COMPLETE VEHICLE CAD EXTRACTION, TRANSLATION AND QUALITY REPORT GENERATION AT CEVT

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ABSTRACT –
During the development a new vehicle, at specific points in times, the current design is frozen and released, and important attributes are analysed virtually to ensure that requirements are fulfilled. After such a release, vast amount of data is available and CAE models needs to be created or updated as fast as possible with high quality. Traditionally, CAD files used to be sent to external resources for modelling. The process of collecting, checking and preparing all data was cumbersome and a significant amount of time was also needed to check and correct the received models which could have been based on incorrect input.

To bring order after a release, CEVT have developed a python-based script for managing all data after a release, which relies heavily on ANSA and METAPOST. After an automated CAD extraction from the PLM-system, models are not only automatically translated. As much model preparation as possible along with a variety of checks are also performed on each model. For example, CAE representation of standard parts are read from ANSA DM, the middle surface is extracted from thin parts and later batch-meshed, intersections are checked internally within each subsystem and externally between different subsystems. Compare reports in ANSA are generated between current and previous release. The process is highly parallelized, and all data is collected and automatically presented in various report-layers.

The day after a release, we now have a clear picture of the quality of the release along with prepared input for external resources. Problematic subsystems with missing input or other issues can easily be identified and additional instructions can be attached before sending to external resources. With the compare reports, we can identify subsystems with small changes. These are more efficiently handled internally and reduces the workload for the external resources. All of this has led to significant time-savings and would not have been possible without the Python API of ANSA and METAPOST.

1. INTRODUCTION

During the development of a new vehicle, at specific points in times, the current design is frozen and released. Virtual vehicles are created and assembled. Important attributes like safety, NVH and durability are analysed virtually to ensure that requirements are fulfilled. All results provide a clear picture of the status of the project. This of course needs to be performed as quickly as possible.

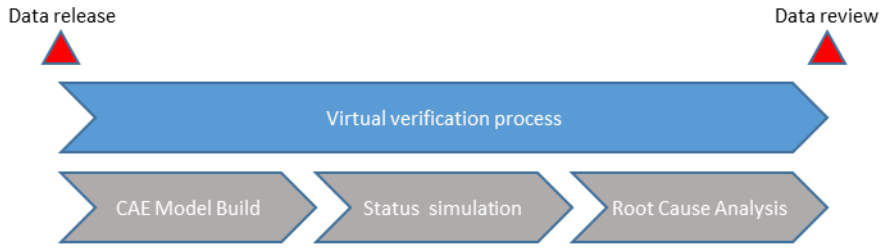

Figure 1 – Overview of virtual verification process

After such a release, vast amount of data is available and CAE models of all subsystems needed for the virtual vehicles needs to be created or updated as fast as possible with high quality.

An important part of the work is being prepared for a release. At CEVT, CAE coordinators first checks which vehicle configurations (drivelines, body-styles etc) are needed to provide status on requested attributes. This list of vehicles can be condensed into a gross-list of subsystems that needs to be taken care of after the release. All information related to these subsystems, like desired mesh-density and how the PLM-system needs to be configured to extract CAD data, are stored in the CAE planning database.

2. AUTOMATED CAD EXTRACTION & TRANSLATION

Traditionally, CAD files used to be sent to external resources for modelling based on the gross-list of subsystems. The process of collecting, checking and preparing all data was cumbersome and a significant amount of time was also needed to check and correct the received models which could have been based on incorrect input.

Instead, a new methodology has been developed, where an automated CAD extraction and translation process is started after a release. First a script on the PLM-server is executed, checks which vehicles that needs to be extracted from the CAE planning database, and extracts all required CAD data. That data is synchronized to the CAE cluster and the translations process is automatically started. Subsystems are not only automatically translated. As much model preparation as possible are performed on each subsystem. During the translation, a check is first made if each part already has been translated and stored in ANSA DM. If not, the part is translated, and the middle surface will automatically be extracted for thin parts. When all parts have been translated or read from ANSA DM, the default CAE representation of all standard parts are read from another ANSA DM containing only standard parts in different representations. This will add an ANSA Bolt_Type connector into the model. Connectivity for the connector is detected and the Batch-mesh scenarios will create washer zones around the connector.

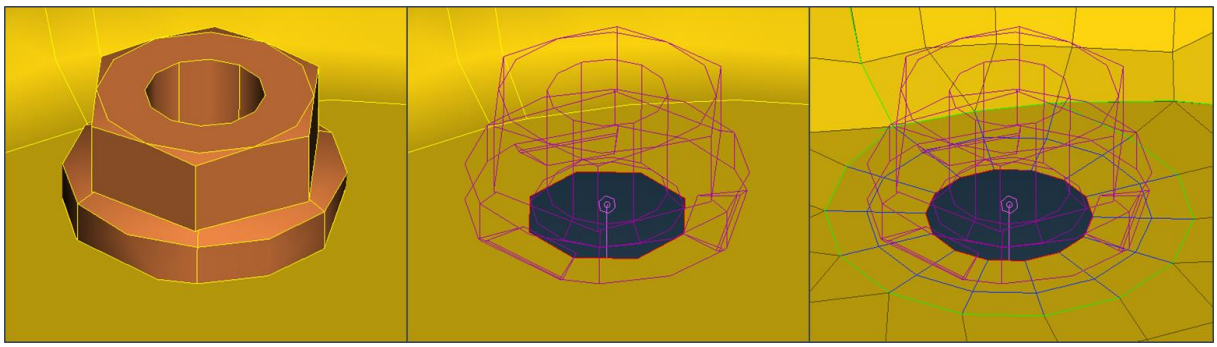

Figure 2 – Example on automated model preparation from CAD to FE-representation

All the above steps have been fully automated using python scripting in ANSA (1) and all subsystems from the CAE planning database can be translated in parallel.

