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M E E T I N G

meeting date *date de la réunion*	30-31/05/00	ref./*réf.*	FIRST/FSC/MOM/0132	page/*page*	1 14
meeting place *lieu de la réunion*	RAL	chairman *président*	SV		
minute's date *dates de minute*	07/06/00	participants *participants*	See appendix		
subject/objet	**FGSSE Mtg #6**	copy/*copie*			

description/description	action/action	due date/date limite

O b j e c t i v e & A g e n d a

See SV's VG#1

There were no comments on the proposed agenda

There were no comments on the FGSSE#5 MoM.

R e p o r t i n g f r o m o t h e r s y s t e m e n g i n e e r i n g a c t i v i t i e s

RH raised the issue of the scope and pace of the FGSSE activities wrt other FIRST related working groups (especially the EGSE group).

All parties recognized that these groups are working largely independently from one another with almost no cross communication and with no formal mechanism in place to coordinate their activities. The coordination relies today largely on individuals who happen to belong to multiple groups . Although, this is believed to have worked so far , it is feared that with design activities stepping up this may not be sufficient anymore. It was recognized that this lack of coordination could lead to 1) unnecessary overlap and duplication of work 2) design inconsistencies or sub-system design (e.g. EGSE) driving FGS design (instead of the other way around). The latter was stressed by RH who feels that the EGSE group is ahead of the FGSSE group in terms of design.

One concrete example was put forward: the CUS. Several groups are working on the CUS (at least the FGSSE and EGSE groups) and it is not clear who is in charge of what. More specifically, the exact purpose/scope of the development of the CUS URD by a sub-group of the EGSE working group could not be clarified. It was also not clear how this development matched the understanding of the FGSSE group

(see FGSSE#5) that the CUS was to be specified/designed as part of the Ground Segment main stream development respectively through use cases and the COM.

To remedy this situation, it was felt necessary 1) to review of the terms of reference of the different WGs so at to make sure that they fit in the overall FGS development picture 2) to establish a formal coordination of the groups/teams activities and as part of it a more formal communication flow between these groups. Wrt the latter, SV pointed that today he is not receiving, nor the agenda, nor the MOM of the EGSE working group(s).

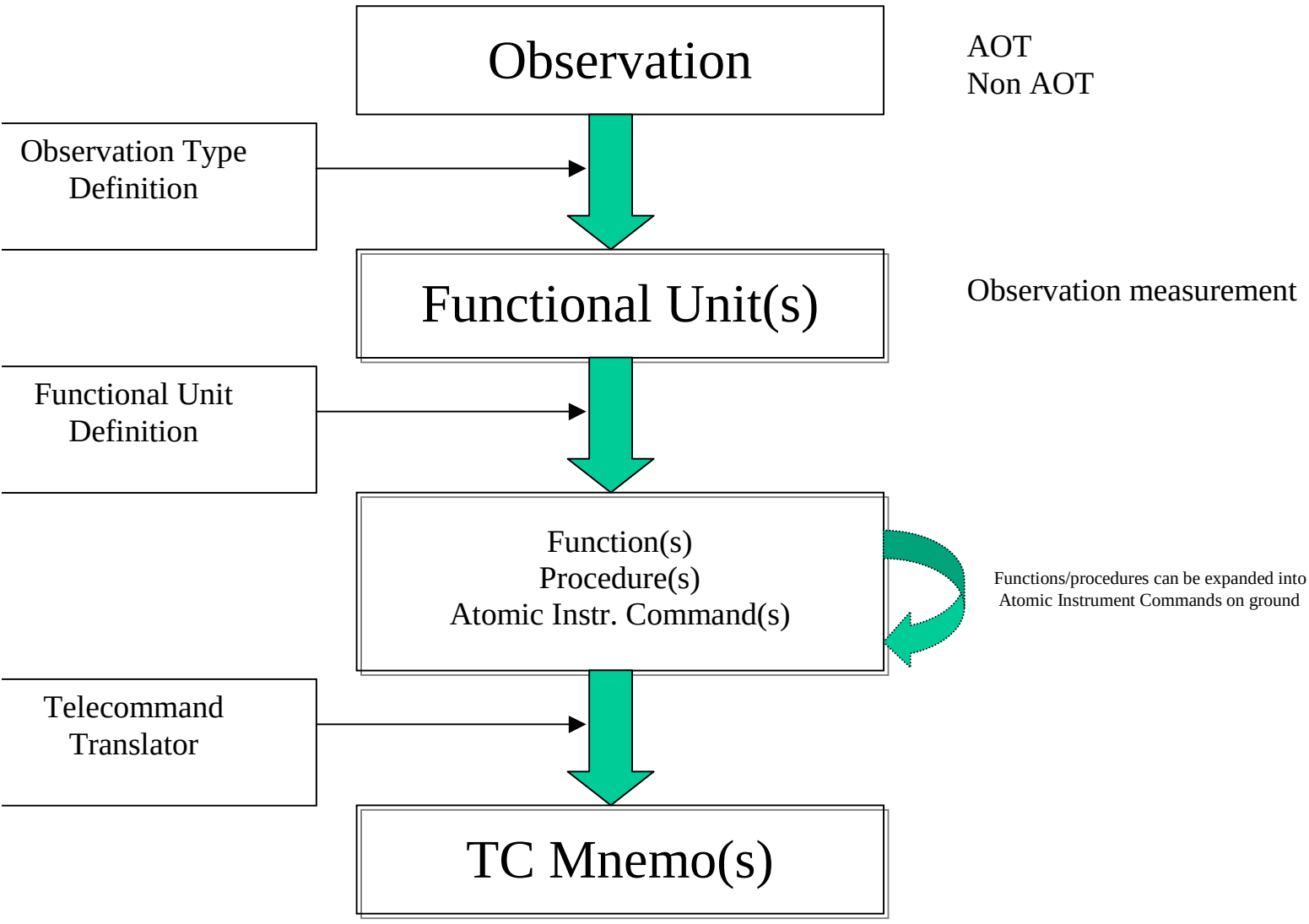
SV pointed out that the FGSSE is not competent to carry-out the above 2 points and that it should be the object of a special FGSAG meeting. SV took the action (non formal action) to have this proposal on the agenda of the next FGS managerial teleconf planned for the 7th of June.

[SV's post meeting comment: In the mean time, this teleconf has been cancelled: project and SPIRE representatives could not attend. Preliminary discussion on this point is now scheduled at the next EGSE meeting on 15/06/00 in ESTEC, a dedicated meeting on this point may take place before end of June (TBD at the EGSE meeting)).

Uplink system design issue: CUS

SV recalled the CUS concept as presented by RH at the FGSSE#5 (see SV's VG#8). PR pointed that the VG was mis-leading: the CUS should allow to define Functional Units directly with atomic instrument commands. In fact, it should be possible to define Functional Units as a combination of procedures, functions or atomic instrument commands. Also, it shall be possible to translate on ground functions and procedures into atomic instrument commands for the purpose of e.g. testing/debugging instrument.

Following this discussion, the CUS concept was redrawn as follows:



The importance of having a technical note which further explains this concept was re-stated by SV and PR. It will serve at least two purposes: 1) to communicate the concept among the different groups/teams interested in the CUS (e.g. EGSE, FGSSE, On-Board SW CWG, FSCDT, ICCs, MOC) and help reach a common understanding among these groups 2) to be used as an input to the elaboration of the COM, as the CUS concept is defining abstractions levels which may have to be translated into the COM.
The action on RH **AI#200400/5: RH to draft a CUS technical note in time for discussion at the next FGSSE meeting** was therefore left open with a new due date: 07/07/000

SV also pointed to the open issue raised by PACS (EW) at the last meeting: Some specific instrument commanding phase (e.g. for instrument set-up or for instrument debugging), may lead to a burst in instrument commanding which may not be compatible with the limitation of (TBC) 2 TC/s from the CDMS to each instrument (see outcome of **AI#200400/4** from PE). This, in turn, could lead to the need to group on the ground several instrument commands within one TC. This is not supported in the current CUS concept. According to RH, PACS does not consider this a problem anymore: the PACS instrument will be designed to be operated with not more than two instrument commands/second in all configuration.
In this discussion, it was also pointed by JD that the OIRD puts a limitation of one instrument command per TC.
JD also pointed that the 4kbs commanding rate is the true limitation wrt to instrument commanding. The bus limitation (2 TC packets/s with TC packet < or = to 256 B) is only a limitation for peak traffic. According to JD's computation, uplink of 30' at 4 kbs for a 24 hours OD corresponds to an on-board commanding rate of 56 bits/s, i.e. well under the bus limitation. JD clarified that 4 kbs TC uplink rate includes overhead (i.e. TC frame and packets header/trailer for the on-board scheduling service)

Overall system design

SV presented the VGs#2 to 6. VG#4 to 6 represents (SV understanding at the start of the meeting) the different FGS centres for respectively commissioning, routine and post-mission and how they interface to each others. VG#2&3 represents respectively the different ILT and IST sub-systems and how they interface to each others. The orange colour and pink colour represent respectively the parts of the FSC System and ICC System which are common to all phases (concept of smooth transition).

The following comments/clarifications on the VGs were made in the meeting:

Overall

- The TM dispatcher in ICC@MOC or in ILT and IST is not necessary: 1) NRT TM is expected to be distributed to ICC@ICC using ODBMS services (replication or remote access) 2) ICC sees no point in having NRT TM going simultaneously to RTA and FINDAS. NRT TM will flow either directly to RTA (potential case where FINDAS is not yet operational at the start of ILT) or to FINDAS, RTA reading then NRT TM from FINDAS.
  SV stressed that the direct flow to RTA should be part of the design and should be considered from the start. ICCs disagreed and do not see the point in making any provision in the design for this direct link at this point in time, as this will only be needed if FINDAS fails to make it for the start of ILT. No agreement was reached on this point.
- FINDAS and RTA will interface through a "receiver"(SCOS-2000 terminology) which will act as a front-end to RTA. SCOS-2000 documentation defines the minimum functionality to be supported by the receiver (e.g. detection of missing TM packets, TM packets bufferisation,). The receiver will be developed by the ICCs.
- The TM packet ingested into FINDAS will not include SCOS-2000 headers. SCOS-2000 headers will be added to TM packets for RTA purpose by the receiver.

