



Coherence JMX Management Framework and Reporter

London Coherence SIG

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■ Agenda

- Introduction/Disclaimer
- Acquiring Coherence Management Data
- Coherence JMX Reporter
- Next generation Coherence Management
- Extending Coherence with custom MBeans.

■ Acquiring Coherence Management Data

- Issues and Concerns
- Original Design and Optimization Patterns
- Coherence 3.4 upgrades
- “Real World” improvements

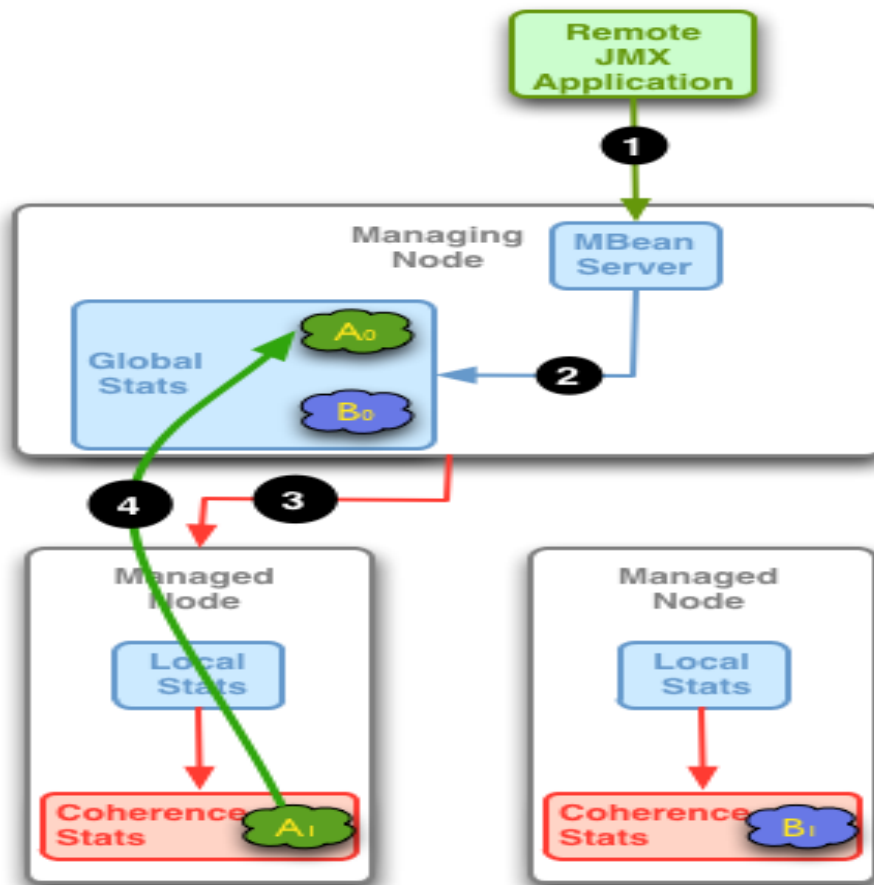
Issues and Concerns

- Data Accuracy
 - Time skew of data – The number of milliseconds between the first data element and the last data element of a snapshot.
 - Data Latency – How current is the data.
 - Sampling Frequency
- Capacity Consumption
 - MBean explosion
 - Number Caches * Number of Nodes (n-squared).
 - Peak vs Average consumption
 - Sampling Frequency



Questions?

