Web-based Collaboration for Optimization Driven Design

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We help companies design the products of the future, TODAY.
What if ..

• experts could focus no more added value engineering?
• more engineers are enabled to perform the routine analysis tasks?
• corporate knowledge is captured and re-used?
• simulation is automated?
• IT managers can reduce time and costs of software deployments?
User Experience

Democratization

Standardization and Interoperability

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ESTECO is an independent software provider, highly specialized in numerical optimization and simulation data management with a sound scientific foundation and a flexible approach to customer needs.
Global presence
Simplify engineers work, by automating repetitive tasks:

» DESIGN BETTER PRODUCTS, FASTER!

The way products are designed and engineered is changed in the last 20 years. ESTECO continuously research and develop innovative technologies to improve products design process.

ESTECO Values

INNOVATIVE

RELIABLE

INDIPENDENT

FLEXIBLE
Design Space Exploration with ESTECO Technologies

- Simulation Models
- Data sets
- Analytical Models

Actionable Models

Design Space Exploration
Desktop Client GUI:
- Workflow Authoring
- Optimization and Robust Design
- Advanced Data Analytics
- Response Surfaces Modeling

Web GUI:
- Collaboration
- Simulation Data Management
- Analysis Execution
- Data Intelligence

Evaluators + mF Engines:
- Concurrent Execution
- Remote Jobs Management
- Batch Engines Balance
VOLTA Scenario

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- Share Analysis in VOLTA
- Share Analysis in PLM
- Share Process in VOLTA
- External Tool
- Integrate Share Models
- VOLTA Distributed Execution
- Monitor Execution
- Check Results on web
- Advanced Post processing
- Share Dataset in VOLTA
- RSM creation
- Share RSM in VOLTA

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Scenario

Analysis Domain Expert

Analysis Model Preparation

Workflow Preparation

Run Analysis

Analyze Data

Metamodel Creation

Same product:
Hundreds of tools

Hydrofoil Systems

System & Control

Structural Response

Wing Flap

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- Users work in Team Data Manager (TDM): Local Storages, SVN/GIT versioning system for WIP models

- Generates versions (S), revisions (A), milestones (M)

- Publish reviewed milestones to PDM/PLM and VOLTA repository
SIMULATION DATA MANAGEMENT

Build Knowledge
capture, version and share interdisciplinary engineering knowledge across the enterprise.

Track Changes
access and share the latest, most up-to-date information anytime and from any location.

Control User Access
profile-based access and item level permissions.
Scenario

Analysis Model Preparation

Workflow Preparation

Run Analysis

Analyze Data

Metamodel Creation

Process Automation Expert

Same product: Many simulation processes

Hydrofoil Systems

System & Control

Structural Response

Wing Flap

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INTEGRATION & PROCESS AUTOMATION

Powerful Workflow
Streamline and automate your engineering process within an integrated workflow.

Increase Efficiency
seamlessly integrate third-party solvers into a unique, automated workflow.

Save Time
automatically run repetitive simulations and avoid the process of manually combining the output from multiple applications.
Simulation Process Automation

The modeFRONTIER workflow guarantees formalization and management of all logical steps of an engineering process. Its powerful integration capabilities allow product engineers and designers to integrate and drive multiple Computed Aided Engineering (CAE) tools.

modeFRONTIER offers over 40 direct integration nodes to couple with the most popular engineering solvers, in which communication is guaranteed by APIs or automatic file exchange. Wizard-style tools are available for building a bridge to any commercial or in-house codes.
From BPMN OMG Standard a fully interactive web-based workflow
Extremely powerful collaborative process editing & management
The MDO Workflow is created by referencing the workflows available in VOLTA repository (NO duplication).
Democratizing Simulation

- Fitness functions – no time for manual judgement during optimization
- Parameters ranges
- Requirement/Logical Functional Architecture

Simulation user (Customer)

- Work Order Request

Simulation Expert

- Model exist?
  - YES: MODIFY Model
  - NO: CREATE Model

- Analyse / Validate

- Exploration (Single Design Points DOE / Optimizations)

- Meets Req?
  - YES: Done until further questions or Reqmnts change
  - NO: Other configs, param

Backend

- SW licensing
- Version Sync, control
- Model Integration & Composition (MDO)
- Appropriate Fidelity/Resolution level
- Execution time

Customer Usable Frontend Webtool
DISTRIBUTED EXECUTION

Leverage Corporate Assets
Balance workloads, minimize downtime and integrate different OS environments

Flexible and Secure
multi-core workstations, HPC clusters and public clouds, while ensuring respect of security standards.

Ease IT Management
manage different resource environments and deliver high computational power in the hands of design teams.
Asynchronous Distributed Execution

VOLTA Application Layer:
• Administrator defines queues and permissions

Queue Abstraction Layer:
• Makes the execution Asynchronous
• Guarantees transactions
• Permissions are managed by the Administrator

Evaluator Execution Layer:
• Hides the complexity of the underlying infrastructure
• Scalable of connected Execution Servers running the VOLTA Evaluator
• Many-to-one connection
Scenario

Analysis Model Preparation
Workflow Preparation
Run Analysis
Analyze Data
Metamodel Creation

Data Analyst

PERFORM
» perform statistical analyses to identify the most important variables a priori and reduce problem complexity

VISUALIZE
» arrange data in a meaningful way, visualize optimization trends and distributions and identify best designs

SPOT
» spot patterns and relationships governing the system response given a particular design configuration

modeFRONTIER
modeSPACE

esteco.com
ENGINEERING DATA INTELLIGENCE

Focus
Quickly identify relevant performance metrics, focus on what is important and make better decisions, faster.

Go collaborative
Stay on track with other experts working on your engineering problem - compare, validate and collaboratively decide on design solutions.

Understand
Turn data into valuable insights and propel your innovation process.
Exportable Mathematical Model

Scenario

Analysis Model Preparation

Workflow Preparation

Run Analysis

Analyze Data

Metamodel Creation

HOW DOES IT WORK?

1. RSMs are trained from an available database of real designs and validated one against another.

2. The best model is used to compute the outputs of the system; this process is called virtual optimization.

3. The best designs obtained through virtual optimization are then evaluated by the real solver.

MAIN ADVANTAGES

- perform thousands of design evaluations in short time
- accelerate the optimization step
- use small amounts of data efficiently
- smart exploitation of available computational resources
VOLTA is a web platform for multidisciplinary business process optimization and simulation data management.
Value, Impact and Benefits

**Value**
- Foundation for the next generation engineering design process

**Impact**
- Enterprise MDO is a key GPDS enabler

**Benefits**
- Achieve product performance improvement
- Achieve balanced, data-driven, global design process
- Reduce engineering & product development turnaround time
- Break time, physical, and organizational boundaries through internet and enable effective communication
- Greatly improve integration capability of engineering process
- Help to execute 24/7 global partner strategy
Summary – VOLTA Benefits

• for the Company
  – Simplified, multi-user repeatable design process
  – Collaboration between teams and organizations
  – Common Repository for sharing knowledge and best practices
  – Compliance with security and data privacy policies

• for Engineers
  – Better organized and more efficient environment for simulation and optimization
  – Trace results to models and simulation parameters

• for Managers
  – Easier and simpler access to results
  – More informed and faster decision making
Thank you for your attention!

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