6.1800 Spring 2025

Lecture #8: Introduction to Networking

Katrina's favorite lecture

Katrina LaCurts | lacurts@mit.edu | 6.1800 2025

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

Lives on hold: internet shutdowns in 2024

PUBLISHED: 23 FEBRUARY 2025 LAST UPDATED: 23 FEBRUARY 2025

"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."

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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/

6.1800 in the news

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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?

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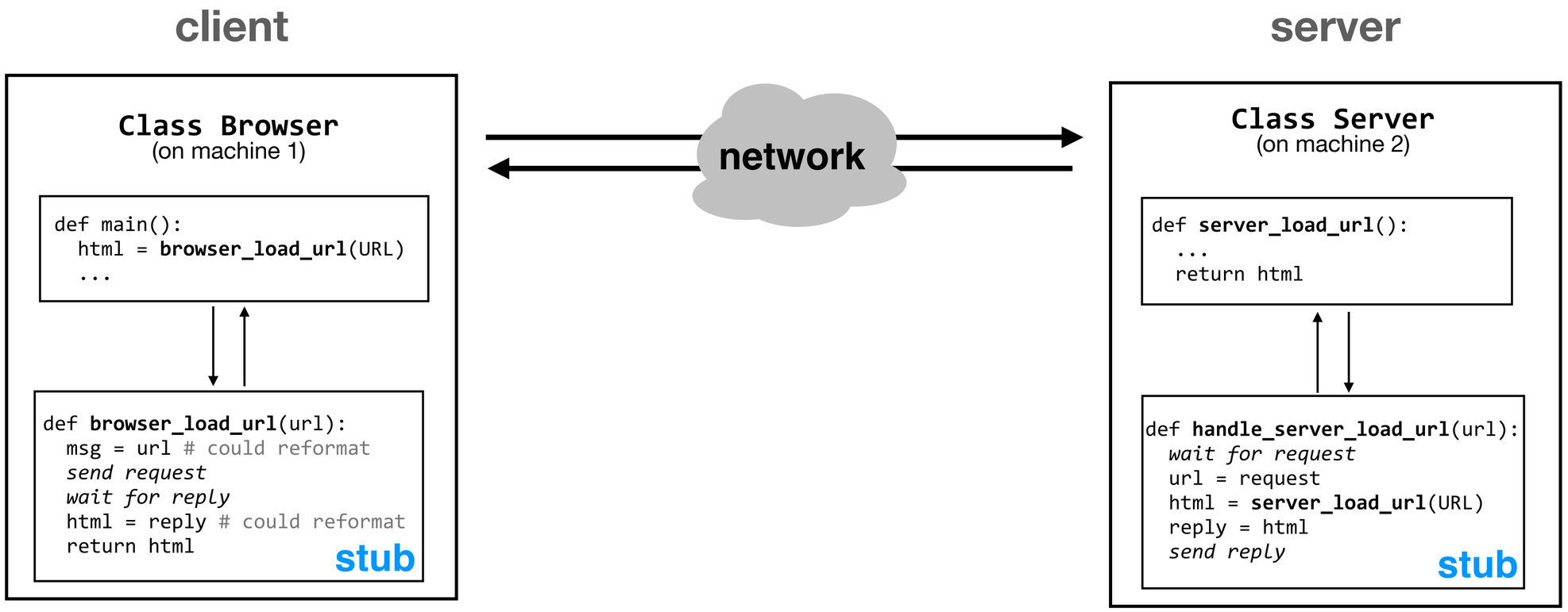
how do modules of a system communicate if they're on separate machines?



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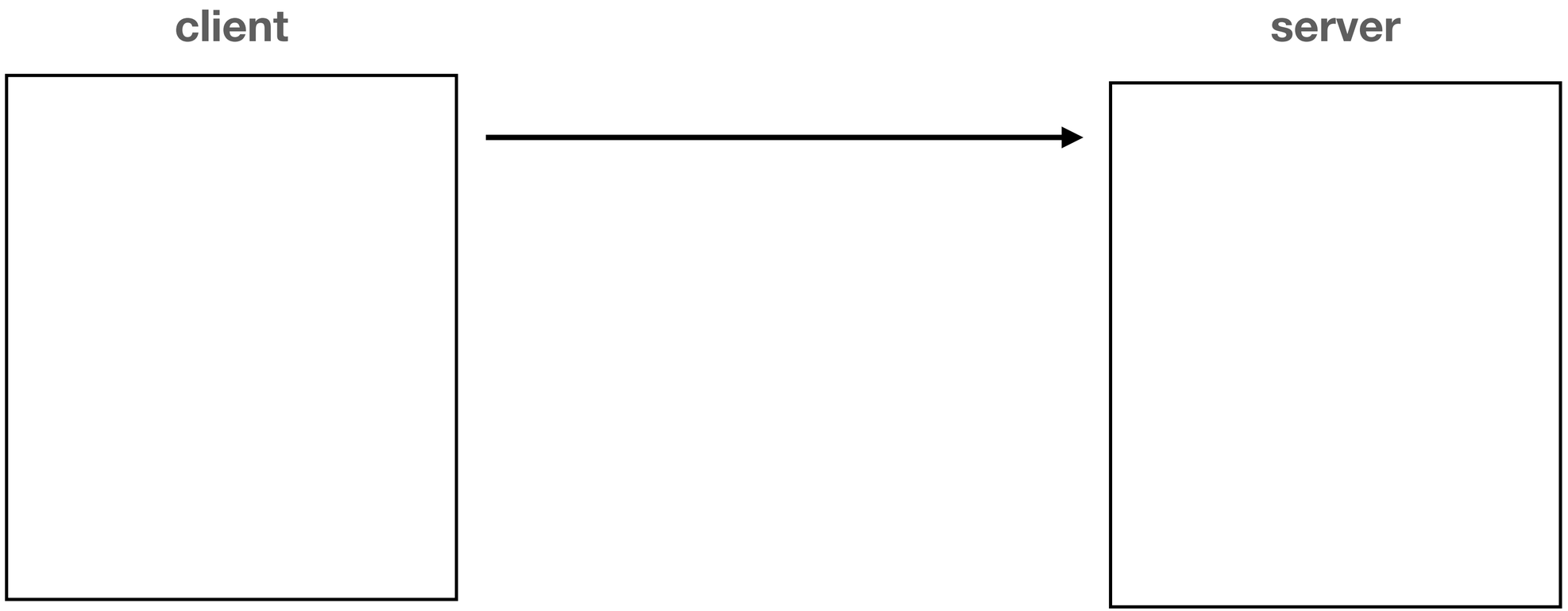

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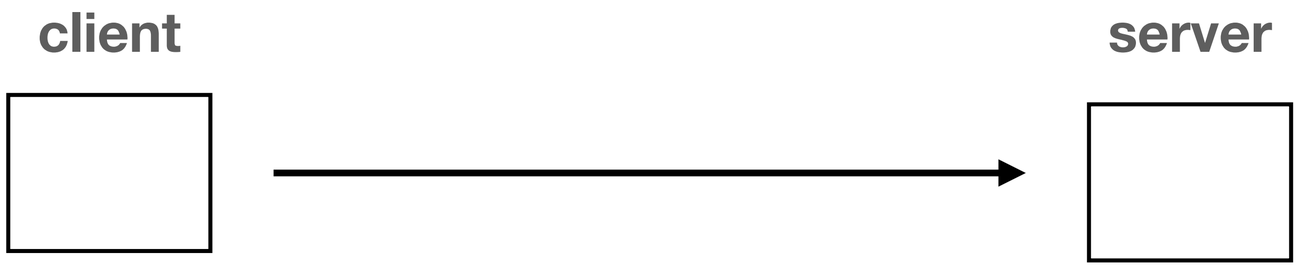

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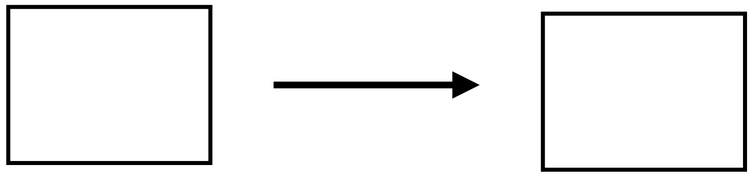

point-to-point links: get a source to talk to a directly-connected destination

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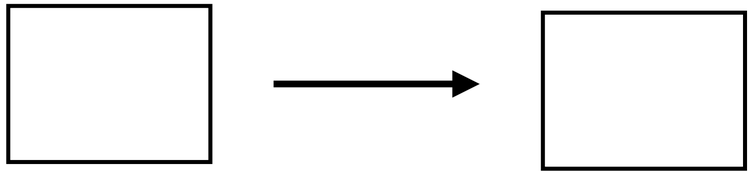

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`link` communication between two directly-connected nodes

examples: ethernet, bluetooth, 802.11 (wifi)

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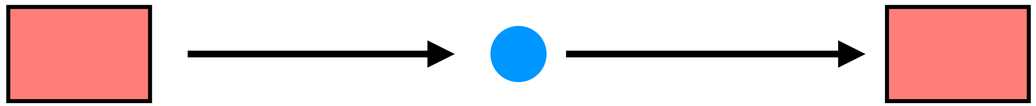

switches: help forward data to destinations that are far away

switches do other things, too

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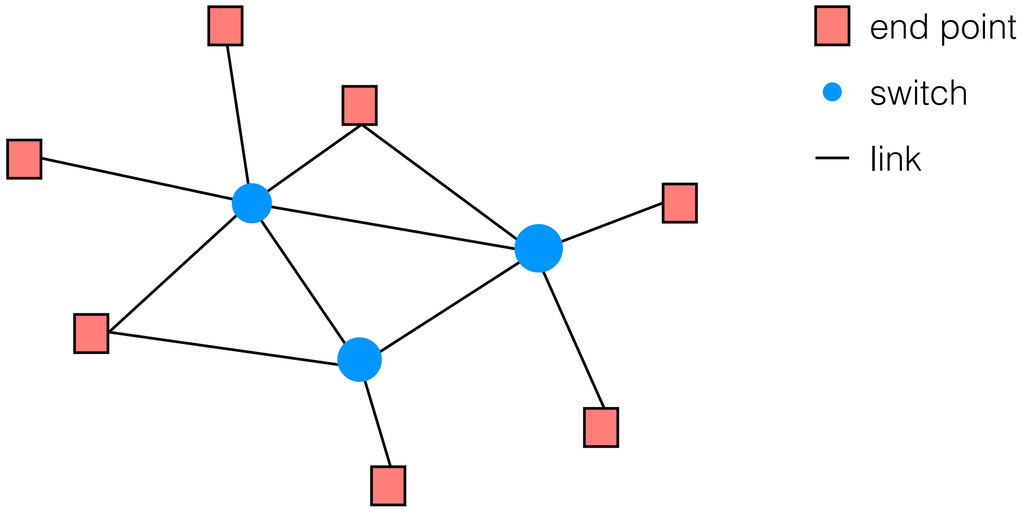

