

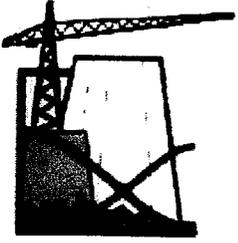
Extreme Collaboration:

Achieving Faster and Cheaper Mission Designs

Rebecca Wheeler
Jet Propulsion Laboratory
NASA

June 25, 2003

The big idea: Face-to-face integrated design environments enable significant efficiency improvements in the design process



Context



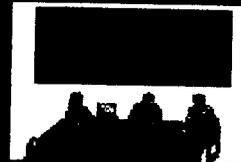
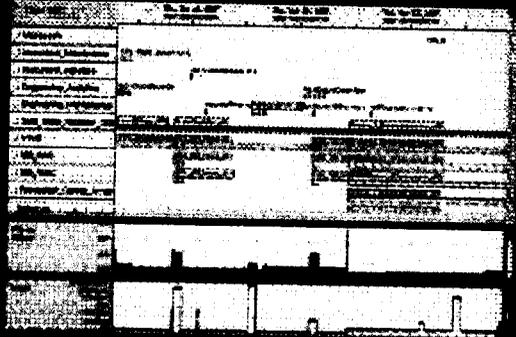
- NASA's Jet Propulsion Laboratory (JPL) has achieved significant mission design time and cost reductions by utilizing "extreme collaborative" teams for initial design work (proposals)
 - More than 15 discipline engineers concurrently develop spacecraft and mission designs in a warroom environment
 - Conceptual designs for proposals are completed and costed in three three-hour design sessions
 - Mission design times reduced from more than 6 months to a few weeks
 - Mission design costs reduced from several hundred thousand to less than \$50K
 - Number of mission designs increased from a few/year to more than 80/year
- This design approach has been so successful that it is being adopted by other NASA centers and the European Space Agency

Elements of Concurrent Design Environment

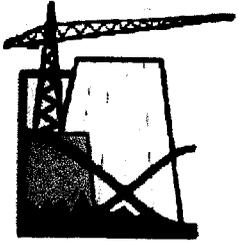


T = 12/16:03:01

USE CNT OVERLIMIT AT 16:02:00
DATARATE OVERLIMIT AT 15:50:00

A computer monitor displaying a 3D wireframe model of a mechanical part. The monitor has a black border and a white title bar at the top. Below the model, there is a status bar with two lines of text: "USE CNT OVERLIMIT AT 16:02:00" and "DATARATE OVERLIMIT AT 15:50:00".

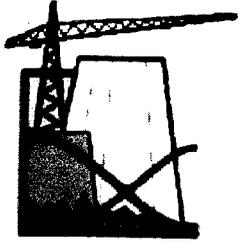
Networked War Rooms, Co-located Designers and Customers,
Real Time Design Process, Discipline-Specific and Collaborative Tools



