

GSAW 2014

# XTCE TAILORING FOR ESA

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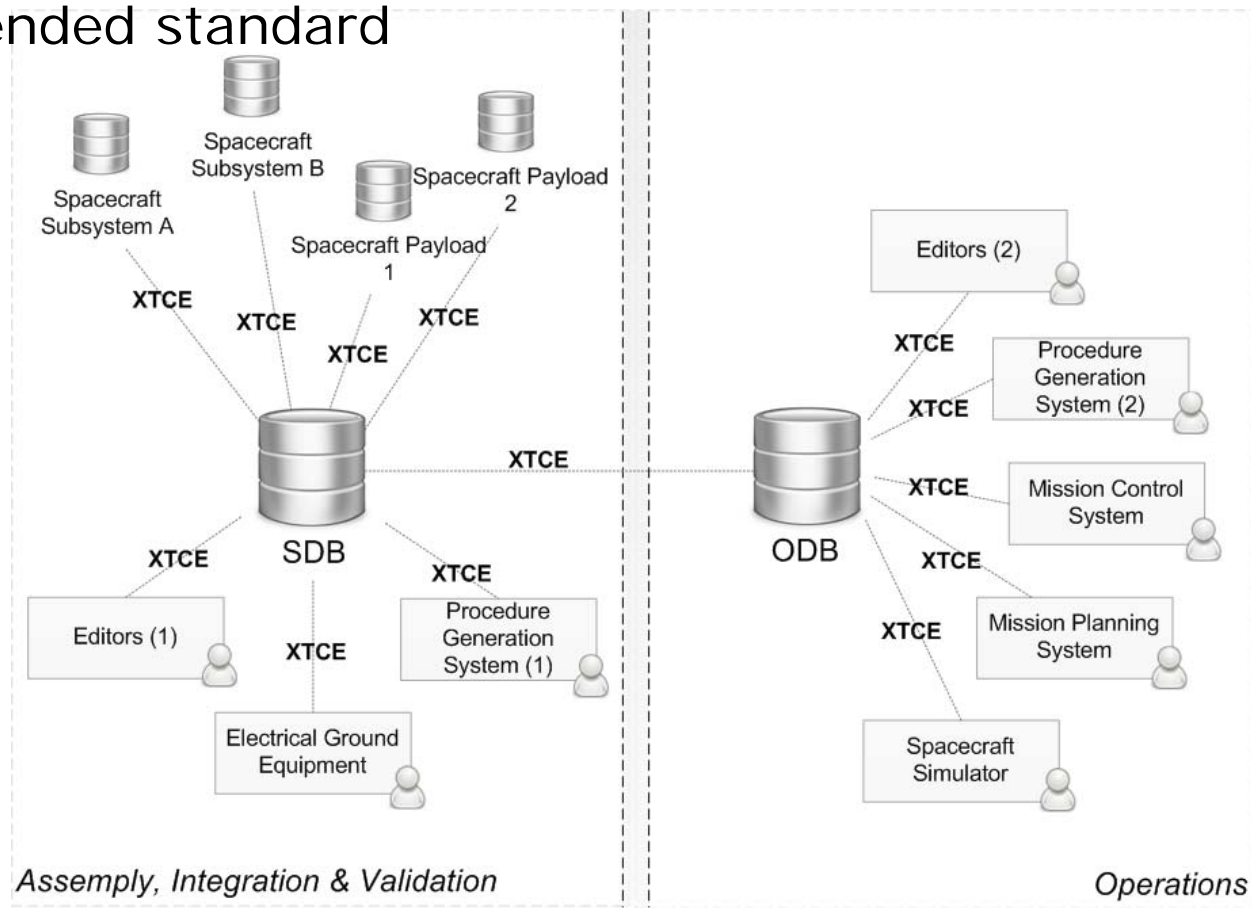
# WHAT IS XTCE?