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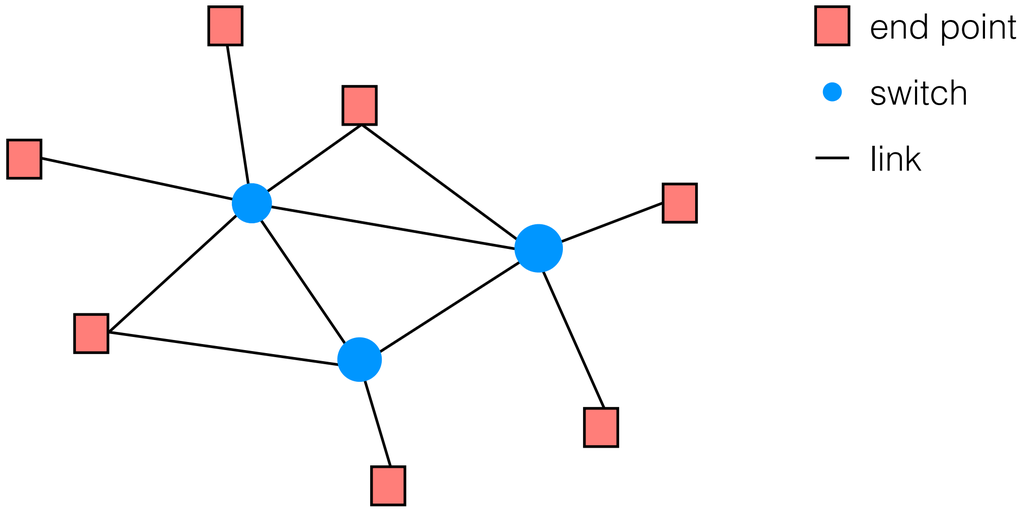

as this system grows, we need to think about how to turn this set of **links** into a **network**

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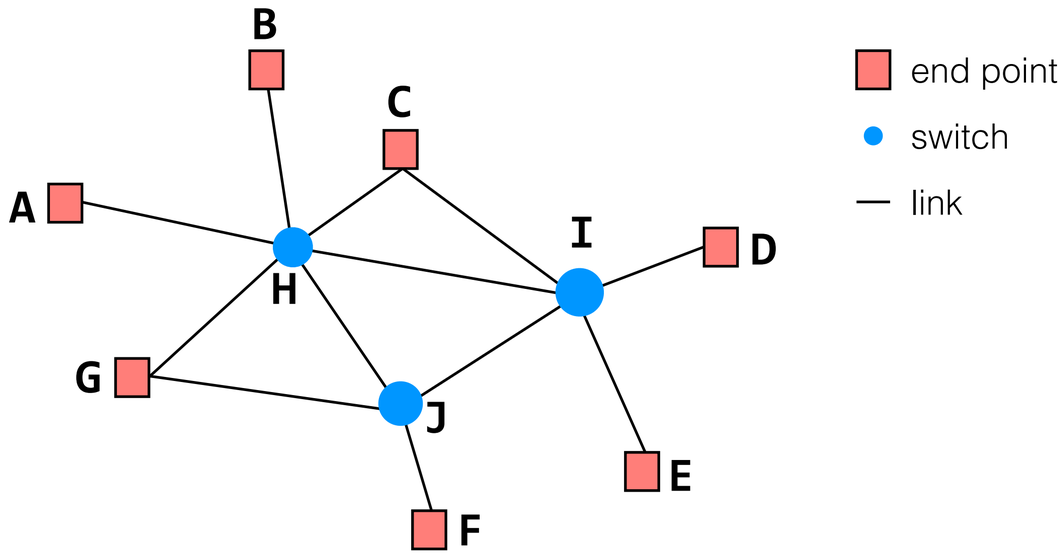

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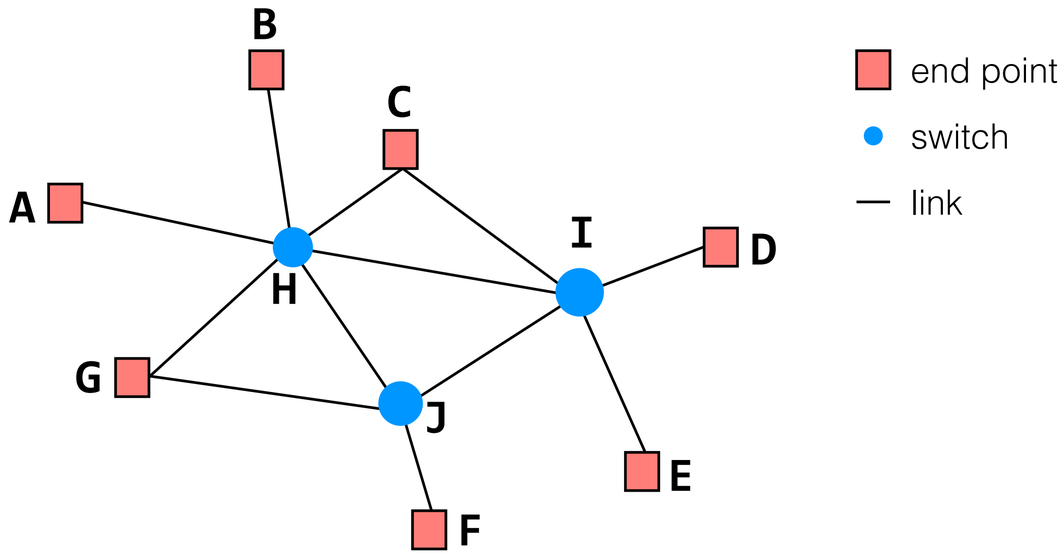

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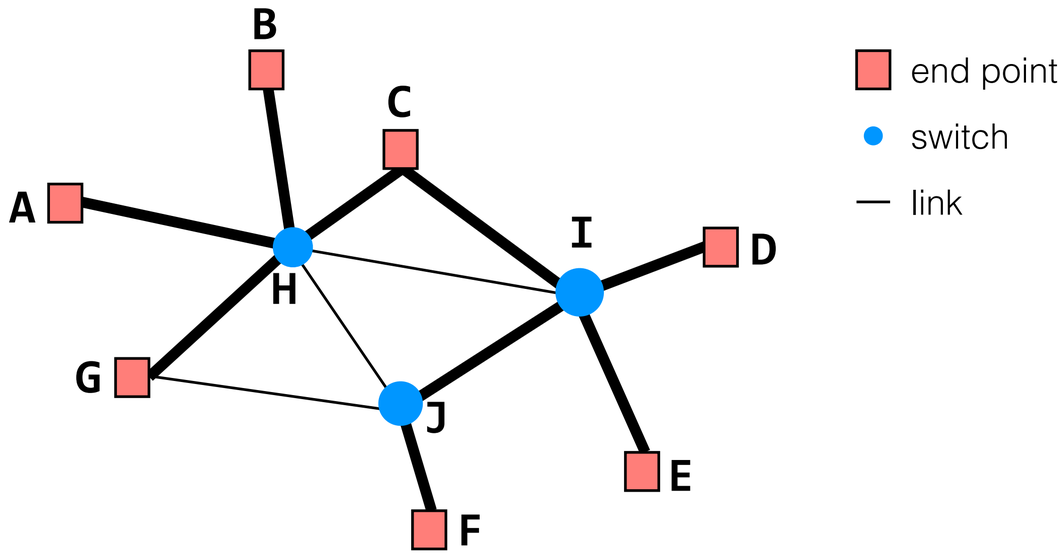

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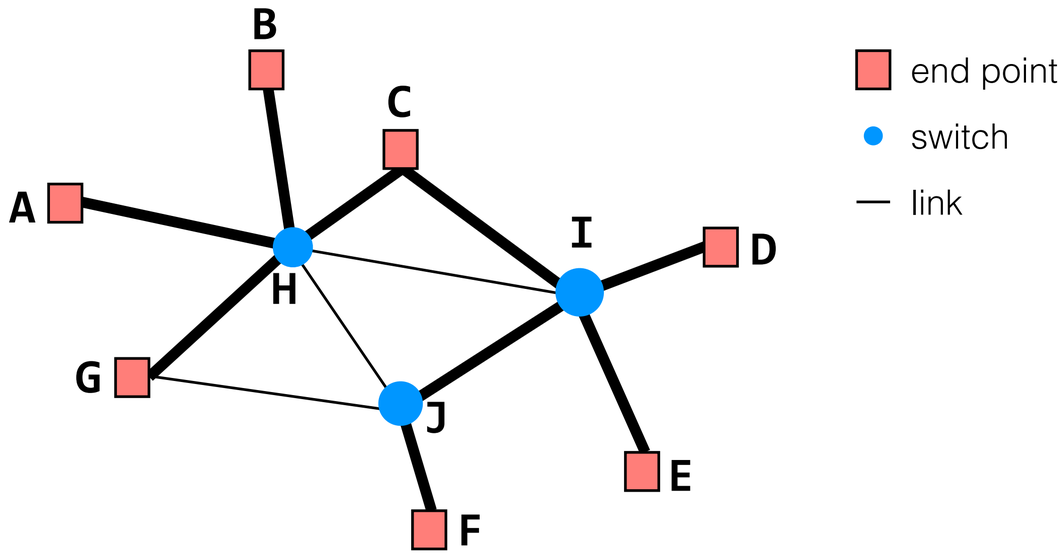

