative source for configuration items such as storage devices, switches and SANs.

With Tivoli Storage Process Manager, you can take advantage of:

- ▶ Workflows

With customizable Tivoli Storage Process Manager templates you can make sure that your processes execute as planned. You define roles and perform storage configuration changes with your existing operational management tools, while Tivoli Storage Process Manager provides assurance that tasks are being assigned to the appropriate person at the right time, and that only approved changes are implemented. Processes allow you automate different tasks that otherwise need to be performed manually.

- ▶ Integration with storage management tools

Processes within Tivoli Storage Process Manager can help implement provisioning, data cleanup and backup incident prioritization. They can interface with your existing Tivoli storage products such as TotalStorage Productivity Center, Tivoli Storage Manager or Tivoli Provisioning Manager. These tools are instructed by the processes to perform operational tasks, monitor their status. Alternatively, integration with TotalStorage Productivity Center also helps to build and maintain a dependency map of storage infrastructure components. This is the information that gets stored in Tivoli CCMDB.

- ▶ Help in improving utilization of storage assets
To analyze storage requirements, pinpoint potential areas for data cleanup and reclaim, you can utilize data cleanup processes. This can also support your efforts to show compliance with regulations for data retention and disposal.
- ▶ Prioritizing storage alerts and storage related change requests
Storage incidents must be handled with care because they can indicate potential service failures. Alternatively, events such as backup problem alerts or requests to extend data storage capacity need to be prioritized according to their business relevance. Tivoli Storage Process Manager is designed to help you rank storage incidents, so that critical issues can be addressed first.
For more information, visit:
<http://www.ibm.com/software/tivoli/products/storage-process-mgr/>

3.7.6 Availability process management

The IBM Tivoli Availability Process Manager is one of the IT process management products in the IBM IT service management solution. It focuses on availability management and certain aspects of incident and problem management.

The IBM Tivoli Availability Process Manager automates component failure impact analysis (CFIA) tasks to show how IT resources and their dependencies are impacting, or might impact, service delivery. The CFIA information is dynamically determined from the resource relationships that are defined in the IBM Tivoli Change and Configuration Management Database (CCMDB) and from information about configuration items (CIs) that is available in multiple IBM IT operational management products. The CFIA information can be provided to IT management, availability managers, incident managers, subject matter experts, and service desk analysts for improved classification, prioritization, and handling of incidents and service disruptions.

CFIA is the process of analyzing a particular hardware or software configuration to determine the true impact of any individual failed component. A *CI* is a unit of configuration that can be individually managed and versioned. The IBM Tivoli Availability Process Manager, therefore, automates CFIA capabilities for availability management and augments incident and problem management by providing CFIA information.

The following IT operational management products integrate with Tivoli Availability Process Manager to maximize the level of detail that is visible through the Tivoli Enterprise Portal:

- ▶ Tivoli Monitoring
- ▶ Tivoli OMEGAMON XE
- ▶ Tivoli Composite Application Manager for Response Time Tracking
- ▶ Tivoli Business Service Manager
- ▶ Tivoli Service Level Advisor

Tivoli Availability Process Manager includes support for determining business impact (Determine Business Impact task). This task helps IT organizations identify the severity and priority of an incident based on the following items:

- ▶ The status of the resource that is reported to have a problem
- ▶ The status of related resources
- ▶ The affected service level agreements

The Determine Business Impact task can also help in assessing the impact of a change to a resource. Although the status of the resource is not as important in this case, the relationship of that resource to other resources and the SLAs that apply to that resource are important.

The following steps are included in the Determine Business Impact task. These steps can be performed by a user or are performed automatically.

- ▶ Search
Identifies the configuration item (CI) to be used as the starting point
- ▶ Assess failing components
Identifies failing resources that are affecting the CI that was identified in the Search step. This step navigates the relationships of CIs in the Tivoli Change and Configuration Management Database (CCMDB) to identify resources that might be affecting the availability status of the respective CI. It also communicates with the installed IT operational management product that is monitoring the resources to obtain the status of the resources. Resources that are reporting “green” availability status are automatically eliminated from the list that is shown to the user in this step. The user can also launch in context of the selected resource to the operational management product that contains more detail about that resource.
- ▶ Assess services impacted
Identifies the impacted business services, applications, transactions, and possibly other CIs that depend on the failed resources that were identified in the Assess failing components step.

This step navigates the relationships of CIs in the Tivoli CCMDB to identify business services, applications, and transactions that depend on the failed resources from the Assess failing components step. It also communicates with the installed IT operational management product that is monitoring the service, application, or transaction to obtain the status of the respective service, application, or transaction. Services, applications, or transactions that are reporting “green” availability status are automatically eliminated from the list that is shown to the user in this step.

► Assess SLAs impacted

Identifies the service level agreements (SLAs) that might be impacted, based on their relationships to the CIs that were identified in the Assess services Impacted step. This step navigates the relationships of CIs in the Tivoli CCMDB to identify SLAs that exist for the business services, applications, or transactions from the Assess Services Impacted step.

All SLAs that are found for these CIs are shown to the user in this step. If the SLA is monitored by the Tivoli Service Level Advisor, one of the IT operational management products, this step uses the Tivoli Service Level Advisor integration module to obtain the status of the SLA.

► Assess incident priority

Summarizes the information from the previous steps. This information can be saved to a file and used in creating an incident and assigning the incident priority. In this last step of the component failure impact analysis in the Determine Business Impact task, the user can view all the information about the business impact on a single Web page, generate an HTML report, and save the information with the incident. Saved information also includes the status of the resources, which is useful in historical analysis and in verification of availability.

For more information, visit:

<http://www.ibm.com/software/tivoli/products/availability-process-mgr/>

3.7.7 Capacity process management

Capacity management is supported by IBM Tivoli Capacity Process Manager. It is based on best practices and supports processes aligned with ITIL, and it is fully integrated with Tivoli Change and Configuration Management Database.

By installing Tivoli Capacity Process Manager, you will have tooling that provides you the following benefits:

- ▶ Customizable process templates and workflows
Customizable process templates enable you to support different capacity management scenarios, such as sizing a new application, monitoring a deployed infrastructure, or capacity tuning an existing environment.
- ▶ A library of task-specific expert advice that guides non-specialist staff through the capacity management process.

By using Tivoli Capacity Process Manager to implement and track capacity management activities, you can avoid upgrades and changes to your infrastructure that are wasteful or insufficient. There are three steps to achieve this:

- ▶ All work requests that could potentially lead to an infrastructure upgrade are captured.
- ▶ Data related to both business requirements and IT metrics are gathered, based on policies and best practices which speed up overall processes
- ▶ Management tools are integrated into common process flows to enable effective, productive handling of all capacity management requests.

For more information about Tivoli Capacity Process Manager, visit:

<http://www.ibm.com/software/tivoli/products/capacity-process-mgr/>

Archived

Sample scenarios for enterprise monitoring

In this chapter, we provide sample monitoring solutions for four scenarios of reference IT infrastructure environment.

This chapter includes the following sections:

- ▶ 4.1, “Introduction to this chapter” on page 114
- ▶ 4.2, “UNIX servers monitoring” on page 114
- ▶ 4.3, “Web-based application monitoring” on page 118
- ▶ 4.4, “Network and SAN monitoring” on page 123
- ▶ 4.5, “Complex retail environment” on page 125

4.1 Introduction to this chapter

This chapter describes some scenarios that can help you to understand the monitoring solution for performance and availability. The scenarios are designed with varying complexity, to show some different options on the management solutions.

The sample scenarios illustrate the possibility of choosing a certain set of Tivoli solutions. There might be other way of delivering a solution with a different set of products. We provide these scenarios as examples for choosing the solution only.

The samples are:

- ▶ 4.2, “UNIX servers monitoring” on page 114, which is a typical small to medium sized enterprise with a back-end server that process back office transaction. There is no major network connectivity as most of the processing (and the users) is performed on a single site.
- ▶ 4.3, “Web-based application monitoring” on page 118, explores the management of an e-business based customer. It has a major emphasize on managing Web-based transaction and its availability.
- ▶ 4.4, “Network and SAN monitoring” on page 123 shows a network management on enterprises that exploits a Storage Area Network (SAN) solution. In this case, networking status is instrumental for providing availability and performance for storage solution. This might be a content provider or an archival system or a Web hosting company.
- ▶ 4.5, “Complex retail environment” on page 125 explores a more complex enterprise, might be more suited to a medium-large enterprises. Diverse set of devices and networking infrastructure exists. The example demonstrates a multi-site operation for retail business.

4.2 UNIX servers monitoring

This scenario is a simple UNIX servers environment. We assume that it has a small number of UNIX servers. The UNIX server can be a specialized application server or a specialized server such as a database server or an application server.

Figure 4-1 shows a sample architecture with a UNIX server environment running SAP applications with the database server. Both servers are running AIX 5L™ V5.3. To make it simple, we do not show the high availability backup servers in the figure. However, in common real environment, these two servers would be designed to backup each other, or there might be separate backup servers.

