The Dark Data Concept
A new approach by Siemens and Bentley Systems
June 14 –16, 2018, Frankfurt, Germany
“The Portal” is just a temporary name, to one characteristic that it is a Open Cloud-based Plant Engineering and Operations Portal.

Contents of this presentation show both current and future development of and may be subject of change.
Agenda

- Market Background/Industry Trends (Business/Information Technology)
- Dark Data – Introduction
- The Dark Data Concept
- Summary
Strategic partnership between …

Discover the potential of digitalization through improved interoperability for more value in the process industries
This collaboration expands our offering across all our business areas

Joint development € 50m joint funding for investments in defined areas

Discrete manufacturing
Combining product and production with lifecycle management of factory infrastructure

Win-win partnership

Process industry
2D and 3D plant design/engineering and collaboration and workflow platforms

Mobility
Data generation and management throughout the entire project phase

Energy management
2D and 3D design/engineering of electrical transmission, distribution grids, transformers and substations

Building technologies
Structural software for building design
Digitalization changes everything
## Major Information Technology Trends

### Major Information Technology Trends shaping the Energy/Process Industries

<table>
<thead>
<tr>
<th>Digital Collaboration</th>
<th>Asset Performance and Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Data Exchange and Access</td>
<td></td>
</tr>
<tr>
<td>• Data Quality/Availability</td>
<td></td>
</tr>
<tr>
<td>• Data Analytics</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SaaS/Cloud/Security</th>
<th>Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT systems/data/asset documentation</td>
<td></td>
</tr>
<tr>
<td>• Industrial “Internet of Things” – IIoT</td>
<td></td>
</tr>
<tr>
<td>• Connecting the mobile workforce</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Accenture, Deloitte, IBM
Resulting drivers in the Process Industry

- **FEED**
  - Basic Engineering
  - Detail Engineering
  - Construction and Commissioning
  - Operation and Maintenance
  - Modernization and Revamp
  - Shutdown

**CAPEX**
- 2 – 3 years and warranty

**OPEX**
- >15 years

**Time to market**
- Ramp-up of plant
- Fast innovation
- More complex products

**Flexibility**
- Technology Lifecycle
- Predictability/ Reactivity
- Individualized mass production

**Efficiency**
- CAPEX/OPEX reduction
- Asset Efficiency and Reliability
- Standardization

**Quality**
- Closed-loop quality
- Traceability
- Supply Chain Integration

**HSSE**
- Health and Safety
- Regulations Requirements
- Environmental protection
- Documentation
Siemens and Bentley drive the Digital Enterprise for the Process Industries

Managing the Digital Twin for OPEX in Process Industries

Integrated Engineering
- Simulation
- Process Models
- Automation
- 3D Models
- Visual Operations
- Data Analytics

Digital Twin – Standardized Business Model
- Recipe, feedstock quality, ...
- Process and plant documentation
- Real Plant
- Integrated Operations and Services
  - Secure Connectivity
  - Digitally enhanced Products
  - Maintenance

Product design 1  Process and plant design 2  Engineering and commissioning 3  Operation 4  Service 5
Agenda

- Market Background/Industry Trends (Business/Information Technology)
- Dark Data – Introduction
- The Dark Data Concept
- Summary
What is „Dark Data“?

• All information in a process plant environment considers **business critical data** and **hidden dark data**
• Dark data are a type of **unstructured and untagged** data
  • 1D (specifications, datasheets, lists, registers, records)
  • 2D (drawings, logical connectivity)
  • 3D (physical layout, sizes, positions)
• In different data storage or applications
  • No or limited relationship
  • Not analyzed or used by daily work even for data which is stored by partners or customers
• Finding the **current and valid status** of these data in the different systems and connecting them is a challenge
• The overall process to make the right data work can be costly and long-lasting

➢ Change **hidden dark data** into **Bright Data**
Agenda

- Market Background/Industry Trends (Business/Information Technology)
- Dark Data – Introduction
- The Dark Data Concept
- Summary
Value Proposition – Operation Focus in Process Industries

Operators, plant owners, service companies continuously improve the production and profit generation. We treasure the business value of existing or “brownfield” process plants by validating and connecting from different data storages or applications for a better competitive intelligence and faster business decision making.

Historical approach
Use CAPEX tools with in-depth engineering functionality for certain disciplines extended to OPEX (O/O-based) workflows

Issues
- Approach was
  - Complex for end-user
  - Loosely coupled

New approach
Lean, web and cloud-based Solution to

Manage the Digital Twin for Process Industries

Value
Provide the Digital Twin for Owner/Operators to enable extended Digitalization services for process plant assets

Value proposition
Goal
Environment to create, augment and manage robust and consistent data to Owners and Operators

By
Foundation for the Digital Twin by consolidating all information and models from Siemens, Bentley, 3rd Parties and validated with Augmented Reality for Visual Operations

Which Enables
Consistent reporting across owner facilities with consistent reviews and markups from multiple devices and forms Basis for future Asset performance improvement

Value
Fast, up-to-date and accurate information enhanced operational safety, operations and decision making
Vision (Phased Approach)

Engineering for OPEX

- Reduce O/O operating costs by realizing the Digital Twin
- Allow holistic 1D/2D/3D viewing and OPEX oriented authoring (e.g. redlining and markups)
- Provide a common Portal information model (BIS), new and existing platform services and features
- Portal to interoperate with established Bentley and Siemens products
- “Everyday use” is ensured by easy entry (= minimal installation), multiple device support and scalability through a cloud-based web editor

Future – For CAPEX/TOTEX

- Add full authoring capabilities of 1D/2D/3D information of the digital twin to allow EPCs to manage and optimize design/engineering lifecycle
- Connect to MindSphere incl. big data management, data analytics, Deep learning, ...

