
About Svom networking
Jean-Paul Le Fèvre
Svom French ground segment project manager

The Svom mission

irfu
cea
saclay

· Svom : a French-Chinese space mission dedicated to GRB (gamma ray burst) studies

· Launch likely in 2016

· By an Italian rocket Vega from Kourou in French Guyana

· Payload on a mini-satellite developped by Thales

· Purchased by China

· Altitude of the orbit : 630 km, inclination of 30°

· Duration of the mission 3 (+3) years

SVOM

Svom scientific requirements

irfu
cea
saclay

- Permit the detection of all know types of GRBs, with a **special care on high-z GRB and low-z sub-luminous GRB**
- Provide fast, reliable and accurate GRB positions
- Measure the broadband spectral shape of the prompt emission (from visible to MeV)
- Measure the temporal properties of the prompt emission
- Quickly identify the afterglows of detected GRBs, including those which are highly redshifted ($z>6$)
- Quickly provide (sub-) arcsec positions of detected afterglows
- Quickly provide redshift indicators of detected GRBs

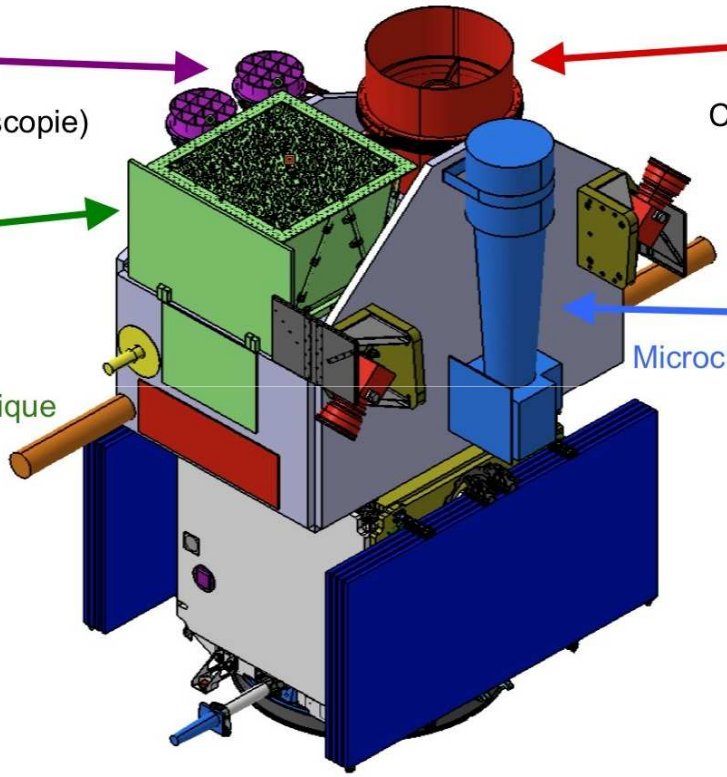
SVOM

The Svom on-board instruments

irfu
cea
saclay

GRM
Gamma Ray Monitor
NaI-CsI (30 keV – 5 MeV spectroscopie)
FOV 2 sr

ECLAIRs
CXG – caméra X/gamma
CdTe (4 – 120 keV imagerie)
FOV 2 sr
UTS – unité de traitement scientifique
détection temps-réel sursaut et
localisation ~ 10'



VT
Visible Telescope
CCD (400-700-1000 nm)
localisation ~ 1"
FOV 21'x21'
M_R = 23

