SVOM Science Ground Segment

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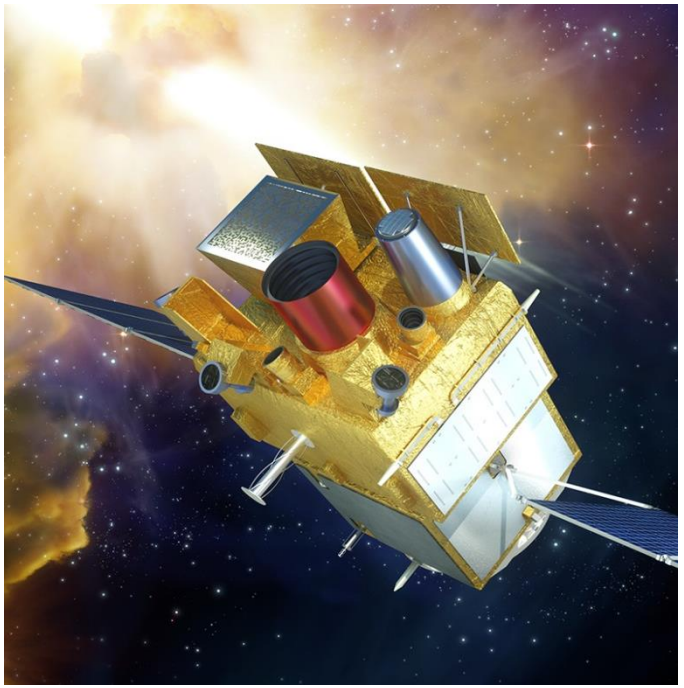
on behalf of the SVOM Ground Segment team

GRB Mission “SVOM”

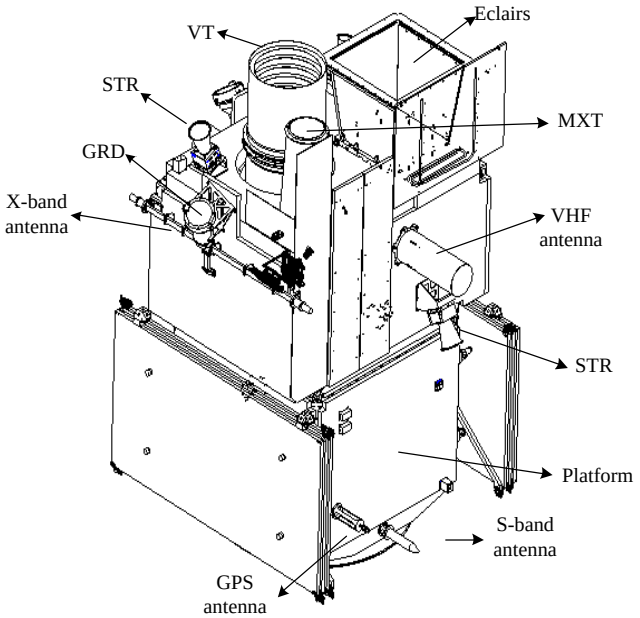
- The Space-based multi-band astronomical Variable Object Monitor (SVOM) is a collaborative project between China and France to detect, localize and study of ~60 Gamma Ray Bursts (GRBs) per year.



- SVOM is being transformed into a time-domain orbital observatory.
- Passed PDR and goes into Phase C starting 2017. Planned to be launched to a low inclination, low earth orbit in 2021, with a life of 3-5 years.

Payload instruments

- *ÉCLAIRs*, dedicated to GRB trigger and localization, having a large field of view (FOV) which can detect GRBs in the hard X-ray energy band (CNES, IRAP, CEA, APC)
- *GRM* (Gamma Ray Monitor) dedicated to measurement of gamma-ray in high energy band (IHEP)
- *VT* (Visible Telescope) an optical instrument dedicated to GRB follow-up observation on board (XIOPM)
- *MXT* (Micro-Channel X-ray Telescope) dedicated to GRB follow-up observation in soft X-ray band (CNES, CEA, LAL, UL, MPE).

