

AVP-2774 BPM Operational Excellence

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Our challenge today...

Operational Excellence





Agenda

Operational Excellence

1. AVP experience... Organisational Recommendations
 - What do our clients say about BPM ?
 - Observations and Organisational Recommendation
 - Efficiently utilize the IBM Support Process
2. L2 Support experience... Technical recommendations





What do our clients say about BPM?

- „BPM is like a black box for us“
- „It integrates several different island solutions“
- „BMP’s purpose is to raise Quality and lower cost at once“
- „For us BPM is the layer to integrate several applications which could never be connected without a Bus since each of them speaks ist own language“
- „The funny thing on BPM is that it reduces the effective complexity to integrate our applications but is itself the most complex middleware ever seen, **for me it hides and covers integration complexity in it**, which is great“



How can we master complexity ?





Observations and Organisational Recommendations

Stay up-to-date and skilled

- Skillset required to understand & maintain a BPM setup is high
- Establish product related knowledge and skills
 - ✓ Classroom courses @ ibm.com/training
 - ✓ developerWorks articles and Technotes
 - ✓ Redbooks and Redpapers
- Use a wide range of educational materials and offerings
 - ✓ Pro-active news and updates via *My Notifications* service
<http://ibm.com/support/mynotifications>
 - ✓ *RSS feeds* for most IBM products
<http://www.ibm.com/software/support/rss>
 - ✓ Customize notifications in the *IBM Support Portal*
<http://ibm.com/support/entry/portal>

- RSS feeds for Information Management products
- RSS feeds for Lotus products
- RSS feeds for Rational products
- RSS feeds for Tivoli products
- RSS feeds for WebSphere products
- RSS feeds for other IBM Software product





Observations and Organisational Recommendations

Utilize the IBM Support Portal

- Customize your private portal according to your product focus

The screenshot shows the IBM Support Portal interface. On the left, a navigation sidebar includes sections for 'Search support', 'Choose your products', 'Choose your topic', and 'Open service request'. The main content area is titled 'Support overview' and features a 'Your customized support experience' banner with gold stars. Below the banner are several portlets: 'Featured links', 'Flashes and alerts', 'Product news', 'Training', and 'Support resources'. A 'Translate this page' section is also visible. Six yellow callout boxes with arrows point to specific features: 'Enhanced search helps to find information quickly' points to the search bar; 'Manage the product list to suit your preferences' points to the 'Manage my product list' link; 'Choose a task to see related content' points to the 'Open service request' link; 'Add portlets to customize your page' points to the 'Add modules to your customized page' button; 'Additional support related links as fastpath' points to the 'Support resources' list; 'Flashes and alerts for your products' points to the 'Flashes and alerts' portlet; and 'News feed and product related announcements' points to the 'Product news' portlet.





Observations and Organisational Recommendations

Team structure considerations



- Clarify responsibilities
 - ✓ Operating your environment is your duty
 - ✓ Fixing defects is IBMs responsibility
- Try to allocate a *stable* and well-skilled development team
 - ✓ let developers interact with your operating team closely
 - ✓ Application design based on operational aspects
- Do not hard-seperate your application support and infrastructural support team





Observations and Organisational Recommendations

Utilize external resources with the skill you need

- Allocate the resources which best fit and have the best skills for certain tasks
 - If you'd like to extend your environment (e.g. to switch your WPS topology) and you are not 100% confident in doing it yourself, engage IBM services or Labservices - they also have the shortcut into IBM support as AVP has it
- Utilize AVP to get proactive support, interact most efficient with the IBM support process, manage your support situation
- Utilize AVP to locate the best resources in IBM



Observations and Organisational Recommendations



Sizing considerations



- Does the initial sizing still fit to your requirements ?
 - ✓ How realistic has the load estimate been before initial sizing
 - ✓ After an environment has been taken into production, directly verify if the initial scaling fits to the real life load
 - ✓ Always keep your rollout-plan in mind and adjust your environments scaling based on realistic load measurements

- Define your business-related view of load
 - ✓ how many users (concurrent and peak) mean how much memory consumption, CPU load, database transactions





Observations and Organisational Recommendations

Create and maintain an operations manual

- Documentation how the setup looks like (machines, products, releases, HA components)
- Dependencies and interoperability with back-end systems
- Tested procedures for application deployment, configuration changes, maintenance, and history change log
- Formalize problem determination
 - Communication with IBM support
 - Data location and collection
 - Analysis according to specific problem situations and scenarios
 - Transmission and exchanging data with IBM support
- Establish coverage and urgency focal points in all divisions





Observations and Organisational Recommendations

Change control management

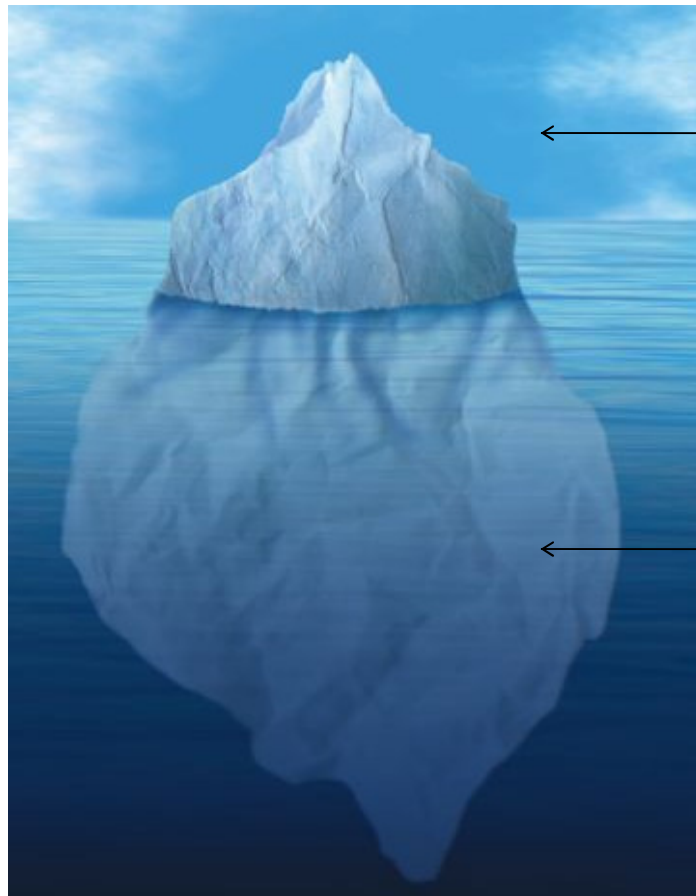
- Key part of operational management and essential to track and plan changes in complex environments
- Helps to revert to working setups in case of bad configurations
- Can immediately be re-used for IBM support involvements
- Assists engineers for more discipline
- Establish communication and protocol sharing between different teams (infrastructure, development, and operations)
- Start early to setup *production like* environments (development, staging, performance, and UAT systems)
 - Same product and release levels (OS and base product stack)
 - Same cluster topologies and interfaces to external dependencies
 - Same degree of complexity
 - Similar hardware





Efficiently utilize the IBM Support Process

How a support situation looks for IBM



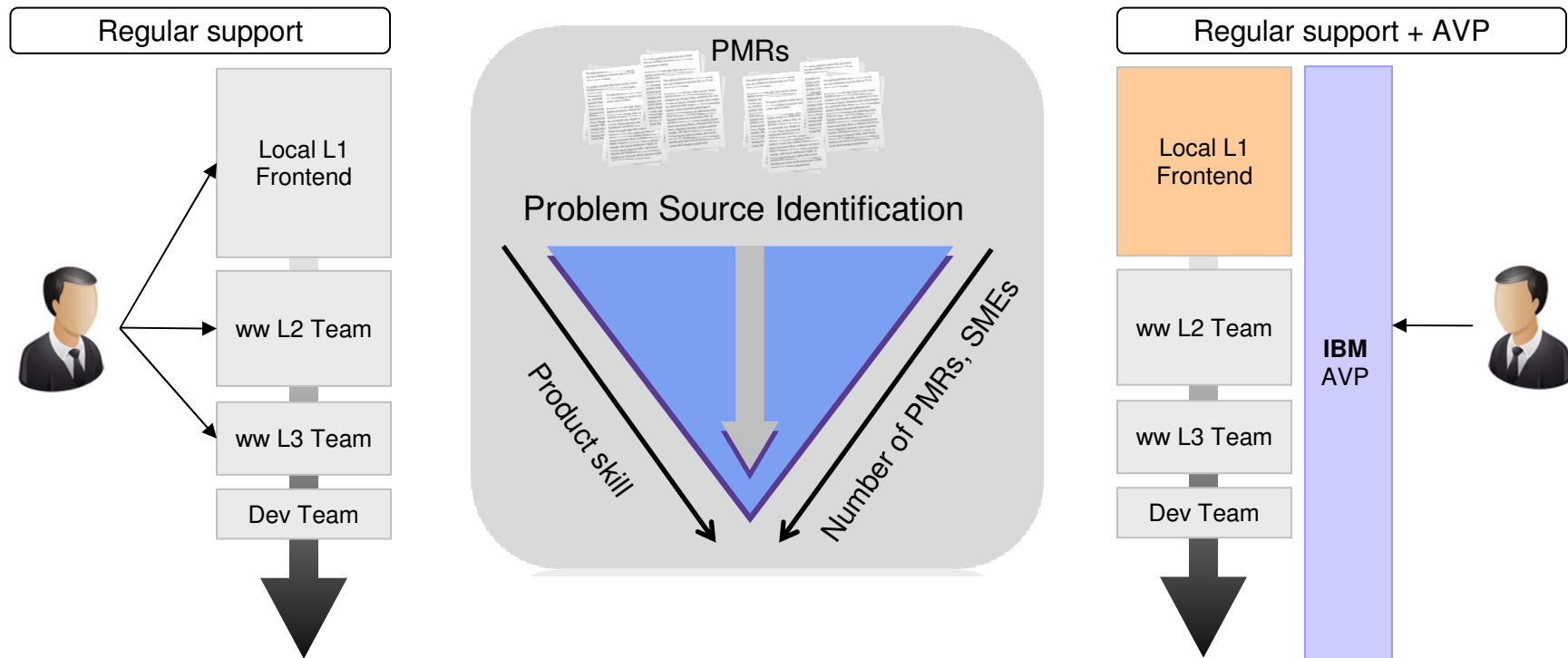
What **WE** know about the problem situation

