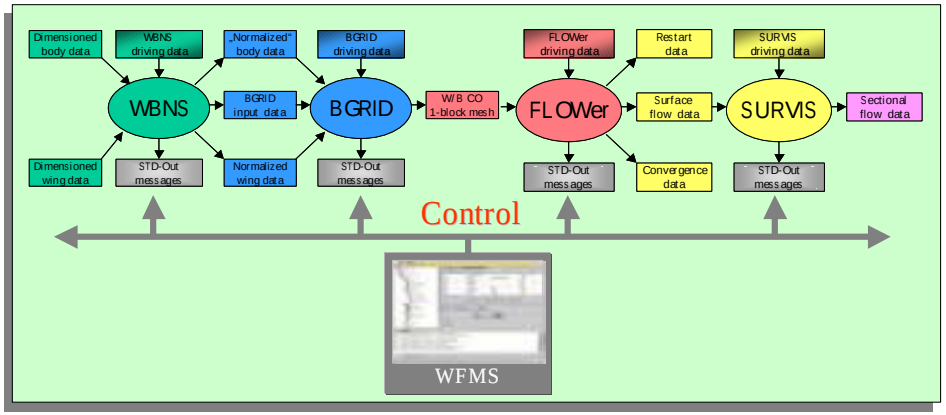
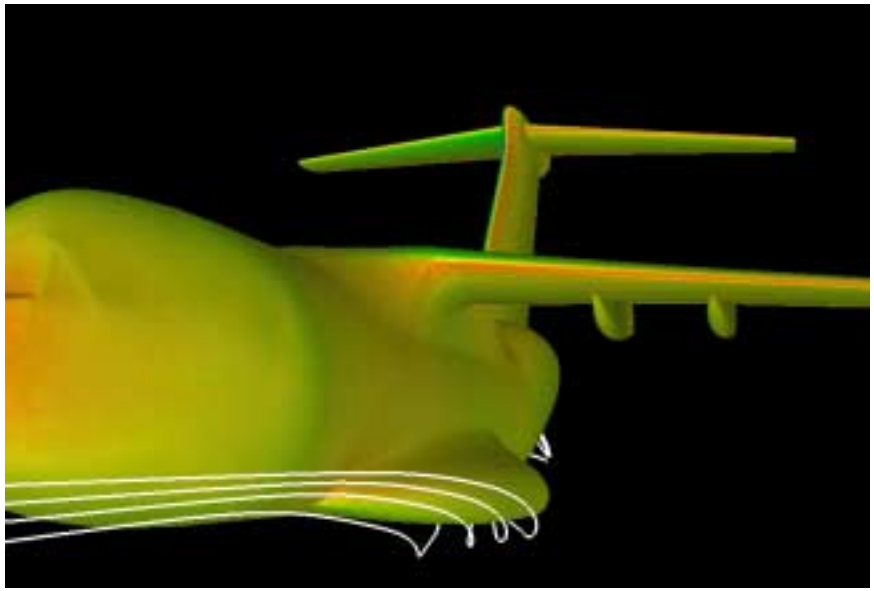
TENT for Airbus Deutschland

Requirements, realisation and 1st experiences





Klaus Becker

Aerodynamic Design&Data

Methods, Tools & Processes

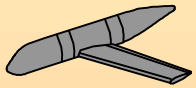
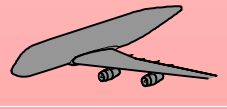
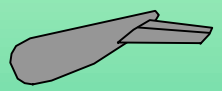
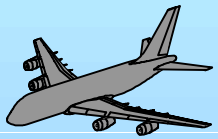
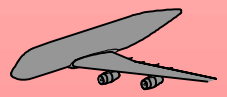
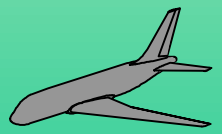
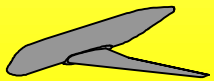
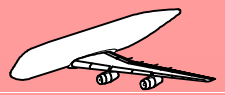
Airbus Deutschland

Bremen

Overview

- Background – why WFMS
- Requirements
- Process chain for CFD
- The TENT solution
- Alternatives?

TENT for Airbus Deutschland

Application/ Methods	Cruise	Take-off/ Landing	Pod/pylon Integration	Rear end/ Tails	Total aircraft
2D Euler/BL coupled methods	 XLS, VICWA, ISES	 HILI, MSES			
2D Navier-Stokes methods		 TAU			
3D Panel / Quasi-3D methods		 VSAERO, Q3D	 VSAERO	 VSAERO	 VSAERO
3D Euler methods (BL-modific.)			 MGAERO, FLOWer	 MGAERO, FLOWer	 MGAERO, FLOWer
3D Navier-Stokes methods	 FLOWer	 TAU	 TAU	 FLOWer	 TAU

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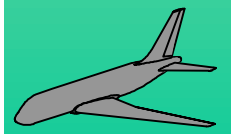
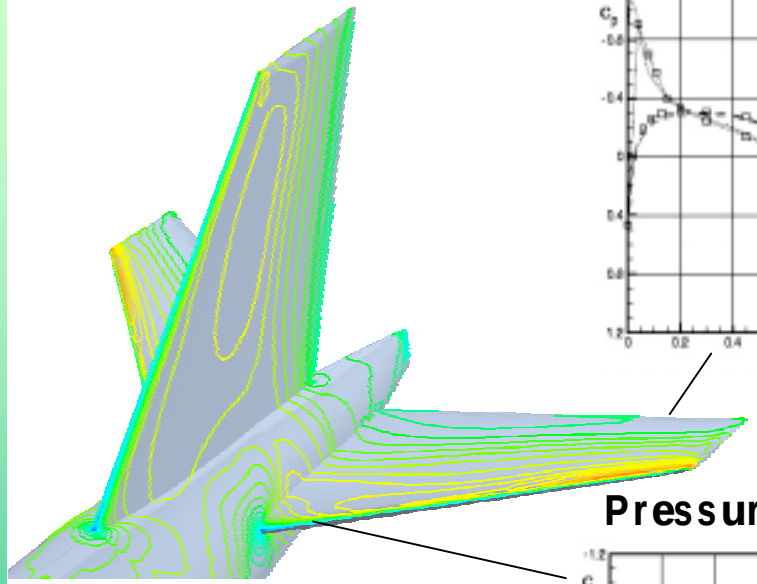
Tails characteristic – typical result