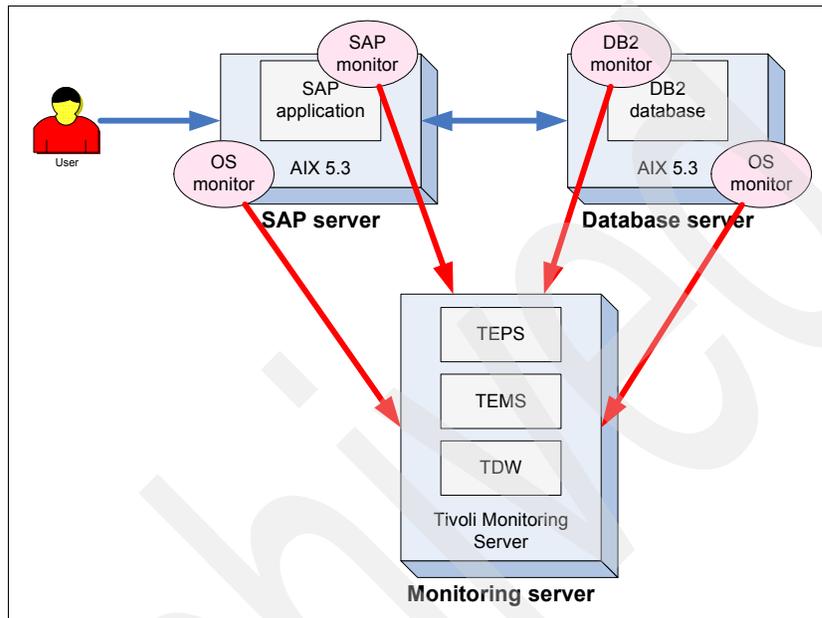


Figure 4-1 Scenario 1 for UNIX servers environment

In this environment, the architecture is simple and the key requirements for monitoring are resource monitoring and application monitoring for availability and performance.

The monitoring requirements for this scenario include:

- ▶ Servers resources monitoring
 - System errors for both hardware and software. The information can come from various system error logs. When the error is belong to fatal error, then the system administrator needs to get a real time alert notice.
 - System resources utilization such as CPU, memory, and file systems disk space utilization. When any key resource utilization is above the predefined threshold value, the system administrator needs to get a real time alert notice.
 - The weekly utilization trend reports for key system resources such as CPU, memory, and file systems disk space.

- Disk I/O performance
- The weekly utilization trend reports for disk I/O performance
- Key processes running status
- Backup servers running and take over status if they are implementing high availability backup solution for servers.
- ▶ Database monitoring
 - Database server running status
 - Database errors in database logs
 - Database various buffer pools utilization
 - Database table space utilization
 - Lock and dead lock information
 - Log space utilization
- ▶ SAP application monitoring
 - mySAP™.com application running status
 - mySAP.com® application interconnectivity
 - System log errors

To address those monitoring requirements, we need tools to help availability and performance monitoring efficiently. We choose the following Tivoli monitoring products:

- ▶ IBM Tivoli Monitoring
- ▶ IBM Tivoli Monitoring for Databases
- ▶ IBM Tivoli Monitoring for Applications

In Figure 4-1, we show that we have three kind of monitoring agents in this environment and that we have a Tivoli monitoring server for centralized monitoring and management.

The agents monitor and collect the performance data and error events from their monitoring areas.

- ▶ The operating system monitor intercepts system error logs for hardware and software errors. It also collects the key system resources performance data. The information is then sent to Tivoli Monitoring Server for analysis and automation.
- ▶ Database monitor intercepts database system errors and collects the database performance data.
- ▶ SAP monitor works with SAP application for collecting errors and performance data.

The Tivoli Monitoring server provides a centralized monitoring and management solution. Because the environment is simple, we install all the key components there, such as the Tivoli Enterprise Monitoring Server, Tivoli Enterprise Portal Server, and Tivoli Data Warehouse:

- ▶ Tivoli Enterprise Monitoring Server acts as a collection and control point for alerts received from agents and collects their performance and availability data.

The Tivoli Enterprise Monitoring Server stores, initiates, and tracks all situations and policies, and is the central repository for storing all active conditions and short term data on every Tivoli Enterprise Management Agent.

- ▶ Tivoli Enterprise Portal Server is the portal server for user presentation. It serves all Tivoli Enterprise Portal user to bring all of the managing components views together in a single window so you can see when any component is not working as expected. This central point of management allows you to proactively monitor and help optimize the availability and performance of the entire IT infrastructure. You can collect and analyze specific information easily using the Tivoli Enterprise Portal.
- ▶ Tivoli Data Warehouse is the repository and central data store for all historical management data. Tivoli Data Warehouse is the basis for the Tivoli reporting solutions.

Together with the agents and the servers, we can have a monitoring solution for the reference UNIX servers environment. It has the following benefits:

- ▶ We can have real time monitoring for system hardware and software errors and real time alerting to system administrators to take action to fix errors, reducing problem identification time. Sometimes, the monitoring mechanism can help to discover and fix minor errors before they become a real problem. Increase overall system availability.
- ▶ The monitoring solution can do errors correlation and help to discover the root cause of problems, reducing the problem diagnose and isolate time.
- ▶ We can have system key resources utilization trend information. Then we can plan the required system capacity in advance to meet the business growth requirements.
- ▶ We can increase system management productivity through the monitoring automation and the centralized monitoring and management solution.

4.3 Web-based application monitoring

The second reference scenario environment is a Web-based application environment, which is a popular application architecture today. It provides a Web server as the first tier, the J2EE application servers as the second tier, and the database servers as the third tier.

Figure 4-2 shows two HTTP servers run in Linux servers in the front end, WebSphere Application Server runs in AIX servers, and the database servers run in AIX servers in the back-end system. It is a three-tier, Web-based application architecture. There are two-layer, four switches in front of the HTTP servers. These switches serve as server load balancing and a high availability mechanism to dispatch HTTP request from clients to the two HTTP servers. There are some additional AIX servers running WebSphere MQ. The WebSphere MQ servers serve as message hub for the application to exchange messages and data with other applications in this environment.

Every server in this environment has high availability backup server in place. For HTTP and WebSphere application servers, these servers are active-active operation. For the remainder of the servers, they are active-standby operation.

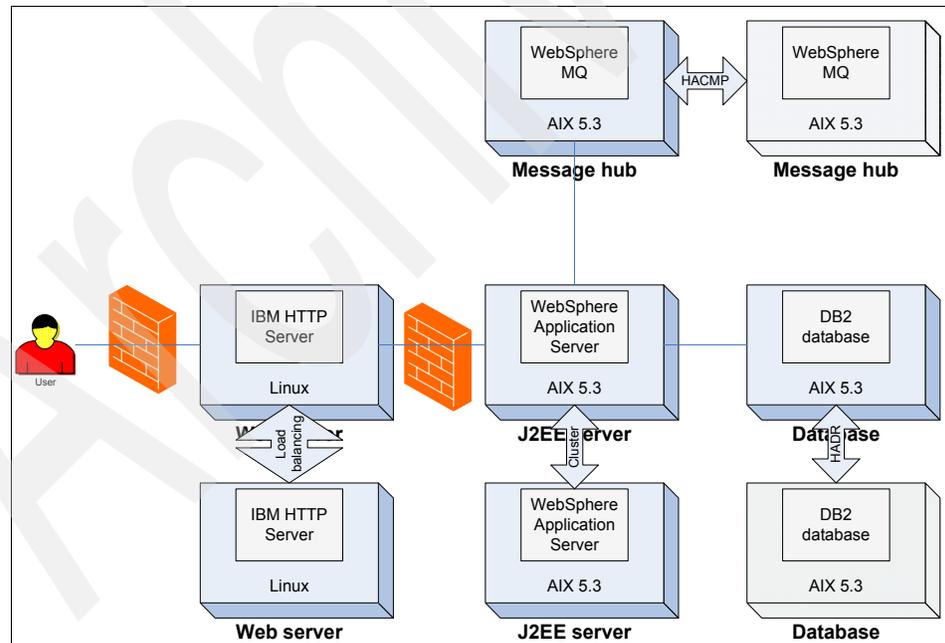


Figure 4-2 Scenario 2 for Web-based application environment

In this environment, application transactions need to traverse multiple servers for processing. It is a standard composite application architecture. In addition to servers and middleware resources monitoring, the key monitoring requirements will also need to include composite application monitoring for availability and performance.

The monitoring requirements for this scenario include:

- ▶ Services resources monitoring
 - System errors for both hardware and software. The information can come from various system error logs. When the error is belong to fatal error, then the system administrator needs to get a real time alert notice.
 - System resources utilization such as CPU, memory, and file systems disk space utilization. When any key resource utilization is above the predefined threshold value, the system administrator needs to get a real time alert notice.
 - The weekly utilization trend reports for key system resources such as CPU, memory, and file systems disk space.
 - Disk I/O performance
 - The weekly utilization trend reports for disk I/O performance
 - Key processes running status
 - Backup servers running and take over status if there have implementing high availability backup solution for servers.
- ▶ Database monitoring
 - Database server running status
 - Database errors in database logs
 - Database various buffer pools utilization
 - Database table space utilization
 - Lock and dead lock information
 - log space utilization
- ▶ MQ message hub monitoring
 - Visibility of all Queue Managers and running status
 - Queue/channel operation performance and statistics
 - Errors in system log
- ▶ Composite application monitoring
 - Transaction availability and response time monitoring
 - HTTP server and WebSphere application server monitoring
 - Transaction tracing for application server

To address these monitoring requirements, we choose the following Tivoli Monitoring and Tivoli Composite Application Manager products:

- ▶ IBM Tivoli Monitoring
- ▶ IBM Tivoli Monitoring for Database
- ▶ IBM Omegamon XE for Messaging
- ▶ IBM Tivoli Composite Application Manager for WebSphere
- ▶ IBM Tivoli Composite Application Manager for Response Time

Figure 4-3 shows the management environment. The diagram illustrates the management agents for each of products and two management servers, Tivoli Monitoring Server and Tivoli Composite Application Manager for WebSphere Managing Server, for centralized monitoring and management.

