

# Development of Internet traffic, standards and complexity

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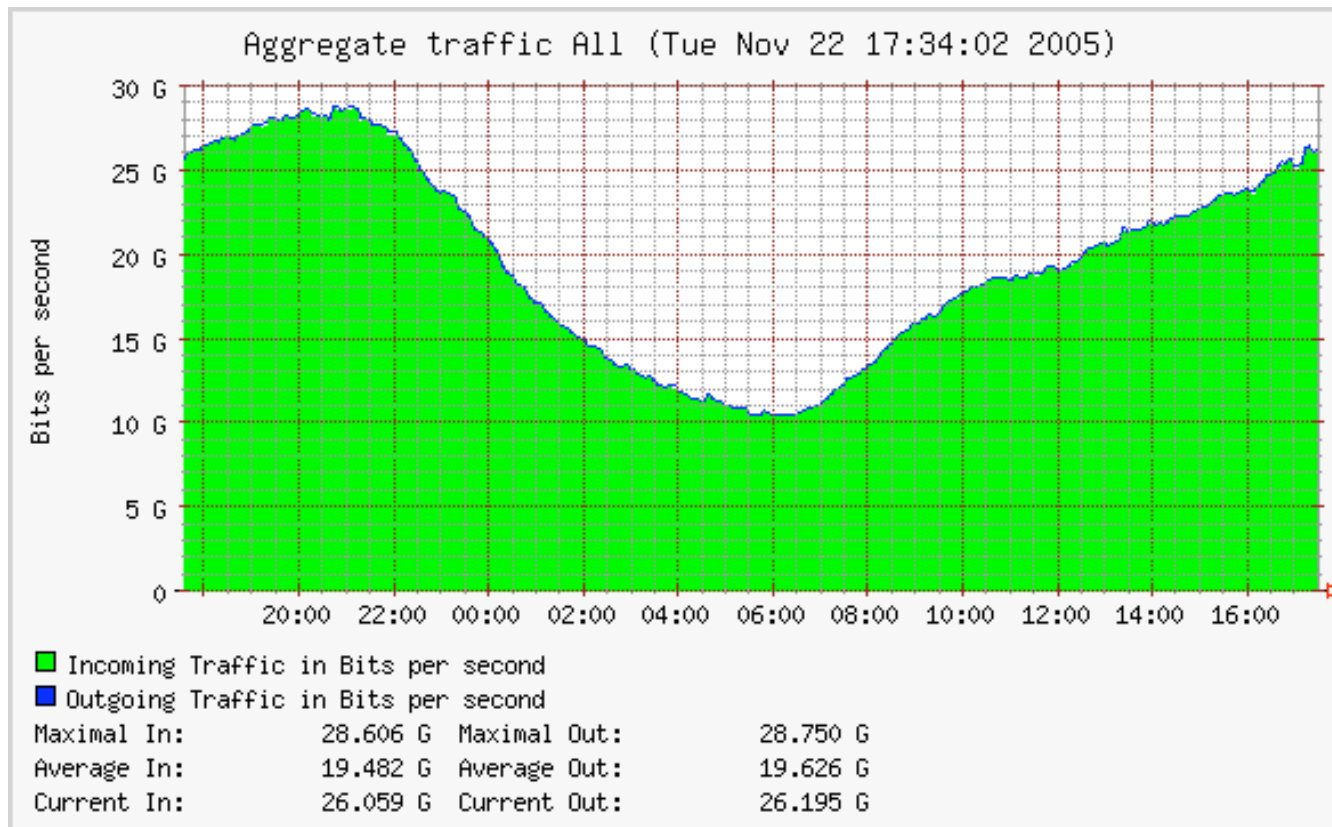
# Who am I then?

- Originally from Åland
- I used to work for KPNQwest in Sweden and Holland
- Currently Managing Director at Netnod / Autonomica
- Member of
  - Internet Architecture Board
  - IETF Administrative Oversight Committee
- Chairman / Working group chair of
  - Euro-IX
  - SOF
  - IETFs shim6 and v6ops WG
  - RIPEs NCC-Services WG



# Traffic....

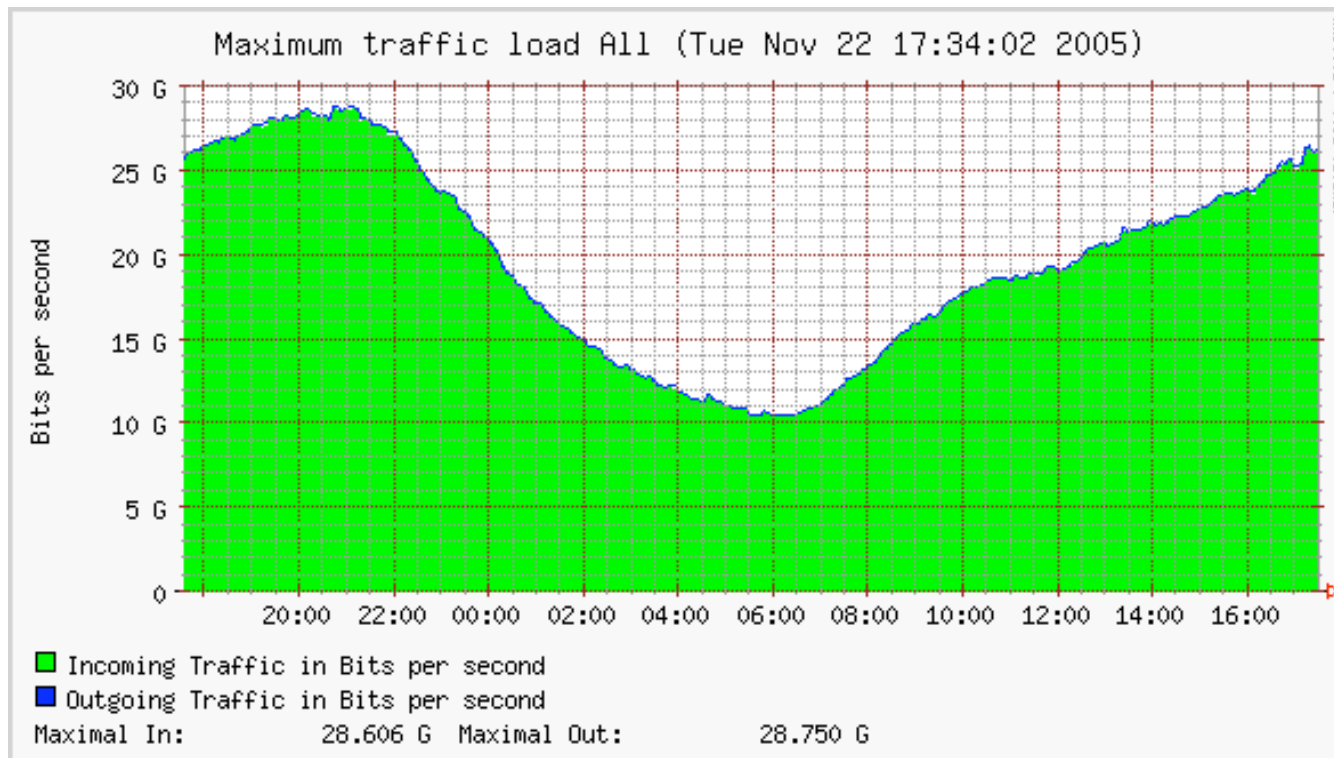
- Continues to grow
  - No big surprise there...
  - But how fast does it really grow?
  - And why?
  - And when?
- The two last are real mysteries...



