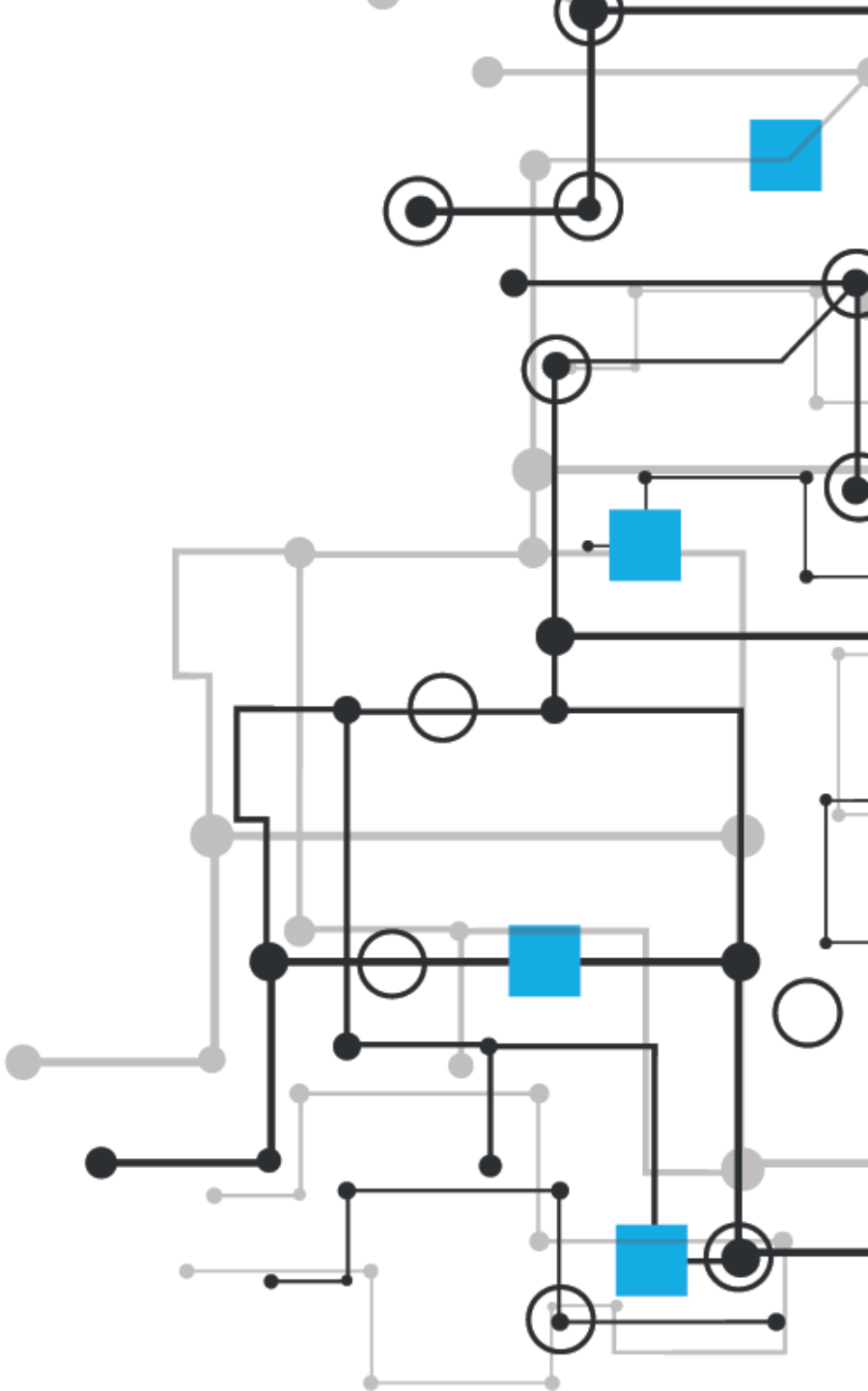
Modern Network Management

Successful implementation and integration of ArcGIS Utility Network

Jesper Vinther Christensen, CEO & Founder Similix



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Similix Introduction

2023 Infrastructure Management & GIS Conference AWARD WINNER

Esri IMGIS Conference 2021 Award Winner

Esri IMGIS Conference 2020 Award Winner

ArcGIS Utility Network SPECIALTY

- System Integrator with focus on the Energy and Utility Industry
- Founded in 2013 by Jesper Vinther Christensen
- Represents decades of experience on Esri technology, data migration, advanced integrations and software engineering
- Gold Partner with Esri, also partner with OSIsoft, SAP and Microsoft
- For the past 7 years we have implemented the ArcGIS Utility Network at utilities around the globe

esri Partner Network Gold

ArcGIS System Ready Specialty

Network Management Specialty

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Trends in Energy – Extending the Scope of GIS

Challenges	Distributed PV	EV charging	Aging infrastructure
Constraints	Labor shortage	Benchmark, quality of service	Investment limitation

ArcGIS Utility Network

+

Similix AssetBus™

- Rich network model
- Enforcing business rules and promoting data quality
- Integrating network model with planning, construction, maintenance, and operating processes

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港燈
HK Electric


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VEITUR


NORLYS


Elvia


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Elia Group


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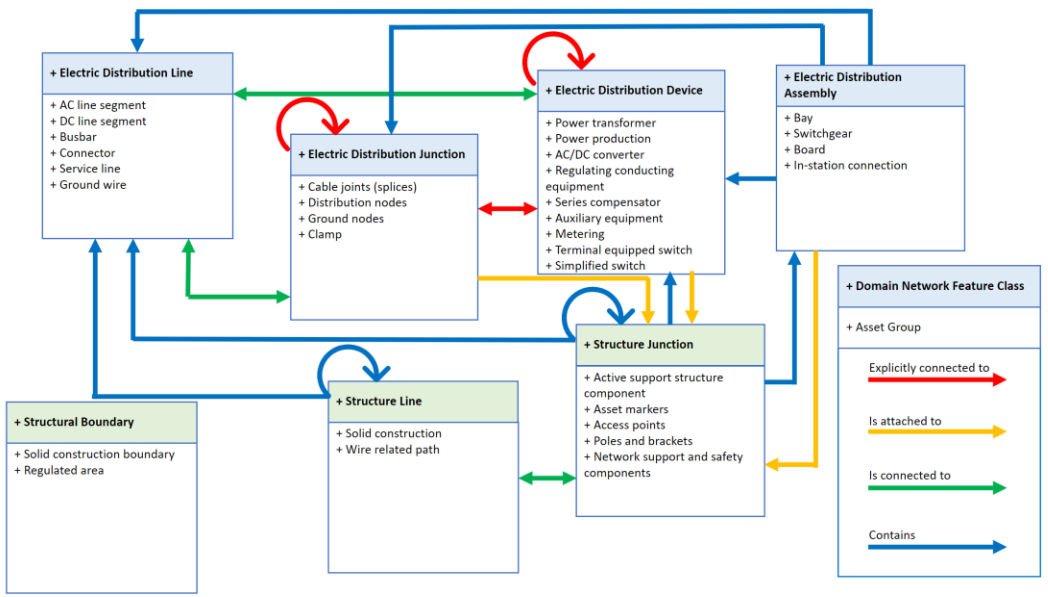
Facilitated development of open-source data model for UN – now adopted by Esri

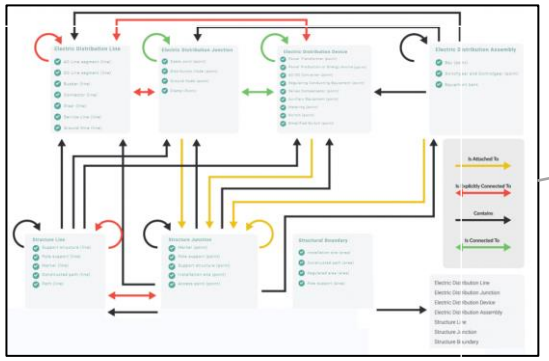


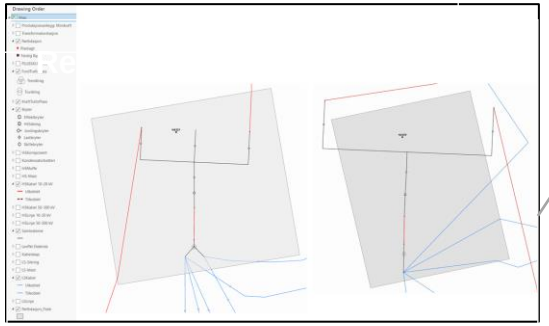
The Design Process

Requirements
- ✓ **Business processes**
- ✓ **Analytics**
- ✓ **Integrations**

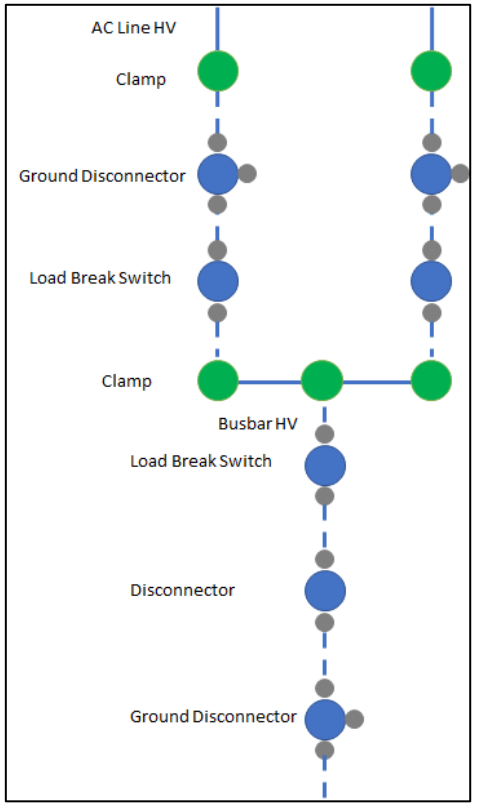
Feature class / Subtype mapping to Asset Group / Asset Type

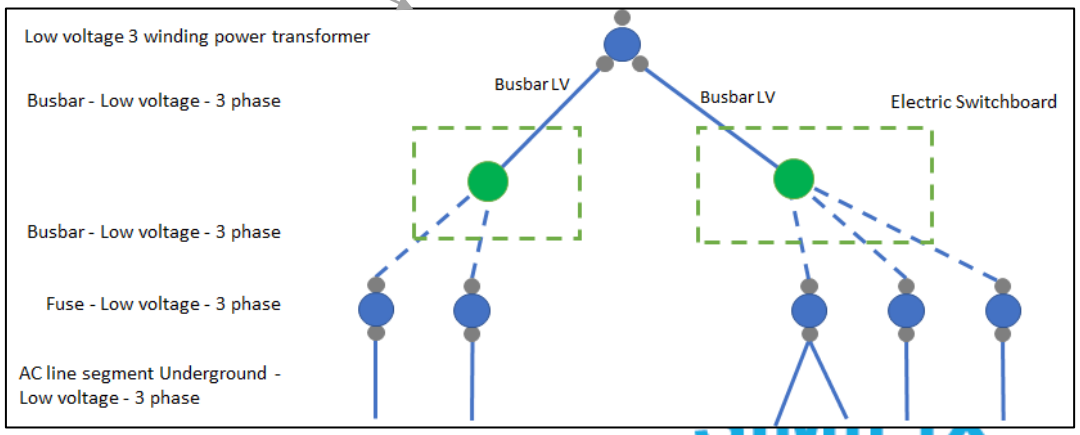
SourceTable	SourceTable Subtype	SourceTable where clause	TargetFeatureClass	TargetAssetGroup
GEONIS.Bryter		Namingconvention ref confluence	ElectricDistributionAssembly	Electric Bay
GEONIS.Koblingsanlegg	1-HS-Skinne	Kompaktanleg = Ja	ElectricDistributionAssembly	Electric Switch gear
GEONIS.Samleskinne	1-HS-Skinne	view samleskinne AND Transformer	ElectricDistributionAssembly	Electric Switch gear
GEONIS.Samleskinne	1-HS-Skinne	view samleskinne AND Transformer	ElectricDistributionAssembly	Electric Switch board
GEONIS.Samleskinne	2-LS-Skinne	view samleskinne AND Transformer	ElectricDistributionAssembly	Electric Switch board
GEONIS.Samleskinne	2-LS-Skinne	view samleskinne AND Transformer	ElectricDistributionAssembly	Electric Switch board
Geonis.Stasjon	4-Linjekryss_Distribusjon 5-Linjekryss_Regional		ElectricDistributionAssembly	Electric distribution Switching station
Geonis.Stasjon	1- Hovedstasjon		ElectricDistributionAssembly	ElectricDistributionPrimarySubstation
Geonis.Stasjon	2- Nettstasjon		ElectricDistributionAssembly	Electric distribution Secondary substation
NA			ElectricDistributionAssembly	Electric Equipment bank
NA			ElectricDistributionAssembly	Electric Equipment bank
NA			ElectricDistributionAssembly	Electric Bay
NA			ElectricDistributionAssembly	Electric Switch gear
NA			ElectricDistributionAssembly	Electric Switch board





Design Workshop





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GEONIS.Samleskinne	1-HS-Skinne	view samleskinne AND Transformer	ElectricDistributionAssembly	Electric Switch board
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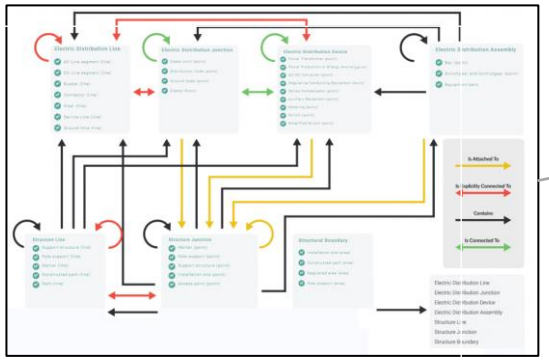
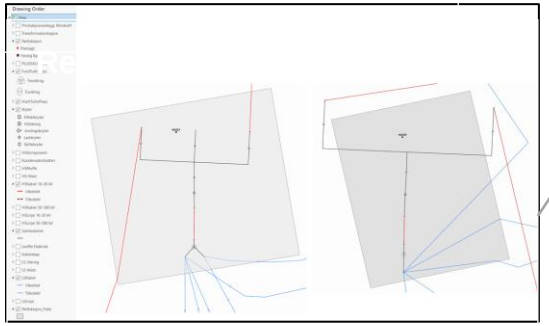
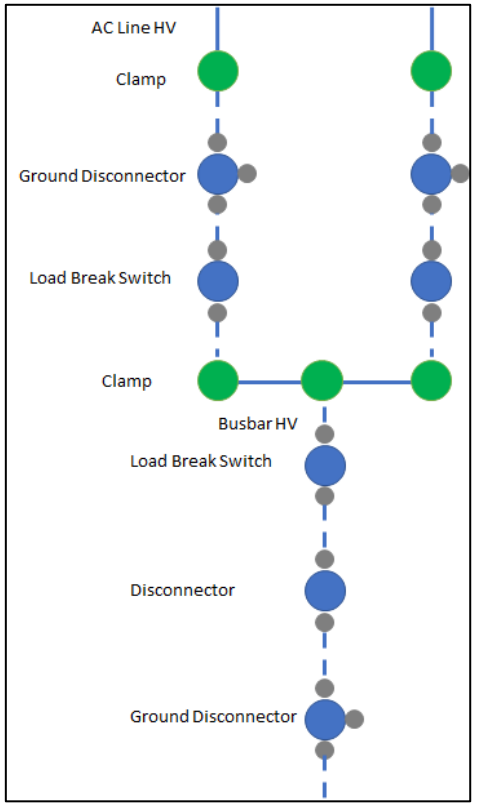
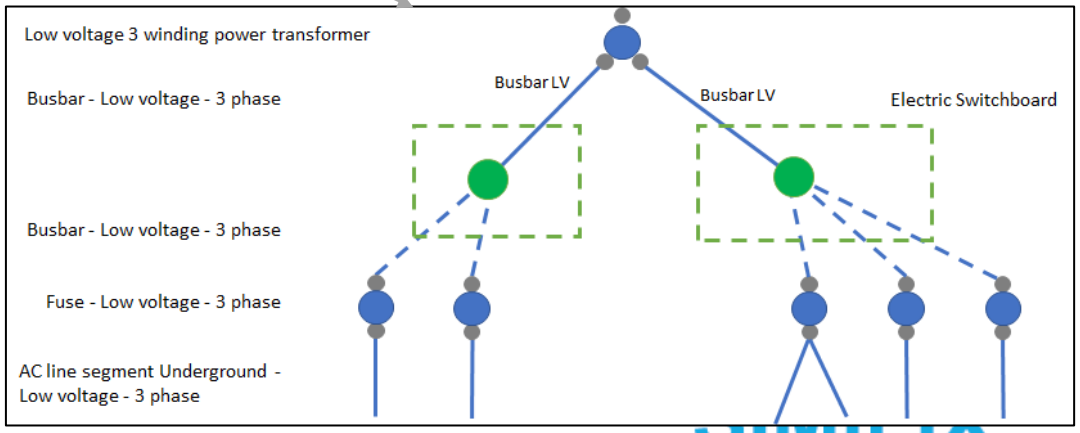




