FROM INCLUDES TO A COMPREHENSIVE CAE APPLICATION ENVIRONMENT

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HYUNDAI‘s CAE Locations Worldwide

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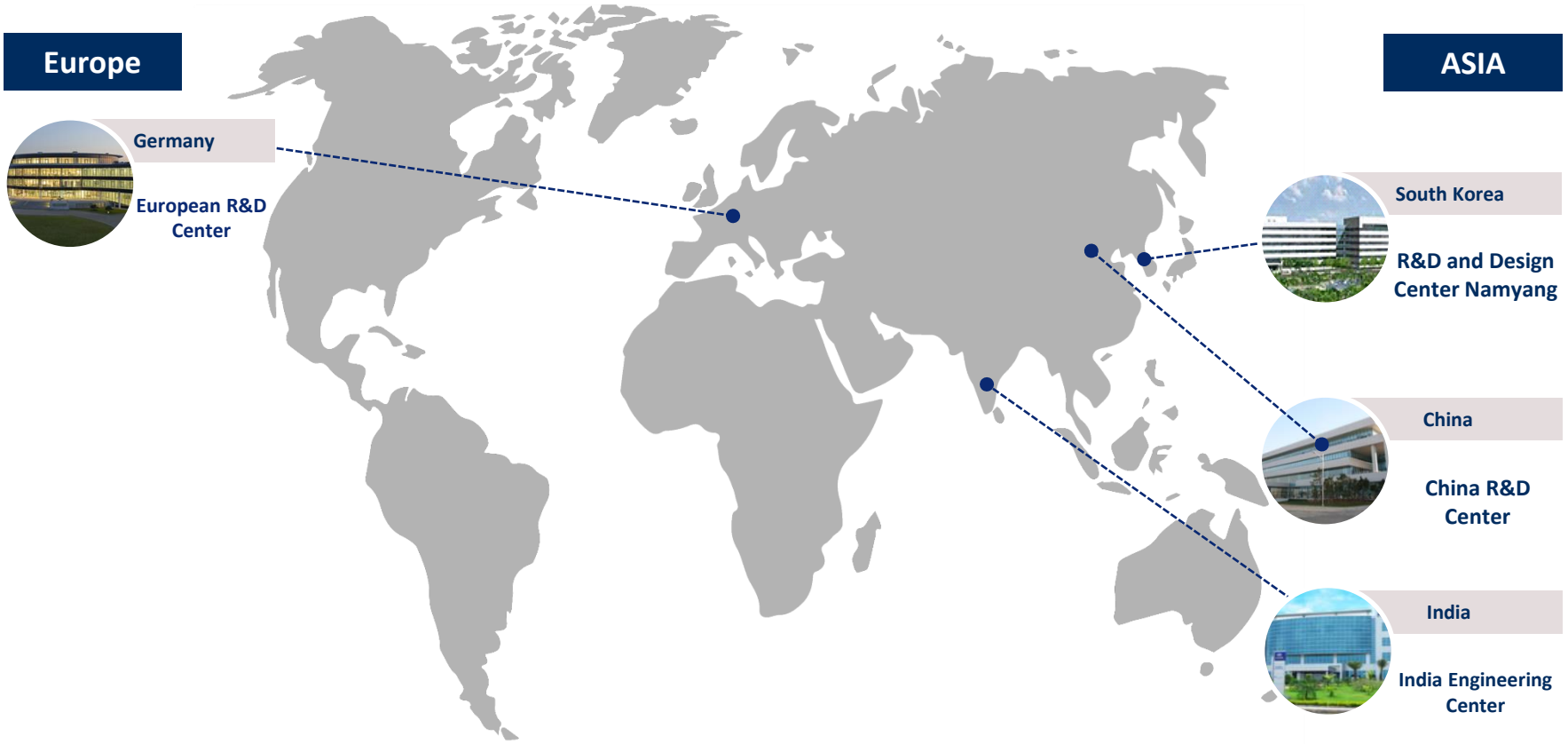

All CAE Teams have access to global Simulation Lifecycle Management (SLM)

