

# Model2ADF Framework

A complete Model Driven “Spacecraft Reference Database application”  
automatic generation

*Francesco Sgaramella* (ESA)

*Emilia Barbagallo* (Sapienza Consulting Ltd)

*Cosimo Bruno* (dottCB consulting)

- **BACKGROUND**
- **THE CHALLENGE**
- **SIB APPLICATION**
- **Model2ADF**
- **CONCLUSIONS**

- **BACKGROUND**
- **THE CHALLENGE**
- **SIB APPLICATION**
- **Model2ADF**
- **CONCLUSIONS**

# SPACECRAFT REFERENCE DATABASES (SRDBs)

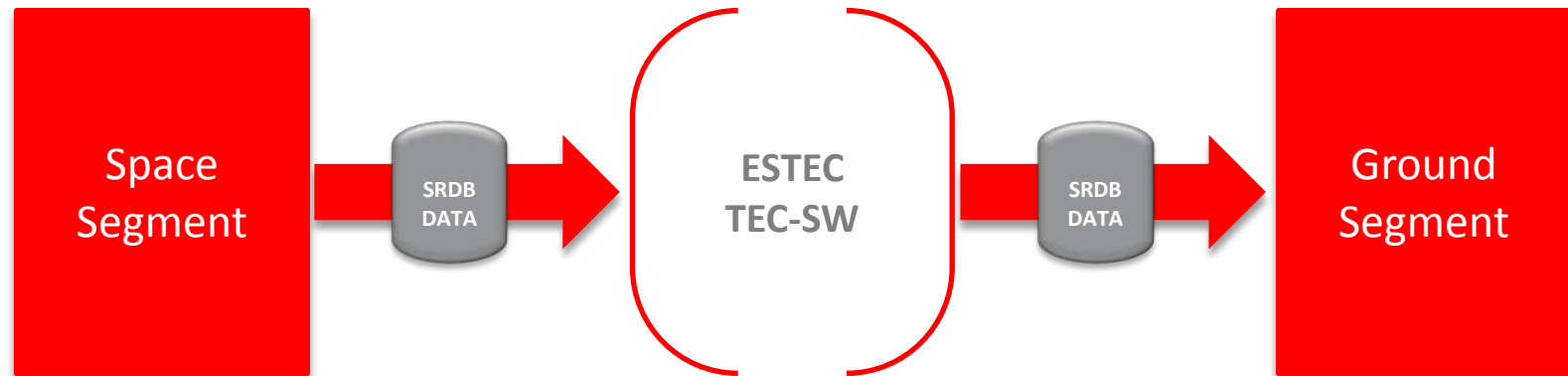


They mainly collect and maintain all the **knowledge** related to spacecraft M&C (e.g. TM/TC) for allowing:

- On board SW development
- System AIT
- Delivery of data for in-flight operations



Verify that the SRDB data delivered by the Space Segment (Prime) to the Ground Segment (Operations) are **valid** and **complete** according to the ESA project requirements.



The TEC-SW-SRDB projects support includes:

- The verification of the compliance of the delivered data with the applicable ICDs
- The verification of the compliance of the delivered data with the applicable validation rules
- The identification of the changes occurred among deliveries
- The impact analysis of occurred changes for non-regression tests

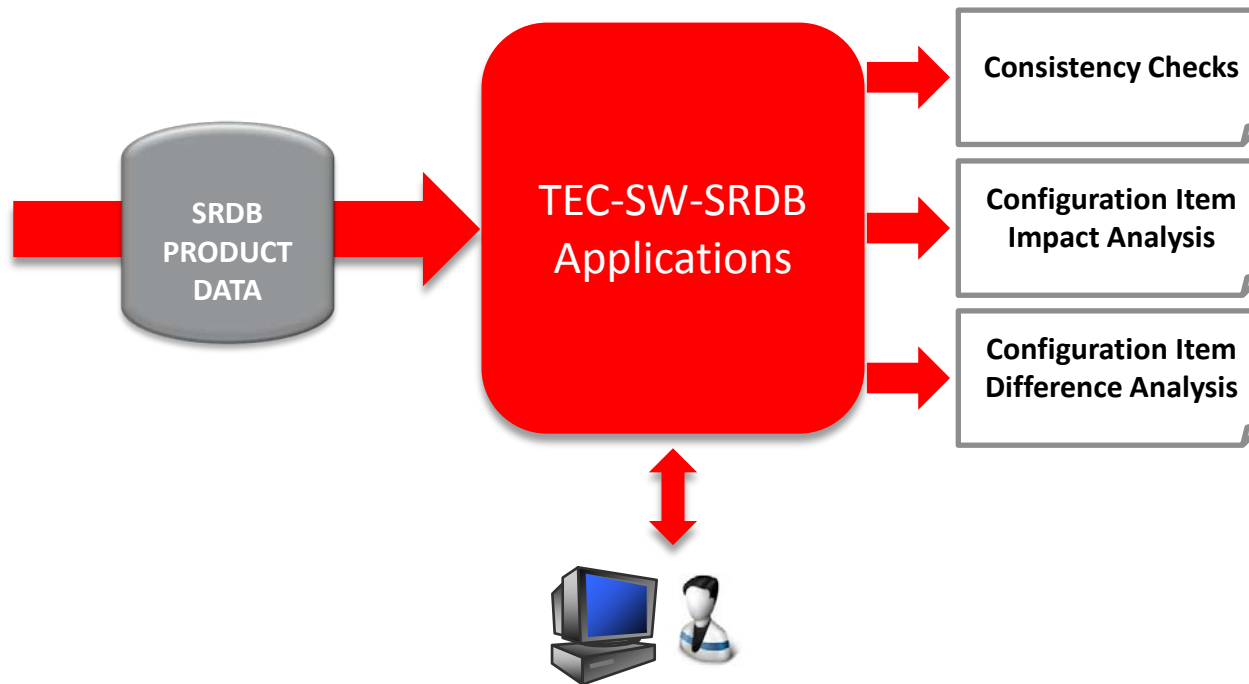
**TEC-SW-SRDB Applications** are the main means for this project support.

Several Applications have been developed during the last years complying with the project specific data requirements.

