Converged Communication and IPv6

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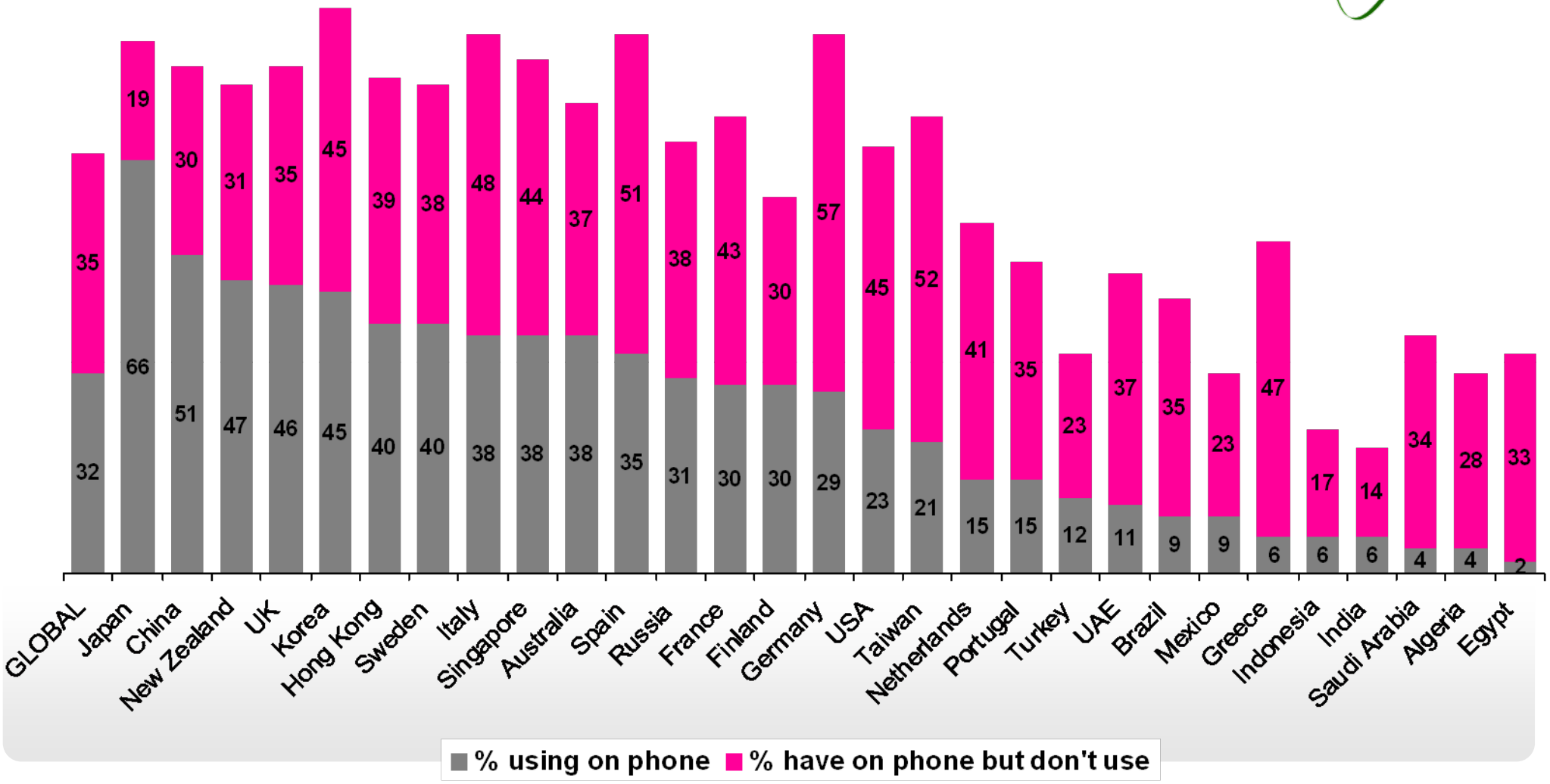
The Mobile Internet is here

Global Mobile Internet Usage and Access



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Mobile Communication is booming in Africa

- According to Total Telecom, "The number of mobile phone users in Africa exceeded 280 million in the first quarter of this year and will reach the 300 million mark in June, according to Wireless Intelligence.
- As a result, the continent has surpassed North America in terms of mobile subscriber numbers, with the U.S. and Canada together having 277 million users.
- Mobile subscription growth stood at 39 percent annually in Africa between 2005 to 2007. (ITU Report)

