The BP strategy

Shift to gas and advantaged oil in the upstream

- Invest in new large-scale gas projects, pursue quality oil projects in core basins and seek out new opportunities in selected regions.

Market-led growth in the downstream

- Build competitively advantaged businesses in manufacturing and expand our marketing businesses.

Venturing and low carbon across multiple fronts

- Pursue new ventures and partnerships to meet rapidly evolving technology, consumer and policy trends, and develop cross-business solutions to create new opportunities or strengthen our existing relationships.

Modernizing the whole group

- Simplify and modernize so we can continue to compete and seize new opportunities with our partners and stakeholders in a changing world.
Journey to a Digital Business

**Digitization** – representing items digitally

**Digitalization** – process is digital

**Digital Transformation** – delivery fundamental change

**Interoperability** – digital systems work seamlessly together
Interoperability Vision

• Plug and play for the exchange of asset and equipment information. No specific coding required, just registration and security setup.

• Definition: “Information need only be entered into electronic systems once, and then it is available to all stakeholders instantaneously through information technology networks on an as-needed basis.” (Fiatech 2012).
Interoperability can help delivering asset integrity

**Why**
Consistent high-quality information about equipment is available

**What**
Engineering information, work management information and control of work systems are aligned to assets in the field

**How**
Tag and equipment data must be managed in systems that **fully interoperate** and synchronize systematically
Interoperability Challenges

- Fragile custom integration
- Expensive information management
- Limited flexibility
- Constraining innovation
- Trapped data
- High switching costs
BP Interoperability Pathway

• The BP Interoperability Program will deliver integrity of asset information across a wide range of operations systems and partners

• Through collaboration with software vendors and other owner operators, drive the adoption of the Open Industrial Interoperability Ecosystem (OIIE) as the industry standard solution architecture

• Drive to production deployment as soon as possible through work in the OGI Pilot environment
Enabling OIIIE Interoperability

**Uses OIIIE to get Supplier Content Loaded to the AIN for use by Upstream Operations**

**Uses OIIIE to Publish Engineering Content to Operator AIN**

**Uses OIIIE to Publish Engineering Content to Operator AIN**

**Uses OIIIE to Publisher Engineering Content to Operator AIN**

**KEY:**
- OIIIE CCOM
- MIMOSA / OIIIE Library

**Using MIMOSA / OIIIE Standards to set-up and populate AIN library**
SAP Asset Intelligence Network Enables Collaboration Connects Design Manufacturers with Operating Companies

<table>
<thead>
<tr>
<th>Manufacturer Apps</th>
<th>Asset Lifecycle</th>
<th>Ticketing / Notifications</th>
<th>Joint Work Scheduling</th>
<th>Benchmarking</th>
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### Projects
- Capex/Opex/Planning/Logistics

### Procurement
- Materials, Services, Suppliers
- Ariba Network

### Content
- consume any information from any source using standardised registry / taxonomy (OIIE)

### Processes
- Decision support, simulation, predictive tools improve efficiency

### Solution Provider Network
- Installation Information
- Risks & Controls
- Maintenance History
- Usage Information
- Failure / Incident Data
- Measurement / Telemetry
- M2M / IoT initiative

### Solution Consumption Network
- Service Bulletin Processing
- Recall Processing
- Design Recommendations
- Reviews

---

**2016**

Manufacturers

Operators
Next Steps

- Sponsor and drive the next phase of the OGI Pilot
- Work closely with Yokogawa, Bentley and SAP to ensure a workable solution out of OGI Pilot
- Develop the architecture for a production deployment
- Implement a “minimum viable product”
... BUT MORE IS REQUIRED
Driving Adoption of Standards

• There are too many overlapping information standards in the Oil and Gas industry, most of which are not broadly adopted.

• The owner/operators have established a group to provide a unified voice of the industry on information standards and to help members adopt standards.

• Group convened under the International Oil and Gas Producers (IOGP) organization.

• The group is the **Information Standards Sub-Committee** (ISSC) and has been operating for 3 years.
ISSC Membership and Process

- BP
- Cepsa EP
- Chevron
- Eni
- Equinor
- Exxon Mobil
- North Oil Company
- PETRONAS
- Schlumberger
- Shell
- Suncor
- Total
- Woodside
ISSC Objectives

1. Help to establish the fundamentals for a low cost digital business model for the O&G industry, by identifying a consistent and current set of operators preferred Information Standards for documents and data in the Upstream space. The initial focus will be on physical asset.

2. Define a portfolio of required information standards to accomplish efficient and effective digitalization and information exchange across the industry.

