Maritime Cargo Processing: Tackling SOA Performance Management Using CA Wily APM

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Abstract

Like many enterprises, Maritime Cargo Processing (MCP) has turned to Service Oriented Architecture (SOA) to improve the flexibility and capability of their online applications. However, this transition to SOA resulted in more application infrastructure to manage (Oracle Service Bus and Web Services) and a lack of visibility into more complex transactions. In this session, CA Wily will provide an in-depth review of the SOA Performance Management capabilities of APM r8.1 and MCP will share case studies and best practices on using CA Wily to meet their SOA Performance Management challenges.
Pete Inman Bio

Pete Inman is the Technical Architect at Maritime Cargo Processing PLC based in the UK. He looks after the WebLogic installation and server infrastructure and is responsible for its performance and smooth running also ensuring that the operations staff have the necessary documentation and scripts available to run the system. Other areas of responsibility include application and SOA development, application builds and deployments, source code control and many other tasks when a small development team is involved. Pete has been working in the IT industry since 1987.
Scott Williamson Bio

Scott Williamson is a Principal Product Manager with CA’s Application Performance Management business unit. He is responsible for driving product strategy & new product development that addresses the unique demands of SOA Performance Management. Scott closely monitors SOA industry trends by collaborating with large enterprise customers that are managing some of the world’s most sophisticated SOA-based applications. He has over a decade of enterprise software experience in a variety of Product Management and Business Development roles.
Agenda

> CA Wily SOA Performance Management (SPM) Overview
  - SOA Performance Management Observations & Challenges
  - Introscope 8.1 SPM Product Overview
  - Introscope 9 SPM Planned Enhancements

> Maritime Cargo Processing Case Study
  - SOA Infrastructure & Application Overview
  - SOA Performance Management Using CA Wily APM
  - Best Practices & Futures
  - Real World Problem Triage Scenarios (time permitting)
CA Wily SOA Performance Management Overview
CA Wily APM Solution Architecture

- **End-User Experience Monitor**
  - Zero Overhead, Passive

- **Management Server**
  - Clustered, Scalable, H-A

- **Enterprise Manager**
  - Management Server
  - Management Console

- **Agents for Java and .Net Servers**
  - Visibility into DBs, Web Servers, Security Servers, Mainframes, etc.
  - Monitor Applications from the Inside

- **Management Console**
  - Web or Thick Client
Key Observations on SOA

> The next generation of composite applications
  - New technology layer on top of existing infrastructure

> SOA is an architectural style; not a technology silo
  - Services layer must be managed in the context of business transactions passing through it

> Customer starting points vary
  - Most environments are hybrid extensions of existing technology

> Loose coupling increases complexity
  - Flexibility and reuse but reduced visibility; many moving parts

> SOA projects are moving from pilot to production
  - Production requirements becoming mainstream
SOA Performance Management

Challenge: Managing Heterogeneous SOA Environments
What Is Introscope SOA Performance Management (SPM)?

> Bundled with Introscope 8.1
  - No additional license fees

> Delivered as extensions to Introscope 8.1
  - Introscope SOA Performance Management
    - Replaces Web Services Manager 7.2
  - Introscope SOA Extension for Oracle Service Bus
  - Introscope SOA Extension for WebSphere Process Server/ESB

> SPM Extensions are separately downloaded and installed
  - Lightweight Agent & EM extension files
New: SOA Dependency Map

- Automatically discovers and maps SOA components
- Dynamically maps service dependencies and relationships
- Overlays real-time performance metrics
New: Real-Time SOA Health Dashboards
New: Oracle Service Bus Support

<table>
<thead>
<tr>
<th>OSB - Home</th>
<th>Proxy Services</th>
<th>Business Services</th>
<th>Pipelines</th>
<th>Transports</th>
<th>XQuery</th>
<th>UDDI</th>
</tr>
</thead>
</table>