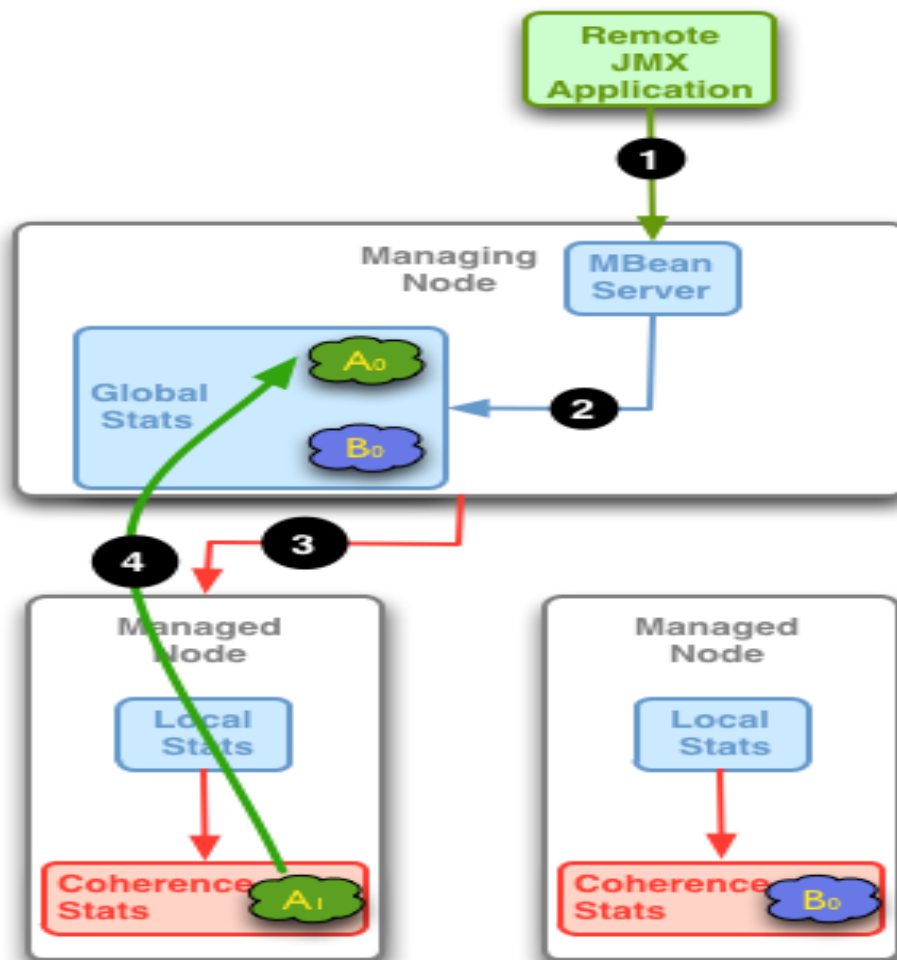
Acquiring Management Data (original)



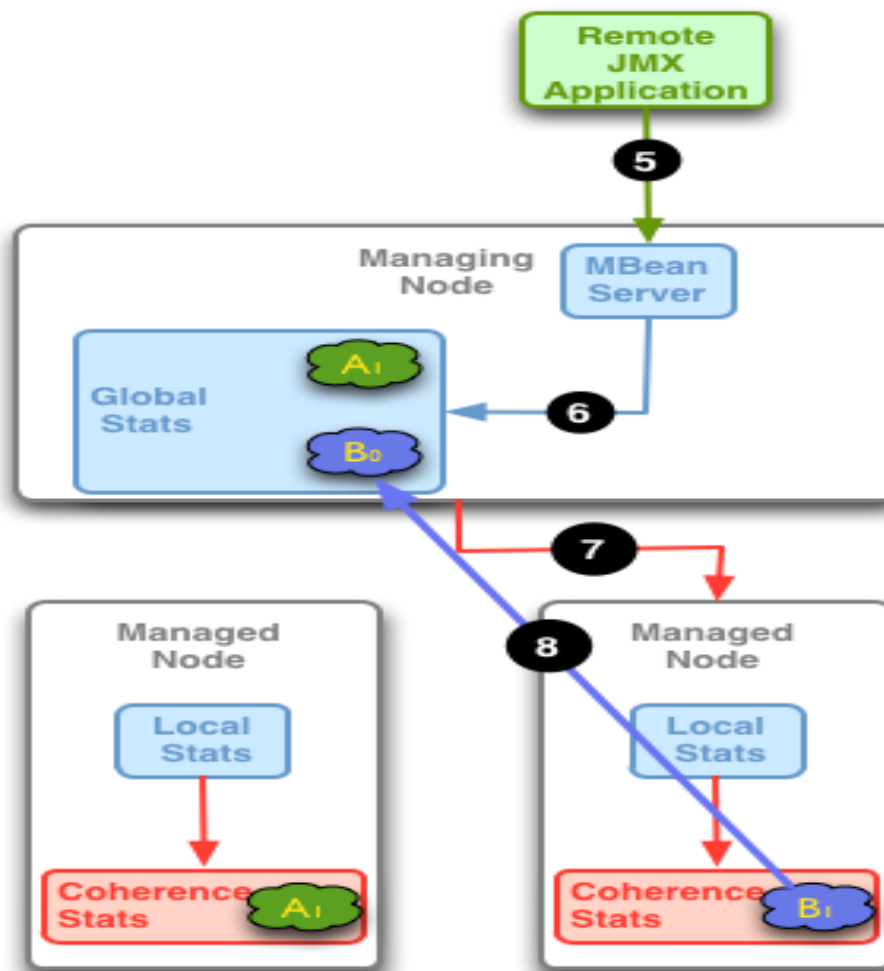
■ Issues with Original (refresh on demand)

- Current Data
- High Time skew of data
- N-squared communications
- Long time between sampling frequencies.
- Longer time to incident notification.

