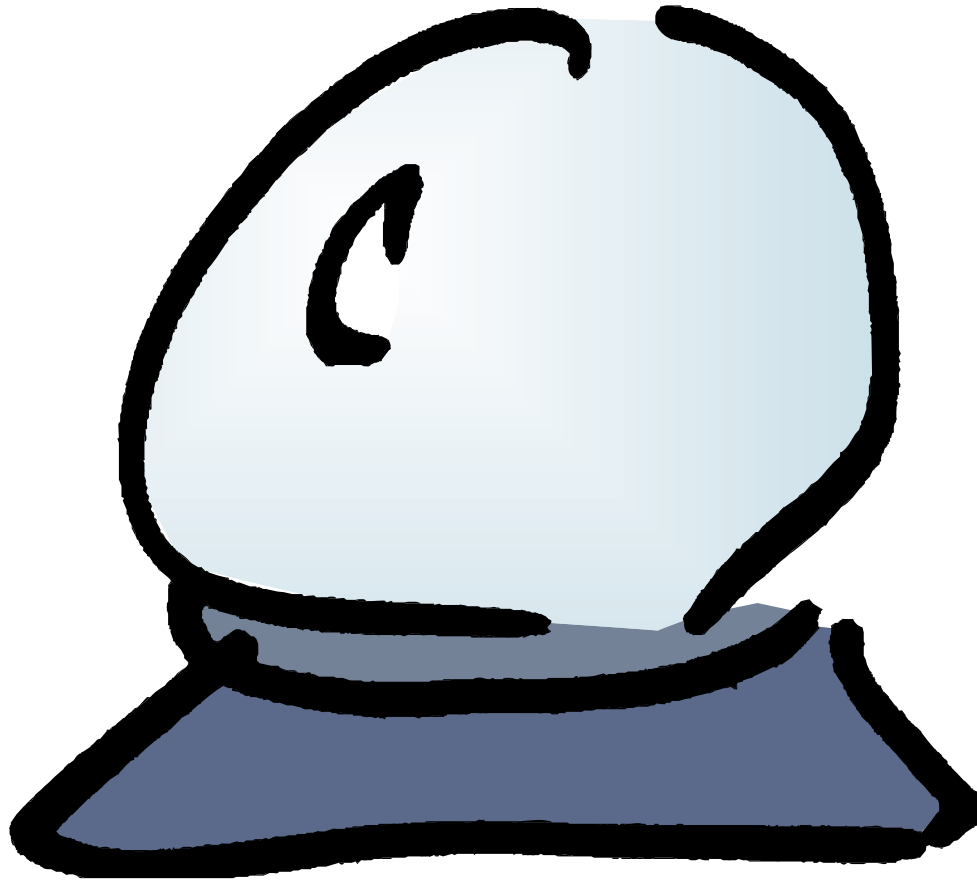


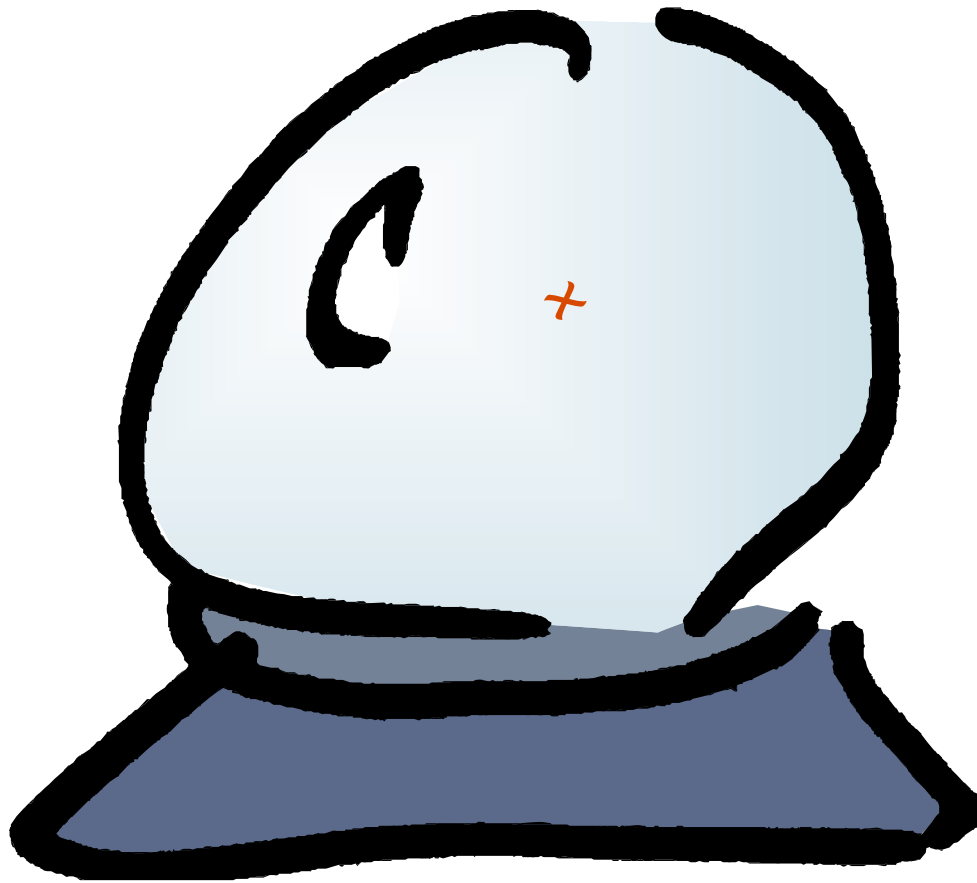
Internet Futures



My Aim:

share some thoughts
about the Internet
and its future

think about some
of the major
factors that will
shape our future



Why?

The mainstream
telecommunications
industry has a
rich history



Why?

The mainstream
telecommunications
industry has a
rich history

...of making very poor
technology guesses

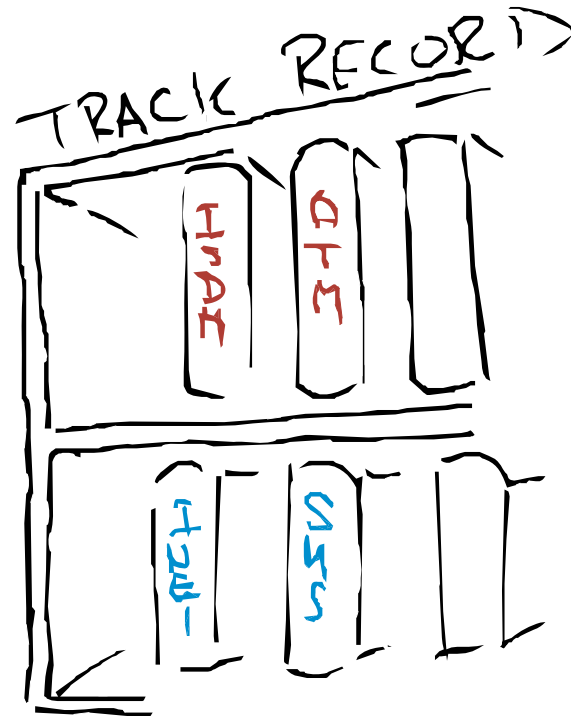


Why?

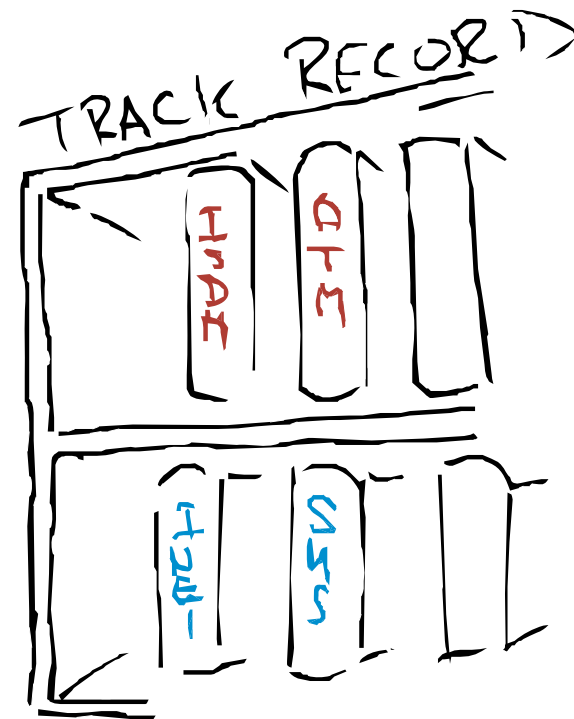
The mainstream
telecommunications
industry has a
rich history

...of making very poor
technology guesses

and regularly being
taken by
surprise!



Can the Internet
do a **better job**
of matching
technology to
user needs?



One approach:

1. Observe the situation and what's happening

One approach:

1. Observe the situation and what's happening
- 2.
3. Understand where this may lead us and what options may be presented on the way

One approach:

1. Observe the situation and what's happening

2. Believe what we see

(the most difficult one!)

3. Understand where this may lead us and what options may be presented on the way

What's Happening Today:
User Preferences and the
Market for Services

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Market for Services

From radio to tv to ?

What's Happening Today: User Preferences and the Market for Services

From radio to tv to ?

