COGNITE

Managing Operational Change with DataOps for Utilities

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About Cognite

Cognite is a global industrial SaaS company that supports the full-scale digital transformation of asset-heavy industries around the world. Our core Industrial DataOps platform, **Cognite Data Fusion®**, enables data and domain users to collaborate to quickly and safely develop, operationalize, and scale industrial AI solutions and applications.

Cognite Data Fusion® codifies industrial domain knowledge into software that fits into your existing ecosystem and enables scale from proofs of concepts to truly data-driven operations to deliver both profitability and sustainability.

Why utilities need DataOps

Utilities are gathering more data than ever — from equipment, sensors, business processes, customer interactions and third-party sources. This data can drive down risk from operational change by helping utilities understand patterns and trends, and also by increasing flexibility and nimbleness. For utilities to become driven by data, rather than drowning in it, they must effectively and efficiently deliver the right, meaningful data to the personnel and applications that need it.

So far, most utilities are not yet using their wealth of data to full advantage. Achieving this goal is nearly impossible when operational data is divided across the utility, buried under layers of complexity, and often lacking context that makes it meaningful.

Turning data into a useful operational tool requires robust systems to make data available, understandable and usable across the entire utility. The emerging discipline of DataOps empowers utilities to build a pipeline that reliably and automatically supplies high-quality data wherever it is needed.

"DataOps tackles the high-overhead problems associated with data management and operationalization," explained Gabe Prado, director of product marketing for power and utilities at Cognite. "Today, it still takes too many steps to add humanlike meaning to data and efficiently integrate the data into applications. The key is to make that process smooth, clean and dependable so applications can return value to operations and the business."

DataOps allows both operational technology (OT) and information technology (IT) data to be assembled, preprocessed and used cross-functionally. Personnel can easily discover, access, understand and apply data from across the enterprise to answer their own questions. This supports optimal alignment of people, processes, technology and assets. Ultimately, DataOps can help foster a more nimble and resilient utility, both operationally and culturally.

"From a technology perspective, working with data is relatively easy. But culture is hard," said Adriana Karaboutis, global chief information and digital officer for National Grid. "Recognizing data as an enterprise asset, and getting past thinking that each department owns its set of data, can be tremendously helpful in shifting utility culture and supporting digitalization."

What is Industrial DataOps?

"DataOps is a collaborative data management practice focused on improving the communication, integration, and automation of data flows between data managers and data consumers across an organization."

Gartner

"DataOps is the ability to enable solutions, develop data products, and activate data for business value across all technology tiers from infrastructure to experience."

FORRESTER

DataOps accelerates the process by which distributed operational data is transformed into practical recommendations

Environmental data

Prolonged drought
GIS data
Weather forecasts
High temperatures

Grid data

Available capacity
(baseload generation +
connected renewables)
Demand forecasts

Asset data

Inspection
Images/LIDAR
Substation metrics
Transformer performance

DataOps & analysis

Increased risks

Wildfire conditions
Vegetation encroachment
Asset failure/damage
Customer/personnel safety

Recommended actions

Tree trimming
Pole repair
Transformer maintenance
Ready peaker generators
(or activate demand response)
Contingency planning
for de-energizing feeders where
fire risk is highest

DataOps solves three fundamental data problems

Access

How can users get to the data they need? Especially when it resides deep in a control system or across a variety of sources. Who is authorized to modify, correct and update it?

Aside from the owner, who is allowed to access or share each type of data?

What are the rules for how data can cross between departments and systems while complying with security and privacy requirements?

Quality

Can data be trusted so that people can trust decisions, reports and predictions based on that data? Is the data accurate, complete and consistent?