Growth in Africa & Middle East Mobile Search Users (m), by Type of Search, 2008 – 2013

	2008	2009	2010	2011	2012	2013
Web Search	11	19	30	50	82	138
Local Search	8	13	22	37	59	92
On Portal	41	56	73	94	118	144
Off Portal	19	26	39	59	89	130
On Device	2	3	5	7	13	23

Juniper Research, “Mobile Search & Discovery Opportunities & Markets 2008-2013” March 2008

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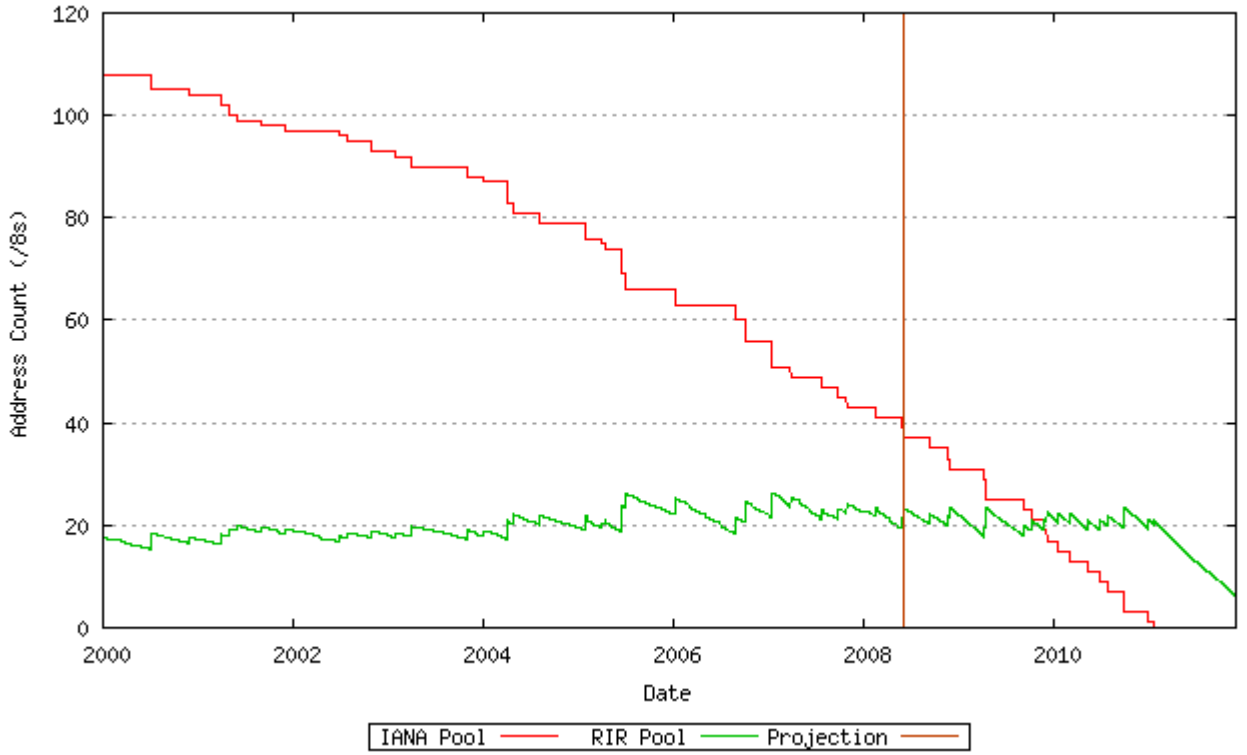
So what, you might ask

- More than 3 billion cellular phone users at the end of 2007
- A growing number are IP capable
  - Trend toward “always-on” applications
    - Push Email, VoIP, IM, multimedia services
- Currently, many operators need to run both a circuit switched and an IP network. This leads to higher CAPEX and OPEX.
- In the future, services will migrate to IP.
- So the choice is between
  - IPv4 with NAT frequent keep-alive messages.
    - This is only the choice during the transition phase.
  - IPv6 and long lived connections
    - Eventually, there will be enough IPv6 only devices in other networks that there is little choice but deploying IPv6 or face obsolescence.

