

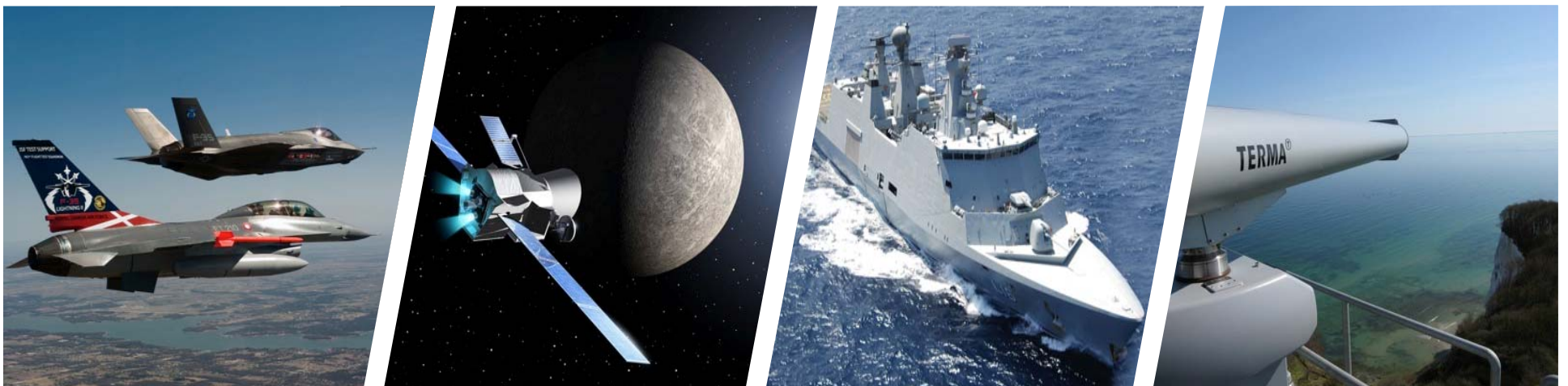


# SESP 2017

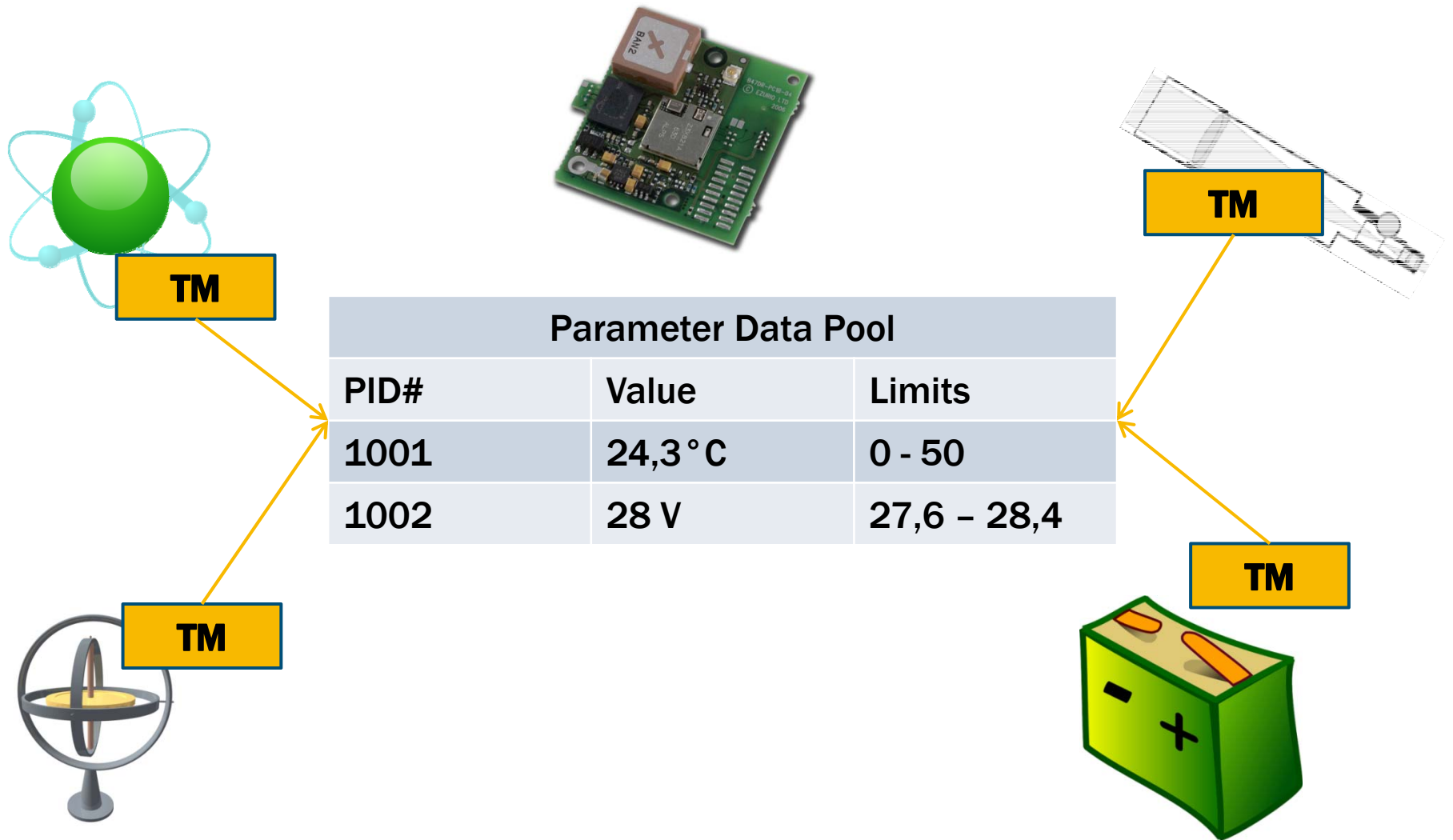
## Managing Telemetry Definitions on the Fly



