A Technology Standards Approach to Risk Avoidance

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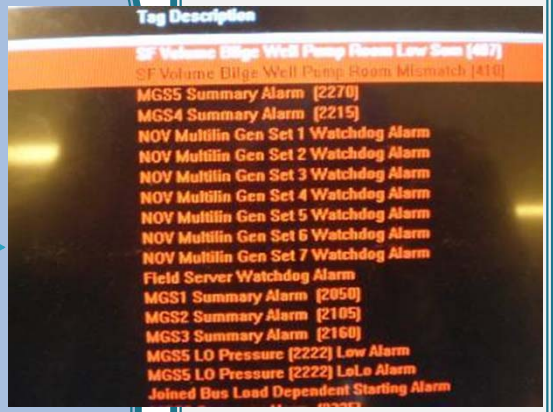
What Are Systems?



Sensors → RTDS → Multilin Controller → PLC Controller → Remote Panel/PC → Bridge Panel/PC

Cables and Terminations

Stewart & Stevenson

GE

Siemens

L-3

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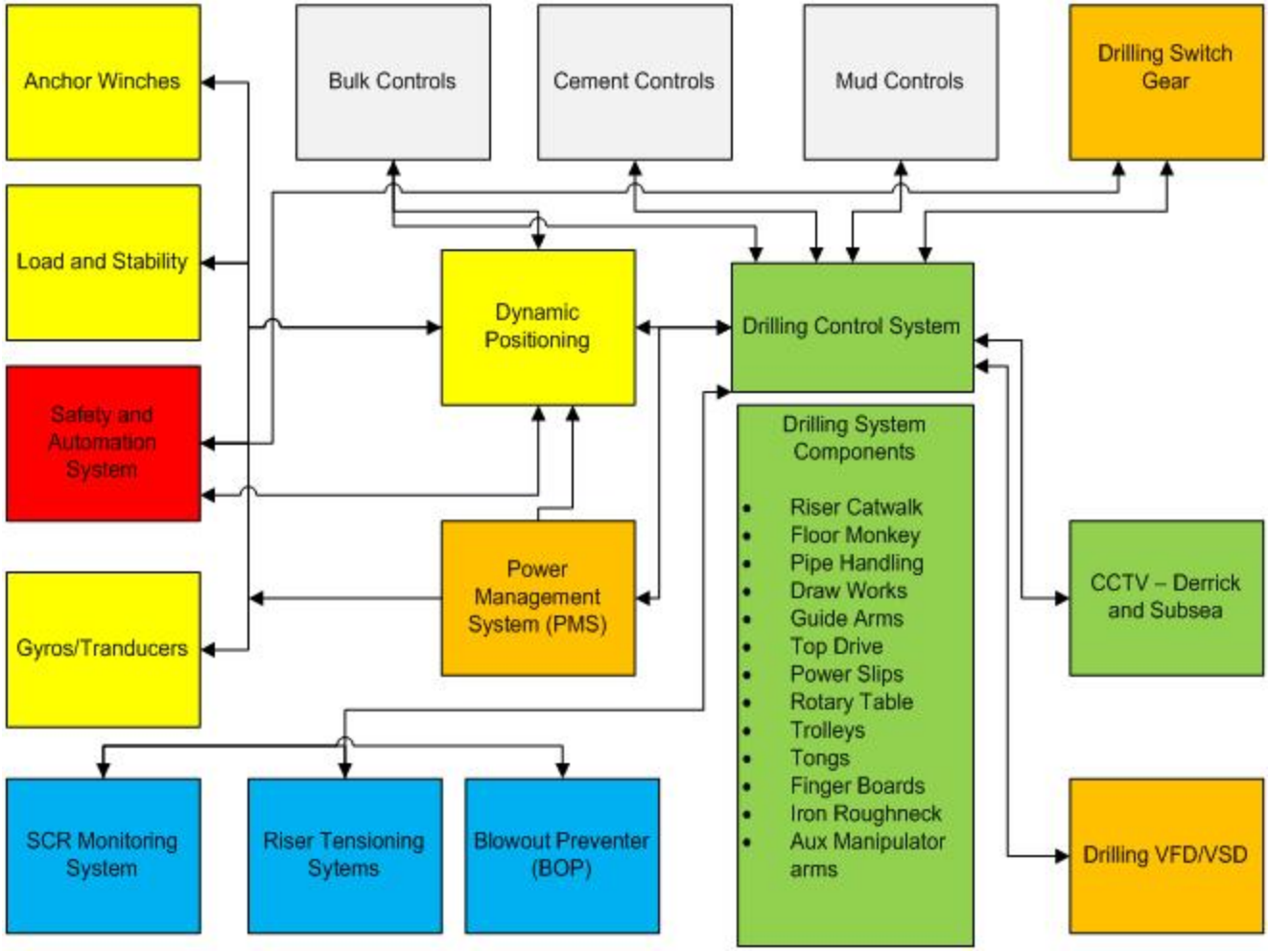
Holistic View of Rig Systems