What **YOU** know about the situation



Efficiently utilize the IBM Support Process

Regular support compared to AVP



- A finite number of engineers being able to take care of the problem according to the severity
- AVP utilizes the best support people to work on problems





Efficiently utilize the IBM Support Process

How to speed things up...

■ Support needs the details!

- Versions from the components involved.
- Whether the problem is reproduceable and how.
- Whether it was working before.
- Any recent changes in the environment.
- If applicable, any observations at the timeframe when the problem occurred.



Communication, cooperation & collaboration is the key

AVP is specialist to support you in all these tasks

■ Support needs the traces and logs ...

- to see what is going on and where exactly it happened

■ Support needs to be able to verify your configuration and understand the set up quickly

- thus, you will be asked to provide the Project Interchange, participate into an AOS session, or provide any screenshots – or all of them.

■ Support needs this data to distinguish between observations made and sequence of events in the application





Efficiently utilize the IBM Support Process

Methodology for Problem determination...

- **Clear communication** speeds up the process of finding a quick solution
- **Prepare** before a problem occurs, ensure you have a **topology diagram** and a **plan to collect diagnostic data** (MustGather documents)
- **Explain** why certain traces or other diagnostic data is needed
- **Establish baselines**: How does the system behave differently from the expectations?
- **Detailed problem description** - Since when? How often? Any recent changes?
- Provide **business background** - How many users? Affected use cases?
- Try to find a short term **relief** first while working on the solution. First priority is to get the environment stable and running again.
- Try to **simplify the issue** as much as possible - **reduce complexity** helps to isolate the problem



Agenda

Operational Excellence

1. AVP experience... Organisational Recommendations
2. L2 Support experience... Technical recommendations
 - Operational Excellence - Theory and Practice
 - BPM Development and Process Center
 - BPM Runtime and Administrative tools
 - Administrators best friends
 - Developing custom management clients





Operational excellence - Theory & practice

Starting up... what do you need ?

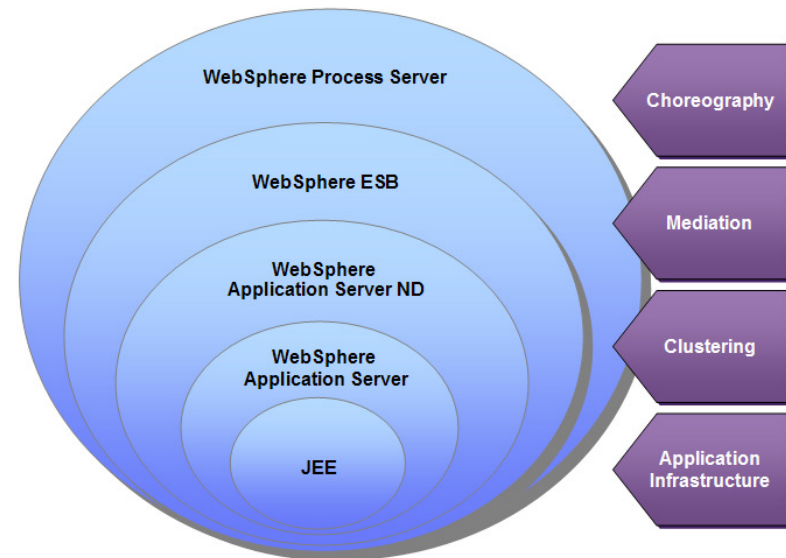


Good knowledge of ...

- WebSphere Application Server (WAS) product stack
- WebSphere Process Server (WPS) product stack
- WAS system administration
- WPS/BPM system applications and tools

Basic knowledge of ...

- BPM 7.5 product portfolio
- WAS clustering concepts





Operational excellence - Theory & practice

Common ideas of an optimal situation

- Well skilled system administrators are aware of all system components and back-ends and their behaviour
- System monitoring identifies all relevant problems, collects the right diagnostic data and notifies right personal
- System remains continuously stable due to performance tuning as well as highly available hardware and software
- Well deployed and tested installations or applications covering all aspects of intermitted issues (e.g. network outage)

Is this situation realistic and what is required to reach operational excellence?





Operational excellence - Theory & practice

Real life challenges

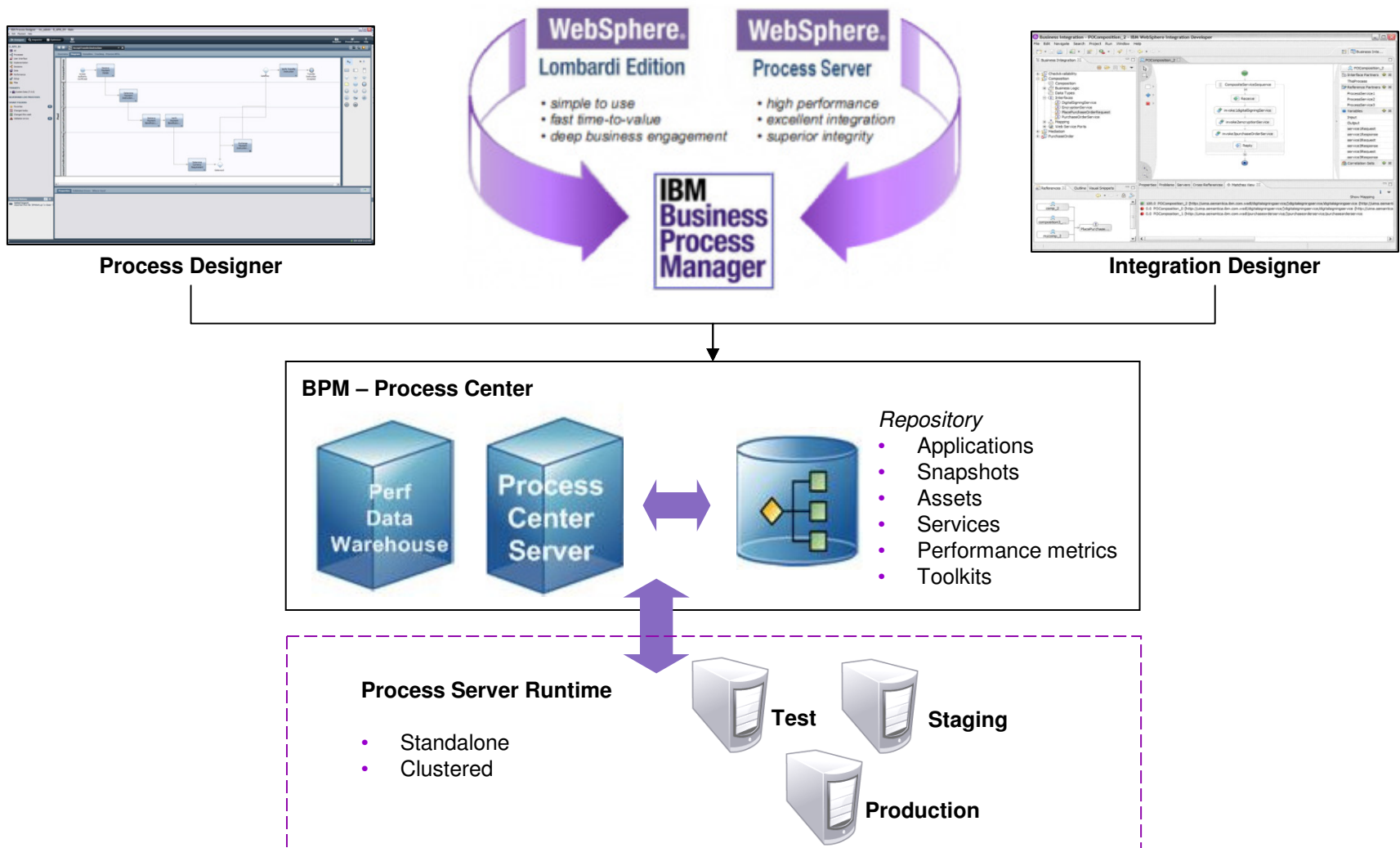
- BPM is one of the most complex SOA product suits and offers dozen of services and interfaces to back-ends
 - DB2, Oracle, Microsoft SQL Server, Informix, ...
 - Adapters for SAP, Siebel, FTP, Flat Files, eMail, ...
 - Web services, EJB, JMS, MQ, SOAP/HTTP, SOAP/JMS, ...
 - Lombardi and WPS services interoperability
 - *You name it you have it*
- Rich skill set required to maintain and understand the technology and product stack
- High efforts to continuously improve, tune and maintain a growing infrastructure (hardware and software)