 → 'IPTV'

What's Happening Today: User Preferences and the Market for Services

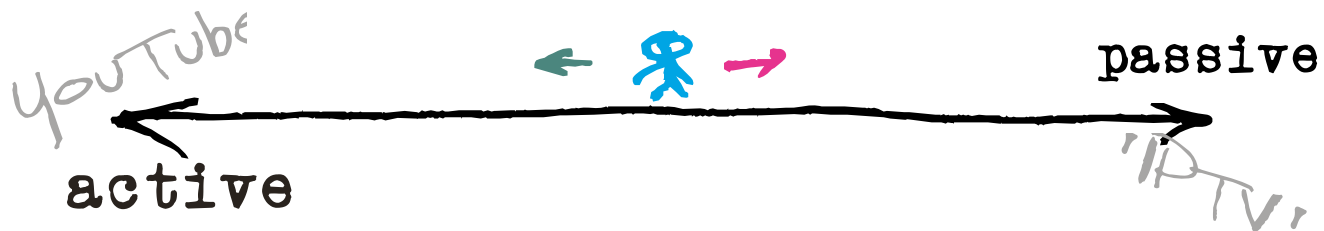
From radio to tv to ?



What's Happening Today: User Preferences and the Market for Services

From telephony to chat
to mashups to p2p to ?

From radio to tv to ?



Service Profile Choices

open vs walled
garden

Service Profile Choices

open collaboration
framework

open

vs

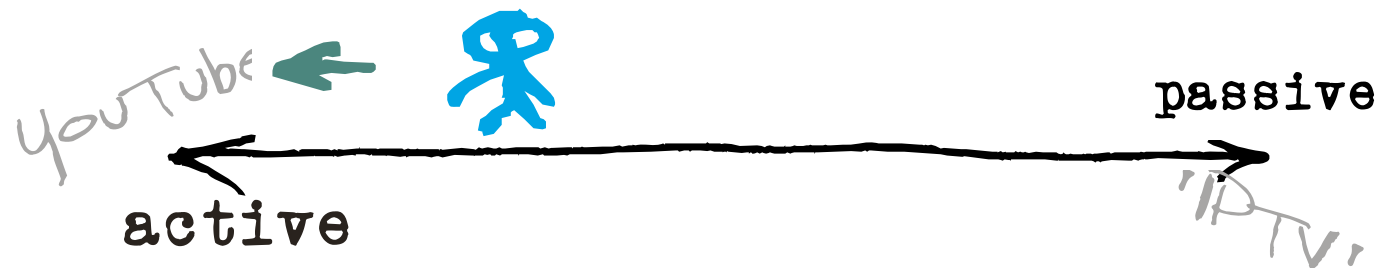
walled
garden

Bundled services

What's Happening Today: User Preferences and the Market for Services

From telephony to chat
to mashups to p2p to ?

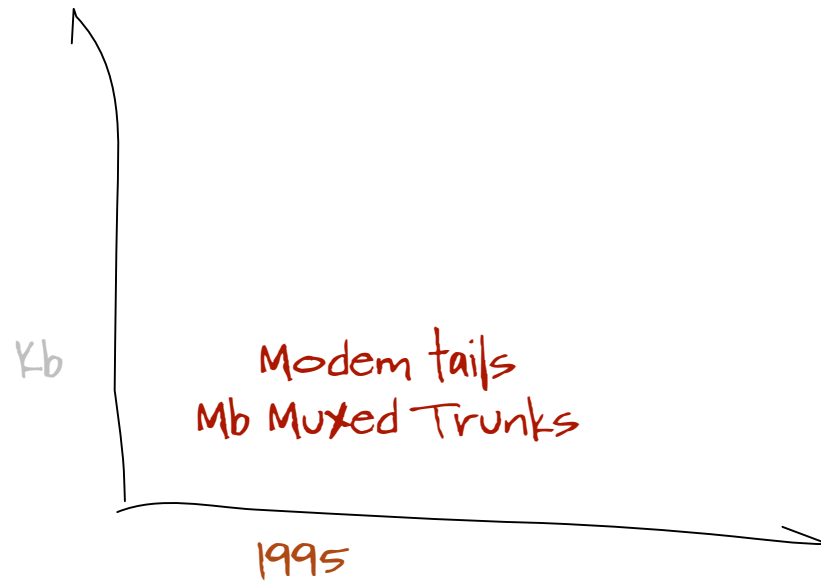
From radio to tv to ?



