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EXECUTIVE SUMMARY

Many of today’s critical business processes depend on complex enterprise applications. These applications consist of a combination of interconnected components that typically reside on a variety of different platforms. The components communicate through middleware using standards-based interfaces. In many cases, some of the components are mainframe applications, such as IMS, CICS, and DB2 applications. The result is a complex web of components, some running on distributed resources and some running on mainframes.

Because of the business criticality of enterprise applications, it’s important to maintain them at agreed on levels of availability and performance. To meet this requirement, IT organizations typically assign owners to composite applications. These owners are responsible for ensuring the overall quality of service delivered by the composite application. IT also typically assigns owners to each of the individual application components, such as mainframe applications. These people are responsible for ensuring the quality of service of their assigned application components.

When problems occur, such as performance degradation or service interruption, the composite application owner must work cooperatively and efficiently with associated application component owners and infrastructure technology administrators to quickly determine the problem sources, and initiate action to resolve the problems. Because of the complexity of composite applications, that presents a challenge.

BMC Software provides a solution that addresses the challenge. The solution integrates the mainframe WebSphere MQ environment monitoring provided by BMC MainView for WebSphere MQ with the advanced middleware management capabilities of BMC Middleware Management solutions. This integration enhances the already comprehensive middleware data gathered by the BMC Middleware Management solutions with additional mainframe-specific WebSphere MQ detail.

The integration permits a unified, enterprise-wide approach for managing composite applications that involve mainframes. From the BMC Middleware Management console, composite application owners, mainframe application owners, and WebSphere MQ administrators can gain a broad view of all application components and their relationships. They can view the performance of applications as transactions traverse through the middleware. They can also drill down into the additional data provided by BMC MainView for WebSphere MQ to gain greater visibility of the mainframe WebSphere MQ environment.

The benefits are significant. A unified approach eliminates wasteful and cumbersome “all hands on deck” exercises in addressing problems, permitting more efficient and faster problem resolution. Consequently, the IT staff can maintain agreed on performance and availability levels in composite enterprise applications and reduce costs at the same time.

This paper examines the challenge IT faces in managing enterprise applications. It presents an overview of BMC Middleware Management and the value of bringing additional BMC MainView for WebSphere MQ data into BMC Middleware Management views. The paper also provides an example showing how the IT staff can leverage BMC Middleware Management enhanced with BMC MainView for WebSphere MQ data to address problems in composite enterprise applications.
A NEW APPROACH IS NEEDED

Many enterprise applications are segmented into components that interoperate to provide application services. The components typically run on a variety of platforms and each platform may host multiple components. A component may call other components and may be called by other components. Some components may be supplied by external sources.

In many enterprise applications, some of the components run on mainframes. Figure 1 shows an example of a composite application that supports order processing and involves a mainframe CICS application that provides billing services.

When a problem occurs, the composite application owner has to quickly determine the source of the problem and initiate the appropriate action to resolve the problem. The source could be in any application component, in the middleware itself, or due to an aggregate performance issue. The problem could also be caused by issues in the enterprise IT infrastructure that underlies the application components, such as the unavailability of a CICS region or z/OS system.

Traditionally, the approach to address problems has been to summon various administrators and application owners in an “all hands on deck” exercise. These people typically use siloed, point tools to determine whether the components for which they are responsible are performing normally. This fragmented approach is expensive, time consuming, and often degrades into finger-pointing sessions.

What is required is a new approach that gives composite application owners, mainframe application component owners, and WebSphere MQ administrators a common, unified, and in-depth view of the application environment. With such a view, these people can work collaboratively to ensure that enterprise applications meet agreed upon levels of performance and availability.

BMC PROVIDES A SOLUTION

With its MainView product line, BMC has long been a recognized leader in mainframe management solutions. In line with its Business Service Management (BSM) strategy, BMC has integrated BMC MainView mainframe management solutions with its solutions for managing distributed resources. The result is a unified environment for managing the enterprise environment, permitting information sharing and process integration across the various IT groups.

A major step in this unification is the integration of BMC MainView technology with BMC Middleware Management solutions. Specifically, BMC has enhanced BMC Middleware Management with out-of-box integration of the monitoring capabilities of BMC MainView for WebSphere MQ. This integration enhances the comprehensive view of enterprise applications provided by BMC Middleware Management with in-depth mainframe WebSphere MQ environment data captured by BMC MainView for WebSphere MQ.
**BMC MIDDLEWARE MANAGEMENT TECHNOLOGY**

BMC middleware management technology monitors all key properties of middleware components, and supports popular middleware technologies. BMC delivers this advanced technology in two solutions: BMC Middleware Management - Performance and Availability and BMC Middleware Management - Transaction Monitoring.

