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Cloud Adoption Unleashes Greater Value for Power and Utility Companies

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The power and utility industry is undergoing a digital transformation. Driving this evolution are the growing opportunities that exist to harness data and analytics to drive better business decisions and outcomes with an emphasis on delivering the best customer experience. As forward-looking power and utility companies begin their journey of digital transformation, data is fast becoming their most valuable asset as the industry focuses on digitization, decentralization, sustainability, and customer satisfaction. As part of this shift, companies are collecting and analyzing vast amounts of new and existing data, which is becoming more difficult to manage, understand, and store as utility business models and market dynamics change. Utility customers are also recognizing the value of this data, and some are using this knowledge to seek more economical and customer-friendly electricity suppliers.

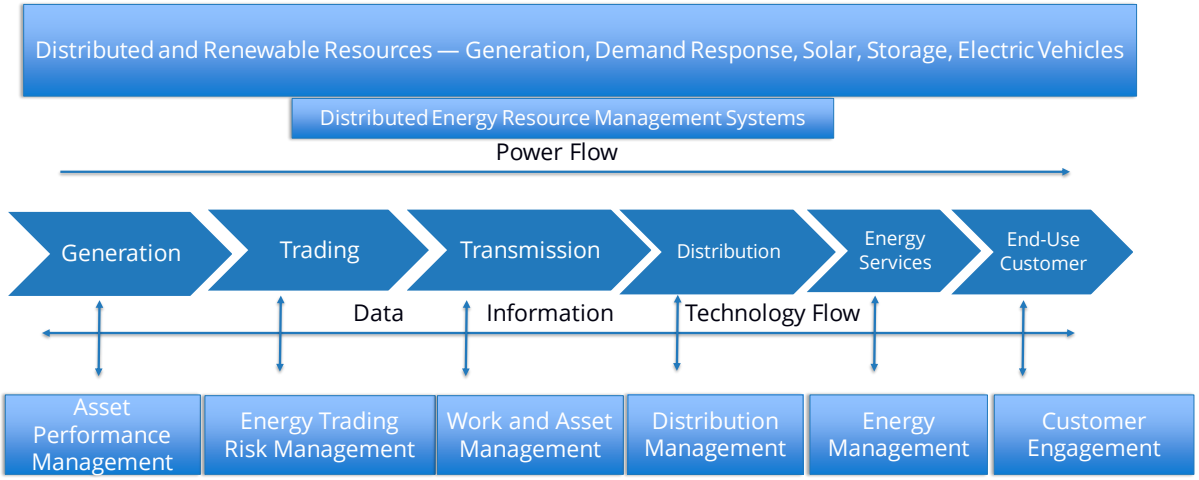
Cloud computing has a critical role to play in enabling the industry's digital transformation. As the power and utility sector increases its digital capabilities, cloud offerings and services present companies with an attractive option for lowering overall IT and infrastructure costs while providing scalable and secure data storage with on-demand access. Cost remains a key factor, however, as cloud is becoming the new normal for driving innovation and migrating existing applications as quickly as possible is taking precedence. Cloud provides power and utility companies with *tools to access and analyze critical operational and customer data that can drive quicker and smarter decision making across the enterprise, producing a superior customer experience. Cloud also enables opportunities for automation, which can save time and reduce costs while allowing IT developers to focus on innovation.*
This Technology Spotlight examines the key trends influencing cloud adoption in the power and utility industry and the enabling technologies that help companies pursue digital transformation.

Cloud Gains from Digital Transformation

The power and utility business has tight profit margins, highly variable energy commodity costs, and increasing consumer demand for an effortless and digitally enabled customer experience. Hence, companies are striving to innovate and explore new business models to increase efficiencies, reduce costs, improve customer satisfaction, and position themselves to become a digital utility that can rapidly build new services to create new revenue streams. Multiple opportunities exist to make digital advancements throughout the power and utility value chain in generation, transmission, distribution, and customer engagement. Leveraging data across the electricity value chain in pursuit of digital transformation (as shown in Figure 1) is creating a greater need for and increased investments in cloud computing capabilities.