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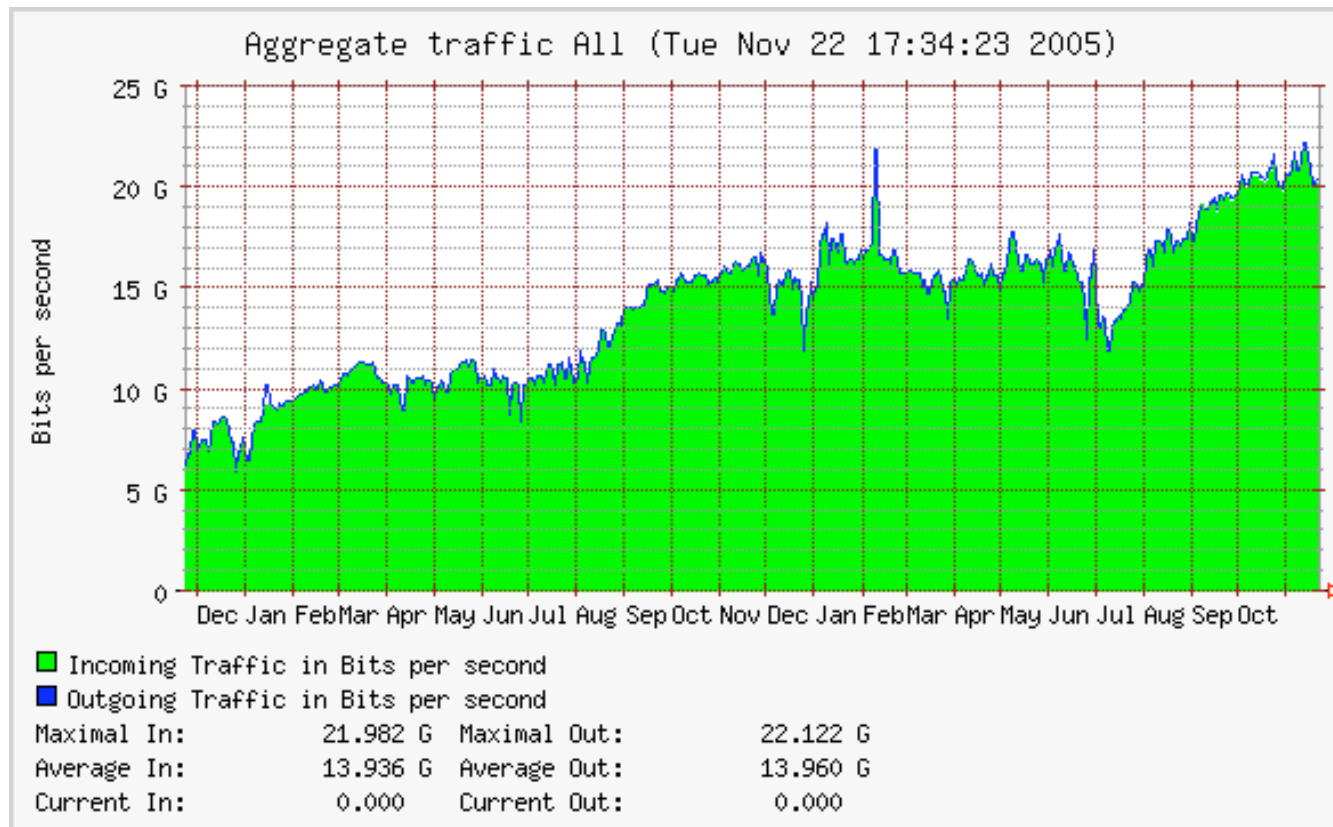
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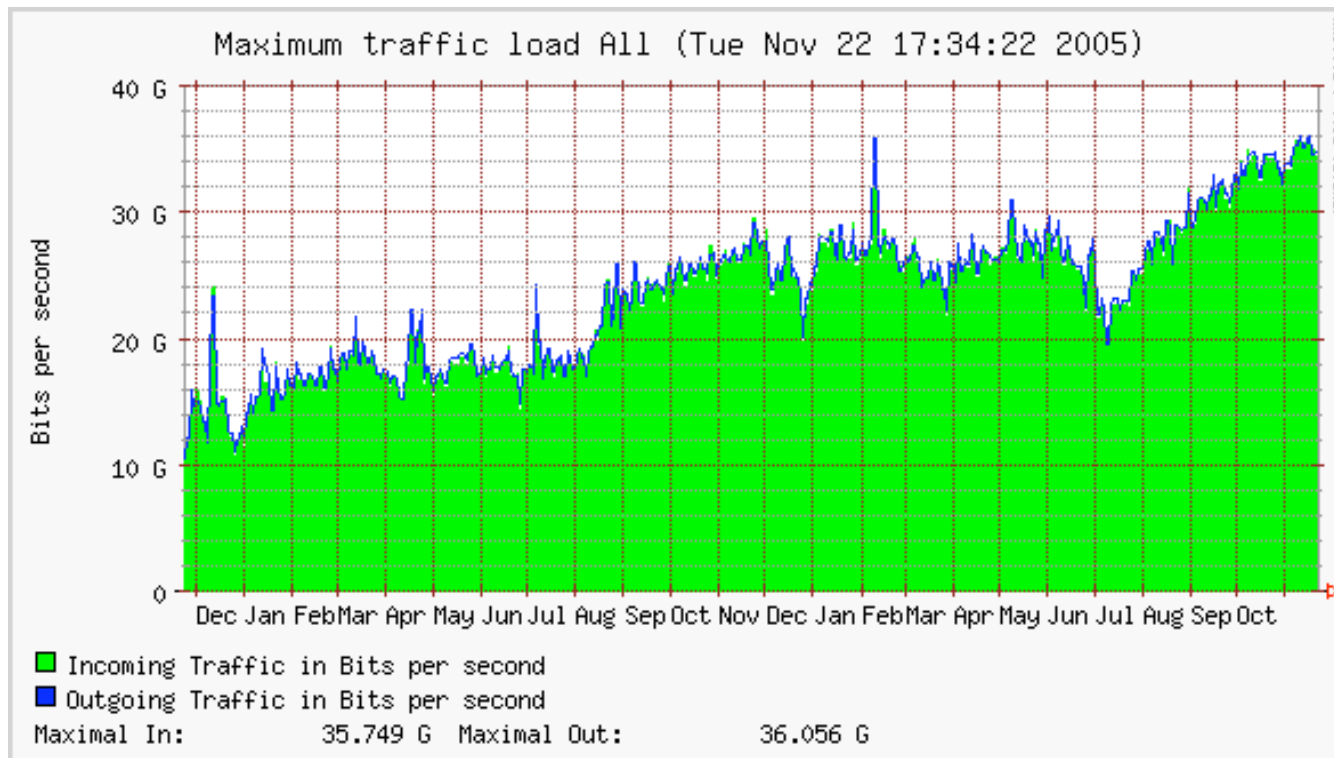
