3DEXPERIENCE®

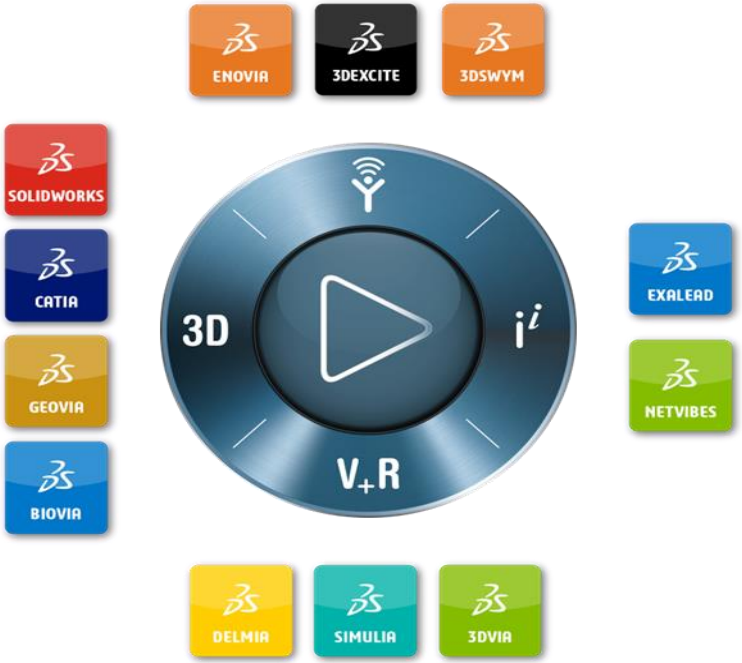
OGC Workshop Underground Infrastructure

City Infrastructure Lifecycle Management
A Platform Approach

Dassault Systemes
Ingeborg Rocker, PhD
Justin Meade
April 24, 2017

3DEXPERIENCE Powers…

… our Brand Applications…



…for 12 Industries

City Infrastructure Lifecycle Management

++ Platform for data collection, storage, integration, management, analysis, and visualization

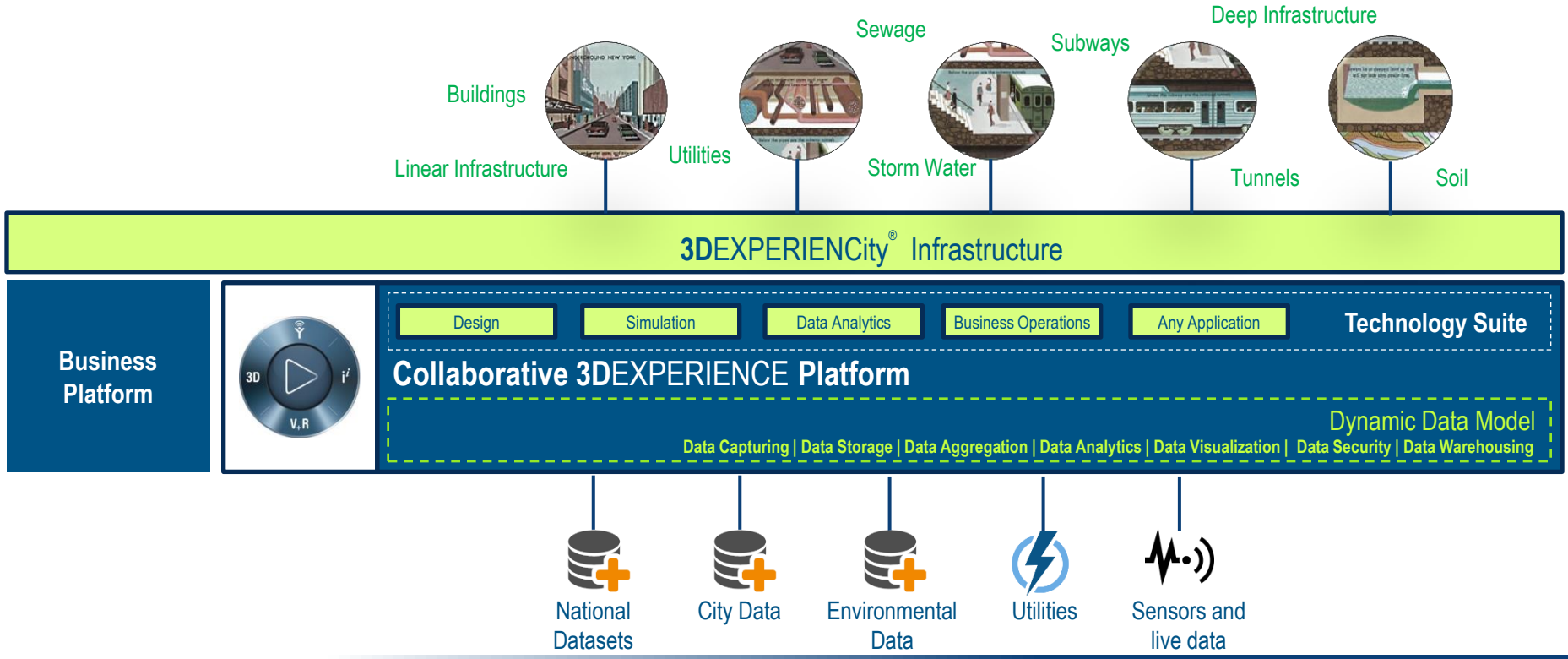
++ Interoperability: possible integration capabilities of Standards via 3DEXPERIENCE Platform

