

Emerging Research Opportunities in Ubiquitous Service Discovery

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Overview

- Mobile computing opportunities
- Service discovery
 - Local
 - Wide
- Ubiquitous service discovery
- The USD platform
- A USD application example
- Summary
 - USD challenges

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Mobile Computing Opportunities

- Mobile devices multiply the opportunities to utilize services
 - Creates entirely new service market segments
 - Enhances user experience with existing services
 - Point of sale
 - Diagnostic: car phone calls service center
- Service offerings change dynamically
 - Beneficial to client and service owner
 - Opportunities exist for
 - Service owners/providers
 - Network providers
 - Infrastructure builders
 - Clients

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Service Discovery

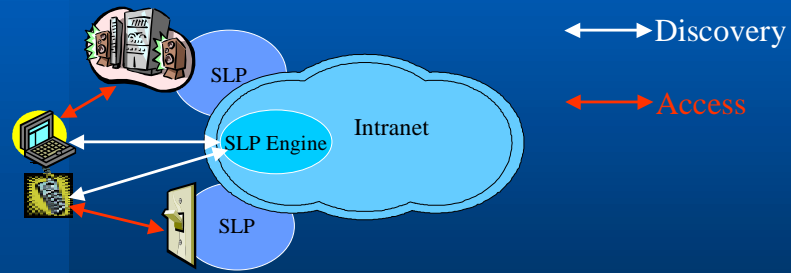
- What's service?
 - Any entity (HW/SW) that can perform an action for the benefit of another entity
- Service Discovery
 - A process of learning about services
 - Examples:
 - Cooltown
 - Jini
 - Salutation
 - SLP
 - UPnP
 - ...

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A Typical Use Case

- Controlling a light switch/stereo



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A Service Discovery Process

- To manage ever increasing number of services, information about services typically resides in a **service directory**
- Registration
 - A process by which a service registers its attributes in a service directory
- Query
 - A process by which an entity inquiries about services
- The registration and query processes may occur independently of each other (e.g., using different protocols)

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Local Area Service Discovery

- Local area service discovery:
 - Number of (logical) service directories = 1
 - For purposes of efficiency, local area systems typically exist within a small geographical area
- State of the art systems support local area discovery exclusively with very few exceptions

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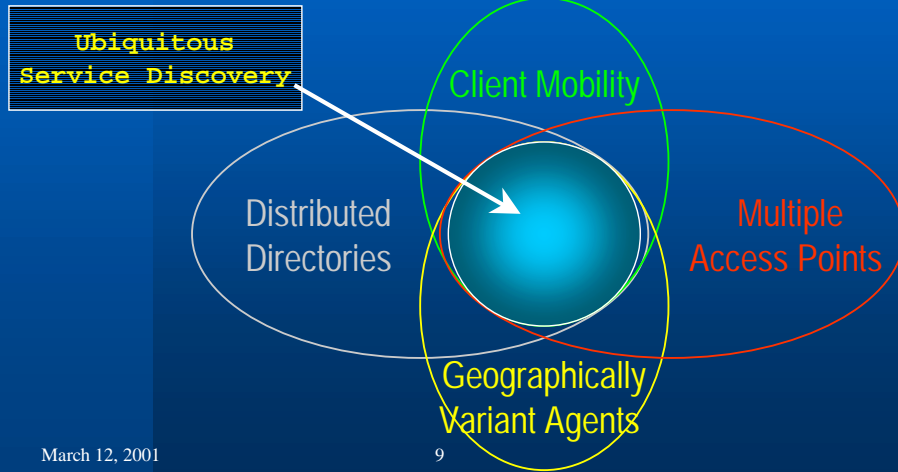
Wide Area Service Discovery

- Wide area service discovery:
 - Number of (logical) service directories > 1
- In practice wide area systems address some of the following issues:
 - Client Mobility
 - Large Scale Distributed Directories
 - Multiple Access Points
 - Geographically Variant Agents