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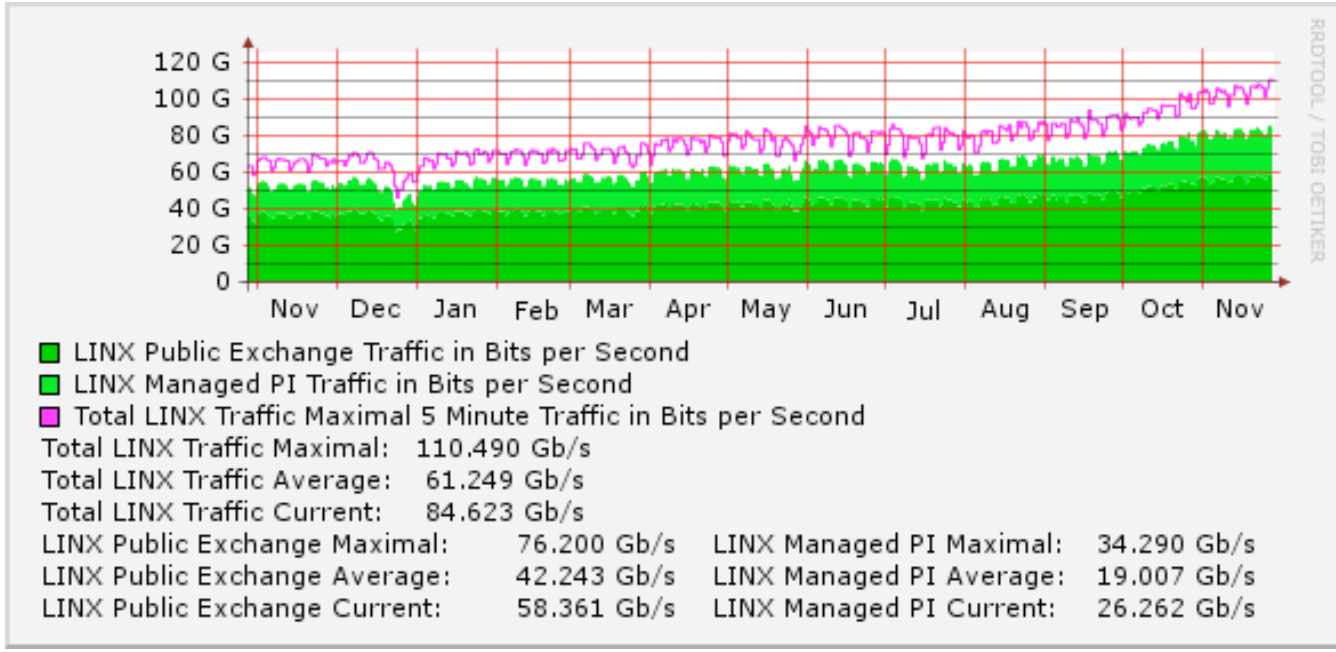
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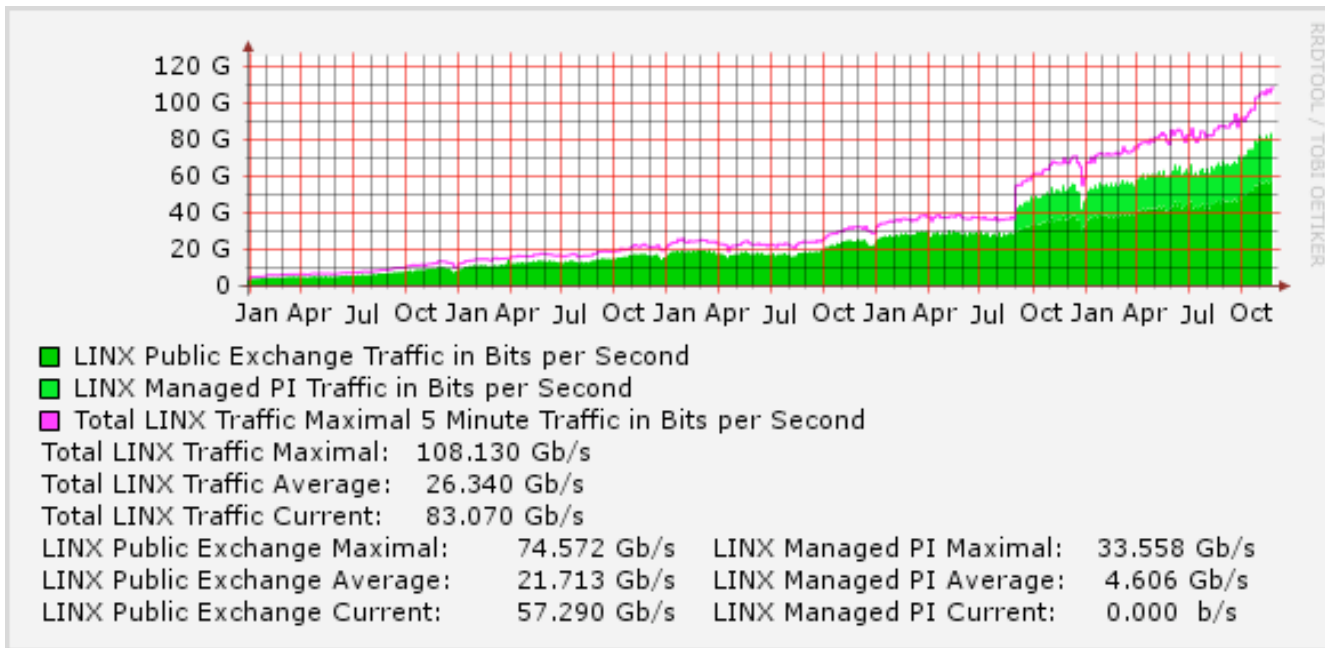
