IO ARCHITECTURE

Fadhli Wong Mohd Hasan Wong
Head Program Office, Integrated Operations,
Operational Excellence, Petroleum Production & Development
Digital Energy Forum
8-9th October 2013, Kuala Lumpur
Introduction

![Diagram showing the relationship between Change Management, People, Organisation, Technology, and Infrastructure.]
## Integrated Operations Architecture

<table>
<thead>
<tr>
<th>Informed Decisions</th>
<th>Dashboards and Visualizations</th>
<th>Workflows and Integration</th>
<th>Applications</th>
<th>Data Management</th>
<th>Instrumentation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dashboard Tools</td>
<td>Workflow Management</td>
<td>Reservoir Management</td>
<td>Real Time Data (PI Historian)</td>
<td>RTU</td>
</tr>
<tr>
<td></td>
<td>Corporate Portal</td>
<td></td>
<td>Well Management</td>
<td>IO DB</td>
<td>PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Drilling</td>
<td>Operational Data</td>
<td>DCS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production Operations</td>
<td>Allocation System</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Corporate SoR's</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Technical Applications
- Reservoir Management
- Well Management
- Drilling
- Production Operations

### Enterprise Applications
- ECM (SharePoint)
- Drilling
- HSE

### Integration Services

### Analytics

### Workflows and Integration

### Dashboards and Visualizations
- Dashboard Tools
- Corporate Portal

### Informed Decisions

### Data Management
- Real Time Data (PI Historian)
- IO DB
- Operational Data
- Allocation System
- Corporate SoR’s

### Instrumentation
- RTU
- PLC
- DCS

---

**Integrated Operations Architecture**

[Visual representation of the architecture with icons and text boxes related to various components such asdashboards, workflows, integration services, technical applications, enterprise applications, data management, and instrumentation.]

---

**People, Process, Technology, and Change Management**
### Instrumentations & Prerequisites

<table>
<thead>
<tr>
<th>Survey Activities</th>
<th>Current Water &amp; Gas Inj. Surveillance Program</th>
<th>New WAG EOR Surveillance Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Testing</td>
<td>Testing / IO Tools</td>
</tr>
<tr>
<td>Injection Pump Performance Monitoring</td>
<td>Condition Based Monitoring (CBM)</td>
<td>Condition &amp; Performance Based Monitoring (CPBM) System for injection pump &amp; gas compressor</td>
</tr>
<tr>
<td>Injection P&amp;T, Flow Rates Recording</td>
<td>P&amp;T Transmitters &amp; Flow Meters</td>
<td>P&amp;T &amp; Flow Transmitters (connected to DCS at all WAG injectors)</td>
</tr>
<tr>
<td>Tubing Integrity Assessment &amp; Monitoring</td>
<td>Caliper Survey</td>
<td>Caliper Survey</td>
</tr>
<tr>
<td>Pressure &amp; Temperature Recording (at producers)</td>
<td>Nil</td>
<td>Permanent Downhole Gauge (PDG) &amp; Distributed Temperature Sensor (DTS)</td>
</tr>
<tr>
<td>P&amp;T Recording (at producers)</td>
<td>P&amp;T Gauges</td>
<td>P&amp;T transmitters (connected to DCS at all producers)</td>
</tr>
<tr>
<td>Gas lift injection pressure, rate, casing head pressure recording</td>
<td>Pressure &amp; Flow Reading at compressor &amp; gas lift headers</td>
<td>P&amp;T &amp; Flow Transmitters (connected to DCS at all gas lift headers &amp; producers)</td>
</tr>
<tr>
<td>Sand detection and monitoring</td>
<td>Nil</td>
<td>Sand Monitoring Device (at test header or MPFM inlet)</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td>Offline Routine Survey &amp; Analysis</td>
<td>Real Time Monitoring</td>
</tr>
<tr>
<td></td>
<td>Monthly</td>
<td>Real Time</td>
</tr>
<tr>
<td></td>
<td>As Required                    (Active injectors &amp; producers, priority should be given to injectors completed with normal carbon steel; low alloy &amp; producers with High Risk Sand Production, High Water Cut or H2S or CO2 present in the gas phase)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nil                           (For key wells only)</td>
<td>Real Time</td>
</tr>
<tr>
<td></td>
<td>Annually for the First 2 Years</td>
<td>Annually for the First 2 Years</td>
</tr>
<tr>
<td></td>
<td>(50% of the total active producers in each reservoir)</td>
<td>(40% of the total active producers in each reservoir)</td>
</tr>
<tr>
<td></td>
<td>Quarterly (For subsequent survey; 25% of active producers in each reservoir)</td>
<td>Quarterly (For subsequent survey; 15% of active producers in each reservoir; priority should be given to key wells)</td>
</tr>
</tbody>
</table>

---

**Translation of requirements:**

- **Business/Operations**
- **EOR Strategy**
- **Terminals**
- **RMP**
- **Monitoring & Surveillance Program**
The requirements for the instrumentation come mainly from the RMP, Monitoring & Surveillance Guidelines.
Data Management

Manages the data interaction between applications and layers, establish a single point of truth, foster the re-use of data which avoids redundancy and duplication.
Applications

Tools to facilitate the current day-to-day routine in managing organisation’s resources
**Workflows & Integration**

A workflow is a sequence of connected steps, where each step follows the precedent without delay and ends before the subsequent step may begin. For IO, its technical workflows include into this sequence the interaction of users and petro-technical applications to produce results with consistent quality.

**Business Process**

A business process is a collection of structured activities or tasks that produce a specific service or goal for the user.
Collaborative Work Environment & Visualisation

There are different types of collaboration, for different IO solutions and for different asset needs.

Represent the analysed data into a meaningful information.
THANK YOU
Acknowledgement

1. Deployment Team, EOR, EPTD, PCSB
2. Mark Anthony Macaranas, Khairul Mustaqim Abd Aziz, Surendran Kandasamy, Dulang IO Team, EOR, EPTD, PCSB
3. IO Department, OE, PCSB
THANK YOU