FIGURE 1

Digital Transformation Across the Electricity Value Chain



Source: IDC, 2018

Some of the core functional areas across the electricity value chain where digital transformation is taking place and helping grow more cloud computing products and services are as follows:

- **Customer engagement.** As customer expectations have changed in recent years, the utility industry is losing the exclusivity of customer interaction, so power and utility companies have sought to improve the customer experience by evaluating best practices from other industries. Utilities and retail energy providers now offer customers more choice and transparency around how they consume, save, and produce energy. For example, data from connected homes is used in apps that inform customers of their consumption levels and provide guidance on controlling and managing energy use and spend. The recent industry emphasis on customer-centric data such as home appliance energy use, billing data, outage information, demand response programs, net metering, and rate options is also changing the interactions between customers and companies. *IDC FutureScape: Worldwide Utilities 2018 Predictions* notes that as power and utility companies target millennials, they will dedicate 50% of their customer experience–related IT budgets to investing in digital channels, product marketplaces, and personalized services to engage this group. Such efforts are expected to boost utility customer effort scores by two points. Investing in cloud capabilities can help utilities harness insightful and time-sensitive consumer data that leads to enhanced customer experiences, customer satisfaction, sustainability, and lower costs.
- **Distributed energy resource (DER) management and renewable energy.** The intermittent nature of renewable energy such as wind and solar, the rise of behind-the-meter DERs including battery and storage, and the rise in electric vehicle loads have increased the need for greater visibility, predictability, and remote operational control of these assets. IDC predicts that through 2020, solar will be the fastest-growing form of distributed energy globally. Solar's growth is expected to drive investment in distributed energy management systems and expansion of advanced distribution management systems by as much as 50%. The high penetration of DERs and renewables is also increasing the need for data such as electricity demand, temperature, sunlight, wind speed, and generation output to feed next-generation load and forecasting engines. Access to near-real-time data sets collected from sensors is critical for power and utility teams managing DERs and renewables. On-demand access to critical operational data sets from

across a company can provide strategic value for teams including but not limited to operations, finance, trading, and risk management. Cloud capabilities allow for better collaboration and quicker, more informed decision making across departments within a power or utility company when managing and operating DERs and renewables.

- **Work and asset management.** For power and utility companies, the ability of workers to react to near-real-time operational data remotely is becoming more critical and represents an improved and strategic approach to work and asset management. For the assets themselves, operational data such as maintenance records, performance anomalies, and equipment stock data is collected and analyzed by machine learning algorithms targeted at predictive, preventive, and prescriptive maintenance of utility assets. IDC predicts that by 2019, 75% of power and utility companies will use strategic asset performance management applications to manage critical operational assets, leading to an improvement of up to 10% in operational performance. Utilization of data through work and asset management efforts can improve the performance and extend the life of assets such as renewable and traditional generation systems, substations, and transmission lines. In turn, these improvements help minimize the downtime of power and utility assets, which will increase revenue while decreasing maintenance costs. An IDC case study concluded that a utility reduced its maintenance and labor costs by 15–20% through applying a strategic and automated approach to asset performance management. Cloud-based work and asset management applications can make access to data in the field easier via mobile devices, helping maintenance crews and linemen perform their jobs more efficiently, leading to quicker outage restoration times and better operational safety.

- **Energy management.** Power and utility companies can gain actionable customer insights geared toward energy conservation and cost savings by using meter data management, demand-side management, and energy-efficiency data. These insights help companies and their customers reduce costs, improve sustainability, and eliminate the need for costly peaker plants. For instance, providing reliability to the power system is growing more complex given the options that electric consumers have in how they produce, consume, and save energy. Energy management through smart thermostats, automated demand response programs, and time-of-use rate plans can help energy-savvy customers conserve energy and reduce costs. Energy management also includes "prosumers" who generate power through solar generation and then sell the excess back to the grid via smart inverters that enable the bidirectional flow of power. Cloud computing can help power and utility companies collect, store, and analyze customer behavioral data related to energy management, leading to the development of new customer engagement programs that promote more efficient energy use by electric consumers while increasing overall system reliability for power utilities.

These areas are a subset of the data-intensive segments within a power or utility company that can profit from cloud, enabling quicker and better-informed business decisions while improving operational efficiencies and customer satisfaction.

