Beyond Control Centers
draft 1

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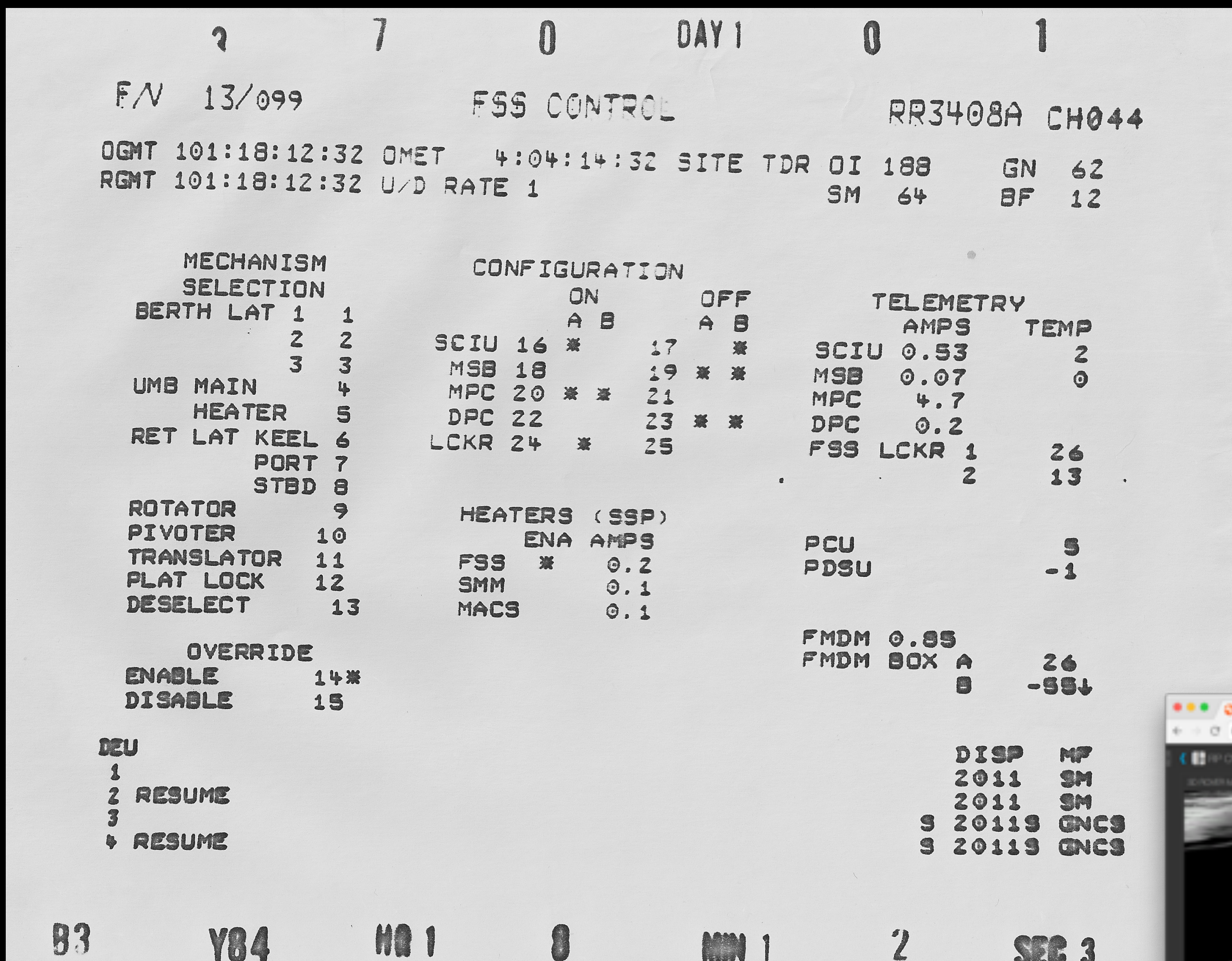
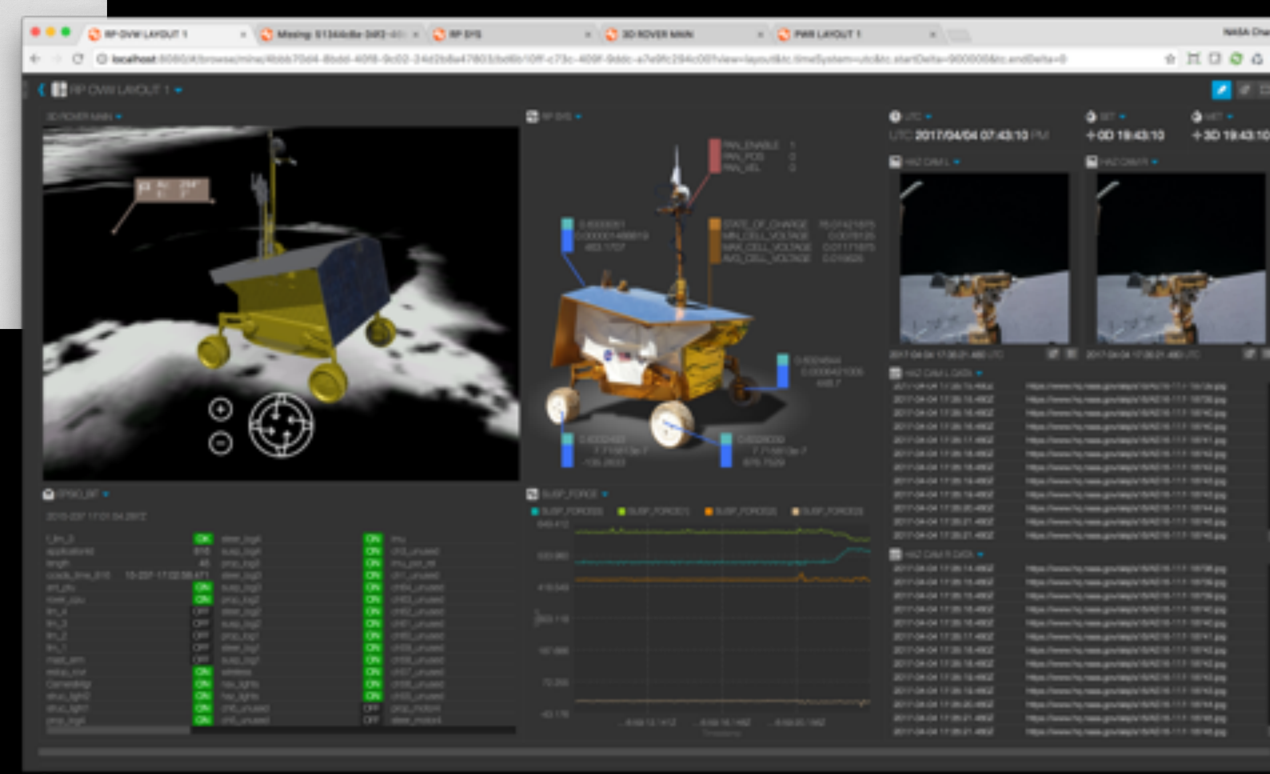
Spaceops Workshop 2017

