Service Discovery in Home Environments

KM-/VS-Seminar

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Structure

- Home Environments, Service Discovery
- Jini
- Universal Plug and Play (UPnP)
- Salutation
- Home Audio/Video interoperability (HAVi)
- Summary & Conclusion

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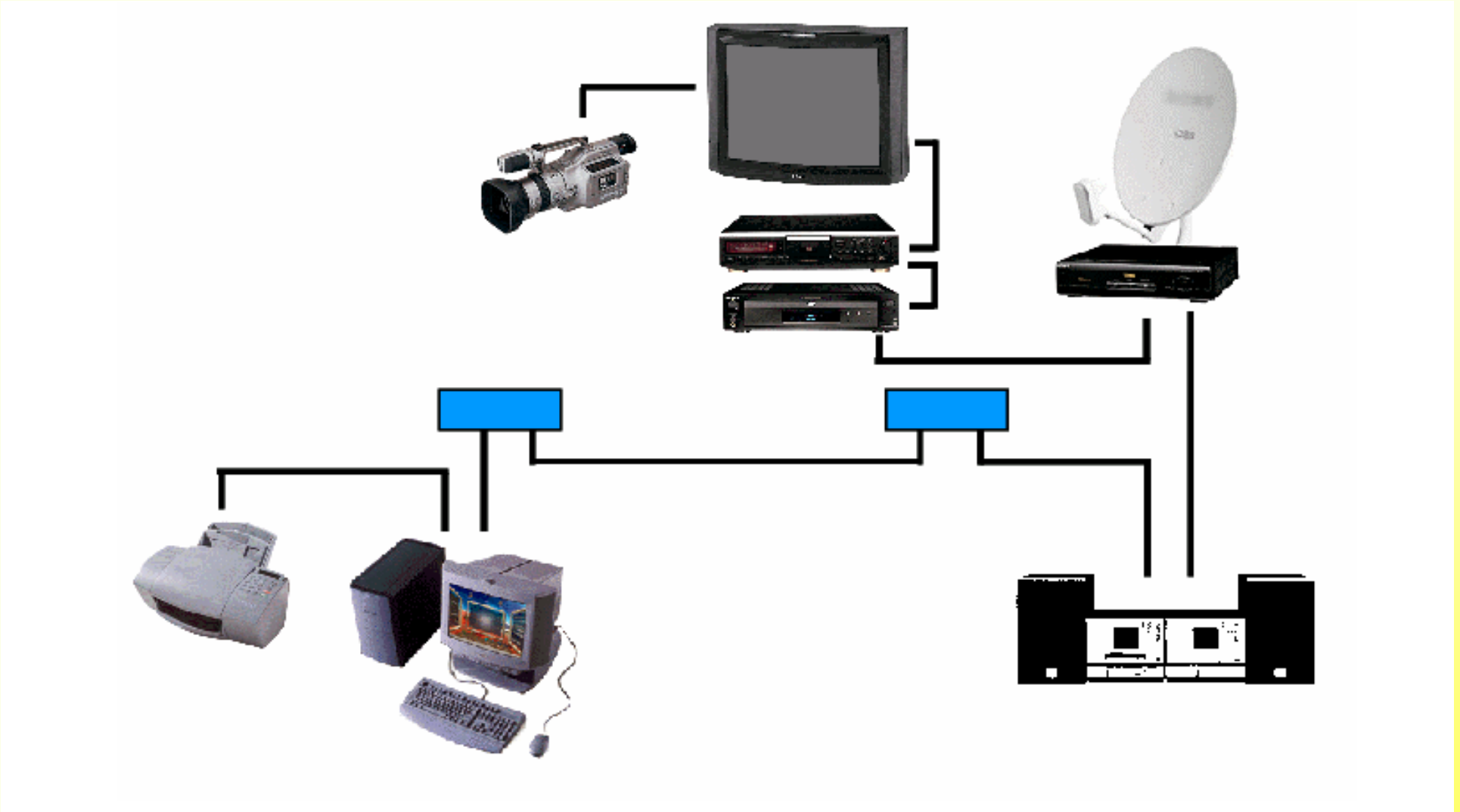
Home Environments



