Flexibility in data handling and relation to (execution) digital twin

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Agenda

▶ Executive overview about Fluor

▶ Digital Twin

▶ Master Tag Register

   – Purpose and Scope

   – Data Centric Execution

   – Technology

   – The Solution

   – The Benefits

▶ Summary and questions

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Executive Overview

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Executive Overview

ONE FLUOR EXECUTION MODEL

OUR CLIENT MARKET PORTFOLIO

1,200 SUBJECT MATTER EXPERTS

10,000+ EMPLOYEES IN EAME

88 OFFICES IN **29** COUNTRIES ON **6** CONTINENTS

78 YEARS' EXPERIENCE IN THE REGION

111-year LEGACY

40,000+ EMPLOYEES EXECUTING PROJECTS GLOBALLY

MISSION SOLUTIONS

GLOBAL PROFESSIONAL AND TECHNICAL SOLUTIONS PROVIDER

URBAN SOLUTIONS

2 FABRICATION YARDS Mexico | China

#303 ON THE 2023 FORTUNE® 500 LIST

1,000+ PROJECTS IN ANY GIVEN YEAR

backlog **US$26** billion

revenue **US$13.7** billion

OUR AVERAGE ANNUAL SUPPLY CHAIN SPEND **$11.4B**

ENERGY SOLUTIONS

NET ZERO 2023

TRS staffing solutions™

AGENCY ACCESS TRS - TO ANSWER MARKET DEMANDS

60 SPECIALISED INDUSTRIES SERVED

ADVANCING OUR COMMITMENT

HA20230001-026

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Technical and Project Management Expertise

334 ACTIVE PATENTS

SUBJECT MATTER EXPERTS **1,200**

80 FLUOR FELLOWS

15 LICENSED TECHNOLOGIES

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HA20230560-001

AV20230011-003

Professional and Technical Solutions

DESIGN

Advanced Process Modeling | Conceptual Design | Estimating | Feasibility Studies | Permitting | Process Simulation | Project Financing | Routing | Scope Definition | Siting | Technology/License Evaluation

ENGINEERING

Advanced Work Packaging | Cost Control | Detailed Engineering | Fabrication | Front-end Engineering | Modular Construction | Planning & Scheduling | Process Simulation | Safety Planning | Systems Integration

PROCUREMENT

Contracts Management | Expediting | Fabrication | Logistics | Low-Cost Country Sourcing | Materials Management | Purchasing | Requirements Planning | Supplier Quality | Staffing Resources | Warehousing

FABRICATION

Contractor Management | Material Control | Modular Construction | Purchasing | Quality Control | Safety Programs | Sourcing

CONSTRUCTION

Construction Management | Contractor Management | Craft Staffing & Training | Equipment, Tools & Fleet Services | Field Mobilization | Modular Construction | Project & Program Management | Quality Control | Rigging | Safety Programs | Scaffolding | Self-Perform Construction | WorkFace Planning

START-UP & MAINTENANCE

Commissioning | Engineering Support | Initial Production | Operations & Maintenance | Plant Readiness | Precommissioning | Systems Checkout | Turnover | Validation

SGMK003A

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Digital Twin

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Digital Twin Definition

Physical Assets as :

- Process
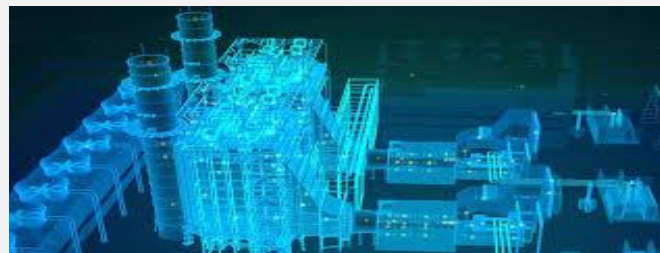- People
- Places
- Systems
- Devices

Digital representation as :