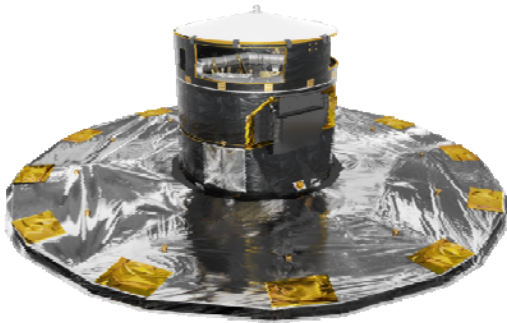
Petro Kazmirchuk, Terma B.V.



# CHALLENGES WHEN TESTING OBSW



# CHALLENGES WHEN TESTING OBSW



HK TM



HEADERS (APID, OBT)

SID

PAR1 = 18,4

PAR2 = OFF

PAR3 = 0xDEADBEEF

...

Allocation?  
Frequency?  
Packet size?

SITL



CITL

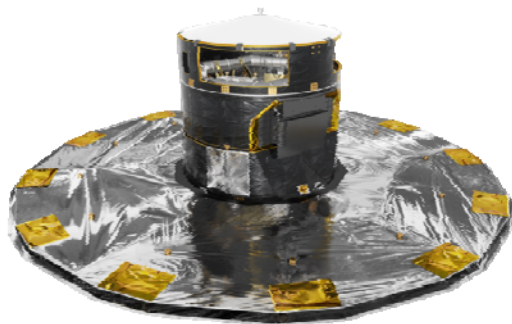


HITL



Difficult to decide  
in advance

# DYNAMIC HOUSEKEEPING IN PACKET UTILIZATION STANDARD (PUS)



HK TM (3,25)

Diagnostic TM (3,26)



Define new HK TM (3,1)

Define new Diagnostic TM (3,2)



Clear HK TM definition (3,3)

Clear Diagnostic TM definition (3,4)

**Can we create new MIB definitions on the fly?**

# DEFINE A NEW TM PACKET



Define new HK TM (3,1)

Define new Diagnostic TM (3,2)

TC application data:

SID	Collection Interval	NPAR1	Parameter#
Enumerated	Unsigned Integer	Unsigned Integer	Enumerated

← Optional →

← Repeated NPAR1 times →

NFA	NREP	NPAR2	Parameter#
Unsigned Integer	Unsigned Integer	Unsigned Integer	Enumerated

← Repeated NFA times →

← Repeated NPAR2 times →

# DEFINE A NEW TM PACKET



Housekeeping Parameter Report (3,25)

