Interworking 04

Service Discovery in Mobile Networks

by a combination of UDDI and LDAP

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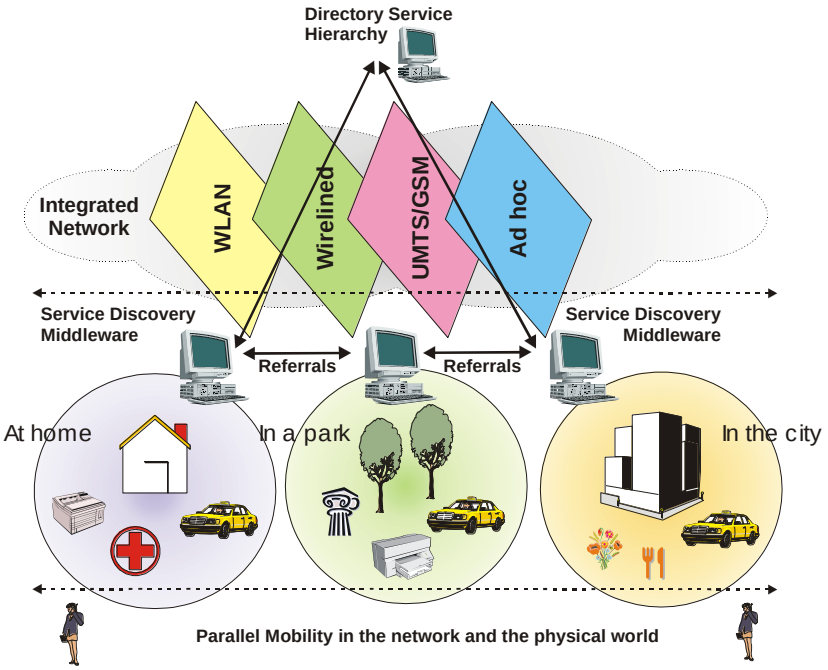
Consultancy & Internet Technologies

Background of the DECOIT GmbH

- Founded at 01. January 2001
- Focus of the company: adaptation of academically approaches for own commercial products and solutions
- Different business areas:
  - System Management to introduce high quality products or stable open source software (OSS) solutions on the customer side
  - Software Development to develop own niche products and innovative own solutions
  - Consultancy as basis for each project and find new technology trends of the market
- Four years after foundation the DECOIT GmbH is a full service supplier
- Residence at the University of Bremen, Germany
- Close partnerships to vendors, resellers, universities, and consulting companies

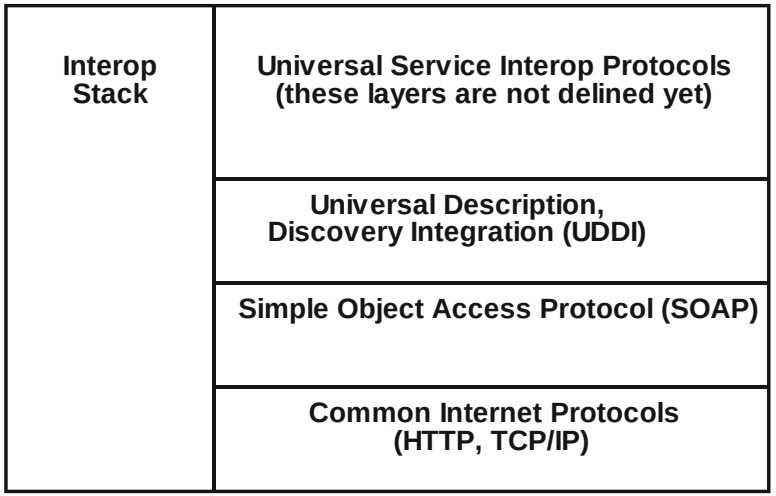
Introduction

- The increasing number of nomadic users will create a trend towards networking technologies that support mobility
- Although wireless networks have already become commonplace and continuously expand their area of application with new technologies, like wireless LAN, wire-line networks as backbones or broadband bearer technologies
- Therefore you need automatic discovery mechanisms to get the network connection and find the available services on this network
- There is a need for service discovery which works independent from the underlying infrastructure



Web Services

- Web services enabling transparent application to application or machine to machine communication on the World Wide Web (WWW)
- Web services are an attempt at making programmable application logic accessible using standard Internet protocols
- Web services in this sense combine component-based development and Web technologies
- Web services can be implemented on any platform in any programming language, as long as they can create and consume the messages defined for the Web service interface
- Additionally, mobile access of such Web services offer new possibilities to interact between user and network related new contexts and information



