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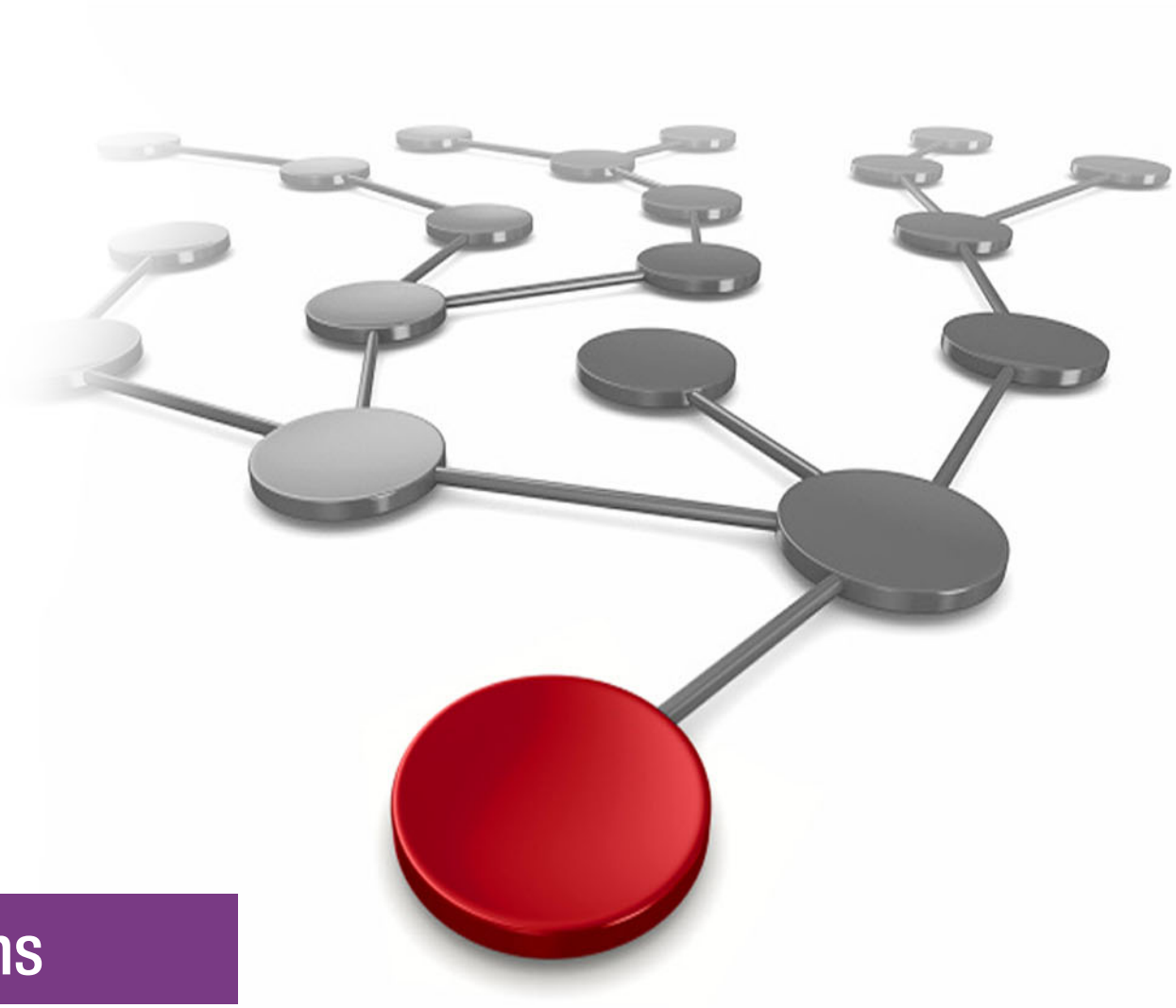
Modernizing Your Business Applications with IBM CICS and Liberty

Hernan Cunico



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Modernizing Your Business Applications with IBM CICS and Liberty

This IBM® Redbooks® Solution Guide provides the information necessary for you to understand IBM WebSphere® Application Server V8.5.5 Liberty (Liberty) within IBM CICS® Transaction Server (CICS TS) V5.3. With this understanding, you can take advantage of the Java EE 6 Web Profile capabilities for running new types of applications in the CICS runtime.