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`transport`	`sharing the network, reliability (or not)`
`network`	`naming, addressing, routing`
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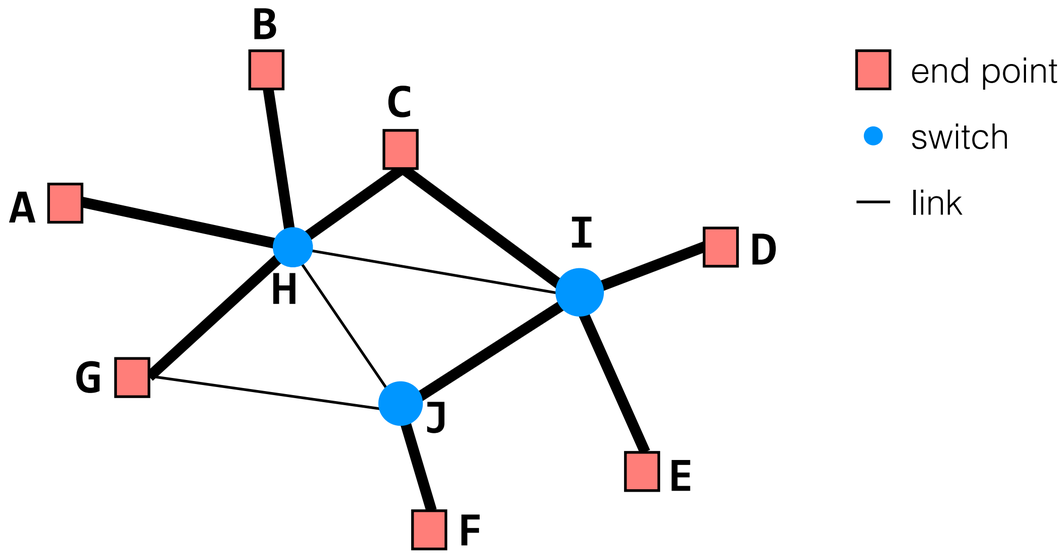

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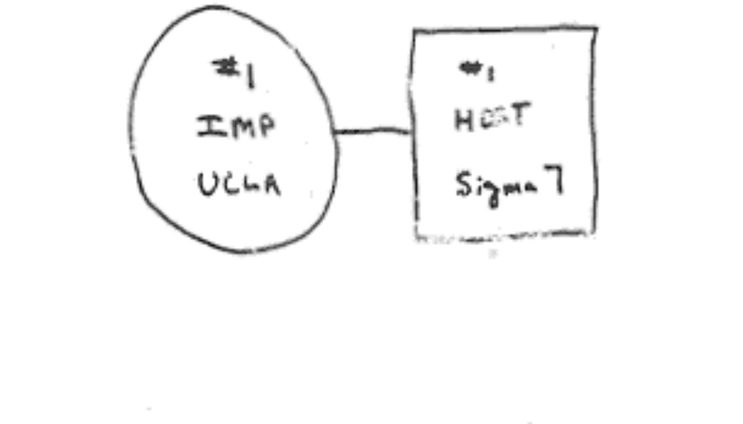

FIGURE 6.1 Drawing of September 1969
(Courtesy of Alex McKenzie)

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

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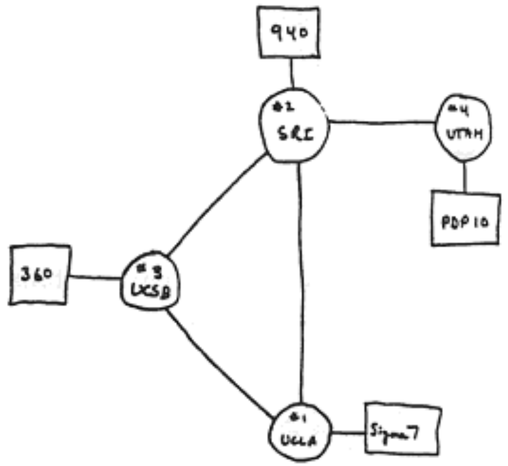

FIGURE 6.2 Drawing of 4 Node Network
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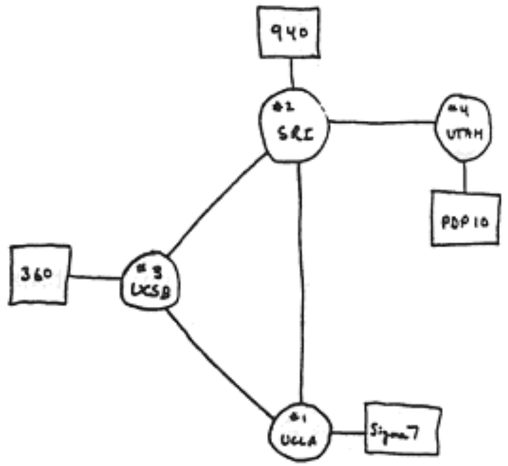
hosts.txt



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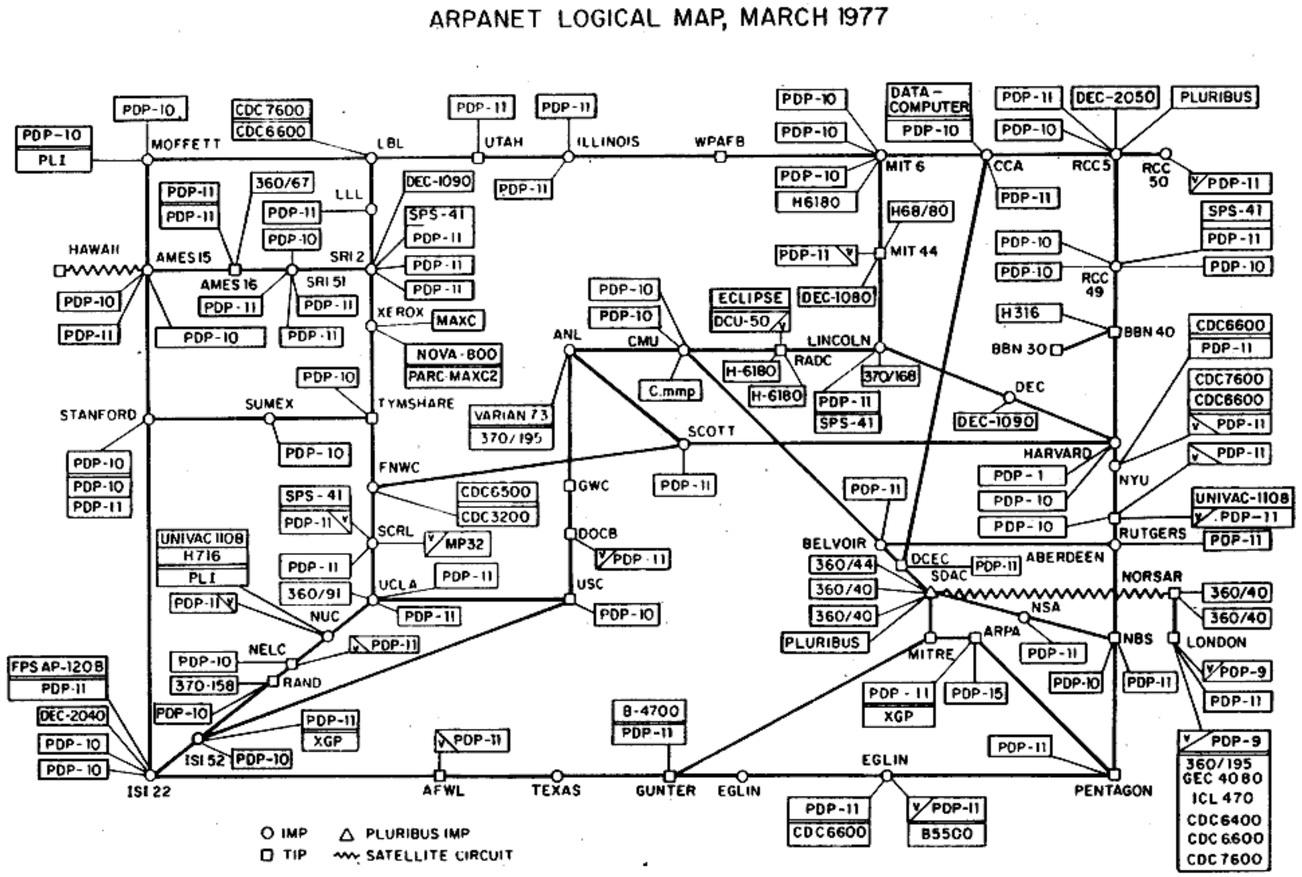

application the things that actually generate traffic

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network naming, addressing, routing

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examples: ethernet, bluetooth, 802.11 (wifi)