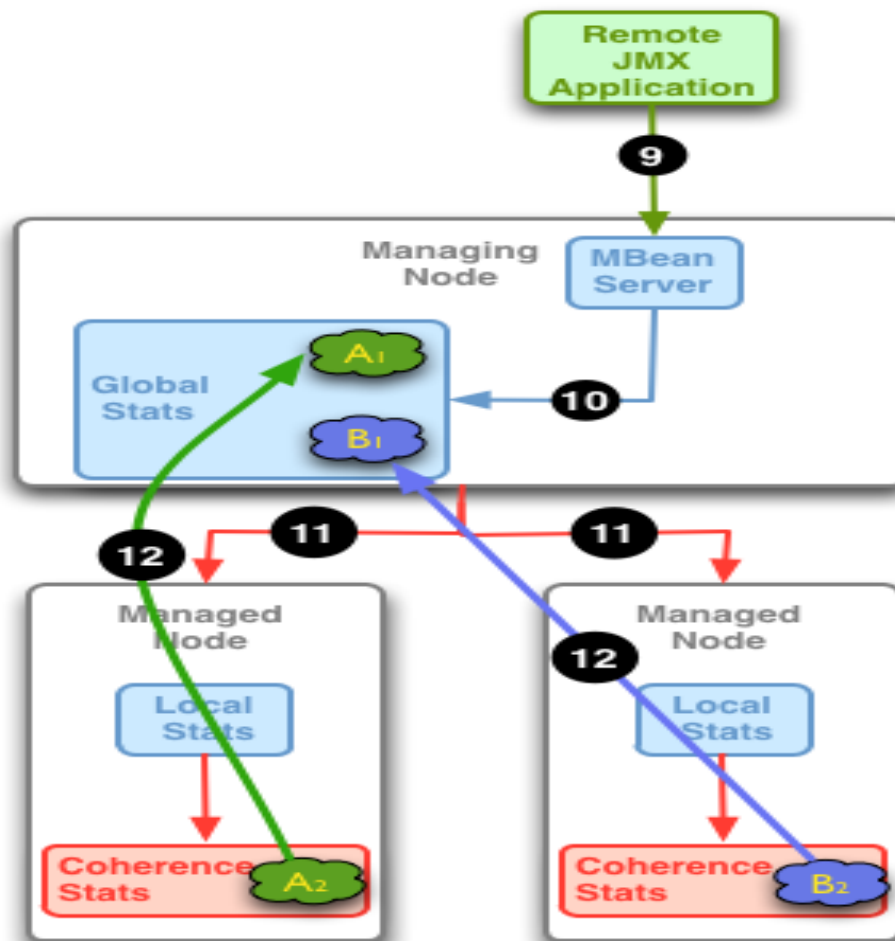
Acquiring Management Data (pre-fetch)



Acquiring Management Data (pre-fetch)



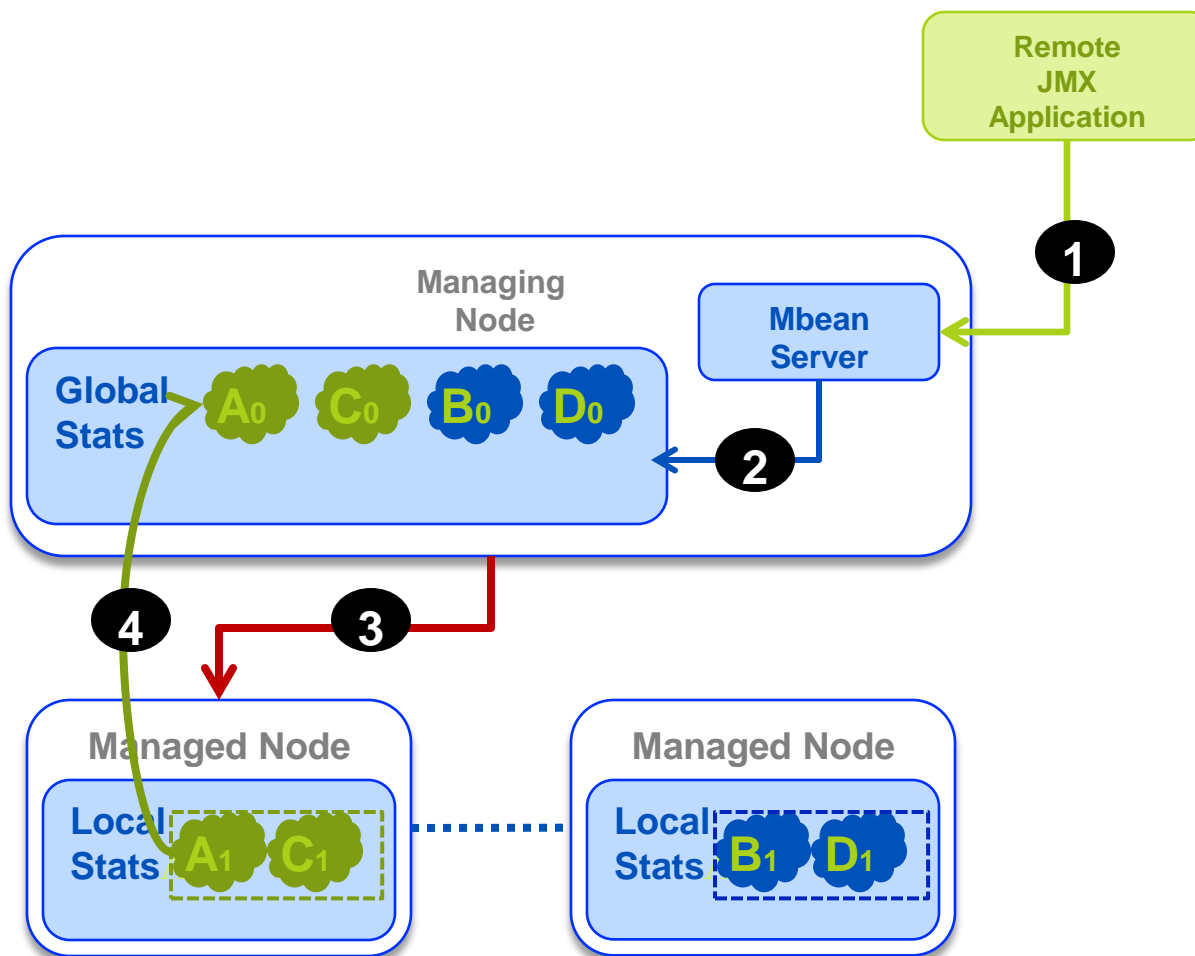
Acquiring Management Data (pre-fetch)



