

Navigating Internet's Course

Vint Cerf

Google

June 2012

Linkages

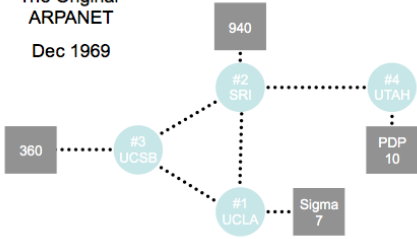
- We share a birthday! (June 23)
- The first computer I programmed was a Bendix G-15 based on Turing's ACE design.
- First principles approach (e.g. packet switching vs circuit switching)

Turing's Legacy

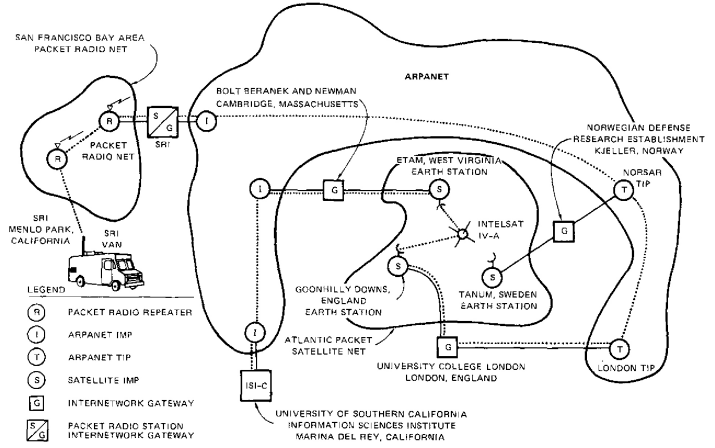
- Curiosity (AI, computability)
- Scope (HW, SW, Architecture)
- Impact (Enigma, Bombe)
- Quirkiness
 - William Newman's story about the Rhododendron leaf invitation