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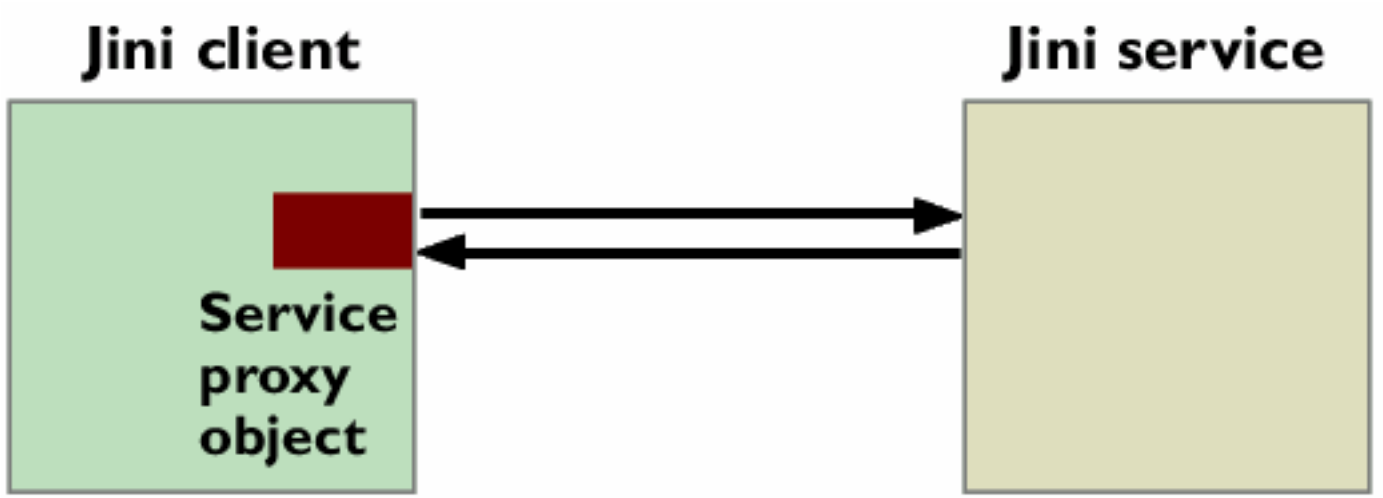
Smart home environment

- Goals of service discovery networks:
  - Network-centric computing instead of disk-centric computing
  - Collection of services and clients instead of applications and peripherals
  - Easy integration and removal of devices
  - Easy communication between devices
- House of future with smart environment
  - Devices help us with daily life
  - User interaction for all sorts of devices from any component with display capabilities from anywhere in the house
  - Digital technology to enhance entertainment experience
  - Remote access of home appliances through the internet

