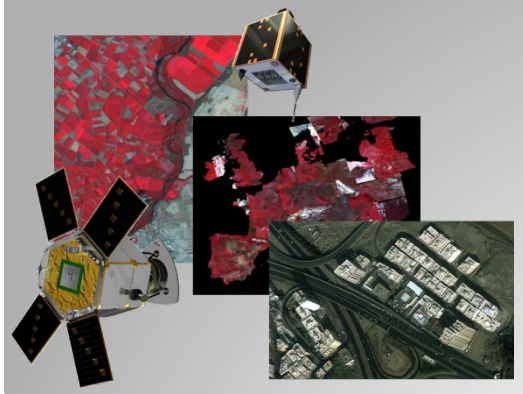

Cloud Architecture for Processing and Distribution of Satellites Imagery

J. Becedas, R. Pérez, G. González, F. Pedrera, M. J. Latorre

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Rubén Pérez Pascual

FOSS4G-Europe July 15th 2014

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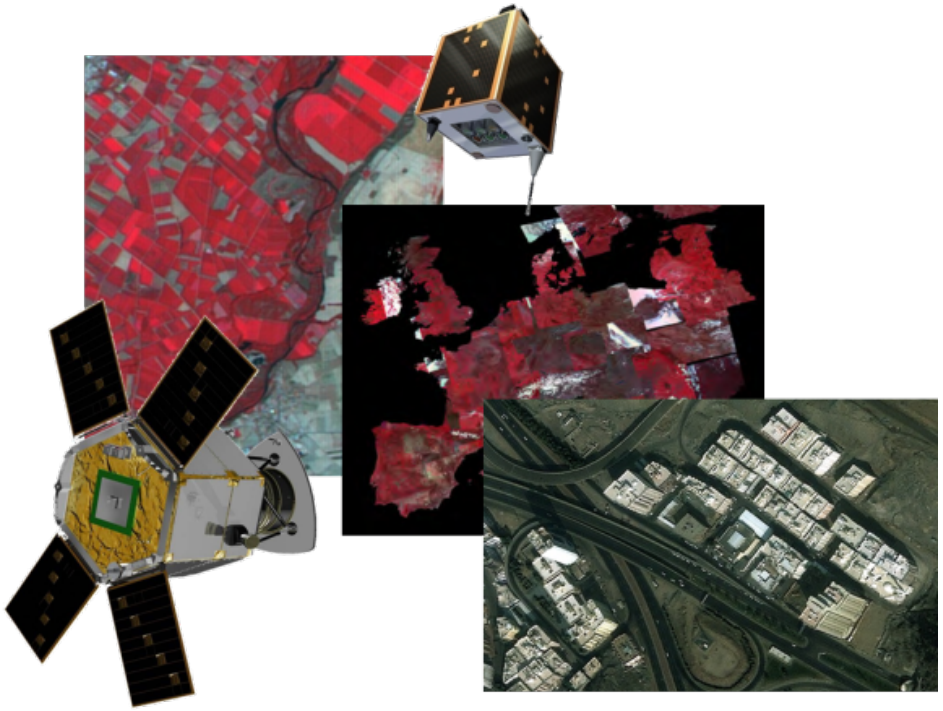


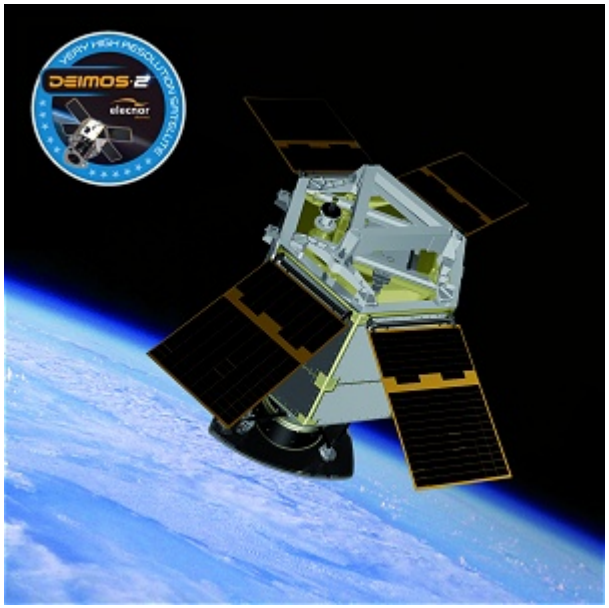
1 Introduction

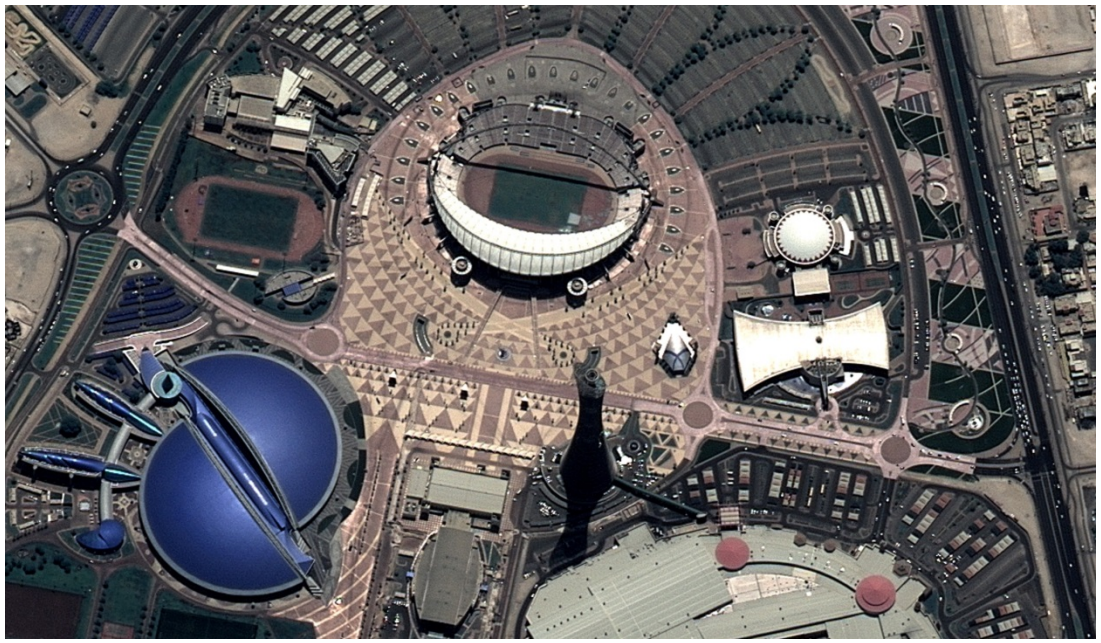
Introduction

- The Organization
- Technology branch of Elecnor Group
- About 500 employees
- Markets: *Aeronautics, Aerospace, Defense, Transport, Energy and Environment, ICT and Security.*
- *Deimos 2 satellite was launched last month*
- *Official Webpage: http://www.deimos-space.com/*

Introduction

- Deimos 2 satellite:
  - First high-resolution spanish satellite.
  - In commissioning stage.