1969

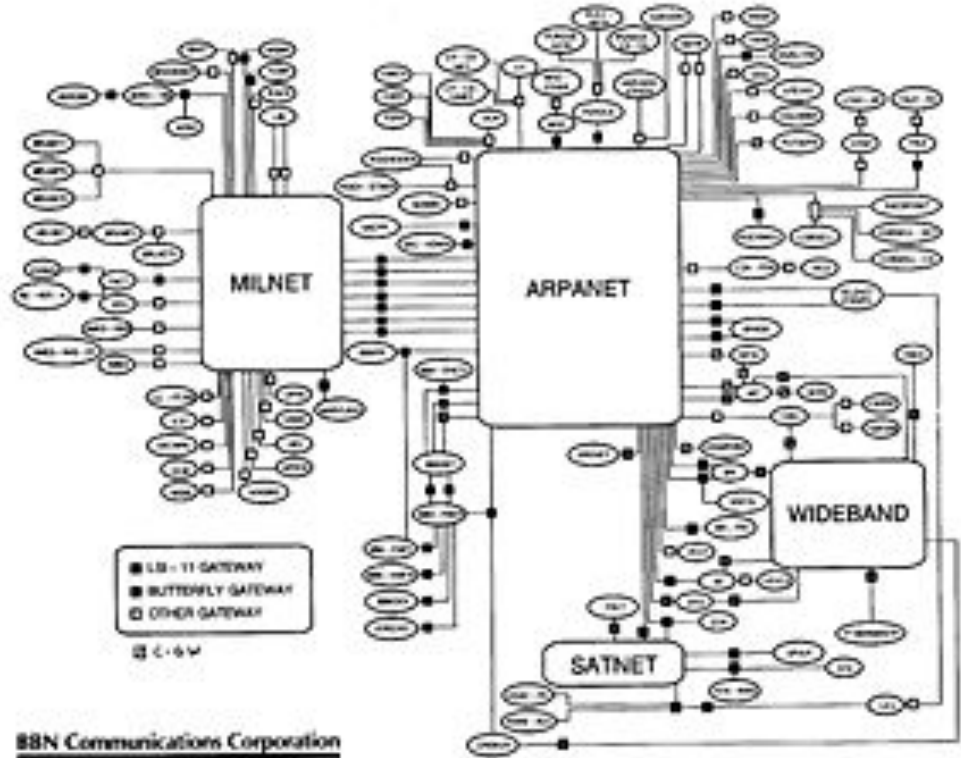
The Original ARPANET
Dec 1969



1977



1982



1986

SBN Communications Corporation

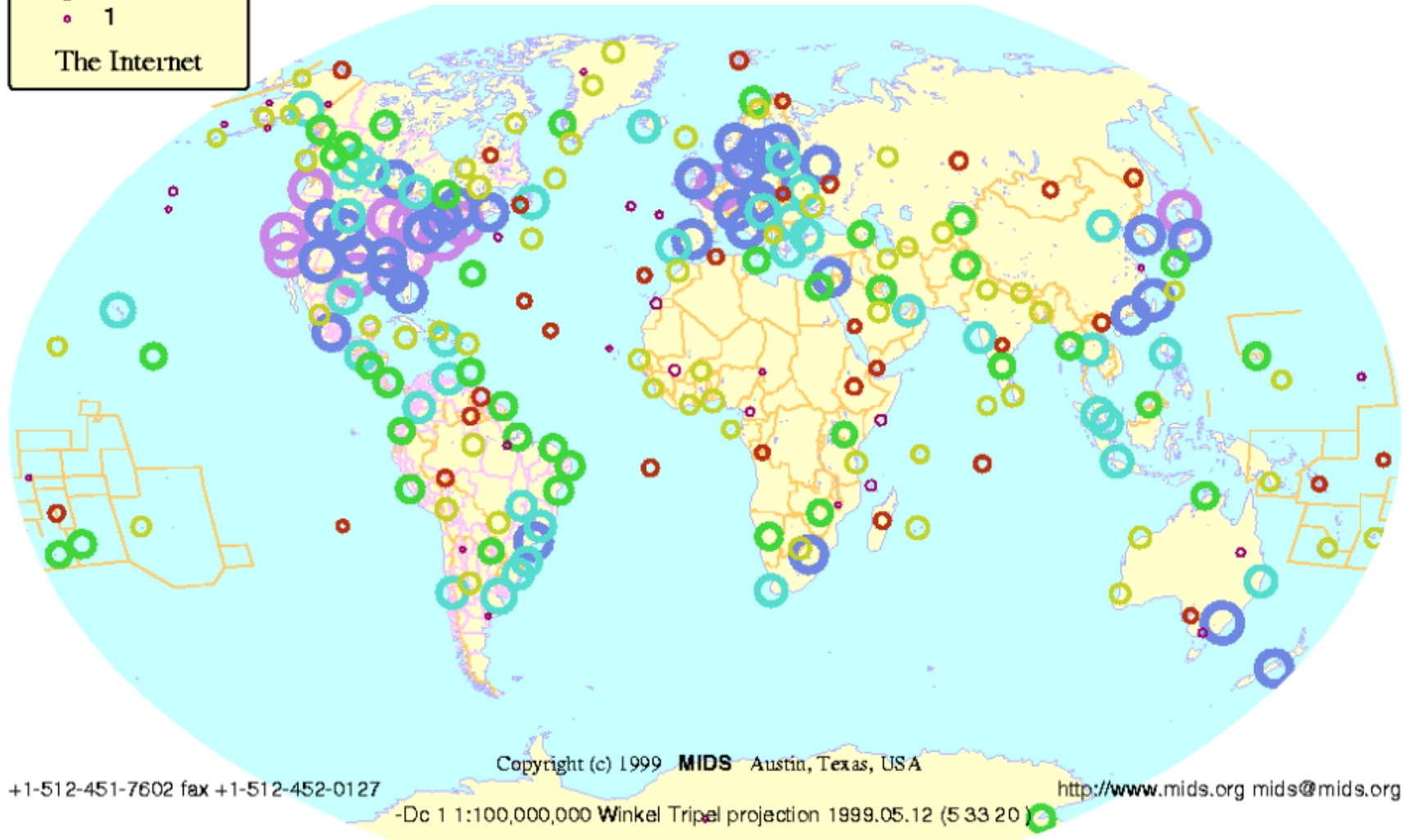
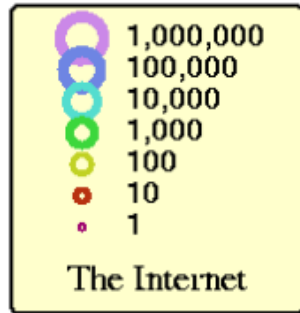


Packet Radio Van
SRI International
1975-1985 (?)



