6.1800 Spring 2025

Lecture #8: Introduction to Networking

Katrina's favorite lecture

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6.1800 in the news

so much of life today relies on the Internet — so much so that Internet shutdowns are sometimes used as tools of oppression

keep that in mind today as we talk about the history of the Internet. was it originally designed to be this crucial to modern life?

Lives on hold: internet shutdowns in 2024

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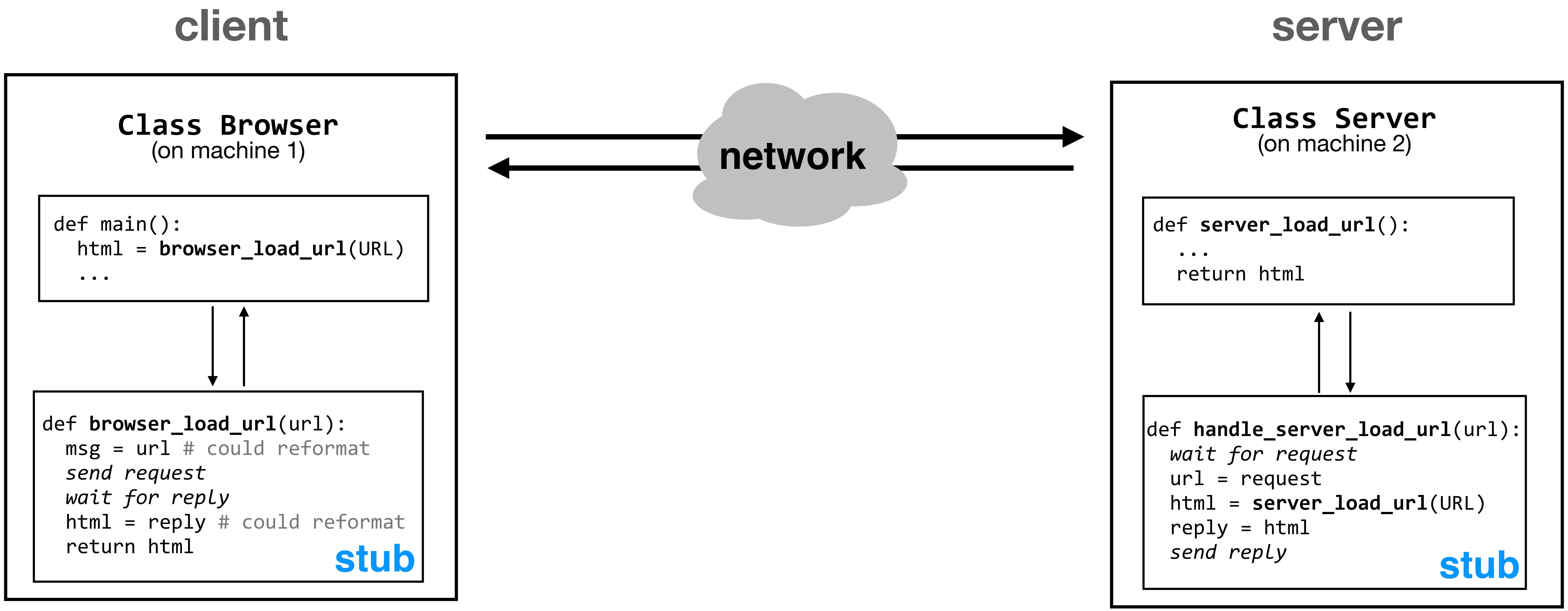
*"During times of political unrest, the streets become dangerous, and information spreads mostly online. **Without internet access, I have no way to stay informed about what's happening.** This isolation disrupts everything. I can only plan and organize when the internet returns, **leaving our lives at the mercy of these shutdowns.**"*

— Retired professor, Venezuela

The data is in and it's official: in **2024, we saw more internet shutdowns, in more countries, implemented by more offenders, and across more borders.** As our new report, *Emboldened offenders, endangered communities: internet shutdowns in 2024*, documents, it was a record-breaking year across the board, providing further proof that the scourge of internet shutdowns is an unyielding threat to human rights — and human life — around the world.

https://www.accessnow.org/internet-shutdowns-2024/

how do modules of a system communicate if they're on separate machines?



