10 Years of PfHSN

- Started on a lake (Zurich 1989)
- Lots of other lakes/harbors:
  - SF Bay (Palo Alto 1990)
  - Baltic Sea (Stockholm 1993)
  - Strait of Georgia (Vancouver 1994)
  - Mediterranean (Nice 1996)
  - Salem Harbor (Salem 1999)

10 Years ago...

- "Things will break at 100 Mbps"
- Latency, data copies were a problem
- Multimedia was the killer app of tomorrow
- Wireless was largely custom
- HS equipment was hard to get

5 Years later (ago)...

- ATM was hot
- Q: Life after ATM for PfHSN?
  - Problems with ATM
  - Still have upper-layer, end-systems

10 Years later...

- "Things will break at 1 Tbps"
- Latency, data copies remain a problem
- Web is the killer app of today;
  - Driven by interaction, not data chunk size
  - Multimedia is still the killer app of tomorrow
- I have 4 wireless nets, all interfering
- HS equipment is commodity
  - Everyone buys it, few of those need it

Changing landscape

- RAM is *really* cheap
- CPUs are fast
  - Still LE, still Wintel
- Backplanes are fast
  - Still bus, still hierarchy, still custom near CPU
- LAN BW is cheap
  - except to servers, access routers
- Performance isn't about steady-state

Recurring Themes

- Data is too oft touched
  - Bad implementations
  - Unfortunate semantics
  - Security processing necessity
- Inboard / outboard processing
  - DMAs are getting smarter --> channels?
- Connection setup is slow
  - TCP, m-IP, RSVP, ATM, etc.

Answered Questions

- TCP doesn't kill performance
  - implementations do
- Fast-path works
  - IP routing, TCP processing, etc.
- Bidirectionality is required
  - "TCP is slow"? --> so is bidir UDP?
- ILP works
  - but watch the instruction cache size

Some wild claims for 2009

- The “LAN” will continue to disappear
  - switching push out to the edge
  - complicated, overlaid clouds
- Some dumb things persist
  - Intel’s “Internet-enabling” LE CPUs
- Latency will be worse
  - increased use of satellite hops, interplanet
  - increased use of lower BW simple devices

Upcoming issues

- Integration of optical and Internet
  - resolve replication of effort
- Multihomed hosts
- Mice
  - Huge number of connections
  - setup is larger part of overhead

Witch way to the future?

- I don't know the future of LANs
  - what they will look like, how they'll perform
  - but they will be called "Ethernet"
- ... the future of global nets is IP
- ... the future of transport is TCP
- Apps will be unique to networking
  - Can't wedge our view of telephone, TV
  - New ability, not supplanted capability

Unanswered questions 1

- Active nets
  - capsules, streams, or app-level
  - make sure they don't slow down non AN
  - what do they do *for* high-speed?
- IPv6
  - if, when, etc.?
  - Are current hacks/solns OK for high speed?
  - Do we need it for high-speed?

Unanswered 2

- Native mcast / mobile (does IPv6 fix?)
- QoS? (do we need it if we have high-speed?)

- Are we hitting a knee in the curve?
  - Will technologies run out of gas?
  - Processing (vs. transmission)
- BW to the 'people'
  - how do we do tech transfer, do the care?

Unanswered 3

- Network management issues
  - manageability, monitor, reliability
  - feel the road vs. virtual couch
  - virtual nets (MMUs, paging algs, etc)
  - quest for speed more important than usability
- wireless .... (Fri)
- what can we do to help app development
  - w.r.t. supercomputer folk, etc.?

Unanswered 4

- What happened to distrib supercomputers
  - called the grid now
  - superservers are clusters
  - feedback on the grid chapter (per, julio)

Administrativia...

- Checkout is at 11am
- Lunch is at 12:30, under the 1st floor
  - Down stairs @ entrance/shop, B in elevator
- Take your things before leaving for lunch
  - We don't have this room past 12
- Proceedings
  - Book included with registration; extras @ $55

Future Issues

- 2000/2001 - merging with HPN
  - Look for a unified CFP next summer
  - Likely venue: Paris
  - IFIP sponsor, IEEE co-sponsor continues
- GBN 2000 in Israel at Infocom
  - Call for one page abstracts 11/99
- High-Speed Networks book
  - James & Joe - Wiley mid-2000

And finally...

- If you liked the arrangements...
  - Jeanine Yamazaki - USC/ISI Div. Coord.
  - Sungita Patel - Asst. Div. Coord.
- If you liked PfHSN...
  - Harry Rudin - IBM Zurich Research Lab
  - Guy Leduc - Univ. Liege, IFIP Rep.
  - IFIP (sponsor), IEEE-TCGN (co-sponsor)
  - Our esteemed program committee...