Agenda

1. Company Overview
2. Focusing on MBSE
3. MBSE Solution Image
4. PoC Introduction
1. Company Overview

NTT DATA ENGINEERING SYSTEMS Corporation (NDES)

- **Hqrs-Address**: 7-37-10, Nishikamata, Ohta-ku, Tokyo, 144-8601 Japan
- **Founded**: Dec 1, 1977
- **Corporate Identity**
  We will grow into a company that contributes to society by earning the trust of our customers through global system business.
- **Business Overview**
  We totally provide the system of engineering and business that is required for value chains of manufacturing industry.
- **Capital**: 100 million yen (770,000€)
- **Sales**: 11,400 million yen (88 million€)
- **Employee**: 457 person
- **Stockholder**: NTT DATA Corporation (100%)

Group company
- **ENGINEERING SYSTEMS SOLUTION SHANGHAI LTD.**: Sell, support and software development mainly Space-E.
- **ENGINEERING SYSTEMS SOLUTION SLOVAKIA s.r.o.**: Europe global business location of NDES that provides PLM system development and support to Japanese or European companies.
### Relationship between NTT DATA and NDES

<table>
<thead>
<tr>
<th>NTT DATA</th>
<th>Main group company</th>
<th>Main capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public and Utility</td>
<td>NTT DATA ENGINEERING SYSTEMS</td>
<td>✓ Provide total systems “Engineering” and “Business” that is required in a series of value chain of manufacturing</td>
</tr>
<tr>
<td>Finance</td>
<td></td>
<td>✓ PLM, ERP, CAE, 3D-Printer, CAD Cloud Service</td>
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<tr>
<td>Corporate and Solution</td>
<td>CATS (MBD)</td>
<td>✓ SI service for JT, SAP, intra-mart</td>
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<td></td>
<td>NTT DATA WAVE (JT)</td>
<td>✓ Support of PC Introduction and disposal</td>
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<td></td>
<td>NTT DATA SEKISUI SYSTEMS (Sekisui Chemical)</td>
<td>✓ SI service for Sekisui Chemical</td>
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<td></td>
<td>NTT DATA CCS (JX)</td>
<td>✓ ASP service for builder, Shift work scheduler</td>
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<td>NTT DATA BUSINESS BRAINS (Nippon Sheet Glass)</td>
<td>✓ SI service for JX</td>
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<td></td>
<td>NTT DATA MSE (Panasonic)</td>
<td>✓ Application development for smart phone tablet</td>
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<td>NTT DATA TERANOS (Kinki Nippon Tourist)</td>
<td>✓ SI service for Nippon Sheet Glass</td>
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<td></td>
<td>NTT DATA SMIS (Saison)</td>
<td>✓ SAP, Electronic form, CMS, AMO</td>
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<td>NTT DATA MHI Systems (Mitsubishi Heavy Industries)</td>
<td>✓ Embedded software of mobile and appliance</td>
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<td>JSOL (Japan Research Institute)</td>
<td>✓ Vehicle platform development</td>
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<td></td>
<td>Qunie</td>
<td>✓ SI service for KNT</td>
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<td></td>
<td>NTT DATA INSITITUTE of MANAGENENT CONSULTING</td>
<td>✓ SI service for distribution industry and retailing</td>
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<tr>
<td>Global</td>
<td></td>
<td>✓ Operation and Maintenance of IT Infrastructure for MHI</td>
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<td>Technical Innovation</td>
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<td>✓ SAP business (Medical industry)</td>
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<td></td>
<td></td>
<td>✓ CAE solution (Structure analysis, Collision analysis etc)</td>
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<td></td>
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<td>✓ Business strategy, business improvement consulting</td>
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<td>✓ Research, business improvement consulting,</td>
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<td></td>
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<td>✓ SAP business, global SAP service</td>
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<td></td>
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<td>✓ Domestic ERP package (intra-mart)</td>
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<td></td>
<td></td>
<td>✓ SAP, Workflow, WEB Integrated Foundation</td>
</tr>
</tbody>
</table>
2. Focusing on MBSE (Business Trends & Current Situation)

- Integration between PLM & ALM
- New technology as agile method
- Cloud computing would be general
- Promotion of additional IT skills
  - How to improve with investment?
  - Models, Systems Engineering, MBSE??