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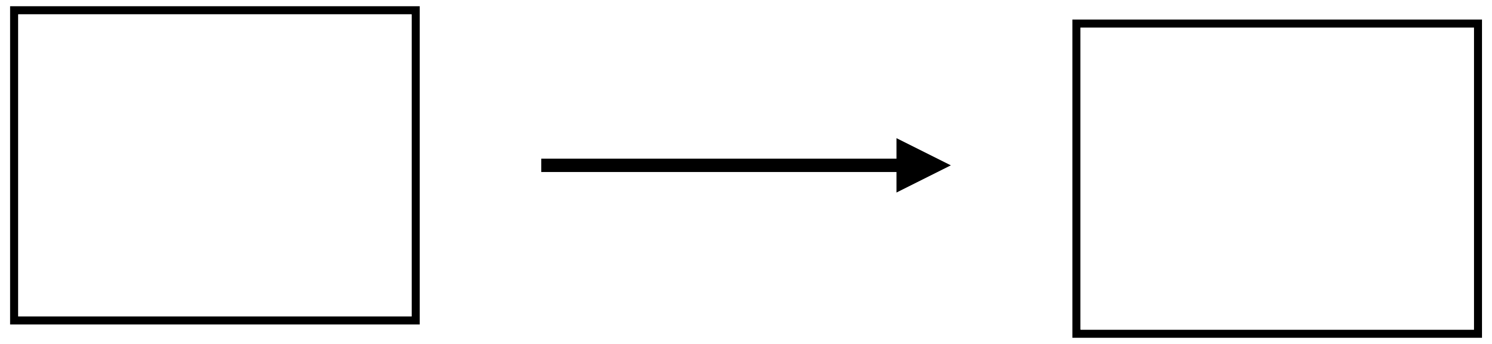

point-to-point links: get a source to talk to a directly-connected destination

`link` `communication between two directly-connected nodes`

examples: ethernet, bluetooth, 802.11 (wifi)

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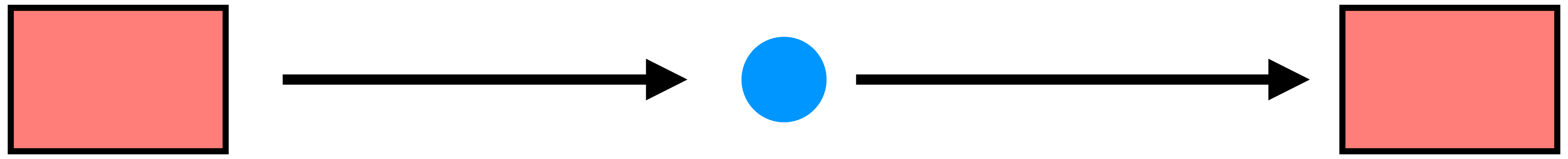

switches: help forward data to destinations that are far away

switches do other things, too

`link` communication between two directly-connected nodes

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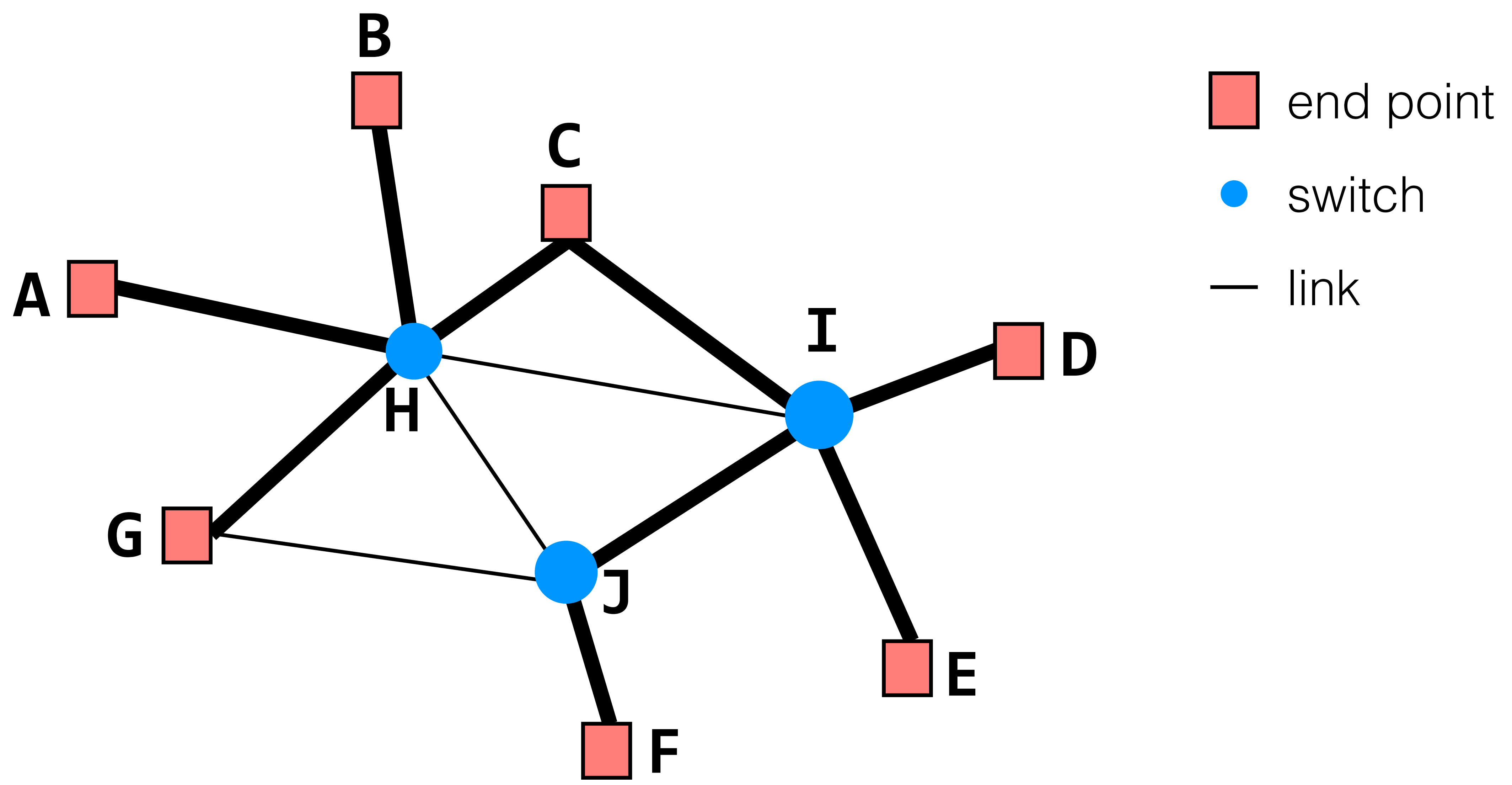

