IPv6 Performance and Reliability^{*}

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Networking for HENP

- BaBar Collaboration at SLAC
 - International Collaboration
 - 10 Countries
 - Currently data is written to the database at 32 MBps
 - Petabytes of data during the lifetime of the experiment
 - Advanced Network users requiring Applications
 - Experience tells us the rest of the Internet is only a few years behind.
- The LHC will be an order of magnitude bigger.

A Place for IPv6 ?

- IPv6 not a solution, but possibly may provide advantages for Physics
 - Developing Countries (address challenged).
 - QoS
 - IPSec/Security Features
 - Porting of Physics Tools

IPv6 Deployment at SLAC

- Native IPv6 Connection from ESnet
 - Small amount of bandwidth carved off
 - 2001:400:0808::/48
 - SLAC Switched Network
 - Cisco, Linux, FreeBSD, Solaris.

PingER

- Started in 1995 at SLAC
- DoE/MICS, ESnet, ICFA-SCIC, XIWT, IAEA
- Simple ping end-to-end Monitoring
 - 32 Monitoring Sites
 - 420 Remote Sites in 72 Countries
- See May issue of IEEE Communications magazine.

PingERv6

- Red Hat Linux with inet-apps from inner.net
- Data Collected from SLAC
 - November and December 1999
 - April to September 2000 (6 Months)
- Data Collected from 6TAP
 - mid-June to mid-September 2000 (3 Months)

PingERv6 Sites

Performance Summary

- Unreachable decreasing
 - Usually requires someone to notice.
- Typically at least 50% are Good or Acceptable
 - Indicates high traffic load on many links
 - Better performance in the summer

Really measuring the performance of the Tunnel !

Packet Loss Between 6TAP and Gendorf.net in August and September 2000.

Packet Loss (%)

Note low packet loss at weekends

**Round Trip Time Between 6TAP and WIDE.JP and
Between 6TAP and Gendorf.net in August and
September 2000**

IPv4 and IPv6 Round Trip Time Between SLAC and ORNL in July-September 2000.

Average Round Trip Time (ms).

IPv6

IPv4

Conclusions

On Performance and Reliability

- Not surprisingly, many of the same performance issues as v4
- Expect IPv6 to do better than v4 in at least some situations
- Tunnels can work well
- Bottlenecks are everywhere

Conclusions For HENP.

- Can't yet say that IPv6 features are going to dramatically improve the lives of physicists.
- If you build it, they will come.
- IPv6 is all over the world, just like the High Energy and Nuclear Physics Community.

Further Work

- Further Deployment of machines and applications
- Porting, especially physics applications.
- Experiment, especially with collaborators in developing countries
 - File Transfers

Thanks !

- To all who volunteered
- Bob Fink, Becca Nitzan and ESnet
- IPv6 team at Viagenie
- The 6Bone mailing list

Further Information

- <http://www-iepm.slac.stanford.edu> (IPv4)
- <http://vvvvvv.slac.stanford.edu> (IPv6)
- iepm@slac.stanford.edu (IPv4 only ☹).
- SLAC Tech-Pub 8642

Any Questions ?