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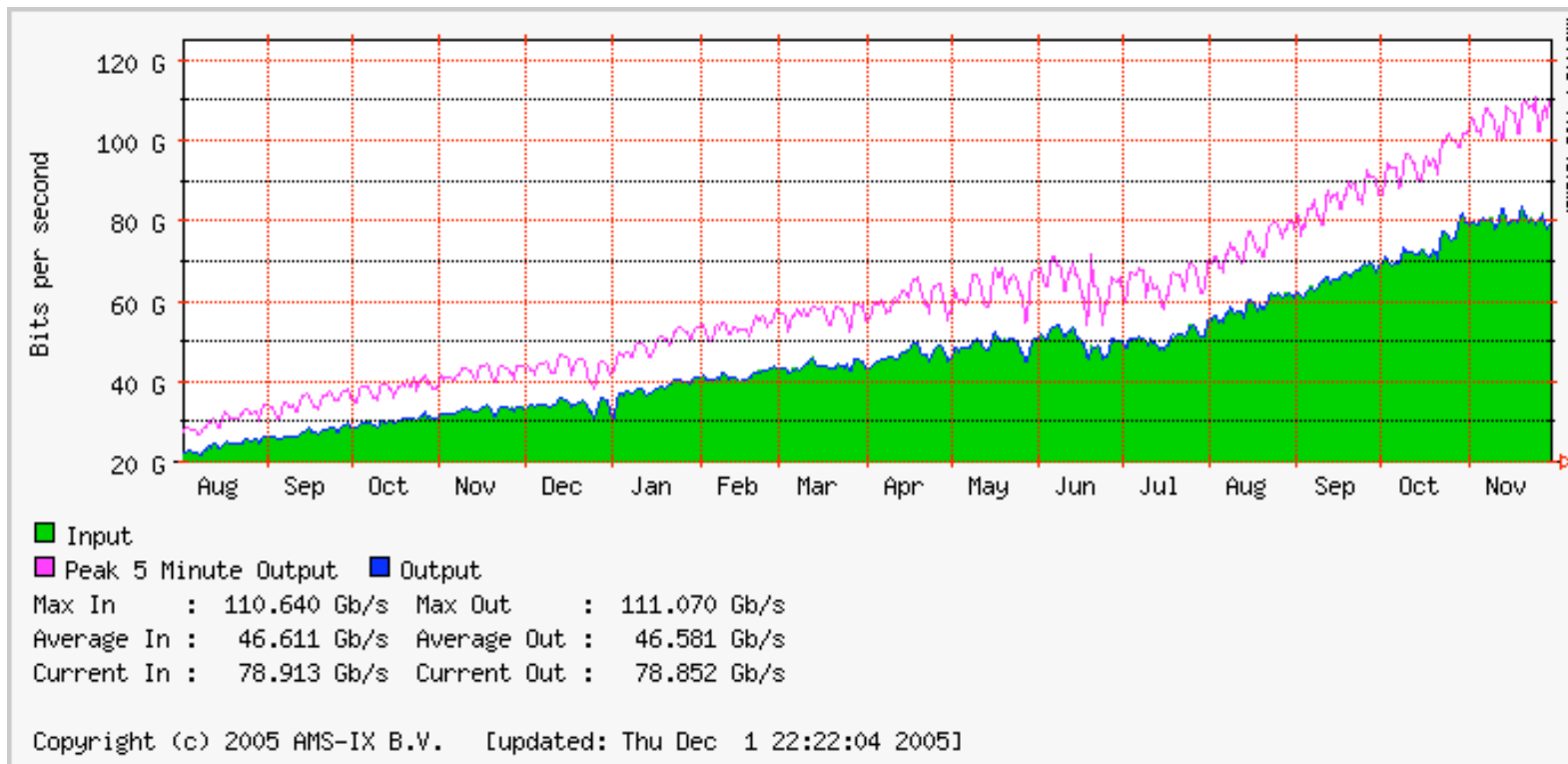
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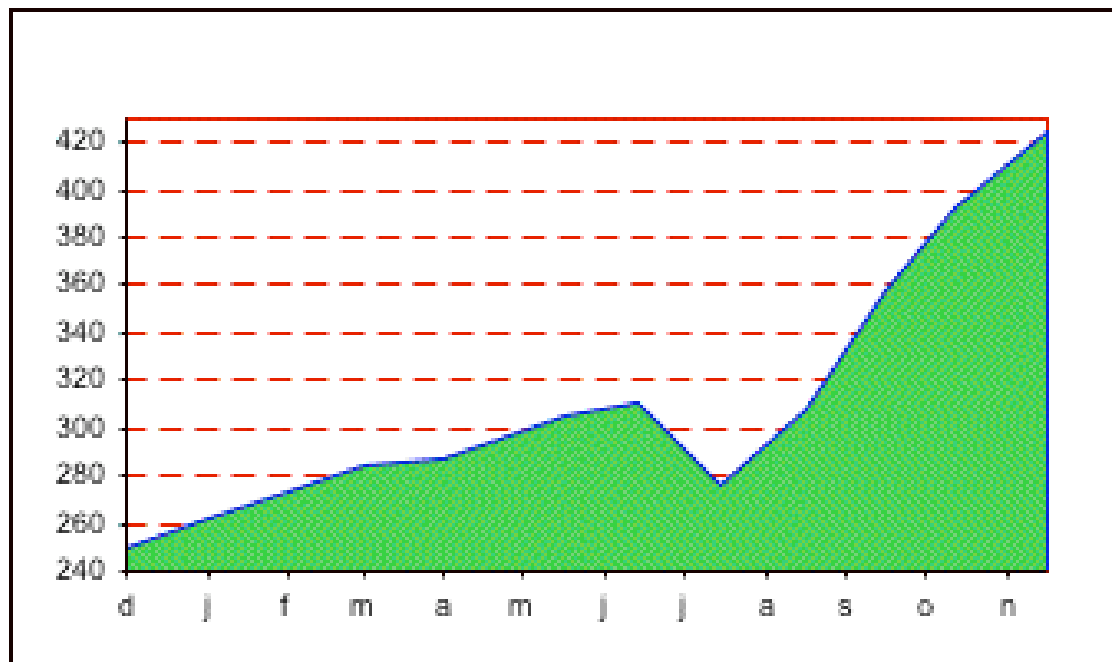