Creates Transparency
Leads to Decisions
Gives Precise Definitions





OMEGA
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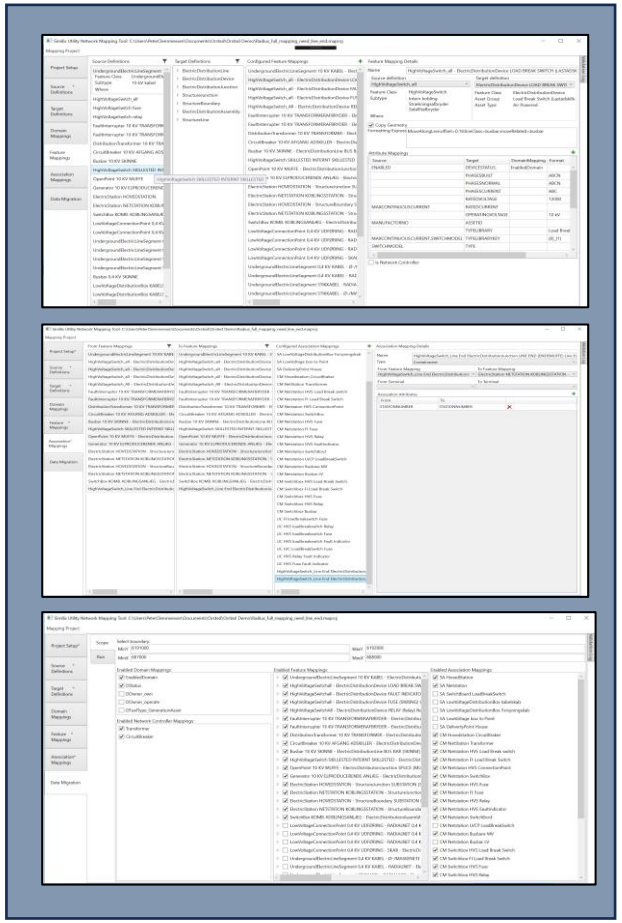
Similix Utility Network Migration Suite

- Fully configurable user-friendly GUI
- Fast iteration cycles
- Complex feature mappings and associations
- Reads data from file geodatabases and enterprise geodatabases
- Writes Asset Packages for full migrations
- Writes to feature services for sync scenarios
- Manages very large datasets



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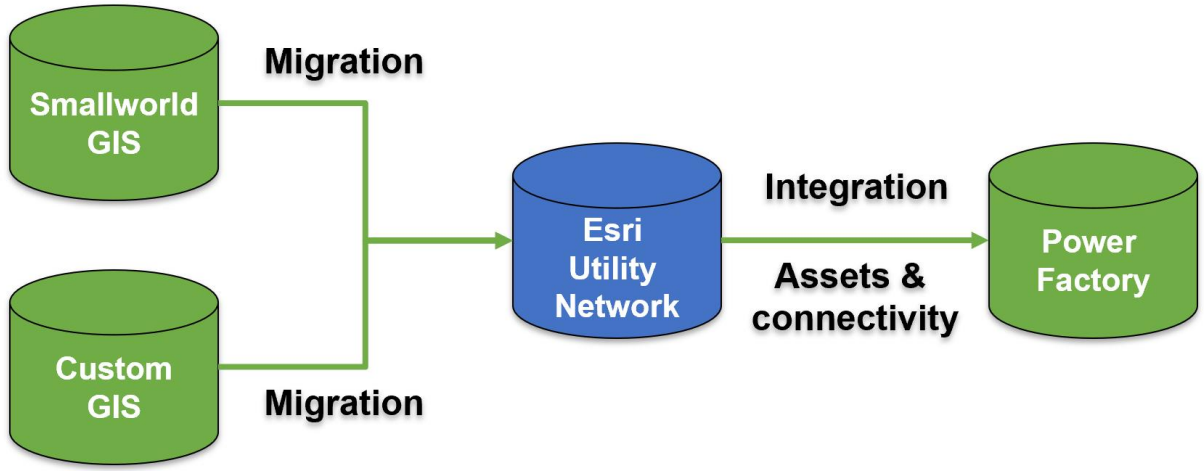
Energy Queensland UGIS Project

- Merger of Energex and Ergon
- 2.3 million customers in Australia
- Go-live August 2021
- Migrating a Smallworld and a custom build GIS to Esri Utility Network
- First UN go-live globally on a merged electric distribution GIS
- One of largest go-live globally
- Product-based migration using Similix UN Migration Suite



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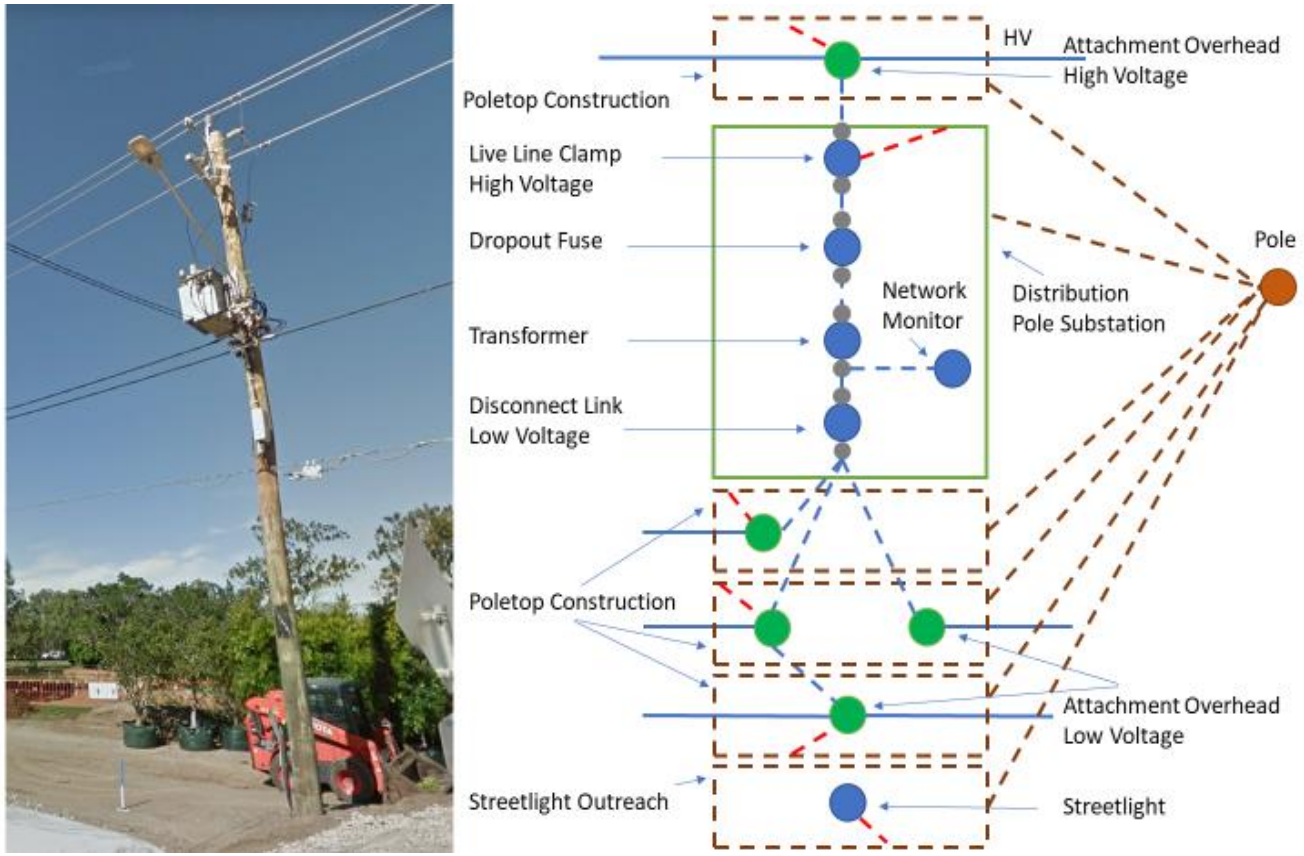
Design Examples



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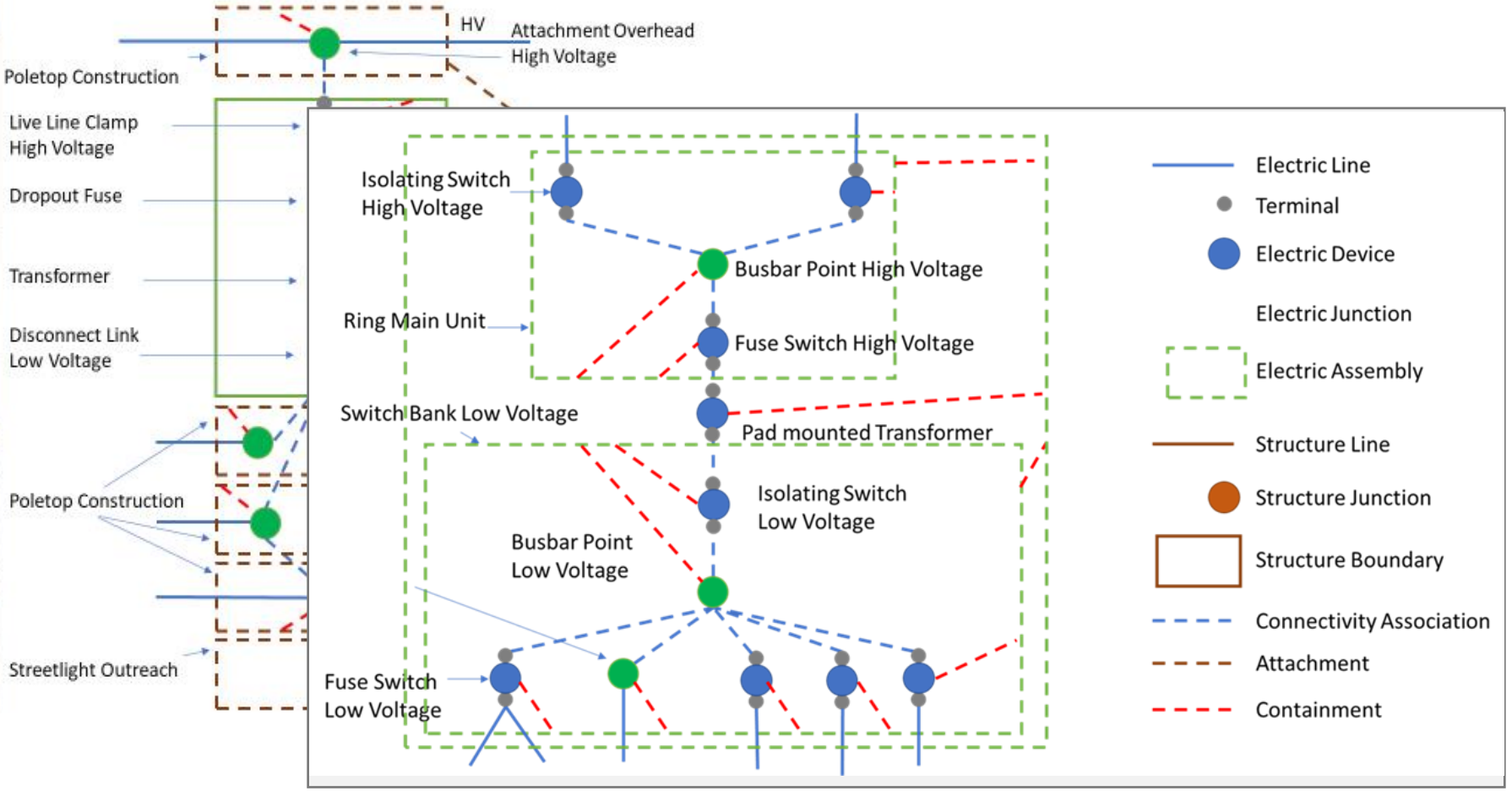
Design Examples



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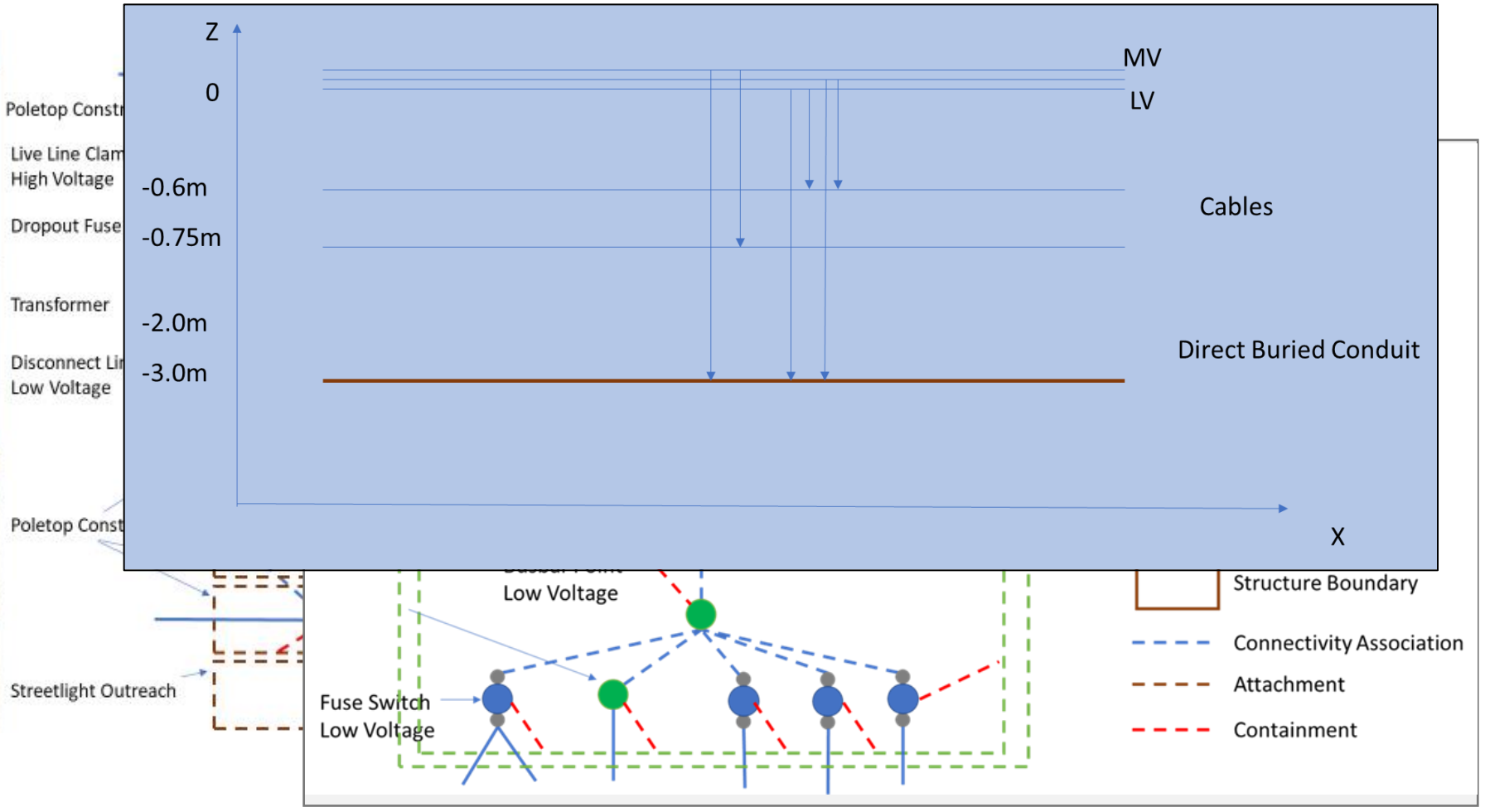
Design Examples