BPM Development & Process Center



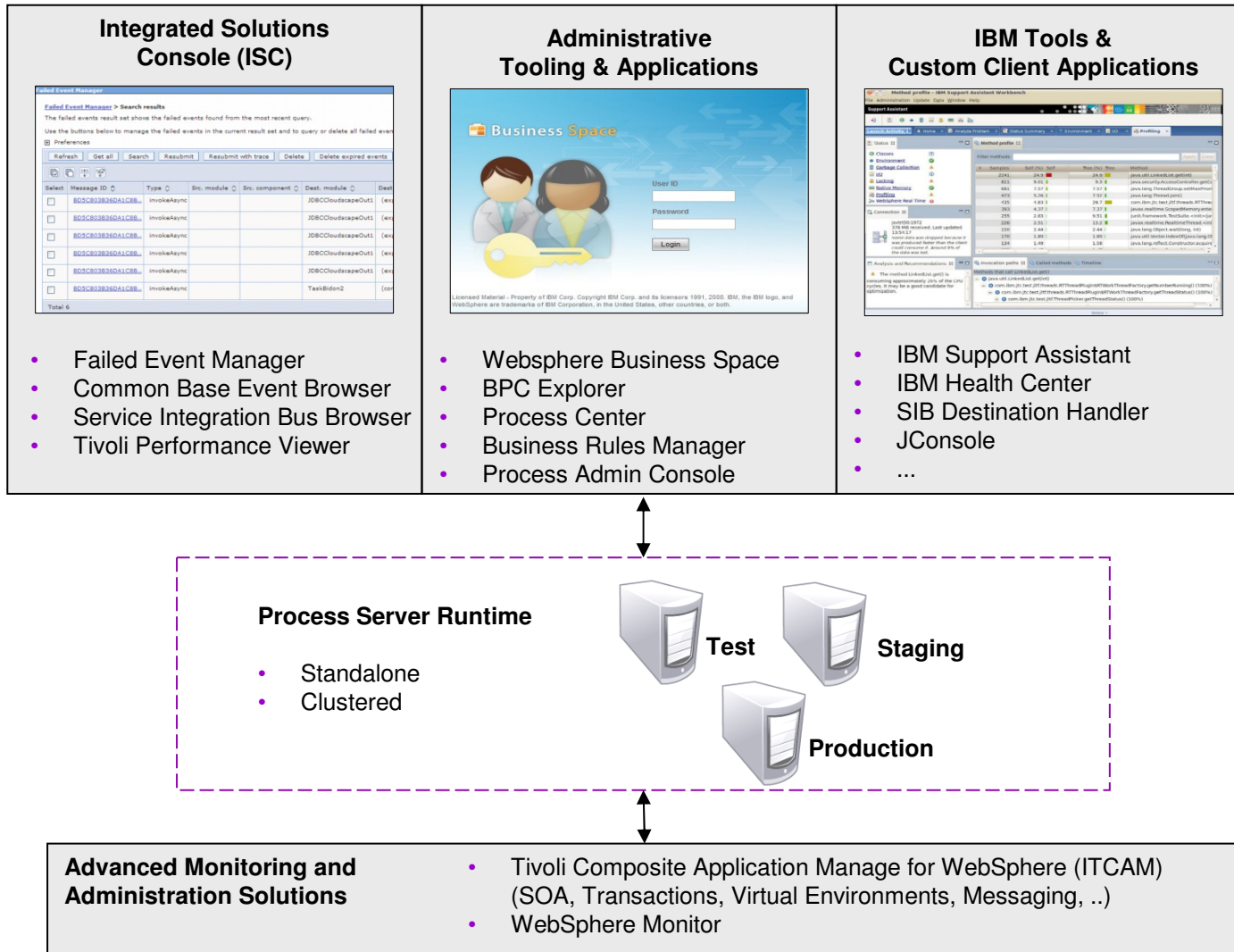
What is new in BPM V7.5 ...?





BPM Runtime & Administrative tools

What is the right tool for the right job?





Administrators best friends

Automation

- Less error prone (no manual interaction)
- Use rich set of WAS and BPM scripting frameworks (e.g. wsadmin, Apache Ant, Jacl, Jython, Python, JMX, ...)
- Time saving samples
 - Start or stop complex environment topologies in specific order
 - Collect troubleshooting data for IBM support
 - Application build and deployment
 - Setup of production like environments with same topology and configuration setups
 - Create comprehensive backups of runtime and backends
- Includes OS specific capabilities (e.g. shell scripts)





Administrators best friends

Logging

- Product specific logging
 - Keep overview of product logs (WAS, WPS, BPC, DB, ...)
 - Which logs are most important for WAS and BPM?
 - SystemOut.log and SystemErr.log logs
 - FFDC (First Failure Data Capture)
 - JVM/Verbose GC log files (Performance and OOM analysis)
TIP: Kepp the Verbose GC log enabled on all servers – performance impact max. ~2%
- Custom logging (e.g. Apache Log4J)
 - Preferred for confidential or application specific data
 - Can be correlated with product logs and is trace level specific (should include time stamps and mask confidential data)

Administrators best friends



Logging

- Make a list of JVM repositories and their purpose

JVM	Purpose	Checkup
Deployment Manager	Central point of configuration and application distribution	Configuration and application deployment issues
Node Agent	Communication and configuration updates	Most important to determine communications issues between nodes (deployment manager, custom nodes)
Messaging Engine (ME) Cluster	Hosting ME for asynchronous communication	Status of the messaging engines – check for <i>started</i> and <i>joined</i> status messages of a ME. Remember there is only one ME active by default.
Application Target Cluster	Commonly hosting BPC/HTM container and custom applications	Execution status of BPM (BPEL, Lombardi processes) as well as custom applications.
Support Cluster	Business Process Explorer, CEI and Performance Data Warehouse (PDW)	Processing of CEI messages and supporting application activities
Web Application Cluster (optional)	Business Rules Manager, BPC Explorer and Business Space	Administration of a BPM environment via deployed service applications

- Avoid excessive tracing on production environments





Administrators best friends

Failed Event Management - Introduction

- Single point for failed events of end-to-end solutions
 - Runtime faults of asynchronous SCA/JMS/MQ invocations
 - Long-running BPEL process failures
(*stopped* activities, *failed and terminated* process instances)
 - Business Flow Manager (BFM) infrastructure failures
(*hold queue messages* are represented as failed events)
 - Failed events are administered through the Failed Event Manager application (integrated in the administrative console)

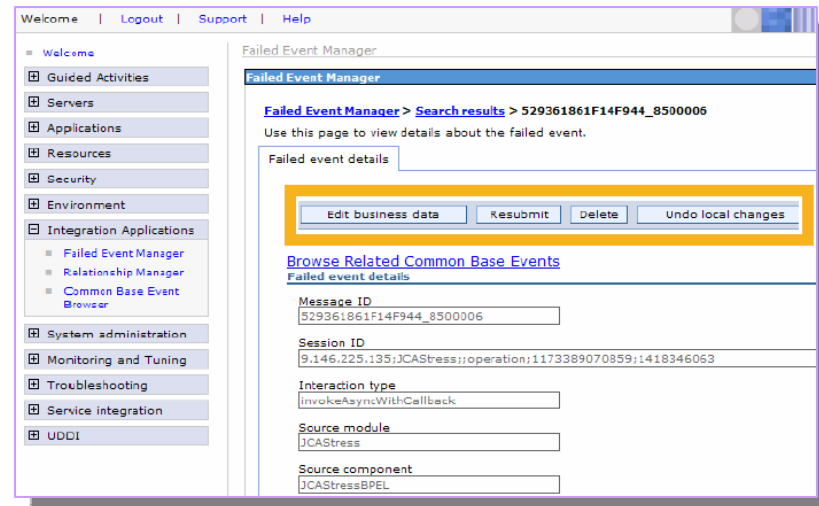
Administrators best friends



Failed Event Management - main Features

- Management of failed events (SCA, JMS or BPC related)
 1. Search (all or by criteria, e.g. date, component, source/destination, ...)
 2. View failed events (payload, business data, and root cause exception)
 3. Access to related components (e.g. BPC Explorer re-direction)
 4. Modify content (e.g. incorrect payload content or format is root cause)
 5. Delete or resubmit

Note: Trace can be enabled *on demand* for resubmission to further analyse a related problem!