# WHAT IS XTCE

**XTCE = XML Telemetric and Command Exchange**

- Solution to exchange TM&TC data
- CCSDS recommended standard
- XML Schema



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**WHY TAILORING**

**XTCE**



# WHY TAILORING XTCE

## 1. To narrow its scope

- Too general in some areas
- Only a subset of the schema is needed

## 2. To specify how to use it

- Too open in some areas
- Need to establish a unique way to define the data

## 3. To add support for additional data

- Need to allow/enforce the use of specific data

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# TAILORING APPROACH

# TAILORING APPROACH: STARTING POINT

- CCSDS standards
  - XTCE CCSDS Best Practices Report
  - **NASA's GovSat Specialization** – XTCE tailoring for a certain type of USA Government satellites
- GovSat approach: Define rules that either forbid or restrict the use of XTCE elements and attributes

XTCE  
Schema

Defines structure and types (**not modified**)

GovSat  
Rules

Define how to use the schema

GovSat  
Template

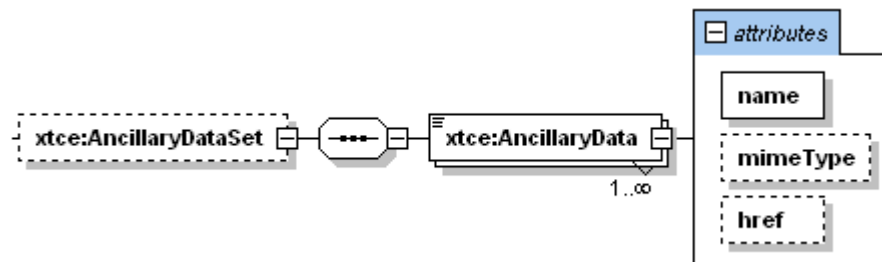
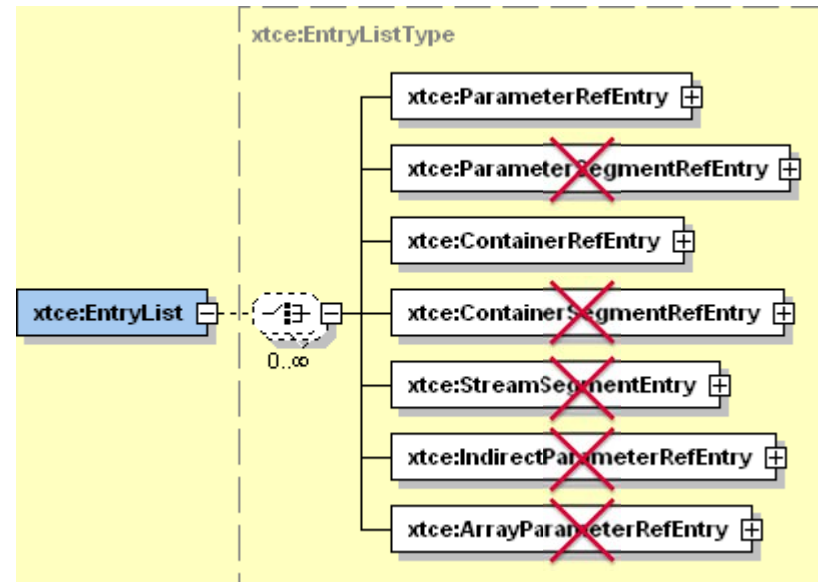
Provides fixed definitions