Today's users have already clearly
demonstrated their preference for
an active service profile based
on sharing

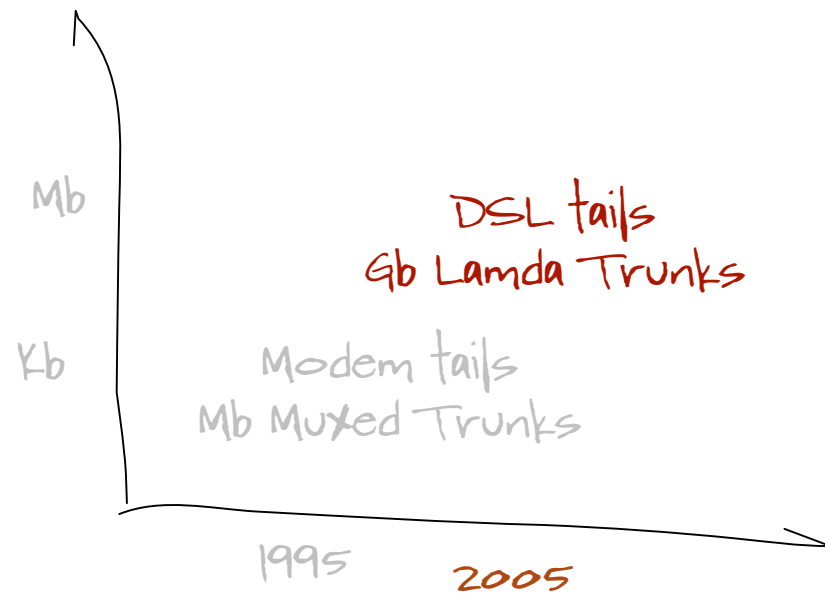
What's Happening Today: Demand for Bandwidth

what mass market customers want for \$25 per month!



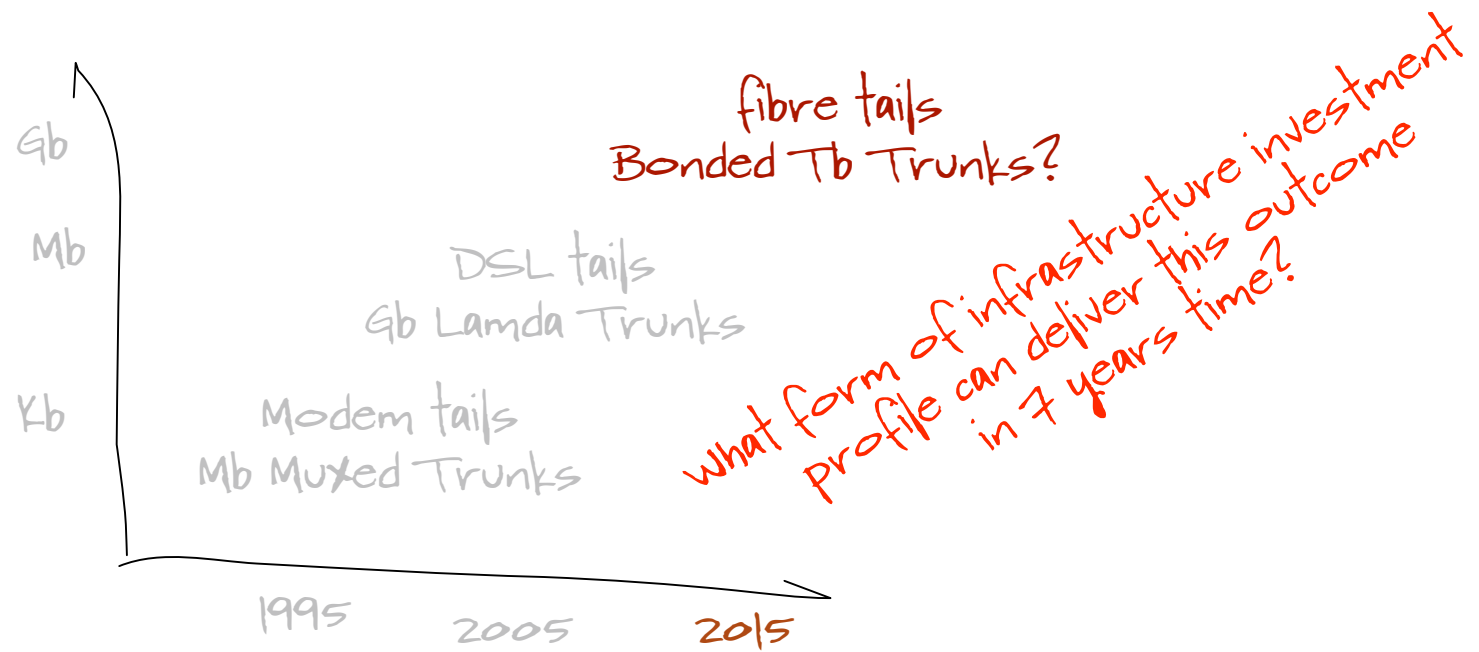
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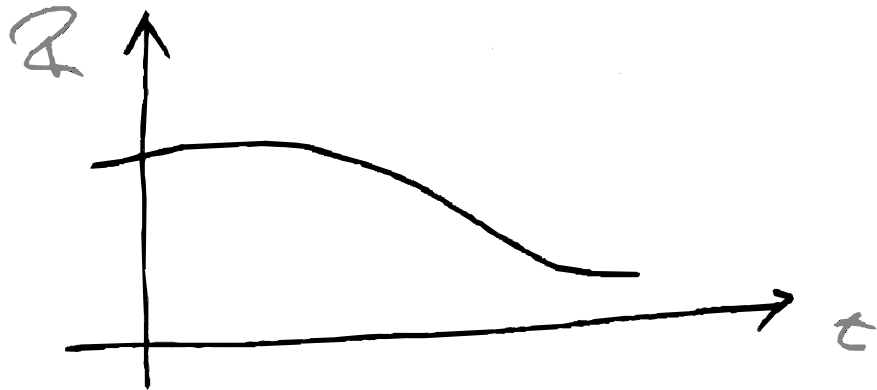