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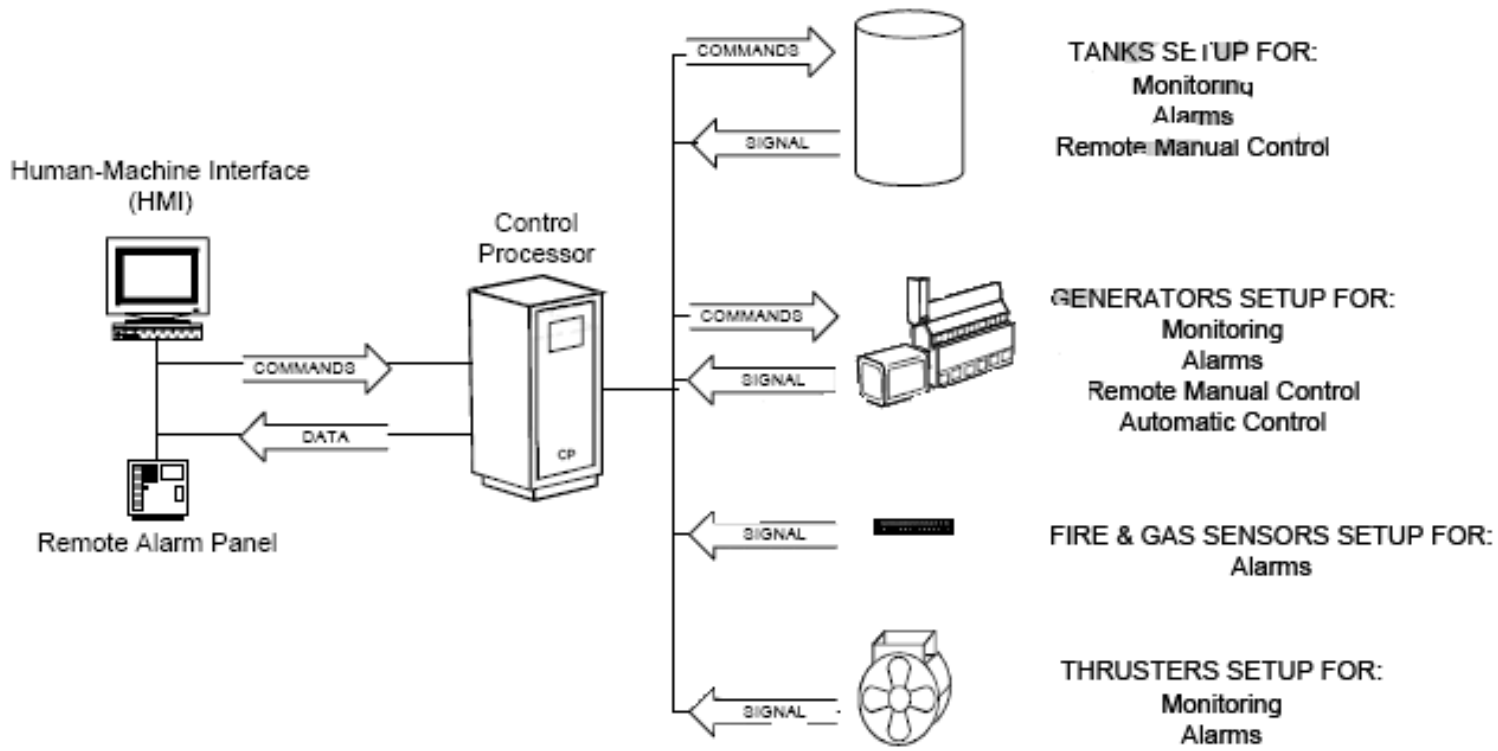
Data Flow Between Integrations



