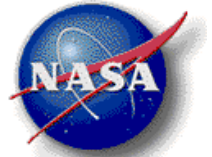




**Ames
Research
Center**



How do we go where no one has gone before?



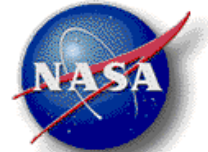
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***Kanna Rajan Collab/SW Eng WS
8/5/02***



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Dan Dvorak	JPL
Charles Fry	Ames
Edward B. Gamble Jr.	JPL
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Bob Kanefsky	Ames
Ron Keesing	Ames
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William Millar	Ames
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Paul Morris	Ames
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Greg Whelan	CMU
Brian C. Williams	Ames
David Yan	JPL



REMOTE AGENT EXPERIMENT

<http://ic.arc.nasa.gov/projects/remote-agent/>

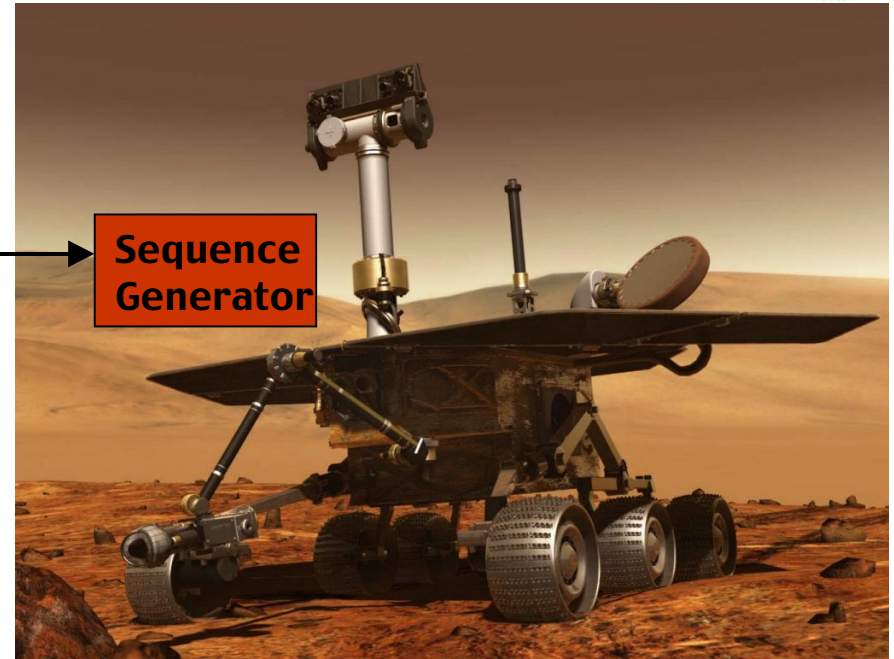
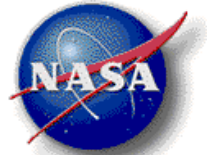
- Remote Agent Experiment May 17–21, 1999
- Remote Agent on DS1 wins NASA's 1999 *Software of the Year Award.*



*Kanna Rajan Collab/SW Eng WS
8/5/02*



MAPGEN for MER



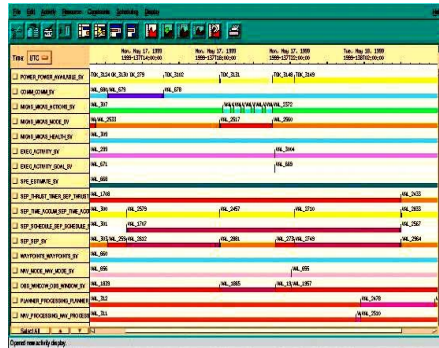
Activity Editor

*High Level
Observation Goals*

Sequence Generator

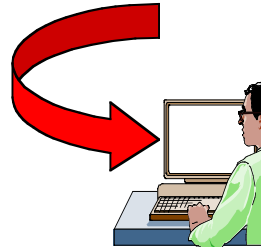
*Fully Specified
Activity Plan*

MAPGEN



Planning System

Models



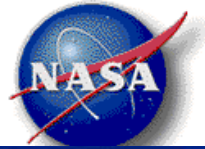
Science Team

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- John Bresina* ARC
- Len Charest* JPL
- Will Edgington* ARC
- Ari Jonsson* ARC
- Adans Ko* JPL
- Bob Kanefsky* ARC
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- Paul Morris* ARC
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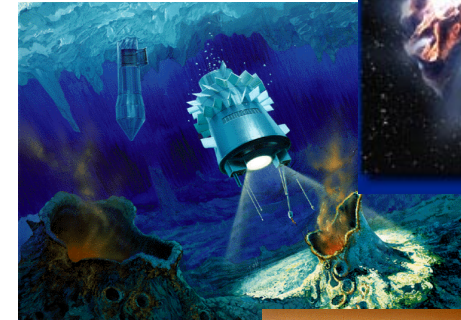
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8/5/02*



Current Drivers

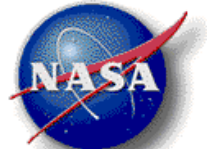


- Shorter lead times to design, build, test and fly
- Deep(er) space missions
- More complexity
 - Visiting comets (CONTOUR)
 - Long range traverses on Mars (MER, MSL)
 - Distributed Spacecraft (LISA, DS3, TPF)
- More science return
- Tighter budgets
- New hardware certification takes time



- Software Reuse
- Newer (better?) software methodologies
- Complexity of software has risen
- Verification and Validation is critical
- Inter-center collaboration

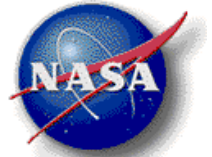




- Testing has become central in s/w development
- Notion of a “process” to design/build/test/deploy
- Notion of model-based approaches on the increase
- Knowledge Acquisition methods are becoming crucial
- Struggle to find ways to collaborate across time-zones and cultures
 - MER
 - 10's of scientists during the design phase
 - 300+ mission staff (JPL)
 - 200+ scientists during mission ops



Needs



- **Formal methods for V&V for autonomous systems**
- **Tools for Elicitation**
- **Rich array of methods for software synthesis**
- **Collaborative methods for design**