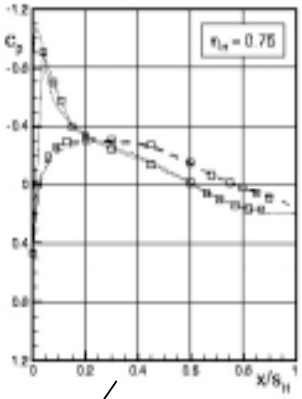
Tails

3D Navier-Stokes Methods

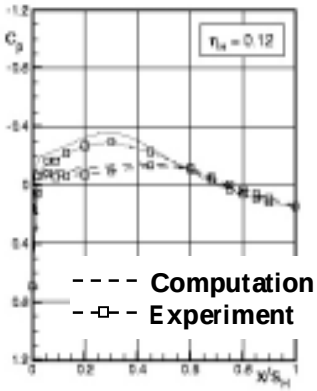


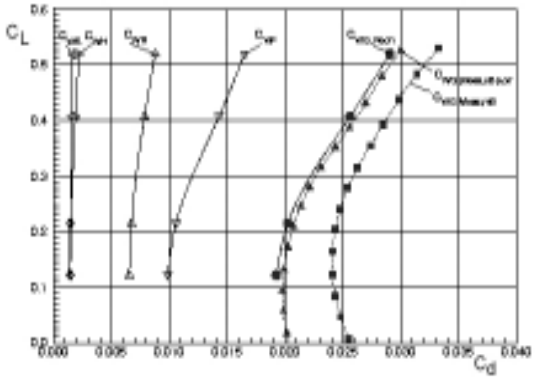
FLOWer

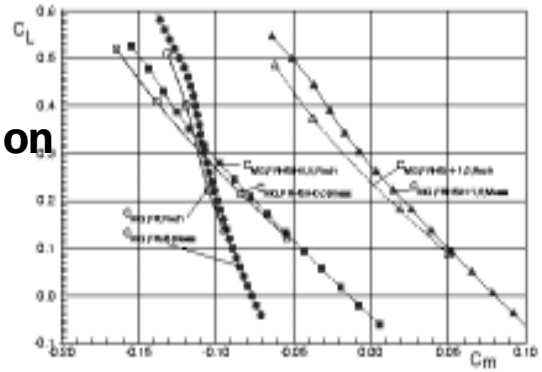




Pressure distribution







Lift polars for drag and moment

FLOWer Navier-Stokes
LEA $\kappa-\omega$ turb. mod.
M_∞=0.85, α=2°
Re =3•10^6, i_H=0