- Project Scheduling
- Document Management
- Work Orders

HYUNDAI's Local EU CAE Environment

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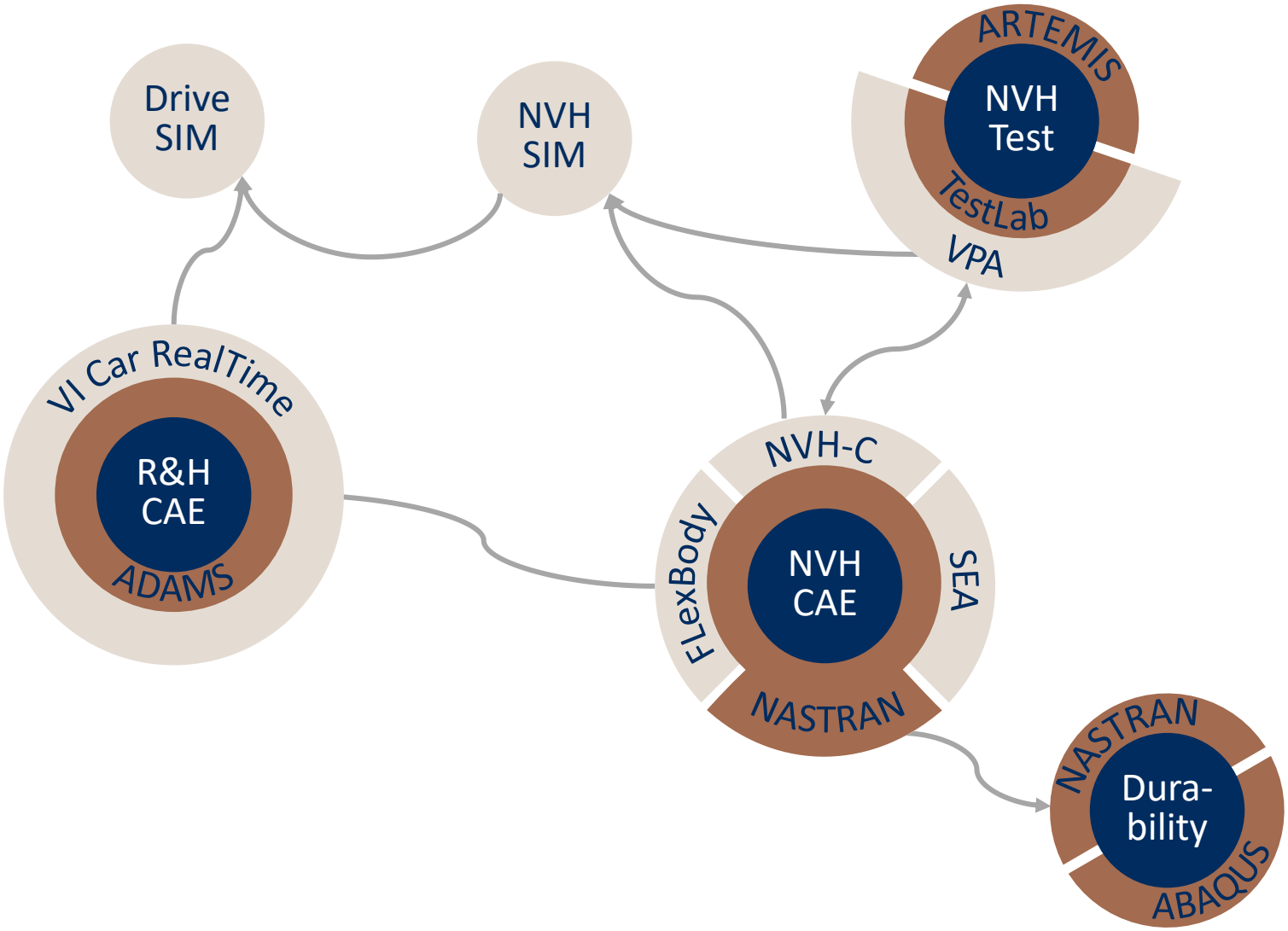

