Assessment of Communication Architecture for Energy Sector

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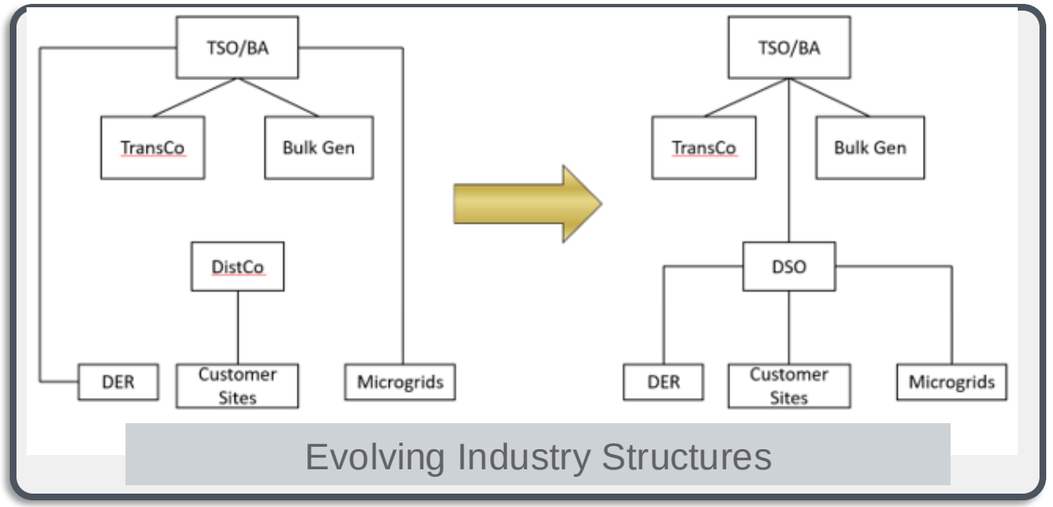
An evolving grid with evolving communications needs

Structure of the Grid is Changing

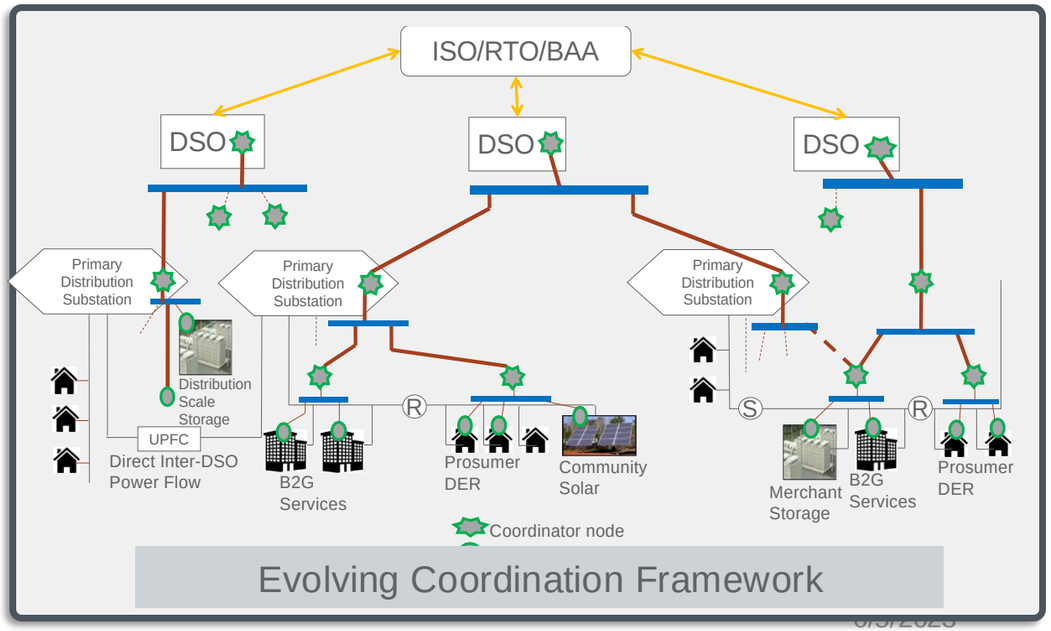
- Integration of distributed energy resources
- Electrification and flexible loads
- New energy stakeholders (e.g. aggregators)
- Availability of intelligent devices and sensors

Coordination requirements are evolving

- What are the sensing, control, and coordination data requirements?
- What are the resulting communication system requirements?
- What communication architectures will provide secure, reliable, and resilient data transport?



Evolving Industry Structures

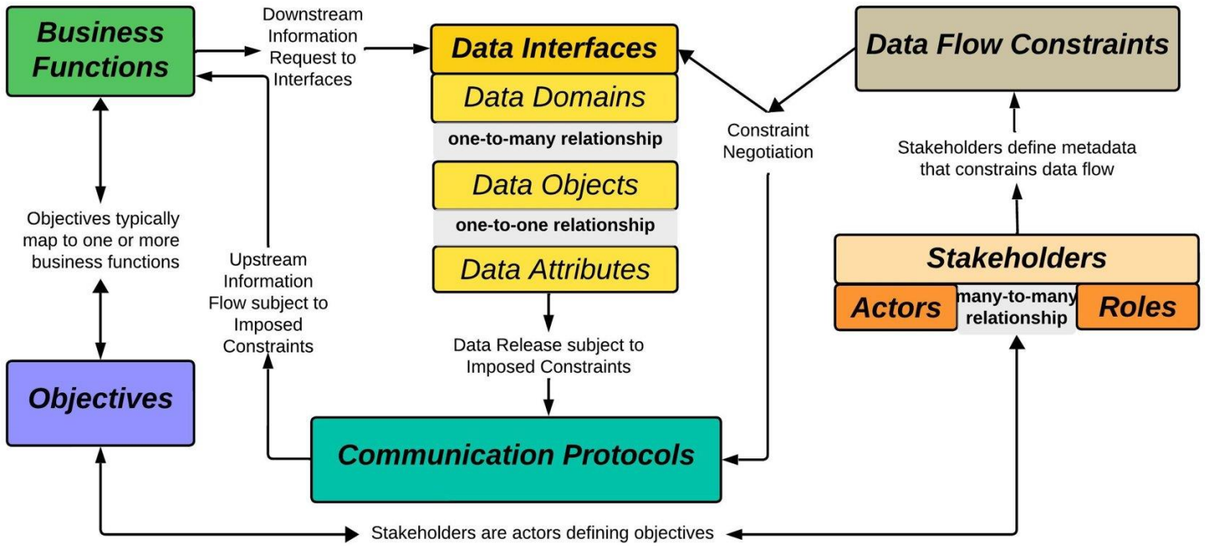


Evolving Coordination Framework

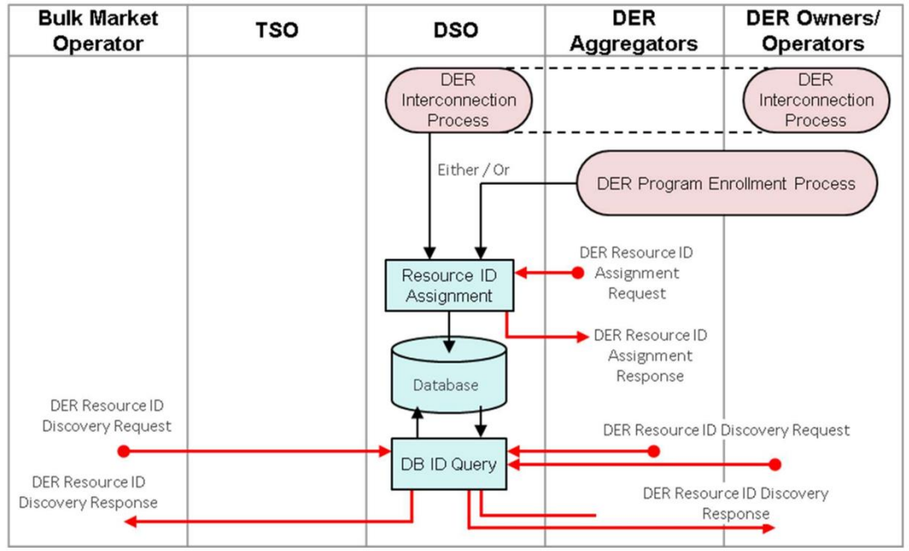
Chart a course to evolve grid communication architecture for future grid