MXT
Microchannel X-ray Telescope
CCD (0,3 – 5 keV)
localisation ~ 20"
FOV 1°x1°

Svom main specifications

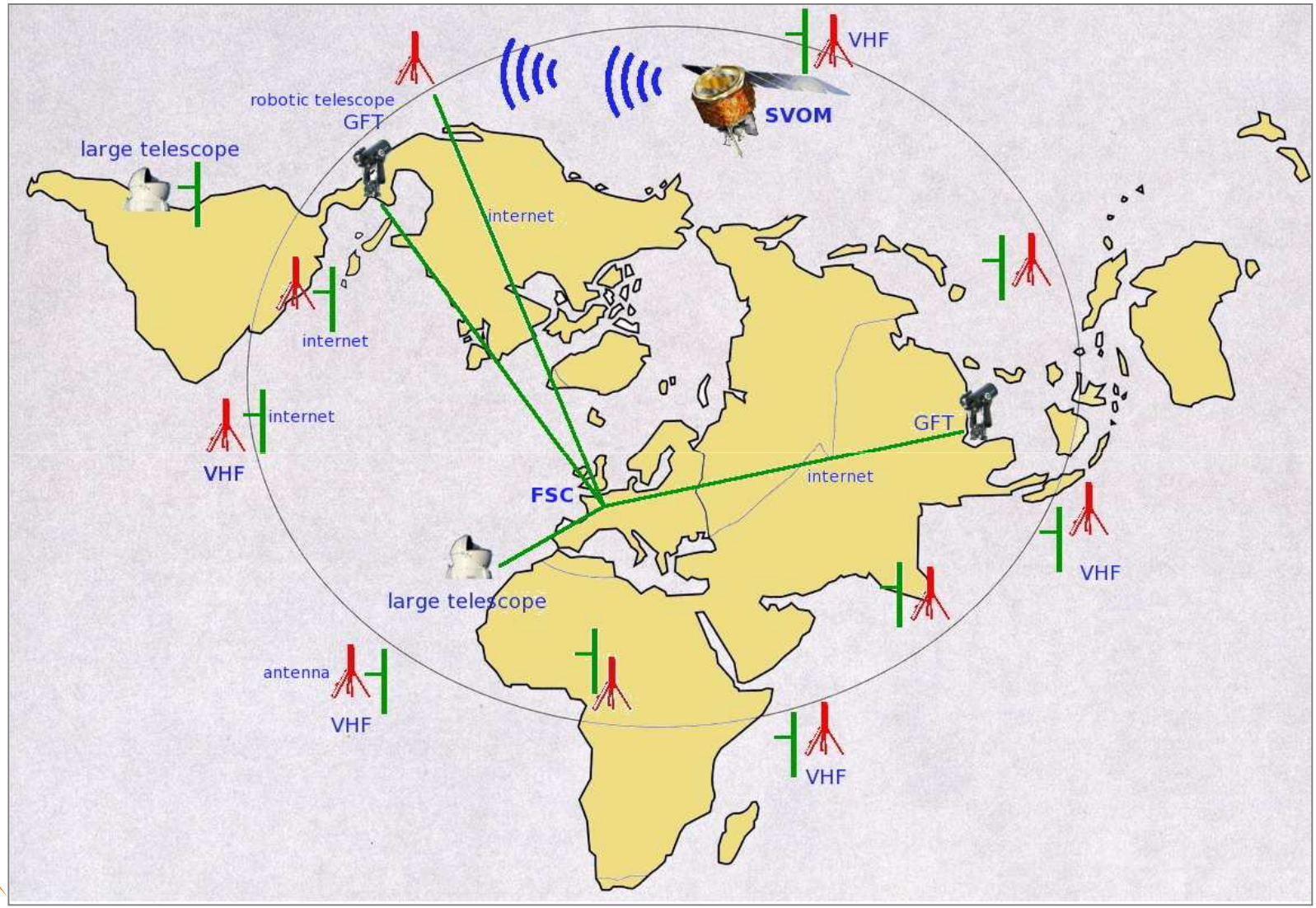
irfu cea saclay

- On board GRB detections must be sent to ground instruments in real time
- The spacecraft communicates with the French Science Center via a network of 40 VHF receivers
- The FSC is located at Saclay near Paris (France)
- The VHF stations are located around the Earth inside a ± 30° strip
- The first recipient of the messages is the Ground Follow-up Telescope located at San Pedro Martir Observatory in Baja California
- Eventually messages are broadcast to large telescopes, e.g. VLT in Chile.
- Participants use the internet to communicate