This experience has identified for this type of applications:

- Main functional requirements
- High-level architecture

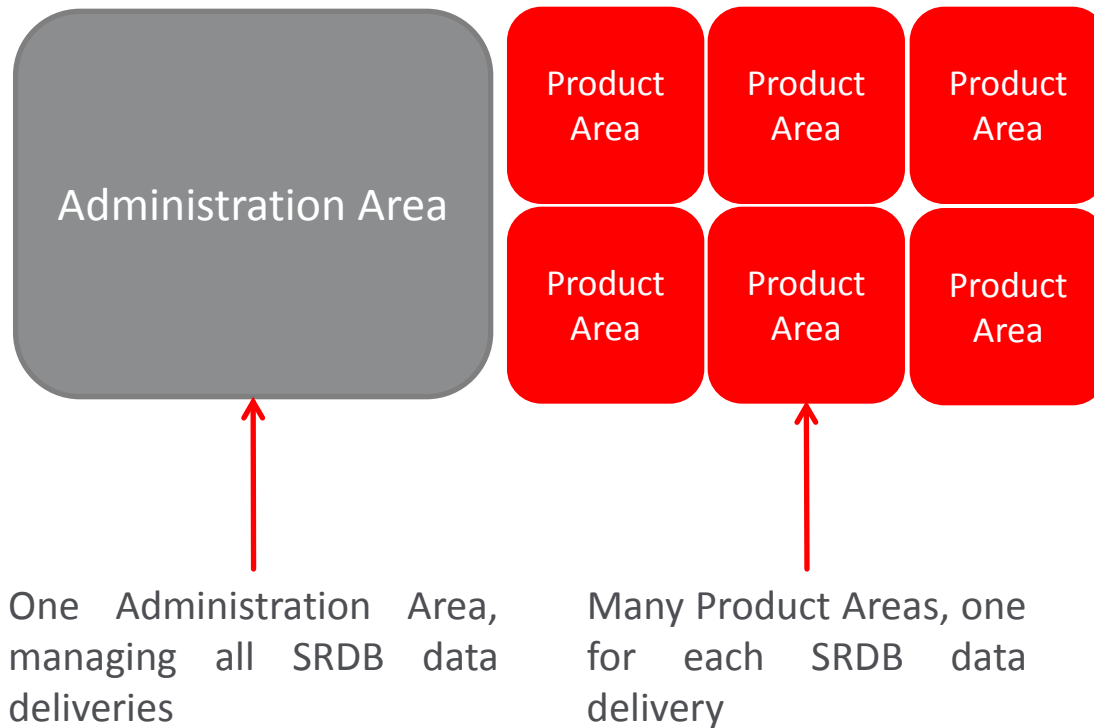
# TEC-SW-SRDB APPLICATIONS: MAIN REQUIREMENTS



MMI to navigate SRDB data  
and consistency violations



# TEC-SW-SRDB APPLICATIONS: HIGH-LEVEL ARCHITECTURE



# TEC-SW-SRDB APPLICATIONS TAILORED FOR ESA PROJECTS



For each project a specific TEC-SW-SRDB application is developed:

- based on the same Architecture
- implementing the same type of functionalities (Import, Export, Consistency checks, ...)

BUT

- with data models **that differ** i.e. project specific
- resulting in project specific interfaces (Import, Export, MMI, ...)

- **BACKGROUND**
- **THE CHALLENGE**
- **SIB APPLICATION**
- **Model2ADF**
- **CONCLUSIONS**

ESA-ESTEC needs to:

*timely and cost effectively* (i.e. in line with the project schedule and constraints)  
produce means to assess the SRDB data quality by **automatically**  
generating the TEC-SW-SRDB applications in compliance with the  
**project specific model requirements.**

- **BACKGROUND**
- **THE CHALLENGE**
- **SIB APPLICATION**
- **Model2ADF**
- **CONCLUSIONS**

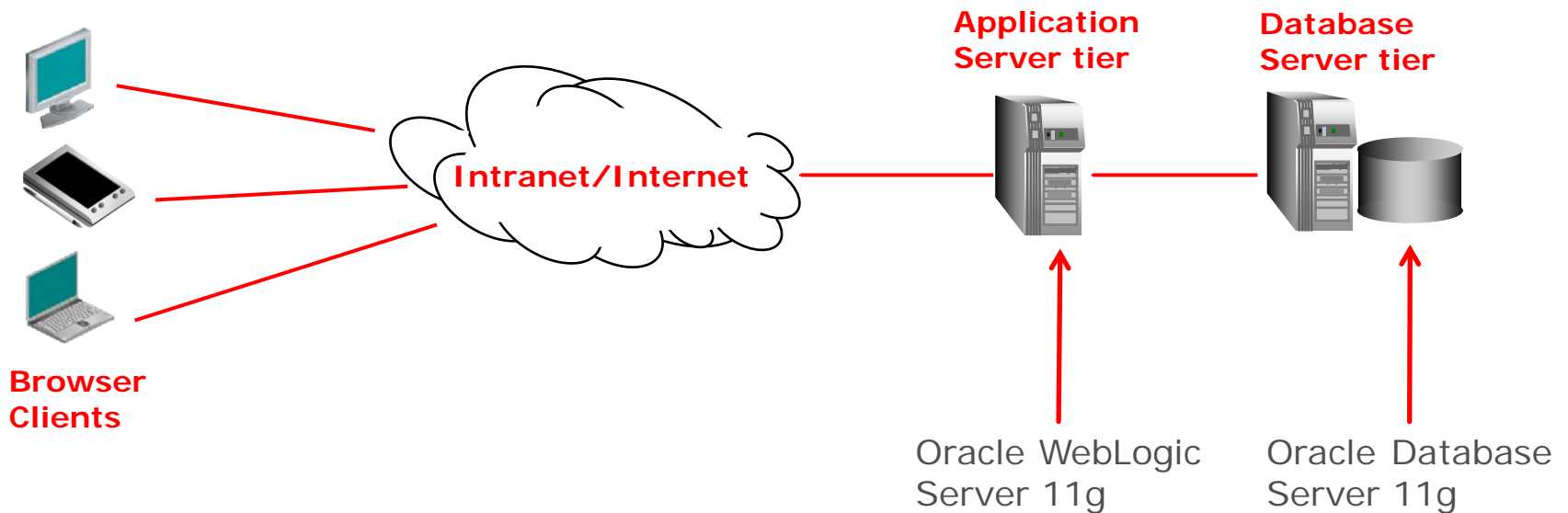
Through the years, many TEC-SW-SRDB applications (e.g. SSM, METOPDB, SSDB, CSDB, FEDs, VIDB) have been developed in support to projects such as METOP, VEGA, IOV, Sentinels, EarthCare, FOC.

The SIB TEC-SW-SRDB application is the result of this **evolution**:

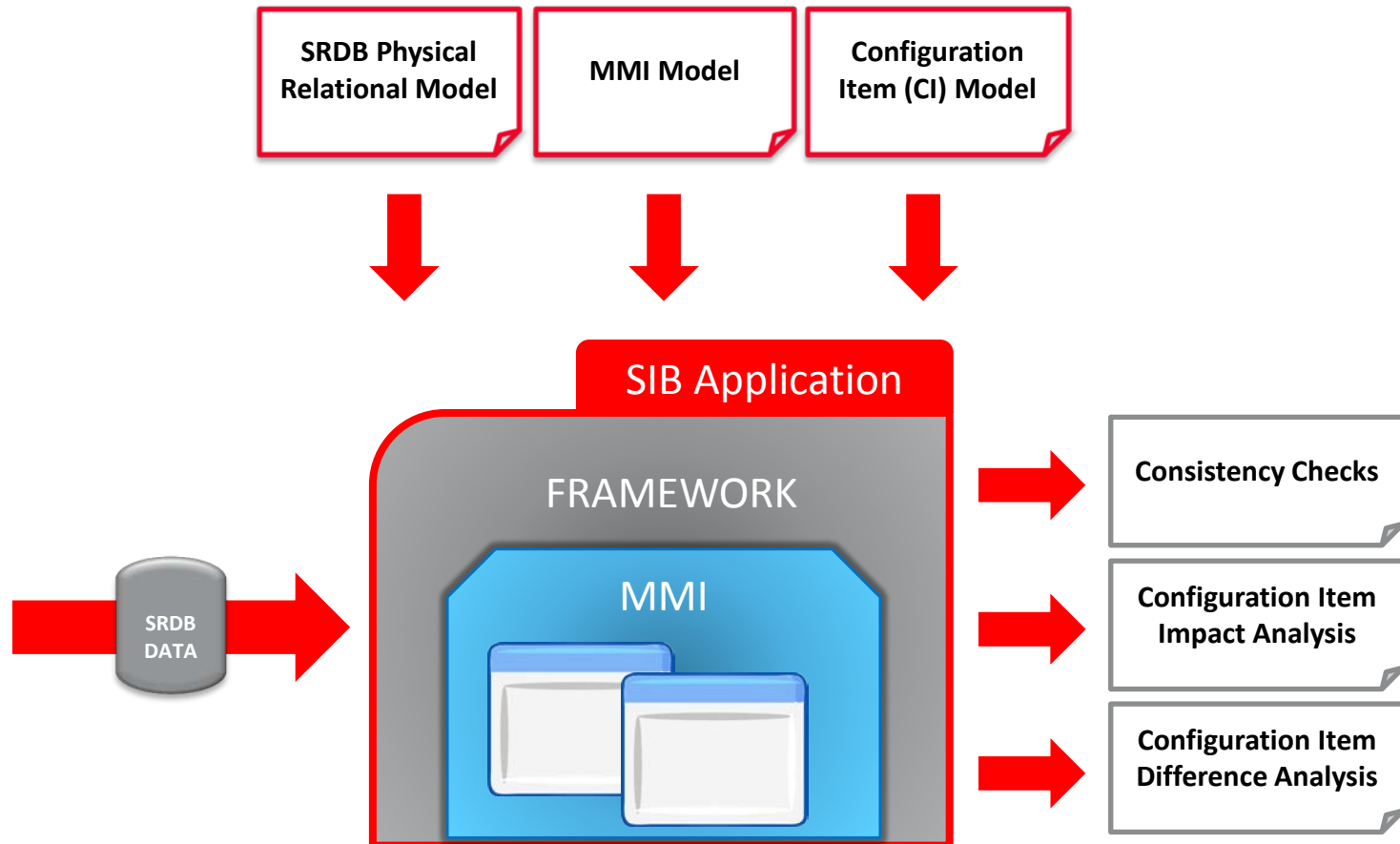
- Moving from a client-server to a **three-tier Deployment**
- Fully **model-driven** application specification, design and development:
  - **SIB Application Framework Software**, able to adapt its behaviour to the input model
  - **SIB MMI** automatically generated according to the input model

Classic three-tier deployment allowing:

- Seamless remote access
- **No client installation (standard Internet browsers)**
- Performance isolation and optimization on server tiers

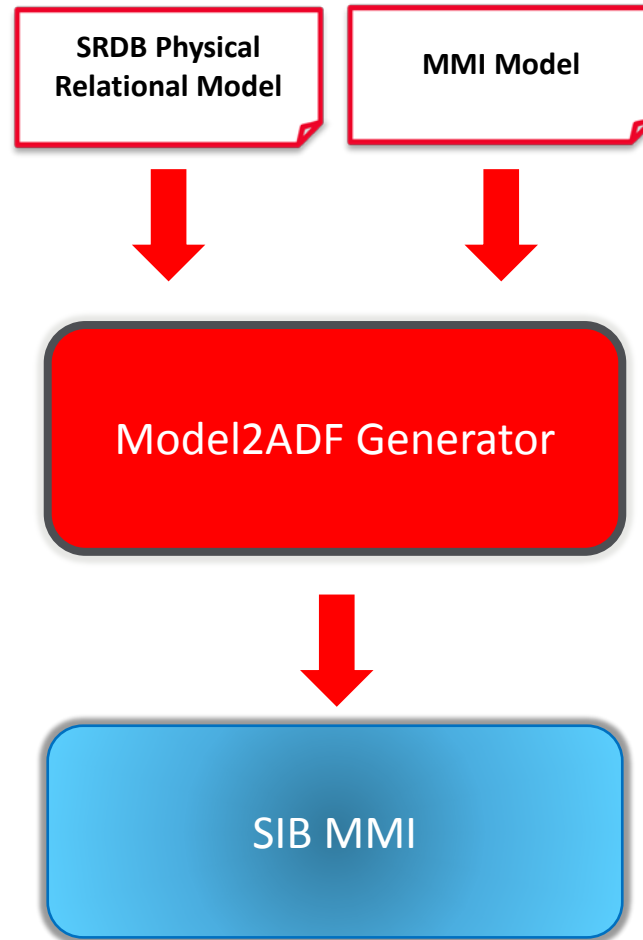


# SIB MODEL-DRIVEN APPROACH

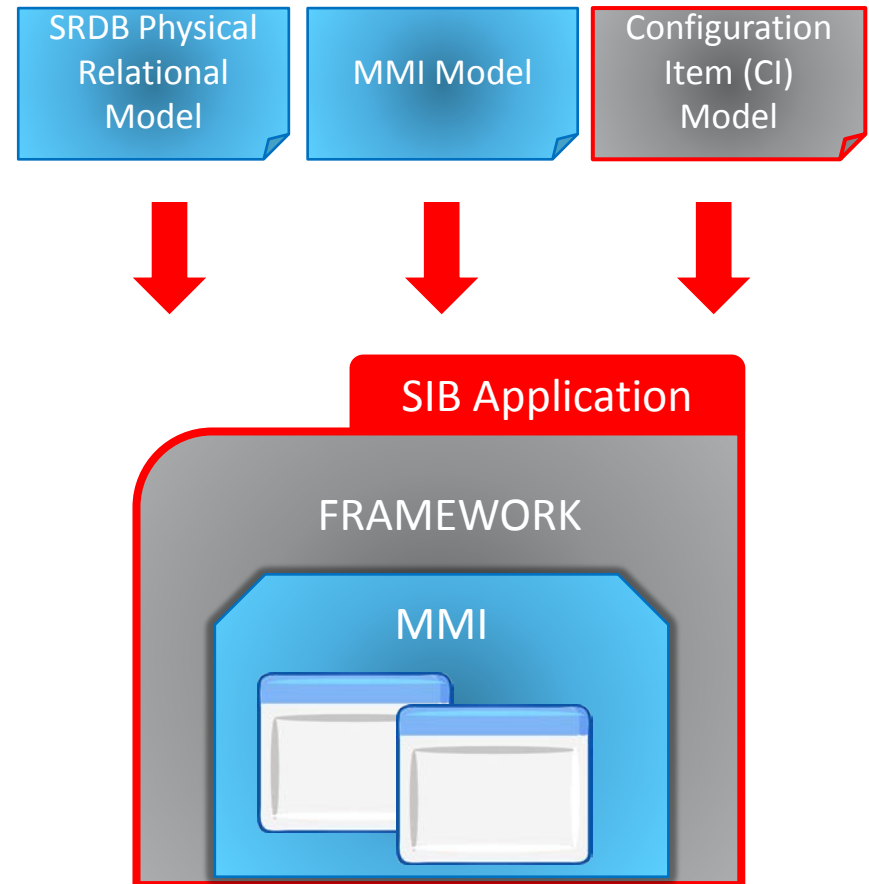




- **BACKGROUND**
- **THE CHALLENGE**
- **SIB APPLICATION**
- **Model2ADF**
- **CONCLUSIONS**



- **SRDB Physical Relational Model**
  - ICD Database Schema Model
  - Validation Rules Model
- **MMI Model**
  - Menu Model
  - Configuration Item View Model
- **Configuration Item Model**
  - *“Part of” Model*
  - *Impact Analysis Model*