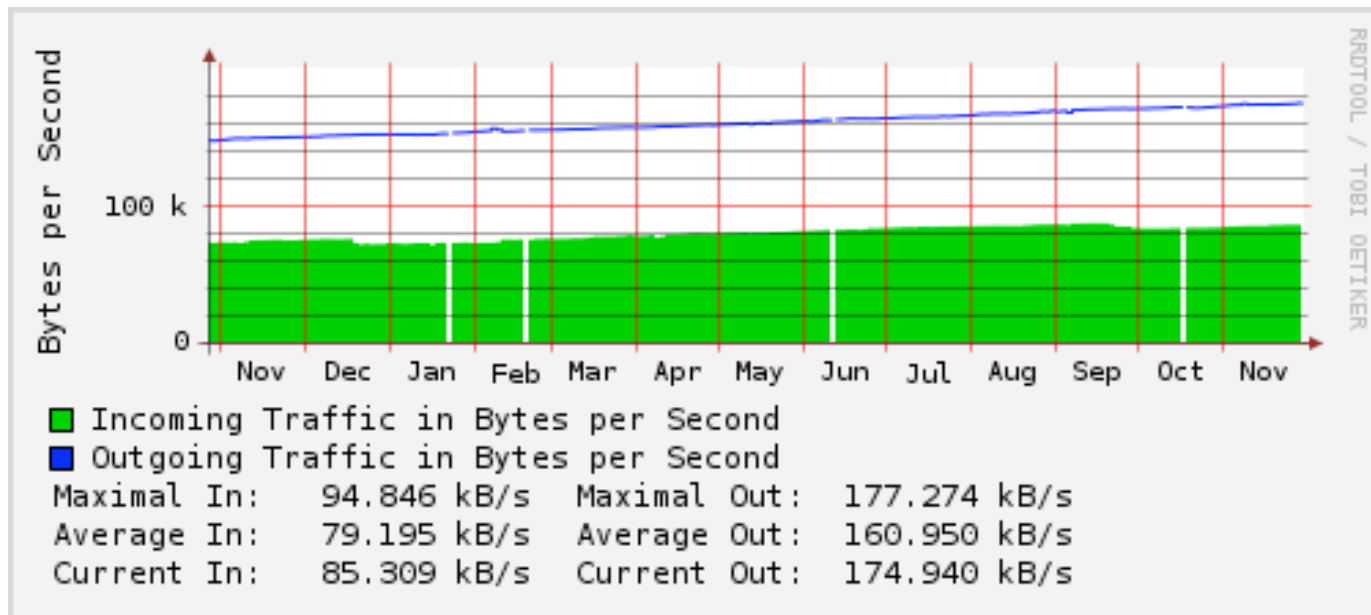
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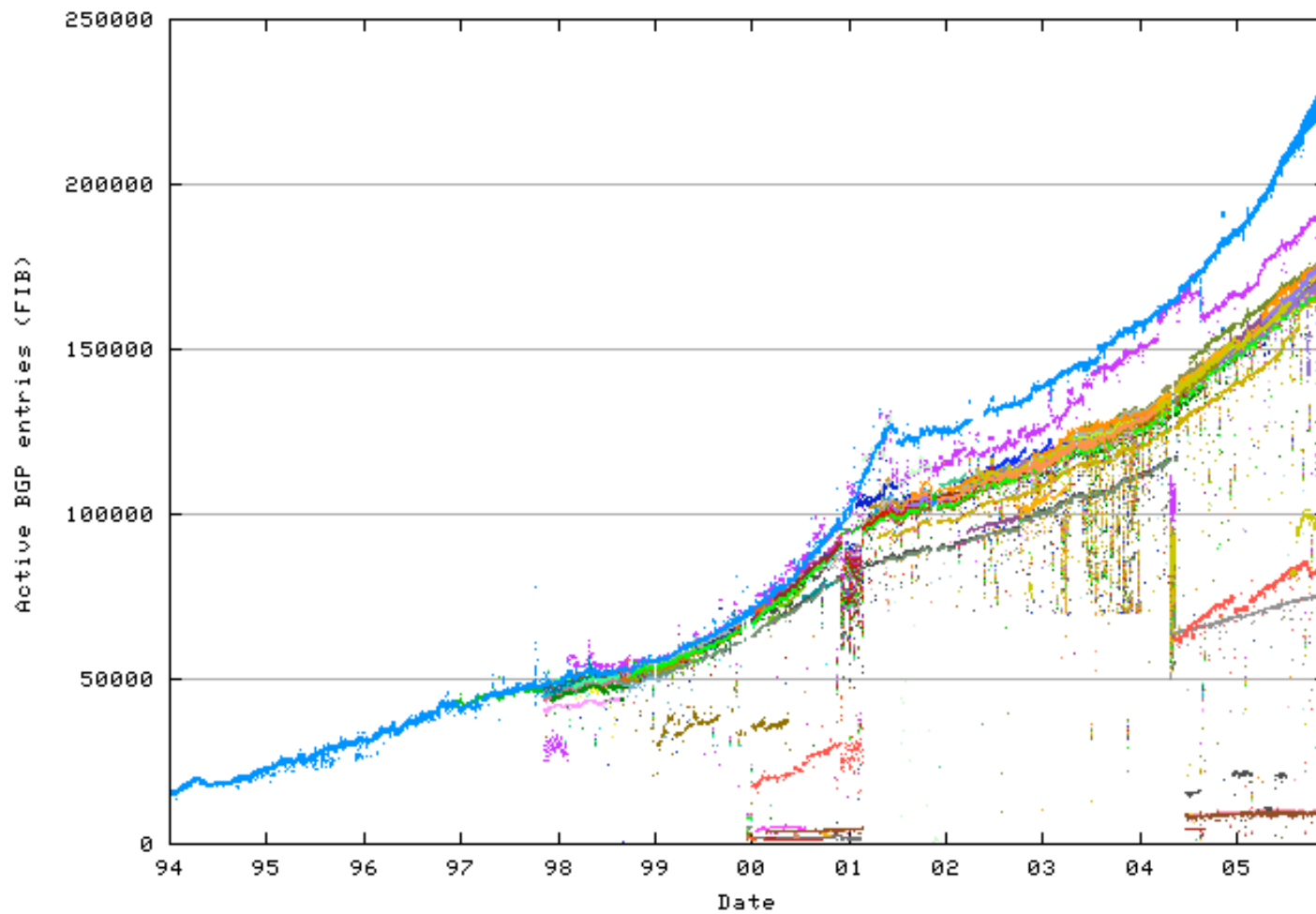




