skkmigas

JOG 4.0

IAFMI
IKATAN AHLI FASILITAS PRODUKSI
MINYAK DAN GAS BUMI INDONESIA

FFPM 2023
FORUM FASILITAS PRODUKSI MIGAS

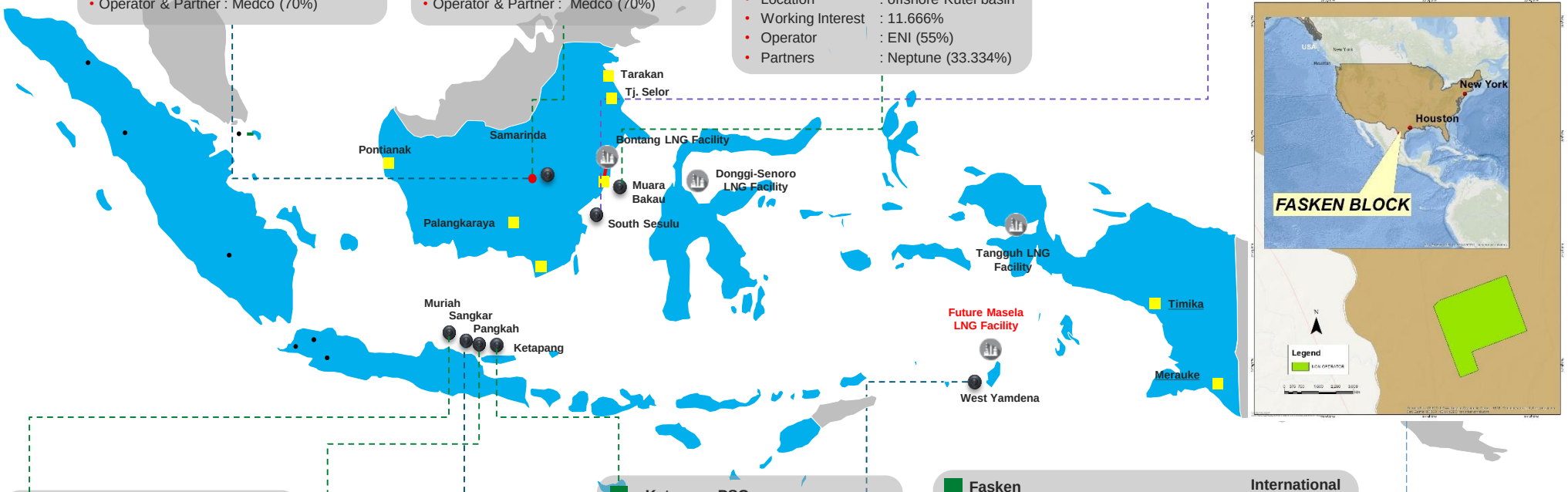
29-31 AGUSTUS 2023
YOGYAKARTA

DIGITAL TWIN INITIATIVE IN WEST PANGKAH FIELD, PANGKAH PSC

Yudi Syahnur

SAKA Energi Indonesia in Brief

PT Saka Energi Indonesia (PGN Saka) was established on 27 June 2011, as a wholly owned *Upstream Oil and Gas Subsidiary* of **PT Pertamina Gas Negara Tbk (PGN)**



West Bangkanai PSC
- Location : onshore Kutei basin
- Working Interest : 30%
- Operator & Partner : Medco (70%)

Bangkanai PSC
- Location : onshore Kutei basin
- Working Interest : 30%
- Operator & Partner : Medco (70%)

Muara Bakau PSC
- Location : offshore Kutei basin
- Working Interest : 11.666%
- Operator : ENI (55%)
- Partners : Neptune (33.334%)

South Sesulu PSC
- Location : offshore Kutei basin
- Working Interest : 100%
- Operator : PGN Saka

Muriah PSC
- Location : offshore Java sea
- Working Interest : 100%
- Operator & Partner : PGN Saka

Pangkah PSC
- Location : offshore Java sea
- Working Interest : 100%
- Operator : PGN Saka

Ketapang PSC
- Location : offshore East Java
- Working Interest : 20%
- Operator & Partner : Petronas (80%)

Fasken — **International**
- Location : Webb County, Texas, United States
- Working Interest : 36%
- Operator & Partner : Silverbow (Previously Swift Energy) (64%)

Sangkar
- Location : offshore Java sea
- Working Interest : 100%
- Operator : PGN Saka

West Yamdena
- Location : offshore Maluku
- Working Interest : 100%
- Operator : PGN Saka

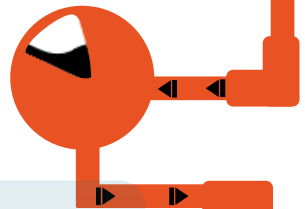
Production Exploration

BLOCKS*
6 operated
5 non-operated

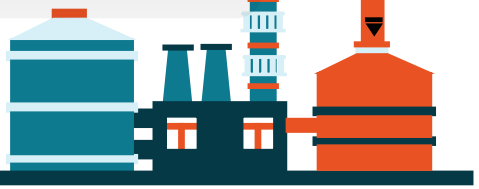
WELLS**
22 exploration
91 production

PLATFORMS**
2 manned
3 unmanned

PIPELINES**
263.66 kilometers



PRODUCTION*
32,000 – 35,000 BOEPD



* All asset ** Operated asset

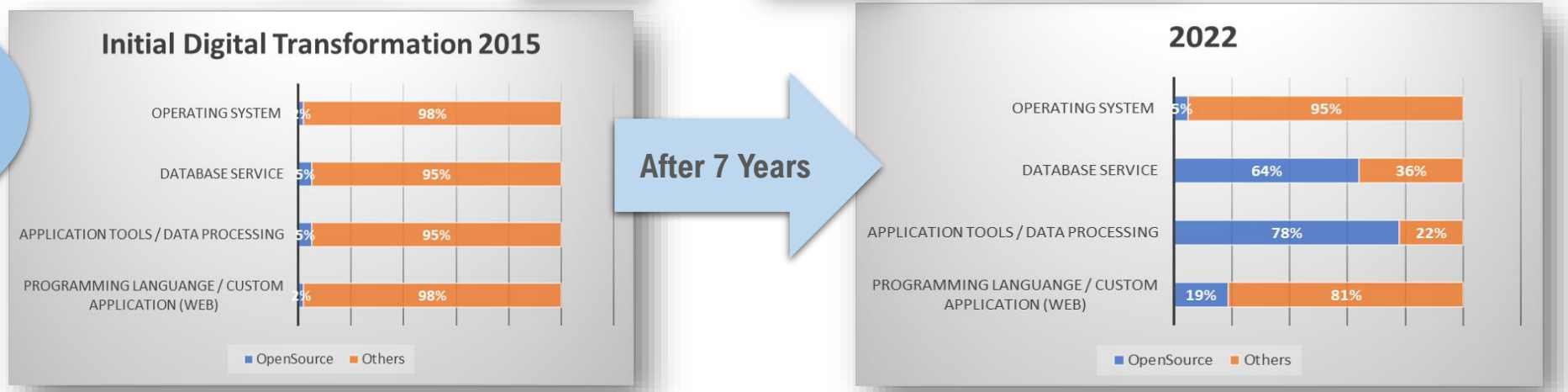
Presentation Outline

- INTRODUCTION
- ***DIGITALIZATION JURNEY IN PGN SAKA***
- WEST PANGKAH DIGITAL TWIN
- CONCLUSION/WAY FORWARD
- DISCUSSION