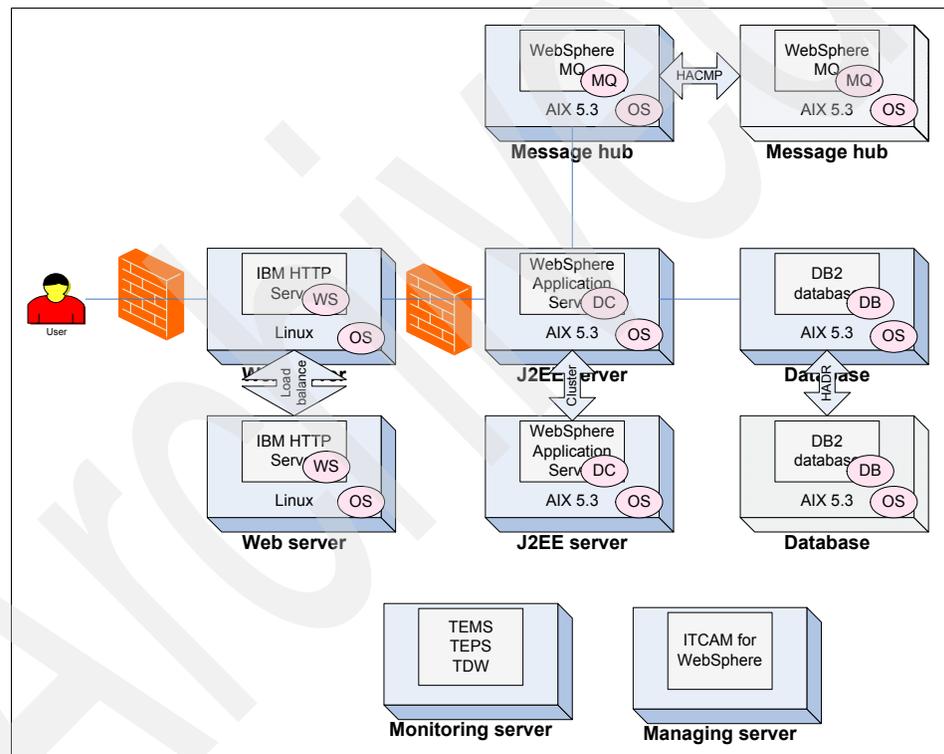


Figure 4-3 Scenario 2 monitoring solution architecture

The agents help to monitor and collect the performance data and the error events from their monitoring territory.

- ▶ The Operating System monitor intercepts system hardware and software errors and collect key system resources performance data. The information is then sent to Tivoli Monitoring Server for analysis and automation.
- ▶ Database Monitor collects database performance data. The information is also sent to Tivoli Monitoring Server for analysis and automation.
- ▶ Tivoli Composite Application Manager for WebSphere data collector provides composite transaction tracing and monitoring for the WebSphere application server. The data collector uses probes in the application servers and collects the performance information. The monitoring data is then sent to the Tivoli Composite Application Manager for WebSphere managing server and Tivoli Enterprise Monitoring Server for centralized monitoring and management.
- ▶ MQ monitoring agent collects queue manager, queue and channel operation availability and performance information. The data then is sent to Tivoli Monitoring Server for analysis and automation.
- ▶ Tivoli Composite Application Manager for Response Time agents monitors end-user response time. It consolidates response time information using the End-user Response Time Dashboard. There are three kinds of response time collection agents:
 - Client Response Time Agent analyzes a combination of windows messages and TCP/IP network traffic to compute the user response time for transactions created by the monitored applications.
 - Web Response Time Agent collects user response time for HTTP and HTTPS Web transactions.
 - Robotic Response Time Agent collects response time and availability information from the supported robotic runtime environment. The robotic runtime environments currently supported are: Rational Performance Tester, Rational Robot, Command Line Interface (CLI), and Mercury LoadRunner

The Tivoli Monitoring Server helps to centralized monitoring and management. There have the key components for the Tivoli Monitoring Server: Tivoli Enterprise Monitoring Server, Tivoli Enterprise Portal Server, and Tivoli Data Warehouse.

- ▶ Tivoli Enterprise Monitoring Server acts as a collection and control point for alerts received from agents, and collects their performance and availability data.

The Tivoli Enterprise Monitoring Server stores, initiates, and tracks all situations and policies, and is the central repository for storing all active conditions and short-term data on every Tivoli Enterprise Management Agent.

- ▶ Tivoli Enterprise Portal Server is the portal for users presentation. Tivoli Enterprise Portal Server brings all of the managing components views together in a single window so you can see when any component is not working as expected. This central point of management allows you to proactively monitor and help optimize the availability and performance of the entire IT infrastructure. You can easily collect and analyze specific information using the Tivoli Enterprise Portal.
- ▶ Tivoli Data Warehouse is the repository and central data store for all historical management data. Tivoli Data Warehouse is the basis for the Tivoli reporting solutions.

The Tivoli Composite Application Manager for WebSphere Managing Sever helps to manage the WebSphere composite application. The server will receive monitoring data from data collector and have a real time display in console for system administrators to monitoring, analysis and management. It can show the topology view of transaction, and it helps for isolating problem quickly. The visualization engine reads the database to present data through the Web console, and snapshot information, such as lock analysis and in-flight transactions, is retrieved directly from the data collectors.

Note: Although not listed in the requirement, this environment can benefit from having a central event processing for analysis and automation for events from various components. Although this processing can be performed in Tivoli Enterprise Monitoring Server, as all agents utilize Tivoli Monitoring, it might be beneficial to introduce Tivoli Netcool/OMNIBus as event processing; especially if additional network management is introduced in the system and application monitoring must relates with network monitoring events.

Together with the agents and the servers, we can have a monitoring solution for the reference Web-based application environment that has the following benefits:

- ▶ We can have tracing and managing capability for composite application in WebSphere J2EE environment. It helps to root cause analysis and reducing problem solving time.
- ▶ We can manage service level using response time monitoring solution and take early actions before the problem have impact to users.
- ▶ We can have real time monitoring for system hardware and software errors and real time alerting to system administrators to take action to fix errors, reducing problem identification time. Sometimes, the monitoring mechanism can help to discover and fix minor errors before they become a real problem. Increase overall system availability.
- ▶ The monitoring solution can do errors correlation and help to discover the root cause of problems, reducing the problem diagnose and isolate time.

- ▶ We can have system key resources utilization trend information. Then we can plan the required system capacity in advance to meet the business growth requirements.
- ▶ We can increase system management productivity through the monitoring automation and the centralized monitoring and management solution.

4.4 Network and SAN monitoring

The third scenario is network and storage area network (SAN) environment. In today's IT infrastructure, network is common, and it is getting more complex for all IT environment. SAN is getting more popular in new storage implementation due to the performance and flexibility for storage management. The network and SAN is very important for business IT operation. Of course, we need a monitoring solution for the network and SAN.

Figure 4-4 shows servers that connect to the network for networking connection and that connect to SAN for storage systems access. From the operation view, the network is the mechanism from which users can access the application, and SAN provides data storage and access facility. These are all key resources in IT environment.

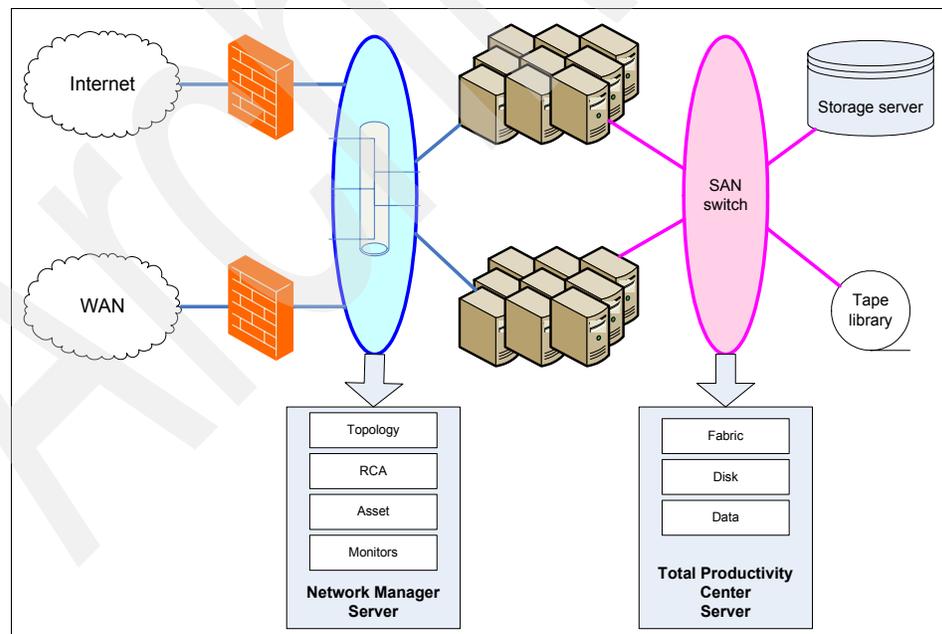


Figure 4-4 Scenario 3 network and SAN environment

The monitoring requirements for this scenario include:

- ▶ Network monitoring
 - Topology view for network nodes and connections
 - The operation health and performance status for LAN and WAN lines
 - Network node up and down events
 - Network traffic statistics and performance information
- ▶ SAN monitoring
 - Topology view for SAN
 - The connection status and performance for SAN
 - Storage system running status
 - Storage system I/O performance
 - Storage system disk logical unit number (LUNs) allocation and utilization
 - SAN zoning information
 - Errors events in SAN fabric

To address these requirements, we need tools to provide effective and efficient monitoring for availability and performance. We choose the following Tivoli Network Manager and TotalStorage Productivity Center products to help the monitoring for the reference network and SAN environment:

- ▶ IBM Tivoli Network Manager IP Edition
- ▶ IBM TotalStorage Productivity Center for Fabric
- ▶ IBM TotalStorage Productivity Center for Disk
- ▶ IBM TotalStorage Productivity Center for Data

As we show in Figure 4-4, there are two monitoring servers for the network and SAN monitoring and management solution.

