IPV6 TRANSITION TECHNIQUES IN MOBILE NETWORKS

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KEY CONCLUSIONS

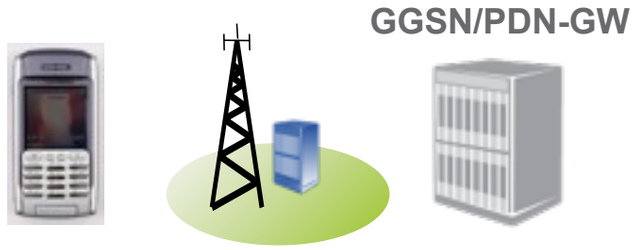
- We have most or all of the technology, but commercial deployment is lacking due to operational, incentive, and compatibility reasons
- But the world is changing rapidly and both the incentives and opportunities are becoming in place
- There are many different ways to use IPv6 in cellular networks, addressed by very different solutions
- Many things can be done today that result in significant IPv6 traffic

STATUS OF IPV6 IN CELLULAR NETWORKS

- Typical deployment today involves either public IPv4 addresses or private addresses and a NAT
- But networks do support both IPv4 and IPv6
  - Supported in 3GPP releases since R5
    - Network products generally support this today
    - Some newer signaling protocols are even IPv6-only
    - Some holes in specifications until R8
- Newer terminals support IPv6
  - High-end terminals has had the support already few years
- Many, many trials but no commercially available service yet
- The situation in cellular networks is a part of the overall IPv6 deployment situation - lack of IPv6 services is a barrier

THE ACTORS – WHO DOES THIS IMPACT?

› The traditional 3GPP view



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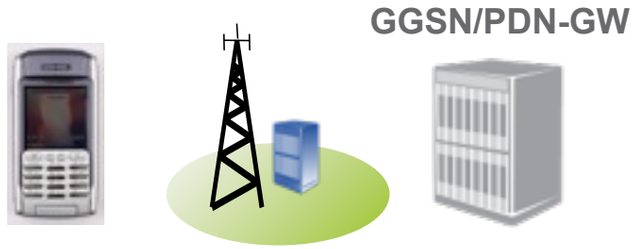

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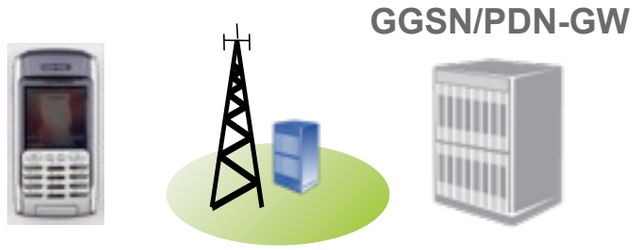

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Operations Roaming agreements Support & debug

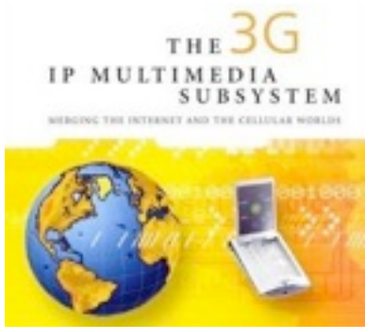
Charging systems Legal interception

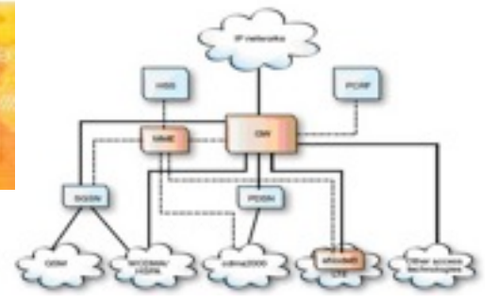
Services Transport network SLAs

IPV6 USAGE SCENARIOS

- Not all use cases are equal
- Different drivers and solutions may be involved

- Operator's own services
- Transport network
- Access to the Internet
- DSL replacement