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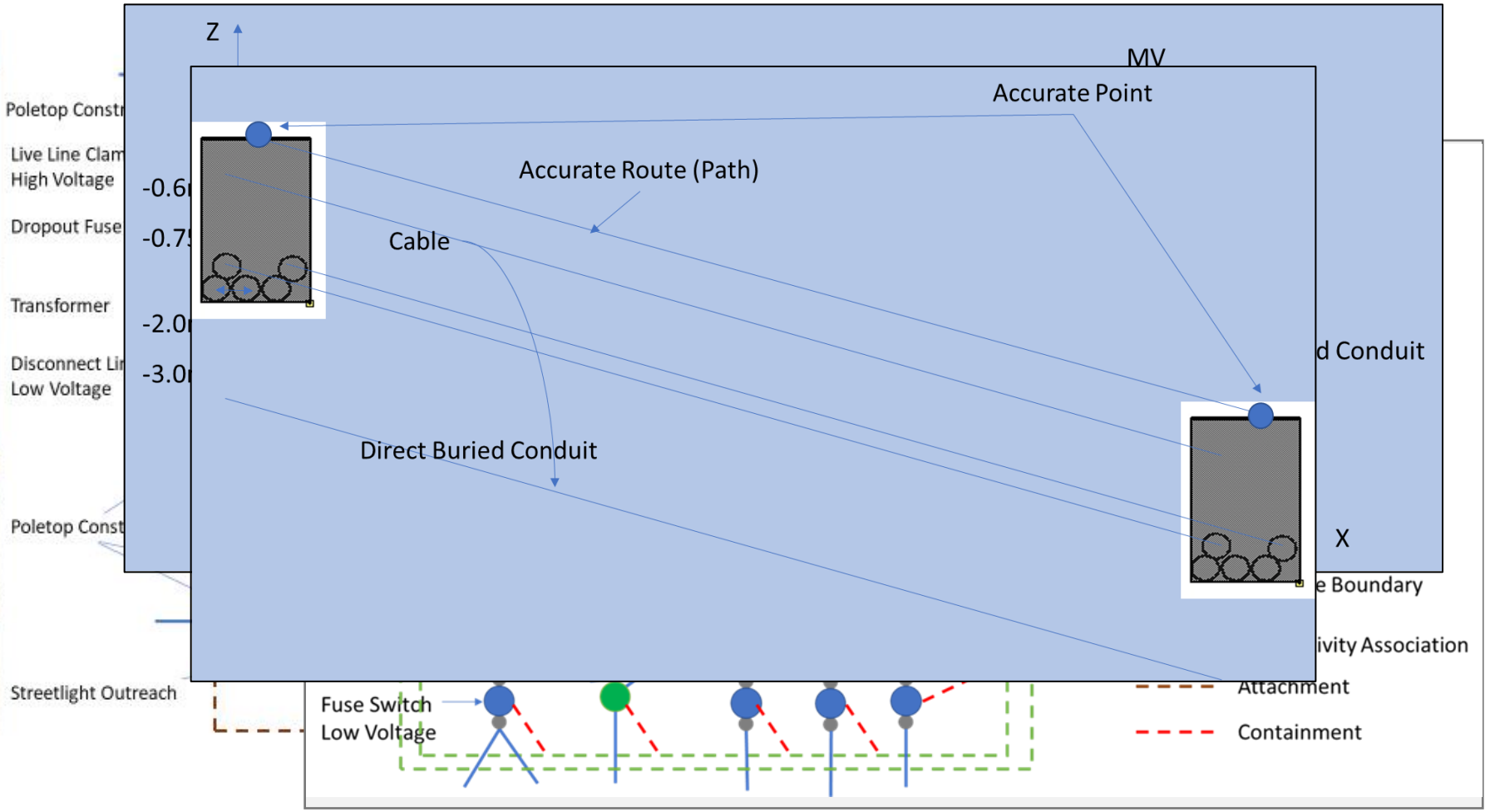
Design Examples



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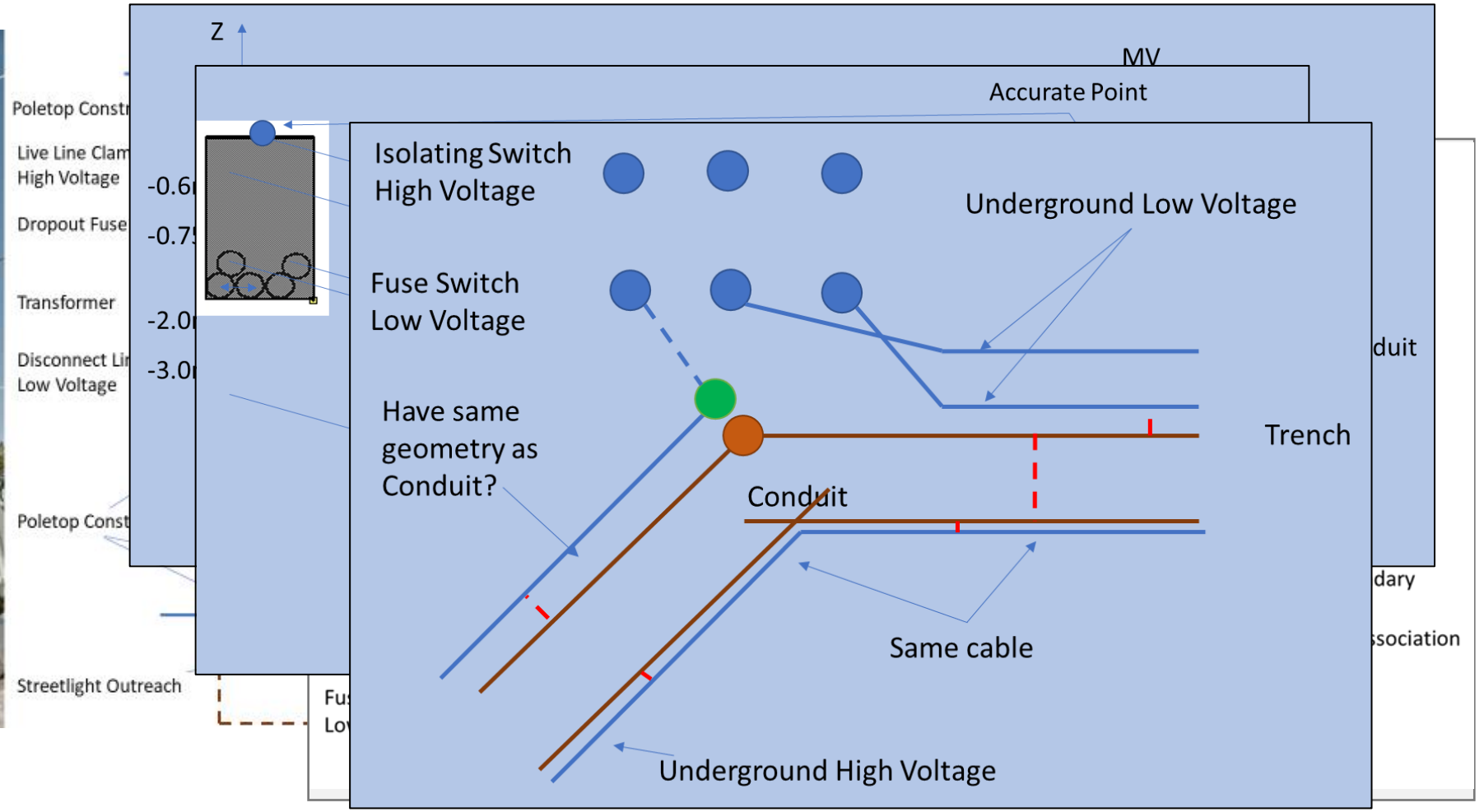
Design Examples



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Energy Queensland

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Energy Queensland

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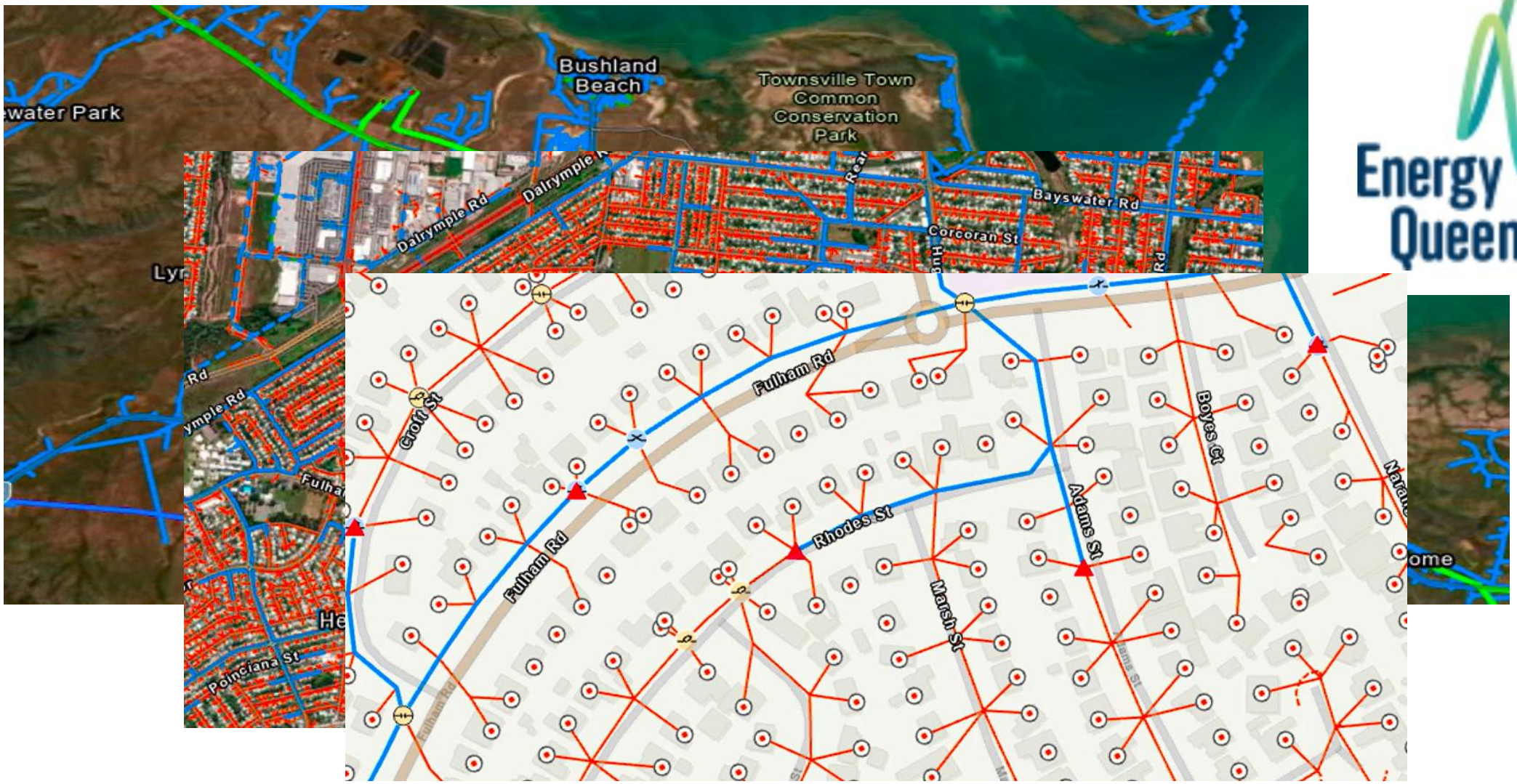

Energy Queensland

SIMILIX
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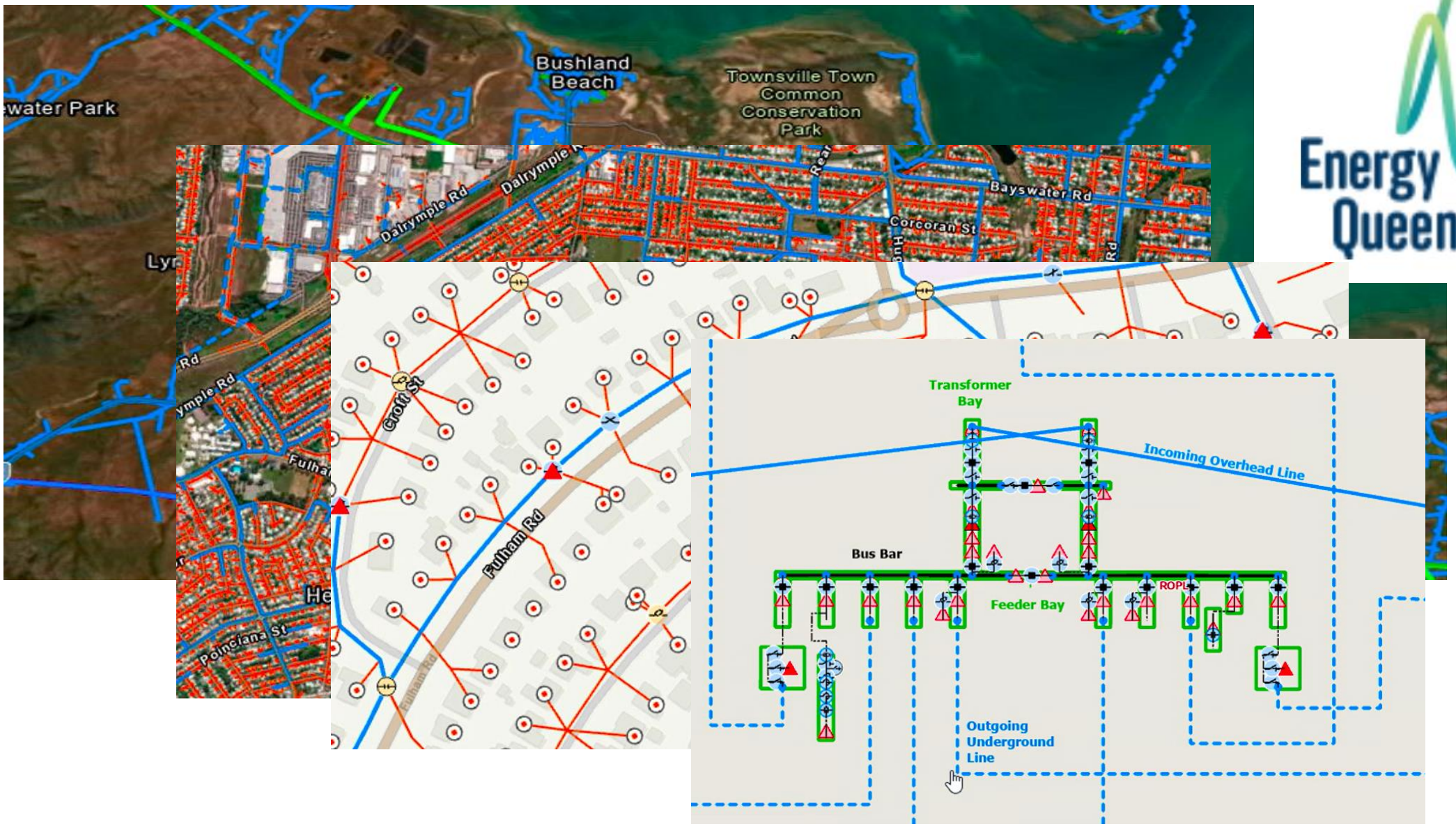

