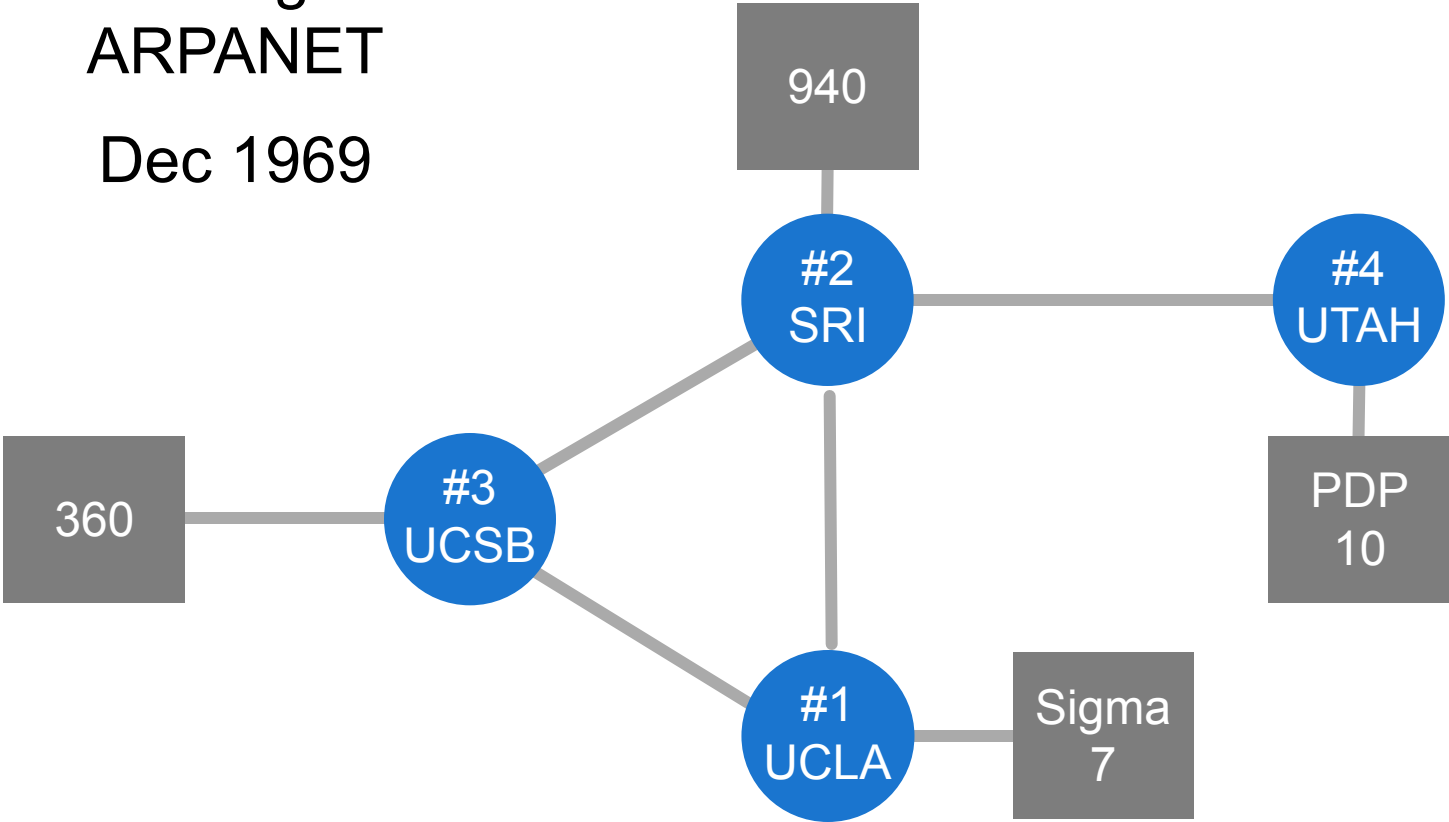

The Future of the Internet and AI

Vint Cerf
Google

April 2024

The Original
ARPANET
