Datadvance User Conference 2018

Toulouse, Oct 10-11th, 2018

Laurent Chec
General Director
Datadvance SAS
laurent.chec@datadvance.net
Company roots goes to French aviation and Russian mathematics:

- DATADVANCE has been incorporated in 2010 as a result of a collaborative research program by:
  - **Airbus Group** – a global leader in aerospace and defense industry
  - **Institute for Information Transmission Problems** – one of the leading mathematical centers in Russia with three Fields prize winners on the staff
Our customers

Aerospace & Defense
- Airbus
- Airbus Defence & Space
- STelia
- Airbus Helicopters
- Aeroflot
- Saturn
- Tupolev
- ArianeGroup
- Roketsan
- Aerinnova
- САКУТ
- С7
- UNAM
- DLR
- 中国航天

Automotive
- Porsche
- Mitsubishi
- ZF
- Michelin
- Sahara Force India
- Honda
- Bosch
- Toyota

Energy, Process & Utilities
- Orano
- Total
- Saft
- Storengy
- KAIST
- Framatome
- Mubea
- IFP Energies nouvelles
- ENGIE
- CEA
- KERI
- Chiyoda Corporation
- Georgsmarienhütte GMH Gruppe

Marine & Offshore
- IHI
- DSME
- Krylov
- Hyundai Ocean Service Co., Ltd.
- Wärtsilä

Others
- Ipsen
- Limagrain
- Cartier
- L’Oréal
- Cooler Master
- Panasonic
- Covidien
- Hitachi

© DATADVANCE, 2017
Our team

**DATADVANCE locations:**

- Headquarters are in the Netherlands
- R&D team of more than 40 highly skilled researchers and engineers (10 PhDs) is in Russia
- Sales offices are in France and Russia
- A network of resellers distributes Datadvance solution **Worldwide**

**Close collaboration with research labs:**

- Skolkovo Institute of Technology
- Massachusetts Institute of Technology
- Institute of Information Transmission Problem of Russian Academy of Science
- Institute of Applied Mathematics of RAS
- Moscow Institute of Physics and Technology
- Saint Petersburg State Polytechnic University
- Bauman Moscow State Technical University
Worldwide presence with business partners
2018 newcomers
New 2018 technology partners

MSC Software
Simulating Reality, Delivering Certainty™

Technology Partner

TRANSVALOR

THERCAST FORGE REM3D COLDFORM

DATADVANCE
The world is changing: Industry 4.0

1st: Mechanization, water power, steam power
2nd: Mass production, assembly line, electricity
3rd: Computer, industrial robots, automation
4th: Cyber-physical systems
Customization, build per-order
Industry trends

Smart Model

- Machine Learning
- Artificial Intelligence
- Big Data
- Predictive Analytics
- Sensors
- IoT
- Digital Twin
- MBSE
Smart Model: Connected models and data

- Smart Model are the computerized clones of physical objects at various stages of product life cycle
- Smart Model use simulation models and historical data from sensors to represent real-time status, working condition or position
- Smart Model can be used for monitoring, diagnostics and prognostics
**Design Space Exploration in brief**

- “**Design Space Exploration** is both a class of methods and category of software tools for systematically and automatically exploring very large numbers of design alternatives and identifying those with optimal performance parameters”,
  
  - B. Jenkins.

- With **Smart Models** one can perform design space exploration easily
  - Understand and develop trust in your model

- Mathematical methods:
  - Design of Experiments
  - Sensitivity and Dependency Analysis
  - Surrogate modelling and data analysis
  - Single and Multi-objective Optimization
  - Uncertainty Quantification
  - Robust and Reliability Based Design Optimization
pSeven capabilities

- Workflow automation
- Design of Experiment
- Approximation
- Optimization
- Uncertainty Quantification
**pSeven building blocks**

- **Process Automation and Integration**
- **Powerful Workflow Execution Engine**
- **Efficient Data Mining and Optimization**
- **Data Analysis and Visualization**

**pSeven Core**

**pSeven Platform**
Enhanced user experience
Standardization and democratization

**pSeven platform architecture is web-based:**
- Backend: Tornado server
- Frontend: Chromium (QtWebEngine)
- Seamless transition to full web solution in future releases

**pSeven Cloud** can be already run from browser

**Easy to add web customer layer**
SmartSelection: Design Space Exploration for any engineer

Leading edge technology made available to any engineer

Problem description → SmartSelection → Approximation → Optimization → Design Of Experiment

- Approximation: 13 Techniques
- Optimization: 16 Algorithms
- Design Of Experiment: 16 Techniques
R&D and algorithms improvement never ends

Never stop improving algorithms fostering model **QUALITY** and optimizer **EFFICIENCY**

**pSeven Beats MOPTA08 Automotive Benchmark**

pSeven significantly outperforms most of the results presented in the original publication with reduced number of evaluation required.
Trends and company alignment

Integration platforms all around (ERP, PLM, SDM, PIDO, IOT etc.). Harmonization is a dream.

Predictive analytics, predictive maintenance

Collaborative Multidisciplinary strategies

Model Based Systems Engineering (MBSE) and disciplines

Centralized architecture. Web access for authors and runners

Open architecture

Smart Models for complex behaviors

Nested workflow, batch execution, workflow by reference, cloud deployment

Most complex smart models export in neutral formats (FMI, C source, Excel etc.) and bridge to MBSE frameworks.

pSeven Could deployment (on premises or public cloud). Service based architecture.
Main pSeven packages

License policy:
- **pSeven Analytics** - new product package
- Learn more at our website:
  - [https://www.datadvance.net/product/licensing](https://www.datadvance.net/product/licensing)

Runner mode available:
- Workflow execution only, with or without post processing.

License files:
- All customers with active maintenance will receive a new license file in order to update to pSeven 6.14

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>pSeven Ultimate</th>
<th>pSeven MDO</th>
<th>pSeven Analytics</th>
<th>pSeven Core</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pSeven Features</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platform</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workflow construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runner 1</td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Workflow execution, including command line and batch mode</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Post-Processing 2</td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Results visualization and analysis</td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td><strong>pSeven Core Features</strong></td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Approximation</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Building and evaluating models</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Approximation Model export</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Design of Experiments</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Sensitivity Analysis</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Data Fusion</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dimension Reduction</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Optimization</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Uncertainty Quantification</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Robust/Reliability-based Optimization</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Integration Features</strong></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Generic Integration</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Integration via command line interface and external files</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>