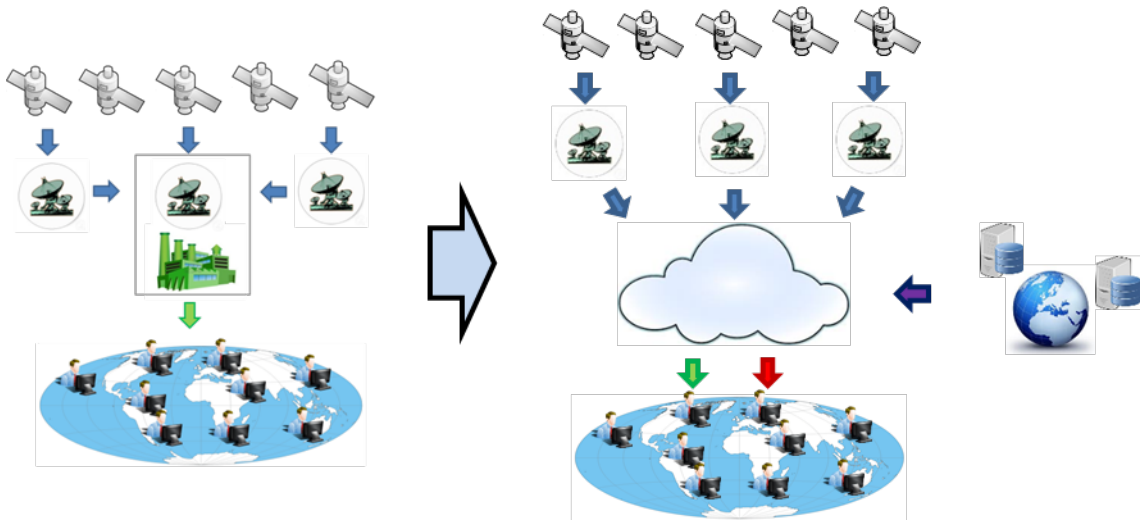
Introduction

- Deimos 2 satellite:
  - First high-resolution spanish satellite.
  - In commissioning stage.

How are these images obtained?

Introduction

- Traditional Processing Earth Observation (EO) images



Introduction

BonFIRE

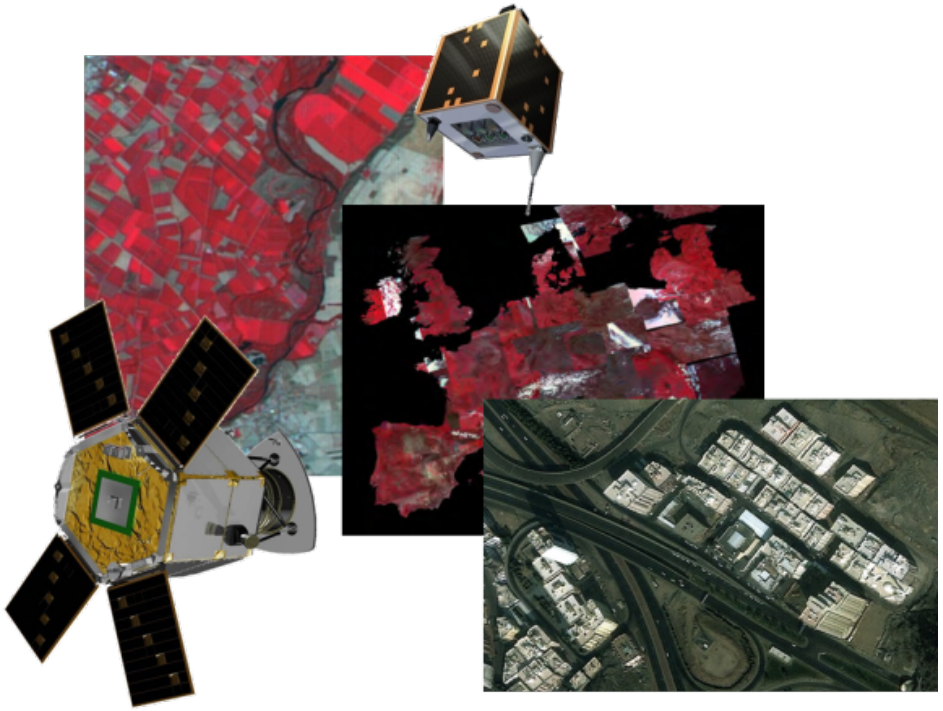
- Official Webpage: http://www.bonfire-project.eu/
- Partner from Fed4FIRE (http://www.fed4fire.eu/)
- Multi-Cloud testbed for services experimentation
  - EPCC cloud (https://www.epcc.ed.ac.uk/) : Offers compute resources with Virtual Machines for processing.
  - INRIA cloud (http://www.inria.fr/): Offers compute resources with Virtual Machines for processing.
  - IBBT for emulated networks and shared storages. (http://www.iminds.be/).