Service Discovery

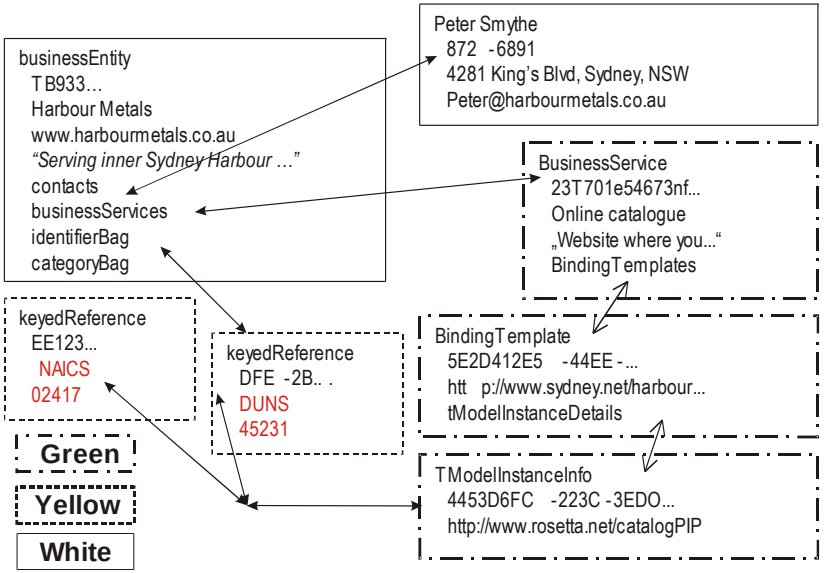
- Why is there a need for Service Discovery?
  - Service definition not only includes what the service should do but also who is entitled to use it (security reasons)
  - Creation and deployment are the means by which a service is produced and put to work
  - Announcement and discovery describes the techniques employed to inform users of the existence and availability of a service
  - Service management describes the various ways a service or resource can be defined, created, deployed, announced, discovered, delivered and consumed

Protocol Approaches

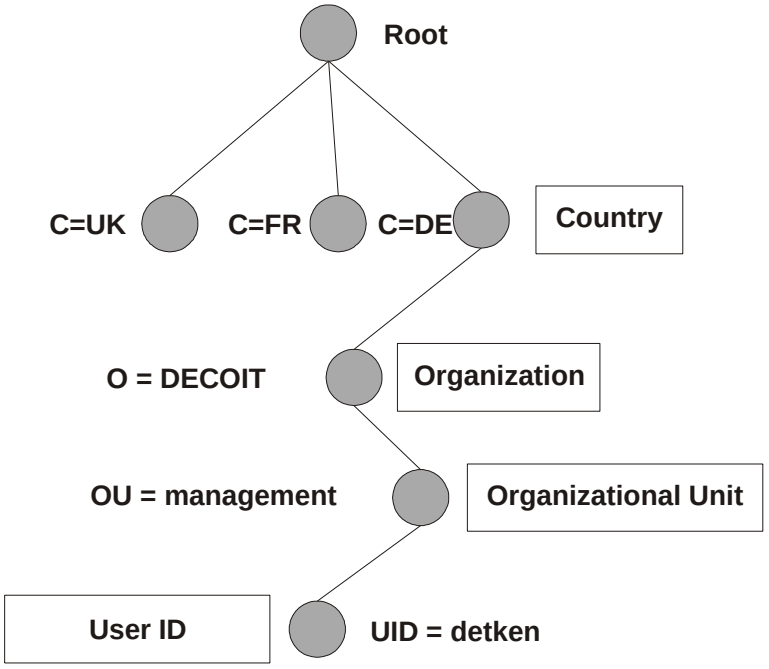
- **Service Location Protocol (SLP):** provides a framework to allow networking applications to discover the existence, location, and configuration of networked services in enterprise networks
- **Lightweight Directory Access Protocol (LDAP):** is a directory access protocol based on the X.500 schema, the original design for a directory service
- **Universal Description, Discovery and Integration (UDDI):** provides functionality necessary in order to describe services, discover desired services, and integrate services into service packages
- **Web Service Description Language (WSDL):** defines an XML grammar for describing network services as collections of communication endpoints capable of exchanging messages
- **Simple Object Access Protocol (SOAP):** operates over HTTP implementing remote procedure calls in XML

Universal Description, Discovery and Integration (UDDI)