Requirements regarding Model Set-Up

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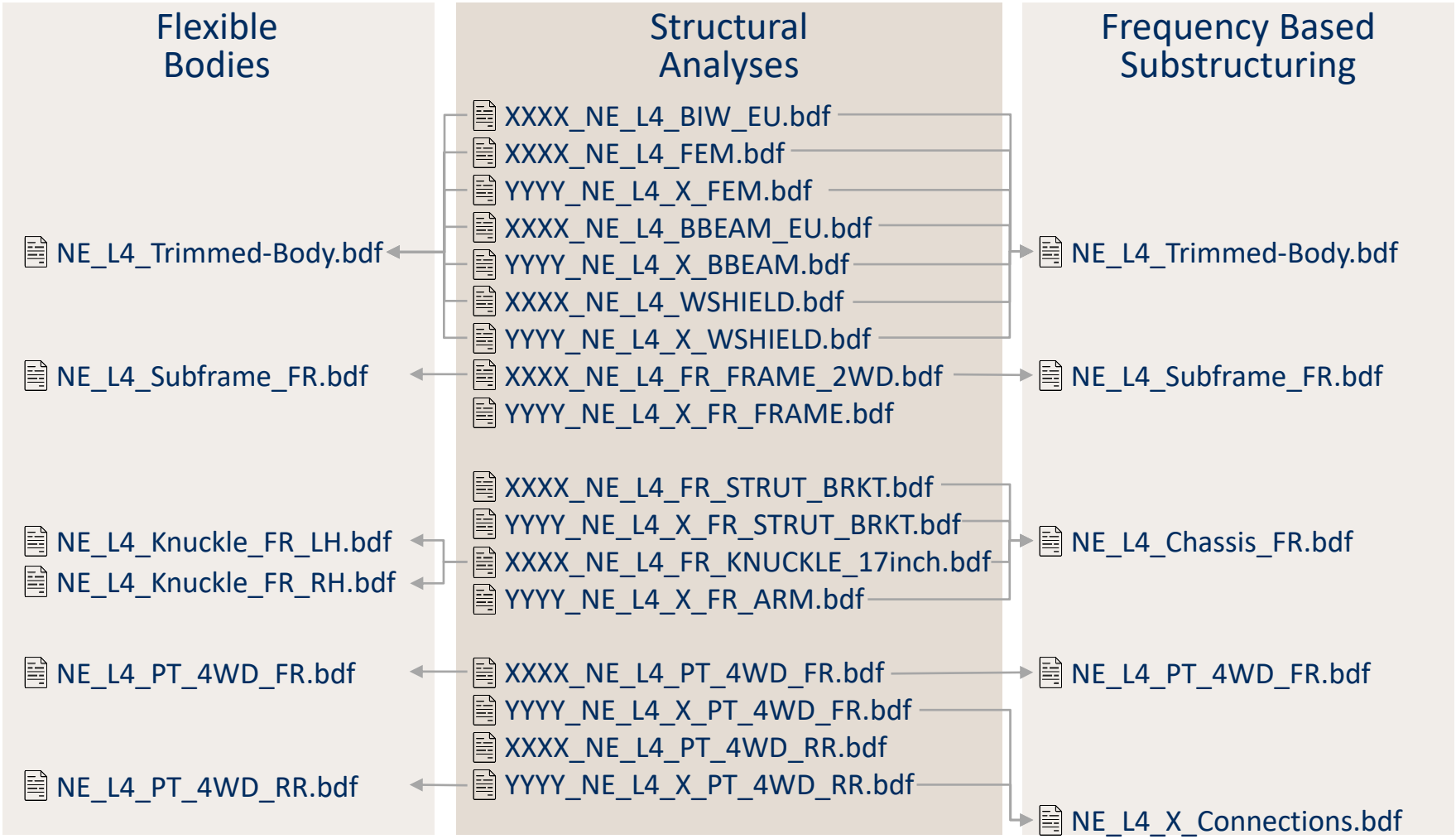
Solver applications use different assembly strategies:



EU Simulation Data Management System

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Goals

- Manage CAE models and configurations
- Keep track of modifications (versioning)
- Cover many applications

Requirements

- Initial model structure needs to be maintained
- Local processes need to be implemented
- High amount of automation
- Suitable for a small local team
- Low effort for installation and maintenance

➢ **Evaluation of file based ANSA/DM as Proof-of-Concept**

ANSA DM Model Structure

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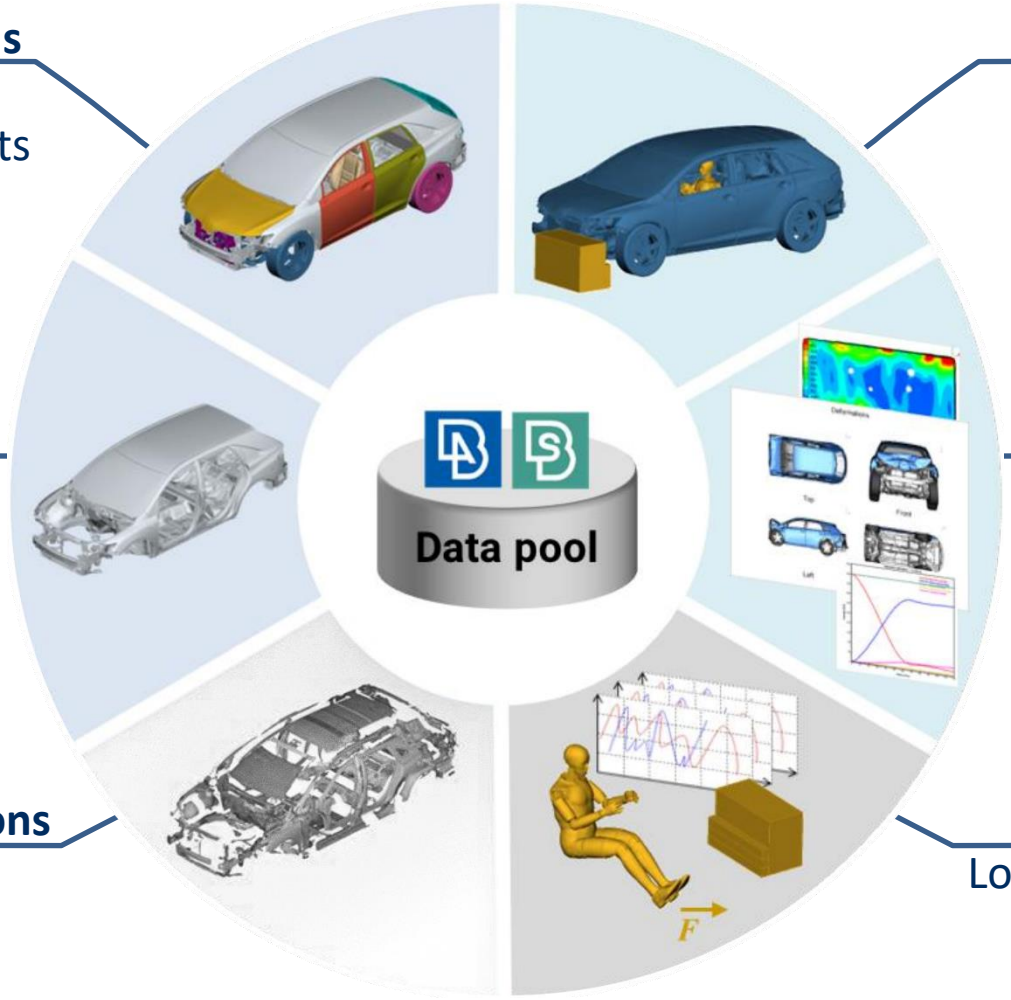
Simulation Models
Assembly models
NVH-C components