Control Centers

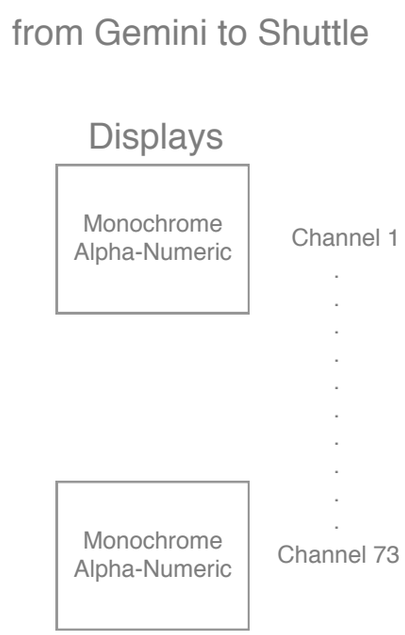
What do the consoles do?

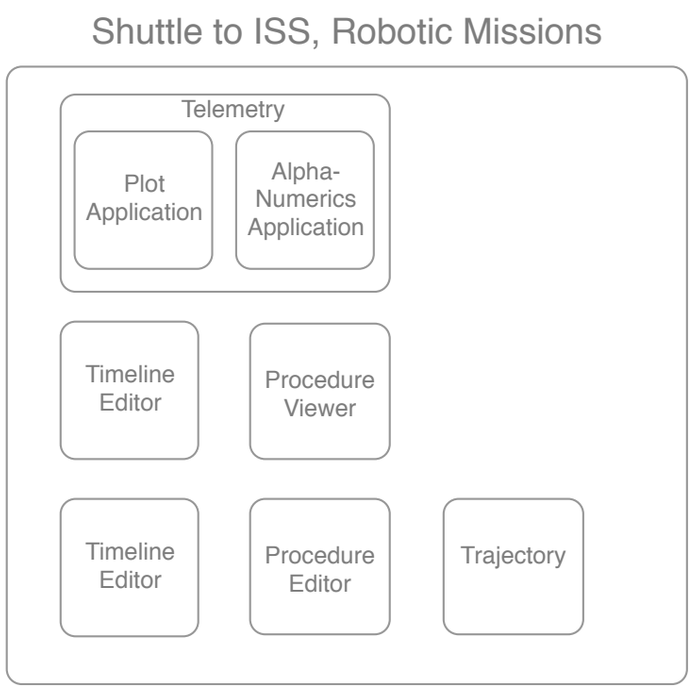
A Long Way

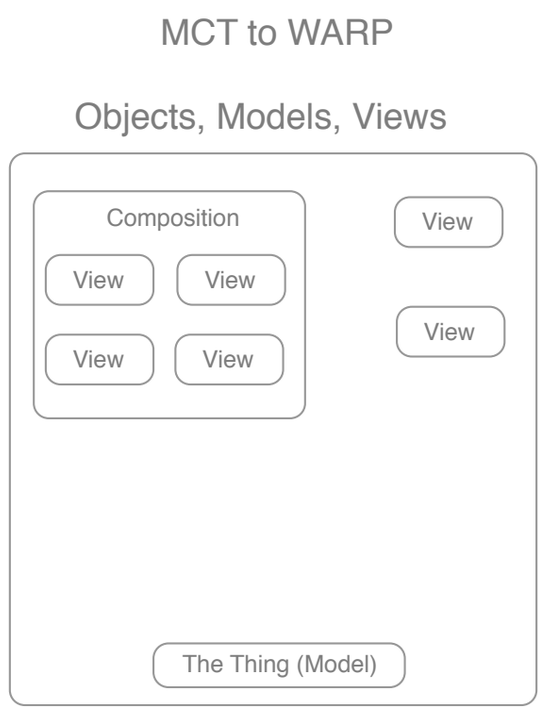

2 7 0 DAY 1 0 1
F/V 13/099 FSS CONTROL RR3408A CH044
OGMT 101:18:12:32 OMET 4:04:14:32 SITE TDR OI 188 GN 62
RGMT 101:18:12:32 U/D RATE 1 SM 64 BF 12
MECHANISM SELECTION
BERTH LAT 1 1
2 2
3 3
UMB MAIN 4
HEATER 5
RET LAT KEEL 6
PORT 7
STBD 8
ROTATOR 9
PIVOTER 10
TRANSLATOR 11
PLAT LOCK 12
DESELECT 13
OVERRIDE
ENABLE 14*
DISABLE 15
CONFIGURATION
ON A B OFF A B
SCIU 16 * 17 *
MSB 18 19 * *
MPC 20 * * 21
DPC 22 23 * *
LCKR 24 * 25
HEATERS (SSP)
ENA AMPS
FSS * 0.2
SMM 0.1
MACS 0.1
TELEMETRY
AMPS TEMP
SCIU 0.53 2
MSB 0.07 0
MPC 4.7
DPC 0.2
FSS LCKR 1 26
2 13
PCU 5
PDSU -1
FMDM 0.85
FMDM BOX A 26
B -55
DEU
1
2 RESUME
3
4 RESUME
DISP MF
2011 SM
2011 SM
S 20119 GNCS
S 20119 GNCS
B3 Y84 HR 1 8 MIN 1 2 SEC 3