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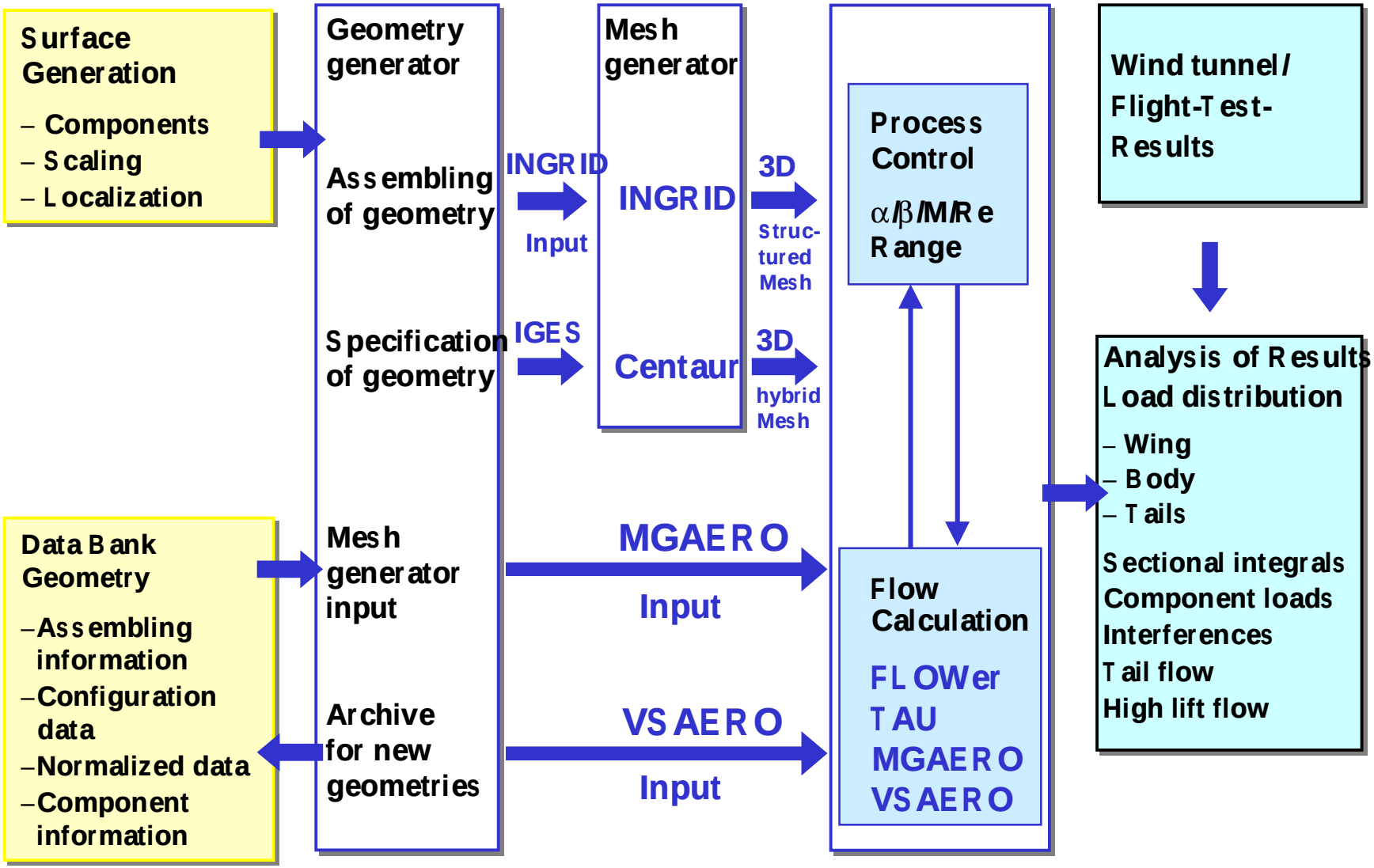
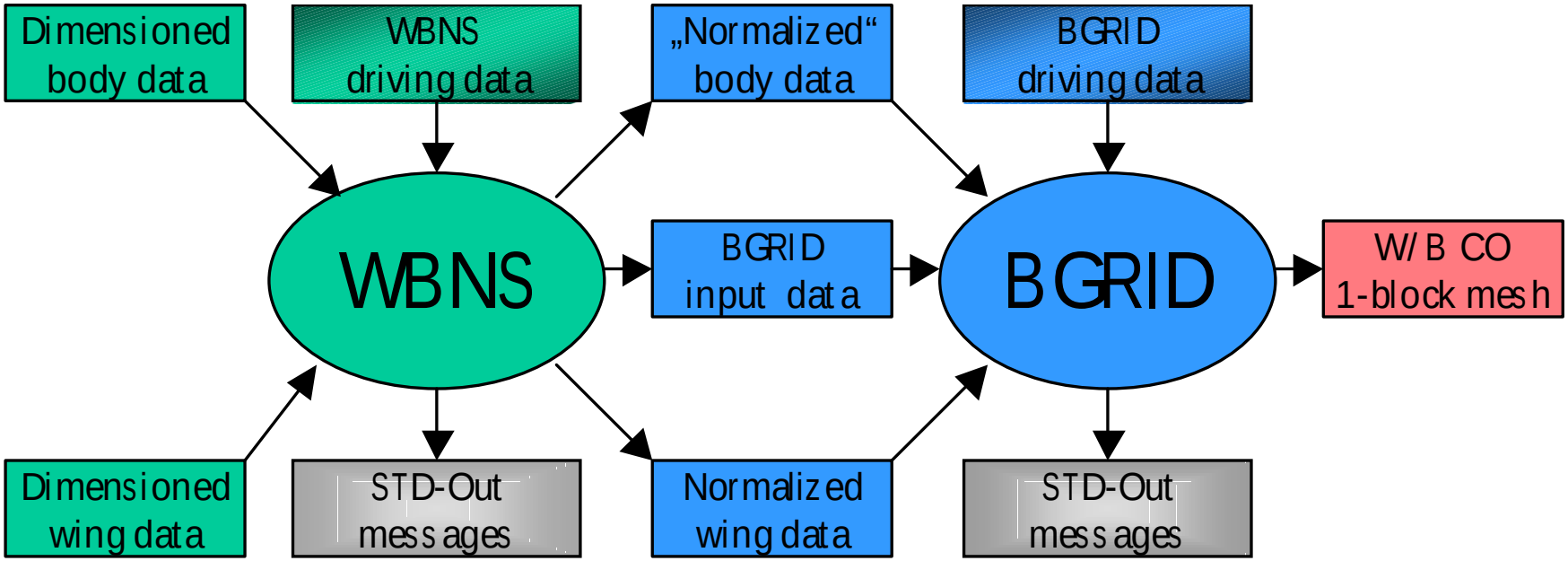
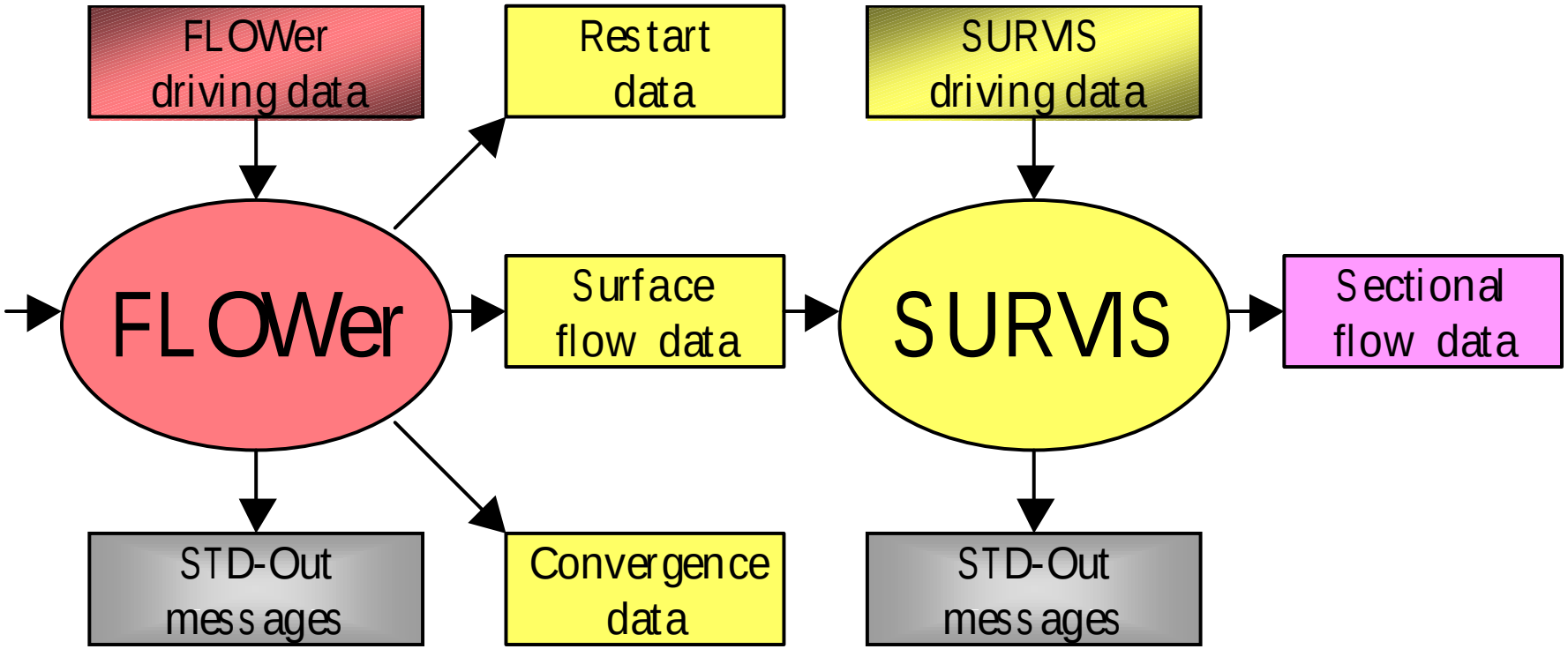
3D Flow Simulation System



