Unification of Process Data – the Chevron SJV Story

Presented by **Neel Chakraborty**

Chevron

- One of the largest energy companies
- Global spread, 135 years of operation
- Upstream, downstream, natural gas, manufacturing, pipelines, lubricants, chemicals, power, technology, etc.

Chevron North America Exploration & Production

- Headquarters: Houston
- Conventional (oil, gas), unconventional (shale, oil sands, coal-bed methane)

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Chevron's San Joaquin Valley Business Unit

San Joaquin Valley BU
7 "Key" Fields

▲ Headquarters: Bakersfield, CA

▲ Crude, natural gas, electricity, steam

▲ Largest in CA net daily oil equivalent

▲ 86% thick, heavy crude

▲ Mature fields

 ▲ Note: Chevron has a non-working interest in Elk Hills. Elk Hills is operated by California Resources Corporation.
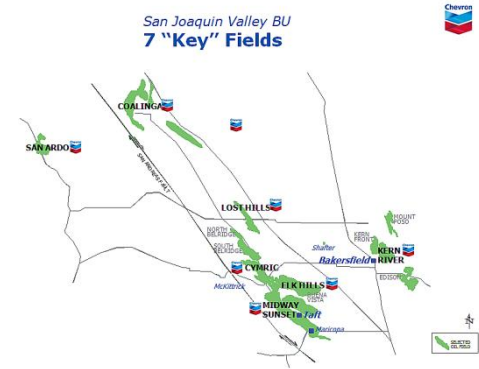
Business Challenge

- ▲ Multiple process data historization methods
  - ▲ From Excel/Access to branded historians
  - ▲ DCS/SCADA vendor-provided historian
  - ▲ Lack of central monitoring, global collaboration
- ▲ 2009: Upstream Foundation template to use PI System for process data unification

"...to provide a **common data architecture** for **process control data** utilizing an aggregate process historian **throughout upstream business units**. The PI Server platform from OSIsoft has been selected..." (UF Template quote)

Objectives of today's presentation

▲ To take you through the journey that SJV undertook

▲ Some challenges that we encountered

    ▲ Some, nothing to do with PI System as such

▲ Some of the mitigation paths

▲ Some opportunities

▲ Hope is that

    ▲ PI System veterans might chuckle

    ▲ Rookies might find some parts enlightening

Unification of Process Data – the big picture

Can we?
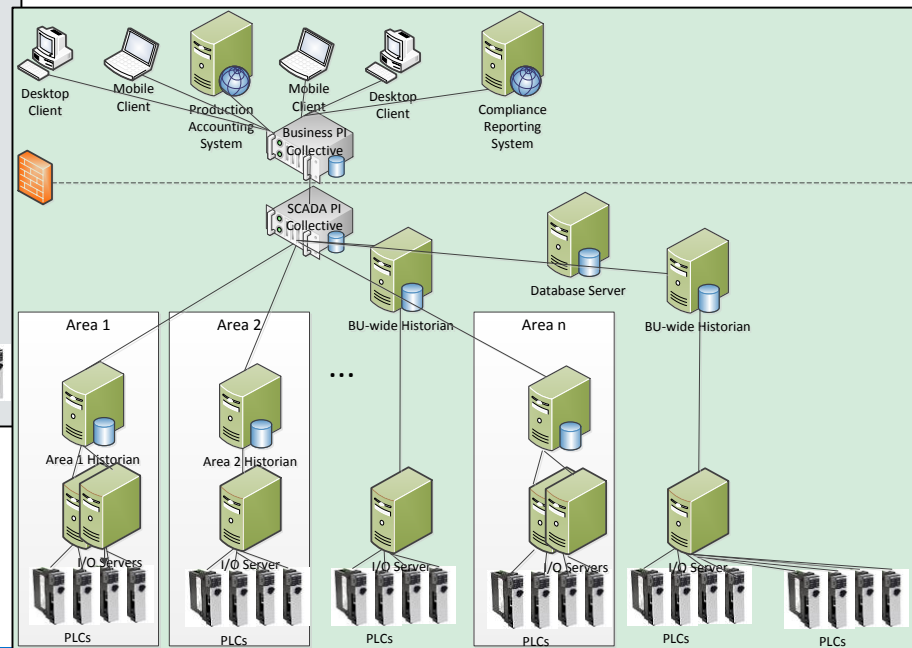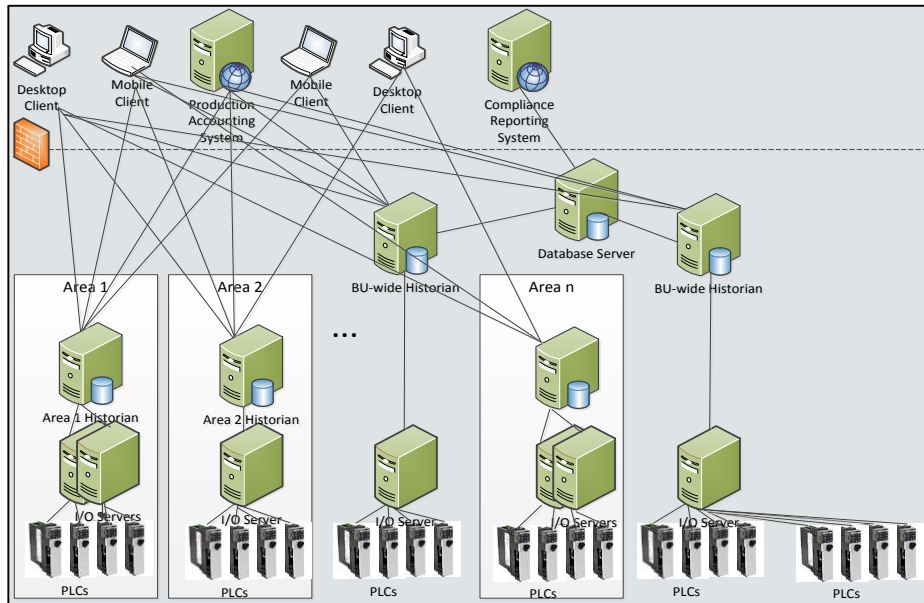
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Implementation Details - Successes