SAKA Digitalization Milestone

More than 100 digital initiatives / apps were made In last 9 Years

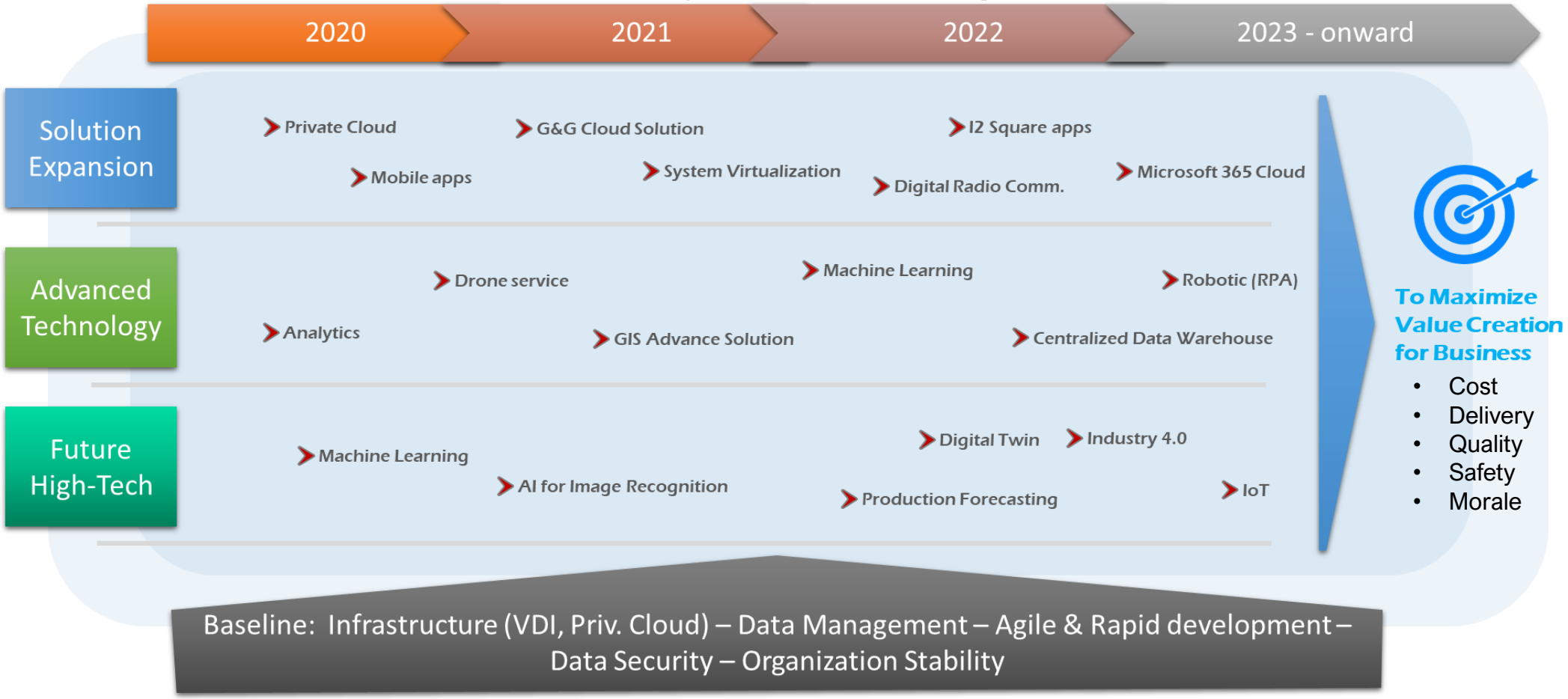
Open Source and **Open Standard** as platform, increasing with rapid growth of apps-based Business Process



Digitalization: The Mission

- Adopting emerging Technology trend (Drone, Face recognition, Mobile apps, Real-time monitoring, Cloud, Analytic, Machine Learning, AI, Robotic) based on Open Standard & Open Source.
- Accelerating the Digitalization of business processes through internal/external collaboration
- Focus on Solution to generate value creation.

pgn SAKA power to discover Digitalization Roadmap



Sistem Operasi Terpadu (SOT)

2015

Background overview

- SKK MIGAS, with PTK 054/SKKMA0000/**2018**/S0 mandated 'Sistem Operasi Terpadu'
- Requirement to report all production data from KKKS to SKK MIGAS, from subsurface facility and production, followed by Finance, Drilling, etc.
- Transform data reporting method, from manual into *digitalization* and *automation*
- Adopting oil and gas data exchange standards (e.g., **XBRL**, **ProdML**, **WITSML**, **XML**,. etc)

Value creation

- Inhouse Opensource system development cost 50% less than proprietary solution
- Shorter development period

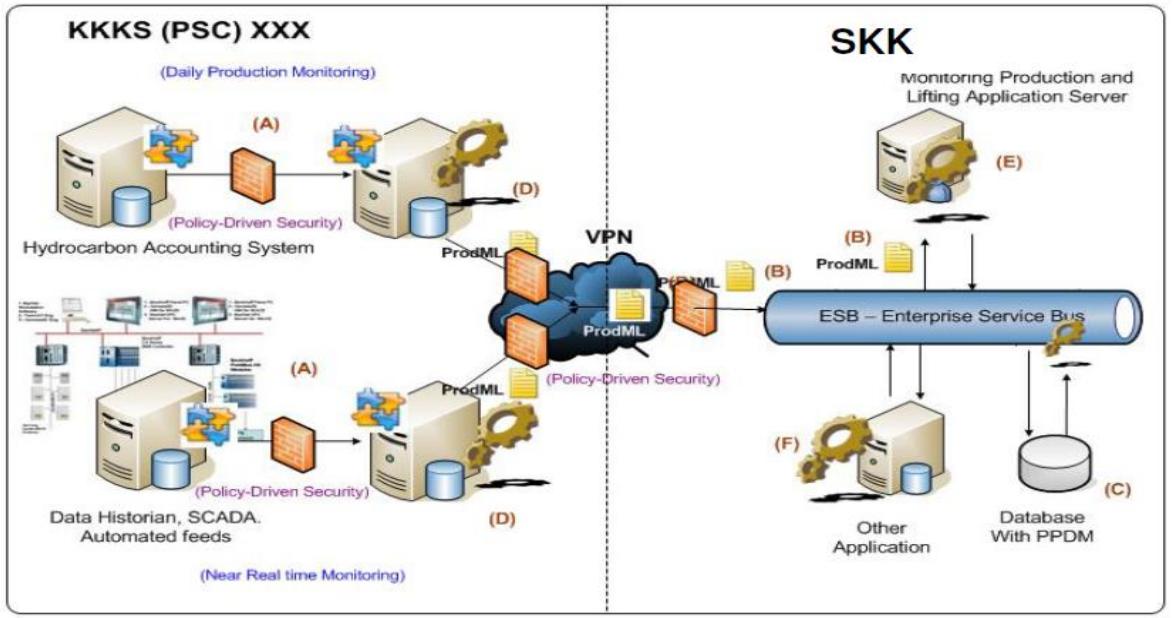
Provided Data

- Daily Production Report (Oil, Gas and LPG)
- Financial Quarterly/Monthly Report
- Daily Drilling Report
- Asset Management Report
- Inventory Report

Open Source %

60%

Network Architecture



Application & Data flow architecture

SWORDS 1.0 (Saka Well Opportunity Register, Define & Selection)

2018

Background and challenges

- Well Review Process, it took 4-5 weeks to review all potential wells for well intervention nomination and involving many man-days to complete manually.
- Collected and stored data are scattered, unstructured, not easy to retrieve and with complex format
- 150-200 well review process a year would be a though challenges for Subsurface engineer