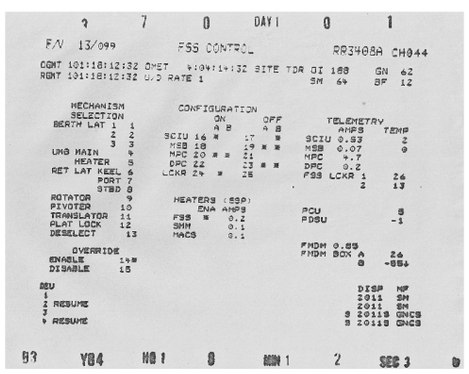


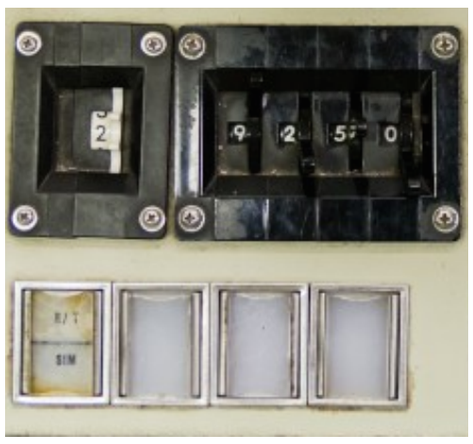
Mental Models - Displays, Applications, Objects

