„Coordination of LTE Resource Management with RTSP based Streaming “

ITG-Fachgruppe 5.2.4

Mobilität in IP-basierten Netzen

Traffic Management for Mobile Networks

March 13, 2011 in Munich

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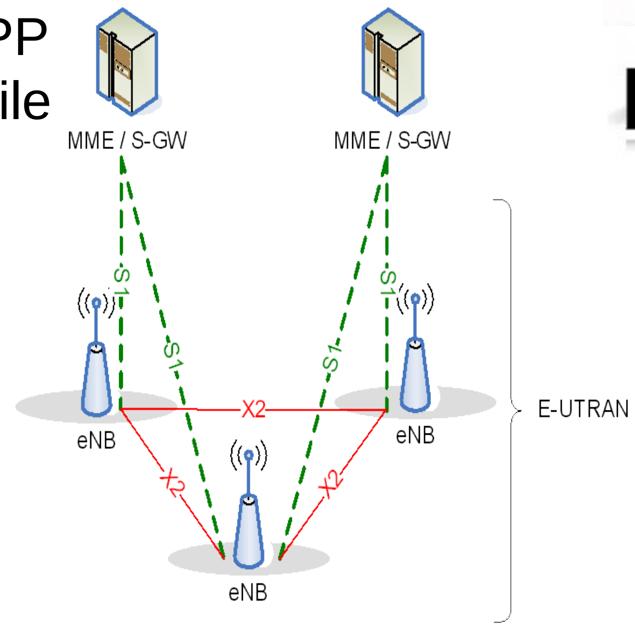
Nokia Siemens Networks Germany

Background – CELTIC Project MEVICO
‘Mobile Networks Evolution for Individual User Experienc

Focus: Long Term Evolution of the 3GPP Core Network (EPC) for the future mobile broadband communications using heterogeneous access systems



WP1 Architecture
- Usage scenarios
- Requirements
- Architectures
- System validations

WP2 Mobility and Routing
- Traffic steering related to handover
- Protocols and Schemes

WP3 Packet Transport
- Packet transport architectures and technologies

WP4 Traffic Management
- Traffic modelling
- Traffic engineering architectures

WP5 Network Management and Engineering
- Network monitoring
- Mobile Transport
- Virtualization of Network Resources

WP6 Techno-Economics
- Capex and Opex evaluation
- Migration cases
- Business case analysis

MEVICO: Project Consortium

Austria
University of Wien

Finland
Nokia Siemens Networks **(Project Co-ordinator)**
Aalto University
EXFO-NetHawk
University of Oulu/Center of Wireless Communic.
VTT Technical Research Center of Finland

Germany
Technical University of Chemnitz
Technical University of Berlin
O2 Telefonica
Nokia Siemens Networks
Deutsche Telecom