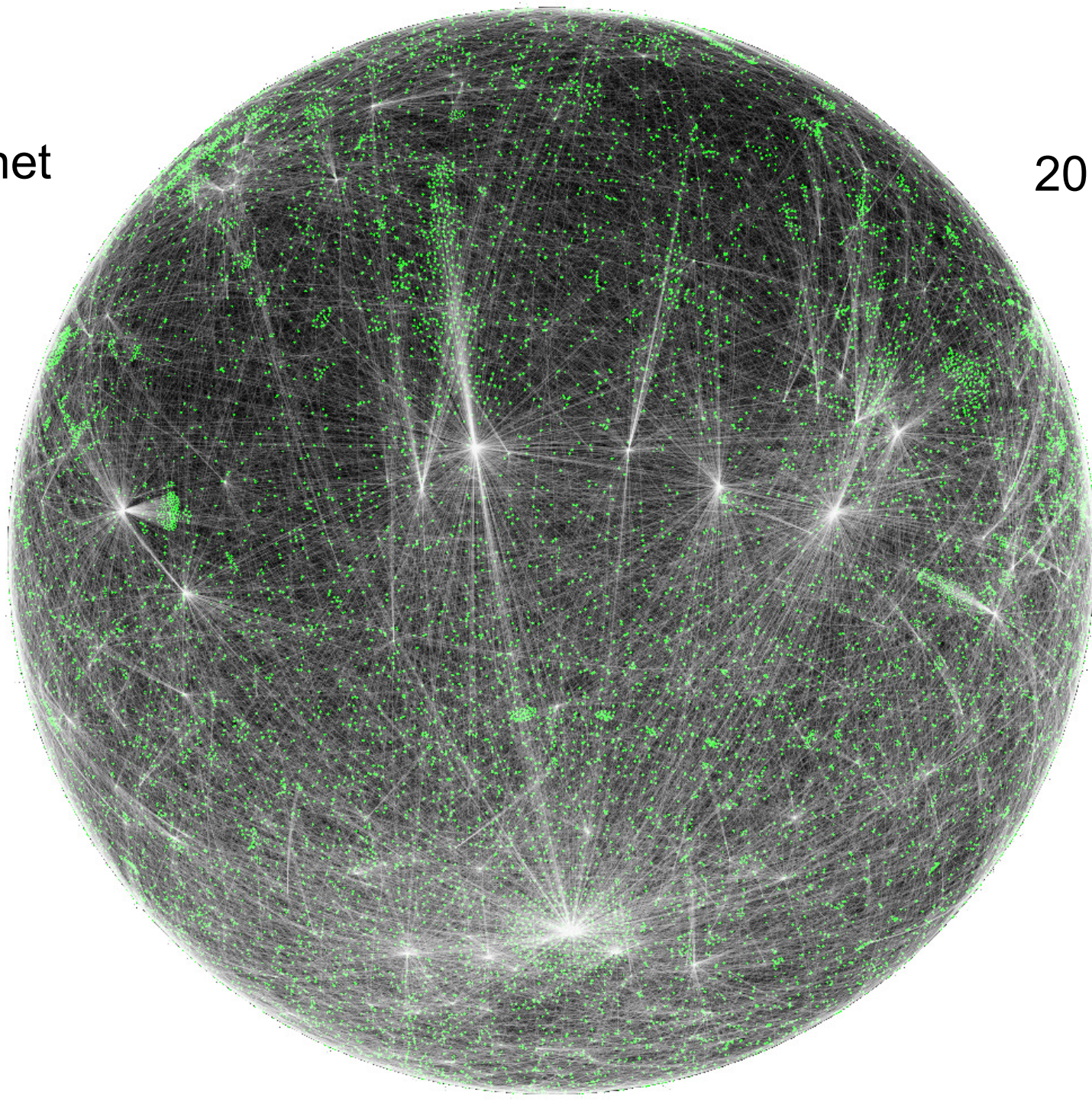
The Internet Jan 1999

World ✕



Internet

2012



Scale

- IPv4 (4.3B – gone!)/IPv6 (3.4×10^{38} -new)
- IPv6 Launch: June 6, 2012 (Internet's D-Day)
- Generic Top Level Domain expansion: 1000 applications?
- 2.27B users; 888M public hosts
- Internet Devices: 2-3B?
(PC:1B, Mobiles: 5.5B, not all IP ready)
- 12 year internet population growth: 15.5%/year compounded
- Networks (~400K entries in global routing table)

Internationalized TLDs

Internationalized country codes

IDN ccTLD	DNSSEC	Country	ASCII form	Transliteration	Other ccTLD
.中国	No	 China	.xn--fiqs8s	<i>zhōngguó</i>	.cn
.中國	No	 China	.xn--fiqz9s	<i>zhōngguó</i>	.cn
.مصر	No	 Egypt	.xn--wgbh1c	<i>masr</i> ^[3]	.eg
.香港	No	 Hong Kong	.xn--j6w193g	<i>hoeng1 gong2</i>	.hk
.рф	No	 Russia	.xn--p1ai	RF (Russian Federation)	.ru
.السعودية	No	 Saudi Arabia	.xn--mgberp4a5d4ar	<i>as-sa'ūdiyyah</i>	.sa
.台湾	No	 Taiwan	.xn--kprw13d	<i>táiwān</i>	.tw
.台灣	No	 Taiwan	.xn--kpry57d	<i>táiwān</i>	.tw
.امارات	No	 United Arab Emirates	.xn--mgbaam7a8h	<i>emarat</i>	.ae

Evident Trends

- All media carried in IP packets+ mobility
- Increased collaboration in all contexts
- AI comes of age
- Online Digital Publication (all forms)
- Potential Bit Rot Hazard (all media)
- Need for new legal and social frameworks, revision of IPR concepts

Internet-enabled Devices





Woodhurst sensor net

2008-09-21 4:16:38 pm EDT

[Help on this Page](#)
[How to Build this Page](#)

Home

Setup

Server

Routers

Nodes

Software Update

System and Network

Connectivity

Energy

Traffic

Reliability

Sensing and Control

Sensor/Actuator Devices

Sensor Data Analysis

Actuator Control

Data Export

Support

User Guide

Network Admin Guide

Developer Guide

I wish this page would...