Energy Queensland

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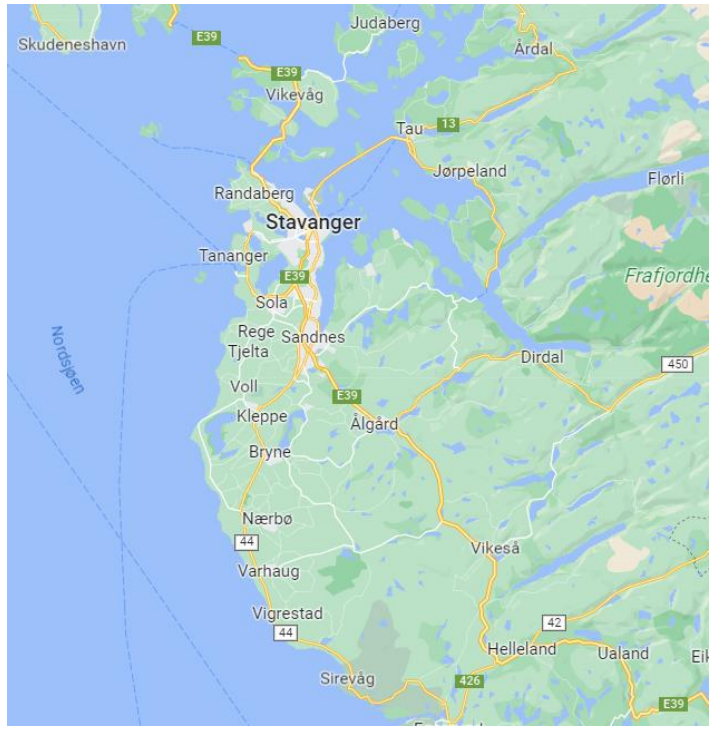

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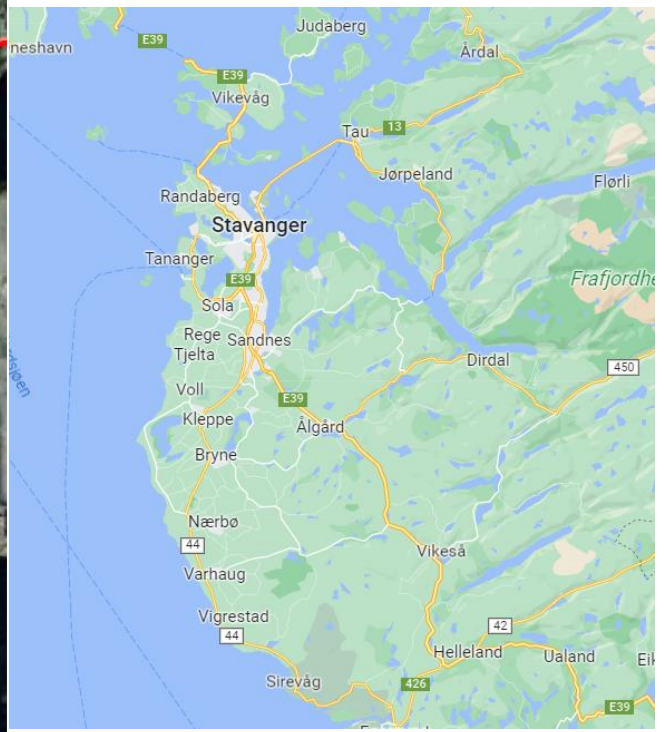

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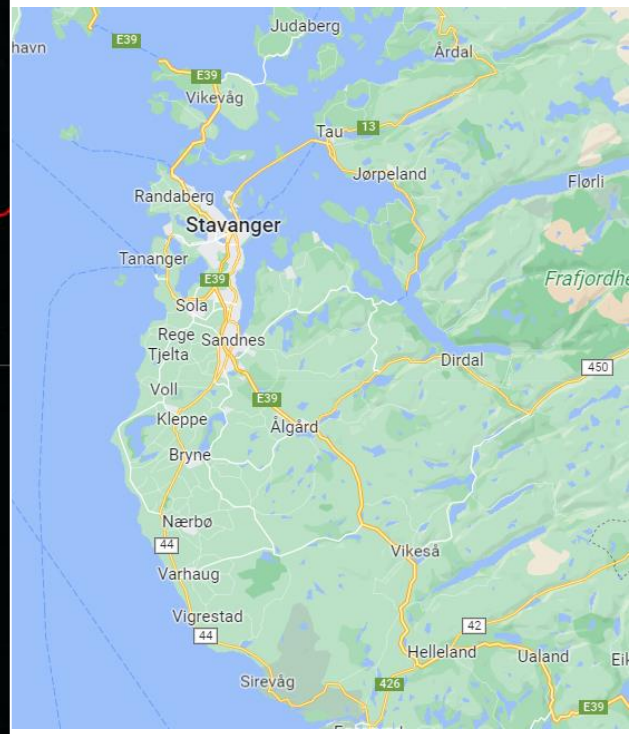

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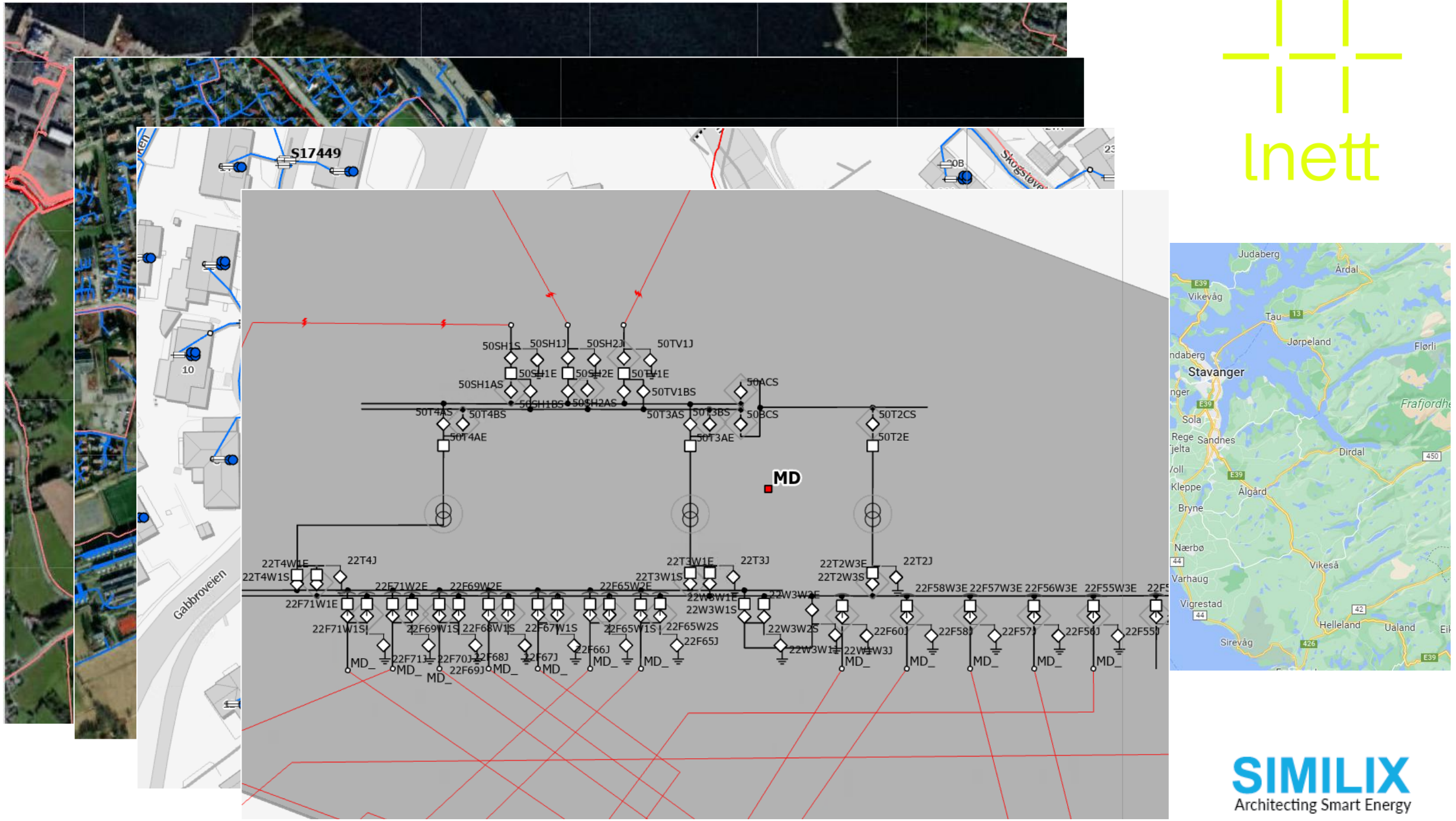

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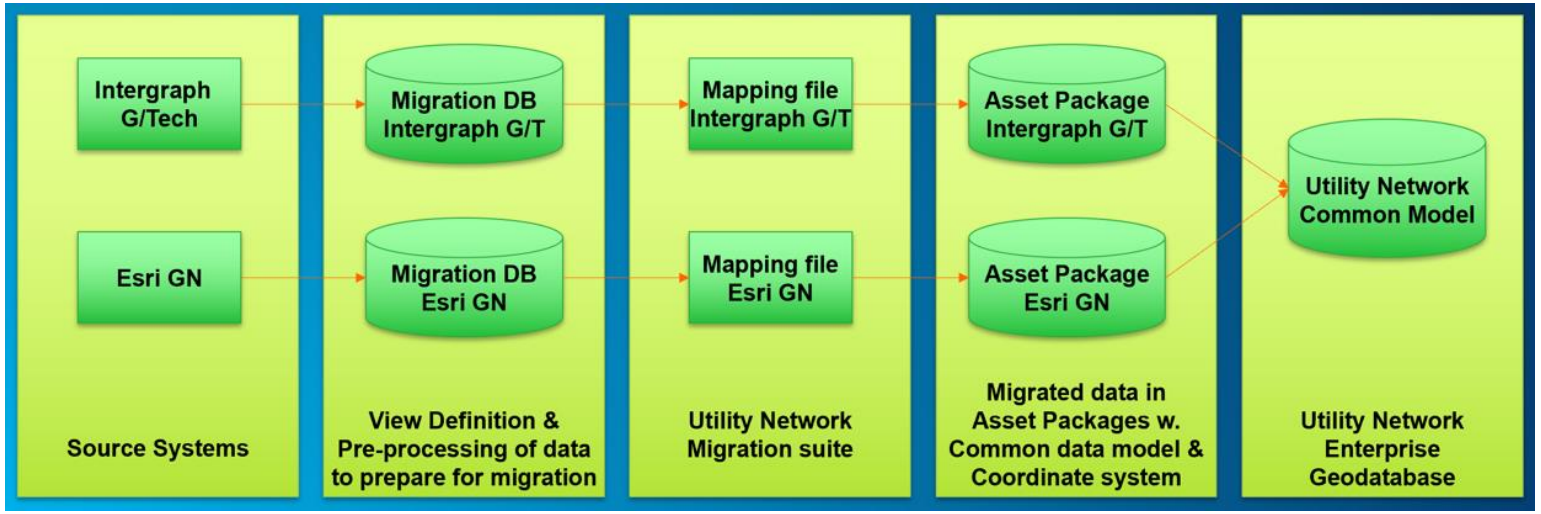
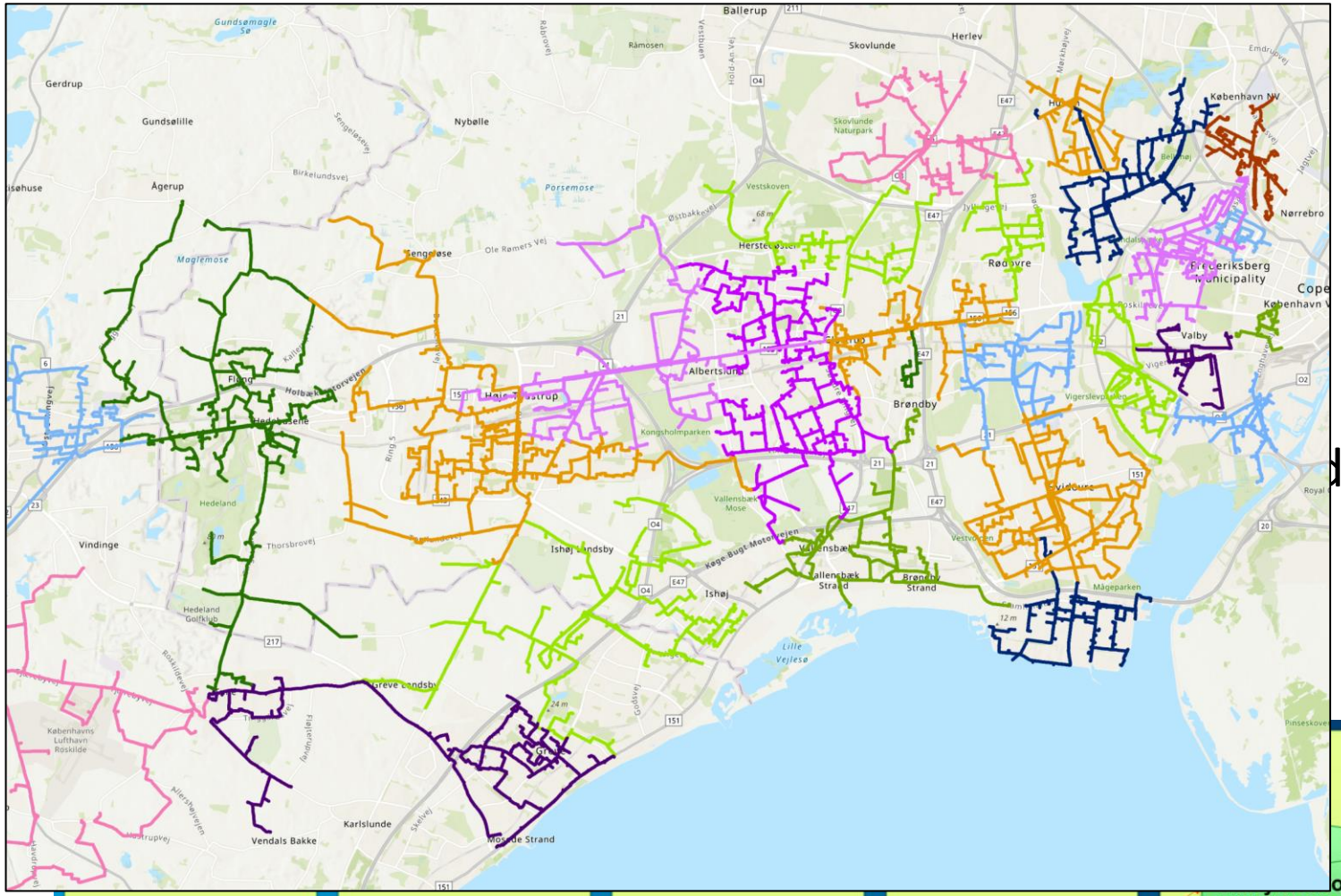
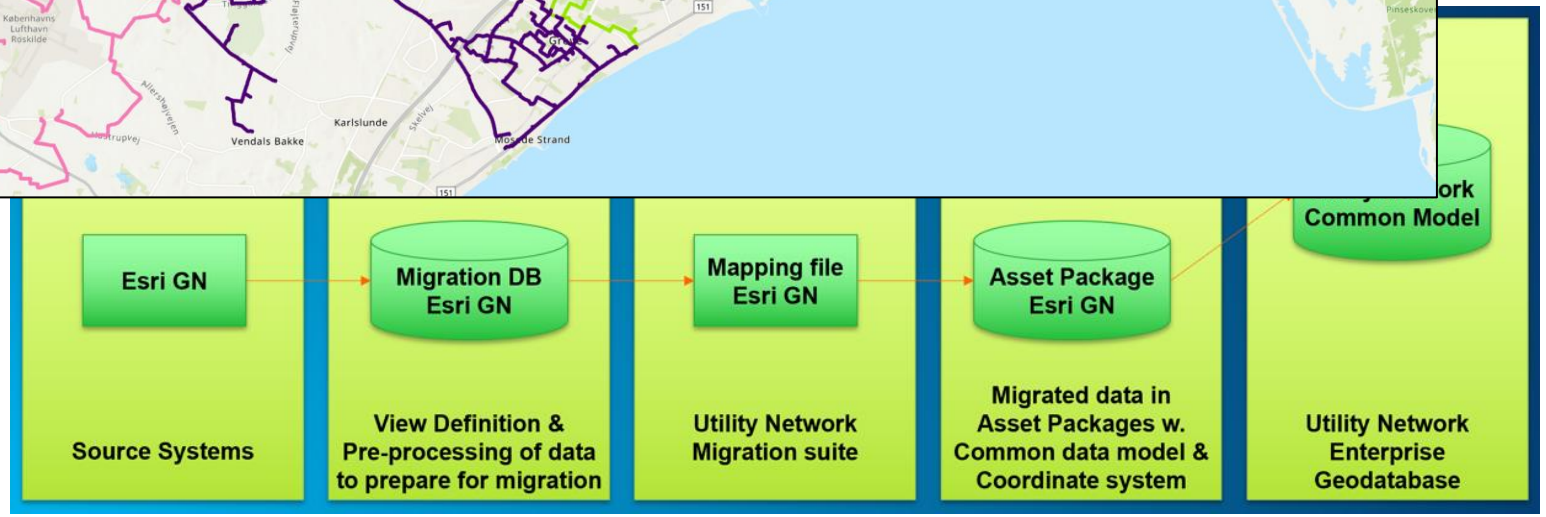
Andel Utility Network project

