Mars Mission Computing Environment

High Level Requirements and Use Cases

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Document History

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0.1	22/06/03	Mark Smith	Initial Draft

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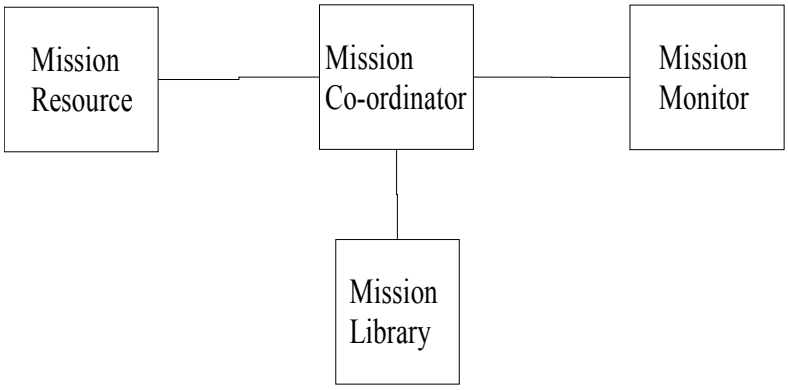
Overview



Requirements

Req-1 A mission is made up of a number of mission resources. It is directed via mission co-ordinators. Any number of mission monitors may observe a sumary position formulated by the cordinator.

Req-2 At the conclusionof a mission the data genreated is stored in a mission library, where it can be retrieved for examination by any of the co-ordinator, resources, or monitors.

Req-3 A mission resource is either a human or a machine. All will transfer observation datat to the co-ordinator. Machines are directable via a standard language called command-talk.

Req-3.1 Resources can communicate with each other . This involves both voice, data and command talk.

Req-4 A co-ordinator and monitor is just a role. An entity may be both a coordinator and a monitor of many views, but may also send strategic directions to co-ordinators who then break this down to objectives for resources.

Req-5 A resource captures streams of data and can channel the reproduction of other streams of data. It is both source and sink limited only by bandwidth.

Req-5.1 Resource data contains GPS position, video, audio & telemetry. Telemetry is a variety of sensore data. The entire set of data is set to time such that it is synchronised. It may be multiplexed into one big pipe and then fed to other sinks.

Req 5.2 Where bandwidth allows data streams may be fed as independent streams to other resources. Ie voice comms, command comms.

Req 6. So, a Resource is a data capture, playback and multiplex device. This allows for team comms and individual comms.

Req 7. But, it is also a journal for a human. There will be events that need to be annotated with thoughts and feelings captured. This may be private. The thoughts and feelings need to be stored and tagged with the data stream.

Req 8. Post Mission, the resource may want to review and further manipulate or classify their data stream.

Req 9. A co-ordinator acts as a comms hub for the group and a central point of co-ordination. In tech terms it is the permanent sink.

Req 10. The coordinator can present a summary of the group broadcast observations/commands to the group, or to individuals.

Req 10.1 The summary is a multimedia, hypertextual exploration of the mission in realtime. That is, time based data can be assembled, summarised and displayed in a manner conducive to the co-ordinators goals.

Req 11. A monitor is an entity that is viewing a summary of the mission ans given by the co-ordinator. They may obseerve and command, but they are at an abstracyted level.

Req 12. A mission can involve a number of extra vehicular activities(EVA's). Each EVA is given a name and tracked as a component of a mission.

Primary Functions

From the requirements the following general functions can be determined:

1. **Resource Application**: Command execution, data capture, data point, effector, encode to stream, multiplex, demultiplex, decode. Comms to others, annotations, permissions, maintenance and control. Identity.
2. **Cordinator Application:** Data summary, command , storage, display, request permission, override, retrieval, stream serving, mux/demux.
3. **Monitor Application:** command, display, summary
4. Mission Planning/Review Application: plan timing, locations, upload/download, annotation, import/export.

User Stories

Story 1: Mission-1, EVA-1

Jon – Geologist

Steve – Psychologist

Robert – Physicist

Jen – Geologist

The team plan a mission to go from the hab out to Nili Patera in Syrtis Major. They call the mission MIS-1. The team transfer to the rover via airlocks and start up. They tell the rover they are MIS-1. This transfers all the planning materials.