Top Management
- Change Business Model
- Make Creative Team
- Relationship with CHINA
- CASE…
- Education for skillful parsons is needed ASAP
- Investment to R&D Div. would be high priority as needed.

Development Department
- What is combination process between hardware and software?
- How to migrate to virtual dev.?
- Traceability from req. to spec?
- Too many tests… so far and future?
- No rule for documentation.
- Uncertain changing impacts.
2. Focusing on MBSE (Issue & Tactics)

<table>
<thead>
<tr>
<th>Issues</th>
<th>Countermeasures</th>
<th>Solution Idea</th>
</tr>
</thead>
</table>
| New Function Available  
  - ECU (50->100 ?)  
  - SW rate is increasing  
  - Over workload | Document Base -> Model Base  
  - Understandable for everyone  
  - Prevent document explosion | Real Time Visualization of Impact Analysis |
| Complicated Product Development  
  - Unexpected return risk  
  - No process/rules for Requirement Engineering | Good Communications  
  - Common language for Other region/Supplier/Global | Usage of Modeling Languages and Process Standardization |
| Cross Domain development & Evaluation  
  - Optimization between HW and SW  
  - Return along less verification | Low Impact Design Change | Appropriate Modeling of Requirements and Functions |
| IT Env.  
  - Skill Less  
  - What is a new process?  
  - Over work load  
  - Application of disruptive Tech. | Storage Know-How  
  - Model know how and evangelize | Education for New Process |
|                      | "Integration" / "Relation"  
  - Criteria for decision |                      | Digital Twin |
|                      | Education  
  - Education curriculum and alliance network |                      | Cloud Computing |
3. MBSE Solution Image-1

H/W,S/W Relational Framework (Technical Service Framework)

Capability on TSF NDES provides...
- Modeling enables to analyze and visualize.
- Opened development based on Global Standard.
- MILS (Model In the Loop Systems) applied.
- Preventing design changes and impact to others

Benefit
- Issue Management
- Early Phase Verification
- Cross Domain Requirement to achieve
- Keep QCD, Re-use “Knowledge”

H/W Design

S/W Design

Technical Service Framework (Process Mgmt, Traceability, Simulation)
NDES Service -Cloud Computing Services: Manufacturing-Space-

Manufacturing-Space®

- File Transfer
- Process Manager
- Network Licensing
- Model Refactoring
- Data Analysis
- Reverse Engineering

Data Concierge

- OEM1
- OEM2
- OEM3
- Supplier1
- Supplier2
- Supplier3

- Users: 800 Companies, from 2013/Oct.
- New services and enhancements and improvement are on-going.
3. MBSE Solution Image-3

Cloud Computing Sourcing Style with Standard System Method. and Solutions

➢ TSF is implemented on Manufacturing-Space. MS上にTSFを実装
➢ Enable independent module for lean verification (PoC).
   リーンな検証は、これだけ抜き出しても他に影響を及ぼさない様にモジュール化。
➢ Lean verifications are developing on NDES test environment.
   お客様フィードバックの結果をテスト・デモ環境で確認し、開発ならびにリリースアップを実施する。

![Diagram showing MBSE Solution Image-3]

- Network Licenses Service
- User Mgmt
- File Transfer
- CAD viewing
- HMI

Manufacturing-Space® Basic Func.