Define	Identify	Quantify	Prioritize
Define grid communication requirements for high DER/EV coordination scenarios	Identify vulnerabilities of communication architectures across multiple cyber-attack scenarios	Quantify operational impact of attack scenarios	Prioritize gaps in communication architecture, standards, and technologies

Linking grid functions to data flows and communication architectures & requirements

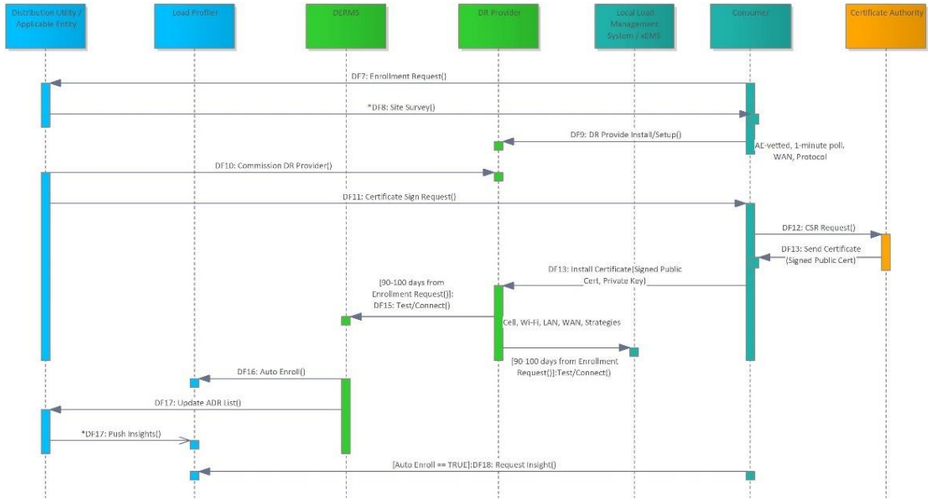


Grid Data Analysis Model



Source: TSO-DSO Coordination Functions for DER. EPRI, Palo Alto, CA: 2022. 3002021985.

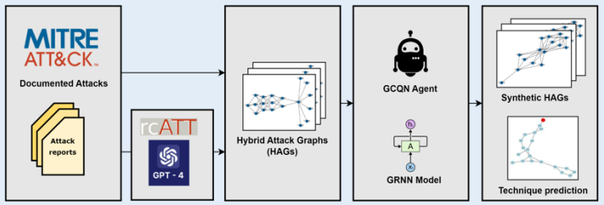
Grid Coordination Interaction



Detailed Data Flow Definition

Assessment framework

Threat Model



Identify Vulnerabilities

Co-Simulation / Testbeds

Grid Operations

Comms Layer

Actuators/ Controllers

Sensors

Physical Layer

ns-3 ⟷ HELICS ⟷ GridLAB-D

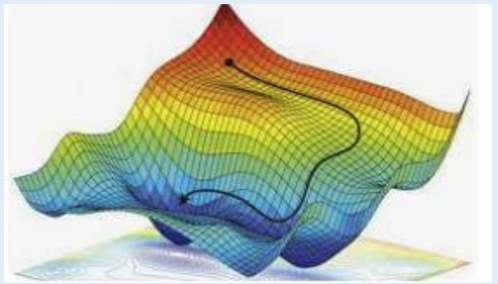
Quantify Impacts

Design Samples

Evaluation Metrics (cyber & physical)

Prioritized Gaps

Architecture Evaluation



Compare Architectures

Thank you

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