**Transports**
- Response Time
- Errors
- Stalls

**Proxy Services**
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**Pipelines**
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**XQueries**
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**Business Services**
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**External Service**

**Message Flow Definition**

**UDDI**
- Import
- Publish
New: WebSphere Process Server/ESB Support
Enhanced: Cross Tier Transaction Tracing

> Trace transactions across heterogeneous tiers for quick problem triage
Enhanced: Cross Tier Transaction Tracing

1. Transaction tracing supports cross-platform and cross-application server environments
   - WebSphere, WebLogic, .NET, SAP, Axis, Oracle Service Bus, WebSphere Process Server/ESB, MQ
2. SOAP tracing is available OOB
3. HTTP and JMS tracing is available with custom tracer development
4. New “Flexible Tracer Field Extension” is available for quick customization for new platforms and non-standard web services
Platform Support

> Websphere 5.1, 6.0, 6.1, 7.0 (JAX-RPC only)
> Axis 1.2, 1.3, 1.4 on Tomcat, Websphere and WebLogic
> SAP NetWeaver 6.4, 7.0 Java
> WebLogic 8.1 SP5, 9.0, 9.1, 10.0 JAX-RPC
> .NET Framework 1.1, 2.0, 3.0, 3.5 – ASP.NET and WCF
> Oracle Service Bus 3.0, ALSB 2.6
> Websphere Process Server/ESB 6.02, 6.1, 6.1.2
CA Wily SOA Performance Management
Planned Enhancements
Planned Introscope 9 SPM Enhancements

> Business Process Mapping & Monitoring
  ▪ Automatic mapping of process flows from Oracle Service Bus, Websphere Process Server, Websphere ESB, TIBCO Business Works, TIBCO EMS, webMethods Integration Server, and WebSphere MQ

> Improved cross process transaction trace visualization
  ▪ New “correlated threads” view for quick triage

> Even Broader Platform Support
  ▪ TIBCO Business Works, TIBCO EMS, webMethods Integration Server, webMethods Broker, Apache CXF Web Services, JBOSS Web Services
Business Process Mapping & Monitoring

- Automatically maps & monitors complex business process flows
- Enables quick triage of complex transaction flows
Correlated Threads Trace View

> Clearly depicts cross-thread call sequence
> Enables sorting of each thread segment by response time
> Quickly triage complex multi-threaded transactions
Deep Support for TIBCO & WebMethods

- OOB metrics, typeviews, dashboards, and cross process tracing
- TIBCO Business Works & EMS
- webMethods Integration Server & Broker
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SOA INFRASTRUCTURE & APPLICATION OVERVIEW
Maritime Cargo Processing PLC

> Based in Felixstowe, East Coast - UK
> 23 staff, 6 developers, me, development manager
> Turnover 6m GBP
> Destin8 – Port Community System
> Outsourced 24 x 7 System Operations
Destin8 - Infrastructure
Destin8 - Infrastructure
Why the ESB layer?

> WebLogic 8.1
  - Java 1.4 starting to become restrictive
  - Too much work to upgrade WLS8.1 at the time

> New development projects required SOAP messaging
  - CERS required latest SOAP standards in Java 5

> Simplify current EDI message processing

> Provided us with a clearly defined termination layer for interfaces
SOA Applications

> CERS
  - Central European Reporting System (Dangerous Cargo)

> EDI
  - EDIFACT -> XML & XSLT
    - Pushes pretty much all functionality for data transformation in the service bus.

> Futures
  - Estimated Discharge (End October 2009)
  - RHIDES
  - ICS
EDI Processing
complex processing flow...
EDI Processing

esb features used:

- Email/IMAP
- EJB transport
- JMS transport
- MFL
- XSLT
- XQuery / SQL
Estimated Discharge

- Data queries on real time database
  - Destin8 load on RTO database a consideration
- Response time is important
  - User initiated request for data, so they can be prepared to wait – but not long
> Similar pattern, but response time critical.