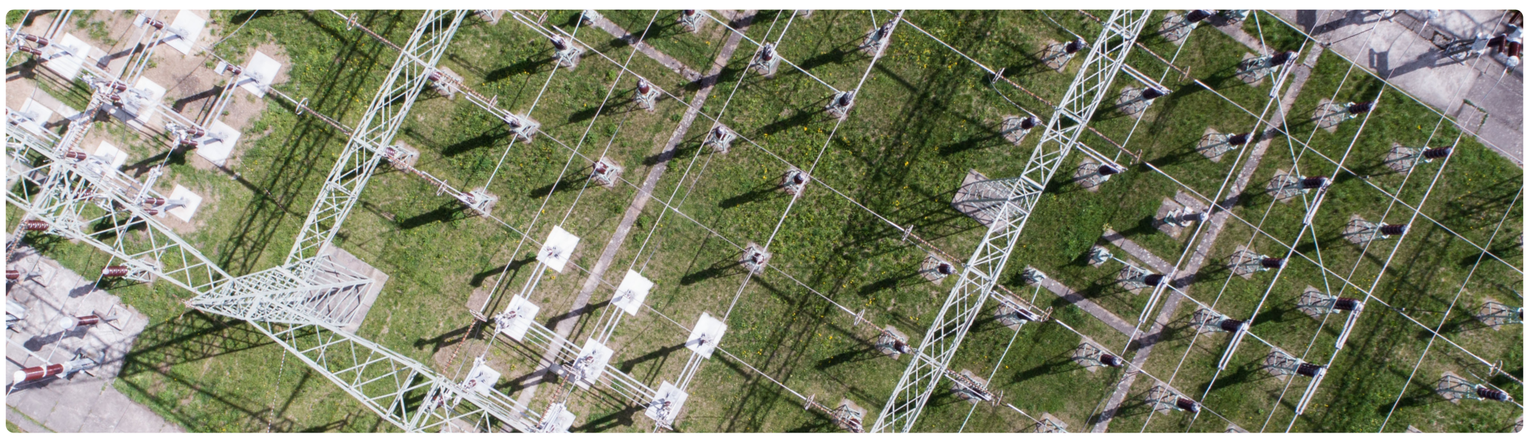
Are users across the enterprise all working from the same “single source of truth”? In particular, artificial intelligence and machine learning demand excellent data quality.

Timeliness

Nearly every kind of utility data has an expiration date, after which its relevance drops.

When any part of the data supporting operational decisions, financial projection or situational awareness is stale, consequences can be costly.

How can automation make data easier to use and apply so that value can be captured more quickly?



WHY COGNITE DATA FUSION® → BENEFITS FOR YOUR TEAMS → CONTACT SALES →

As almost every aspect of utility operations is undergoing profound change, systematically liberating data across the utility supports optimal realignment of people, processes, technology and assets. This empowers utilities to address challenges related to ongoing disruptions, such as:

- Shifting energy supply and demand patterns, both short-term (such as from the COVID-19 pandemic) and long-term (from renewables, technology evolution, shifting consumer needs and more active grid participation from "prosumers").

- Rising risks to infrastructure and safety. Climate change is yielding more severe storms, wildfires and floods while also shifting routine weather patterns. This complicates predictive maintenance, outage response and plans for system upgrades. Utility assets are more likely to incur damage or failure, risking harm to utility personnel and the public.

- Workforce evolution. Remote operations are increasingly common at utilities — partly due to the COVID-19 pandemic, but also due to a long-term trend of wider deployment of sensors, automation and robotics. Also, as experienced employees retire, the value of their accumulated experience and insight must be preserved. At the same time, utilities face daunting competition for new talent with strong digital skills.

Big change presents opportunities as well as challenges. Recognizing this, more utilities have adopted innovation as a business strategy. Robust access to data allows innovation to flourish by revealing the best opportunities and resources, encouraging exploration and experimentation, and supporting smart decisions.

"DataOps is at the heart of where everyone is going in the utility industry," said Karaboutis. "Data leads the way toward insights. Today the challenge is: How do utilities bring in operational data — readings from sensors, substations, etc. — to support decisions and predictive analytics? Building your data foundation will allow you to accomplish digitalization."

Making utility DataOps happen

Automation helps organizations fix overload and bottlenecks of any kind. DataOps directly addresses the quandary of data supply/demand noted in the research paper DataOps in Manufacturing and Utilities Industries →: "While data generation is spontaneous, its consumption is not. With data piling up every day, fresh ways of thinking are required to accelerate its consumption and usage."

At utilities, silos are the most fundamental obstacle to spontaneous, ubiquitous data access. Historically, utilities have been highly siloed organizations, especially with limited interaction between operations and other departments.

As utilities adopted computers, this translated into the IT/OT divide: IT has been mostly managed separately from OT.

Now that the operational technologies of power generation, distribution and consumption have themselves grown highly digitized, IT and OT are merging. Utilities must unify their management. Building a "data backbone" infrastructure does more than connect silos; it also creates opportunities to overcome these common problems with utility data:

- Inconsistent data types. Utility data exists in a vast range of formats (structured and unstructured), which are used in different ways by different departments and systems.
- Metadata deficiencies. The contextual tags and categories used to characterize data often are missing, inconsistent or hard to interpret. Without good metadata, data is difficult to understand and use.
- Vendor lock-in. Many utilities rely on equipment and software that use proprietary data formats, which can limit a utility's access to its own data.