# SRDB PHYSICAL RELATIONAL MODEL: ICD Database Schema Model



**ICD Versions**

Filter By Ver

Action View Format

* Ver	* Suffix	* Issue Date	* Description	VR	VR Package	Application
MIB6.9.1	MIB6.9.1	06-Jul-2010	MIB ICD 6.9	1168	PKG_Check_Constr_Util	SIB_PA
1						

**ICD Tables**

Action View Format

* Table Name	Alias
CAF	
CAP	
CCA	
CCF	
CCS	
CDF	
CPC	
CPS	
CSF	
CSP	
55	

**ICD Fields**

Action View Format

* Field Name	* Pos	* Data Type	Max Size	Def. Val.	* Mandatory ?
CCF_CNAME	1	VARCHAR2	8		N
CCF_DESCR	2	VARCHAR2	24		N
CCF_DESCR2	3	VARCHAR2	64		N
CCF_CTYPE	4	VARCHAR2	8		N
CCF_CRITICAL	5	CHAR	1	N	N
CCF_PKTID	6	VARCHAR2	8		N
CCF_TYPE	7	NUMBER	3		N
CCF_STYPE	8	NUMBER	3		N
CCF_APID	9	NUMBER	5		N
CCF_NPARS	10	NUMBER	3		N
21					

# SRDB PHYSICAL RELATIONAL MODEL: Validation Rules Model



**Validation Rules**

Filter By: Table Name

Action View Format Freeze Detach Wrap

	MIB					
	Icd Version	Table Name	Constraint Id	Constraint Type	Class	Severity
	MIB6.9.1	PCFREC	PCFREC_03F	Cross Check	MIB	Error
	MIB6.9.1	PCF	PCF_01A	Primary Key	MIB	Error
	MIB6.9.1	PCF	PCF_01B	Field Check	MIB	Error
	MIB6.9.1	PCF	PCF_01C	Field Check	MIB	Editorial
	MIB6.9.1	PCF	PCF_01D	Field Check	MIB	Error
	MIB6.9.1	PCF	PCF_01E	Cross Check	MIB	Error
	MIB6.9.1	PCF	PCF_02A	Field Check	MIB	Warning
	MIB6.9.1	PCF	PCF_03A	Unique Key	MIB	Error
	MIB6.9.1	PCF	PCF_03B	Field Check	MIB	Error
	MIB6.9.1	PCF	PCF_05A	Field Check	MIB	Error
					1,168	

**Validation Rules**

Filter By: Table Name

Action View Format Freeze Detach Wrap

	MIB					
	Icd Version	Table Name	Constraint Id	Constraint Type	Class	Severity
	MIB6.9.1	PCF	PCF_07A	Field Check	MIB	Error
	MIB6.9.1	PCF	PCF_08A	Record Check	MIB	Error
	MIB6.9.1	PCF	PCF_08B	Foreign Key	MIB	Error
	MIB6.9.1	PCF	PCF_08C	Field Check	MIB	Editorial
	MIB6.9.1	PCF	PCF_08D	Record Check	MIB	Editorial
	MIB6.9.1	PCF	PCF_08E	Cross Check	MIB	Error
	MIB6.9.1	PCF	PCF_08F	Cross Check	MIB	Error
	MIB6.9.1	PCF	PCF_08G	Cross Check	MIB	Error
	MIB6.9.1	PCF	PCF_09A	Record Check	MIB	Error
	MIB6.9.1	PCF	PCF_09B	Foreign Key	MIB	Error
					1,168	

Description: PCF\_NAME shall be unique (i.e. PK).

Definition: PCF\_NAME

Encoding: [PCF],[PCF\_NAME]

Description: PCF\_NAME should be uppercased.

Definition: PCF\_NAME=UPPER(PCF\_NAME)

Encoding: [PCF],[PCF\_NAME=UPPER(PCF\_NAME)]

Description: IF PCF\_USCON='Y' then shall exist at least one CVE entry having CVE\_PARNAM=PCF\_NAME.

Definition: [nv(PCF\_USCON,'#') = 'Y'] implies [exists (select 1 from CVE where CVE\_PARNAM = PCF\_NAME)]

Encoding: [PCF],[exists (select 1 from CVE where CVE\_PARNAM = PCF\_NAME) OR NOT (nv(PCF\_USCON,'#') = 'Y')]

Description: PCF\_PID shall be unique.

Definition: PCF\_PID

Encoding: [PCF],[PCF\_PID]

Description: PCF\_VALID shall point to a PCF entry having PCF\_NAME = PCF\_VALID.

Definition: PCF\_VALID -> PCF\_NAME

Encoding: [PCF],[PCF],[PCF\_VALID.PCF\_NAME]

Description: IF PCF\_VALPAR is not null then PCF\_VALID is not null.

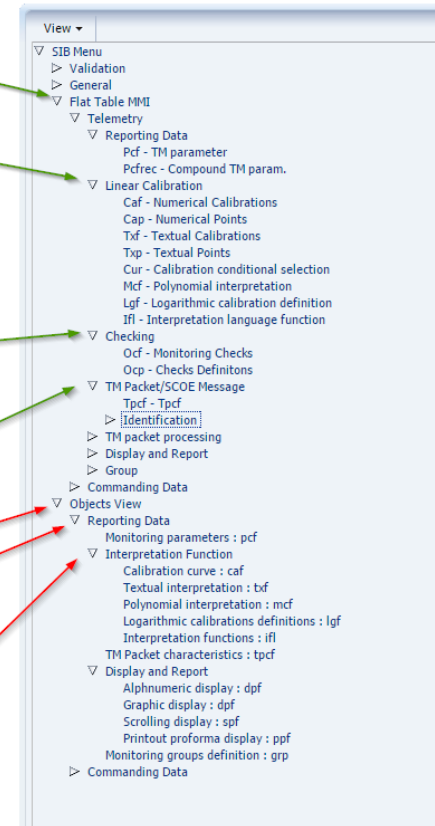
Definition: (PCF\_VALPAR is not null) implies (PCF\_VALID is not null)

Encoding: [PCF],[PCF\_VALID is not null] OR NOT (PCF\_VALPAR is not null)]