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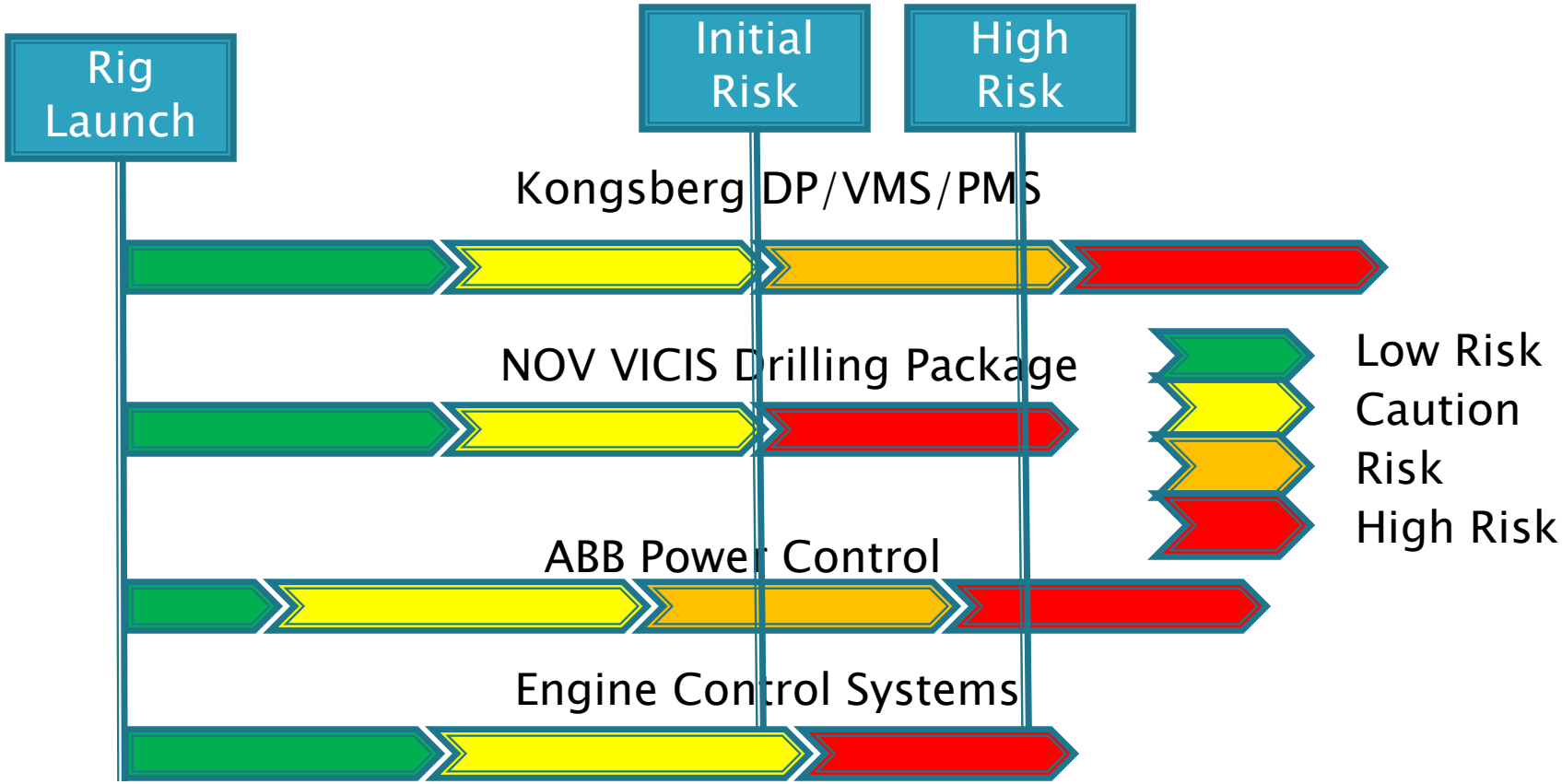
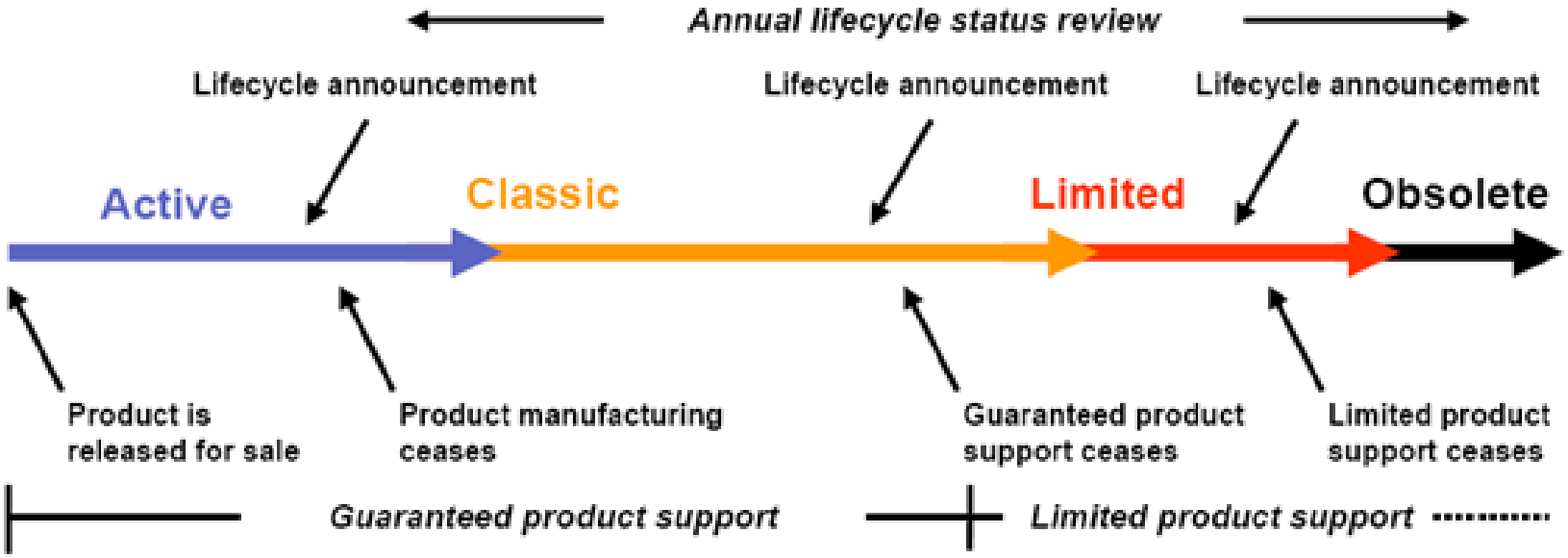
Example of Systems Lifecycle Alignment for RISK Analysis



The above is an example of a rig with vendor software that has dependencies on other vendor versions and products to operate. When a vendor de-supports a product, risk can be beyond the specific vendor product or it can have integrations that depend on a specific technology such as DDE dependant on the operating systems. In the above scenario, we would make recommendations to the client regarding upgrades and half life planning as appropriate.

Vendor Considerations

- Example of a systems lifecycle, the opportunity here is to align all systems that integrate to highlight risk considerations.