3. Act as a common voice of Oil and Gas Operators toward information standards development organizations globally, driving cooperation and avoiding duplication of activities.
Backup Slides
**Terminology**

**Digitization** can be defined as creating digital versions of previously analog or physical items. An example would be creating a digital work order that was previously a paper work order. This is really the beginning step for an asset management company.

**Digitalization** on the other hand, is the use of digital technologies to change a business model and provide new ways and opportunities of doing business; For example, utilizing data from the digital work order you produced via digitization to improve.

**Digital transformation** is a more holistic view, in that it not only focuses on digitizing and digitalizing, but also focuses on how to implement these changes throughout an organization. It engages the entire company and the people that make up the data that are part of the company.

*carina.sturm@viziya.com*
To achieve SBII a set of compatible information standards are required operating at many different levels. For this discussion the following key components are considered:

- **Information Object Model** – this underpins all message definitions. It is converted into an XML schema, term store or other data payload definition.
Custom Integration

- Custom development
- Specific data adapters
- Owner/operator responsible for sustainment

Open Interoperability Ecosystem

- Configuration rather than development
- Based on well defined standards
- Suppliers responsible for sustainment
Device Manufacturers

IT Networks

Automation and Control

Enterprise Business Systems

Manufactured Asset

(Make/Model Information, Serial#)

(OEM) Device Manufacturers

EPC Firms

Engineering and Construction

IT Networks

(Monitoring, Diagnostics, Prognostics)

Plant/Facility Operators

Enterprise Business Systems

Automation and Control

IT Networks

OIIE Features

• Multiple Platforms and Networks
• Digital Business Ecosystems
• Supplier-neutral Framework

OIIE Ecosystem
SAP Asset Intelligence Network Enables Collaboration
Connects Design Manufacturers with Operating Companies

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1. **Content**
   - Decide any information from any source using standardized registry / taxonomy (OiIE)
   - Failure Modes
   - Safety Controls
   - Process Controls
   - Measuring Point

2. **Processes**
   - Decision support, simulation, predictive tools improve efficiency
   - Service Bulletins & Revs
   - Recalls
   - Design Improvements
   - Licensing

3. **Projects**
   - Capex/Opex/Planning/Logistics
   - Installation Information
   - Risk & Controls
   - Maintenance History
   - Usage Information
   - Failure / Incident Data
   - Measurement / Telemetry

4. **Procurement**
   - Materials, Services, Suppliers
   - Ariba Network
   - Service Bulletin Processing
   - Recall Processing
   - Design Recommendations
   - Reviews

**Owners**
- Manufacturers
- Operators

**Networks**
- Solution Provider Network
- Solution Consumption Network

**Actions**
- Publish
- Subscribe

**2016**
CCOM model scope and subject areas

Data Manipulation
- Algorithms

State Detection
- Events
- State Regions
- Triggered State Regions

Assessments & Studies
- Assessments
- Engineering Studies

Advisory Generation
- Recommendations
- Ambiguity Sets

Maintenance
- Work Packages
- Requests for Work
- Work Orders

Data Acquisition
- Signal Processing
- Measurements
- Tests & Samples

Resource Management
- Agents
- Materials
- Ordered Lists

Registry
- Functional Locations
- Product Models
- Physical Assets
- Measurement Locations
- Documents

Taxonomy & Types
- Base Types
- Attributes
- Taxonomies
- Value Qualification

Primitive Types
- Primitives
CCOM Simplified conceptual model

- **Agent**: acts as a connector role.
- **Organization**: represents an entity involved in the asset's ownership.
- **Manufacturer**: provides the asset's origin.
- **Site**: the location where the asset is registered.
- **Segment**: the specific area within an organization that the asset is associated with.
- **Asset**: a tangible, instantiated, serialized object. Can represent an entire facility, a functioning platform, or a component piece of equipment.
- **TimestampedEvent**:
  - **AssetOwnerEvent**: tracks changes in ownership of an asset as it is purchased/sold between Organizations and Sites.
  - **AssetModelEvent**: tracks the Models that an asset was associated with throughout its life.
  - **AssetSegmentEvent**: associates a specific asset with the segment in which it is/was installed/removed.
- **LifecycleStatus**: has lifecycle state criticality.
- **Function**: performs the function associated with the asset.
- **Network**: network of connectivity relationships between assets, e.g., flow.
- **Connection**: contains the connectivity relationships between assets, allowing them to be associated in ordered input-output flow chains.
- **TypedEntity**:
  - **Asset**: tangible, instantiated, serialized object. Can be an entire facility, a functioning platform, or a component piece of equipment.
  - **Organization**:
  - **Manufacturer**:
  - **Model**:
  - **Segment**: specific area within an organization associated with the asset.

