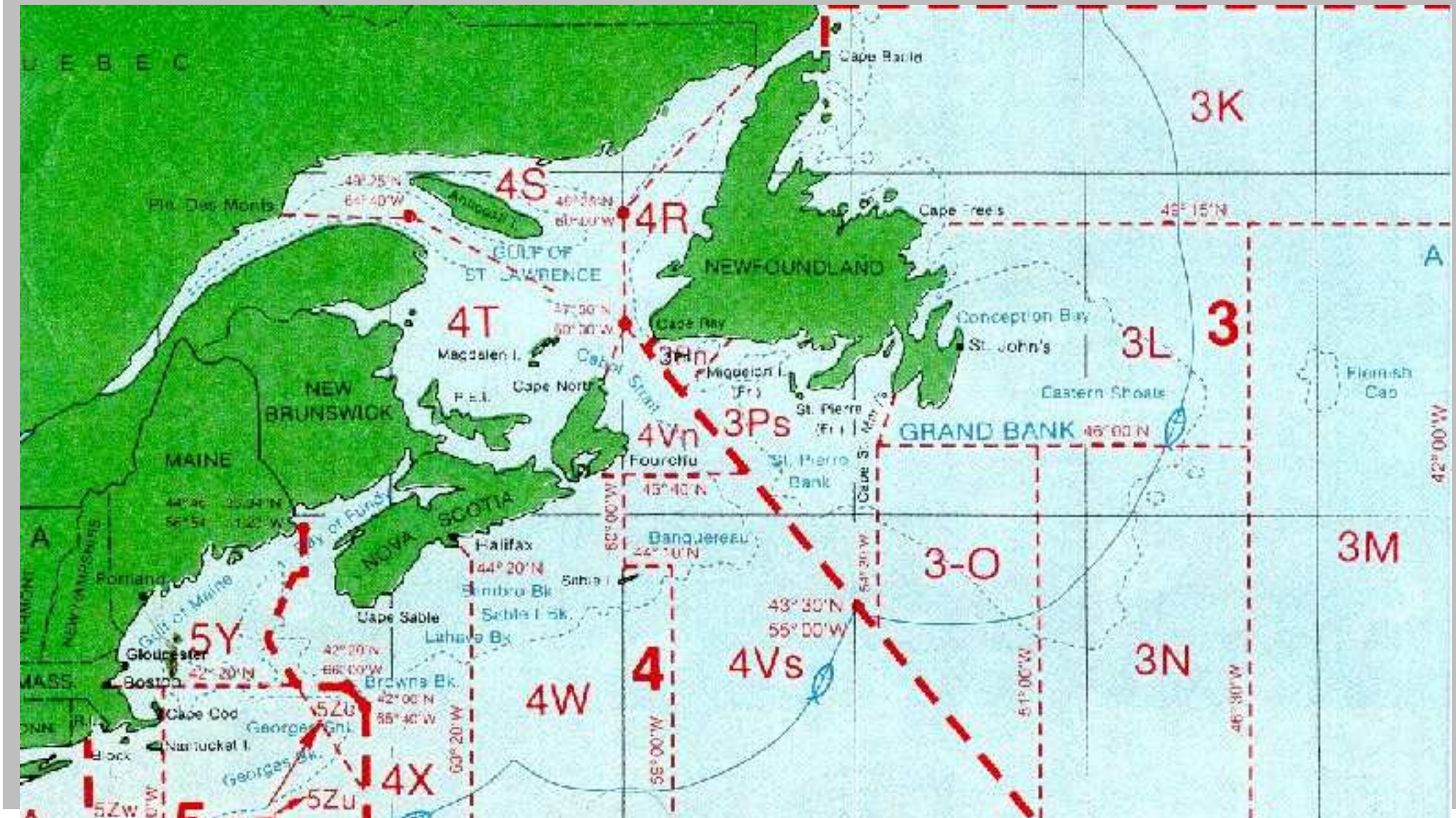
What is this Perfect Storm stuff all about?



Agenda

- Background and Context
- So what is the "Perfect Storm"
- Three Central Tenets
- A Few Things to Think About
- Where to from here?
- Discussion

But before we start...