Geoff Huston's predictions

- Projections as of June 3rd 2009:
- (http://www.potaroo.net/tools/ipv4/index.html):
  - Projected RIR Unallocated Address Pool Exhaustion: 02-Dec-2011 (Red)
  - Projected IANA Unallocated Address Pool Exhaustion: 20-Jan-2011 (Green)



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IPv4 has a finite lifetime

- The previous slide's projections are based on past history, so all bets are off once scarcity starts.
- Expect that the exhaustion event will occur before the end of this decade.
- The impact of exhaustion and trading will affect everyone that gets address space from a provider.
- A rough ROI calculation for IPv6 deployment based on the IPv4 alternative being $5-10 per day times the number of devices times the number of employees.
- For more info see
  - http://www.potaroo.net/tools/ipv4/
  - http://www.cisco.com/web/about/ac123/ac147/archived_issues/ipj_8-3/ipj_8-3.pdf

NATs with keep alive messages

- IPv4 Mobile Devices are usually behind IPv4 NATs
  - Always on application are becoming more prevalent
    - Push Email, VoIP, IM, etc.
  - Applications that want to be reachable need to send periodic keep-alive messages to keep NAT state active
    - Current NATs require Keep-Alive from 40 seconds to 5 minutes
    - Need to implement for minimum (~30 seconds)
- Sending of NAT periodic keep-alive messages decreases mobile device standby time by several days
- Not a problem for devices with power cords, but for mobile devices it is a big problem.
- Additionally, this causes additional infrastructure to be built.

Not All NATs are created equal

Product	TCP timeout	UDP timeout
Check Point NG FP2 firewall	60 min	40 s
Cisco IOS router NAT	1440 min	300 s
Cisco PIX firewall	60 min	120 s
Juniper Netscreen firewall	30 min	60 s
Nokia IP VPN gateway	60 min	120 s
ZyXEL Prestige 660 ADSL router	60 min	60 s
ZyXEL ZyWALL 70 firewall	150 min	180 s

Table 1. Default connection state timeouts (source: product manuals)

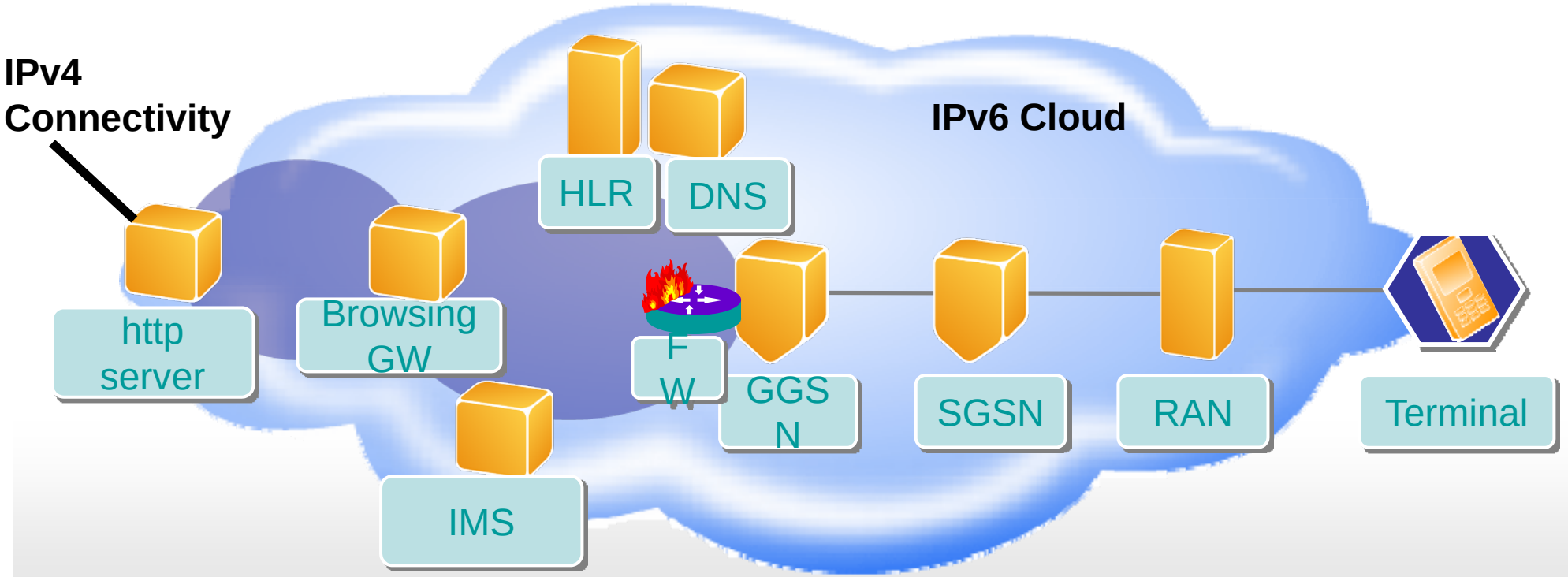
- UDP and TCP timeouts vary widely, a default 30 seconds may be needed for UDP.
- Several different NAT traversal mechanisms are needed
  - STUN, TURN, ICE, Teredo
  - All bring additional terminal and network complexity
  - Additional CAPEX and OPEX
  - All NAT traversal mechanism do open some security holes.
- Even worse, you might be behind different NATs at different times of the day
  - Home, office, hotspot networks often use different types of NATs.
  - Each requiring a different traversal mechanism
- Performance over 3G is even worse
  - UMTS radio state management prevents the mobile device from entering sleep mode, often reducing standby time by days.
  - http://www.niksula.hut.fi/~peronen/publications/haverinen_siren_eronen_vtc2007.pdf

