How Red Hat is preparing to help power the future of utilities

The emerging need for modernized utilities

The utilities industry is on the cusp of a major transformation, as advancements in technology have opened up an opportunity to address key electrification challenges.

The growing adoption of distributed energy resources (DER), such as solar panels and electric vehicles, and spikes in energy demands due to rising adoption of e-mobility and artificial intelligence (AI), have left utilities providers struggling to accurately predict supply and demand and to adjust accordingly with static infrastructure. This is further exacerbated by existing challenges in substation automation and power grid management caused by limited flexibility and scalability of proprietary hardware.

To address these challenges—as well as cybersecurity concerns brought on by the added complexity of using a wide range of devices and platforms or adopting DERs—many utilities providers are trying to find ways to modernize their infrastructure. This shift could create a more efficient way to use their existing resources, to help minimize wasted energy production and allow them to flexibly adapt to change as the industry continues to evolve and innovate, while also providing opportunities to reinforce their security posture.

A shift to software-defined environments with virtualized components would allow these organizations to reduce how many physical hardware changes need to be made as needs fluctuate, while also benefiting from real-time reconfigurability. With the support of a reliable, highly available, and security-focused platform, this would allow them to improve their grid responsiveness and overall operational efficiency, while also providing an opportunity to unify and automate their IT and operational technology (OT) ecosystems.

Other benefits of virtualization include:

- Ability to use automation to streamline development and testing, which can help mitigate risk and improve resource utilization.
- Improved cost efficiency.
- More environmentally sustainable IT operations.

To facilitate this transformation, Red Hat offers an enterprise open platform that supports the software needs of utilities in any environment (including on premise, in private clusters, or in cloud environments). It also provides the opportunity for cooperative innovation with the existing utilities industry ecosystem of electrification technology providers and system integrators.

Red Hat's role in the future of utilities

Building on its expertise in IT solutions and experience in helping modernize the banking and telecommunications industries, Red Hat is committed to collaborating with the existing utilities industry ecosystem to build specialized solutions that directly address industry challenges, while allowing utilities to focus on their expertise in OT.

Red Hat's commitment includes an investment in understanding key industry standards (such as IEC 61850 and IEC 62443), industry technology requirements (including lifecycle, stability, and real-time latency requirements), and aligning with and contributing to key utilities industry standardization efforts.

This has already materialized in a number of ways, such as Red Hat certifying a range of IEC 61850-certified substation automation servers for Red Hat® Enterprise Linux® and including them in the Red Hat partner ecosystem. This includes the Dell PowerEdge XR4000 series, Advantech's ECU579 and ECU479, and Welotec's RSAPC Mk2.

Red Hat has also become a member of key industry organizations, including the Virtual Protection Automation and Control (vPAC) Alliance and the SEAPATH project.

The vPAC Alliance is an industry consortium aimed at establishing a standards-based, open, interoperable, and security-focused software-defined architecture to host virtualized protection, automation, and control solutions for power system substations.

The SEAPATH project aims to offer a solution for setting up highly available and real-time-capable compute infrastructure for substation automation via a reference design and an open source platform for grid operators to run virtualized automation and protection applications.

By becoming a member of these industry organizations, Red Hat joins forces with key industry partners to help establish standards and bring its proven enterprise virtualization technology to digital substations.

This will help increase grid reliability and resilience, reduce grid emissions, maintenance, and operations costs, and help position utilities organizations to handle the needs of today and future industry changes.

The value of Red Hat's open approach

To understand the value of Red Hat's open source platform and its potential role in the future of utilities, it is important to distinguish between community-sourced open source and what Red Hat provides, as well as how Red Hat's open platform approach can help facilitate the innovation and collaboration that is key to the future of the industry.

Community-sourced open source software is publicly available at no cost through shared source code, and the community behind it is responsible for all updates to that source code. Red Hat provides enterprise-ready open source software. This still comes with the flexibility, transparency, and adaptability of open source, but extends that value with vendor support, improved functionality, testing against stringent security standards, and a partner ecosystem of certified solutions to meet any other needs.

This flexibility is paired with an open hybrid cloud approach that allows utilities to run their software anywhere they need to, including public and private cloud environments, substation servers, and even single intelligent electronic devices (IEDs), such as circuit breakers, transformers, and capacitor banks.

One of the biggest benefits that Red Hat's open approach provides is the collaborative innovation that can happen when building on open platforms. This is especially valuable for an industry whose modernization efforts will likely require extensive and close collaboration between software and hardware developers.

To best accelerate that collaborative innovation in a way that still meets the specific needs of the utilities industry, this process must include a full DevSecOps methodology for electrification technology providers, system integrators, and utilities. This methodology promotes agile software development and the strongest possible focus on security, availability, and reliability for all software-based products, from protection and control of primary equipment to network management and energy trading.

By building open platforms that allow for open collaboration and align with key utilities industry standards, Red Hat is in a position to provide an essential piece of the technology that the industry will need to move into a truly modernized future.