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# Traffic...

- Traffic seems to always grow after summer
  - Last two years exceptionally
  - A full year growth Aug-Nov
- Explanations vary
  - Probably a combination of a number of things
- The last slide could also show a significant shift in peering patterns...

# Measurements

- Average versus max
  - Maximum traffic is more interesting for capacity planning and trend analysis
- For Netnod measured across all cities
  - Traffic is dynamic and shifted for operational reasons
- Traffic is a result of
  - Number of connected ISPs
  - Number of advertised routes
  - Number of end-users

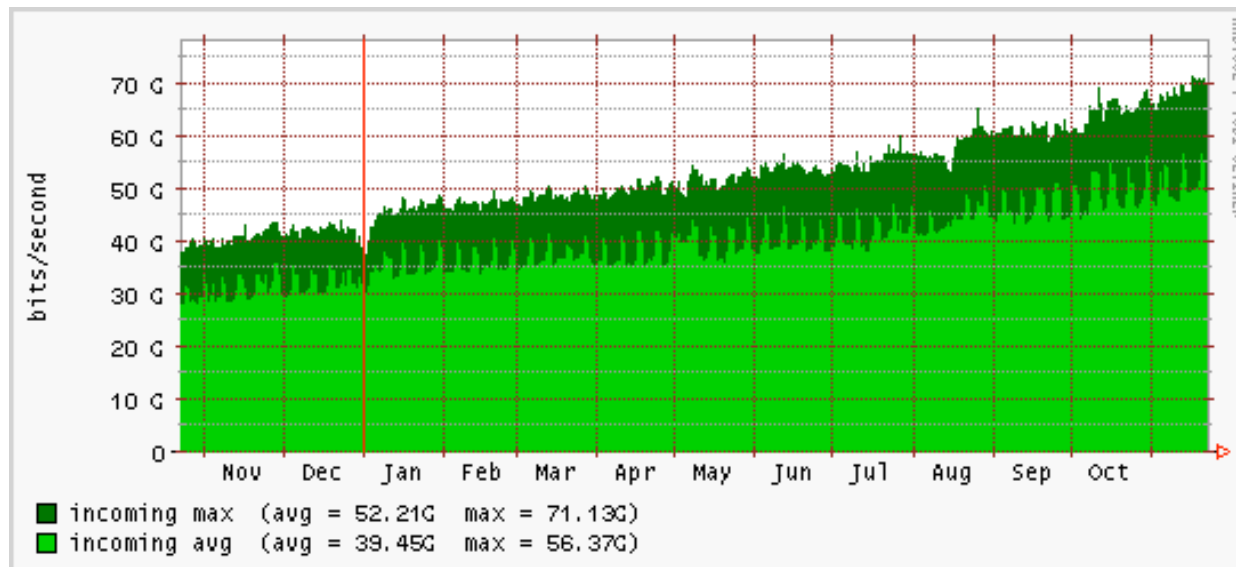
# Traffic and locality

- 1990's rule
  - 80% of traffic destined for the US
  - 20% of traffic local
- Today
  - Local content and localised content means that traffic to 80% is local
- Interesting problem in developing countries
  - Infrastructure is cool but what do we use it for?

# Traffic and scaling

- Traffic scaling characteristics have direct impact on deployment
- We are already outgrowing planned technology upgrade plans
- “Let’s just skip 40G and go for 100G if that is not already too late”
  - *Henk Steenman, AMS-IX*
- Same holds true since long in Aisa