Dec 1969



The ARPANET IMP



Packet Radio Van



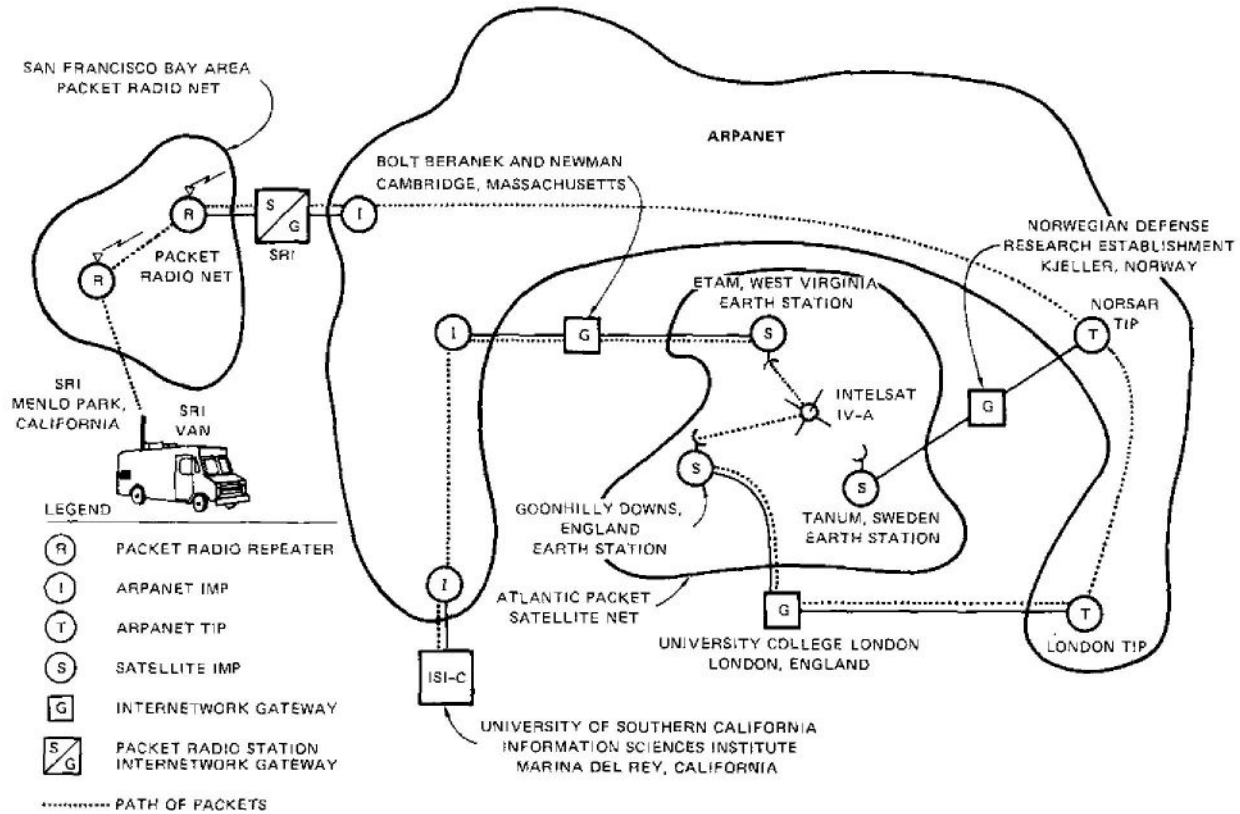
Inside the PR Van



Inside the PR Van (2)