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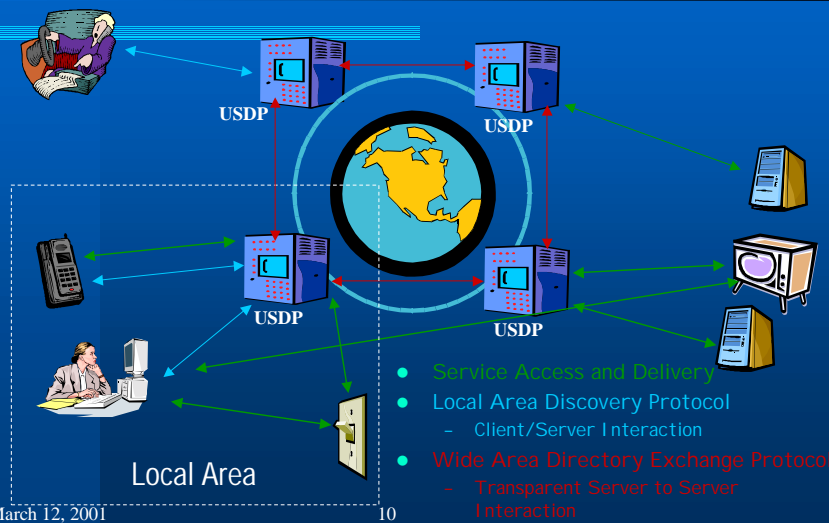
Ubiquitous Service Discovery



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A USDP Use Case



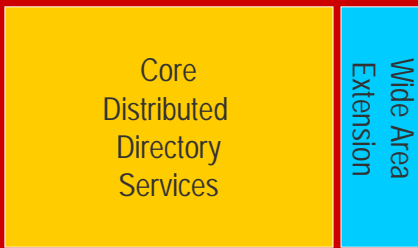
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USDP System Overview

value-added services

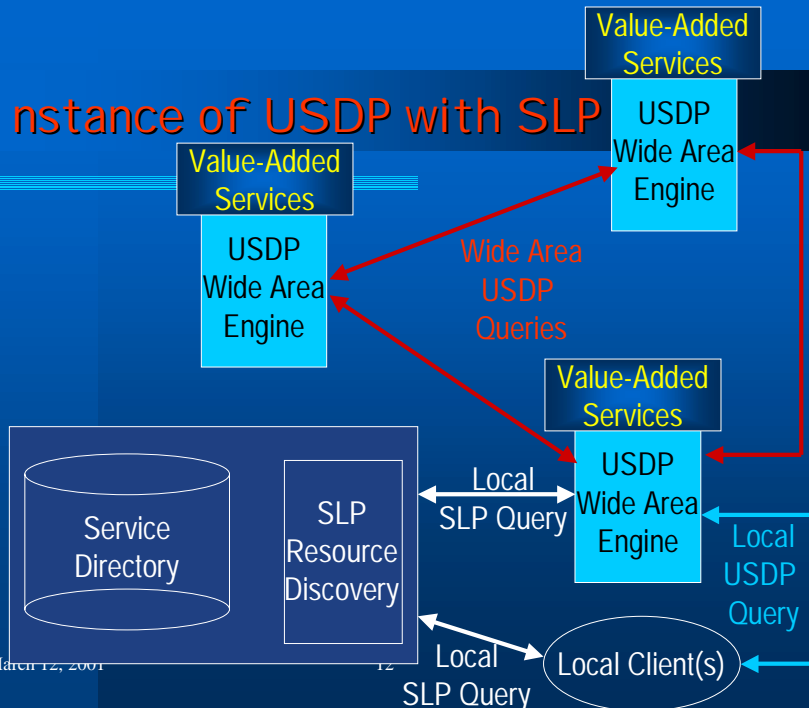
Customization Service Composition Security