++ Virtual | Operational Twin: Design Build | Build Run

++ Role of Dynamic modeling and prediction for Lifecycle Management

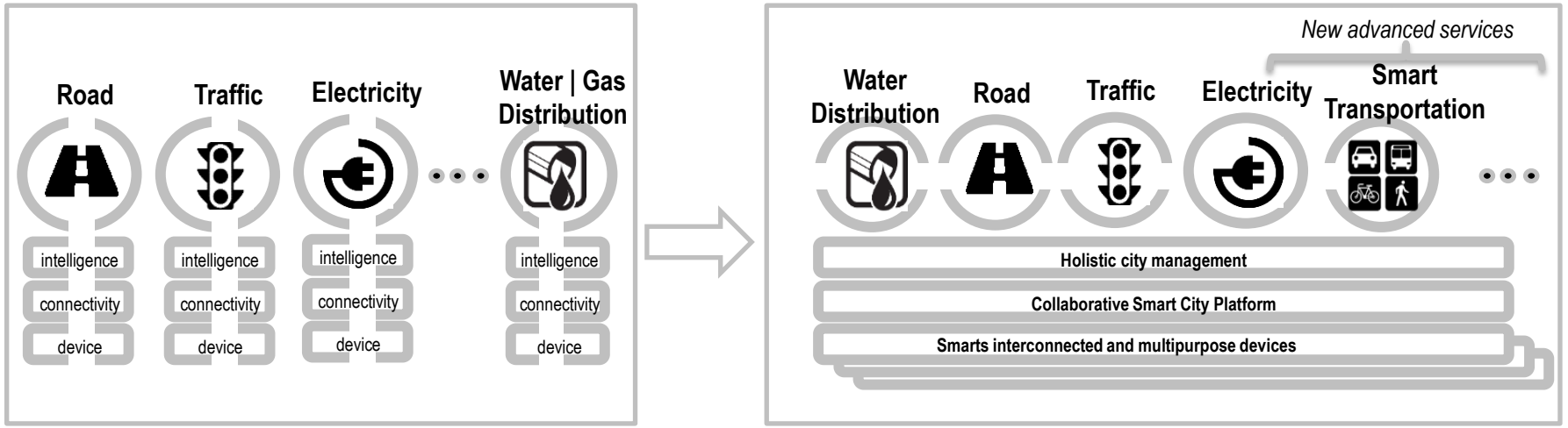
++ Project experiences in above and underground infrastructure modeling and mapping

3DEXPERIENCE Platform for City Infrastructure



3DEXPERIENCE Platform | Cross Domain Approach

From silos services … to smart advanced services



3DEXPERIENCE Platform connects the dots

- By moving from a file-based approach to an object-centric approach

- This avoids gaps, overlaps and silos over decades between:
  - People
  - Organizations
  - Responsibilities

* Electronic Document Management System

City Infrastructure Lifecycle Management

Interoperability: The Integration of Standards via the Platform

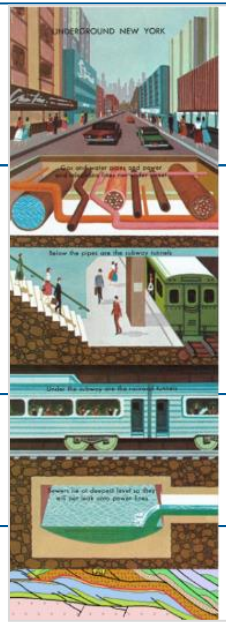
How its governed and represented

BOM *ISO/IEC 15288*
KML *ISO 55000*
OGC *ISO 16739*
ISO 10303 (STEP) *ISA 95*

CityGML ISO TCS211
CityGML 3.0
CI/ASCE 38-02
ANSI/ASCE/EWRI 12-13, 1313, 14-13
ANSI/ASCE/EWRI 56-10, 57-10
ISO 15926 (Xmplant)