The Network Manager Server helps to centralized monitoring and management for network:

- ▶ The server collect layers 2 through 3 network data and build and maintain the network topology information. At the same time. the server monitors the whole network operation status and collect events. With accurate network visibility, we can visualize and manage complex networks efficiently and effectively.
- ▶ The root cause analysis engine provides valuable advanced fault correlation and diagnosis capabilities. Real time root cause analysis helps operations personnel identify the source of network faults and speed problem resolution quickly.
- ▶ The software have asset control capabilities help organizations optimize utilization to realize greater return from network resources. It delivers highly accurate, real time information about network connectivity, availability, performance, usage, and inventory.

The TotalStorage Productivity Center Server helps with centralized monitoring and management for SAN:

- ▶ TotalStorage Productivity Center for Fabric is for monitoring the availability and performance for SAN fabric.
 - Automatic device discovery function is to enable you to see the data path from the servers to the SAN switches and storage systems.
 - Real time monitoring and alerts functions help administrators to discover the problem for maintenance.
- ▶ TotalStorage Productivity Center for fabric for Disk is for monitoring the availability and performance for storage system.
- ▶ TotalStorage Productivity Center for fabric for Data is for monitoring the space usage for file systems and database in the hosting servers.

Together with the servers, we can have a monitoring solution for the reference network and SAN environment that provides the following benefits:

- ▶ A clear picture of network topology and the network connection status so that the problem is easy to discover.
- ▶ A clear picture of the SAN topology and the SAN connection status so that the problem is easy to discover.
- ▶ A real time monitoring and alert mechanism for network and SAN to discover the problem and fix it as soon as possible.
- ▶ Understanding of the operation performance for network and SAN environments.
- ▶ Obtain disk utilization information and know the usage trend for storage system.

4.5 Complex retail environment

In this section, we describe a complex scenario of a fictitious company, called *ITSO Enterprises*. ITSO Enterprises wants to implement advanced infrastructure management. So, we discuss the management needs of the company and go through the basic component selection steps to illustrate how to design a comprehensive management infrastructure.

We detail this scenario in the following sections:

- ▶ 4.5.1, “Scenario overview” on page 126
- ▶ 4.5.2, “Infrastructure management requirements” on page 127
- ▶ 4.5.3, “Management infrastructure design for ITSO Enterprises” on page 129
- ▶ 4.5.4, “Putting it all together” on page 138

4.5.1 Scenario overview

ITSO Enterprises is a retail company with country-wide coverage that is headquartered in a large city. ITSO Enterprises' IT environment is complex and distributed. The following major characteristics describe its environment:

- ▶ Networking infrastructure
 - ITSO Enterprises operates a geographically distributed network. It has about 200 remote offices all around the country, each connected to the headquarter through WAN links.
 - WAN lines are also utilized for in-company voice connections. Branches use VoIP links to reduce communication charges.
 - The network is built using SNMP manageable active devices.
- ▶ Servers and applications
 - The server park is heterogeneous. It is mostly AIX, but there are Solaris and Linux servers, too.
 - The most important business application of ITSO Enterprises is the retail application. It is supported by a central server farm of high-end AIX boxes as well as smaller application and database servers located at the remote sites. Site servers run AIX or Linux at a few locations.
 - At headquarters, several central database servers consolidate sales and distribution data, those run Oracle RDBMS.
 - In terms of ERP, ITSO Enterprises relies on SAP applications that run on AIX servers and that use DB2 as the back-end database.
 - Application integration is accomplished using IBM WebSphere Message Broker that connects all major applications using a message-oriented approach of loose coupling. Message Broker runs on AIX.
 - Base domain services, such as file and print, are provided by Microsoft Windows infrastructure, messaging infrastructure is Microsoft Exchange based. All users use Windows desktops.

Figure 4-5 shows the simplified IT architecture overview of ITSO Enterprises.

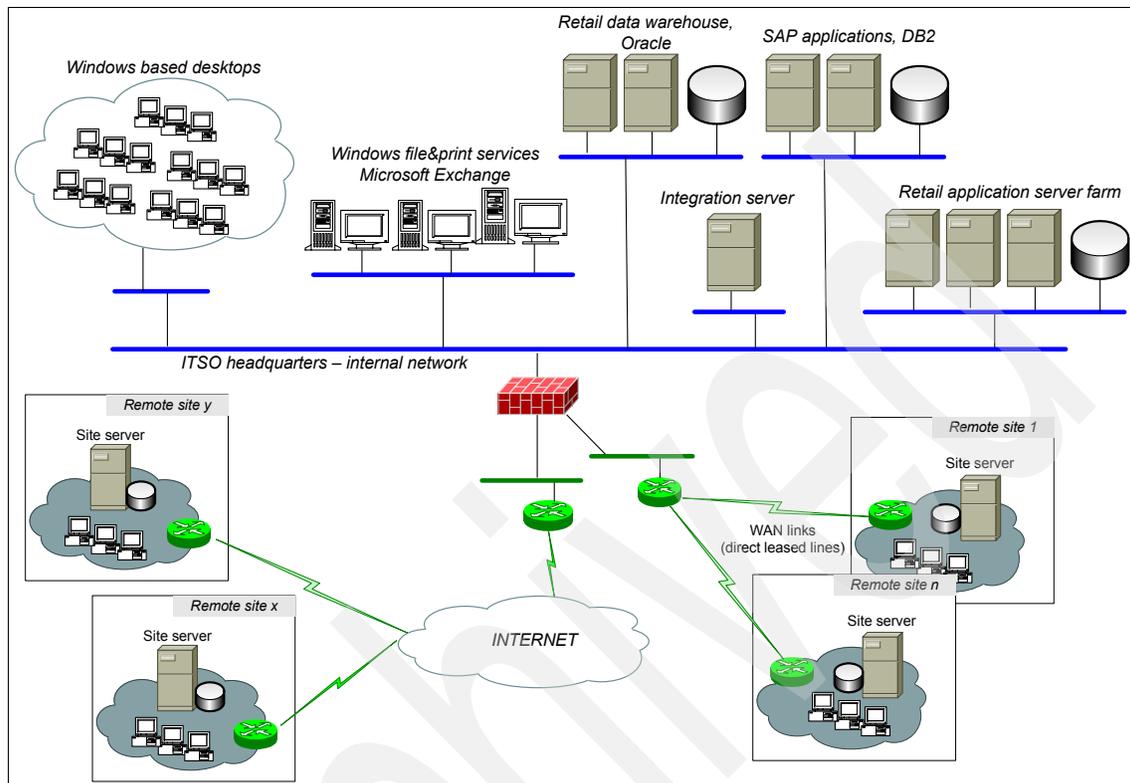


Figure 4-5 Architecture overview of ITSO Enterprises

4.5.2 Infrastructure management requirements

ITSO Enterprises intends to implement an end-to-end performance and availability monitoring environment for their server and application infrastructure. They just released an IT infrastructure management RFP (request for proposal) with the following high level functional requirements:

- ▶ Server management
 - Monitoring of key server resources such as CPU, memory, or disk
 - Monitoring base platform (operating system) resources
 - Consolidated management for a mixed environment of AIX, Solaris, Windows and Linux
 - Support for task automation and automated notifications to make IT operations more effective and efficient

- ▶ Application management
 - Resource specific monitoring of ITSO Enterprises' key applications that include
 - WebSphere Application Server
 - WebSphere Message Broker
 - SAP applications
 - DB2 and Oracle RDBMS
 - Microsoft Exchange Server
 - Common management platform with base server management
- ▶ IP network management
 - Network topology discovery and graphical visualization
 - Networking device monitoring at layer 2/3 level
 - Both IP and VoIP network traffic to be monitored with performance reporting and alerting
- ▶ Central event console
 - Consolidate events from server, application and network monitoring as well as from performance management
 - High capacity event processing: correlation, event reduction, cross-domain root cause analysis
 - Policy driven sophisticated event processing capabilities, integration with external inventory database to support event handling
 - Web-based user interface
 - Comprehensive historical reporting
- ▶ Service management
 - Service model based service monitoring
 - Integration of business metrics in addition of availability data to support comprehensive service monitoring
 - Service level objectives (SLO) management and reporting for the critical business services
- ▶ Help desk
 - Consolidated “single point of contact” help desk environment for the network, servers and applications
 - Trouble ticketing, incident and problem management
 - Escalation management
- ▶ General requirements
 - Web browser accessible graphical interfaces
 - Scalable and robust management infrastructure
 - Integrated components

4.5.3 Management infrastructure design for ITSO Enterprises

To answer the broad range of requirements, we need a series of different Tivoli components. We also need to show that these components are not isolated but can be integrated to build a comprehensive solution that covers all necessary functionalities.

The management infrastructure that we design in response of the request for proposal (RFP) is divided into three layers:

- ▶ Data collection layer

This layer, that is logically at the bottom of the management architecture, is responsible for performing basic and advanced monitoring of resources, such as networking devices, servers or applications. It collects base availability data by periodic polling of the devices or by receiving event driven management data (in the form of management traps).

Solution components in the first layer also cover the data collection tasks of performance management by reading equipment counters for network traffic or others.

To some extent, the data collection components are already able to implement advanced functions such as event correlation but these are limited to the subdomain these tools deal with (for example servers or network).

