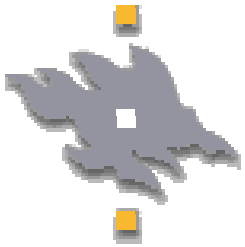

Lecture #10: 4th March 2004

ESB: Enterprise Service Bus

Suresh Chande

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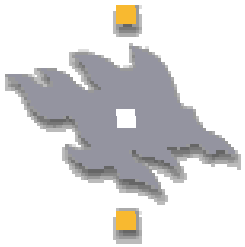

Industry Visions/Hypes?

- Enterprise service bus (ESB) as an open standards–based technology concept that will potentially revolutionize IT and enable flexible and scalable distributed computing for generations to come [IDC March 2003]
- Today, enterprise service buses are used only in leading-edge applications. They quickly will evolve; major vendors will offer them in 2004. ESBs will supersede traditional communication middleware in new applications by 2007 [Gartner December 2003].

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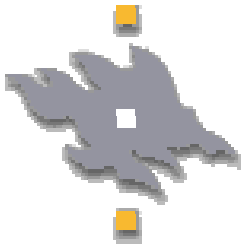

Industry Definitions

- The ESB term coined by Stamford, in a report from Gartner
- ESB is a light weight integration broker based on standards such as XML and web Services technology Stack.
- ESB combines messaging, basic transformation, and content-based routing
- Uses Web services and message queuing to facilitate the development of flexible SOA
- Universal Enterprise Integration backbone
- Enterprise Nervous System

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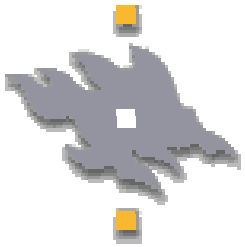
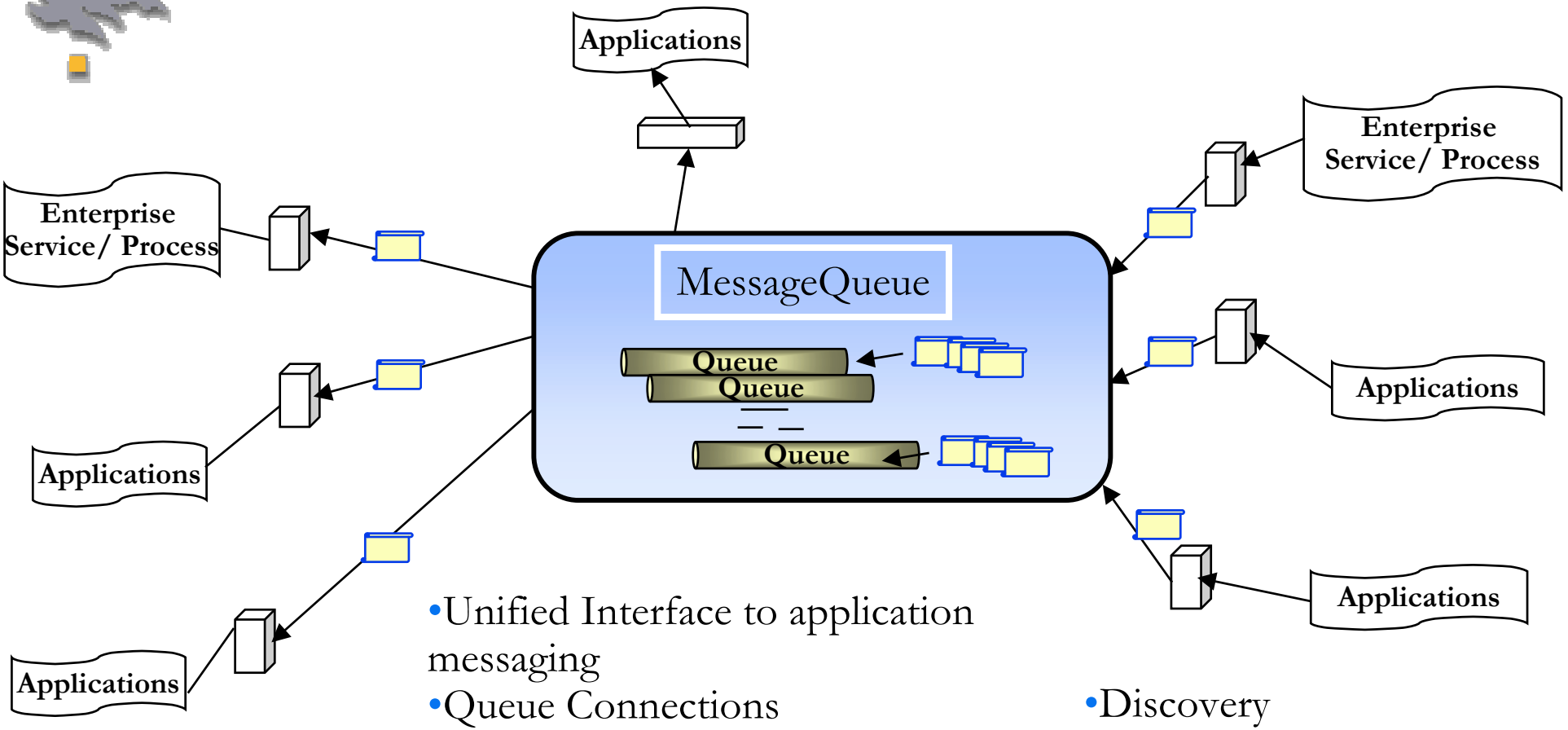