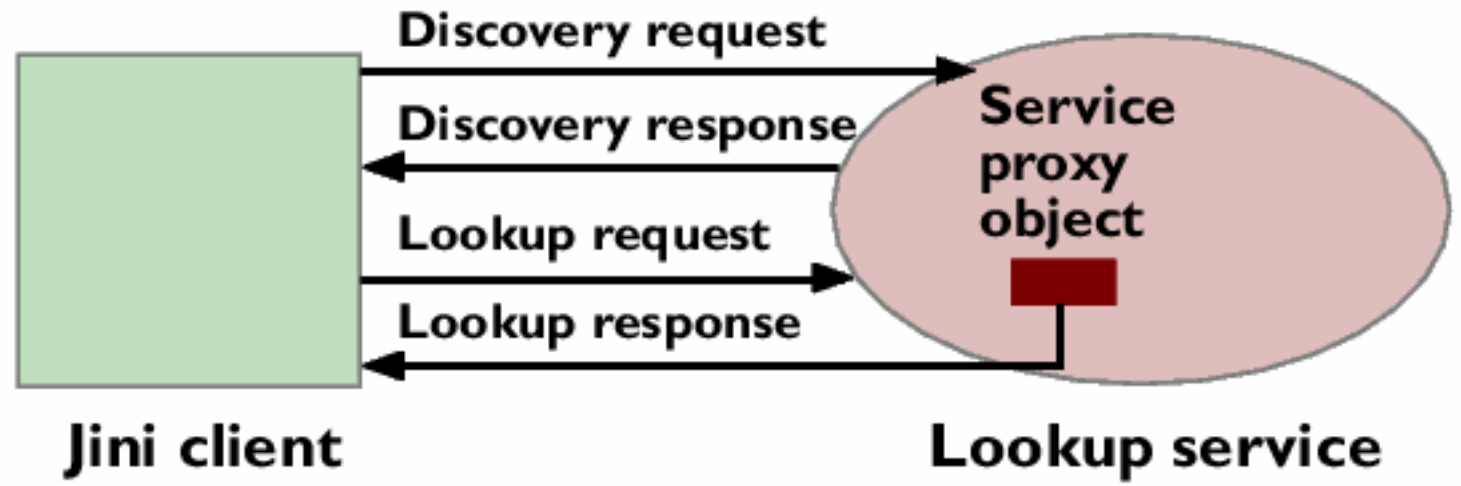
Jini

- Developed by Sun Microsystems
- Open license, but fee for commercial use
- Architecture based on Java
  - Federation of easily pluggable and removable components
  - Low level of administration
  - Avoidance of single points of failure
- Home environments: Useful, but few interfaces for home appliances have been specified