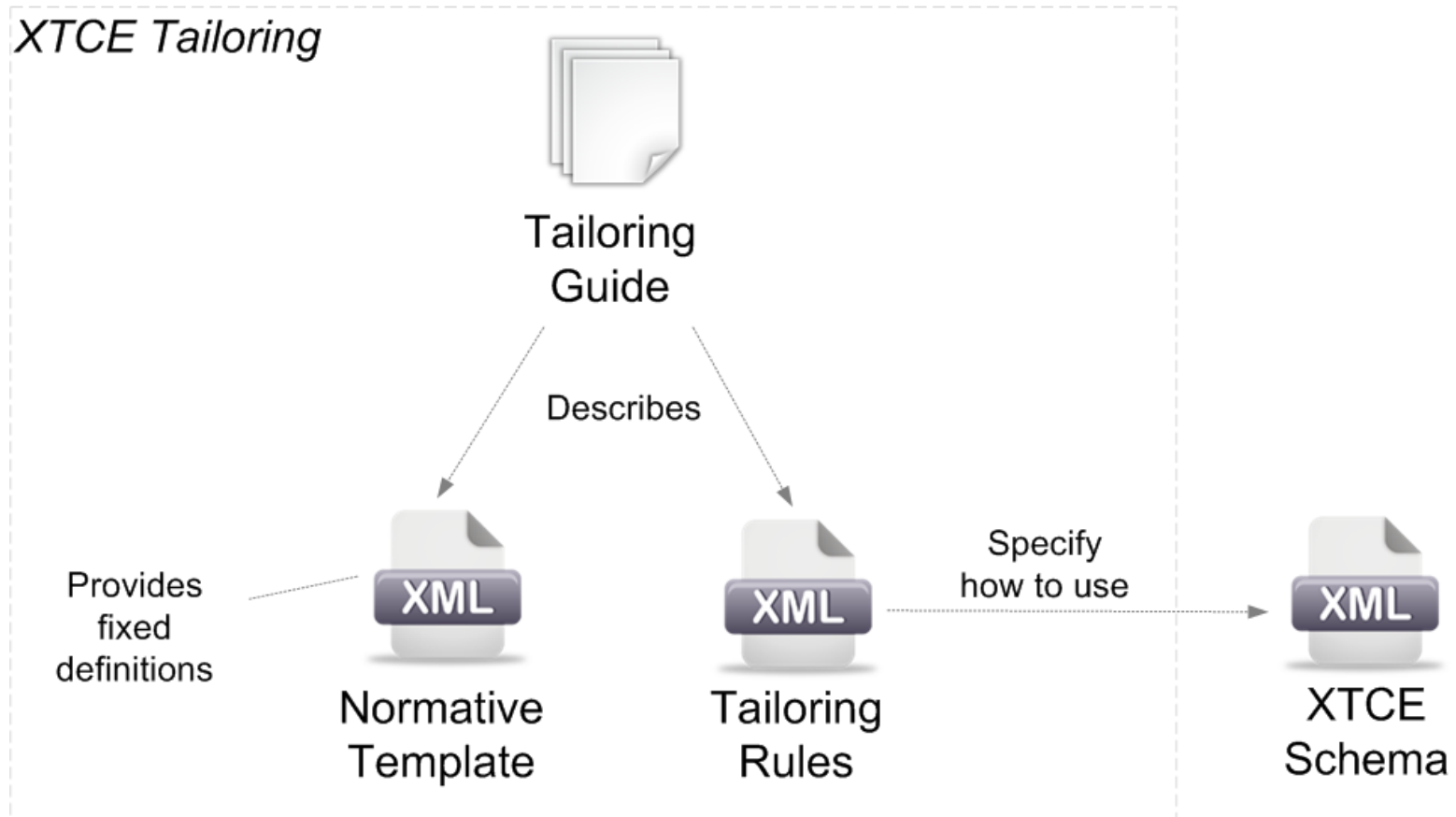
# TAILORING APPROACH: RULES

- Forbid elements or attributes that are not applicable
- Constrain elements in particular ways
- Extend elements in particular ways