They then drive to their destination. The rover guides their travel using the planned route. Jon,Rob, Jen don suits and power up. The suit discovers the rover & determines it is part of MIS-1. The suit asks the wearer to confirm they are MIS-1. (could be a visitor from another rover) & confirm their identity.

Steve remains inside the rover, while the rest of the group go outside. From power up, all data available (vital signs, temperature, suit pressure, oxygen, video, GPS etc are captured and stored & streamed back to the rover.

Upon confirmation of MIS-1 an immediate voice communications network is set up (using multicast SIP/RTP). This allows for communications between the group of people in MIS-1. The comms network includes the rover operator steve. For this EVA, they have chosen to take UtilBot-1 A general purpose tool carrier.

The rover operator goes to the computer console and logs in. MIS-1 standard view is shown. This is a map of the area(loaded from mission data) with each suit indicated as an icon with the wearer name on the outside. The voice network is played through speakers. UtilBot 1 also appears on the monitor with a different icon type as it detaches from outside the rover. It's default behaviour is to tag along with the group. Jon & Jen put geological instruments in UtilBot 1

They walk for a while, talking on the voice comm.. The mission is to explore the valley they are in. So they split up. Jon discovers an interesting feature. Jon says to suit "SUIT: EVENT Geological formation 21, OK". The suit responds "New Event". This flashes on Steve's screen by blinking Jon's icon. The event name 'Geological formation 21' appears on steve's screen. Steve clicks on the icon and a view of the event comes up in a separate window. This is video from Jon.

The event is sent as notification to mars hab who are logging missions. Mina, an operator mthere sees the event and clicks on it. At present she sees only the name of the event. If she clicks, she will see what mission/eva, and be able to see who is there etc. She can choose to get vid feed/audio feed if bandwith allows.

All data on Jon's suit is now associated with the event. The rover is recording all data against the vent. Jen and Rob are also notified of Jon's event via the PDA. The notification may come over the voice network as well. Jon calls over Jen. She clicks on Jons event in her display and her data is also associated with Jon's event. Her attendance to the event is noted at rover & hab. At rover her vid is also displayed.

Jon looks at the format and directs suit "SUIT, PICTURE Big Rock, OK". This picture is named

and noted to all parties monitoring. Jen then directs “SUIT, NOTES to PICTURE Big Rock. This rock is blah blah blah, OK”.

Jon shows Jen, and they begin talking on voice comm. Net. Rober says “Can you go separate?” They apologise. Jen says “SUIT, EVENT COMM, OK”. All personnel associated with the current event for Jen have a little voice net set up for them. The mission comms net, and eva comms net are now options in the PDA. By clicking on one they can rejoin either conversation. They can also opt to keep listening to mission comms, but only transmit to the eva comms. All comms are associated with the event and streamed/logged.

Jon calls over Util Bot 1 by saying “SUIT, COMMS WITH UTILBOT-1 CALLTYPE COMMAND”. He gets a third comms session on the PDA. He then says “UTILBOT1, MOVE TO ME”.

The bot comes over. The bot & data is automatically added to the event and this is notified.

Jon takes out the instruments and plugs it into his suit. They take data readings and these are logged into the Event.

They have now finished the event. Jon says “SUIT, EVENT COMPLETE”, and all are removed from the event and keep logging against the mission. The comms network is also closed.

They all return to the rover. When they enter the rover, EVA-1 is completed automatically.

Story 2: Mission 1, EVA-1 Review

Once they have settled down and reovered from the walk, they review the EVA. Jon logs in to the console, and sees a mission timeline displayed. He then sees eva-1 and event 1. He double clicks on the event and can review all data logged. He can put this data into any other tool in the system for analysis (eg spreadsheets). He can also further annotate the event or eva. He can also associate reports and any data analysis results with the eva. This is so that any conclusions drawn can be auto linked back to this EVA. The results are also viewable by any mission monitors.

Story 3: Mission 1, Planning

Jon wants to go out to ili Patera in Syrtis Major. He brings up the locations database, and selects the appropriate maps. The destination is known in GPS co-ordinates. The distance is then calculated to the destination and any geographical input helps the program estimate fuel/resources required for the trip. Jon adds other personnel (Jen, Steve & Robert) to the roster for the mission. He brings up the mission timeline, and, with the program estimating travel time, identifies which times/days he will be where in the mission and plans out approximate EVA's. When the mission is saved, and approved, it is lodged with the mission register as an active mission, scheduled to go.