IPv4-IPv6 Co-Existence in the Internet and the Mobile Internet

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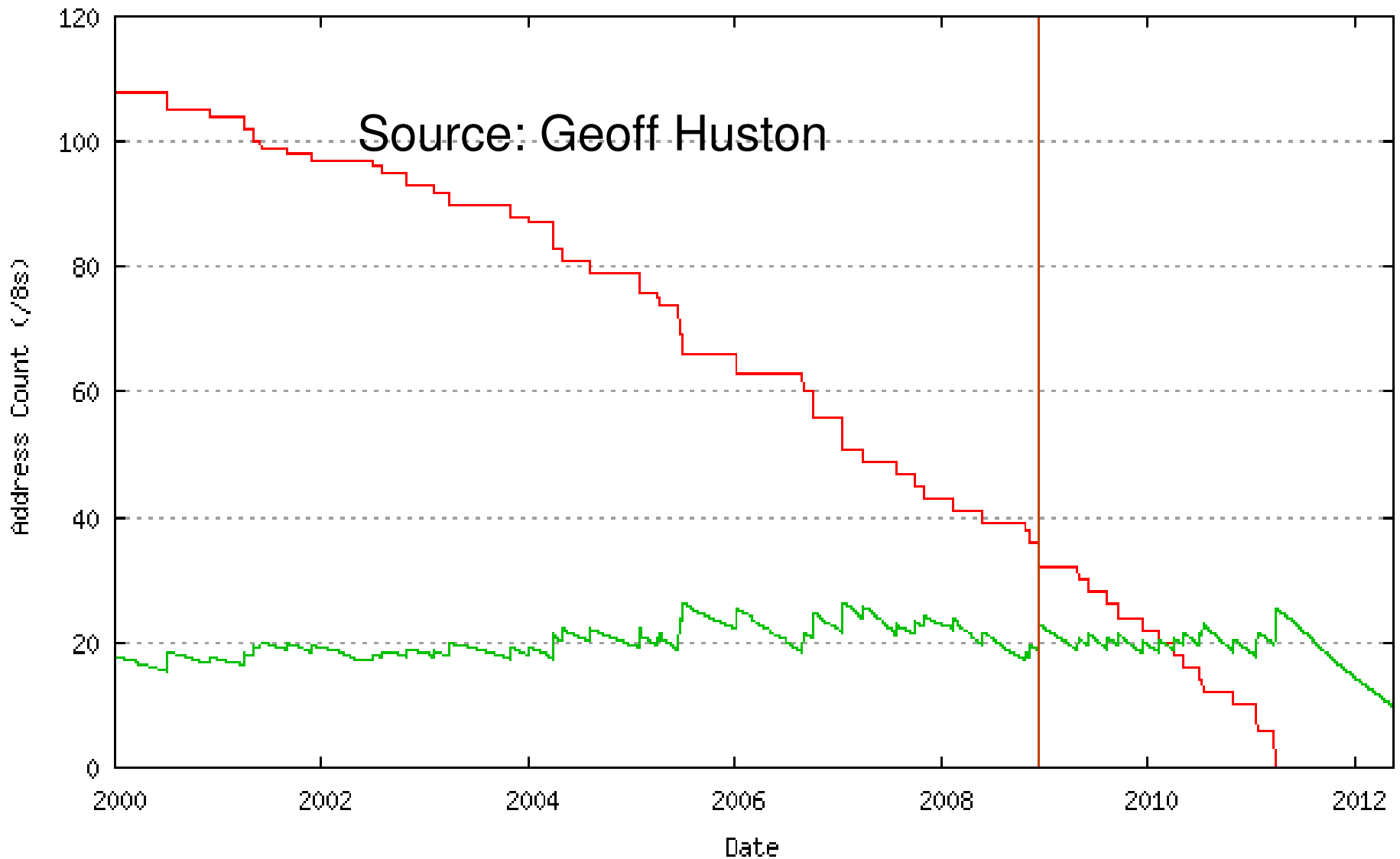
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Topics to Talk About

- IPv4 depletion
- IPv6 deployment
- Recent IETF efforts for new deployment situations
- Implications for the mobile Internet
- Summary

