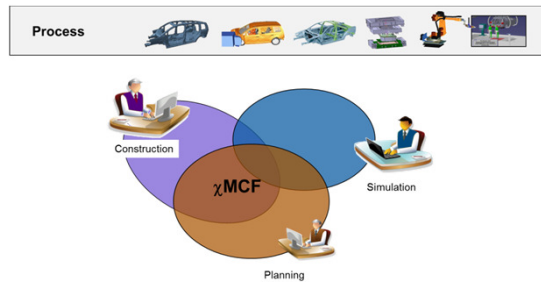FAT | Forschungsvereinigung Automobiltechnik

χMCF (extended Master Connection File)

A Standard for Describing Connections & Joinings in Structures

FAT WG 25 - Joining Technologies
Dr. Matthias Weinert (Ford)

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Agenda

1. Introduction
- Background, Current State
- Why do we need a Standard / Proposed Future State

2. FAT-Project χMCF
- Working Group
- Short History

3. Overview χMCF (xMCF) – VDA/FAT Standard

4. Next
- Why ISO

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Introduction
Background / Current State
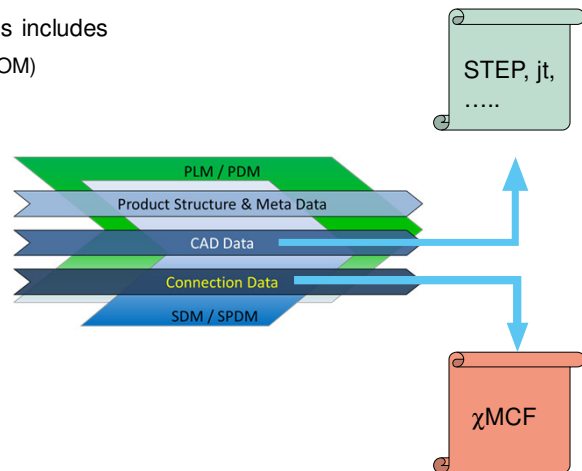
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- Complete description of structures / mech systems includes
  - Product structure / tree, Engineering information (BOM)
  - Geometry of the parts & assemblies (CAD)
  - Joining data
- Geometry/CAD Exchange: STEP, jt, …
- Exchange of Connection Data:
  - No real worldwide standard
  - Methods proprietary to software or companies
  - Not consistent along development chain
    - Scripts required (inefficiency)
    - Data often incomplete and errorneous
    - Different handling of different joing types

STEP, jt, …..

PLM / PDM
Product Structure & Meta Data
CAD Data
Connection Data
SDM / SPDM

χMCF

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Introduction
χMCF – Proposed Future State

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- Enable a seamless consistent data flow from CAD/CAE/CAM
- Variety of tools being used along the chain (no „one fits all")
- One connection data format „understood" by all tools at all process steps
- Enable a single complete data set of all connections
  (single data source for all process steps)
  - for more automation (critical example: bolts, clips)
  - avoid re-generation of data during the development process
  - No extra constraints in individual process steps (e.g. FEA modelling)
- Minimizes development and maintenance cost for software vendors
- Data flexibility (adding data as required, keep data even if not required
 for a certain process step)

CAD CAE CAM   Process

Tools

Language

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FAT Project χMCF
Working Group

FAT Working Group 25 – Joining Technologies

- FAT – German automotive research association (part of VDA)
- coordinating pre-competitive research projects (incl publicly and government funded projects)
- WG 25 initiates & supervises projects for joining technologies (welding, glueing, mechanical joining, …)
- Projects partners: automotive OEMs & suppliers, university & research institutes, other companies

χMCF Project Group

- Subgroup of WG 25 + key SW vendors
  (e.g. Beta CAE, Altair, HBK, Siemens, Dassault, Magna Steyr (ECS)) and consultants (Prostep)
- Regular meetings 1-2 times a year
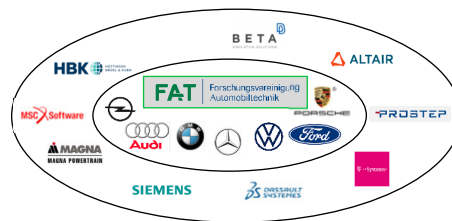
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FAT Project χMCF
Short History

- Project started 2006/07
- Format strawman developed from an older xml based Ford format (MCF – Master Connection File)
- Original intention was to enable seamless data transfer especially for seamweld fatigue but was quickly extended to all relevant joining element types
- Continuous support of key group members over more than a decade now
- χMCF Versions: V1.1 (2011), V2.0 (2014), V2.1 (2.1), V3.0 (2016), V3.1 (2020)
- Version 3.0 & 3.1 published on VDA webserver
  (V3.1: https://www.vda.de/de/services/Publikationen/Publikation.~1654~.html)
- Latest version includes besides full documentation schema, example & test files)

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χMCF – Overview
Objectives

➢ Enable a seamless data flow from CAD <> CAE <> CAM

➢ Variety of tools being used along the chain (no one fits all)