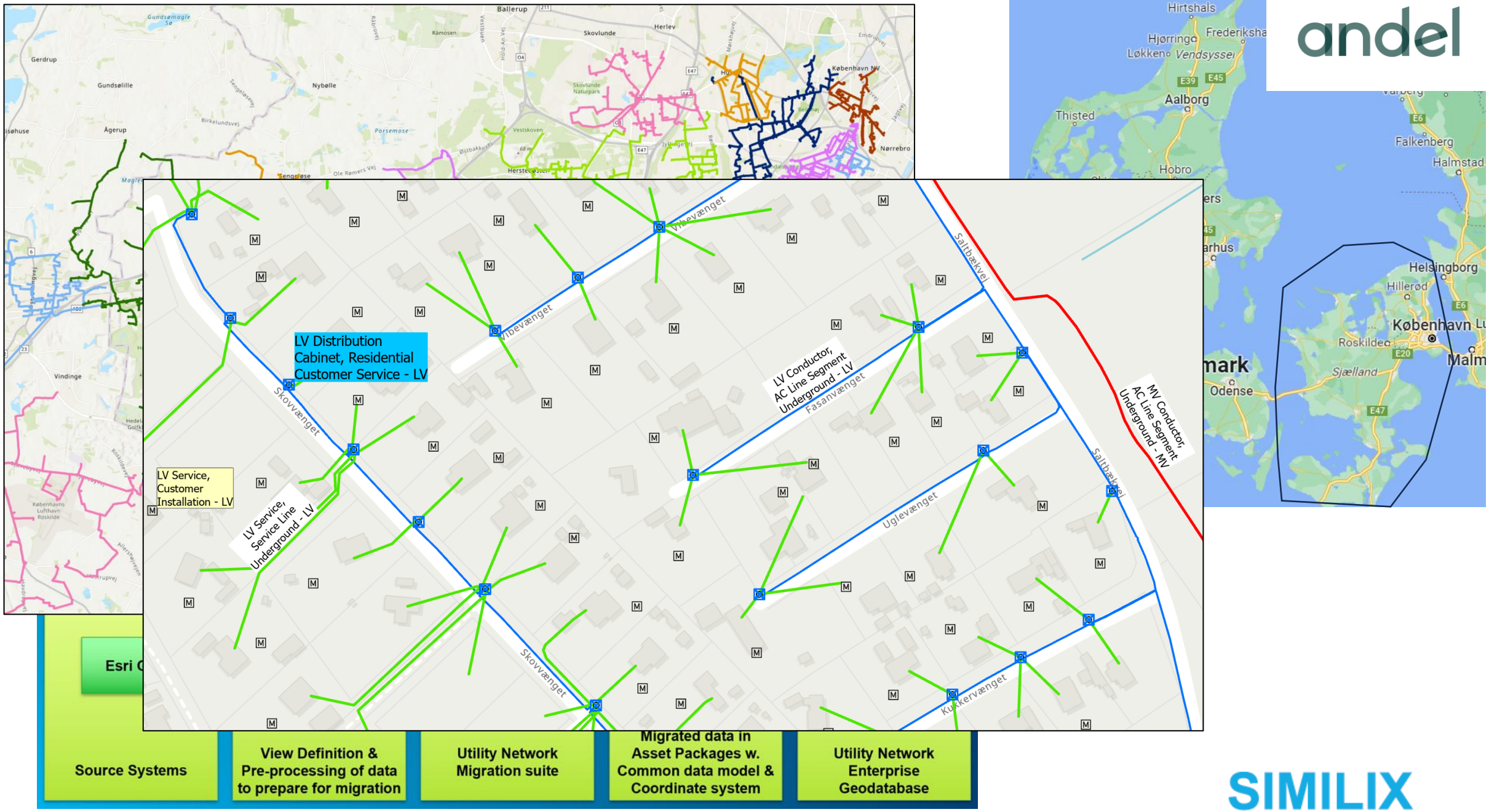
- Merge of Radius and Cerius network into one Utility Network
- Combined 1.5 million meters
- Migration started august 2022 and go-live is planned for February 2023
- Includes integrations with SAP, SE ADMS and PSI




Ballerup
Skovlunde
Herlev
Gerdrup
Gundsølille
Nybølle
Ågerup
Tange Sø
Maglemose
Porsemose
Albertslund
Brøndby
Ishøj
Vallensbæk
Hedeland
Vindinge
Karlslunde
Vendals Bakke
Valby
Nørrebro
Frederiksberg Municipality


Skagen
Hirtshals
Hjørring
Frederikshavn
Løkken
Vendsyssel
Aalborg
Thisted
Hobro
Skive
Viborg
Randers
Silkeborg
Herning
Aarhus
Horsens
Billund
Vejle
Esbjerg
Kolding
Danmark
Odense
Nationalpark Vadehavet
Flensborg
Helsingborg
Hillerød
København
Roskilde
Sjælland
Falkenberg
Halmstad
E45
E39
E6
E20
E47


Esri GN
Migration DB Esri GN
Mapping file Esri GN
Asset Package Esri GN
Common Model
Source Systems
View Definition & Pre-processing of data to prepare for migration
Utility Network Migration suite
Migrated data in Asset Packages w. Common data model & Coordinate system
Utility Network Enterprise Geodatabase


LV Distribution Cabinet, Residential Customer Service - LV
LV Service, Customer Installation - LV
LV Service, Service Line Underground - LV
LV Conductor, AC Line Segment Underground - LV
MV Conductor, AC Line Segment Underground - MV
Vibevænget
Skovvænget
Fasanvænget
Ugievænget
Kukkervænget
Saltbækvej
Esri C
Source Systems
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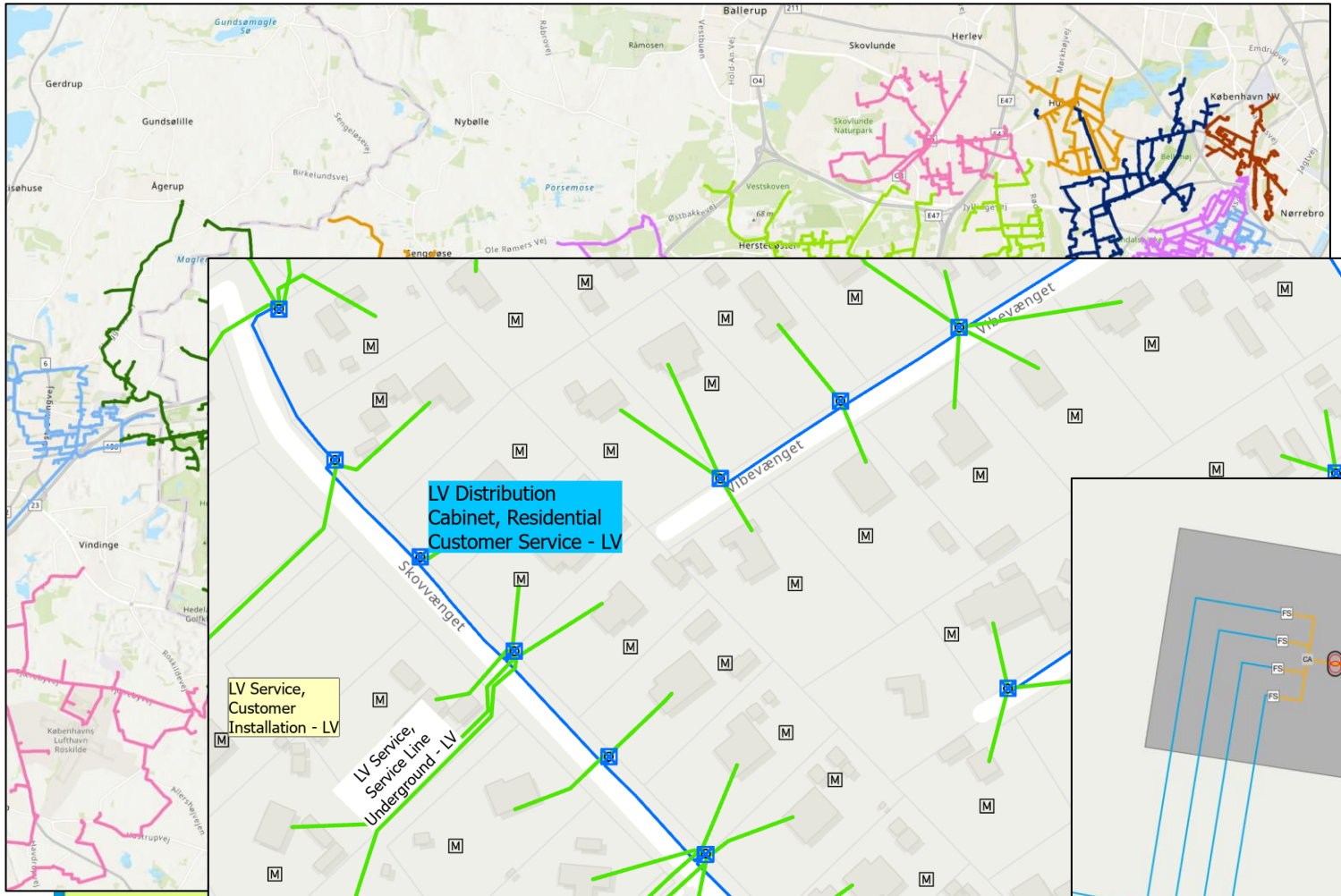

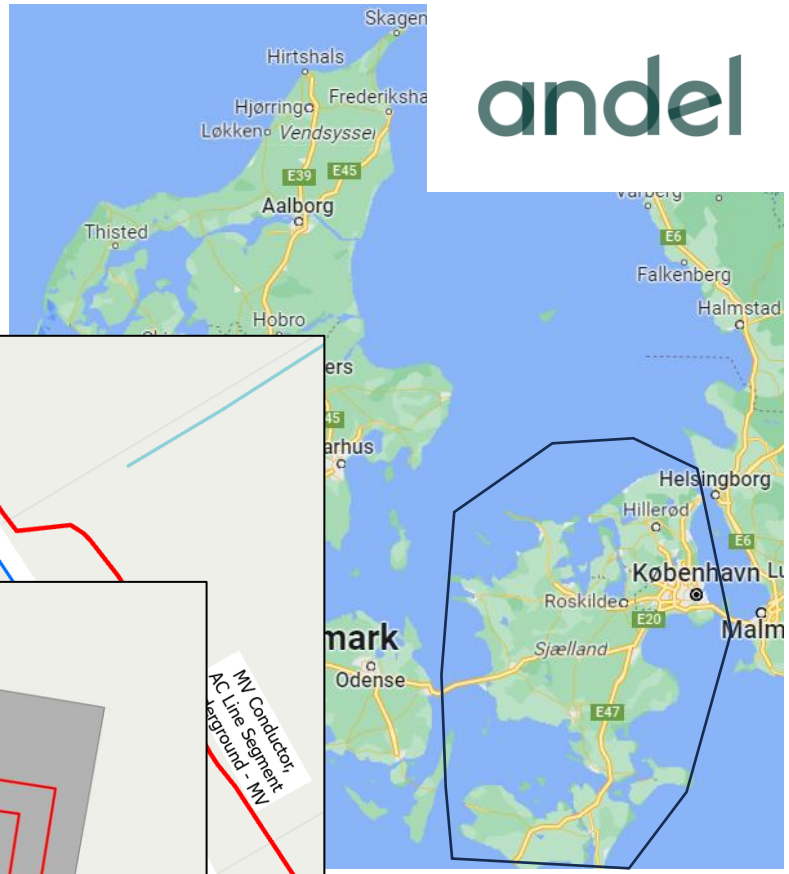

Esri G

Source Systems

View Definition & Pre-processing of data to prepare for migration

Utility Network Migration suite

Migrated data Asset Packages Common data model & Coordinate system

Enterprise Geodatabase

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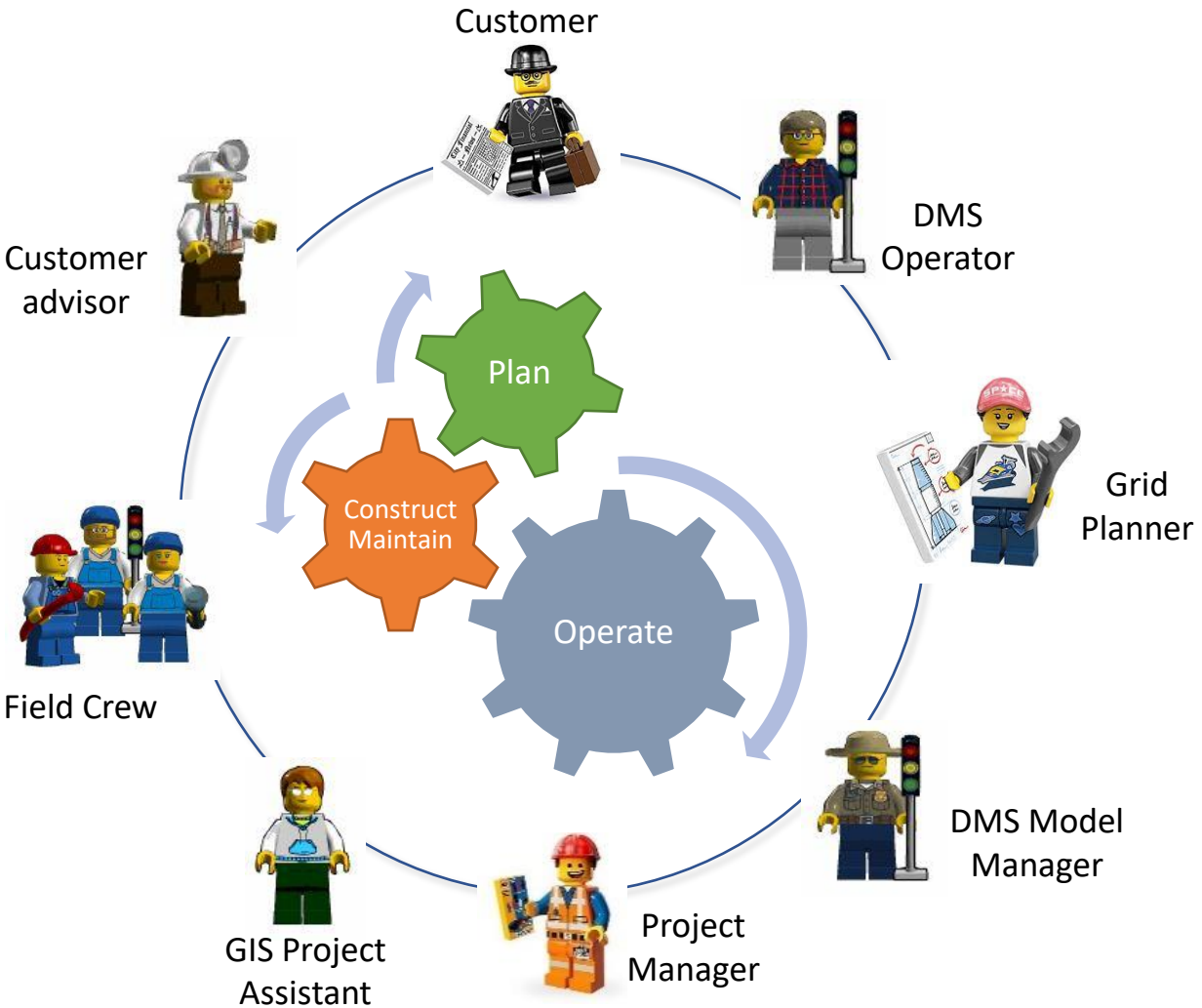
Integrated Business Processes - Collaboration