- Tagname convention
  - Early realization
    - Tagname discipline critical
    - Now was the opportunity
  - AF was still early in SJV learning
- Information Objective Analysis (IOA)
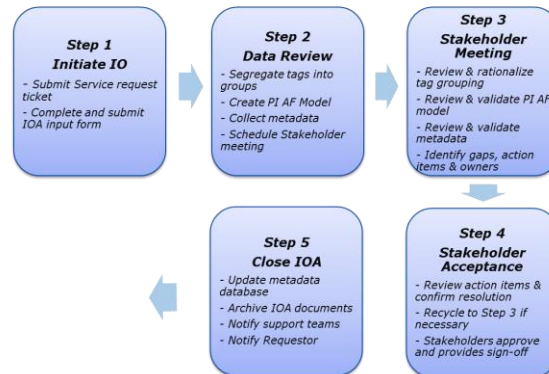 - Process for
    - Rationalization
    - End-to-end mapping of tags

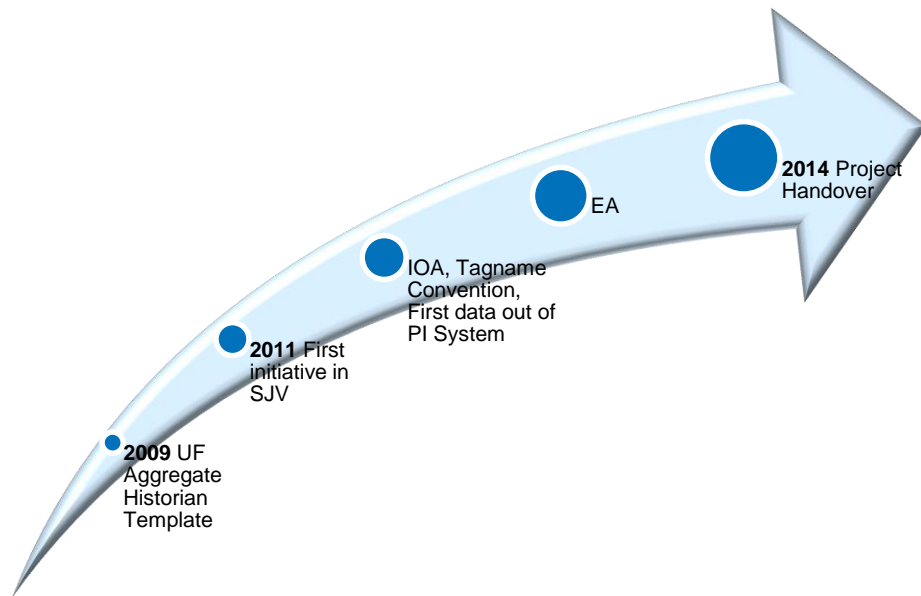BBB.AAA.FFF[FFFF].PP.S[SSS-].E[EEE-].F[FFF-].L[LLL-].M[MMM-].X[XXX-].D[DDD-]

