Context-aware Services for UMTS-Networks*

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Outline

I. Properties of current context-aware architectures

II. Challenges when trying to realize context-aware services in UMTS

Remark:
This talk will give an overview over the problems we see when trying to realize context-aware services in UMTS-networks. Not all of them will necessarily be addressed within the project!
I. Properties of current context-aware architectures

- **Scenario spans only one domain**
  - No roaming
  - Application owner has in general full control over and complete knowledge of the sensors
  - Accounting and privacy are no issues

- **Limited scope (regional scope, complexity)**
  - Resource discovery is often relatively easy (sometimes a central component manages the sensors)
  - Limited scenario = limited storage requirements (system can have one policy which historical context to store)

- **Service tailored to a specific scenario**
  - Interoperability is automatically given (common protocols, common semantics)
  - Sensors are already known in design-time
  - no customization resp. personalization necessary
What are the challenges when trying to realize context-aware services in UMTS-Networks?
II. Challenges

1. Multiple Players in Value Chain

Value Chain of Context-Awareness:

Operators of context-aware services will often not be able to create the complete required context information on their own →

- Decoupling of service provisioning and context provisioning
- New business role: Context Provider?
- Architecture is overlaid with business model
- Accounting and privacy become important issues
- The context information receiver must be able to assess the quality of the context information
  → Quality of Context Parameters are needed
II. Challenges
1. Multiple Players in Value Chain

What could the cooperation between context providers and context users look like?

Context Providers

Context Users = Service Providers

CIS = Context Information Service

CAS = Context-Aware Service

Domain

Uses

- Context request
- Context delivery
II. Challenges

1. Multiple Players in Value Chain

Who will own and offer context information?

UMTS Business Model

- Subscriber
  - Payment
  - Billing
  - Delegation of Service Usage
- Service-Provider
  - User Profile Management
  - Delegation of Service Provision
- Value-Added Service Provider
  - Payment
  - Billing
- User
  - Payment
  - Billing
- Mobile Network Operator
  - Payment
  - Usage
- Fixed Network Operator
  - Accounting
  - Usage

Additional Options
- Context Provider
- Sensor Network Operator
- Profile Repository

i.e. enterprises, government, families etc.

i.e. employee, family member

i.e. Content Providers
The described high-level cooperation model and the value chain need to be mapped on lower, technical planes:

**Service plane**

- Context Information delivered by context information services (CIS) → Service

**Descriptive plane**

- Context sensing → Context refinement → Context dissemination → Service session

**Component plane**

- Context source → Raw data distribution and storage → Aggregator/Interpreter → Context distribution and storage → Aggregator/Interpreter → Context distribution and storage → Context repository → Context push and pull → Service component

**Physical plane**

- Sensor, database, mobile terminal, base station, link → Communication link → Context node → Communication link → Context node → Communication link → Service node
II. Challenges

2. Scaling Problems

The plethora of service and context offers makes the coordination between the parties difficult.

Resource discovery is a problem:

- Query routing vs. Yellow Pages
- How to describe context offers and queries?
- How to advertise services?
II. Challenges

3. Interoperability

In spite of heterogeneous, independent service and context providers, the parties must be able to communicate with each other.

Interoperability can only be provided through standardization:

Major problems are:

- Service description
- Context description (for query purposes)
- Context presentation (for transmission and interpretation purposes)
II. Challenges

4. Roaming

The users will be highly mobile ➔

- Roaming between different network operators must be permitted
- Service portability is necessary
- A seamless deployment of services must be possible, even if the user changes the communication device (the user becomes the communication end-point)
II. Challenges

5. Mass Customization

Context-aware services will be developed for a wide audience →

– Customization and Personalization will become an issue
– Diverse preferences
– Diverse handheld capabilities
– Diverse networks
– Diverse platforms
Thank you for your attention!

Any Questions?
Underlying understanding of important terms (1)

- **Setting**: All possibly relevant entities and relations between them in semantic proximity to a reference entity
- **Context**: Part of the Setting that is relevant for the concrete use case
- **Context Information**: Interpreted, aggregated results of a measurement of the attributes of entities within the Context and the relations between these entities

**Resulting Context Paradigm**

- Context is not just there, something “becomes” context in light of a use case
- Context information is being *created, provided and used*
- Context information is relative to a “reference entity“
- Context information has a quality
• **Context Information Service (CIS):**
  
  A CIS is a service that finds, measures, interprets and aggregates the relations between entities and the attributes of entities, that are relevant parts of the setting in light of the concrete use case, to supply the desired context information.

• **Context-Aware Service (CAS):**
  
  A CAS is a service that possesses the ability to subscribe to a CIS, to use the CIS-results to trigger customized actions or adaption, and to eventually unsubscribe from the CIS.