

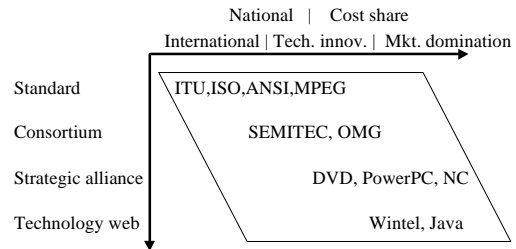
Strategic  
Computing and Communications  
Technology

CS 294, EE 290X, IS 290, BA 296  
Spring 98

## Industry cooperation

by  
David G. Messerschmitt

## Cooperation taxonomy



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## Interoperability and portability

by  
David G. Messerschmitt

## Summary

- Interoperability
- Portability
- Mobility

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## Interoperability

- When products from different vendors work together
- New emphasis because:
  - Popularity of open systems
  - Internet
  - Enterprise and commerce applications

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## Portability

- When software applications run on different platforms
- New emphasis because
  - Internet connects different platforms
  - Enterprise and commerce applications
  - Minimize development/support costs
  - Prevent platform dominance

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## Mobility

- When software components can be dynamically transported to a new platform and executed
- New emphasis:
  - Interactivity with poor connectivity
  - Scalability - move processing to client
  - Interoperability - will explain shortly

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## Approaches to interoperability

- Attempt open industry standard
  - Avoid standards war
- Win a standards war
  - Resulting in a de facto standard
  - Promulgated by alliance or consortium
- Embrace heterogeneity, add middleware
- Automate interoperability

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## Examples of interoperability

- Cooperative standard: MPEG, XML
- Win a standards war: OpenDoc, Java
- Middleware: Distributed Object Management
- Automate: Plug 'n Play, Jini
- Others?

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## Interoperability and network effects

- If you are dominant supplier, try to extend dominance through network effects
  - e.g. Microsoft DCOM, OLE
- If you are not dominant
  - Create an alliance and gang up (e.g. Java)
  - Promulgate a standards effort (e.g. OMG)
  - Destabilize by technical innovation (e.g. Jini)

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## Approaches to portability

- Two issues:
  - Instruction set (can be handled by compiler)
  - API
- Middleware hiding heterogeneity
  - e.g. Java
- Standardized application envelope
  - e.g. browser plug-in

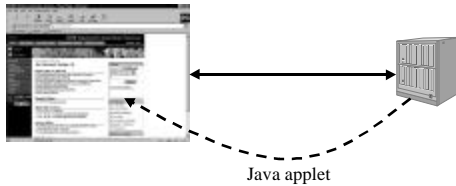
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## Portability and lock-in

- If you own a dominant platform, try to undercut portability
  - e.g. Microsoft's "improved" Java
- If you are not dominant
  - Use lock-in as a marketing tool
  - Create an alliance and gang up (e.g. Java)
  - Promulgate a standards effort (e.g. OpenDoc)
  - Destabilize by technical innovation (e.g. Be)
  - Destabilize by process innovation (e.g. Linux)

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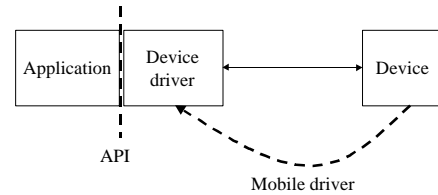
## Mobility and interoperability



Standardization of envelope still required,  
but may be easier than standardizing whole application

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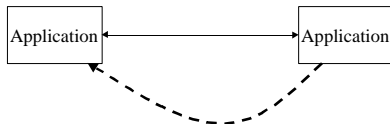
## Mobility and interoperability



Standardization of API is still required, but  
may be easier than device protocol

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## Mobility and peer-to-peer



A way to overcome network effects, which are  
most severe in peer-to-peer architectures  
e.g. fax machine

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## Question

- How should software licensing work with mobile code?