FED4FIRE

Inria INVENTEURS DU MONDE NUMÉRIQUE

iMinds

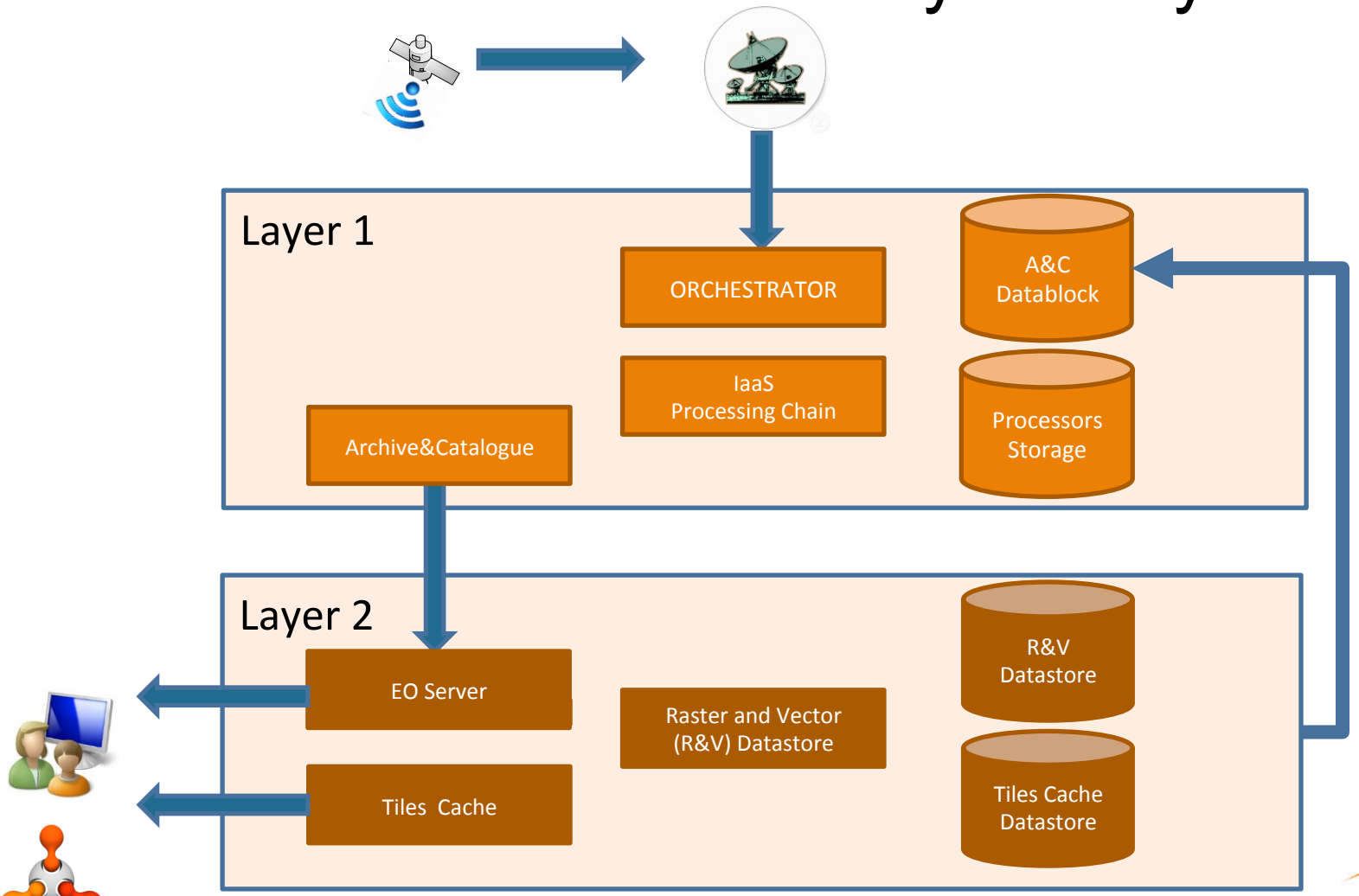
epcc



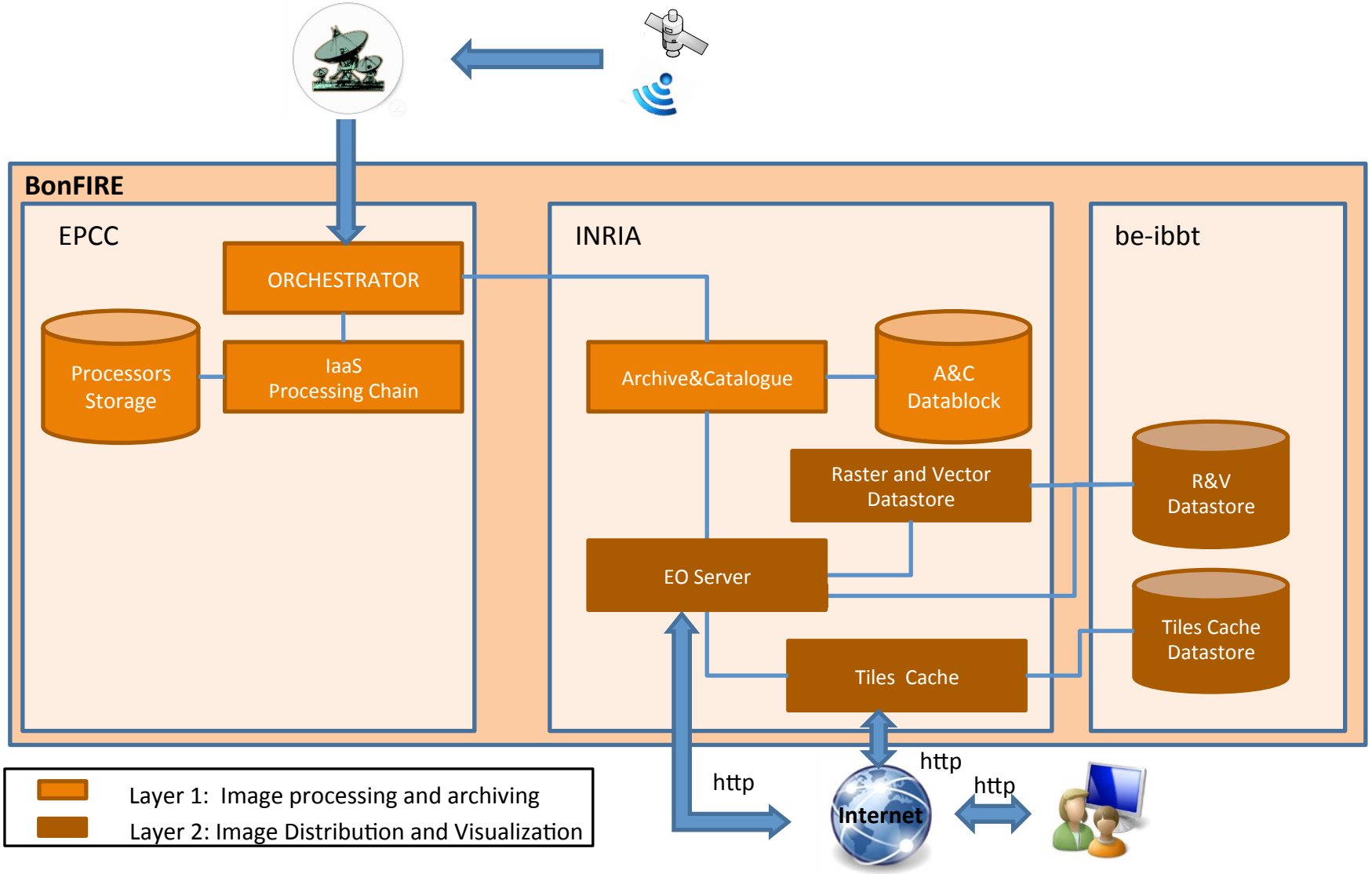
2 Cloud Architecture

Cloud Architecture 4EO

- Architecture constituted by two layers:



Cloud Architecture 4EO



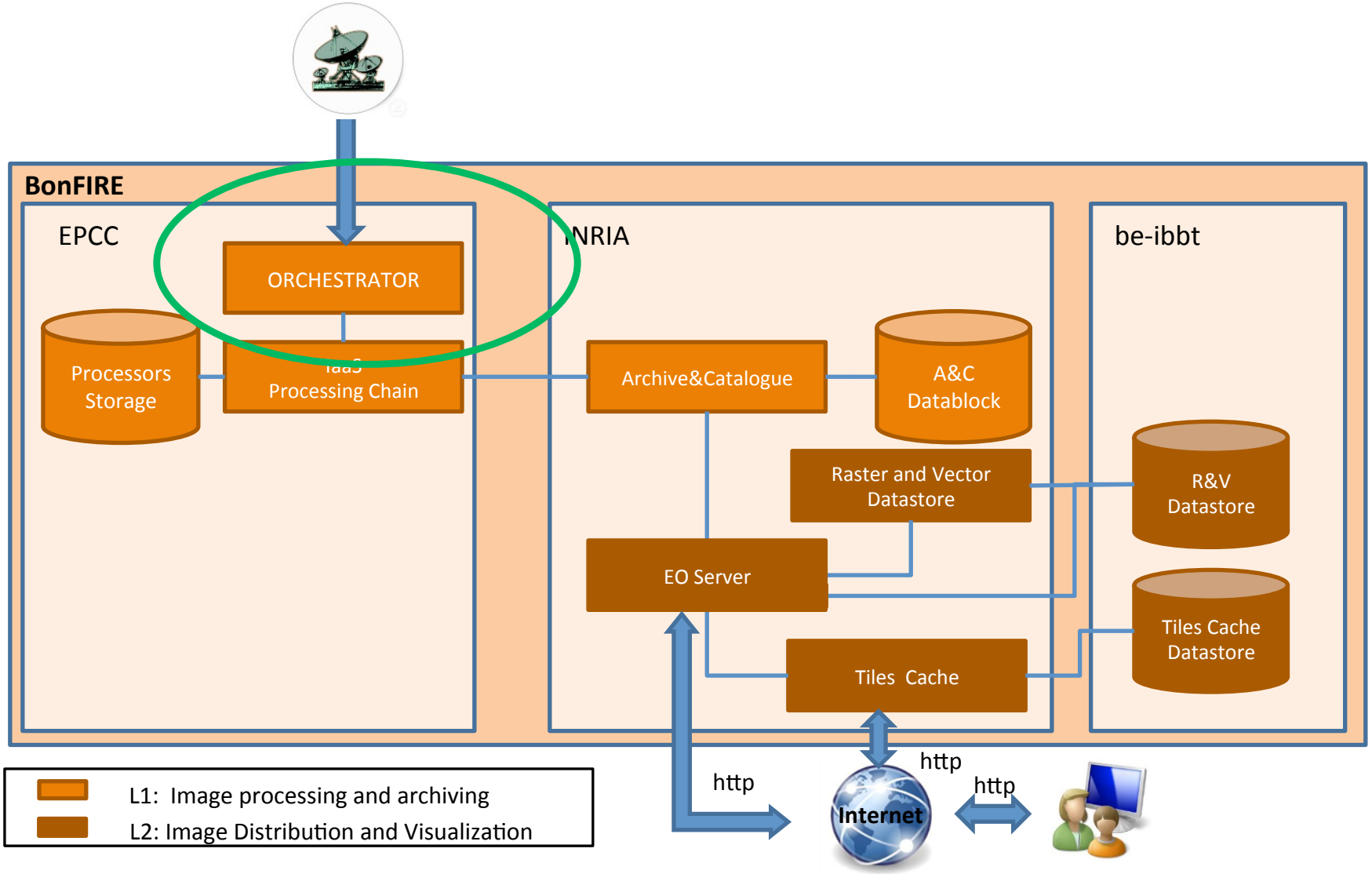
Cloud Architecture 4EO

- Layer 1 Components:
  - **Orchestrator:** it manages the ingestion, processing, archiving and cataloguing.
  - **Processing Chain Cluster:** It processes the raw data that the Orchestrator ingests and obtains geo-located images. It uses the Processing Chain Shared Store.
  - **Archive & Catalogue:** It stores and catalogues the Processing Chain products. It uses the Archive & Catalogue Storage for storing the images.

Cloud Architecture 4EO

- Layer 2 Components:
  - Image distribution and visualization module
    - EO Server
    - Tiles Cache

Cloud Architecture 4EO: Orchestrator

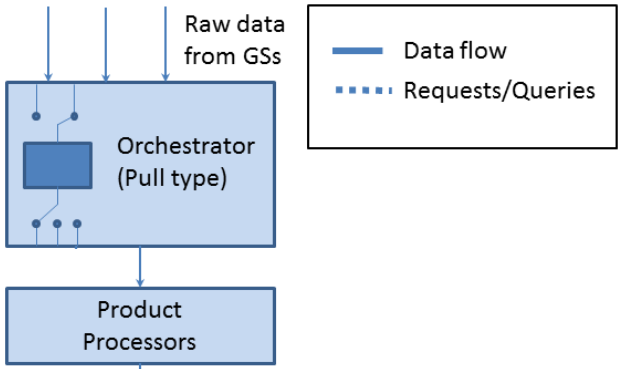


Cloud Architecture 4EO: Layer 1

- Orchestrator
  - It connects with the Ground Stations by FTP protocol.

