Research and Education Networks: Tomorrow’s Problems, Today’s Technology

Ron Hutchins, CTO – Georgia Tech
Marshall Chambers, Strategic Initiatives – Barrow County Schools, Georgia
And a host of others...
A Proposition: a question of life?

I live my life in growing orbits
Which move out over the things of the world
Perhaps I can never achieve the last,
But that will be my attempt.

I am circling around God, the ancient tower,
And I have been circling for a thousand years,
And I still don’t know if I am a falcon, or a storm,
Or a great song.

Rainer Maria Rilke.
... a bit of history...

- ARPAnet – an experiment with packet switching
- Regional networks – connecting campuses to High performance computational centers
- NSFnet – interconnecting regionals, converts to:
  - The Internet – commercialization of NSFnet
  - Internet2 – bringing back higher education and research into the networking “business” - apps
- National Lambda Rail – focusing on research in the high performance networking world – Lambdas: Physics, HPC, telepresence
So... what’s different about high performance networking?

• Original notion of the internet: connect everyone on a single network (what’s the value of one fax machine???) worldwide – Email as killer app.

• Changes over time
  – High speed national backbone vs. high speed campus
  – Many networks vs one network
  – Security as a motivator: separation, isolation...
  – Dark fiber as an owned resource – telecom downturn
  – Layer2 (Ethernet) as the “coin of the realm” instead of Layer3 (IP layer)
R&E vs Commercial ISP Services

• Different business models – R&E motivated by research, commercial motivated by growth/sales.

• Different architectures – R&E networking serves compartmentalized communities similar to insurance, banking, healthcare, Wall Street except with varied requirements (jitter, latency, bandwidth, hold time)

• Commercial space is beginning to adopt similar architectures and find similar needs: Telepresence!
The Broader Scope of R&E Networking

• Regional aggregators (Regional optical networks, or RON’s) serve diverse communities
• Connect similar communities for broader impact and collaboration to solve grand challenges
• K-20 participants can benefit and bring value themselves past the original research agenda
• The Shrinking of the World!!! A grand experiment
We are all in the gutter…
but some of us are looking at the stars.

Oscar Wilde, *Lady Windermere's Fan*, 1892, Act III
Irish dramatist, novelist, & poet (1854 - 1900)
Barrow County Schools

Lori Ann Bone
2009 - 2010
Teacher of the Year

“World Class Education
... Hometown Values”
Vision

• Barrow County Schools is known throughout the world as THE model for what it means to Provide a World Class Education with Hometown Values
BANDWIDTH & LATENCY

Define the capacity and quality of the **foundational layer** of our network Infrastructure.
Local, State, and National Issues Relative to K-12

Direct To Discovery

Seeks to engage and motivate students in the excitement of science discovery

Leverages high speed networks and advanced media technologies to create lab to classroom experiences

Provides ageless curricula consistently in sync with advances and discoveries in science

Establishes a process for collaboration on problems important to K-12 and post secondary institutions

Potentially a strong component in the development of Georgia’s labor and talent pool

The network also supports cultural events
Time: It’s Greek to Me

• Chronos: Chronological or sequential time

• Kairos: A moment ‘in between’
  – Of undetermined duration
  – In which an opportunity exists
  – To do the extraordinary and/or exercise leadership
Beyond the Bandwidth Barrier

- Educated Populace
- Emergency Preparedness
- Economic Development
We are all in the gutter, but some of us are looking at the stars.

Oscar Wilde, *Lady Windermere's Fan*, 1892, Act III

Irish dramatist, novelist, & poet (1854 - 1900)