Jini Service Object / Proxy



Jini Lookup Service



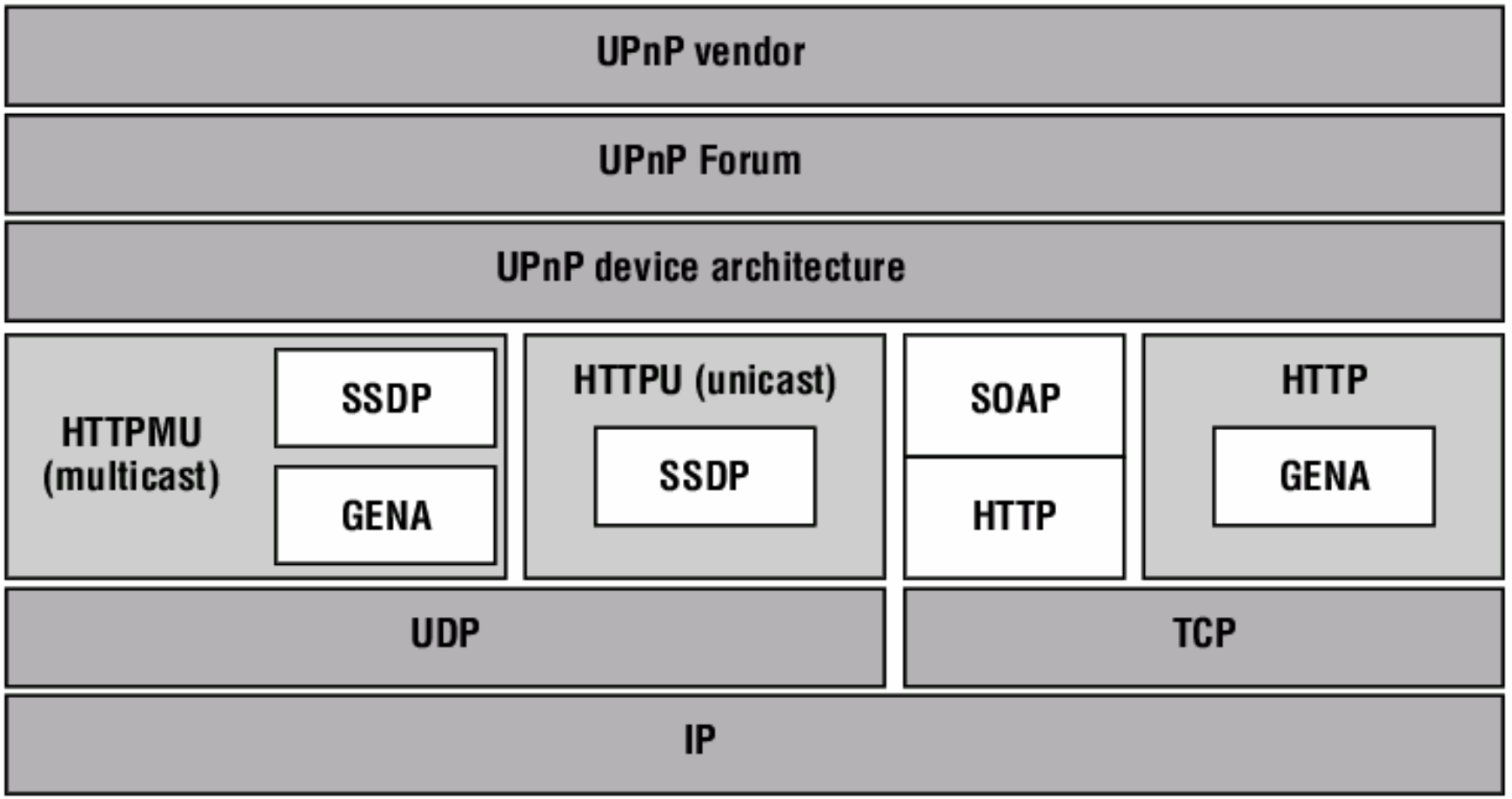
Jini Leasing

- Resource allocation and deallocation throughout the network
- Grant of usage of resource for a limited time
- Examples:
  - Service registration lease
  - Use of memory, disk space or display capabilities of other devices
  - Event subscription
- Advantages:
  - Deactivated services
  - Recover from temporary breakdown of network
  - Cancellation of leases

Universal Plug and Play (UPnP)

- Developed by UPnP Forum, led by Microsoft
- Open source
  - Based on open protocols available almost anywhere
  - OS and language independent
- Targets small to medium size IP networks
  - UPnP included in Windows XP

UPnP protocol stack



UPnP description of services

- Device contains set of services corresponding to functional units
- Description stored in XML file, location given in unicast reply
- List of actions to access service
- List of variables expressing run-time state of service
  - Update messages formatted with GENA
- Description may include Presentation URL
  - Higher level UI at URL
  - Displays status or may allow user to change it

UPnP configuration, AV

- Configuration: DHCP or AutoIP
- Consumer electronics: UPnP AV
  - Set of device and service definitions for devices handling entertainment content
  - Media Server: Has access to entertainment content
  - Media Renderer: Can render such content on local hardware
  - Control Point: Coordinates Servers and Renderers