Simulation Runs



Subsystems
Include Files

Results
Result files
Key Values
Reports

Parts & Connections

Library Data
Load case templates
Evaluation scripts

[BETA CAE: Data Management Reference Manual Rel. 23.1.1]

Import from Includes to DM

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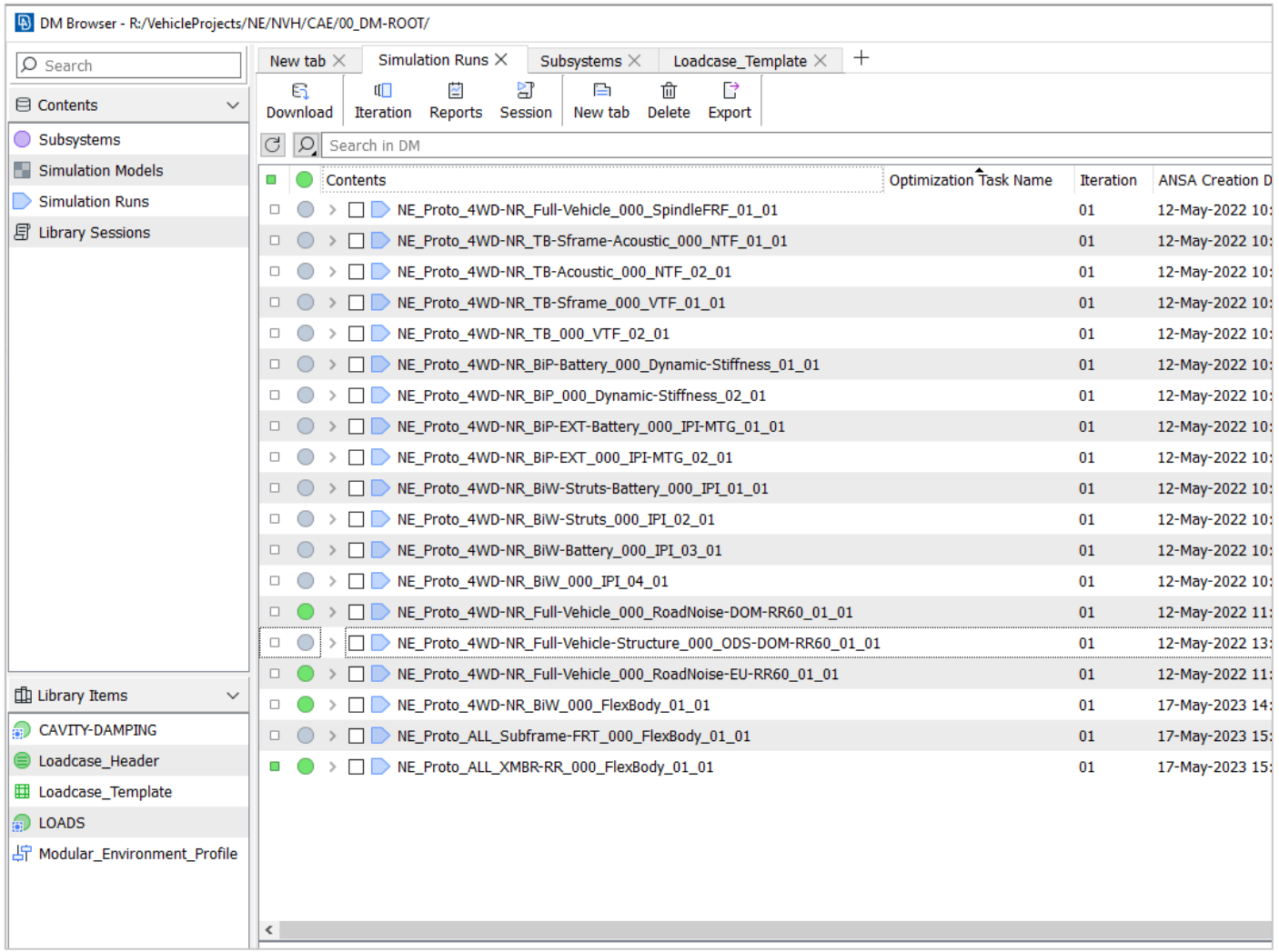
- Define Configuration
- Import Nastran
- Plugin „From Includes...“
- Subsystem Preparation
- DM-Upload Subsystems
- Simulation Config Table
- DM-Upload Nastran Runs
- DM-Upload NVH-C Models