- It was clarified that no SCOS-2000 functionalities will be lost having FINDAS between the TM I/F and RTA, in particular it should still be possible to play back TM and automatically resynchronize with RT monitoring.

Commissioning:
- NRT TM from MOC includes both live and dump TM.
- There will be two separate NRT TM streams per instrument, one for live TM and one for dump TM.
- Upon interruption of the MOC-ICC@MOC NRT link, the NRT TM distribution will not be recovered, i.e. TM packets arrived at MOC during the interruption will never be delivered to ICC@MOC.
- Conceptually the MOC DDS is in charge of NRT TM distribution , however NRT TM distribution will be supported by a separate server.

Commissioning and routine:
- Any file import from the DDS shall be initiated by a request from the FSC (also valid for consolidated TM)
- Time Correlation information will be passed from MOC to the FSC in a separate file. It was pointed by JD that Time Correlation information may not be needed at all by FSC and ICC. Indeed MOC has the requirement (see OIRD) to maintain the on-board time correlated with ground time with an accuracy of 30 ms.
  Ground and board time reference would be in IAT (International Atomic Time) and not UTC, this is a project requirement (JD). This may lead to complication in the FGS, e.g. the SCOS-2000 generate the TC history with UTC times, to correlate TC and TM may therefore not be so trivial. This needs to be further investigated, however no formal FGSSE action was taken. A definition of IAT can be found at http://www.bipm.fr/
- OOL and Derived parameter information will be passed as separate TM packets (TBC) as part of the consolidated TM.

ILT:
- SV clarified that the MPS-ILT and PHS-ILT should be understood as the minimum environment to support the submission of non-AOT observations (PHS-ILT) and the generation of instrument TC mnemomics from these observations (MPS-ILT). This will correspond to the ILT implementation of the CUS concept.
- ICCs are looking at the SCOS-2000 router for supporting the TM/TC I/F.

IST:
- SCOE should be renamed CCE (Check-out Control Equipment)
- FEE outputs are expected to be provided in the same format as satellite TM, i.e. PUS TM packets, which can then be ingested into FINDAS. JD mentions that this is covered by a requirement on the CCE in the ITT. However, it was not clear that there were a requirement on the CCE to accept instrument commanding as to be generated by MPS/CUS. PR will check it.

ILT & IST:

- In ILT and IST, the instrument commanding absolute timing will be defined at the level of the test and not at the time of the generation of the instrument commanding sequence by the MPS/CUS. Absolute time of the TC execution will then be fed-back to FINDAS with the TC history (in fact the absolute time at which the TC has been released to the instrument by the scheduler (IST) or the Test Control (ILT)). As a consequence the TC history has to be ingested within FINDAS for ILT and IST.
  It was noted that this is different from in-orbit operation where the absolute time of the instrument commanding will be generated up-front by the MPS within the FSC.

As part of the above discussion the VGs were amended, see appendix.

It was then agreed that on the basis of the amended VGs and above comments, the FGSSE could start to formally document the FIRST GS System Design. A consolidated draft of this document (the FIRST GS System Design Document or FGSDD) should be issued for Oct 00, i.e. in synch with the end of the FSC System elaboration phase part 1. It was agreed that this document should be written with text/diagrams inputs from all 3 parties, MOC, ICC and FSC. In this context, 3 actions were taken:

⇨ **AI#310500/1 : SV to propose a TOC for the FGSDD, with draft definition of scope and purpose of the document and define responsibilities for the different sections. Due date 09/06.**

⇨ **AI#310500/2: ICC and MOC representatives to comment on SV input to FGSDD ToC : Due date 23/06**

⇨ **AI#310500/3: FSC, ICC representatives to deliver first inputs to FGSDD in time for the next FGSSE meeting: Due date: 07/07.**

⇨ **AI#310500/4: MOC representatives to deliver first inputs to FGSDD in time for FGSSE meeting in August. Due date: 25/08**.

JD and NP are on leave in July and cannot attend the FGSSE meeting in July.

ICDs identification

SV presented the list of ICDs as sent prior to the meeting, see appendix. It was first clarified that this was only a first attempt at establishing the list of FGS ICDs and that a final list could only be established once the FGSDD would be consolidated.

However , it was agreed that this first list was already worth reviewing. An action was taken by MOC and ICC to do so for end of June.

⇨ **AI#310500/5: MOC and ICCs representatives to comment on the FSC drafted ICD list. Due date 30/06.**

Some preliminary comments were provided at the meeting:

- A column should be added to capture the required availability date for each ICD (PR)
- TC, instrument TC mnemonic and TM format will be captured within the S/C and instrument databases (JD and NP). A formal document may therefore not be needed (TBC). For TM, that will include the format definition of the S/C and instrument HK TM packet (header + data segment) as well as the science TM packet header (not science TM data segment). That will also include the format definition for derived TM and OOL TM which will be generated by MOC. Variable TM packets may require a particular ICD (JD). The instrument database may first be the responsibility of the PIs but should then move to the prime contractor (development) and then to MOC (operation).
- It was noted that TC format was missing from the list.
- An ICD should be added for CCE generated TM (PR).
- The ICD related to the TM dispatcher is to be removed from the list (TM dispatcher is removed). However there is a need for an ICD to define the protocol to interface with the TM archiver (should be the same protocol in all phases).
- The instrument simulator SW I/F should be under the responsibility of MOC not ICC.

O D B M S f e a t u r e s

SV presented the output of **AI#200400/3**, see appendix.

ICCs took an action to send comments.

⇨ **AI#310500/6 , ICCs to send their comments on the list of required ODBMS features in time for the FSC objectivity/DB training. Due date: 09/06.**

Some preliminary comments were provided at the meeting:

- Regarding the SW development and CC support, PR and RH stressed the need to be able to link versions of SW and versions of data. If this cannot be supported by the ODBMS (Objectivity/DB does not), PR and RH sees it implemented as part of the data model. SV pointed that 1) in principle the FSCDT will privilege OTS tools to support CC, 2) if there is no current OTS solution, we need to know which are the future plans of ODBMS vendors in this respect, i.e. there is no need to develop now what can be offered OTS in a few years time 3) the effort for such a development should be carefully assessed before going for its development, if it was a simple low cost development, ODBMS would certainly already offer it.
- The fact that ODBMS ad-hoc queries cannot include call to classes methods is seen by PR as a problem. According to current understanding, ad-hoc queries can only reference classes attributes, i.e. data which are explicitly defined in the object model. PR argued that we cannot know in advance all data which will be needed in ad-hoc queries.

- It should be able to trace the need for test areas (sand boxes) to an FSCS UR. SV will check (non formal action).

Review of actions

Past actions:

⇨ AI#200400/1: PR to formulate the requirement on the FSC System to capture the need to have links between data, software and documents in the FSC System. Due date: 30/04/00.

Closed

⇨ AI#200400/2 RH to provide explanatory text to complete the FSC System requirement " The FSC System shall support distributed SW development". Due date 30/04/00.

Closed

⇨ AI#200400/3: FSC and ICCs representatives to compile the list of features to be supported by the DBMS in time for next meeting. Due date: 26/05.

Closed by SV email dated 26/05 (see appendix) and new action **AI#310500/6**

⇨ AI#200400/4: PE to provide the order of magnitude of the number of commands, which could be sent to an instrument by the CDMS within one second. Due date 30/05/00.

Closed

⇨ **AI#200400/5: RH to draft a CUS technical note in time for discussion at the next FGSSE meeting. Due date: 26/05/00 (i.e. in time for FGSSE group to read it before next meeting).**

Open with new due date: 07/0700

New actions:

⇨ **AI#310500/1 : SV to propose a TOC for the FGSDD, with draft definition of scope and purpose of the document and define responsibilities for the different sections. Due date 09/06.**

⇨ **AI#310500/2: ICCs and MOC representatives to comment on SV input to FGSDD ToC : Due date 23/06**

⇨ **AI#310500/3: FSC, ICCs representatives to deliver first inputs to FGSDD in time for the next FGSSE meeting: Due date: 07/07.**

⇨ **AI#310500/4: MOC representatives to deliver first inputs to FGSDD in time for FGSSE meeting in August. Due date: 25/08**.

⇨ **AI#310500/5: MOC and ICCs representatives to comment on the FSC drafted ICD list. Due date 30/06.**

⇨ **AI#310500/6 , ICCs representatives to send their comments on the list of required ODBMS features in time for the FSC objectivity/DB training. Due date: 09/06.**

A O B & N e x t M e e t i n g

FGGSE#7 meeting will be held in ESTEC on 13/07/00.

FGSSE#8 meeting will be held in ESOC on 30/08/00.

AOB:

PR notified JD and NP that HIFI had troubled to get SCOS-2000 documentation and code (e.g. router) from ESOC. JD and NP will check.

