

The New Web Hera: A Full Astronomical Data Processing Environment on the Web

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Summary: The HEASARC at NASA/GSFC has provided an on-line astronomical data processing system called Hera for several years. Hera provides a complete data processing environment, including installed software packages, local data storage, and the CPU resources needed to support astronomical research by external users. The original design of Hera was based on a 'client/server' model which required that the user, a) download and install a small helper program on their own computer before using Hera, and b) ensure that several non-standard computer ports/sockets be open for communication through any local firewalls on the user's machine. Hera has now been redesigned to eliminate these restrictions by operating within a purely Web-based environment which is accessed via a standard Web browser. This poster describes the first public release of Web Hera.

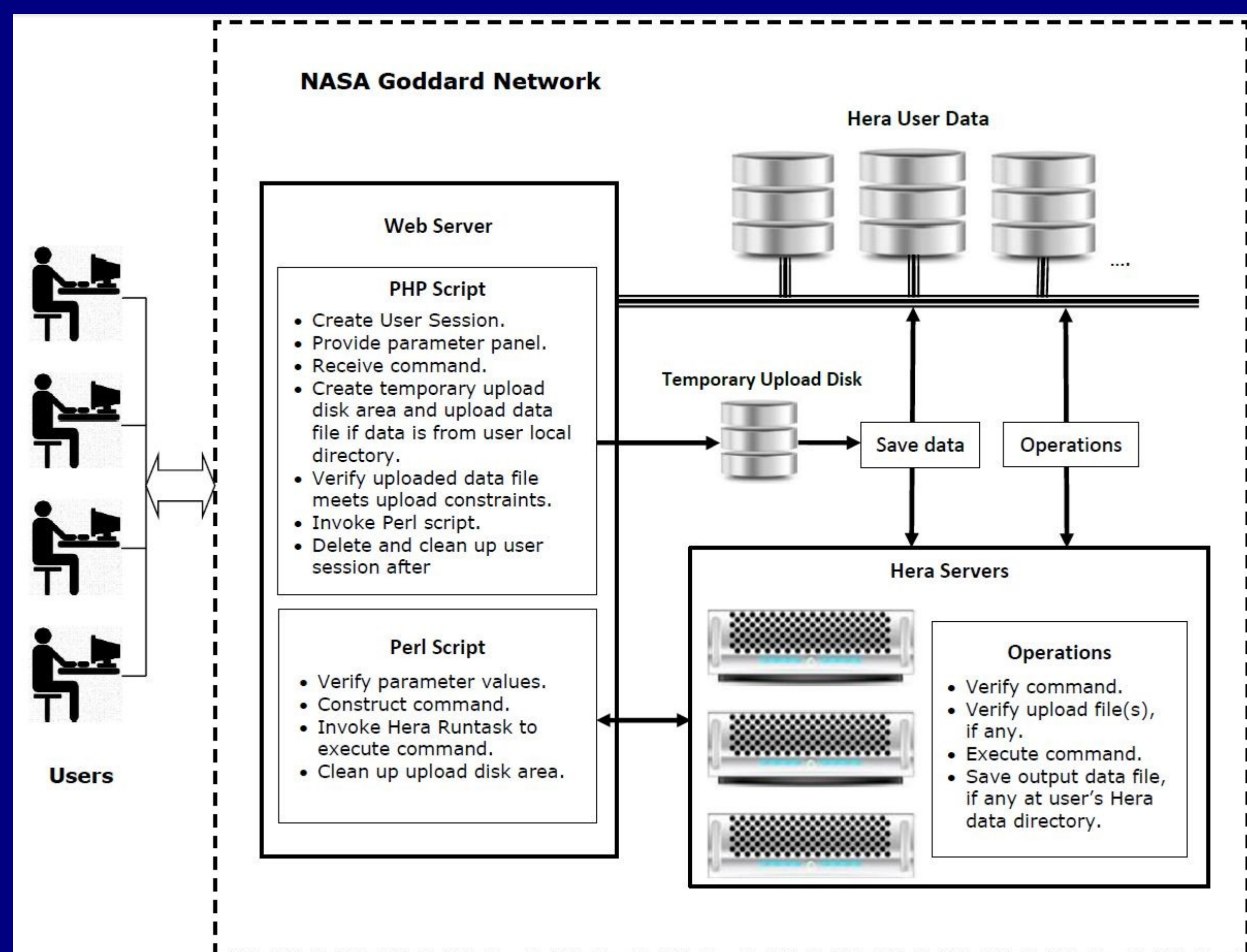
URL: <http://heasarc.gsfc.nasa.gov/webHera>