- UDDI specifically focuses on functionality for the deployment and discovery of Web services
- The concept behind UDDI is based on a distributed registry of service descriptions described with the help of a common XML format
- A common analogy used for UDDI is a "phone book for Web services"
- It contains names, mailing addresses, contacts, contact phone numbers, Web services offered, addresses of Web services (i.e. URLs), meta-data describing the "interfaces" of Web services, etc.
- The UDDI registry is a logically centralised, physically distributed database with multiple root nodes that replicate data with each other on a regular basis



Lightweight Directory Access Protocol (LDAP)



- The LDAP information model is based on entries
- An entry is a collection of attributes that has a globally-unique Distinguished Name (DN)
- The DN is used to refer to the entry unambiguously
- Each of the entry's attributes has a type and one or more values
- The types are typically short strings, like “cn” for common name, or “mail” for an e-mail address. The syntax of values depend on the attribute type
- Directory entries are arranged in a hierarchical tree-like structure

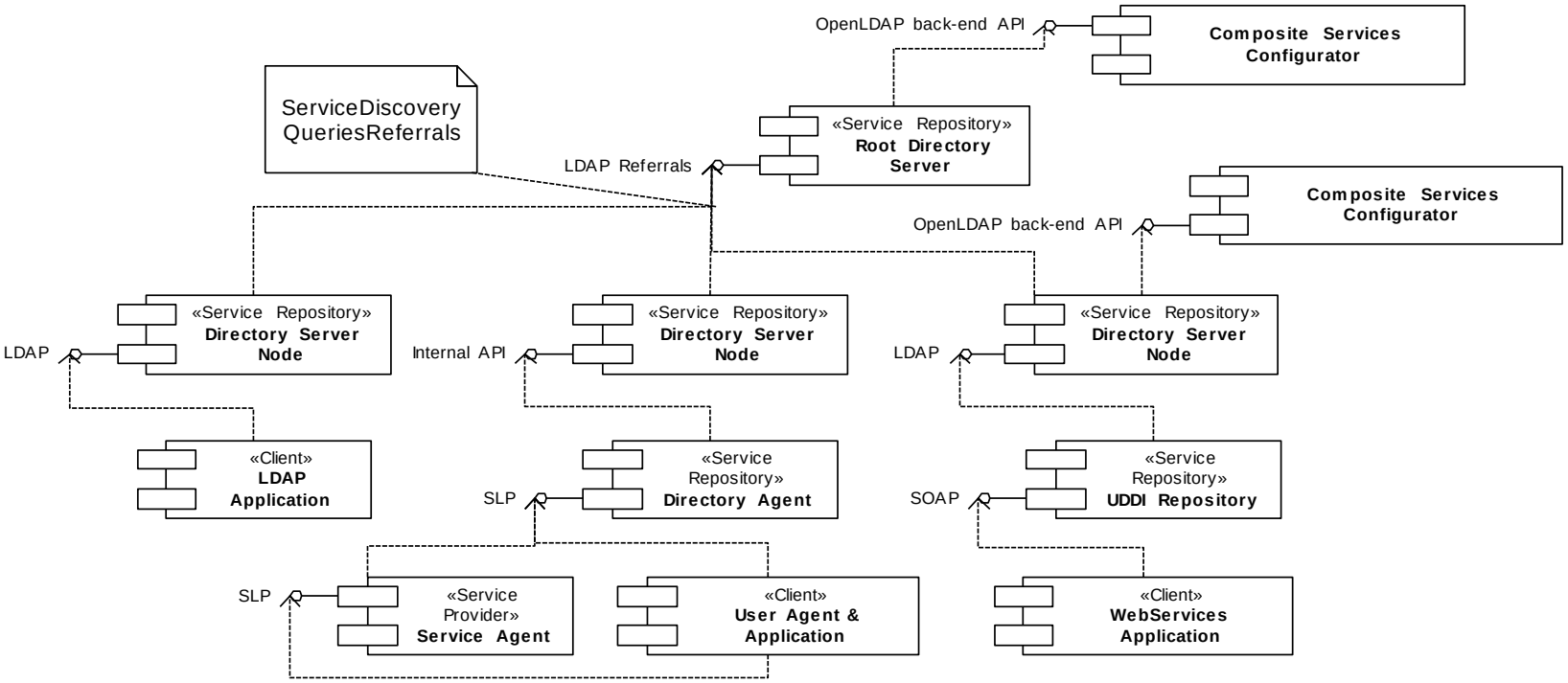
Bottlenecks

- Existing technologies focus on a subset of issues thereby offering different combinations of advantages and disadvantages:
  - Centralised repositories are efficient but inherently not scalable
  - Replicated databases are more scalable than centralised solutions, but not truly distributed and additionally suffer from update and synchronisation issues
  - Architectures based on existing infrastructure are efficient, but require additional configuration every time the infrastructure (or the locality) changes
  - Ad-Hoc networks are very adaptive and easy to set-up, but have high overhead and are not scalable