Analysis handling

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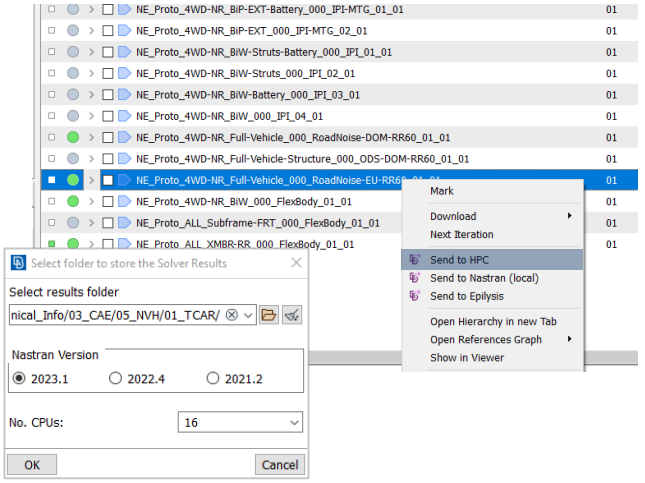
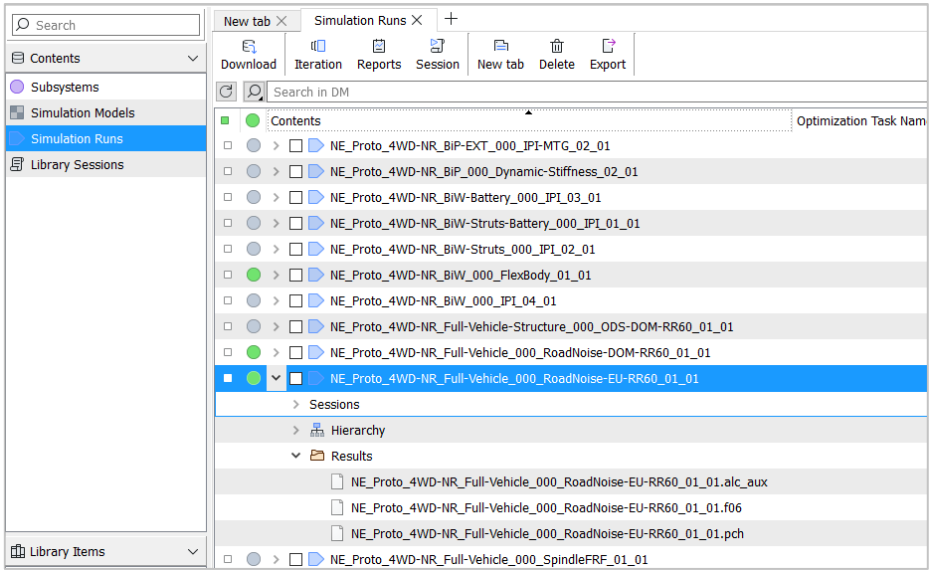
Job submission

- Initiated from DM Browser
- Remotly on High Performance Cluster or locally
- Customized by Python script, including
  - Software version
  - No. of cores