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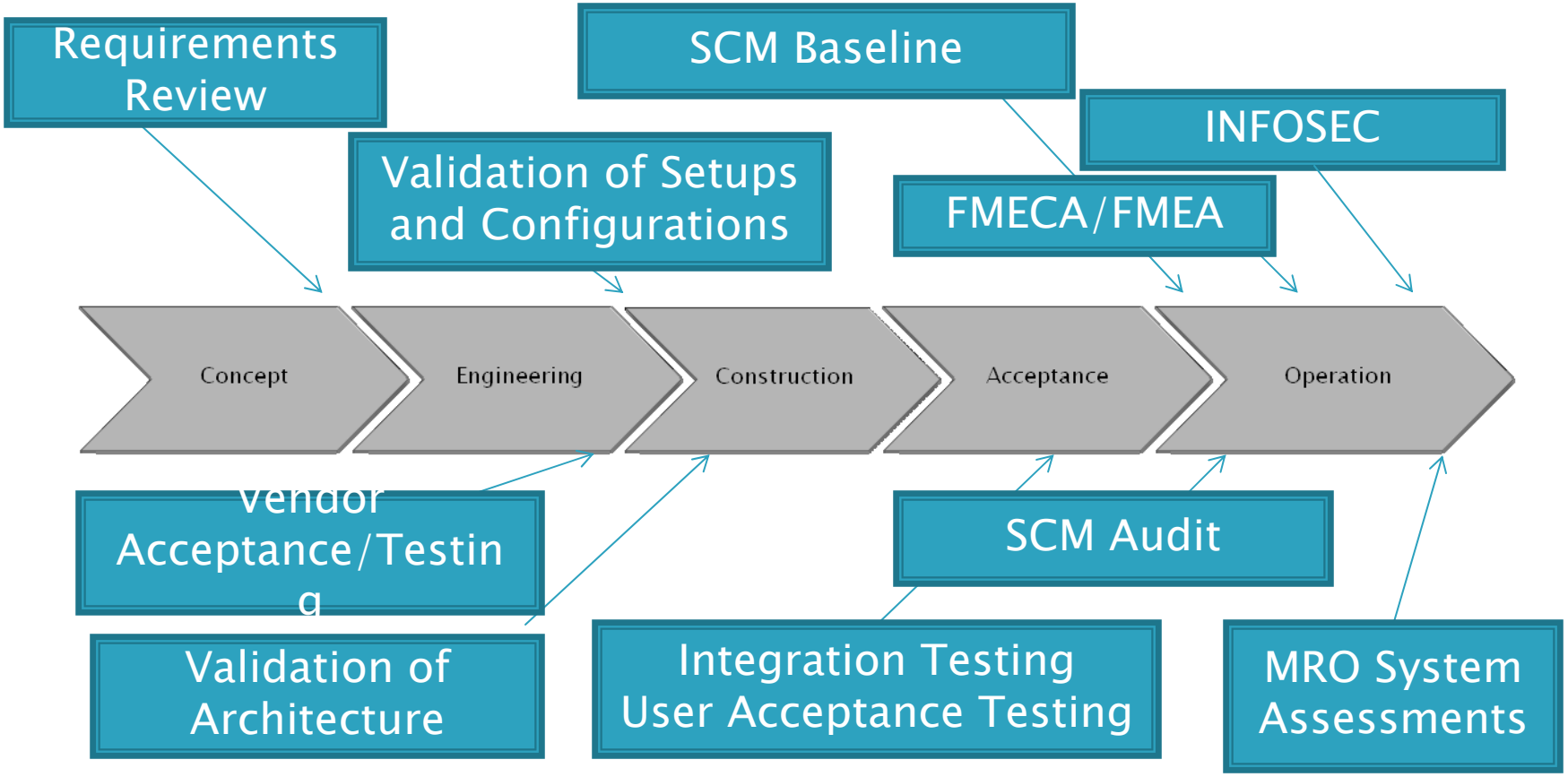
Rig Systems Lifecycle Checkpoints



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Some Relevant ISO Related Activities

ISO TC 67
Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries

ISO 14224

Petroleum, petrochemical and natural gas industries -- Collection and exchange of reliability and maintenance data for equipment

ISO TC 108
Mechanical vibration and shock

SC5
Condition monitoring and diagnostics of machines

ISO 13374

MIMOSA OSA-CBM

WG6

Formats and methods for communicating, presenting and displaying relevant information and data

ISO TC 184
Industrial automation systems and integration

SC4
Industrial Data

15926- Data for Process Industries

10303-Product data representation and exchange

STEP/PLCS

OASIS

Collaborating on the deployment of an international standard for product data exchange (ISO 10303)

SC5
Architecture, communications and integration frameworks

ISO 18435

MIMOSA OSA-EAI

WG7

Diagnostic and maintenance applications integration

Requirements Review

The objective of this phase is to define the scope of the project, the needs and constraints it should fulfill, and to establish the preliminary design of the system. It should identify the main ISDS (Integrated Software Dependent System) Elements which will be assembled in the system. This is also a setup phase, where project organization should be defined, as well as the planning of the development. At the beginning of this phase the Confidence Level shall be defined

Less unplanned issues at startup and delays

- Insight into long term stability and supportability based on software engineering standards
- Confirmation of systems compliance mandates and philosophy, for instance alarms, interlocks etc.
- Failure modes identified in systems design
- Confirms systems lifecycle

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Engineering Phase

During In this phase, the detailed design of the system is established, and suppliers are involved to setup the development of each subcontracted ISDS Element of the system. Contracts are established with suppliers and detailed design of each ISDS Element is performed.

- Time to establish a chain of information relative to system versions, software controls, documentation of systems, testing results, integration etc.
- Meeting with system developers, and observing their internal quality process, we can establish expectation for future reliability issues, make recommendations to mitigate risk and make constructive recommendations to help establish a better delivered product.

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Construction Phase

- During the construction and installation phase, the systems team will be able to confirm:
  - Wire and cable installation to standards – using cable verification and test tools all or select links can be tested.
  - Capture initial setups and software versions
  - Note any inconsistencies between design and as delivered configurations
  - Note any risk to system operating as designed

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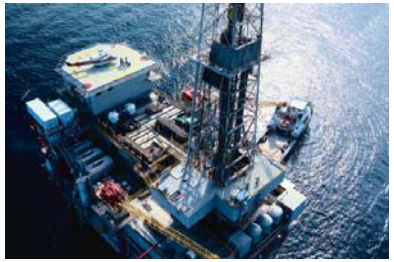
Acceptance



- Technical teams typically provide the following "value add" during the acceptance phase:
  - Testing validation and witness
  - Confirmation of final alarm mapping to cause
  - Software configuration and documentation of final versions
  - Review of NVM backup of critical PLC code
  - FMECA and focused testing review of safety related systems
  - Review of version changes that could impact testing objectives