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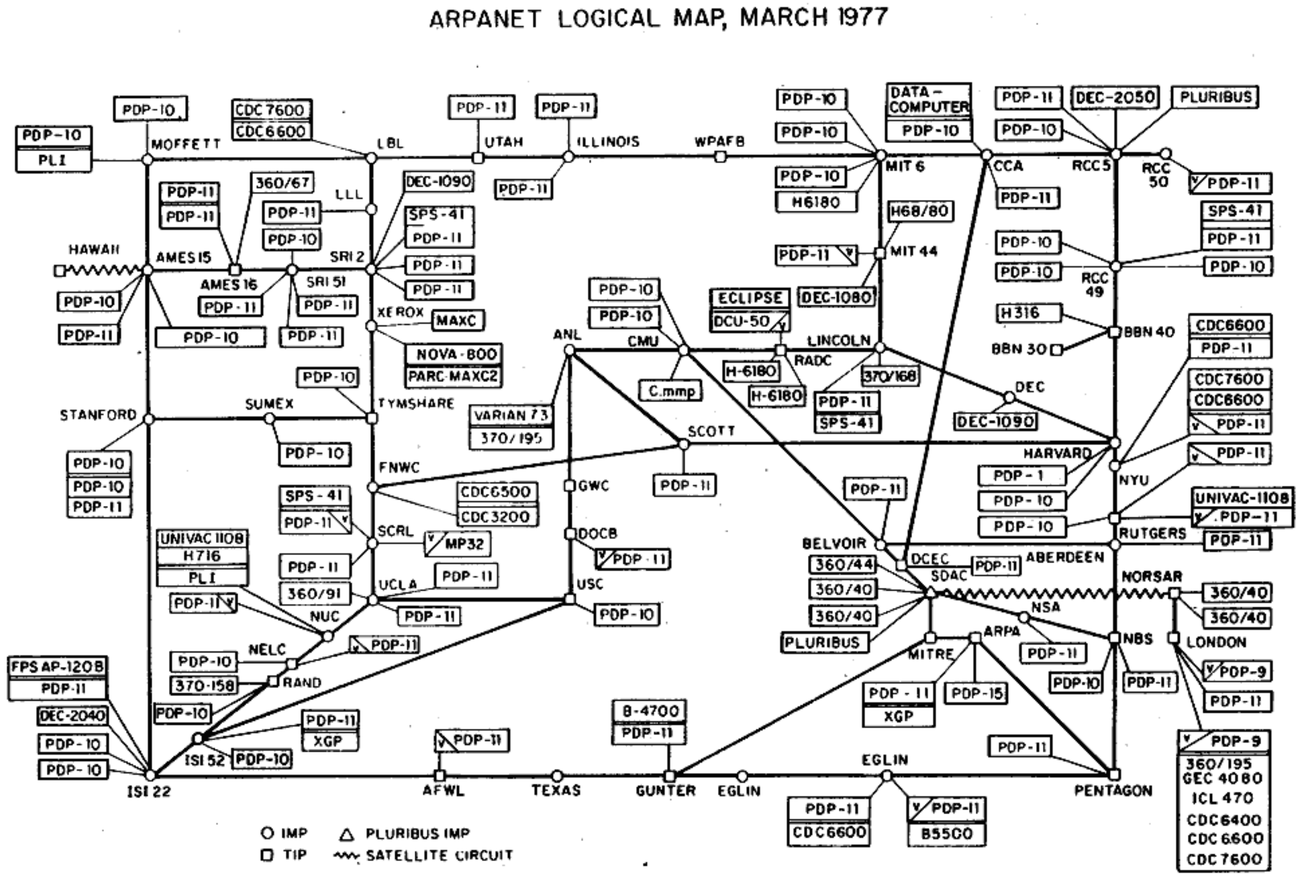

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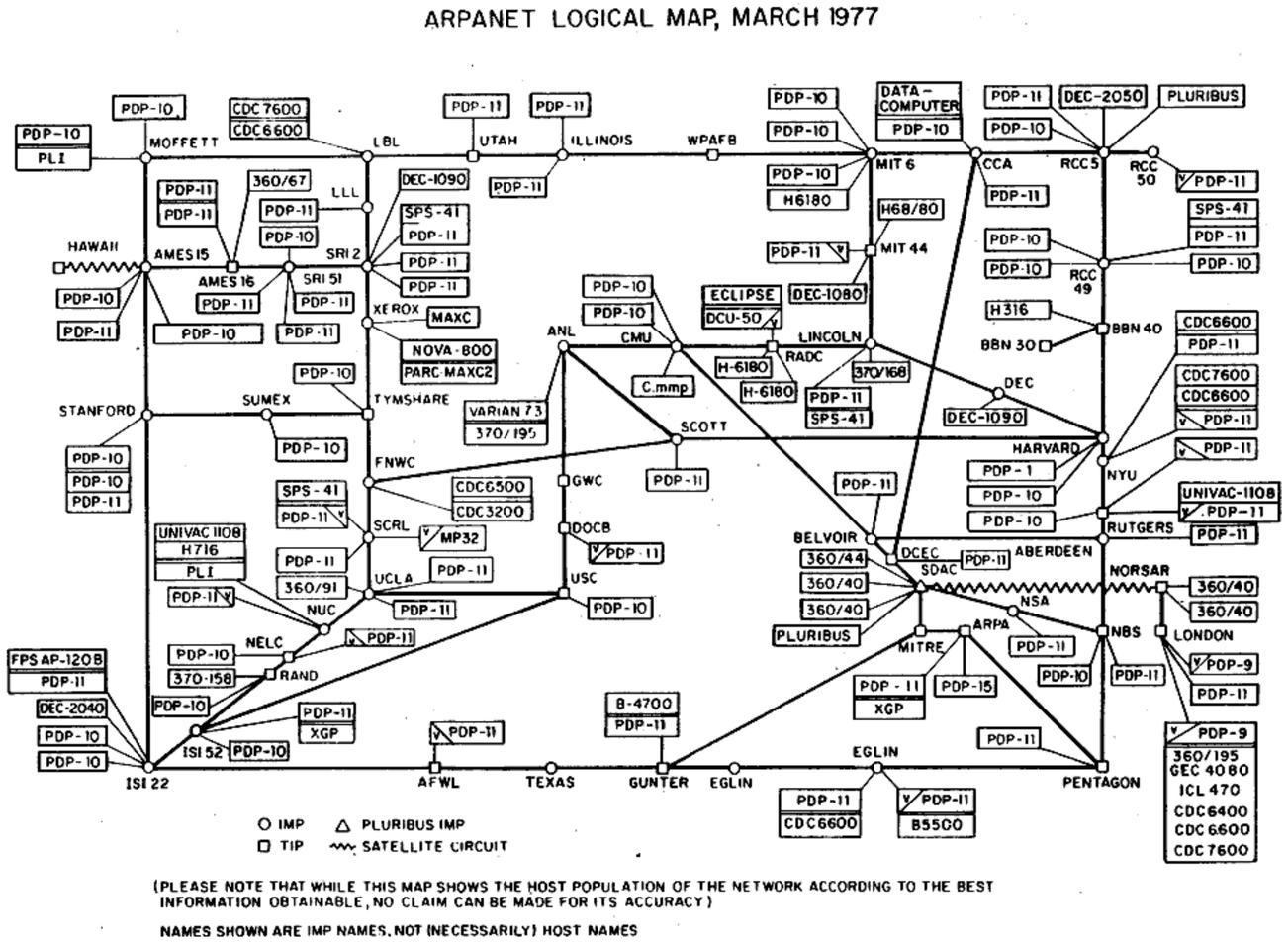

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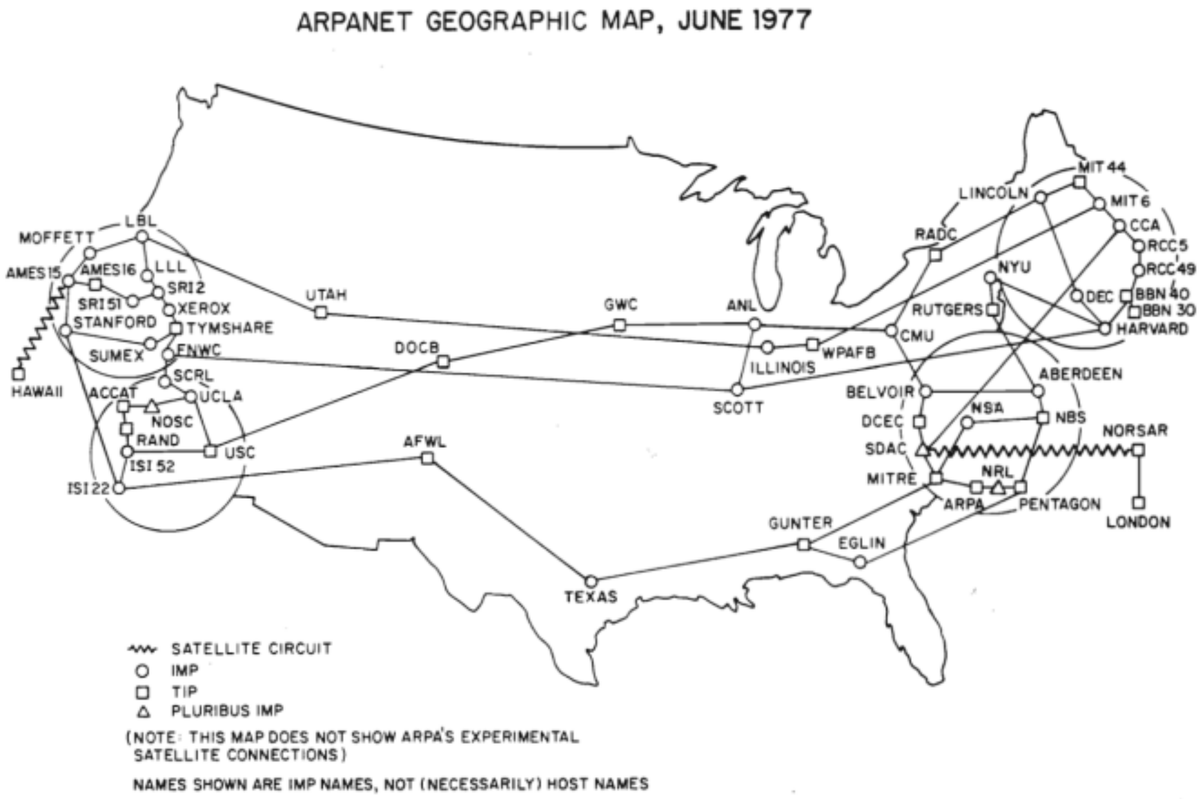