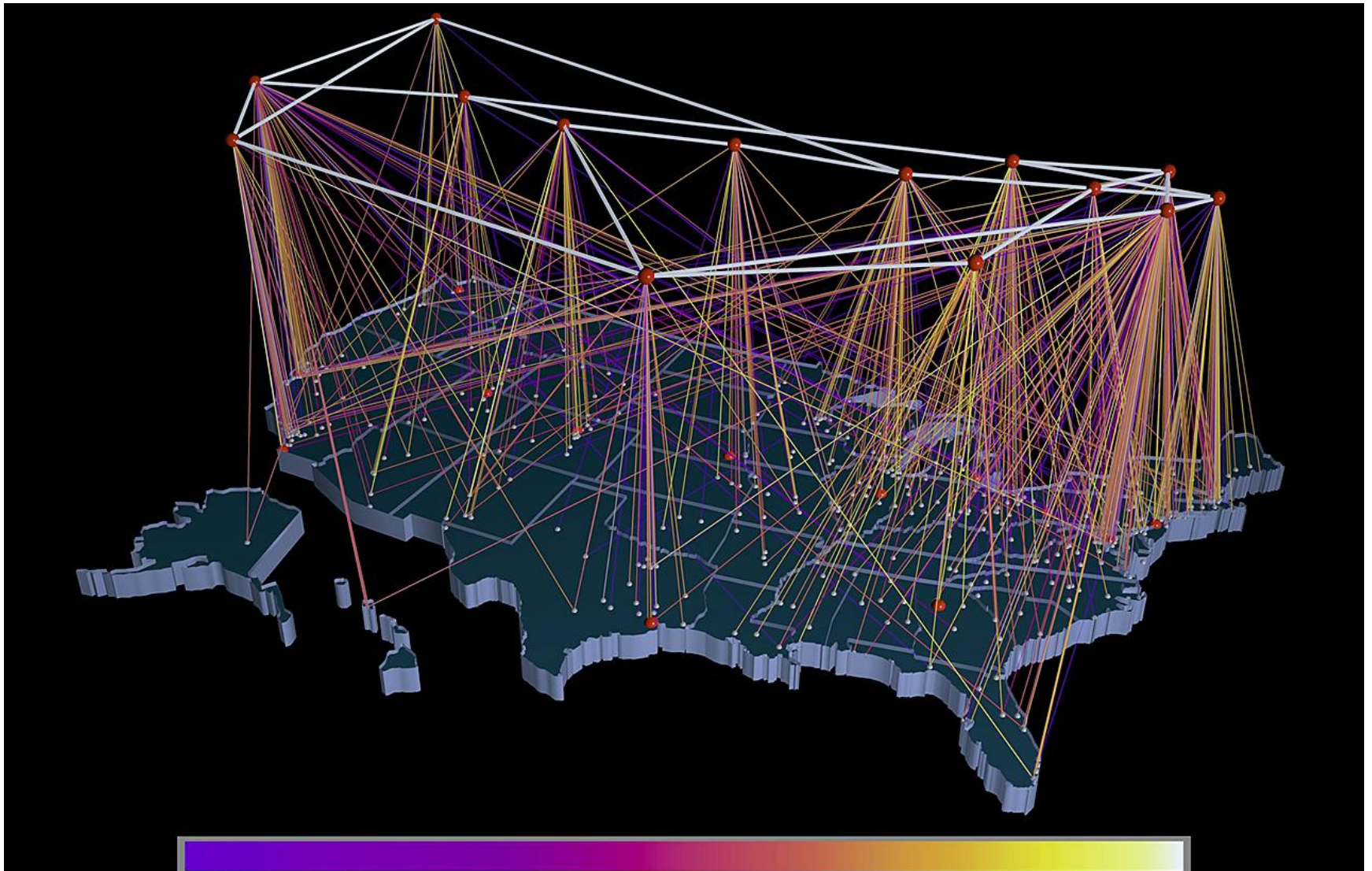


First Three-Network Test of Internet

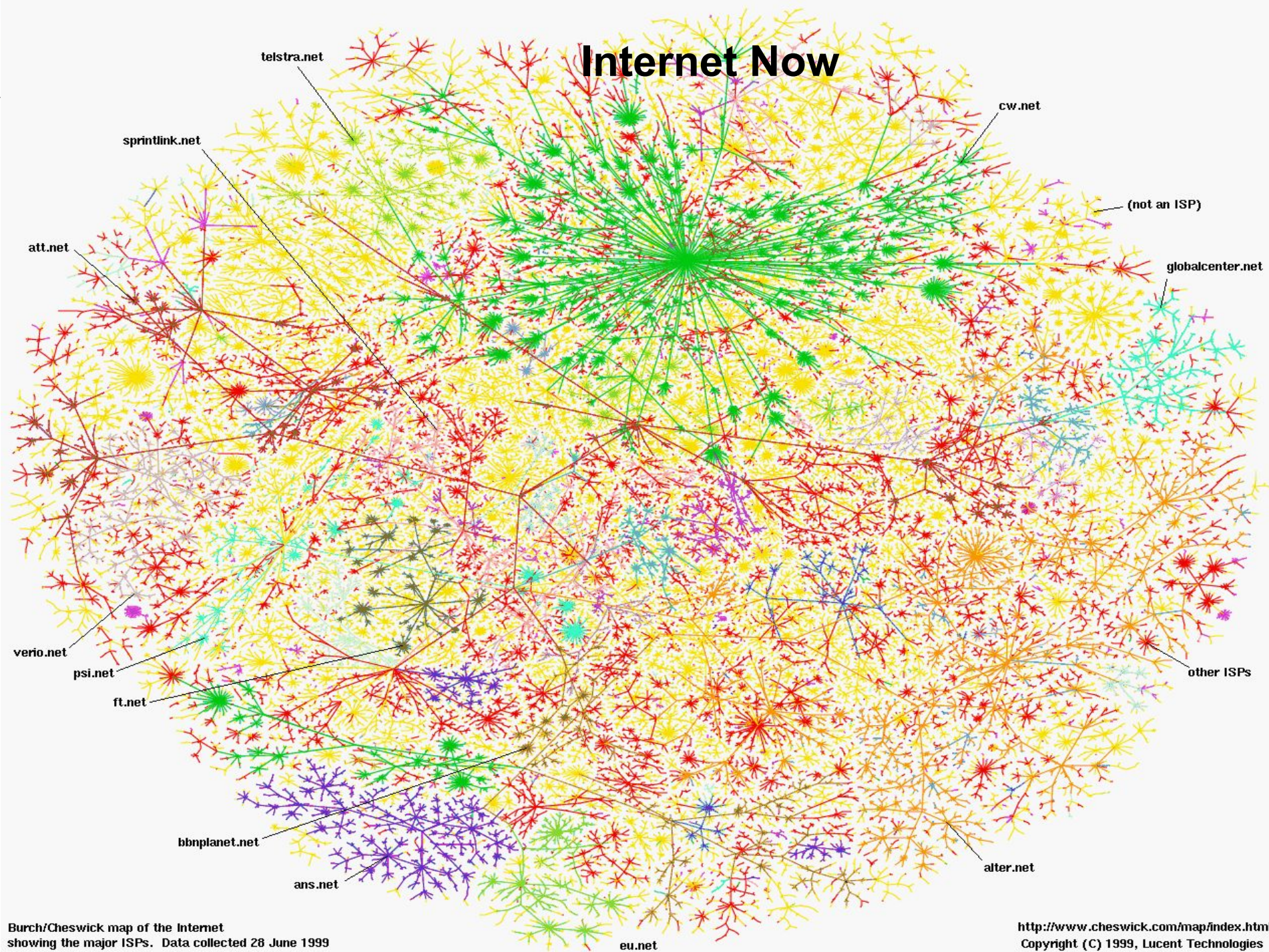


November 22, 1977

NSFNET - ESNET(DOE) - NSINET(NASA)



Internet Now



Key Takeaways

- Internet entity creation as need/incentive arises
- High diversity of entities in ecosystem
- Entities have many interests and incentives re: Internet
- Entities span many functions needed for Internet use & operation

Key Takeaways

- Web of formal and informal relationships and processes
- Multiple jurisdictions and potential for extraterritoriality
- Loose coupling among entities in the ecosystem
- Long history of successful if sometimes contentious operation
- Transnational nature of multi-stakeholder policy making - Internet Governance Forum - Global Digital Compact

Where is technology taking us?