# JPNAP



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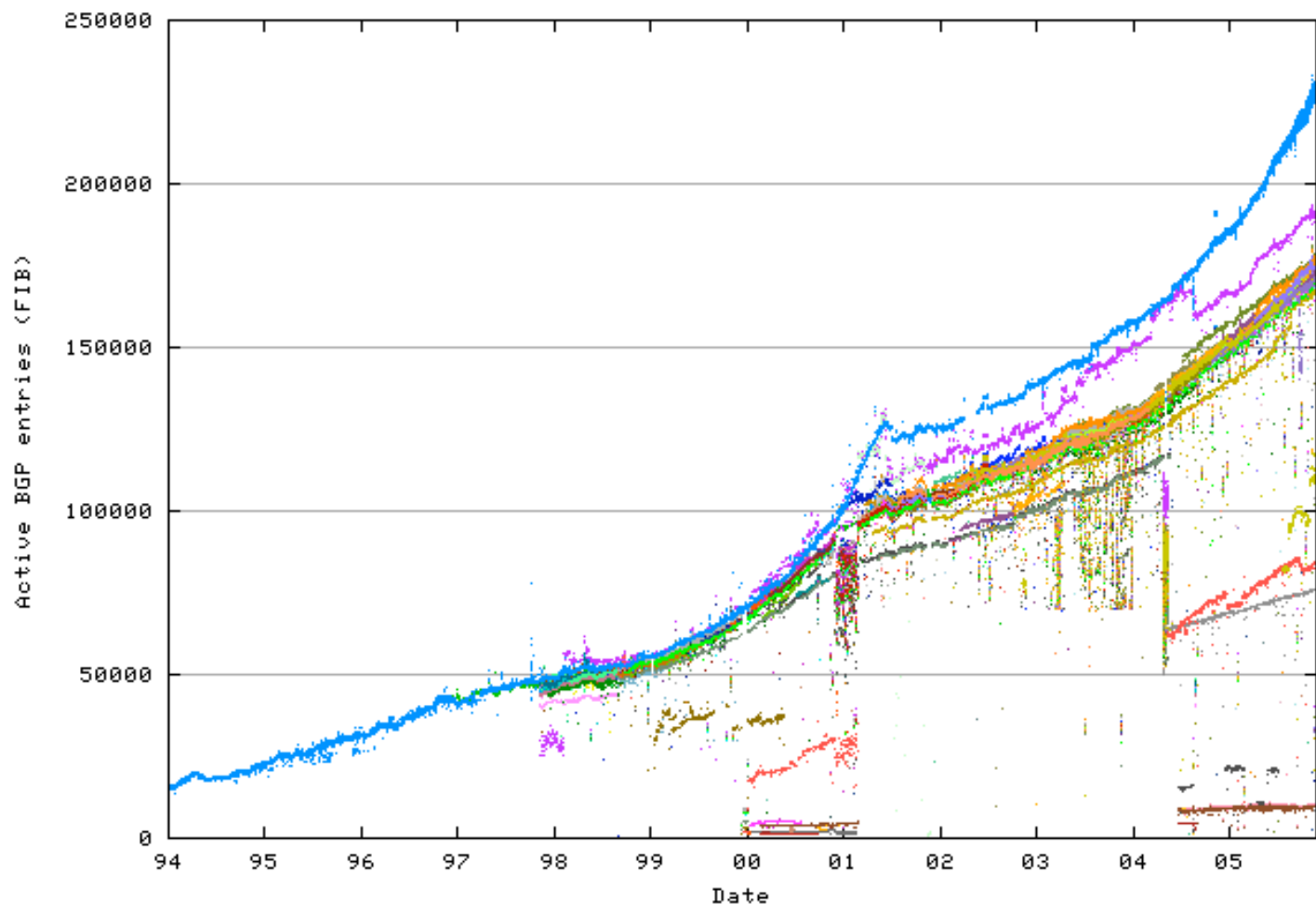
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# Traffic...

- Doesn't seem like much but that is just the public interconnect
- Growth also put other strains on the architecture
  - Traffic per user is increasing
  - But also the number of users
- Demands on the services increase
  - Bigger, better cheaper!

# Scaling...

- Increasing demands will impact technology and architecture...
- The BGP routing table is seeing it's growth in small networks multihoming...



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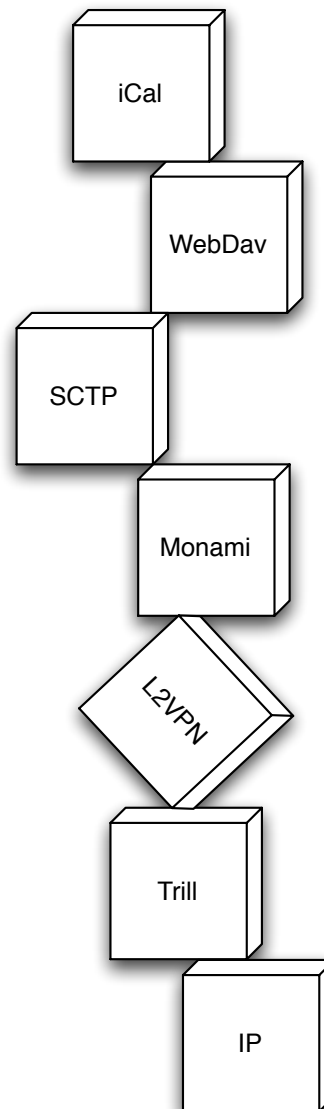
# Scaling...

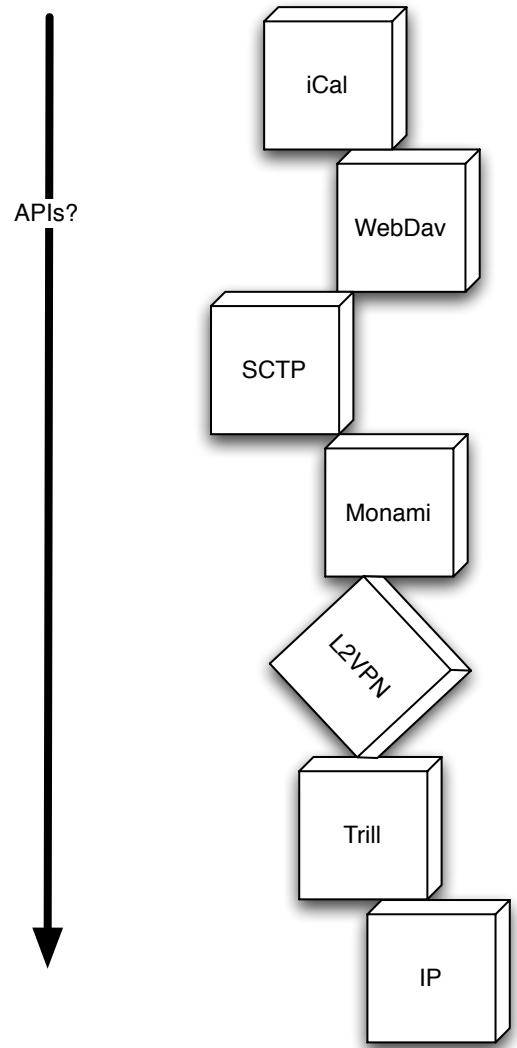
- We have yet to solve some pretty fundamental problems with the Internet architecture
  - Renumbering
  - Resilience
  - Independence (Mobility)