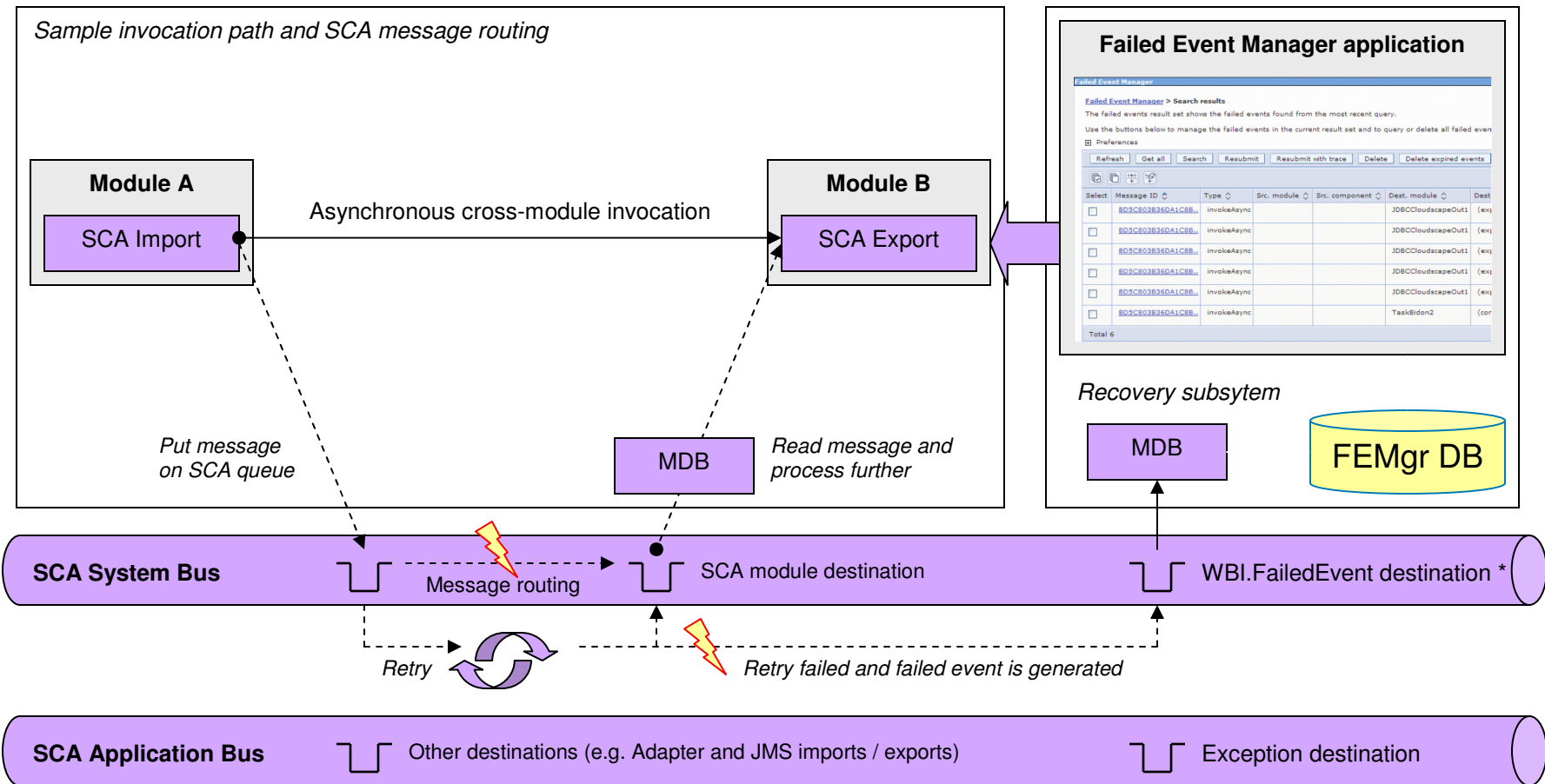
- Consider writing your own Failed Event handler





Administrators best friends

When are failed events generated at runtime ?



* There is also an exception destination for non-SCA module specific queues (e.g. custom queues) but not shown in this simplified scenario

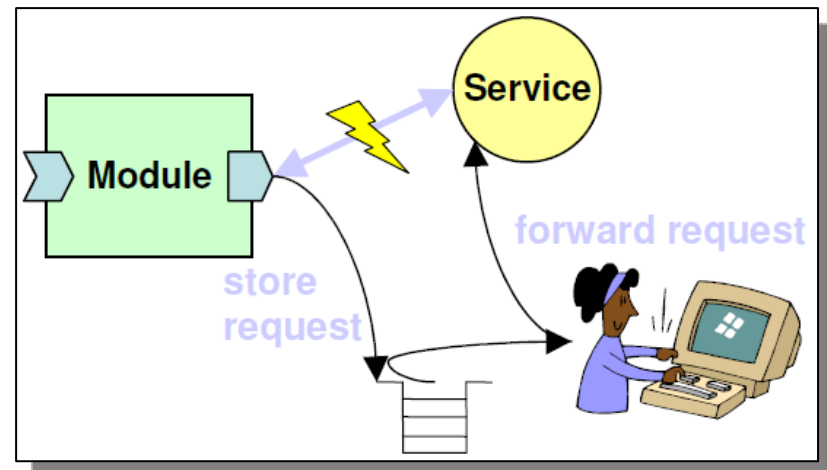




Administrators best friends

Store & Forward - Application QoS

- Failed events pile up in the Failed Event Manager DB
- Manual resubmit required for all events
(if not scripted but root cause analysis is required)
- Application services can be enabled for *Store and Forward* QoS via *Integration Designer*
- Asynchronous messages can be stored on additional queue to avoid creating failed events

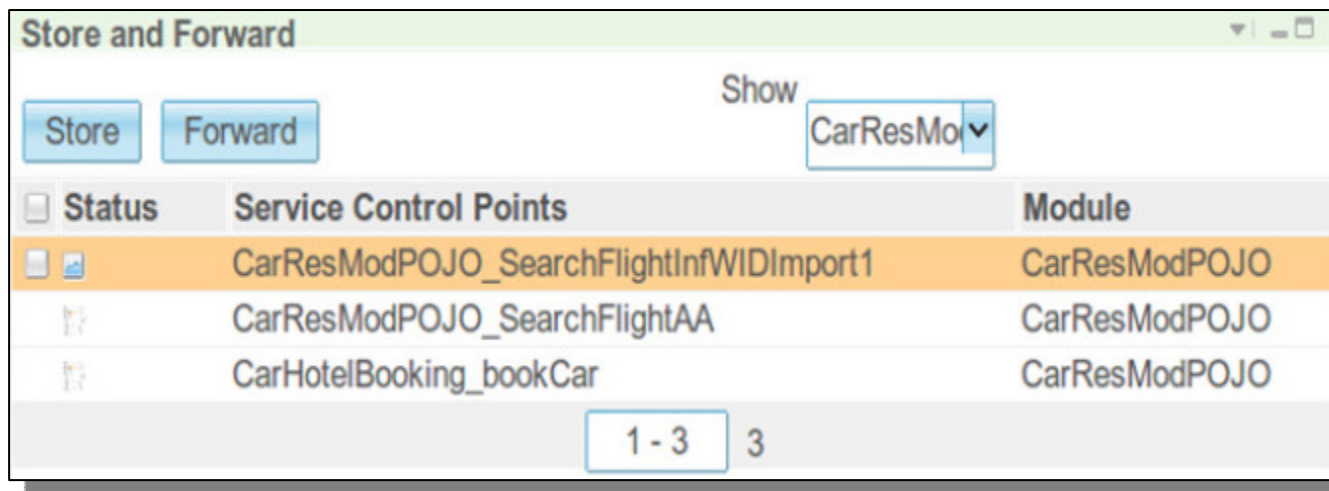




Administrators best friends

Store & Forward - Application QoS

- Store and Forward control points can be managed via Business Space Solution Administration widget
- Check status of all enabled modules and services
- Initiate forward of all previously failed request messages at once