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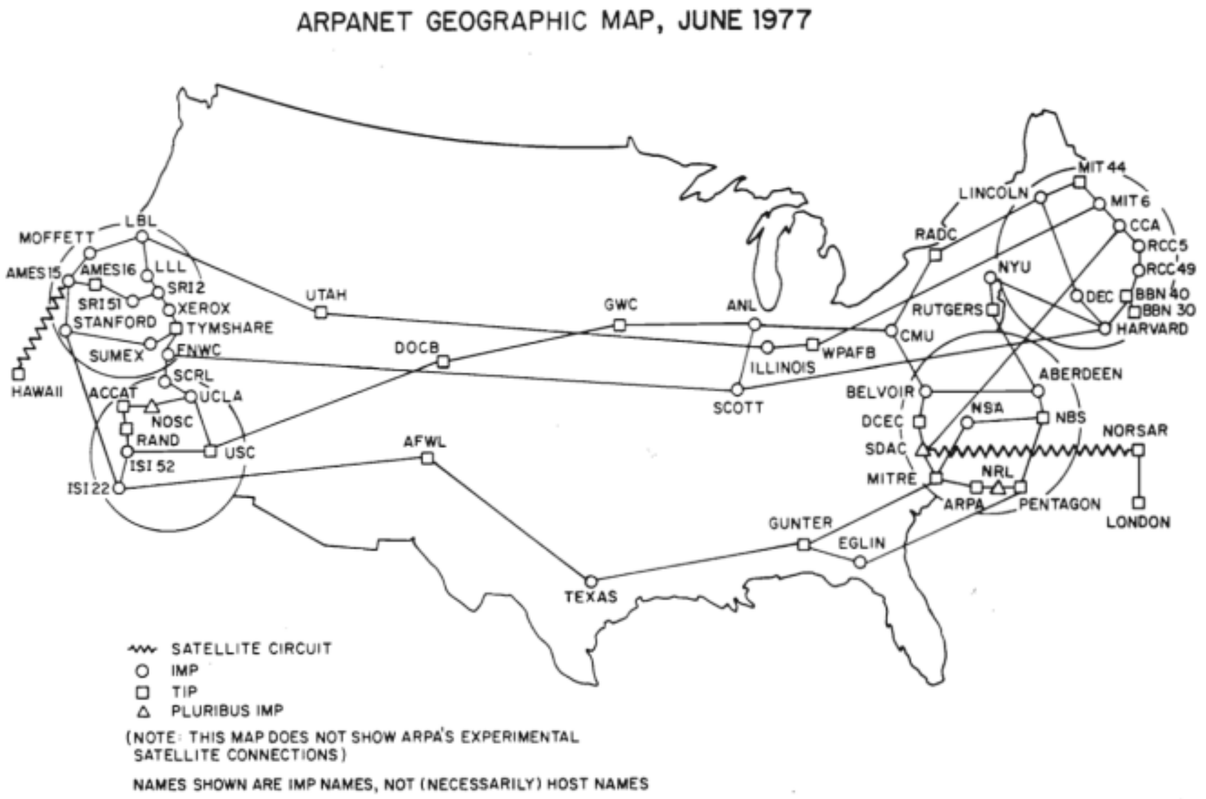

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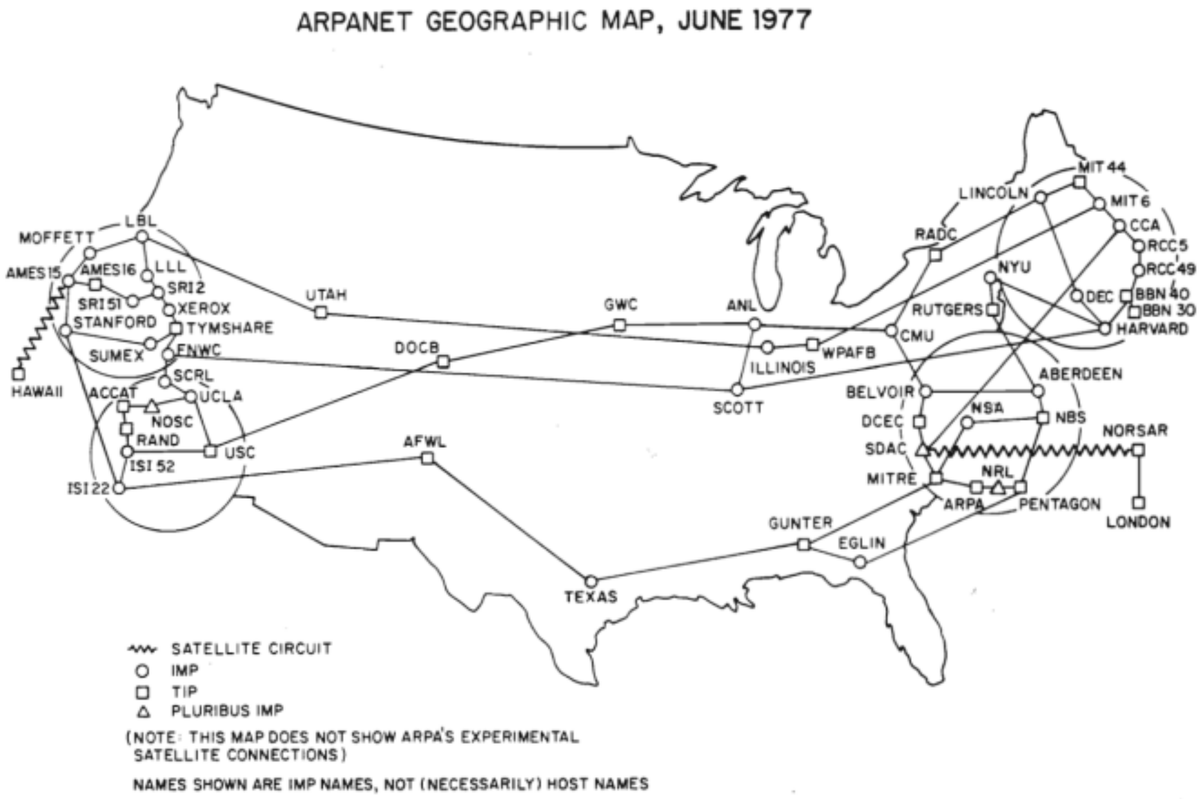

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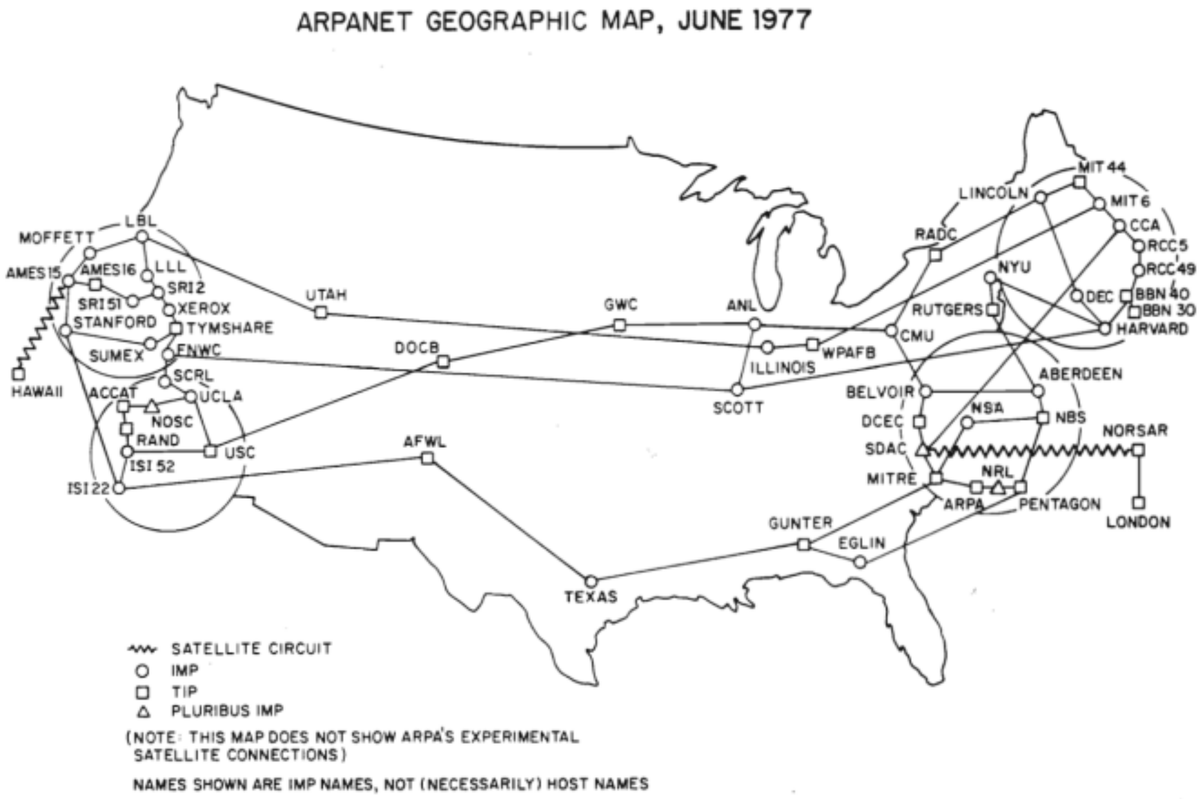

