NASA Glenn Engine Control Research Facilities

Dennis Culley
NASA Glenn Research Center
Cleveland, Ohio

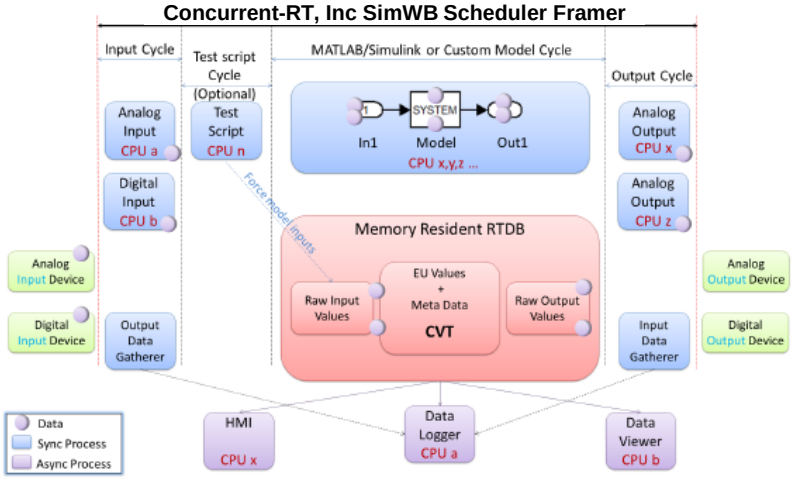
Intelligent Control and Autonomy Branch

NASA Glenn Hardware-in-the-Loop Facility
The Distributed Engine Control System Simulation (DECSS)

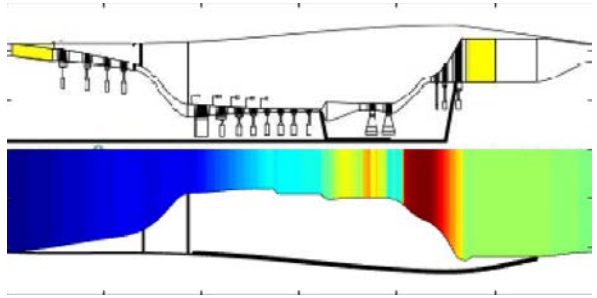
The DECSS was developed with Rolls-Royce LibertyWorks and is based on the latest hardware-in-the-loop technology. It provides us with the capability to integrate multiple simulations and run them simultaneously in real time while defining how they interact with each other and with external hardware.

Real-Time Operating System: Red Hawk Linux
Processors: 2x Intel Xeon 8-core processors

- Multi-rate simulation
- Multi-Processor (Multithreading)
- Model Referencing
- Multi-model Integration
- Expandable COTS-based I/O



DECSS – Distributed Engine Control System Simulation



Propulsion transient performance simulation coupled to engine casing temperature

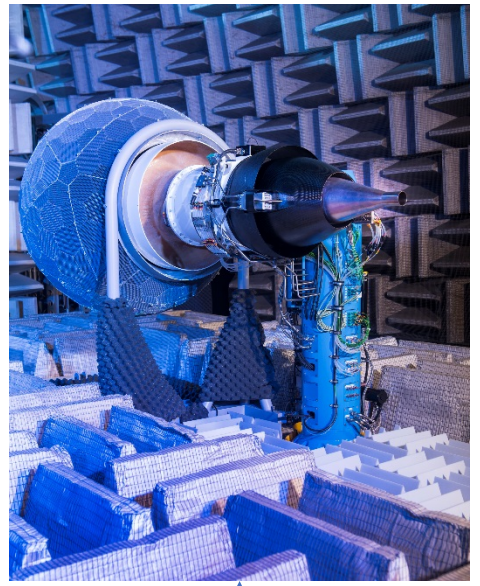
Thermal Product Solutions

Environmental testing of hardware coupled to real-time simulation

DGEN 380 Geared Turbofan Engine
Advanced Control Technology Test Platform

Akira Mecaturbines
Control Station

The DGEN 380 Geared Turbofan is a 500 lb_f thrust class, two-spool turbine engine produced by Akira MecaTurbines (previously Price-Induction). It has characteristics that resemble much larger modern turbofan engines. The engine features all-electric actuation and an in-line motor/generator on the high spool. This propulsion system is installed in the Aero Acoustics Propulsion Lab but is designed to be portable and can be easily installed at Plumbrook Station.



The engine control system has been modified, from its production design, to a flexible distributed control architecture thus enabling research in modern control methods, sensors, and hybrid-electric research.

Direct Analog
I/O

Advanced
Control Unit
(ACU)

The Advanced Control Unit provides the high power processing resources that are necessary to implement advanced control algorithms and methods, which are the focus of this current effort.

Smart Engine
Control Unit
(sECU)

dSPACE GmbH
MicroAutoBox

CAN Bus

Akira Mecaturbines
Engine Control Unit