FIA: Future Internet Key Architectural Challenges

Management of Future Internet

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Overview

- Future Internet era: requirements - solution
- UMF mission statement
- UMF functional specification- methodology
- Use Cases – Use Case Analysis
- UMF Functional Blocks
- Possible deployment scenario
- Conclusions/Future plans
Future Internet Era: Requirements and Solution

**Future Internet**, an ecosystem consisting of:
- interconnected networks operating at diverse technologies;
- terminals with cognitive capabilities, e.g., through learning functionality and knowledge management, in their own sphere;
- services, for all areas of human activities and content provision, with end-to-end minimum Quality of Experience (QoE) level

**Problem**
Complexity of management (applications and ways to serve them)

**Solution**
Autonomics Consolidation, Unification, Federation, Governance, Knowledge, Embodiment, Trust

**Unified Management Framework (UMF)**
Design and specification of a Unified Management Framework

- Network Governance
- End-to-end service management
- Unification of existing Management Approaches and Systems
- Embedding of autonomic paradigm in any type of network
- Management of Future Networks

Mission Statement (1/2)
Mission Statement (2/2)

- UMF is a framework that will help produce the unification, governance, and “plug and play” of autonomic networking solutions within existing and future management ecosystems
  - “framework” → a methodology that can support business, system, and implementation views of autonomic networking solutions

- UMF includes a repository of guidelines, patterns, models, specification and IT tools to support development of UMF compliant systems

- **UMF impact on telecommunication actors:**
  - **Operators**: Enables the management of complex networks, services and automated processes
  - **Vendors**: Enables the design of hardware and systems that can easily and quickly being integrated with third-party systems
  - **System integrators**: Facilitates the integration of new hardware and software elements into the telco operators’ environment

- **Dimensions/key domains:**
  - Governance
  - Network empowerment/Embodiment
  - Information, Context, Knowledge management
  - Trust
UMF functional specification - methodology

High-level requirements/challenges:
• Governance
• Unification and Federation
• Service-oriented
• Automation/Autonomicity/Self-x
• Orchestration/Coordination
• Embodiment/Network Empowerment

Requirements from a set of use cases expressing real-life operator’s problems:
• Self-diagnosis/healing (emphasis on IMS/VoIP)
• Network stability
• Virtualization and migration of content and respective servers
• Self-Organizing Network (SON) operation/collaboration according to policies
• Operator-governed end-to-end autonomic joint network and service management
• Network and services governance

Identification of re-usable features, potential gaps & areas for further improvement/research
Bottom Up approach: Use Cases

- Six use cases expressing real life operator problems, which require autonomics, are investigated in UniverSelf Project:
  - Use Case 1 focuses on self-diagnosis and healing in both IP networks/IMS services and VPN networks
  - Use Case 2 aims at simulation and emulation results about stability and performance of a network (with a great number of nodes and real impairments) with cross-layer and cross-domain self-configuration mechanisms
  - Use Case 3 focuses on the dynamic virtualization and migration of data/content and network entities (gateways and servers) nearer to users
  - Use Case 4 aims at resolving traffic rise/congestion problems and the associated deterioration of service provisioning by means of policy-based coordination of SON entities
  - Use Case 6 envisages an operator-governed, automated, end-to-end, service (or new traffic) deployment on top of heterogeneous networks encompassing both RANs and backhaul/core segments
  - Use Case 7 aims to demonstrate the importance of the network and service governance, through the use of IPTV services running on top of both fixed and mobile networks
Bottom Up approach: Use Cases analysis (1/2)

- “Black Box” methodology: decomposition of the use in a set of sub problems (black boxes) at different level of granularity
Bottom Up approach: Use Cases analysis (2/2)

- Identification of:
  - Functions, required to solve the use case problems
  - Models, consisting of information & knowledge bases required to fulfill the Functions’ operation
  - Interfaces

- Grouping of common functions and designation of reusable functional blocks as part of UMF

\[ \text{Req}_F_{x.y} \]: for Functional requirement number \( y \) of use case \( x \)

According to [D4.1] nomenclature
UMF Functional Blocks (2/2)

**Governance (H2N) FB**
- Business goals/policies edition in high level terms through a human-to-network (H2N) interface and visualization of network events

**Situation Analysis/ Diagnosis FB**
- Monitored data processing, filtering, correlation, etc

**Monitoring FB**
- Collection of monitoring data from network, service & end user equipment

**Solution Evaluation/ Assessment FB**
- Evaluating the solution & possibly triggering further actions or fine-tuning/optimizations

**Policy Derivation & Management FB**
- Policy repository
- Local Policies

**Candidate Solutions Computation FB**
- Inference of potential solutions to an identified situation
- Local Policies

**Solution Selection and Elaboration FB**
- Decision taking resolution of possible incoherence/conflicts
- Local Policies

**Configuration Enforcement FB**
- Enforcing the configuration decision

**Cooperation FB**
- Coordinating/orchestrating self-x managing and managed entities including conflicts resolution

**Information & Knowledge Building FB**
- Static knowledge stored in databases e.g. existing information on the managed elements, the offered applications, served users & equipment
- Dynamic, high level information & knowledge

**Profiles & Models FB**
- Profiles
- Local Policies

**Knowledge Base**

**Profiles & Repository**

- Policy repository
- Local Policies

**Cooperation FB**

- Profiles & Models FB
- Information & Knowledge Building FB

- Static knowledge stored in databases e.g. existing information on the managed elements, the offered applications, served users & equipment
Interactions among FBs for realizing use cases
Possible deployment scenario: instantiation in UC6 (Operator-Governed, End-to-End, Autonomic, Joint Network and Service Management)
UMF overview – future plans

- UMF constitutes solution for Autonomics in Future internet, realizing:
  - Autonomics Consolidation
  - Unification
  - Federation
  - Governance
  - Knowledge
  - Embodiment
  - Trust

- UMF FBs constitute functionality, implementing essential operations, required in every autonomic solution

- Future Plans:
  - Advancements of corresponding enablers: Information & Knowledge, Network Governance, Intelligence Embodiment
  - Demonstrations are envisaged in Future Network and Mobile Summit
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Thank you!