Benefits of Cloud in Power and Utility Companies

As power and utility companies digitally transform, there are several key benefits from investing in cloud computing capabilities:

- **Innovation.** A big benefit of cloud is its ability to unleash innovation. Cloud provides numerous efficiencies that can free power and utility developers to design new products, business models, and services quickly and reliably — and at a lower cost — while speeding time to market. Cloud can help software engineers leverage next-generation technologies such as machine learning and artificial intelligence to better understand electric consumption patterns and then design products and services to meet customers' needs. For example, innovative new offerings and applications to improve customer experience, such as voice recognition in smart thermostats and other connected home appliances, represent emerging areas where utilities can improve customer engagement. Energy efficiency, demand response, and smart home products are innovative areas that utilities can focus on now. Developers can also create and utilize microservices, enabling agile software development. Cloud provides the opportunity to work on multiple projects at once in a flexible creative environment where developers can experiment with prototypes for high-value products and services.

- **Flexibility, adaptability, and scalability.** The growth of connected devices in the power and utility industry will vastly increase the collection and analysis of operational and customer data. The industry will spend $73 billion on Internet of Things (IoT) solutions in 2018, according to IDC's *Worldwide Semiannual Internet of Things Spending Guide*. Globally, only the manufacturing ($189 billion) and transportation ($85 billion) verticals will spend more on IoT solutions. With the continued growth in IoT spend, cloud-based services offer power and utility companies greater flexibility when data storage bandwidth exceeds on-premises capacity. Furthermore, cloud provides the ability to quickly scale this bandwidth up or down as needed, allowing companies to adjust to events such as the pace of smart meter rollouts or the timing on the deployment of sensors on assets in the field. Cloud capabilities also help manage the increased collection and utilization of data, providing security, scale, and agility while managing cost effectively.

- **Enhanced speed and collaboration.** Cloud enables seamless collaboration across an enterprise's many departments and stakeholders. It provides a competitive advantage to power and utility departments in real-time operational environments where staff members are physically dispersed when critical decisions need to be made fast. For example, when an electric utility or an independent power producer is buying and selling power, analysis and decisions need to come from the energy trading floor, plant operations, and risk management. In such cases, cloud can quickly provide information and insights to stakeholders across the company, breaking down silos and enabling better and faster time-sensitive business decisions.

- **Cost effectiveness.** Moving to a cloud computing model can yield economies of scale and create savings in several ways for power and utility companies. Cloud services enable automation, reducing the number of IT staff needed and allowing redeployment of essential in-house talent to higher-priority projects. Cloud also reduces IT infrastructure costs by lowering capital expenditures incurred in managing, running, and owning datacenters and servers. In addition, cloud computing and services create savings through lower operational costs and reduced downtime and maintenance of company-owned hardware and software. A cloud software-as-a-service (SaaS) offering can help lower total cost of ownership by approximately 30%, according to IDC.

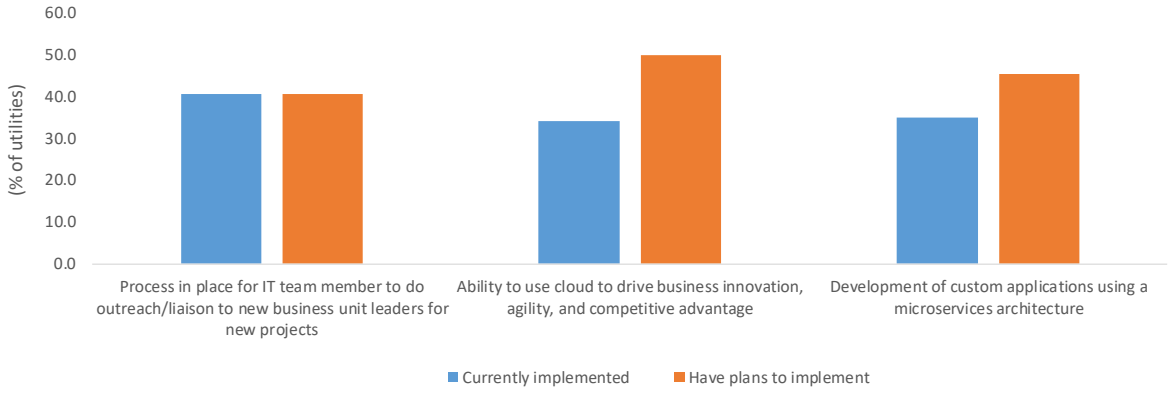
- **Accelerated information technology/operation technology (IT/OT) integration.** As power and utility business models evolve, cloud services can accelerate IT/OT convergence. Companies can leverage IT/OT integration as an opportunity to collaborate and use data from both operations and the business, improving reliability and efficiency while reducing costs and enhancing customer service. For example, outage management is a key area that can benefit from IT/OT convergence. Outage management systems use near-real-time operational data from field-based equipment sensors to provide utilities with an accurate and quick damage assessment. Utilizing both IT (managing, processing, and storing data) and OT (equipment, sensors, and software) within an outage management system allows for more efficient field worker dispatch, leading to improved safety for utility crews and quicker restoration times. Cloud services can also improve how operations and lines of businesses use time-sensitive critical data to drive decision making, customer satisfaction, and field crew performance.
- **Document control and knowledge transfer.** A huge demographic shift looms as large numbers of power and utility professionals reach retirement age and leave the workforce. The arriving generation of workers is more tech savvy and expects modern digital tools for data mining and analysis in areas such as operations or customer service. As the number of young industry professionals rises rapidly, cloud adoption by power and utility companies will accelerate. Moreover, cloud can provide an organized and accurate way to store and transfer working knowledge from retiring workers to the next generation by making critical data and technical documentation available in a common data repository that can be refined, updated, and utilized by stakeholders throughout the organization.