ASCE/EWRI 45-05, 46-05 & 47-05
ASCE/EWRI 12-05, 13-05 & 14-05

GML; GeoSciML
EarthResourceML
INSPIRE



Depth	Classification
0 m	Surface
15-50 m	Near-Surface
100 m onwards	
	Subsurface

Information represented

Buildings
Road & Traffic
Rail
Terrain & Land use

Basements, Cellars
Cable network
Utilities
Telecommunications
Water

Road Tunnels
Subways
Sewage

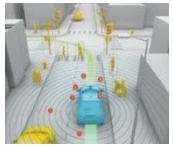
Geology
Geotech, RQD etc


3D
iENCE

3DEXPERIENCE Platform | City Lifecycle

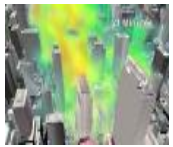
3DEXPERIENCity® SERVICES

3DXCity IOT - IOE
Interoperable interconnected object man agement and tracking in the real | virtual city, Geo-located and updated in real time, Consuting

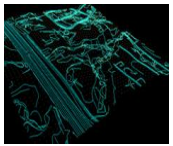


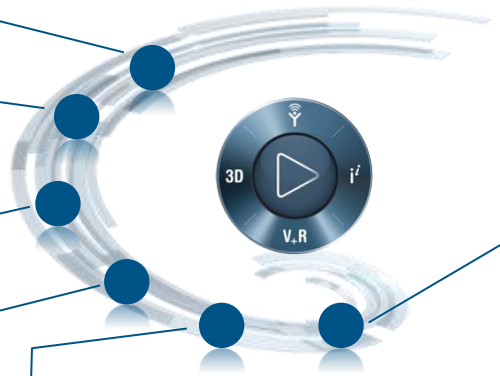
3DXCity Business Operations
Data analytics, planning and opitimiztion for service providers and companies in the city context, turn urban data into business opportunity, Logistics, Consulting

3DXCity Simulation
Model and simulate impacts of urban choices in real time, compare alternatives, systemic approach Visualization of results 1-4 d, Consulting



3DXCity Design
Imagine, Design, realize iProjects For the Future in the 3DEXPERIENCity and share, evaluate and validate, Consulting





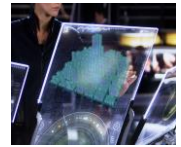
3DEXPERIENCity® SDK
Develop value added aps
Propose online services
Deliver content

3DEXPERIENCE® PLATFORM

3DXCity Data
Upload and access 3DEXPERIENCity Data in one click, Push data to improve it Build Digital City Reference

3DXCity Cockpit
City 3D Navigation, data federation, data crawling, city dashboard information Present data in real time

3DXCity Navigation
Life-style tool for navigating the Real | Virtual city Geolocated and updated in real time



3DXCity Collaboration
Share data, processes Capitalize on city projects

3DXCity Forum
Access and Exchange btw cities and citizens

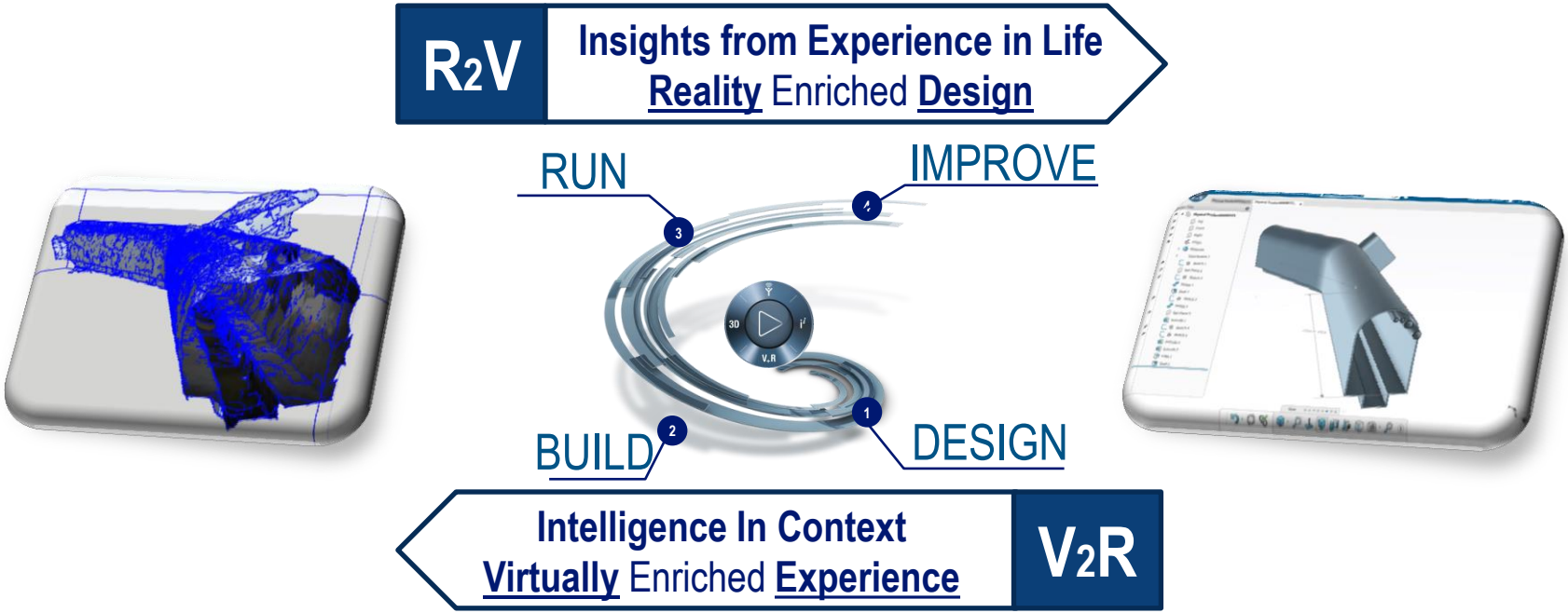
City Infrastructure Lifecycle Management