- ▶ Event correlation and automation layer

The middle layer holds the cross-domain event correlation and automation capabilities. As opposed to similar but subdomain limited functionalities that are present in the elements of the data collection layer, components in the middle layer can provide an enterprise-wide view to ITSO Enterprises' IT staff.

The middle layer also helps to transform equipment-specific information, such as availability events from a server or a networking device, into business-relevant service information.

- ▶ Visualization layer

As its name already says, this layer provides an integrated, Web-based graphical interface for most of the solution components and it also supports IT operations staff with Web-based event lists.

Product selection, data collection layer

This section discusses the product selection for the data collection layer.

Server and application monitoring

ITSO Enterprises needs a solution that is able to monitor their heterogeneous servers with a unified management system.

Servers running various operating systems can be monitored by deploying Tivoli Monitoring agents on them. These are low footprint pieces of code that collect data and forward those to the central management server.

Base monitoring cannot cover application metrics like table space allocation details (databases) or message queue length (WebSphere Message Broker). Specific knowledge and monitoring capabilities that are relevant from the applications perspective can be added to the management system by additional Tivoli Monitoring modules. The mapping is as follows:

- ▶ DB2 and Oracle RDBMS - Tivoli Monitoring for Databases
- ▶ SAP - Tivoli Monitoring for Applications
- ▶ Microsoft Exchange - Tivoli Monitoring for Messaging and Collaboration
- ▶ WebSphere Message Broker - OMEGAMON for Messaging

Both base monitoring and application monitoring components report to the central Tivoli Monitoring Server (called Tivoli Enterprise Monitoring Server). If the network topology and bandwidth conditions or scalability issues require, we can also implement a distributed monitoring infrastructure by deploying additional (remote) servers.

Tivoli Monitoring data can be displayed using Tivoli Enterprise Portal using screens that are customizable by the operators and can be accessed using Web browsers. With Tivoli Monitoring we can prepare and perform automated tasks to handle incoming events collected by the monitoring agents. Also, it is able to forward filtered events and messages to the central event management engine.

Figure 4-6 illustrates the Tivoli Monitoring part of the management architecture.

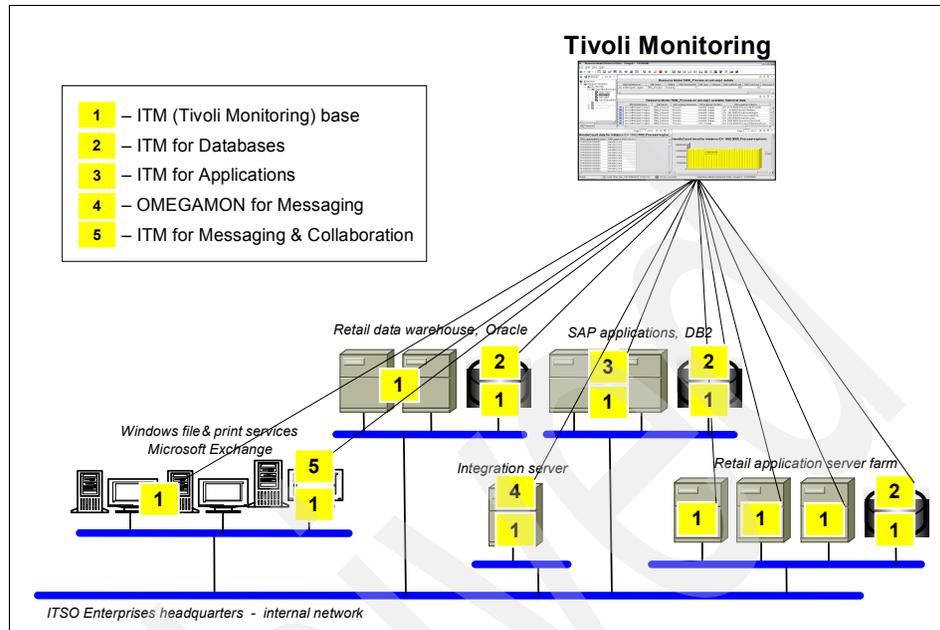


Figure 4-6 Data collection layer: Tivoli Monitoring

The figure shows which Tivoli Monitoring components are used to manage the different servers and applications. For servers running specific applications that need to be monitored both base monitoring and application specific monitoring agents are deployed.

Network monitoring: Availability and performance

ITSO Enterprises network is IP-based and consists of numerous LAN and WAN devices. ITSO Enterprises has a requirement to be able to do a discovery that builds a graphical topology map and to keep that updated. Both Layer 2 and 3 should be handled.

To meet these requirements, we can use Tivoli Network Manager IP Edition. It can discover and model the network topology and visualize that in a graphical display. It interfaces with the network elements and collects and consolidates events. It can visualize and report on devices, connectivity and event status. It performs root cause analysis at the network level and forwards information to the central event processing engine.

According to ITSO Enterprises' needs, it is not only the availability of the network that has to be monitored but they want to know how their network behaves from the performance perspective, too. ITSO Enterprises is dependent on their VoIP

solution when communication internally between branch offices, therefore they need a solution that can handle VoIP-specifics.

For these purposes, we can use Tivoli Netcool/Proviso. It interacts seamlessly with the devices that are used by ITSO Enterprises and can provide a full-blown performance management solution for ITSO Enterprises.

It reads raw data from the devices using its dataload collectors, does aggregation and transforms data into meaningful key performance indicators (KPIs). It has coverage for both native IP and VoIP traffic. Reporting needs of ITSO Enterprises can be met by rich reporting features of Tivoli Netcool/Proviso.

We can define alerting thresholds for key metrics and once those are crossed Tivoli Netcool/Proviso can send performance alerts to the central event console by utilizing a native integration to it.

Both Tivoli Network Manager and Proviso have a browser based graphical interface.

In Figure 4-7, we show two different types of data connections illustrated by dashed and solid lines. Dashed lines represent data flow between the SNMP based devices and Tivoli Netcool/Proviso, that is reading performance counters from the devices to collect data for performance management. Solid lines represent device polling and topology discovery by Tivoli Network Manager that serve the purposes of availability management.

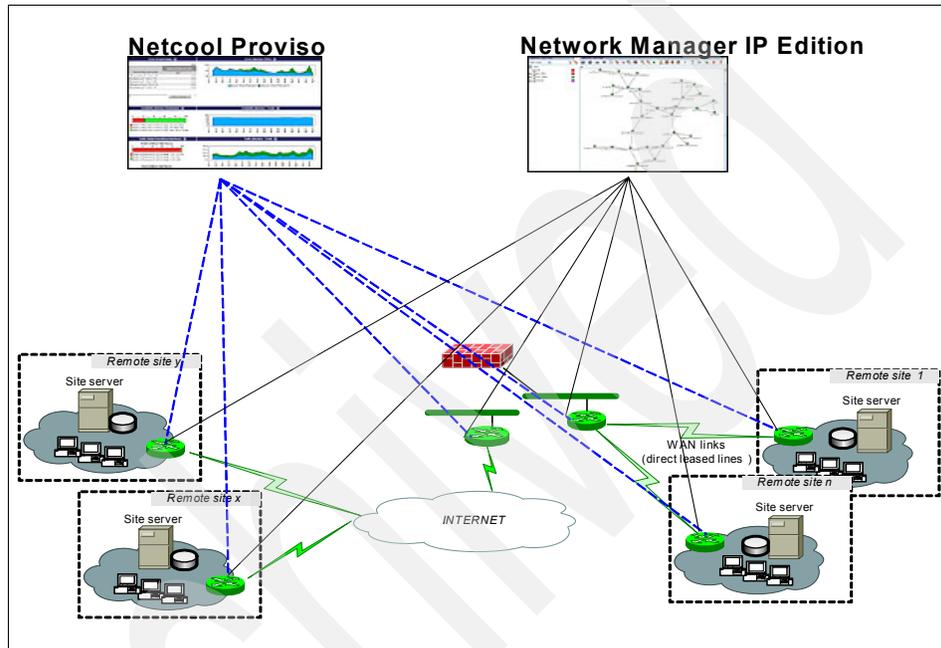


Figure 4-7 Network management: Performance and availability

Figure 4-8 shows an overview the data collection layer that we have discussed thus far. These components report to the central event console for automation and correlation. As we go further with our discussion of the management architecture, we will show how the remaining layers are built.

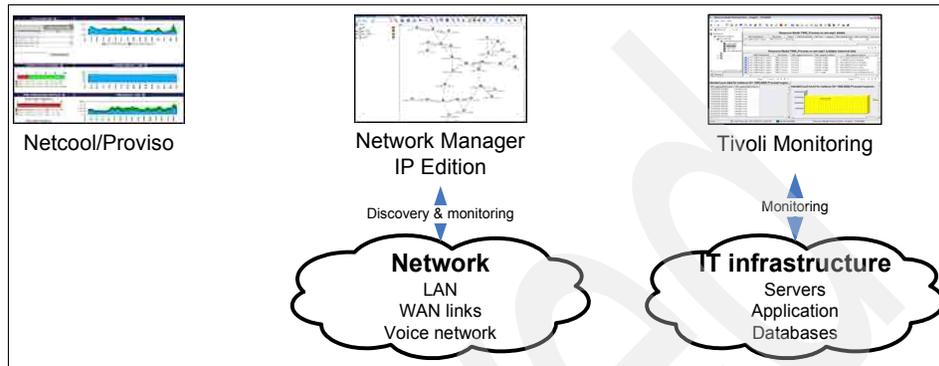


Figure 4-8 Data collection layer of ITSO Enterprises' management infrastructure

Product selection, correlation and automation layer

We now discuss product selection topics in the middle layer—the correlation and automation layer.

