

## Image Quality Assessment using Web Services

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**Abstract.** Nowadays, image processing can be very demanding in terms of disk space, CPU, memory, resources which laboratory might not necessarily have. As a result, TERAPIX (Institut d’Astrophysique de Paris) has developed an image quality assessment tool which can be accessed by a web service. This service is developed with Virtual Observatory standards in mind, and will be accessible through standard protocols in order to ensure its interoperability with other software.

### 1. Introduction

Large mosaic cameras like MEGACAM have become increasingly common in recent years, and such cameras are producing very large quantities of data. Not every astronomer has access to sufficient computing power to process these datasets in a timely manner. However, thanks to the falling costs and increasing capacity of network connections between institutes, it is now practical to offer remote processing of even gigabyte-sized datasets. These processing tasks can be implemented and managed as web services. TERAPIX (Institut d’Astrophysique de Paris) intends to provide most of the common processing tasks to the community in this fashion, starting with the image quality assessment tool “QualityFITS”.

### 2. QualityFITS web service

A web service is a software system which can be used in any arbitrary code over a network. The communications between the client and server are transmitted by messages enclosed in a SOAP (Service-Oriented Architectural Pattern) envelope. To process data and manage results, our web service<sup>1</sup> uses two main packages (QualityFITS and TORQUE/MAUI) encapsulated in “methods” available to the users. To access QualityFITS web services, users must first register at the client interface web site<sup>2</sup>.

#### 2.1. QualityFITS

This program aims to provide a quick quality assessment of flat fielded images. For each image, QualityFITS performs the following tasks :

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<sup>1</sup><http://clix.iap.fr/ws/terapixServices.php>

<sup>2</sup><http://clix.iap.fr/QualityFitsWS/>

- measurement of the sky background and generation of maps and histograms
- measurement of the FWHM of the PSF and generation of maps and histograms
- detection of cosmic rays and image mask construction
- building of weight and flag maps using a master flat-field, the cosmic ray mask and any other provided mask
- building of PNG images and their associated weightmaps
- computation of star and galaxy counts
- plot of a PSF model and computation of PSF ellipticity
- creation of a FITS table and a XML file summarizing the above statistics

## 2.2. Resource and Queue Manager

To manage the queued jobs and efficiently process user requests, the QualityFITS service uses the following tools to dispatch jobs on the TERAPIX cluster (see Figure 1):

- a resource manager, TORQUE<sup>3</sup> (Tera-scale Open-source Resource and QUEUE manager) based on the original PBS (Portable Batch System) project, which provides control over batch jobs and distributed computing nodes.
- an advanced job scheduler, MAUI<sup>4</sup>, capable of supporting a large array of scheduling policies, dynamic priorities and extensive reservations.

Methods used by QualityFITS web service include the management of these tools in order to check the current progress of the task.

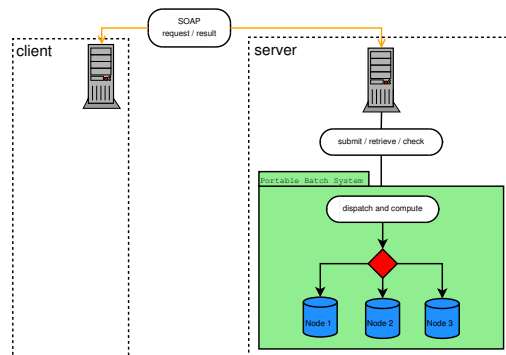


Figure 1. Distributed computing for QualityFITS web service

<sup>3</sup><http://www.clusterresources.com/products/torque/>

<sup>4</sup><http://www.clusterresources.com/products/maui/>

### 3. TERAPIX Client Interface

A web service needs a client interface. Thus, a user-friendly interface has been created to process data, using the QualityFITS web service. This interface is available at <http://clix.iap.fr/QualityFitsWS/>. To have access to this client, users must subscribe to this service by sending an email to the administrator.

#### 3.1. Main Interface

With this interface, one can send FLAT image, WEIGHT image and science images. Once data has been uploaded on the TERAPIX cluster, it is possible to start the process and check the processing status (see Figure 2).

An email is sent to the user at the beginning and the end of the process, as well as in case of failure.

Some statistics about processing are also given to the user such as processing time and memory used.