Tailored definition of packet entries

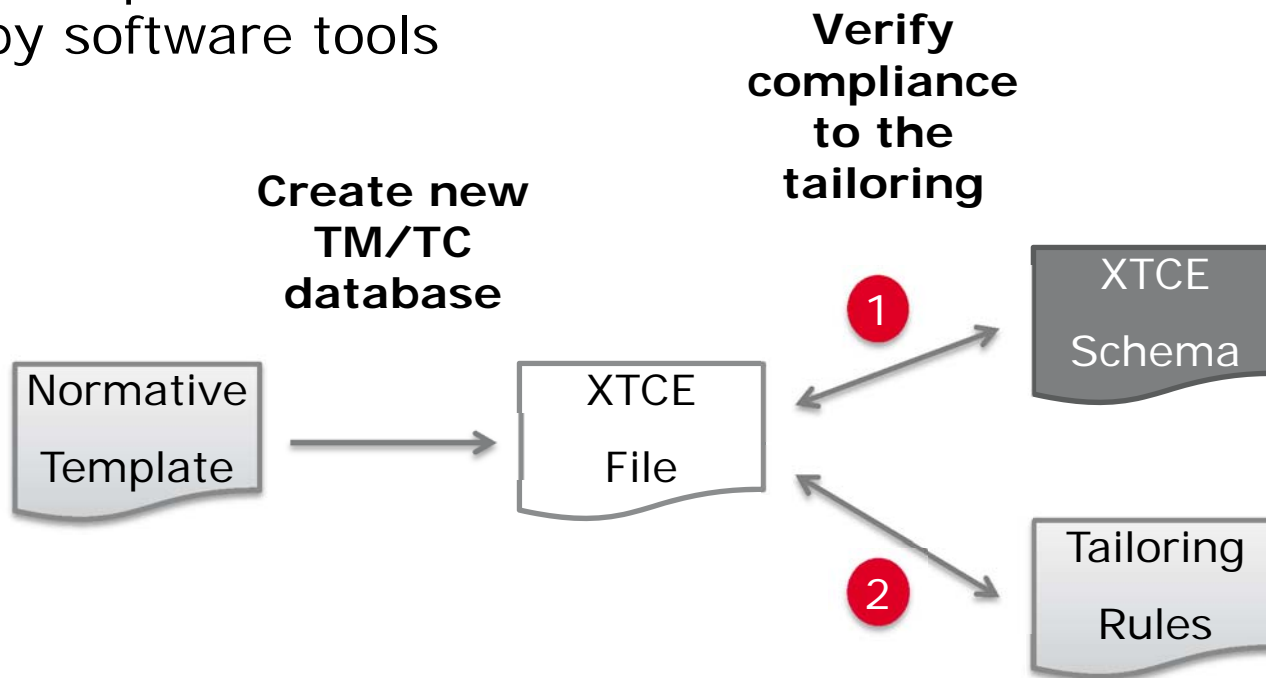


# TAILORING APPROACH: OVERVIEW



# TAILORING APPROACH: PRACTICAL VIEW

- Tailoring rules formalized as Xpath expressions
  - Unique interpretation
  - Easy verification
- Rules, template and schema used by software tools



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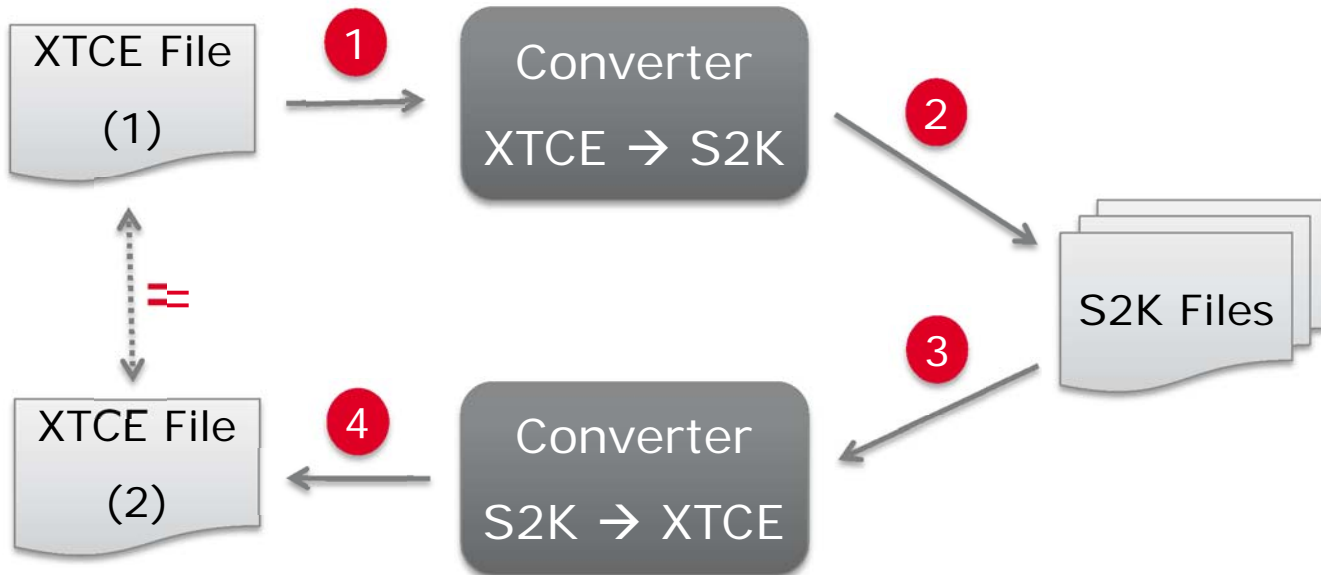
# ESA TAILORING OVERVIEW



