IP Proposal call 8 in Objective 1.1

“Software Defined Future Networks”

Proposers’ Day 14th June 2011 Warsaw

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Software Defined Future Networks Model

Service-aware & Management-aware functions

Virtualization & Programmability functions

Networking, processing and storage resources (Infrastructure Resources)

Applications/Services

Requests

API

Control

Functional Features

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Main Objective: Develop and validate an architecture and control infrastructure for wire and wireless networks as ‘software defined features’ and optimal integration with the connectivity layers.

Software Defined Features

- Fundamental characteristics that are neglected in designing today’s networks
- Capabilities that should be supported by future networks

Why

→ Software Defined Network as a Service (SdNaaS)
→ High level network functional programmability & elasticity & In-bound manageability
Software Defined Features

Fundamental characteristics that are neglected in designing today’s networks

• Environment awareness and friendliness (*Green Network*)
• Energy awareness – support device, and network level technologies to improve and control power efficiency (*Energy Management*)
• Service awareness – support for service programmability and deployability (*Service cognisance*)
• Social-economic awareness – support for explicit economic incentives to reduce barriers of use for the various participants/actors or use of telecommunication/ICT sector (*Explicit Incentives*)

Capabilities that should be supported by future networks

• *(Flexibility/elasticity /programmability)* FNs should have flexibility to support and sustain new services derived from future user demands
• *(Virtualization of resources)* – supporting mechanisms so that a single physical resource can be used concurrently by multiple virtual resources.
• *(Data/content Access)* - support isolation and abstraction /mechanisms for retrieving data in a timely manner regardless of its location.
• *(In-bound Cognitive Network Management)* – support in-bound operation management of increasing number of services and entities; embedded autonomic management in systems and elements
• *(Mobility)* - support different types of mobility in an environment where a huge number of nodes can dynamically move across the heterogeneous networks.
• *(Optimisation)* – control of performance by optimizing capacity and usage of networks based on service requirements and user demand.
• *(Identification)* - support new identification infrastructure for network entities that can effectively support mobility and data access in a scalable manner.
• *(Reliability and Security)* - support extremely high-reliability services
Scenario 1 – SdN as Programmable Virtual Infrastructure

- Requests
- API
- Applications/Services
- Functional Features
- Networking, processing and storage resources (Infrastructure Resources)

Integrated Execution Environments

Service-aware & Management-aware functions

Virtualization/Programmability functions

Control

API

Data Path / Forwarding (H/W)

Software Defined Future Networks Scope

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Scenario 2 – SdN as Programmable Open Routers

Software Defined Future Networks Scope

Functional Features

Networking, processing and storage resources (Infrastructure Resources)

Requests $\downarrow$ API

Applications/Services

Control

Service-aware & Management-aware functions

Virtualization/Programmability functions

API $\downarrow$ API

Open Flow Controller

Data Path / Forwarding (H/W)

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Scenario 3 – SdN as Programmable LTE

Software Defined Future Networks Scope

Control

Service-aware & Management-aware functions

Virtualization/Programmability functions

LTE Controller

Data Path / Forwarding (H/W)

Networking, processing and storage resources (Infrastructure Resources)

Applications/Services

Functional Features

Requests

API

Requests

API

API
Scenario 4 – SdN Programmable SmartObjects

- Requests
- API
- Applications/Services
- Service-aware & Management-aware functions
- Virtualization/Programmability functions
- Objects Virtualisation and VMs
- Smart Objects
- Networking, processing and storage resources (Infrastructure Resources)

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Baseline Technologies

• **Programmability of Networks**
  – Activation on demand of new functions/services running on execution environments of the infrastructure
  – Open Flow programmability

• **Integrated Virtualisation of Resources (Network, Computation, Storage virtualisation)**
  – Enables creation of logically isolated network partitions over shared physical network infrastructures so that multiple heterogeneous virtual networks can simultaneously coexist over the shared infrastructures; it allows the aggregation of multiple resources and makes the aggregated resources appear as a single resource

• **In-system Autonomic Network Management (Management)**

• **Network Optimization (Optimization)**
  – Device / System / Network level optimization (Path optimization, Network topology optimization, Accommodation point optimization)

• **Energy-saving of Resources (Energy Consumption)**
  – Forward traffic with less power
  – Control device/system operation for traffic dynamics
  – Satisfy customer requests with minimum traffic
Concluding Remarks

• We are seeking industrial and academic partners

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• University College London (UCL) has significant expertise & interest in
  – Network programmability and autonomicity
  – Service awareness for clouds
  – Network & Service virtualisation and manageability
  – Large scale experimental testbed