

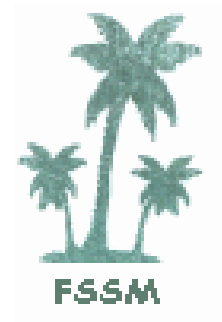
Dynamic Adaptability of Services in

Enterprise JavaBeans Architecture

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Motivation

- Software has to deal with an increasing diversity and complexity of execution environment
 - a wide spectrum of hardware platform (e.g. PDA)
 - each with dynamically varying resources (e.g. fluctuating network bandwidth, decreasing battery power)
- In some cases, software evolution may need to be dynamic, with changes being performed on running systems
- Software must be able to *adapt* their behavior to fit dynamically the evolving environment

Current EJB Model

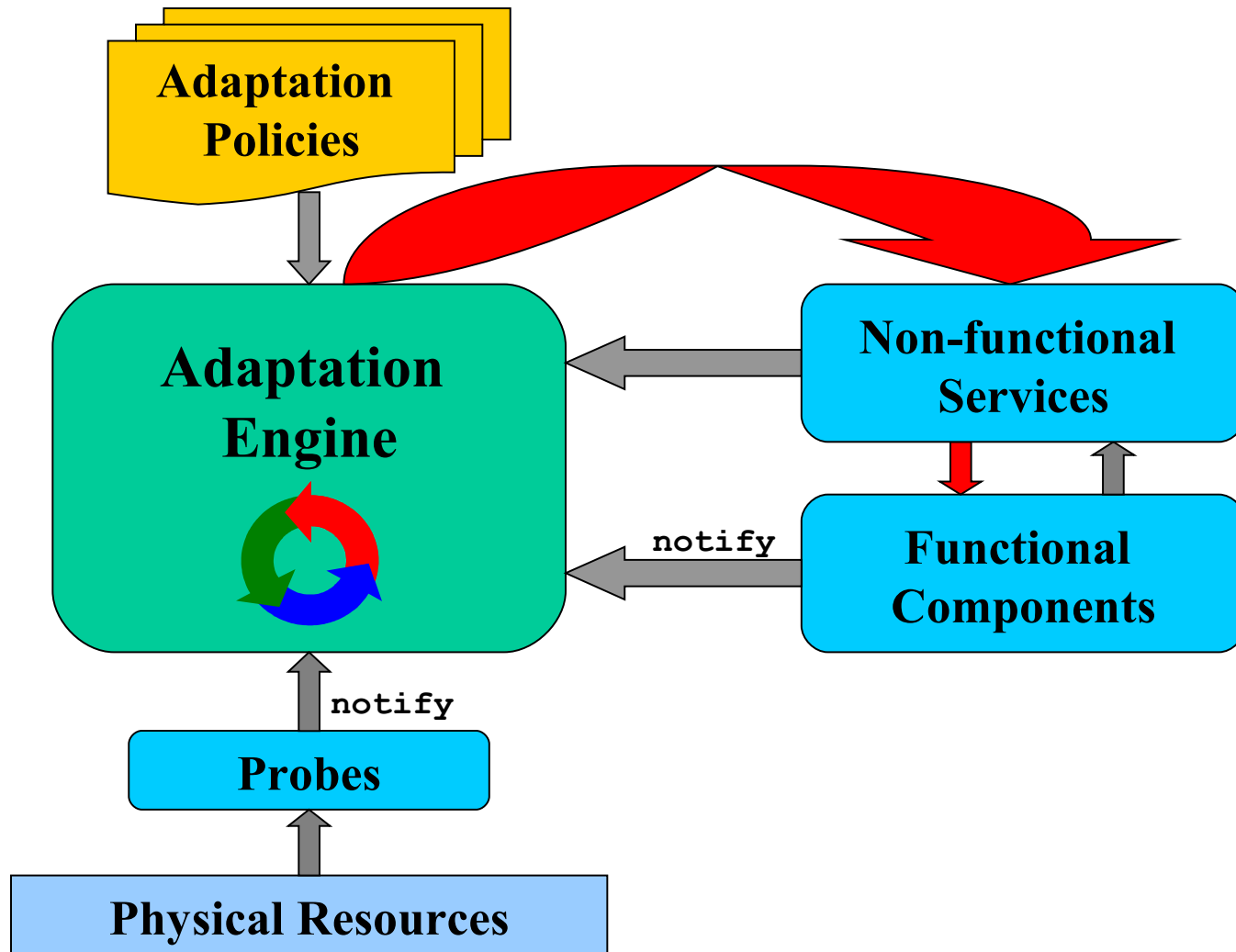
- Based on a *separation of concerns* approach allowing to distinguish functional code (i.e. EJB components) from non-functional code (i.e. middleware services) such as persistency, security, transactions and so on
- Configuration between EJB components and middleware services is only supported at the deployment-time (declarative deployment descriptor)