Background & Domain

- Enterprise Application Integration
  - Integration of applications in a manner that the evolution of the application is independent from the integration solution
  - Loosely coupled integration solutions
    - Message oriented Middleware : MOM based systems
    - Web Services technologies
    - Generic Message Object Repositories
  - Enhance the existing integration by adding Gauranteed, persistant and reliable communication infrastructure
  - Management : Provide abilities to control and monitor the integrated applications and processes

MOM : Message-Oriented Middleware



- Unified Interface to application messaging
- Queue Connections
- Establishments of a queue
- Reliable and persistent queues
- Gauranteed deliveries

- Discovery
- Publish
- Subscribe
- Queries
- Notifications
- Message priorities

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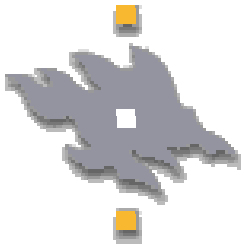
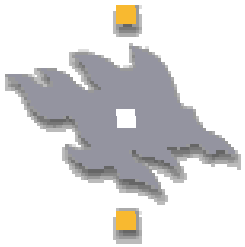


Limitations or short comings of MOMs

- Proprietary protocols
- No standardized over the wire protocols
- Islands of MOM based infrastructures
- Platform specific interfaces and deployments
- Poor scalability
- Single Point of Failures
- Inter-operability with MOM's of alternative vendors
- Security concerns on authentication, encryption not well addressed
- Total dependency on the infrastructure



Other relevant Technologies

- XML Spaces : read, scan, scantake, count, query, AndQuery,write, take
- Java Spaces: A space for Objects (used in Jini)
- Products :
  - Microsoft's MSMQ
  - IBM's Websphere MQ