Liberty is an asset to your organization, whether you intend to extend existing enterprise services hosted in CICS, or develop new web-based applications supporting new lines of business. Fundamentally, Liberty is a highly composable, dynamic profile of IBM WebSphere Application Server that enables you to provision Java Platform, Enterprise Edition (Java EE) technology on a feature-by-feature basis. Some of the main features are depicted in Figure 1.

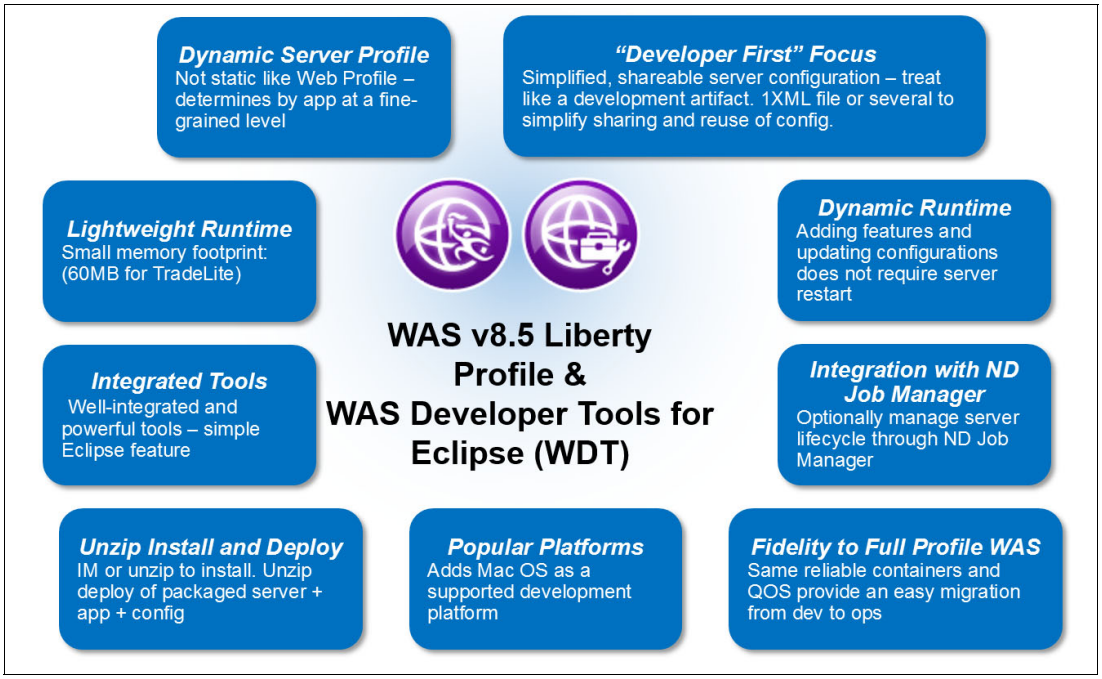

Figure 1 The Liberty platform and some of its main features

Did you know?

Integrating Java applications with existing CICS applications has been recognized by many customers as a cost-effective way of modernizing business applications by taking advantage of the mixed language application-serving environment offered by CICS. Java components can run alongside existing COBOL, PL/I, and assembler applications, with CICS providing the runtime integration, without having to provide a dedicated new application server for the Java components.

Business value

So, what are the benefits of running web applications using Liberty in CICS? There are many ways of analyzing this issue, but stepping back, there are key benefits that running web applications in CICS provides: Skills, integration, performance, and cost reduction.

Skills With Liberty in CICS, you can develop Java EE web applications in an integrated development environment (IDE) and then deploy them to CICS. This allows Java web developers to participate in developing, extending, and updating business applications for CICS.

Integration Integrating Java applications with existing CICS applications has been recognized by many customers as a cost-effective way of modernizing business applications.