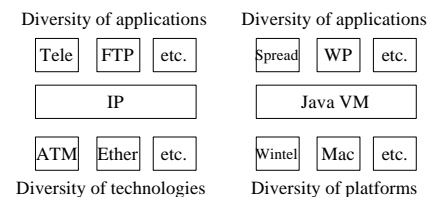
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## Java

- Portability
  - “Write once, run anywhere”
- Programming productivity
  - Garbage collection (no memory leaks)
  - Multi-threaded
- Scalability
  - Move execution cycles
- Interoperability
  - Software components come from common repository

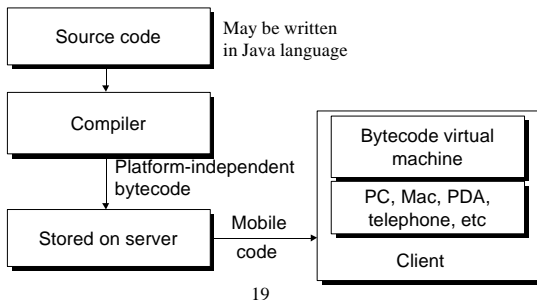
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## Java as spanning layer



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## Java environment



## SUN/Java strategy

- License Java freely, even to rival Microsoft
  - Why?
- License terms give Sun a modicum of control over the “standard”
  - Why?
- How does Sun expect to make money?

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## General Magic

- Followed a proprietary path
  - Technology partners
  - Private agent-based network
  - Proprietary language (Telescript)
- Questions:
  - What went wrong?
  - What lessons did Sun learn that they applied to Java?

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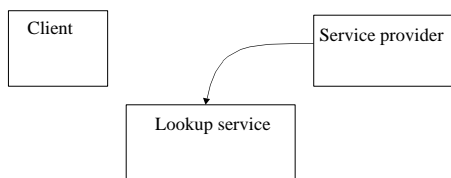
## Jini

- Based on Java environment for mobile code
- Exploits decreasing cost of hardware
- Allows appliances to opportunistically interact over a network without central control
  - or coincidentally a PC
- Typical application: peripherals and information appliances in home network

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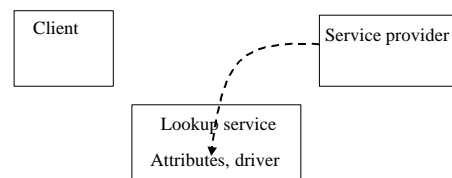
## Jini protocol

1. Service provider finds lookup service on the network



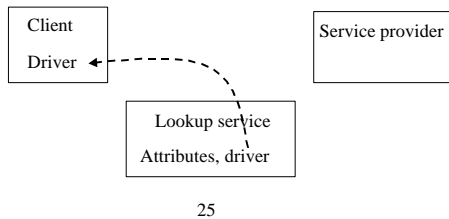
## Jini protocol (con't)

2. Service provider advertises its attributes and also provides a mobile driver



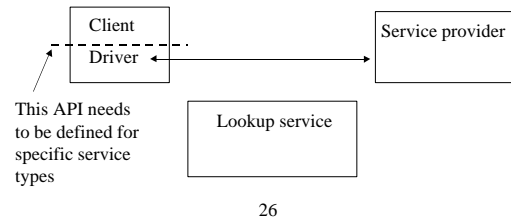
## Jini protocol (con't)

1. Client requests service, and is provided a mobile driver



## Jini protocol (con't)

1. Client interacts with service provider, using the driver as a proxy for that service provider

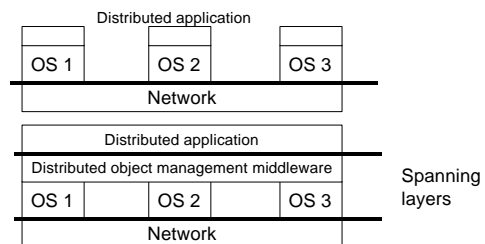


## Promise of CORBA

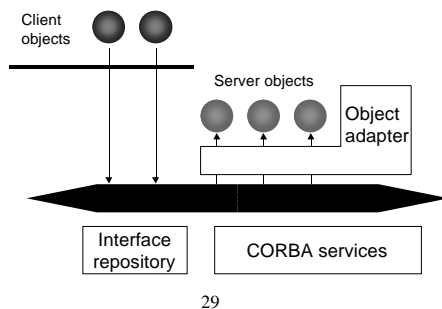
- Interoperability
  - Allows objects on one host to invoke methods of objects on another host
  - Platform, language independent
- No portability
  - ORB vendors not motivated to allow applications/customers to move (desire lock-in to their ORB)

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## CORBA/DCOM



## CORBA 2.0



## Importance of CORBA

- Inter-enterprise computing
  - Platform and language independence
  - Electronic commerce, network management, etc
- Reduction of network effects
  - Another spanning layer
  - Significance of platform reduced

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## CORBA in practice

- Used in coordinated environments
  - e.g. telecommunications network management
- Vision as spanning layer seems to be losing momentum
  - XML becoming popular
  - why?