The new company Nokia Siemens Networks is expected to start operations by January 1, 2007, subject to customary regulatory approvals, the completion of standard closing conditions, and the agreement of a number of detailed implementation steps.
Outline

- Evolution UMTS up to SAE
- Beyond SAE
  - Flexible policy framework
  - Dynamic configurability [Network Composition]
Evolution of mobile networks: Increased Heterogeneity, Flexibility and Complexity

- **Network “A”**
  - Analog, Historical
  - One Service
  - Nomadic use
  - No alternatives
  - Hard-coded

- **Network “B”**
  - Digitized
  - Some flexibility through STK
  - More services
  - Increasing complexity

- **Network “C”**
  - GPRS/UMTS CS/PS
  - PS applications
  - CS backwards-compatibility
  - First alternative wireless interfaces (e.g. IEEE 802.11)
  - Many operators
  - More flexibility

- **Network “D”**
  - LTE/SAE, VoIP, All-IP
  - Large-scale wireless alternative (802.x)
  - Very large number of cells
  - Almost everything can be configured
  - How to harmonize subscriber/operator?
  - Policies

- **Hard-coded**
- One Service
- Nomadic use
- No alternatives

**Increased Heterogeneity, Flexibility and Complexity**

- Full mobility
- Roaming
- Some flexibility through STK
- More services
- Increasing complexity
UMTS: Core Network Architecture (Rel6)

- Current drivers for evolving UMTS
  - Support higher bit rates
  - Support of multiple (incl non-3GPP) access networks
    - Inter-access mobility
    - Access-independent authentication framework
  - High quality network services
- ⇒ Long Term Evolution (LTE) and System Architecture Evolution (SAE)
**SAE: Core Network Architecture**

- GERAN
- UTRAN
- Evolved RAN
- SGSN
- Packet Core
- HSS
- S4
- S3
- S1
- MME
- UIE
- S5b
- S5a
- 3GPP Anchor
- SAE Anchor
- IASA
- ePDG
- PCRF
- SGi
- SGi
- Rx+
- Op. IP Serv. (IMS, PSS, etc...)
- Trusted non 3GPP IP Access
- e-I-WLAN

**Legend:**
- *Color coding:_ red indicates new functional element / interface

**Key terms:**
- GERAN, UTRAN, evolved RAN – Radio access networks
- HSS – Subscriber data base
- SGSN, MME – intra-3GPP Mobility, AAA,…
- SAE Anchor – inter-system Mobility
- PCRF – policies for AAA
- IMS - Services

**Scenarios and architecture are currently under investigation in 3GPP**
Beyond SAE Core Network Architecture

- SAE solves heterogeneity
  - Presumably in a static fashion

- Deal with heterogeneity, flexibility…
  …while maintaining high-quality network services
  - Seamless mobility
  - QoS
  - Security
  - Charging

- Flexible policy framework
  - Policy-based mobility management
  - Policy-based flow management
  - Policy-based charging

- Dynamic configurability [Network Composition]
  - Charging self-configuration
  - Nomadic IWLAN
Policy-based Mobility Management

- Handover decision today based on:
  - Signal reception quality, resource availability
  - Hard coded
- In heterogeneous environment handover decision based on:
  - Signal reception quality
  - Velocity
  - Pricing
  - User preferences
  - Operator preferences
⇒ Policy-based mobility management
  - Flexible
  - Shields complexity from user
Policy Based Mobility Management
Layers & Mobility

- Decision Engine
- Dynamic Input (triggers)
- Semi-dynamic Policies
  (low change rate)
- Static Input
- Contract Data, Service Descriptions, …

- Subscriber
- Operator
- Policies

- Dynamic Decisions
“SA1 discusses how users access a PLMN from their PANs using multiple network connections through other access systems”

- Specific PNEs (i.e. MEs) within a PAN have their own network connections.
- User may want to receive the video service through a more suitable PNE and AS.
- User selects “best” access and re-directs traffic using DFM.
- User has to authorize the re-direction via DFM Agent@PNM.

3GPP TS 22.259 V8.1.0 (2006-09), section A.3
Charging data collection in CTF today hard coded
- "Flow-based charging" allows policy-defined selection of flows
- More flexibility by allowing policy-based reconfiguration of CTFs
- Support new tariff models
- Load balancing
Dynamic Configurability Charging self-configuration

changed
product offers

Charging System

Creates charging rules based on new capabilities or new tariff model

register capabilities (chargable events)

New ngCTF

ngCTF finds charging system

health signals performance data

adapted configurations

ngCTF – next generation Charging Trigger Function
Network Composition

- Network interworking today hard-coded
  - IWLAN
  - Roaming Agreements

- Dynamic, uniform procedure to achieve network interworking:
  Network Composition
    - EU Project Ambient Networks

- **Uniform** procedure
  - independent of network type and technology

- **Dynamic** procedure
  - minimize human intervention

- Feasibility studied in 3GPP SA1 Study Item „Network Composition“
  - TR 22.980
Static interworking of a WLAN Access Network and a 3GPP network standardized in TS 23.234 ("IWLAN")
- Allows UEs to access the IWLAN / Internet / 3GPP Services on basis of USIM
  - Authentication, Authorization and charging handled by 3GPP Network
- Interworking is manually configured
- Interworking is static: IWLAN expected to be immobile
- Composition enables making the scenario dynamic
Business Case: Provisioning of IWLAN Services at mass events

- IWLAN Provider move their equipment to Olympic Games, rock concerts,…

Scenario description

- On the site of the mass event, IWLAN uses e.g. DSL to connect to 3GPP network
- IWLAN and 3GPP network authenticate each other based on pre-shared secret
- E.g. 3GPP operator sells off-the-shelf „nomadic IWLAN packet“ including a „WLAN USIM“ to be inserted into the IWLAN Access Router
- IWLAN and 3GPP network establish a secure bearer
Composition of a nomadic IWLAN – Scenario Extension

- Nomadic IWLAN offers its services to subscribers of several 3GPP networks
  - No pre-established trust between IWLAN and 3GPP network
    - E.g. trusted third party
Summary and Outlook

- Evolution of mobile networks: Increased Heterogeneity, Flexibility and Complexity

- SAE statically integrates heterogeneous access networks

- What could come after SAE
  - Flexible policy framework
    - Policy-based mobility management
    - Policy-based flow management
    - Policy-based charging
  - Dynamic configurability [Network Composition]
    - Charging self-configuration
    - Nomadic IWLAN
The new company Nokia Siemens Networks is expected to start operations by January 1, 2007, subject to customary regulatory approvals, the completion of standard closing conditions, and the agreement of a number of detailed implementation steps.