“Empower your data value by using new technologies over the entire lifecycle for O/O and EPCs of the Digital Twin”
Main Use Cases

Demands of Owner/Operators (O/O) during the OPEX phase (“brownfield scenarios”)

1. **Build and constantly enrich the digital twin of their plant**
   - To get a central and current overview of their distributed data
   - Reality models as part of a digital twin (from 1D/2D/3D data acquisition and laser scans and photos)
   - Digital models of the digital twin
   - Data acquisition, interpretation, aggregation
   - Continuously keep digital twin up-to-date (status from “unknown”/“as designed” to “as is”/“as-operated”)

2. **Plan, run and supervise Maintenance, Repair and Operations (MRO) tasks**
   - Inspection “walk-downs”
   - Maintenance with and without shutdown (turnaround)
   - Commissioning

3. **Plan, run and supervise plant revamps**
   - to optimize plant efficiency and reduce production downtime

4. **Plan, run and supervise operator and emergency training simulations**

5. **Collaborate with EPCs and update the digital model with authoring tools**

Frei verwendbar © Siemens AG 2018
Page 15       June 14 – 16, 2018

Frank Jankowiak | PD PA AE CIS S
## Main Use Cases

### Demands of Owner/Operators (O/O) during the OPEX phase ("brownfield scenarios")

<table>
<thead>
<tr>
<th></th>
<th>Use Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Portal – on The Web</td>
</tr>
<tr>
<td>2</td>
<td>Data acquisition</td>
</tr>
<tr>
<td>3</td>
<td>Data aggregation</td>
</tr>
<tr>
<td>4</td>
<td>Data visualization</td>
</tr>
<tr>
<td>5</td>
<td>Conflict resolution</td>
</tr>
<tr>
<td>6</td>
<td>Simple editing functions</td>
</tr>
<tr>
<td>7</td>
<td>Authoring</td>
</tr>
<tr>
<td>8</td>
<td>Update digital twin</td>
</tr>
<tr>
<td>9</td>
<td>Use digital twin</td>
</tr>
<tr>
<td>10</td>
<td>Data distribution</td>
</tr>
</tbody>
</table>

**1. The Portal – on The Web**
- Easy and central entry point

**2. Data acquisition**
- Import from various data sources and store centrally in the cloud

**3. Data aggregation**
- Extract, interpret and link data to build digital twin

**4. Data visualization**
- View digital twin with 1D, 2D and 3D aspects (Single Source of Truth (SSoT))

**5. Conflict resolution**
- Identify and resolve data collisions

**6. Simple editing functions**
- (In phase 1): Redlining and markups

**7. Authoring**
- In Bentley, Siemens 3rd party tools (in phase 1): Modify redlined data in original tools

**8. Update digital twin**
- To keep digital twin in "as is" status and up-to-date

**9. Use digital twin**
- For daily Owner/Operator (O/O) work search, navigate, field support (offline work), inspection rounds, MRO tasks, deviation and change management, approval, plan revamps, check lists for plant safety

**10. Data distribution**
- Handover to discipline departments and sub-contractors
P&ID and Tag Management Workflow/Storyboard

Scenario
I am a Process Engineer. I need to log into the system through the new web portal to work on my current P&ID. I have also just received updated information on new valves which I need to import from Excel, then view the new data using the new 2D Viewer.

Core capabilities
- Web Portal
- Tag Configuration
- Data Acquisition
- Data Viewer
- 1D: Tree, Status, Properties
- Task Management
3D Legacy Data Aggregation/Review Workflow/Storyboard

Scenario
I am a Mechanical Engineer.
I need to import SmartPlant 3D data using the new iModel Bridge, then select my iModelHub project. This will give me access to the 3D model information where I can start to review the current status of work done. I then receive notification of new model changes so I reopen iModel Bridge, apply initial model filters to the same model to create a difference between models for comparison. The models are viewed using the Web Portal Navigator.

Core capabilities

- iModel Hub
- Tag Service
- ID Service
- 3D Import
- SmartPlant 3D Model
Agenda

- Market Background/Industry Trends (Business/Information Technology)
- Dark Data – Introduction
- The Dark Data Concept
- Summary
Summary

**Engineering for OPEX**
Based on capturing information from existing systems and making available to review, markup and light weight editing in operations using a consistent data schema

**CAPEX**
Moving existing design tools to natively modify and edit models using the consistent data schema

**TOTEX**
Integrating operational maintenance tools to the same consistent data schema, with the assumption that the data schema will be expanded to meet those specific requirements
## Benefits

<table>
<thead>
<tr>
<th>Direct and easy access to information changed in different disciplines. Collaboration between engineering, operations and maintenance is facilitated</th>
<th>The time to find information is reduced substantially, which leads to <strong>productivity improvements</strong> and improves adequacy of actions in emergencies</th>
<th>Maintenance decisions and activities become more accurate and improve reliability while reducing cost</th>
<th>Plant documentation is kept up-to-date to meet regulatory obligations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scalable</strong> – supports the smallest plant modification workflow, to complex capital projects (scalability, maintenance cost/IT cost)</td>
<td>Object-orientation enables <strong>modular engineering</strong>. Applied throughout the enterprise, it improves standardization that generates <strong>time and cost benefits</strong>, facilitates cooperation and increases <strong>flexibility</strong> in personnel assignment</td>
<td>Configured workflows enable <strong>compliant, quality controlled processes</strong>, projects, and document generation</td>
<td><strong>Operational readiness</strong> can be predicted more reliably and reached sooner</td>
</tr>
</tbody>
</table>