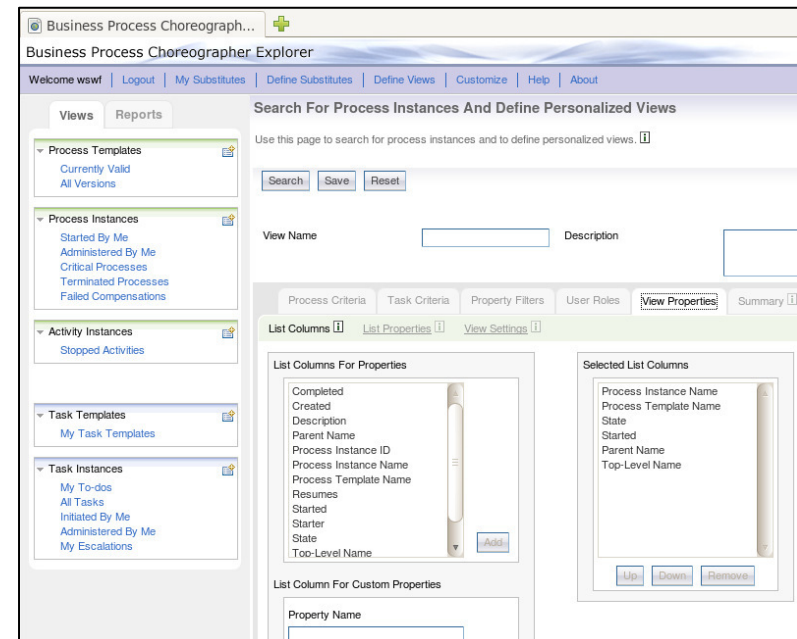


Administrators best friends



Business process and Human Task monitoring

- Use the out-of-the-box and customizable BPC Explorer
 - Provides default views for processes and human tasks (templates, running instances, insight view and visualization)
 - Create custom views to track and monitor specific instances
- Life-cycle management
 - Review and change process and task states
 - Repair instances by modifying states and runtime variables
 - Additional capabilities
 - ✓ Migration to new versions
 - ✓ Change ownerships





Administrators best friends

BPC Explorer - Custom views

- Define own views and custom queries to track instances

The screenshot displays the 'Define Views' interface in BPC Explorer. The top navigation bar includes 'Welcome: ehtest (English)', 'Logout', 'Customize', 'Define Views', and 'Help'. The left sidebar shows 'Process Templates' and 'Process Instances' sections. The main area is titled 'Search And Define Views' and contains instructions and links for defining views for process templates, process instances, and activity instances. A detailed view of the 'Available Actions' configuration panel is shown on the right, featuring a search bar, 'Save' and 'Reset' buttons, and a list of actions including State, Starter, Process Template Name, Administrative View, Started After Date, and Started Before Date. The 'State' dropdown is currently set to 'Ready'.

- Custom views are available in the process and task views

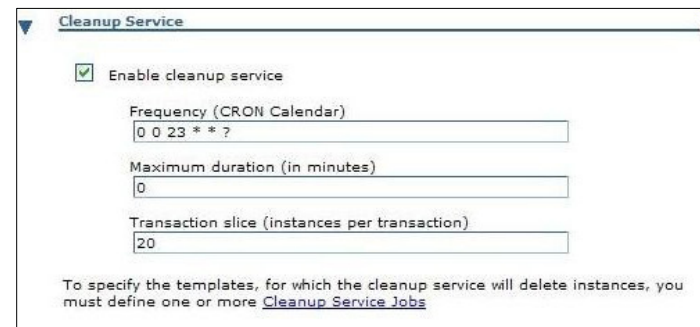
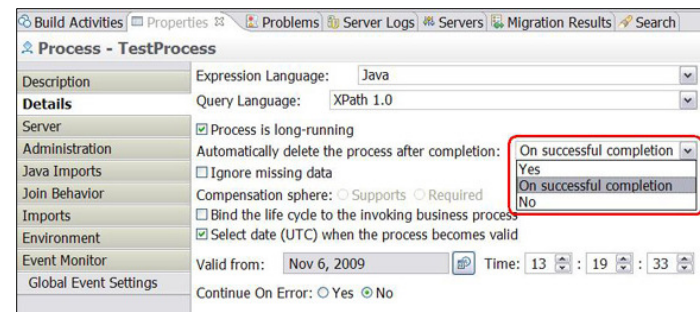


Administrators best friends



Process and task management best practices

- Keep track and check regularly on completed, finished or terminated processes/tasks
 - Remove or archive them to reduce the BPC database size
 - Use product scripts to remove not needed processes and tasks (e.g. deleteCompleted[Process|Task]Instances.py)
- Delete processes on completion option during development
- BPC cleanup service (WPS V6.2+)
 - Administrative console
 - Plan for less workload intensive business hours



Administrators best friends



Process review and repair

- Check regularly for stopped activities and their activity status

The screenshot shows the Business Process Choreographer Explorer interface. The main window displays a list of stopped activities under the heading "Stopped Activities". The "View Process State" button is highlighted with a red box. A callout box shows a process flow diagram with the activity "Store Job Posting In Job Offering Data Store" highlighted in red. Below this, the "Error Details" tab is open, showing a runtime fault: "CWWBE0003E: A runtime fault was returned by the implementation of activity 'SynchronizeJobPostingwithJobOffering... javax.naming.NamingException - Error during resolve org.omg.CORBA.UNKNOW - Unexpected exception resolving URL 'corbaname::r8ghe48:2810/NameServiceServerR... org.omg.CosNaming.NamingContextPackage.NotFound - IDL:org.omg/CosNaming/NamingContext/NotFound:1.0".

Activity Name	State	Stop Reason	Skip requested	Kind	Owner	Activated
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no	Invoke		3/1/2011
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no			
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no			
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no			
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no			
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no			
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no			
SynchronizeJobPostingwithJobOfferingDataStore	Stopped	Implementation failed	no			

Activity Description

Activity Name SynchronizeJobPost
Kind Invoke
State Stopped
Stop Reason Implementation failed
Description

Details Activity Input Message Activity Output Message Tasks Custom Properties Error Details

CWWBE0003E: A runtime fault was returned by the implementation of activity 'SynchronizeJobPostingwithJobOffering...

javax.naming.NamingException - Error during resolve

org.omg.CORBA.UNKNOW - Unexpected exception resolving URL 'corbaname::r8ghe48:2810/NameServiceServerR...

org.omg.CosNaming.NamingContextPackage.NotFound - IDL:org.omg/CosNaming/NamingContext/NotFound:1.0

- Determine the root cause to be solved first
- Restart, complete, skip, ... activities





Administrators best friends

Common Event Infrastructure (CEI)

- Common Base Events (CBE) to track events can be issued by:
 - BPEL processes and Human Tasks
 - WebSphere Adapters
 - Custom code utilizing the CEI infrastructure
- Configured on processes and tasks or via WebSphere Modeler
- In practice often used to track events and route them to a WebSphere Monitor to collect KPI metrics
 - Duration of business processes and invocations
 - Special event tracking and exceptional situations
 - Rich set of predefined CBE available
 - Can be customized for own data collection purposes





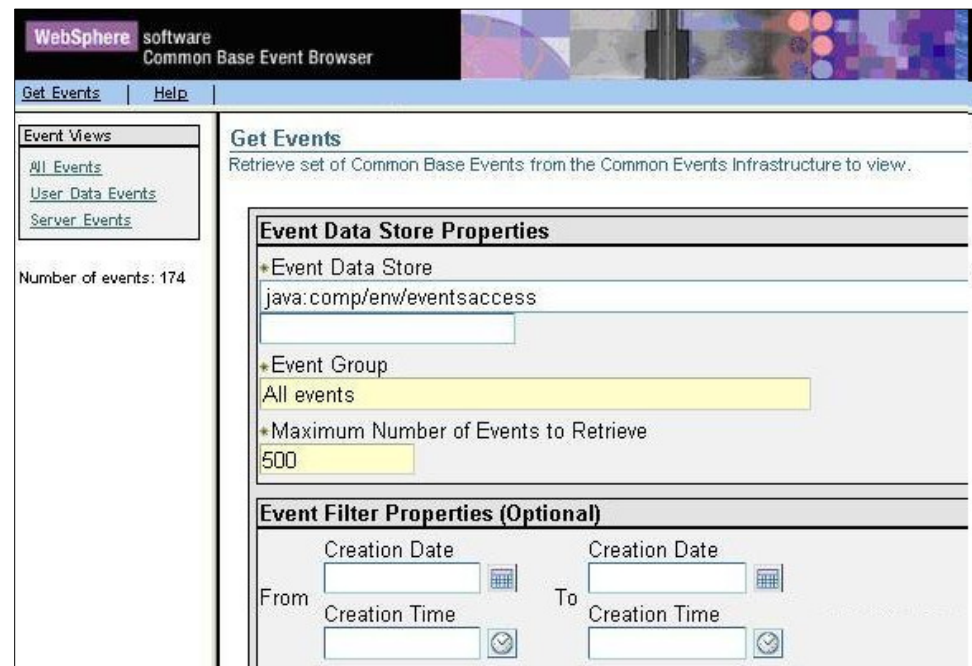
Administrators best friends

Common Event Infrastructure (CEI)

- Managed by CBE Browser in the administrative console
- CBE are stored in the event database by default that requires special attention regarding growth and maintenance
TIP: Disable the event if store if not required

CBE Browser

- Browse and review CBE
- Filter and search events
- Event purge supported only via scripts





Administrators best friends

Service Integration Bus (SIBus)