1. Real-world representation of a plant

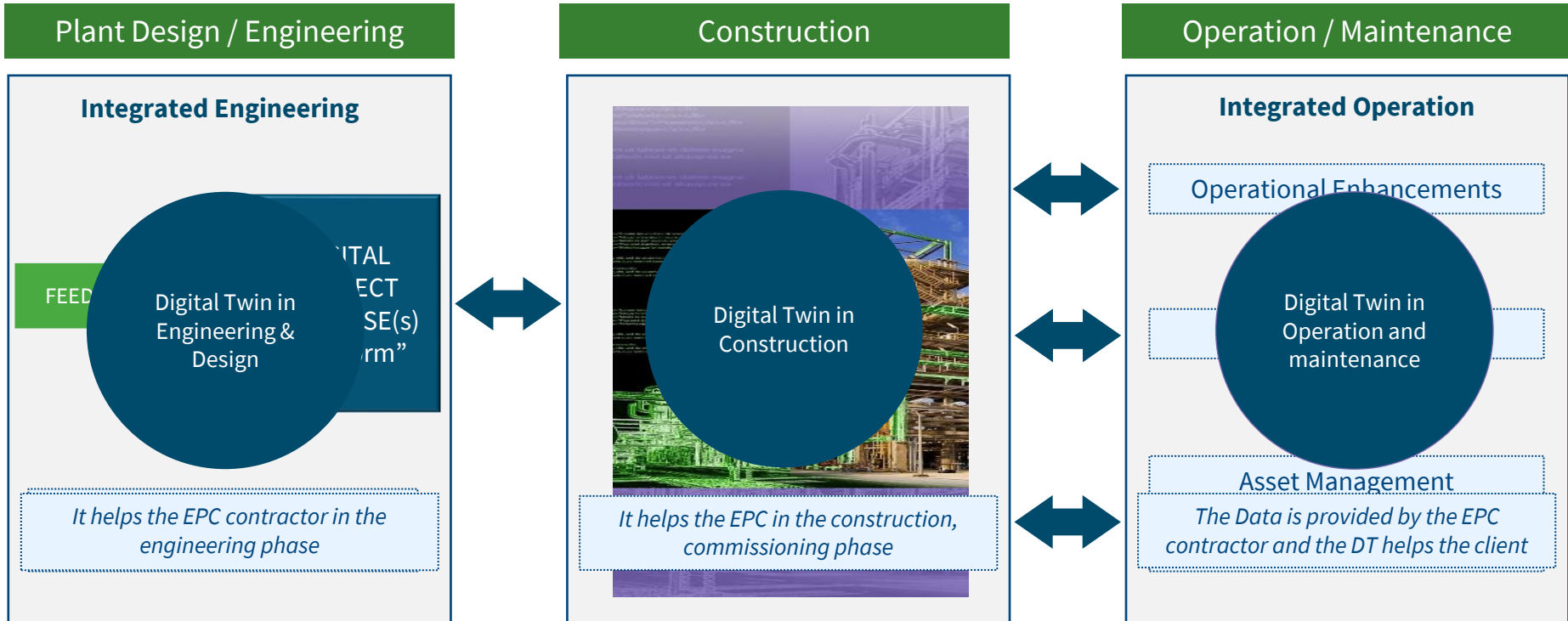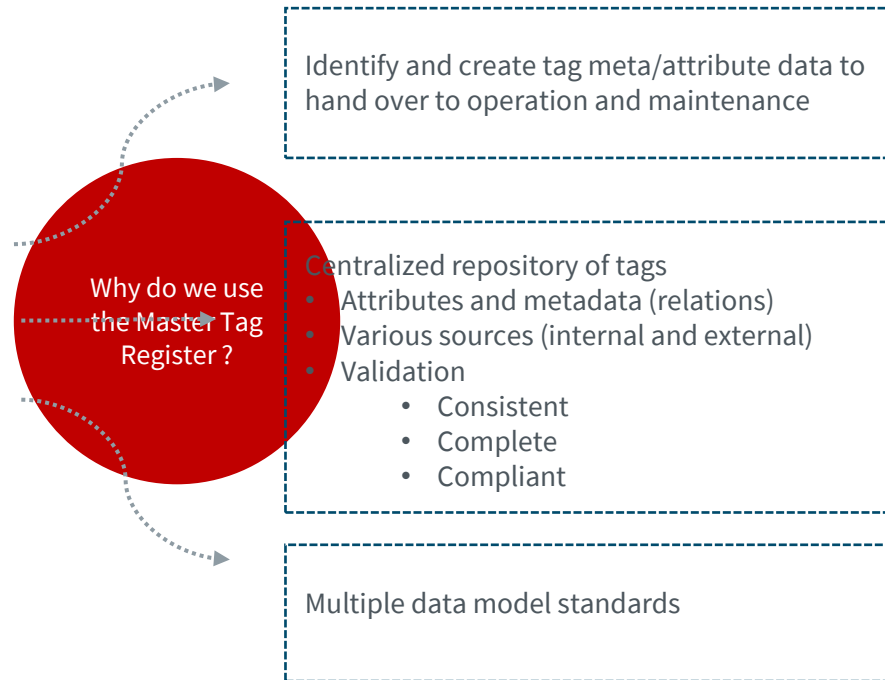2. Neural representation of the interdependencies of assets of the same plant

