Remote Diagnosis of the International Space Station utilizing Telemetry Data

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Modern systems such as fly-by-wire aircraft, nuclear power plants, manufacturing facilities, battlefields, etc. are all examples of highly connected network enabled systems. Many of these systems are also mission critical, and need to be monitored round the clock. Such systems typically consist of embedded sensors in networked subsystems that can transmit data to central (or remote) monitoring stations. Moreover, many legacy systems were originally not designed for real-time onboard diagnosis, but are safety critical and would benefit from such a solution. Embedding additional software or hardware in such systems is often considered too intrusive and introduces flight safety and validation concerns. Such systems can be equipped to transmit the sensor data to a remote-processing center for continuous health monitoring.

At Qualtech Systems, we are developing a Remote Diagnosis Server (RDS) that can support multiple simultaneous diagnostic sessions from a variety of remote subsystems. The RDS server is built on a three-tier architecture with a "Broker" application in the middle layer, and multiple TEAMS-RT based reasoners at the backend. The client layer consists of sensor agents that collect test results and transmit them over a message-passing network. The resultant solution is remarkably efficient. Even an old 50MHz Sparc20 can support tens of concurrent systems involving hundreds of tests. The solution scales easily to hundreds of systems in any modern workgroup server.

One of the goals of the RDS project is to implement a remote health monitoring system based on telemetry data for the International Space station. It, as well as most other NASA space systems. transmits voluminous amounts of sensor data to ground support systems (at NASA-Johnson Space Center, Houston. Texas) for health assessment. This data stream is near real-time, and consists of detailed sensor data from multiple subsystems on board the spacecraft. This presents a unique opportunity. We can demonstrate a real-time remote monitoring solution that utilizes this telemetry data to monitor the health of the various subsystems and we can demonstrate the benefits of an onboard solution. without having to actually install any software on the space station itself.

The International Space Station utilizes a highly redundant, fault tolerant, software configurable, complex, 1553 bus system that links all major sub-systems. All sensor and

To: Diane Alexander <dalexander@mail.arc.nasa.gov>
Subject: Re: Publication question

Hi Diane,

It looks like it was the same conference as the other one (they were written by an outside collaborator, so I must not have had the conference info at the time when I submitted the 1676):

S. Deb, C. Domagala, S. Ghoshal, A. Patterson-Hine, and Ri. Alena, " Remote Diagnosis of the International Space Station utilizing Telemetry Data", in Proceedings of the SPIE Aerosense Conference, Orlando, FL, April 16-20, 2001.

Thanks,
Ann

Hi Ann:

Here is another title.

I am entering into a database all the NASA 1676's for Export Control. Your form for the article "Remote diagnosis of international space station utilizing telemetry data", didn't indicate where this would be published.
It was submitted last Sept 2000.

Thank you.

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