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IPv4 Address Depletion

Source: Geoff Huston

Implications of the IPv4 Situation

- Leads to a change in the network business
- Painful discussions on how the remaining addresses are allocated
- Address trading is likely to become a reality
- Impact on how network address translators (NAT) are used and placed
  - One public address per subscriber no longer feasible; have to share addresses
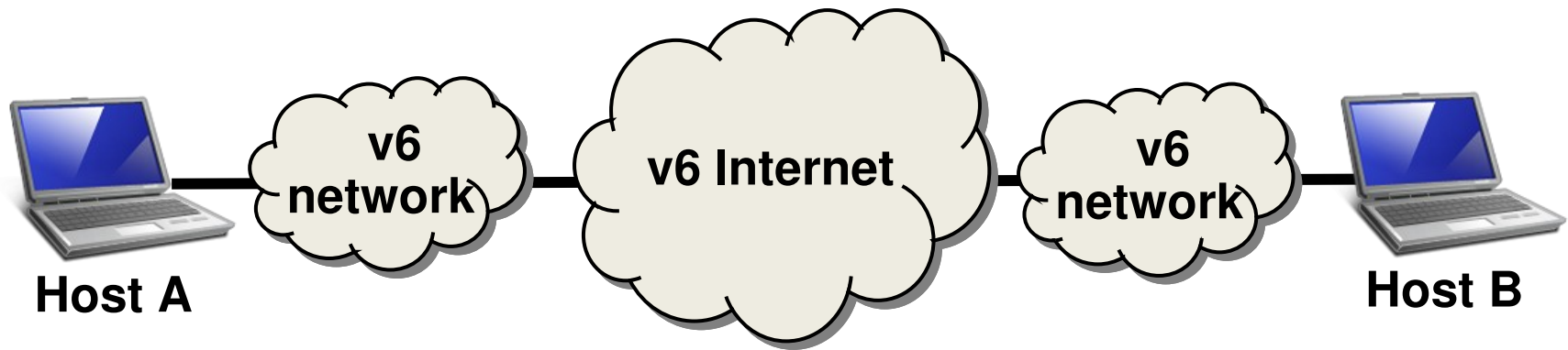- IPv6 deployment becomes even more crucial

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IPv6 in IETF

- Specifications completed in the early 2000s
- Very widely implemented
- A maintenance working group (6MAN)
  - Fixed a bug in routing header processing
  - Fixing a bug in address selection rules
- Looking at new needs and additional features (just as with any IETF technology)
- For IPv6, the big discussion recently has been whether we need new mechanisms to enable new ways to deploy IPv6

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New IPv6 Deployment Tools at the IETF

IPv6 Deployment

- New deployment scenarios identified
    - Unilateral IPv6 deployment
    - IPv6-only provider networks while still providing IPv4 connectivity to customers
- Chartered two new work items in the Internet and Transport areas
- Expecting the first results in March 2009, the rest at the end of 2009
- The new tools are for new scenarios; existing tools continue to be valid for other cases
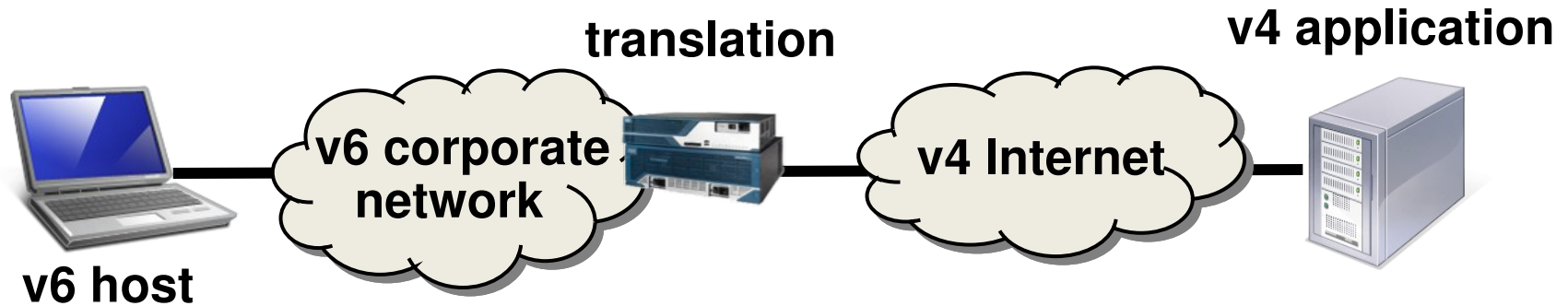
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Understanding the IPv6 Deployment Challenges

- Individual adoption is possible, but multiple stakeholders are needed for actual use
  - Application, host, local network, and Internet
- No universal implementation support yet – appliances, firewalls, etc.