as this system grows, we need to think about how to turn this set of **links** into a **network**

application	the things that actually generate traffic
transport	sharing the network, reliability (or not)
network	naming, addressing, routing
link	communication between two directly-connected nodes *examples: ethernet, bluetooth, 802.11 (wifi)*

1970s:
ARPAnet

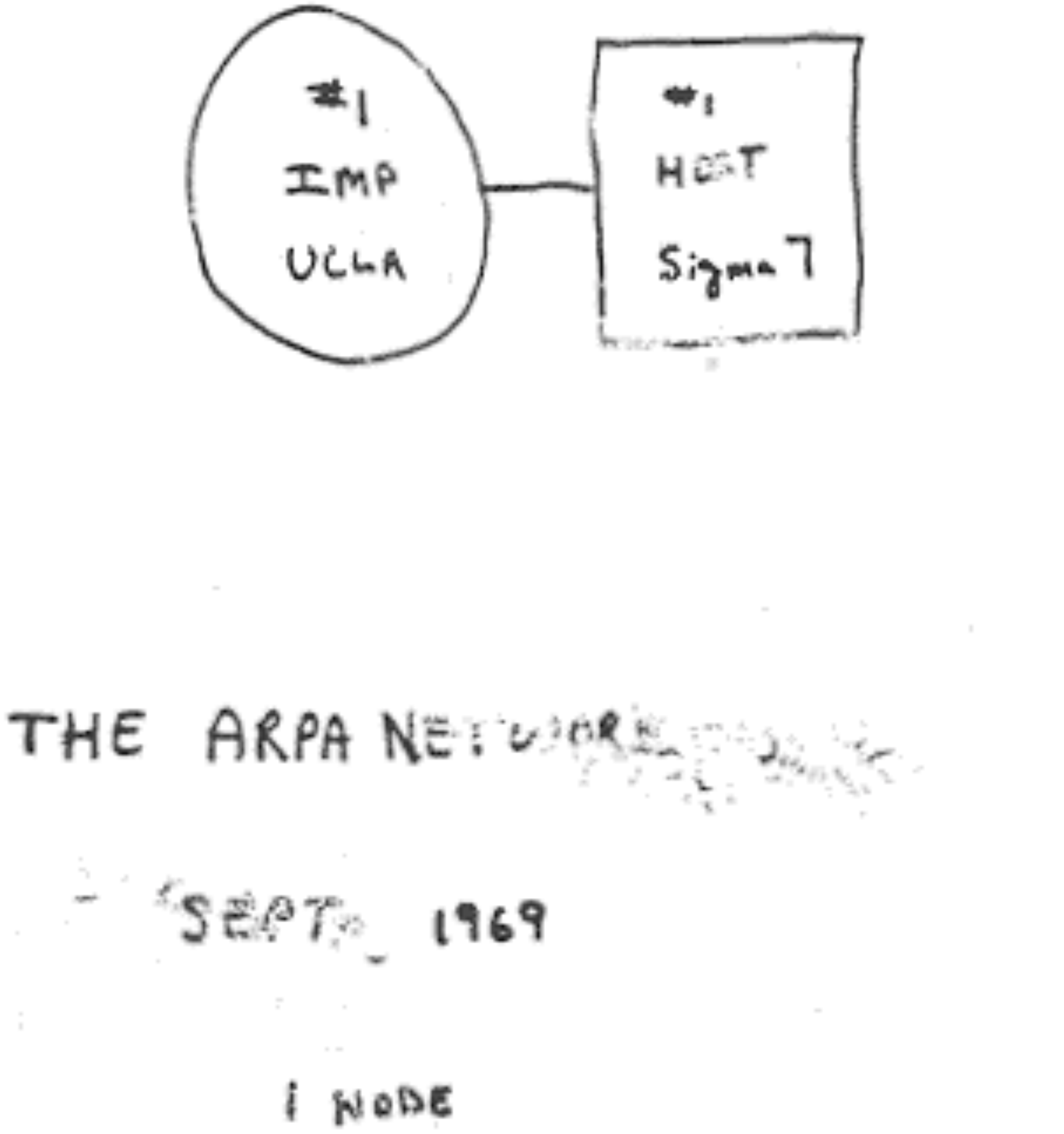

FIGURE 6.1 Drawing of September 1969
(Courtesy of Alex McKenzie)

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https://en.wikipedia.org/wiki/Interface_Message_Processor#/media/File:ARPANET_first_router_2.jpg

1970s:
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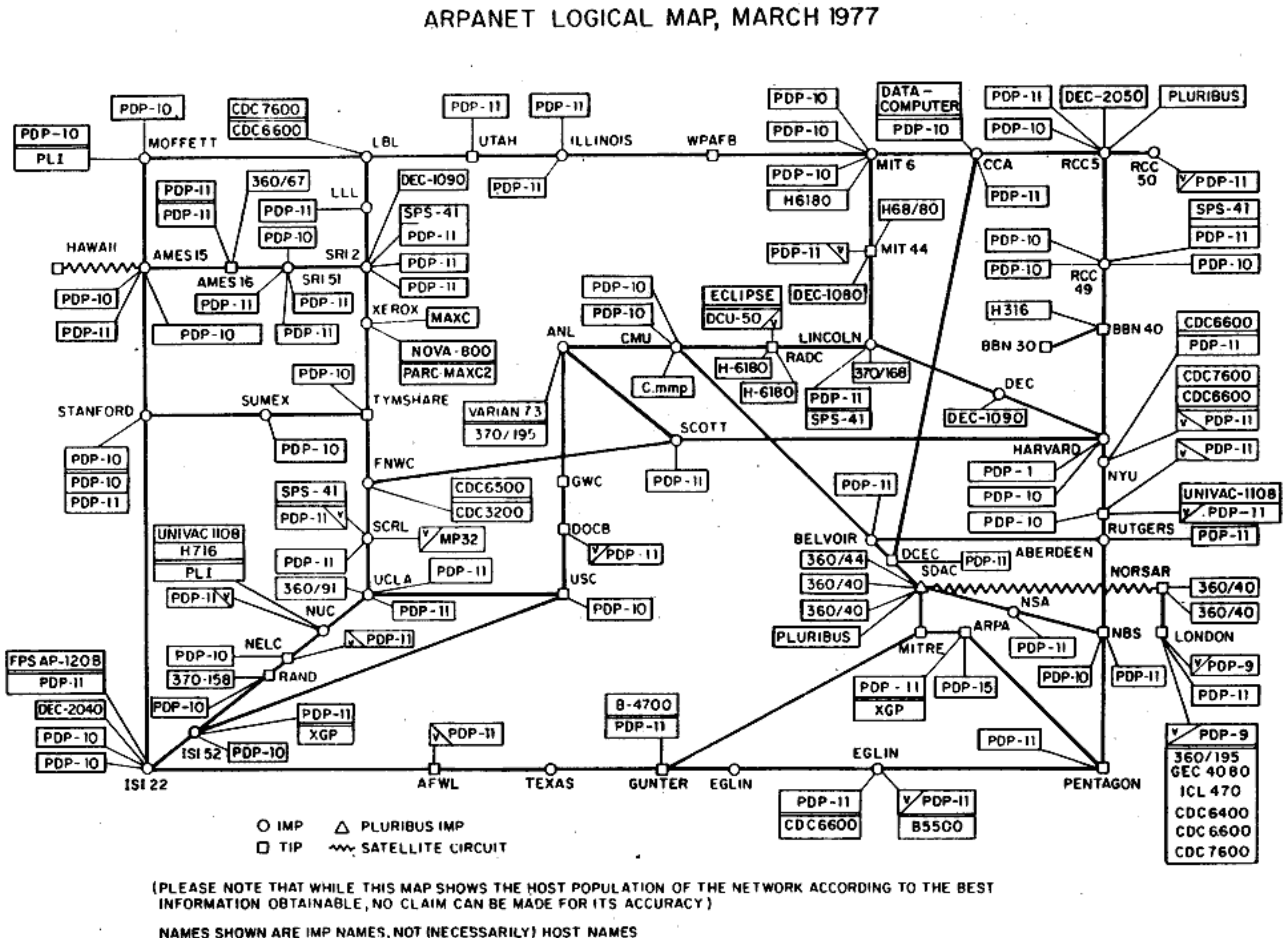
hosts.txt