What's Happening Today: Demand for Bandwidth

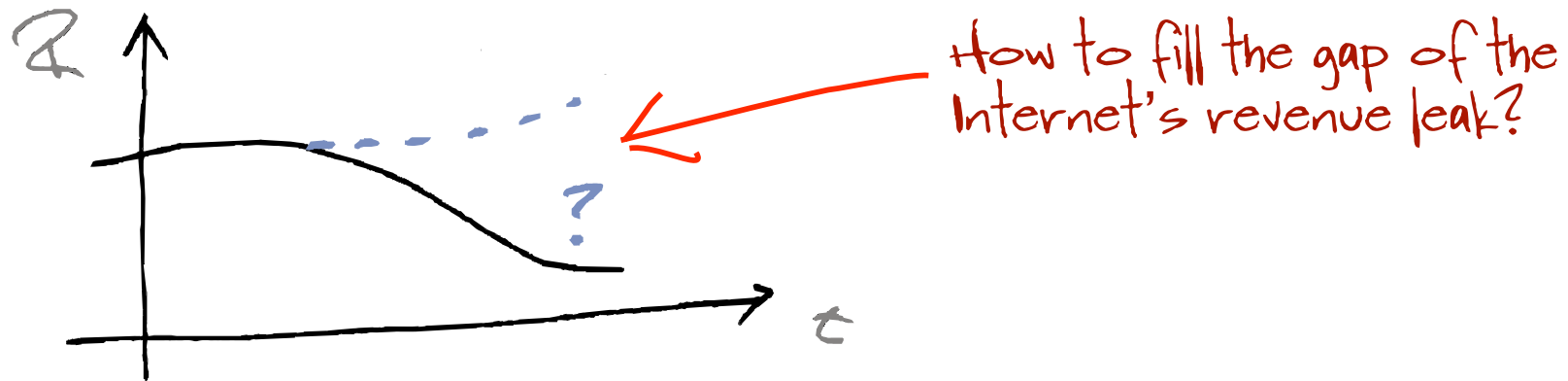
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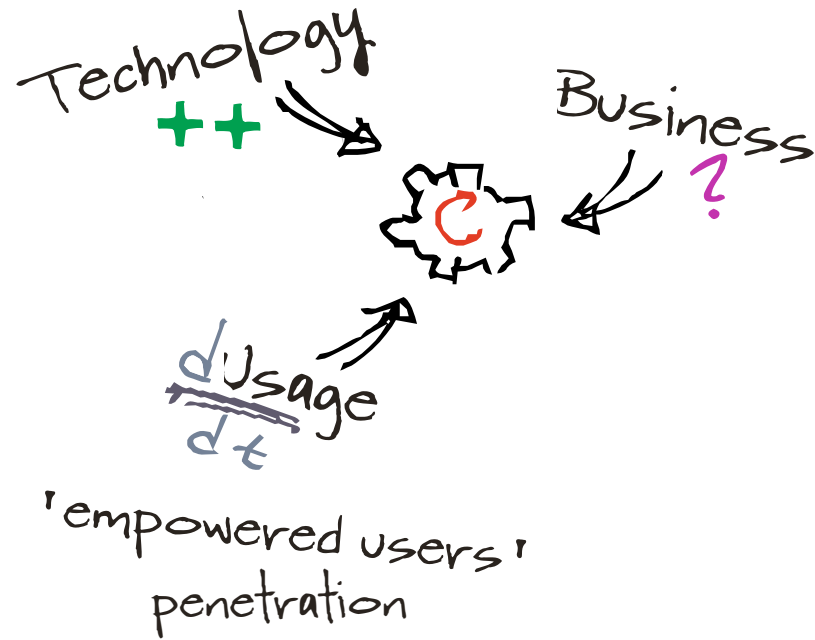
What's Happening Today:
Declining Revenue Profile
for incumbent telcos