Virtual | Operational Twins – from Design Build – to Build Run

- Infrastructure's complete functionality, the operation of the geometrical, mechanical, electrical and electronic systems of system can be simulated, tested and optimized. Similar analysis and simulations are conducted to test and optimize the production of the infrastructure. What traditionally is known in the industry as Product Life Cycle Management (PLM) is now applied as City (Infrastructure) Life Cycle management (C(I)LM).
- The advantages of the City Infrastructure Life Cycle Management for the design is obvious: as it enables to create a coherent link between Design-Build and Built-Run for the entire infrastructure systems in cities – a process through which significant optimizations can be achieved prior to building and managing that infrastructure

City Infrastructure | Virtual Twin

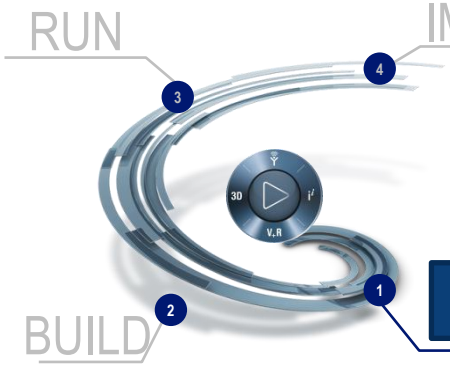
End-to-end User Experience

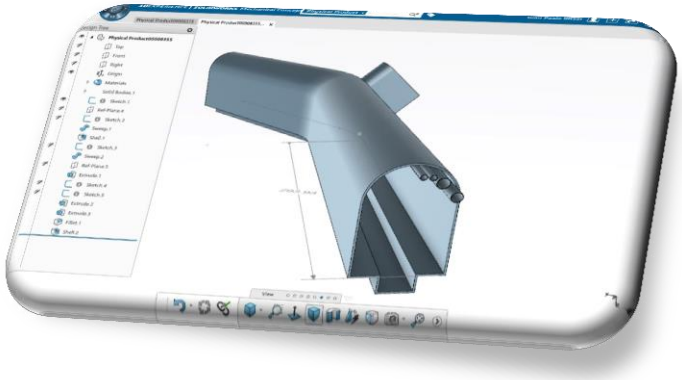


City Infrastructure Virtual Twin

Virtually Validated Design

R2V — Insights from Experience in Life
Reality Enriched **Design**





DESIGN

- **Digital Mock-Up:** 3D CAD, configuration management
- **Requirements:** Operational & Technical specifications
- **Simulation:** Project execution simulation and refinement

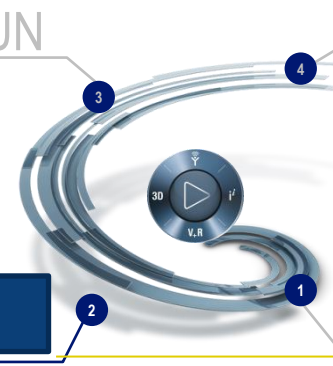
Intelligence In Context
Virtually Enriched **Experience**