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https://personalpages.manchester.ac.uk/staff/m.dodge/cybergeography/atlas/historical.html

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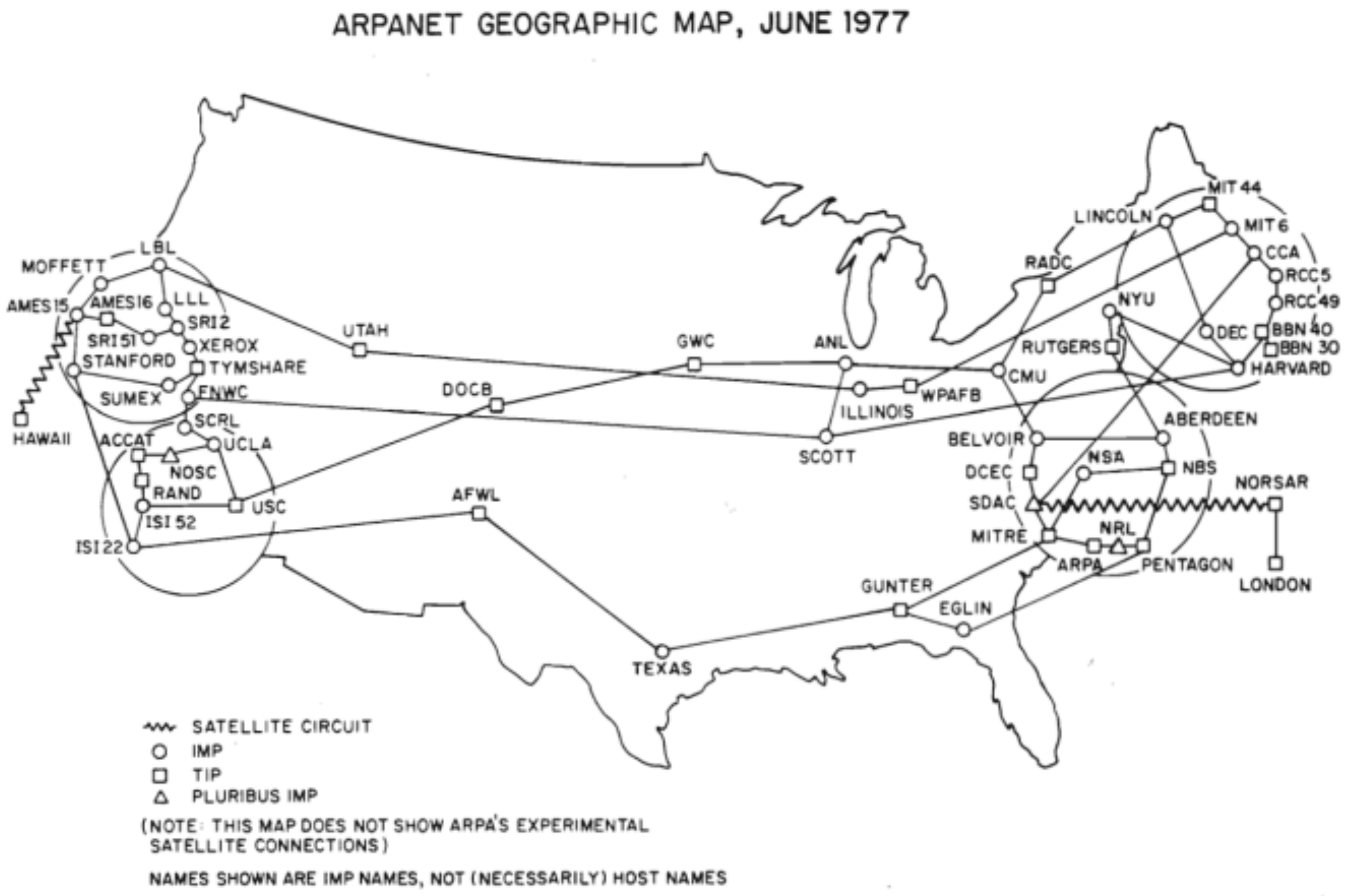
https://en.wikipedia.org/wiki/Pluribus#/media/File:BBN_Pluribus_at_Wharton_School,_by_Tony_Patti,_April_1979.jpg