- Danger Will Robinson!!!
- There are some radical concepts in what follows
- Or maybe not...

Background and Context

- I’d been spending a lot of time around things like
  - NGN and IMS

    http://www.1-4-5.net/~dmm/talks/NANOG33/ims
  - And studying complexity

    http://www.1-4-5.net/~dmm/talks/NANOG26/complexity_panel

    RFC 3439
- Its all about controlling how networks are used

  And in particular, its about tying (perceived) high margin application revenue directly to the packet transport (and...charge differently/prevent/degrade "over-the-top" services)
  - And given my background/sensibilities, I was/am skeptical
- So I proposed a (hedge) strategy that became known as "Meyer’s Telecommunications Perfect Storm " (TPS)

Ok, so what exactly is the TPS?

- TPS is deeply multi-disciplinary
  - Involves economics, public policy, and the Internet technology
- TPS is based on the Internet Architecture
  - In particular, the end-to-end (e2e) principle

    We can argue (like everyone else) about what the e2e principle actually states...
    http://users.exis.net/~jnc/tech/end_end.html
- Key observation:
  - e2e principle ==> IP packet carriage is a commodity business
- TPS is also strongly anti-convergence
  - In the "holy grail" sense
- TPS is based on three central tenets

Aside: On Commodity Businesses

- Commodities tend toward low margins
  - In those cases in which the incremental cost of providing a unit of the commodity goes to zero

    That is the point at which it makes sense to price your commodity just below the price set by your competitor(s)
  - And the "race to the bottom" ensues

    Which is exactly what we're seeing

- BTW, this doesn't mean that gear sold into a low margin industry itself must be low margin
  - The gear just must aggregate
  - Think Airbus (or Boeing) and the airline industry

On Commodity Businesses, cont

- So a classic commodity has the property that the incremental cost of providing the good or service approaches its marginal cost of production

- What is the marginal cost of forwarding an IP packet in the core of the Internet?
  - Well, there are high fixed capital costs (routers, circuits, etc)
  - and high OPEX
  - and a very small marginal cost

    i.e., the incremental cost of forwarding a packet

- More understanding of this topic for the IP backbone case is needed (obviously)

So what happens if...

The following three things (aka central tenets) happen?

Keep this question in mind as we talk about the tenets.