# MMI MODEL: MENU MODEL



```
<groupNode id="FlatMMI" idref="FlatMMIMenu" label="Flat Table MMI">
  <groupNode id="TelemetryMMI" idref="TelemetryMMIMenu" label="Telemetry">
    <groupNode id="ReportingDataMMI" idref="ReportingDataMMIMenu" label="Reporting Data">
      <itemNode id="PcfMI" label="Pcf - TM parameter" action="uishell:Pcf" focusViewId="Pcf"/>
      <itemNode id="PcfrecMI" label="Pcfrec - Compound TM param." action="uishell:Pcfrec" focusViewId="Pcfrec"/>
    </groupNode>
    <groupNode id="LinearCalibrationMenuMMI" idref="LinearCalibrationMenuMMIMenu" label="Linear Calibration">
      <itemNode id="CafMI" label="Caf - Numerical Calibrations" action="uishell:Caf" focusViewId="Caf"/>
      <itemNode id="CapMI" label="Cap - Numerical Points" action="uishell:Cap" focusViewId="Cap"/>
      <itemNode id="TxfMI" label="Txf - Textual Calibrations" action="uishell:Txf" focusViewId="Txf"/>
      <itemNode id="TxpMI" label="Txp - Textual Points" action="uishell:Txp" focusViewId="Txp"/>
      <itemNode id="CurMI" label="Cur - Calibration conditional selection" action="uishell:Cur" focusViewId="Cur"/>
      <itemNode id="McfMI" label="Mcf - Polynomial interpretation" action="uishell:Mcf" focusViewId="Mcf"/>
      <itemNode id="LgfMI" label="Lgf - Logarithmic calibration definition" action="uishell:Lgf" focusViewId="Lgf"/>
      <itemNode id="IflMI" label="Ifl - Interpretation language function" action="uishell:Ifl" focusViewId="Ifl"/>
    </groupNode>
    <groupNode id="CheckingMenu" idref="CheckingMMIMenu" label="Checking">
      <itemNode id="OcfMI" label="Ocf - Monitoring Checks" action="uishell:Ocf" focusViewId="Ocf"/>
      <itemNode id="OcpMI" label="Ocp - Checks Definitions" action="uishell:Ocp" focusViewId="Ocp"/>
    </groupNode>
    <groupNode id="TMPacketSCOEMessageMenu" idref="TMPacketSCOEMessageMMIMenu" label="TM Packet/SCOE Message">
      <itemNode id="TpcfMI" label="Tpcf - Tpcf" action="uishell:Tpcf" focusViewId="Tpcf"/>
      <groupNode id="TMPacketIdentification" idref="TMPacketIdentificationMenu" label="Identification">
      </groupNode>
    </groupNode>
  </groupNode>
  <groupNode id="ObjectViewMI" idref="ObjectViewMenu" label="Objects View">
    <groupNode id="ReportingDataMMI" idref="ReportingDataMMIMenu" label="Reporting Data">
      <itemNode id="PcfObjectMI" label="Monitoring parameters : pcf" action="uishell:PcfObject" focusViewId="PcfObject"/>
    </groupNode>
    <groupNode id="InterpretationFunctionMMI" idref="InterpretationFunctionMMIMenu" label="Interpretation Function">
      <itemNode id="CalibrationCurveMI" label="Calibration curve : caf" action="uishell:CafObject" focusViewId="CafObject"/>
      <itemNode id="TextualInterpretationMI" label="Textual interpretation : txf" action="uishell:TxfObject" focusViewId="TxfObject"/>
    </groupNode>
  </groupNode>
</groupNode>
```



**Monitoring parameters**

**Pcf** Save Cancel

Filter By: PcfName Advanced Search

Action View Format En.Cons. Dis.Cons. Freeze Detach Wrap

Name	Descr	Pid	Unit	Ptc	Pfc	Width	Valid	++	Related	++	Categ	Natur
PNS1241S	STATUS SGEN ESQ	131,868		2	1			++		++	S	R
PNS1242S	STATUS SGEN L1	131,869		2	1			++		++	S	R
PNS1243S	STATUS SGEN E6	131,870		2	1			++		++	S	R
PNS1244S	STAT E6 PRS LOSS	131,871		2	1			++		++	S	R
PNS1245S	STAT L1 PRS LOSS	131,872		2	1			++		++	S	R

