Death of the Internet:
GIF at 11

Scott Bradner
NANOG
3 June 2020
What Internet?

• Not talking about local connectivity

• Talking about the Internet as a “thing” made up of interconnected networks that, together, provides a connectivity service for Internet protocol packets
What is “Death”? 

• Predicted significant outage
• Predicted uselessness
• Predicted wholesale replacement
Many “Deaths”

• The ‘Net started “dead” and “died” many times over the years
• Someone was generally ready to transform it, but not always to resurrect it
• I’ll review a few predicted deaths & would-be net killers
• Spoiler: none of the deaths took
• The ‘Net has had "a lively death indeed"
  
  Elliott Norse (writing about fallen trees in Ancient Forests of the Pacific Northwest – 1990)
Categories

- Political
- Financial
- Application
- Presentation
- Session
- Transport
- Network
- Link
- Physical
Early 1960s: Dead before it was born

- Paul Baran – developed concept of multi use packet switched network (data & voice)
  Cheap & reliable
- Presented packet switched networking to AT&T
  "Son, this is how a telephone works"

Oral history interview with Paul Baran – 1990 - Charles Babbage Institute

- But, ARPA persisted (yes, Donald Davies, Larry Roberts & many others were also key)
1976: X.25
Mid 1980s-mid 1990s: OSI/GOSIP/IPv7

<table>
<thead>
<tr>
<th>Layer</th>
<th>ISO Standards</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>FTAM</td>
<td>CMISE</td>
</tr>
<tr>
<td></td>
<td>ISO 8571</td>
<td>ISO 9596</td>
</tr>
<tr>
<td>6</td>
<td>ACSE</td>
<td>X.227, ISO 8650</td>
</tr>
<tr>
<td></td>
<td>X.217, ISO 8649</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ACSE</td>
<td>X.227, ISO 8650</td>
</tr>
<tr>
<td></td>
<td>X.217, ISO 8649</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ROSE</td>
<td>ISO 9072</td>
</tr>
<tr>
<td></td>
<td>X.219, X.229</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>X.226, ISO 8823</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.209, ISO 8825 BER</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>X.225, ISO 8327</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X.215, ISO 8326</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>X.224, ISO 8073 / AD 2</td>
<td>ISO 9542 (ES-IS)</td>
</tr>
<tr>
<td></td>
<td>(X.214, ISO 8072 / AD 2)</td>
<td>ISO 10589 (IS-IS Level 1) / ISO 10747 (IS-IS Level 2)</td>
</tr>
<tr>
<td></td>
<td>class 4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ISO 8473-3 (CLNS)</td>
<td>ISO 8473-2 (CLNS)</td>
</tr>
<tr>
<td></td>
<td>ISO 8206 X.25 Packet Level</td>
<td>ISO 8473-4 (CLNS)</td>
</tr>
<tr>
<td>1</td>
<td>ISO 7776 LapB</td>
<td>ISO 802.2 LLC</td>
</tr>
<tr>
<td></td>
<td>X.25 Data Link Layer</td>
<td>ISO 802.3 MAC</td>
</tr>
<tr>
<td>0</td>
<td>X.21 / X.21bis</td>
<td>Q.921 LapD</td>
</tr>
<tr>
<td></td>
<td>V.35 / G.703</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2M TS n</td>
<td></td>
</tr>
</tbody>
</table>

**GOSIP**

Government Open Standards Interconnect Profile
1988: ISDN
1990 - Running out of IP Addresses (1\textsuperscript{st} time)

<table>
<thead>
<tr>
<th>Depletion Dates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigned Class “B” network numbers</td>
<td>March 11, 1994</td>
</tr>
<tr>
<td>NIC “connected” Class B network</td>
<td>April 26, 1996</td>
</tr>
<tr>
<td>NSFnet address space</td>
<td>October 19, 1997</td>
</tr>
<tr>
<td>Assigned Class “A-B” network numbers</td>
<td>February 17, 1998</td>
</tr>
<tr>
<td>NIC “connected” Class A-B network</td>
<td>March 27, 2000</td>
</tr>
<tr>
<td>BBN snapshots</td>
<td>May 4, 2002</td>
</tr>
</tbody>
</table>

* all types: may be earlier if network class address consumption is not equal.
1992: Asynchronous Transfer Mode (ATM)

Asynchronous Transfer Mode
1995: Porn
1996: Gigalapse

Metcalfe (left) and Bradner meet back to back.
1996: Communications Decency Act

Just as the strength of the Internet is chaos, so the strength of our liberty depends upon the chaos and cacophony of the unfettered speech the First Amendment protects. Judge Dalzel
2001 – 2012: 3G/4G
2003: Flow-based networking

“The Internet is broken. I should know: I designed it.”
2004: ITU-T Next Generation Network (NGN)
2015-2017: Title II / ! Title II
2019: 5G
2020: New IP
2020: COVID-19

COVID-19
Safer at Home

- Leave home only for essential work or necessities
- Practice good hygiene: cover coughs and sneezes, don't touch your face, and wash hands often
- Work remotely whenever possible
- Physical distancing of at least 6 feet
- Use cloth face coverings when in public
- Disinfect frequently used items and touched surfaces often

Will Coronavirus Crash the Internet?

With most of the world now working from home, an increased need for speed could break the
Root cause
Mother of revolution

“The invention of the printing press is the greatest event in history. It is the mother of revolution.”

“In its printed form, thought is more imperishable than ever; it is volatile, irresistible, indestructible. It is mingled with the air. ... Now it converts itself into a flock of birds, scatters itself to the four winds, and occupies all points of air and space at once.”

“A book is so soon made, costs so little, and can go so far! How can it surprise us that all human thought flows in this channel?”

Victor Hugo: Hunchback of Notre Dame
Thank You