SVOM

The French Science Center

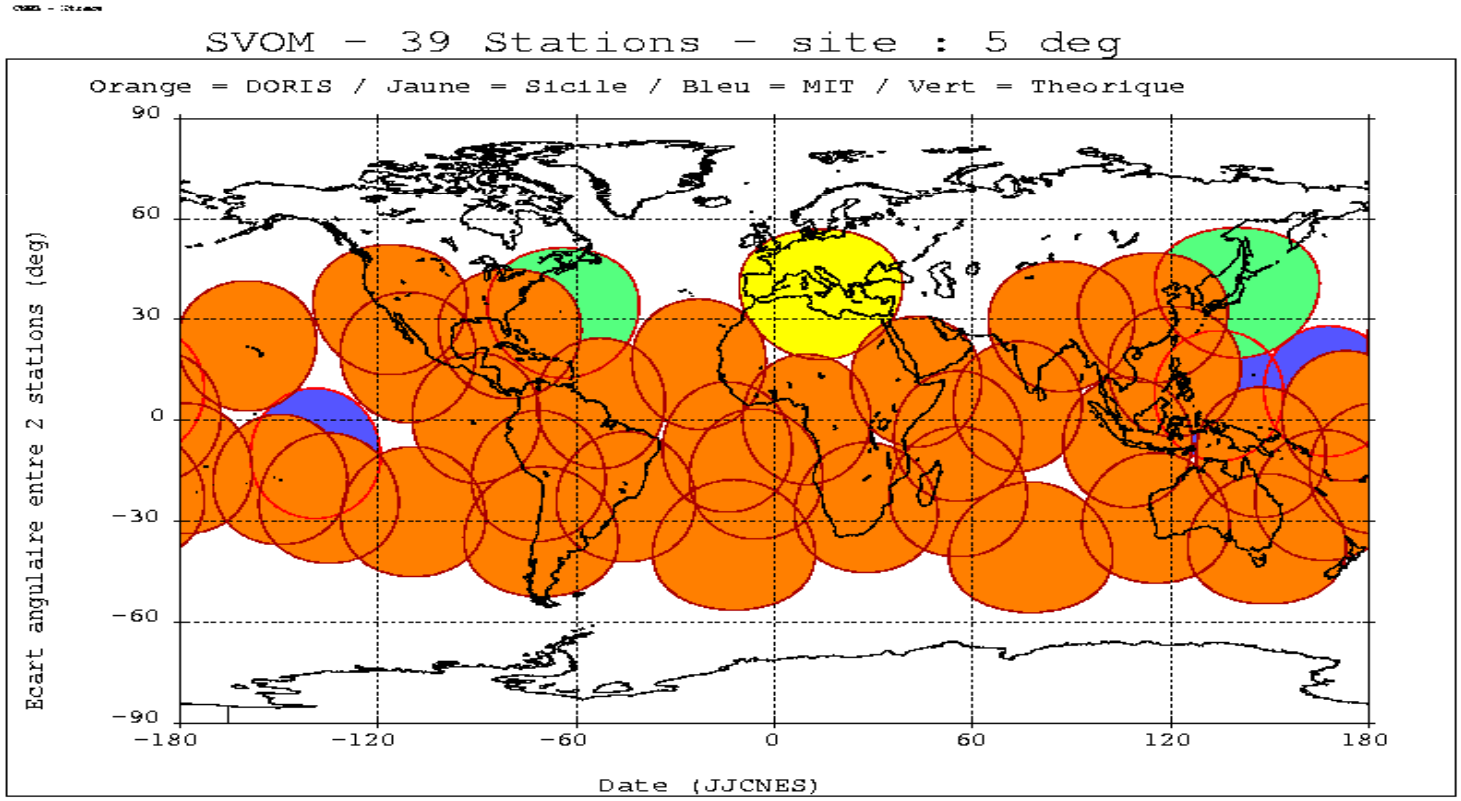
irfu
cea
saclay



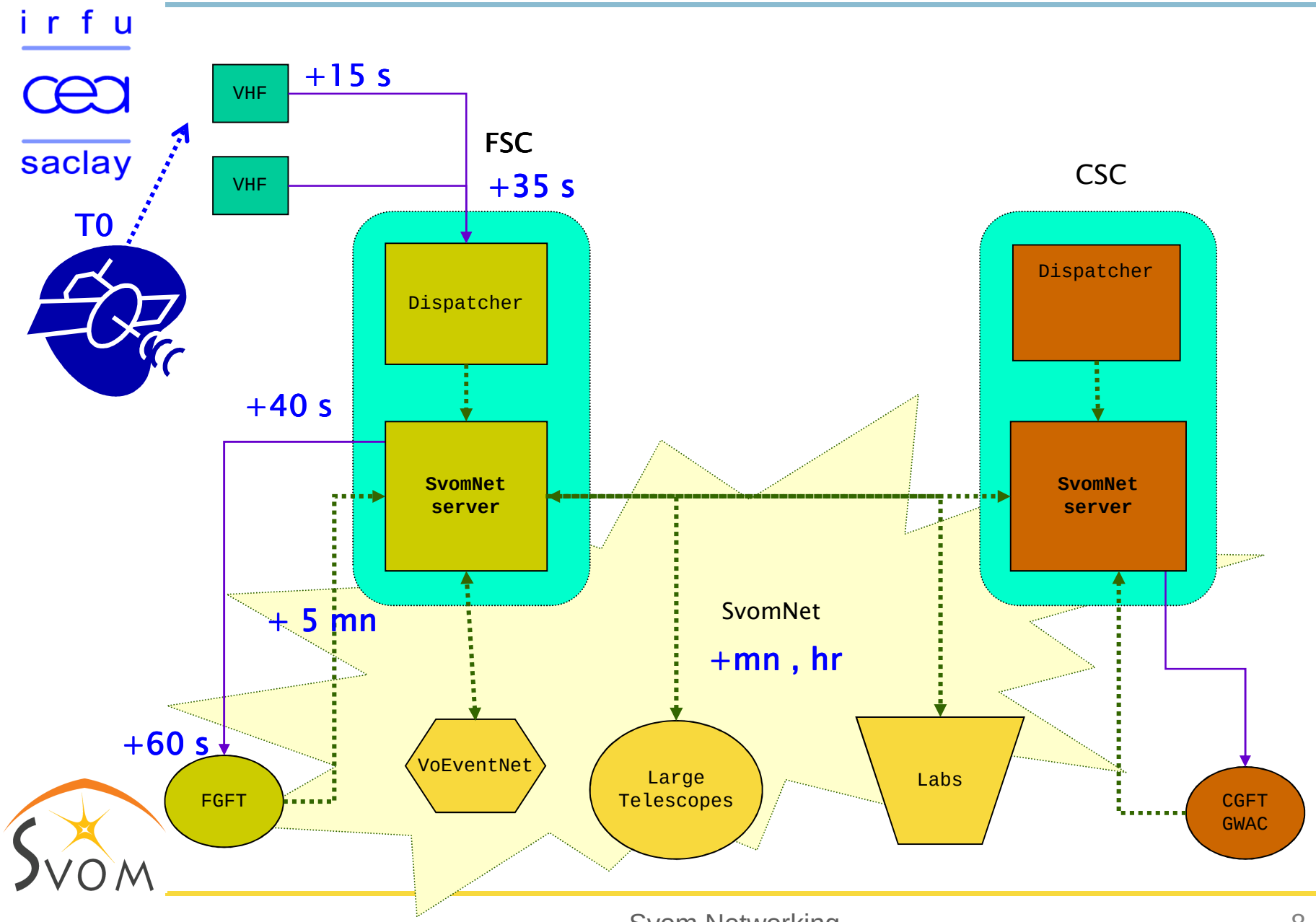
The VHF network

irfu cea saclay

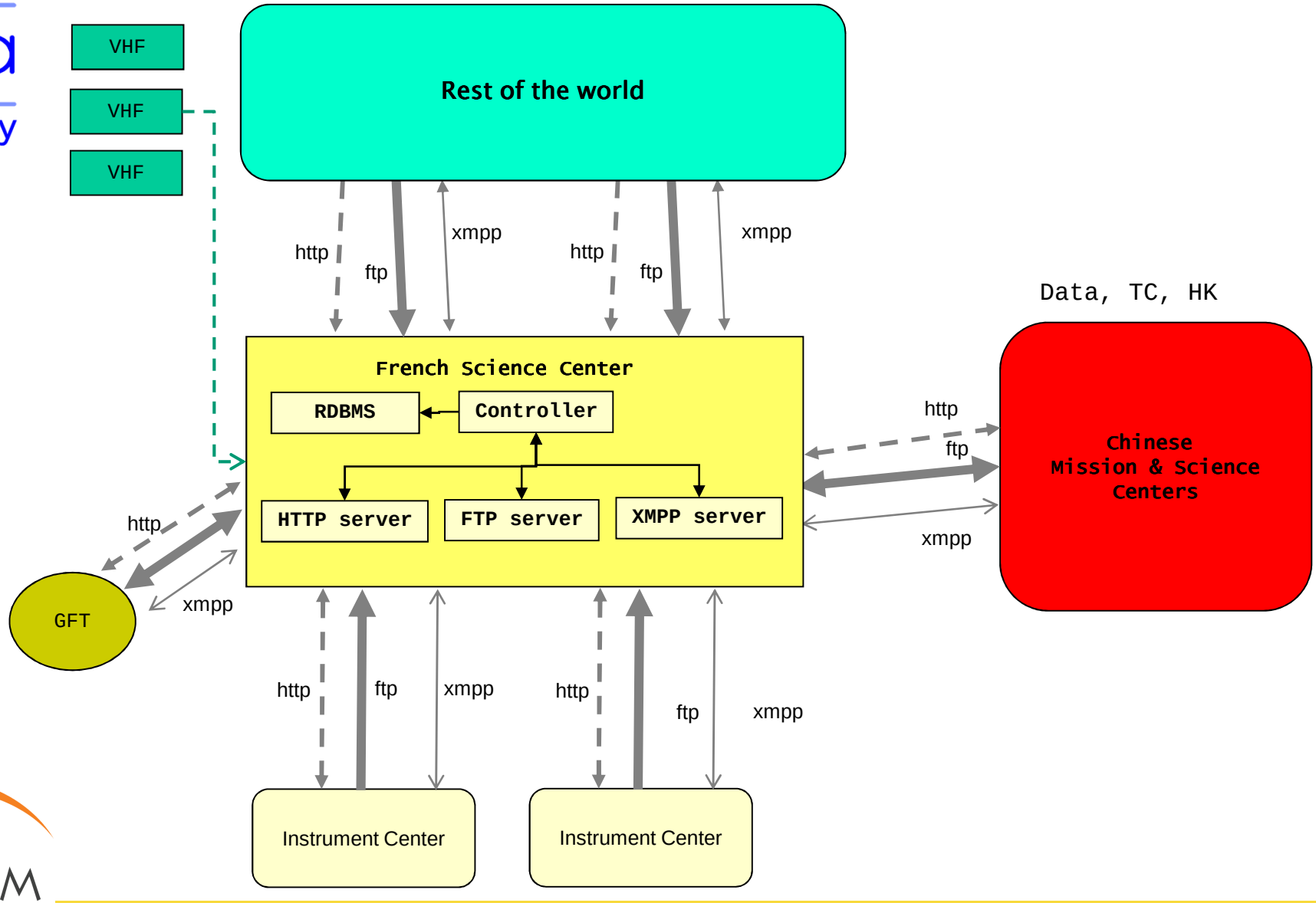
- Svom is based on the same principle as Hete2
- The spacecraft stays permanently in contact with the ground thanks to a radio link
- Possible locations are shown below :