# OBJECTIVE

- Map XTCE to the SCOS-2000 MIB format

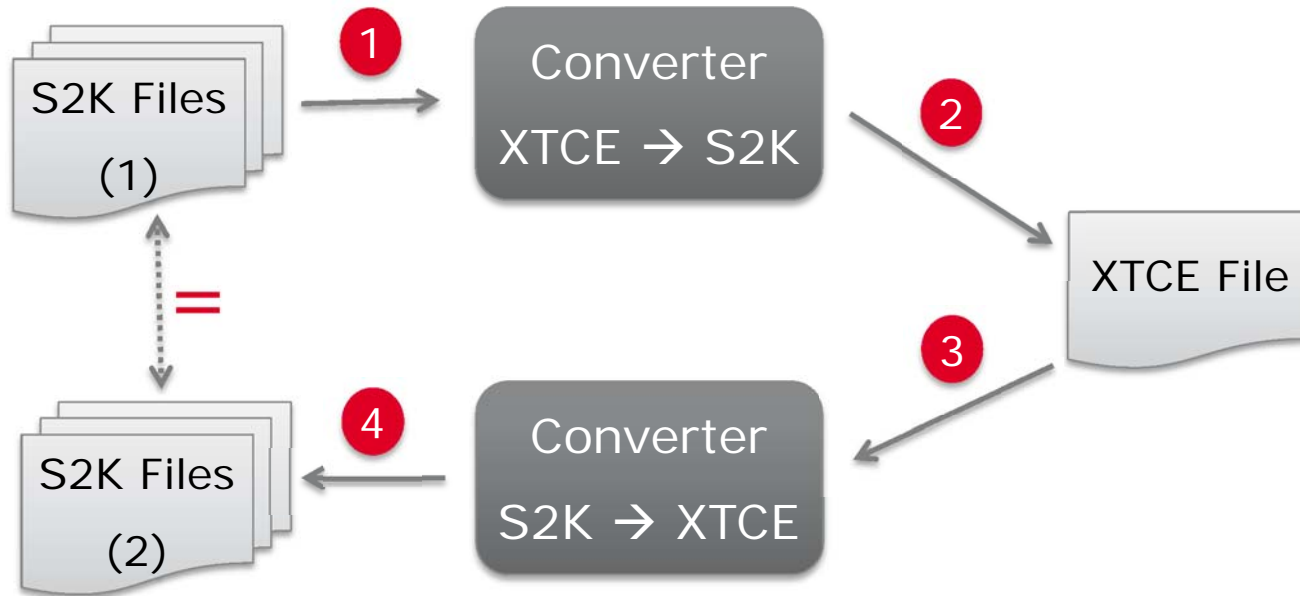
Enable conversion XTCE  $\leftrightarrow$  MIB without data loss



# OBJECTIVE

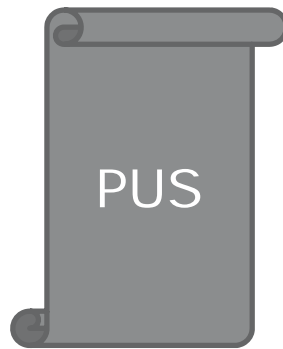
- Map XTCE to the SCOS-2000 MIB format

Enable conversion XTCE  $\leftrightarrow$  MIB without data loss

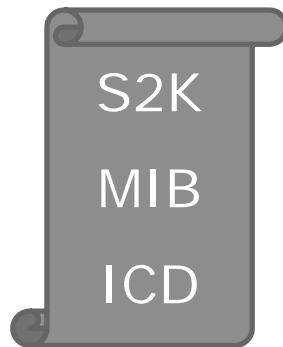


# INPUTS

The rules have two sources:



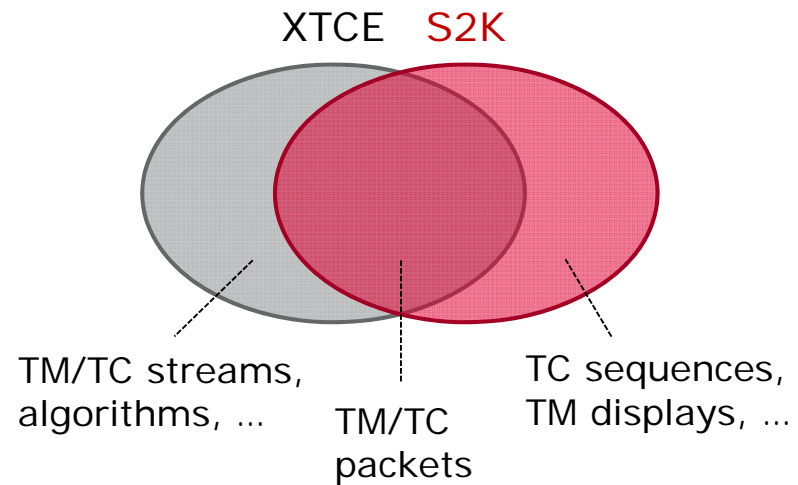
- PUS packet patterns
- PUS parameter types



- Data defined as in the MIB
- Including MIB-specific data

# DIFFICULTIES

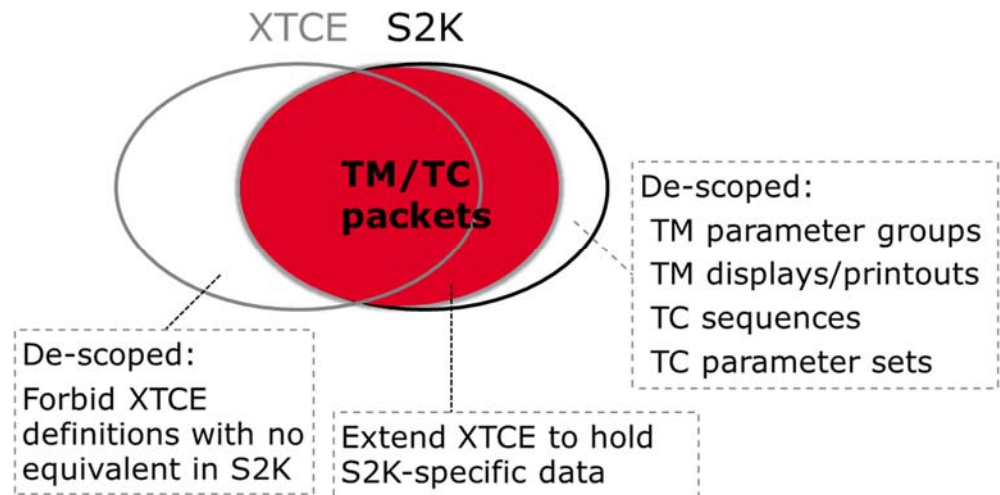
- Different scope
  - XTCE scope is wider
  - S2K includes specific data
  - No unique mapping
- Different data model
  - Relational vs hierarchical
- Different data format
  - Schema types vs relational database types