Result File Handling

- Manual selection and upload of files
- Results files are linked to DM



Results Handling

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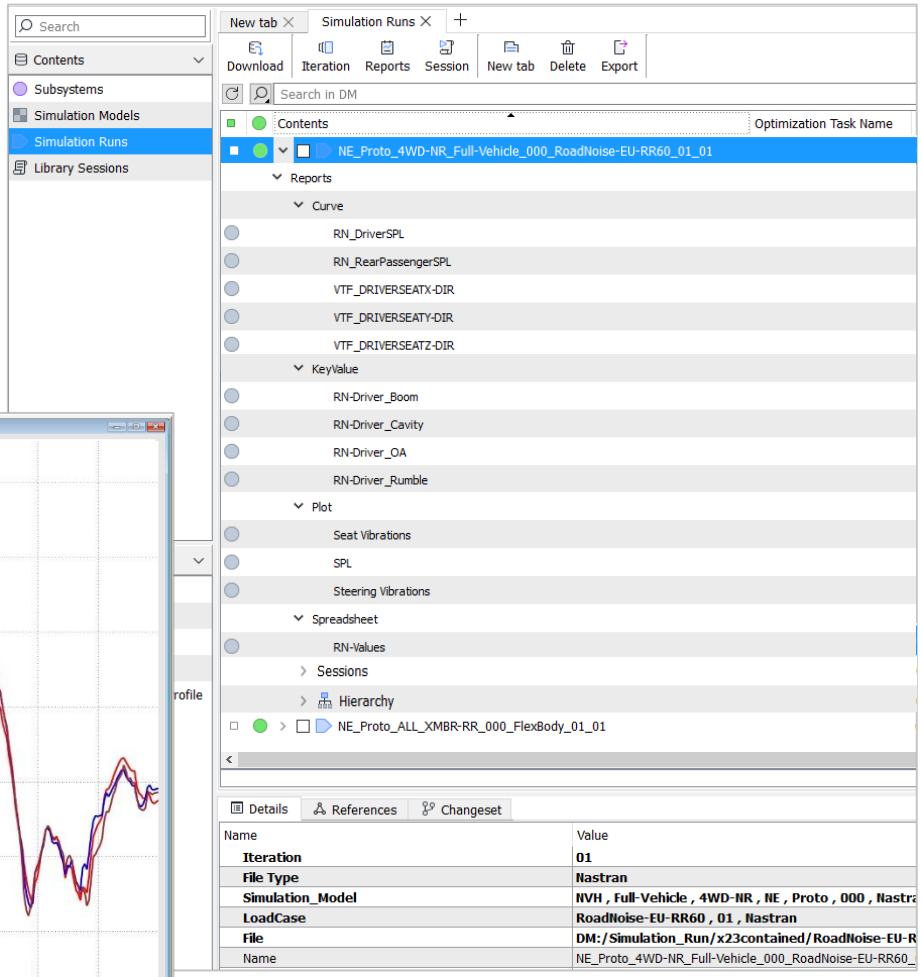
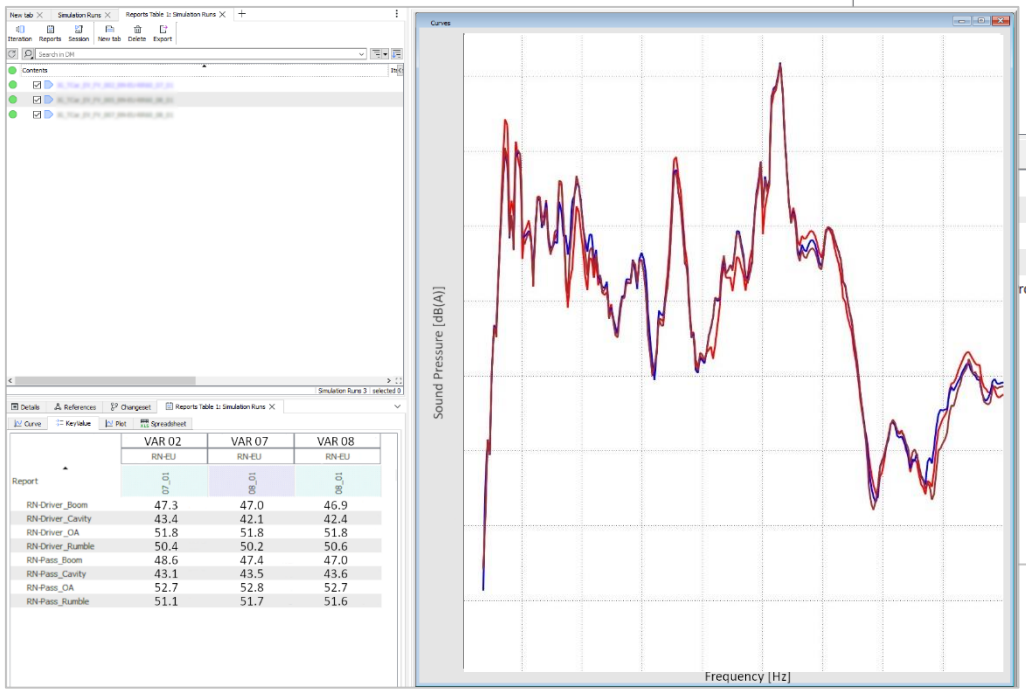
Evaluation of results

- Automated post-processing
- Following HMG standards
- Evaluation by META session files
- Key results are stored directly in DM
- No further user interaction needed





Report	VAR 02	VAR 07	VAR 08
	RN-EU	RN-EU	RN-EU
	07_01	08_01	08_01
RN-Driver_Boom	47.3	47.0	46.9
RN-Driver_Cavity	43.4	42.1	42.4
RN-Driver_OA	51.8	51.8	51.8
RN-Driver_Rumble	50.4	50.2	50.6
RN-Pass_Boom	48.6	47.4	47.0
RN-Pass_Cavity	43.1	43.5	43.6
RN-Pass_OA	52.7	52.8	52.7
RN-Pass_Rumble	51.1	51.7	51.6