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Operations

- Continued refinement of process as well as risk management are the core objectives
  - SCM – Software configuration management, audit of prior SCM engagements for governance of practice
  - INFOSEC audit and assessment
  - FMEA/incident investigation – on going
  - Systems lifecycle planning– Evaluating risk relative to systems lifecycles and assessing optimum time for upgrade activities
  - ISM compliance of safety systems

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Examples of Mitigated Risks

Problem	TAC Resolution
During rig acceptance from the shipyard, initial configurations of systems were expedited to meet aggressive date commitments. The systems were configured to base line settings and values without coordination with other integrated systems vendors. During sea trials, it was observed that thruster power was limited and operation was unstable. It was resolved that the power control systems were never properly configured and restricted performance of thrusters	Acceptance test planning, vendor management of configurations. SCM.
During rig acceptance, a number of transient anomalies in the drilling systems was impeding success. Rig and Vendor specialists were involved for several days troubleshooting issues.	A recommendation of cable verification and certification uncovered several bad fiber terminations, crimped strands and incorrect wire-maps on copper RJ45 terminations.
A operator with several sister rigs engaged a vendor to make minor changes on one of the rigs drilling systems, the vendor assumed that the rig baseline configuration was the same as a sister ship and proceeded to attempt consolidating changes to this rig as well. When the vendor completed his activity, the rig floor began experiencing anomalies of unknown source. The vendor realized he had over written the configurations of prior vendor changes and lost the baseline reference version. A recovery was finally done by re-programming all the changes again manually and retesting. The rig was out of operation for several hours and risked several more days of down time if the baseline could not be recovered.	A recommendation to establish formality of SCM – software change management was done. Procedures and processes for software change were developed for the rig operation and vendors were included in the initiative to insure compliance

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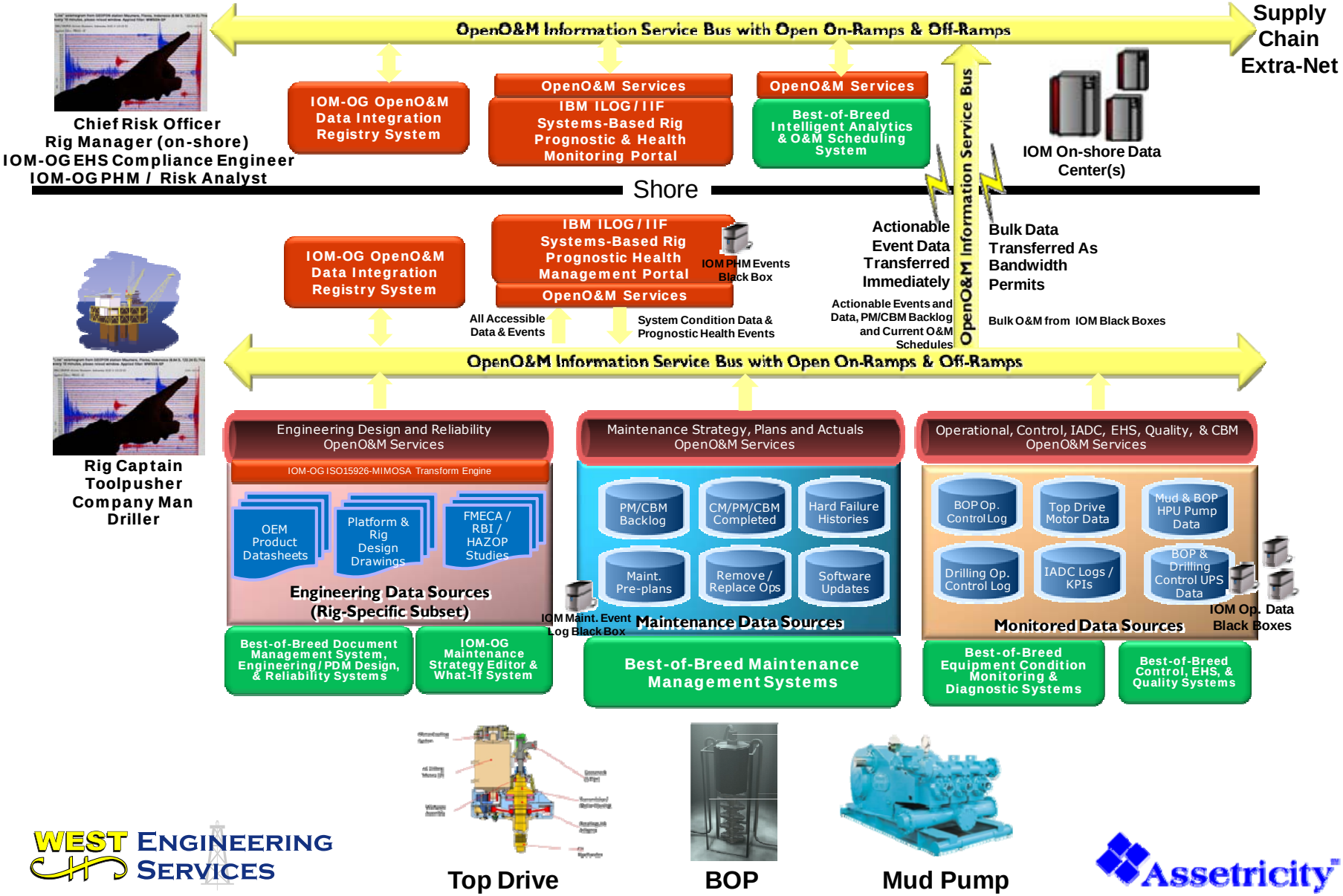
IOM-OG™ Integrated Operations and Maintenance for Oil and Gas