SJV.MCK.31X.OC.Settling.T101.DiffLvl.PV

- ✓ SJV = San Joaquin Valley
- ✓ MCK = McKittrick
- ✓ 31X = 31X Lease
- ✓ OC = Oil Cleaning Plant
- ✓ Settling = Settling Area
- ✓ T101 = Tank #101
- ✓ DiffLvl = Differential Level
- ✓ PV = process value

Step 1 Initiate IO
- Submit Service request ticket
- Complete and submit IOA input form

Step 2 Data Review
- Segregate tags into groups
- Create PI AF Model
- Collect metadata
- Schedule Stakeholder meeting

Step 3 Stakeholder Meeting
- Review & rationalize tag grouping
- Review & validate PI AF model
- Review & validate metadata
- Identify gaps, action items & owners

Step 4 Stakeholder Acceptance
- Review action items & confirm resolution
- Recycle to Step 3 if necessary
- Stakeholders approve and provides sign-off

Step 5 Close IOA
- Update metadata database
- Archive IOA documents
- Notify support teams
- Notify Requestor

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OSIsoft.

Implementation Timelines

2009 UF Aggregate Historian Template

2011 First initiative in SJV

IOA, Tagname Convention, First data out of PI System

EA

2014 Project Handover
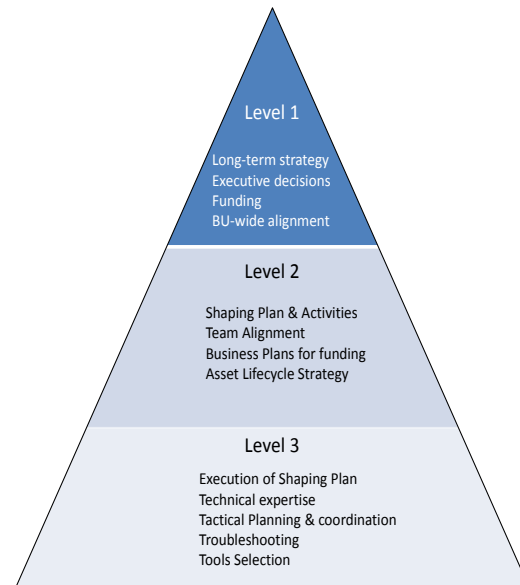
- ▲ Major Milestones
  - ▲ 2009: UF Template
  - ▲ 2011: First initiative
    - ▲ IOA
    - ▲ Tagname Convention
    - ▲ First data to Biz system
    - ▲ EA
  - ▲ 2011-14: Additional tags / systems
  - ▲ 2014: Project handover

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Challenges - Organizational

- 4 groups involved – primary handling
  - Automation, SCADA & Power (ASPT)
  - Operations Support organization (OSO)
  - Information technology (IT)
  - Upstream Workflow Transformation (UWT)
- Multiple user groups
- Different priorities
- Mitigation: Create a 3-tier governance model involving all 4 groups

Level 1
Long-term strategy
Executive decisions
Funding
BU-wide alignment

Level 2
Shaping Plan & Activities
Team Alignment
Business Plans for funding
Asset Lifecycle Strategy

Level 3
Execution of Shaping Plan
Technical expertise
Tactical Planning & coordination
Troubleshooting
Tools Selection
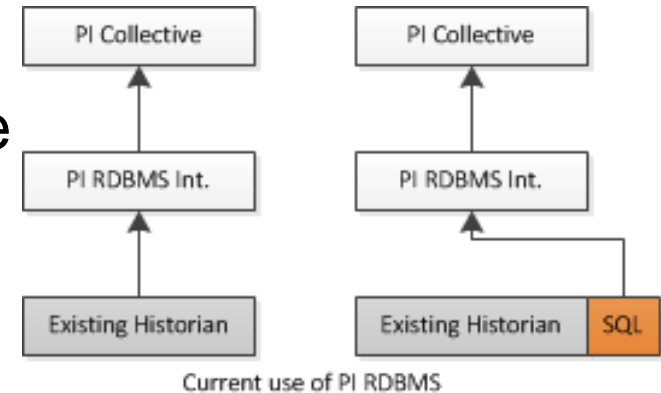
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Challenges – Organizational Capability

▲ Implementation & support of PI System by contractors

  ▲ PI System technical know-how in SJV: high-level only

▲ Mitigation: Leverage EA to train additional SJV personnel

Challenges – Technical – data interfaces

- ▲ Data from existing historian to PI System
- ▲ Options
    - ▲ Native interface → early development
    - ▲ OPC DA/HDA → additional layer, uncertainty
    - ▲ PI RDBMS → latency
- ▲ Mitigation: Introduce an intermediate SQL server

Current use of PI RDBMS

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Challenges – Technical – event data

▲ How to handle non-time series event data?