Alert distribution requirements



FSC main interfaces & protocols



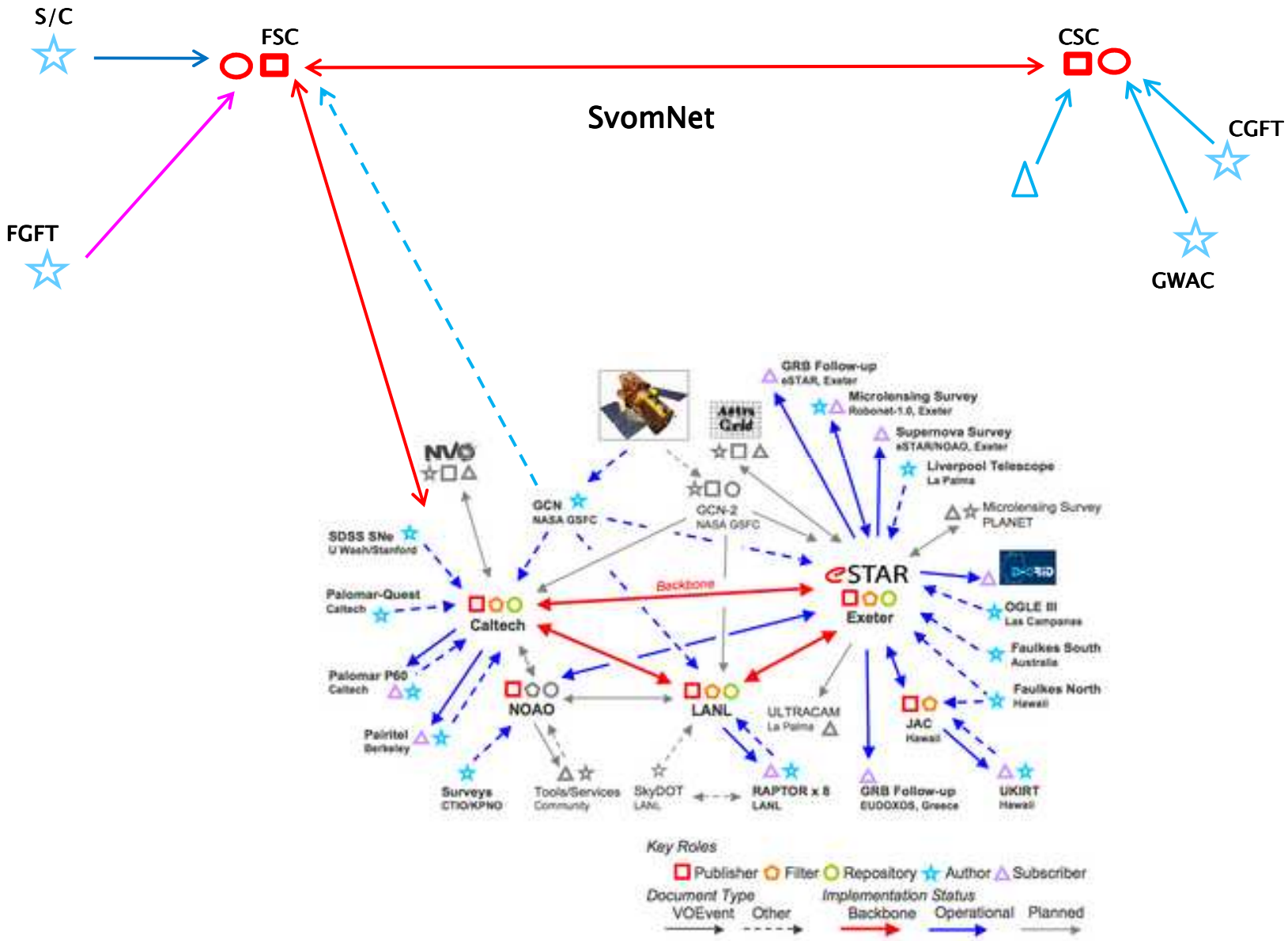
The VOEvent technology

irfu cea saclay

- Three different layers need to be addressed :
  - Content of the VOEvent packets
    - Format v1.1, v2.0
    - Mission-specific data
  - Transport protocol
    - How to transmit a packet from a source to a destination ?
  - Global architecture
    - Servers, repository, registry
    - Queries