Comprehensive Systems-Based Rig Data Monitoring Architecture



Top Drive

BOP

Mud Pump

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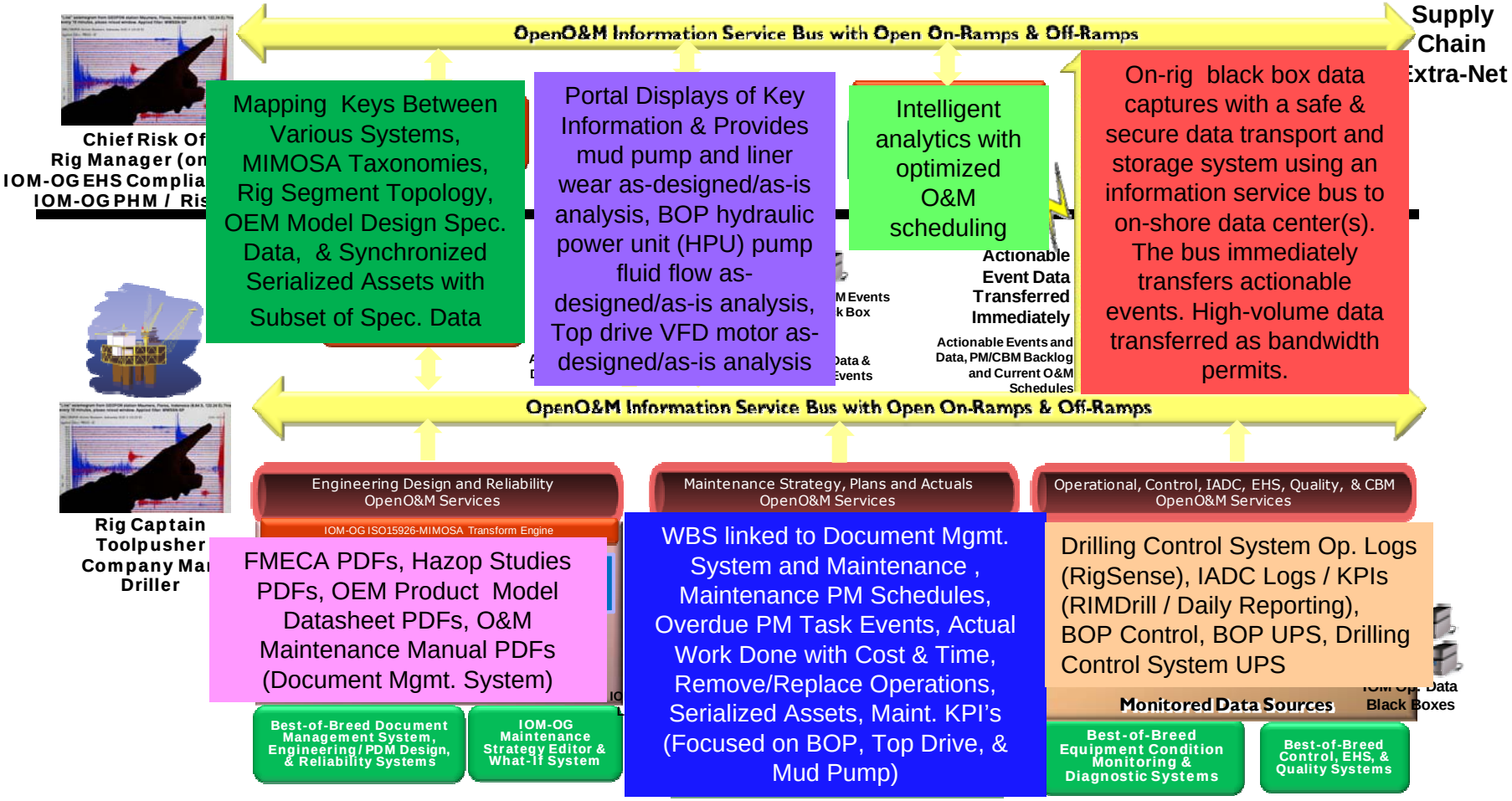
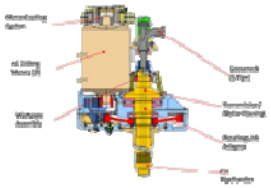
Assetricity™

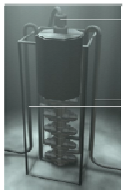
IOM-OG™ Integrated Operations and Maintenance for Oil and Gas