➢ Avoid re-generation of data during the development process

➢ Avoid extra constraints in individual process steps

➢ Enable a single, fully complete data set of all connections for more automation (critical example: bolts, clips)

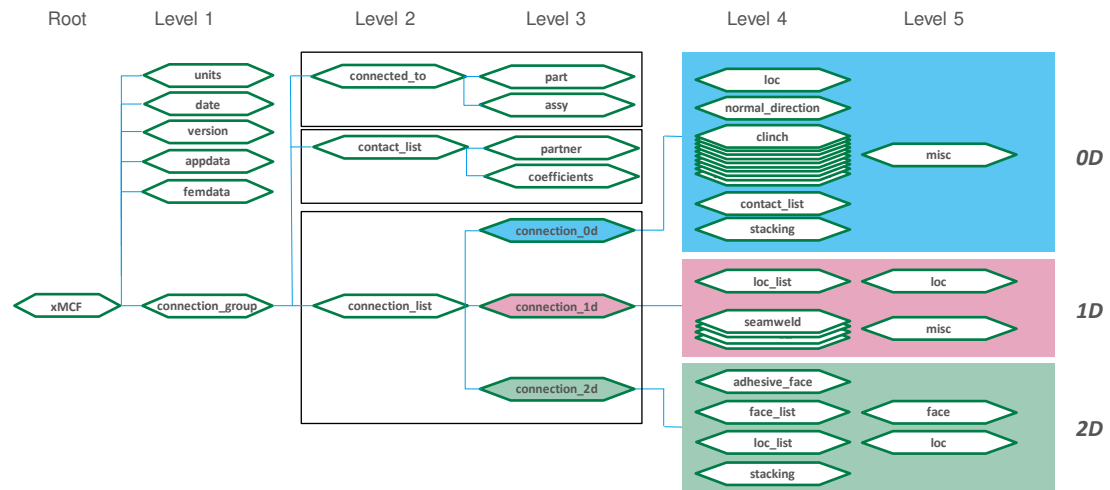➢ Data flexibility (adding data as required, keep data even if not required for a certain process step)

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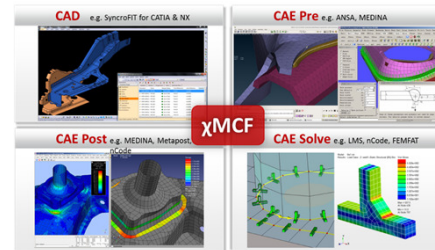
χMCF – Overview
Design Principles

➢ Build on an industry standard (xml 1.1) & allow readability

➢ Describe all connection types used in the automotive industry *unambigiously* and *completely* (spot welds, seam welds, adhesives, rivets, bolts, …)

➢ Address all data / attributes required for all types of processes in CAD, CAE, CAM

➢ Allow flexibility to include future connection types, applications or processes

➢ χMCF does only contain information on connections; references to external sources possible

➢ χMCF is allowed to be incomplete; information can added in process steps (supports min-max)

➢ Reconstruction of connections is possible at any stage of the process based on χMCF only

➢ Application or user specific data can be stored in χMCF; specific empty containers are provided by χMCF

➢ Compact format: Re-use elements whenever possible

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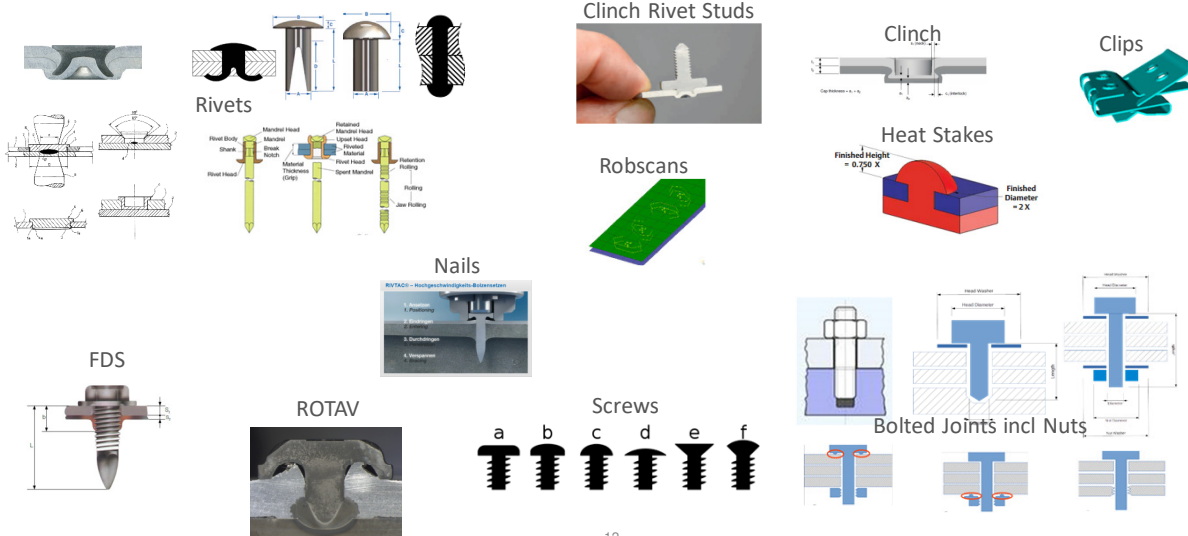ISO Submission of χMCF | TC184/SC4 Meeting | 02.11.2020