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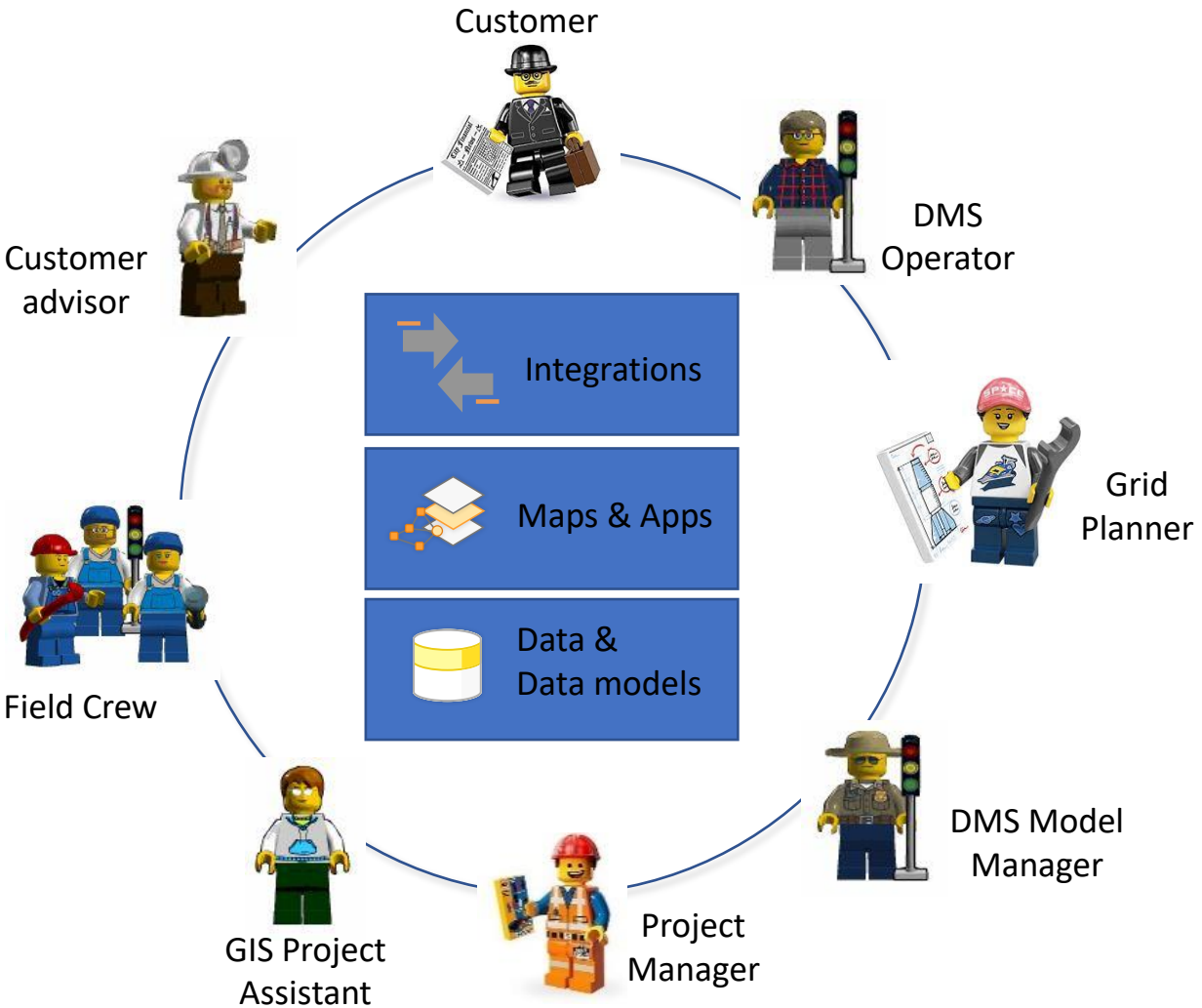
Integrated Business Processes – Sharing Information



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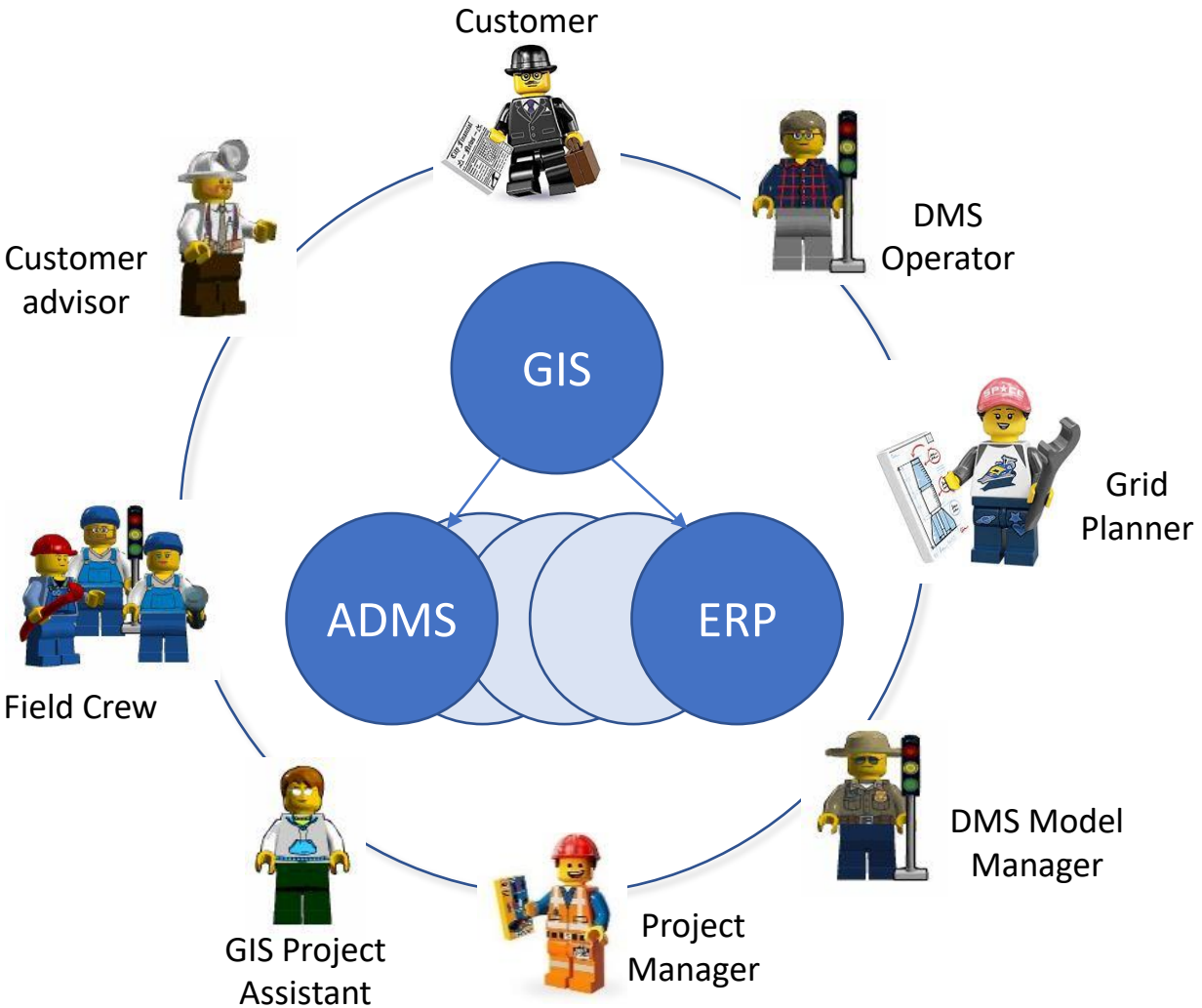
Integrated Business Processes – System Integration



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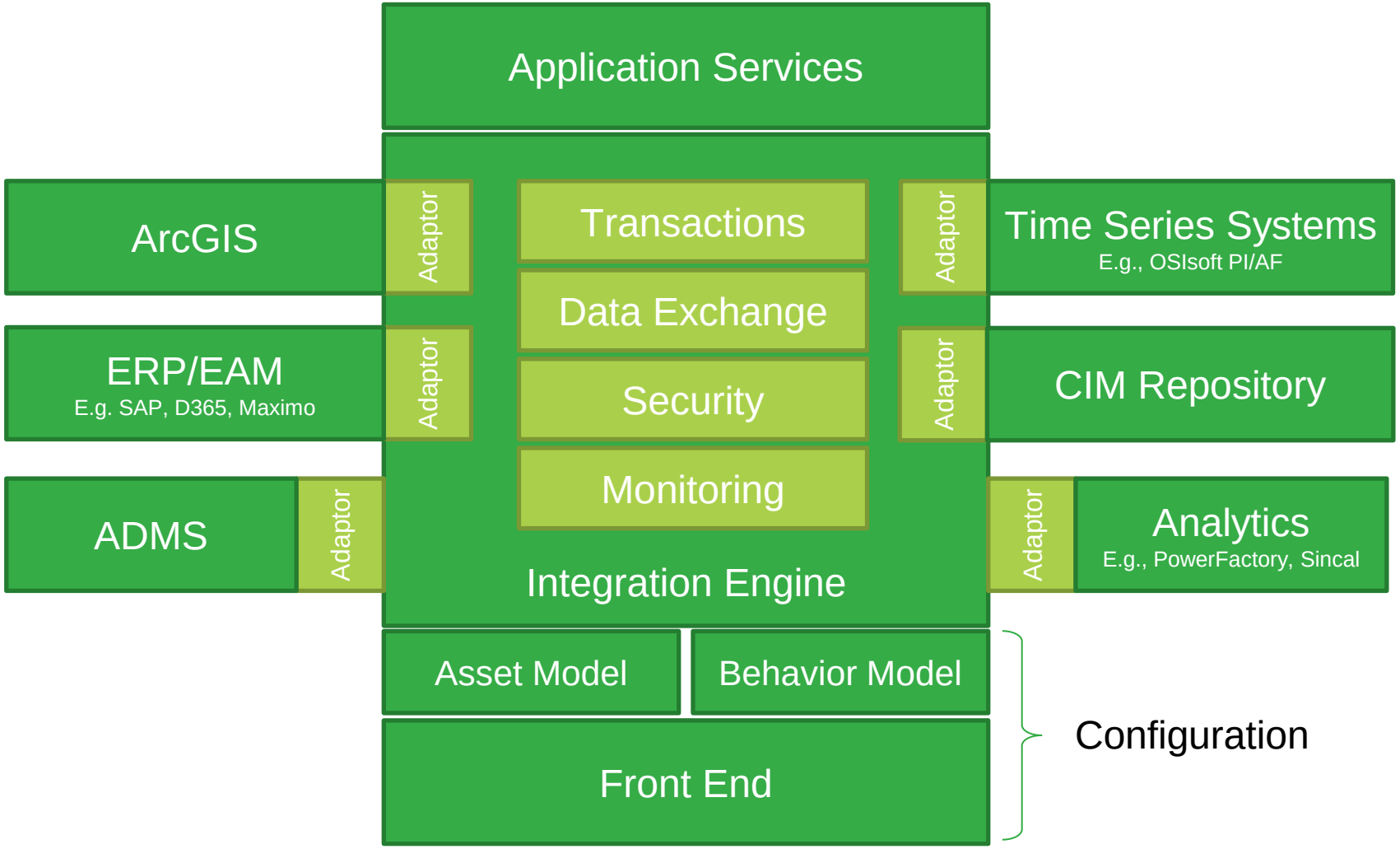
Similix AssetBus™ - Architectural Vision



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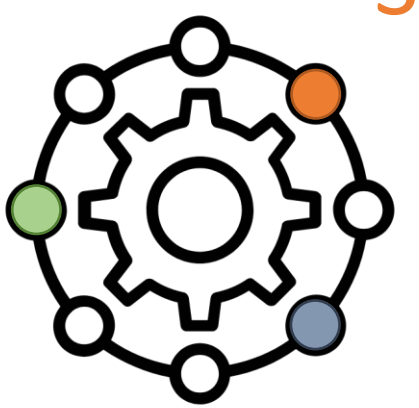
Three AssetBus™ Technologies

Similix Sync Engine



Similix CIM Adaptor

Similix Integration Services

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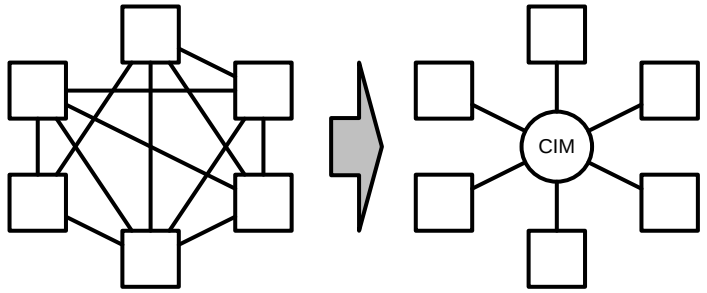
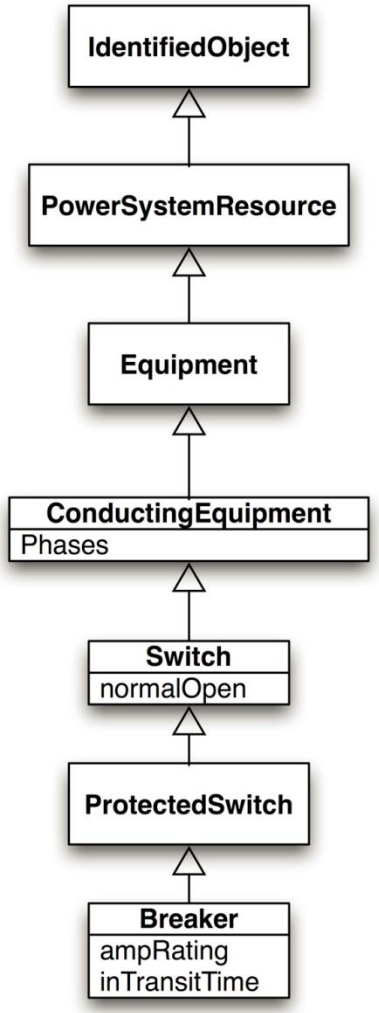
CIM in one page



- Common Information Model (CIM) is a semantic model describing the components and structure of electric power systems
- It is specified in the IEC 61970 (Transmission) and 61968 (Distribution) standards. Using UML as the specification language
- Uses XML and RDF (Resource Description Framework) to encapsulate descriptions of e.g. electric networks
- CIM profiles are used to define a subset of the CIM-model relevant to specific usages of the standards
- Profiles can also be used to extend the CIM model to fit specific needs