BMC Middleware Management - Performance and Availability provides both historical and real-time views of all monitored properties. Views can include:

- Average time between invocation and corresponding response of each middleware component
- WebSphere MQ queue data, including enqueue and dequeue rates, oldest message age, and failure/dead letter queue depth
- WebSphere MQ channel data, including channel status, and sender and receiver status
- Message flow data, including pool size and elapsed time
- Message flow node data, including elapsed time and CPU time per node
- HTTP servlet or EJB interface method response time

Users can easily customize the views to present the information vital to their job roles and in the formats most useful to them. Formats range from graphs and spreadsheets to gauges and text boxes. Historical information views allow users to spot and examine trends within the middleware environment.

BMC Middleware Management - Transaction Monitoring tracks how specific transactions flow through the infrastructure. It examines the content of messages, tracking individual business transactions and their content from hop to hop as they move through middleware environments. The solution provides real time views of the response of the middleware to individual clients calling a common service. It tracks history on the number of transactions of each type processed and generates alerts on transactions that exceed user-specified delay limits.

**BMC MAINVIEW TECHNOLOGY**

BMC MainView technology is available in a variety of solutions that enable cost-effective automation, monitoring, managing, and optimizing z/OS applications and resources. With BMC MainView solutions, the IT staff can proactively monitor and automatically manage availability and application service levels across z/OS, CICS, IMS, DB2, WebSphere Application Server, USS, WebSphere MQ, IP, VTAM, and Linux environments — all from a single point of control.

BMC MainView for WebSphere MQ monitors and collects detailed data about the mainframe WebSphere MQ environment. This data includes:

- Specific status of individual WebSphere MQ calls, such as the function performed, message latency, job name using the function, and user name that initiated the function
- Queue management status, “get” and “put” rates, and the number of queues at maximum depth that reside on specific page sets
- History data, both at the object name level and the application level

BMC MainView for WebSphere MQ presents the data in a variety of views, including:

- Storage classes that are defined to each page set that is in use, and the queues that are defined to the storage classes
- OTMA bridges between WebSphere MQ and IMS, including views of the different bridges and the pipes between the bridges
- Status and details of the channel initiator and listeners

**NEW, MORE INCLUSIVE VIEWS**

BMC solutions for monitoring and managing WebSphere MQ across platforms are now fully integrated and provide a seamless view of the IT infrastructure. The integration brings MainView for WebSphere MQ data directly to the BMC Middleware Management console. The resulting extended views provide detailed information about all mainframe queue managers and their associated objects.

Standard views display availability, usage and performance for all key components. Historical reports highlight trends in performance and usage. As a result, users can directly access critical details of WebSphere MQ performance on the mainframe without having to switch consoles.
Extended information encompasses key areas, including buffer pools, shared queues and the coupling facility, logs, channel initiator, page sets, and zparms.

**BUFFER POOL DATA**
The integration more than doubles the page set data provided by BMC Middleware Management alone. The additional information gives application owners enhanced visibility into buffer pool usage, including visibility into buffer pool read and write rates. With this extended information, application owners can better manage buffer pool sizes to ensure that application performance does not degrade due to insufficient buffer pools. The owners can determine whether the current buffer pool configurations are adequate for supporting current usage/workloads, and can better plan for future growth.

**SHARED QUEUES AND THE COUPLING FACILITY**
The integration of BMC MainView for WebSphere MQ brings more than 150 additional attributes on the DB2 queue sharing group to BMC Middleware Management. Enhanced BMC Middleware Management dashboard views take advantage of this additional data. For example, new views show detailed information on shared queues, including usage, as well as minimum, maximum, and average time to insert and delete. Extended coupling facility views display performance, allowing application owners to detect problems early before they impact shared queues and DB2.

With these extended views, application owners can better manage the usage and loads of shared queues on DB2, an important capability if the IT infrastructure employs shared queues and channels for high availability and workload balancing.

**CHANNEL INITIATOR**
BMC MainView for WebSphere MQ brings detailed data on the channel initiator, including the number of connected channels and channel status. This data helps application owners ensure the availability of the channel initiator, which is critical to enable systems to connect to the mainframe and permit uninterrupted flow of business data to the mainframe.

**LOG MANAGER**
BMC MainView for WebSphere MQ provides statistics usage on LOG management and information pertinent to recovery, such as High Used RBA. LogManager is in the critical path of applications and is essential for recovery to assure delivery. With the insight provided by this information, application owners can avoid incorrect Log Buffer specifications that adversely impact application performance.

**PAGE SETS**
BMC MainView for WebSphere MQ adds more than 200 metrics on application performance, including detailed data on performance of the API calls made by applications. This additional data helps application owners quickly detect and resolve problems involving latency, WebSphere MQ access, or putting and getting messages.

The integration also brings additional queue statistics, such as detailed information on queue access (API calls), including open, close, number of expired messages, time since last get and put, and average get latency. This information permits application owners to monitor and manage page set usage. By closely monitoring queues on heavily used page sets, application owners can avoid poor application response times.

In addition, BMC MainView for WebSphere MQ provides data that indicates whether the IMS applications are connected. That’s important if the IT infrastructure employs the WebSphere MQ-IMS Bridge to integrate IMS applications with MQ.