Cloud Platform Capabilities in Power and Utility Companies

Cloud platforms help better align IT and lines of business, leading to reduced costs, enhanced performance, and gains in operational flexibility. IT can act as a clearinghouse for transformation projects, coordinating the cloud needs of a power or utility company while lowering costs and providing visibility across organizational silos. Such coordination also can rapidly disseminate best practices and lessons learned. The importance of close collaboration between IT staff and business leaders is identified in Figure 2, which shows that nearly 40% of utilities in North America have a process in place for IT to work with new business unit leaders on cloud-related projects.

FIGURE 2

Cloud Platform Capabilities for North American Utilities



n = 192

Source: IDC's *CloudView Survey,* April 2018

Using cloud to drive innovation is a key capability for power and utility companies that need to be agile and make rapid adjustments to changing conditions. Organizations must develop and alter apps and workflows to address changes in assets, markets, and other areas. Nearly 50% of North American utilities plan to use cloud capabilities to drive business innovation and agility to gain a competitive advantage in the next two years.

The capacity to rapidly develop and deploy scalable apps — both internally and externally — is the most technically critical cloud capability. Cloud provides the ability to develop and support apps without the heavy demands of a legacy IT staff. Cloud computing can make it easy for companies to start using microservices architectures, so applications are easier to scale and faster to develop. Over 45% of North American utilities plan to develop custom applications using microservices architecture.

Considering Amazon Web Services

Cloud platform offerings from Amazon Web Services (AWS) provide power and utility companies with the foundation for digital transformation. AWS brings a partner network, a suite of transformational tools, and the scale needed by companies of all sizes. AWS cloud services can help an organization achieve benefits in the following areas:

- **Innovation.** Accelerate innovation with a state-of-the-art cloud platform where power and utility companies have the breadth of tools to experiment with prototypes and to create new products, services, and business models. For example, AWS makes it easy to develop and manage a wide range of smart devices in the home powered by AWS IoT and Alexa, giving consumers the ability to improve energy efficiency. AWS also provides tools such as cloud-based contact centers to manage maintenance calls at scale, IoT to detect and prevent equipment downtime, and analytics to improve operational efficiency and reduce overall energy costs.

- **Security.** As the industry digitally transforms and increases its cloud capabilities and the deployment of connected devices on field assets, power and utility companies are looking closely at the risks and strategies around cybersecurity and physical security. AWS maintains strong safeguards to protect customer data, which is stored in its highly secure datacenters. AWS maintains some of the highest standards of security for its datacenters. Security provided by AWS is cost effective because companies no longer maintain or secure their own infrastructure. Compliance programs in the AWS infrastructure also allow power and utility companies to keep up to date with frequent changes in compliance requirements. Further, AWS security provides scalability as data volume increases over time.