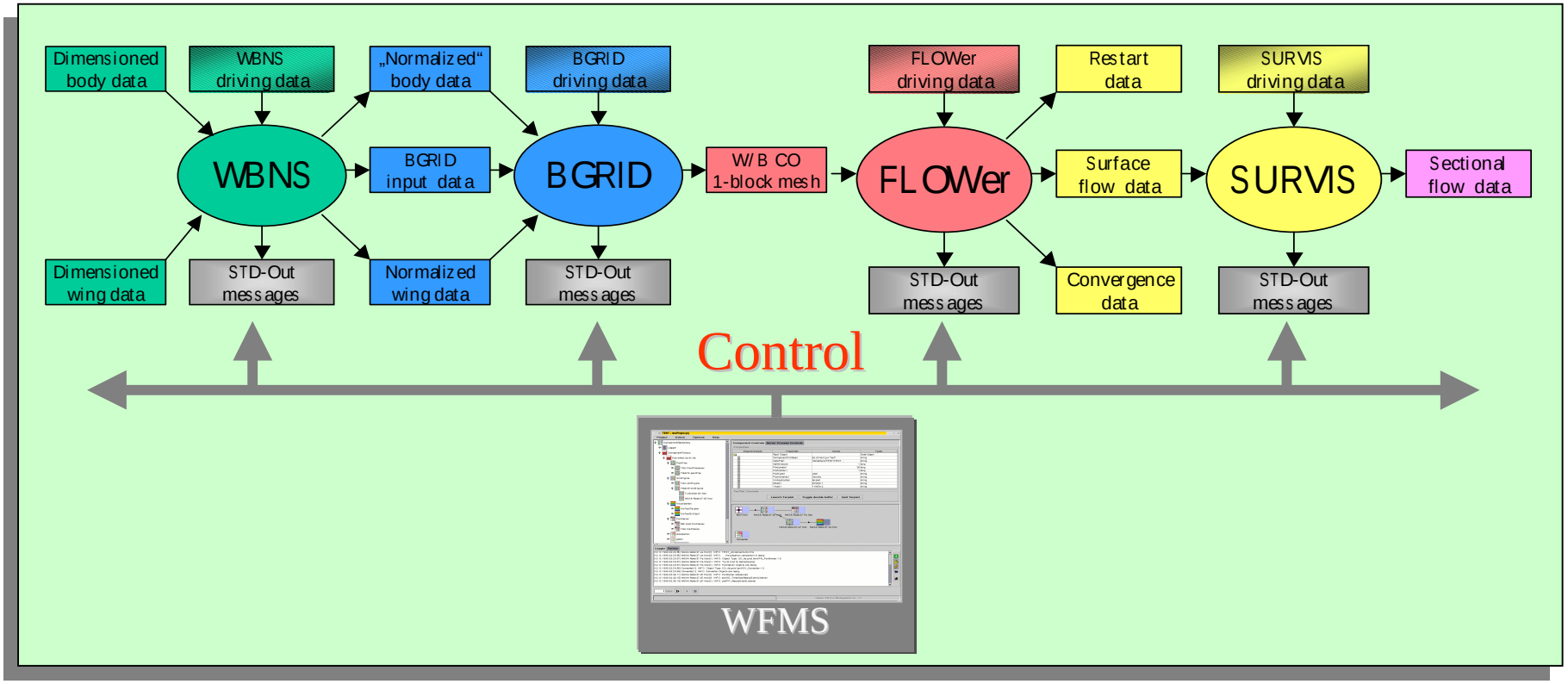
Basic CFD process (1)



Basic CFD process (2)



Controlled CFD process



Integration platform WFMS

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

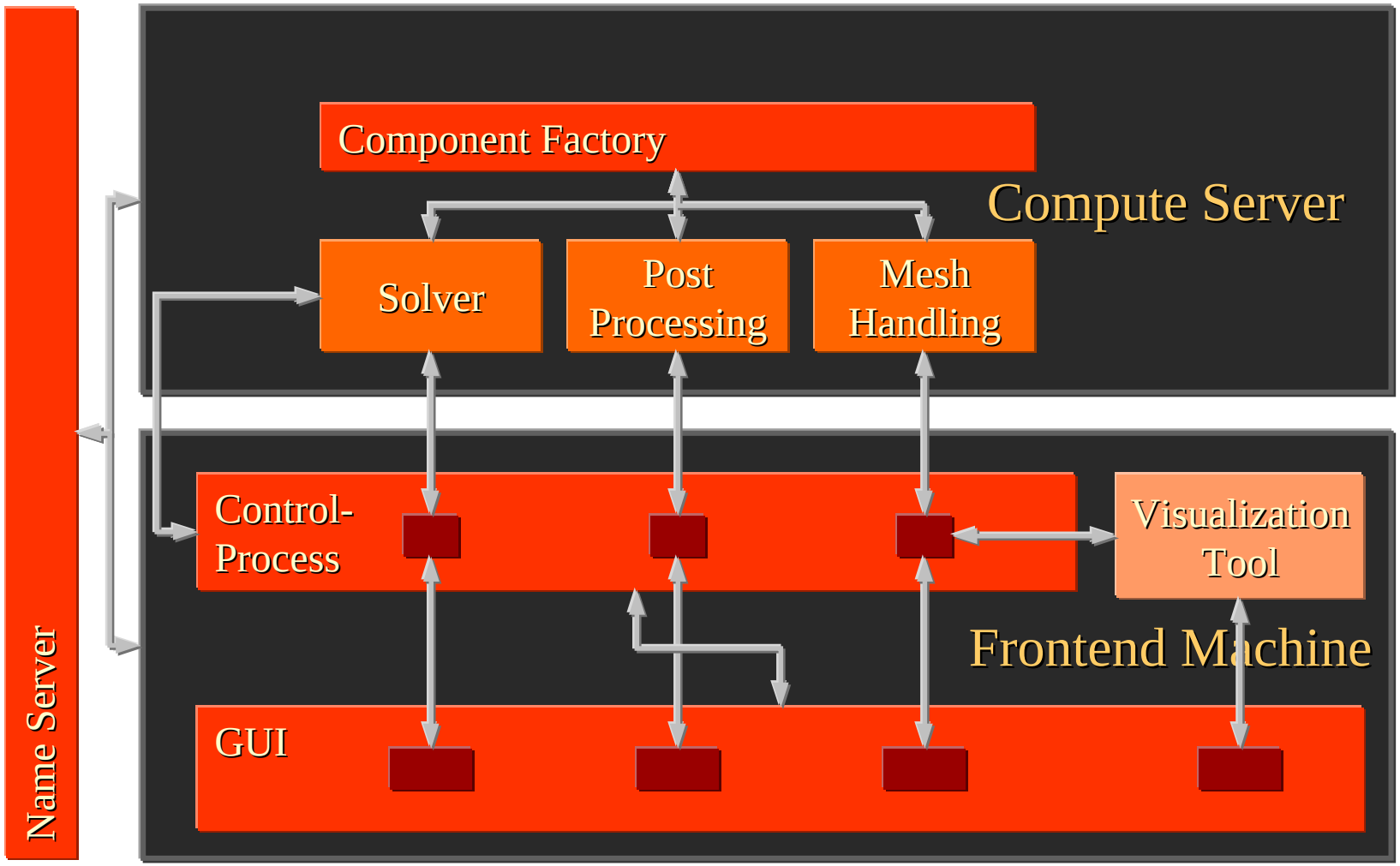
Work flow management: Requirements (2)