The first step in bridging silos is to standardize and integrate utility data stored in department-specific repositories or systems. This involves creating an inventory of data, systems and users, then connecting them in useful ways.

Security (physical and cyber) can be a sensitive issue when bridging utility data silos. Compartmentalization has long been a protective strategy for utilities. Malware that enters a utility via an internet-connected IT system (such as email or enterprise resource planning) might migrate to connected systems for customers or operations, increasing the risk of data breaches, outages and even damage to assets and people.

Cloud-based DataOps platforms can enhance security. Rather than building direct interfaces between departmental systems, data is transferred from one system to another via the cloud. This creates a layer of abstraction that serves as a safety buffer between systems, preventing potentially harmful executable code from accessing the control systems. Cloud-based DataOps also offers the enhanced layers of security offered by cloud vendors.

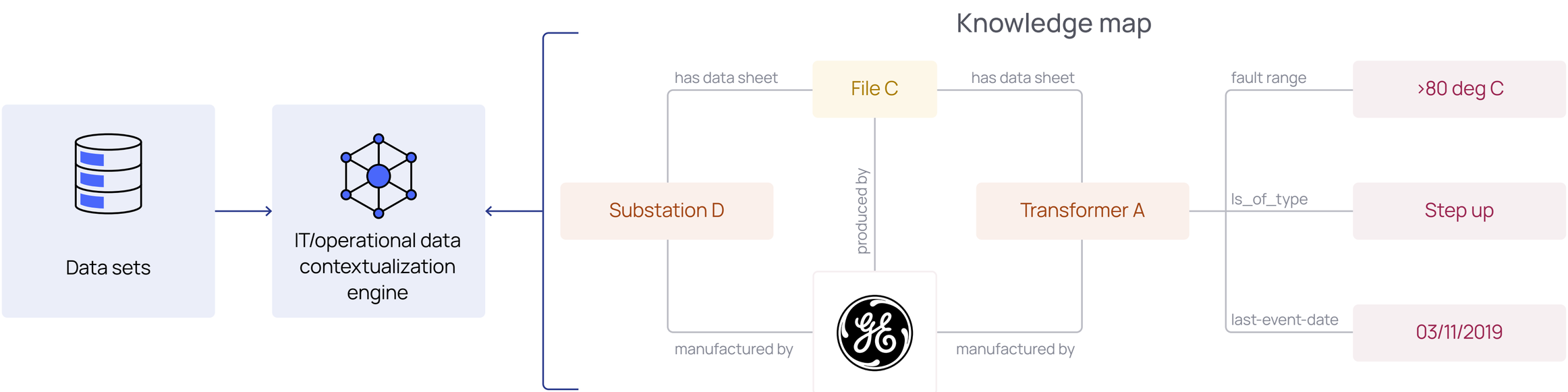
"Regulators are very concerned about utility cybersecurity and privacy," Karaboutis said. "Talking to regulators about DataOps is an opportunity for utilities to have this discussion in a constructive way. Both regulators and utilities want to do more for stakeholders, and DataOps enables that while managing the complexities of security and compliance."

The next step in implementing utility DataOps is to automate context. Data is only useful to people when it has meaningful context. "Humanizing" data involves recognizing and replicating the immense amount of effort that people already invest to manually place information into context.

The contextualization engine in a DataOps platform automatically applies intuitive, consistent metadata that clarifies relationships between data sources and types. For example, operating data from a substation would be tagged automatically according to the originating device/component (such as "transformer 3"), the information conveyed by the data (such as load or temperature), the date and time, and pertinent characteristics (such as condition, efficiency or safety).