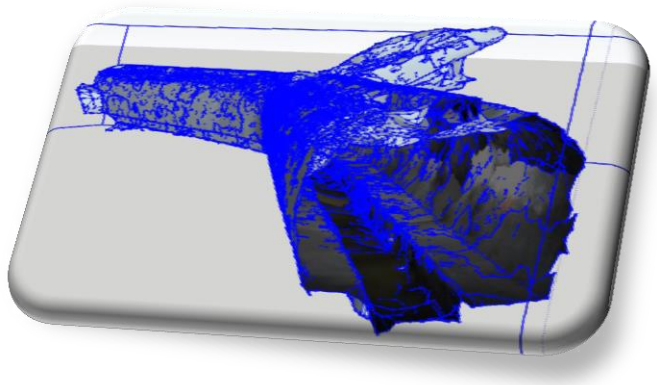
V2R

City Infrastructure Virtual Twin

Digitally Augmented Operation

R2V — **Insights from Experience in Life**
Reality Enriched **Design**





Infrastructure Digitalization:
Laser Scan / Point of Clouds

Augmented Reality:
Operational guidelines

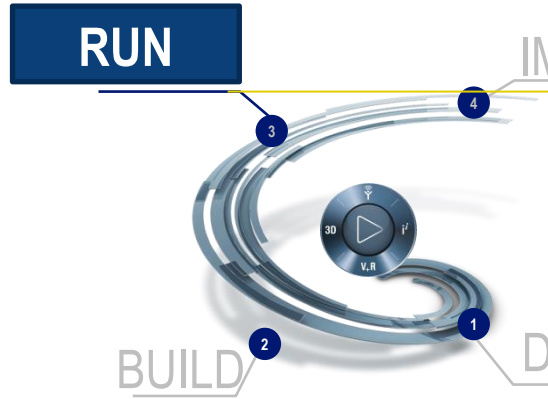
IIoT:
Real-time and historical process data connectivity

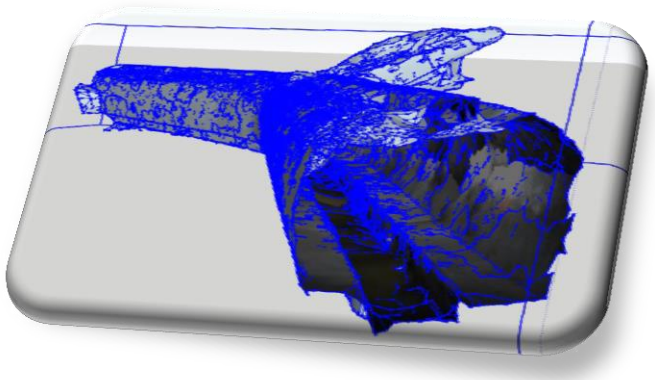
V2R — Intelligence In Context
Virtually Enriched Experience

City Infrastructure Virtual Twin

Real-time Experience Optimization

R2V — **Insights from Experience in Life**
Reality Enriched **Design**





Condition-Based Monitoring:
Edge computing
Process & Asset Monitoring

Machine learning:
Operational Intelligence

Energy Efficiency:
Energy monitoring & optimization

Analytics/Dashboarding:
Asset in Operation,
Process Optimization,
360° view

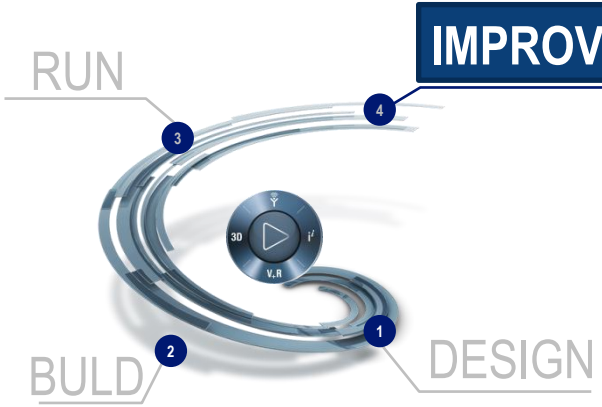
Maintenance:
Predictive maintenance,
Prescriptive analytics

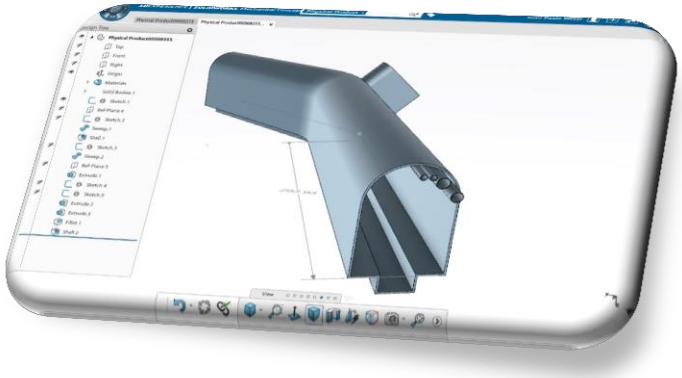
Intelligence In Context
Virtually Enriched **Experience** — **V2R**

City Infrastructure Virtual Twin

Accurate Data Enriched Simulation

R2V — Insights from Experience in Life
Reality Enriched **Design**





Mission Preparation:
Clash detection, elaboration of Electronic Work Instructions