1. Hera Description and History

Hera is a complete on-line data analysis system provided by the HEASARC since 2003. Hera embodies the 'cloud' computing paradigm where all the resources (e.g., programs, data, disk space, and CPU cycles) are provided on the server rather than on the user's local machine. Hera enables users to run any of the hundreds of programs in the FTOOLS data analysis package as well as some of the programs from the Chandra CIAO and XMM Newton SAS packages. All the data files in the HEASARC archive of high-energy astrophysics observations are available for immediate analysis. Users may also upload data files from other sources into their personal disk storage area on the Hera machines for analysis.

The design of the original Hera system (which is still operational in parallel with the new Web-Hera system) relied on a client/server architecture. Potential Hera users had to first install a small helper program (the fv FITS file viewer) to serve as the client. They also had to make sure that several high-numbered ports on their machine are open through their firewall to communicate with the Hera servers. Both of these requirements are problematic for some users, therefore, we recently developed the new Web-Hera interface which only requires a standard Web browser with no privileged port access.

2. Web-Hera Architecture



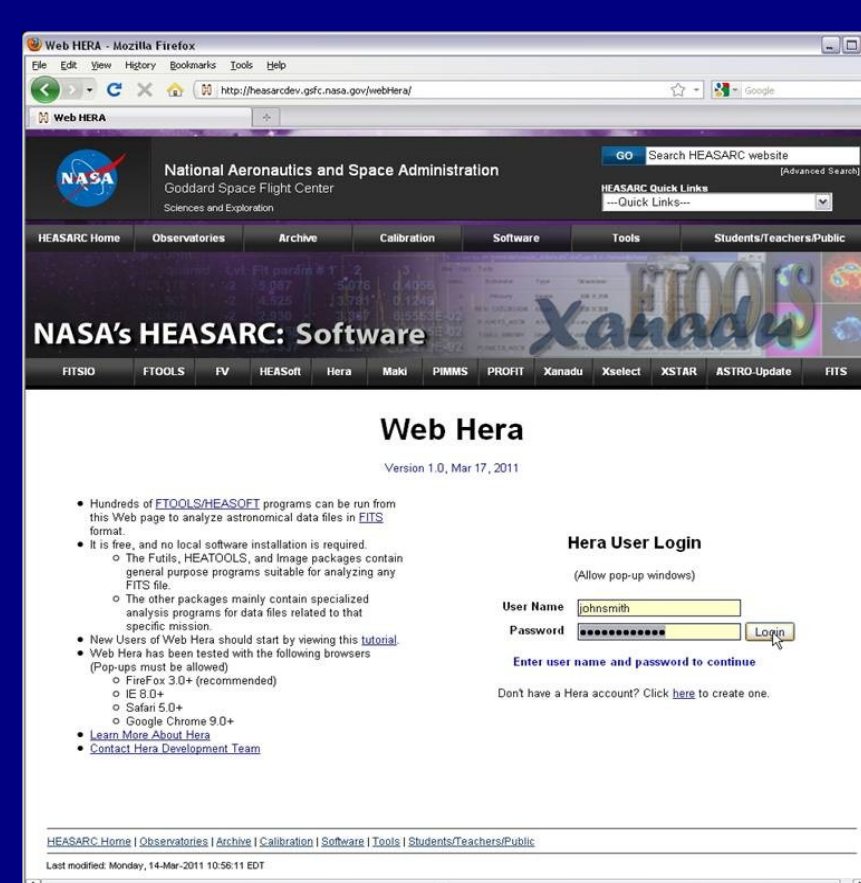
External users connect to Web-Hera via a standard Web browser. The interactive forms on the Hera Web site enable the user to select which task to run and to enter all required input parameters needed to execute that task. The analysis tasks can operate on any data files residing in that user's individual Hera disk area or residing on the user's local machine.