- **Cost effectiveness.** Meter data management, asset performance management, customer care and billing, network management, and mobile workforce management are data-intensive areas where utilities are investing in or considering cloud to reduce costs, improve efficiency, and achieve better business outcomes. For example, a water technologies company reduced its operating costs by 90% and accessed new opportunities for innovation using AWS. Additionally, a flexible "pay as you go" approach makes AWS' cloud-managed service appealing from a cost perspective, lowering overall IT infrastructure spend and total cost of ownership. AWS' fully managed cloud service eliminates onsite servers and storage devices while freeing internal IT staff for higher-priority projects such as creating innovative new products. Utilizing AWS services can also eliminate real estate, building, and facility costs.

- **Performance.** Machine learning, high-performance computing, and real-time analytics are increasingly critical in a power and utility company's digital transformation journey. To derive insights that can improve safety and efficiency outcomes, companies require new tools and more capacity to analyze growing data sets such as electric demand, outages, power pricing, and power plant ramp rates. AWS provides power and utility companies with the computing performance and toolset to uncover deeper insights faster.

- **Accelerated IT/OT integration.** IT/OT integration creates opportunities to collaborate and use data from operations and the business, improving reliability and efficiency while reducing costs and enhancing customer service. For example, AWS worked with a large investor-owned gas and electric utility to apply natural language processing (NLP) to quickly analyze over 60,000 corrective action program (CAP) tickets, reducing the company's safety analysis from two weeks to two minutes. Using AWS' natural language search and analysis applications, the company converted unstructured data into a usable form to create an efficient and successful CAP process that increased safety.

- **Scalability.** As power and utility companies collect more data from smart meters and digital sensors replace analog on power plants, substations, and the power grid, AWS cloud services provide scale by using modern IT infrastructure as a service (IaaS), which is especially useful for organizations with ongoing smart meter rollout programs or DERs coming online. AWS also yields time and cost savings when expanding smart grid technologies and edge devices or in maintaining self-hosted databases. Further, AWS eliminates the uncertainty of limited data storage capacity as the collected volume and use of both operational and customer data increase.

- **Agility and speed.** Smart grid initiatives, customer engagement programs, and DER systems are changing how power and utility companies operate. AWS provides software engineers with flexible services that simplify provisioning and managing infrastructure. Amazon SageMaker is a fully managed platform that enables developers and data scientists to quickly and easily build, train, and deploy machine learning models at any scale. Additionally, AWS can provide an increased pace of automated software releases so that companies can create and improve products faster to meet customers' needs. AWS' DevOps model also allows for a tightly integrated process across the entire life cycle of an application.

- **Collaboration and mobility.** Power and utility companies are recognizing the collaboration and mobility benefits of cloud applications. AWS cloud services accelerate IT/OT integration and allow dispersed departments to collaborate and share information in near real time. Power and utility employees and customers can access cloud-based data and applications via mobile devices, improving internal workflow and customer engagement. More efficient collaboration and mobility result in greater internal productivity and better customer interactions. For example, enabling the utility field crew to see what the operation team sees reduces the time to complete restoration efforts.

Challenges

Although sentiment is changing, security remains a major concern for power and utility companies considering cloud investments. However, many cloud-based services are more secure than most traditional on-premises IT systems when it comes to cyberattacks and data breaches. Cloud capabilities can help power and utility companies securely streamline compliance requirements related to the North American Electric Reliability Corporation Critical Infrastructure Protection (NERC CIP) plan. NERC CIP compliance measures require frequent changes and timely updates by power companies. A secure cloud environment provides the flexibility and scalability to incorporate required changes while quickly supplying access to internal and external stakeholders in remote locations. However, power and utilities companies — whether they use cloud or not — are conservative in their approach to NERC CIP compliance due to the high costs of noncompliance.