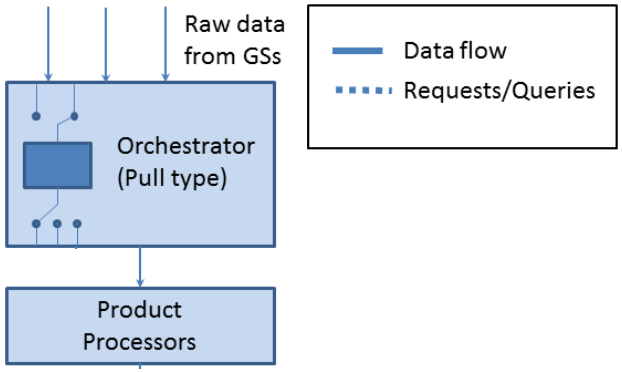
Cloud Architecture 4EO: Layer 1

- Orchestrator
  - It connects with the Ground Stations by FTP protocol.
  - It ingests the available Raw Data from the Ground Stations



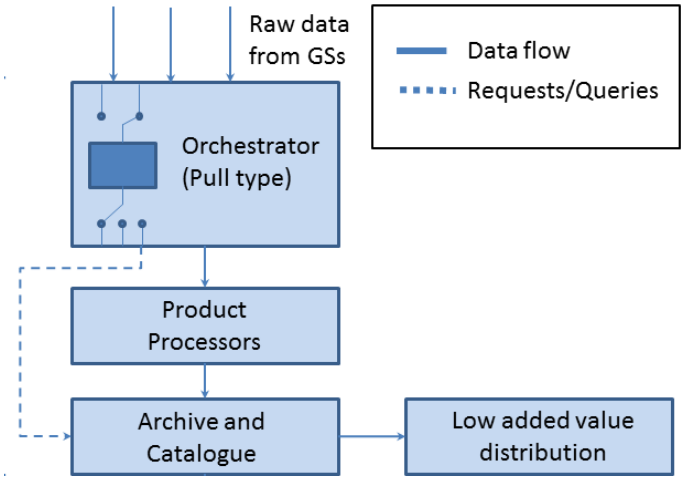
Cloud Architecture 4EO: Layer 1

- Orchestrator
  - It connects with the Ground Stations by FTP protocol.
  - It ingests the available Raw Data from the Ground Stations
  - It creates a new Processing Chain to process the ingested data.

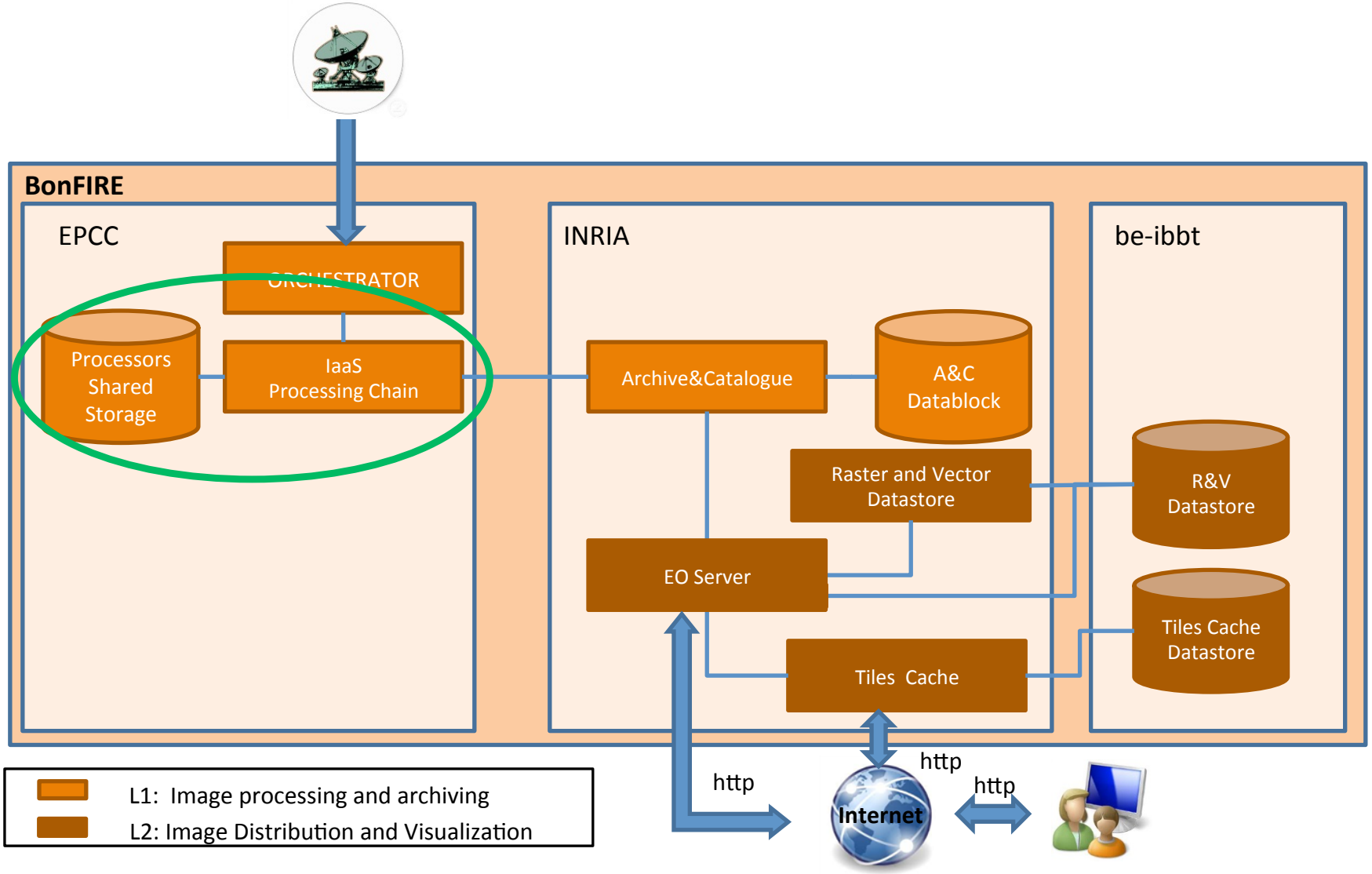


Cloud Architecture 4EO: Layer 1

- Orchestrator
  - It connects with the Ground Stations by FTP protocol.
  - It ingests the available Raw Data from the Ground Stations
  - It creates a new Processing Chain to process the ingested data.
  - When a Processing Chain ends its execution, the Orchestrator sends the results to the Archive and Catalogue module.