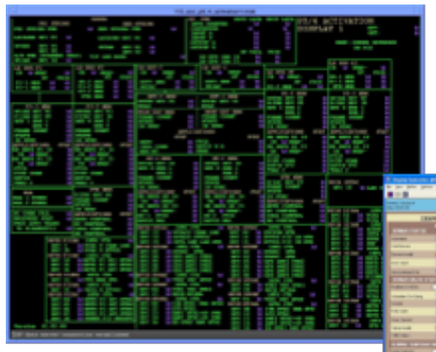


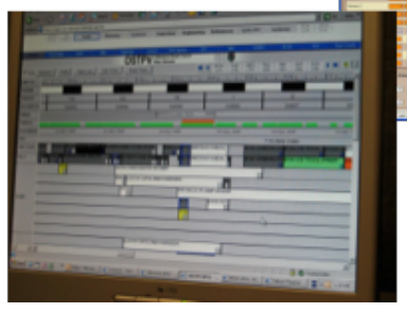


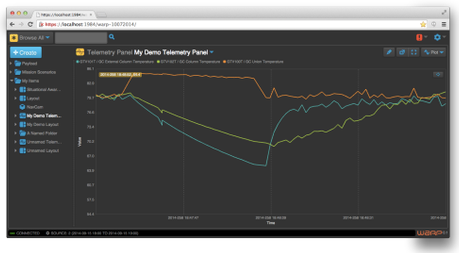


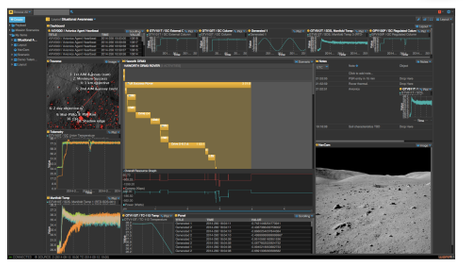










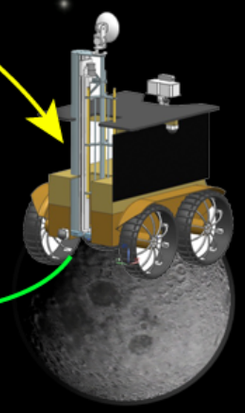


Resource Prospector

Commands

Round Trip Command
to Telemetry Receipt
~6 seconds

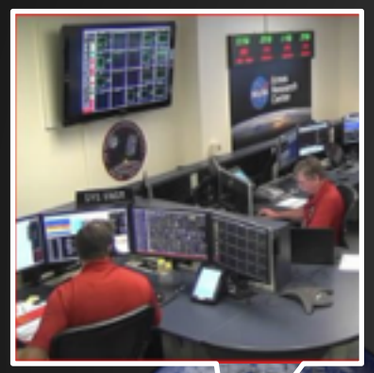
Telemetry/Data



Physical Co-Location

- Why co-location?
- Gestures
- Face to face

Mission Operations



1. Monitor health & status
2. Examine science data
3. Examine other data
4. Decide what to do next
5. Command spacecraft

*command**

*telemetry**

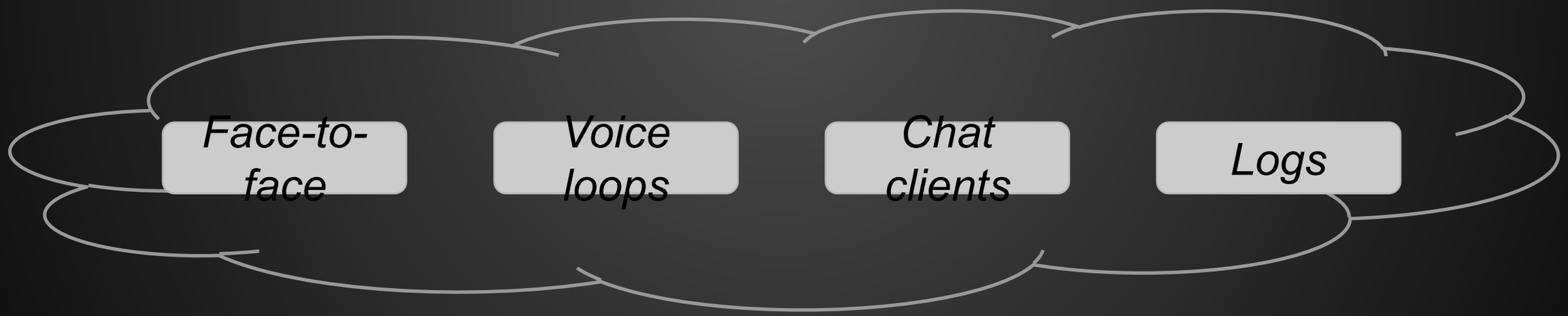
* Intermediaries (such as satellites and ground stations) omitted for simplicity.

Multi-Disciplinary Operations

Operations	Engineering	Science
Flight directors, planners, and decision-makers who conduct the mission.	Specialists monitoring the health and status of subsystems, instruments.	Experts in areas pertinent to the science goals of the mission.

Personnel from many different areas of expertise collaborate and contribute toward achieving mission goals.
Effective communication is essential!

Multi-Disciplinary Communication



Mission Tools

Operations personnel use a broad variety of tools to work with a broad variety of data.

- Telemetry visualization
  - Plots
  - Alphanumerics
  - Dense displays
- Telemetry dictionaries
- Data product viewers
  - Imagery
  - Spectra
- Procedures
  - Viewers, editors
  - Executors
- Planning tools
  - Timeline-based
  - Traverse-based
- Clocks, timers
- Session management
- Commanding
  - Issue commands
  - Sequencers
- Text editors
- Version control systems
- Webcams
- Console logs
- Simulators

Mission Requirements

New missions do new things. The hardware, software, and human processes that worked for one mission may not be appropriate for e





History

- The early Mercury Control Centers were distributed around the world
- Centralization became possible only with advances in communications and tracking networks