Technical Service Framework
- Production Environment
  - ZIPC Family
  - Model Ex
  - ALM
  - Refactoring
  - Reverse Engineering
  - Attribute Mgmt
- HMI
- Access Mgmt
- Configuration Mgmt

Data Concierge Service

- User1
- User2
- NDES Development Team

Solution Pool

Solution Development

Offshore Team

Cust. Legacy Systems

TSF New Service Pool
- New Service
- Release Up
- Test

<TSF Basic Func.>
- Traceability
- OSLC, Issue Mgmt

PLM/CAE

ALM
NDES’s Problem Statement

◆ The point solution is mainstream.

◆ To select 1 bender to integrate tools and it costs too much.

Benefit of work with NDES

◆ No tool dependence for integration.

◆ Members having not only IT view point but also engineer’s view point.

Premise of PoC

◆ SysML is widespread as a modeling language.

◆ Cloud computing enables to...クラウドコンピューティングにより、

- Reduce user workloads.ユーザ負荷が軽減できる
- Execute independent PoC of new model connection.新規モデル接続のPoCが独立して実行できる

NDES provides development environment without tool dependence.

ツールに依存しない開発環境をNDESはご提供いたします
Scope of the PoC & Benefit of the PoC

Scope of the PoC

Benefit of the PoC

Enable to maintain traceability between multiple tools on the cloud.

Execution of the PoC

- Requirement Diagram is created on No Magic from DOORS model.
- Structure models and behavior models are created from Requirement Diagram.
- SysML model will be modified based on Req Diagram change.
Abstract of Demonstration

Theme of Scenario
Flexible Product Line Strategy with Specification “Late Change”
「よりユーザ/市場に近いところで仕様変更ができる、柔軟な商品戦略の仕組み」

Scenario①
Visualization using Feature Model (“Variable Model”).
可視化 → フィーチャーモデル（可変性モデル）、フィーチャーモデル（可変性モデル）の展開

Scenario②
Impact Analysis using Feature Model (“Variable Model”), Req Documents Mgmt & Traceability
影響分析 → フィーチャーモデル（可変性モデル）と要求文書管理、トレーサビリティ

Scenario③
Verification of Late Change using Model Communication & “DataHab”
LateChangeの検証、効率化 → コミュニケーション＋“DataHub”
Next Challenges

Co-Creation Use Case Trial

- Communication between OEM and Supplier.
- Application enhance: Simulation Tools, CAE Tools, etc…
- Connect Verification Area: ASAM-ODS

Image of Multiple Tools Connection

Image of ASAM-ODS Connection
Remarks

• Please ask us at the networking.
  懇親会の場でご意見等いただければと思います。

• We have some movie of demonstration.
  デモ映像もあります

• We will visit for consultation / explanation.
  別途ご相談/ご説明にお伺いいたしますのでお気軽にご相談ください
Technical Service Framework
（MBSEのためのFramework）のご紹介

NTT DATA

Manufacturing-Space®のクラウド上で動作するTechnical Service Framework (TSF) は、製品開発ライフサイクル全体において発生する企業間のト雷斯バリティ不整合をツールに依存しないモデル間整合により解決します。

TSFは、クラウド上でモデルのコミュニケーションができる環境を提供し、複数企業の協業に関連するト雷斯バリティ不整合を解決します。

各企業異なるツールにより開発を行うことからト雷斯バリティ不整合につながると考えています。

TSF利用イメージ

OEM様サイド

モデルごとSysMLモデル、Simulinkモデルなどにツールに依存せず接続できます。

サプライヤ様サイド


※TEMASCに関しては、キャッシュ形式で保存に協議いたしております。
※Manufacturing-Space®は、株式会社NTTデータエンジニアリングシステムズの登録商標です。

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Traceability
TSF/ASAM-ODS連携

Manufacturing-Space®のクラウド上で動作するTechnical Service Framework（TSF）は、国際標準であるASAM-ODSと連携し、製造過程での業務立案・設計・検証における仕様書・設計書・実験データなどの全体のトレーサビリティを実現します。

TSFは、ASAM-ODSで管理する実装データを生成の全体モデルと連携することで全体の最適化を行い、キャリブレーションを実施できます。