9469 Columns Frozen: 2

**Referenced By**

CDF 0 CUR 0 CUR 0 CVE 0 DPC 0 GPC 0 GRPA 0 OCF 1 OCP 0 PCF 0 PCF 0 PCFREC 0 PCFREC 0 PLF 2 PPC 0 PTV 0 SPC 0 VPD 0

**Cl ob columns**

**Ocf**

Action View Format En.Cons. Dis.Cons. Freeze Detach

Name	++	Nbchck	Nbool	Inter	Codin
PNS1241S	++	3	1	C	A

1 Columns Frozen: 2

**Referenced By**

OCP 1

**Ocp**

Action View Format En.Cons. Dis.Cons. Freeze Detach Wrap

Name	++	Pos	Type	Lvalu	Hvalu	Rlchk	++	Valpar
PNS1241S	++	1	H	IN_LIMITS			++	1

1 Columns Frozen: 4

**Cur**

**Pcfrec**

```

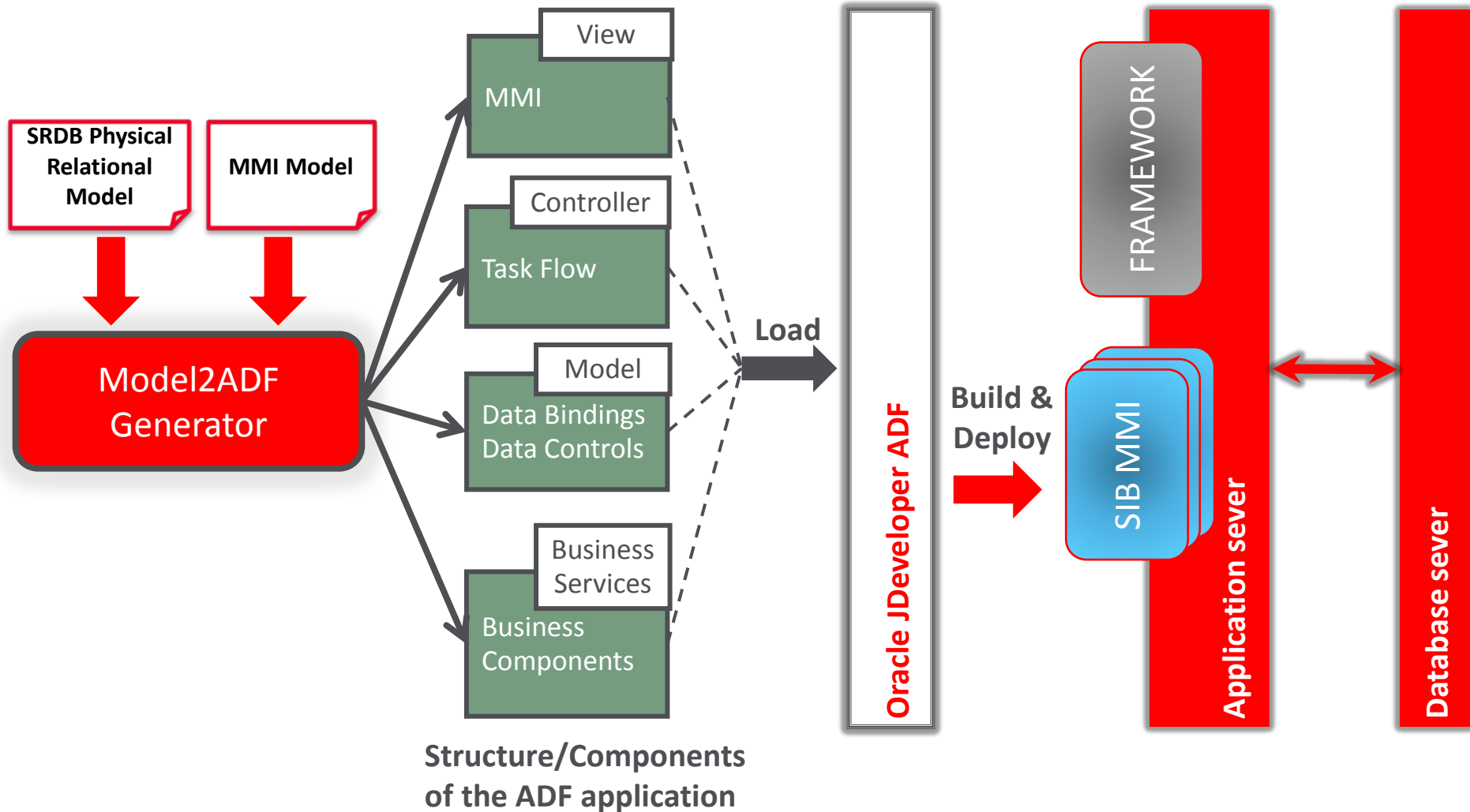
<Group Name="Pcf" tableName="PCF" label="Monitoring parameters">
  <GroupRegion name="Ocf"/>
  <GroupRegion name="Cur"/>
  <GroupRegion name="Pcfrec"/>
</Group>

<Group Name="Ocf" tableName="Ocf" label="Checking">
  <GroupRegion name="Ocp"/>
</Group>
    
```

```
<UserObjectType Name="Alphanumeric Display" Description="AND" IsContainer="False">
  <PhysicalTableMapping TableName="DPF">
    <Primarykeyfield>DPF_NUMBE</Primarykeyfield>
    <IsRootTable>true</IsRootTable>
    <ChangeImpactDefinition FieldName="DPF_HEAD" Severity="Editorial"/>
    <ChangeImpactDefinition FieldName="DPF_NUMBE" Severity="Critical"/>
    <ChangeImpactDefinition FieldName="DPF_TYPE" Severity="Editorial"/>
  </PhysicalTableMapping>
  <PhysicalTableMapping TableName="DPC">
    <PrimaryKeyField>DPC_NUMBE</PrimaryKeyField>
    <PrimaryKeyField>DPC_FLDN</PrimaryKeyField>
    <HasParentTable TableName="DPF">
      <ForeignKey SourceFieldName="DPF_NUMBE" TargetFieldName="DPC_NUMBE"/>
    </HasParentTable>
    <ConceptReference TargetConcept="Reporting Data">
      <ForeignKey SourceFieldName="PCF_NAME" TargetFieldName="DPC_NAME"/>
    </ConceptReference>
    <ChangeImpactDefinition FieldName="DPC_COMM" Severity="Critical"/>
    <ChangeImpactDefinition FieldName="DPC_FLDN" Severity="Minor"/>
    <ChangeImpactDefinition FieldName="DPC_FORM" Severity="Minor"/>
    <ChangeImpactDefinition FieldName="DPC_MODE" Severity="Critical"/>
    <ChangeImpactDefinition FieldName="DPC_NAME" Severity="Critical"/>
    <ChangeImpactDefinition FieldName="DPC_NUMBE" Severity="Critical"/>
    <ChangeImpactDefinition FieldName="DPC_TEXT" Severity="Minor"/>
  </PhysicalTableMapping>
</UserObjectType>
```



# HOW IT WORKS



**Structure/Components of the ADF application**

# STANDARD FEATURES OF GENERATED MMI



Logged In application : SIB\_SRDB/MYDATASET SIB Designer Logout

**Menu panel**

- View ▾
- ▽ SIB Menu
  - ▽ Validation
  - ▽ General
  - ▽ Flat Table MMI
    - ▽ Telemetry
      - ▽ Reporting Data
      - ▽ Linear Calibration
      - ▽ Checking
      - ▽ TM Packet/SCOE Message
      - ▽ TM packet processing
      - ▽ Display and Report
      - ▽ Group
    - ▽ Commanding Data
      - ▽ Packet Header
      - ▽ Telecommand/SCOE command
      - ▽ Command Sequence
      - ▽ Command/sequence parameter set
      - ▽ Verification
      - ▽ Command/sequence Interpretation
      - ▽ Command/sequence parameter range check
  - ▽ Objects View
    - ▽ Reporting Data
      - Monitoring parameters : pcf
    - ▽ Interpretation Function
      - Calibration curve : caf
      - Textual interpretation : txf
      - Polynomial interpretation : mcf
      - Logarithmic calibrations definitions : lgf
      - Interpretation functions : iff
    - ▽ Display and Report
      - Alphanumeric display : dpf
      - Graphic display : dpf
      - Scrolling display : spf
      - Printout proforma display : ppf
      - Monitoring groups definition : grp

**Monitoring parameters**

Pcf Transaction commit / rollback Save Cancel

**Advanced Search** Quick Search

Match  All  Any

Case Sensitive?

Name  Width  Inter  Sptype

Descr  Valid  Uscon  Corr

Pid  Related  Decim  Obtid

Unit  Categ  Parval  Darc

Ptc  Natur  Subsys  Endian

Pfc  Curtx  Valpar  Simval

Search Reset

Hide advanced search area

**Toolbar**

Action View Format En.Cons. Dis.Cons. Freeze Detach Wrap **Toolbar**

Name	Descr	Pid	Unit	Descr	Ptc	Pfc	Width	Valid	++	Related	++	Categ
ACSP095_	PPR_CSSNORMLIM	131,293			5	2			++		++	N
ACSP096H	PPR_CSSUMBRAMAX	131,294	5		5	2			++		++	N
ACSP230_	ADS_CSSBLENDK	131,295			5	2			++		++	N
ACSP422_	FDIR_CSSCCT	131,296			5	2			++		++	N
ACSPF09_	FDIR_CSSAMSG	135,082			2	1			++		++	S