- 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

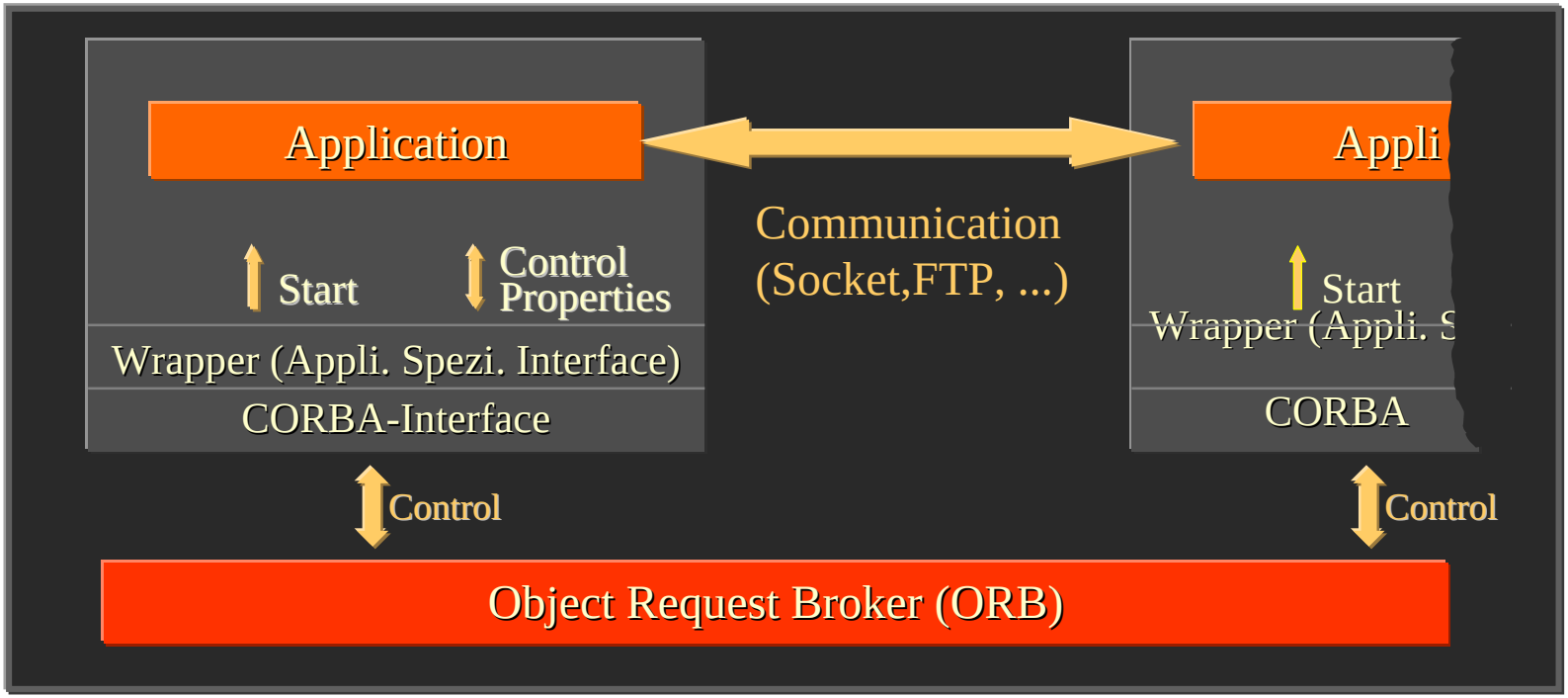
- **Properties of components**
  - Components have specific basic functionalities and interfaces
  - For CFD process, we have at least 5 types of components: Geometry Generation, Mesh Generation,
    Flow Simulation, Postprocessing and Visualisation
- **Communication of Components**
  - Realisation by CORBA (Common Object Request Broker Architecture)
  - Exchange of data directly on network protocol