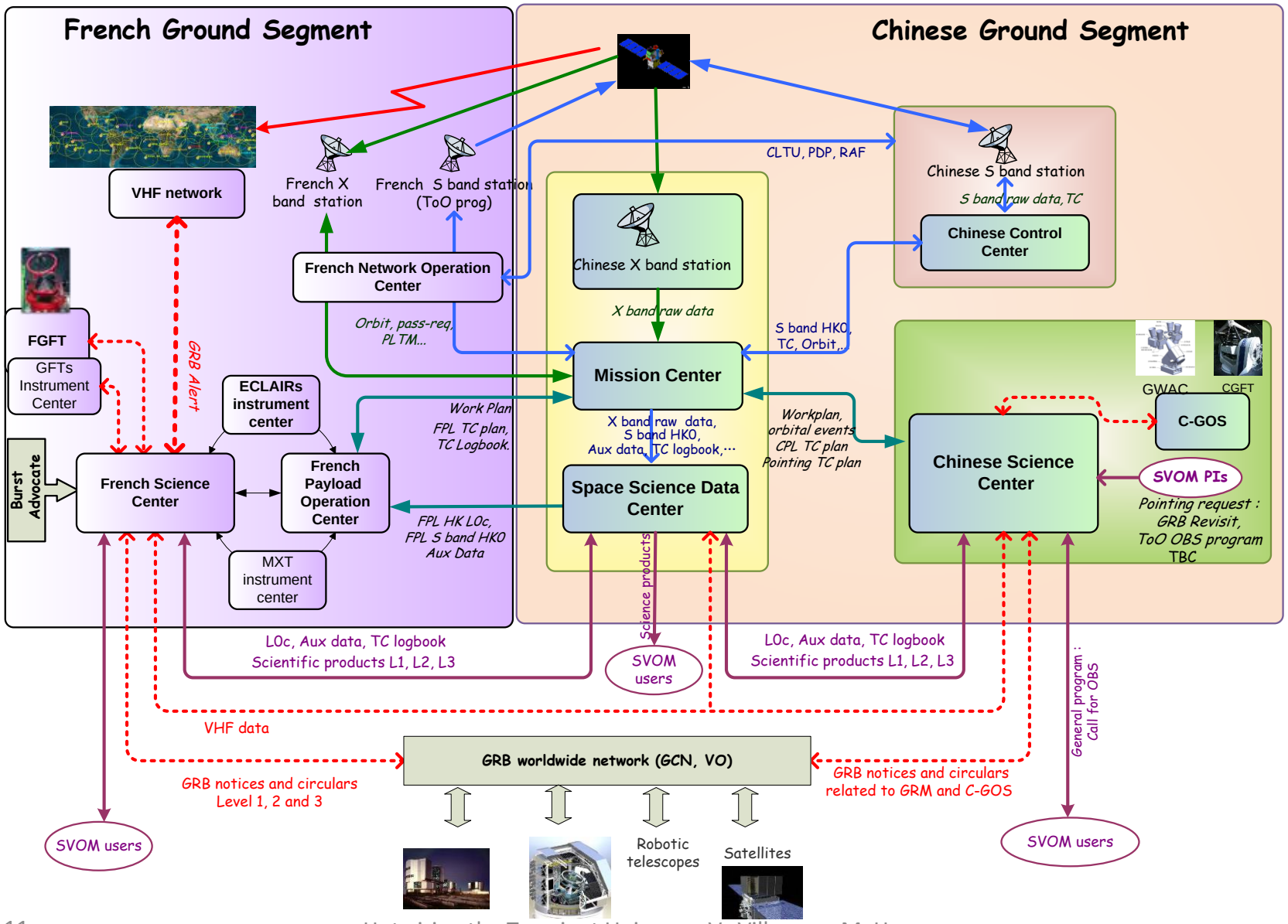


Ground based instruments

- C-GFT, the Chinese ground follow-up telescope
  400-1000nm 26'×26'
- GWAC, an array of ground wide angle cameras
  400-900nm 5000 SqDeg
- F-GFT, the French ground follow-up telescope
  400-1700nm 25'×25'



