How the Internet can survive?

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Can the Internet survive as is?

☆ **There are tooooo many concers we have now:**

- AS space exhaustion
- Address space exhaustion
- Routing space explosion
- Many security related concerns
  - DDoS, Phishing, vulerability, ...
- Waste of BW due to unnecessary traffic
  - DoS, SPAM, Virus, ...
- Something new...
  - Radio, Mobility, QoS, Long Fat Pipe, ...
- Other concerns
  - Dependability on disaster,
  - Social issues on Copyright, IP, WIPO, ...

Characteristics of Internet

☆ **There is no fixed strict definition of Internet**
- The interpretation have varied over time
- Is an intranet a part of the Internet?
  - Yes, it can communicate through a box
  - No, no direct IP connectivity is there

☆ **New applications can be deployable**
- Introduce changes to users impression

Can we change the Internet?

☆ **We may need to change the Internet someday**
- in order to fix various issues

☆ **A pessimistic observation**
- No, we can't

☆ **Did we successfully change the Internet?**
- Yes, many new applications have developed
  - even deployed, commonly used, ...
- No, they are just addtions not changes
- Kato's view:
  - Yes but limited at its early stage
  - Very difficult once it deployed widely

One example what we did

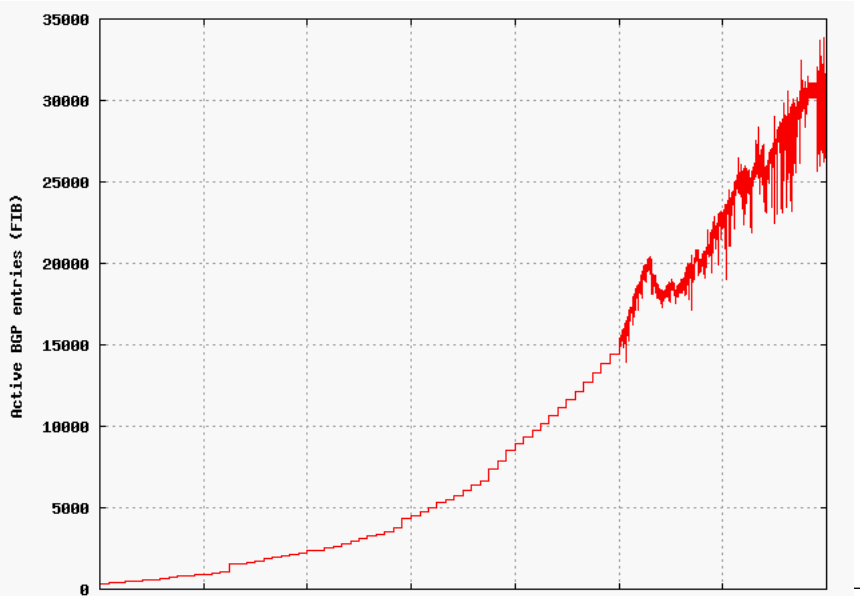
☆ **In late 1980's**
- People got class B space for routing efficiency
  - Rather than to have multiple class C space
- Address space exhaustion became a concern
  - Routing space explosion, as well
- Two solutions had been proposed:
  - CIDR for short term solution
  - IPng for long term solution

☆ **Classless InterDomain Routing**
- Initial RFC "Supernetting" in June 1992

☆ **In early 1990's**
- BGP-4 developed to enable route aggregation
  - RT growth were mitigated to almost linear

RT growth by early 1990's

☆ **Thanks to Huston's site: www.potaroo.net**



Why CIDR successfully deployed?

☆ **The Internet was so small, first of all**
- Users are almost limited to R&D

☆ **No change required in the hosts**
- proxy arp helped the legacy hosts

☆ **Only the routers required to change**
- Forwarding algorithm, configuration
- Protocol change : BGP-3 -> BGP-4
  - Changes can be done gradually
  - Until aggregated announcement
- OSPF-1 was already classless

Why CIDR successfully deployed? (2)

☆ **Not only technical initiative contributed**
- Some social engineering were required
- Education why arregation required

☆ **Top-10 announce by Tony Bates contributed**
- Those who "don't" aggregated were announced
  - Weekly posted in CIDRD? mailing list
- Today, aggregation was broken by

Why IPv6 migration is not completed?

☆ **IPv6 efforts active for more than 10 years**
- 6bone started in 1995, changed to pTLA in 1997
- But IPv6 is not for daily use

☆ **Even if many implementations are there**
- Lack of dialup, services, ...
  - Lack of debugging on the environment

☆ **People love to develop "excuses"**
- "I have IPv4 address already"
- "IPv6 is nothing new"
  - All IPv6 can offer are offered by IPv4 already
  - Because IPv6 inherits many things from IPv4
  - It just solve the address space issue
- "Who pay the cost w/o increase of revenue?"

Why IPv6 migration is not completed? (2)

☆ **Dual-stack introduced extra complexity**
- Need to make proper choices, IPv4 or IPv6?
  - Wrong decisions sometimes result in timeout
  - Even inaccessible if IPv6 is not stable
- Programming becomes non-streightforward
  - getaddrinfo(3) mitigated a lot
  - Need to maintain multiple sockets
  - use IPv4 compatible address?
- Not easy to modify millions of lines already written
  - How about programs being developed now?

☆ **Nobody want to complete assignment earlier**
- Didn’t you write various reports after mid-night?

Migration to 4-byte ASN

☆ **Doable as only BGP speakers affected**
- Still need implementations on all BGP speaking boxes

☆ **A nice workaround is provided**
- People don’t have to take care of packet format
  - Shut all chaos to implementors
  - Don’t open the box!

☆ **4-byte ASN just fixes AS space exhaustion**
- It never solve other BGP issues
  - Security, stability, scalability, etc

☆ **A new interdomain routing architecture required?**
- If it is a case, migration will be hard

Future Internet

☆ **Discussion is being active in academia**
- Each person has a different "view"

☆ **Considering the Internet in 10-20 years ago**
- Discussion just started
- No convergence of proposed architecture
- Not usable for at least next 10 years

☆ **They are not intending to fix the Internet**
- At least for primary
- Some proposals could contribute sooner
  - Before real "Future Internet" launches

What shall we do?

☆ **Freeze the Internet now?**
- No new users, no new apps, no new ...
- Prohibit traffic engineering for RT Table size?
  - 10Gbps is just in common
  - No 100Gbps ethernet available now
  - Some apps require smaller RTT/Jitter

☆ **Develop Internet toward the future?**
- Contribution from JP community required
  - Brain cycles, budget, etc

☆ **The choice is up to YOU**
- as more than just one of stakeholders