Performance Faster responses are provided because requests do not need to travel through an adapter and across a network. It is faster to run your web application as close as possible to the data.

Cost reduction All Java applications on IBM z/OS® can benefit from the price advantages of IBM z Systems™ specialty processors (IBM System z® Application Assist Processor (zAAP) or IBM System z Integrated Information Processor (zIIP)).

Also, consider that web applications written using the features of the Java EE 6 Web Profile subset can be hosted in CICS TS V5.3. So, running web applications using Liberty in CICS provides you with the portability you need for application development and deployment.

Solution overview

Liberty is a modular implementation (or profile) of WebSphere Application Server technology. It is intended to provide a lighter weight and more dynamic runtime than the classic WebSphere Application Server runtime. It provides support for most of the Java EE technology previously supported in WebSphere Application Server, but in a composable runtime using configurable components *termed* features. Liberty is provided with WebSphere Application Server V.8.5 onwards, and runs on various distributed platforms as well as on z/OS. It is also available for developers as a download from the `wasdev.net` website.

Solution architecture

A Liberty server can be provisioned with as little as the WebSphere Application Server kernel, web container, and HTTP transport features for a servlet engine. If you require access to a database, Liberty can dynamically initialize the Java Database Connectivity (JDBC) feature, or, if you require a RESTful interface, the JAX-RS feature can be initialized. The approach of being able to select the features you require allows Liberty to initialize quickly with a basic web application and have the smallest footprint as possible in the system. The initialization of features and applications is achieved dynamically, meaning you are not usually required to restart your Liberty server to add features. This can be particularly powerful in development environments where developers need code changes to be reflected easily and immediately.

Liberty is built by using Open Services Gateway initiative (OSGi) technology and concepts. The fit-for-purpose nature of the run time relies on the dynamic behavior inherent in the OSGi framework and service registry. As bundles are installed to or uninstalled from the framework, the services that each bundle provides are added or removed from the service registry. The addition and removal of services similarly cascades to other dependent services. The result is a dynamic, composable run time that can be provisioned with only what your application requires and responds dynamically to configuration changes as your application evolves.

The Liberty server in CICS is supplied with and licensed through the installation of CICS TS for z/OS. It supplies the same Liberty technology as supplied with the IBM WebSphere Application Server Liberty products, with a set of CICS specific features, which provide for the integration with the CICS runtime. These CICS specific feature extensions are shown in Figure 2.