9469

Columns Frozen 2 group: Monitoring parameters: pcf

**Referenced By** Hyperlinks to referenced records

CDF 1 CUR 0 CUR 0 CVE 0 DPC 1 GPC 0 GRPA 0 OCF 0 OCP 0 PCF 0 PCF 0 PCFREC 0 PCFREC 0 PLF 1 PPC 0 PTV 0 SPC 0 VPD 0

- > Clob columns
- > Ocf
- > Cur
- > Pcfrec

Collapse panel widget

**Pcf**

Filter By: PcfName  Advanced Search

Action View Format

Name	Descr	Pid	Unit	Ptc	Pfc	Width	Valid	++	Related	++	Categ	Natur	D	Curbx
<input type="checkbox"/> AESAI11S	ESA_INHIBIT_CH_1			2	1	8					S	D		AES_TCHI
<input type="checkbox"/> AESAI12S	ESA_INHIBIT_CH_1			2	1	8					S	D		AES_TCHI
<input type="checkbox"/> AESAI32S	ESA_INHIBIT_CH_3			2	1	8					S	D		AES_TCHI
<input type="checkbox"/> AESASM1S	ESA_SCAN_MODE			2	1	8					S	D		AES_TSCA
<input type="checkbox"/> AESBI31S	ESB_INHIBIT_CH_3			2	1	8					S	D		AES_TCHI
<input type="checkbox"/> AESBSM1S	ESB_SCAN_MODE			2	1	8					S	D		AES_TSCA
<input type="checkbox"/> AAAXS20S	CS_USABLE			2	1						N	D		
<input type="checkbox"/> AAAXS28S	ES_CH1_POLES_BLI			2	1						N	D		
<input type="checkbox"/> AMT2AAVI	MT2AVCURRENTA		MA	5	2						N	D		
<input type="checkbox"/> AMT2BAVI	MT2AVCURRENTB		MA	5	2						N	D		
<input type="checkbox"/> AMT1AAVI	MT1AVCURRENTA		MA	5	2						N	D		
<input type="checkbox"/> AMT1BAVI	MT1AVCURRENTB		MA	5	2						N	D		
<input type="checkbox"/> ESDXSP1D	POT_STEP_TO_DEG		DEG	5	1						N	D		
<input type="checkbox"/> CDUPMAOS	PM A PWR STATUS			1	0						S	D		CDU_T_OI
<input type="checkbox"/> CDUPMBOS	PM B PWR STATUS			1	0						S	D		CDU_T_OI

148

Columns Frozen 2

**Referenced By**

CDF 0 CUR 0 CUR 0 CVE 0 DPC 0 GPC 0 GRPA 0 OCF 0 OCP 0 PCF 2 PCF 0 PCFREC 0 PCFREC 0 PLF 0 PPC 0 PTV 0 SPC 0 VPD 0

**Clob columns**

PcfSyn

# Use PM B power status acquired by TTR A if TM Encoder A is active and PM B power status acquired by TTR B if TM Encoder B is active

```
VAR_PMBOnStatus := (CDUTMEAS.raw == 1 land CDUPBATS.raw == 1) lor (CDUTMEAS.raw == 0 land CDUPBBTS.raw == 1);
```

return(VAR\_PMBOnStatus);

# CONFIGURATION ITEM VIEW MMI



**Monitoring parameters**

**Pcf**

Filter By: PcfName [Advanced Search]

Action View Format [En.Cons.] [Freeze] [Detach] [Wrap]

Name	Descr	Pid	Unit	Ptc	Pfc	Width	Valid	++	Related	++	Categ	Natur	Curtx
PMI35975	MI_C1_RS_E_ER	1,876		2	1	8			++		5	R	PPP_

Columns Frozen: 2

**Referenced By**

CDF0 CUR0 CUR0 CVE0 DPC1 GPC0 GRPA0 OCF1 OCP0 PCF0 PCF0 PCFREC0 PCFREC0 PLF2 PPC0 PTV0 SPC0 VPD0

**Clob columns**

**Ocf**

Action View Format [En.Cons.] [Dis.Cons.] [Freeze] [Detach]

Name	++	Nbchck	Nbool	Inter	Codin
PMI35975	++ 3	1	C	A	

Columns Frozen: 2

**Referenced By**

OCP1

**Ocp**

Action View Format [En.Cons.] [Dis.Cons.] [Freeze] [Detach] [Wrap]

Name	++	Pos	Type	Lvalu	Hvalu	Rlchk	++	Valpar
PMI35975	++ 1	H	VALID				++ 1	

Columns Frozen: 4

**Cur**

Action View Format [En.Cons.] [Dis.Cons.] [Freeze] [Detach] [Wrap]

Pname	++	Pos	Rlchk	++	Valpar	Select
No rows found						

Columns Frozen: 4

**Pcfrec**

# THE Model2ADF CONSOLE



Model2ADF Wizard - FullSIB.jcb

File Help

Main Panel Tables

Application name: SIB\_SRDB

Description: Full SIB MIB ICD 6.9

Service File: E:\Projects\SIB\MMI Generation\Model2ADF\Generator\Client\FullSIB\_ServiceDefinition.xml  
Browse...

Menu File: E:\Projects\SIB\MMI Generation\Model2ADF\Generator\Client\FullSIB\_menu.xml  
Browse...

Access through: Admin page

Isolation level: Validation plug-in

Trans. Level: Read/Write

Driver: oracle.jdbc.OracleDriver

URL: jdbc:oracle:thin:@//localhost:1521/orcl.esa-ad.esa.int

User ID: FM09\_1220\_N

Password: ●●●

Test connection

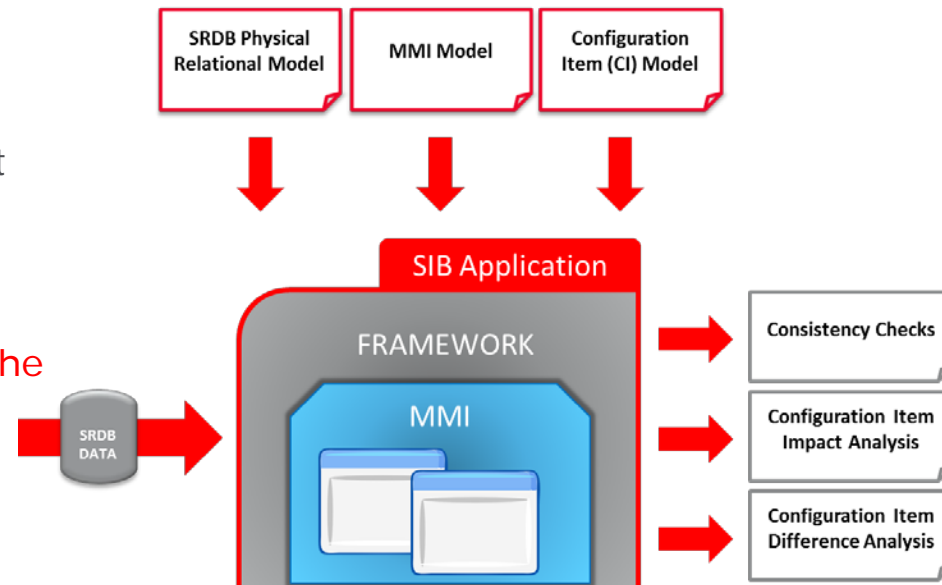
Set of tables:

- CAF
- CAP
- CCA
- CCF
- CCS
- CDF
- CPC

- **BACKGROUND**
- **THE CHALLENGE**
- **SIB APPLICATION**
- **Model2ADF**
- **CONCLUSIONS**

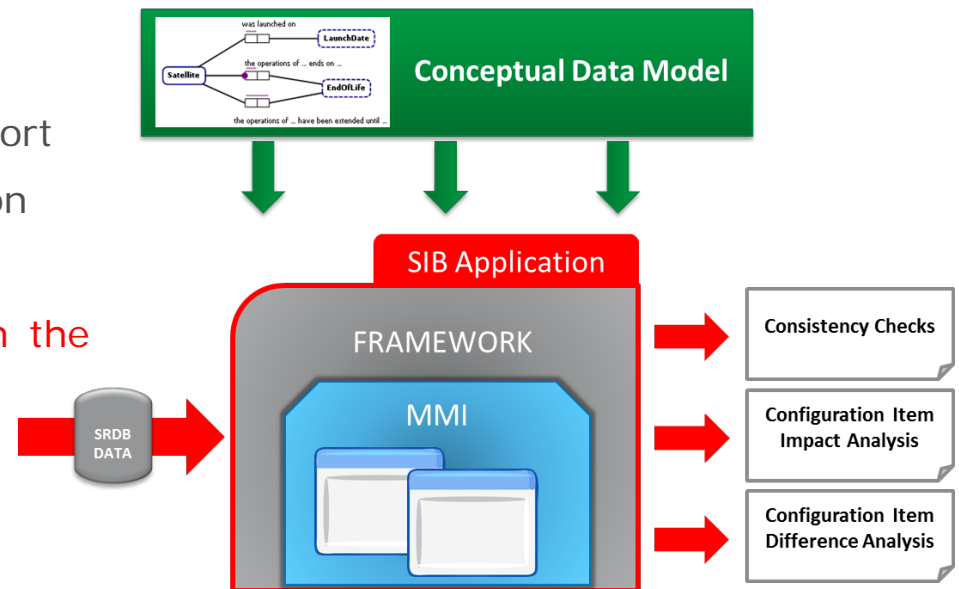
## 100% Model Driven SRDB Application:

- Fulfilled Requirements:
  - Import/Export (driven by the SRDB Physical Data model)
  - Consistency Checks
  - Impacts Analysis & Differences Report
  - MMI for Data & Violations Navigation
  - Flat MMI
  - Configuration Item MMI (based on the master-detail pattern)
- Input Models:
  - SRDB Physical Data Model
  - MMI Model
  - Configuration Item Model
- Three Tier Deployment



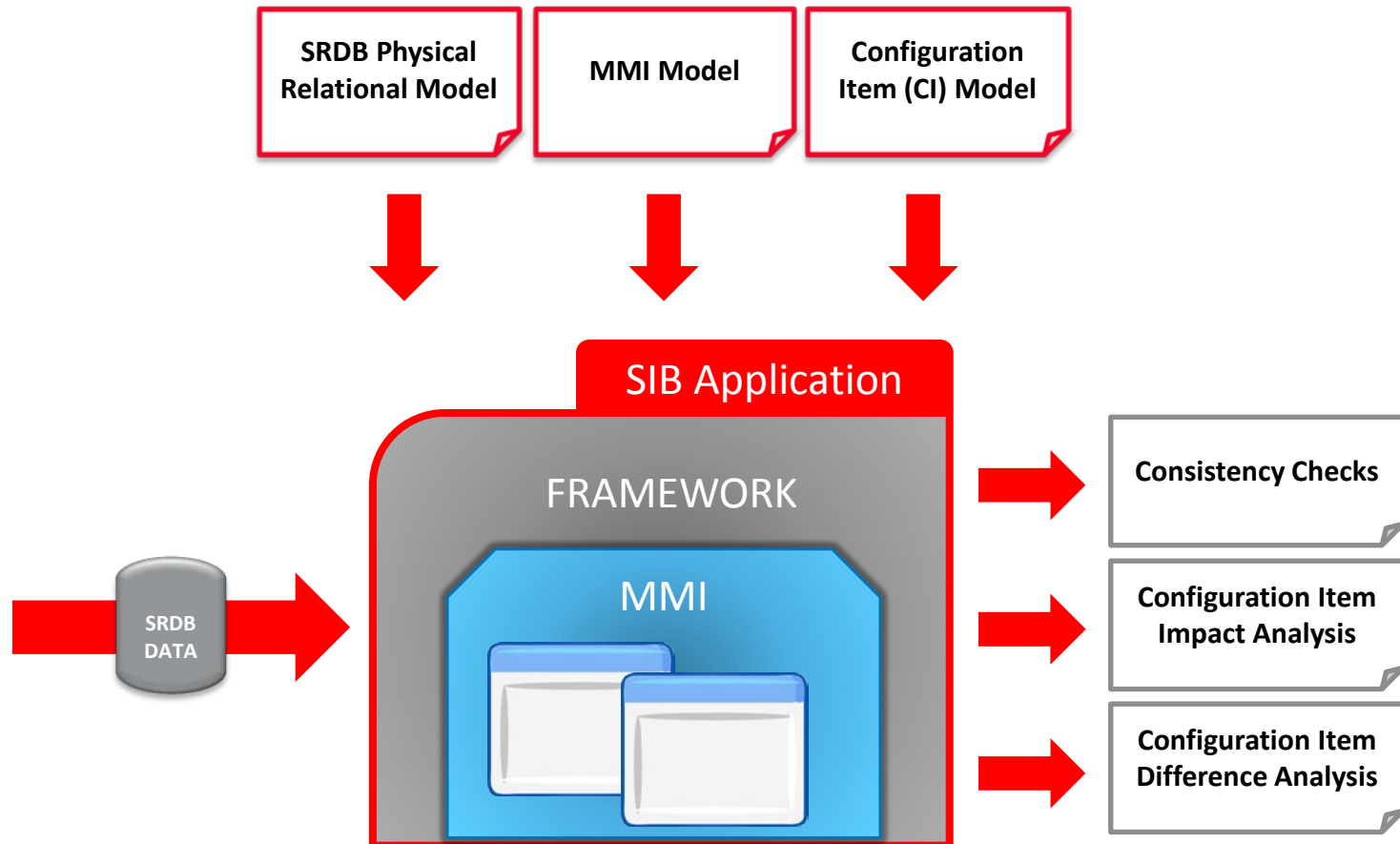
## 100% Model Driven SRDB Application:

- Fulfilled Requirements:
  - Import/Export (based on the user specific conceptual views)
  - Consistency Checks
  - Impacts Analysis & Differences Report
  - MMI for Data & Violations Navigation
  - Flat MMI
  - Configuration Item MMI (based on the user specific conceptual views)
- Input Model:
  - Conceptual Data Model
- Three Tier Deployment





# Any Questions?



***Thank you!***



**CONTACTS:**

**francesco.sgaramella@esa.int**

**emilia.barbagallo@esa.int**

**cosimo.bruno@dottcb-consulting.it**