

SERVICE DISCOVERY, WIRELESS ENTERPRISE, AND VIRTUAL AND CLOUD NETWORKS

Lesson 01 Service Discovery

SERVICE DISCOVERY

- An adaptable middleware in a device (or mobile computing system) that dynamically discovers services
 1. Bluetooth Service discovery protocol
 2. JINI

SERVICE DISCOVERY

3. SLP (service location protocol)

4. UPnP (Universal Plug and Play) service discovery

STEPS FOR SERVICE DISCOVERY

1. Lets nearby service network (or device or system) recognize that device
2. Lets the nearby network know of device service(s)
3. Searches and discovers a new service(s) at the network
4. Interacting with nearby network using discovered service(s)

SELF-ADMINISTRATION

- Software for starting the operating system
- Allocating network and system access addresses
- Initiating accesses

SELF-ADMINISTRATION

- Establishing and terminating the connections
- Making secure connections by the provisions by a system on its own without using network administration software when connecting to a network

SERVICE DISCOVERY MIDDLEWARE

- Features of self-healing and self-configuring

SELF CONFIGURATION

- Means establishing and modifying the route information for the connections by a system on its own

SELF-HEALING NETWORK

- Means that the network can establish an alternative route when a connection or enroute node breaks
- The discovery of the neighbouring devices and server and interactions done without administering the device

JINI ENABLED PRINTER

- When placed close to the camera, the latter discovers the former and starts interacting with it
- Prints the selected pictures

USING BLUETOOTH SELF DISCOVERY PROTOCOL (SDP)

- Enable camera placed near a Bluetooth enabled PC discovers that the PC is Bluetooth enabled
- The camera exchanges information with the PC, which downloads the pictures or video clips onto it

BLUETOOTH ENABLED PC DISCOVERING WIFI LAN

- Downloads MP3 files from the broadband Internet

SERVICE DISCOVERY IN IPOD

- When placed near it, the PC transfers the media files to iPod
- The user can now listen to selected music when mobile
- The iPod can also download photo albums and iTunes form the PC or network

JINI

1. Sun Microsystems open architecture network technology
2. Sun responsibility now transferred to Apache
3. Enables the programming for the distributed environment, for example, mobile devices and server, and for developing modular and cooperating services as it enables the download of classes for the service components.

JINI

- Provisions for not only service discovery but also for the lookup for the databases,
- RMIs (remote method invocations),
- Joining (binding) of APIs, and
- Programs of a device with those of other devices discovered using the lookups

JINI CORE SERVICES

Jini core protocols for the service discovery, join, and lookup

Core Services:

- Lookup for databases of all devices and their services to make available the service of a newly connected device to all other devices. The device querying is by using attribute and value pair. Lookup protocol at client searches service by database lookup using discovery protocol.
- Remote Method Invocation (RMI) to enable invocation (calling) of objects at the other devices for collaborative and distributed computing.
- Discovery to enable a device to become a part of Jini system by using a discovery protocol. Discovery protocol uses lookup service to register the new device.
- Discovery provides a service object to lookup service to join the service. Joining to the lookup service enables not only uploading of descriptions by a client device, but also the Java classes, and downloading of the other device descriptions. Java classes enable use of other device services. Join enables the interaction of API and programs of a device with those of other devices.

JINI JAVASPACE TECHNOLOGY

- A simple and powerful high-level tool —
Used for programming collaborative and distributed applications
- Share network-based object space(s)

JINI JAVASPACES TECHNOLOGY

OBJECT SPACE

- Associates memory for the distributed objects on the network
- Used both for object storage and as exchange area
- Communicating nodes use the space indirectly
- It creates a simple API for use by source and destination nodes

JINI

- Also includes extensible remote invocation (JINI ERI)
- Enables programming and dynamic computing in a device and provides a platform to create adaptable, scalable, evolvable, and flexible network-centric services

JINI

- Highly adaptive to changes in software and hardware
- Provides spontaneous interactions between devices and network
- A discovery protocol may or may not provide the facility of device querying but JINI makes it possible using the pairs