Central event console

The central event console needs to handle the information that is collected by the components in the data collection layer underneath. Because ITSO Enterprises' network contains a large number of networking devices, servers and application, we need to pay attention to the data and event volumes that need to be processed at this point.

For the role of the central event console we can pick Tivoli Netcool/OMNIBus. This is a robust, scalable, high performance event processing engine that can handle large volumes of events from all over the IT infrastructure of ITSO Enterprises.

It has native interfaces (so called probes) to data collecting components such as network management (Tivoli Network Manager) or Tivoli Monitoring and can be extended to integrate with other parts of the management infrastructure utilizing its gateways. We can use this feature when designing integration with the help desk component, later on.

Tivoli Netcool/OMNIBus can do filtering and automated event processing by applying a sequence of rules to determine the impact of the faults. It is calculated in the context of all information that has been collected from all parts of the

network (cross-domain analysis). Events are then displayed in customizable and filterable event lists for the operators.

For sophisticated policy based event processing and event enrichment we can use Tivoli Netcool/Impact. It is fully integrated with Tivoli Netcool/OMNIBus using a bi-directional link to catch and process Omnibus events and feed back the results of the processing into the original event records in forms of additional or modified fields. This can help ITSO Enterprises' IT staff to better prioritize incoming events and decide which ones should be addressed first to remedy business service problems.

During policy processing, Tivoli Netcool/Impact can interface with external data sources, applications or databases to fetch data. We can take advantage of this to design an integration point between the central event console and ITSO Enterprises' third-party inventory database, as requested.

In terms of reporting, Tivoli Netcool/OMNIBus can forward event data to a persistence database of a historical reporting tool. For this purpose, we can deploy Tivoli Netcool/Reporter. Using a standard gateway between Omnibus and Reporter, data can be transferred for reporting purposes. Tivoli Netcool/Reporter provides rich functionality to build, customize and display reports on event data. All functions of Reporter can be accessed using Web browsers.

Service management

On top of standard element-related event management, ITSO Enterprises requested service modeling and service monitoring as well as SLA management.

To cover these areas we need two additional components: Tivoli Business Service Manager and Tivoli Service Level Advisor.

Tivoli Business Service Manager provides graphical tooling to compose business models from the monitored devices and applications. We can group and combine those objects into composite objects called services and calculate the overall availability of the services based on individual availability data of the devices. Thereby we have the tooling to manage the infrastructure from the business perspective. We can rely on what is monitored at the infrastructure level but bring that information to a level higher: to the level of business services supported by that infrastructure.

To achieve this, we need a mechanism to import status data into our service model. There is a smooth integration between event processing and service monitoring. At Tivoli Business Service Manager's core there is a technology that has the same roots as Tivoli Netcool/OMNIBus. Events and device status information that are handled by Omnibus can be forwarded to Business Service Manager to provide a live feed to the business model. We can even use data from outside of the *traditional infrastructure management domain*. Service

models can also be fed by data coming from external sources such as sales figures or anything else that means relevant data from the business service perspective.

Tivoli Business Service Manager can give a clear picture of the real-time operational state of ITSO Enterprises, but it does not offer a corresponding historical view of this information. So what is still missing is historical service level management and reporting.

Tivoli Service Level Advisor can fill the gap here. It gives a clear picture of the historical performance of defined SLAs and so it complements Tivoli Business Service Manager. Together these products show the complete view of an SLA.

Tivoli Service Level Advisor is able to keep track of service offerings and relate those to services that are being monitored. Service models are shared with Tivoli Business Service Manager so we do not need to redefine our services from scratch. By collecting service availability data in a database, we can run detailed reports using a Web-based graphical interface that show how services availability met objectives.

Help desk

In a complex management environment like this help desk is essential in terms of implementing consistent support processes. Incident and problem handling are related processes according to ITIL and those make a good match with availability and performance management. In ITSO Enterprises' environment help desk function can be implemented using Tivoli Service Request Manager.

Service Request Manager is a full-featured service desk application that can help IT professionals to better perform their daily tasks, such as:

- ▶ Record incidents and service requests
- ▶ Enforce a predefined life cycle through workflows
- ▶ Use escalations to facilitate problem solving as necessary
- ▶ Document the whole life cycle of incidents and service requests

Based on the recorded activities associated to incidents and requests, Tivoli Service Request Manager can provide managers of ITSO Enterprises with detailed reports on how IT support processes perform. If there is a bottleneck in terms of personnel, or there is a risk of severe service disruption, managers can quickly pinpoint those and take respective actions.

Figure 4-9 shows the components in the correlation and automation layer. You can also see how these work together (indicated by arrows data between them). We provide a detailed description of common data flows across these components in 4.5.4, “Putting it all together” on page 138.

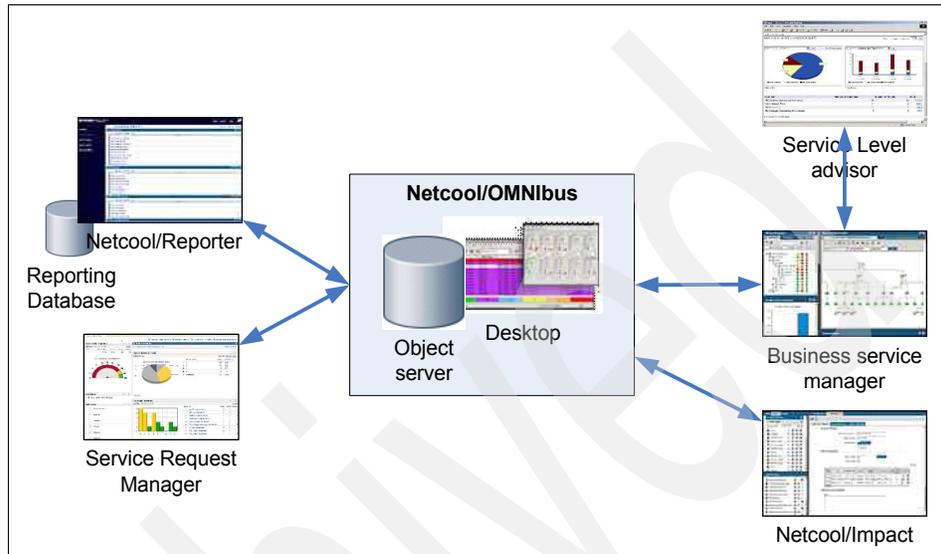


Figure 4-9 Correlation and automation layer of ITSO Enterprises management infrastructure

Product selection, visualization layer

The core architecture is mostly based on Tivoli Netcool solutions (or on those that came from that product family, like Tivoli Network Manager or Business Service Manager). These components utilize a common visualization framework, called Tivoli Netcool GUI Foundation and can be easily integrated into a consolidated Web portal, implemented by Tivoli Netcool/Portal.

Therefore, for our architecture here, we choose Tivoli Netcool/Portal as the visualization layer. With customization that is supported by Tivoli Netcool/Portal, it can be extended to include information from other Web-based components in the architecture, such as Service Request Manager or Service Level Advisor.

Tivoli Netcool/Portal can also serve as a single sign-on mechanism across applications that are integrated, enabling specific role-based privileges by user.

4.5.4 Putting it all together

These solution components can be integrated to form a comprehensive service management solution for ITSO Enterprises. The environment consists of the IBM Tivoli products shown in Table 4-1.

Table 4-1 Tivoli products in ITSO Enterprises' management architecture

Product	Function within the architecture
Tivoli Monitoring and Monitoring for... modules, Tivoli OMEGAMON	Server and application monitoring
Tivoli Network Manager IP Edition	Network monitoring, topology discovery
Tivoli Netcool/Proviso	Network performance management and reporting
Tivoli Netcool/OMNibus	Central event console
Tivoli Netcool/Impact	Advanced event processing
Tivoli Netcool/Reporter	Historical availability reporting
Tivoli Netcool/Webtop	Graphical interface to Omnibus
Tivoli Netcool/Portal	Consolidated Web-based interface
Tivoli Business Service Manager	Service modeling and monitoring
Tivoli Service Level Advisor	SLA management and reporting
Tivoli Service Request Manager	Centralized help desk, incident and problem management

Figure 4-10 shows the overall architecture.