Turkey
Ericsson
Turk Telecom
Avea

France
France Telecom
Alcatel-Lucent
Cea
Montimage
Artelys

Hungary
Nokia Siemens Networks
Budapest TU/Mobile Innovations Center

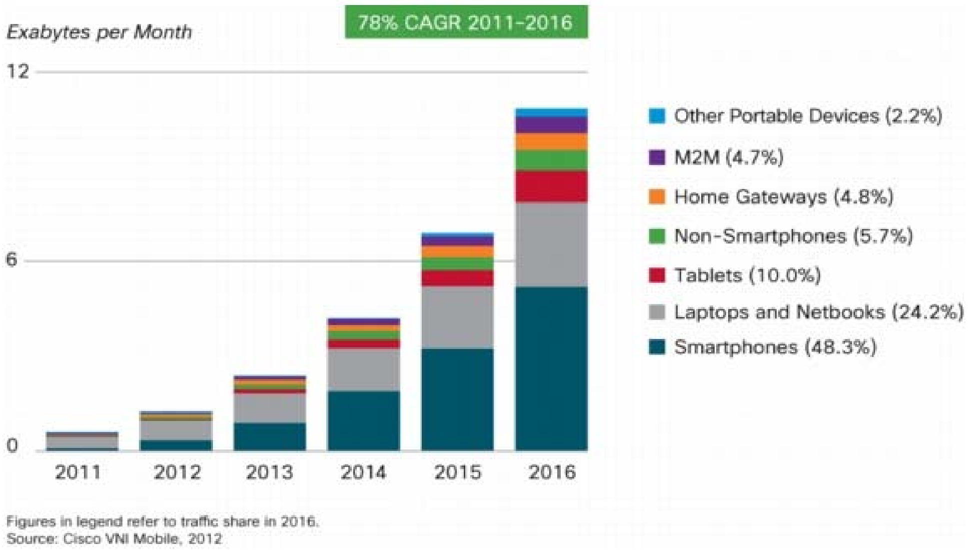
Israel
RAD Data Communications

Sweden
Ericsson

- A total of 23 Partners from 8 countries
- More than 100 person years of effort
- From May 2010 until December 2012
  - BMBF funding until Sep. 2013

Motivation

- CAGR global mobile traffic through 2016 is 78 % (CISCO VNI forecast Feb. 12)
- Streaming traffic has a significant share
  - 52 % of global mobile traffic by EOY 2011
  - Request to Youtube Mobile > 400 Mio per day CAGR 300 %, Rel. Share 13% by EOY 2011



- High QoE for streaming services is important for users satisfaction
- Streaming server use variable bit rate transport to stream media
  - use of GBR bearer with GBR set to peak rate would waste resources
  - Transport of streaming media via non-GBR bearers may suffer during high load / congestion

➔ Suitable mechanisms are required for efficiently streaming support

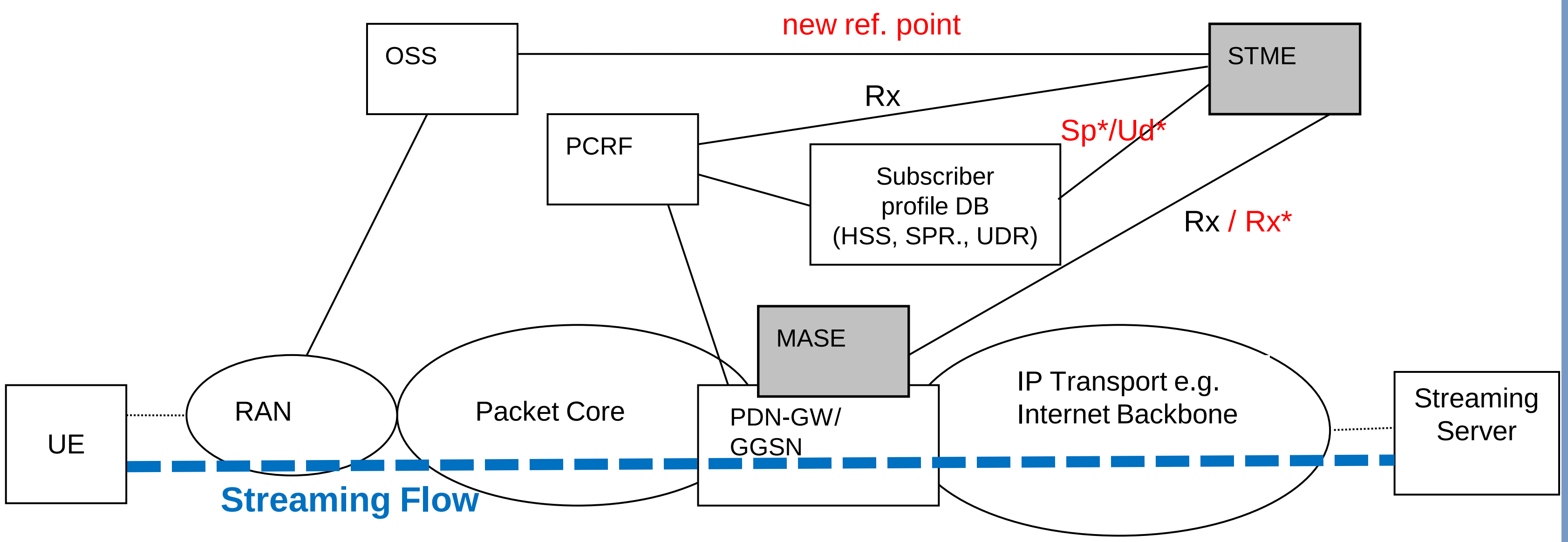
Some (high level) problems for video streaming in 3GPP networks