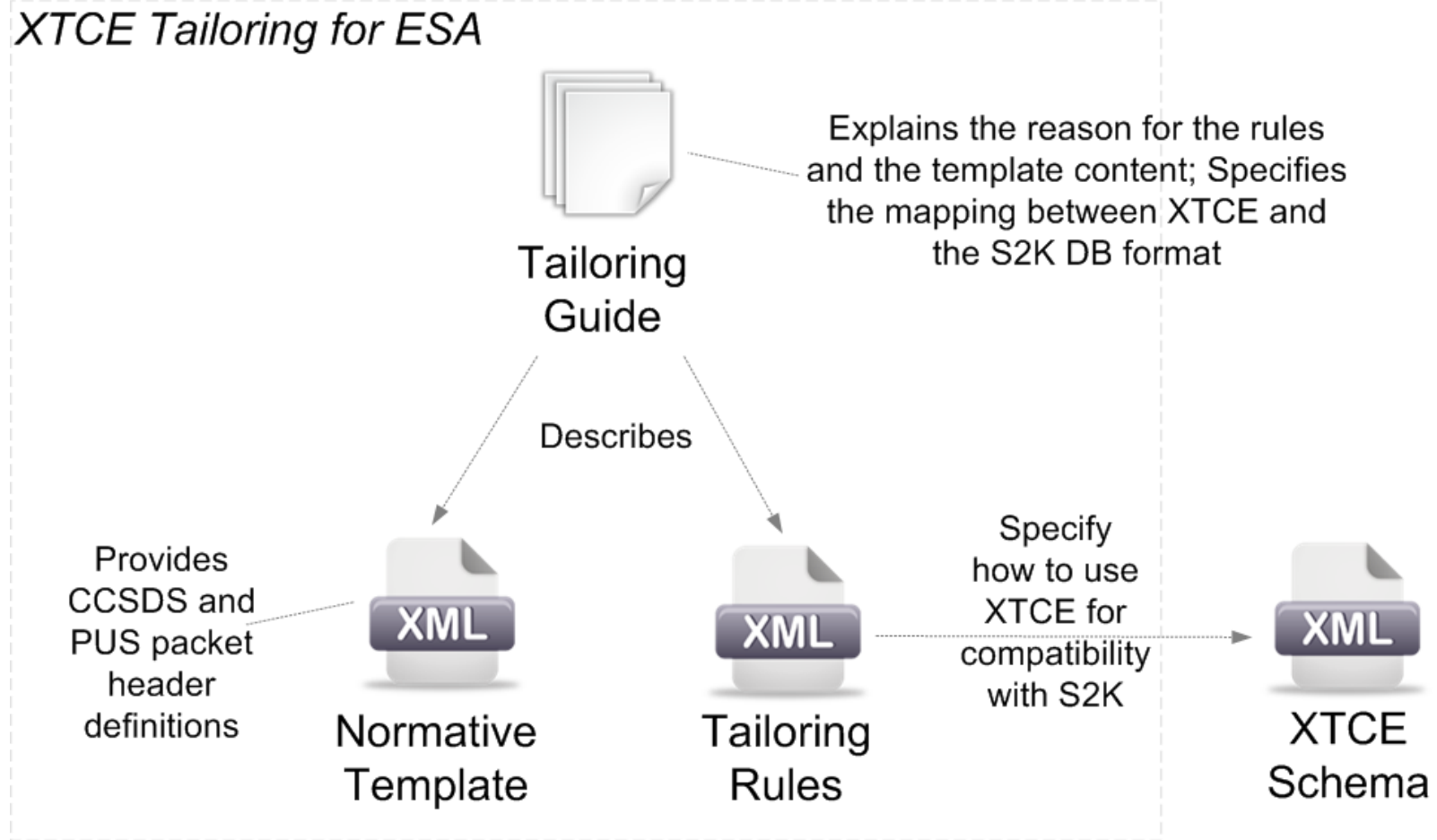


# SOLUTIONS

- Different scope
  - Narrow scope to TM/TC packets
  - Extend XTCE definitions to support S2K data
  - Define rules to enforce a unique mapping
- Different data model
  - Disallow hierarchical data
- Different data format
  - Define rules for compatibility with S2K types

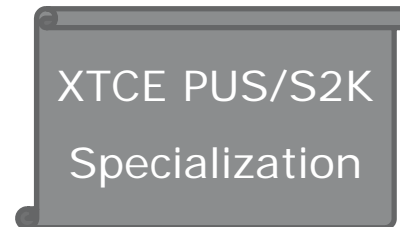


# ESA TAILORING OVERVIEW



# RESULTS

1. New tailoring guide
  - Tailoring rules
  - Normative template



2. Conversion XTCE  $\leftrightarrow$  MIB  
implemented in DABYS SCOS-2000 Data Manager



# CURRENT STATUS & FUTURE EVOLUTION

## Current status

- First version of tailoring guide available
- DABYS extension
- Known limitations
  - Significant number of ancillary data items required
  - Some workarounds needed to achieve the mapping

## Future evolution

- Reduce number of XTCE ancillary data items, and remove workarounds
  - Requires changes in XTCE and/or S2K format
  - Some XTCE changes are already planned
- Update tailoring based on practical experience

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# CONCLUSION



# CONCLUSION

## Generic approach for tailoring XTCE

- Simplifies XTCE adoption
- Enables reuse of tools and procedures

## ESA tailoring available

- XTCE  $\leftrightarrow$  SCOS-2000 mapping
- Working software for using XTCE with SCOS-2000

# Thank you

(Enrique Rivero on behalf of)

Isabel del Rey

XTCE4MIB Project Manager

Email: [idelrey@gmv.es](mailto:idelrey@gmv.es)

[www.gmv.com](http://www.gmv.com)