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early 80s: growth → change

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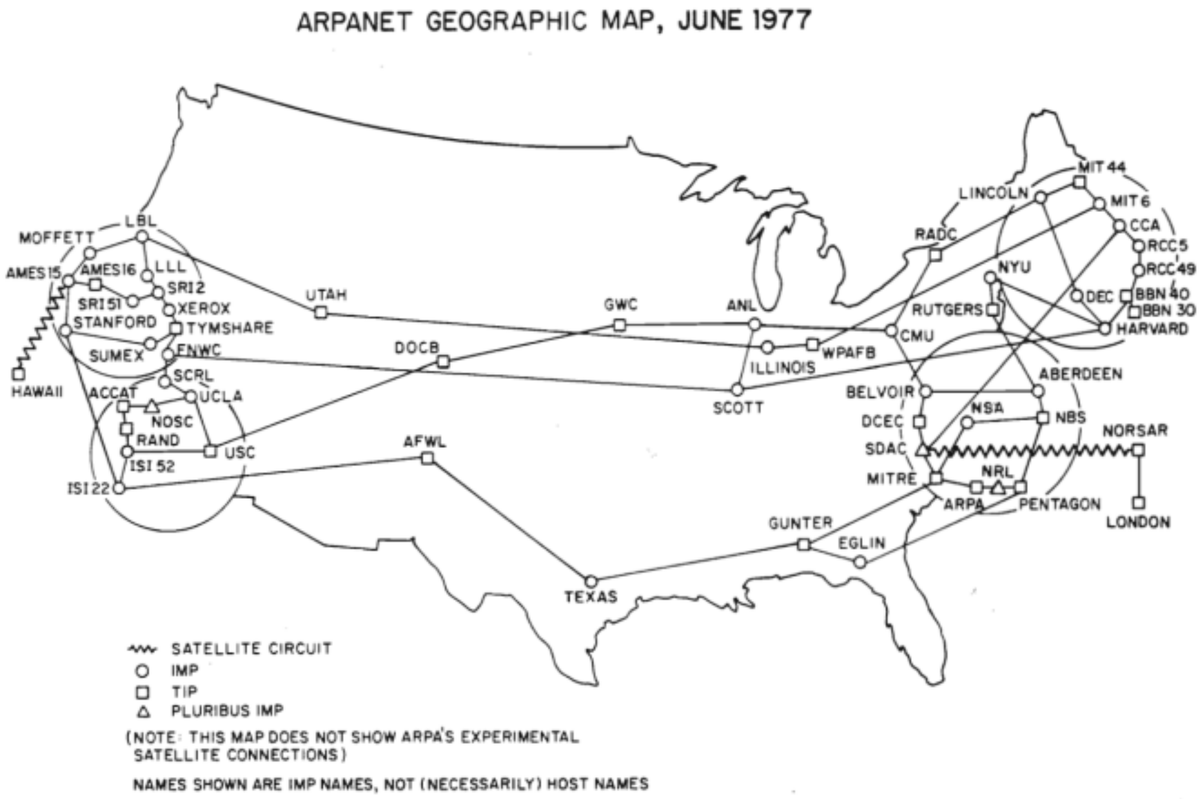

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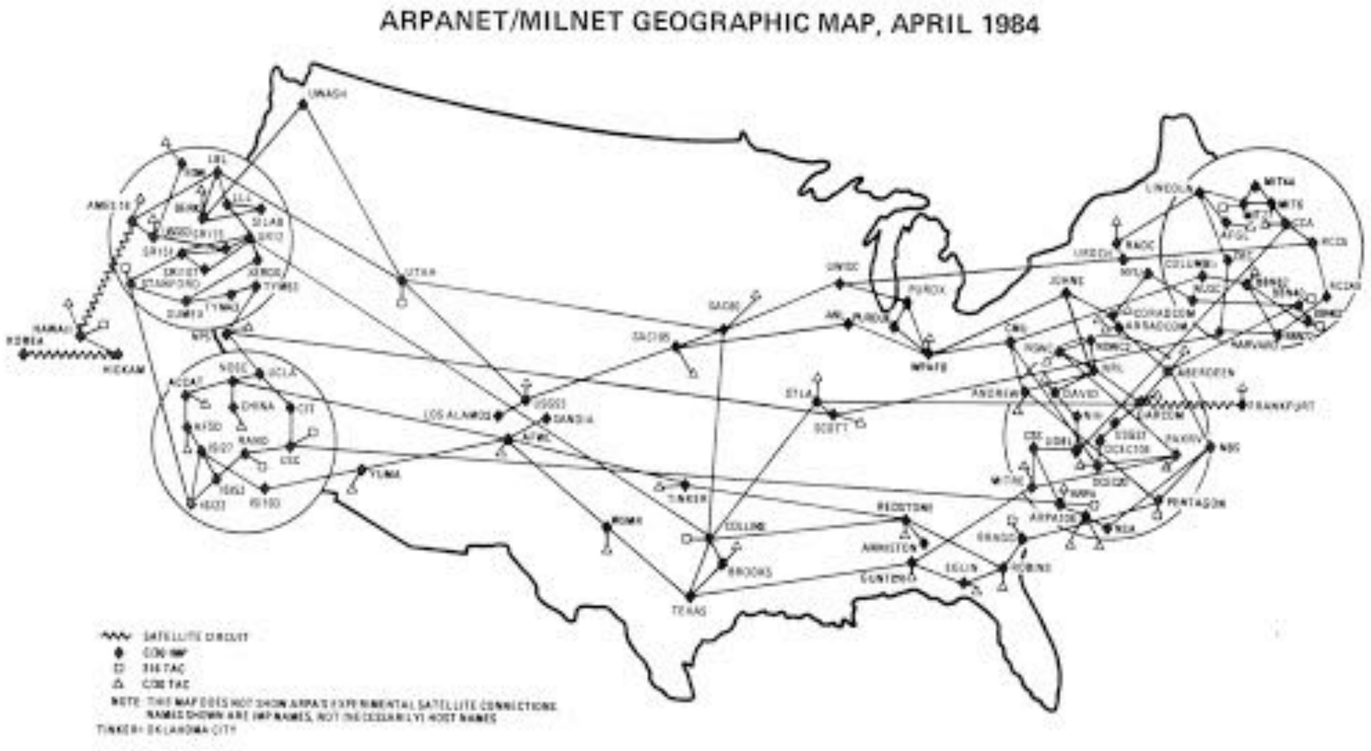

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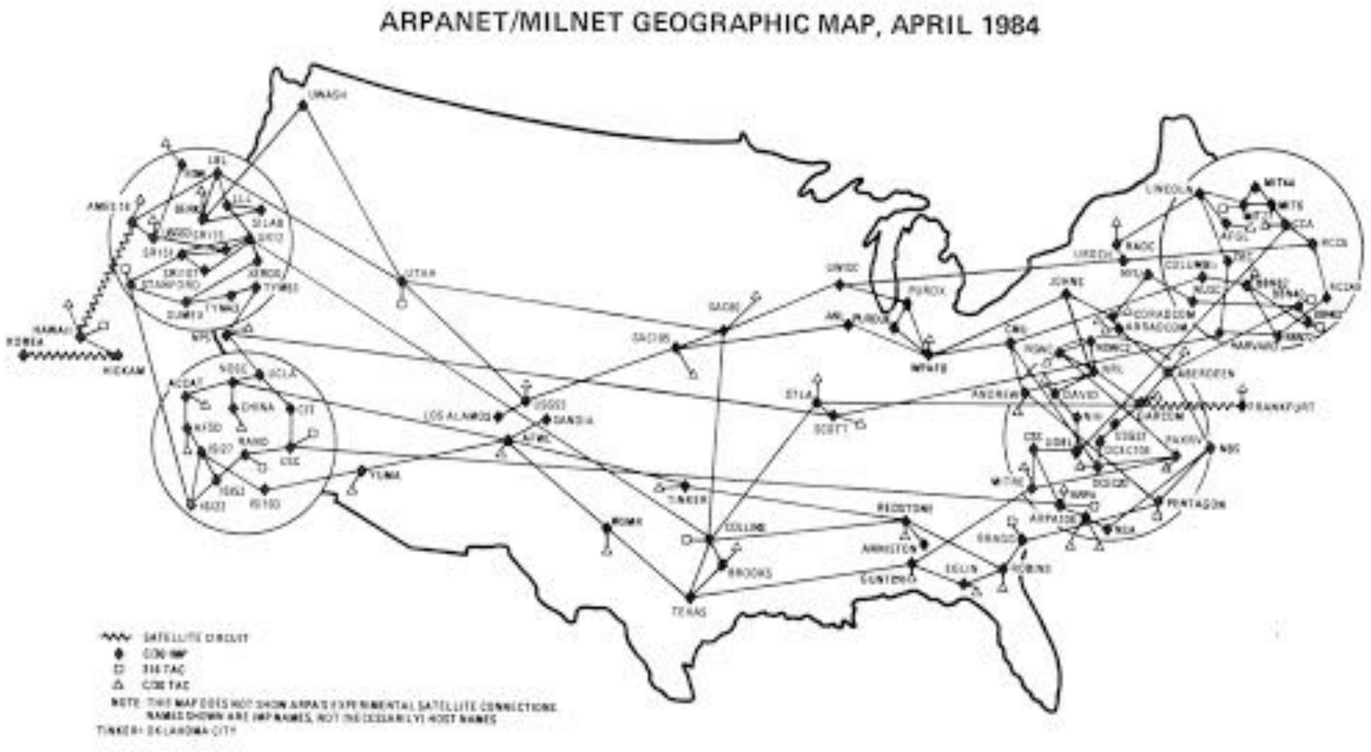