Cloud Architecture 4EO

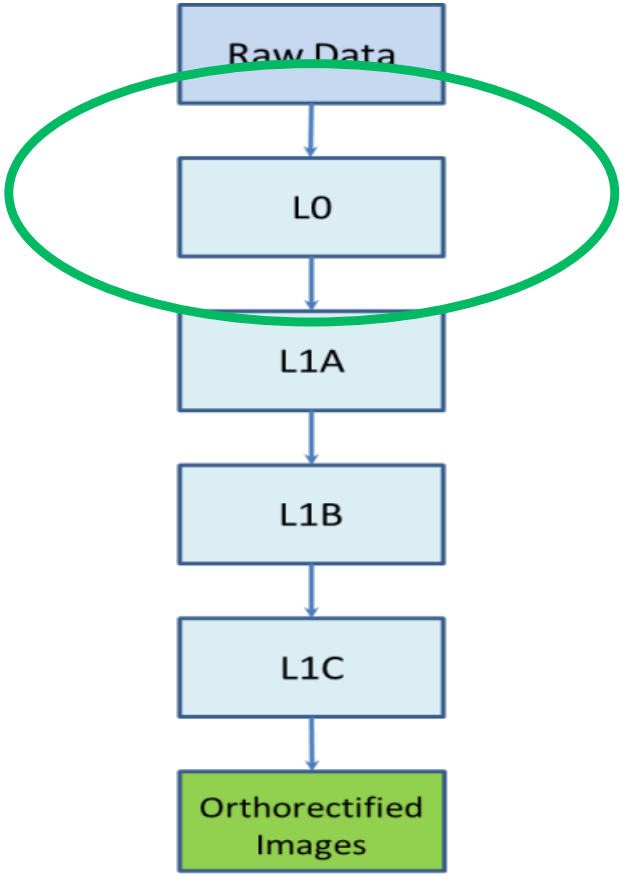


Cloud Architecture 4EO

- Processing Chain Cluster
  - *Elasticity as a Service* (IaaS) works in a cluster.
  - When a new raw data is incoming, a new *Processing Chain* is created by the IaaS manager for performing the data.
  - When the *Processing Chain* has finished, the used resources are released.
  - *Processors Shared Storage* where the temporally files are stored during the processing.

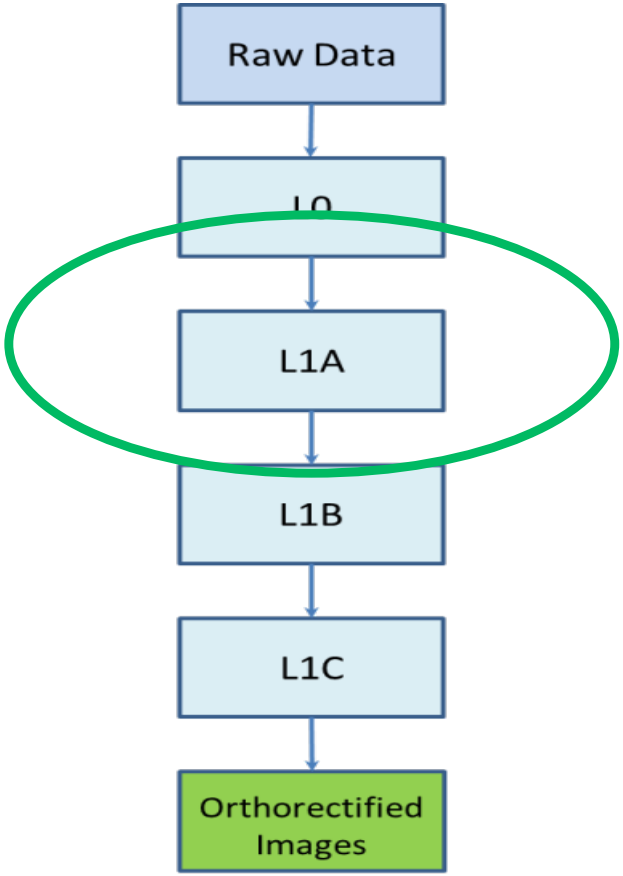
Cloud Architecture 4EO

- Processing Chain: Stages
  - L0
    - The acquired data is organized into image sectors of predefined size and structure and it is converted into scenes.



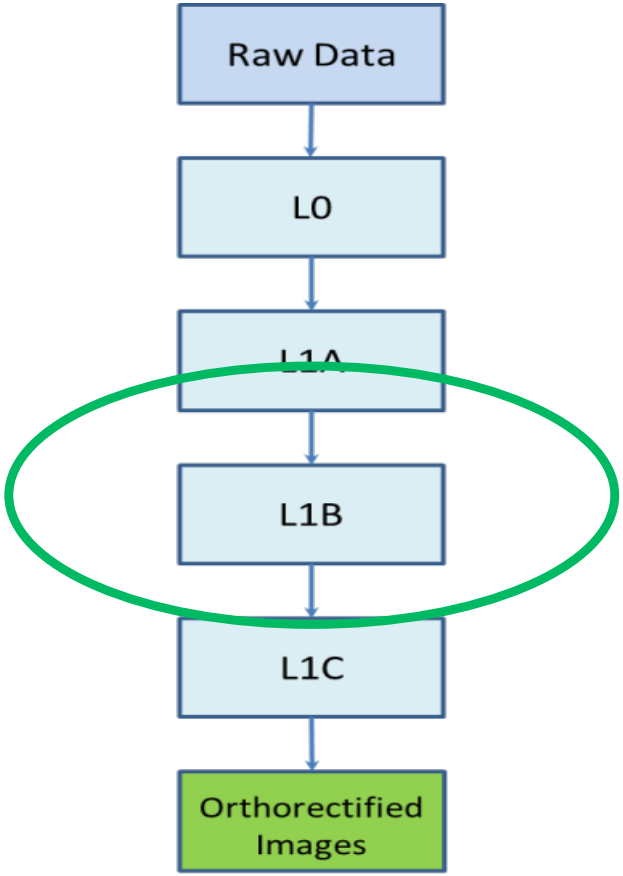
Cloud Architecture 4EO

- Processing Chain: Stages
  - L1A
    - L0 products are calibrated in units of radiance.