What's Happening Today: Declining Revenue Profile for incumbent telcos



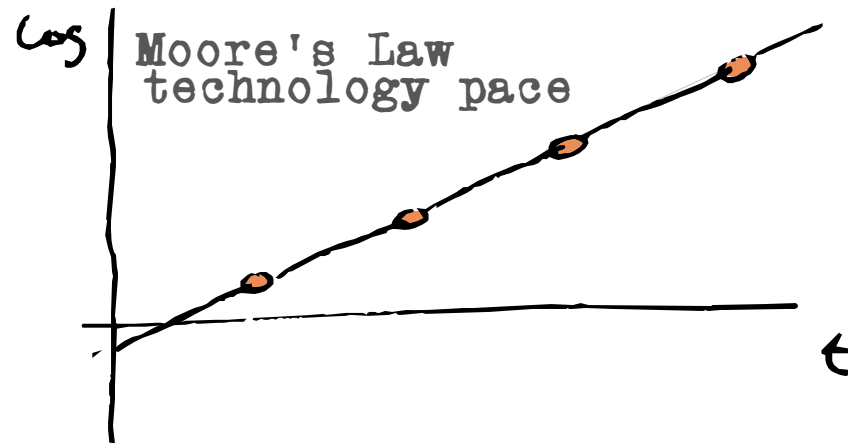
driver dimensions



technology



surplus
rapid infill
enabling windows

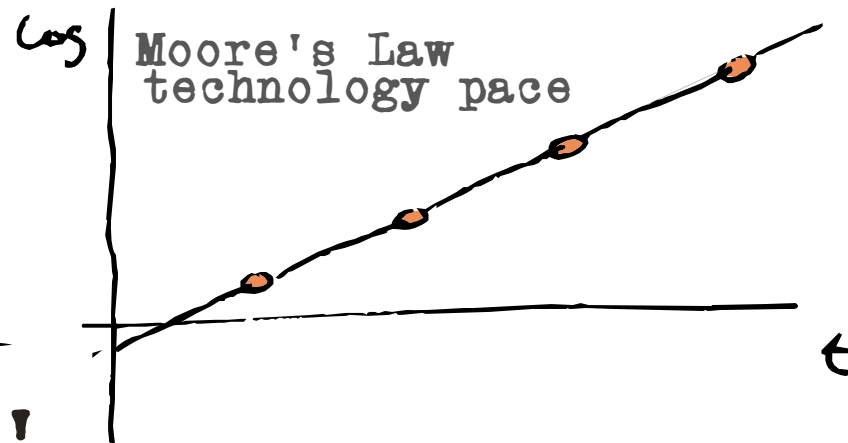


technology

++

surplus
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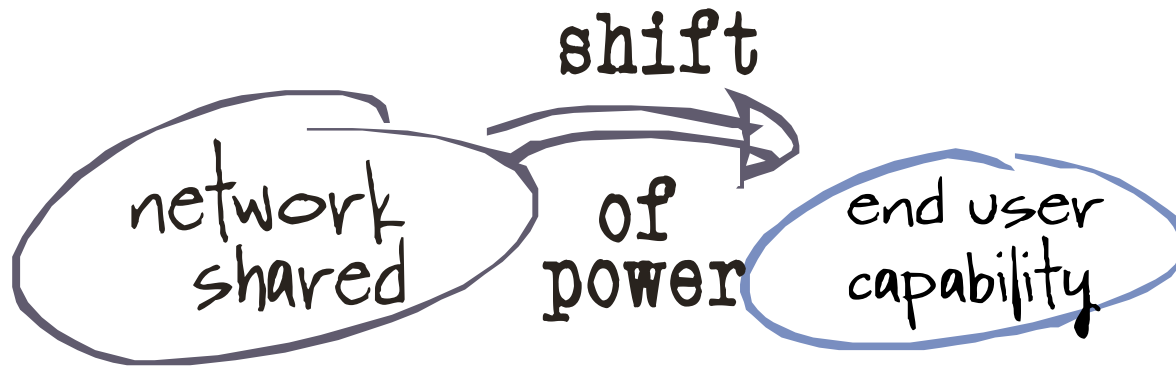
see it ...
... seize it !



