IPv6 and 3G/UMTS Mobile Core Networks

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  - Current 3GPP Architecture
From computer connections to person-to-person communications
Internet Growth

- Mobility as a standard of communication

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<th>Year</th>
<th>Total Terabytes per Month</th>
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- 24% total traffic - 240% CAGR
- 30% total traffic - 75% CAGR
- 46% total traffic - 26% CAGR

- Business Solutions incl. Mobile intranet
- Mobile Internet
- Person-to-Person Consumer
Introduction

- 3G consists of several radio access networks (WCDMA, EDGE) attached to a common core network.
- IPv6 is supported in the current 3GPP specifications.
- Specifications for an IP-based 3G network are currently being developed.
- Two levels of IP protocols in IP based 3G Networks.
  - Transport level (Network layer transport)
  - Application level (IP Telephony layer)
All-IP System Level Architecture

IPv6 All-IP Core

3G RAN

WLAN, DSL, cable...

Iu-PS

IPv6

OSA

Service capability servers

Application servers

Legacy Cellular

PSTN

Internet

IPv6

All-IP Core

Call State Control Function

CSCF

Home Subscriber Server

HSS

Media Gateway Control Function

MGCF

Media Gateway

MGW

Gr+ MAP+

HSS

CAP WIN

SGSN

GGSN

RAS

RSGW

ISUP

IS-41

FW

H.248

IPv6

All-IP Core

SIP

CSCF

MGCF

MRF

Multimedia Resource Function

RAS

Remote Access Server (DSLAM, head end...)

RSGW

Roaming Signaling Gateway

TSGW

Transport Signaling Gate

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IPv6 Benefits for 3G

- Protocol for bigger, better quality Internet.

Address Space Problem
- There will be billions of mobile terminals when the first IP based 3G networks are deployed.
- Since these terminals should have IP addresses, the address space for IPv4 is not sufficient.
- The lack of IPv4 addresses will be first felt in Asia.

Autoconfiguration
- IPv6 includes address autoconfiguration, which can help network administrators in configuring the networks.

Security and mobility built-in
- Global address facilitate end-to-end security.
- IPv6 includes packet encryption and source authentication.
- To support real-time traffic, IPv6 has "Flow Label".
IPv4 Successes

- Behind huge success of Internet:
  - “Everything” supports IPv4
  - 3G network architecture is considered because synergy with existing Internet
- but
  - Security issues are unsolved.
  - IPv4 requires the use of NAT between operators and even within large operators - which will be expensive and hard to manage.
  - Global roaming could be quite difficult.
  - IPv4 is running out of addresses.
  - Transition to IPv6 will take place - 3G will be the driver.
IPv6 Deployment Problems

- Existing operator networks & hardware are based on IPv4.
- Extensions to legacy call control protocols may be required by IPv6.
- Support for legacy IPv4 systems.
- Interworking with existing IPv4 networks.
- But, there are solutions for these problems, the trick is picking the proper solutions for the correct problems.
Deployment Scenarios (1/2)

- Operator deployment decision:
  - Interoperability problems may exists, due to existing equipment, operators may end up of selecting IPv4
  - IPv4 and the IPv6 are not directly compatible, protocol interworking / conversion / tunneling is needed

- 3G networks are fully IPv6 based at deployment on both transport and application level.
  - The solution is future proof, backward compatible and interoperability is assured.
Deployment Scenarios (2/2)

IPv6

3G Core Network

IPv6 Network

IPv4 Internet

IPv6 Network

Dual Stack Host

Local servers (e.g., DNS, DHCP)

Dual Stack Router

Dual Stack Router

Dual Stack Device

IPv6 Device

IPv4

Dual Stack Device

3G Core Network
Conclusions

- Services are the key to 3G/UMTS success.
- 3G networks will be the ultimate driver for IPv6 deployment.
- Addresses are needed.
- The inter-working between the legacy IPv4 network and the 3G IPv6 network can be handled at the borders.
- 3G Core Networks should be IPv6 based right from the start:
  - The transition period between the legacy IPv4 networks and the IPv6 networks will be considerably shorter.
  - Less time, money and effort will be spent on fixing problems caused by IPv4.
- IPv6 + 3G = the Mobile Information Society.
Further Reading

- Nokia 3G Page
  - http://www.nokia.com/3g/index.html

- IETF IPng Working Group
  - http://playground.sun.com/ipng

- Third Generation Partnership Project
  - http://www.3gpp.org

- Third Generation Partnership Project (ANSI)
  - http://www.3gpp2.org

- IPv6 Forum
  - http://www.ipv6forum.com/

- Internet Engineering Task Force
  - http://www.ietf.org
Thank you!