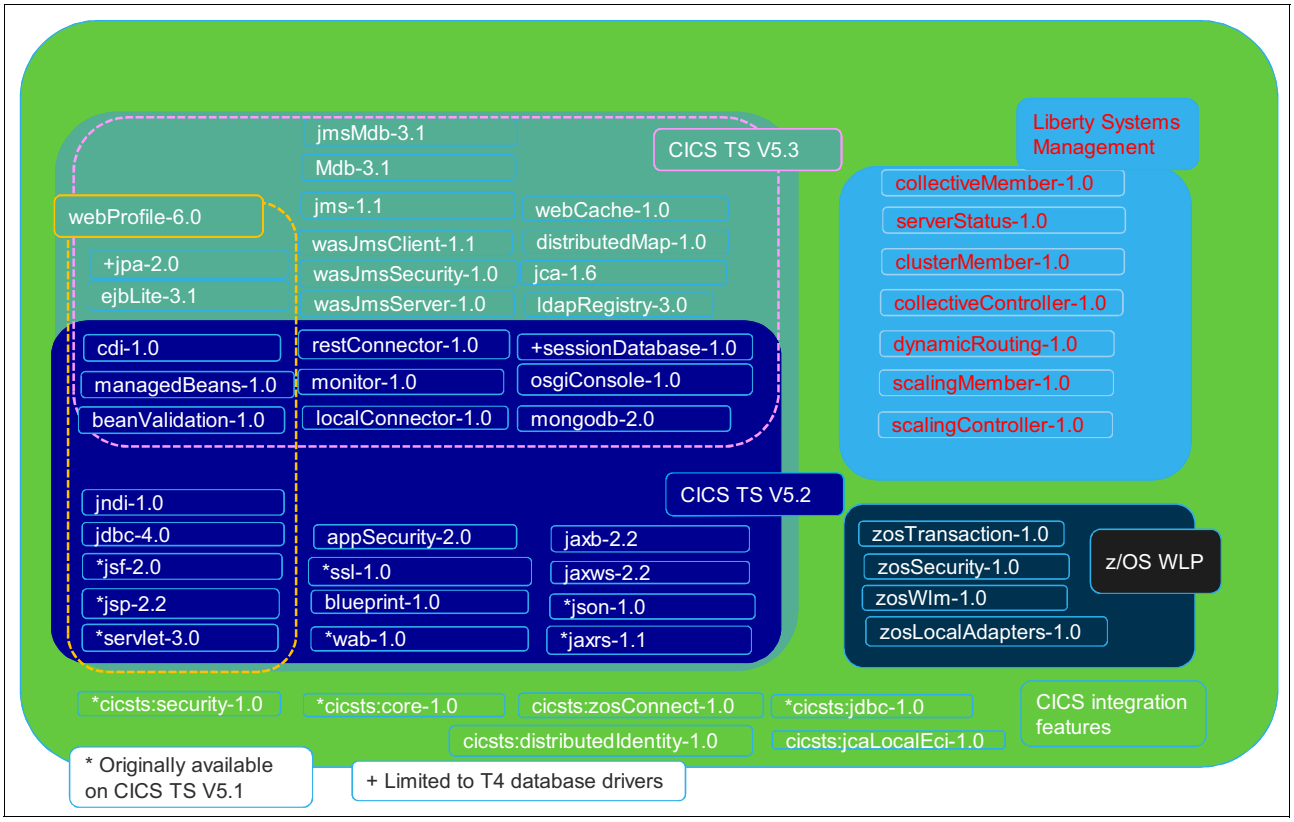

Figure 2 CICS TS V5.3 Liberty features

Usage scenarios

This section briefly describes three scenarios:

- Porting web applications to z/OS
- New integration logic for existing CICS services
- Java business logic in CICS

Complete details about these scenarios are included in the book associated with this Solution Guide (see *SG24-8335* in the Related Information section). The book contains example code using Java EE 6 web applications and Liberty. These scenarios are based on the CICS general insurance (GENAPP) Support Pack (CB12), which you can download and follow along with the examples in the book.

Download the code at:

http://www.ibm.com/support/docview.wss?uid=swg24031760

Porting web applications to z/OS

In this scenario, we look at taking a presentation logic web application from a third-party Java EE web application server, and migrating it into the Liberty profile Java virtual machine (JVM) server in CICS with minimal changes. This is sometimes referred to as the *lift and shift* of an application to Liberty in CICS.

You might consider deploying existing web applications to CICS TS V5.3 for reasons of convenience, consolidation, or flexibility. However, a particularly compelling reason to make that move is for those applications that use the CICS Transaction Gateway external call interface (ECI) Java EE Connector Architecture (JCA) resource adapter to invoke a program on CICS. Figure 3 illustrates a pre-migration scenario of a web application using servlets and JavaServer Pages (JSPs) and a JCA call to a CICS program using the CICS Transaction Gateway.