Overview of SVOM ground segment



SVOM Observing Programs

- Core Programs (GRB)
- General Programs
- ToO Programs
  - Nominal ToO (including revisit of GRBs)
  - Exceptional ToO

Core Program actions and time requirements from satellite to VOEvent network / GCN

Data acquisition on board T0+22 sec

Onboard instruments

VHF Network Ground Stations

VHF Data (All onboard instruments) 5 sec

FSC (CEA, Saclay)

CSC (NAOC, Beijing)

Alert notice 5 sec

GRB Notices 5 sec

Alert notice 2 sec

X-band and S-band telemetry

VOEnet, GCN

FGFT

Mission Center

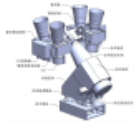
L0 data T0+4 to +14 hour

GRB Notices and Circulars As soon as available

GFT Observing results 5 min

CGFT

GWAC



Responsible Science Center (CSC or FSC)

Space Sci. Data Center

GWAC results -5 min

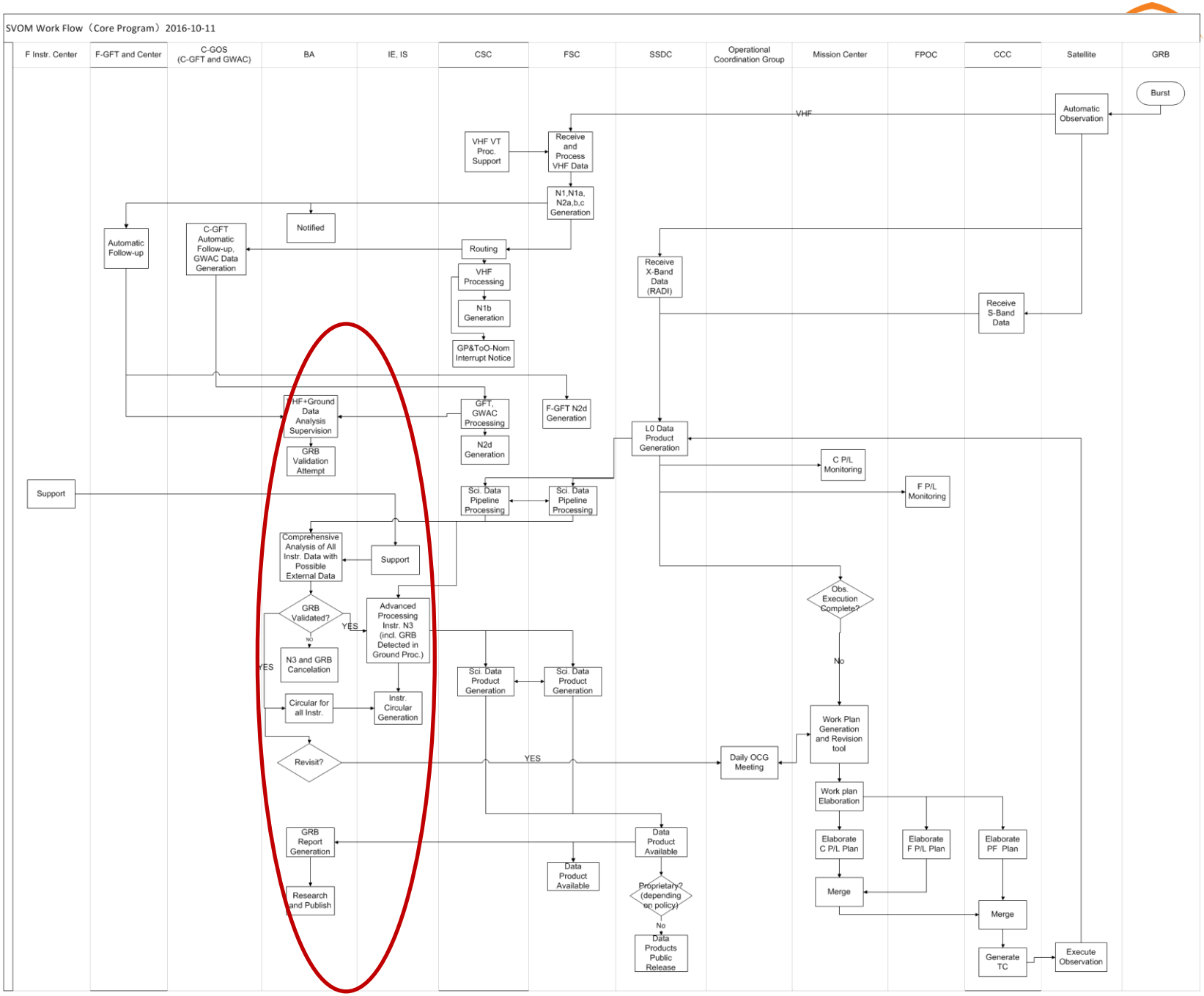
Final Products T0+24 hour

Burst Advocate and Instr. Scientists and Engrs

GRB Community

Many telescopes can be added to follow-up networks with flexibility.