Mission rehearsal:
Virtual Training / Immersive Training / Safety

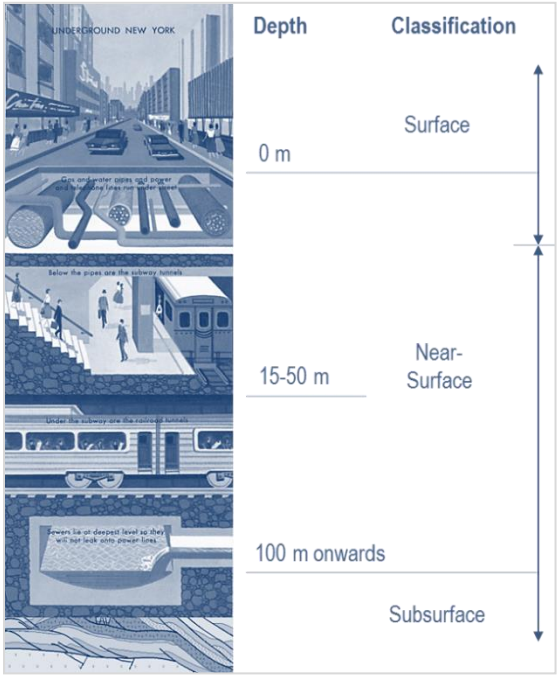
Fitness For Service:
Functional & Dysfunctional simulation

Intelligence In Context
Virtually Enriched **Experience** — **V2R**

City Infrastructure Lifecycle Management

Project Experiences in Above and Underground Infrastructure

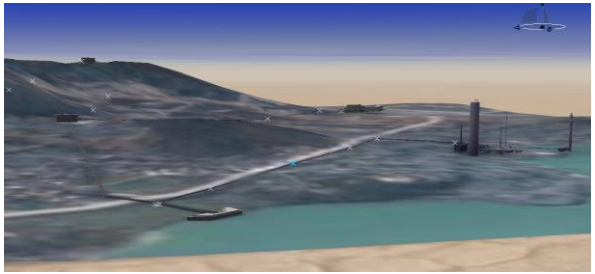
- Infrastructure Maintenance Planning
- Wastewater Collection
- Hydro Power

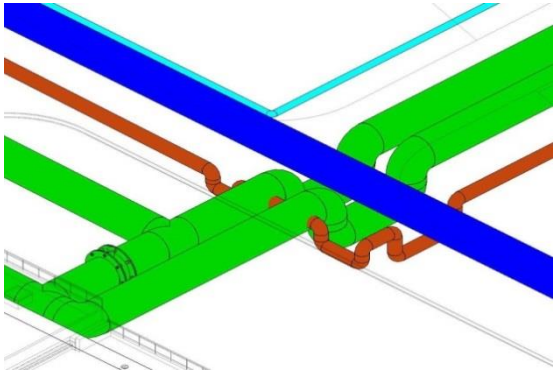


- Infrastructure Networks
- Freshwater Intake
- Environment Model

Infrastructure Design & Design Analysis

Implementation example – Wastewater Collection





Some of the standards (not an exhaustive list) that can be used for data exchange –

++ Geographical annotation and visualization for 2D & 3D
KML for earth browsers,

++ Data transfer standard for geological data and geosciences
GeoSciML for earth data, (CityGML)

++ Urban Subsurface Drainage
ASCE/EWRI 12-05, 13-05, and 14-05 Standard Guidelines for the Design of Urban Subsurface Drainage,

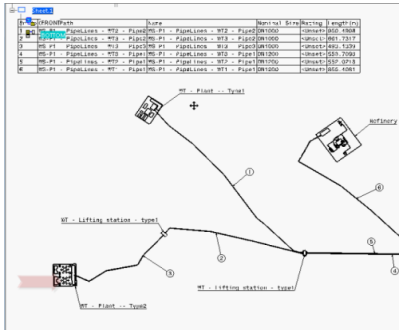
++ Physical Security of Water Utilities
ANSI/ASCE/EWRI 56-10, 57-10 Guidelines for the Physical Security of Water Utilities; Guidelines for the Physical Security of Wastewater/Stormwater Utilities.

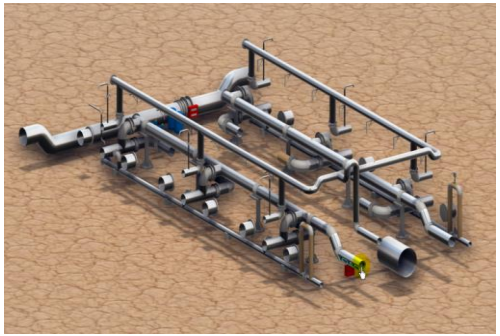
++ Systems Engineering Standard & ILCM:
ISO / IEC 15288 for Systems engineering standards, ISO 15926 for Plant data exchange,

A comprehensive interface and data standard are required to combine different utility types, geology in a collaborative environment.