The screenshot shows the TERAPIX QualityFITS Web Service client interface. The browser window title is "QualityFITS Web Service - Mozilla Firefox". The address bar shows "http://viz...OTable.xsd" and "QualityFits Web S...". The page header includes the TERAPIX logo and "QUALITYFITS ASTROWISE". The main content area is titled "TERAPIX > QualityFits Web Service > Logout".

On the left side, there is an "Input" section with the following fields and buttons:

- + your email:
- + your image:  Browse...
- + your flat image:  Browse...
- + your mask image:  Browse...
- + zero point:
- submit
- >> Advanced mode

Below the input section is a "Check if result available" section with the following fields and buttons:

- + your jobid:
- + your email:
- check

At the bottom left, there is a note: "The total file size should be less than 800MB or it will be rejected." and "Copyright © 2005 TeraPix - J.C. Malapert". There are also logos for "WS HTML 2.01" and "WS CSS".

On the right side, there is a "Processing Report" table:

Job name	04395ed586cda
Job state	completed
Job created	Tue 06 Dec 2005 11:50:13
Queue	medium
Job queued	Tue 06 Dec 2005 11:50:13
Host used	pix1/1+pix1/0
Job started	Tue 06 Dec 2005 11:50:27
Job ended	Tue 06 Dec 2005 12:42:45
Memory used	195004kb
Virtual memory used	226192kb
Walltime used	00:52:17

Below the table are buttons: "Download Result", "View Result", and "Delete Job".

At the bottom right, there is a "Processing step" bar with the following steps: "Artefacts", "Weight Map", "PSF", "Source Extract", "Resampling", "Background Map", and "Data compression".

Figure 2. Client interface: <http://clix.iap.fr/QualityFitsWS/>

### 3.2. Final Data Product

Results are available in two formats. One is a web page (see Figure 3) and the other one is a compressed tar archive. The web page contains all information about image quality, that is, a background map and histogram, a PSF map and histogram, galaxy/star counts and a RH-mag diagram.

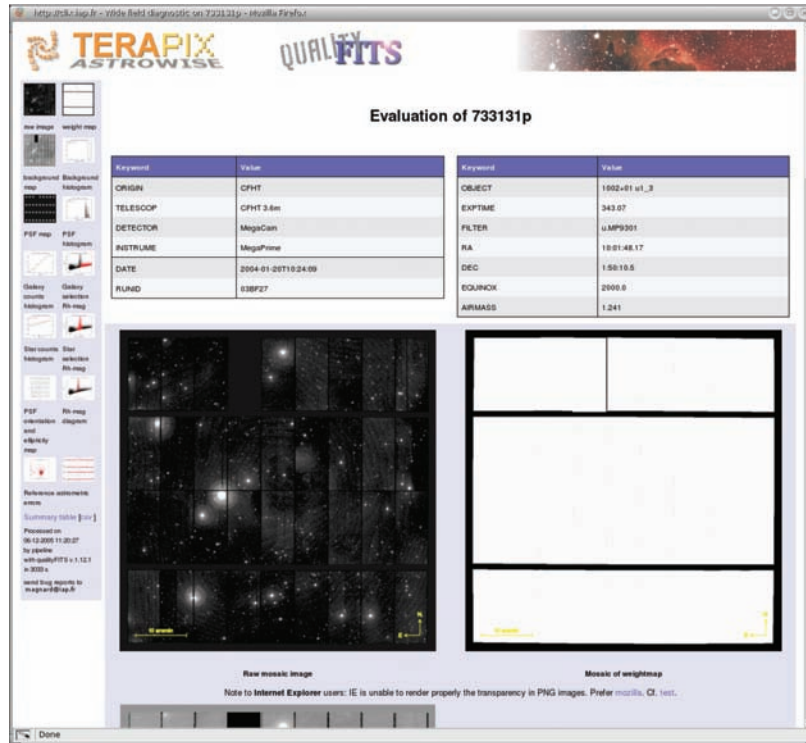


Figure 3. Result page of QualityFITS web service

### 4. Conclusion

The QualityFITS web service is now available. To use it, connect to <http://clix.iap.fr/QualityFitsWS/> and subscribe to this service.

### References

TORQUE, <http://www.clusterresources.com/products/torque/>  
 MAUI, <http://www.clusterresources.com/products/maui/>  
 nuSOAP, <http://sourceforge.net/projects/nussoap/>