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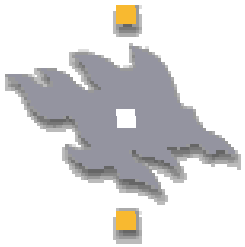
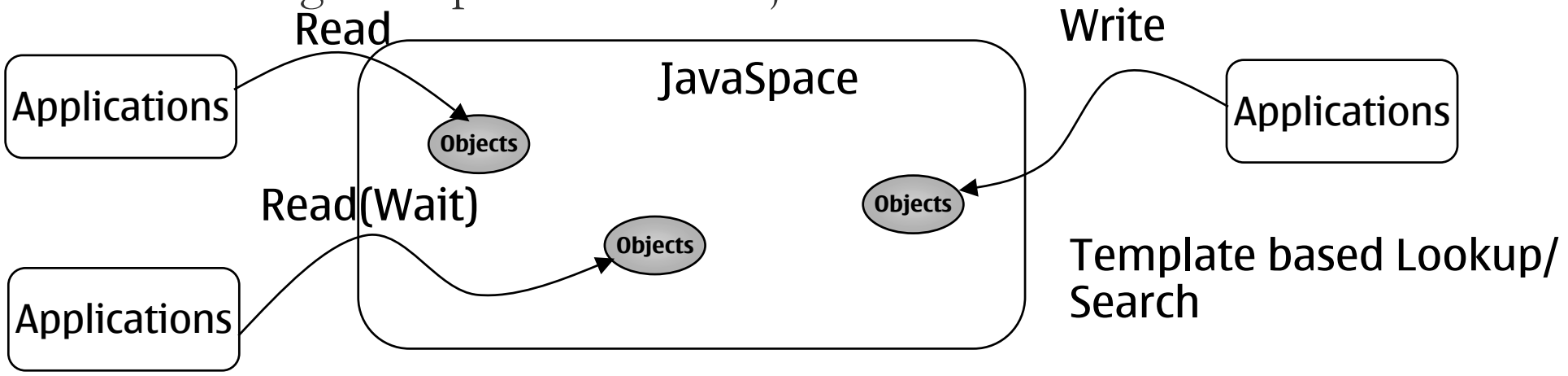
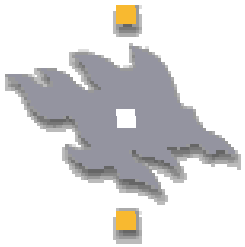