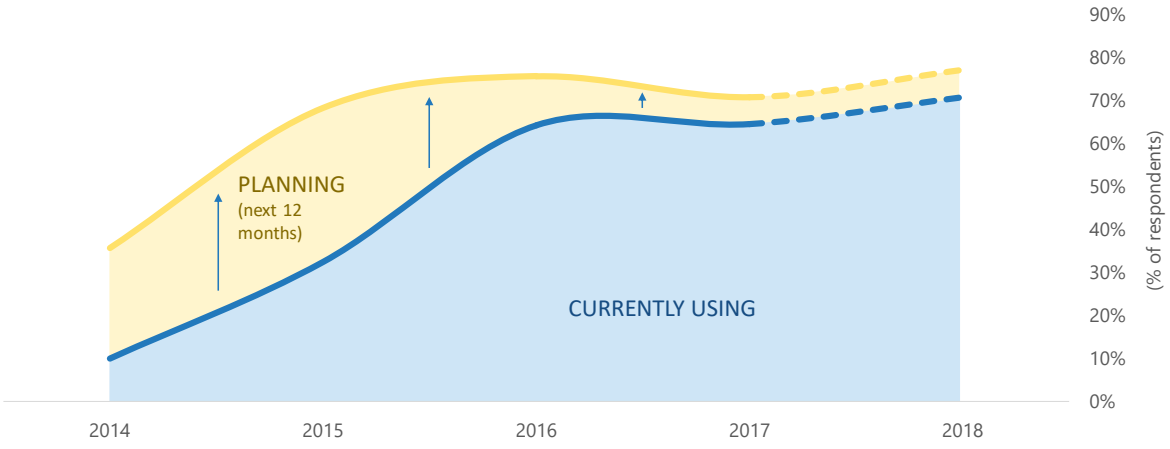
Cloud adoption is increasing in the power and utility sector, but the industry still needs to improve IT-related skill sets and acquire greater knowledge of new cloud standards, offerings, and methodologies. In a capital-intensive and operations-focused industry, power and utility companies require strong leadership to drive IT/OT integration in breaking down organizational silos and creating an agile DevOps culture committed to providing greater operational efficiency, reliability, and customer experience.

The capitalization of cloud remains a barrier to adoption for some large investor-owned utilities in the United States. However, there is a movement to allow cloud investment to be rolled into the utility rate base, which is dependent on state-by-state and local regulations. In Europe and Asia/Pacific, cloud capitalization is a nonissue. Those markets have a different competitive landscape that drives higher cloud adoption rates. For example, in Italy and Australia, utilities are unbundled in a competitive market, giving electric retailers and generators more flexibility, with limited or no regulations around cloud investments. We see the European utility market embracing cloud more quickly than the U.S. utility market (see Figure 3).

FIGURE 3

European Utility Cloud Adoption

Q. Does your organization use public/private cloud solutions of any type?



n = 117 (2014), n = 120 (2015), n = 140 (2016), n =175 (2017 and 2018)

Source: IDC Energy Insights' *Annual IT Survey*

Conclusion and Essential Guidance

Digital transformation in the power and utility sector accelerates investment in and adoption of cloud technologies and services. Cloud services provide power and utility companies with an efficient, flexible, agile, and cost-effective alternative to the traditional approach to IT infrastructure and fuel innovation that drives new products, services, and business models that improve operational and organizational performance and competitiveness while increasing customer satisfaction.

Today's power and utility business faces many challenges, including decreasing electric demand, the evolution and growth of microgrids, distributed and renewable energy generation, and the need for better customer engagement. As the industry changes and new business models evolve, cloud computing is an essential strategy for power and utility companies in delivering a customer-first experience and

operational efficiency across distributed energy resources. As digital transformation reshapes the industry, power and utility companies will increasingly consider cloud technology and services as key to their software portfolio. IDC therefore offers the following cloud adoption guidance:

- Investigate service providers' data security constructs carefully. Ask cloud providers to provide proof for any data that falls under compliance requirements.
- Make sure your organization has the services, hardware, and support to invest in cloud technology. Utilities are invariably asset intensive, so a solid IoT strategy is critical to getting the full value out of cloud.
- Evaluate cloud professional services firms that promise to accelerate digital transformation by improving the agility, flexibility, and ability to govern IT on behalf of the entire organization. The service provider should define which IT roles are most valued by the business and should be developed internally.
- Do not fear cloud lock-in. Clearly define and document any cloud dependencies in case you need to switch providers, and move forward with the best provider for you at this moment.
- Request that 24 x 7 maintenance, support, and restoration agreements be in place. In case of service downtime, providers should be able to provide maintenance around the clock. Create service restoration SLAs if necessary.
- To achieve effective IT/OT integration, educate and train your organization on the potential for enterprise and industry clouds to support business requirements across both IT and operations.

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