What is Nokia Doing About This?

- Nokia has 3 major operating systems in use
  - Symbian is used for the S60 user interface
  - The Nokia Embedded OS is found on S40 terminals
  - Linux is supported on Nokia Internet Tablets.
- IPv6 is well supported over different radios:
  - 802.11 bg are supported in phones.
  - GSM, EDGE, WCDMA, HSPDA (which is 3.5G - up to 3.6 mps downlink),
  - Wimax will be supported in 2008.
- Application support
  - SIP is supported, as well as VoIP.
  - SIP/SIMPLE is now available. NAT traversal is supported via STUN.
  - IMS-based applications support IPv6 such as VideoSharing and Push-to-talk.
  - S60 Browser, S60 Email, S60 Media Player, Helix multimedia engine and mobile VPN support IPv6
- Roaming is supported for VoIP, phones can select VoIP over WiFi when WiFi is available
  - Several flavors of Enterprise VoIP are supported, as well as 3rd party add-ons for Skype, MSN.
  - VoIP support works with Gizmo Project and other services using standard SIP backend.
  - In theory, IPv6 should work, but I haven't tested against all the different back-end servers.
- Transition mechanisms are currently not supported, but the major reason has been that no one has seriously asked for any to be supported.
- Most operators are taking a proxy-like approach for IPv6 deployment

IPv6 Open Issues in Mobile Networks

- Originally, 3G mobile connections were IPv4 only or IPv6 only.
  - What is the fall-back logic to IPv4 if IPv6 PDP context opening fails.
- Third party API support for IPv6 is an open issue.
- Mobile operators want to deploy IPv6 for specific services initially.
  - This simplifies the network and also device configuration.



Conclusions

- IPv4 addresses will run out, but there are going to be some dynamic issues which affect this.
- Operator testing has mainly concentrated on IPv4 side while IPv6 code has had lower priority

  ----- > “turn IPv6 on” for a commercial service and start using it might be problematic from all sides.
- Windows Vista is quickly enabling IPv6 usage globally, so it is just a matter of time when this opportunity is widely used at least for some applications
- Existing mobile operators are likely to be almost the last ones facing the address exhaustion problem (perhaps with some exceptions) – so operator requirements should not be the last result.
- Public IPv4 addresses may be needed for transition, so earlier usage of IPv6 can help.

Take-away thoughts

- I want my device to help me to communication, but I cannot communicate with an IP address or if my battery is dead.
- Convergence means taking disparate or fragmentary elements and integrating them into a new a new whole.
- IPv6 is the only scalable technology to enable multiple services, interconnecting with other networks.
- The Internet and mobiles are booming in Africa, but to gain further deployment, the total cost of ownership and usage needs to be as low as possible.

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List of Nokia phones supporting IPv6

- http://www.forum.nokia.com/devices/matrix_s40_3ed_1.html
- http://www.forum.nokia.com/devices/matrix_s40_5ed_1.html
- http://www.forum.nokia.com/devices/matrix_s60_3ed_1.html
- http://www.forum.nokia.com/devices/matrix_s80_1.html

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