A t t e n d e e s:

John Dodsworth (ESA – ESOC)
Rik Huygen (KUL)
Nestor Peccia (ESA-ESOC)
Peter Roelfsema (SRON)
Sunil Sidher (RAL)
Stephane Veillat (ESA – FSC)

C c :

O. Bauer (MPE)
J. Brumfit (Aurora – FSC)
P. Claes (ESA – FSC)
T.G. Dimbylow (RAL)
Pierre Estaria (ESA - FIRST/PLANCK project)
K. Galloway (Aurora – FSC)
A. Heras (ESA-FSC)
S. Lord (IPAC)
J.J. Mathieu (ESA)
G. Pilbratt (ESA – FSC)
J. Riedinger (ESA - FSC)
E. Wiezorrek (MPE)

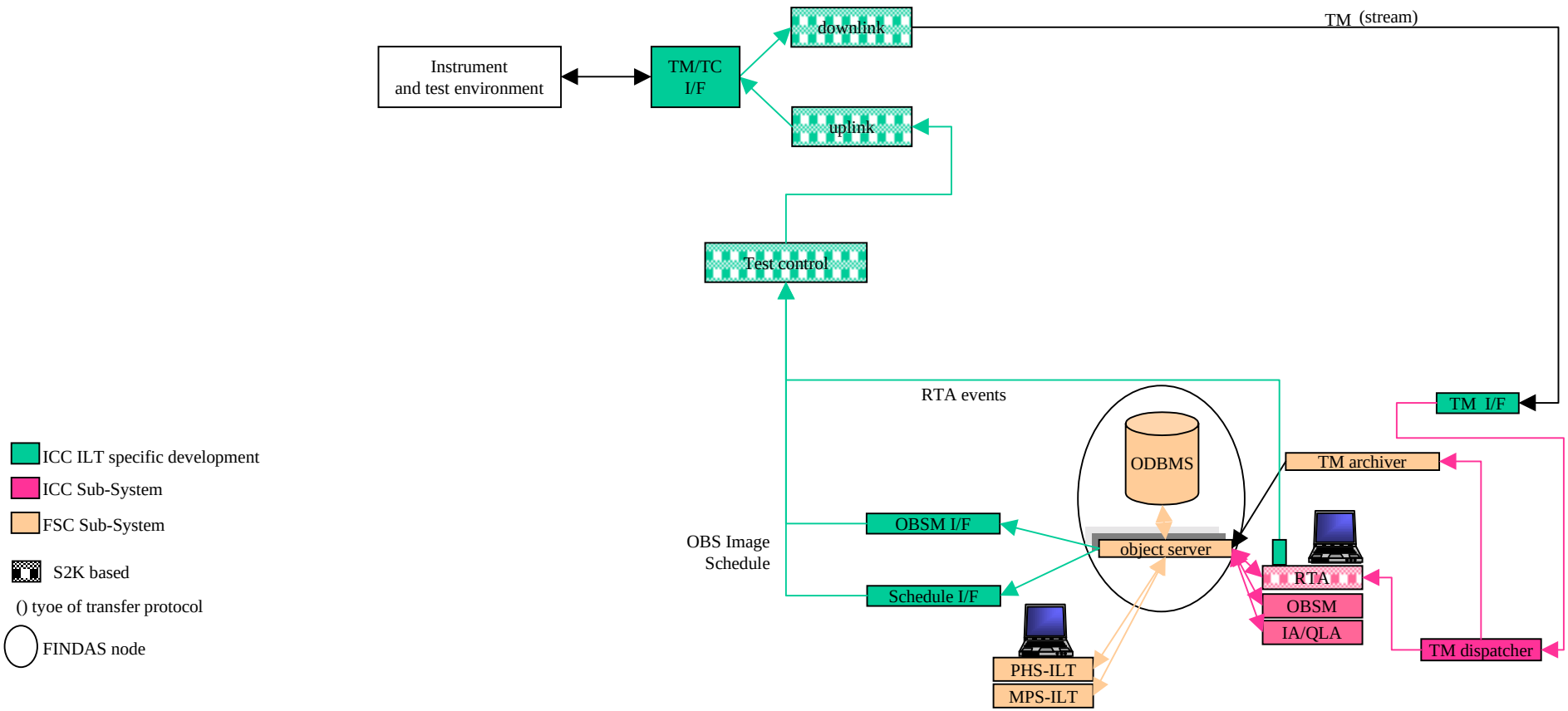
S V ' s V G s :

Agenda

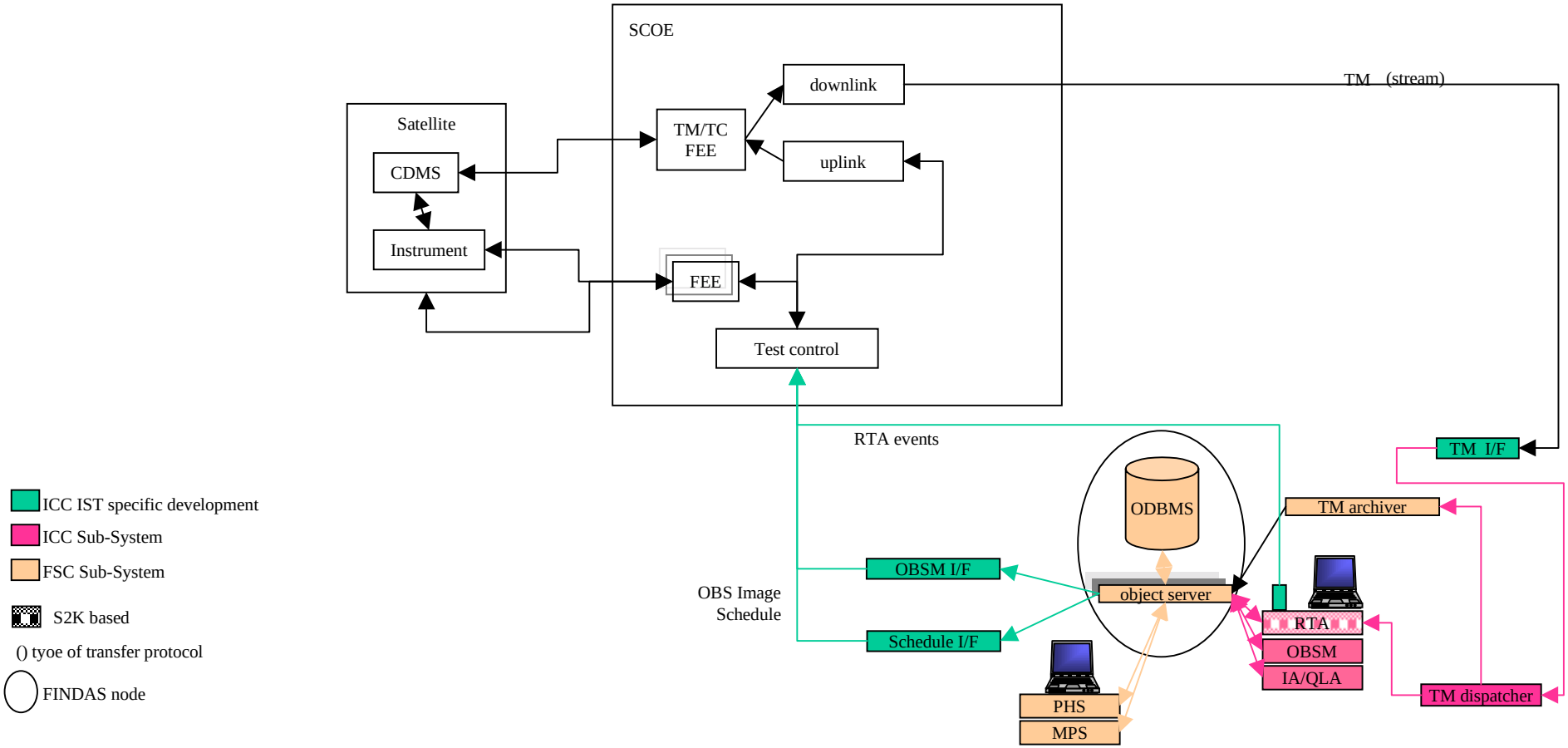
- **Comments on FGSSE Mtg#5 MoM, FGSSE#6 agenda**
- **Uplink system design issue: CUS (~ 1 hour)**
  - Review/consolidation of concept presented at FGSSE#5 wrt
    - instrument commanding concept as revisited at the May 15 meeting in Rome
    - limitation on on board commanding rate as outlined by PE answer to AI#200400/4
- **Overall system design recap (~ 2 hours)**
  - Presentation of current understanding of system design baseline (SV)
  - What remains to be defined to support ICD definition
  - Documentation of system design
- **ICDs identification, prioritization and schedule (initialization of) (~ 1 hour)**
  - Initialization of the ICD definition process
    - identification of ICDs wrt system design
    - prioritization/schedule of ICDs wrt ILT
- **FSC system URD and FINDAS URD vs OODBMS features (~ 2 hours)**
  - Review of FSC System URD/FINDAS URD relevant to OODBMS features (output of action AI#200400/3)
  - Discussion on features non supported by Objectivity/DB.
- **Other System activities reporting/monitoring/co-ordination (~ 1 hour)**
  - **Use cases**
  - **EGSE**
  - **CUS (URD)**
- **FGSSE actions (status+recap)**
- **Next FGSSE meeting**
- **AOB**

(We can decide the order in which we shall discuss the above agenda items at the start of the meeting)