GRB (Core) Program

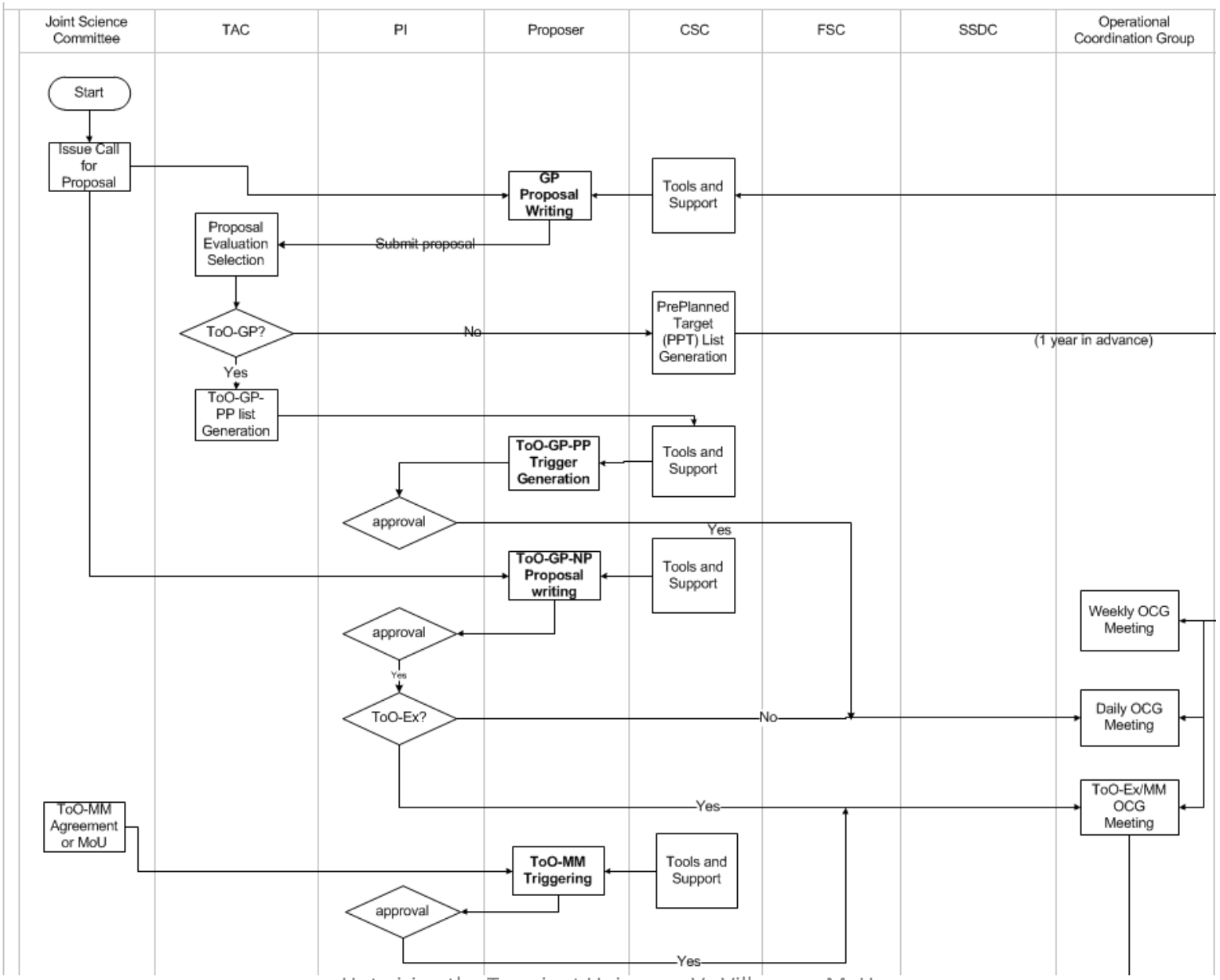


General Programs

1. PIs issue call for proposal once a year for ÉCLAIRs, VT, MXT, and ground instruments
2. Observers write and submit proposal with tools supported by the Science Centers
3. TAC evaluates, selects and allocates time, and form a one-year Pre-Planned Target