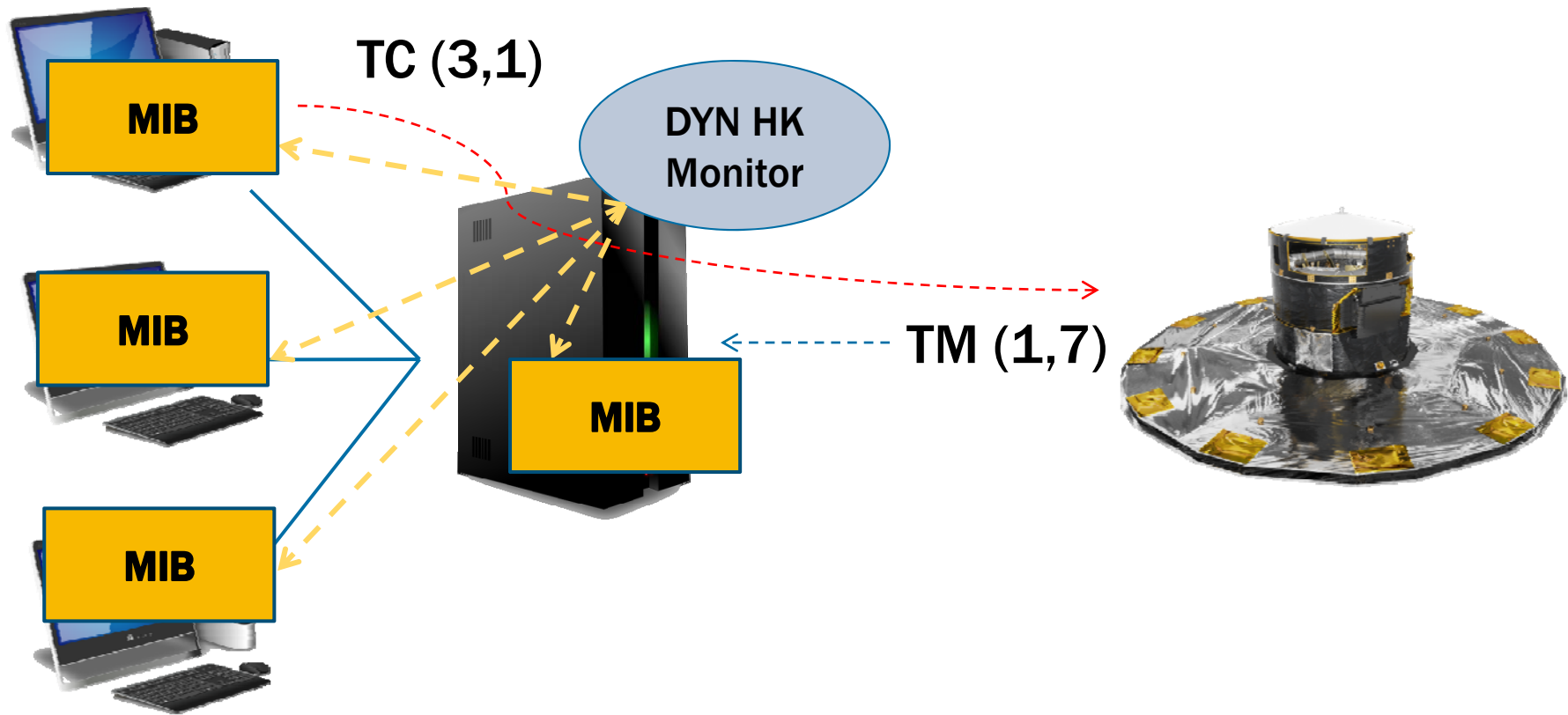
Diagnostic Parameter Report (3,26)

Telemetry source data:

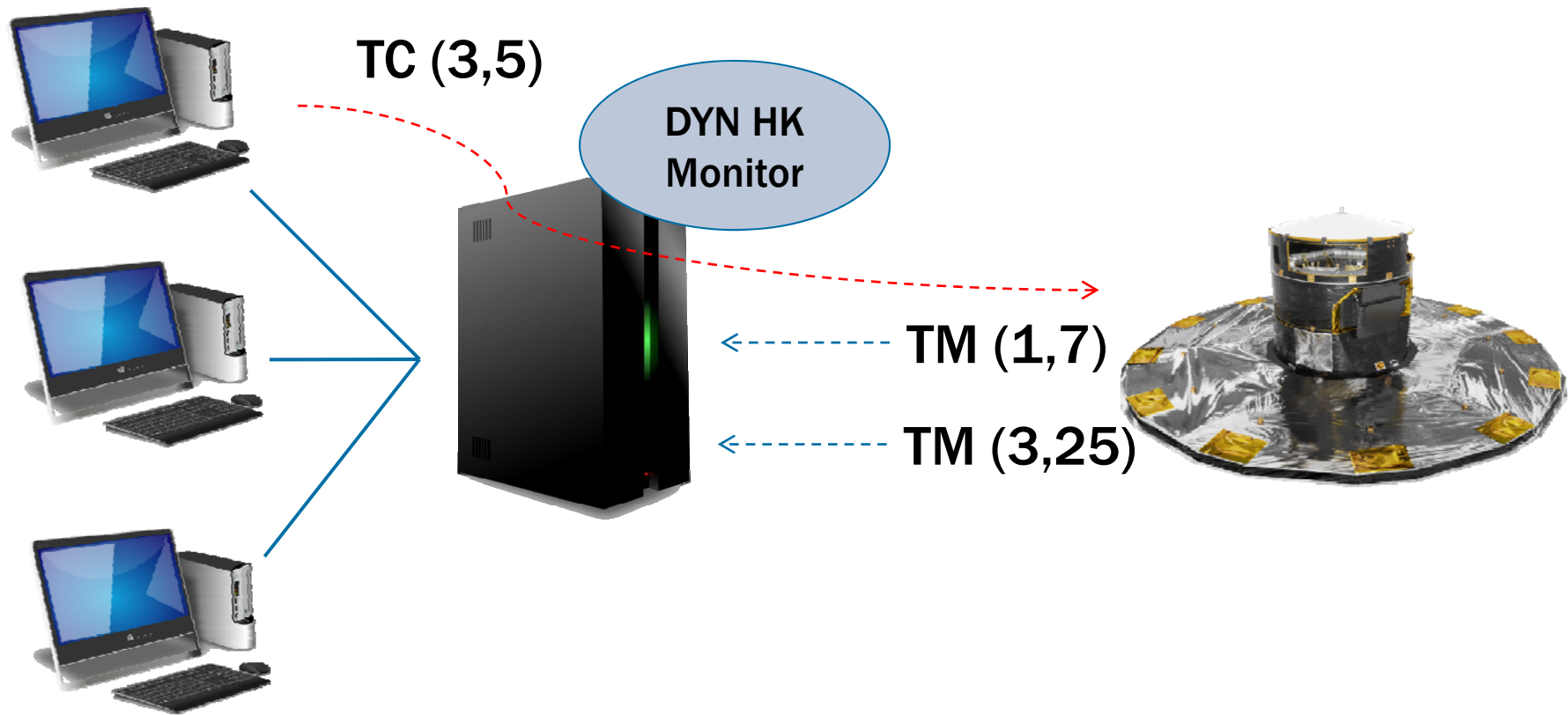
SID	Mode	Parameters
Enumerated	Enumerated	Any

|← Optional →|

# DYNAMIC HK IN CCS5



# DYNAMIC HK IN CCS5





# TM PACKET IDENTIFICATION

according to SCOS2000 MIB ICD



CCSDS

PUS DFH

Length	Field
3	Version number
1	Type
1	DFH flag
11	APID
2	Grouping flags
14	SSC
16	Packet length
1	Spare
3	PUS version
4	Spare
8	Service type
8	Service subtype
	...