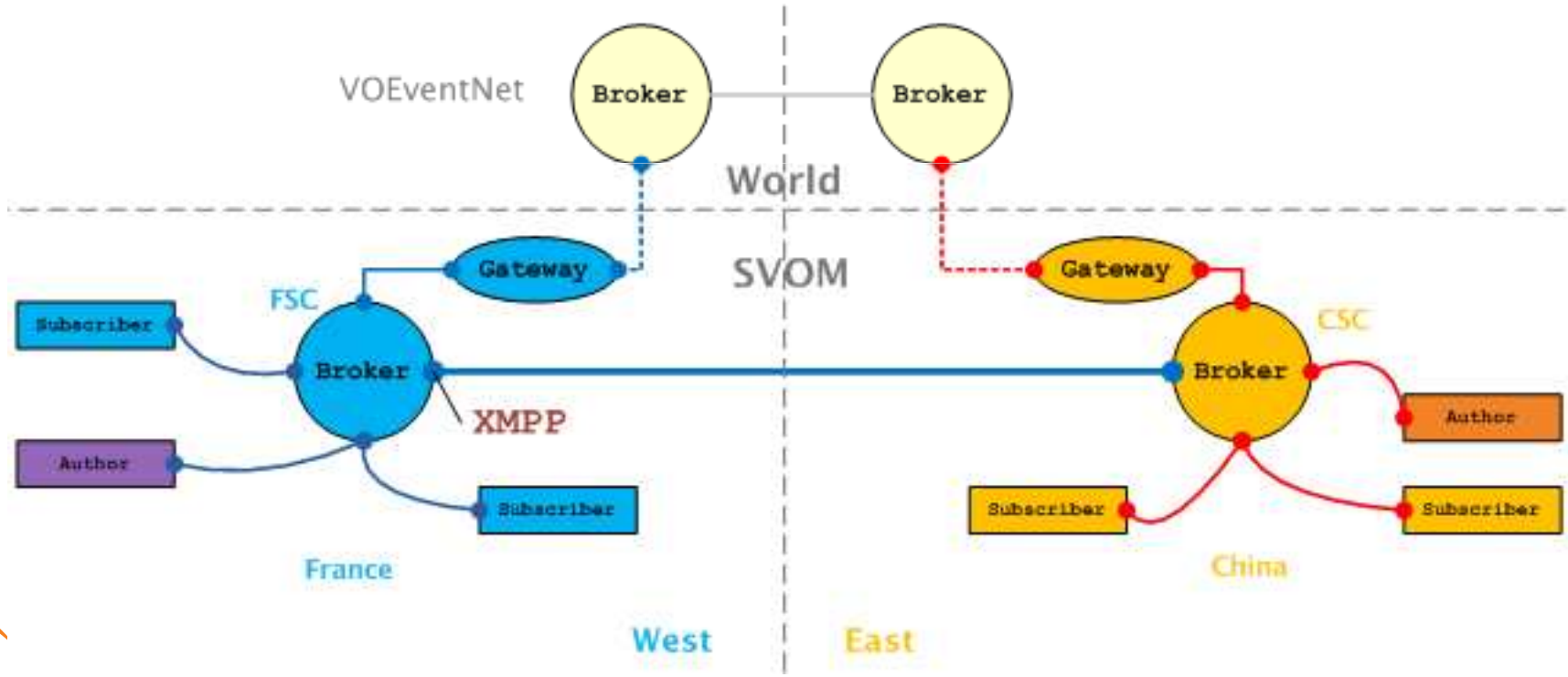
SVOM

SvomNet collaboration



Alert messaging architecture

- France-China symetry
- Gateway between Svom and the rest of the world
- Brokers are in charge of the message distribution
- Some agents publish messages, others read them



Which transport protocol for our VOEvents ?

irfu cea saclay

- XMPP, VTCP, Dakota ?
- Our choice is XMPP + PubSub :
  - No need to reinvent the wheel
  - Widely used on the internet
  - Open source libraries, clients, servers available
  - Provide features necessary for Svom

- Svom is not an observatory but a PI-led mission
  - We are required to control access to the alert messages
- The Publish-Subscribe extension has the concept of *Affiliations* defining various privileges granted to the possible different user roles
- Technical tools are available to implement any policy decided by the PIs

SVOM

Affiliations and their Privileges

irfu cea saclay

Access models : Open, Presence, Roster, Authorize, Whitelist

Affiliation	Subscribe	Retrieve Items	Publish Items	Delete Single Item	Purge Node	Configure Node	Delete Node
Owner	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Publisher	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*No*	*No*
Publish-Only	*No*	*No*	*Yes*	*Yes*	*No*	*No*	*No*
Member	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*
None	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
Outcast	*No*	*No*	*No*	*No*	*No*	*No*	*No*

SVOM

The roadmap

irfu cea saclay

- The actual content of the Svom VOEvent messages is not yet specified so we decided to work on the distribution architecture
- The first step was to get used to working with XMPP : installing a server, implementing test clients, playing with them from different locations
- Then we set up the link between the French and Chinese servers
- In a second stage we have been working with the PubSub extension : creating nodes, displaying their configuration, checking the access rules
- Then we started to manipulate VOEvents using real messages sent by Swift, Fermi, Integral …
- And now we are integrating VOEvent handling and XMPP distribution