4. PPT executed by the Mission Center, subject to interruption and re-scheduling due to Core and ToO activities
5. Once observed, data are processed in standard pipeline and released to observer.

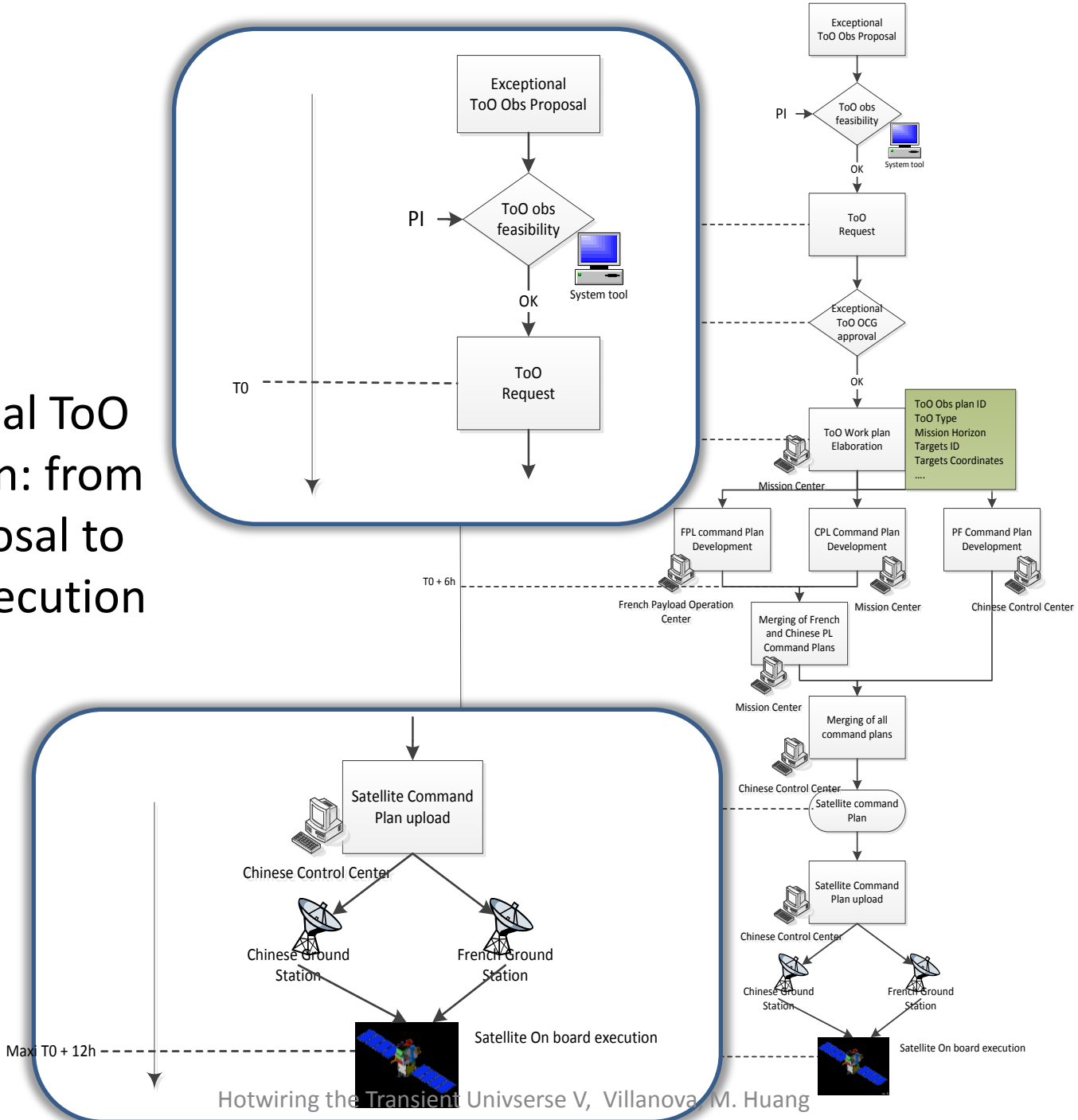
- the details are being refined.