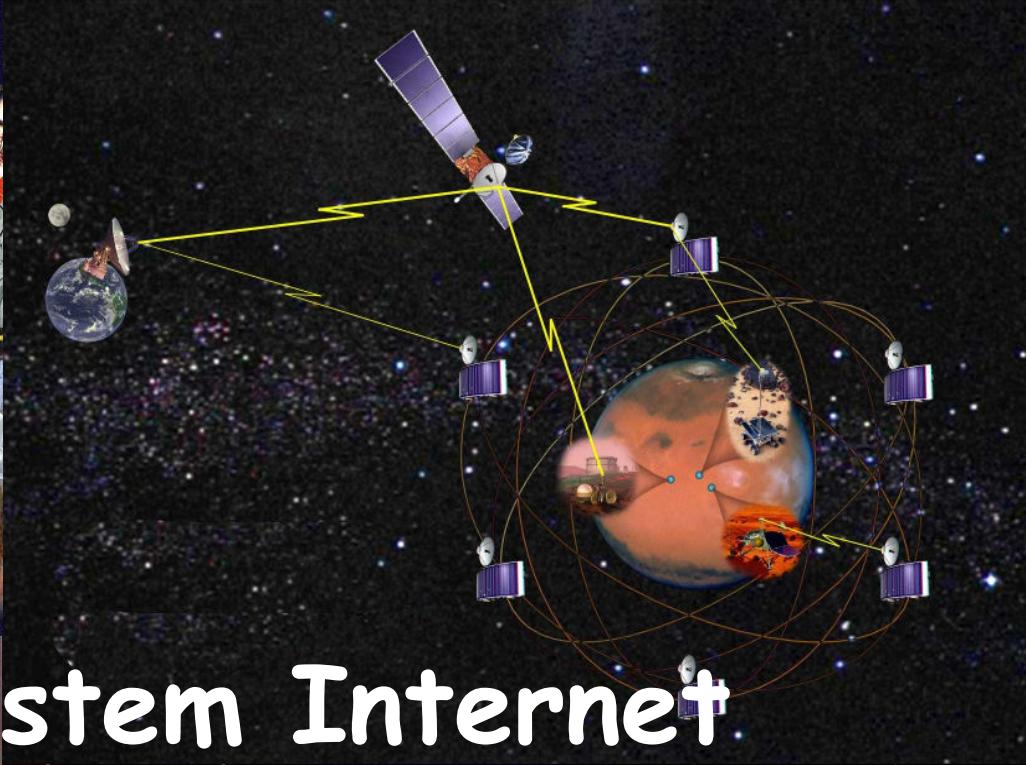
- Computers are everywhere
 - Work stations, desk tops, laptops, pads, mobiles, smart phones
 - 3G-4G-5G-6G (major architecture change: edge computing), WiFi 6e
 - Bluetooth, Near-field communication (chips in cards)
 - Internet of Things
 - The Internet (IPv4 -> IPv6)
 - Computational-X for every value of X: physics, chemistry, biology, linguistics
 - Large Language Models (GPT-3, GPT-4, ChatGTP, Gemini,)
 - Massive neural networks (AlphaGO, AlphaZero, AlphaFold, etc.)
 - Cloud computing - inter-cloud operation - heterogeneous computing (cpu, gpu, tpu, qpu) - edge computing – confidential computing

And so is data!

- Business data of all kinds
- Sensor data (terrestrial, satellites smart watches!)
- Financial data
- Medical data (MRI, CT, direct imaging, microscopes of all kinds, ultrasound, biological assays, DNA sequences, diagnoses and treatments.....)
- Leading to:
 - Data Science, modeling, machine language training
 - Language translation, speech recognition and generation
 - Generative Artificial Intelligence leading to Artificial General Intelligence?
 - LEO satellites (Starlink, Kuiper, OneWeb)

On Artificial Intelligence

- Three Phases
 - Heuristic systems that sometimes worked and sometimes didn't
 - Expert Systems (If-this-then-that rules derived from experts)
 - Neural Networks (hundreds of layers of “neurons” - superhigh dimensionality)
- Today's Machine Learning successes
 - Deep Mind: AlphaGO, AlphaZero, AlphaFold, ...
 - Google Large Language Models: Gemini etc.
 - Open.AI: GPT-n (GPT-4 most recently)
- But there are risks and rewards
 - Entertainment, story telling, text generation, summarization
 - Medical image analysis and diagnosis
 - Hallucinations (mixing of facts leading to inaccurate and false assertions)
 - Obituary story (Cerf)
 - High risk applications (medical diagnosis, treatment, financial and policy advice)
 - Automatic programming (but potentially buggy)
 - Real-time language translation, speech to text and text to speech
 - Image and sound synthesis