Solution – Adopting Analytics and Machine Learning (ML) system

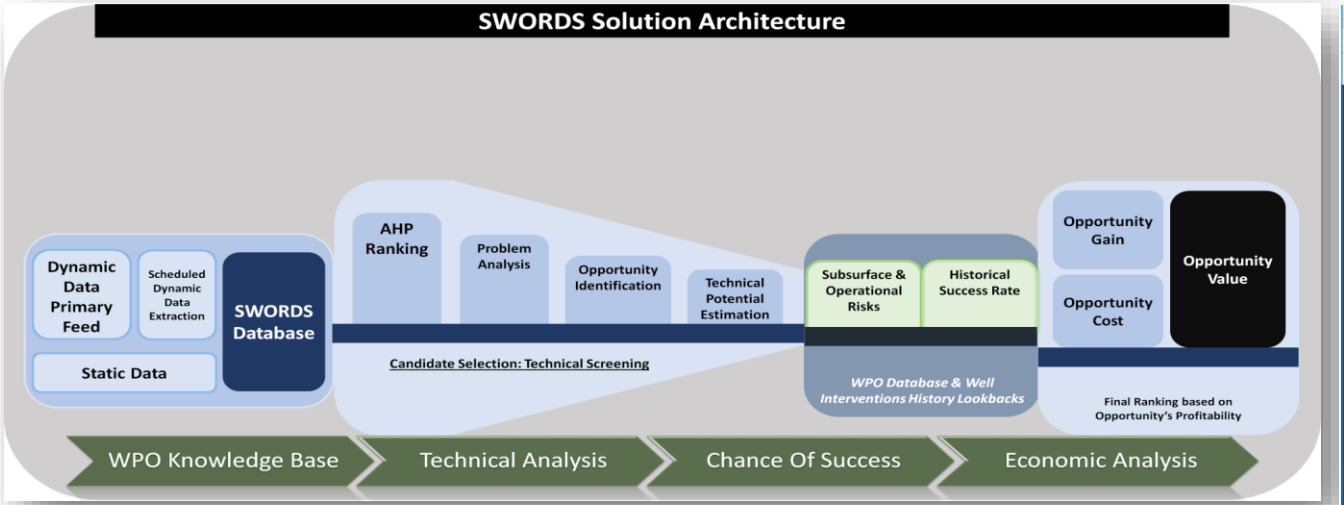
- Mutual collaboration with SLB
- develop Well opportunity maturity process – ML framework
- data cleansing and standardization
- develop technical screening and ranking analytics
- Problem analytics and opportunity identification
- Develop operational risk and historical success rate
- Economic analysis and final well ranking

Value Creation

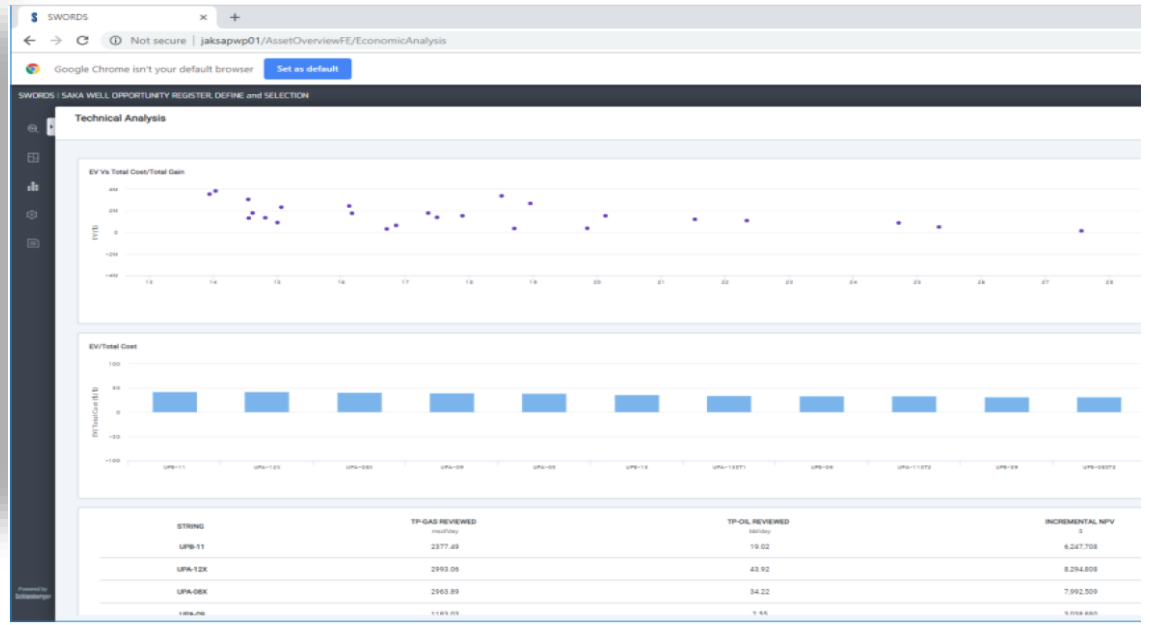
- 190 well review within a week - Faster Process **90%**
- Reduce workforce man-days **90%**
- Increase ROI **45%** within next 5 years
- Better data structure for future usage

Open Source % **60%**

Solution Architecture



Web application – Economic analysis



IOC (Integrated Operation Center) SKK MIGAS

2019

Background overview

- SKK Migas to monitor all KKKS production and lifting result daily with high accuracy
- SKK Migas to eliminate unplanned shutdown at KKKS production facilities
- To reduce stocks at KKKS hence increasing production and lifting for revenue
- Provide real-time data direct from DCS/SCADA.

IOC Control Room & Dashboard

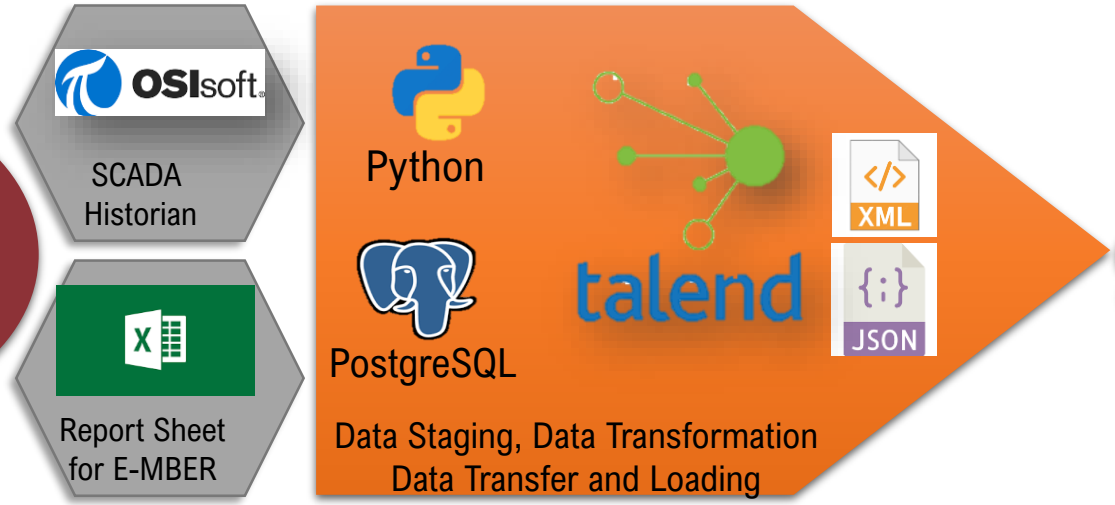
IOC Modules

- E-MBER (Electronic Maintenance Brief Report) – 2019
  - Comply with PTK 041 rev2 of Production Facility Maintenance
  - Reporting Maintenance KPI and Shutdown Plan - quarterly
- ATG (Automatic Tank Gauge) – 2020
  - Status surveillance of Crude oil Tank
- PIMS (Production Integrated Monitoring System) – 2020
  - Direct access to real-time data application at DCS network
  - Alert system from specific production facility critical equipment.

Open Source %

60%

SAKA IOC Architecture and Data Flow



Critical Equipment Dashboard (i-MMS) 2023

Challenges

- Frequent problems with Turbo Machinery such as Gas Turbine, Compressor, Generator, etc. including:
  - Unplanned Stops
  - Planned Stops
  - Slow Cycles
  - Production Rejects
  - Start-Up Reject
- Dependency to proprietary monitoring system, cost ~ $600k/y

Open Source % 100%

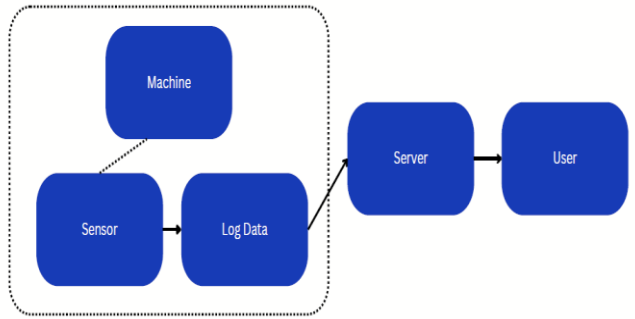
Solution – integrated Machinery Monitoring System