3. CAE QUALITY REPORTS

After the translation, automated checks are executed. For example, intersections are checked internally within each subsystem and externally between different subsystems. Intersection checks in ANSA on CAD geometry can often report clashes in radii's where closely spaced faces have different perimeter resolution. By using the Python capabilities of ANSA, a custom intersection check has been created which allows small clashes, and only CAE critical issues will be reported. Important subsystem statistics like weight and if all material mapping has been successful are also collected on each subsystem.

When using the methodology throughout the lifetime of a project, it is also very easy to create ANSA compare reports between current and previous release. These compare reports makes it very easy to see if a subsystem can be reused from a previous release or if the changes are to significant that a new model needs to be created.

All data from the ANSA checks, the subsystem statistic and the compare reports are collected and used to create a single quality report on each subsystem using the report composer in METAPOST in PowerPoint format. Key-metrics from each quality report is collected and presented in a single summary report for the release. The summary report provides a quick overview of the quality of the entire release which can consists of hundreds of subsystems.

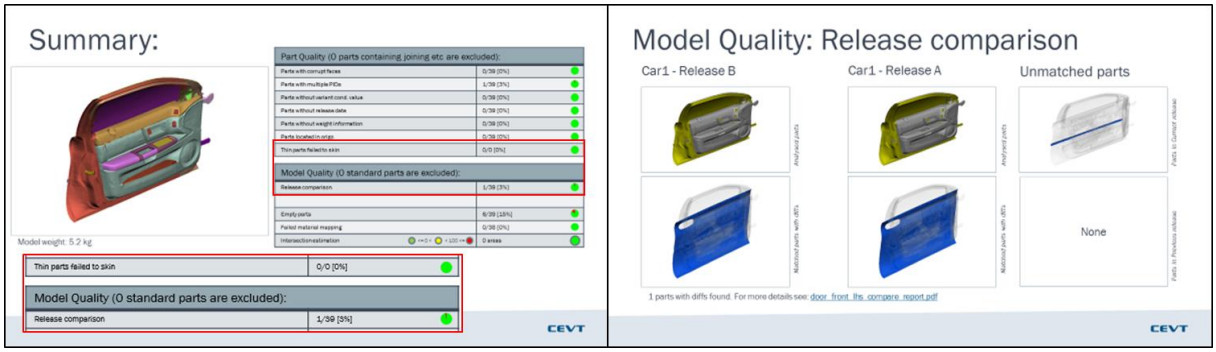

Figure 3 – Quality report example

4. CONCLUSIONS

To bring order after a release, CEVT have developed a python-based script for managing all data after a release, which relies heavily on ANSA and METAPOST. The entire flow from PLM to CAE models has become fully automated using the CAE planning database as a source for all information and a python-script to initiate CAD extractions, translations and quality report generation.

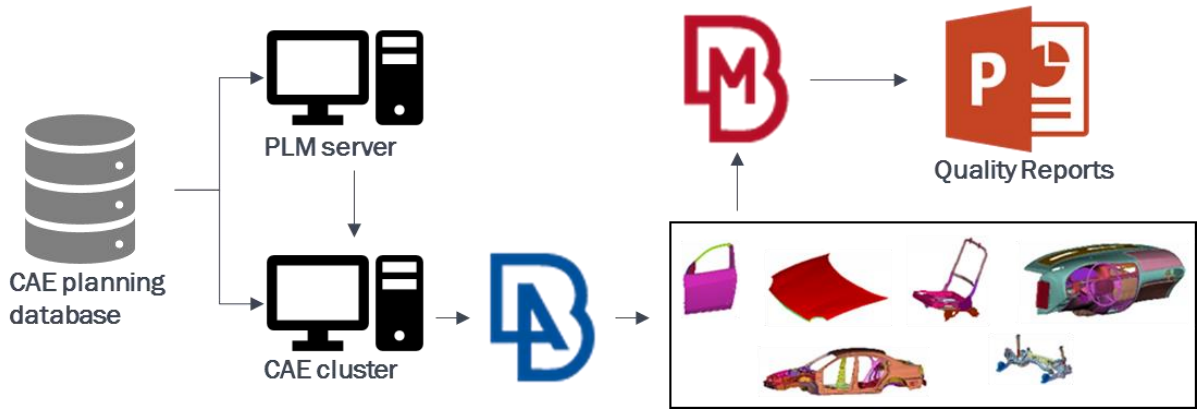

Figure 4 – Overview of automated workflow

The day after a release, we now have a clear picture of the quality of the release along with prepared input for external resources. Problematic subsystems with missing input or other issues can easily be identified and additional instructions can be attached before sending to external resources. With the compare reports, we can identify subsystems with small changes. These are more efficiently handled internally and reduces the workload for the external resources. All of this has led to significant time-savings and would not have been possible without the Python API of ANSA and METAPOST.

REFERENCES

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