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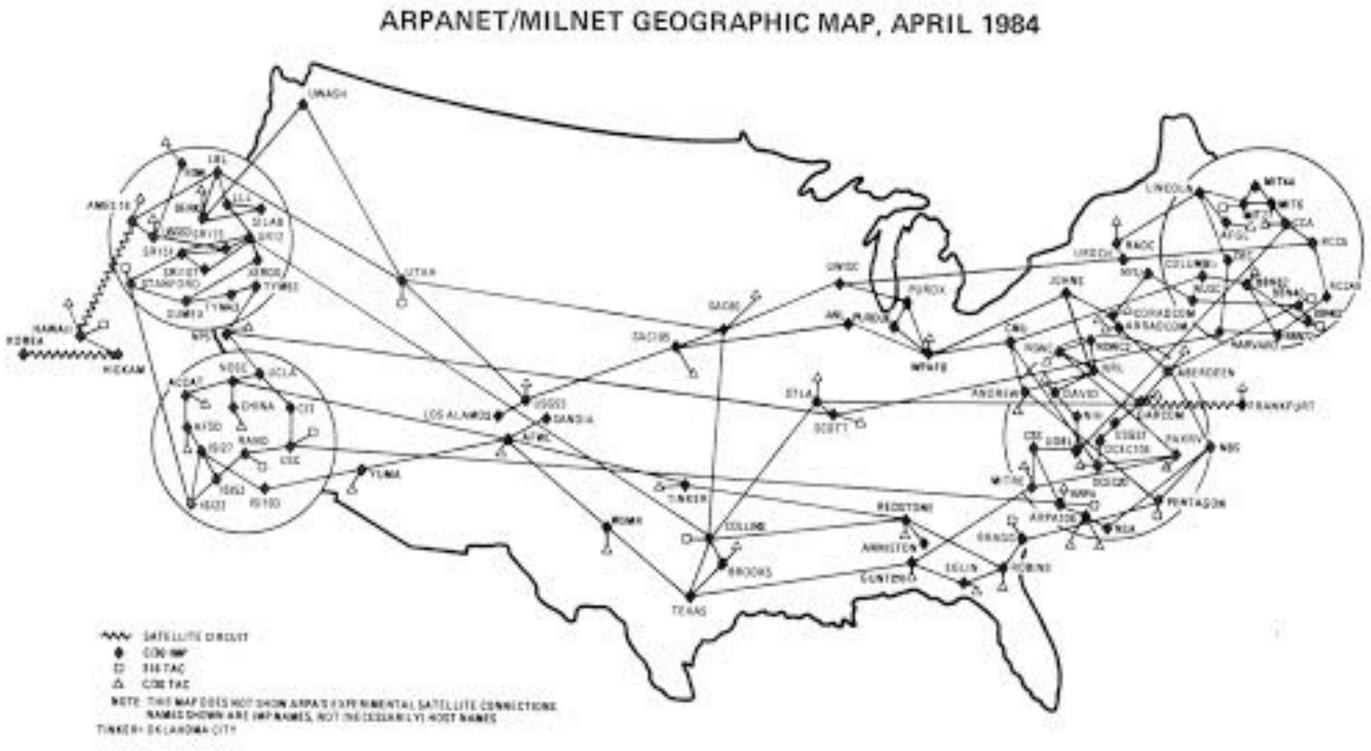
hosts.txt | distance-vector routing | TCP, UDP | OSPF, EGP, DNS



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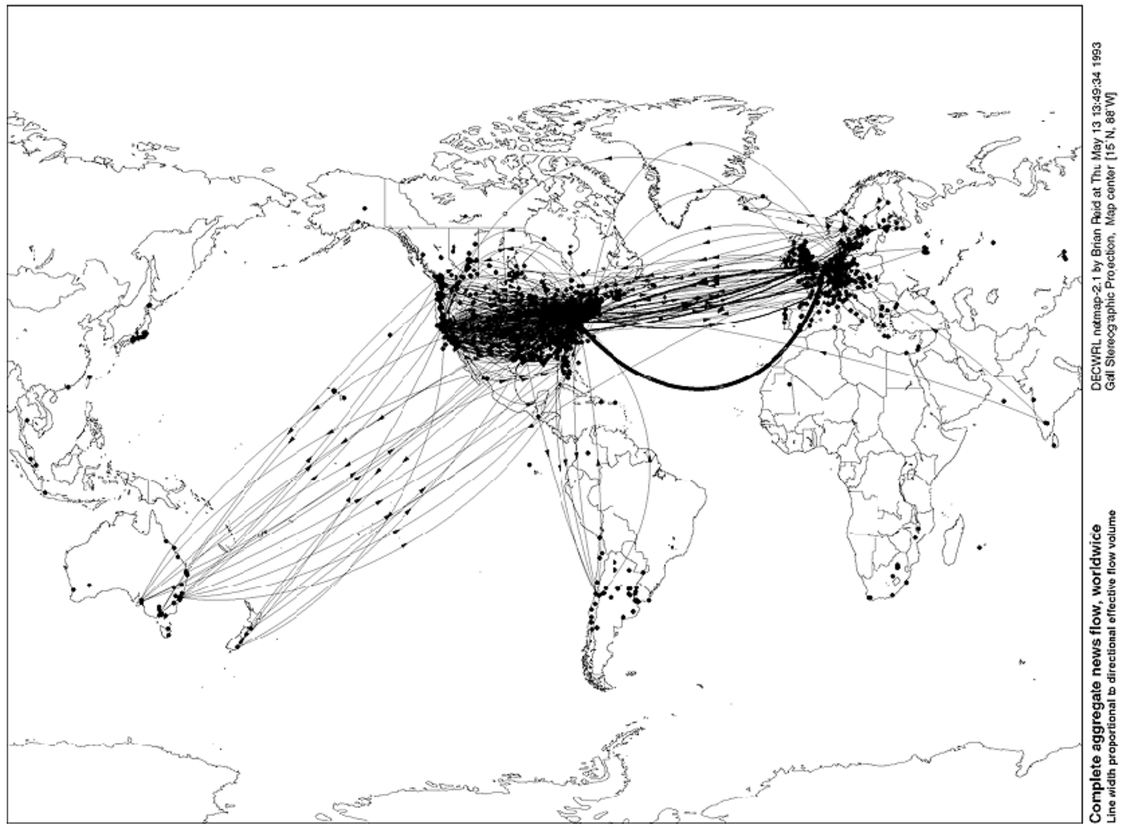

https://www.vox.com/a/internet-maps

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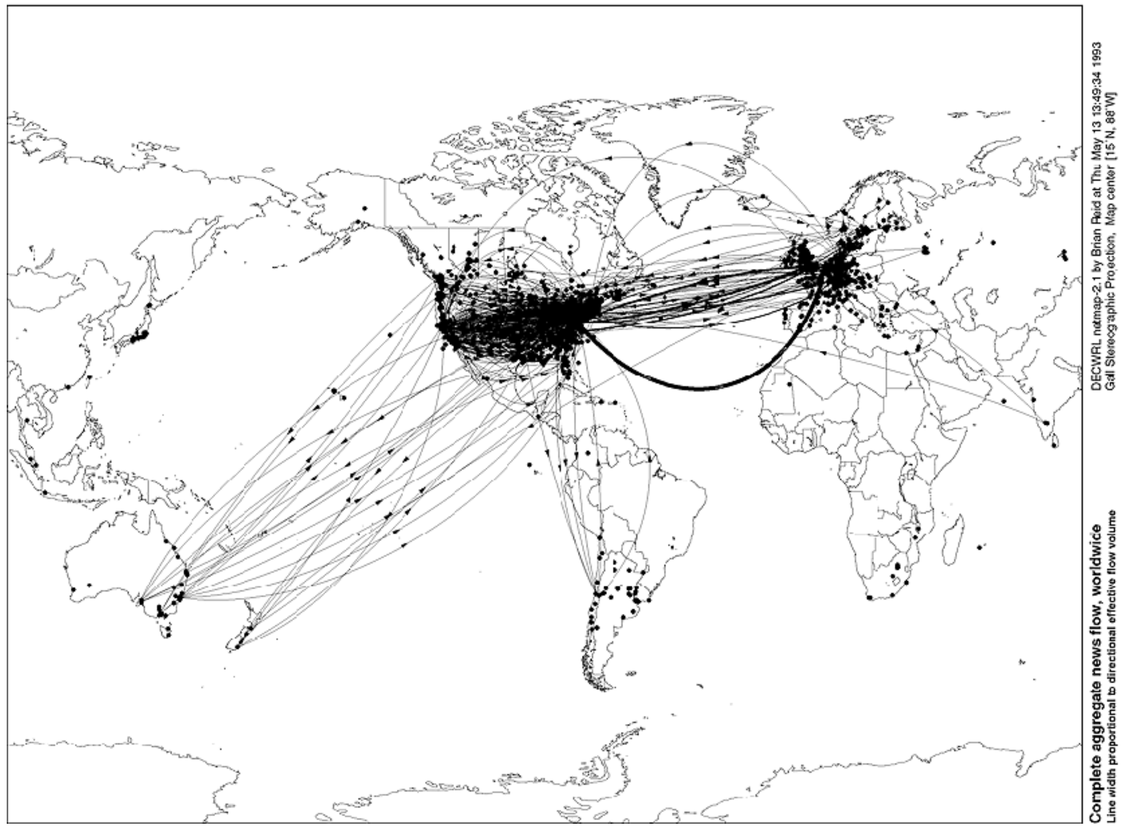

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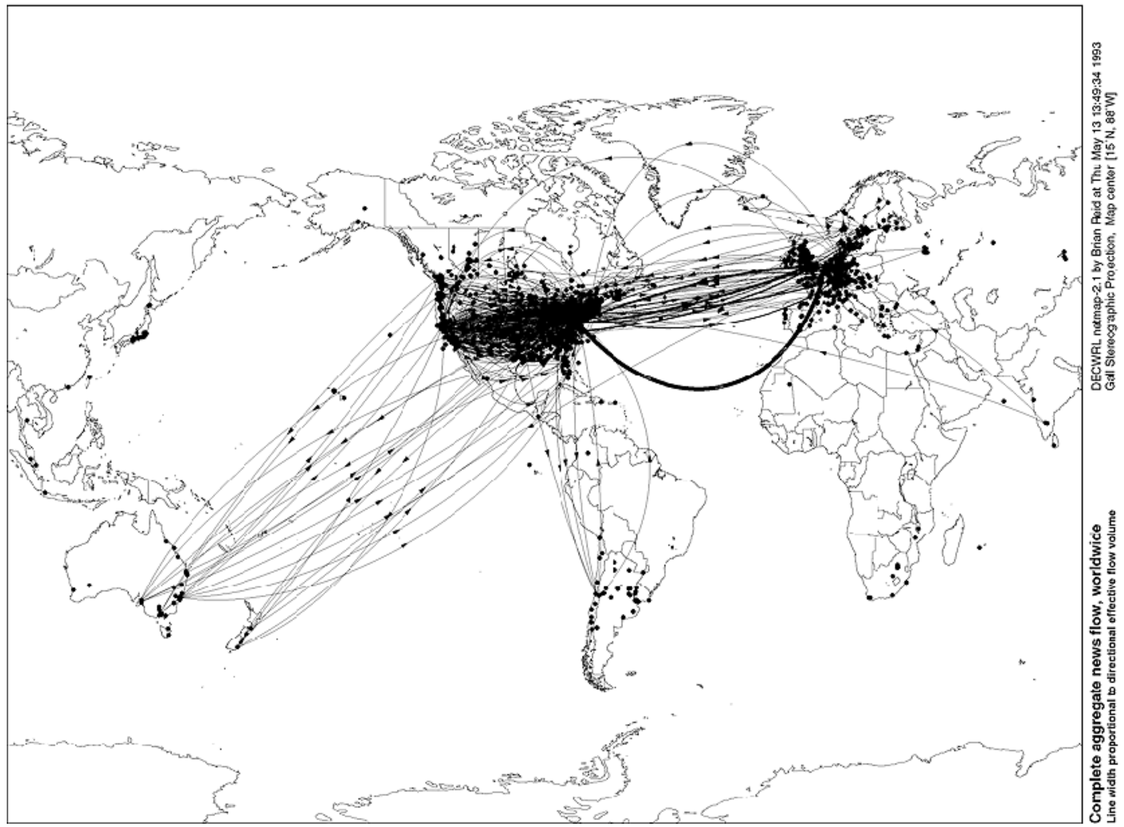