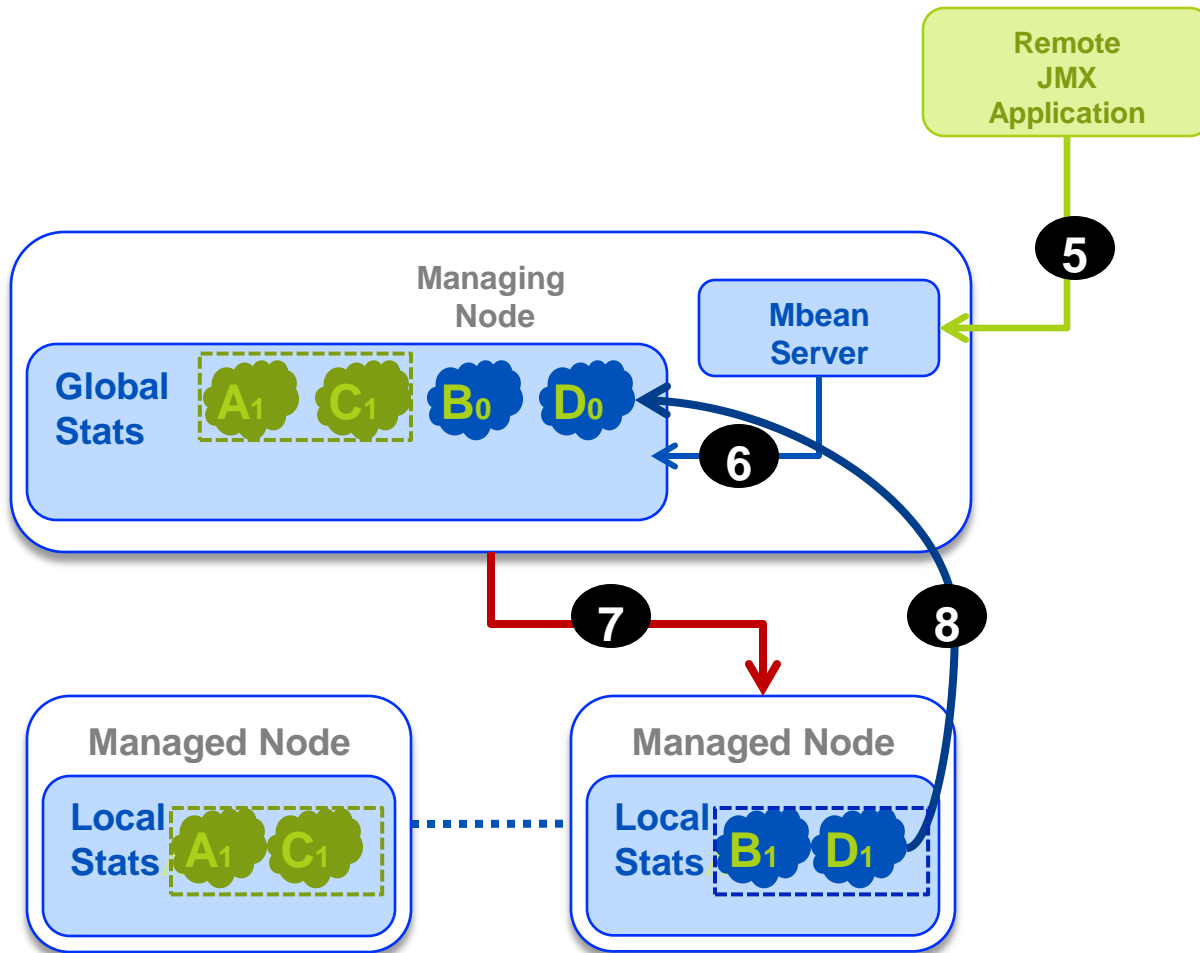
■ Issues with prefetch

- It takes at least one cycle to determine the pattern
- Multiple usage patterns on the same node significantly impacted performance
- Increased the maximum load on the coherence nodes (spike)
- Increased the load on the managing node (client).
- n-squared communications.

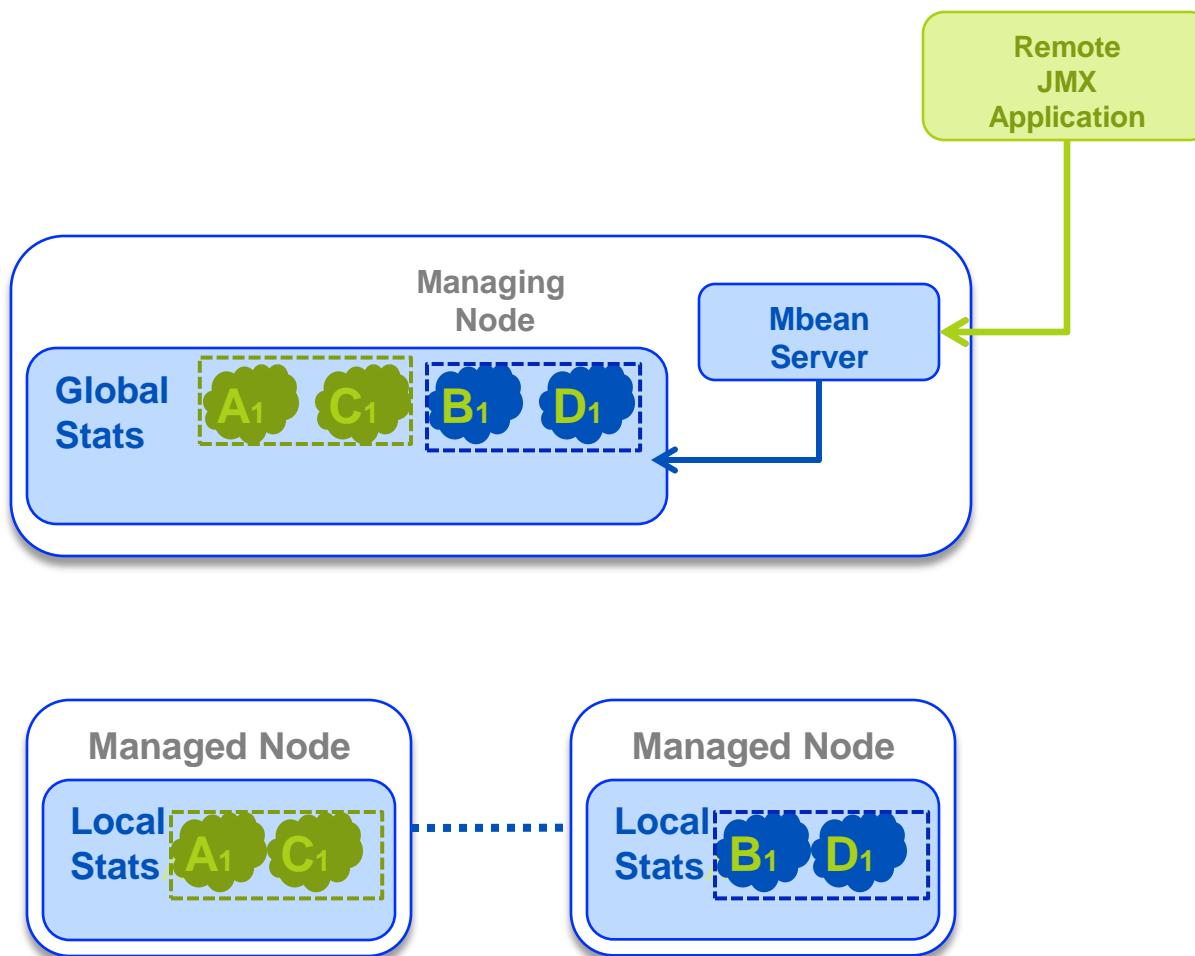
Acquiring Management Data (real world)



Acquiring Management Data (batch)



Acquiring Management Data (batch)



■ Batch Retrieval

- Optimized for snapshots
- Minimizes Time Skew of data from each node and overall cluster.
- Independent of refresh policy
- Order N (node count) communications per snapshot.
- Significantly reduces the load on the cluster. ~(factor of 3)
- Significantly reduces the time from incident to notification.