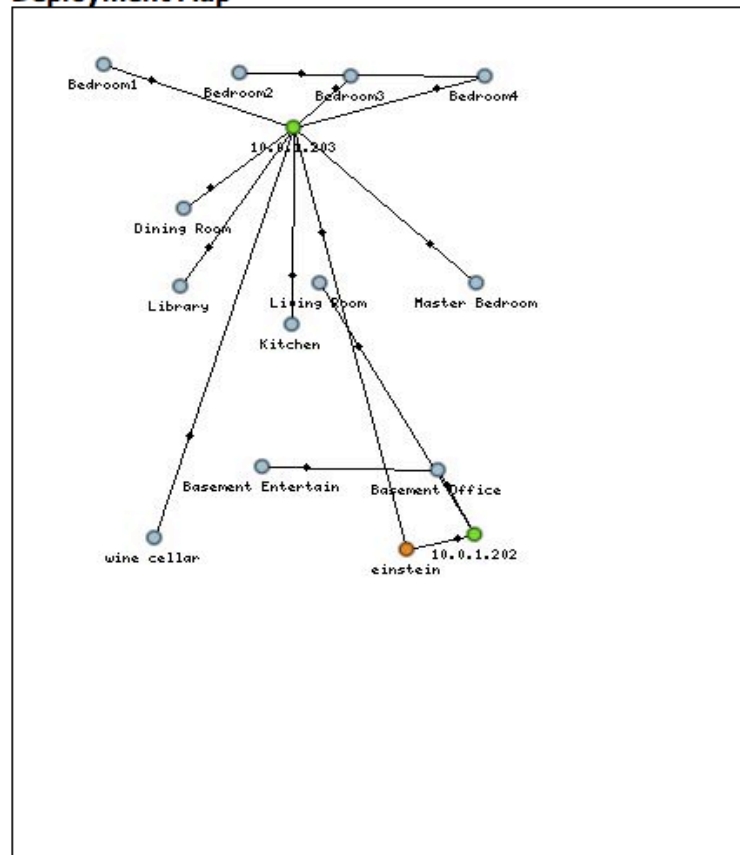
 © 2006-2008 Arch Rock Corporation.
 All Rights Reserved.

Home

● Server
 ● Router
 ● Node
 ● Missing Router or Node

Deployment started on 2008-07-11 12:35:48 pm EDT, running for 72d 3h 40m 51s.

Deployment Map



Network Devices

15 Devices

● einstein

● 10.0.1.202

4:15:01 pm

● 10.0.1.203

4:15:00 pm

1st Floor

● Dining Room

4:15:05 pm

71 °F 55.3 % 10 lux 1 lux

● Kitchen

4:12:03 pm

72.9 °F 51 % 21 lux 1 lux

● Library

4:12:35 pm

73.3 °F 50.1 % 10 lux 0 lux

● Living Room

4:14:57 pm

70.4 °F 51.5 % 7 lux 0 lux

● Master Bedroom

4:15:13 pm

70.1 °F 56 % 14 lux 2 lux

2nd Floor

● Bedroom1

4:12:14 pm

74 °F 48 % 14 lux 1 lux

● Bedroom2

4:15:10 pm

74.4 °F 49 % 80 lux 17 lux

● Bedroom3

4:15:12 pm

73.5 °F 47.9 % 14 lux 1 lux

● Bedroom4

4:15:06 pm

70.7 °F 56.7 % 3 lux 0 lux

Global Information

- 200,000 ship tracks/day (two satellite sensors)
- Google Maps (crowd sourced)
- Google 3D (crowd + satellite sourced)
(interior AND exterior)
- Traffic (crowd sourced via mobile)



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Vinton Cerf: "Cuanto más flexibles sean los medios, mejor les irá en Internet"

ROSA JIMÉNEZ CANO 22/04/2009

Vota ☆☆☆☆☆ Resultado ★★★★★ 8 votos

Comentarios - 10

Es uno de los padres de Internet, creador del primer servicio comercial de correo electrónico y vicepresidente de Google. Le gusta la red de redes y ejerce de evangelista de la misma allá donde va. Con motivo de los veinte años de la World Wide Web ha vuelto a España, que no visitaba desde 2002 cuando recibió el premio Príncipe de Asturias.

> "Los periódicos impresos nunca desaparecerán"

La noticia en otros webs

- webs en español
- en otros idiomas

P: Se celebran 20 años del nacimiento de la web como, más o menos, la conocemos. ¿Qué la parece la evolución de Internet en España?

R: Desde la última vez que vine a España en 2002 se ha notado una gran evolución tecnológica.

Por las cifras que manejo, España se encuentra ligeramente por debajo del resto de Europa en

acceso a la red. Sin embargo, los jóvenes están aprendiendo a usar estas herramientas de manera más rápida que el resto de Europa. Confío en que el plan Avanza [el proyecto digital del Gobierno] sirva para desarrollar el comercio y la democracia electrónica en



Vinton Cerf se mostró distendido durante el Congreso-GORKA LEJARCEGI

publicidad

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Vinton Cerf: "The more flexible the means, the better they will go on the Internet"

Rosa Jiménez Cano 22/04/2009

Rate ☆☆☆☆☆ Staff ★★★★★ 8 votes

Comments - 10

It is one of the fathers of the Internet, the creator of the first commercial email service and Google vice president. Like the network and acts as an evangelist of the same wherever it goes. On the occasion of the twentieth anniversary of the World Wide Web has returned to Spain, which was not visited since 2002 when he received the Principe de Asturias award.



Vinton Cerf was distended during the Congress - GORKA LEJARCEGI

> "The newspapers will never disappear"

Q: We celebrate 20 years of the birth of the Web as more or less know it. What seems the evolution of the Internet in Spain?

A: Since the last time I came to Spain in 2002 there has been a major technological evolution.

By handling the figures, Spain is slightly below the rest of Europe on access to the network. However,

The news on other websites

- Websites in Spanish
- Other language

publicidad



Google Goggles

Golden Gate Bridge

Landmark

Navigation bar with a back arrow, a search box containing "Golden Gate Bridge", a camera icon, and a dropdown menu icon.



Landmark

Golden Gate Bridge

San Francisco, United States

http://www.panor...