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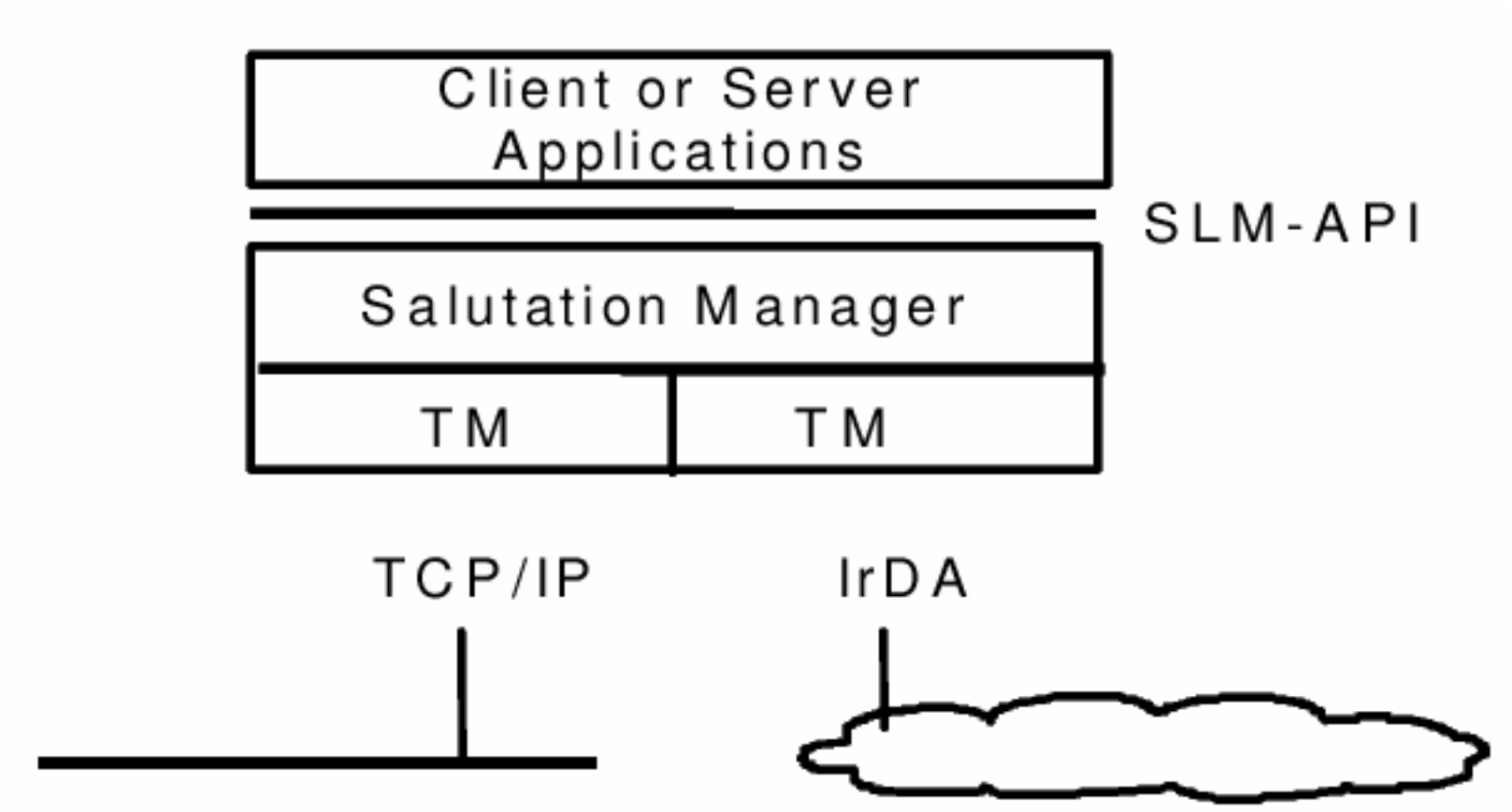
Salutation

- Developed by Salutation Consortium
- Devices available since 1996, but mostly office components
- Support of multiple infrastructures