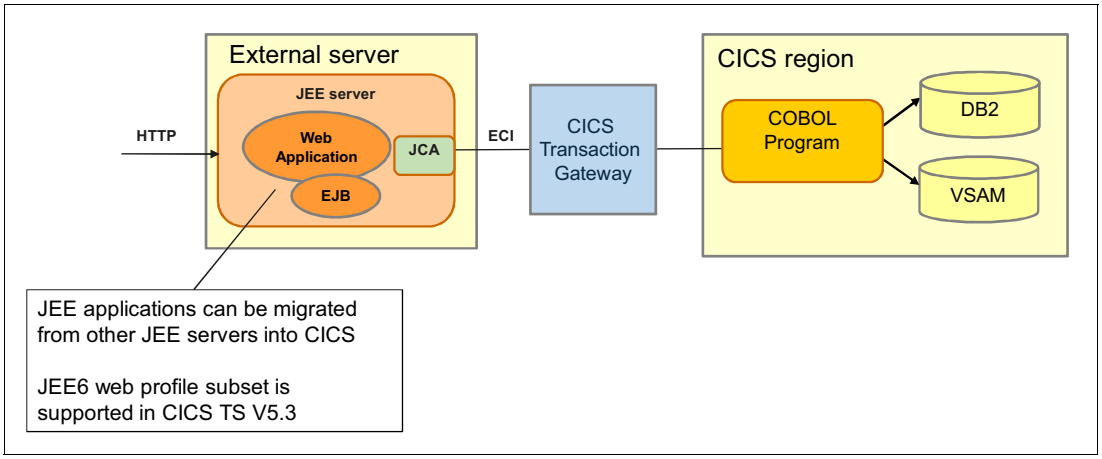

Figure 3 Application running on an external server before migration

Figure 4 on page 5 illustrates the application after it is migrated into a Liberty JVM server. The application can remain unchanged, and the function of the CICS Transaction Gateway can be replaced by the local JCA ECI feature running within CICS.

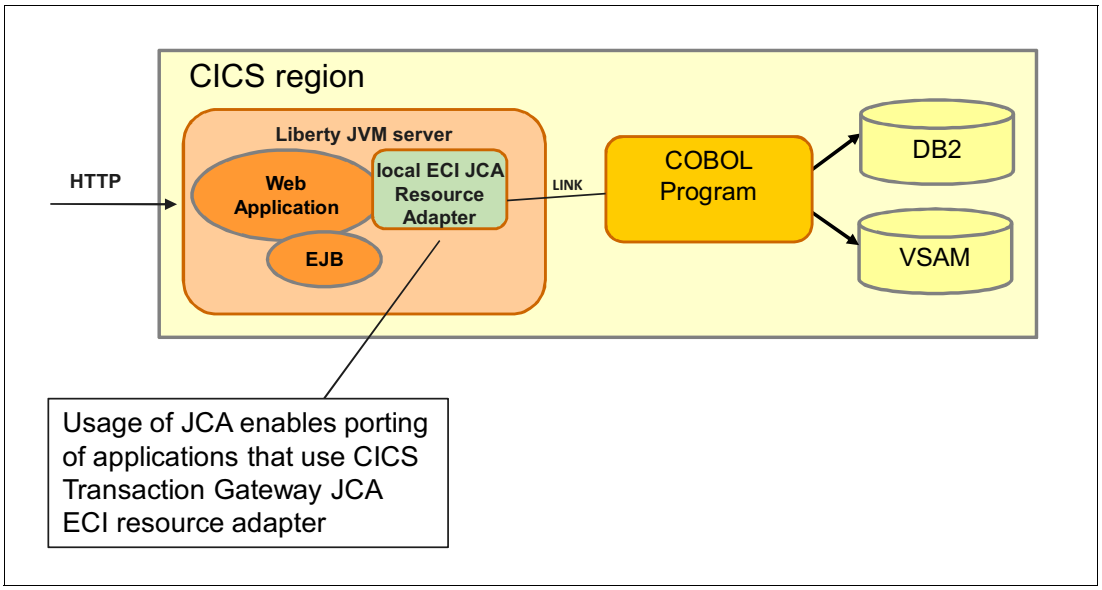

Figure 4 Application running in Liberty in CICS after migration

Figure 3 on page 4 and Figure 4 show how you can consolidate the two halves of this type of web application. The front-end web application runs in a Liberty JVM server in the same CICS region as the program invoked through JCA. This lift and shift consolidation has the potential to improve the performance of the web application by eliminating the network latency. Improved performance is more likely to be realized in cases where the web application makes frequent calls to the CICS COBOL program, or large amounts of data are transferred.

New integration logic for existing CICS services

A big benefit of Liberty in CICS is being able to take advantage of the existing and growing pool of Java development skills. For example, those skills can be put to use developing a RESTful (JAX-RS) or web service (JAX-WS) Java application that provides a new service interface to an existing business logic program in CICS TS. Such an application can be deployed directly into a Liberty JVM server collocated with the business logic program in the same CICS region.