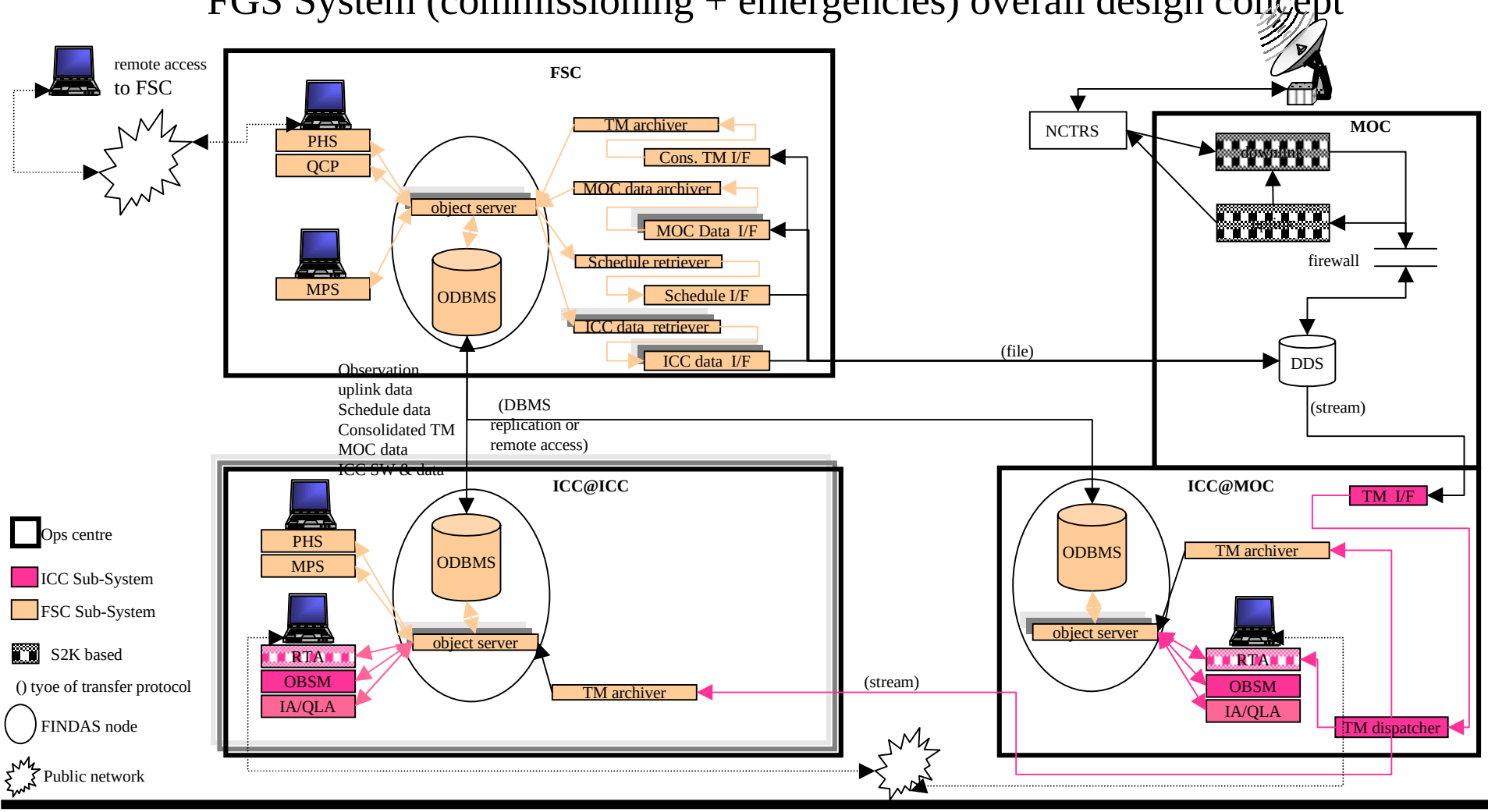
ILT System overall design concept



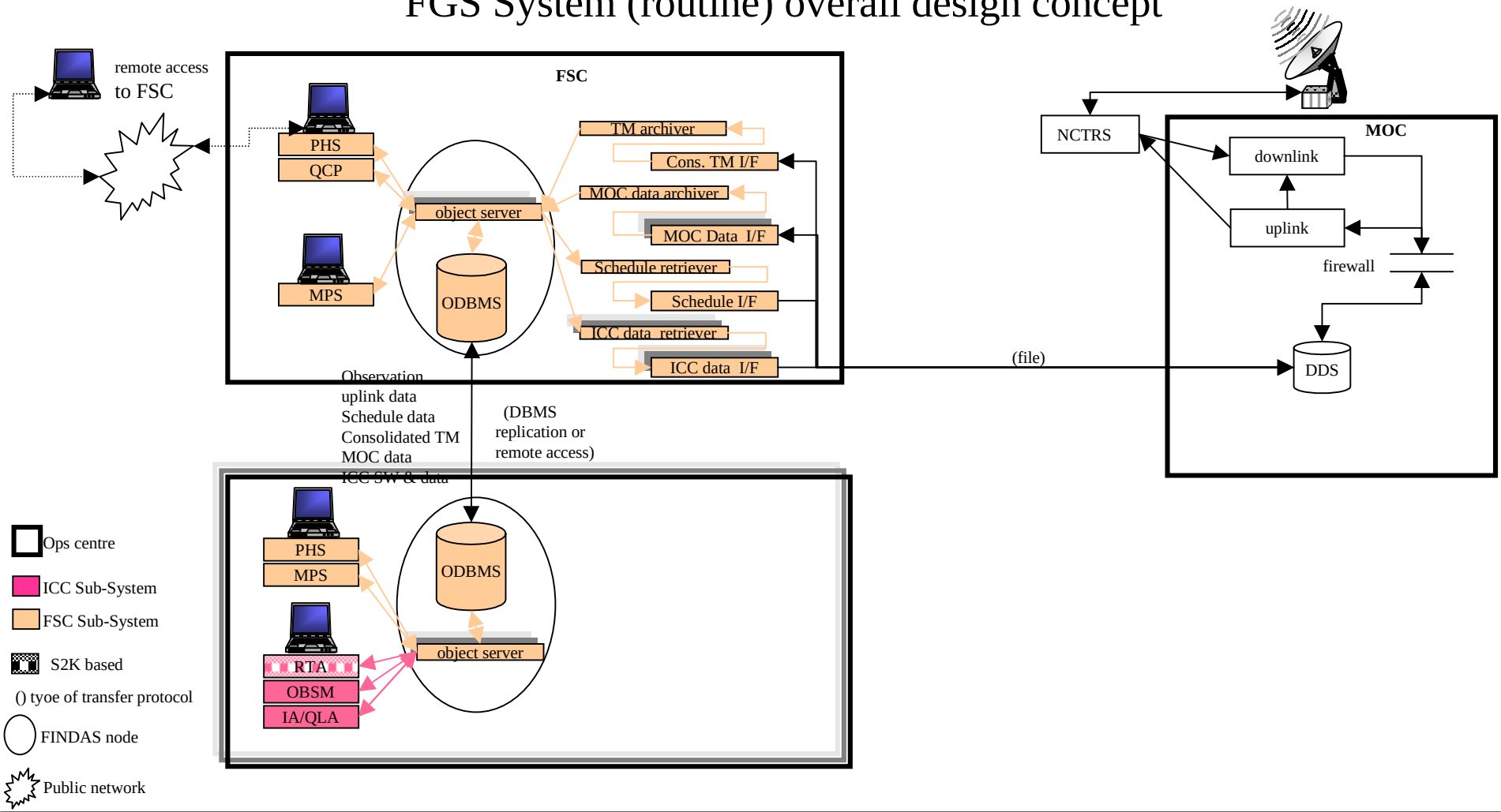
IST System overall design concept

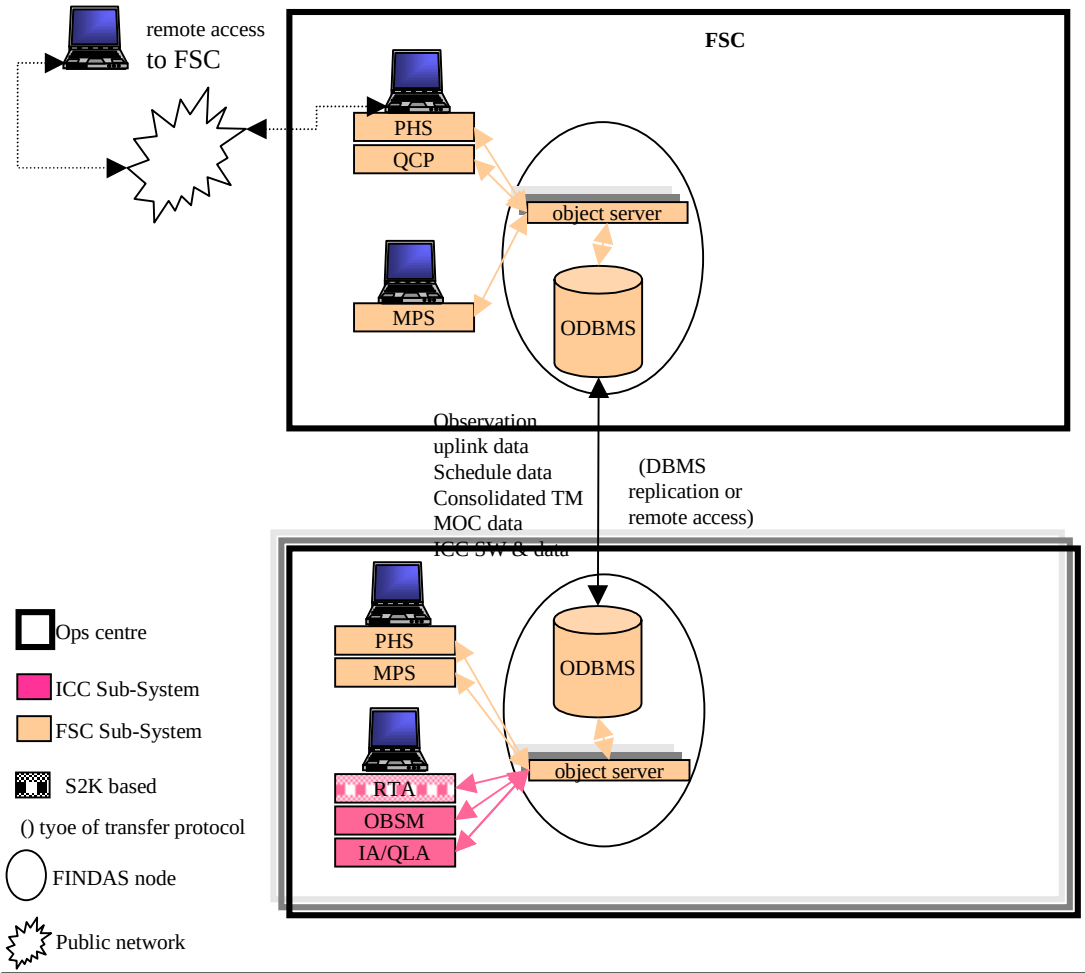


FGS System (commissioning + emergencies) overall design concept



FGS System (routine) overall design concept



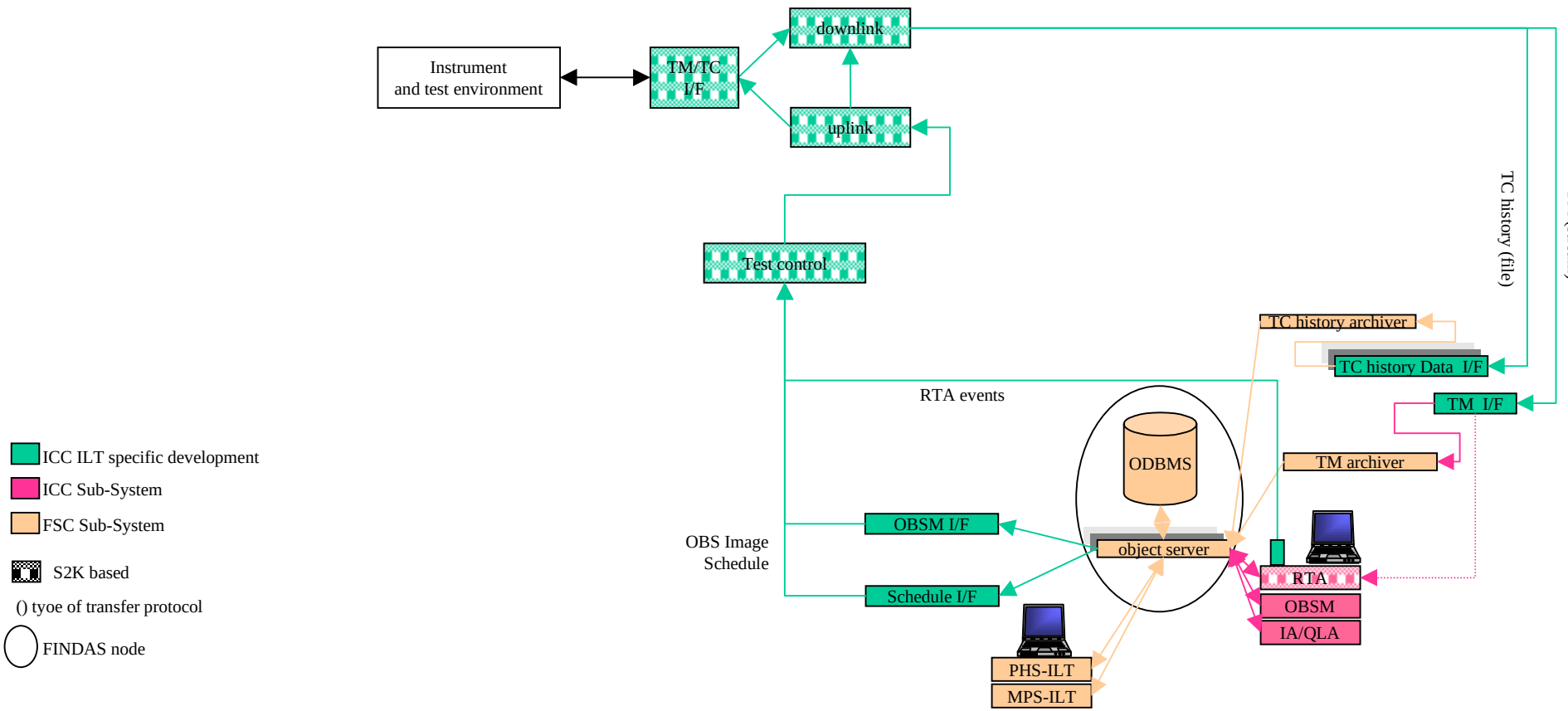

remote access
to FSC
FSC
PHS
QCP
object server
MPS
ODBMS
Observation
uplink data
Schedule data
Consolidated TM
MOC data
ICC SW & data
(DBMS
replication or
remote access)
PHS
MPS
ODBMS
RTA
OBSM
IA/QLA
object server
Ops centre
ICC Sub-System
FSC Sub-System
S2K based
() tyoe of transfer protocol
FINDAS node
Public network

System Overall Design (comments/questions?)

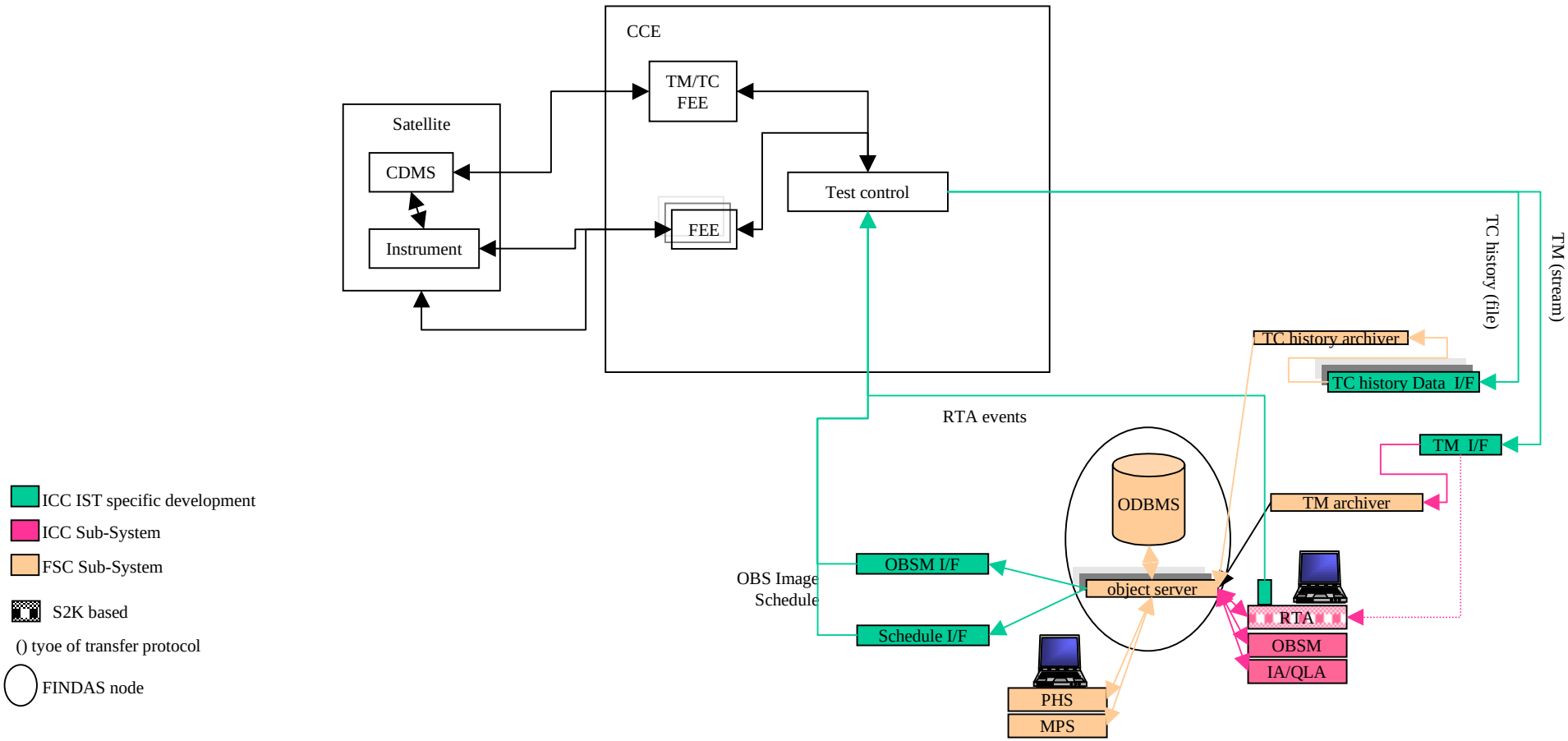
- ILT/PHS: concept of proposal needed?
- ILT/MPS: limited to TC mnemonic generation from a given observation (not scheduling features)
- ILT/MPS: absolute time or relative time?
- ILT/TM archiver: Special processing for Instrument test environment generated TM?
- ILT/Test Control: shall support timeline generation (MPS only support schedule generation)
- IST/schedule: do not support commanding of FEEs, different from ILT?
- IST/TM: do not include measurement from FEEs, different from ILT?
- ILT&IST/Downlink: Generate TiC TM packets as MOC
- PHS: supports non AOT observations submission (ICC provided code).
- TM dispatcher: could be S2K based (PDS server)? Would have 3 advantages: already developed + direct I/F with RTA is already implemented + I/F with TM archiver easier to specify
- OBSM is RTA based?