Panel on VDC

Networked War Rooms: Project Design Center

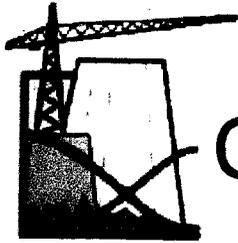




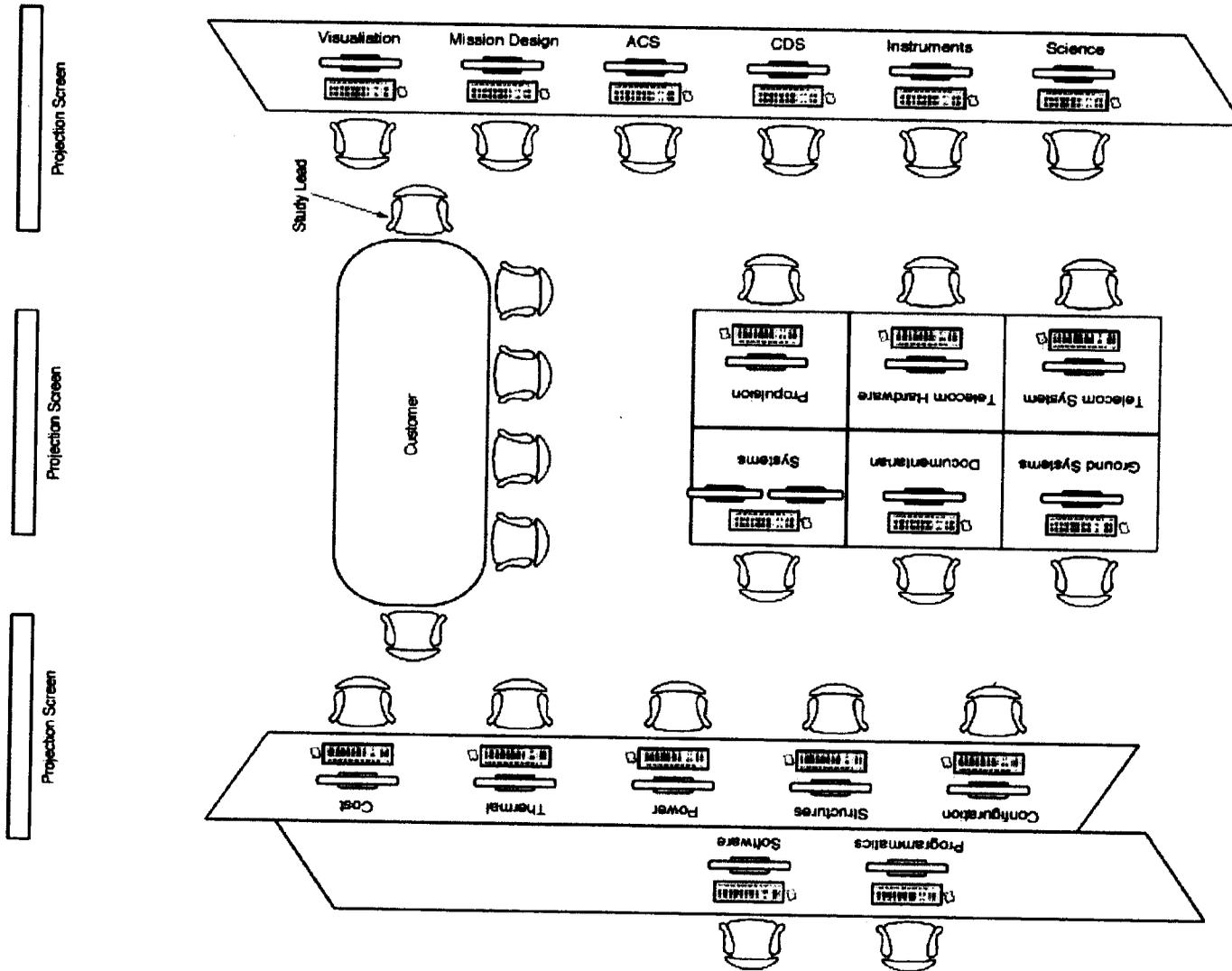
Panel on VDC

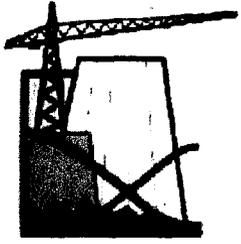
Networked War Rooms: Next Generation





Co-located Customers and Designers

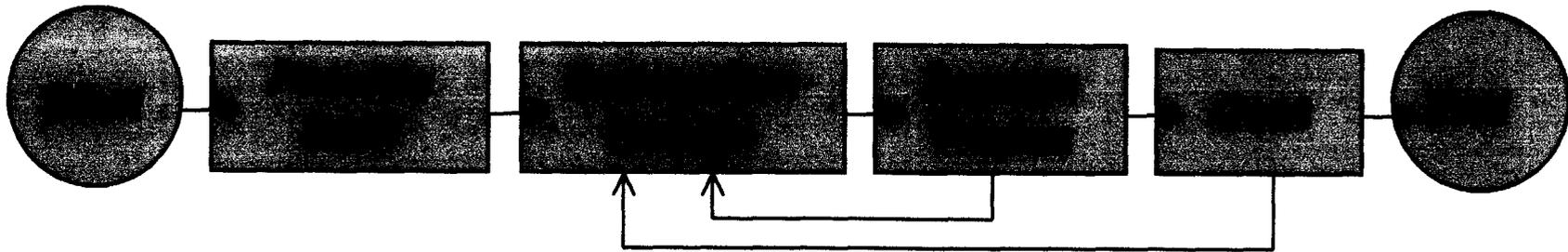




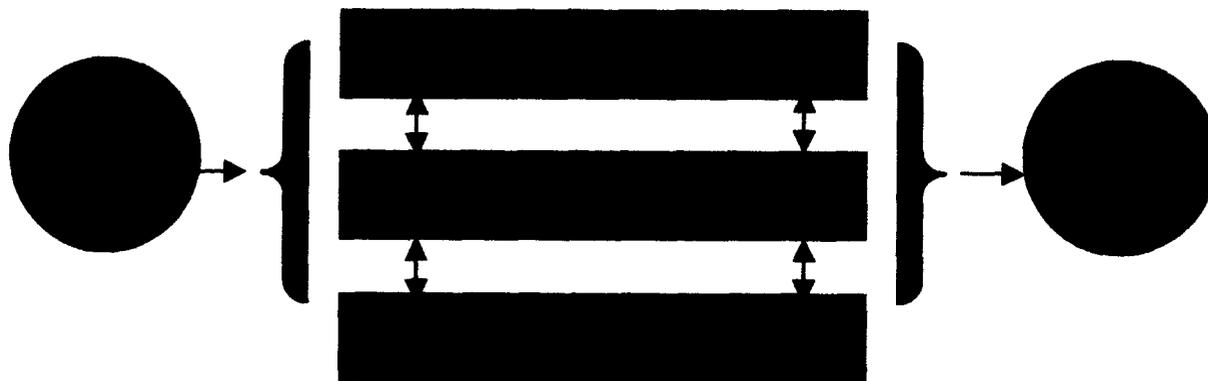
Real Time Design Processes

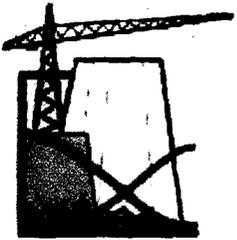


Old Process – Sequential



New Process – Concurrent

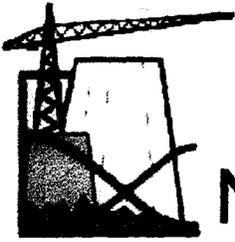




Design Tools

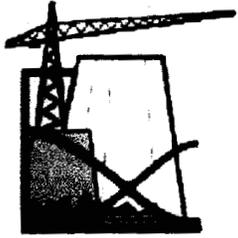


- Level-1 Visualization Models:
 - Discipline-Specific Models: analytic models located on, or accessible from, workstations in located a networked environment
 - Examples: trajectory design, information systems design, spacecraft subsystems design, spacecraft bus, cost
- Level-2 Product Models:
 - Integrated set of spreadsheets interconnected using publish and subscribe capabilities
 - Each team member calculates discipline-specific design parameters using discipline-specific tools
 - Any team member can **subscribe** to the latest value of any design parameter generated by another discipline (~2000 data parameters generated)
 - Team members convene real time design negotiations (“**side-bars**”) between affected parties as the design progresses
 - Team members **publish** updated design parameters as the design evolves



Next Challenge: Distributed Design Teams

- Distributed mission design teams in similar design environments now want to collaborate with each other
- AND**
- Maintain the same efficiencies accomplished by using local war room design environments
 - How do we understand the complex interactions between the people, their processes and their tools so that we can decide where to intervene to improve the efficiencies and effectiveness of these distributed design teams?



Panel on VDC

Distributed War Room Environment