SERVICE LOCATION PROTOCOL (SLP)

- Enable client device dynamically discover a service
- SLP stack— consists of SLP header and SLP service URL (universal resource locator)
- A URL is a universally accepted unique identifier for resource and thus a location
- SLP URL enables other devices to use the service of the client device

SERVICE LOCATION PROTOCOL (SLP)

- SLP URL provides the location of the device in the network
- SLP advertises its service needs in multicast mode and does not use directory service

MULTICAST TRANSMISSION USING SLP

- Multiple nodes get to a service directory, service catalogue or service database/descriptions
- Client uses a multicast message to discover a service

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SLP

- An alternative to lookup service database in JINI or a service catalogue
- It provides Java classes (program codes) to a client device

SLP DIFFERENCES FROM JINI

- SLP just provides the lookup for the URLs and description of other devices during discovery phase
- Does not provide for database lookup, join, and spaces as JINI

DESCRIPTION

- Specifies a service
- Device textual description at a lookup database service or service catalogue enables a new device to use a service of a specific device

DESCRIPTION

- It is uploaded at the database when a new device joins a network and is downloaded to the new device to let the device discover the services
- It can be in XML

UNICASTING SERVICE DISCOVERY

- Unicast using TCP/IP or any other SDP means that the service discovery is directly by connecting to the lookup service (database/descriptions)
- Each device as well as lookup service has a URL
- These interact through unicasting

MULTICASTING SERVICE DISCOVERY

- Means service discovery by a broadcast of the descriptions of the service to a group of devices
- The directory, service catalogue or service database/descriptions multicast and enables service discovery

MULTICASTING SERVICE DISCOVERY

- Each device can use a multicast message to discover a service
- Multicast permits dynamic service discovery
- A device receiving a multicast message for a new service uses it to discover that new service

ADVERTISEMENT FOR SERVICE DISCOVERY

- Means a device need not discover a service
- A new device establishing a connection to a network advertises its services
- A device disconnecting from the network advertises its disconnection
- In this way, each device maintains the database or descriptions of the services presently available

UNIVERSAL PLUG AND PLAY (UPNP)

- A Microsoft solution for service discovery
- For service and device descriptions
- For use of control points
- For Control for registering the subscription events and withdrawal after subscribed interval
- For Presentation and event notifications (called venting)

UPNP CORE PROTOCOLS FOR THE SERVICE DISCOVERY, DESCRIPTION, CONTROL, AND EVENTING

UPnP core protocols for the service discovery, description, control, and eventing

Core Services:

- Control point(s) is a registry for any device establishing connection with the network and deregistering the device disconnecting the network.
- Discovery is by new device multicasting messages using SSDP, which uses control point(s) service to register and save device service descriptions for the new device.
- Device sends description when registering its service.
- Eventing advertises the changes in the state or parameters of a device. The control point(s) register these changes (events).
- Control point also registers the events of subscription and withdrawal of time limit (duration) of subscription.
- Interaction between the devices is by peer-to-peer architecture.

CONTROL POINT— A REGISTRY

- For any device establishing connection with the network or disconnecting from the network
- Provides descriptions and URLs of all devices presently connected to the network and makes available the service of a newly connected device to all other devices

CONTROL POINT— A REGISTRY

- Does not allow device querying
- Provides only descriptions of device service

NOT A PART OF UPNP—

- **Discovered Device providing the APIs**
For querying, downloading and uploading of classes
- A device itself need programming for dynamic computing and adaptability using the descriptions and URLs provided by the control point(s)

SUMMARY

- Service discovery
- Service discovery self-administered, self-configured and self-healing
- Bluetooth SDP
- SLP
- Unicasting, multicasting and advertisement for service discovery

... SUMMARY

- JINI
- Provisions for the lookup for the databases
- RMIs, Joining (binding) of APIs and Spaces

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... SUMMARY

- UpnP
- UpnP Provides descriptions and URLs of all devices presently connected to the network
- Does not provide for for querying
- Downloading and uploading of classes

End of Lesson 05

Service Discovery