**Notes**:
- **Asset's ShortName**: user identification tag following the nomenclature of the plant. It is normally an abbreviation or user-defined alpha-numeric code from which the plant derives meaning.
- **Asset's LifecycleState**: tracks installation on and off.
- **Asset's Function**: connects to and from other assets.
- **Asset's ModelChange**: tracks model changes to and from.
- **Asset's OwnershipChange**: tracks purchase from and to organizations.
- **Asset's Sale**: tracks sale to and from organizations.
- **Asset's Manufacturer**: manufactured by and registered to organizations.
- **Asset's Segment**: Associate a specific asset with the segment in which it was installed/removed.
- **Asset's LifecycleState**: tracks installation on and off segments.
- **Asset's ModelChange**: tracks model changes to and from the asset's lifecycle.
- **Asset's OwnershipChange**: tracks purchase from and to organizations.
Clarity on central role of registry in OIIE

- **EPC ENG**
  - EPC Engineering Design

- **EPC CONSTRUCT**
  - EPC Construction & Commissioning Management

- **EPC MATERIAL**
  - EPC Material / Procurement Management

- **OEM MODEL**
  - OEM / Supplier Model Catalog

- **GLOBAL RDL**
  - Global Reference Data Library

- **O/O ENG**
  - Owner/Operator Engineering Design

- **O/O CONSTRUCT**
  - Owner/Operator Construction / Commissioning Management

- **O/O MATERIAL**
  - Owner / Operator Material / Procurement Management

- **O/O MODEL**
  - Owner / Operator Model Catalog

- **ENT RDL**
  - Owner/Operator Reference Data Library

- **EngCM, ECM**
  - Engineering & Enterprise Content Management

- **SDAIR**
  - Structured Digital Interoperability Registry
    - **TRANSFORM**
      - ISO 15926 – MIMOSA
    - **REG-LOCATION**
      - Registry of Functional Locations
    - **REG-ASSET**
      - Registry of Serialized Assets
    - **REG-MATERIAL**
      - Registry of Material Items
    - **REG-MODEL**
      - Registry of Supplier Models
    - **REG-TAXONOMY**
      - Registry of Reference Types and Taxonomies

- **CIR**
  - Common Interoperability Registry
    - Source Object to UUID key mapping

- **ISBM**
  - Information Service Bus Model
  - Service Directory
    - Configuration of available ISBM services

- **MMS**
  - Maintenance Management (CMMS, EAM)

- **MES**
  - Production Forecasting & Scheduling

- **ERP, ERM, PORT**
  - Enterprise Resource Planning, Enterprise Risk Management, & Enterprise KPI/Event Portals

- **ORPM**
  - Operations Risk Management (AHMS, EMS, FRACAS, ISSOW, PSMS, QMS, SHES)

- **OPM**
  - Operations Performance Modelling & Optimization

- **CONTROL**
  - Operational Data Historian (DCS, HMI, PLC, SCADA, and SIS)

- **CMS**
  - Condition Monitoring (Measurements, Events, Inspections, Calibrations, Conditions, Usage and Sensed O&M Actions)

- **I&C Device Monitoring**
  - Performance Monitoring (Sand, Water, Gas, Crude)

- **Corrosion Monitoring**
  - Rotating Machinery Monitoring (Vibration, Electrical, Thermography, Ferrography, LIMS)
Package ISDDs: The Bigger Picture

Standardised ISDD Group for Package

ISDDs for Devices & Equipment
ISDDs and RDLs

Shared Reference Data Library

- Temperature Device (Equipment Type)
- Organisation Metadata (Property Class)
- Sheath and Fitting Data (Property Class)
- Temp. Device Housing (Property Type)
- Temp. Device Housing Values (Picklist)
- Extruder Bolt Housing
- High Pressure Bolt Housing

Equipment Type: Temperature Transmitter

Attribute Set Definition: 20T2201 Device Specifications

Attribute Group Definition: RESPONSIBLE ORGANIZATIONS

Attribute Group Definition: PROTECTIVE SHEATH AND FITTING

Attribute Definition: Housing Type

Attribute Type: Housing Type

Enumeration: Housing Type

Enumeration Items:
- Extruder bolt
- High pressure

- Mappings defined and queried based on MIMOSA CIR specification.
- Supports terminological mappings and resolution within an OII.
- Modified CIR spec to enable ISO 22745 conformance.