> Business transaction will make SOAP request to ESB during rule validation
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SOA PERFORMANCE MANAGEMENT USING CA WILY APM
How We Use Introscope

> SOA applications seem more complex than regular J2EE applications

> Use of technologies like XQuery/XSLT in ESB which you may not choose in J2EE EJB’s etc.

> They are a bit of a black box & promote re-use so applications in a large SOA landscape can be extremely complicated.

> Monitoring becomes extremely important
24 x 7 Operations

> Port Of Felixstowe IT Operations provide 24 x 7 first line support

- No formal WebLogic training
- Dashboards provide triage and diagnosis of issues
- Documentation + custom built admin scripts
- Server patching, hardware maintenance, backups
- SAN infrastructure
- Dual data centers
- Implement daily UAT builds

> Most problems sorted without involving MCP development

- Small team, not enough resources for 24 x 7.
- On-call Rota
Introscope – High Level

DESTIN8 System Health Overview

Front End
- IIS Health
  - UAT
  - PRD
- Web Services (SOAP) ISL/CHIEF

OLTP Application Cluster
- Application Health
- Database Health
- JVM Health
- Messaging Bridges

BATCH Application Cluster
- Application Health
- Database Health
- JVM Health
- Database Stalls

Connected Systems
- CHIEF
- CHARTS
- CNS
- CERS

NETOP Gateway
- OSB Monitoring - SOA Pack
  - WebService Monitoring

All Servers Health
- Statistics
  - RTS
  - ISL
  - EDI
  - Scheduled Jobs
  - Background Jobs

JVM Information
- JEDI
- FISS
MCP & Introscope – Level 2

Polling Process | Outbound Message Queue | ISL MDB Deployed | Pending Messages | Queuing in Database | Inbound ISL
---|---|---|---|---|---
[Green] | [Green] | [Green] | [Green] | [Green] | [Green]

CHARTS Message Status

Last Message Sent: 09/09/09 22:29

Last Message Received:
- WLS05
- WLS06
- WLS07
09/09/09 22:30

CHARTS Message Summary

(These counters are automatically reset at midnight)

<table>
<thead>
<tr>
<th>Messages From CHARTS</th>
<th>Messages Sent To CHARTS</th>
<th>XCP Requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>11320</td>
<td>14109</td>
<td>2916</td>
</tr>
</tbody>
</table>

"Queueing In The Database" => Indicates Failed ISL Report Generation

"Pending Messages" => This indicates CHARTS is unavailable

There is likely to be TPENOENT errors in WLSLogs on D8PRDWLS03 => C:\Destin8\WLSLogs\WLS07\WLS07.log
MCP & Introscope – Level 3

Destin8 - CHARTS

- CHARTS Poller
- Average Response Time CHARTS Poller

- DB Queue Size

- Currently Queued

- Pending Messages

- MDB Deployed?

WTC

- ISL Out (PASO) Response Time
- ISL Out (PASO) Invocations

- ISL In (PASO) Response Time
- ISL In (PASO) Invocations

ISL To CHARTS (minute)

- CHARTS ISL MDB - Response Time

- Messages Received From CHARTS - (PASO Service in TUX)

- ISL
- XCP

- Messages Sent To CHARTS

- Last Message Sent

- Last Message Received

14110
09/09/09 22:30

WL.S05
09/09/09 22:31

WL.S06

WL.S07
How We Monitor SOA Applications

OSB - Home

Proxy Services | Business Services | Pipelines | Transports | XQuery | UDDI

Transports
- Response Time
- Errors
- Stalls

External Client

Inbound

Proxy Services
- Response Time
- Errors
- Stalls

Message Flow Definition

UDDI
- Import
- Publish

Outbound

Business Services
- Response Time
- Errors

Transports
- Response Time
- Errors
- Stalls

External Service
Proxy Services

10 Slowest Proxy Services

Displaying Top 10

<table>
<thead>
<tr>
<th>Proxy Service</th>
<th>Average Response Time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destin8PRDI</td>
<td>418</td>
</tr>
<tr>
<td>Destin8PRDI</td>
<td>418</td>
</tr>
<tr>
<td>Destin8PRDI</td>
<td>0</td>
</tr>
<tr>
<td>Destin8PRDI</td>
<td>0</td>
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<td>Destin8PRDI</td>
<td>0</td>
</tr>
</tbody>
</table>