**Z/PARMS**
BMC MainView for WebSphere MQ data also provides greater visibility into system, archival, and logging configuration information, enabling application owners to review and troubleshoot startup problems.

**LEVERAGING THE NEW VIEWS**
BMC Middleware Management, enhanced with the additional information provided by BMC MainView for WebSphere MQ, provides a powerful tool for both composite application owners and mainframe application owners. As Figure 2 shows, they can gain unified, comprehensive, application-oriented views of composite applications that display:

- All application components
- The relationships of the components to each other and to the overall business process
- The sequencing of transactions (workflow) through the various application components
- Key metrics regarding middleware, such as the load placed on each component (number of times it is being called), the response rate of the component (number of times it responds), and the latency of the component (time between requests and responses).
Application owners can leverage the additional data provided by BMC MainView for WebSphere MQ to speed problem analysis and resolution. Figure 3 shows two BMC Middleware Management views enhanced with data from BMC MainView for WebSphere MQ. One view shows the status of individual MQ calls and the other shows queue management status.
As Figure 4 illustrates, application owners can “zoom out” to an enterprise-wide view of the application. They can also “zoom in” for more detailed data, including that provided by BMC MainView for WebSphere MQ. This is analogous to zooming out and in on an online geographical map to obtain a broader or a more detailed view.

In the event of a problem, the composite application owner can use the application-oriented view to determine where transaction flow is being delayed or interrupted. If the problem appears to be in a mainframe application, the owner can zoom in for more detailed data about the mainframe WebSphere MQ environment.

Likewise, the mainframe application owner can zoom out to view the mainframe application in the broader, enterprise-wide context of the composite application. The owner can see the relationships of the mainframe application to the other application components, including middleware, as well as to the supported business services. This broad view provides insight into the interaction of the mainframe application with other application components, helping the mainframe application owner determine possible problem areas. The view also enables the mainframe application owner to assess the business impact of problems.

As shown in Figure 4, both composite and mainframe application owners can also access an infrastructure-oriented view provided by the BMC Atrium CMDB. This view shows the details of IT infrastructure components that support the application as well as their physical and logical relationships. The view also highlights infrastructure problems. The combination of application-oriented and infrastructure-oriented views gives application owners two perspectives from which to investigate problems.
All participants work with common views that are based on the same underlying application, middleware, and IT infrastructure data. In addition, BMC Middleware Management, BMC MainView for WebSphere MQ, and the BMC Atrium CMDB keep the data current, so users are always working with accurate and consistent information.

**A PRACTICAL EXAMPLE**

The following example demonstrates the power of BMC Middleware Management enhanced with BMC MainView for WebSphere MQ data in addressing a problem in a composite, enterprise application:

A web-based application running in WebSphere Application Server on Windows receives an HTTP request to submit an order. To process the request, the distributed systems application must access key account information stored in DB2 on the mainframe. Although it would be possible for the Windows application to access this data directly through JDBC, the application instead uses an existing CICS transaction that contains the logic necessary to efficiently retrieve the proper account information.

The Windows application calls to the CICS transaction by sending an MQ message to the transaction input queue on the mainframe. When that message arrives, the MQ-supplied CICS Trigger Monitor (CKTI) directly invokes the requested CICS transaction on the distributed application’s behalf. The CICS transaction then accesses the requested data and sends it back to the WebSphere Application Server system as an MQ reply message.

In normal circumstances the composite application would receive a reply in a short time and use the returned data to continue processing the order. In this example however, the maximum task count is reached for the class in CICS on the mainframe, preventing the CKTI from invoking the CICS transaction. To the Windows application, this appears as a failure in the order submission application. The root cause, however, lies exclusively in the mainframe environment.

In this case, BMC Middleware Management detects a message buildup in the triggered application queue due to the inability to invoke the CICS transaction. BMC Middleware Management sends a notification to the account information CICS transaction owner indicating that a failure is occurring in accessing the account information CICS transaction.

The owner accesses the BMC Middleware Management view for the application, enhanced with the detailed information provided by BMC MainView for WebSphere MQ, and sees that the failure is due to the maximum task count being reached. From the BMC Middleware Management console, the transaction owner links directly into MainView Explorer, accesses the CICS transaction view for the failing transaction, and then uses BMC MainView facilities to zero in on the root cause of the maximum task count problem.
CONCLUSION

Today’s business enterprises depend heavily on composite enterprise applications to support critical business processes. Effective management of these applications is imperative to ensure that they meet agreed-on levels of availability and performance. Considering the complexity of composite applications, that presents a daunting challenge requiring the close collaboration of composite application owners and owners of the individual components that comprise the applications.

BMC provides a solution for managing composite applications that involve both distributed resources and mainframes. The solution enhances the already comprehensive application views provided by BMC Middleware Management with additional in-depth mainframe WebSphere MQ environment data provided by BMC MainView for WebSphere MQ. The resulting enhanced views permit broader and deeper looks into the application environment. With these new views, composite application owners, mainframe application owners, and middleware administrators can work collaboratively and efficiently to address problems.