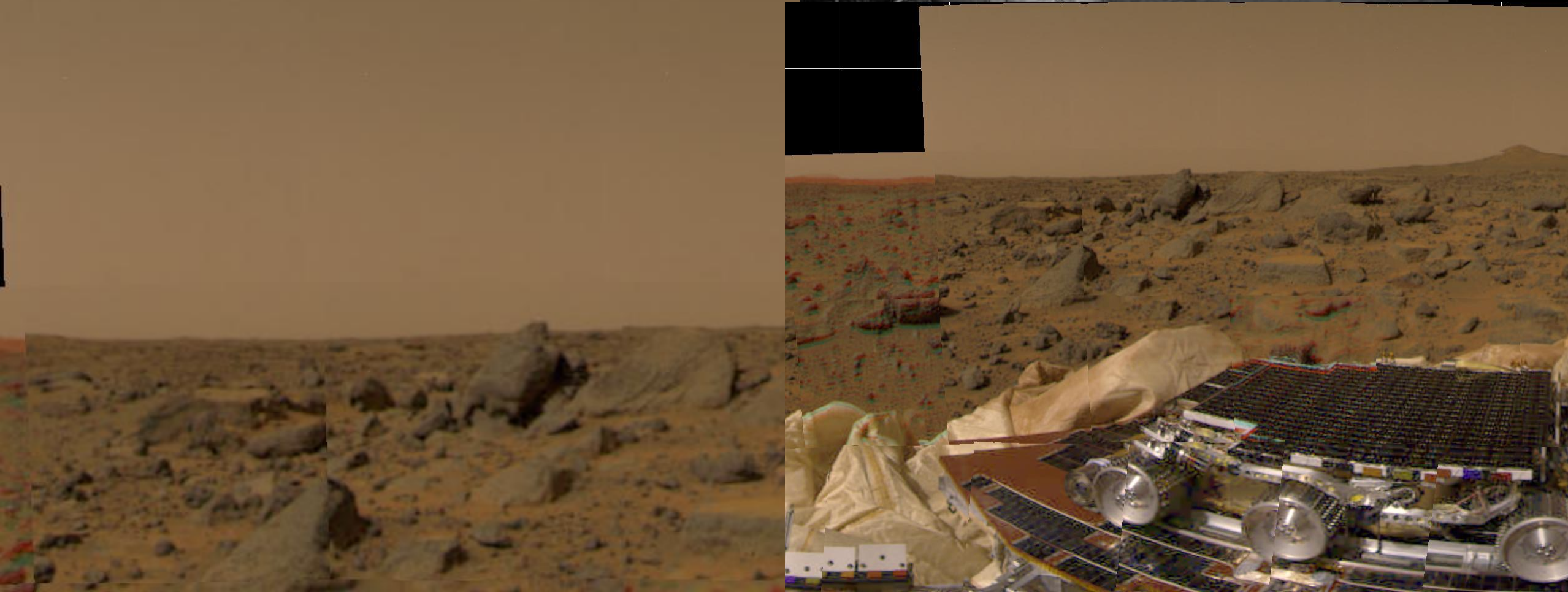


CSE 550: Systems for all

Au 21

Ratul Mahajan



Mars pathfinder 1997

Deemed super-successful at first

- Unconventional landing with airbags
- Sent beautiful pictures to Earth

Then frequent system resets 😞

- Accompanied by data loss

What happened: System design

Tasks on Pathfinder were structured as threads with priorities

Share information using an information bus

Synchronization based on mutexes

What happened: Component interactions

High-pri: Information bus manager

Medium-pri: Communication task

Low-pri: Meteorological data gatherer

1. MetData thread acquires lock
2. Interrupt → schedule InfoBus thread → wait for MetData
3. Interrupt → schedule Comms and pre-empt MetData
4. A watchdog notices that InfoBus is not working, resets everything

Fix?

Priority inheritance

- Priority of MetData becomes high when InfoBus is waiting on it

More detailed story at

<http://www.cs.cornell.edu/courses/cs614/1999sp/papers/pathfinder.html>

Over to Priyal and Tina

What do applications want from the network?

Reliable delivery

Delivery acknowledgement

Prevent duplication

High throughput

Guarantee min. throughput

Guarantee latency

FIFO

Encryption

Authentication

...

File transfer: High throughput, reliability

YouTube: Min throughput, low jitter

Phone call: Low jitter, low latency

Zoom: Low jitter, min throughput, low latency

Web: Low latency

Key architectural questions

1. How do design a network that serves diverse applications?
2. What other factors to prioritize beyond application performance?