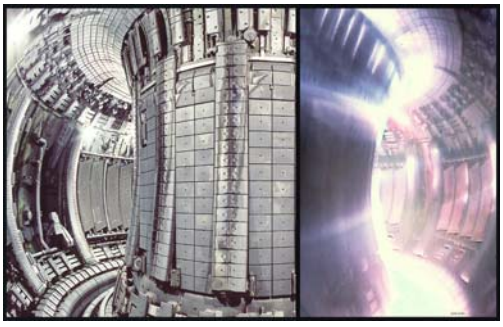
Client | JET

Monitoring JET Diagnostics

The JET facility, run by UKAEA, is the world's largest nuclear fusion research establishment. It has played a leading role in many of the advances in fusion research.

Business and IT challenge

JET produces a high temperature plasma in a series of experimental pulses. During each pulse, a range of diagnostic equipment measures parameters of scientific interest.



Approximately half of the JET diagnostics are operated from a PC / Windows platform. Communication between these PCs and central computers was initially via files written to two dedicated PC servers.

When a diagnostic PC failed, data was not produced, but this could only be detected after the pulse. At times, data from important diagnostics was lost for tens of pulses. Occasionally one of the central PC servers also failed, resulting in the substantial loss of data for one or more pulses.

With an estimated cost of £20,000 per JET pulse, such loss of data was unacceptably expensive. It was also important to remove the reliance on the central PC servers and detect the failure of a diagnostic PC in real time.

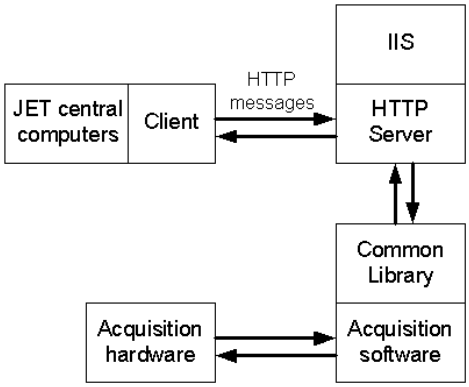
Delivering the vision

Tessella staff recommended that the software be re-engineered to enable each diagnostic PC to communicate directly with the central JET computers. The individual diagnostic

could then inform a central system of software or hardware failures. Any failure of the PC would also become apparent if it should cease to respond to messages.

To develop communication software for each different system would, however, be time consuming, labour expensive and prone to error. A generic solution was required which could be used across the systems.

Tessella and JET staff agreed on a new message-based communication between the central computers and diagnostics. This was based on the standard web protocol HTTP, allowing commercial web servers to be used as the basis for the new software, reducing development time and using well tested products.



HTTP Architecture

Many of the diagnostic systems were already based on a common software library that supervised the data acquisition. The remaining systems were re-developed to use this library and the new communication protocol incorporated within it.

The library reports the diagnostic status and any error conditions to an HTTP server based on the Microsoft IIS server. The server was extended using Microsoft's ISAPI interface to provide additional features such as:

- enhanced security, limiting access to a single central system
- a complex logic to interpret whether the diagnostic could be considered 'operational' or not
- a longer-term record of diagnostic errors and warnings

Regular status requests enable the diagnostic state to be closely monitored. Errors are also reported on a regular basis. Those that occur during the pulse cycle can alert control staff to the problem, which can then be rectified before the pulse continues. Missing data is also associated with the relevant diagnostic errors when the data is collected.

Results and Benefits

JET's core purpose is to create scientific data from the experiments it runs. Producing this data is very costly, so any lost data because of data-acquisition equipment failure is an expensive loss - either JET pulses will need to be re-run to reproduce it (at £20,000 per pulse) or the data is lost forever (with the resulting potential loss to scientific knowledge). The monitoring system engineered by Tessella drastically reduces the potential for data loss from the systems on which it is installed.

Benefits of the system include:

- Fast detection of PC failure at a distance
- Reduction in amount of data lost unnecessarily
- Cost savings due to constant monitoring

A generic communication protocol was implemented on approximately 30 varied diagnostic systems throughout JET. A single software solution has proved easy to maintain and enhance, with high reliability, over the first year of use.

Tessella plc 26 The Quadrant, Abingdon Science Park, Abingdon, Oxfordshire OX14 3YS, UK
T: +44 (0)1235 555511 | F: +44 (0)1235 553301 | E: info@tessella.com

Tessella Inc 233 Needham Street, Suite 300, Newton, MA 02464, USA
T: 1 617 454 1220 | F: 1 617 454 1001 | E: info@tessella.com

Tessella
Technology & Consulting

Tessella – successfully delivering IT and consulting services to world leaders in R&D, science and engineering.

For decades, Tessella has been successfully delivering IT and consulting services to world leaders in R&D, science, and engineering. Through the application of scientific methods and rigorous quality procedures, we enable clients in life sciences, energy, the public sector, and consumer industries to achieve a wide range of objectives, including, forecasting floods, developing fusion power, enhancing military sensor capability, increasing drug discovery and development efficiency, and reducing risk to health and the environment in the extraction and production of oil and gas. With offices in Europe and North America, global companies rely on Tessella for business critical assignments.