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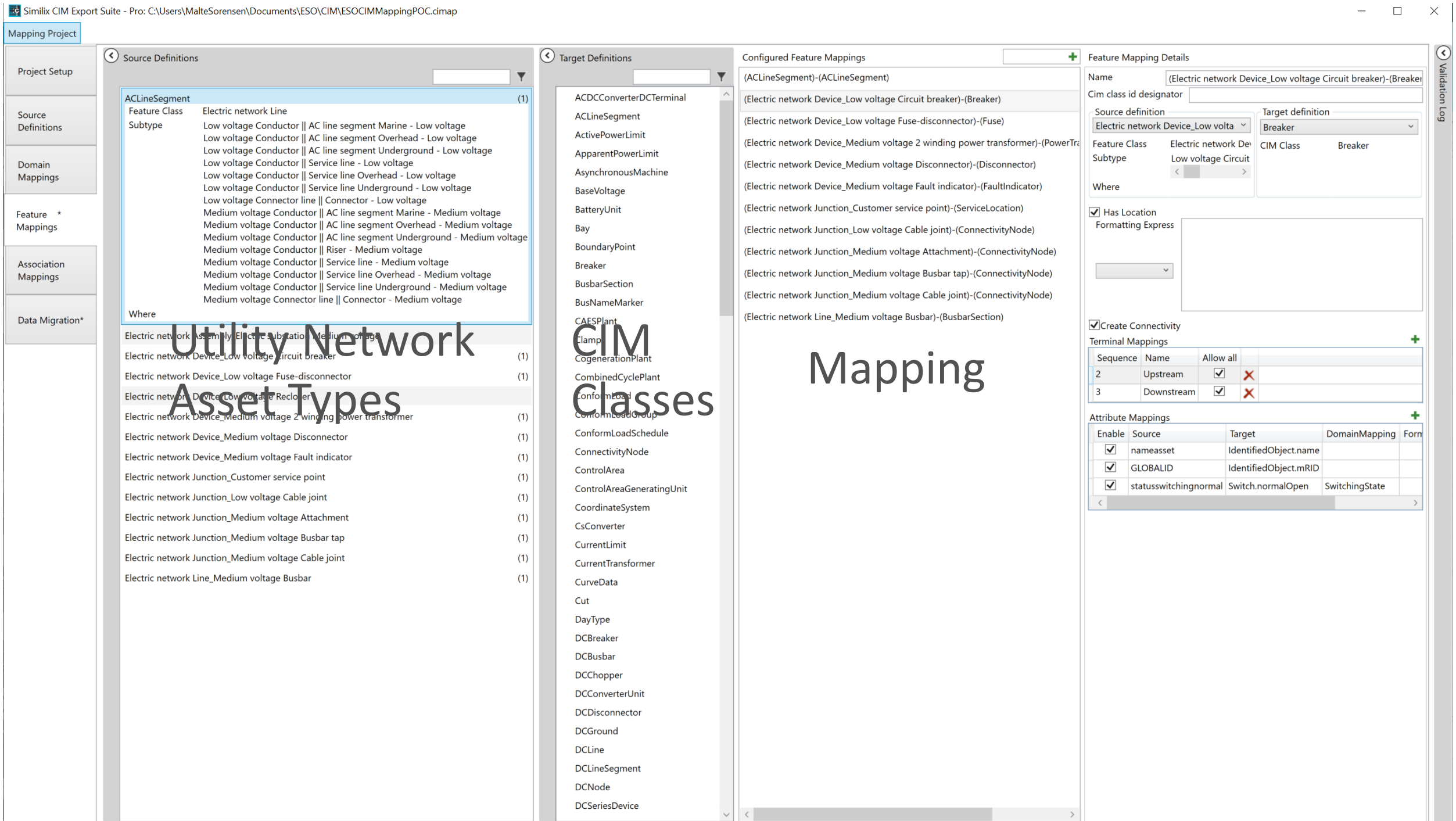
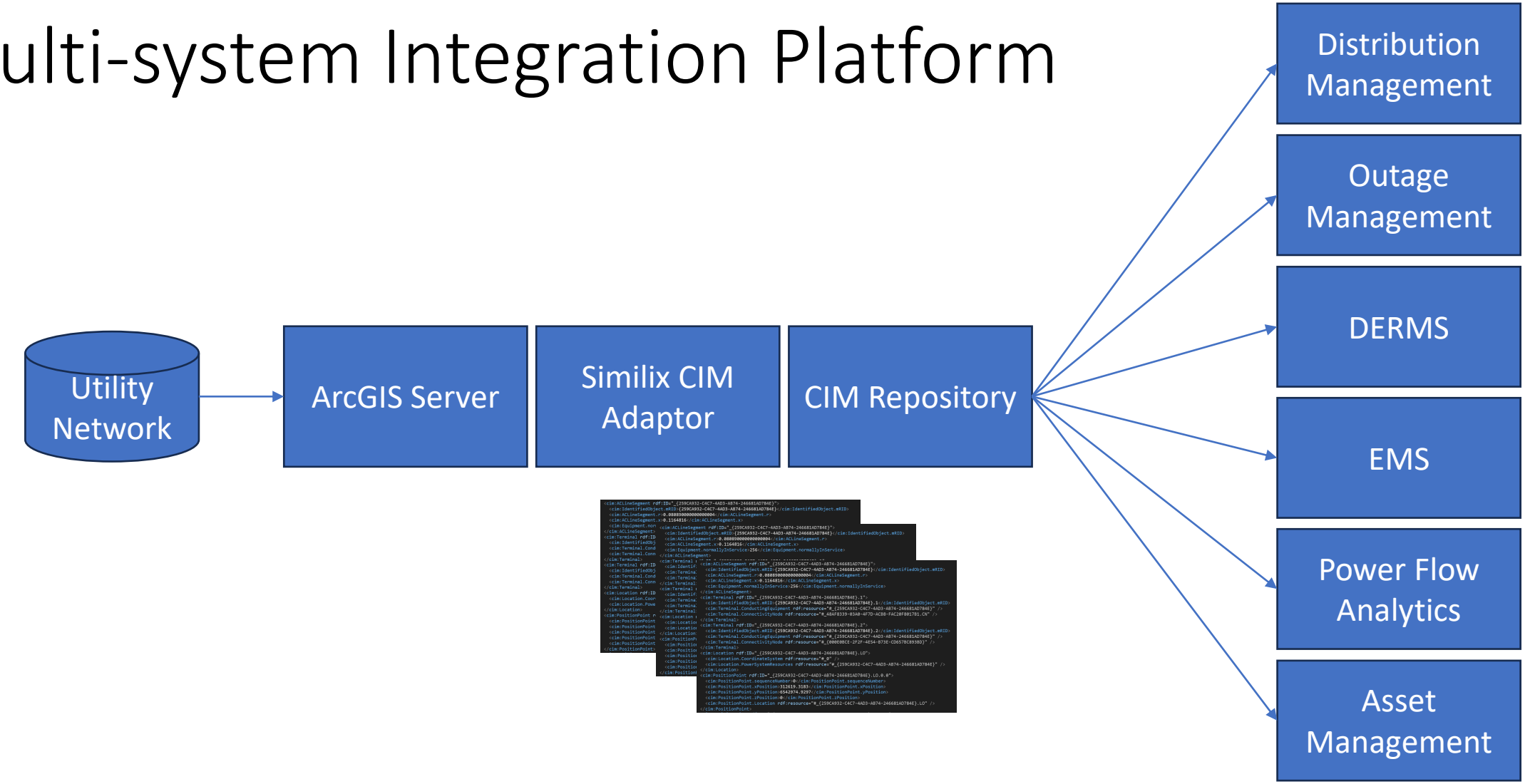

Similix CIM Export Suite - Pro: C:\Users\MalteSorensen\Documents\ESO\CIM\ESOCIMMappingPOC.cimap
Mapping Project
Project Setup
Source Definitions
Domain Mappings
Feature * Mappings
Association Mappings
Data Migration*
Source Definitions
ACLineSegment (1)
Feature Class Electric network Line
Subtype
Low voltage Conductor || AC line segment Marine - Low voltage
Low voltage Conductor || AC line segment Overhead - Low voltage
Low voltage Conductor || AC line segment Underground - Low voltage
Low voltage Conductor || Service line - Low voltage
Low voltage Conductor || Service line Overhead - Low voltage
Low voltage Conductor || Service line Underground - Low voltage
Low voltage Connector line || Connector - Low voltage
Medium voltage Conductor || AC line segment Marine - Medium voltage
Medium voltage Conductor || AC line segment Overhead - Medium voltage
Medium voltage Conductor || AC line segment Underground - Medium voltage
Medium voltage Conductor || Riser - Medium voltage
Medium voltage Conductor || Service line - Medium voltage
Medium voltage Conductor || Service line Overhead - Medium voltage
Medium voltage Conductor || Service line Underground - Medium voltage
Medium voltage Connector line || Connector - Medium voltage
Where
Utility Network
Asset Types
Electric network Device_Low voltage Circuit breaker (1)
Electric network Device_Low voltage Fuse-disconnector (1)
Electric network Device_Medium voltage 2 winding power transformer (1)
Electric network Device_Medium voltage Disconnector (1)
Electric network Device_Medium voltage Fault indicator (1)
Electric network Junction_Customer service point (1)
Electric network Junction_Low voltage Cable joint (1)
Electric network Junction_Medium voltage Attachment (1)
Electric network Junction_Medium voltage Busbar tap (1)
Electric network Junction_Medium voltage Cable joint (1)
Electric network Line_Medium voltage Busbar (1)
Target Definitions
ACDCConverterDCTerminal
ACLineSegment
ActivePowerLimit
ApparentPowerLimit
AsynchronousMachine
BaseVoltage
BatteryUnit
Bay
BoundaryPoint
Breaker
BusbarSection
BusNameMarker
CAESPlant
Clamp
CogenerationPlant
CombinedCyclePlant
ConformLoad
ConformLoadGroup
ConformLoadSchedule
ConnectivityNode
ControlArea
ControlAreaGeneratingUnit
CoordinateSystem
CsConverter
CurrentLimit
CurrentTransformer
CurveData
Cut
DayType
DCBreaker
DCBusbar
DCChopper
DCConverterUnit
DCDisconnector
DCGround
DCLine
DCLineSegment
DCNode
DCSeriesDevice
CIM
Classes
Configured Feature Mappings
(ACLineSegment)-(ACLineSegment)
(Electric network Device_Low voltage Circuit breaker)-(Breaker)
(Electric network Device_Low voltage Fuse-disconnector)-(Fuse)
(Electric network Device_Medium voltage 2 winding power transformer)-(PowerTra
(Electric network Device_Medium voltage Disconnector)-(Disconnector)
(Electric network Device_Medium voltage Fault indicator)-(FaultIndicator)
(Electric network Junction_Customer service point)-(ServiceLocation)
(Electric network Junction_Low voltage Cable joint)-(ConnectivityNode)
(Electric network Junction_Medium voltage Attachment)-(ConnectivityNode)
(Electric network Junction_Medium voltage Busbar tap)-(ConnectivityNode)
(Electric network Junction_Medium voltage Cable joint)-(ConnectivityNode)
(Electric network Line_Medium voltage Busbar)-(BusbarSection)
Mapping
Feature Mapping Details
Name (Electric network Device_Low voltage Circuit breaker)-(Breaker
Cim class id designator
Source definition
Electric network Device_Low volta
Feature Class Electric network Dev
Subtype Low voltage Circuit
Where
Target definition
Breaker
CIM Class Breaker
Has Location
Formatting Express
Create Connectivity
Terminal Mappings
Sequence Name Allow all
2 Upstream
3 Downstream
Attribute Mappings
Enable Source Target DomainMapping Form
nameasset IdentifiedObject.name
GLOBALID IdentifiedObject.mRID
statusswitchingnormal Switch.normalOpen SwitchingState
Validation Log

CIM is XML

```
<cim:ACLineSegment rdf:ID="_{259CA932-C4C7-4AD3-AB74-246681AD784E}">
  <cim:IdentifiedObject.mRID>{259CA932-C4C7-4AD3-AB74-246681AD784E}</cim:IdentifiedObject.mRID>
  <cim:ACLineSegment.r>0.08089000000000004</cim:ACLineSegment.r>
  <cim:ACLineSegment.x>0.1164816</cim:ACLineSegment.x>
  <cim:Equipment.normallyInService>256</cim:Equipment.normallyInService>
</cim:ACLineSegment>
<cim:Terminal rdf:ID="_{259CA932-C4C7-4AD3-AB74-246681AD784E}.1">
  <cim:IdentifiedObject.mRID>{259CA932-C4C7-4AD3-AB74-246681AD784E}.1</cim:IdentifiedObject.mRID>
  <cim:Terminal.ConductingEquipment rdf:resource="#_{259CA932-C4C7-4AD3-AB74-246681AD784E}" />
  <cim:Terminal.ConnectivityNode rdf:resource="#_48AF8339-03A0-4F7D-ACB8-FAC20F8017B1.CN" />
</cim:Terminal>
<cim:Terminal rdf:ID="_{259CA932-C4C7-4AD3-AB74-246681AD784E}.2">
  <cim:IdentifiedObject.mRID>{259CA932-C4C7-4AD3-AB74-246681AD784E}.2</cim:IdentifiedObject.mRID>
  <cim:Terminal.ConductingEquipment rdf:resource="#_{259CA932-C4C7-4AD3-AB74-246681AD784E}" />
  <cim:Terminal.ConnectivityNode rdf:resource="#_{000E0BCE-2F2F-4E54-B73E-CD657BC893BD}" />
</cim:Terminal>
<cim:Location rdf:ID="_{259CA932-C4C7-4AD3-AB74-246681AD784E}.LO">
  <cim:Location.CoordinateSystem rdf:resource="#_0" />
  <cim:Location.PowerSystemResources rdf:resource="#_{259CA932-C4C7-4AD3-AB74-246681AD784E}" />
</cim:Location>
<cim:PositionPoint rdf:ID="_{259CA932-C4C7-4AD3-AB74-246681AD784E}.LO.0.0">
  <cim:PositionPoint.sequenceNumber>0</cim:PositionPoint.sequenceNumber>
  <cim:PositionPoint.xPosition>312619.3183</cim:PositionPoint.xPosition>
  <cim:PositionPoint.yPosition>6542974.9297</cim:PositionPoint.yPosition>
  <cim:PositionPoint.zPosition>0</cim:PositionPoint.zPosition>
  <cim:PositionPoint.Location rdf:resource="#_{259CA932-C4C7-4AD3-AB74-246681AD784E}.LO" />
</cim:PositionPoint>
```