Average Response Time

Value: 15,079.00

Min: 15,079.00
Max: 15,079.00
Count: 1

11-Sep-2009 16:35:45

Overall Health

Response Time

Errors

Stalls
Why the supplied dashboards?

> OOTB dashboards work for us at the moment.
  - Only have CERS & EDI Processing
  - Very few performance issues on the bus we need to worry about

> Estimated Discharge, RHIDES & ICS will require specific monitoring
  - Destin8 application response time critical
Real OSB problem..

> EDI Processing

- QA testing taking place with EDI – no messages received
  - Investigated log files, could see ESB logging the EDI message but where is it.
  - Sent another one and same thing.

> Check Introscope
Stall in the Pipeline

OSB - Home

Transports
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External Client

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External Service

UDDI
- Import
- Publish

Message Flow Definition
Stall in the Pipeline!
Stall Analysis

> Thread dumps just to see what it was up to
> First time we’d encountered a message that messed up the EDI->XML conversion process
> Message corrected and re-processed
Transaction Trace

> When do we use it?
  - Out of interest, trace everything over 5 seconds
  - Customer calls and complains about web response time, trace specific user id

> Traces transactions across JVM boundaries

> 3 different views of the transaction trace
  - Summary
  - Trace View – Upside down wedding cake!
  - Tree View

> I prefer the summary and tree view to work with
  - Trace view can be used to find out URL parameters for possibly re-creating of the response time issue
> If you double click any of the details in the lower pane, it takes you to the investigator view
Transaction Trace – Trace View
Transaction Trace – Tree View
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BEST PRACTICES & FUTURES
Best Practices
or...things we’ve done which make life easier

> Keep configurations the same if possible across JVM’s
  - May not possible on large installation
    - We have same agent profile and instrumentation on all JVM’s.
    - Some sites have 100+ JVM’s instrumented and many applications

> Use something like Subversion
  - Put everything in it; Jars, agent profile, pbd’s etc

> Use diff tool on agent profile when upgrading Introscope versions
Corporate website
Corporate website – how?

ESB used just because we could!!
Futures

> Destin8
>   - WebLogic 11g upgrade. 1\textsuperscript{st} Qtr 2010

> Introscope
>   - Cluster EM’s
>     - Originally due to load when running 7.2.1
>     - Since 8.1, no performance issues at all.
>   - Still plan on clustering but no urgency and it will be done for resilience – but maybe the SAN gives us that anyway

> Change Detector
>   - WLS8.1 issue with Jrockit, Wait for WebLogic 11g

> .Net agent for corporate website running asp.net

> CEM?
Questions?

> Interested in beta?
> Need a direct line to product management?

Contact me anytime at Scott.Williamson@ca.com
CA User Community Forums

> discuss CA product related topics
> share best practices
> and exchange tips & tricks.

Some notable features of the forums include: user ranking based on contributions, tagging, posting attachments, a powerful search feature, RSS notifications, profile preferences, and private messaging.
Maritime Cargo Processing

REAL WORLD PROBLEM TRIAGE SCENARIOS
Destin8 – When it goes wrong!
Destin8 – When it goes wrong!

> Execute threads in default thread pool = 0
Destin8 – When it goes wrong!

> But – only on a single JVM
Destin8 – When it goes wrong!

> Normally, these are due to database issues
> Web application was running normally. A bit slow at times, but it was running
> Messaging bridges between clusters building up queues, so something other than database as bridges purely network and JMS
Destin8 – When it goes wrong!

> JVM Thread Dumps

> What were all the default threads doing?