## PIC table in MIB

Field name	Example
PIC_TYPE	3
PIC_STYPE	25
PIC_PI1_OFF	16
PIC_PI1_WID	32
PIC_PI2_OFF	-1
PIC_PI2_WID	0
PIC_APID	1812

1. Search for type + subtype + APID
2. Search for type + subtype
3. Search for type + subtype + APID in the PID table

# TM PACKET IDENTIFICATION

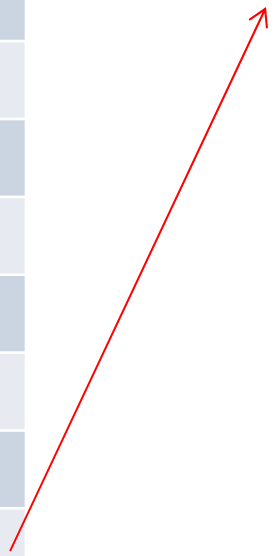
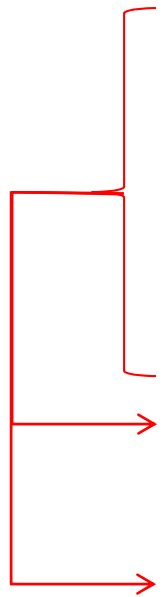


## PID table

Field name	Example
PID_TYPE	3
PID_STYPE	25
PID_APID	1812
PID_PI1_VAL	15
PID_PI2_VAL	0
PID_SPID	1150
PID_DESCR	Dyn HK 15
PID_TPSD	1150
PID_DFHSIZE	20
PID_INTER	1000
PID_VALID	True
...	

## VPD table

Field name	Example
VPD_TPSD	1150
VPD_POS	1
VPD_NAME	PAR001
VPD_GRPSIZE	0
VPD_FIXREP	0
VPD_OFFSET	0
...	



# GENERATION OF MIB TABLES



## PID table

Field name	Example
PID_TYPE	3
PID_STYPE	25
PID_APID	1812
PID_PI1_VAL	15
PID_PI2_VAL	0
PID_SPID	1150
PID_DESCR	Dyn HK 15
PID_TPSD	1150
PID_DFHSIZE	20
PID_INTER	1000
PID_VALID	True
...	



TC subtype (1=>25, 2=>26)

SID

Auto-increment



PI1 offset + length

# GENERATION OF MIB TABLES



## PID table

Field name	Example
PID_TYPE	3
PID_STYPE	25
PID_APID	1812
PID_PI1_VAL	15
PID_PI2_VAL	0
PID_SPID	1150
PID_DESCR	Dyn HK 15
PID_TPSD	1150
PID_DFHSIZE	20
PID_INTER	1000
PID_VALID	True
...	

Mapping TC APID => PID\_APID

Scheduling rate × collection interval

# GENERATION OF MIB TABLES



## VPD table

Field name	Example
VPD_TPSD	1150
VPD_POS	1
VPD_NAME	PAR001
VPD_GRPSIZE	0
VPD_FIXREP	0
VPD_OFFSET	0
...	

from 1 to NPAR  
PCF\_PID – raw  
PCF\_NAME - eng

# GENERATION OF MIB TABLES



## VPD table (supercommutated parameters)

Field name	Example
VPD_TPSD	1153
VPD_POS	2
VPD_NAME	REPEATER
VPD_GRPSIZE	2
VPD_FIXREP	3
VPD_OFFSET	0
...	

**NPAR2 (N of parameters)**  
**NREP (N of samples)**

# CLEAR TM DEFINITIONS



## PID table

Field name	Example
PID_TYPE	3
PID_STYPE	25
PID_APID	1812
PID_PI1_VAL	15
PID_PI2_VAL	0
PID_SPID	1150
PID_DESCR	Dyn HK 15
PID_TPSD	1150
PID_DFHSIZE	20
PID_INTER	1000
PID_VALID	<b>False</b>
...	

TC (3,3) or (3,4)



# CONFIGURATION



- Add PIC definitions
- Setup settings:
  - Scheduling rate
  - APID mapping
  - SPID offset
- Start the DYNHK monitor
- Run a test
  - Keep a small pause between completion of TC(3,1) and sending TC(3,5)
- (Optionally) save the new MIB tables to disk
  - If OBC remembers the dynamic HK definitions till the next test session



# CONCLUSIONS AND FUTURE DIRECTIONS



- Solved challenges:
  - Allow dynamic definitions of TM packets
  - Match MIB and PUS
  - Distribute the new TM definitions across the system
- Dynamic HK leads to potential savings in AIT
- Future work:
  - Support for the new PUS 2016 standard
  - MMI to request TM parameters from OBSW DP
  - Look for other opportunities to reduce MIB definitions



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