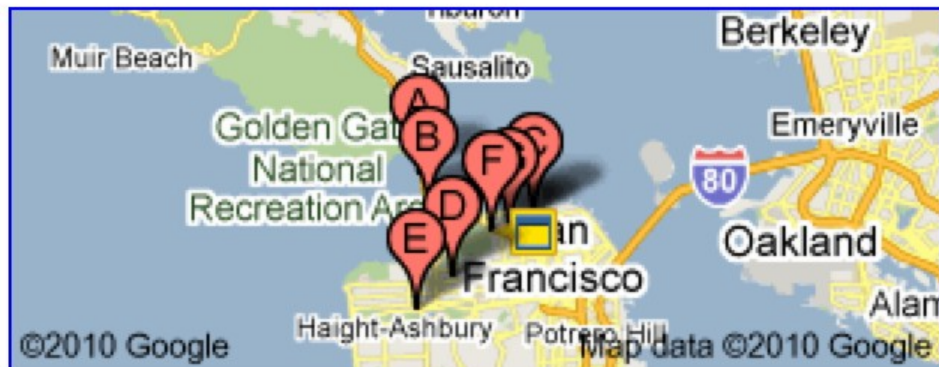
Map button: A blue location pin icon followed by the text "Map".

Web

[Options](#) ▼

[Local results for Golden Gate Bridge San Francisco United States](#)

San Francisco, CA ▼



A. [Golden Gate Bridge](#)



Self Driving Cars



Note Network involvement in this capability

Security Problems

- Spam
- Viruses/Worms/Trojan Horses
 - Infected websites
 - Infected thumb drives
 - Infected CD-ROMs, DVDs, etc.
- DOS and DDOS attacks
- Social Engineering
- Poor passwords (re-usable especially)
- Phishing, Pharming (DNS compromise)
- IP address poaching
- Spectacular human error (configuration esp.)

Origins of Security Weaknesses

- Weak operating systems
- Naïve Browsers (running with too much privilege)
- Poor access control practices
- Improper configuration of hosts and clients
- Compromised lap/desktops + servers

Leading to BOTNETS

- Hackers, Organized Crime, State-sponsored cyberwarfare

Cyber Challenges

- Attribution (and side-effects of failure)
- Defensive Programming (teach malware!)
- Software defenses reinforced with hardware
 - BIOS signature [but see potential abuse]
 - Command regimes (enterprises) should be able sign corp loads
- Internal AND external Firewalls
- Strong authentication even “inside” the network
- User training in defensive Internet use
- StopBadWare Initiative

Privacy Problems

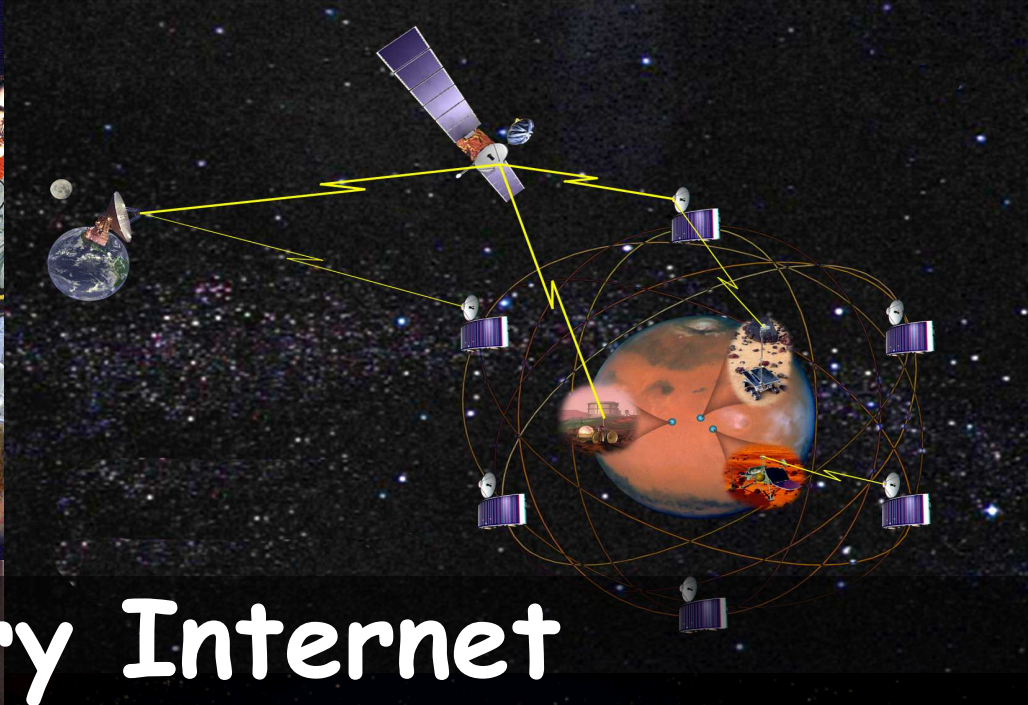
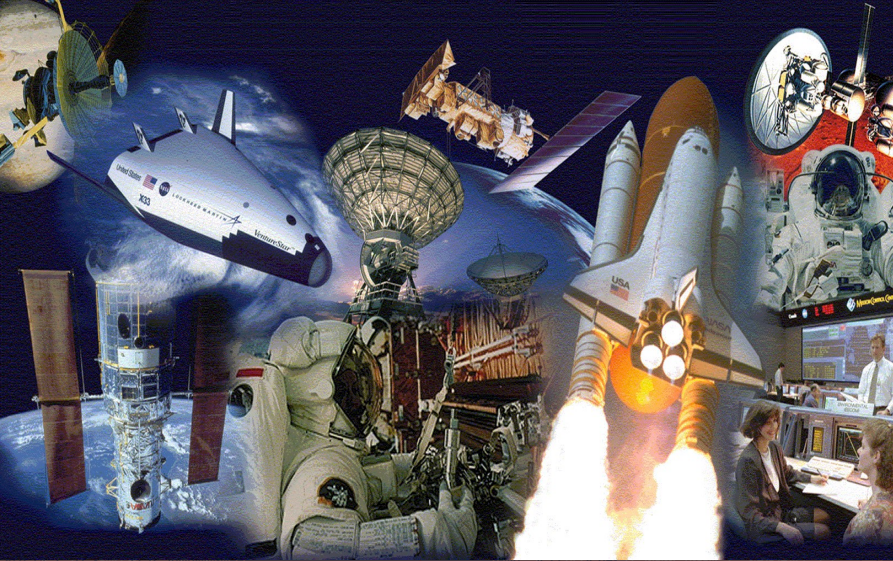
- Lax user behaviors (social networking, unsafe configuration)
- Weak protection of personal data by business, government
 - Lost laptops, thumb drives
 - Weak security configuration of servers
 - Poor access controls
 - Bad business practices (sharing personal information)
- Invasive devices
 - Mobiles with cameras and sound recording capacity
 - GPS tracking
 - RFID tracking
 - Closed Circuit TV surveillance (traffic, stores, public places)