1970s: ARPAnet — hosts.txt

1978: flexibility and layering — distance-vector routing

TCP, UDP



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with a layered model, we can swap out protocols at one layer without much (or perhaps any) change to protocols at other layers

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network	naming, addressing, routing *examples: IP*
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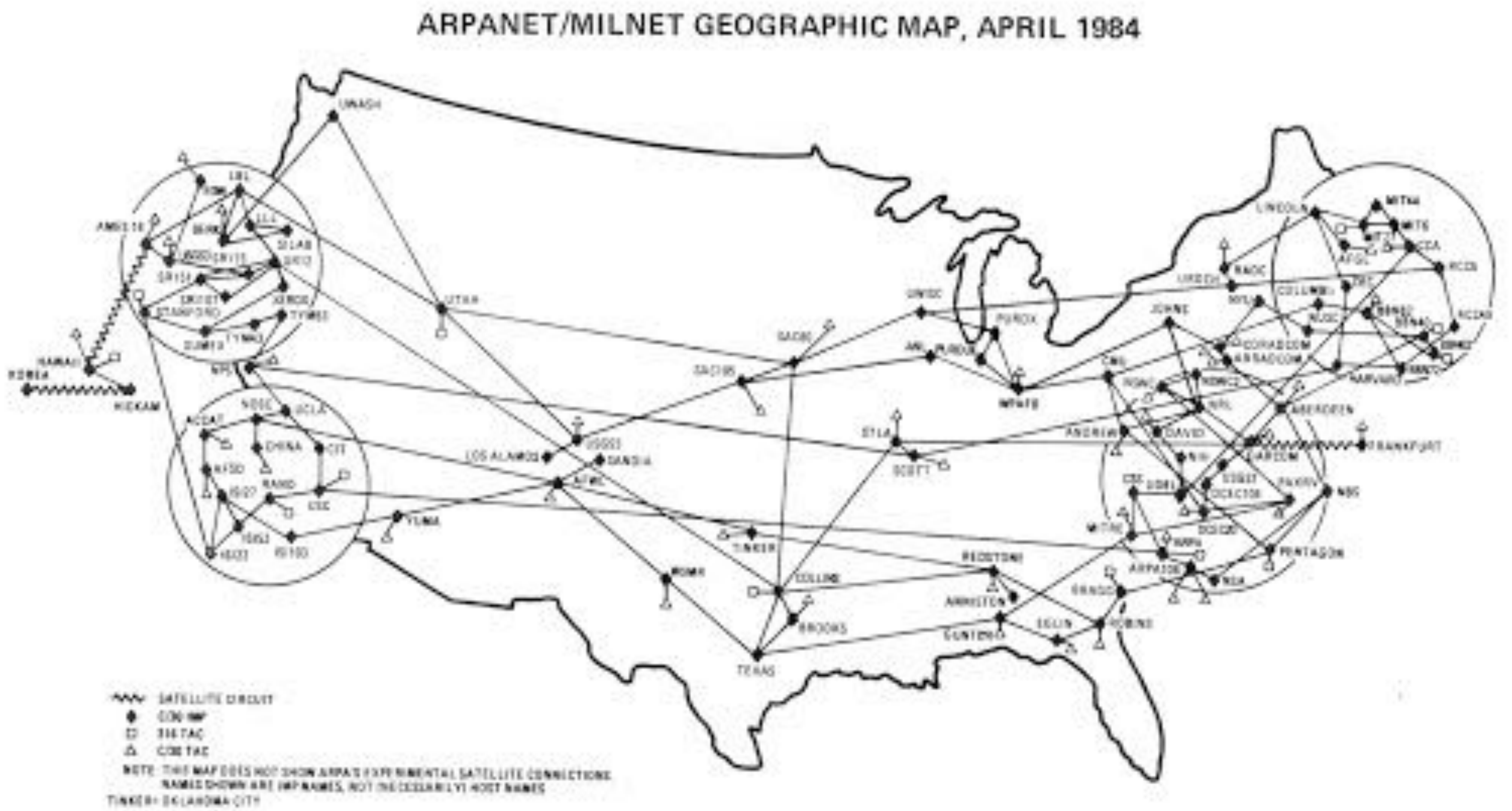
1970s: ARPAnet — 1978: flexibility and layering — early 80s: growth → change

hosts.txt — distance-vector routing — TCP, UDP — OSPF, EGP, DNS



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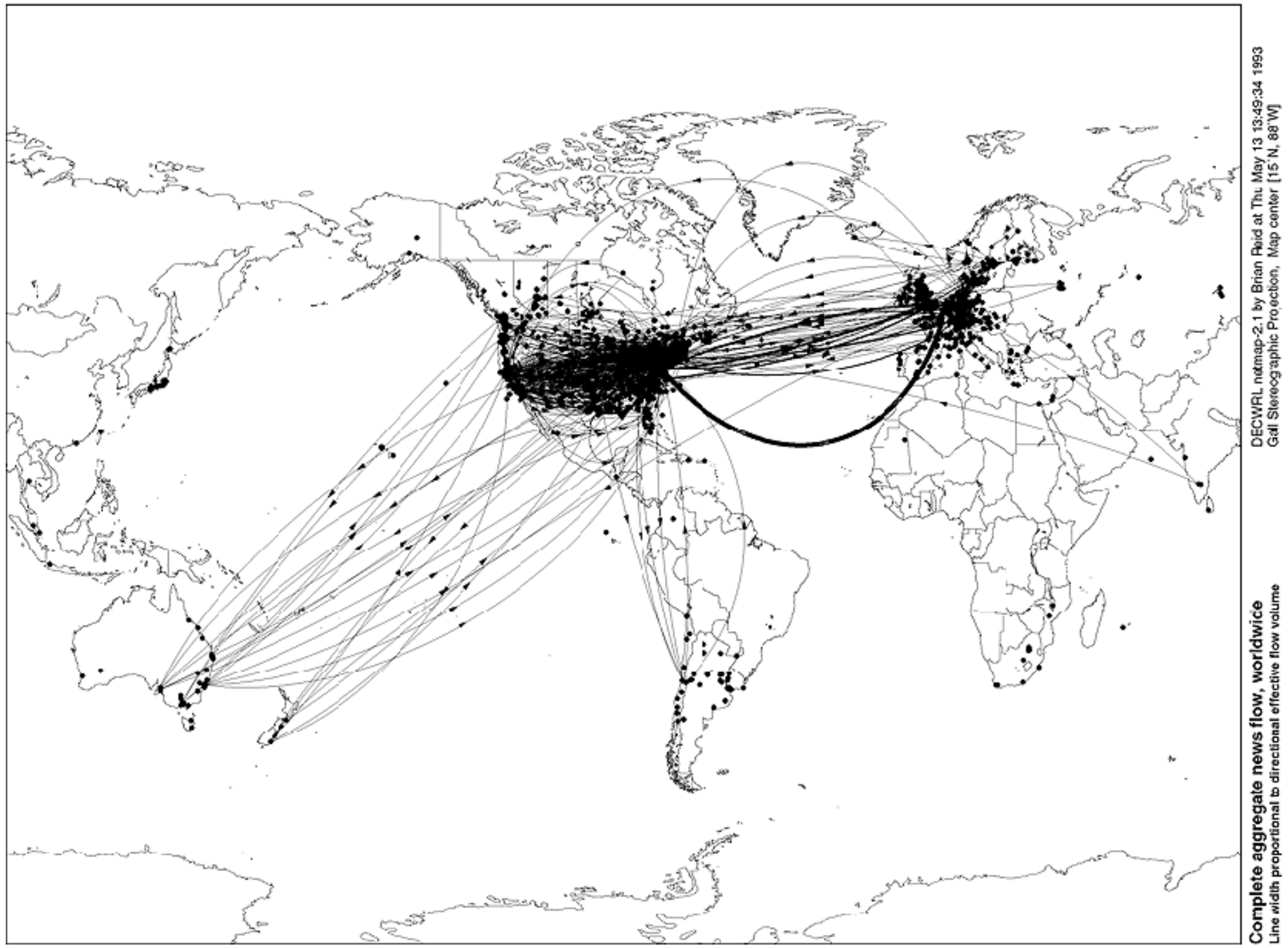
1970s: ARPAnet	1978: flexibility and layering	early 80s: growth → change		late 80s: growth → problems		
hosts.txt	distance-vector routing	TCP, UDP	OSPF, EGP, DNS	congestion collapse	policy routing	CIDR



https://www.vox.com/a/internet-maps

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1970s: ARPAnet | 1978: flexibility and layering | early 80s: growth → change | late 80s: growth → problems | 1993: commercialization

hosts.txt | distance-vector routing | TCP, UDP | OSPF, EGP, DNS | congestion collapse | policy routing | CIDR

http://blog.lastpass.com/2013/05/for-the-love-of-security-end-of-week-link-round-up/internet-1993-3/

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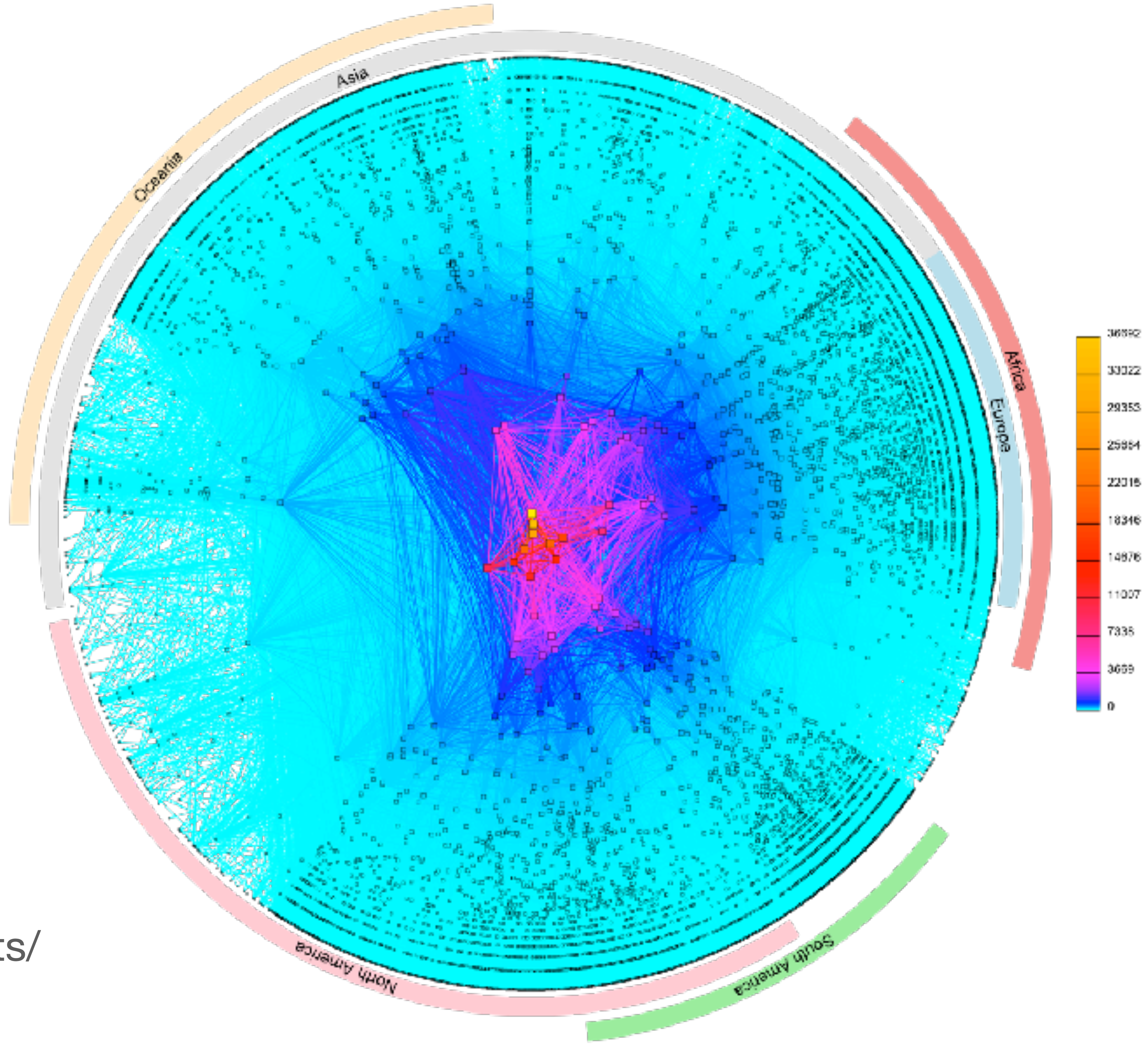

CAIDA's IPv4 AS Core, January 2020 (https://www.caida.org/projects/cartography/as-core/2020/)

on the Internet, we have to solve all of the "normal" networking problems (addressing, routing, transport) **at massive scale, while supporting a diverse group of applications and competing economic interests**

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