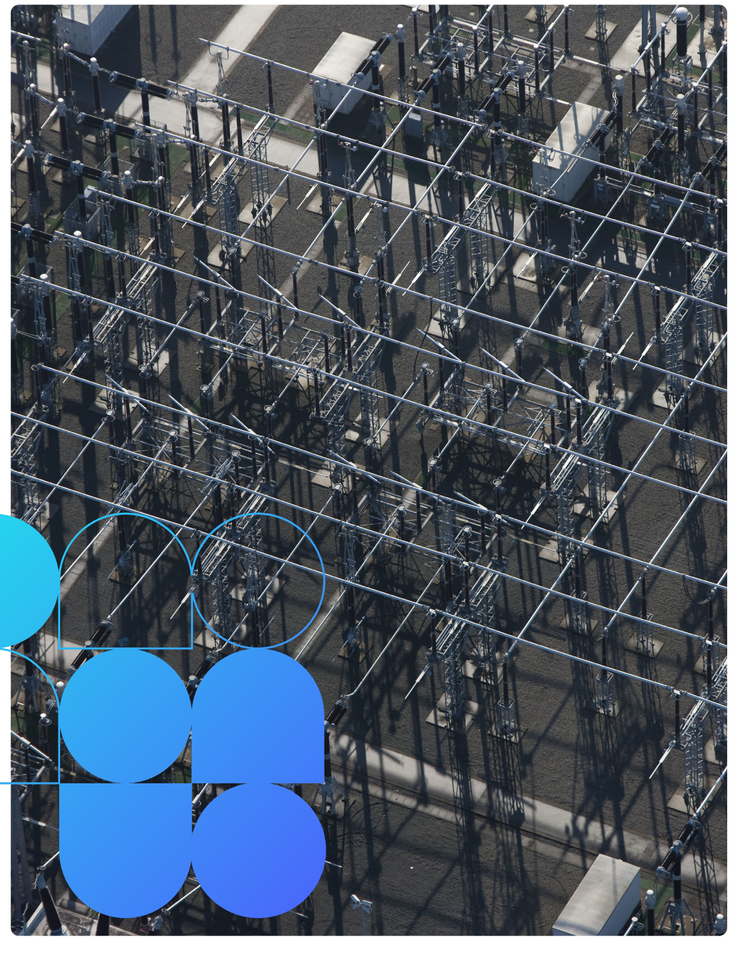
Cross-departmental teams work together to develop metadata schema (labels and hierarchies) that support unaided interpretation by people working in a variety of roles or departments, on a variety of problems. For instance, a financial analyst budgeting capital-improvement projects might want to identify specific grid assets that are likely to fail in the next three years, how much those failures might cost and how to replace them most cost-effectively. When the finance department has some input and insight into metadata, a mass of otherwise arcane technical details can be easily interpreted by someone who knows little about how transformers work. This yields answers to important business questions.

The end result of this preparation is a functional data model. This "single source of truth" enables more users across the utility to access and use data, regardless of where it originated. It allows people to focus on business or operational issues, not data issues. It also supports efficient real-time access to data via open application programming interfaces (APIs) and standard development kits (SDKs).



DataOps fuels utility innovation

Utilities exist in a highly dynamic landscape, where market opportunities, technologies and the operating environment are constantly changing. Harnessing data not only helps utilities understand what's going on around (and within) themselves, but it also points the way to the future. DataOps equips utilities to perform better, faster, more accurate analysis and then operationalize the analysis into applications. This supports short-term gains (such as deploying a predictive model) as well as long-term success (such as changing an entire workflow, or optimizing capital investments).



DataOps also makes it easier for utilities to connect the dots between important issues, allowing room for gains in the face of disruption. For instance, the COVID-19 pandemic drastically disrupted utilities in early 2020, causing sudden major changes in their internal operations as well as in energy-consumption patterns. To adapt, utilities learned how to conduct more work by remote, with fewer personnel in offices and at plants. This has accelerated interest in more sophisticated modeling.

"Remote-working tools depend on reliable access and trust in data," Prado said. "The imagery, locational data, video feeds and text chats all get captured in different systems and have to integrate together to paint a vivid picture of the operations. This is how utilities can work smarter, not harder, even after workplace health concerns return to a more normal level. It can help preserve institutional memory and improve processes and training."

The need to support increased remote work has raised utility interest in increasing the quality and scope of modeling, including digital twin capabilities. "If you need to replicate the experience of a worker on-site at a plant, the digital twin effectively becomes the plant. But it's also where you can run simulations and projections, to try out different scenarios," Prado said. "When all the data relationships are mapped out and constantly updated, any authorized personnel can use that model to get a more realistic idea of what could happen and where the opportunities for improvement are."

On an ongoing basis, DataOps can help utilities adapt to more routine disruptions. Ideally, this should include data about what's happening in the world outside the utility.

"Events start coming into the mix of relevant data. If there's a big soccer match happening this week, that might affect the amount of energy needed to keep the grid balanced," said Karaboutis. "Consider all triggers or sources of data and ask: How can we make this more accurate? How can we distribute this data faster, treat it with more rigor, to gain better insights? Then you start scaling up the use of data. DataOps becomes a discipline in and of itself."