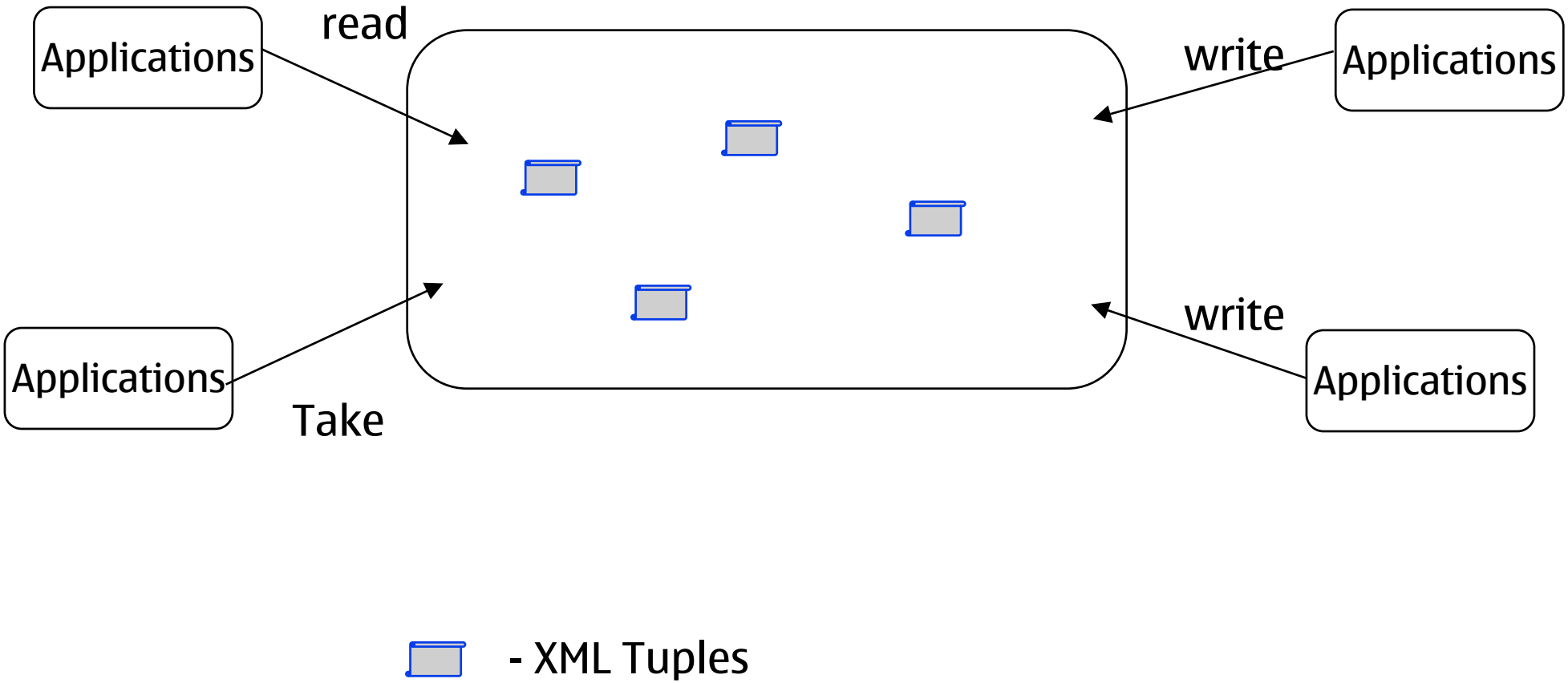
Java Spaces

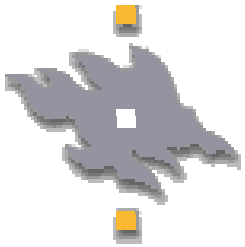
- A *space* is a shared, network-accessible repository for objects.
- Processes use the repository as a persistent object storage and exchange mechanism; instead of communicating directly, they coordinate by exchanging objects through spaces.
- Simple operations to ***write*** new objects into a space, ***take*** objects from a space, or ***read*** (make a copy of) objects in a space
- When taking or reading objects, processes use a simple value-matching lookup to find the objects that matter to them





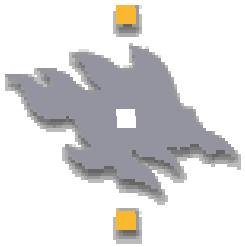
XML Spaces


Applications
read
write
Applications
Applications
Take
write
Applications
- XML Tuples



ESB