Solar System Internet



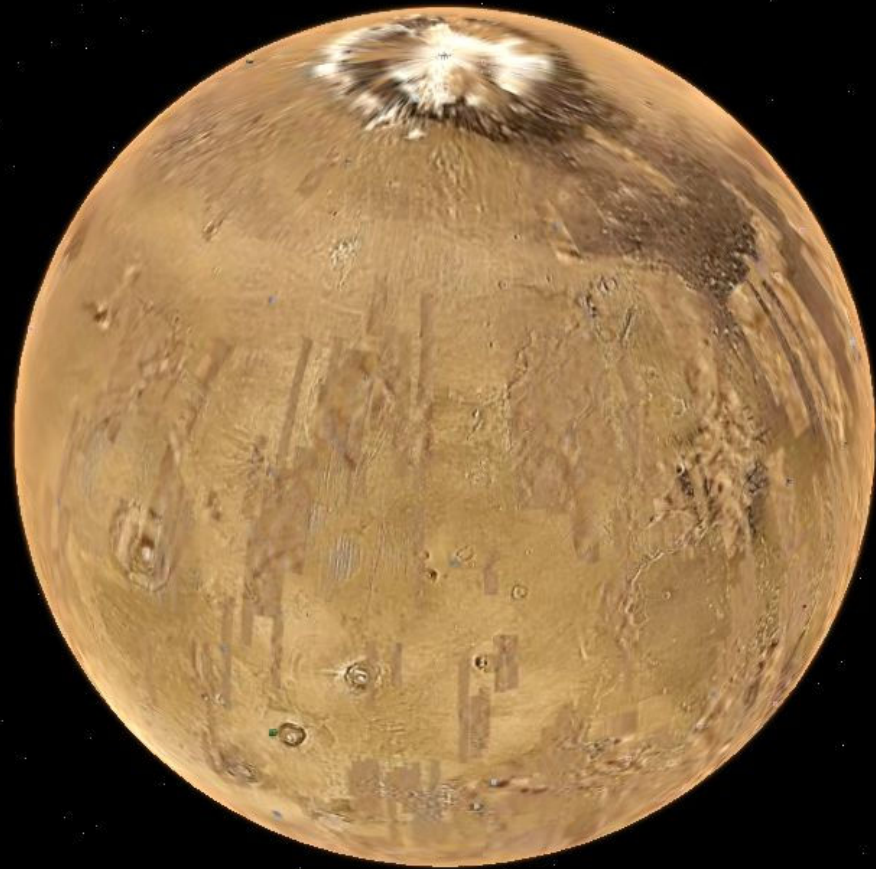


Image NASA / USGS
ESA / DLR / FU Berlin (G.Neukum)