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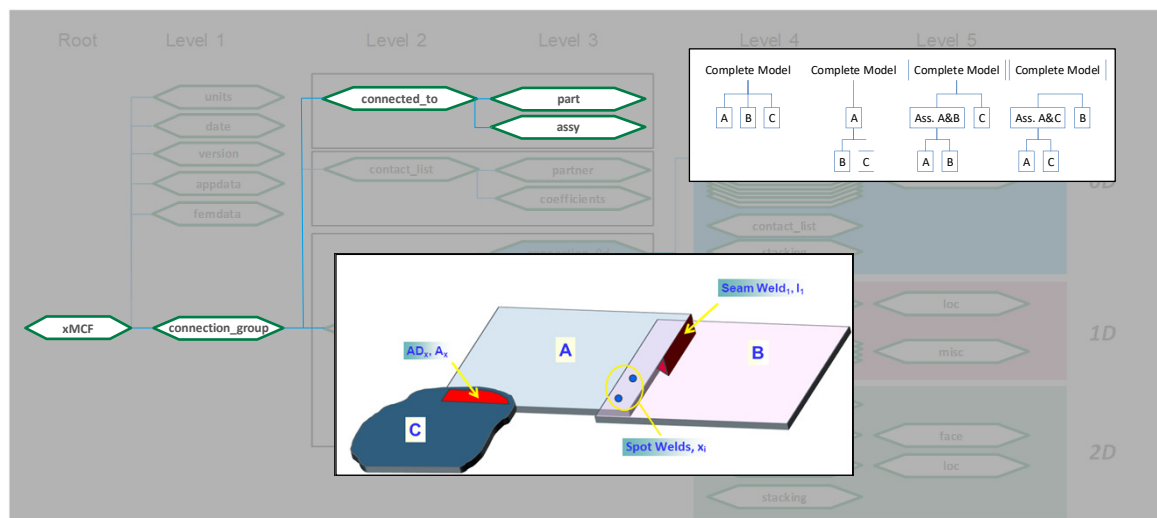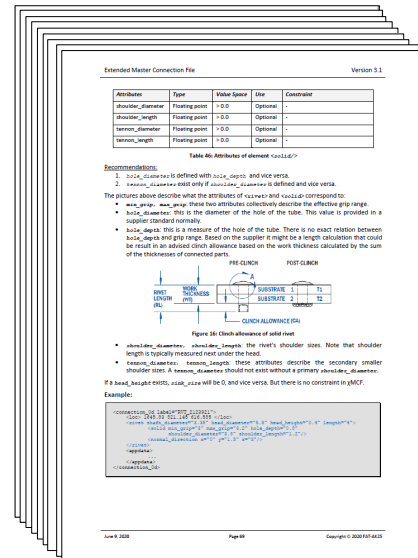
χMCF – Overview
1D Connections

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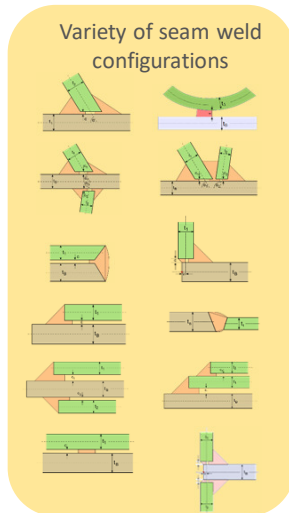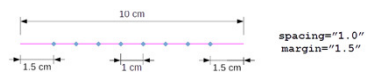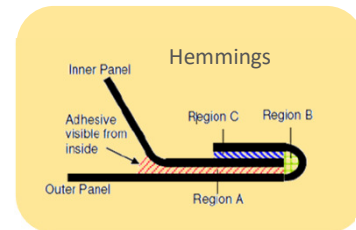
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χMCF – Overview
2D Connections & Future Joining Types

Adhesive Faces

Future Joining Types or Attributes

➢ Interim Containment:
  • <appdata/> can be used to add software or company specific parameters

➢ Permanent Solution:
  • Elements/attributes will be added after agreement in WG

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Next
χMCF – Why ISO

➢ Wider reach and influence (including other industries)

➢ Enabler for highest possible stability / sustainability

➢ Enable / protect compatibility with other PLM standards

➢ Better protection of investments of supporting software vendors

➢ Working Group existing and available as seed for an ISO Working Group

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Thank you!

Q & A

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