Interfacing to NVH-Console

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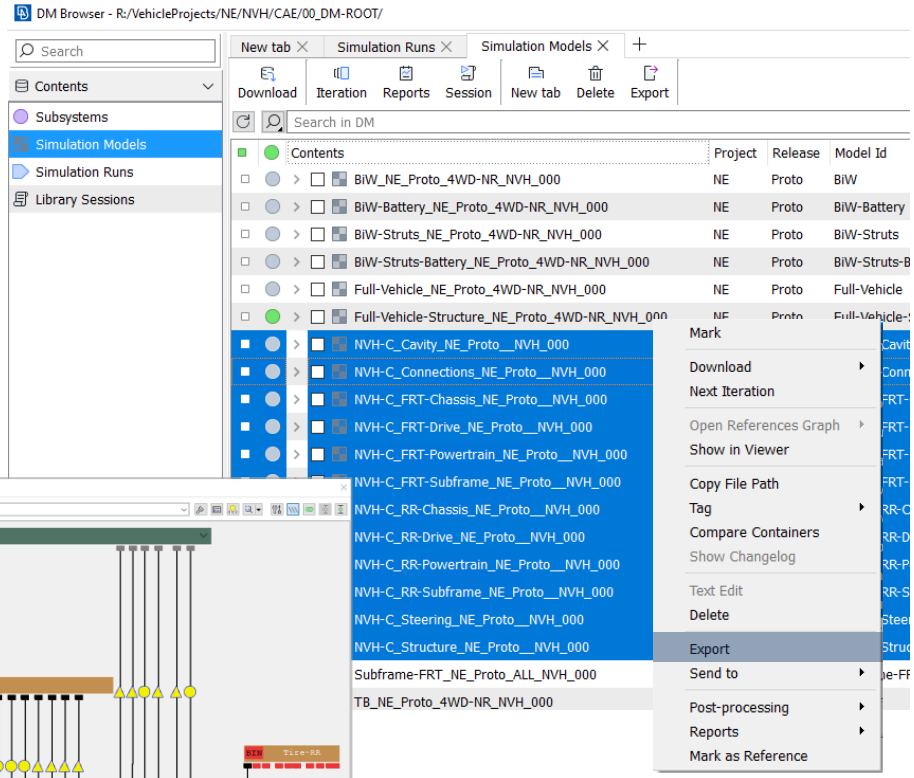
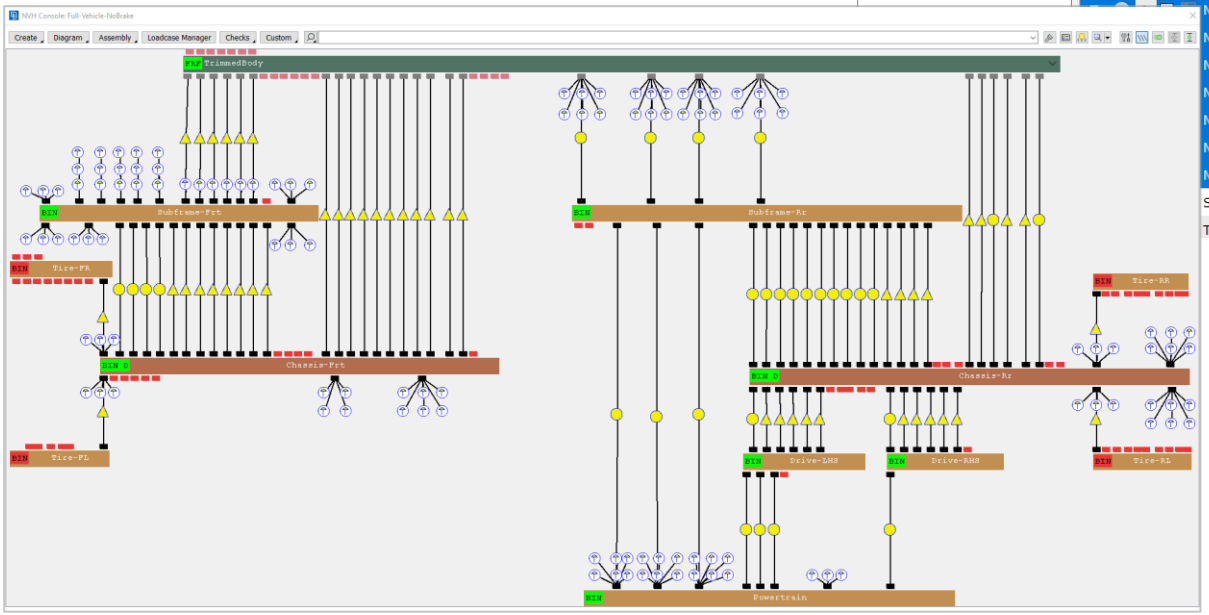
Export of NVH-C components

- Representation as Simulation Models
- Bulk export from Model Browser to standard folder template
- Import and base set-up by customized scripts





Interfacing to NVH-Simulator

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Integration of Road Noise CAE to NVH Simulator