GP and ToO workflow as of PDR



Mission Center

Exceptional ToO observation: from obs. proposal to satellite execution



ToO Summary

ToO	Approval	From accep-tance/ trigger	GRB inter-ruption	Frequency	Duration	Tiling process	Science product availabl-ity	VHF Canal	VHF data
ToO-NOM	PI	<48h	Yes	MAX 1/day => 5/day	1 orbit	No	24h	No	-
ToO-EX	PI	<12h	No	MAX 1/month	1-14 orbits	No	24h	No	-
ToO-MM	Automatic +PI	<12h	No	MAX 1/month	1-14 orbits	Yes, 3 tiles/orbit	VHF<1h BX 24h	Yes	MXT photon-list

ToO-NOM :

ToO-CP (GRB revisit)

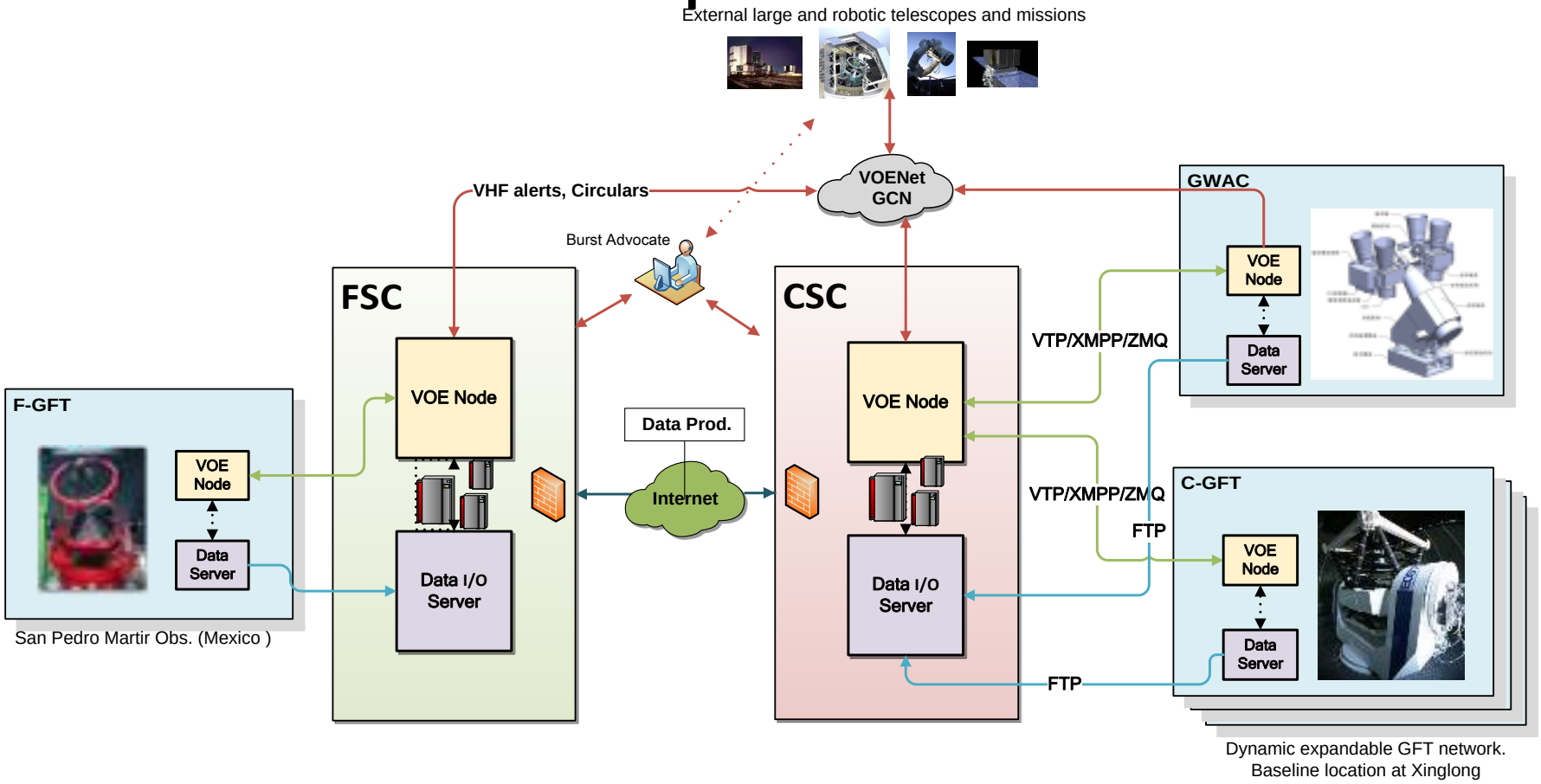
ToO-GP-PP (Pre-plannedGeneral Program targets)

ToO-GP-NP (General Program targets not planned)

ToO-EX : for exceptional astrophysical events

ToO-MM : search for EM counterpart to multi-messenger alert

Ground telescopes SVOM to use



- Two base-line ground follow-up telescopes with guaranteed fast (T0+5 min) turn around photometric results. More telescopes can and will join the network with flexibility (implementing a standard interface).
- A wide angle camera array as a time-machine (T0-5 min)
- Burst Advocates (BAs) will coordinate extensive use external large telescopes and missions for multiband and spectroscopic follow-ups .

Overall development approach

- There is significant risk in SGS readiness if a “Water Fall” development approach is adopted, where a full functional system only come into existence at the end of Satellite/System development.
- To mitigate the risk, the Science Centers are to follow an iterative approach to develop a **Basic** simulation system, a **Core** function system, and a **Full** system in Phase B, C, D, respectively.
- The goal is that by the time of launch, the SGS will be highly mature. It will have been used by its users for years to process simulation data, ground instrument data, and payload testing data during development phases. There will be a smooth, seamless transition between mission phases.

summary

SVOM ground segment is being designed to offer guaranteed follow-up capabilities, quick reaction time, a flexible architecture, and essential infrastructure to meet the requirements of SVOM observation programs as time-domain astronomy enters a rapidly expanding period.

Wishes

- A pool of follow-up telescopes implementing a standard interface (data, control, condition), ready to observe with little human negotiation.
- Automated broker/aggregator to provide not only all available data of a given position with error box, but also all scheduled observation of that position in a given time window in near future. APIs need to be in place by telescope facilities for this.
- A mobile multimedia platform to connect BAs, IS/IEs (instr. Scientists and experts), proposal observers, and anyone who has observed the target, and make result sharing easy.

Thank you