Data Flow & Data Transfer - From Design to Operation

Plant Design / Engineering

Integrated Engineering

Digital Twin in Engineering & Design

FEED

ITAL
ECT
SE(s)
rm"

It helps the EPC contractor in the engineering phase

Construction

Digital Twin in Construction

It helps the EPC in the construction, commissioning phase

Operation / Maintenance

Integrated Operation

Operational Enhancements

Digital Twin in Operation and maintenance

Asset Management

The Data is provided by the EPC contractor and the DT helps the client

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Master Tag Register (MTR)

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MTR - Purpose and Scope

Why do we use the Master Tag Register ?

Identify and create tag meta/attribute data to hand over to operation and maintenance

Centralized repository of tags
- Attributes and metadata (relations)
- Various sources (internal and external)
- Validation
  - Consistent
  - Complete
  - Compliant

Multiple data model standards

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Master Tag Register

Project Sources

Project Data Lake

Common Data Environment

Client

Project Object Data Model ← Client Data Requirements

Standard Fluor Source

Non-Standard Fluor/Project Source

Vendor Sources

Prescribed Template

Vendor Data

Vendor Structured Documents

Vendor Untructured Documents
Typically only Tag – Doc relations

HARVEST
TEMPLATE DEFINITION
EXTRACT
DEFINE TRIPLES
TRANSLATE
VALIDATE

Validation
- Naming Convention
- Consistency
- Completeness

AI Applications

DASHBOARDS

Historical Data

Asset Management
Maintenance Data
Corrosion Loop Data
Spare Part Data
Tag – Doc Relations
Tag Naming Conventions
Engineering Data

DATA COMPLIANT WITH CLIENT REQUIREMENTS

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HARVEST:
collect tags from documents

TEMPLATE DEFINITION:
structured tag model

EXTRACT:
collect (structured) tags

DEFINE TRIPLES:
Conversion from relational data

TRANSLATE:
from basic triples to project data model

VALIDATE:
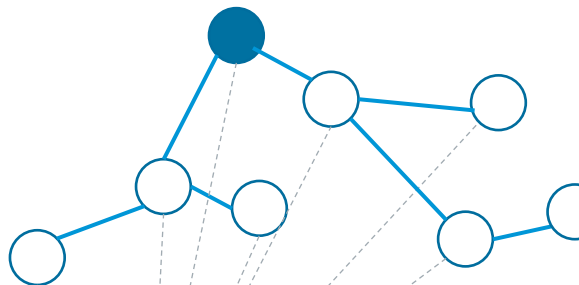is data in line with project data model

Data structures
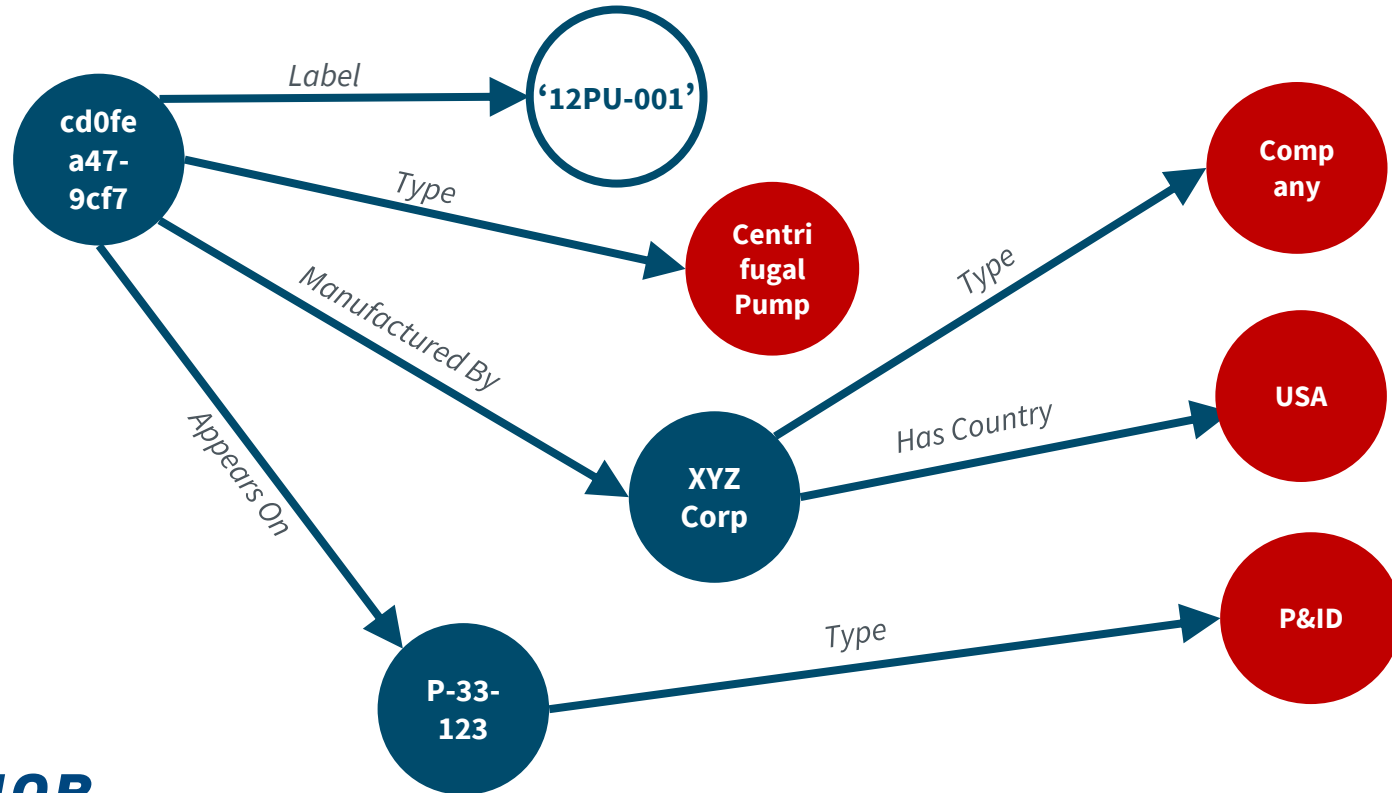
The RDL in semantic, is called a vocabulary