USDP

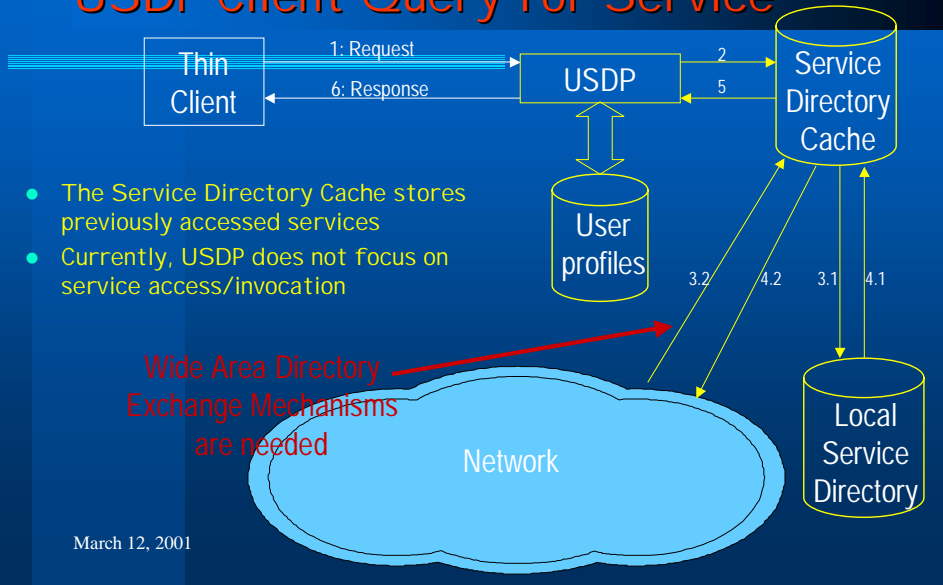
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Instance of USDP with SLP



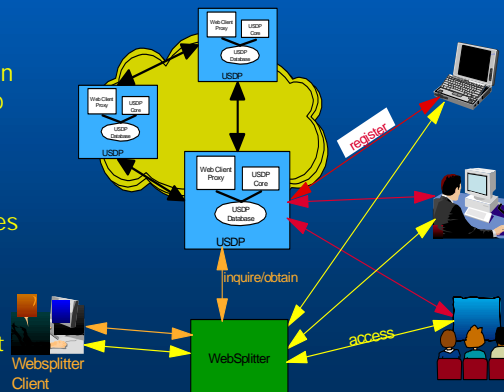
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USDP Client Query for Service



USDP Application Example: WebSplitter

- USDP facilitates applications that require access to dynamically updated and customizable (personalized) data
- WebSplitter creates a framework for collaboration of devices in rendering web content
- Provides web content adaptation and distribution based on devices capabilities and user preferences
- With USDP
 - cooperates with USDP in locating legitimate content players



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USDP challenges

- Need to address challenges of distributed systems
- Associate physical topology with network topology
- Security, topology/routing, performance
- Formalize customization and environmental awareness
 - user profile, customizable policies (event triggering), ...
- Network of USDP servers
 - USDP servers need ability to inquire and obtain service from remote servers for local clients

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Summary

- USDP Facilitates Wide Area Service Discovery
- USDP provides value-added services to Service Discovery:
 - Customization
 - Service Composition
 - Security

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USDP: A Value-Added Ubiquitous Service Discovery Platform

- USDP is a management platform that brings heterogeneous clients and service providers together
 - Services register availability to provide service
 - Allows for clients locate desired services
 - log-on to "http://www.usdp.com"
- Provides value-added service discovery
 - enhances service discovery with personalization & customization of services access opportunities

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USDP Design Points

- Servers comprise a USDP network
- Local services register with local servers
- Thin Client Support
- Client access
 - Provide web access with remote service execution
 - Web is the de-facto standard user interface
 - Provide network APIs to allow for programs to access services
- Clients inquire for service at local server
 - Based on inquiry attributes, the discovery process will resolve locally or systematically expand to additional servers

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