New Freedom?

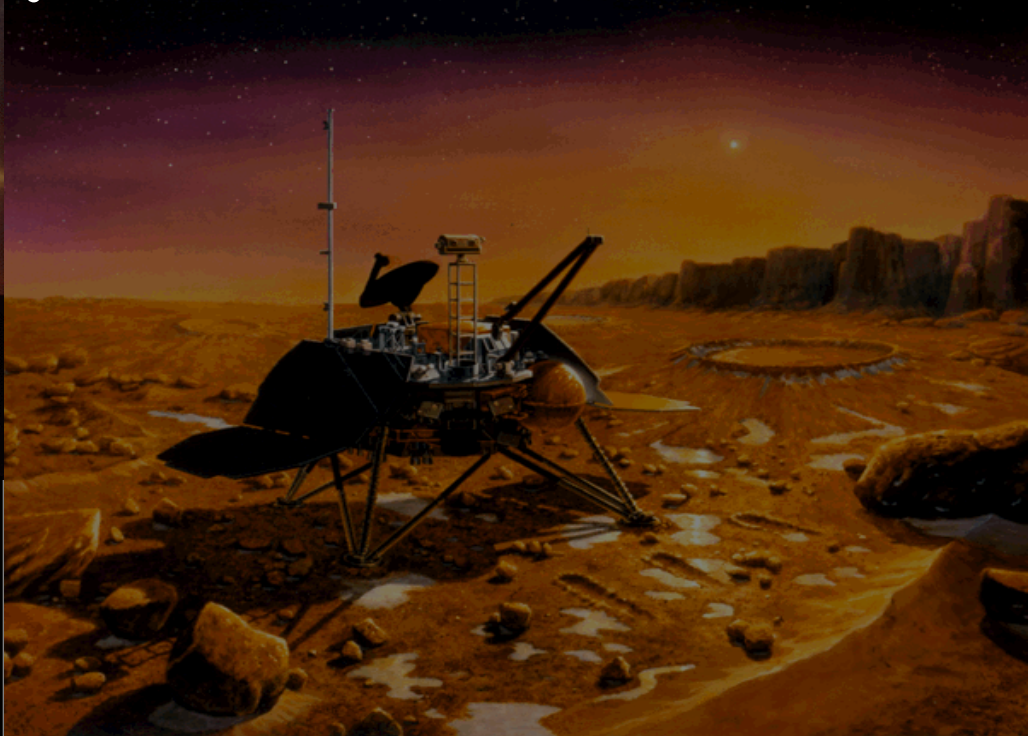
- Freedom from Harm (individuals, institutions)
 - Fraud, theft
 - Viruses, worms, Trojan horses, keyloggers,.....
 - Bullying, Stalking
 - Denial of Service
 - Counterfeiting
 - Piracy [Digital Letters of Marque and Reprisal?!]
 - Privacy