- ***Dashboard feature:*** Utilization, Availability, and Reliability calculations based on the selected machine
- ***Machine Data Management feature:*** View, Manage and Actionable features such as Machine List, Detail and Edit info.
- ***Machine Historical feature:*** View and Manage Historical for each machine including showing and create new historical data
- ***Machine TAGS feature:*** View and Manage Tag Data for each machine, actionable features including showing and create new tag data
- ***Charts feature:*** Provide various Chart to monitor *Reliability Prediction Performance Curve, Temperature Radar Chart, SPC Chart, Multivariable, Scatter Plot, Chart XYZ*
- Collaboration with Local University (ITS)

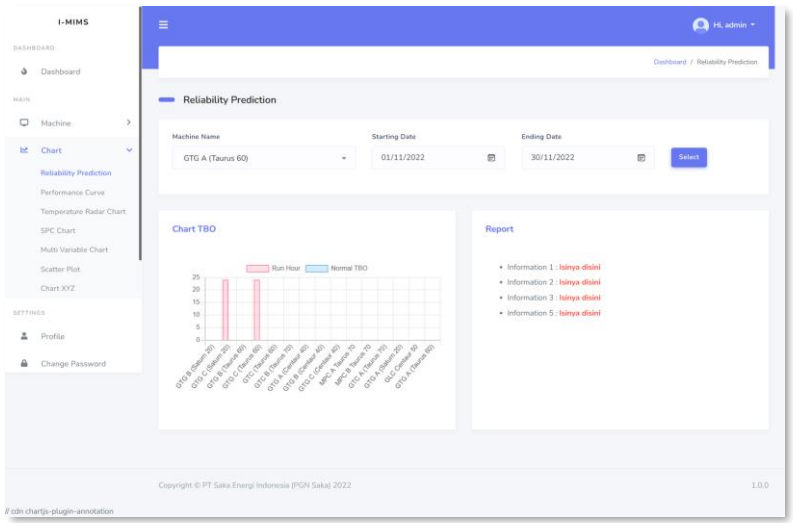
Value Creation

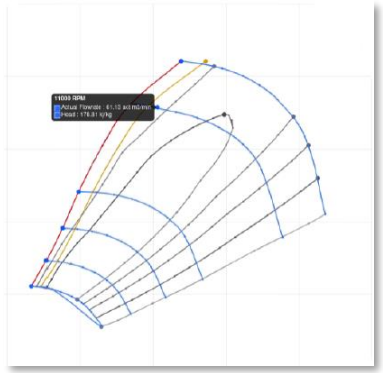
- Increase Productivity
- Increase Machine Output
- Reduce Maintenance Cost
- Extend Machine Life Span
- Easy Monitoring Machine

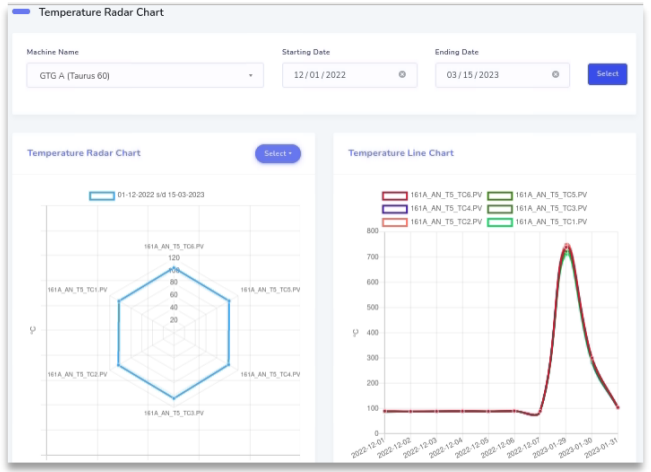
Solution Architecture

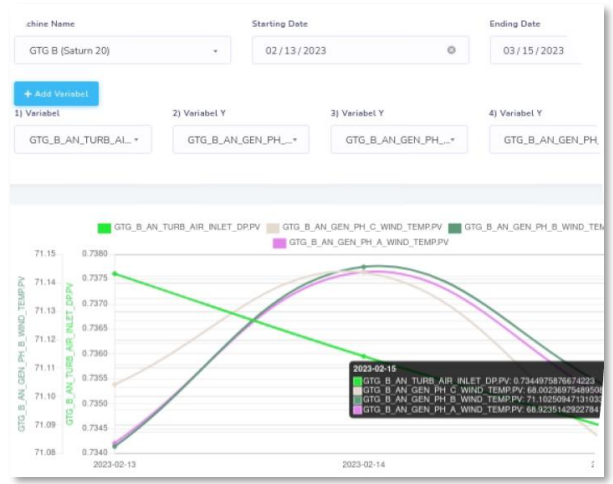


Web application UI









SAKA E&P Integrated Information Solution

2018

Overview

- In-house web-based platform to integrate various SAKA E&P Data and Information for better-informed business decision
- Centralized database turned dormant and underutilized data into knowledgeable action in timely manner
- Secured access from anywhere allow cross-functional workers breaking silos and collaborate more easily

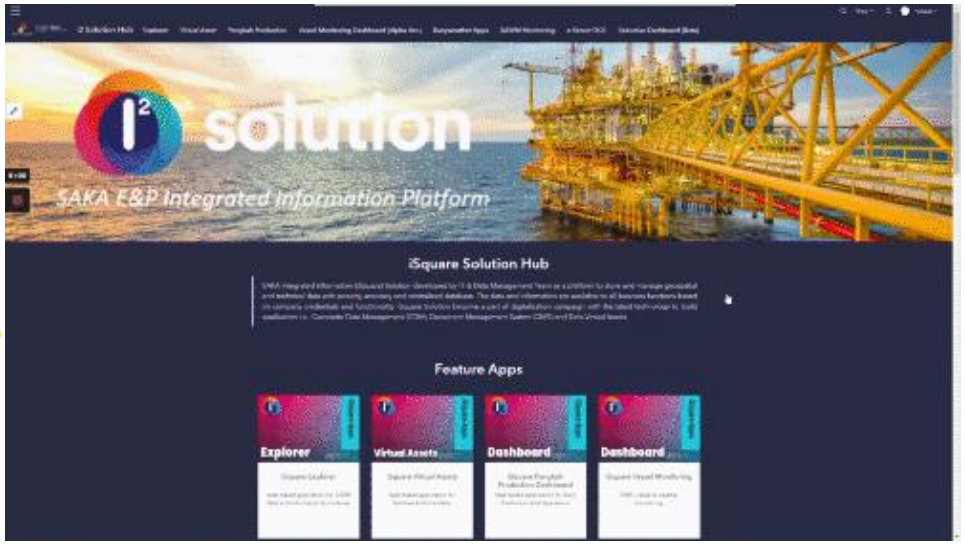
Development Strategy

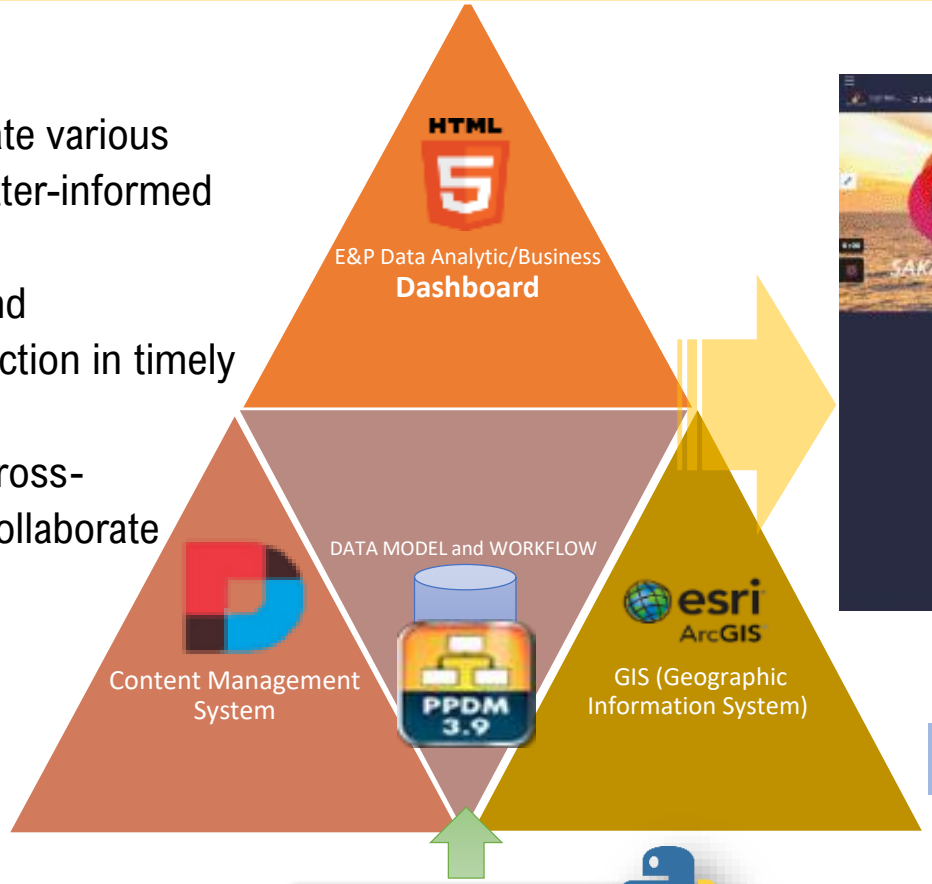
- AGILE approach to allow partial Modules or Tools development as needed by End-Users and to keep development cost efficient