S V ' s V G (a m e n d e d) :

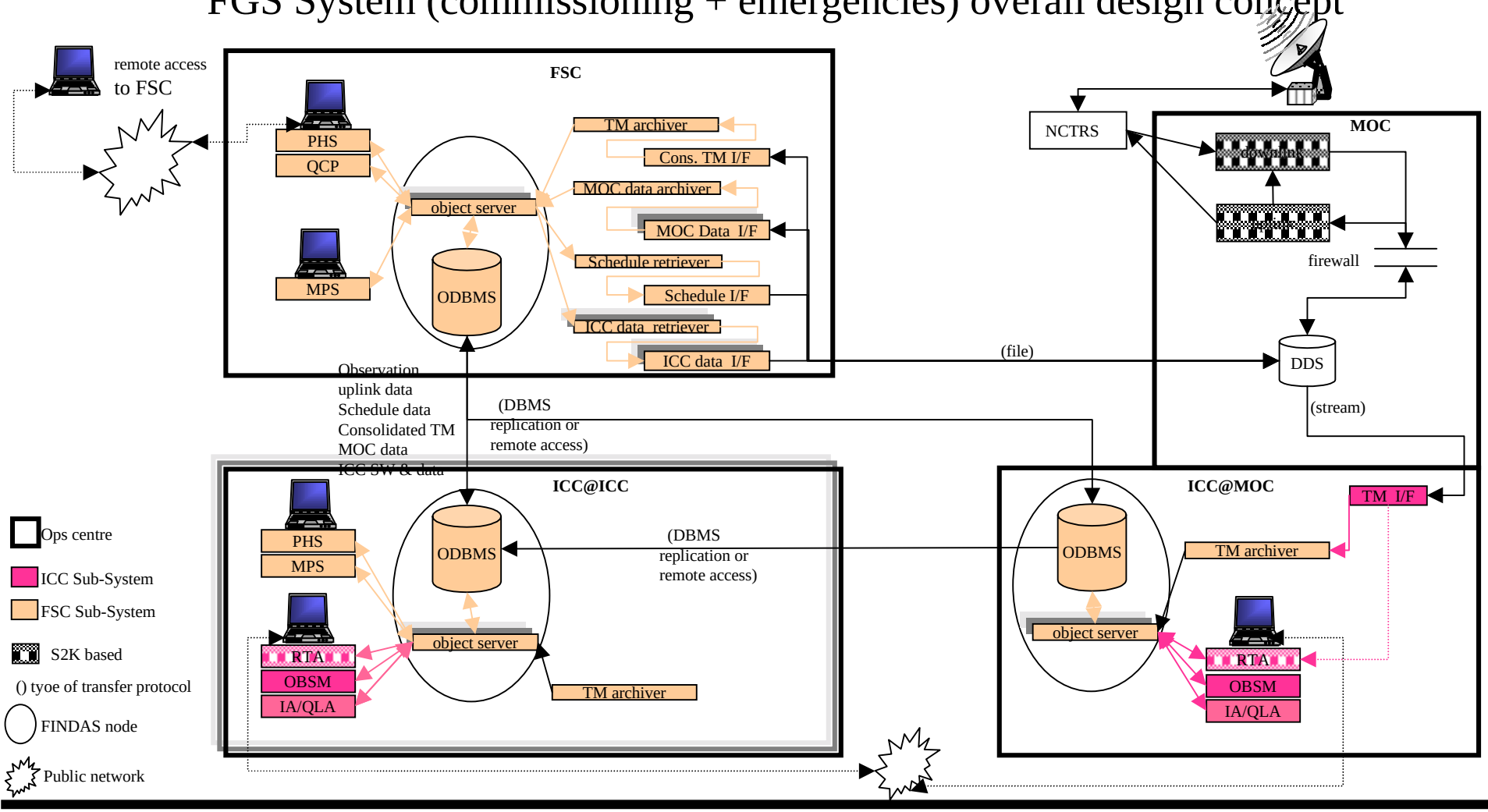
ILT System overall design concept



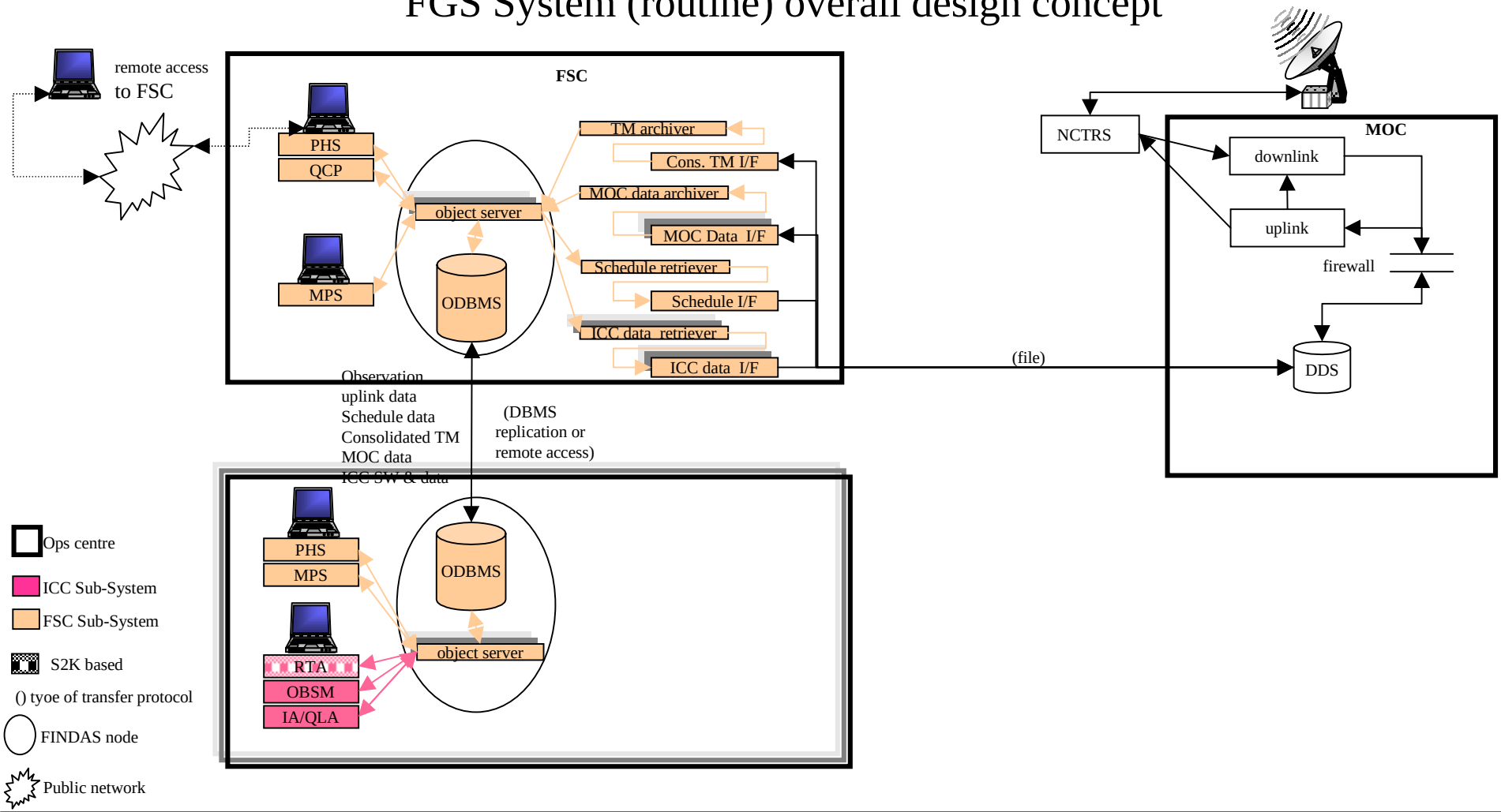
IST System overall design concept

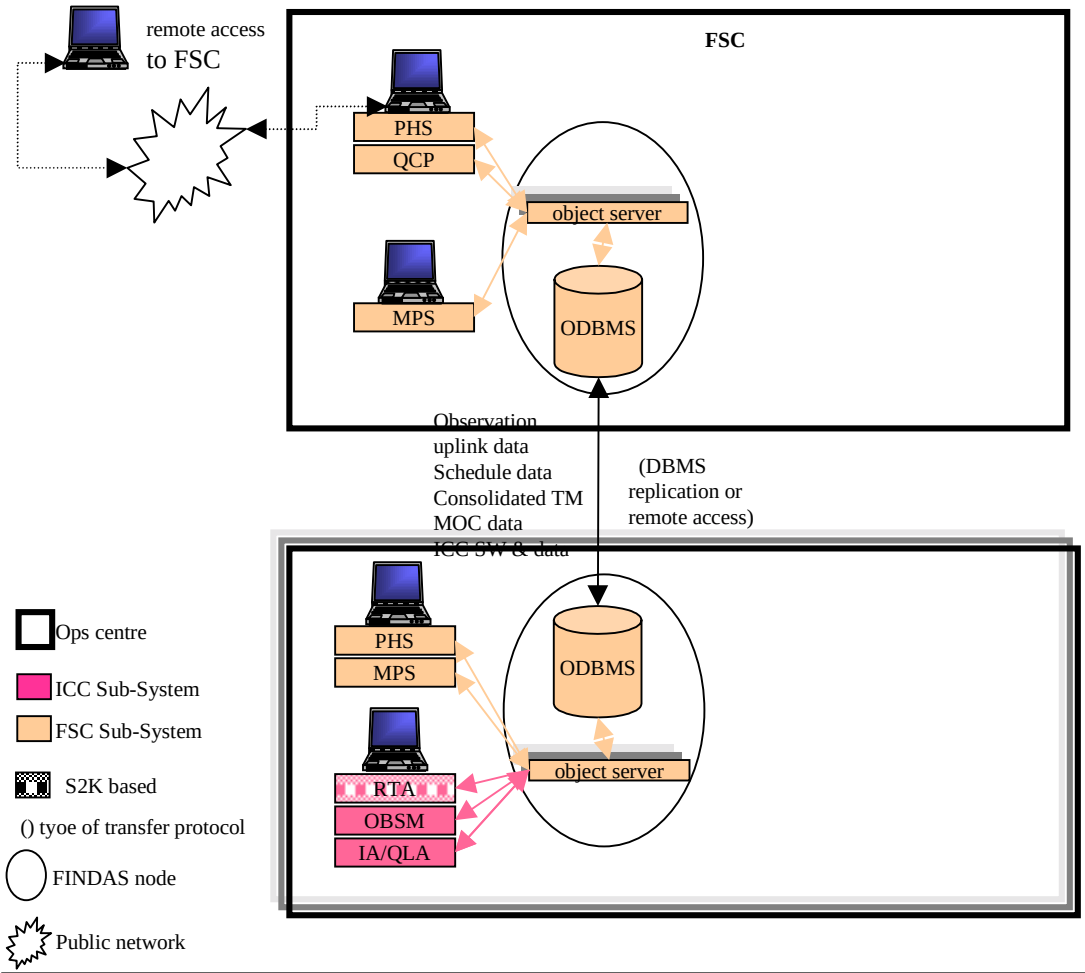


FGS System (commissioning + emergencies) overall design concept



FGS System (routine) overall design concept




remote access
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remote access)
PHS
MPS
ODBMS
RTA
OBSM
IA/QLA
object server
Ops centre
ICC Sub-System
FSC Sub-System
S2K based
() tyoe of transfer protocol
FINDAS node
Public network

O D B M S f e a t u r e s (S V i n p u t) :

ODBMS requirements to support the FIRST GS development and operation	ODBMS requirements rationale from: FSCS URD V1.0 & FINDAS URD V0.6	ODBMS requirement supported by Objectivity/DB release 5 (August 1999) YES or NO. Source: - Objectivity Technical Overview - http://wwwinfo.cern.ch/asd/rd45/white-papers/9907/ODBMSExperience.html - inputs from Williams Owen and Peter Claes
Object Storage		
The ODBMS shall be able to store objects and object relationships	**FINDAS-UR-S34**	YES Objectivity supports : - User defined type - is_a relationships - part_of relationships - multiple inheritance - uniderectional/bi-directional - all categories of cardinality
The ODBMS shall support composite objects	**FINDAS-UR-S37**	YES Objectivity support the creation of composite objects (group of inter-related objects) which can behave as single objects for locking and delete operations
The ODBMS shall support the storage, of the object methods in the DB	**FSC-UR-FSC-0850** **FINDAS-UR-S34**	NO Objectivity/DB does not store methods in the DB *Objectivity Plan to do it? Technically feasible for JAVA?*
Object Browsing & Queries		
The ODBMS shall allow to graphically browse the Class Hierarchy Tree and view the structure of individual classes.	**FINDAS-UR-S27**	YES Objectivity/DB Type browser
The ODBMS shall provide an object browser, supporting the display of object attributes and the navigation along object relationship	**FSC-UR-3.1-0880**	YES (partially) Objectivity/DB data browser facility but not very user friendly. Note that it does not seem to support the interactive execution of methods. 3rd party tool from MICRAM: Object Console (TBC)
The ODBMS shall allow to access data by query	**FSC-UR-3.1-0890**	YES Objectivity/DB supports predicate queries on object attributes within a class which return iterators on objects.

The ODBMS shall support ad-hoc queries (i.e. non pre-defined queries).	**FSC-UR-3.1-0930** **FINDAS-UR-S32** **FINDAS-UR-F-13**	YES(partially) 1) Objectivity/DB predicate queries can be written at run time 2) Objectivity/DB databases can be queried interactively using SQL (thanks to Objectivity/SQL++ which makes an automatic mapping between Objectivity/DB class and tables) However search on data content are not supported if data is not a class attribute: Objectivity/DB does not allow to call methods of the scanned class in predicate or SQL.
The ODBMS shall support ad-hoc query with a GUI	**FSC-UR-3.1-0940**	YES(partially) supported by data browser and Object Console (TBC)
The ODBMS shall have an associative query capability (i.e. the query can follow object relationships)	**FINDAS-UR-S33**	NO? Objectivity predicate is limited to a given class What about queries using SQL?
Language binding		
The ODBMS shall support an ODBMG language binding	**FINDAS-UR-C15**	YES Objectivity supports application and persistent object programming in - C++ - JAVA - SmallTalk Objectivity/DB supports *language interoperability*, e.g. object written with JAVA can be read with C++
Multi-users support		
The ODBMS shall support concurrent data access	**FSC-UR-3.2-0100**	YES Objectivity/DB supports - long transactions - multiple reader one writer (MROW) concurrently accessing a given data
The ODBMS database shall have deadlock detection algorithms and deadlock avoidance mechanisms.	**FINDAS-UR-S30**	YES Objectivity/DB supports active deadlock detection (on distributed databases)
The ODBMS shall enable locking in the case of concurrent read-write access.	**FINDAS-UR-S30**	YES
Multi-sites support		
The ODBMS shall support distributed databases**.**	**FSC-UR-3.2-0120** **FINDAS-UR-S24**	YES Objectivity/DB support databases distribution over multiple WS and sites within a federated database through remote servers and centralized lock server (one per federated database)
The ODBMS shall support database replication	**FSC-UR-3.2-0130** **FINDAS-UR-S26** **FINDAS-UR-S31**	YES Objectivity/DB supports multiple copies of a database across single machine, LAN & WAN. Objectivity/DB supports automatic /transparent update of databases upon update of image Objectivity manages replication in cases of comms failure (automatic re-synchronization, concept of

		quorum).
The ODBMS shall support the simultaneous opening of multiple databases	**FINDAS-UR-S29**	YES Multiple databases can be opened within a federated database