Salutation architecture



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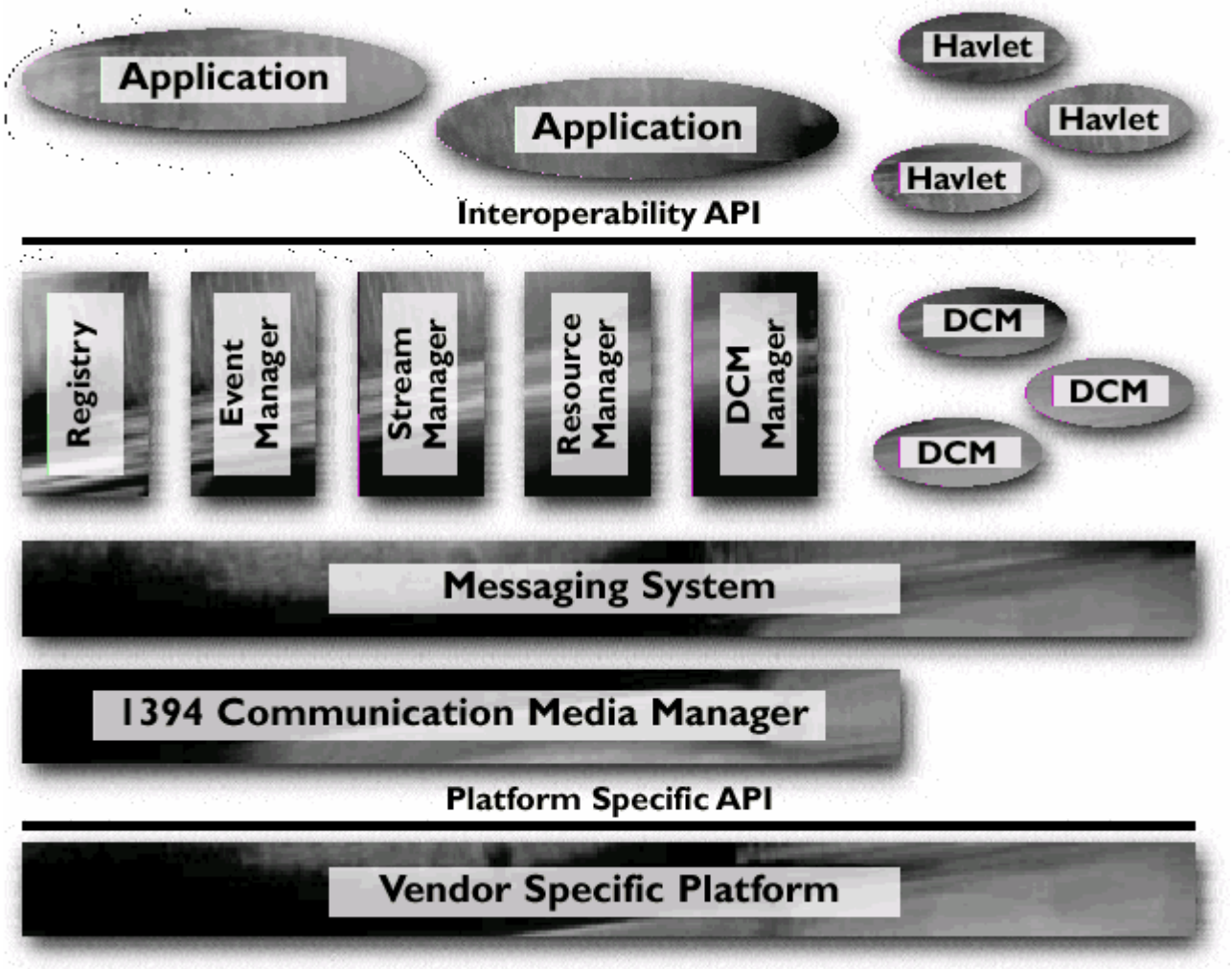
Salutation

- Functional unit: One service of a device
- Three ways of communication for components
  - Native mode
  - Emulated mode
  - Salutation mode
- Salutation Lite: Reduced version of architecture for small devices
  - Suitable for devices with limited storage space, low communication bandwidth and little power consumption

Home Audio/Video interoperability (HAVi)

- Focuses on consumer electronics (CE)
- Developed by HAVi organization, founded by eight well-known CE companies (e.g. Sony, Grundig)
- Networking software specifies protocols to be used by components
- Allows multi-directional audio/video streams and share of resources
- Narrow product range: Easy for vendors to develop interfaces and meet demands of audio and video

HAVi architecture



HAVi configuration

Device Class / Element	FAV	IAV	BAV	LAV
Java Runtime	✔			
Application Module	[✔]	[✔]		
DDI Controller	[✔]	[✔]		
Resource Manager	✔	[✔]		
Stream Manager	✔	[✔]		
DCM Manager	✔	[✔]		
Registry	✔	✔		
Event Manager	✔	✔		
Messaging System	✔	✔		
1394 Communication Media Manager	✔	✔		
SDD data	✔	✔	✔	
DCM	✔	[✔]	✔	✔

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Summary

Feature	Jini	UPnP	Salutation	HAVi
Developer	Sun Microsystems	Microsoft	Salutation Consortium	HAVi Organization
License	open license, but fee for commercial use	open source	open source	open source
Version	1.0	1.0	2.1	1.1
Network transport	TCP/IP	TCP/IP	independent	IEEE 1394
Programming language	Java	independent	independent	independent
OS and platform	independent	independent	independent	independent
Code mobility	yes (Java RMI)	no	no	yes
Srv attributes searchable	yes	no	yes	yes
Central cache repository	optional	no	optional	no
Operation w/o directory	Lookup Table required	-	yes	Registry required
Leasing concept	yes	yes	no	yes
Security	Java based	IP dependent	authentication	access levels, signatures

Conclusion

- Most service discovery solutions still in developmental stage
  - Product availability
  - Mobile devices
- Interconnecting bridges between architectures

- Thank you for your attention
- Questions & Discussion