Open Source %

50%

iSquare HUB





iSquare Explorer

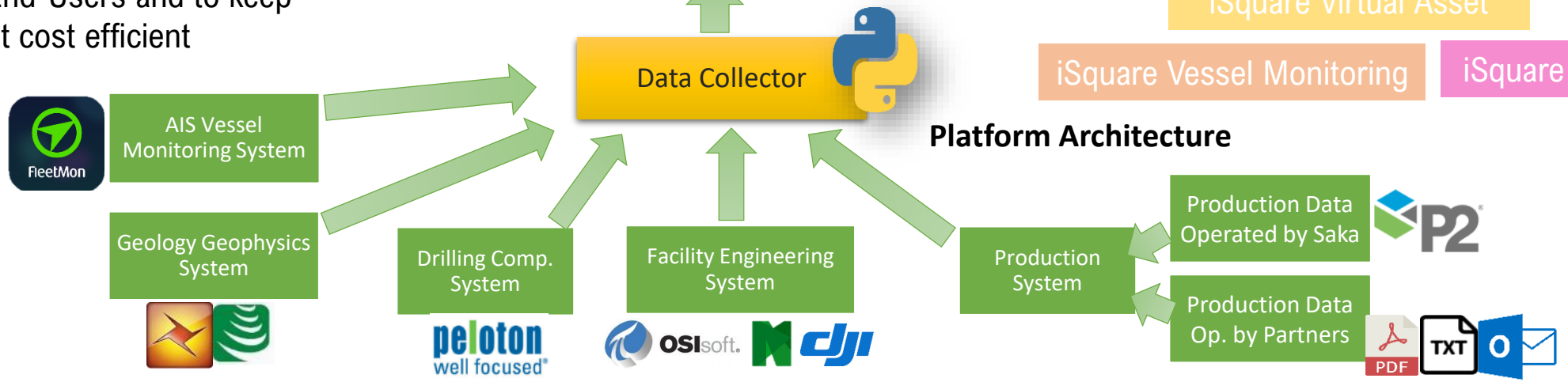
iSquare Dashboard

iSquare Virtual Asset

iSquare Vessel Monitoring

iSquare Digital Twin

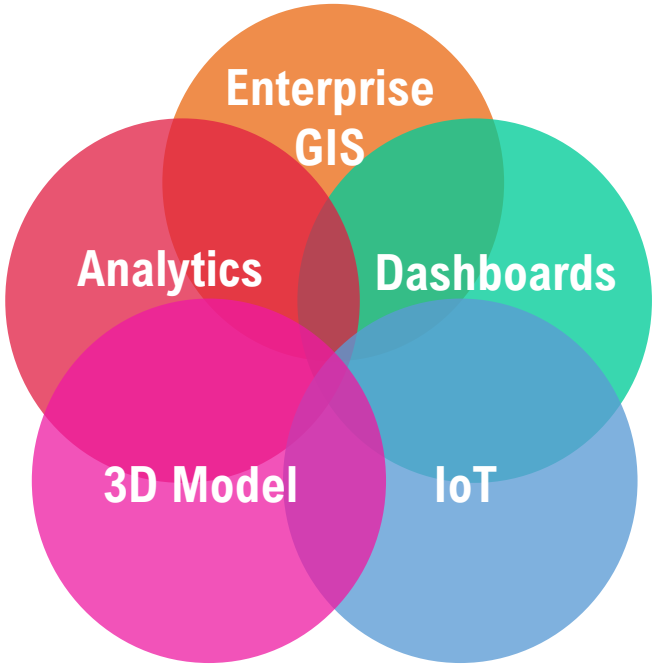
Platform Architecture

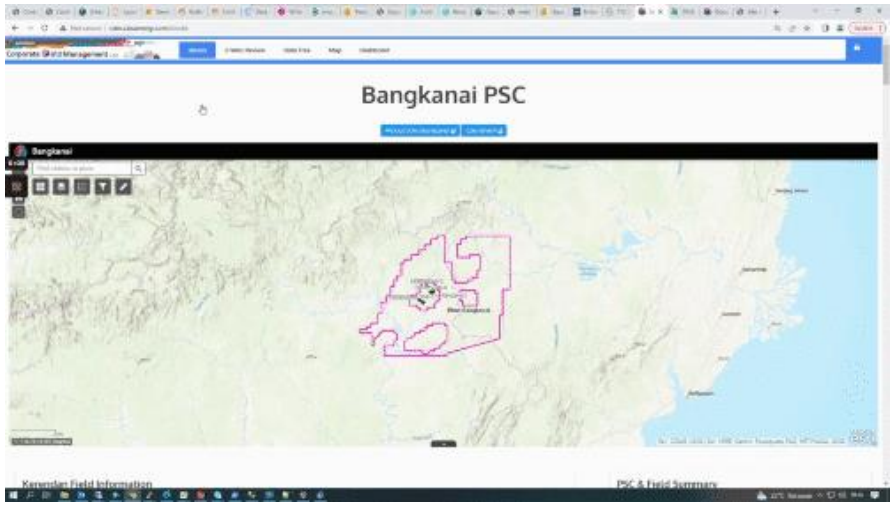


Blend of Industry's Best Practices and Emerging Technologies

iSquare HUB

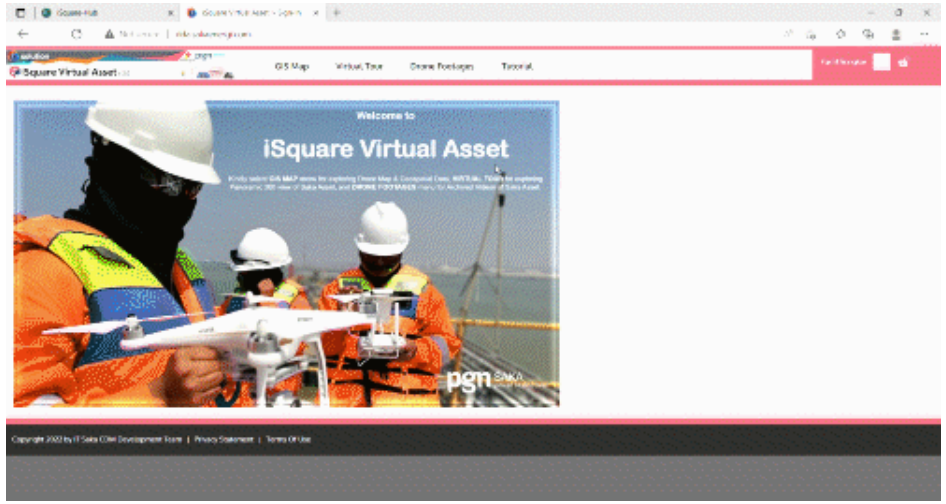
Saka's respond to Industri 4.0, adopting AI, ML, Big Data, and Analytics into current business process