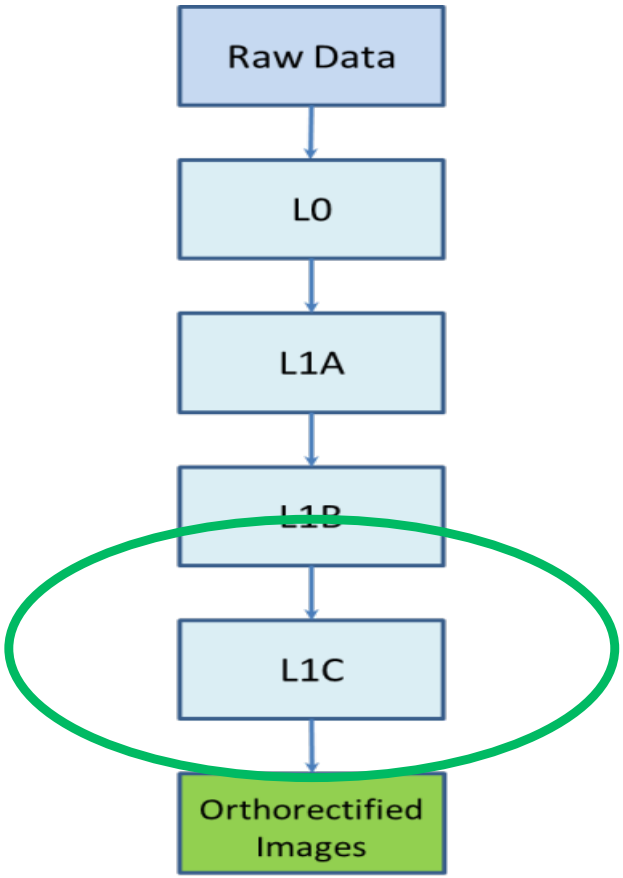
Cloud Architecture 4EO

- Processing Chain: Stages
  - L1B
    - L1A products are geo-located, resampled and packed.

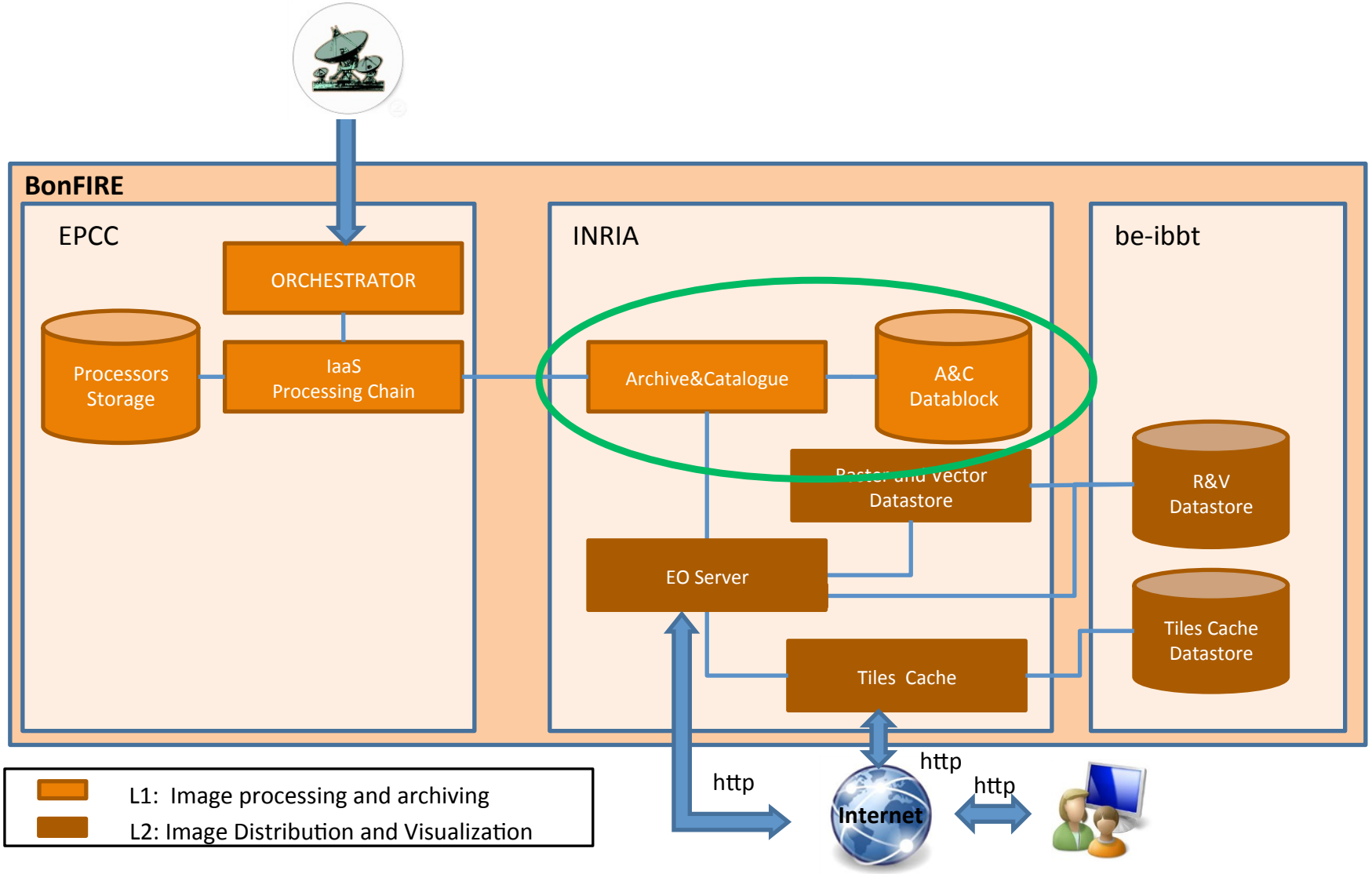


Cloud Architecture 4EO

- Processing Chain: Stages
  - L1C
    - It performs the ortho-rectification of the L1B products using ground control points.