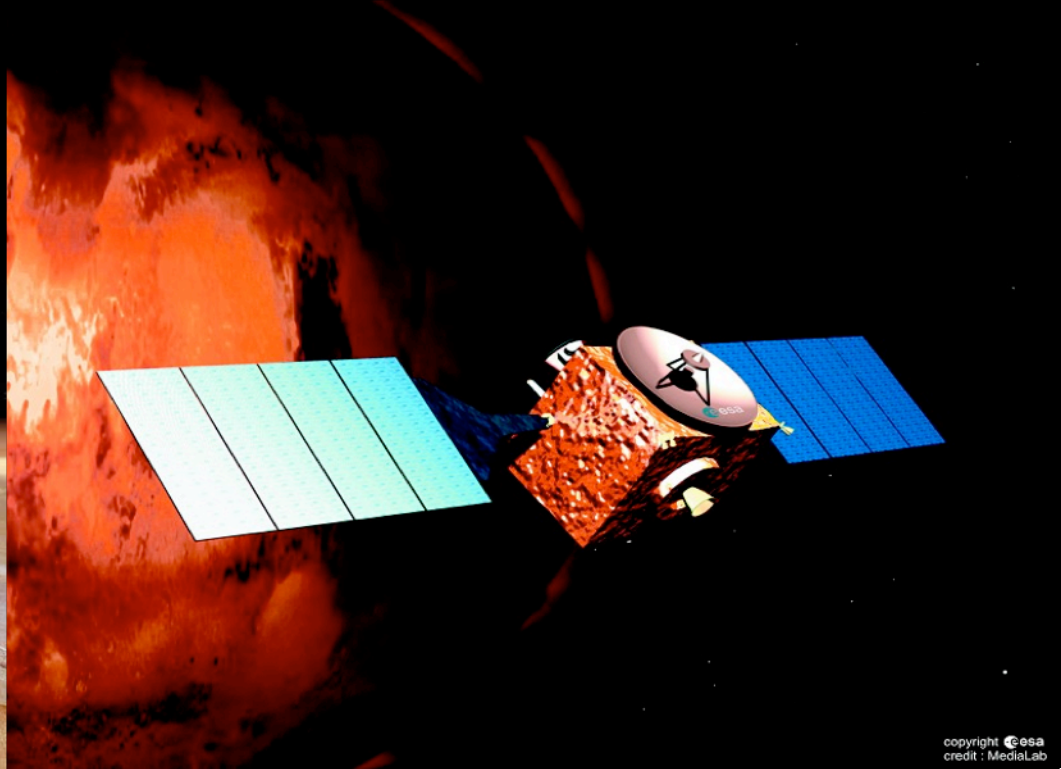
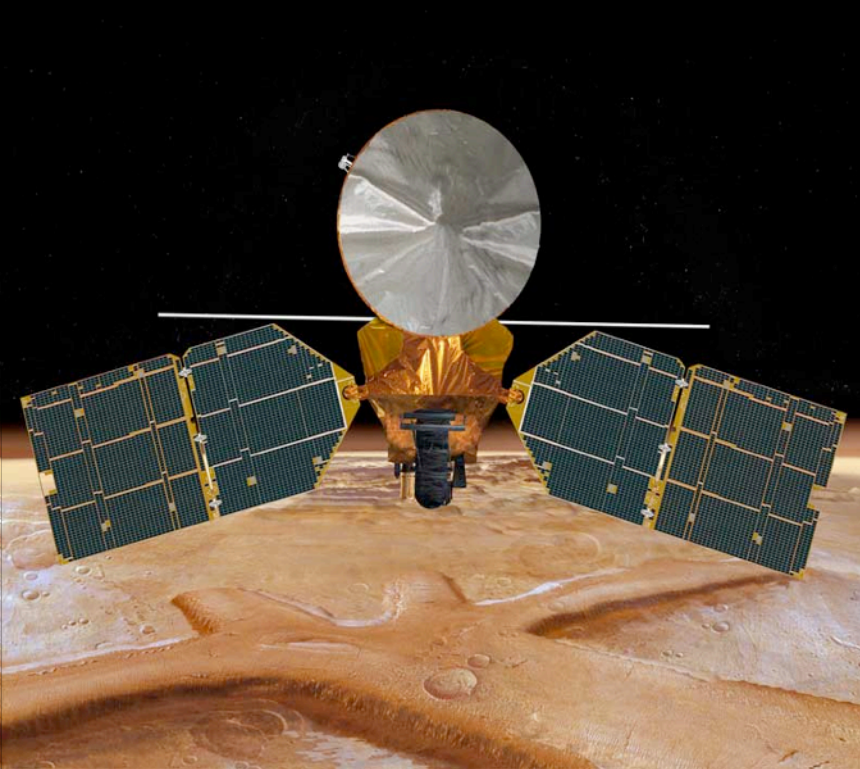
Policy Challenges

- New social norms needed (e.g. privacy)
- New jurisdictional and multi-lateral agreements and processes
- New business models (economic effects e.g. digital books, music, movies, newspapers...)
- Collaboration of technologists, academics, legislators, civil society, industry needed!