Overall, power systems are becoming more automated and dynamic, generating and using vast amounts of data as they glean ever more efficiency and safety from limited resources. Similarly, consumers are using more sophisticated technologies, from mobile apps and smart thermostats to rooftop solar, battery energy storage and electric vehicles (EVs). Growing consumer interest in play-

ing a more active role on the grid is leading utilities to leverage data as a tool of external communication and interoperation.

“With good DataOps practices, utilities can spot emerging patterns, especially when they’re nuanced,” Prado said. “For instance, if several consumers in one part of the grid are adding solar or EVs, that can help you optimize and stabilize power flows at different times.”

DataOps can help utilities more precisely match consumers with programs and tailor offerings to consumer desires and capabilities. By combining market and operational data, utilities could design special rates and services for EVs or demand response that leverages home or building automation systems. These represent new revenue opportunities as well as potential sources of avoided costs or resource aggregation.

Navigating this much dynamism requires a firm grasp of utility data. Without this, utilities will miss business opportunities and also risk compromising regulatory compliance, efficiency, customer satisfaction, public trust, safety and reliability.

Venturing into DataOps at your utility

DataOps is such a versatile capability that it can be challenging to figure out where to start. Fortunately, DataOps augments existing systems and does not require significant infrastructure disruption. Rather, DataOps becomes the fabric that weaves together data, process and experts with tooling and contextualization.

Prado recommends identifying a well-scoped project that has a clear business problem to solve, such as building a dashboard or a predictive model. Ideally, this project would draw data from more than one department or system. Clear goals should be identified up front: What questions should people be able to answer with this new data model?

A utility then must determine which data is available, who owns it and how to access it. Then, DataOps professionals can then work with utility personnel and data scientists to create a data model and populate it with cleaned, current data that is layered with useful metadata.

The goal is for DataOps to become a self-sustaining aspect of utility operations. It's best to start small, with a single DataOps use case that will quickly demonstrate success. Once the model is deployed, the utility evaluates the accuracy of its results and projections, fine-tuning it where necessary. When the model is deemed accurate, confidence in it will grow, and it can be applied to optimize workflows, automation or decisions. DataOps infrastructure can be expanded to explore additional use cases, yielding long- and short-term benefits.

Eventually more users can be added across the enterprise which helps the utility adopt a more data-driven culture.

Using sound DataOps principles and tools on smaller projects creates a common backbone of support, which allows utilities to safely expand the scope of DataOps.

Utilities interested in exploring the potential of DataOps might consider these questions:

1. Who needs our data? What internal classes of data consumers are emerging at your utility: citizen data scientists, product managers, digital teams, etc.? Do they have the data access they need?

2. Are we responsive enough? At this time, can we easily and quickly find the data needed to answer ad hoc operational, business or regulatory questions?

3. Are we wasting resources? How much time do our data scientists spend finding and cleaning big datasets? How often do they succeed in deploying models into production?

4. Do we deploy solutions fast enough? How long does it take our digital teams to deliver and scale internally developed digital applications? How might improved agility and productivity enhance our business and operations?

With enough high-quality, accessible and understandable data, utilities can tackle these and many other issues. This not only allows them to navigate disruption more smoothly and effectively, but it can also help utilities learn to embrace change as an opportunity to keep learning and growing while providing ever-improved services to their customers.

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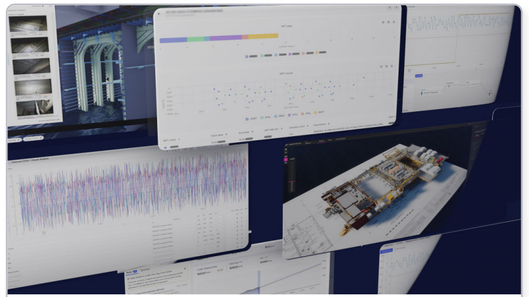

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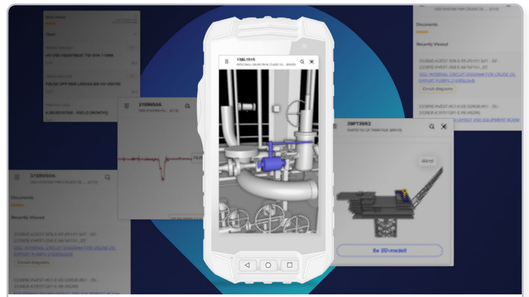

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