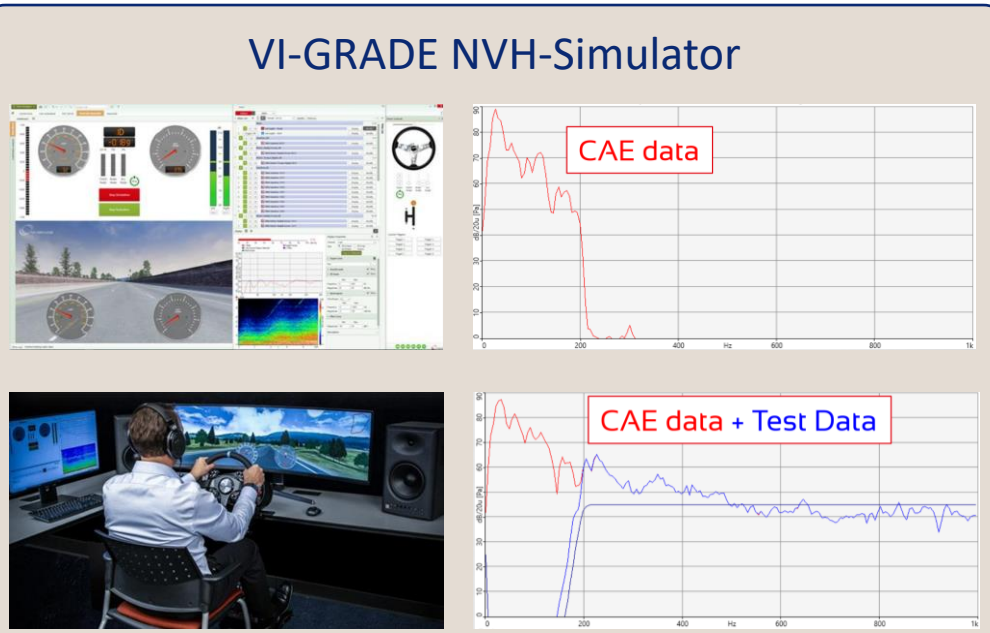
- Aligned hierarchy between CAE and Simulator models
- Curves and Node-mapping table exported from DM
- Data imported to VIGrade CAE-Auditioner
- Used for subjective evaluation of CAE based design variants

META POST PROCESSOR

CSV

Node Mapping
Transfer Functions
Source Functions

Test Data



Interfacing to ADAMS CAR

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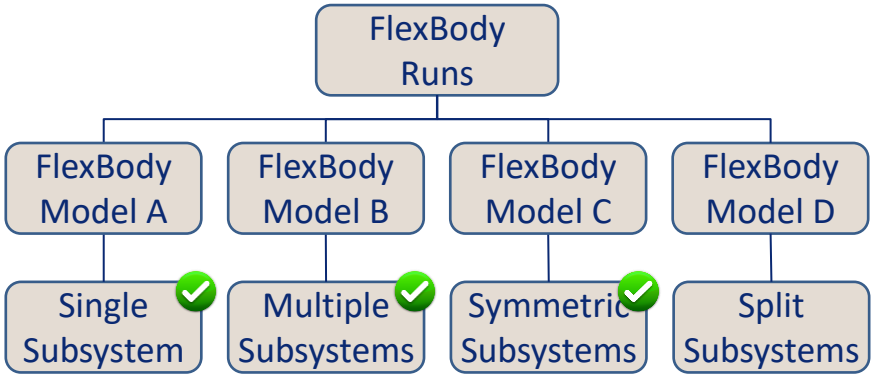
Generation of Flex Bodies for R&H

- Flex Runs built from Simulation Models and Library Load Case
- Simulation Models:
  - Type A & B: standard process
  - Type C: LHS/RHS created by script
  - Type D: manual built
- MNF result files stored in DM



Proof of Concept - Review

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Achievements

- Implementation of a local Simulation Data Management System (PoC)
- Model import with no modifications
- Implementation of configuration management
- Implementation of version control
- Implementation of standard NVH analyses
- Joined model handling for FEA, FBS and Flex Bodies
- Data export to NVH Simulator

Effects

- Significant reduction of manual work for assembly, load cases and evaluation
- Improved repeatability by automated standard processes
- Improved traceability due to versioning
- Improved collaboration due to central data access point
- Low efforts for operating and maintaining the system

Ongoing and Future Enhancements

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Current activities

- Complete integration of all NVH and Durability load cases
- Integration of test rigs (e.g. for static measurements)
- Full automation of Flex Body generation
- Full automation of NVH-C model set-up from DM browser
- Simplification of import process

Short & mid term enhancements

- Integration of further analyses and processes (e.g. VPA, SEA)
- Migration from file-based to server-based DM
- Implementation of a comon Data Model for all CAE and Test teams
- Implementation of cross-domain analysis and reporting tool BETA ANSERS
- Connect to other HMG‘s data management systems

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and **BRING EMOTIONS TO THE ROAD**