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 😞
  • Accompanies 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
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?