- resource control for streaming applications
  - IMS supports SIP based applications
    - but most streaming application are not SIP based
    - HTTP and RTSP most common for managed and OTT services
  - no exact resource control via PCRF
  - PCRF can only make a best guess
    - non-GBR vs. GBR bearer

- no sufficient responsiveness to changed n/w conditions
  - congestion or interference in radio cell
  - challenge to distinguish between variable encoded bitrate and path transmission rate

➢ coordination between EPS resource control and streaming protocol required

New components for streaming solutions



MASE – Media Aware Serving Entity

STME – Streaming Traffic Management Entity

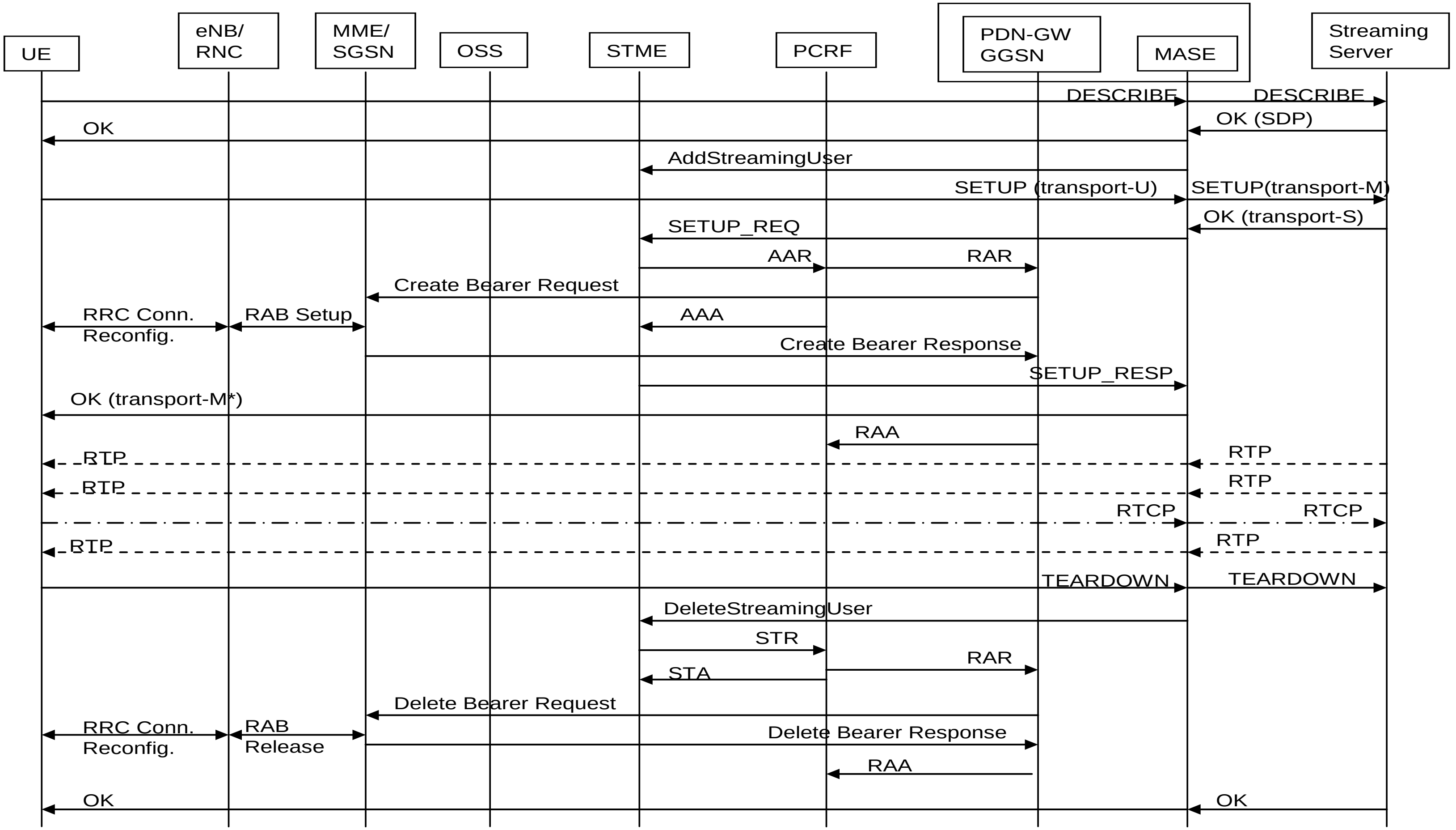
MASE functional description

- located in the data path
- protocol specific recognition mechanism to extract media flow properties (e.g. from session description information)
  - e.g. SDP in RTSP messages
  - description for streaming within an HTTP object (manifest file), based on the URL
- trigger initiation or update of resource allocation for the bearer with resource management
  - MASE may not necessarily be 3GPP compliant (Rx*)
- analyzes performance based on higher layer protocol information
  - e.g. reception of RTCP report from UE
  - analysis of TCP parameters such as window size for HTTP streaming applications
- initiate rate adaptation if resources are changed
  - gets informed by resource management
  - forward the information to the streaming server or
  - provide adaptation itself for middlebox implementation
    - e.g. using transcoding, selecting suitable layer in case of SVC encoded videos

STME functional description

- provide initial and updated media flow information to PCRF (via Rx)
  - controls network resources in behalf of multimedia application
- optionally PCRF and STME can be co-located
- receives measurement reports and triggers concerning (via OSS)
  - congestion detection in the radio access
  - changed cell load conditions
  - information might be obtained from operations support system (new ref. point)
- interacts with streaming application (via MASE)
  - gets informed of changed QoS for a streaming session (e.g. reduced throughput)