Central Tenet #1

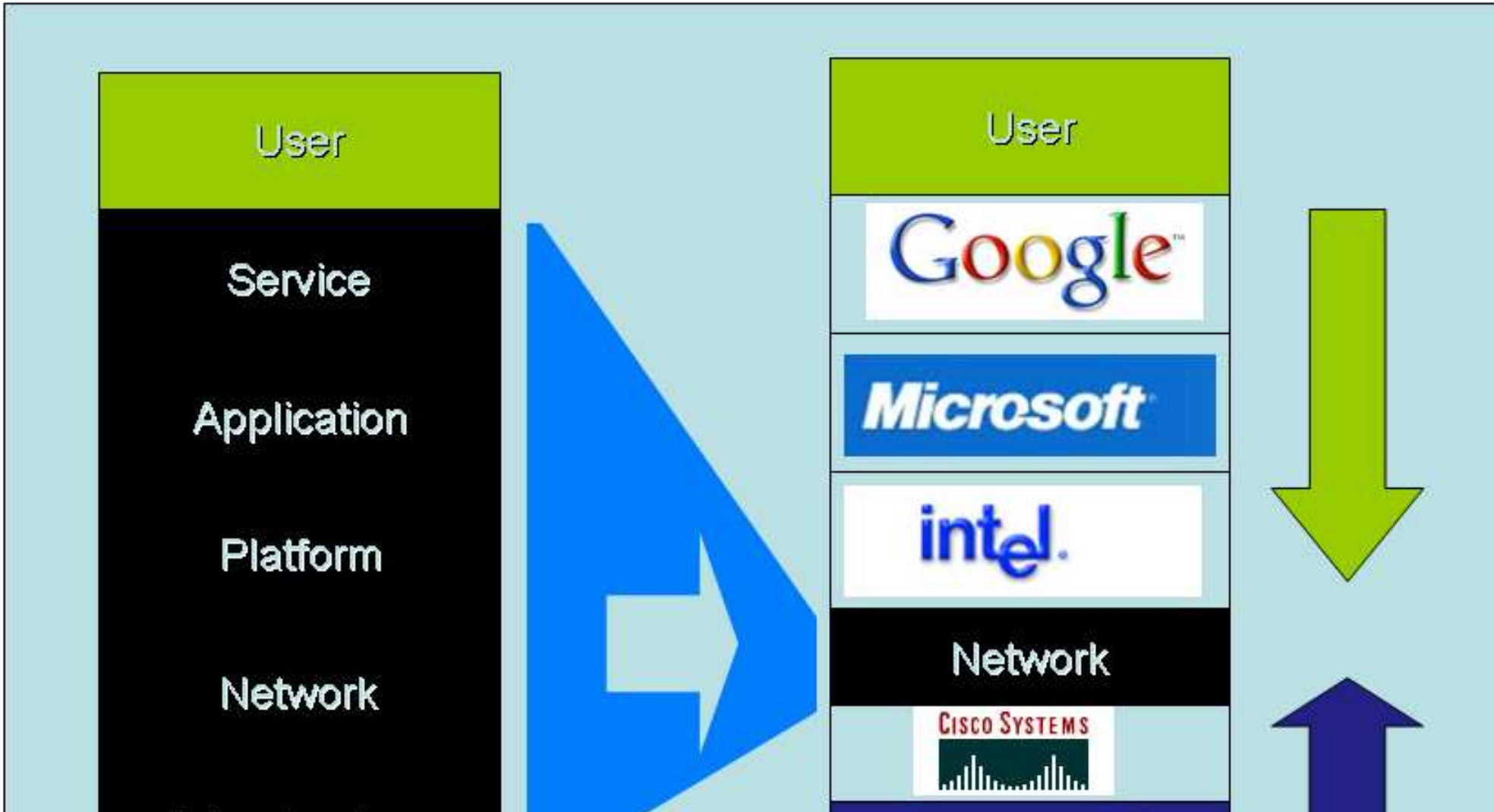
- Someone learns how to run a low margin yet profitable packet carriage business
  - As implied by the e2e principle
- Remember that the hypothesis here is that packet carriage will always be a low margin business as a direct consequence of the e2e principle
  - Note that some providers are already building "simple" networks in an attempt to lower OPEX
    Something you'll need if you want to get to a profitable low margin business
- And BTW, there is the question as to whether we're optimizing these networks for the "right" thing in the first place...
  - 80/20? (Or is it more like 95/5?)
  - Consider "convergence" (in the holy grail sense)
    See e.g., http://www.potaroo.net/ispcol/2006-02/converged.html

Central Tenet #1, cont

- Lighting (even inexpensive) fiber is still expensive
  - OPEX, however, still dominates margins
  - And we need to watch out that our economic models are not based on "glut economics" or the availability of "distressed assets" [vaf]
- But even that is changing
  - What are the future economics of lighting fiber?
- So what this is really about is...
  - The convolution of our technology with the economics of IP packet transport
  - And BTW, in case you were wondering, we understand all of this about as well as we understand complexity

On Economic Realities....

Image courtesy Geoff Huston



On Economic Realities, cont

Image courtesy Geoff Huston via kc claffy

capital distribution problem

(the ones who need to innovate in the core don't have capital)

INNOVATOR	EPS ($)	MKT CAP ($B)
MCIW	-11.22	6.5
SPRNT/NXTL	-0.31	34
VERIO/NTT	1.98	71.6
LEVEL3	-0.74	1.9
SBC/T	1.41	78
QWEST	-0.45	7.7
COGENT	-7.42	0.2
GLBC	-13.84	0.3
SAVVIS	-0.90	0.12
ABOVENET	n/a	n/a
WILTEL	n/a	n/a
TELEGLOBE	-0.74	0.2

INNOVATOR	EPS ($)	MKT CAP ($B)
CISCO	0.87	108
GOOGLE	3.41	97
AMAZON	1.25	19
YAHOO	1.07	49
EBAY	0.73	51
JUNIPER	0.53	13
APPLE	1.56	47.
INTEL	1.33	141