technology

++

technology push and network architecture

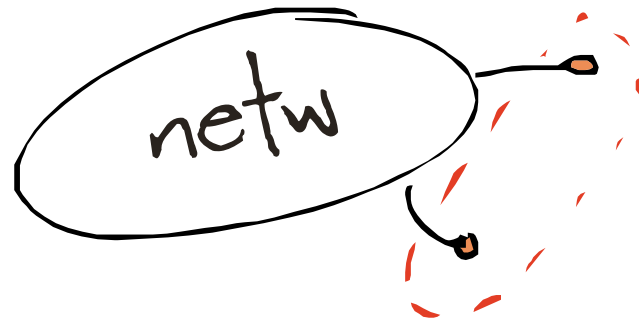


technology

++

new production paradigms

"Over the top"
applications



a 'network-service'
produced outside
of the 'network'

technology

++

new production
paradigms

"Over the top"
applications



a 'network-service'
produced outside
of the 'network'

Content production is a commodity application that users sustain through sharing, rather than a valuable service that is produced externally through dedicated specialized production channels

technology

++

surplus enables
divergence

for
simplicity and
performance

technology

++

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divergence

for
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~~QoS~~ ~~IMS~~
~~Network VPNs~~

technology

++

surplus enables
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no need for
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technology

++

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~~QoS~~

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Web 2.0 enabled user generated
content

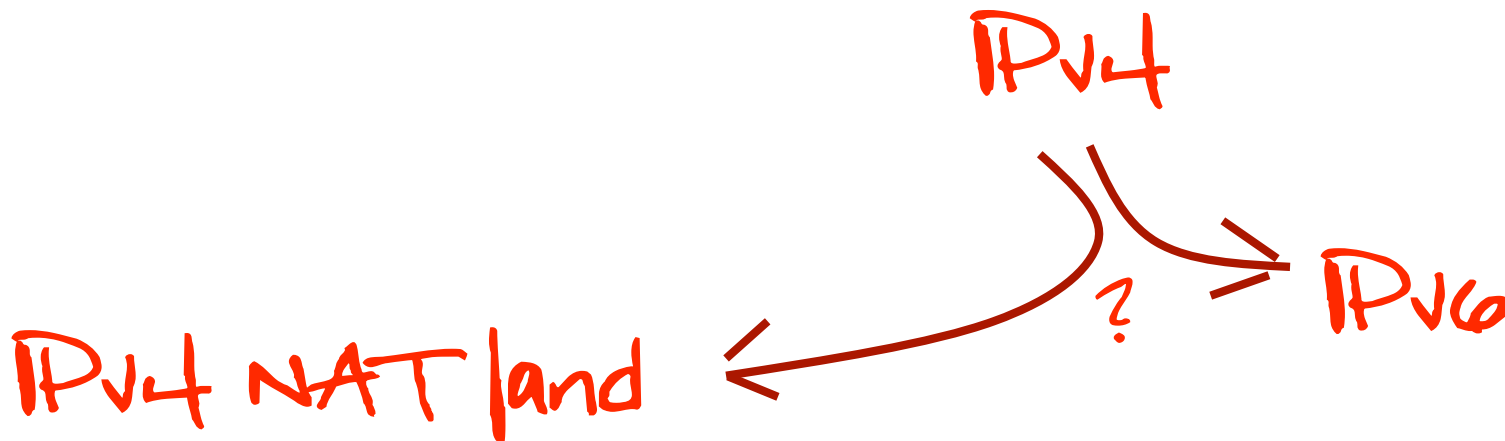
flickr
facebook
doppler ok youtube
google wikipedia

technology



tensions at the lower levels of the technology stack

Users simply want applications to work



Network operators often base their business model on driving complexity into the network

So who really wants a simple end-to-end IP network?

And who is willing to pay for it?

$\frac{d}{dt}$ usage

fuelling the usage growth fire

usage = scaling

$\frac{d}{dt}$ usage

fuelling the usage growth fire

Please send heaps more....

bandwidth
switching fibre routes
routing
addressing delivering storage
silicon density power heat dissipation
memory speed
storage efficiency

usage = scaling

Business modelling

?

is challenging when today's businesses appear to have radically different ideas of what this business is all about

Business modelling

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and very few of these ideas will be right!

And some of these ideas appear to be just plain wrong even now!

Business modelling

?

..today operators
tend to be very
hype driven ..

is challenging when today's businesses appear to have radically different ideas of what this business is all about

and very few of these ideas will be right!

And some of these ideas appear to be just plain wrong!

Business modelling

?

..today operators
tend to be very
hype driven ..

convergence

seamless networking

NGN - . . .

triple play

Business modelling

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..today operators
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✦ Everyone is talking
about it

Business modelling

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..today operators
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NGN - . . .

triple play

- ✘ Everyone is talking
about it
- ✘ Few have actual
experience

Business modelling

?

..today operators
tend to be very
hype driven ..

convergence

seamless networking

NGN - . . .

triple play

- ✘ Everyone is talking about it
- ✘ Few have actual experience
- ✘ .. and the actual experiences are mostly failures

Business modelling

What are we learning?

?