iSquare Explorer

SAKA G&G Data and Information repositories based on Blocks

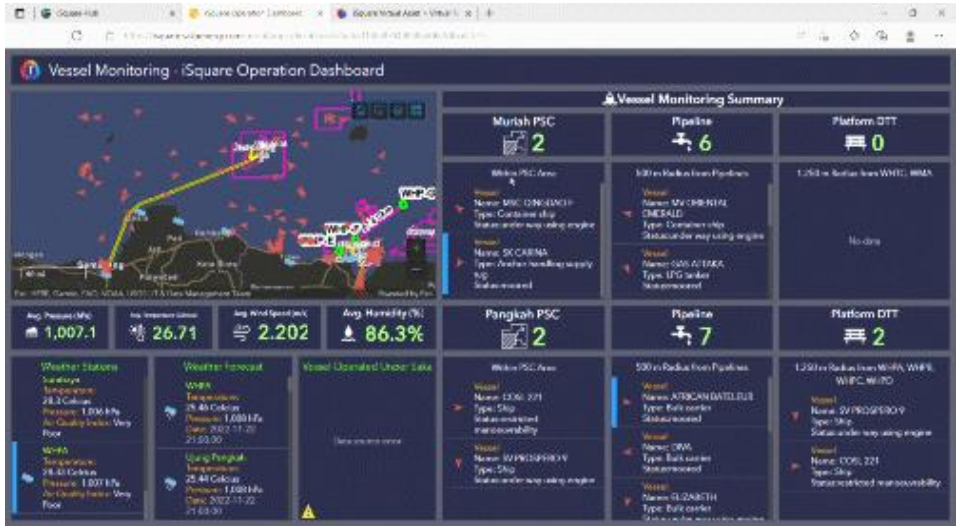


iSquare Virtual Asset

GIS based system of records, integrating As Built Drawings with Drone and 360° imageries

iSquare Prod Dashboard

Interactive dashboard for Production Data monitoring and analysis



iSquare Vessel Monitoring

Real-time monitoring of Vessel activities on Pangkah DTT

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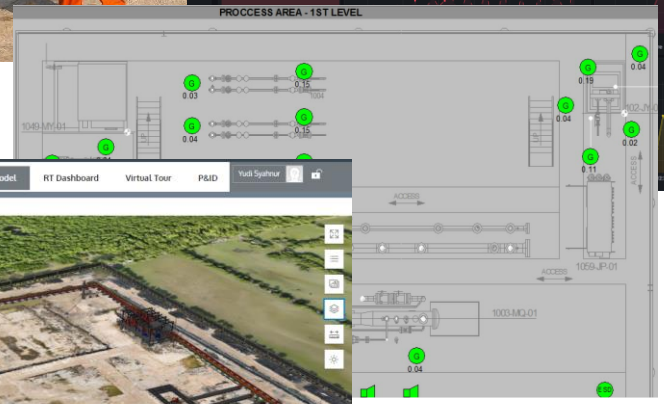
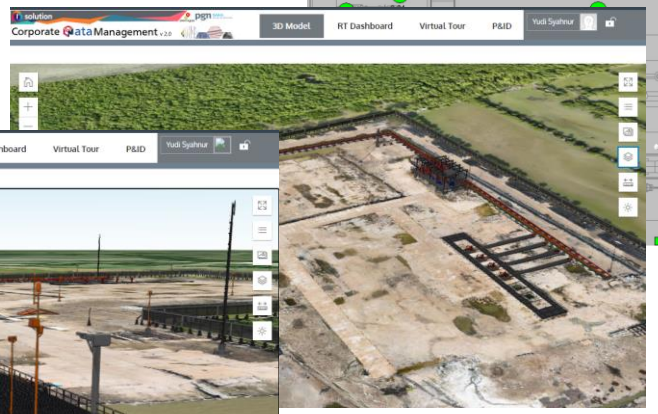
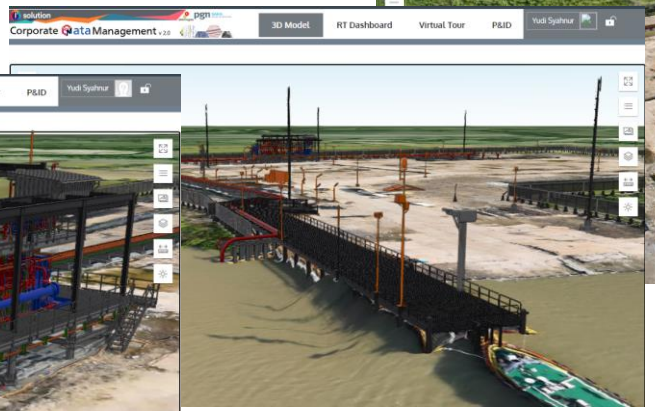
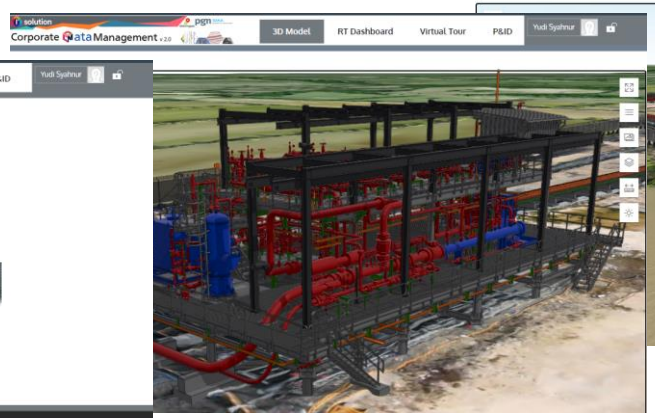
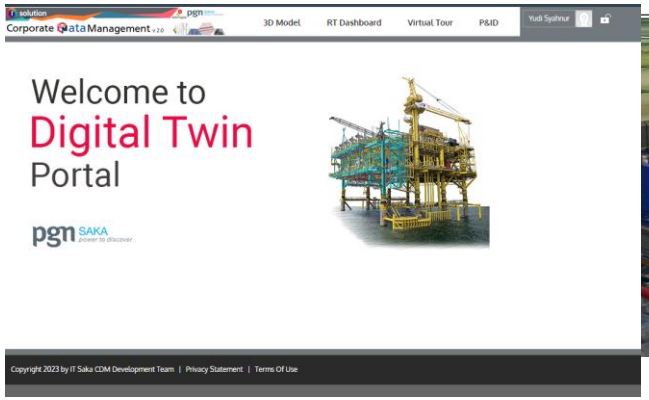










What is Digital Twin?

- A representation of physical assets, systems or processes designed to optimize business value through real-time analytical activities including detect, prevent, and predict failures *(General Electric).*
- The purpose of a digital twin is to simulate real-world systems, to help people make better decisions that impact the real world.

Basic Process of Digital Twin (*Vidya Technology*)

Who use Digital Twin?

- BP Angola Block 18: Handover of The Greater Plutonio FPSO engineering and facility documentation *(Drawings, Text & Scanned Document, Spreadsheets, Diagram and P&IDs).*

- Lundin Norway: Required engineering information to plan a repair job is presented in One Screen: *Parts, Equipment history, Future jobs, etc.* No need to access multiple systems to find engineering information.

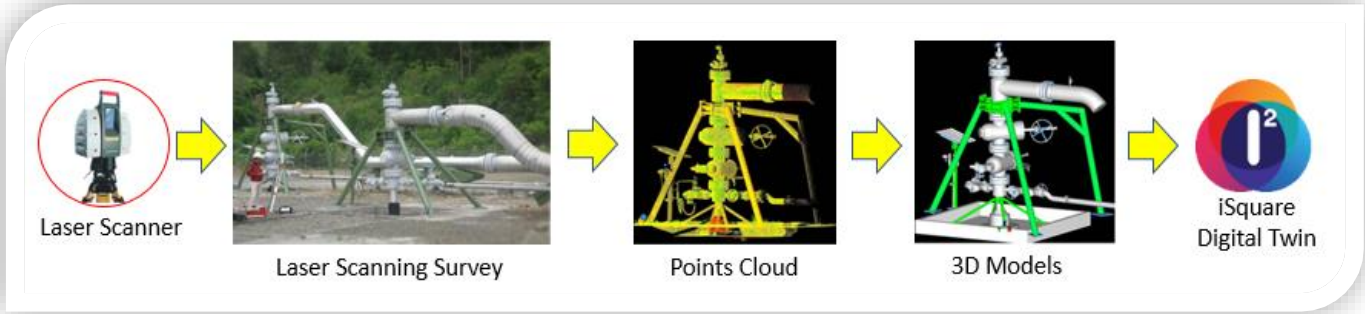
Why Digital Twin?