Comprehensive Systems-Based Rig Data Monitoring Architecture





Top Drive



BOP

Mud Pump

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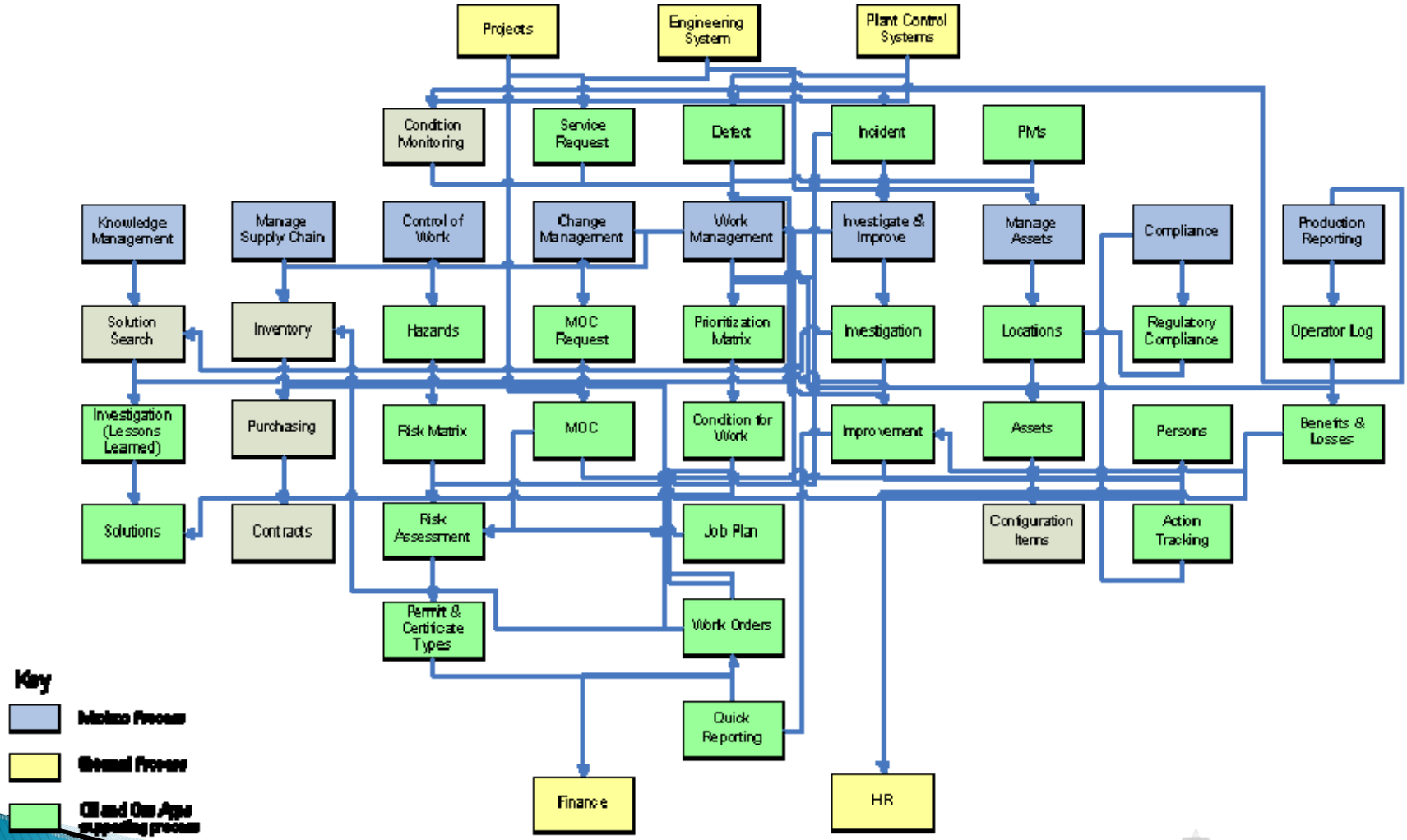
Integrated Maintenance



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Domains of SCM

PLC / PC

- Siemens
- Rockwell
- Schneider (Concept, Unity*)
- 3S CoDeSys
- TwinCAT, Bosch CPS 21
- NC, CNC, DNC (840D…)
- Screw plc etc.

DCS / SCADA / HMI / ROBOTS

- PCS7, WinCC etc.
- WinCCflex & ProTool
- InTouch, iFix
- Citect
- Robots: KUKA, ABB, FANUC, Motoman etc.