SVOM

The development environment

irfu cea saclay

- Our code is written in *Java* (Sun jdk 1.6)
- It is managed with *trac* and *subversion*
- We also use *hudson, checkstyle, findbugs, testng, …*

- VOEvents are parsed using *jaxb* version 2.2.1
- We managed to parse v1.1 and v2.0 VOEvents

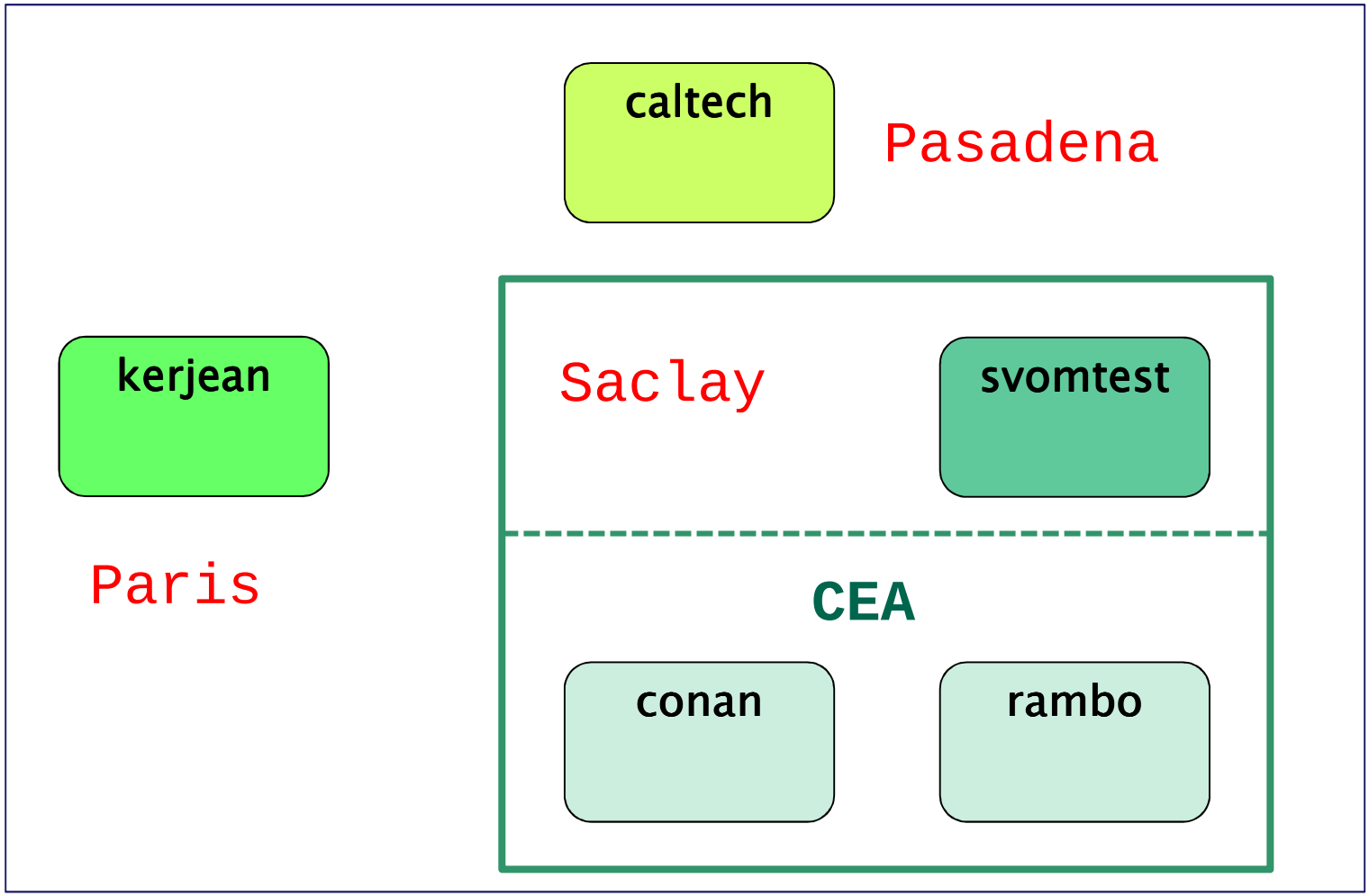
- **Openfire** has been selected for the XMPP server side but we also have an Ejabberd available
- The **Smack** API is used to implement the various clients needed by this study
- The last available versions from the Ignite Realtime *svn* repository are necessary