> All appeared to be blocked writing transaction logs to disk, so call the SAN experts at in the Port IT Department!

"ExecuteThread: '2' for queue: 'weblogic.kernel.Non-Blocking'" id=128 idx=0x214 tid=7812 prio=5 alive, in native, blocked, daemon
-- Blocked trying to get lock: weblogic/transaction/internal/TransactionLoggerImpl$IOBuffer@0x03502008[thin lock]
at jrockit/vm/Threads.sleep(I)V(Native Method)
at jrockit/vm/Locks.waitForThinRelease(Locks.java:1209)
at jrockit/vm/Locks.monitorEnterSecondStageHard(Locks.java:1342)
at jrockit/vm/Locks.monitorEnterSecondStage(Locks.java:1259)
at jrockit/vm/Locks.monitorEnter(Locks.java:2439)
at weblogic/transaction/internal/TransactionLoggerImpl$LogDisk.release(TransactionLoggerImpl.java:1322)
at weblogic/transaction/internal/TransactionLoggerImpl.release(TransactionLoggerImpl.java:389)
at weblogic/transaction/internal/ServerTransactionImpl.releaseLog(ServerTransactionImpl.java:2773)
at weblogic/transaction/internal/ServerTransactionManagerImpl.remove(ServerTransactionManagerImpl.java:1496)
at weblogic/transaction/internal/ServerTransactionImpl.setRolledBack(ServerTransactionImpl.java:2630)
at weblogic/transaction/internal/ServerTransactionImpl.ackRollback(ServerTransactionImpl.java:1093)
^-- Holding lock: weblogic/transaction/internal/ServerTransactionImpl@0x13B8E490[fat lock]
at weblogic/transaction/internal/CoordinatorImpl.ackRollback(CoordinatorImpl.java:298)
Destin8 – What happened?

> We had migrated to a new SAN 2 weeks ago and for some reason yesterday the performance on this disk dropped massively.

> Execute threads stuck trying to flush transaction logs

> Messaging bridges stuck trying to write messages to the destination JMS file store – also uses disk storage.

> Dashboards had so many red indicators due to other parts of the application being held up waiting for transactions to finish and also waiting for the large numbers of messages on the bridges to be processed.
Destin8 – What happened?

> Introscope provided information to help diagnose the problem
  - JVM thread dumps finally found it
> After the event analysis found a metric!
> JMS Stall count when adding a message to a queue.

> Metric never reported before, so we can now consider adding this to our dashboards as a further clue
Other things we've done

> EPA
  - Session Stats
  - SQLServer DTS – HTTP Request indicate start & stop
  - External JMX enabled Java client
    - MX4J

> Corporate Website
  - System status - screenshot
HTTP Session Issues

- HTTP Request Received by IIS
- IIS forwards the request to WebLogic app server
- WebLogic creates secondary HTTP session for fail-over
- Everything happy.
HTTP Session Issues

> Sometime during production running, secondary sessions start to be lost and no more are created by WLS

> Only became apparent when a new IIS server was added to the cluster
  - OS was SP2, downgraded to SP1
  - Re-installed OS

> Remove new IIS server, sessions fine for a whole week before weekly system restarts

> Needed to find out when the sessions started to drop and if there was a pattern
HTTP Session Issues

> Session statistics available in WebLogic console, so therefore must be in JMX
> Complex datatype for the JMX values
> Java code written as EPA plug-in to extract session details from JMX and feed these into Introscope.
> Allowed me to graph the metrics and produce a graph like.....
HTTP Session Issues

> This is showing primary and secondary sessions to be the same as each other which is great
> Allowed me to see the usage pattern of our web users!
HTTP Session Issues – the pattern

> I now had visibility into the dropping session problem!
> It was around 12 hours of live running with all 3 IIS servers

![Graph showing sessions starting to drop over time](image-url)
HTTP Session Issues – summary

> Still on going issue
> Currently the 3\textsuperscript{rd} IIS server may be a red-herring