- WAS infrastructure for asynchronous communication
- Used by many BPM related components
 - Service Component Architecture (SCA)
 - Business Process Choreographer (BPC)
 - Common Event Infrastructure (CEI)
 - Performance Data Warehouse (PDW)
 - Lombardi Process Server
- Should be clustered in production environments for high availability (messaging engines do not scale)
- **TIP:** Keep the number of destinations and modules as small as possible or introduce an additional messaging cluster to reduce failover time and improve performance



Administrators best friends

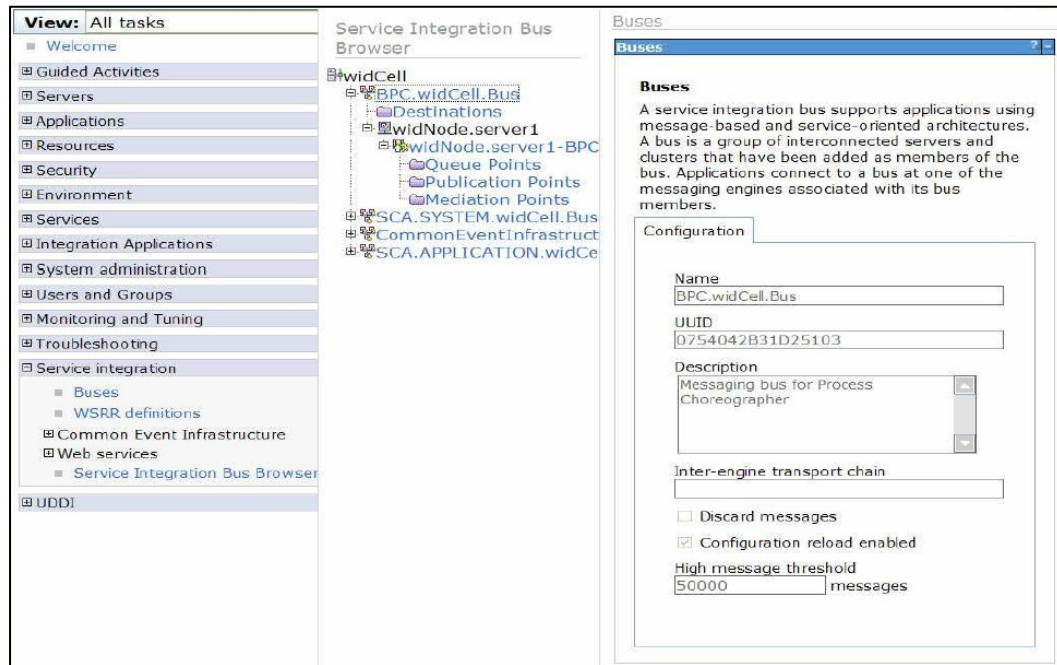


Service Integration Bus (SIBus)

- Keep an overview of queue destinations and their message depth to identify problems early (easier tree view)
- Use SIB Browser to get all data at a glance (ME, buses, queue, destinations, message content, ...)

SIB Browser

- View
- Edit
- Delete
- Dump





Administrators best friends

Service Integration Bus (SIBus)

- What should be monitored and kept empty?
 - BPC and Human Tasks **hold queues**
(backup storage of BPEL long-running process messages)
TIP: Use the Failed Event Manager (WPS V6.2+)
 - SIBus **exception destinations**
(last resort for underliverable messages stored due to system overload or application errors)
 - SCA module **destination queues**
(central queue of BPEL processes to route messages)
 - Queues to **external JMS/MQ** back-ends
(connectivity between messaging back-ends and the BPM messaging providers/listeners)



Administrators best friends

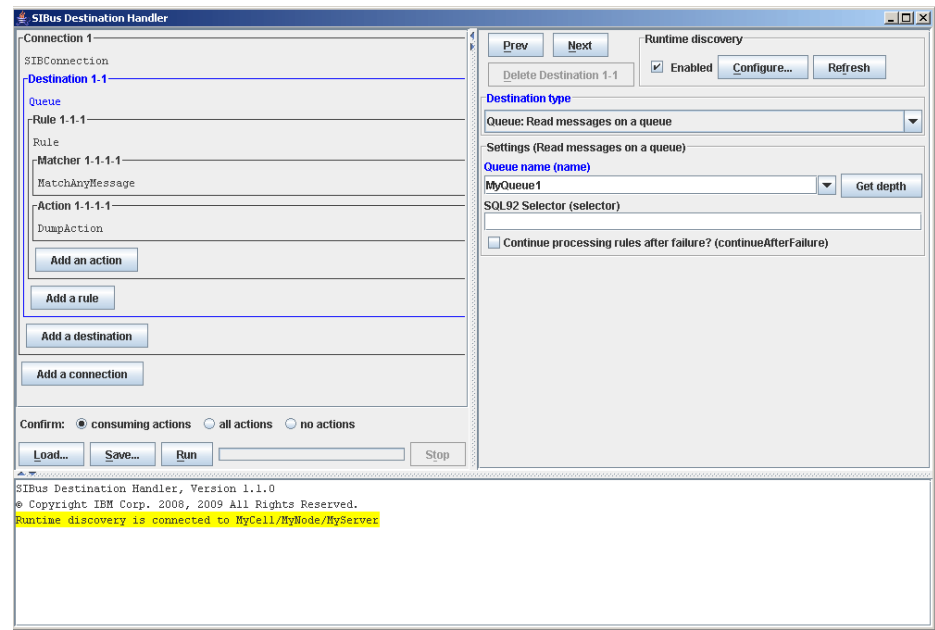


SIB Destination Handler tool

- Free IBM standalone or WAS scheduler task application
- View, move, copy, delete, backup/restore messages in SIBus
- Avoid manual actions (custom coding) and automate tasks even via custom message handlers

Use cases

- Examine erroneous messages
- Move messages back to destination queue
- Load messages from disk on queue for testing
- Exception destination handler for notifications

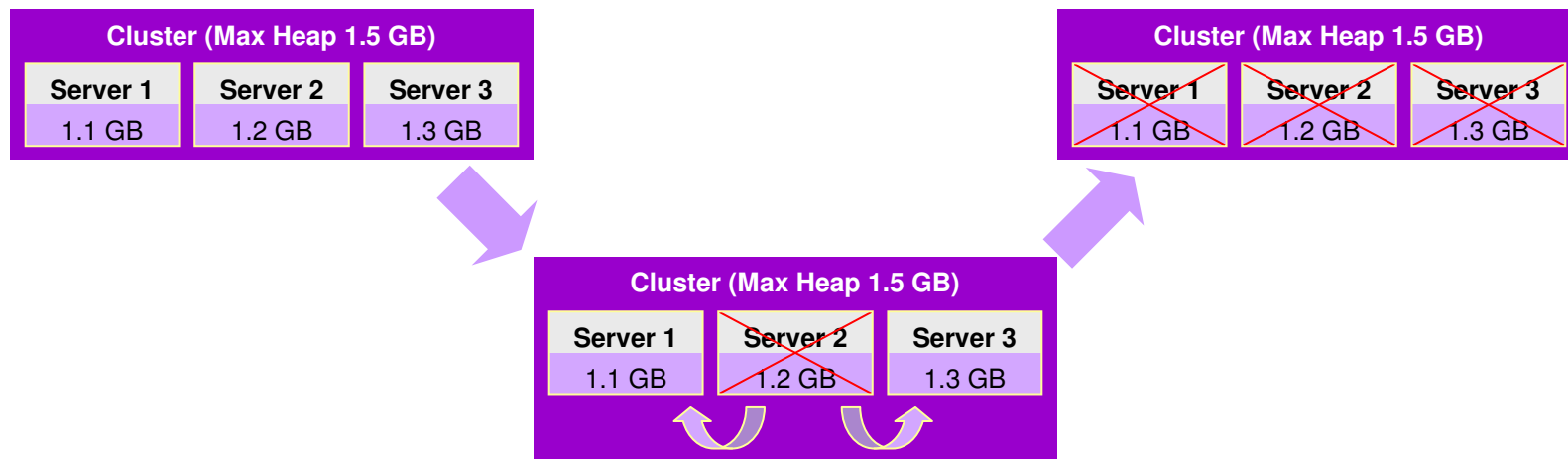




Administrators best friends

Monitoring of hardware and OS resources

- Sufficient and available operating system resources are the key for a healthy system
 - CPU and memory consumption
 - Disk space, I/O and network utilization
- Plan HW/OS resource assignment carefully and keep a buffer for exceptional situations (e.g. cross server cascading crashes)

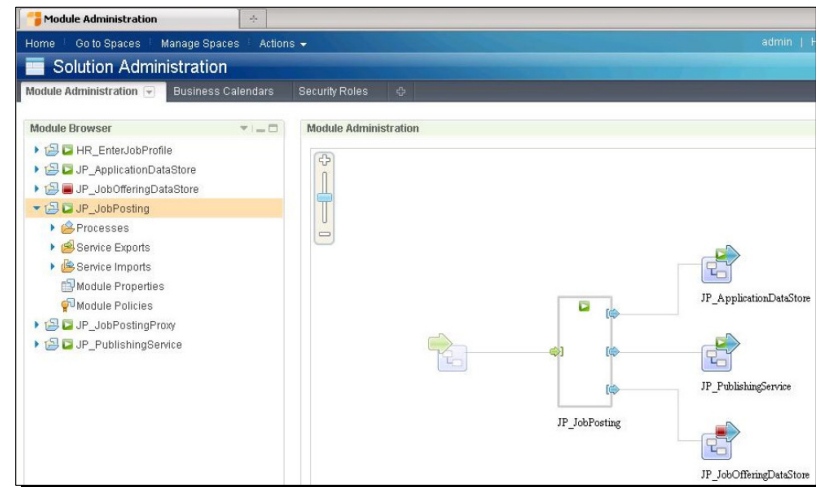


Administrators best friends



WebSphere Business Space

- Portal solution and widgets (similar to portlets) for system administration, monitoring and custom purposes
 - **Module administration**
 - ✓ Integration module status and administrable artefacts
 - ✓ Determine external connections/interactions
 - **System and interaction module health**
 - ✓ SIBus, Store & Forward
 - **BPC processes and tasks**



The screenshot shows the 'System Health' interface with a 'Problem Determination' tab. It displays a table of system applications with columns for Status, Application Name, Deployment Target, Module, Module Version, and Cell Identifier.