Reference
Data
Library
RDL
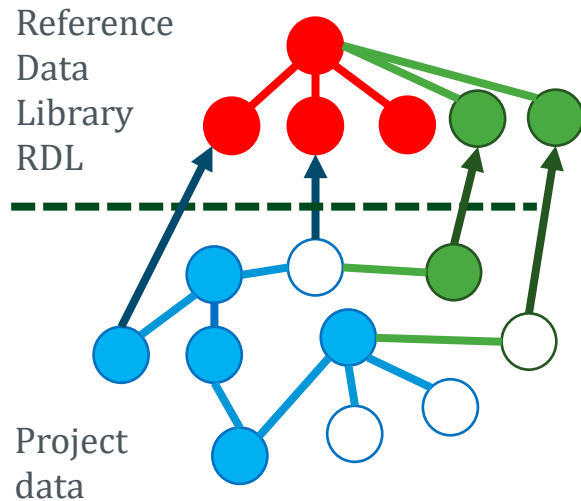
Project
data

▶ The Reference Data Library (RDL) is a so-called **Taxonomy** and the area it is in is called a Vocabulary

▶ The RDL + **Project Data** together is a so-called Knowledge Graph

▶ Project data has **relations** to the RDL to use its standardized terms

▶ A project can easily add **project-specific items** to the vocabulary and **relate** project data to it

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② Relationships between the data are made available to the project by mapping to the Vocabulary