Questions?

■ JMX Reporter

- Original design and goals
- Configuration
- Starting, Stopping, Status
- Data Generated
- Reporter Features

Original Design and Capabilities

- Designed for POC teams.
- Zero additional infrastructure
- JMX Capture Utility
- Central and Distributed execution model.

■ Configuration (Report Definition)

- JMX Query
- Simple Join
- Row operations (add, subtract, divide)
- Aggregations
- Delta Operations
- Row Filters

■ Configuration (Report Group)

- Report Groups are a set of report definitions that are run together.
- There is one report-group per node.
- Out of the box report groups
 - Report-all.xml – all the reports will be executed
 - Report-group – standard reports.
 - Report-web-group.xml - Standard Reports + coherence web reports.

■ Standard Report Group

- Cache Usage (Hits, gets, puts, etc)
- Service Information (Tasks, Requests, etc)
- Network Health (Publisher/Receiver Success Rates, packet information)
- Network Health Detail (by node)
- Node listing
- Management Performance.
- Proxy Node and Proxy Connection.
- Each Row of Data is stamped with a batch number, a report time, and refresh time.

Starting and Stopping

The screenshot shows the Java Monitoring & Management Console window. The title bar reads "Java Monitoring & Management Console - pid: 6892 com.tangosol.net.CacheFactory". The window has a menu bar with "Connection", "Window", and "Help". Below the menu bar are tabs for "Overview", "Memory", "Threads", "Classes", "VM Summary", and "MBeans". The "MBeans" tab is selected. On the left is a tree view of MBeans, with "Operations" selected. The main area displays the "Operation invocation" for the selected MBean, showing four methods: "stop ()", "start ()", "runReport (sReportFile String)", and "resetStatistics ()". Each method name is followed by a button and its signature in parentheses.

Java Monitoring & Management Console - pid: 6892 com.tangosol.net.CacheFactory

Connection Window Help

Overview Memory Threads Classes VM Summary MBeans

Coherence
Cache
Cluster
Everett
Management
Node
PointToPoint
Reporter
Attributes
Operations
Service
StorageManager
sl
JImplementation
com.sun.management
java.lang
java.util.logging

Operation invocation

java.lang.Void stop ()

java.lang.Void start ()

java.lang.Void runReport (sReportFile String)

java.lang.Void resetStatistics ()

■ Command Line

- AutoStart
 - `-Dtangosol.coherence.management.report.autostart=true`
- Report Group
 - `-Dtangosol.coherence.management.report.configuration=<file>`

Reporter Status

Java Monitoring & Management Console - pid: 6892 com.tangosol.net.CacheFactory

Connection Window Help

Overview Memory Threads Classes VM Summary MBeans

- Coherence
 - Cluster
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 - Reporter
 - Attributes
 - Operations
 - Service
 - sl
- JMImplementation
- com.sun.management
- java.lang
- java.util.logging

Attribute values

Name	Value
AutoStart	false
ConfigFile	reports/report-group.xml
CurrentBatch	1
IntervalSeconds	60
LastExecuteTime	Thu Jan 20 15:25:55 PST 2011
LastReport	reports/report-management.xml
OutputPath	C:\training\
RefreshTime	Thu Jan 20 15:26:10 PST 2011
Reports	reports/report-network-health-detail.xml reports/report-memory-status.xml reports/report-service.xml reports/report-cache-effectiveness.xml reports/report-proxy.xml reports/report-management.xml
RunAverageMillis	174.0
RunLastMillis	174
RunMaxMillis	174
State	Sleeping