A scenario in which RESTful services or SOAP web services interface with existing CICS components is shown in Figure 5.

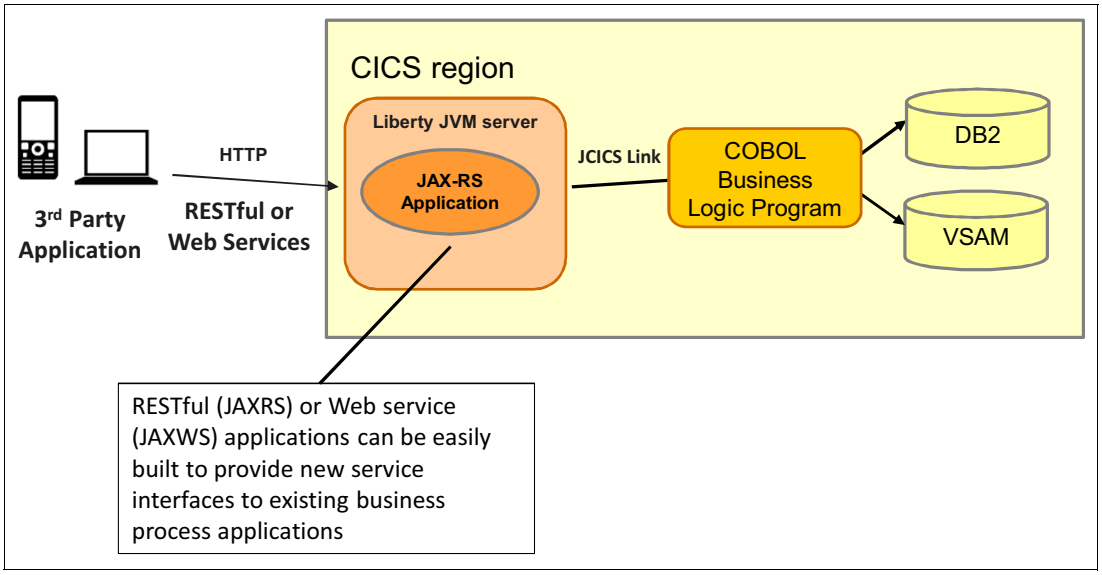

Figure 5 Integration with existing CICS services

Java business logic in CICS

In the previous scenarios in this section (see “Usage scenarios” on page 3), the web application was presented as a pass-through to the core business logic contained in the COBOL program. The natural progression to this is to develop new web applications that handle the business logic. With Liberty in CICS, Java EE developers can use Java EE frameworks and application programming interfaces (APIs), such as Enterprise JavaBeans (EJB), Java Persistence API (JPA), Java Transaction API (JTA), and CDI Managed Beans, to develop such applications. These new applications can use the JCA local ECI resource adapter to invoke CICS applications, the JCICS classes to access CICS resources such as VSAM files, and the JDBC data sources to access relational databases such as IBM DB2® or Derby (Figure 6).