General architecture using component model

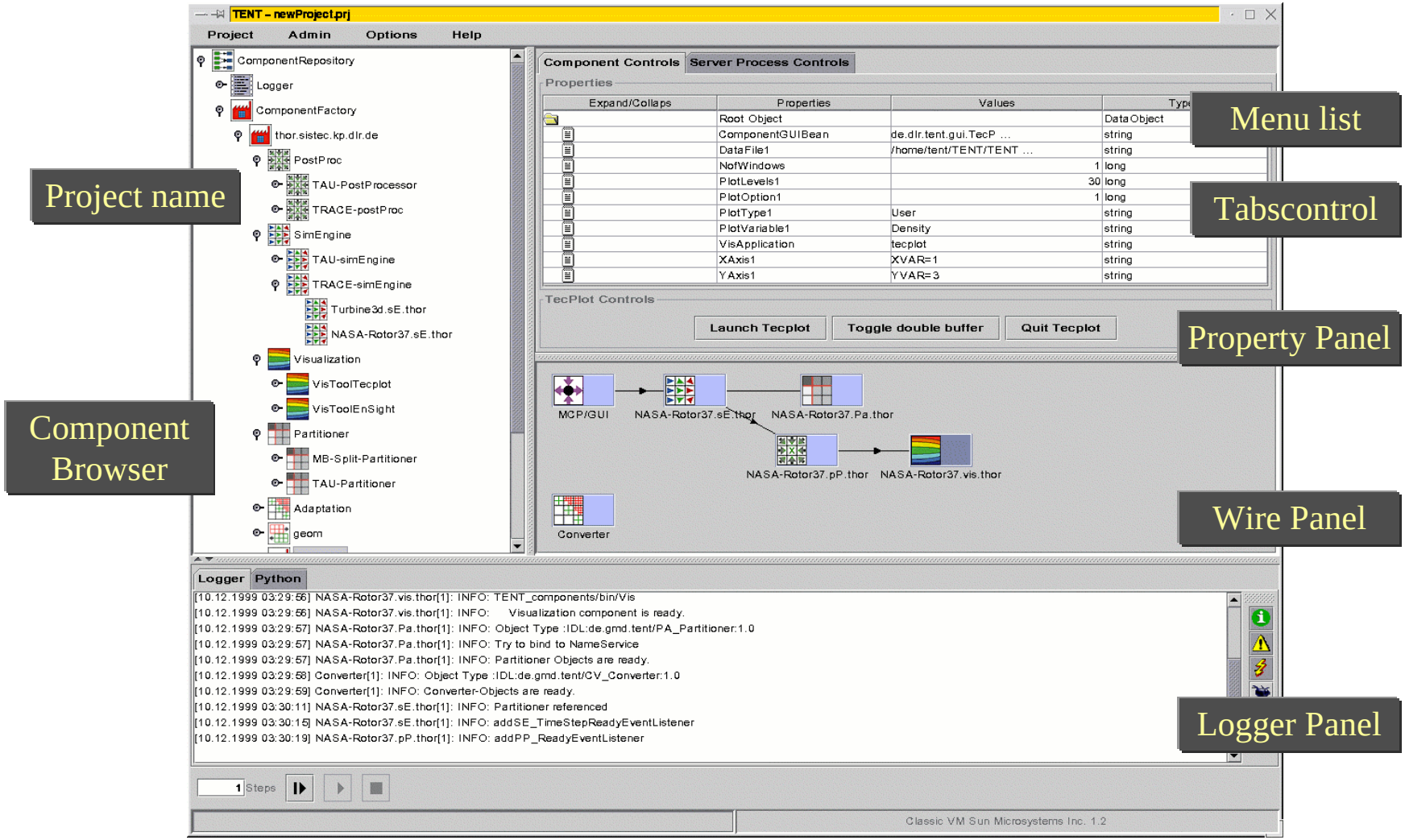


Parallel communication between distributed applications

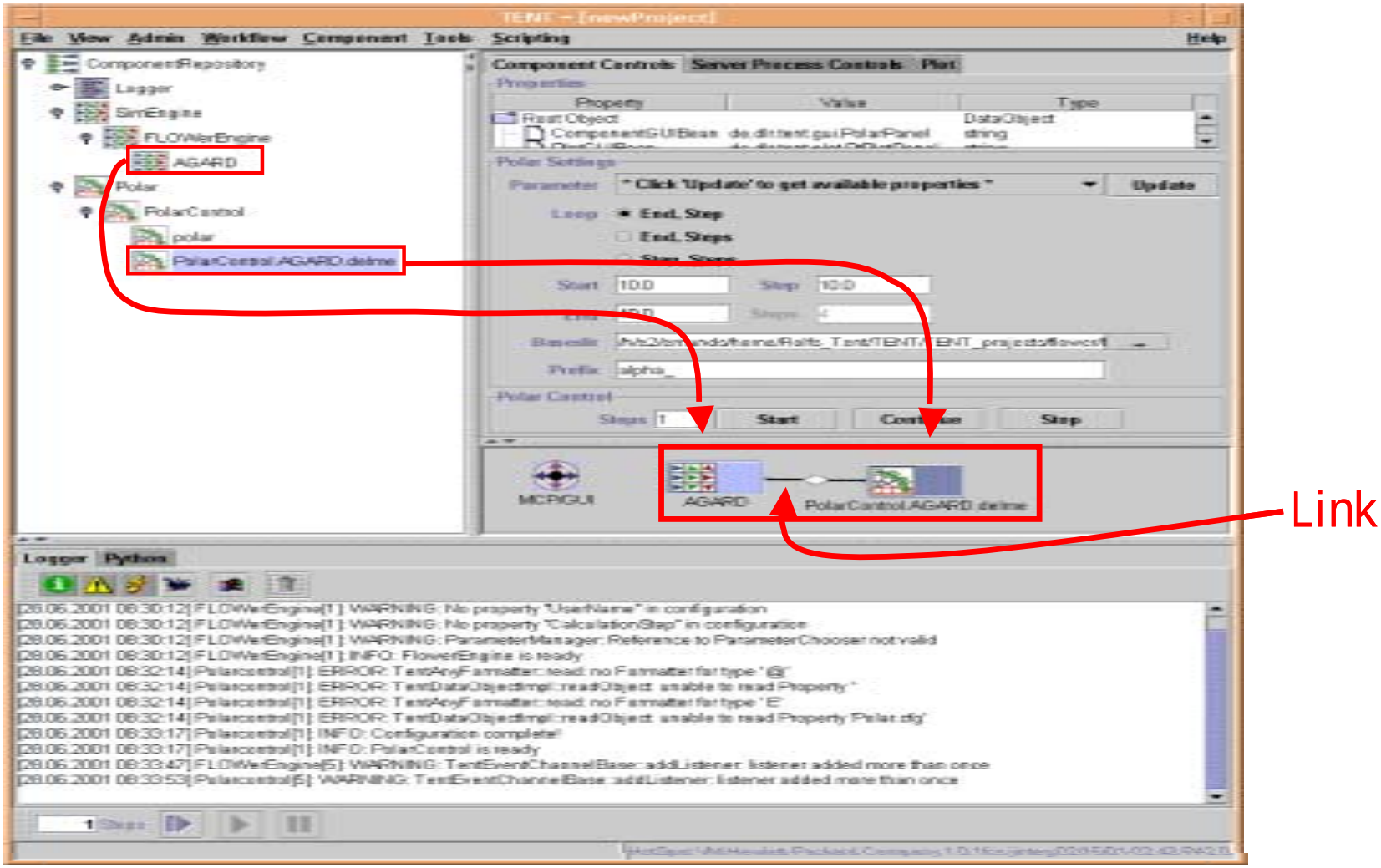
- Process control is via CORBA bus (ORB)
- Data transfer is running on transport level of network protocol (TCP/IP) – for performance reasons



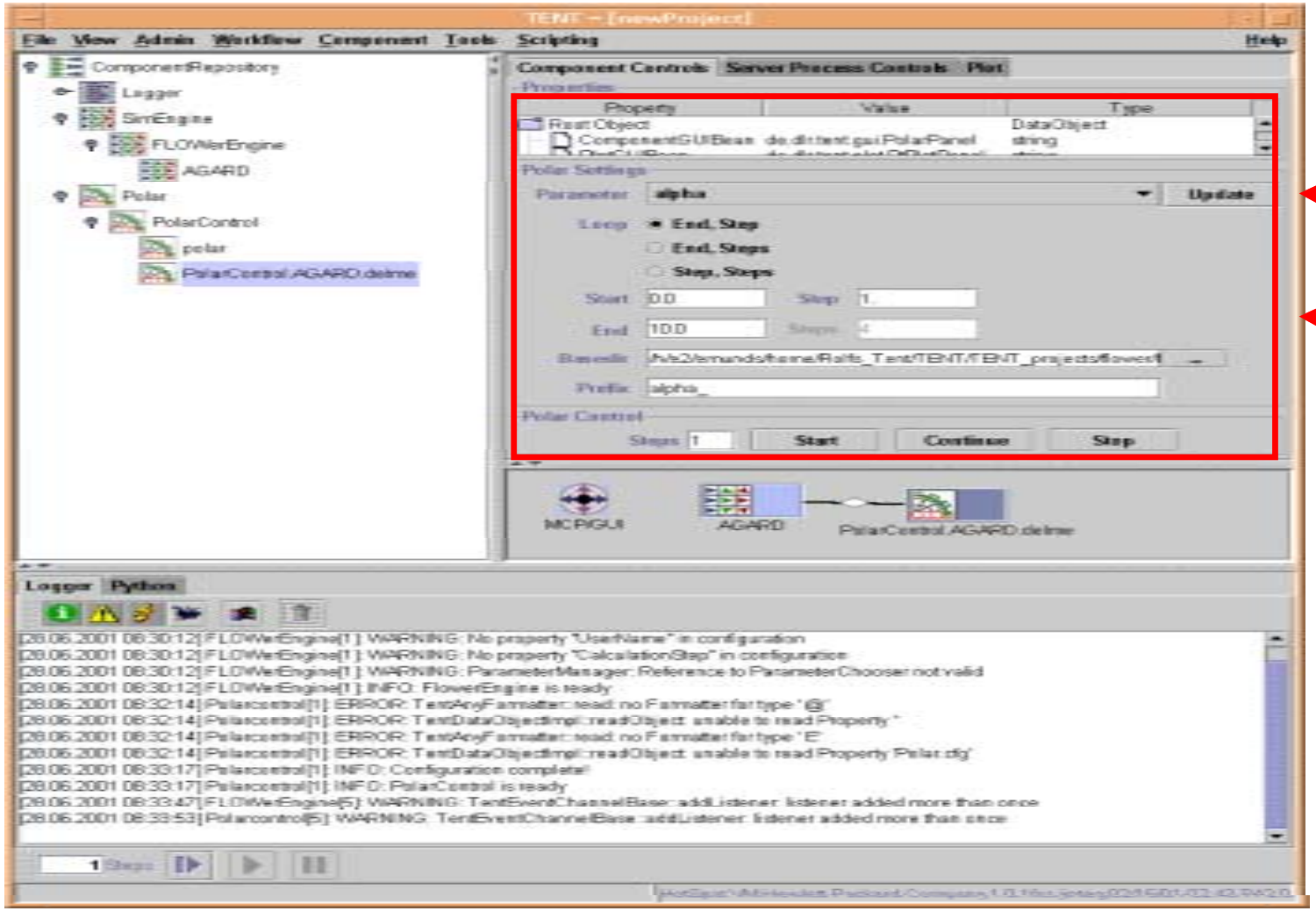
Workflow Mangagement Application - General