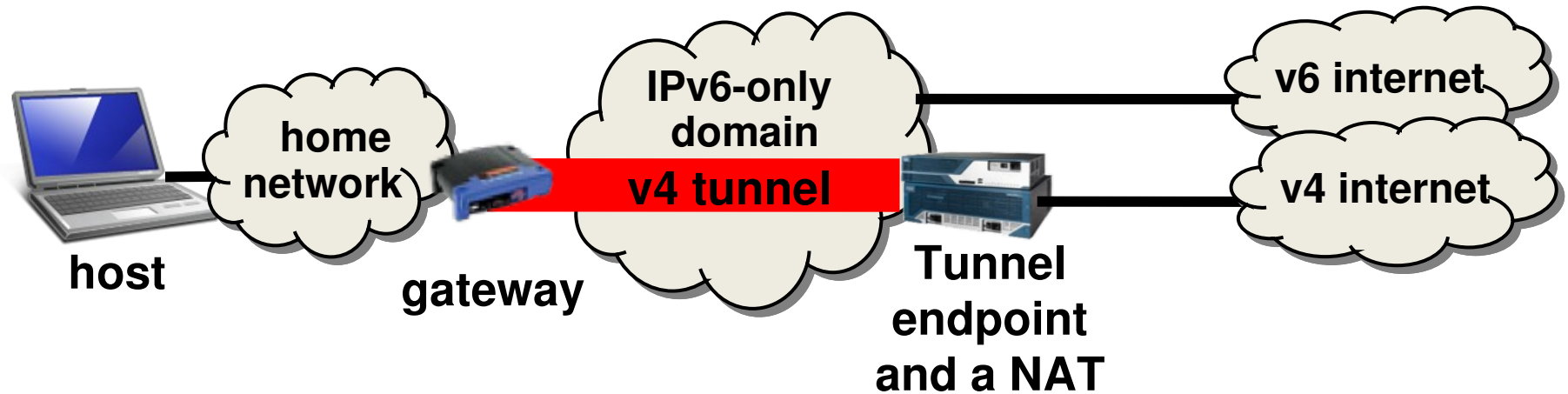ERICSSON

New: Unilateral Deployment

- Translation through a general purpose IP protocol translator or an application proxy
- Enables unilateral deployment
- Some networks use a deprecated tool NAT-PT, leading to some DNS, DNSSEC problems
- Improved specifications to come out

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More on Translation

- Work will address 4 cases: connecting a specific IPvX-only network to the IPvY Internet (initiation on either side)

- IPv6 access to a set of IPv4 servers
- IPv6-only branch office connecting to IPv4 Internet
- IPv4 access to a set of IPv6 servers
- The last IPv4 holdout accessing the IPv6 Internet

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New: IPv6-only Operator Domain

- Problem: less than 1 address per subscriber
- Problem: operator domain larger than net10
- The solution is dual stack lite
- Employs an IPv6 only network, but uses tunneling to provide IPv4 service
- NAT in the operator domain (address sharing)

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IPv4 Depletion and IPv6 Deployment in the Mobile Internet

IPv6 in the Mobile Internet

- Why and how to use IPv6 in operator's cellular networks?

- What are the drivers for changes?

- How does the IPv4 address situation affect the mobile Internet?

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IPv6 Status in Cellular Networks

- Most work to date has been in ensuring that mobile networks have both IPv4 and IPv6 access: providing dual-stack

- Network products generally support IPv6 for end users

- Some terminals support IPv6

- Some LTE components are Ipv6-only

- Many, many trials but no commercially available service yet

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Drivers for a Change

- We need to understand why we should do something new

- But this depends on what aspect of cellular networks we are talking about:

1) Basic network access through GGSN

2) Operator's own services (such as IMS)

3) User's traffic to the Internet

4) Internal network signalling and tunneling

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Operator's Own Services

- Services such as IMS
- Not so dependent on the rest of the Internet
- One key factor is new networks that are all-IP and no longer provide circuit switched voice
- These networks require connectivity to ALL subscribers at ALL times cf. number of simultaneous data users in current networks
- Not enough IPv4 addresses to every phone
- How does one user talk to another one?
- Complex NAT passthroughs or IPv6

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User's Traffic to the Internet

- Here we are very dependent on what is happening on the other side, e.g., CNN
- 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?
- Have to do something different here in the future
- More aggressive address sharing through IPv4 NATs
- IPv6 and translation to IPv4 (similar to above)
- Some applications move to IPv6

Possible Conclusions

- IPv6 can and should be offered for end-users over existing cellular networks
- As we move to pure IP based networks, a good application for IPv6 is operator's own services
  - Reduces the pain from managing NATs and opening ports for two hosts to talk to each other
- Access to Internet services requires IPv4 and NATs into the foreseeable future
  - However, given the first bullet item above, some applications can move to IPv6

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Summary

- The Internet faces a challenge as IPv4 address pool runs out

- Deployment of IPv6 is a necessity, but will require effort

  - We have the tools for the most important cases; IETF is addressing some remaining deployment scenarios

- IPv6 can help reduce the pain of IPv4 address space situation in the mobile Internet

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