## SERVICE DISCOVERY, WIRELESS ENTERPRISE, AND VIRTUAL AND CLOUD NETWORKS

# Lesson 01 Service Discovery

© Oxford University Press 2018. All rights reserved.

#### **SERVICE DISCOVERY**

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

#### **SERVICE DISCOVERY**

3. SLP (service location protocol)4. UPnP (Universal Plug and Play) service discovery

## **STEPS FOR SERVICE DISCOVERY**

- Lets nearby service network (or device or system) recognize that device
- 2. Lets the nearby network know of device service(s)
- Searches and discovers a new service(s) at the network
- 4. Interacting with nearby network using discovered service(s)
  © Oxford University Press 2018. All rights reserved.

# **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 selfconfiguring

## **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

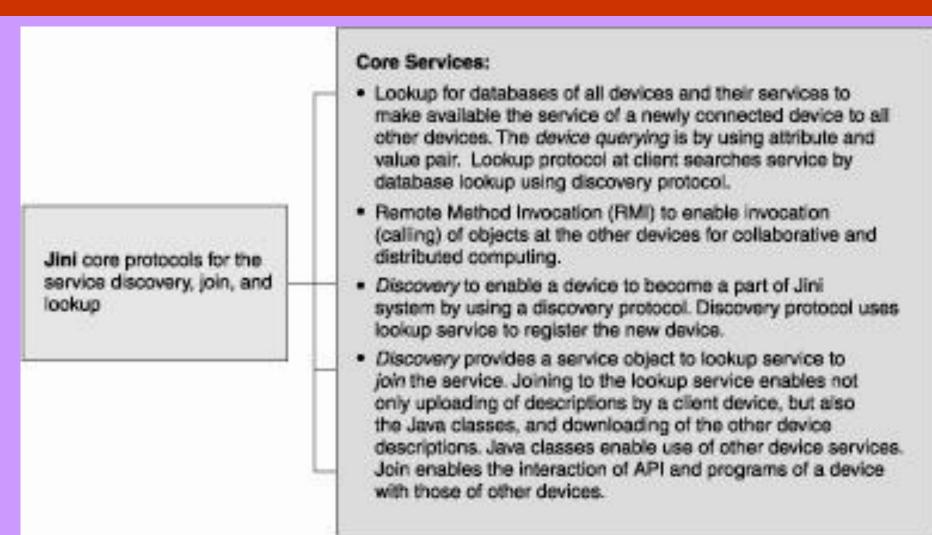
- 1. Sun Microsystems open architecture network technology
- 2. Sun responsibility now transferred to Apache
- 3. Enables the programming for the distributed environment, for example, mobile devices and server, and for developing modular and cooperating services as it enables the download of classes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

© Oxford University Press 2018. All rights reserved.

# 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 JAVASPACES 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
   © Oxford University Press 2018. All rights reserved.

# 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

# 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



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

# **SLP DIFFFERENCES 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**

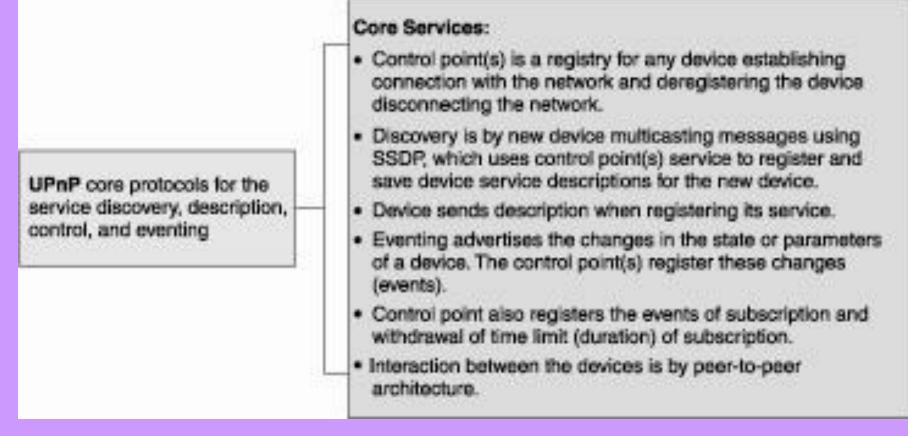
- Means a device need not discover a service
- A new device establishing a connection to a network advertises its services
- A device disconnecting from the network advertises its disconnection
- In this way, each device maintains the database or descriptions of the services presently available

# 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) © Oxford University Press 2018. All rights reserved.

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

#### **EVENTING**



# **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

© Oxford University Press 2018. All rights reserved.

# **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, selfconfigured and self-healing
- Bluetooth SDP
- SLP
- Unicasting, multicasting and advertisement for service discovery

© Oxford University Press 2018. All rights reserved.



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

© Oxford University Press 2018. All rights reserved.



- 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

© Oxford University Press 2018. All rights reserved.