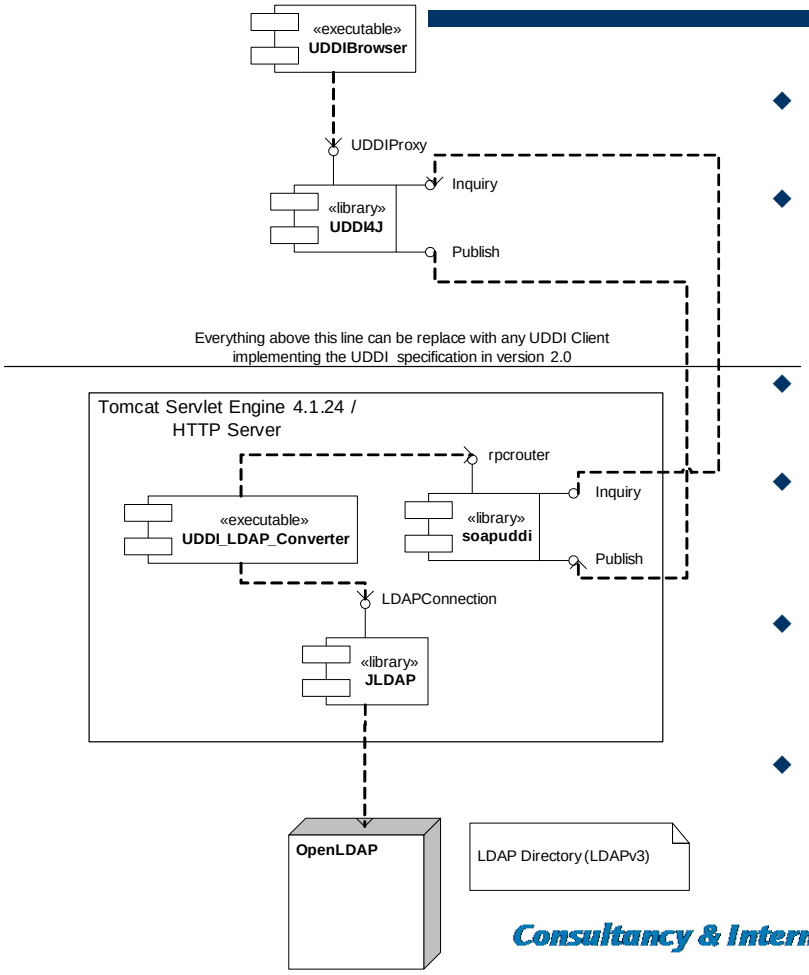
Service discovery platform

- Within the European project NOMAD (IST-2001-33292) a service discovery platform has been developed to address the following issues:
  - Efficiency
  - Scalability
  - Ad-Hoc operation, i.e. without prior configuration
  - Dynamic service update support
- This service discovery architecture is based on the concept of integrating a distributed service repository based on a hierarchical infrastructure
- In accordance with the concept of integration and extension of COTS (Commercial-Off-The-Shelf) technologies a directory service based on LDAP was chosen as a distributed database and hierarchical service repository

Service discovery platform components



Software components overview



- Here you can see the communication between the UDDI browser and JLDAP
- The UDDI browser uses UDDI4J to connect to a modified SOAPUDDI software and is acting as a usual UDDI server
- This software is called UDDI_LDAP_CONVERTER
- The backend of this converter uses JLDAP to read and write a normal LDAPv3 conform directory
- To be independent from platform and operating system the software has been implemented in Java
- This has the benefit that various existing software libraries in Java are available and has been used

One simple example

- A user is searching for hotels in his environment
- He find some hotels
- He is looking for details…
- He gets a security note
- He gets all information of this Web service

Conclusions

- Service discovery is an efficient way to recognise a service in a foreign network automatically
- The first approach is that we use a central database to find available services
- Each service was assigned to a category, which offers information about the service to the user
- The second decentralise approach includes different logical areas on several server systems
- This requires a continuously communication between all components
- After a test phase one result was that the centralise data approach is the only possibility for mobile users to get the services just in time with the correct information
- The scalability problem in such model has been solved by a central repository which gets its information from different databases
- That is possible by the use of LDAP and UDDI as the most relevant protocol standards which exist for service discovery

Thank you for your attention

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