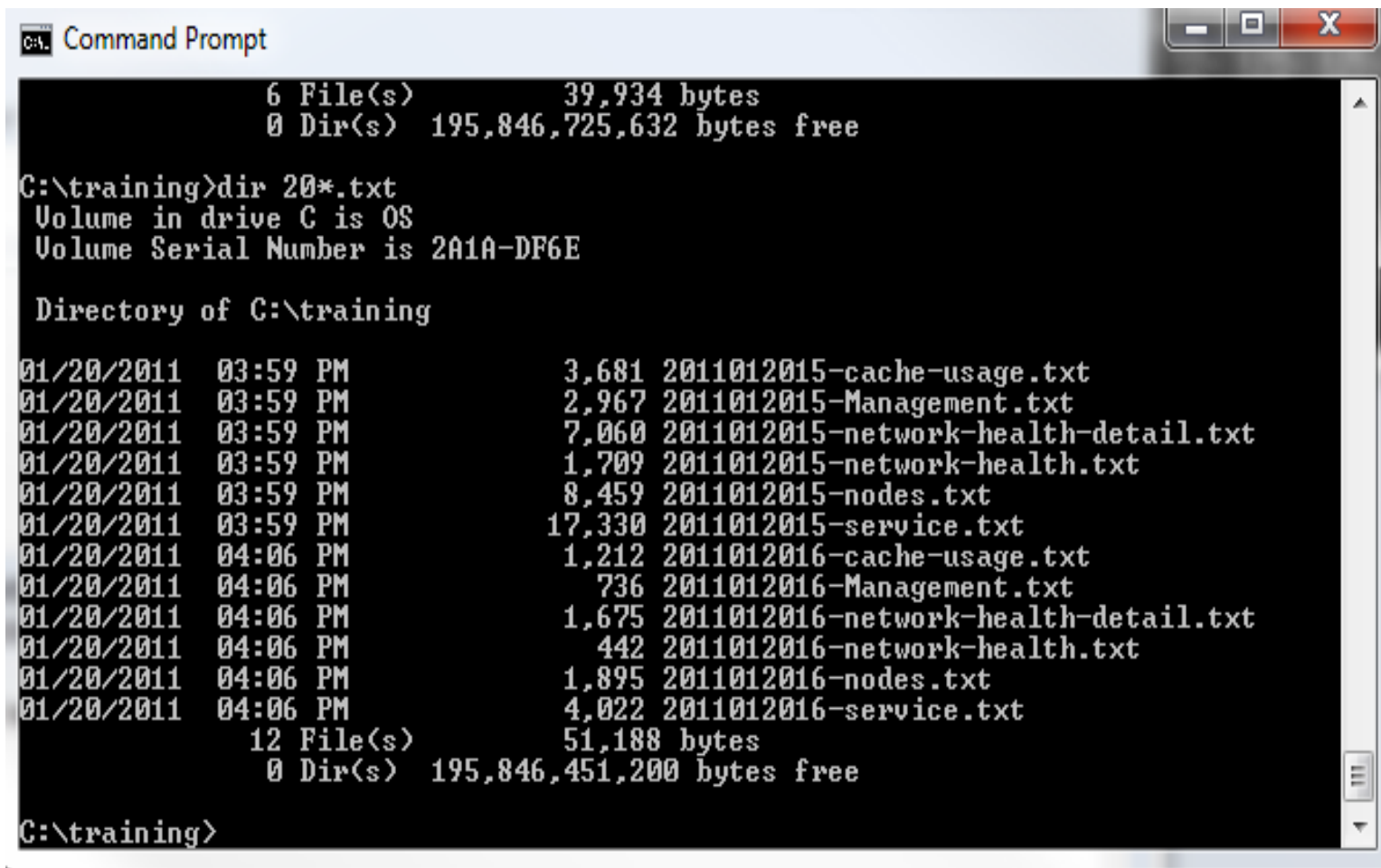
Refresh

Reporter Status

Command Prompt - manageing.bat

```
Map <dist-test>:
2011-01-20 16:10:59.213/3547.370 Oracle Coherence GE 3.6.0.0 <Info> <thread=Reporter, member=1>: Loaded Reporter configuration from "jar:file:/C:/coherence/3.6/lib/coherence.jar!/reports/report-network-health.xml"
2011-01-20 16:10:59.235/3547.392 Oracle Coherence GE 3.6.0.0 <Info> <thread=Reporter, member=1>: Loaded Reporter configuration from "jar:file:/C:/coherence/3.6/lib/coherence.jar!/reports/report-network-health-detail.xml"
2011-01-20 16:10:59.249/3547.406 Oracle Coherence GE 3.6.0.0 <Info> <thread=Reporter, member=1>: Loaded Reporter configuration from "jar:file:/C:/coherence/3.6/lib/coherence.jar!/reports/report-memory-status.xml"
2011-01-20 16:10:59.250/3547.407 Oracle Coherence GE 3.6.0.0 <Info> <thread=Reporter, member=1>: Loaded Reporter configuration from "jar:file:/C:/coherence/3.6/lib/coherence.jar!/reports/report-service.xml"
2011-01-20 16:10:59.262/3547.419 Oracle Coherence GE 3.6.0.0 <Info> <thread=Reporter, member=1>: Loaded Reporter configuration from "jar:file:/C:/coherence/3.6/lib/coherence.jar!/reports/report-cache-effectiveness.xml"
2011-01-20 16:10:59.282/3547.439 Oracle Coherence GE 3.6.0.0 <Info> <thread=Reporter, member=1>: Loaded Reporter configuration from "jar:file:/C:/coherence/3.6/lib/coherence.jar!/reports/report-proxy.xml"
2011-01-20 16:10:59.282/3547.439 Oracle Coherence GE 3.6.0.0 <Info> <thread=Reporter, member=1>: Loaded Reporter configuration from "jar:file:/C:/coherence/3.6/lib/coherence.jar!/reports/report-management.xml"
Map <dist-test>:
```