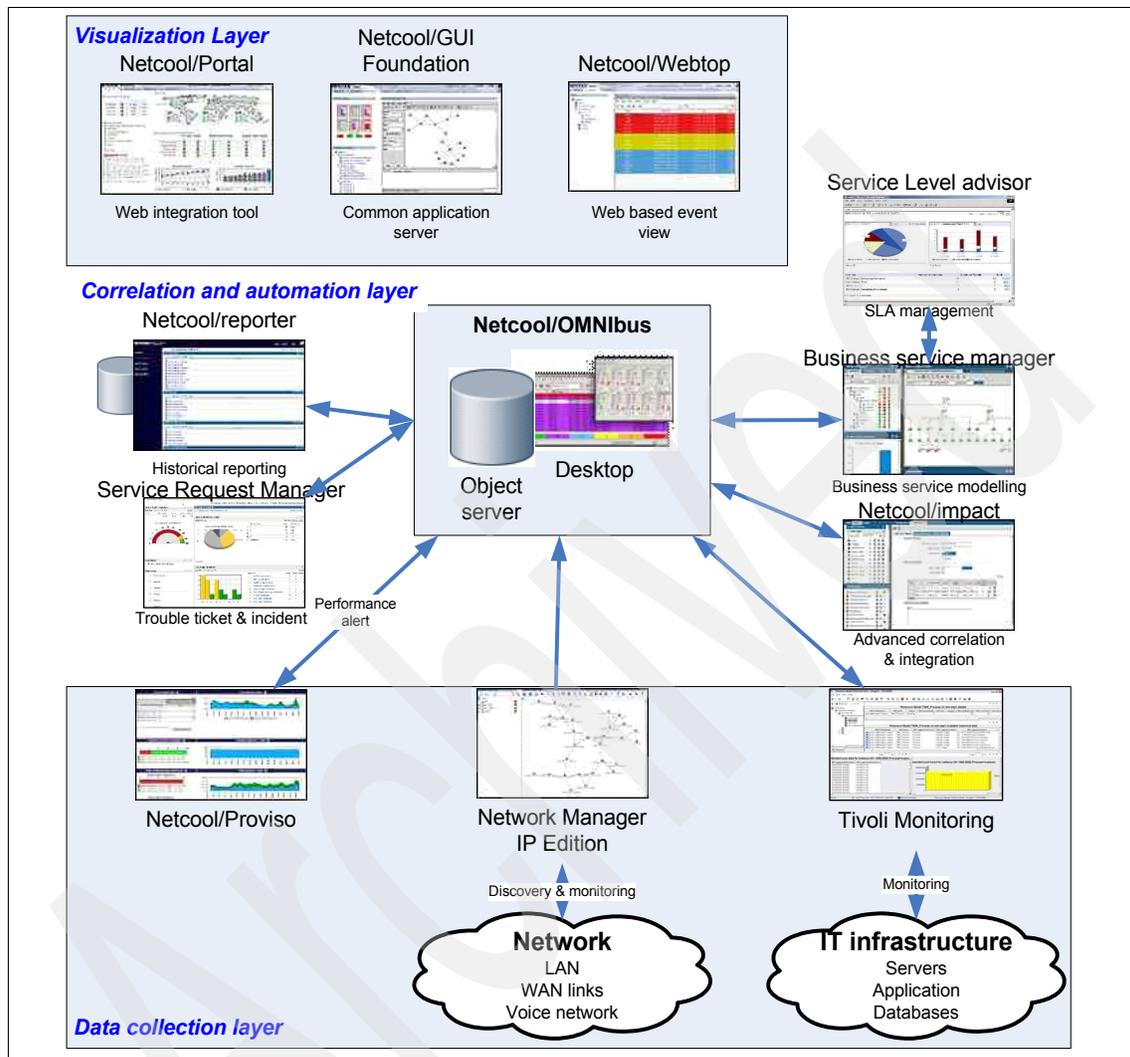


Figure 4-10 Monitoring and service management infrastructure designed for ITSO Enterprises

The flow of data processing within the infrastructure is as follows:

- ▶ Element availability data is collected from the infrastructure (servers, applications or network), it is preprocessed by Tivoli Monitoring and Tivoli Network Manager at these management levels.
- ▶ Performance data is gathered and processed by Tivoli Proviso. Performance reports can be viewed using Web-based reporting tools of Proviso.

- ▶ Filtered, preprocessed event information is forwarded to the central event management console that runs cross-domain analysis and automation. Event information can be derived from what is monitored by Tivoli Monitoring or Tivoli Network Manager as well as from performance monitoring done by Tivoli Proviso. In the latter case information is forwarded in form of performance alerts. For data links towards Tivoli Netcool/OMNIBus we can use specific Netcool Probes that are available with the product.
- ▶ The central event engine, Tivoli Netcool/OMNIBus, performs de-duplication, filtering and correlation. Advanced policy processing and event enrichment is done by integration of Tivoli Netcool/Impact that interfaces with ITSO Enterprises' third-party inventory management database.
 - Filtered event lists are displayed to the operators on the graphical screens of Tivoli Netcool (using Webtop component to show event lists).
 - Availability data is forwarded to Tivoli Netcool/Reporter using a standard gateway. Historical reports can be displayed using data that is available in the Tivoli Netcool/Reporter database
 - In case of the need of opening trouble tickets, data is forwarded automatically to Tivoli Service Request Manager. It handles the life cycle of the tickets by following predefined workflows and escalations. When tickets are closed, this information gets synchronized back to the central event console to clear the originating event. There is a standard bi-directional gateway that can support this integration.
- ▶ Availability data is transferred from Omnibus to the service models of Tivoli Business Service Manager using a standard integration interface between the two products. Tivoli Business Service Manager processes this information to calculate service status. It displays color-coded real-time status of the business services and can generate events in case a key service is experiencing problems. Service related events can be used in correlation activities in the central event console or can be forwarded to the trouble ticketing application to open tickets.
- ▶ Tivoli Service Level Advisor collects historical data on availability and calculates service level achievements based on service definitions defined. A standard integration interface exists between Tivoli Service Level Advisor and Business Service Manager to exchange SLA events.

With its trending algorithm, Tivoli Service Level Advisor can predict SLA breaches and generate events from those to be processed in the central event console. Finally, SLA reports are displayed on its graphical interface.
- ▶ A consolidated graphical view of the overall system is displayed using Tivoli Netcool/Portal.

Solution characteristics

As you might have realized by now, the environment that we described clearly aims at implementing a management system that corresponds to *Level 3 - IT Service management* (see 2.2, “Maturity levels in the infrastructure management” on page 16). We are proposing a solution here that is able to do simple resource management as well as make a significant step towards a business-focused infrastructure management, that is IT service management.

It is important to see how our building blocks can be positioned within the IBM blueprint discussed in 2.3.2, “The IBM service management blueprint” on page 23. You can see that these can be categorized as being part mostly of Operational management products but as a full-blown service management solution, the environment contains elements from the Service management platform and Process management products layers, too. This is what we can expect in the majority of cases that are about designing complex solutions for large enterprises.

Solution benefits

This management solution gives the following clear benefits to ITSO Enterprises:

- ▶ Unified end-to-end management of availability and performance for the whole environment, including various server platforms, applications and networking components
 - Centralized and consolidated event management with advanced event processing policies
 - Business service management focus allows
 - Operators to focus on faults and problems that have the most critical effect on business continuity
 - IT managers to quickly overview the actual status of the infrastructure from the business services perspective
- ▶ Help desk and problem management ensures repeatable IT service support processes
- ▶ Integrated tooling shortens deployment time and helps reducing implementation project risks

- ▶ The solution can be further extended to include a CMDB (by potentially replacing the existing inventory database of ITSO Enterprises) and related processes, such as change management or release management
 - Product integrations are available and can be taken advantage of
 - Between CMDB (implemented by Tivoli Change and Configuration Management Database) and Tivoli Business Service Manager to support business service modeling and management by discovered dependency and topology data
 - Between CMDB and Tivoli Service Request Manager
- ▶ The solution can be further extended to include capacity management for servers. Tivoli Performance Analyzer can be used as an add-on for Tivoli Monitoring.

Overview of IBM acquisitions

IBM has acquired several companies and technologies in the last years that have had an impact on the product lines from IBM. These acquisitions brought significant changes to the Tivoli product family, too.

In this chapter, we describe briefly the acquisition strategy of IBM and the latest technology acquisitions that are relevant to this publication. We include a short discussion of major technologies that were integrated recently into Tivoli offerings from IBM and a mapping of former and rebranded product names that are used by IBM now.

This chapter contains the following sections:

- ▶ “Acquisition and product integration strategy from IBM” on page 144
- ▶ “Recent acquisitions in the Tivoli product family” on page 145

Acquisition and product integration strategy from IBM

Within IBM, we make build versus buy decisions. IBM is investing heavily into its own product development to improve its market position with leading edge software solutions. Alternatively, in some cases, it is more effective to buy certain technology components to supplement internal product development.

Acquisitions can bring several benefits to the IBM:

- ▶ Fill gaps in existing technology quicker than internal development
- ▶ Round out key aspects of the portfolio
- ▶ Help quickly move into new markets and further differentiate IBM from the competition

These benefits all fit within the infrastructure strategy from IBM.

After finishing acquisitions from the legal perspective, acquired technologies get merged and integrated into the product portfolio.

Based on the decisions of responsible product line managers and architecture board members, the activities to be performed during the product integration process can include the following steps. These steps are not listed in the sequence of real execution and are not performed necessarily for each and every acquired product.

- ▶ Extending platform and operating system support of the product
The goal here is to match major platform coverage of other IBM offerings. Major platforms usually include IBM AIX, major Linux distributions, Microsoft Windows, or IBM z/OS.
- ▶ Component standardization
Product development to provide support for standard IBM components (if not already supported), which can include:
 - WebSphere Application Server
 - DB2 database
 - IBM Directory Server (the IBM LDAP directory)

If technically required by the those, IBM usually ships its own components as limited free of charge licenses with the products. A good example for this is Tivoli Monitoring that is shipped with a limited license of DB2 to support data persistence. Limited license here means that the license shipped with the product cannot usually be used for purposes other than running the product itself (for instance, in case of Tivoli Monitoring DB2 cannot be used to store data of any other application).

- ▶ Integration with existing product family members
This can be product development that:
 - Aims at providing native interfaces between existing and acquired products, including data interfaces, agents or adapters
 - Covers API level or other low-level integration activities
- ▶ Product rebranding (for example new naming and logo change) and documentation refresh.

