TENT for Airbus Deutschland

Requirements, realisation and 1st experiences

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Overview

- Background – why WFMS
- Requirements
- Process chain for CFD
- The TENT solution
- Alternatives?
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<table>
<thead>
<tr>
<th>Application/Methods</th>
<th>Cruise</th>
<th>Take-off/Landing</th>
<th>Pod/pylon Integration</th>
<th>Rear end/Tails</th>
<th>Total aircraft</th>
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<tr>
<td>2D Euler/BL coupled methods</td>
<td><img src="cruise.png" alt="Image" /></td>
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<td>XLS, VICWA, ISES</td>
<td>HILI, MSES</td>
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Tails characteristic - typical result

\[ \text{FLOWer Navier-Stokes} \]
\[ \text{LEA } \kappa-\omega \text{ turb. mod.} \]
\[ M_\infty = 0.85, \ \alpha = 2^\circ \]
\[ \text{Re} = 3 \times 10^6, i_H = 0 \]

Pressure distribution

Lift polars for drag and moment
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3D Flow Simulation System

Surface Generation
- Components
- Scaling
- Localization

Geometry generator
- Assembling of geometry
- Specification of geometry

Mesh generator
- INGRID Input
- IGES
- Centaur

Process Control
\( \alpha/\beta/M/Re \) Range

Wind tunnel/ Flight-Test-Results

Analysis of Results
Load distribution
- Wing
- Body
- Tails
- Sectional integrals
- Component loads
- Interferences
- Tail flow
- High lift flow

Data Bank
Geometry
- Assembling information
- Configuration data
- Normalized data
- Component information

MGAERO Input

Flow Calculation
FLOWer
TAU
MGAERO
VSAERO

VSAERO Input
Basic CFD process (1)
Basic CFD process (2)
Controlled CFD process

Integration platform
WFMS
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**Work flow management: Requirements (1)**

- Individual set-up of process chains (work flow networks)
- Process and data control through WFMS – interactive and on demand
- Intelligent process control
- Monitoring of running processes
- System to be run on heterogeneous platforms
- Minimum effort integration of additional computational tools
- Integration of no-source-available codes
- Traceability of runs
- Automatic data management
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Work flow management: Requirements (2)

- Capability to run with job queueing systems
- To run on WAN/LAN
- Cope with SSH/SCP restrictions
- Distributed location of data
- Distributed parallel run of contributing simulation tools
- Run robust with 99% reliability
- Multi-user operation capability
Basic approach: Component model

• Properties of components
  – Components have specific basic functionalities and interfaces
  – For CFD process, we have at least 5 types of components: Geometry Generation, Mesh Generation, Flow Simulation, Postprocessing and Visualisation

• Communication of Components
  – Realisation by CORBA (Common Object Request Broker Architecture)
  – Exchange of data directly on network protocol
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General architecture using component model
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Parallel communication between distributed applications

- Process control is via CORBA bus (ORB)
- Data transfer is running on transport level of network protocol (TCP/IP) – for performance reasons
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Workflow Management Application - General

Component Browser

Project name

Tabscontrol

Menu list

Property Panel

Wire Panel

Logger Panel
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Workflow Management Application at Airbus (1)
Workflow Management Application at Airbus (2)
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Workflow Management Application at Airbus (3)

Final output
Polar
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**1st experiences**

- TENT is running with/on HP workstation network
- Special problems with software implementations/versions have been resolved
- Test phase is running
- Further development is necessary for adaptation to Airbus needs
- Specification of requirements is ongoing process

TENT is a practical basis for the development of an overall software system for the automated use of complex CFD
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PointerPro - alternative system? (1)
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PointerPro Optimizer - alternative system? (2)

Criteria

Membership

Rules
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Work flow management: contextual considerations

• What is the importance of standardisation?
  - CORBA, JAVA
  - Independence on hardware/operating systems, etc.

• Can we solve the problem with different approach?
  - mask driven tools communication via files (ASCII) like PointerPro

• What about integration of PDM and data bank systems?
  - Windchill or others
  - ORACLE

• Who will provide comprehensive service?
  - Necessary for all-day-working tool!

• Why is TENT a leading tool?