Reporter File Listing



```
Command Prompt
6 File(s)          39,934 bytes
0 Dir(s)  195,846,725,632 bytes free

C:\training>dir 20*.txt
Volume in drive C is OS
Volume Serial Number is 2A1A-DF6E

Directory of C:\training

01/20/2011  03:59 PM                3,681 2011012015-cache-usage.txt
01/20/2011  03:59 PM                2,967 2011012015-Management.txt
01/20/2011  03:59 PM                7,060 2011012015-network-health-detail.txt
01/20/2011  03:59 PM                1,709 2011012015-network-health.txt
01/20/2011  03:59 PM                8,459 2011012015-nodes.txt
01/20/2011  03:59 PM               17,330 2011012015-service.txt
01/20/2011  04:06 PM                1,212 2011012016-cache-usage.txt
01/20/2011  04:06 PM                 736 2011012016-Management.txt
01/20/2011  04:06 PM                1,675 2011012016-network-health-detail.txt
01/20/2011  04:06 PM                 442 2011012016-network-health.txt
01/20/2011  04:06 PM                1,895 2011012016-nodes.txt
01/20/2011  04:06 PM                4,022 2011012016-service.txt
        12 File(s)          51,188 bytes
        0 Dir(s)  195,846,451,200 bytes free

C:\training>
```

Reporter Links

- Analyzing Reporter Data
 - http://download.oracle.com/docs/cd/E15357_01/coh.360/e15723/manage_reportercont.htm#CIHIHEHG
- Creating a Custom Report
 - http://download.oracle.com/docs/cd/E15357_01/coh.360/e15723/manage_createcustreport.htm#CIHDCCFE

■ Coherence JMX Reporter

- Proprietary XML
- No History
- Simple Data Management
- No Analytical Capability – No trending, history, etc
- Single Threaded, Single Timer



Questions?

Notifications

- Were added in Coherence 3.6 as support for custom platform Mbeans
- Support Notifications generated by Standard, Dynamic or 3rd party (replicated) Mbeans
- Currently only two Coherence Specific Notifications (member left, member joined).

Overview | Memory | Threads | Classes | VM Summary | MBeans

Coherence

- Cluster
 - Attributes
 - Operations
 - Notifications [3]
- Everett
- Management
- Node

Notification buffer

TimeStamp	Type	UserData	SeqNum	Message
02:57:12:929	member.joined	Member(Id=3, Timestamp=2011-01-26 02:57:12.92, Address=10.9.200.161:8090, MachineId=52129, ...	3	Member 3 joined
02:57:06:973	member.left	Member(Id=2, Timestamp=2011-01-26 02:57:06.961, Address=10.9.200.161:8090, MachineId=52129, ...	2	Member 2 left
02:55:51:111	member.joined	Member(Id=2, Timestamp=2011-01-26 02:55:51.098, Address=10.9.200.161:8090, MachineId=52129, ...	1	Member 2 joined

■ Notifications Impact

- Usage Patterns
 - Point in time metric monitoring and thresh alerting
 - Event Notification
- Significantly increase the scalability of Coherence Monitoring
- Does not eliminate the need for Sampling (polling)
- Should be used with caution.
 - Over Notification can be worse than polling
- Algorithms to process and interpret the notification streams.
- Reduce the time from the incident to when the support team is notified.



Questions?

■ Extending Coherence with Custom MBeans

- Example Usage Patterns
 - Application Performance metrics
 - Centralizing 3rd party MBeans
 - Extending “missing” functionality
- Integrating Custom MBeans
 - Standard MBeans and Notifications are simple to implement
 - Integrating with coherence is as simple as modifying an XML file.
 - Caution should be used to avoid impacting performance with too many measures.

■ Extending Coherence with Custom MBeans

- Benefits of Custom MBeans
 - Provides a consolidated view of the impact of application usage on coherence resources.
 - Consolidating infrastructure component (container, etc) statistics helps spot systemic bottlenecks
 - Leverage 3rd party analytic tools for visualization and management of the system.



Questions?