    ▲ Automated Well Tests, Cyclic Steaming

    ▲ Previously handled through PLC storage arrays, HMI scanning scripts and SQL databases

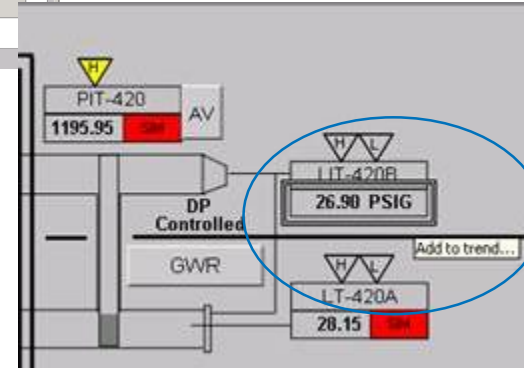▲ Mitigation: use of Event Frames

Challenges – Technical – A&E database

▲ Existing historian has separate alarm & events database

▲ PI System meant for time-series only → how to handle A&E?

▲ Mitigation: ??
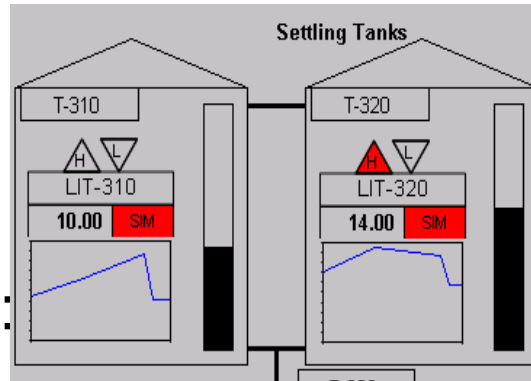
Challenges – Technical – HMI interface

▲ HMI trends
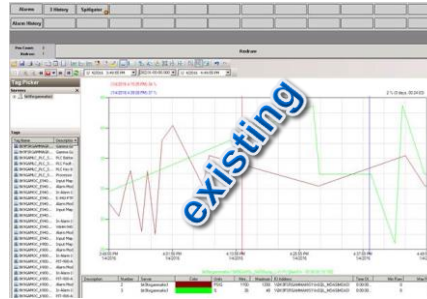
▲ Right-click add-to-trend functionality

▲ Tail charts
  ▲ Mitigation: Spark Lines??

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Challenges – Technical – others

- ▲ Alarm Notification System
  - ▲ Cellphones, smartphones, email
  - ▲ Built on current historian, using SQL services
  - ▲ Mitigation: PI Server's Notifications
- ▲ Historization of HMI engine parameters / diagnostics
  - ▲ Currently native interface
  - ▲ Mitigation: PI Interface for OPC to HMI

Looking Forward

- ▲ Process Control Network separation using PI Server
  - ▲ PI Server as data conduit between PCN & BWAN
- ▲ ArcGIS / PI System-based well control
  - ▲ Replace existing well control system
- ▲ Event prediction / condition-based maintenance
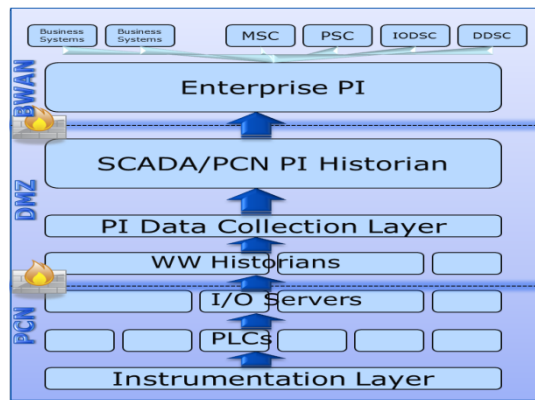 - ▲ Predictive Analytics
  - ▲ Future Data

Summary Slide – *See slide notes* for examples & instructions

COMPANY and GOAL

Chevron is one of the world's largest energy producer, in the business for over 135 years. SJVBU produces crude, natural gas, electricity, steam

CHALLENGE

Disparate information systems prevented global monitoring and collaboration

- Multiple process historians
- Information silos
- Unreliable data

SOLUTION

By prescribing the PI Server platform as the uniform repository of process data

- Tagname standards
- Data cleansing
- End-to-end mapping of data (IOA)

RESULTS

Worked through several organizational and technical challenges

- Starting to yield positive results
- Working at it for >5 yrs
- Looking forward to major plans

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Questions

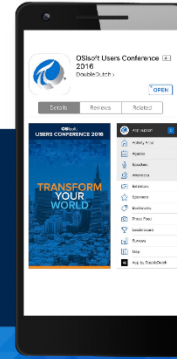Please wait for the **microphone** before asking your questions

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谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado