

1st VMAP User Meeting 2024

VMAP-ENABLED MULTI-DISCIPLINARY COLLABORATION ON JET ENGINE DESIGN

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We present applications of the VMAP Standard in the field of gas turbine aero-engines. The utilization of VMAP enables the transition from conceptual/preliminary design to higher fidelity design in a sustainable and scalable way. After providing information on the context of engine development at DLR, we elaborate on concrete use cases of VMAP.

Engine design at DLR

The basis of many activities around engines at DLR is the software platform “**GTlab**” (Gas Turbine Laboratory). A **central data model** (CDM) is at its core. This model allows for the parametric lower-fidelity description and hierarchical representation of major engine components.

Modules of diverse disciplines provide **processes** that interact with the CDM. Here we present the novel integration of **VMAP files** and **CSM processes** into the ecosystem.

VMAP use cases

1. Blade-to-Blisk (bladed disk)

This initial process creates two VMAP files and attaches them to the respective components of the CDM. Multiple interactions with other, parametric elements of the CDM also take place.

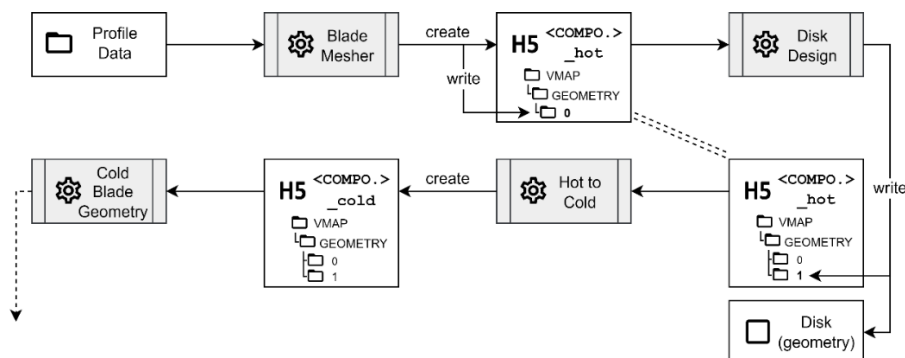


Figure 1: Standard process, creating two VMAP files.

2. Static FSI (Fluid Structure Interaction)

An equilibrium state between the rotor blade and its surrounding fluid is found by means of an iterative procedure. In each iteration, the corresponding VMAP file attached to the CDM is read and modified. Feedback to other parts of the CDM is possible, depending on the outcome of the FSI.

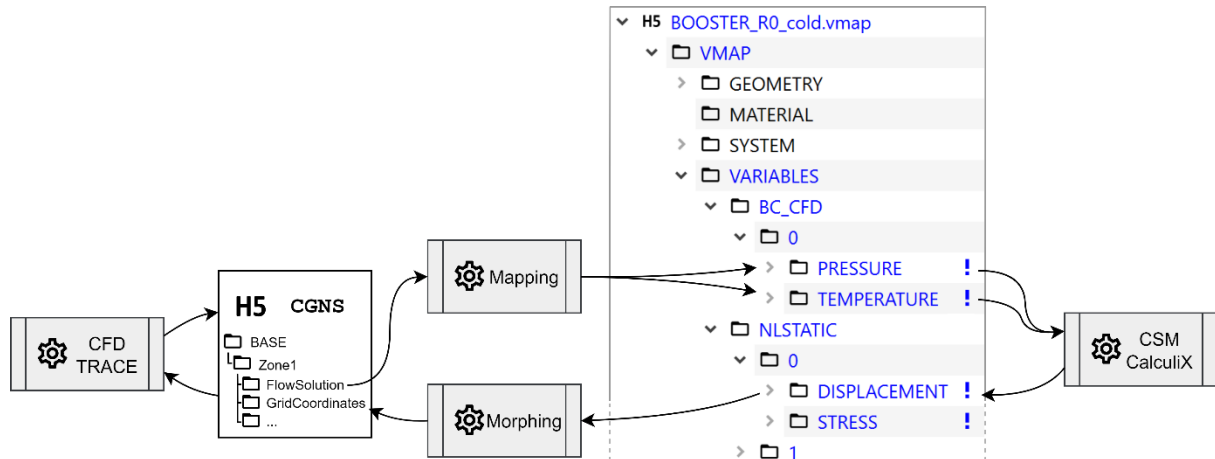


Figure 2: Iterative FSI process.

3. Other processes

Other examples of VMAP-enabled higher-fidelity CSM processes include but are not limited to:

- Modal FSI
- Modal analysis
- Foreign Object Damage (e.g. birdstrike)
- Pre- and post-processing of VMAP models and results inside a dedicated Mesh Viewer in GTab

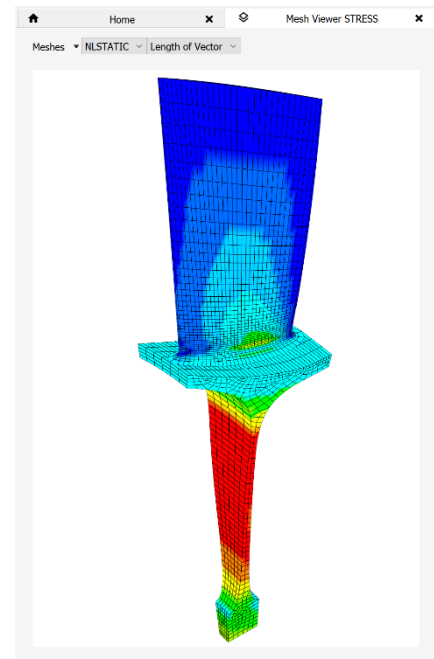


Figure 3: GTab's Mesh Viewer prototype displaying VMAP data.