Infrastructure Design + Design Analysis

Implementation example – Freshwater Intake





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KML for earth browsers,

++ Data transfer standard for geological data and geosciences
GeoSciML for earth data, (CityGML)

++ Systems Engineering Standard & ILCM:
ISO / IEC 15288 for Systems engineering standards, ISO 15926 for Plant data exchange,

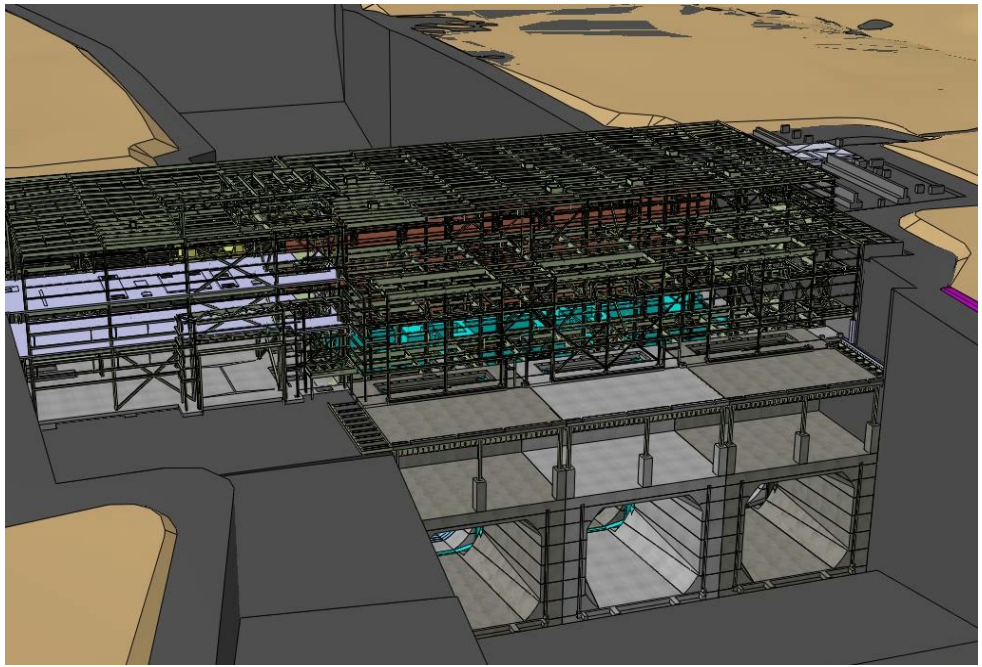
++ Existing Subsurface Utility Data
CI/ASCE 38-02 Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data,

++ Standard Guidelines for the Design, Installation, and Operation and Maintenance of Urban Infrastructure
ANSI/ASCE/EWRI 56-10, 57-10 Guidelines for the Physical Security of Water Utilities.

A comprehensive interface and data standard are required to combine different utility types, geology in a collaborative environment.

Infrastructure Design + Realization

Implementation example

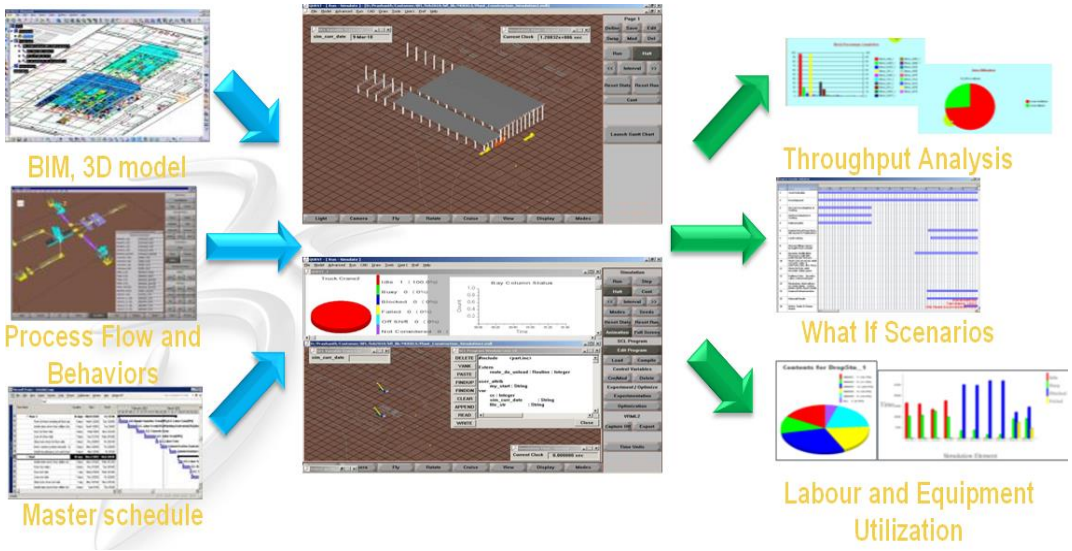


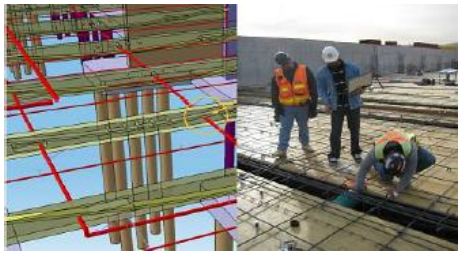
Some of the standards that can be used for partial data exchange – GeoSciML for earth data, (CityGML)
ISO 10303 STEP for mechanical data, KML for earth browsers,
ISO | IEC 15288 for Systems engineering standards,
ISO 55000 Asset Management,
ISO 15926 for Plant data exchange,