- **Quality**: *Common Operating Picture* to improve decision making process during *Plan, Design, Build and Operation* phase of Upstream Business.
- **Delivery**: 3D visualization of Production Facilities hyperlinked with Engineering information and Real-time data Monitoring.
- **HSSE**: Latest & up-to-date information to advance safety.
- **Cost**: Reduction of cost due to streamlined/better access to information.

How to build Digital Twin?

- ***Phase 1: Component/part Twins*** simulate the smallest example of a functioning component.
- ***Phase 2: Asset Twins*** simulate two or more components working together and analyze the interactions between them.
- ***Phase 3: System/unit Twins*** simulate how multiple systems assets work together, simulating an entire production line, for instance.
- ***Phase 4: Process Twins*** take the absolute top-level view of systems working together, letting user to figure out how an entire factory might operate.

Proof of Concept: West Pangkah Field



West Pangkah Digital Twin

GO-LIVE in 2023

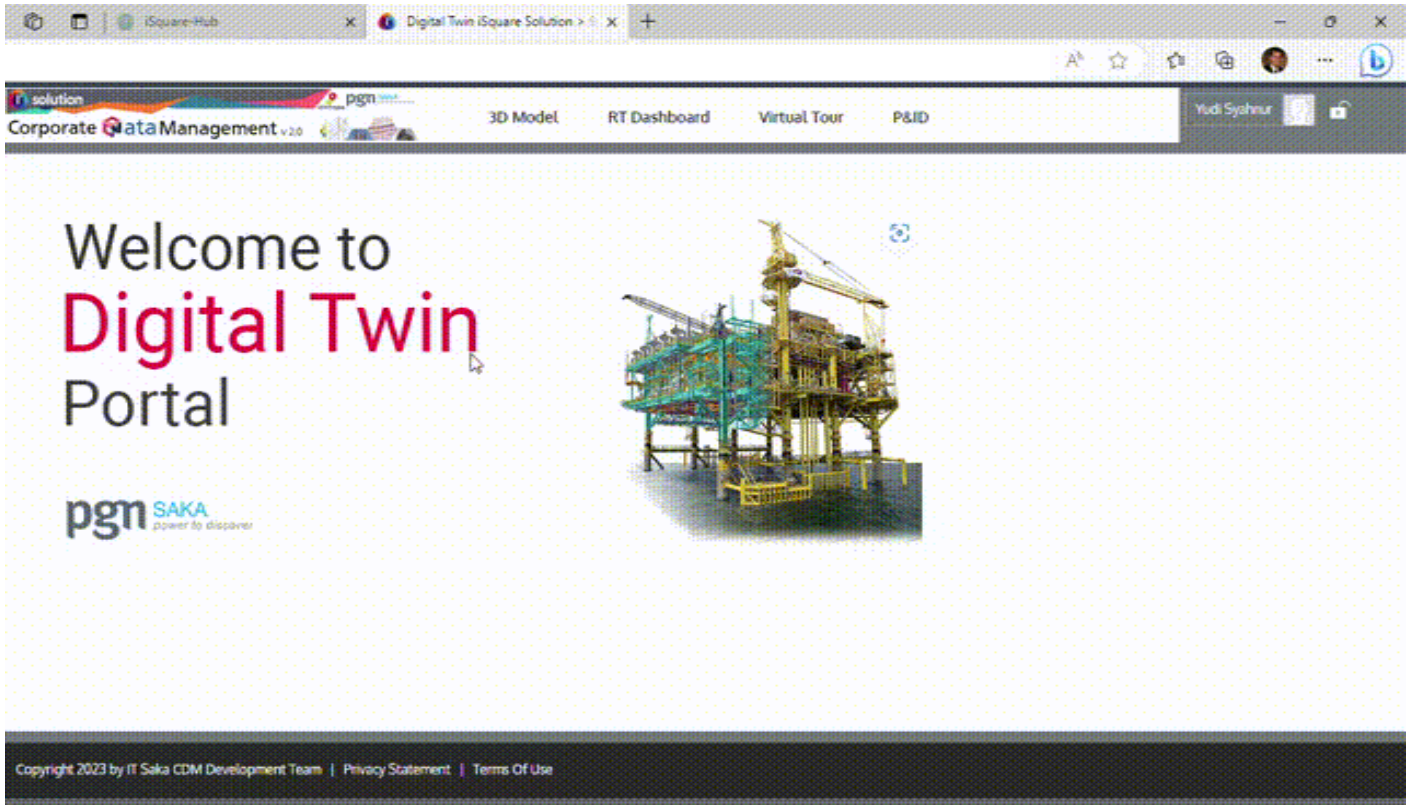
Challenges and Opportunities

- SAKA Production Facilities (West Pangkah Field and Onshore Processing Facility Gresik) need timely *Structural Integrity Assessment, Monitoring and Visualization tools* due to Land Subsidence in the area.
- The Availability of As-built Drawings, 3D Models & DCS system can be optimized to provide further insight:
    1. ***Descriptive Analytics*** (Asset Documentation, Defect Detection, Remote Monitoring, Anomaly Detection)
    2. ***Predictive Analytics*** (Asset Maintenance, Asset Life Span, Repair/Replacement Plan using AI/ML)

Solution

- Build a web-based Digital Replica of SAKA Production Facilities, connecting high res 3D Model with PNID info, real-time equipment sensors and other existing system such as SAP and Virtual Tour

Apps Interface – Key Features



Roadmap

Item	2022	2023	2024
Business process design & application development			
Go Live, socialization, user development, change management & monitoring			
Implementation to Onshore Processing Plant Gresik			

Project Timeline

Stages	Jan	Feb	Mar	Apr	Mei	Jun
Data Acquisition						
Data Processing						
Mock-up Application						
Migration to Production Server & Testing						
Launching						
Training and Socialization						

West Pangkah Digital Twin Architecture

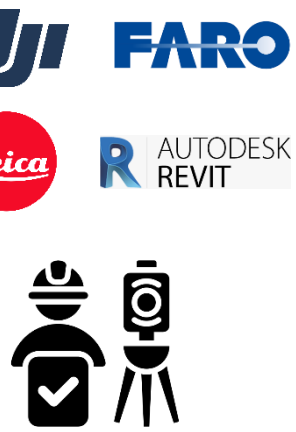
Back End: Data Acquisition and Processing

Spatial Data Preparation

- Drone, GPS and Terrestrial Laser Scanning acquisition
- Data processing (Orthomosaic; CORS; Point Cloud/3D Drawings)
- Data cleansing

Raw PI Data Migration

- Mapping PI tag sensor for West Pangkah area
- Prepare timeseries database
- Deploy ETL processing



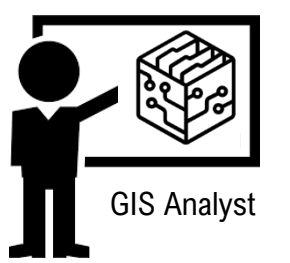
Geomatics Analyst

Data Scientist

Front End: Visualization and Analytics

3D Model Integration

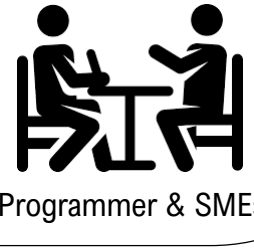
- Scene layer package from vendor
- Prepare Scene project from ArcGIS Pro
- Deploy feature service
- Deploy web scene apps for Digital Twin