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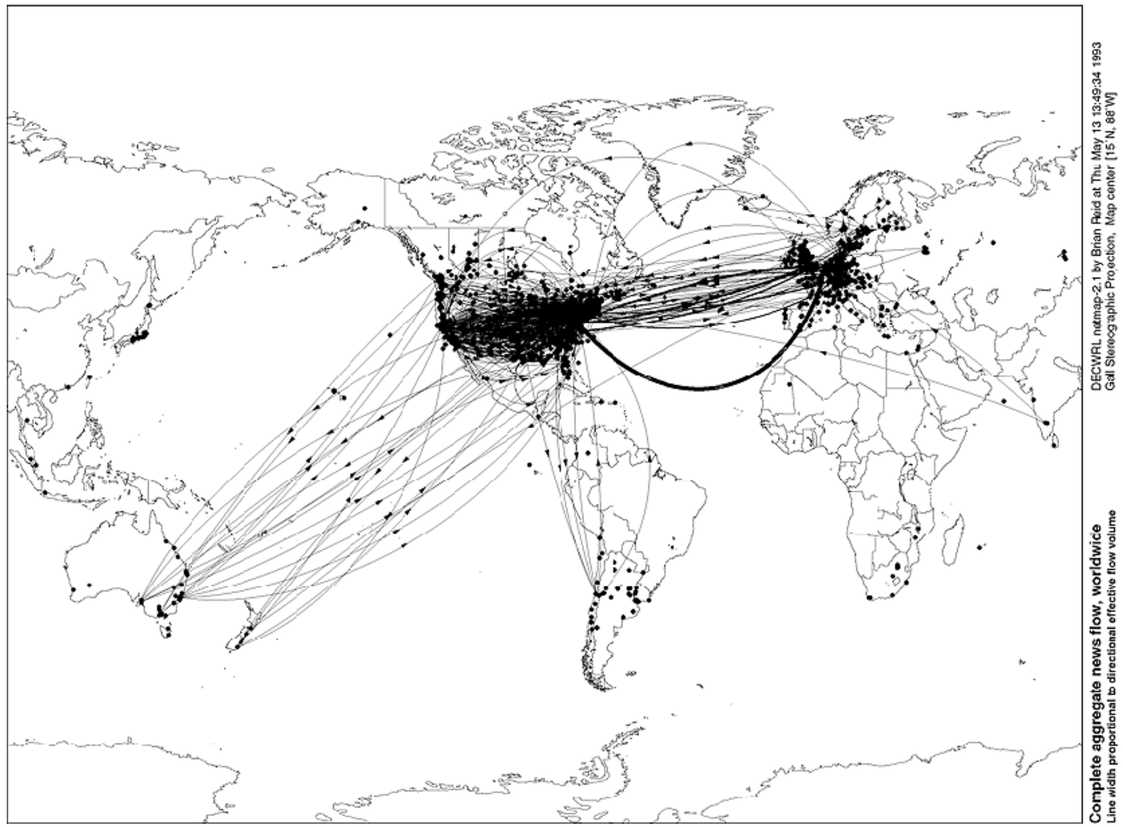
CIDR



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

application the things that actually generate traffic

transport sharing the network, reliability (or not)

examples: TCP, UDP

network naming, addressing, routing

examples: IP

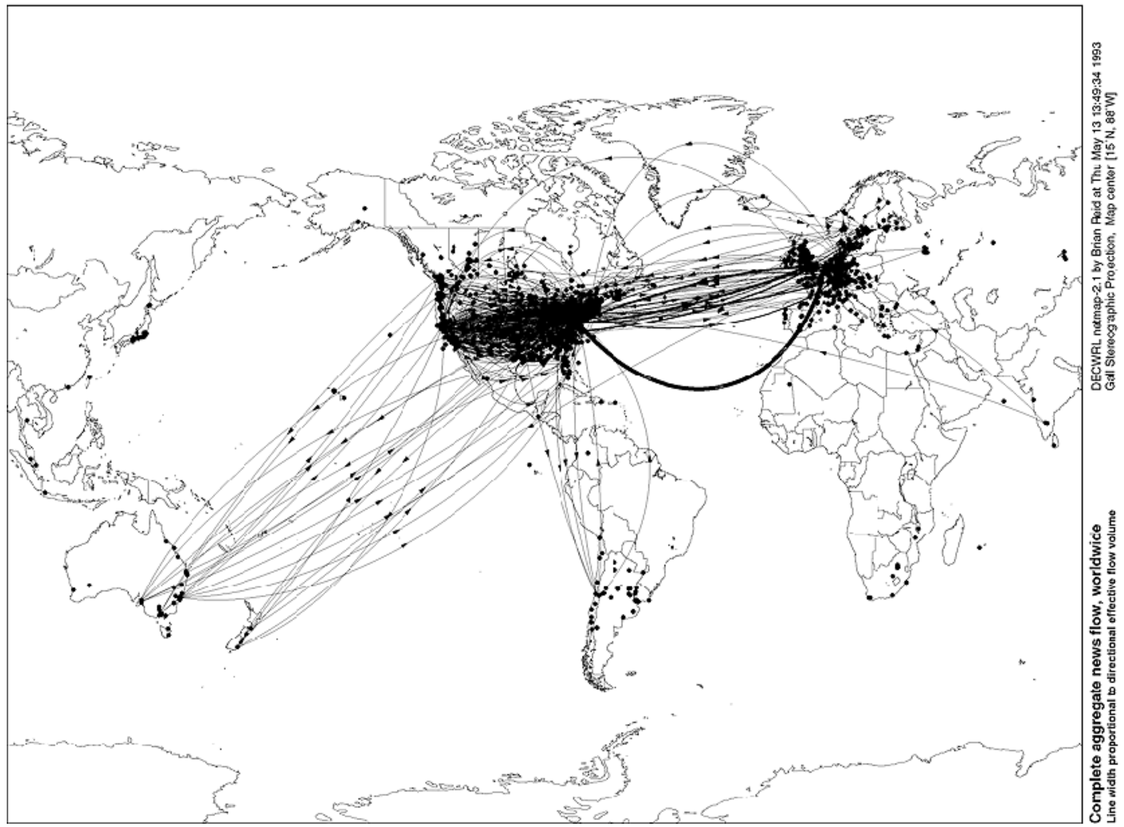
link communication between two directly-connected nodes

examples: ethernet, bluetooth, 802.11 (wifi)

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

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



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

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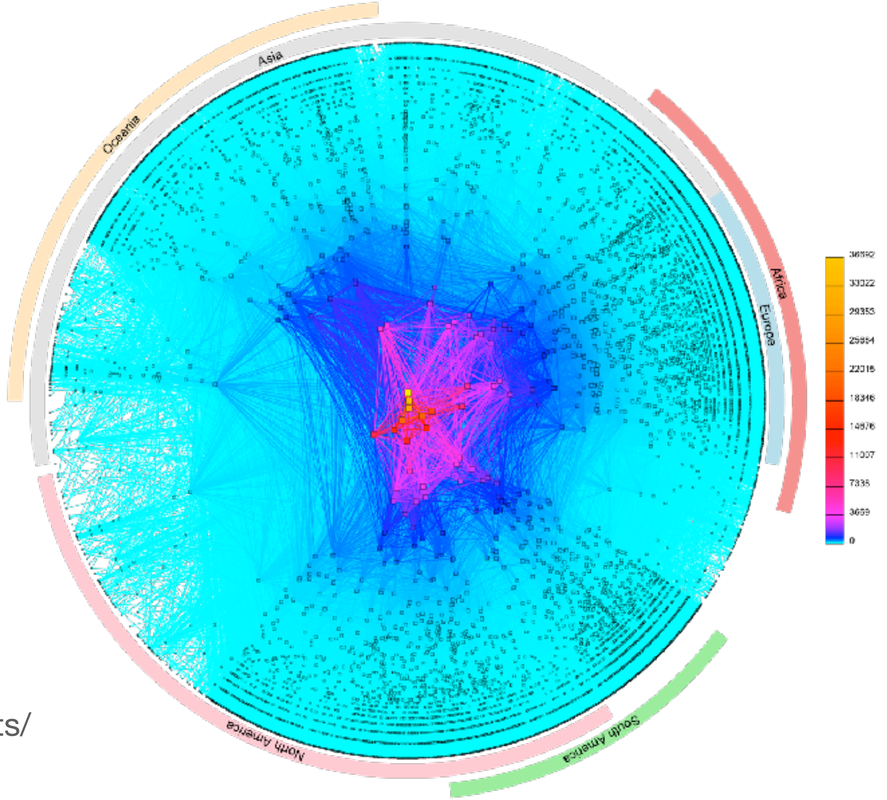

CAIDA's IPv4 AS Core, January 2020 (https://www.caida.org/projects/cartography/as-core/2020/)

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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