Workflow Mangagement Application at Airbus (1)



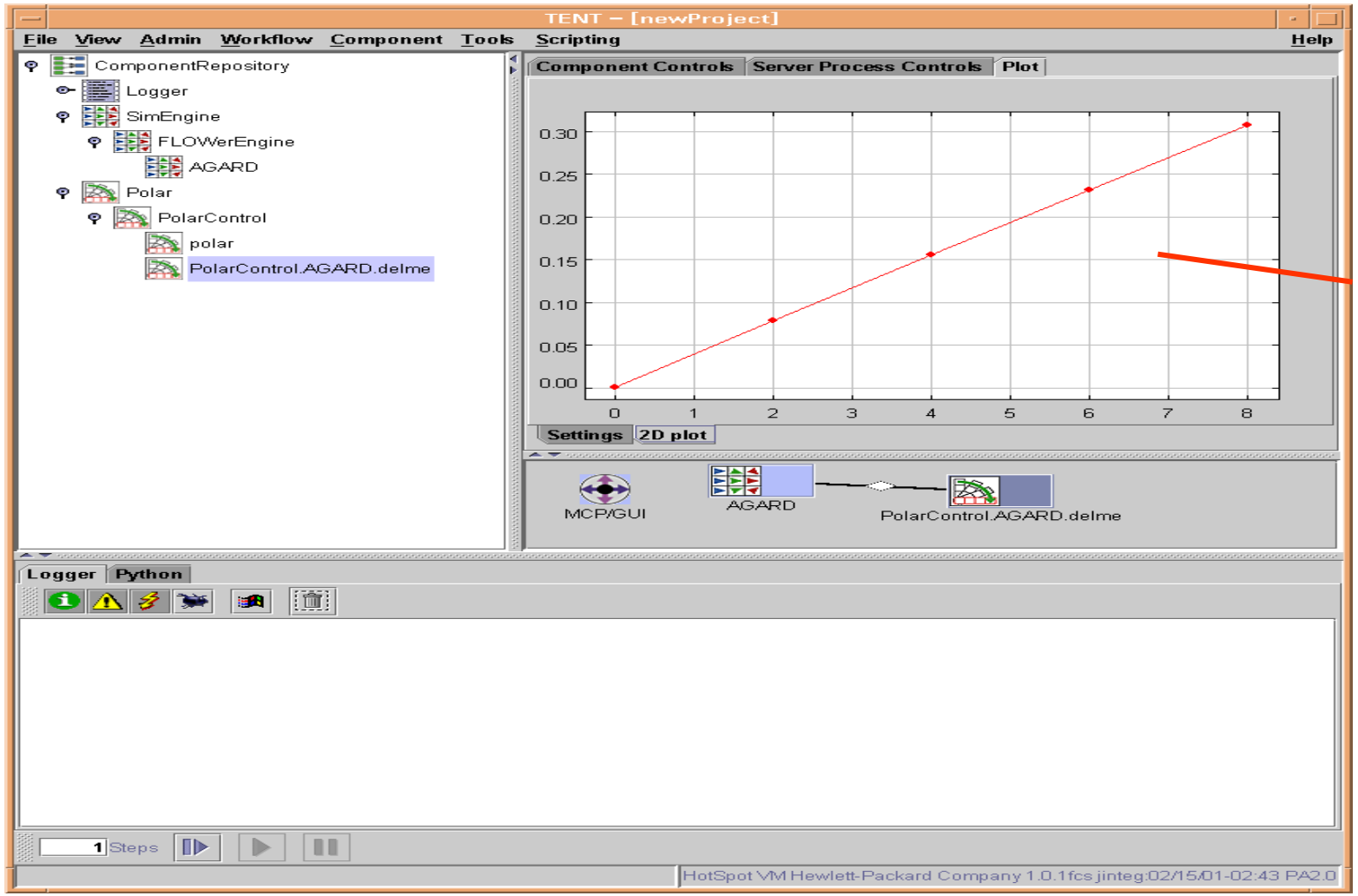
Workflow Mangagement Application at Airbus (2)