Central Tenet #2

- Access monopolies cease to exist
  - Say, due to the emergence of technologies like WiMAX

    or just competition in the access

    Truth in advertising: We still don't have a (inexpensive) wireless technology that could deliver 100s (or even 10s) of HDTV channels

- Competition makes it much harder (impossible?) to profitably field policy-based access networks
  - Why? Well, consider the cost (OPEX) of running one of these networks

    and given the complexity, its reliability

- And there is no way your SP is going to be able to innovate at the same rate as the *entire Internet*
  - Consider the success of AOL or other attempted "walled-garden" providers

Central Tenet #2, cont

- Bottom line: Policy-based networks (walled-gardens) cost more, are less reliable, and are less "service rich"
  - Who buys that if there is a choice (read: competition)?
  - And we can talk about the "bundling argument" if we wind up with time...
- So this is about a convolution of our technology with public policy
- To be precise, "Net Neutrality"
  - http://www.potaroo.net/ispcol/2006-03/content.html

Aside: Walled Gardens - What's the problem?

- Innovation on the edges forces walled garden providers to let the new service through
  - Their customers demand it
    Canonical example: ports 80/443
  - This is part of the reason why the existence of competition in the access is a critical component of all of this

- But then everything can be tunneled over those (now open) ports
  - e.g., skype
  - plus encryption + anonimzation
  - And BTW, you can't really find this stuff with, say, a DPI engine
  - Why, you ask?

Aside: Walled Gardens - What's the problem?

- Why can't you find this stuff with a DPI engine?
  - While you may be able to find the signature (e.g.) of encrypted voice (today), you basically have to block everything that you can't identify

    And the app developers are a step ahead...
  - The implication is that most applications that are "over-the-top" have to be treated by default logic
- Conclusion: You can't effectively stop over-the-top services
  - if there is competition in the access
- This is a classic arms race

Central Tenet #3

- Third piece of this puzzle is that you get a set of peer-to-peer (p2p) applications that attack the incumbents revenue streams
  - "attack" in the capture-the-revenue sense (contrast DDOS)
  - Key: p2p decentralization

- Starting with voice
  - Large easily attacked revenue stream

    cf. Vonage, skype, etc...
    But also video, FMC, presence, IM, ...

- So this (again) is about a convolution of our technology with public policy

TPS Summary

- So...what happens if we wind up with...
- Low margin but profitable packet transport
  - Emergence of "new world players"
- No access monopolies
  - Competition and/or new technologies
- Large scale attacks against traditional access provider revenue streams
  - Possibly based on p2p technology

TPS Summary, cont

- Net Neutrality is the public policy angle to all of this
- And BTW, how many of the "central tenets" are already occurring?

A Few Things to Think About

- If the TPS comes to pass, will the (Internet) industry restructure?
  - And how fast
  - cf. the (music) recording industry
- Under this hypothesis...
  - What do we tell SPs, researchers, vendors...
- Back to the future?

Where to from here?

- All of this is just a scenario in which the e2e Internet that we all know and love wins
  - Contrast with the "value-added-transport" position
    Noting that *everything* is Over-the-Top on the Internet
- We also need to be teaching and informing the community at large
  - Where "community" includes SPs, enterprise operators, content providers, researchers, vendors, ...

Final Comments

- A bad (tm) outcome would be to find ourselves in a situation where
- Service Providers can’t be profitable enough to continue bandwidth upgrade cycles
  - e.g., we can’t get to the low-margin-yet-profitable scenario for whatever reason
- Service Providers choke off innovation
  - e.g., via legislative/regulatory action

A few selected references

- http://www.1-4-5.net/~dmm/talks/perfect_storm/Cerf_Testimony_final-feb_7.pdf
- http://www.1-4-5.net/~dmm/talks/perfect_storm/Marcus-060323-Fin-v2.1.pdf
- http://www.itu.int/osg/spu/ngn/documents/presentations/marcus-23-march-2006.ppt
- http://www.itu.int/osg/spu/ngn/documents/presentations/horrocks-23-march-2006.ppt

Questions/Comments?

Thanks!