Status	Application Name	Deployment Target	Module	Module Version	Cell Identifier
✓	JP_ApplicationDataStoreApp	node=fmtc7061Node01_server=server1	JP_ApplicationDataStore		
✗	JP_JobOfferingDataStoreApp	node=fmtc7061Node01_server=server1	JP_JobOfferingDataStore		
✓	JP_JobPostingApp	node=fmtc7061Node01_server=server1	JP_JobPosting		
✓	JP_JobPostingProxyApp	node=fmtc7061Node01_server=server1	JP_JobPostingProxy		
✓	JP_PublishingServiceApp	node=fmtc7061Node01_server=server1	JP_PublishingService		
✓	PageBuilder2_fmtc7061Node01_server1	node=fmtc7061Node01_server=server1			





Administrators best friends

IBM MDD4J Health Center - introduction

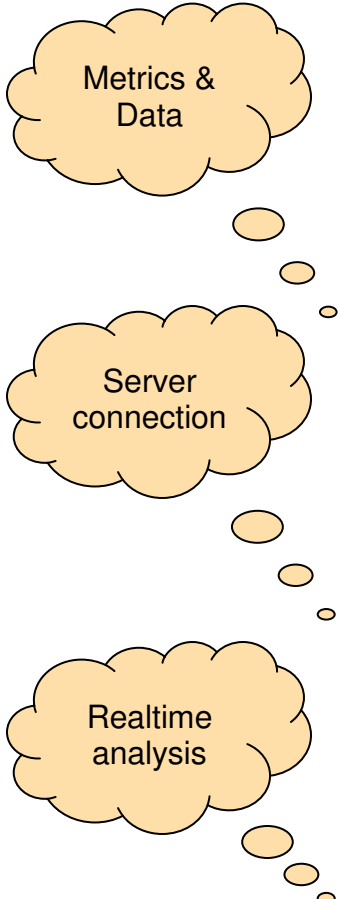
- Light-weight JVM diagnostic and monitoring solution
 - Real-time monitoring of JVM resources and behaviour
 - Analyze JVM performance and receive recommendations
 - In-depth analysis of JVM method invocations via profiling/sampling
 - Anticipate and foresee issues and resource shortage
- Enablement of JVM monitoring in less than 10min
 - On demand monitoring possible
 - Supports IBM JVM only (cross-platform)
- Shipped as free tool with IBM Support Assistant (ISA)



Administrators best friends



IBM MDD4J Health Center - overview



Samples	Self (%)	Self	Tree (%)	Tree	Method
2241	24.9		24.9		java.util.LinkedList.get(int)
811	9.01		9.3		java.security.AccessController.getCo
681	7.57		7.57		java.lang.ThreadGroup.setMaxPriori
473	5.26		7.52		java.lang.Thread.join()
435	4.83		29.7		com.ibm.jtc.test.jlth.threads.RTTThre
393	4.37		7.37		javax.realtime.ScopedMemory.enter
255	2.83		9.51		junit.framework.TestSuite.<init>(ja
226	2.51		13.2		javax.realtime.RealtimeThread.<ini
220	2.44		2.44		java.lang.Object.wait(long, int)
170	1.89		1.89		java.util.Vector.indexOf(java.lang.O
134	1.49		1.58		java.lang.reflect.Constructor.acquire

Invocation paths

Called methods

Timeline

Methods that call LinkedList.get()

- java.util.LinkedList.get(int)
- com.ibm.jtc.test.jlth.threads.RTTThreadPlugin\$RTWorkThreadFactory.getNumberRunning() (100%)
 - com.ibm.jtc.test.jlth.threads.RTTThreadPlugin\$RTWorkThreadFactory.getThreadStatus() (100%)
 - com.ibm.jtc.test.jlth.ThreadPicker.getThreadStatus() (100%)

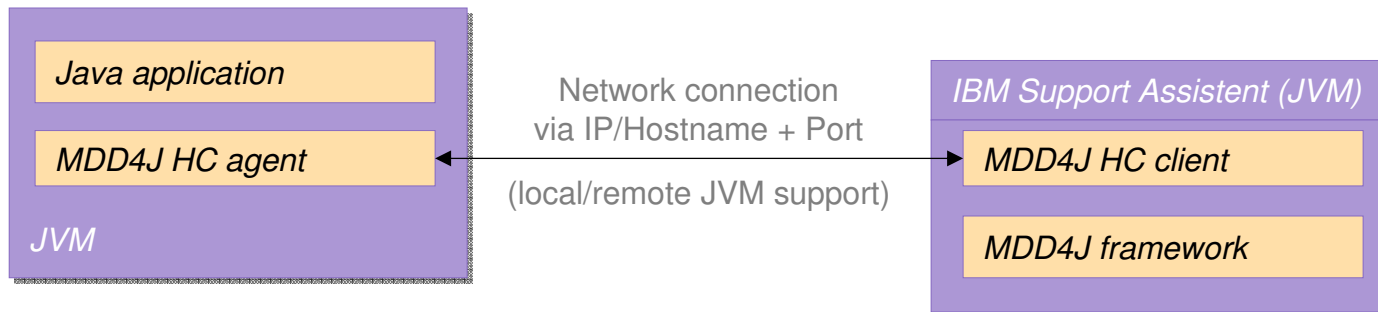




Administrators best friends

IBM MDD4J Health Center

- Client/server architecture
 - JVM agent installation and configuration files on JVM
 - ISA integrated Health Center plug-in/tooling



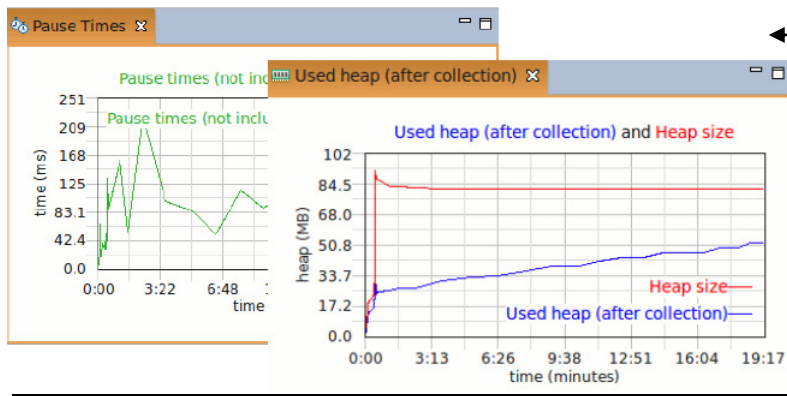
- Small performance overhead on JVM (~5% to ~10%)
 - Depends on data collection metrics, samplings and trace level
- Agents starts collection data either on-demand (with HC connection) or preventive



Administrators best friends

IBM MDD4J Health Center - metrics

- Garbage collection (GC) status, analysis, recommendations
- Foresee memory constraints and leaking behavior

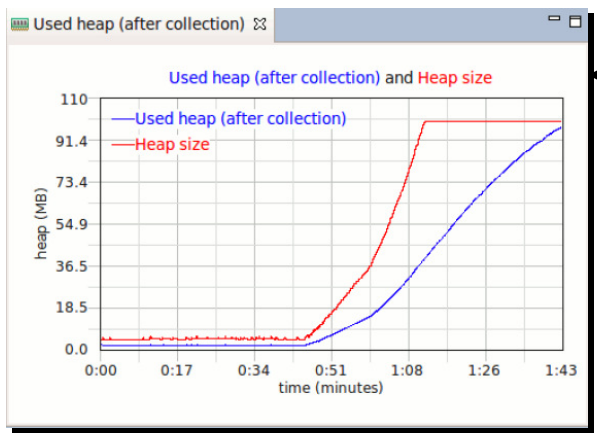


Monitoring heap usage and GC cycles

Tuning recommendations
Keep attention on the report and potential issues that should be investigated

Tuning recommendation

- ⚠ The application seems to be using some quite large objects. The largest request which triggered an allocation failure (and was recorded in the verbose gc log) was for 647 KB.
- ✅ The mean occupancy is 61%. This is close to optimal, so you do not need to tune your heap size.
- ℹ Heap usage seems to be growing over time. It increased by 47% in the last third of the log compared to the middle of the log. However, the number of collections decreased by 54%. This indicates that the rate at which your application is producing garbage seems to be slowing down. This may mean that your application will reach a steady state at which the heap usage will no longer be increasing.