Recent acquisitions in the Tivoli product family

Recently, IBM acquired the following companies (we only list those that are relevant from the availability and performance management area, in alphabetical order):

- ▶ Candle® Corp.
Provides infrastructure management and monitoring; application management solutions; also with a focus on System z (mainframe)
- ▶ Collation®, Inc.
Provides application discovery and mapping; auto-discovery of the infrastructure and population into configuration management database.
- ▶ Cyanea® Systems
Monitoring for composite applications, end-to-end response time monitoring
- ▶ Micromuse, Inc.
You might know Micromuse for their Netcool product family. Provides real time network management of voice, video, and data over IP infrastructure.
- ▶ MRO Software
Provides a complete consolidated service management platform for all critical business assets (enterprise asset management).
- ▶ Vallent Corp.
Offers software that manages service providers' network performance and quality of services delivered over that network.

For your convenience, we summarize the former and actual names of the technologies that were rebranded while getting merged into the Tivoli product portfolio in Table A-1.

Table A-1 Product name mapping for acquired technologies

Former vendor	Former product name	Rebranded IBM name	Function
Candle Corp.	OMEGAMON	Tivoli Monitoring Tivoli OMEGAMON	Infrastructure management and monitoring
Collation, Inc.	Confignia®	Tivoli Application Dependency Discovery Manager	Application discovery and mapping
Cyanea Systems	Cyanea/One®	Tivoli Composite Application Manager for WebSphere	Monitoring of WebSphere environments
Micromuse, Inc.	Netcool/Omnibus	Tivoli Netcool/OMNIibus	Infrastructure management, event console, event processing
Micromuse, Inc.	Netcool/Impact	Tivoli Netcool/Impact	Infrastructure management, advanced event processing
Micromuse, Inc.	Netcool/Portal	Tivoli Netcool/Portal	Integrated visualization interface (portal) for infrastructure management
Micromuse, Inc.	Netcool/Precision for IP Networks	Tivoli Network Manager IP Edition	IP network management
Micromuse, Inc.	Netcool/Precision for Transmission Networks	Tivoli Network Manager Transmission Edition	Network management for telecomm networks
Micromuse, Inc.	Netcool/Realtime Active Dashboard	Tivoli Business Service Manager	Service modeling and monitoring
Micromuse, Inc.	Netcool/Reporter	Tivoli Netcool/Reporter	Reporting tool for infrastructure management
Micromuse, Inc.	Netcool/Webtop	Tivoli Netcool/Webtop	Web based
MRO Software	Maximo Family	Tivoli Maximo Family	Enterprise asset management
MRO Software	Maximo Service Desk	Tivoli Service Request Manager (formerly also Tivoli Service Desk)	Service desk, incident and problem management
Vallent Corp.	NetworkAssure	Tivoli Netcool Performance Manager for Wireless	Performance management for wireless networks
Vallent Corp.	ServiceAssure	Tivoli Netcool Service Quality Manager	Service quality management for telco networks

Abbreviations and acronyms

ATM	asynchronous transfer mode	NMS	network management systems
BCM	business continuity management	OMPs	operational management products
CCMDB	Change and Configuration Management Database	OPAL	Open Process Automation Library
CDRs	call detail records	OSS	other operational support systems
CFIA	component failure impact analysis	RFC	request for change
CI	configuration item	RFP	request for proposal
CLI	Command Line Interface	SAN	Storage Area Network
CMDB	Configuration Management Database	SLA	service level agreement
CMMI	Capacity Maturity Model Integrated	SLM	service level management
DAS	direct access storage	SLR	service level requirements
DSL	Definitive Software Library	SNMP	simple network management protocol
DVIPA	Dynamic Virtual IP Addressing	SOA	service-oriented architecture
EMS	element management systems	SQM	service quality management
GUI	graphical user interface	SSO	single sign-on
IBM	International Business Machines Corporation	TDW	Tivoli Data Warehouse
ITCAM	IBM Tivoli Composite Application Manager	TEMS	Tivoli Enterprise Monitoring Server
ITIL	Information Technology Infrastructure Library	TEP	Tivoli Enterprise Portal
ITM	IBM Tivoli Monitoring	TPC	TotalStorage Productivity Center
ITSM	IT Service Management	TSRM	Tivoli Service Request Manager
ITSO	International Technical Support Organization	VLAN	virtual local area network
ITUP	IBM Tivoli Unified Process	VPN	virtual private network
KPIs	key performance indicators	eTOM	enhanced Telecomm Operations Map
MPLS	multiprotocol label switching		
NAS	network attached storage		

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Related publications

We consider the publications that we list in this section particularly suitable for a more detailed discussion of the topics that we cover in this paper.

IBM Redbooks publications

For information about ordering these IBM Redbooks publications, see “How to get IBM Redbooks publications” on page 152. Note that some of the documents referenced here might be available in softcopy only.

- ▶ *IBM Tivoli Composite Application Manager Family Installation, Configuration, and Basic Usage*, SG24-7151
- ▶ *Getting Started with IBM Tivoli Monitoring 6.1 on Distributed Environments*, SG24-7143
- ▶ *Migrating to Netcool/Precision for IP Networks --Best Practices for Migrating from IBM Tivoli NetView*, SG24-7375
- ▶ *Automation Using Tivoli NetView OS/390 V1R3 and System Automation OS/390 V1R3*, SG24-5515
- ▶ *An Introduction to Tivoli NetView for OS/390 V1R2*, SG24-5224
- ▶ *IBM Tivoli OMEGAMON XE V3.1.0 Deep Dive on z/OS*, SG24-7155
- ▶ *Implementing OMEGAMON XE for Messaging V6.0*, SG24-7357
- ▶ *Introducing IBM Tivoli Service Level Advisor*, SG24-6611
- ▶ *IBM Tivoli Business Service Manager V4.1*, REDP-4288
- ▶ *Event Management Best Practices*, SG24-6094
- ▶ *IBM Tivoli Application Dependency Discovery Manager Capabilities and Best Practices*, SG24-7519

Online resources

These Web sites are also relevant as further information sources:

▶ Tivoli information center

<http://publib.boulder.ibm.com/tividd/td/tdprodlist.html>

▶ IBM service management and tools Web sites

http://www.ibm.com/software/tivoli/governance/servicemanagement/welcome/process_reference.html

<http://www.ibm.com/software/tivoli/governance/servicemanagement/itup/tool.html>

<http://www.ibm.com/software/tivoli/itservices/>

<http://www.ibm.com/software/tivoli/opal/>

▶ Tivoli product Web sites

<http://www.ibm.com/software/tivoli/products/netcool-Omnibus/>

<http://www.ibm.com/software/tivoli/products/netcool-impact/>

<http://www.ibm.com/software/tivoli/products/netcool-reporter>

<http://www.ibm.com/software/tivoli/products/bus-srv-mgr/>

<http://www.ibm.com/software/tivoli/products/ccmdb/>

<http://www.ibm.com/software/tivoli/products/performance-analyzer/>

<http://www.ibm.com/software/tivoli/products/netcool-webtop/>

<http://www.ibm.com/software/tivoli/products/netcool-performance-mgr-wireless/>

<http://www.ibm.com/software/tivoli/products/service-level-advisor/>

<http://www.ibm.com/software/tivoli/products/netcool-service-quality-mgr/>

<http://www.ibm.com/software/tivoli/products/netcool-portal/>

<http://www.ibm.com/software/tivoli/products/netcool-proviso/>

<http://www.ibm.com/software/tivoli/products/omegamon-xe-db2-peex-zos/>

<http://www.ibm.com/software/tivoli/products/service-request-mgr/>

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<http://www.ibm.com/software/tivoli/products/monitor-systemp/>

<http://www.ibm.com/software/tivoli/products/monitor-virtual-servers/>

<http://www.ibm.com/systems/storage/software/center/fabric/>

<http://www.ibm.com/systems/storage/software/center/disk/>

<http://www.ibm.com/systems/storage/software/center/data/>

<http://www.ibm.com/software/tivoli/products/totalstorage-replication/>

<http://www.ibm.com/software/tivoli/products/network-mgr-entry-edition/>

<http://www.ibm.com/software/tivoli/products/netcool-precision-ip/>

<http://www.ibm.com/software/tivoli/products/netcool-precision-tn/>
<http://www.ibm.com/software/tivoli/products/composite-application-mgr-ism/>
<http://www.ibm.com/software/tivoli/products/monitor-db/>
<http://www.ibm.com/software/tivoli/products/monitor-apps/>
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<http://www.ibm.com/software/tivoli/products/omegamon-xe-messaging-dist-sys/>
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<http://www.ibm.com/software/tivoli/products/omegamon-xe-messaging-zos/>
<http://www.ibm.com/software/tivoli/products/omegamon-xe-storage/>
<http://www.ibm.com/software/tivoli/products/omegamon-xe-sysplex/>
<http://www.ibm.com/software/tivoli/products/omegamon-xe-uss/>
<http://www.ibm.com/software/tivoli/products/omegamon-xe-zos/>
<http://www.ibm.com/software/tivoli/products/omegamon-xe-zvm-linux/>

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End-to-End Planning for Availability and Performance Monitoring



Planning Tivoli performance and availability solution

This IBM Redpaper discusses an overall planning for availability and performance monitoring solution using the IBM Tivoli suite of products. The intended audience for this paper includes IT architects and solution developers who need an overview of the IBM Tivoli solution.

Product selection and integration guide

The Tivoli availability and performance monitoring portfolio has grown significantly in since 2003 because of the strategic acquisition that enhanced the Tivoli product line. These acquisitions also expanded the product coverage.

ITIL-based management approach

The broad spectrum of the product solution usually left the IT architect to understand only a part of it. Some solutions might be accommodated with a newly integrated product, but because the designer might not be aware of other products, other more strategic options might be missed.

In this paper, we provide an overview of the Tivoli product line that has interaction with availability and performance monitoring solution. An additional service management approach is taken by adding Information Technology Infrastructure Library (ITIL) consideration to the solution.

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