When the user runs a data analysis task, the Web server sends the execution command to one of the Hera compute servers. This minimizes the CPU load on the Web server itself. Once the task finishes, the Hera server communicates the results back to the Web server which then displays the results to the User.

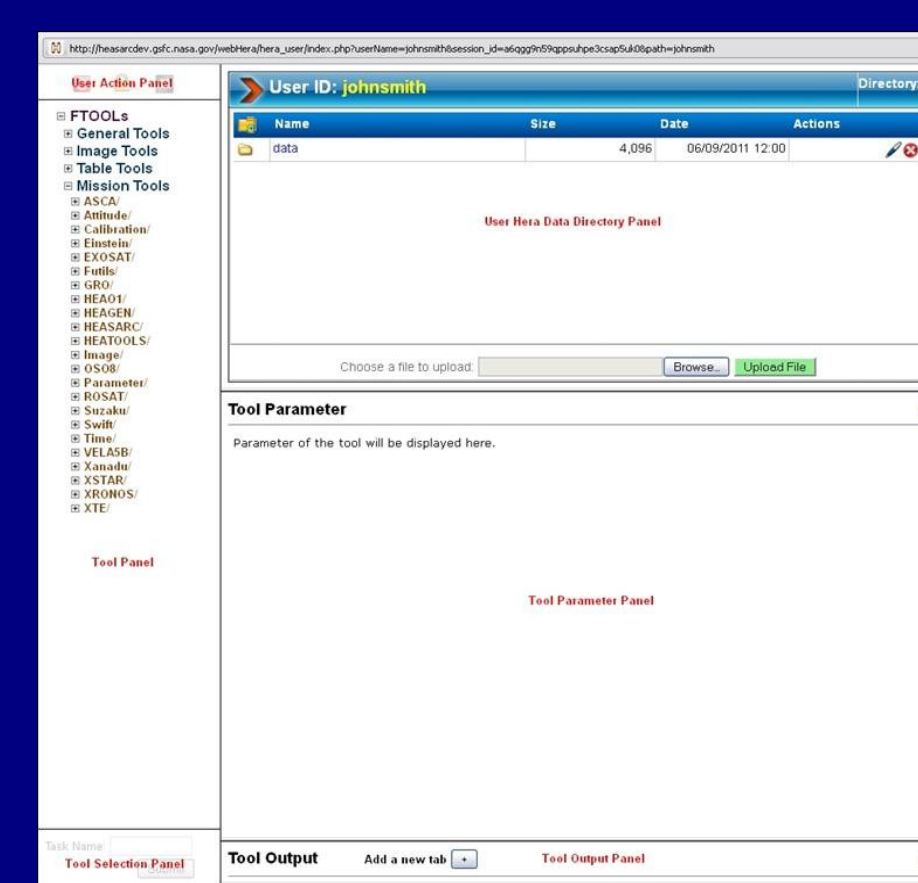
The Hera compute servers reside within a virtual machine environment, so in principle additional virtual Hera servers can be rapidly cloned as needed to support increased user loads.

Users have fast and immediate (read) access to the entire HEASARC data archive. Users can also upload and download data files between their local machine and their personal disk area on the Hera server.