Data Import/Export		
The ODBMS shall support data import/export mechanism	**FINDAS-UR-F20**	NO? From CERN experience, does not seem to be the case
Notification		
The ODBMS shall provide a notification service to notify users or application of a change in the DB.	**FSC-UR-3.1-1280**	YES? Objectivity/DB supports an Event Notification service, however the exact level of support is offered is yet to be understood
It shall be possible to customize the user service on a user basis	**FSC-UR-3.1-1280**	NO? Objectivity/DB supports an Event Notification service, however customization on individual users is not expected to be supported (TBC)
Schema handling and evolution		

The ODBMS shall support schema access/definition/modification (schema evolution).	**FINDAS-UR-S38**	YES
		Objectivity supports schema evolution:
		- automatic object conversion (when feasible)
		- automatic call of conversion functions
		- different conversion modes
		  - deferred (object are translated to new schema only when accessed. Granularity: object)
		  - on-demand (explicit function in the application. Granularity: container or database or federated database)
		  - immediate (one-off deployment. Granularity: federated database)

The ODBMS shall support schema evolution without interrupting current operations	**FINDAS-UR-S38**	YES Database can still be maintained operational when schema evolution takes place. Although not recommended
The ODBMS shall support multiple schemas.	**FINDAS-UR-S28**	YES Objectivity allows to have different data bases with different data models in a federated database. *Can we have relationships between objects of these different databases? Or links are made only through clients?*
The ODBMS shall provide schema/database model management tools.	**FINDAS-UR-S36**	**YES?** *Third party tool from MICRAM?*
SW development support		
The ODBMS shall provide a configuration control system (version control, history, etc.)	**FSC-UR-3.1-0860** **FSC-UR-3.1-0870**	YES (very partially) Objectivity/DB supports object versioning although only for objects created by C++ and SQL application *Objectivity plan to support JAVA created object*

		versioning? However considering above point (methods not stored in DB), versioning will only apply to data.
The ODBMS shall support the set-up of separate areas in which changes to the operational system can be tested without affecting operation or other development activities (concept of sandbox)	**FINDAS-UR-S14**	NO Not as such Separated federated database can be used *Could Objectivity/DB concept of private autonomous partition be used in this context?*
Administration		
The ODBMS shall provide logging of all (storage and retrieval) transactions with the database and a means to display this information to the database administrator.	**FSC-UR-3.1-1110** **FINDAS-UR-F11**	*??* *No information found*
The ODBMS shall support back-up and restore of data	**FSC-UR-3.2-0220** **FSC-UR-3.2-0230**	YES Objectivity/DB supports backup (full & incremental) to disk/tape and restore of federated database *No information found on performance of restore operation*
The ODBMS shall support performance diagnosis and tuning tools	**FINDAS-UR-S35**	*??* *No information found*
Performance		
The ODBMS shall support the storage of at least 12 Tbytes of data	**FSC-UR-3.2-0160**	YES CERN experience
The ODBMS shall be able to ingest TM data at a rate equal or higher than 200kbps	**FSC-UR-3.2-0170**	YES? With 100kbps*2 and TM packets of 1KB, we are talking ingesting ~ 25 TM packets/s which is above what was experienced in the FINDAS test with O2 (5 packets/s) However this required performance is below reported Objectivity DB I/O performance (10 to 100 MBps.
The ODBMS shall support TM data retrieval at a rate equal or higher than 1Mmps.	**FSC-UR-3.2-0190**	YES? With 100kbps*10 and TM packets of 1KB, we are talking ingesting ~ 125 TM packets/s which is above what was experienced in the FINDAS test with O2 (7.5 packets/s) However this required performance is below reported Objectivity DB I/O performance (10 to 100 MBps.)
The ODBMS shall not generate at a local node more than a minute delay between the ingestion and the retrieval of TM data.	**FSC-UR-3.2-0200**	YES?
Availability		
The ODBMS shall have a MTTF of more than TBD weeks	**FSC-UR-3.2-0250**	Objectivity/DB supports automatic hot back-up of databases in federated database through replication of the databases on different machines which can allow continuous availability of data
Security		
The ODBMS shall implement data access restriction according to user privileges	**FSC-UR-3.2-0040** **FSC-UR-3.2-0050**	YES? Objectivity/DB includes Secure Framework as a separated module. Secure Framework allows to restrict

		client access to the DB. It is not clear whether the restriction can be linked to user privileges.