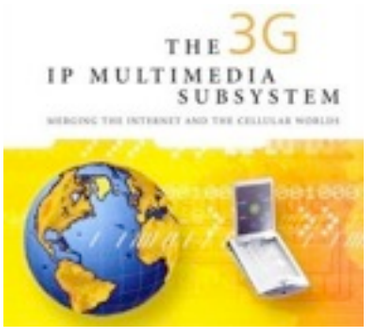




USER PLANE - USAGE SCENARIOS

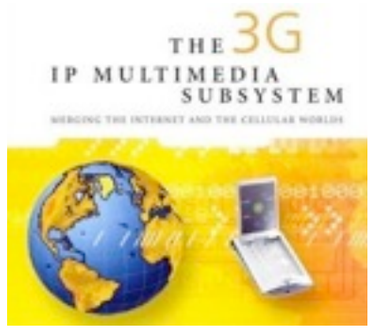
- 3GPP networks have multiple bearer types
  - IPv4, IPv6, Dual-Stack - IPv4v6
  - Originally started with 2 different bearers
  - Dual-Stack defined later, although implemented by some vendors
- Not all use cases are equal
- Different drivers and solutions may be involved

- Different usage scenarios identified for user plane
  - Operator's own services
  - User's Traffic to the Internet
  - DSL Replacement



facebook

OPERATOR'S OWN SERVICES



- IPTV, IMS, ...
- Not so dependent on the rest of the Internet

Drivers:

- New networks that are all-IP and no longer provide circuit switched voice
- Require connectivity to ALL subscribers at ALL times
- Not enough IPv4 addresses to every phone
- How does one user talk to another one?

Solutions:

- Complex NAT passthroughs or IPv6

USER'S TRAFFIC TO THE INTERNET

- Here we are very dependent on what is happening on the other side, e.g., Facebook, CNN, Microsoft

Drivers:

- One key factor is the type of the applications
- Facebook chat, Google maps, p2p, VoIP, all demand more from the network than simple web page access
  - Many (even hundreds) of TCP sessions
  - Always-on
- This is all positive for the operator... more income

USER'S TRAFFIC TO THE INTERNET

- But the issue is, how do we enable all the subscribers to access the Internet, given limited IPv4 address and port resources?

Solutions:

- Have to do something different here in the future
- More aggressive address sharing through IPv4 NATs
- IPv6 and translation to IPv4 (similar to above)
  - NAT64 requires equal # ports on public IPv4 side
- Some applications move to IPv6

DSL REPLACEMENT

- Cellular data is a cost-effective alternative to DSL

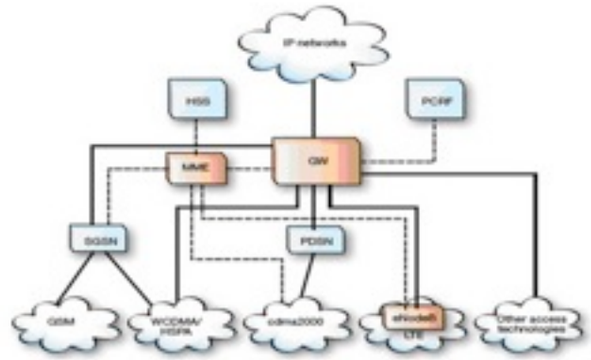
Drivers:

- Connection sharing for an entire home or office is typically performed via IPv4 NATs
- What is the IPv6 equivalent of this?
- Broadband forum has chosen the prefix delegation model – 3GPP is looking in to using same

Solutions:

- Prefix delegation (not currently supported by R8)

TRANSPORT NETWORK



- User data travels in tunnels
- Network nodes employ signaling protocols
- Full IPv6 support from R7
- Roaming users need DS in SGSN

Drivers:

- Better use of valuable IPv4 address space elsewhere
- Running out of Net 10 addresses
- Simplifying network management

Solutions:

- Moving to internally IPv6-only networks
  - Roaming users still might require IPv4 on certain nodes
  - NO effect to user traffic!
- Overlapping usage of RF1918 addresses on user plane
  - Dual-Stack extra lite
  - Gateway initiated Dual-Stack lite

RECOMMENDED TOOLS

- Dual-Stack with/without IPv4 NAT
  - Tackle public IPv4 address depletion with IPv4 NATs
  - Dual Stack + plain old IPv4 NAT is a very typical configuration
- Add Dual Stack support to hosts, and they will immediately be able to use all existing IPv6 services
- Add IPv6 services to discover that most hosts are IPv6 capable
- IPv6-only and other variations should be considered only when Dual-Stack enabled

RECOMMENDED TOOLS – GOOGLE OVER IPV6

- ATLAS Internet Observatory Report 2009:
- Internet is at an inflection point
- Suddenly, 6% of all Internet traffic is via Google
- 10% of all Internet traffic is via the CDNs
- 150 ASNs are responsible for 50% of all traffic

- Make an agreement with Google and the CDNs, and you could have 16% of your traffic in IPv6 tomorrow