3. Screen Shots of the User Interface



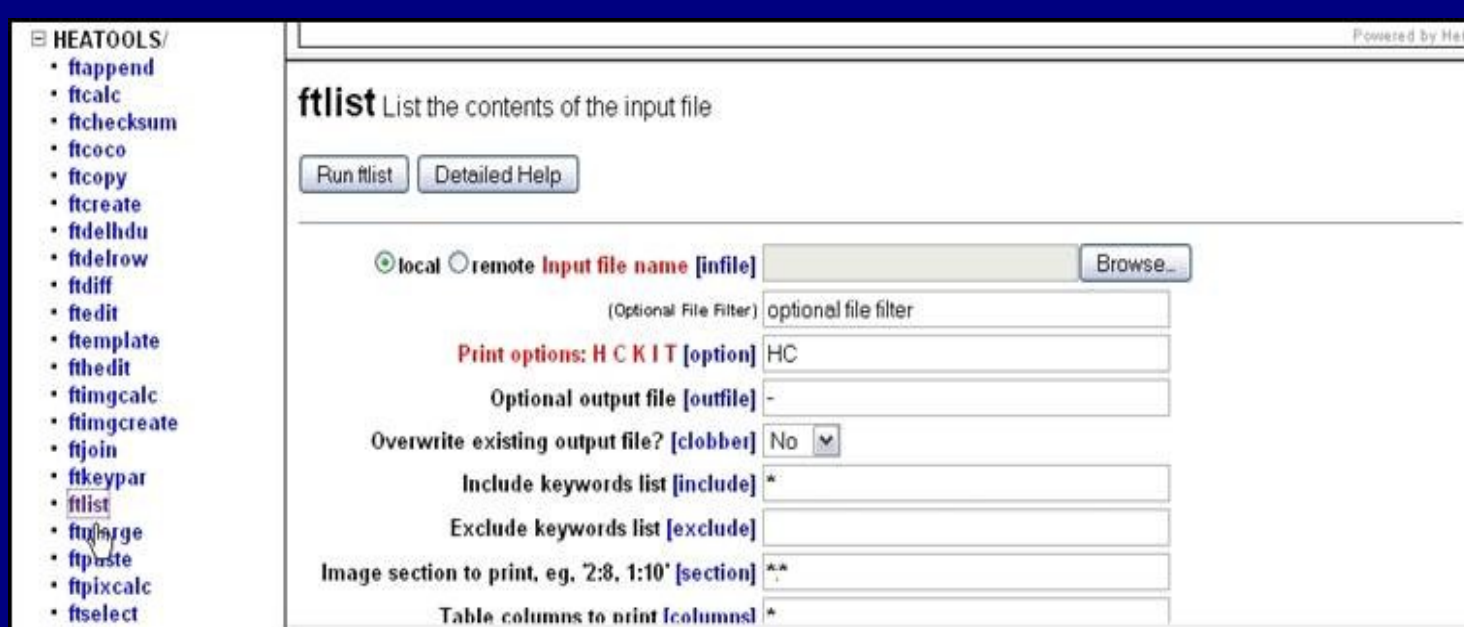
Secure User Login Screen



Main Hera Screen consists of 3 panels: 1) a file directory panel (top right), 2) a list of available tasks (left), and 3) a dual purpose parameter entry and output display panel (lower right).



Directory Panel: Users can interactively navigate through the files in their Hera data directory. The 'Actions' icons enable downloading, renaming, or deleting of files. Files may be uploaded from the local machine using the 'Browse' button at the bottom.



Task and Parameter Panels: After selecting a task from the left panel ('ftlist' in this example) a customized parameter entry panel appears to the right in which the user can enter all the information needed to run that task. The 'Browse' button is used to select which input file to use from the upper file directory panel. After entering all the input parameters, clicking on the 'Run ftlist' button will execute the task. The task-specific help file can be displayed by clicking the 'Detailed Help' button.



When a task is executed, the parameter input panel is replaced by the tool output panel. This displays the full command that is being executed as well as diagnostic information about the status and progress of the job. Any text output from the task is also displayed here. By default the text output from each task that is executed will be appended to this scrolling window. The user may also create multiple tabs in this window and segregate the output for different types of tasks into separate windows. If the task creates new output files, then they will be visible in the directory panel at the top after the task is finished.

4. Usage Statistics

Anyone may create an account on the Hera Web site for immediate use. 300 new Hera user accounts have been created in the past 6 months. Currently there are more than 600 active individual Hera accounts that have been accessed at least once by users in the past 12 months. In a typical week, Hera supports about 5–10 return users.

Hera also supports research activities on an Education web site that is used on average by about 10 students a week.

5. Future Plans

The new Web-Hera interface does not currently provide all the capabilities that are available in the older client/server Hera interface. We are working to implement these capabilities, including an interactive command-line interface and more image display and line graphics capabilities.

Hera will also play an increasingly important role at the HEASARC in providing new Web-based services to our users in which Hera will serve as the back-end compute server. This is likely to include new 'apps' for mobile devices aimed towards professional researchers as well as for Education and Public Outreach.