

**Operating Systems
Fall, 1999
Dr. Dennis Kafura**

Computer Science 5204

Course Overview

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Models of Computing

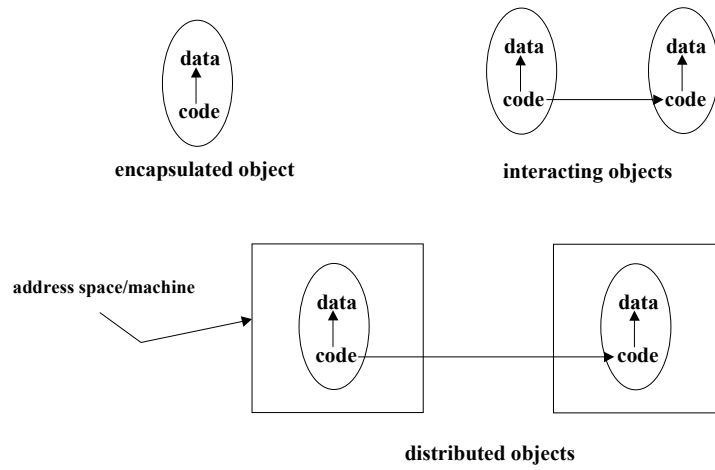
In this course we will study a number of different models that appear in distributed systems:

- object model
- tuple space model
- agent model
- metasystem model
- transaction model

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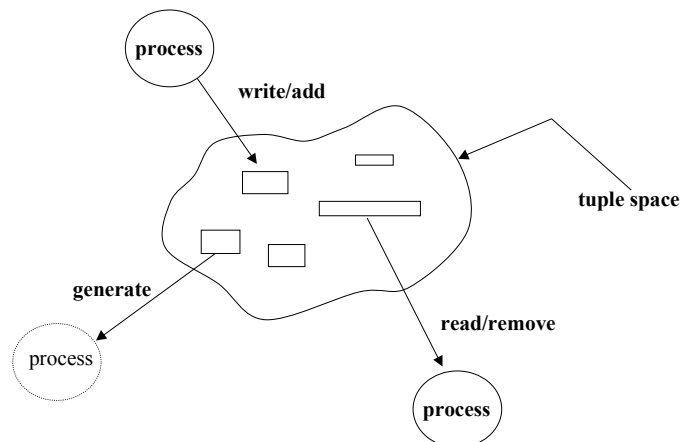
Object Model



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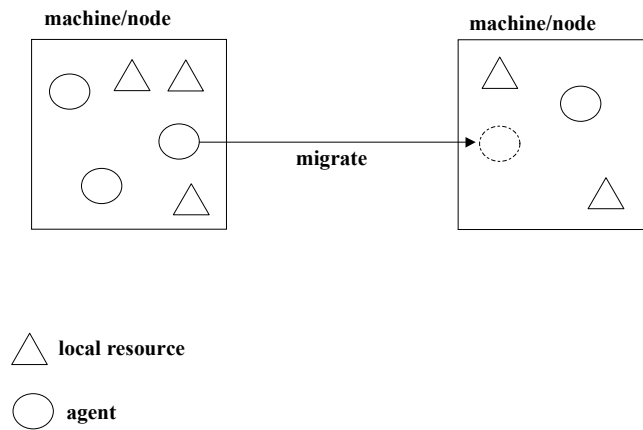
Tuple Space Model



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Agent Model

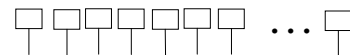


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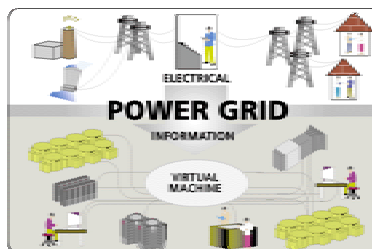
Metasystem model

Cluster:



very high speed, low latency network
(e.g. myrinet)

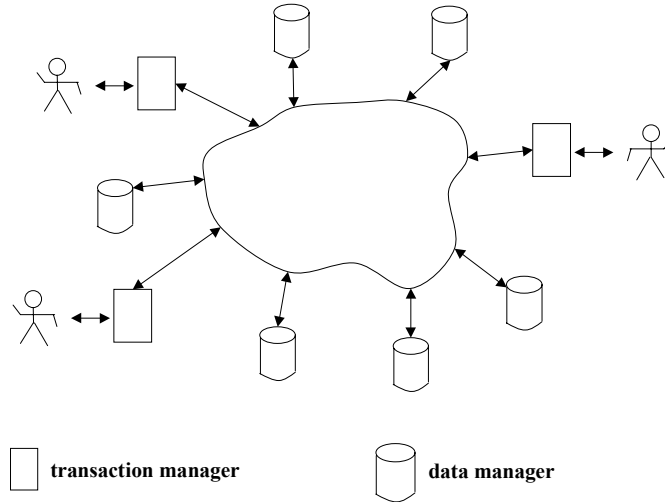
Grid:



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Transaction Model



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Examples of Models

•Fixed computation-transportable data

•Object-based

- CORBA (OMG)
- RMI (Java)
- Com/Dcom (MS)

•Transportable computation-transportable data

•Metasystems

- Globus
- Legion

•Agents

- Voyager
- Aglets

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Major Topics

- Concurrency, Synchronization, Coordination
 - programming languages: Java
 - modeling/analysis languages: CCS
- Distributed Scheduling
- Fault Tolerance/Recovery
- Protection/Security

Concurrency, Synchronization, Coordination

- safety vs. liveness
 - safety: insuring consistency of system
 - liveness: insuring progress of systems activity
- conservative vs. optimistic:
 - conservative: refuse to perform any action unless the system's consistency can be guaranteed
 - optimistic: perform actions with the expectation of their successful completion and be prepared to recovery to a consistent state if they cannot be completed

Forms of Synchronization

- mutual exclusion - preventing concurrent access to shared objects to preserve the consistency of the object
- condition synchronization - blocking attempted operations on a shared object until that object is in a state where the operation will preserve the consistency of the object

Java as a Concurrency Programming Language

- Language:
 - language concepts for threads and synchronization
 - platform independent
- Libraries for basic network programming
 - sockets
 - Remote Method Invocation
- Used to implement distributed systems
 - Aglets
 - Voyager