SIMILIX
Architecting Smart Energy

Multi-system Integration Platform



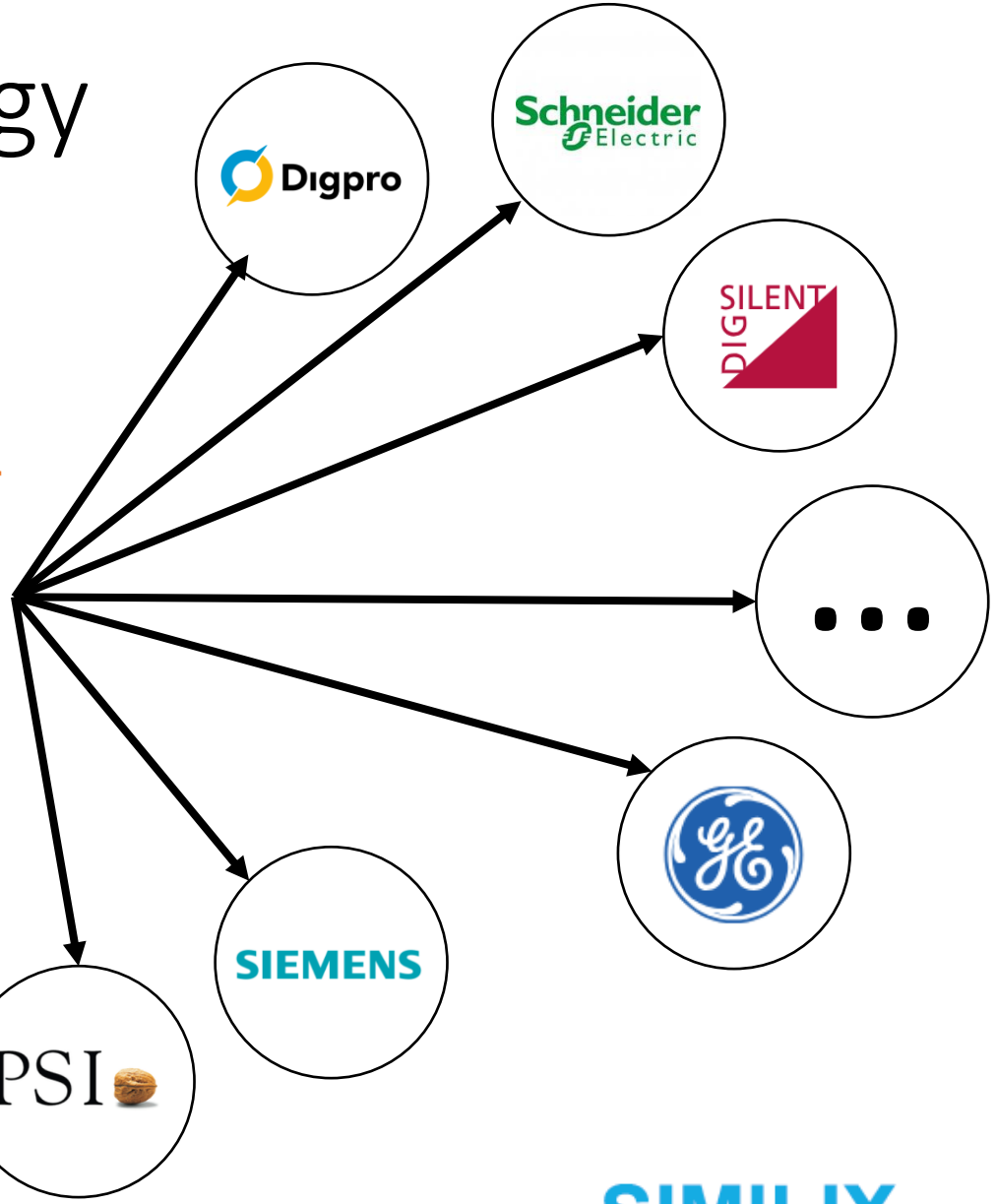
SIMILIX
Architecting Smart Energy

Integration to Any Technology

ArcGIS Utility Network

+

Similix CIM Adaptor



SIMILIX
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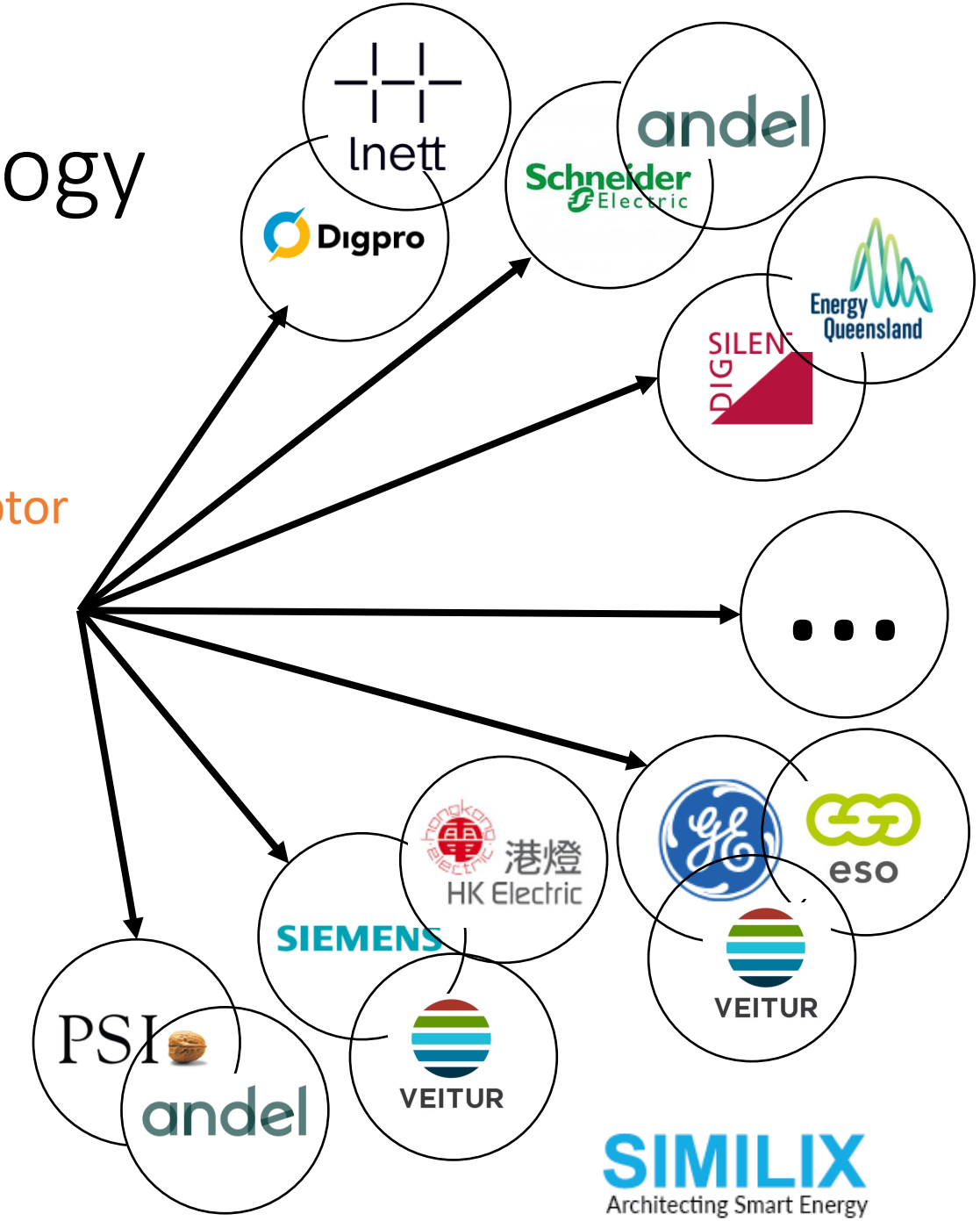
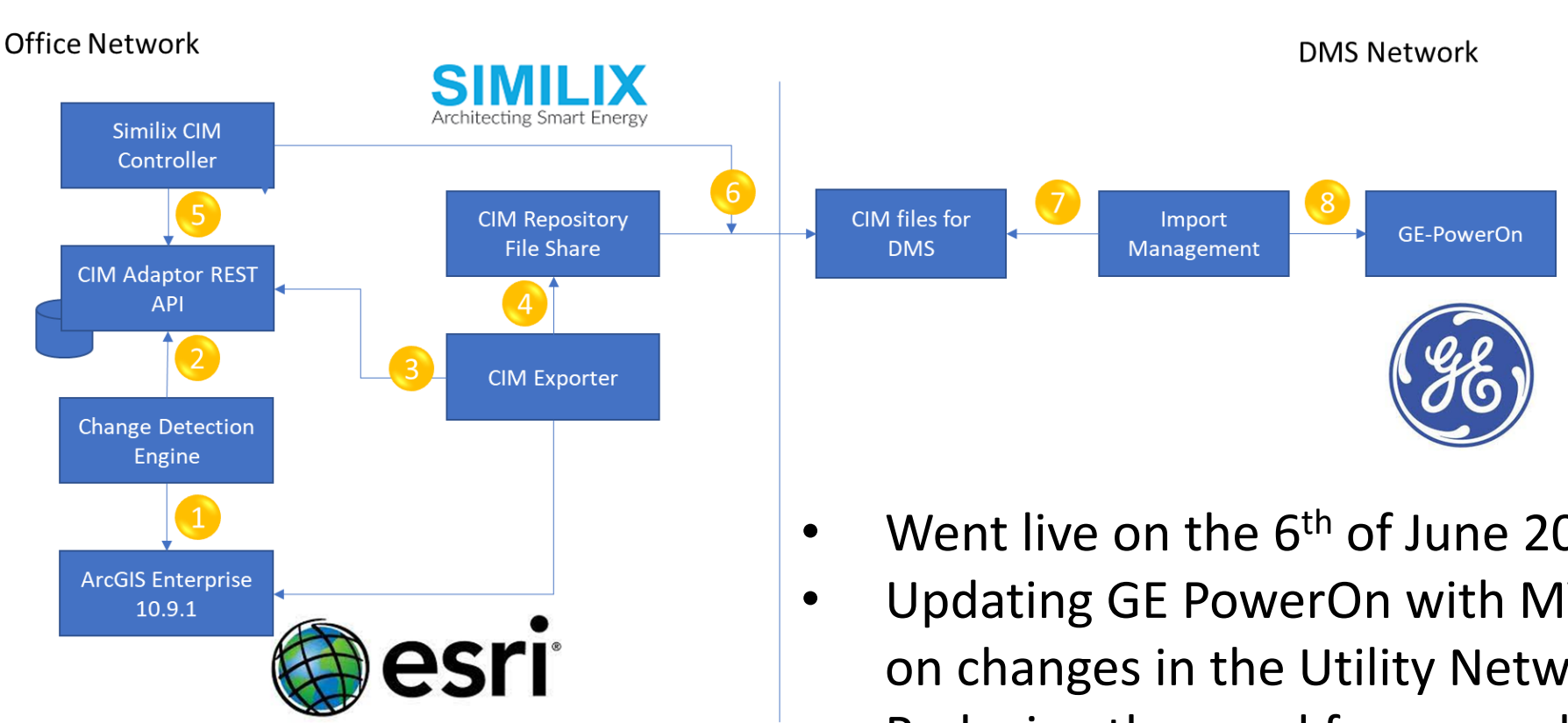
Integration to Any Technology

ArcGIS Utility Network

Similix CIM Adaptor



Utility Network – PowerOn integration at ESO



- Went live on the 6th of June 2023!!
- Updating GE PowerOn with MV and LV feeders based on changes in the Utility Network
- Reducing the need for manual editing data in the import process to ADMS

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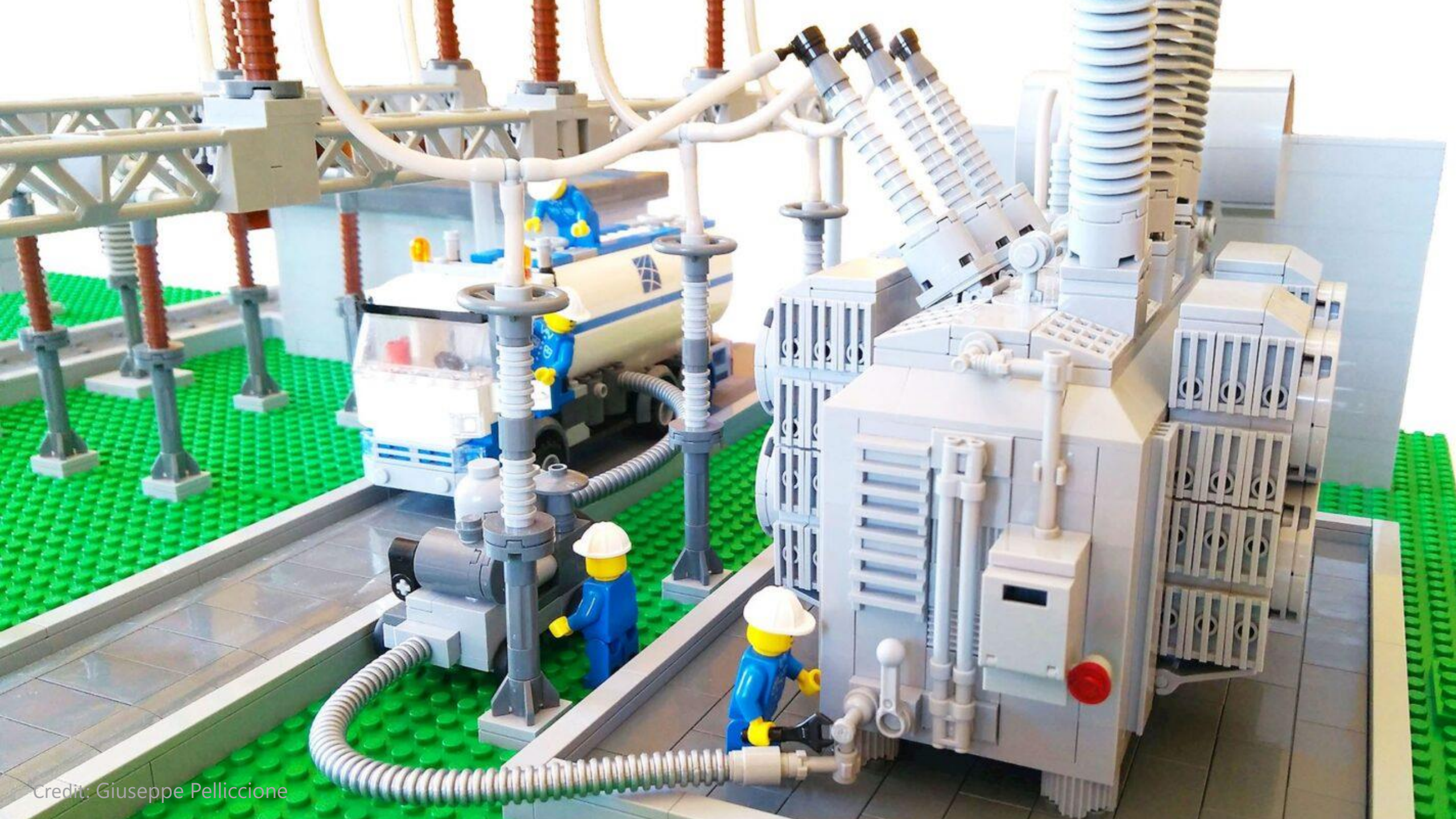
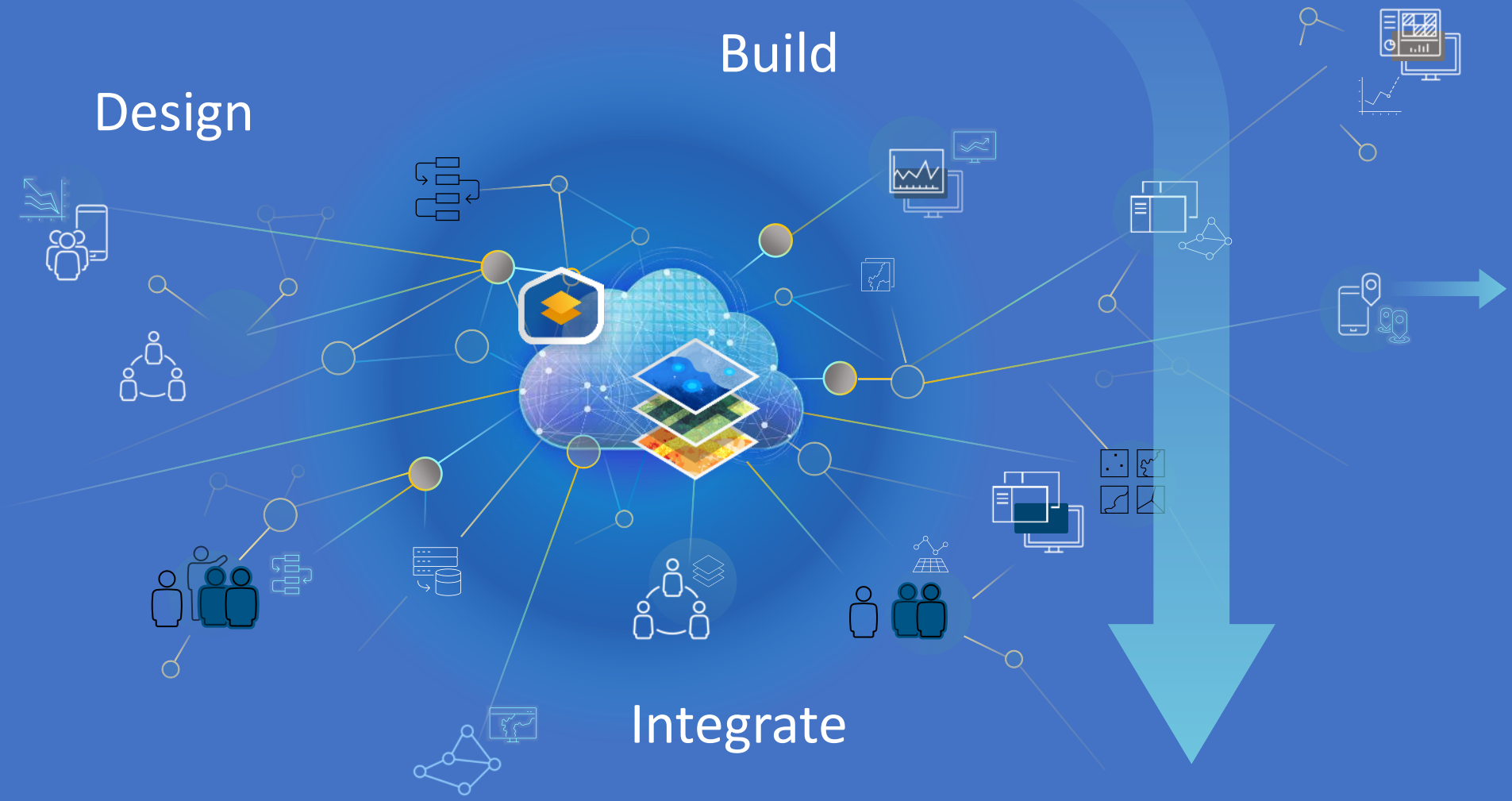


Credit: Giuseppe Pelliccione

Modern Network Management



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Create Responsive Organizations