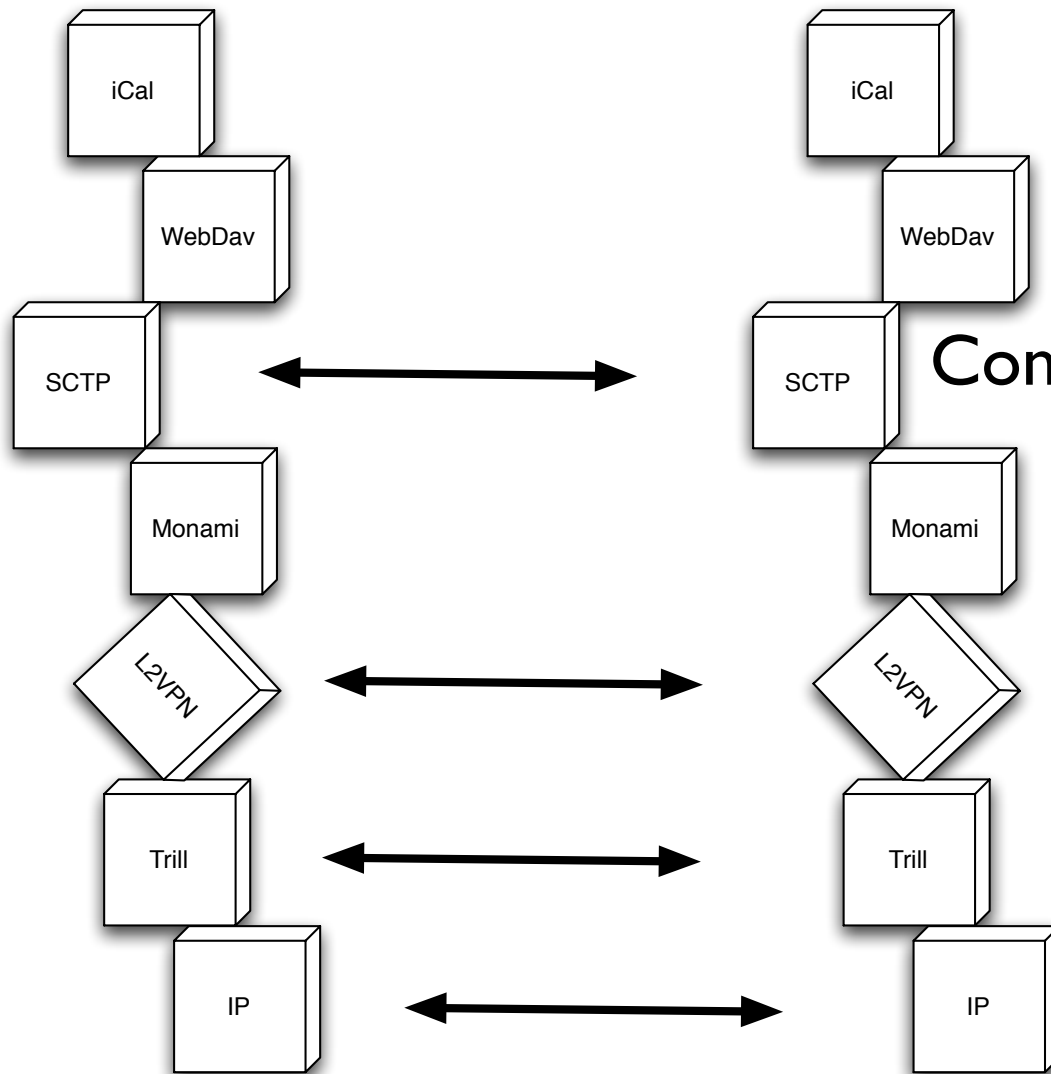
# Scaling and the architecture

- As an “overall solve it all solution(s)” doesn’t exist...
- We are solving it on all layers :-)
- Applications are starting to handle some of the fundamental transport problems
- HTTP - The universal transport protocol

# Today's Internet Architecture...







Convergens happens where?

# Where are we heading...?

- Identifier locator split
  - Fairly large change in the architecture
  - shim6, HIP, etc
  - Deployment will take time
- IAB looking at “stories”
  - How are supposed to use this stuff and why?

# Dangers ahead...

- We are close to building an architecture that has dependencies on layer violations
- Personally I am more worried about layer bloat than feature bloat...
  - And recursion....
- Complexity is ever increasing...

# Complexity...

- What is complexity?
  - And when does something become complex?
  - Deep philosophical questions....
- Does have some relevance on the Internet architecture...
- Is there a point when we can refuse to add building blocks to the architecture?
  - Should we?

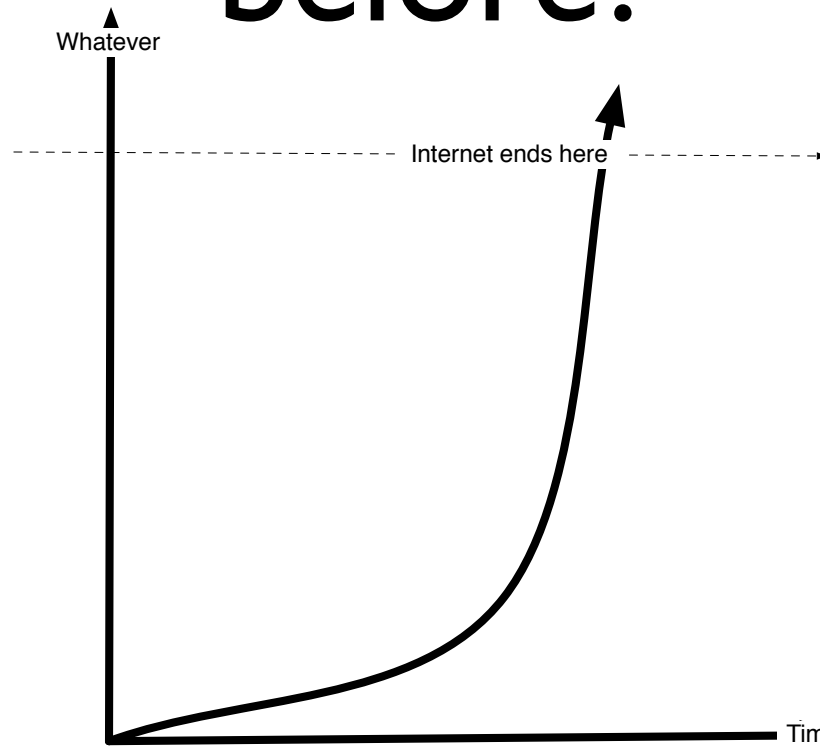
# Standards...

- Trying to tie it all together
  - We are faced with a wider range of demands
  - That need very different scaling properties
  - Properties that are not necessarily compatible with each other
  - The architecture needs to so simple, even at high bandwidths that the customer will not call customer care

# Standards...

- Understanding of the current model is
  - limited
  - Locked into area specifics
  - Recursive
- Operationally it's
  - Expensive
  - Overly complex (we can't afford that customer call!)

# Haven't we been here before?



Courtesy of the late Abha...

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# The end is near!

- We can't stop the addition of features, layers or recursiveness
- But we can control it and make sure we understand it
- Ask yourselves
  - *“Am I solving the right problem at the right layer, with the right tools and for the right purpose?”*

# Thank you!



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