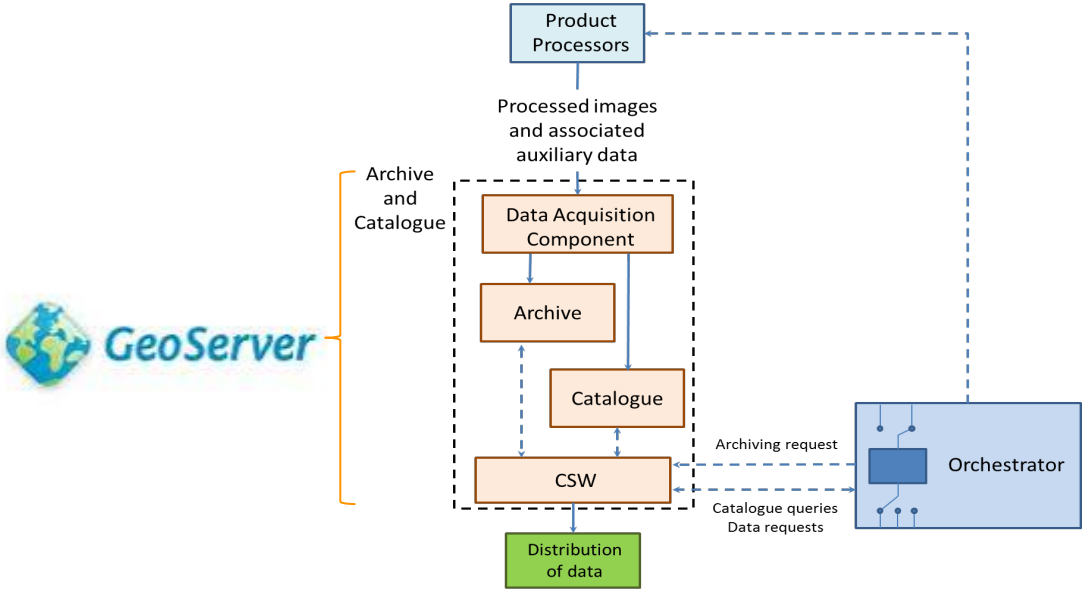


Cloud Architecture 4EO



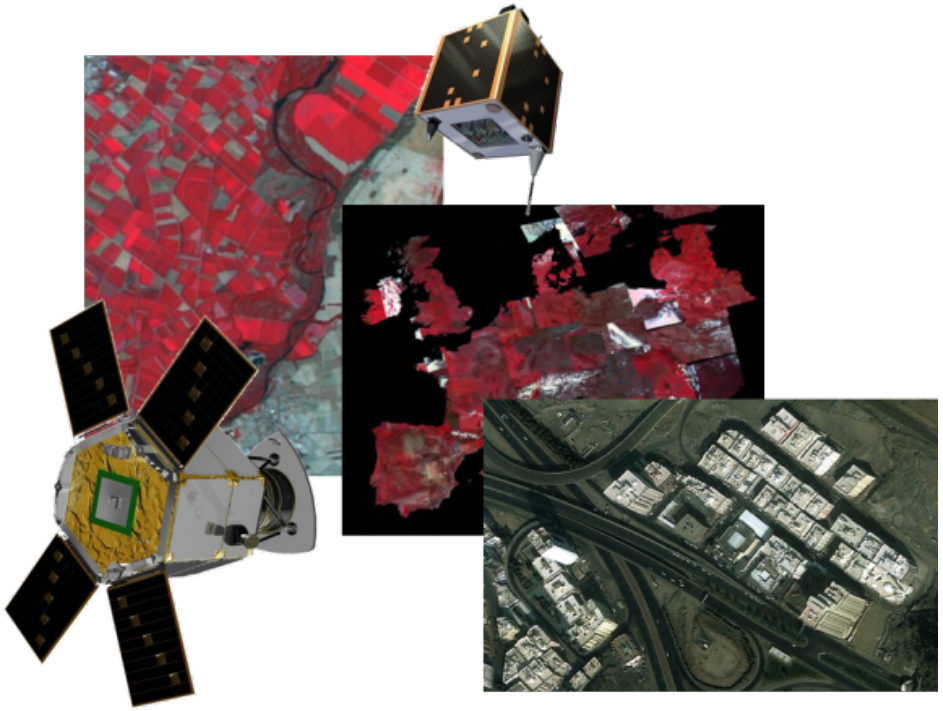
Cloud Architecture 4EO

- Archive & Catalogue
  - It is implemented by Geo-Server and CSW Geo-Server's plugin.
  - It stores and catalogues the processed images.
  - It provides the catalogue through a CSW interface.



Cloud Architecture 4EO

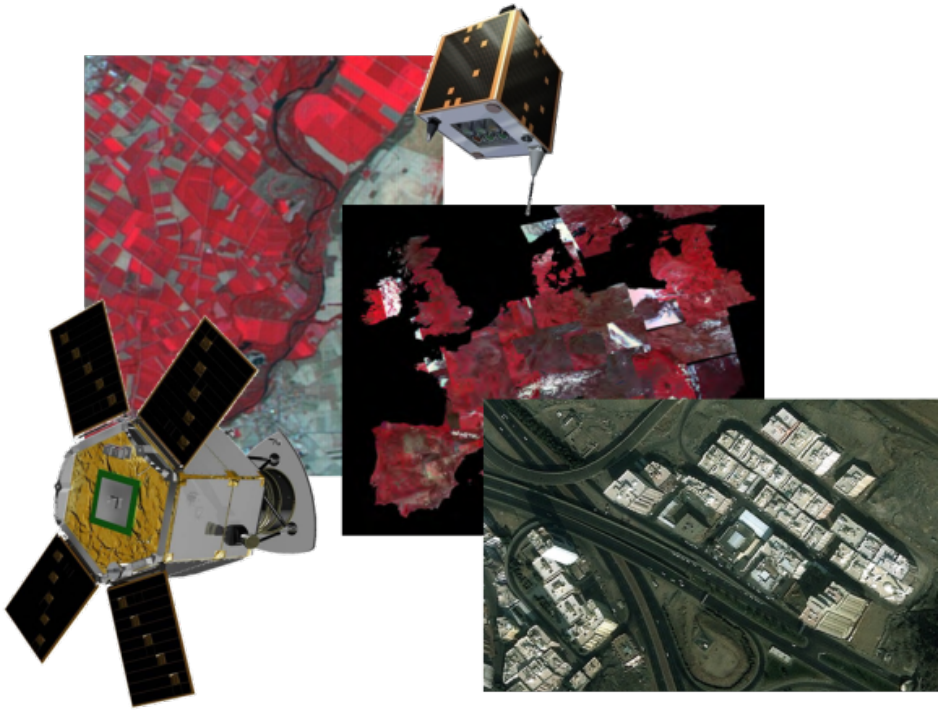
- Tools



3 Preliminary Results

Preliminary Results

- Reduction in the delivery of the images to the end users. About 8 minutes a radiometric corrected and geolocated image.
- Reduction in the transfer of data.
- Parallel image processing.
- Automatic archive and catalogue of satellite imagery.
- Instantaneous access to satellite imagery through the Internet.



4 Conclusions

Conclusions

- The architecture reduces the images delivery time for end-users.
- Using open-source platforms, an operational cloud architecture can be implemented.
- The EO bussiness capabilities can be improved using cloud computing.
- Fed4FIRE provides multiple test-beds and tools for experimenters facilitating:
  - The deployment, control and monitor of the experiment
  - Easy access to the testbeds
  - Valuable tools for experimentation

Acknowledgement

- This work was carried out with the support of the Fed4FIRE-project (“Federation for FIRE"), an Integrated project receiving funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no 318389
- It does not necessarily reflect the views of the European Commission. The European Commission is not liable for any use that may be made of the information contained herein.

Thanks for your attention

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