- "An Enterprise Service Bus (ESB) is a new architecture that exploits ***Web services, messaging middleware, intelligent routing, and transformation***. ESBs act as a lightweight, ubiquitous integration backbone through which software services and application components flow.“ [Gartner]



What does ESB provide ?

- Communication channel for XML-based message(SOAP) exchanges, often asynchronously
- Standards-based infrastructure utilizes building blocks of the Web Services technology, such as:
  - Secure and reliable messaging,
  - Intelligent routing and intermediaries,
  - Data transforming,
  - Quality-of-Service features.

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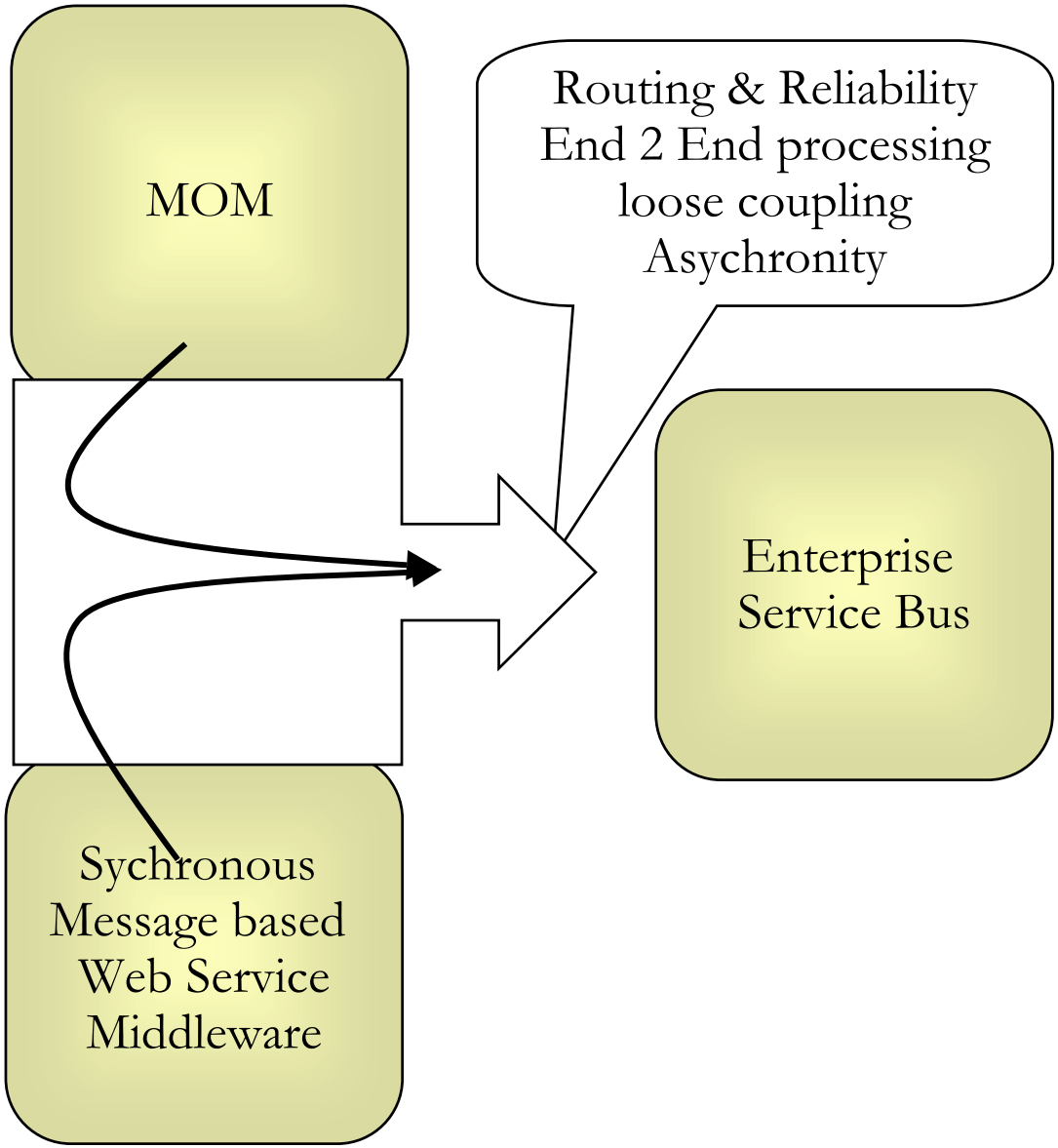
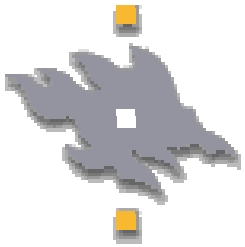
MOM & Web Services -> ESB