④ **Relationships between sources are created** in the model or by scraping or by learning
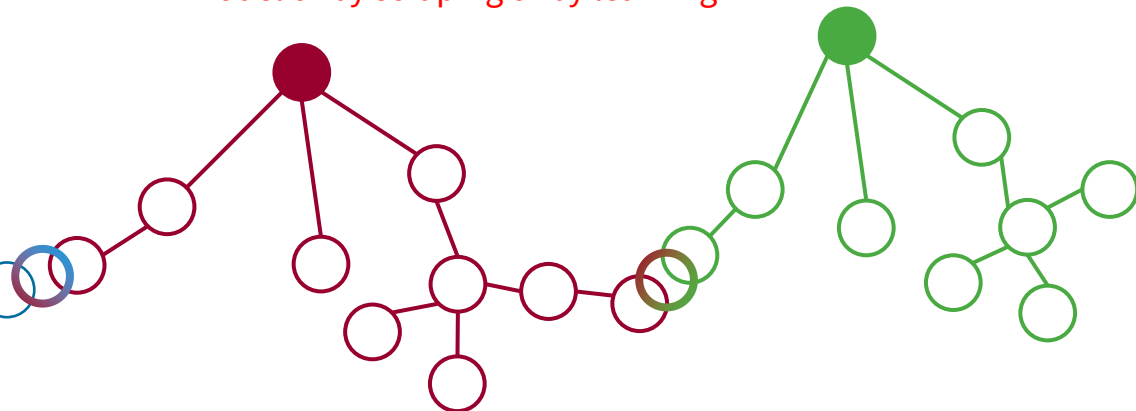
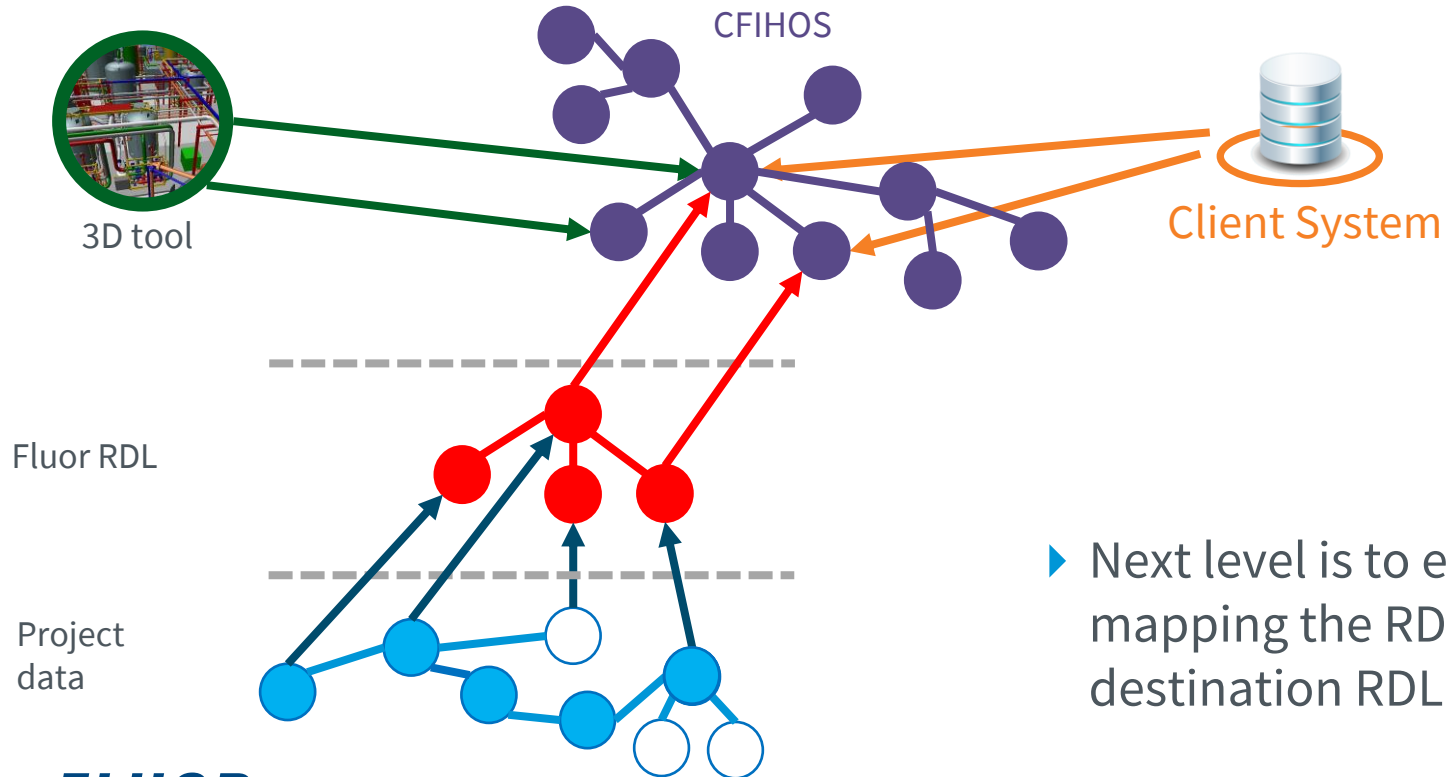③ More source data and relationships are made available

① Source data is made available to the project as data in addition to a document

Data Source #1

Data Source #2

Data Source #3

Demo

Linking to systems and standards

3D tool

CFIHOS

Client System

Fluor RDL

Project data

▸ Next level is to export data by mapping the RDL to a destination RDL

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The Benefits

- Flexible and scalable

- Ability to address client specific requirements for handover

- Data is read only (source to be updated)

- Tool independent

- Future proof (supports Digital Twin – IOT – Industry 4.0)

- Semantic models are extremely suitable to apply AI

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Summary

▶ Digital Twin

▶ Master Tag Register (and semantic technology)

▶ Extension and use with other tools and standards

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Questions?

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