ICDs (FSCDT input):

I/F grouping	I/F	Type	Validity	Comments	Custodian	trace to IRD
	I/F = All procedural, data format and protocol interfaces between centers (MOC, FSC, ICC) or SW interface between sub-systems developed by separate teams (e.g. RTA, FINDAS). Note that several related I/F could be documented in one ICD		Phase at which the interface needs to be operational			
operational interactions between centers						
	MOC-FSC operational interactions	procedural	In-orbit phase	MOC-FSC interface procedures	FSC	FGS-IR-3.1-130 FGS-IR-3.1-140 FGS-IR-3.1-160 FGS-IR-3.1-170 FGS-IR-3.1-190 FGS-IR-3.1-200 FGS-IR-3.1-220 FGS-IR-3.1-240 FGS-IR-3.1-250 FGS-IR-3.1-280 FGS-IR-3.1-320 FGS-IR-3.1-360 FGS-IR-3.1-390 FGS-IR-3.1-530 FGS-IR-3.1-540 FGS-IR-3.4-40 FGS-IR-3.4-60 FGS-IR-3.4-70 FGS-IR-3.4-90
	MOC-ICC operational interactions	procedural	In-orbit phase	MOC-ICC and ICC@MOC interface procedures	MOC	FGS-IR-3.2-10
	FSC-ICC operational interactions	procedural	In-orbit phase, post mission	FSC-ICC interface procedures	ICC	FGS-IR-3.5-30 FGS-IR-3.5-150 FGS-IR-3.5-160 FGS-IR-3.7-20 FGS-IR-3.7-40 FGS-IR-3.7-70 FGS-IR-3.7-130 FGS-IR-3.7-140 FGS-IR-3.7-150

TM						
	Satellite TM	data format	ILT (instrument TM only) , IST, In-orbit phase post-mission	Satellite TM format per APID/SID	Project	FGS-IR-3.1-30 FGS-IR-3.1-40 FGS-IR-3.1-50 FGS-IR-3.1-60 FGS-IR-3.1-70 FGS-IR-3.2-30 FGS-IR-3.3-20
	Time Correlation TM		ILT, IST, In-orbit phase post-mission	TiC TM is created by downlink during ILT, SCOE during IST and MOC during in-orbit phase	MOC?	FGS-IR-3.1-420 FGS-IR-3.1-430
	Derived parameter TM	data format	In-orbit phase	Derived parameter TM created by MOC	MOC	FGS-IR-3.1-450
	OOL TM	data format	In-orbit phase	OOL TM created by MOC	MOC	FGS-IR-3.1-470
	ILT TEI TM	data format	ILT		PIs	
	MOC/DDS to FSC consolidated TM ICD	protocol	In-orbit phase	DDS services and protocol to retrieve consolidated TM. (TM format is described in project document)	MOC	FGS-IR-3.1-20 FGS-IR-3.1-80 FGS-IR-3.1-90 FGS-IR-3.1-100 FGS-IR-3.1-110 FGS-IR-3.1-340 FGS-IR-3.1-440 FGS-IR-3.1-460 FGS-IR-3.1-480
	MOC/DDS to ICC@MOC TM ICD	protocol	In-orbit phase	DDS services and protocol to retrieve TM in NRT from MOC	MOC	FGS-IR-3.3-10 FGS-IR-3.3-30 FGS-IR-3.3-40
	ICC TM dispatcher to XXX TM ICD	protocol	ILT, IST, In-orbit phase	Services and protocol to retrieve TM from the ICC TM dispatcher for RTA in ICC@MOC, TM archiver in ICC@MOC and TM archiver in ICC@ICC . The FSC Consolidated TM I/F should present the same services/protocol to allow unique TM archiver implementation (TBC).	ICCs	FGS-IR-3.2-20 FGS-IR-3.2-40
data from MOC to FSC						
	Planning Skeleton	data format	In-orbit phase		MOC	FGS-IR-3.1-210
	Schedule status information	data format	In-orbit phase		MOC	FGS-IR-3.1-260
	Commanding timeline summary	data format	In-orbit phase		MOC	FGS-IR-3.1-270

	TC history	data format	In-orbit phase		MOC	FGS-IR-3.1-300 FGS-IR-3.1-310
	S/C orbit data reconstituted	data format	In-orbit phase		MOC	FGS-IR-3.1-350
	S/C attitude history	data format	In-orbit phase		MOC	FGS-IR-3.1-380
	S/C data base	data format	IST, in-orbit phase, post-mission phase		MOC	FGS-IR-3.1-500
	SSO database	data format	in-orbit phase	Can we assume that database update are exchanged with the same data format as complete database?	MOC	FGS-IR-3.1-520 FGS-IR-3.4-110
	MOC/DDS to FSC file I/F	protocol	In-orbit phase	DDS services and protocol to retrieve MOC data files. It is assumed that MOC/DDS provides a unique protocol for all MOC data exported to FSC as a file.	MOC	FGS-IR-3.1-230 FGS-IR-3.1-290 FGS-IR-3.1-330 FGS-IR-3.1-370 FGS-IR-3.1-400
data from FSC to MOC						
	Schedule	data format	ILT (subset only) , IST, In-orbit phase	Format of schedule as output of FSC	FSC	FGS-IR-3.4-10 FGS-IR-3.4-20 FGS-IR-3.4-30
	ILT schedule export (TBC)	protocol	ILT	protocol to export ILT schedule to Test control	ICC	
	IST schedule export (TBC)	protocol	IST	protocol to export IST Schedule to SCOE	ICC	
	Instrument Memory (common to all instrument)	data format	ILT, IST, In-orbit phase	Can we assume that the instrument memory as returned by MOC and the instrument memory update from ICC to MOC will be exchanged in the same format?	MOC?	FGS-IR-3.1-490 FGS-IR-3.4-80 FGS-IR-3.7-10
	Instrument database (one for each instrument?)	data format	ILT, IST, In-orbit phase	Can we assume that the instrument memory as returned by MOC and the instrument memory update from ICC to MOC will be exchanged in the same format?	PIs?	FGS-IR-3.4-120 FGS-IR-3.7-160
	Instrument procedures and command sequences	data format	In-orbit phase	Needed? Or can be considered included in instrument database	ICC	FGS-IR-3.4-130 FGS-IR-3.7-170
	Instrument apertures and pointing misalignement	data format	In-orbit phase		ICC	FGS-IR-3.1-510 FGS-IR-3.4-140

	FSC to MOC/DDS file I/F	protocol	In-orbit phase	DDS services and protocol to export files from FSC to MOC. All data from FSC to MOC are transferred as files.	MOC	FGS-IR-3.4-50 FGS-IR-3.4-100
data from ICC to FSC						
	Scheduling contraints (TBC)	data format	In-orbit phase	Only needed if MPS is not used by ICCs to define scheduling constraints on calibration and engineering observations	FSC	FGS-IR-3.7-60
	Observation quality (TBC)	data format	In-orbit phase, post-mission	to be included in COM (?)		FGS-IR-3.7-80
MOC SW						
	S/C orbit predictor SW API	SW	In-orbit phase		MOC	FGS-IR-3.1-120
	S/C atitude constraints SW API	SW	In-orbit phase		MOC	FGS-IR-3.1-150
	S/C slew time and path predictor SW API	SW	In-orbit phase		MOC	FGS-IR-3.1-180
ICC SW						
	Instrument simulator SW API	SW	EE, In-orbit phase		ICC	FGS-IR-3.7-90
	Instrument time estimator SW API	SW	AOs, EE, In-orbit phase	to be defined in the COM	ICC	FGS-IR-3.7-100
	Instrument commanding SW API	SW	ILT, IST, In-orbit	to be defined in the COM	ICC	FGS-IR-3.7-110
	Instrument data processing SW API	SW	In-orbit phase	to be defined in the COM?	ICC	FGS-IR-3.7-120
FSCS SW						
	Common Object Model	SW	ILT, IST, In-orbit phase, post-mission	defined all the data (including their relationships) and relationships shared by FSC and ICC	FSC	FGS-IR-3.5-10 FGS-IR-3.5-40 FGS-IR-3.5-50 FGS-IR-3.5-60 FGS-IR-3.5-70 FGS-IR-3.5-80 FGS-IR-3.5-90 FGS-IR-3.5-100 FGS-IR-3.5-110 FGS-IR-3.5-130 FGS-IR-3.5-140 FGS-IR-3.7-10 FGS-IR-3.7-50

	TM servers API	SW	ILT, IST, In-orbit phase, post-mission	to be defined in the COM. Will serve RTA, QLA/IA	FSC	
	Observation servers API	SW	ILT, IST, In-orbit phase, post-mission	to be defined in the COM. Will serve QLA/IA	FSC	
	On Board SW servers API	SW	ILT, IST, In-orbit phase, post-mission	to be defined in the COM, will serve OBSM	FSC	
	other objects servers API	SW		to be defined in the COM	FSC	
ODBMS						
	ODBMS replication and/or remote access set-up	database	In-orbit phase	definition of the set-up of the ODBMS in terms of replication, remote acess between the different databases over the different FSC and ICC sites.	FSC	FGS-IR-3.5-20 FGS-IR-3.7-30