□ Packet pushing is a commodity utility activity

Low margins

Low barriers to entry

No product differentiation

Deregulation and competition

Valued services are overlays to the network

Business modelling

What are we learning?

?

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Deregulation and competition

Valued services are overlays to the network

□ Traditional revenue streams are vaporizing

wired telephony

Business data products

Local Access
monopolies

Mobile telephony

Business modelling

What are we learning?

?

□ **Packet pushing is a commodity utility activity**

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monopolies

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□ **Investors are still nervous about telcos**

Cost of capital is high

Consumers are fleeing legacy telcos in the face of price gouging

Shareholder returns need to stay high

No residual expertise left in-house

Business modelling

?

Informed decision making about network infrastructure investment is the key to the next few years!

Poor network investment choices will lead to business failures

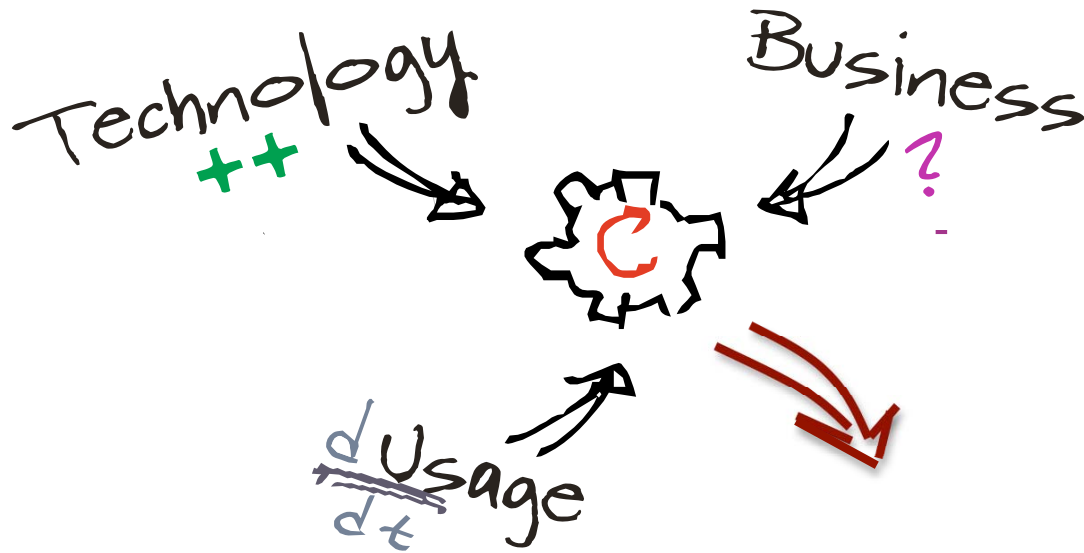
Those who are prepared to question the hype and construct their networks in a way that supports user needs will emerge as stronger ISP players

So where are
we heading?

My personal view sees the following..

So where are we heading

My personal view sees the following..



'empowered users'
penetration

new roles being defined

with different
relationships

.. involving users
and other stake-holders

So where are
we heading?

My personal view sees the following..

network

commodity utility
network operation

high capacity
packet pushing

So where are we heading?

My personal view sees the following..

network

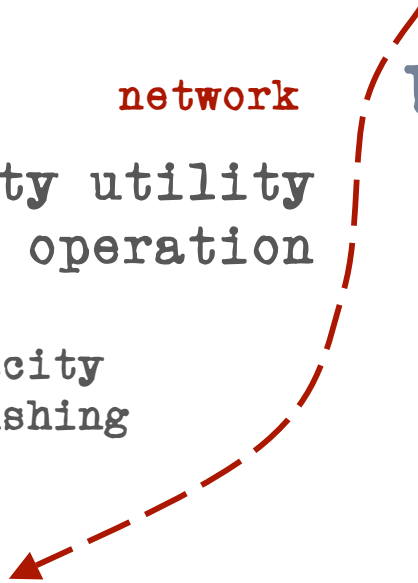
commodity utility
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high capacity
packet pushing

user - drive, production
p2p, content, ..

User-centric applications,
not network-centric services

Value shift up
the protocol stack



So where are we heading?

My personal view sees the following..

network
commodity utility
network operation

high capacity
packet pushing

user - drive, production
p2p, content, ..

User-centric applications,
not network-centric services

Value shift up
the protocol stack

Reinvention:

opportunities will arise with

involving users

new partners

and different business models

a closing thought ...

I'm probably going to be proved wrong as much as I may be right with these thoughts. There is no certain track of progress here.

Each shift of the Internet's use paradigm through innovation is as much a surprise to the innovator as it is to everyone else.

which is probably a very good thing!

Thank You!

Geoff Huston
gjh@apnic.net