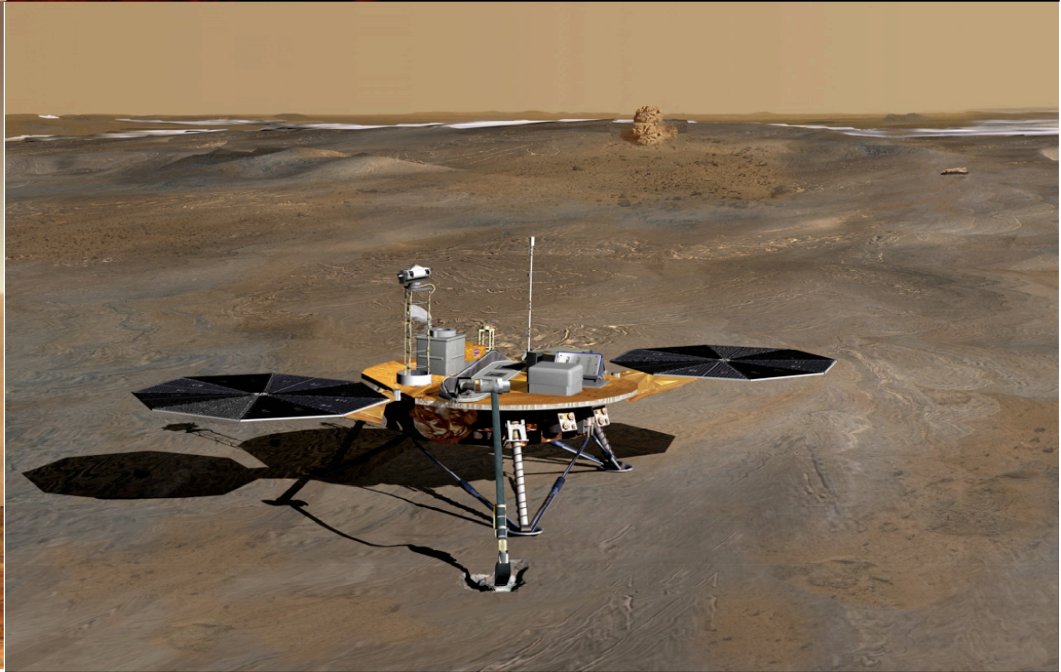


InterPlaNetary Internet





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credit : MediaLab

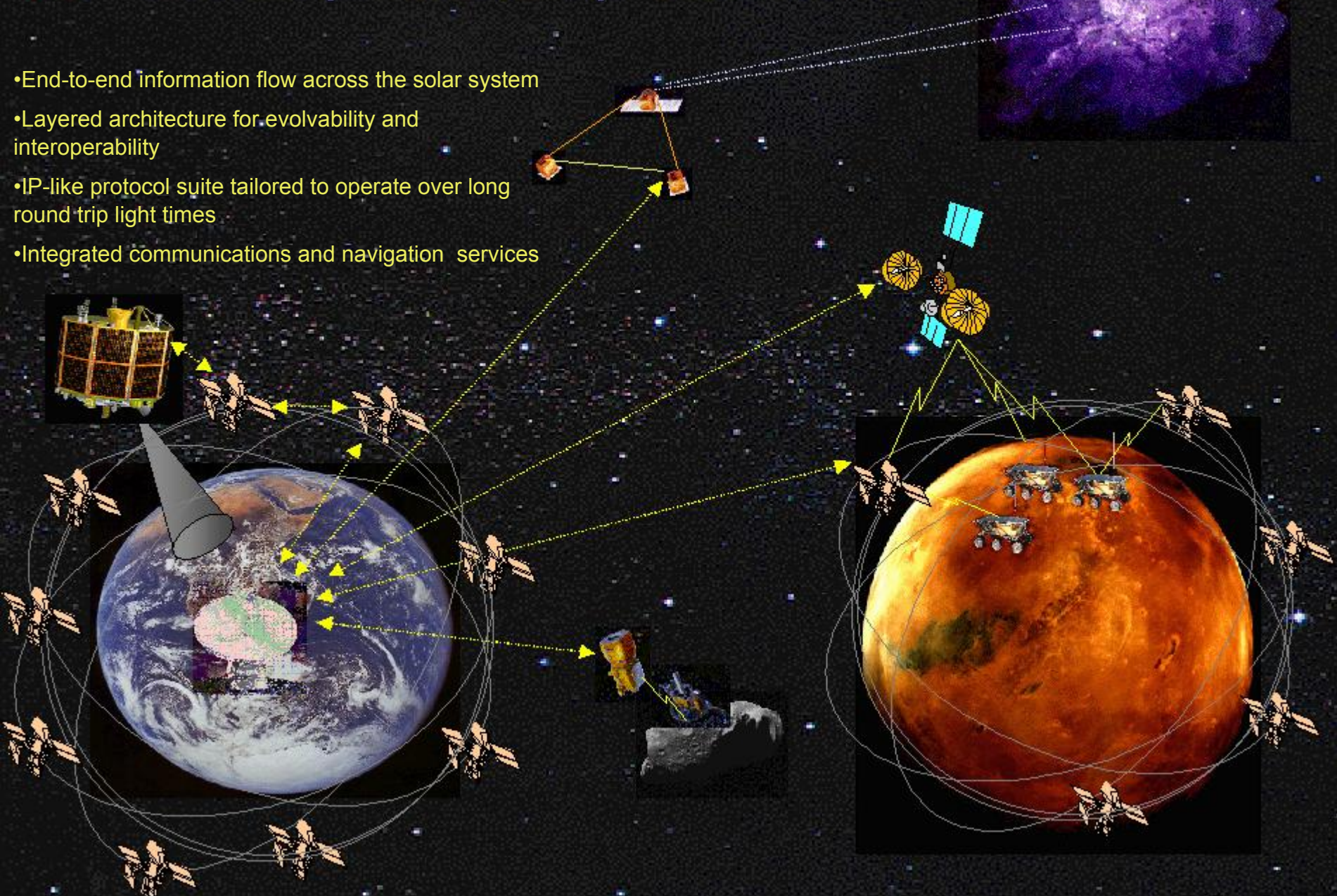




Interplanetary Internet



- End-to-end information flow across the solar system
- Layered architecture for evolvability and interoperability
- IP-like protocol suite tailored to operate over long round trip light times
- Integrated communications and navigation services



Next stop: Alphacentauri A
Project ICARUS

<http://icarusinterstellar.org>

<http://100yss.org/about>