ESB Overview

- It is an Asychronous Message based web services communication infrastructure
- ESB assures reliable messaging between services and applications
- Provides means of routing messages across/between services and applications
- Will allow simpler integration of services in a loosely coupled manner by :
  - Deviating from interface to message based infrastructure
  - Utilising standard protocols and architectural components (by leveraging Web Sevices technologies)
  - Allowing higher levels of integrations(organizational processes)
  - Providing open and better management tools for the services

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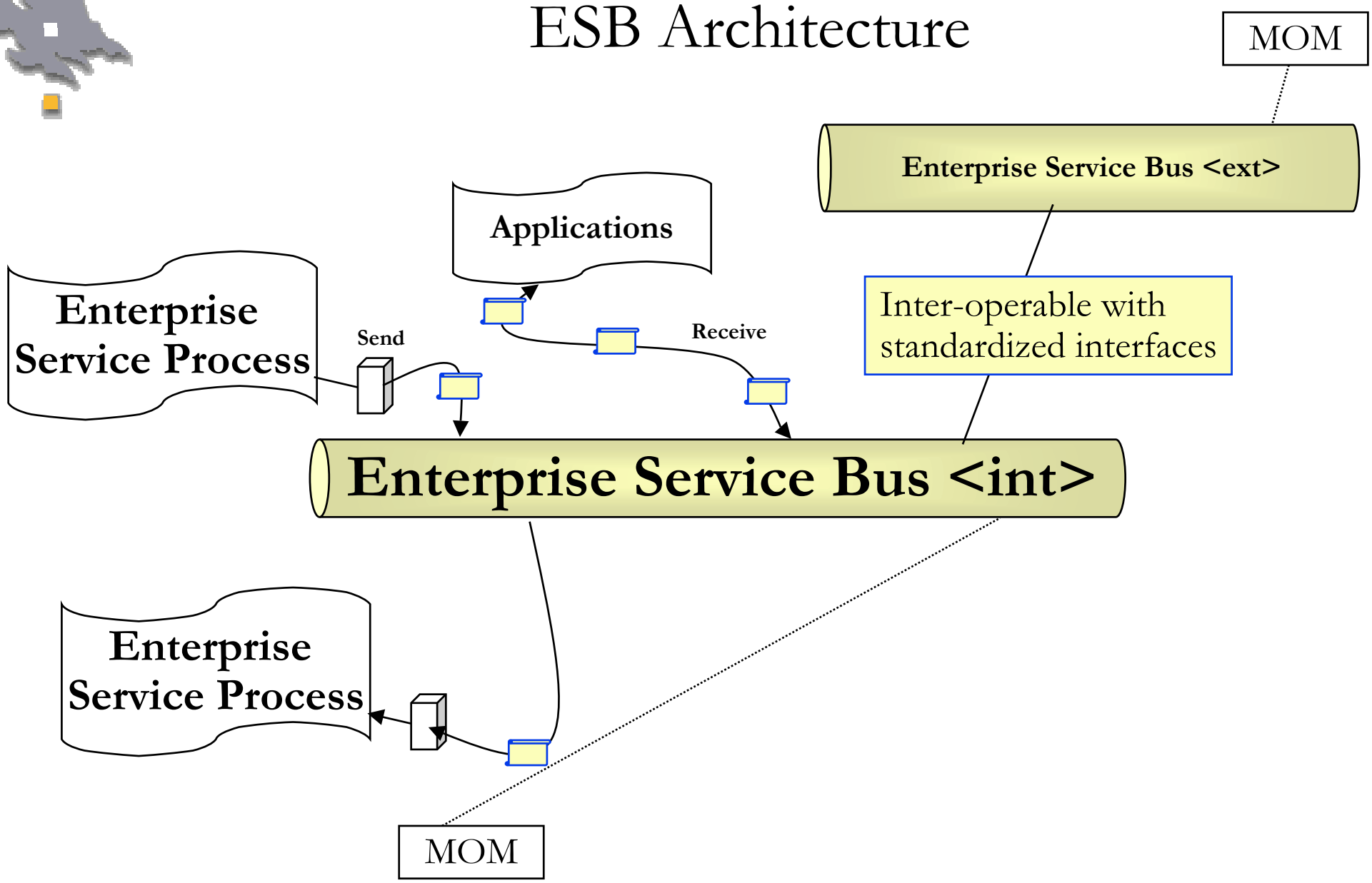
ESB Architecture



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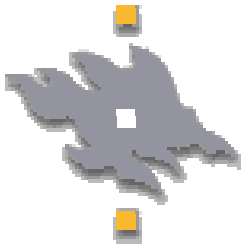

ESB Features

- Addressing Mechanism
- Distributed and a concept of a Virtual Bus infrastructure
- Routing history and tracing
- Monitoring and controlling the flow of execution
- discovery and publishing
- Message persistance and Reliability
- Routing message based on the message semantics

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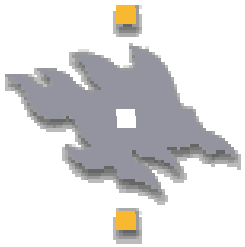
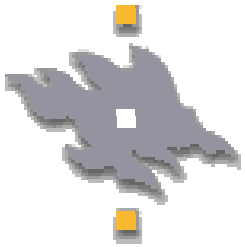


ESB Features

- Shortest route to target destination/s
- Message Adaptation and Manipulation
- Message Delivery QOS : *"delivered at most once," "delivered exactly once," "delivered at least once."*
- Message Transformation and distributed message Processing
- Will introduce new message exchange patterns: Publish, subscribe and notification and as well as content based routing.



Conclusions

- A Long time before this can be realized
- A natural application of web service technologies and architecture towards SOA
- Web Services require an asychronous means of exchanging soap messages and the Bus based means of doing so provides a perfect match for ESB and Web Services
- Standardization will involve compromising existing MOMs and driving towards open integration solutions

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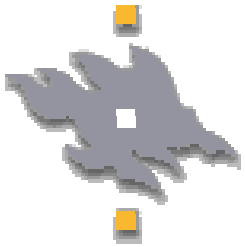

Conclusions

- This whole technology is pretty new and requires lot to crystallize before relalization of it in real industry.
- ESB will realise the Evolution of Point-2-Point EAI into End-2-End messaging based infrastructure
- The mapping and utilization of the current web services technologies into ESB will be good for Reliability, Routing, Subscription, Notifications

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