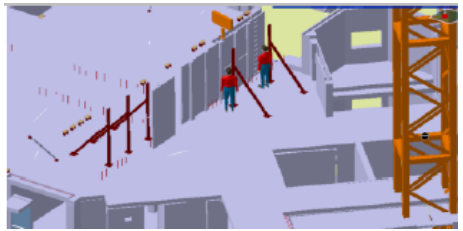
ISO 16739 and ISO 29841 for IFC BIM models.

Infrastructure Planning and Project Management

Implementation example – Maintenance Planning







Infrastructure Design + Realization

Implementation example

Currently some of the standards that can be used for partial data exchange –
KML for earth browsers, GeoSciML for earth data, CityGML
ISO 10303 STEP for mechanical data,
ISO | IEC 15288 for Systems engineering standards, ISO 55000 Asset Management,
ISO 15926 for Plant data exchange,

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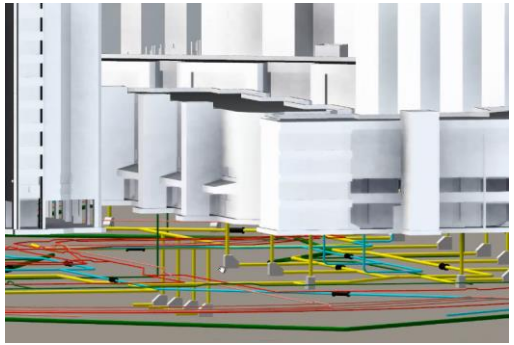
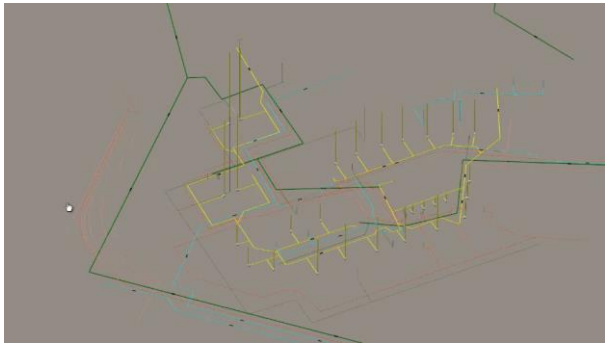
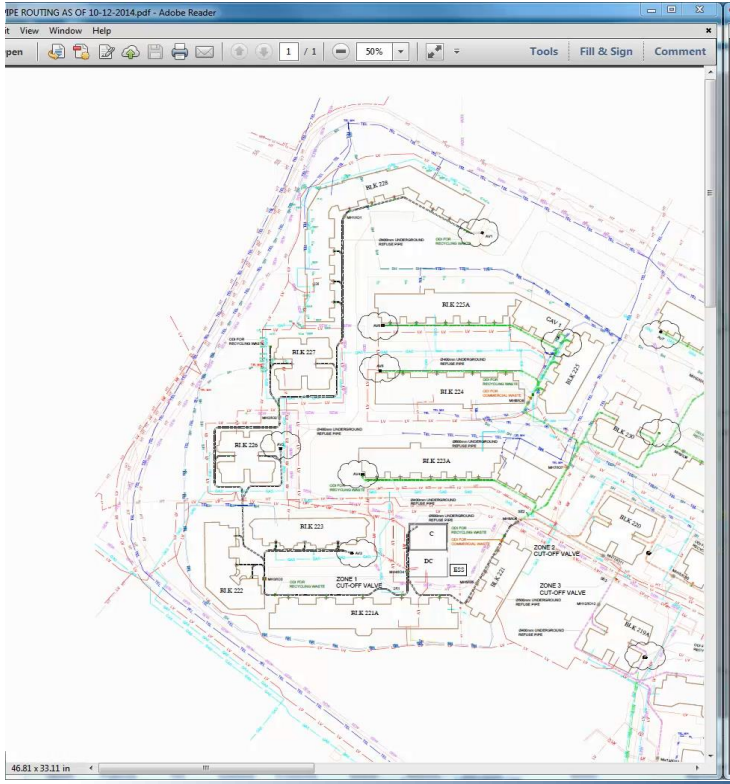




City Infrastructure Networks Model



City Infrastructure Environment Model