Parameter

Range

Workflow Mangagement 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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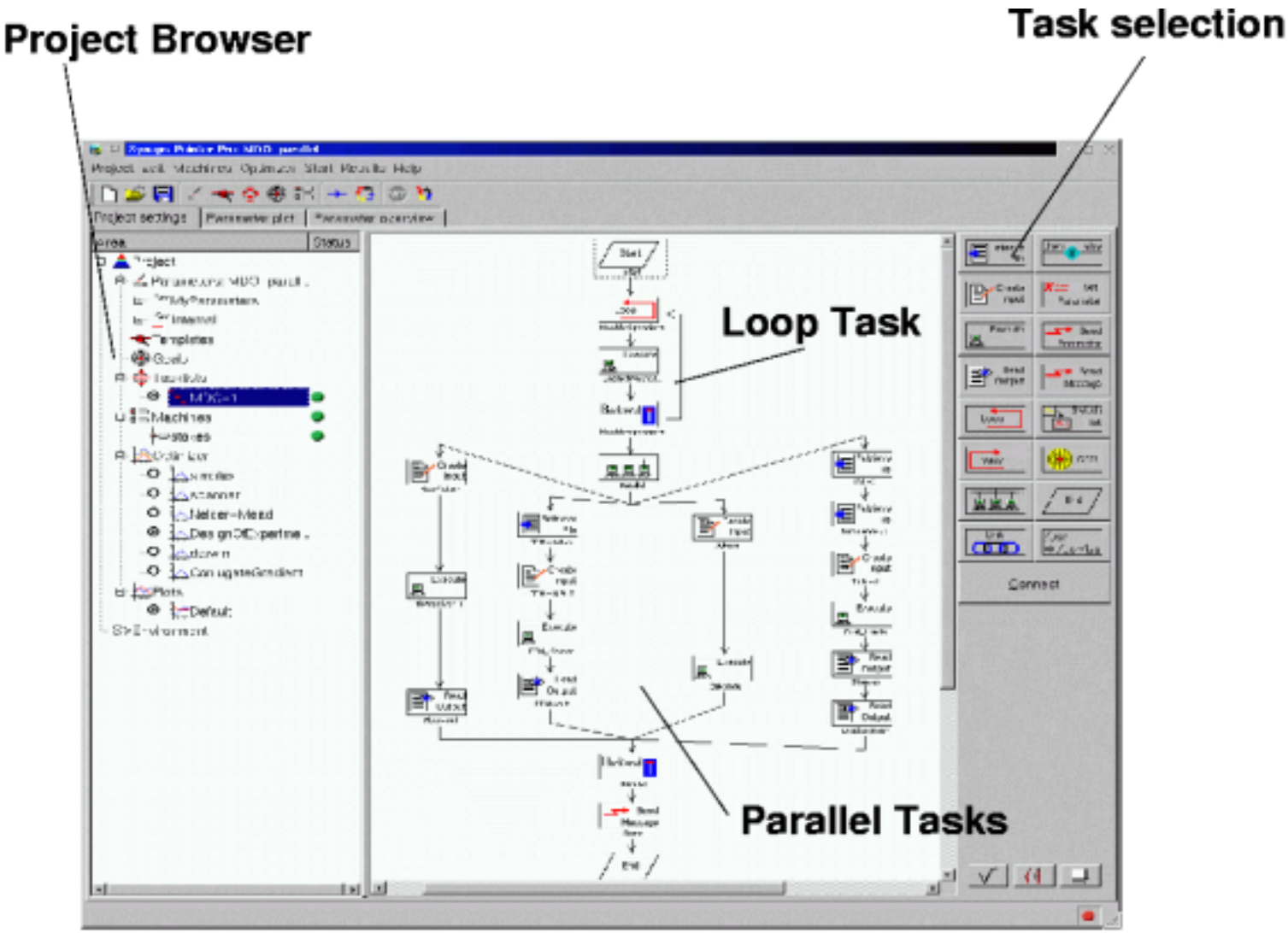
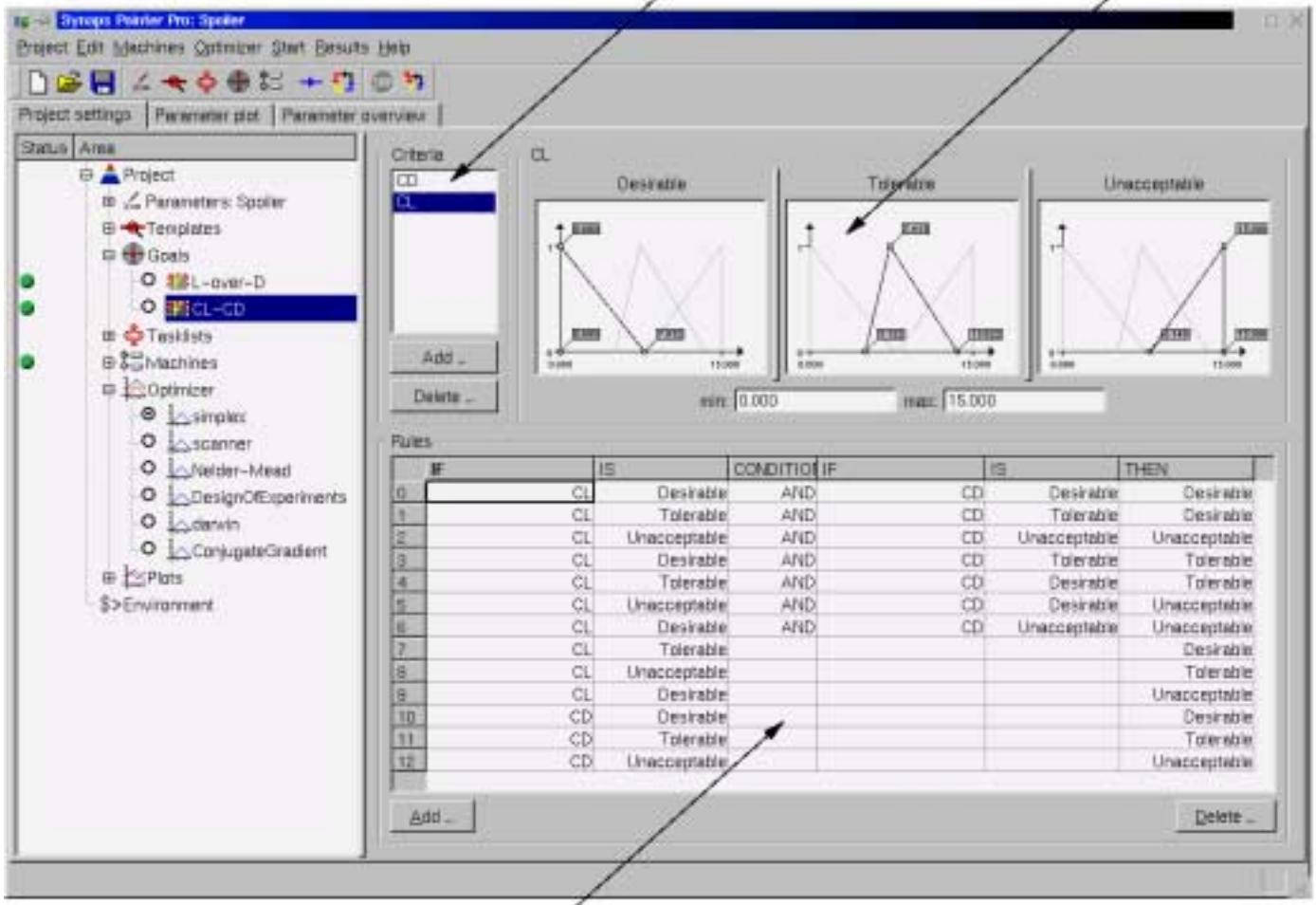
PointerPro – alternative system? (1)



PointerPro Optimizer – alternative system? (2)

Criteria

Membership



Rules

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?**