GIS Analyst

Realtime Data Monitoring

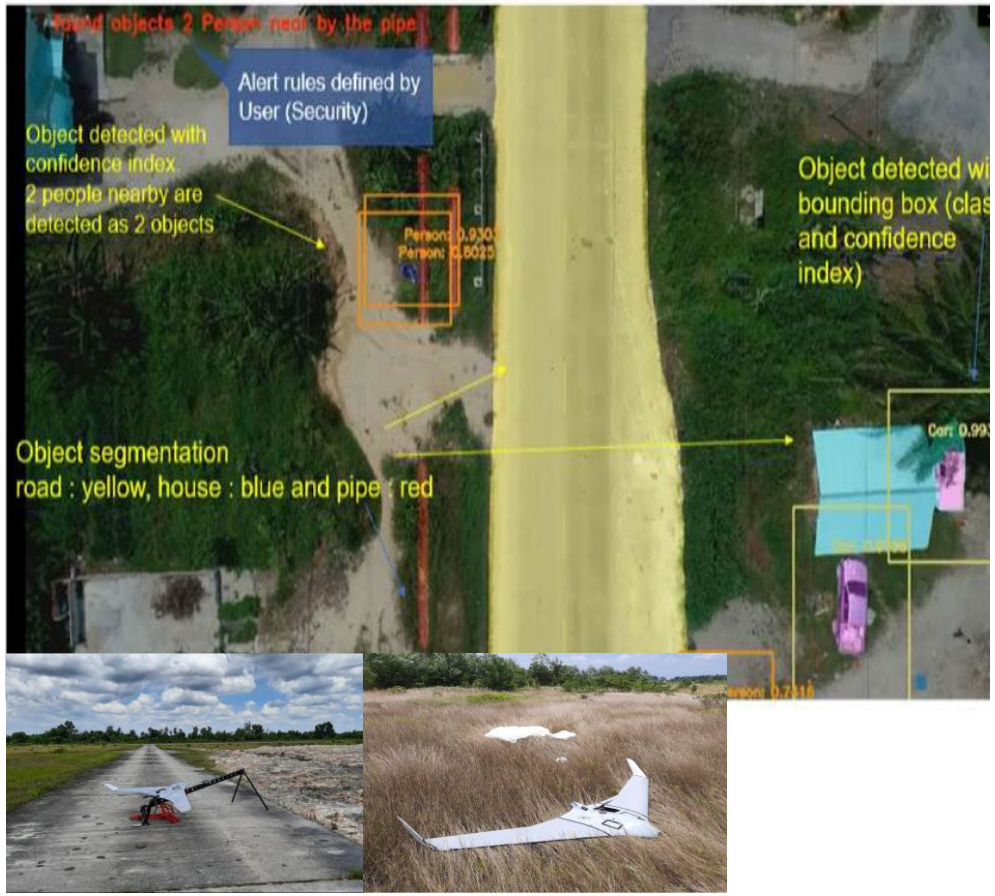
- Build visualization with defined category.
- Sync time series database with dashboard apps
- Apply scheduler for run script using Apache Airflow



Programmer & SMEs

What's next: Computing Vision integration

Object Recognition and Segmentation for Pipeline Surveillance using Drone



Images and Video courtesy of PERTAMINA Hulu Rokan

AI object detection, eliminate dedicate personnel for analyzing large data and simplify monitoring process

PPE Compliance Monitoring using CCTV

Source: Panduan Implementasi AI/ML dalam Industri Minyak dan Gas – Rapat Kerja TI SKK MIGAS/KKKS 2023

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Conclusion

- All Oil & Gas Industry is embracing new approaches to perform operation in a Safer and more Efficient way through Digital Transformation.
- Digital Twin in SAKA is highly customizable to fit SAKA business purpose, with initial development focused on descriptive analytics *(Asset Documentation, Defect Detection, Structural Integrity Assessment, Remote Monitoring, Anomaly Detection)*
- SAKA is fully committed to foster Innovative Environment to increase business value & talent development (I2 Solution, I MIMS, Digital Twin).

Way forward

- Pangkah Digital Twin phase 2 implementation for Onshore Processing Plant in Maspion Gresik to increase operations and business process efficiency.
- Continue to develop Pangkah Digital Twin phase 1 (West Pangkah Field) for Computing Vision module automation & data analytics by in-house development and collaboration with universities.
- SAKA has a planning in 2023 to create Collaboration Room as a Smart Room to centralize all digital application from all entities in one room.

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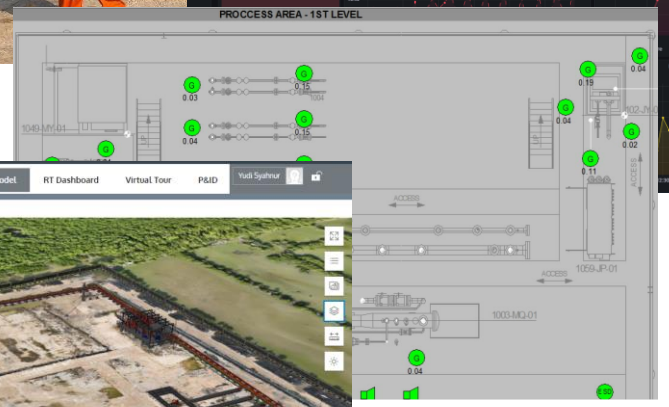

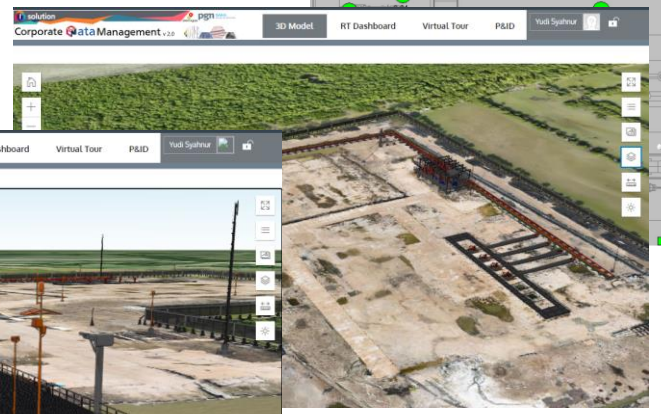

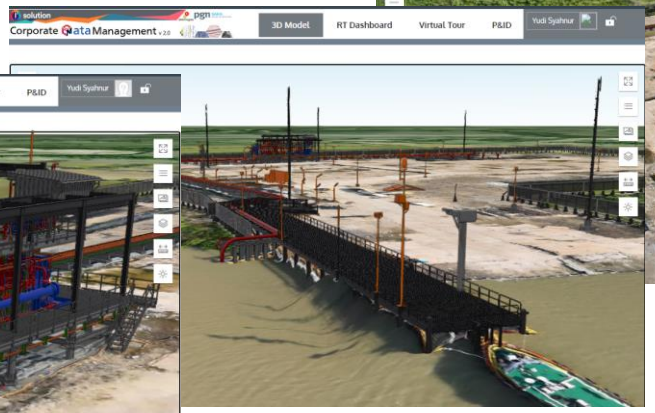

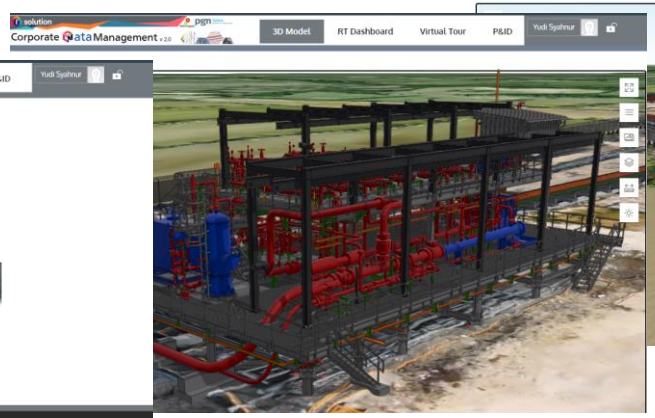

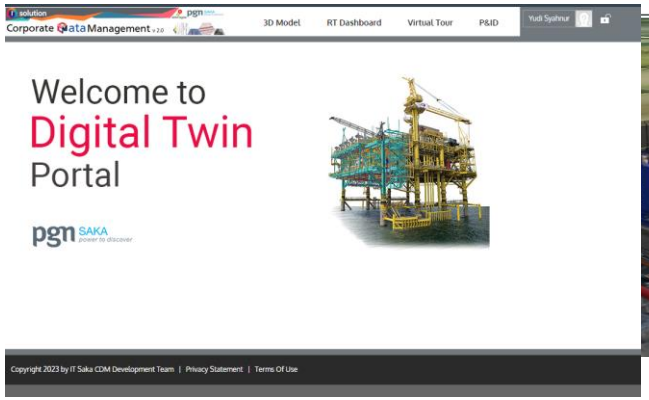

Demo – Key Features