38°57'34.00" N 95°15'55.87" W elev 422 m



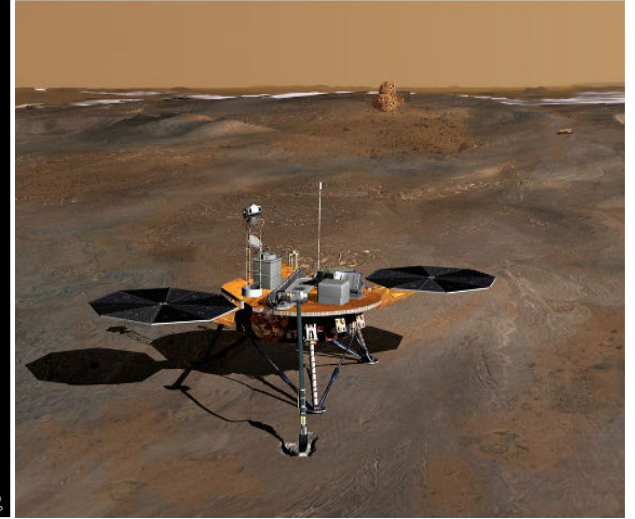
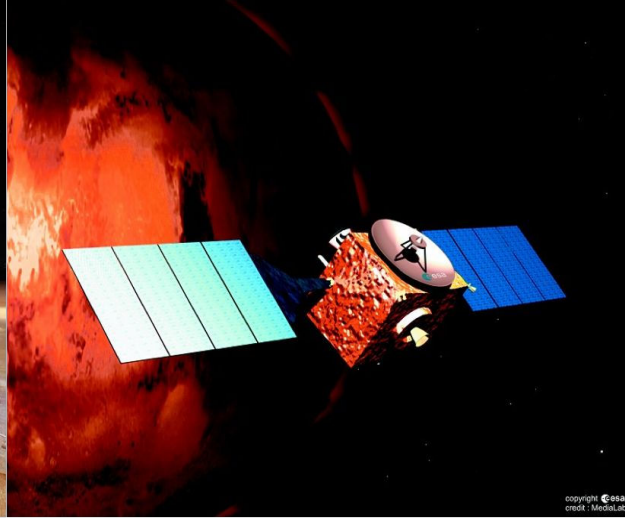
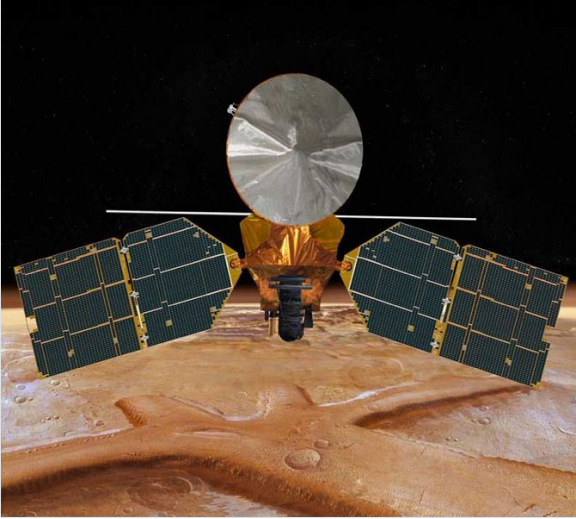
Eye alt 11001.42 km

Curiosity, 2012

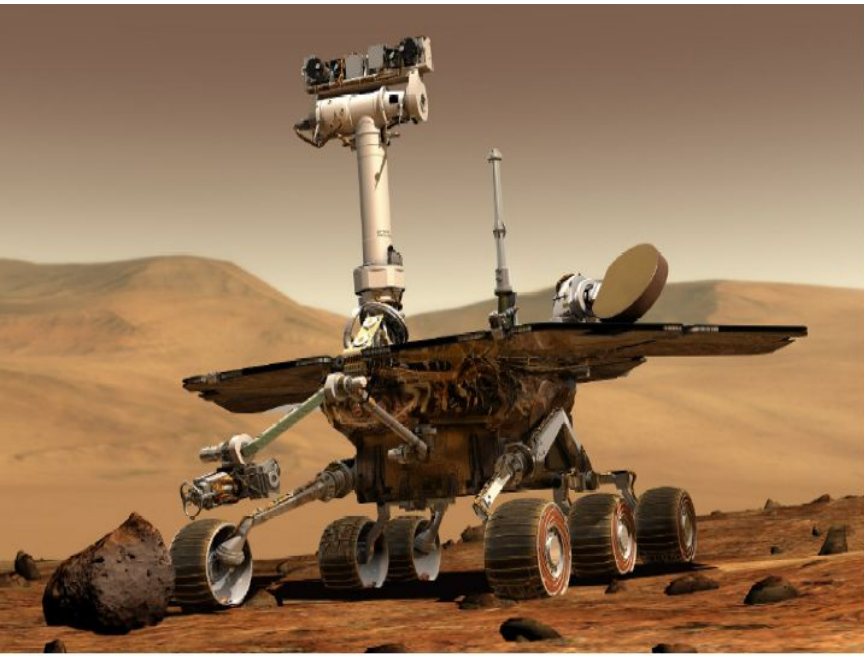
Spirit/Opportunity, 2004

Sojourner, 1997





*ODYSSEY, RECONNAISSANCE ORBITER,
EXPRESS, PATHFINDER, SOJOURNER,
PHOENIX, SPIRIT, OPPORTUNITY,
CURIOSITY, PERSEVERANCE, INGENUITY*



2030s

