



# Technology Opportunity

Glenn Research Center • Cleveland • Ohio

Technology Transfer & Partnership Office

TOP3-00202

## Tempest: Embedded, Real-Time Server Software

### Technology

The National Aeronautics and Space Administration (NASA) seeks to transfer technology used to create Tempest, a real-time embedded Web server. Tempest enables almost any real-time application to be remotely controlled/monitored over the Internet or an intranet using nothing more than a standard Web browser.

### Benefits

Tempest saves significant time and money in the software development lifecycle by enabling the real-time software developer to use standard COTS products from the Internet. Some examples include

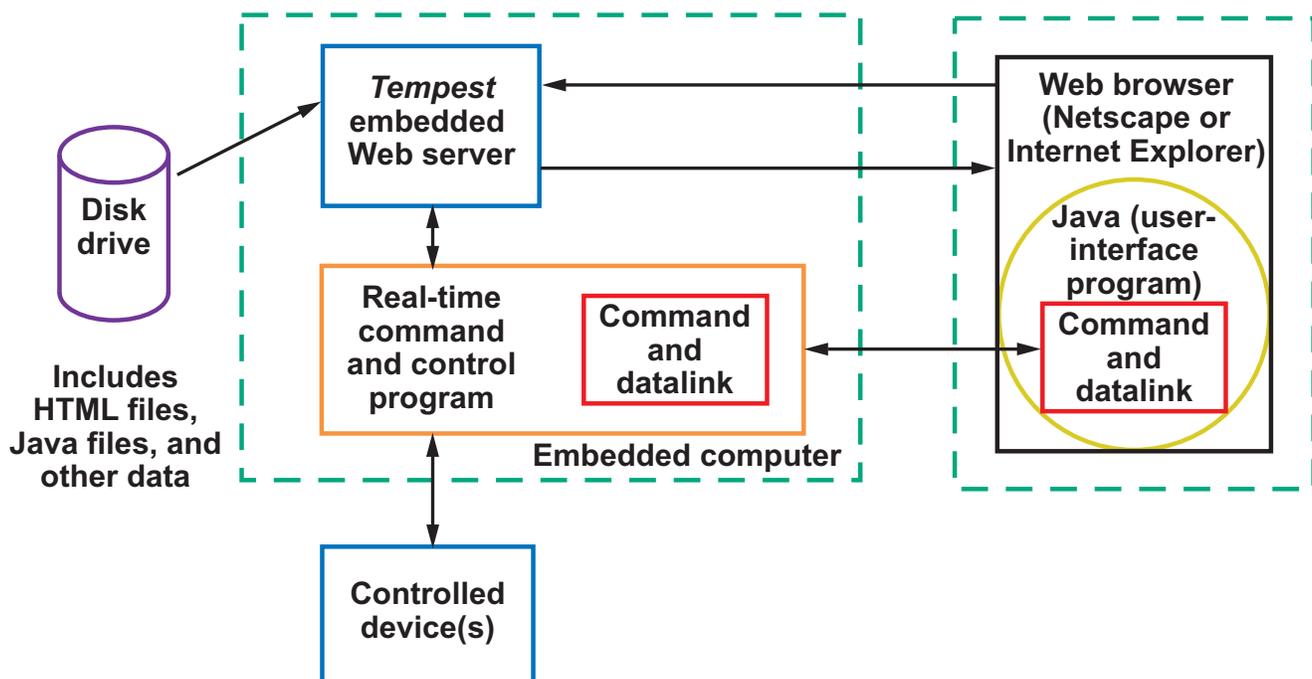
- Java graphic user interfaces (GUIs) are easily written in the form of Java applets that can be used to monitor and control a device.

- CORBA or DCOM technology frees the real-time software application designer from developing custom communication layers between processors.
- Streaming audio/video provides alternate methods of delivering information to the end user.
- VRML provides interactive 3-D environment for training and/or maintenance.

Tempest drops easily into both new and legacy embedded applications.

### Commercial Applications

- In production, remote monitor/control of production line equipment
- In building management, remote monitor/control of security, environment (e.g., HVAC, fire, elevator).



- In offices, remote monitor/control of printers, copiers, fax machines, etc.
- In aerospace, remote monitor/control of instruments in flight
- In medicine, remote monitoring of patients at home
- In education, remote monitor/control of scientific experiments by students. This technology is currently being used in the Virtual Interactive Classroom (VIC) at NASA Glenn Research Center. The VIC can be found online at <http://vic.grc.nasa.gov>.

## Technology Description

Tempest was created to provide Internet/intranet connectivity to real-time, embedded applications. It was the first HTTP server of its kind for real-time embedded systems. This is a unique marriage of World Wide Web technology and Embedded Systems technology. The result is Embedded Web Technology (EWT). In addition to many standard Web functions, Tempest has the following features:

- Compact footprint, as small as 34 KB, necessary in real-time software.
- Custom <TEMPEST...> dynamic HTML tags for snapshot views of the real-time operating system and application events.
- Command line options, ASCII configuration files, logging, debugging, security layer.
- Runs as prioritized task under multi-tasking kernels. Intranet transaction have been clocked at 3–4 msecs.
- VxWorks version of Tempest currently runs on Motorola 680x0 and PowerPCs.
- Java version of Tempest runs on a wide variety of operating systems.

## Options for Commercialization

Tempest is available at Open Channel Software at <http://openchannelfoundation.org/projects/Tempest>. Opportunities for partnering to develop commercial application can be explored using the information in the contact section.

## Contact

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## References

LEW–16674

## Key Words

Software  
 Embedded  
 Real time  
 Web Server  
 HTTP  
 Internet  
 Intranet  
 Remote control  
 Remote monitor