  - may request bitrate adaptation
  - may convert resource control information for non 3GPP compliant MASE
- may request the identities of all subcribers located in a reported radio cell (via OSS)
- apply streaming specific policies
  - may decide to change stream specific properties of a single or multiple flows at a time
  - may need to prioritize between media flows in the considered radio cell
    - congestion may require to reduce bitrate for one or more media flows
    - additional resources may allow to increase bitrate for one or more flows.
- prioritization can be based on user profile / user data information as well (via Sp*, Ud* ref. point)

Example message flow setup / teardown



Protocol issues to be considered

- HTTP dominates streaming applications
  - progressive download and adaptive streaming is most popular (VoD services)
  - RTP is more appropriate for delay sensitive applications (e.g. live IP-TV) and used for managed services
  - HTTP server is less expensive to run (license costs etc.)
- RTSP is more straight forward to control resources
  - HTTP may need a middlebox solution (due to receiver control)
  - RTSP may work without middlebox
    - depends on client / server feature set
- HTTP adaptive streaming has several variants to consider
  - HTTP Live Streaming (HLS) – Apple
  - Microsoft Silverlight Smooth Streaming (MSS)
  - HTTP Dynamic Streaming (HDS) - Adobe

➢ we started with RTSP but need to look closer into HTTP

Conclusion

- optimized stream delivery is key success factor for MNO
- new components MASE and STME enable resource control for non IMS streaming services
- proof of concept is currently in preparation
  - simulator / emulator vs. experimental system
  - KPI definition tbd
    - based on user QoE and MNO resource utilization aspects
- solution keeps impact on network architecture low but depends on
  - accessible user / control plane (e.g. no encryption)
  - suitable congestion detection function (via OSS)
    - related to 3GPP UPCON work (TR 22.805)
- MASE / STME approach suitable for more optimizations
  - multicast support
  - media processing
  - resource coordination with external domains

Q&A

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