

Managing JMX Views with JMXPrism

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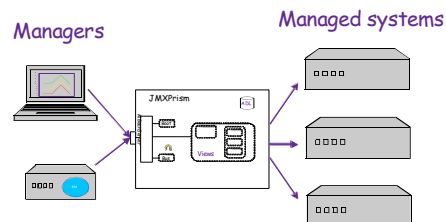
Objective



Simple JMX mediation layer

Between managers (console, programme) and managed systems

- To adapt legacy JMX management profiles (JVM, J2EE, ad-hoc...)
- To instrument Fractal applications (FractalJMX)



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Outline



Problem statement

Background on JMX
Additional requirements

Proposed solution

Approach
Design

Examples

AutoTune, GIS

Conclusion

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Background on JMX



JSR
3(core), 255 (Mustang)...
160 (remote), 262(WS)...
77(J2EE), 174(JVM)..

Framework and API

to build manageable Java applications
and integrate them with existing management solutions

Architecture (core)

Instrumentation

MBeans (resources)

Agent

MBeanServer (registry, ObjectName)

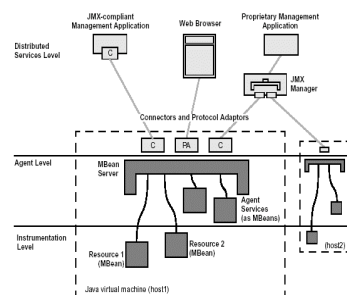
To let managers invoke op-att, rcv/snd notif

Agent services

Distribution

Remote managers

Adaptors/connectors (http, snmp, rmi, WS...)



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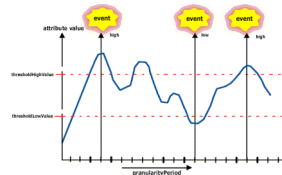
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Background on JMX (2)



Agent services

Timer, relation, Monitors...

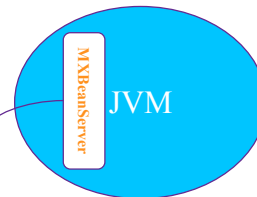
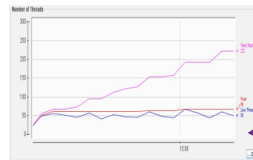


Management profiles

Ex. Monitoring and Management Specification for the JVM (JSR 174)

Threads (counters, state, locks..), Mem (heap, pools...), Class loading, GC...

Ex. Thread stat. (Jconsole)



On-demand, low overhead, JMX/SNMP access...

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Additional requirements



JMX

De-facto management standard, relatively complete on the server side...

However, on the manager side

How to avoid ad-hoc design?

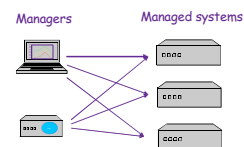
Multiple connexions

Additional services (not planned)

Multiple publishers

Feedback loop

Transformation (filtering, renaming, aggregation...)



How can dynamic and non-intrusive properties be obtained?

- To adapt legacy JMX management profiles (JVM, J2EE, ad-hoc...)
- To instrument Fractal applications
- Etc.

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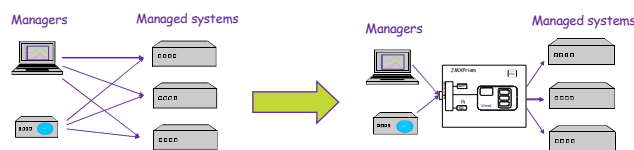
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Approach



Simple mediation layer (JMXPrism)

Between managers (console, programme) and managed systems



Basic features

Unique access point (JMXPrism MBeanServer)

Configure/deploy custom JMX management profiles

- Assembly of components (views, sources, connectors, bus...)
- To populate JMXPrism MBeanServer with relevant Mbeans

Dynamic and non-intrusive

Bus to handle MBeans notifications

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Design



➤ Instrumentation layer → pure JMX

*MBeans (static/dynamic...) represent resources, services...
in a uniform way (attributes, operations, notifications)*