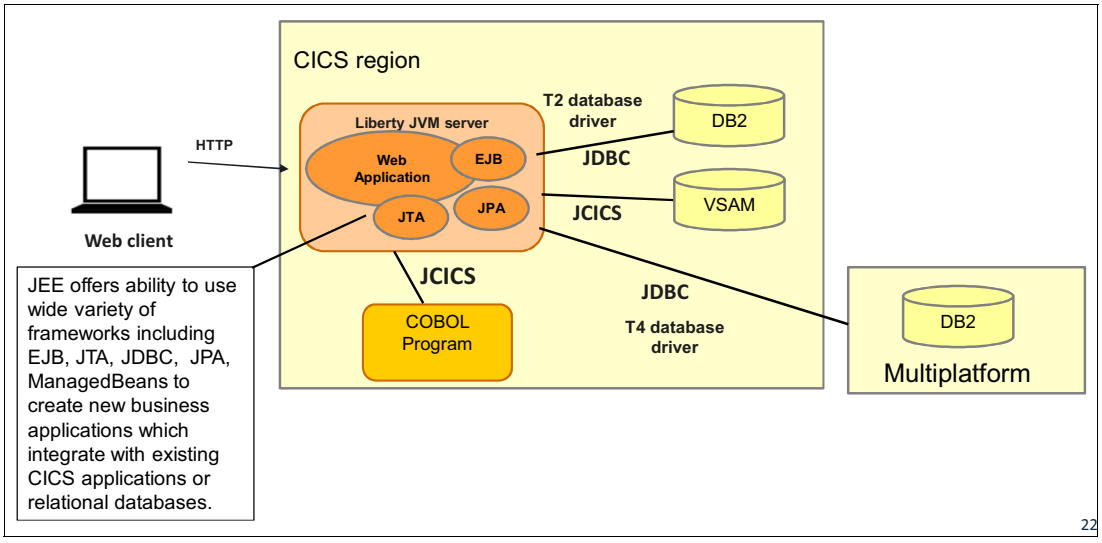

Figure 6 Java business logic on z/OS

Integration

The CICS Liberty runtime is based on embedded technology from IBM WebSphere Application Server V8.5.5, and is compatible with the Java 7 and Java 8 runtimes provided by the IBM Software Development Kit (SDK) for Java on z/OS.

Java applications deployed into CICS Liberty provide the ability to easily integrate with data held in the following systems of record:

- Local VSAM data on z/OS using the JCICS API
- IBM DB2 for z/OS using either the JDBC DriverManager or DataSource API
- Third-party relational databases using data sources and JDBC
- NoSQL MongoDB database on a remote platform, such as Linux on z Systems

The service enablement function in CICS Liberty provides the following options to integrate with other systems of engagement:

- Web service providers and consumers using SOAP/XML via JAX-WS and JAXB or RESTful services via JAX-RS and JSON.
- Java Message Service (JMS) applications using the WebSphere Liberty JMS messaging engine
- Messaging applications using IBM MQ for z/OS and the IBM MQ Java base classes

Supported platforms

CICS Liberty is supplied as part of CICS TS V5.3, which runs on z/OS using IBM z Systems. For full details about supported hardware and software, see:

http://www.ibm.com/support/docview.wss?uid=swg27006382

Ordering information

Before updating to CICS TS V5.3 from an earlier version of CICS, visit *Upgrading information for CICS when changing releases of CICS, z/OS, DB2, or IMS* at:

http://www.ibm.com/support/docview.wss?uid=swg21207399

Before planning for an upgrade or applying maintenance, review the Preventive Service Planning (PSP) bucket information for a product at:

http://www.ibm.com/support/docview.wss?uid=swg21231874

Ordering information is shown in Table 1.

Table 1 Ordering part numbers and feature codes

Program name	Program ID number	Charge unit description
CICS TS V5.3	5655-Y04	Basic MLC, PSLC below 3 MSU Basic MLC, PSLC AD SYSUSGREG NC, PSLC AD

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Related information

For more information, see the following documents:

Companion IBM Redbooks publication:

- *IBM CICS and Liberty: What You Need to Know*, SG24-8335

  http://www.redbooks.ibm.com/abstracts/sg248335.html
- *CICS Transaction Server family*

  http://www.ibm.com/software/products/en/cics-tservers
- *CICS Transaction Gateway for z/OS*

  http://www.ibm.com/software/products/en/cics-ctg-zos
- *IBM CICS Transaction Server for z/OS, V5.3 delivers advances in service agility, operational efficiency, and cloud enablement with DevOps,* IBM United States Software Announcement 215-363, October 5, 2015

  http://www.ibm.com/common/ssi/cgi-bin/ssialias?infotype=an&subtype=ca&supplier=897&letternum=ENUS215-363
- IBM Offering Information page (announcement letters and sales manuals)

  http://www.ibm.com/common/ssi/index.wss?request_locale=en

  On this page, enter the product name, select the information type, and then click Search. On the next page, narrow your search results by geography and language.

Authors

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