Out of memory caused by memory leak?

Tuning recommendation

⚠ Heap usage seems to be growing over time. It increased by 1,311% in the last third of the log compared to the middle of the log. The heap size increased by 1,308% in response to the increased pressure on the heap. While this kept the change in the rate of collections to 4%, the heap growth is not sustainable. Unless the application stops growing its memory requirements, it is likely that an out of memory error or severe performance degradation will eventually occur. If you don't know of a reason why the memory requirements of your application should be growing, your application may be leaking memory. Consider reviewing your application for references which are being held unnecessarily, large maps and sets, and large statically-held objects. Using weak references where appropriate may help.





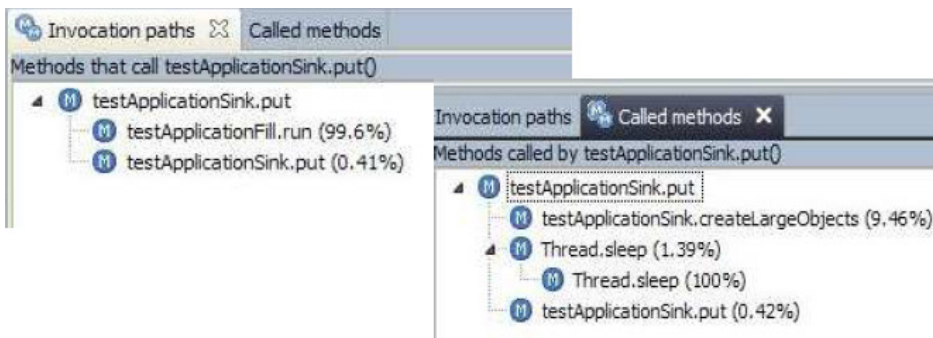
Administrators best friends

IBM MDD4J Health Center - metrics

- Profiling of Java method invocation and execution
- Metrics for most often called methods and execution times

Samples	Self (%)	Self	Tree (%)	Tree	Method
638	46.8		52.5		testApplicationSink.put(I)
439	32.2		35.4		testApplicationSink.get()
106	7.77		7.77		testApplicationSink.createLargeObj...
27	1.98		1.98		java.lang.Thread.sleep(JI)
23	1.69		1.69		java.lang.String.lastIndexOf(II)

← Spending a lot of time within method executions



← Drill down by reviewing the methods invocation path and invoking methods

Two other methods invoke the top consumer and one perfect hi(n)t

99.6% @ testApplicationFill.run





Administrators best friends

MBeans and JMX

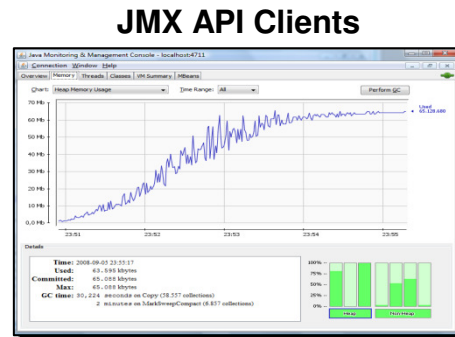
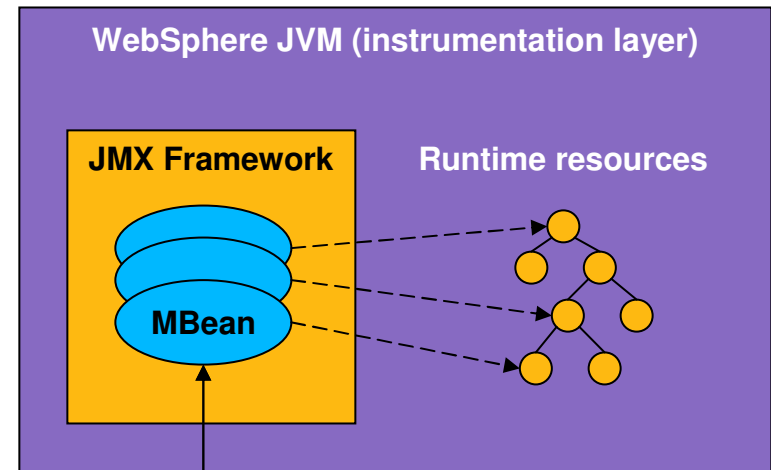
- Motivation
 - Configuration changes are often performed manually (might lead to failures – *we are all human*)
 - Automate administrative tasks as soon as possible (e.g. deployment, start, stop, data collection)
 - Reuse automated tasks also for environment configurations (setup identical environments e.g. for staging, production)
- Manage your servers using standardized technologies
- Write custom scripts via *wsadmin* tool or Java clients
- System management and monitoring can be implemented without significant investment



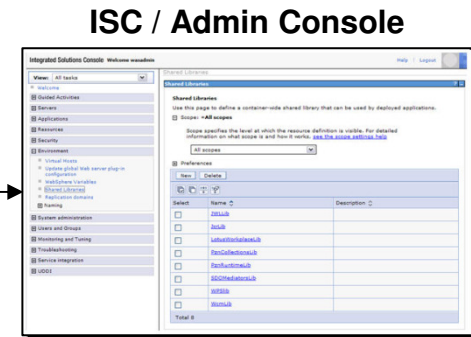
Developing custom management clients

MBeans and JMX

- MBeans available for management, configuration as well as monitoring (e.g. WAS PMI)
- Scalable management and access also in distributed environments
- Simple API and easy integration
- Multiple connector protocols and security standards supported
 - SOAP
 - RMI
 - IPC



(wsadmin, JConsole, ...)



SOAP, RMI,
or IPC



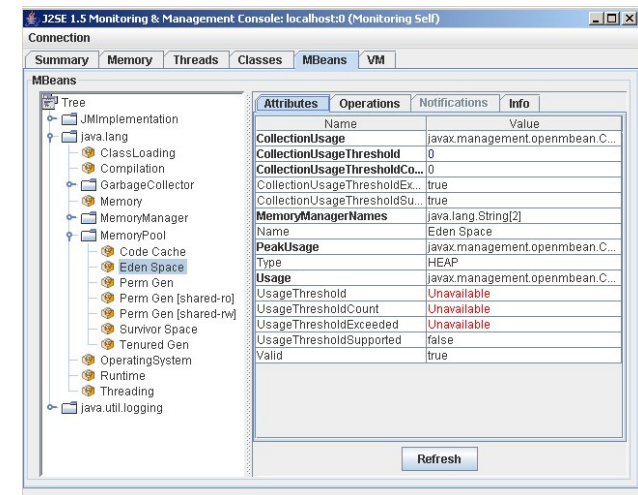
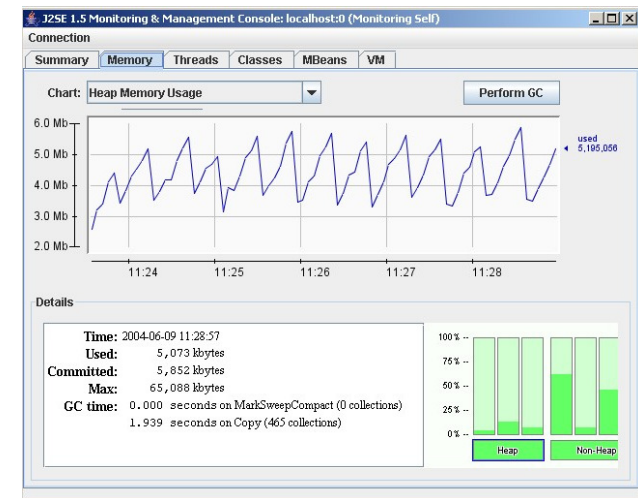


Developing custom management clients

JConsole – Helps you to explore JMX interfaces

- As-is application shipped with the JDK
- Reference JMX implementation and client to administer JVMs
- In-depth and dynamic analysis of JMX interfaces as well as operations
- Collection and analysis of JVM runtime data (memory, threads, classes, ...)

*Excellent tool for application analysis.
Supports your learning path towards
JMX clients and back-end
system interfaces!*



Summary



We illustrated and discussed

- Real life challenges and how to handle them
- IBM support and AVP offerings
- Introduction of the BPM product stack and related tools
- Out-of-the-box solutions in BPM making your life easier
- Best practices of monitoring and operating a BPM environment
- Recommended tools and their capabilities
- Tips and traps operating a complex environment





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Thank You...





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