➤ Information model

➤ "Interaction model"

➤ Framework

Fractal components

Fractal instrumentation

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Design – information model



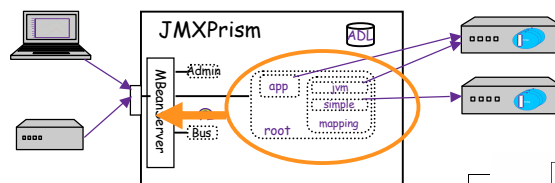
Management views to

Describe relevant information → e.g. on legacy rmi/mejb JMX profiles

Cnx + filters (MBeans, operations....) + additional services (monitors...)

Deploy this information → i.e. to expose MBeans in JMXPrism MBeanServer

Proxy MBeans (cascading MBeanServers)...



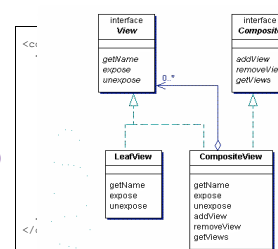
Definition <itf>

➤ View: expose (mbs) / unexpose (mbs)

➤ Composite (hierarchical name space, forwards expose)

➤ [Attributes] (e.g. sources, filters, monitors...)

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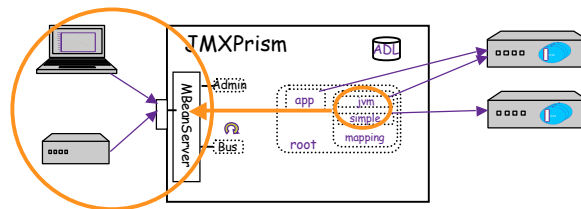
Design – "interaction model"



Managers use paths in the hierarchical name space of views

Admin: expose(path) / unexpose(path)

Avoid complex navigation & API dependencies (MBeanServer...)



```

expose("root/mapping/jvm")      // deploy "jvm" view
expose("root/mapping/simple")   // deploy "simple" view
                                →
expose("root/mapping")          // deploy "jvm" & "simple" views

unexpose("root/mapping/jvm")    // undeploy "jvm" view
unexpose("root/mapping/simple") // undeploy "simple" view
                                →
unexpose("root/mapping")        // undeploy "jvm" & "simple" views
    
```

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Design – Framework



Fractal-Based

No Fractal implementation dependencies

Component library (to extend)

Agent (MBeanServer, Admin)

Connectors (server side)

Management views

Sources (client side)

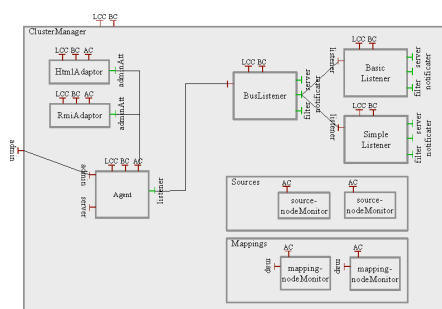
BUS (MBeans notifications)

Listener/effectors

...

ADL, API

or JMX (self-instrumentation)



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Notes on Fractal instrumentation



Additional functionality of JMXPrism (formerly FractalUMX)

Dynamic instrumentation of Fractal applications

Principe

- 1 – added to any (Java) Fractal application
Subcomponents: Agent, Connectors (rmi, http...)...
- 2 – expose → Introspect the component structure
Implicit view: super-component(s) & sub-components (recursively)
- 3 - Create & register (dynamic) MBeans
Fractal server interfaces (fct, att, ctrl)
- 4 - Attributes
JMX monitors & Filters to avoid flooding

Agent View [JDKMS1_01]

Filter by object name:

This agent is registered on the domain **Fractal**.
This page contains 4 MBeans(s). Admin

List of registered MBeans by domain:

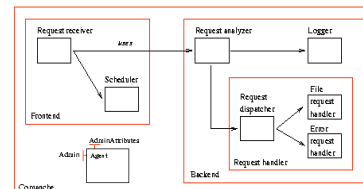
- Agent
 - if=admin
 - if=attribute-controller
- JMImplementation
 - type=MBeanServerDelegate
- Rt_HtmlAdapter@99681b
 - type=HtmlPort@8082

E.g. Comanche

```
<definition name="comanche.Comanche" extends="comanche.ComancheType">
  <component name="fe" definition="comanche.Frontend"/>
  <component name="be" definition="comanche.Backend"/>
  <binding client="this.r" server="fe.r"/>
  <binding client="fe.rh" server="be.rh"/>
</definition>

<definition name="comanche.JmxComanche" extends="comanche.Comanche">
  <component name="agent" definition="org.objectweb.fractal.jmx.AgentHost"/>
</definition>
```

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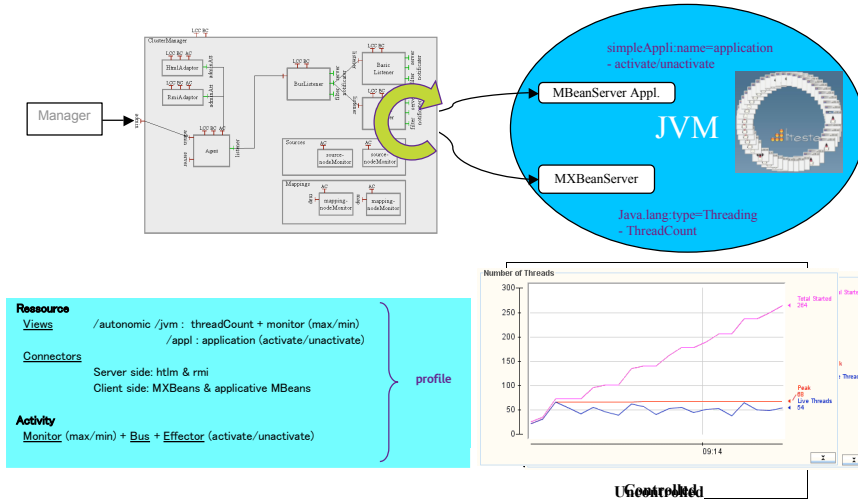
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AutoTune



Simple control of available resources (JVM & app. Monitoring)



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Grid Information System (GIS)

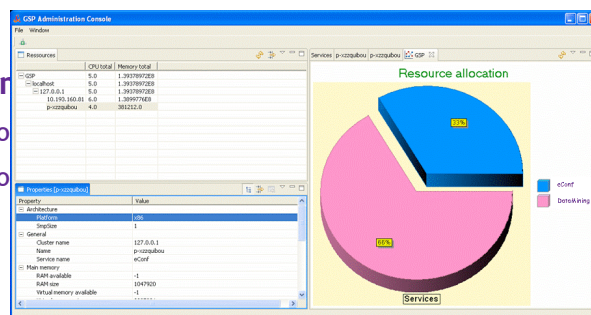


Monitoring Service for large-scale grids

- Clusters of clusters of heterogeneous servers
- Software probes deployed on every server
monitoring performance metrics (CPU load, memory usage, number of jobs...)
- Human & automatic resource management

JMXPrism

- To
 - To
- ter
of information



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- Approach
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Examples

- AutoTune, GIS

Conclusion

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Conclusion



JMXPrism: a simple JMX mediation layer

The framework is component-based, (relatively) easy to use & extend

It is suited for management profile adaptation (JMX oriented)

Not to model the managed systems as a component-based architecture

Its prototype library & functions are simple but have been tested in real cases

Status

2003: FractalJMX (ObjectWeb)

Non-intrusive, dynamic instrumentation of (Java) Fractal applications

No impl. dependencies except optional Julia controllers (basic exponential smoothing)

2004: JMXPrism v0

Extensions to adapt legacy management profiles (JVM, J2EE, ad-hoc...)

2005: use cases (GIS, Speedo)

Future works?

Re-factoring, extensions, synchronisation, aggregation....

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Questions?