⇒ EJB Model does not support dynamic adaptation

Proposed Enhancement

- Allowing EJB applications to be aware of, and adapt to, variations in the execution context
 - enable dynamic reconfiguration between EJB components and middleware services
 - according to the changes of the execution environment
- How ?
 - Reuse an infrastructure for adaptable middleware developed in a previous work
 - and which relied originally on a MetaObject Protocol instead of a component model like the EJB model

An Infrastructure for Adaptable Middleware



Adaptation Policies

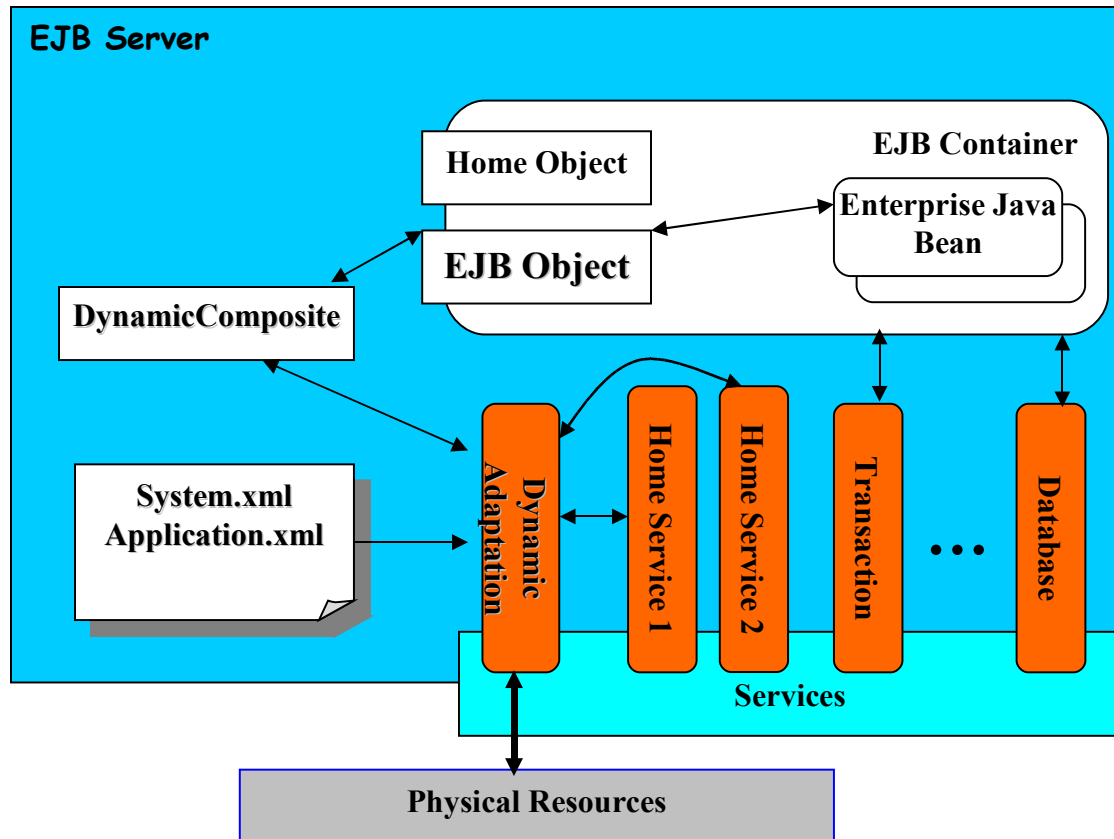
```
<system-policy name="tracer">
  <rule>
    <when>
      <less-than>
        <property-value name="/system/network.bandwidth"/>
        <number value="40000"/>
      </less-than>
    </when>
    <ensure>
      <attached service="logservice" role="main"/>
    </ensure>
  </rule>
</system-policy>
```

```
<application-policy>
  <group name="logged-components">
    <select from="all">
      <or>
        <equals>
          <property-value name="className"/>
          <string value="Account"/>
        </equals>
        <equals>
          <property-value name="className"/>
          <string value="AccountWithInterests"/>
        </equals>
      </or>
    </select>
    <bind policy="tracer"/>
  </group>
</application-policy>
```

Introducing Dynamic Adaptability in JOnAS

- Add a new optional tag, `<DynamicComposite>`, to deployment descriptors
- Modify **GenIC** (Generate Interposition Classes)
 - tool that generate container code based on descriptors
 - creates a special indirection for `DynamicComposites`
- Create a custom (simple) service API
 - JOnAS service API not adapted (code too tangled)
- Add new service to JOnAS: **DynamicAdaptation**
 - encapsulates the adaptation engine and monitoring framework

An Adaptable EJB Architecture



Conclusion & Perspective

- Conclusion
 - An Adaptable EJB architecture consists in modifying at run-time and with a fine granularity the association between EJB components and middleware services
- Current Work
 - Use of this enhanced architecture to build a concrete application - a client/server based bookstore system
 - adaptable towards changes related to its execution context
- Open Issues
 - Cooperation/reuse of existing EJB services ?
 - Is it possible to go further without breaking the EJB model ?