Red Hat's complete IT platform

Red Hat offers the utilities industry an enterprise-ready platform built on hardened open source software. This allows providers to run all their electrification-related software, while also supporting the needs of disconnected environments and data-intensive workloads, such as applications powered by AI.

Red Hat's platform helps simplify deployment, maintenance, and operations, while also providing features designed to address the needs of organizations that require the highest reliability and availability. This is reinforced by safeguarded software supply chains and an ecosystem of certified partners to address any additional needs.

This platform is primarily composed of an operating system (OS), application platform, automation platform, and a number of solutions designed to meet the specific needs of disconnected environments with rugged hardware and data-intensive workloads.

Red Hat's platform and complementary solutions allow utilities providers to benefit from:

Robust security and compliance features. With comprehensive security solutions (including security features for Linux and Kubernetes clusters), utilities providers can increase the reliability of their grid systems that often collect data from a range of devices with various communications protocols, and make sure they meet stringent security and regulatory requirements.

Streamlined data management and analytics. With solutions for streamlining and improving data management and analysis—including storage, backup, and recovery capabilities, and high-performance messaging and data integration that allows for real-time data processing and analysis—utilities providers can benefit from actionable insights that help them optimize grid operations.

Hardware and software standardization. With a reliable, security-focused, and high-performance OS to standardize all of their hardware and software on, utilities can use software-defined controls. This unlocks real-time monitoring and management, as well as unified automation, for their entire estate of technology assets, from energy management systems down to protection and control on substation level.

Containerization and virtualization. Using a highly available application platform that supports both containerization and virtualization allows utilities providers to deploy any electrification-related workload in hardware within a substation or in more centralized datacenters and cloud environments, depending on their specific needs. This makes deployments more flexible and adaptable to changing requirements at any point in time, and helps protect the future value of investments made today.

IT automation. By bringing IT automation into OT, with fully centralized automation spanning standardized devices and disconnected environments, utilities providers can improve operational efficiency and focus on security across every area of their operations.

AI adoption and integration. With an AI-optimized OS to help develop, test, and run generative AI (gen AI) foundation models, and an application platform that supports the entire lifecycle of predictive and gen AI models across any environment, utilities providers can efficiently adopt and integrate innovative AI applications.

Navigating the evolving utilities industry

Red Hat is committed to helping the utilities industry navigate the digital transformation of the electrification domain, and a vital piece of that is making sure that investments made today will support future innovation that could change how the industry operates.

By supporting utilities organizations to focus on standardizing computing infrastructure across all environments with open, enterprise-ready platforms and certified partner solutions built through strategic collaboration with industry leaders, Red Hat is ready to help them find flexible solutions that will adapt to their future computing needs.

Additionally, with its experience in helping modernize the banking and telecommunications industries, Red Hat is dedicated to proving how similar operational approaches could be applied to the utilities industry's own modernization efforts.

Building functions as portable applications

A relevant example of modernization is the evolution of online banking. In the past, for security reasons, users needed to access a specialized device in order to securely use any online banking services. To create more efficient processes that benefited both the customer and the service providers, an industry mindset shift was required.

By shifting the development approach within the industry, the solution was to build these functions as applications that could then be hosted on devices that customers already used, like smartphones, rather than building devices to fulfill the functions.

A similar approach can be applied to the utilities industry, so that specialized hardware is no longer created to host dedicated software whose functionality is restricted to that hardware. Instead, key functions needed in the industry could be delivered as software that can run in any type of computing infrastructure, on any hardware from any provider.

Bridging the IT/OT divide

By decoupling hardware and software through a software-defined approach, and fostering collaboration with electrification technology providers and system integrators, Red Hat can help utilities modernize, virtualize, and ultimately, bridge their IT/OT divide.

Similar to the approach taken in recent years in the manufacturing industry, integrating OT and IT allows utilities organizations to benefit from remotely accessing operational data to facilitate real-time monitoring and equipment control. This increases the efficiency of inspections, damage assessments, inventory management, and most importantly, any required changes to hardware.

Red Hat's open, cloud-native approach helps utilities streamline this integration between IT and OT and allows them to deploy, operate, and automate both in the same way, which reduces operational costs, fills skill gaps, and prepares utilities technology for the future.

Furthermore, by offering consultation on how best to separate IT and OT concerns, and bringing its own extensive IT expertise into the equation, Red Hat helps utilities achieve these benefits while allowing them to focus on their core competency: managing their OT.

Fostering the future of utilities innovation

With an open, collaborative approach, and alignment with utilities industry standardization efforts, Red Hat is committed to innovating with electrification technology providers and system integrators to bring modern software solutions onto their proven hardware.

By supporting long-time providers of essential utilities hardware and the system integrators that work with them, all sides can deliver value to utilities in a more efficient and effective manner, while addressing existing industry challenges and preparing for any future challenges or opportunities.

Learn more about how Red Hat can help

To review your current infrastructure and learn how Red Hat solutions can help address your needs now and in the future, speak to an industrial subject matter expert at Red Hat.

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