SVOM

The testing environment

irfu cea saclay

- Many servers and clients in different locations



My XMMP Toolbox

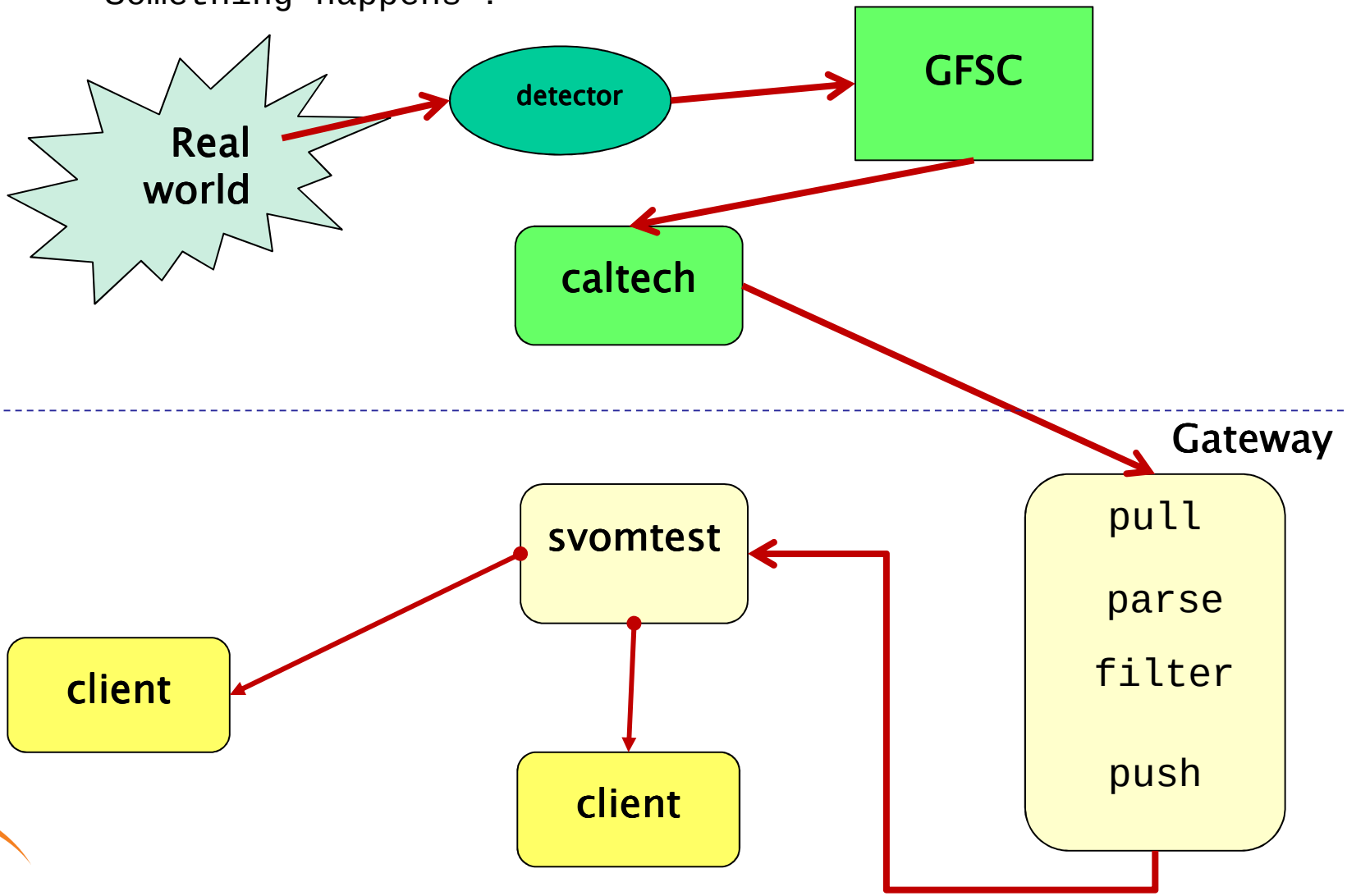
irfu cea saclay

- At this point we have more than 10 client programs available to investigate our XMPP configuration , e.g. :
  - `java fr.svom.xmpp.clients.Ping`
  - `java fr.svom.xmpp.clients.Hello`
  - …
  - `java fr.svom.xmpp.clients.VoEventReceiver`
  - `java fr.svom.xmpp.clients.NodeManager`
  - `java fr.svom.xmpp.clients.InfoQuery`
- And we have a couple of add-ons plugged in the server :
  - `fr.svom.openburst.plugin.PubSubProbePlugin`
  - `fr.svom.openburst.plugin.NodeProbePlugin`

What is implemented and working …

irfu cea saclay

- Something happens !



First conclusions

irfu cea saclay

- No major difficulties in XMPP programming
- But a bunch of minor problems to work out
- And many different aspects to deal with

- Architecture looks correct
- The Openfire server works fine and is easily configurable

- Travel times in the internet stay small : from some tens of ms to some hundreds of ms.
- VOEvent parsing take some time : a couple of hundreds of **ms** on a standard computer

- More details on : **`http://svomtest.svom.fr`**
- Contact : **`jean-paul.lefevre@cea.fr`**

SVOM


That’s all folks !