FIELD DEVICES AND DRIVES

- Indramat
- SEW
- Lenze
- Leutze
- Datalogic

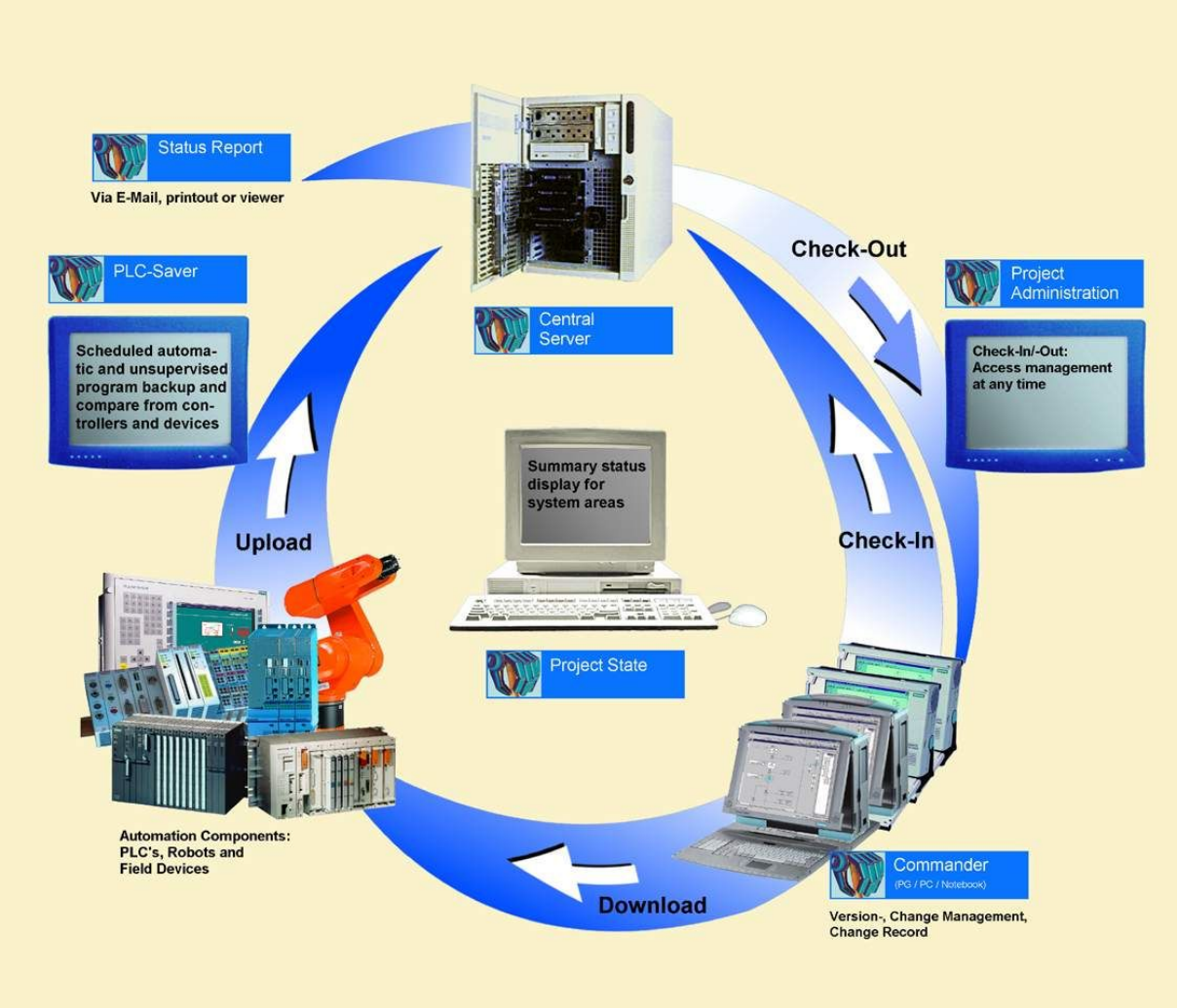
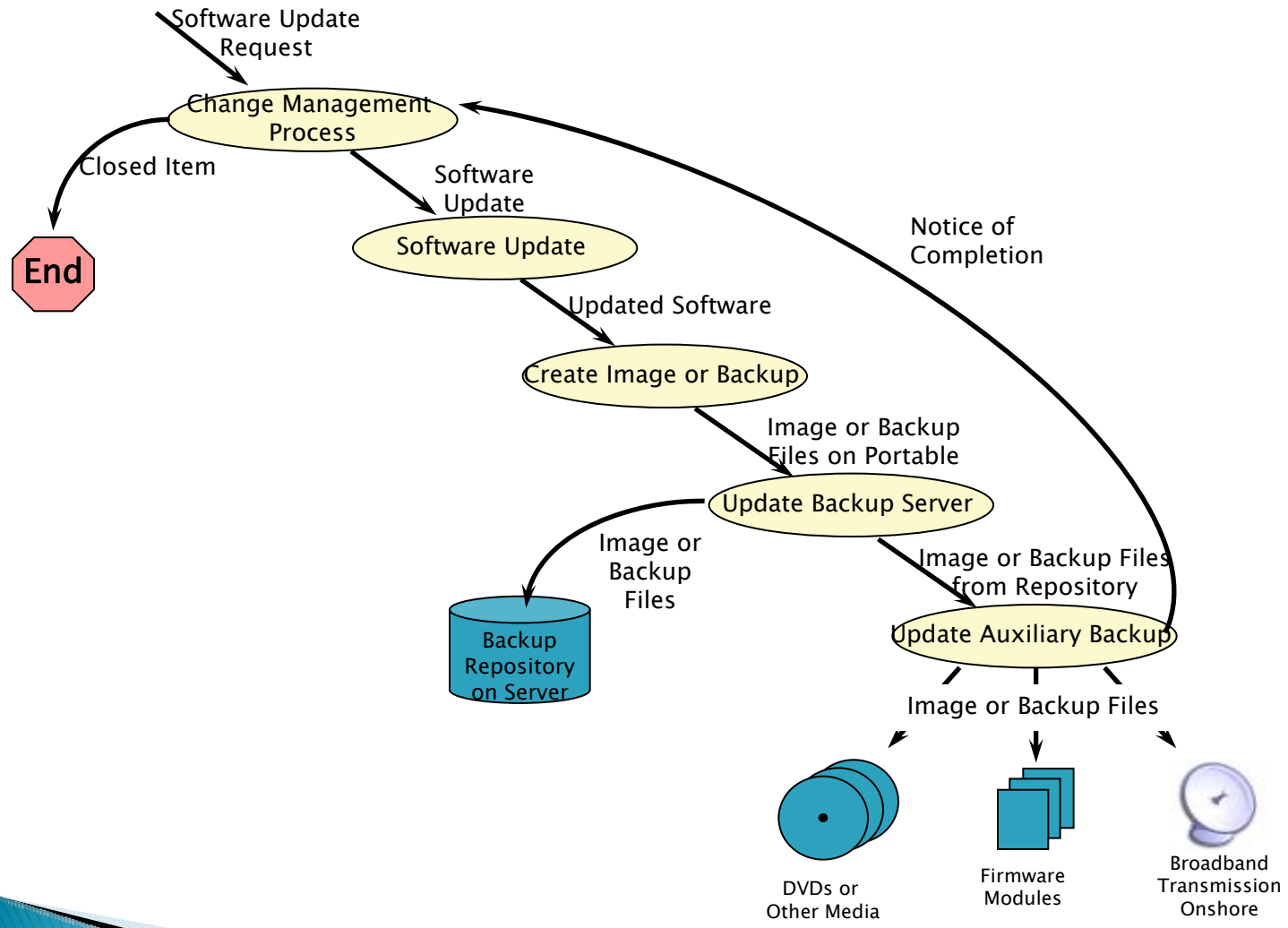
etc.

FILES / DOCUMENTS

- .bin, .xls,
- .exe, .ppt,
- .txt, .mdb,
- .doc
- E-CAD
- Images (Ghost etc)

etc.

SCM Activity flow



Proposed Backup Process High Level