PrescientDevices

Accelerating IoT Edge Computing

Time to Value with Prescient Designer

October 2020

Time to Value

About this Paper

Written with both technical and business decision-makers in mind, this white paper addresses how edge computing and Internet of Things (IoT) impacts the real-world challenges facing businesses today. It provides an overview of how businesses can accelerate time to value with Prescient Designer.

About the Author

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Doug Levin is a business leader, technologist, and serial entrepreneur. He is the sole founder and first CEO of Black Duck Software. Earlier in his career Doug held senior management positions at Microsoft Corporation over a nine-year period. Today, he is an Executive-in-Residence (XIR) at the Harvard Business School and mentor to MIT startup ventures. Doug also serves on the Board of Directors of several technology companies and as an advisor to an array of young companies in the IoT, cybersecurity and AI/machine learning segments.

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Overview

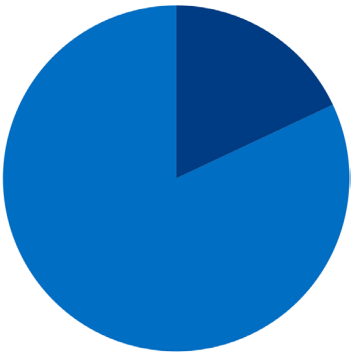
The foundational technology underlying edge computing consists of computers, network equipment, sensors, and data that are located "at the edge" of a company's cloud and physical computing infrastructure. This is often where products are manufactured, utilities are maintained and distributed, and where professionals and personnel are consuming information and supporting many de-centralized or distributed functions.

IoT devices may have sensing, computing, and connectivity capabilities combined in many different ways by hardware manufacturers, resulting in a dizzying array of choices. These devices include smart factory equipment, wireless inventory trackers, ultra-high-speed cellular routers, biometric cybersecurity scanners, sensor arrays, and many more.

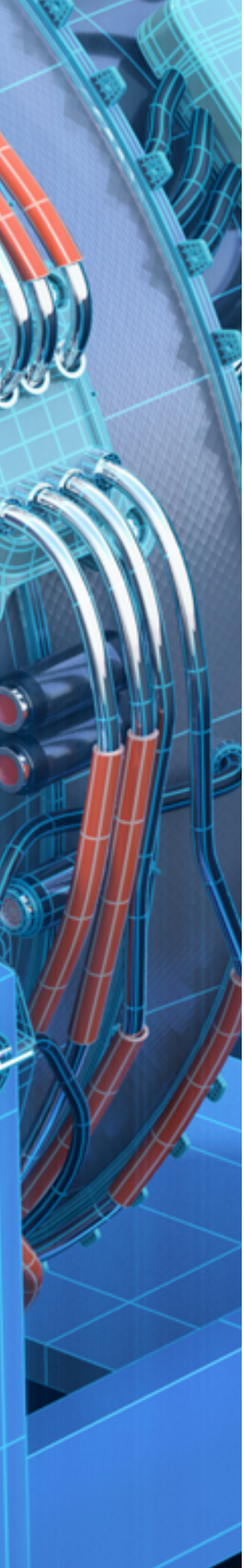
IT professionals know that many IoT edge devices require hardware, software programming and data to optimize worker productivity and company operations. Edge computing is fueled by data from IoT devices that is analyzed and connected through networks with other data from the company's data center and the cloud. Lower latency and efficient data processing are therefore requisite amid IoT devices at the edge for successful IoT deployments.

16.56B

Expected edge computing market growth by 2025



18% of total spend on IoT infrastructure will be spent on **edge infrastructure** by 2020



Edge Computing and IoT Project Fundamentals

By 2020, according to IDC[1], the IT spend on edge infrastructure will reach up to 18% of the total spend on IoT infrastructure. This spending is driven by the deployment of converged information and operational technology systems which reduce the time to value of data collected from their connected devices. The edge computing market is expected to grow from US $1.73 Billion in 2017 to US $16.56 Billion by 2025, at a compound annual growth rate (CAGR) of 32.8% during the forecast period.[2]

> “Today, with greater cloud computing, security and software support, edge computing has become a means by which more efficient machine learning can be realized.

This “local” processing at the edge minimizes both latency in decisions and data exchange to and from the cloud.

The following edge computing projects involve a substantial number of IoT devices, software applications, data, cloud and network connections that support distributed business activities and corporate functions. These projects provide strong exemplars for the current state of the art of advanced, successful edge computing and IoT technology deployments:

[1] IDC FutureScape: Worldwide IoT 2018 Predictions, IDC, October 2017.
[2] Global Edge Computing Market Opportunities and Forecasts, 2018-2015, Allied Market Research, May 2019.

Edge computing projects with IoT deployments that support distributed business activites and corporate functions:

Sensor Arrays	Provides multiple entry points for data collection and analysis used in security, logistics, and remote control
IoT-enabled Self-Healing Automated Systems	Intelligently regain control when any downtime occurs
HaLow Wi-Fi	Extends WiFi into 900-MHz band to enable low power connectivity for apps, sensors, and wearables
IoT-enabled GPS Trackers	Track and trace a company's inventory system on a global scale for logistics efficiency
Computer Vision	Using ML and AI computers to identify and understand digital images to aid processes and decisions
Digital Twins	Replicates and models physical products/processes in a digital form to increase accuracy and efficiency
Smart Lighting	Intelligent control for surveillance, safety, billboard, environmental, and energy efficiency
Smart Pumping	Collects real-time systems performance information to help customers control electricity expenses, reduce manual labor, and monitor waste

With the wide application of these IoT projects in almost every industry, in the form of remote management and logistics, anti-crime and security, collecting and analyzing real-time system performance for efficiency and accuracy, edge computing and IoT have become a focal point for companies moving forward with digital transformation. The challenges in designing and deploying these and many other projects make a case for a "prescient" solution featuring low-code automation and design capabilities.

Deployment Challenges

When Prescient Devices was founded it carried out research for months, interviewing literally hundreds of cloud and software architects, software, DevOp's and security engineers, project managers, IoT integration specialists, edge computing consultants, business and senior technology decision makers, and others.

Considering today's edge computing and IoT deployments, we concluded there are seven challenges to be overcome:

1. Edge computing and IoT deployments were negatively impacted by the absence of a well-defined project roadmap and budget with a clear set of objectives.

2. Many edge computing and IoT deployments require a massive team, including (1) edge computing and IoT hardware integration and signal processing specialists and software engineers; (2) software architects, engineers and developers to utilize SDKs, containers, code repositories, corporate networks and help make continuous integration and continuous deployment (CI/CD) successful; (3) Cloud architects and DevOps data acquisition and signal processing; (4) security architects and software engineers, and (5) a project manager(s) too.

3. Connecting edge computing and IoT devices via various combinations of public, private and hybrid cloud create configuration, performance, storage efficiencies and control issues. This is especially true of emerging technology, such as using 5G wireless devices in projects.

4 After the inception of the project, businesses encounter difficulties sourcing parts of the infrastructure from different vendors, and problems around the lack of interoperability of these parts and the company's operations and information technology.

5 Businesses encounter challenges associated with processing, and acting on, voluminous quantities of data.

6 Many edge computing and IoT deployments leave the "last mile" of edge software application development up to the end-user.

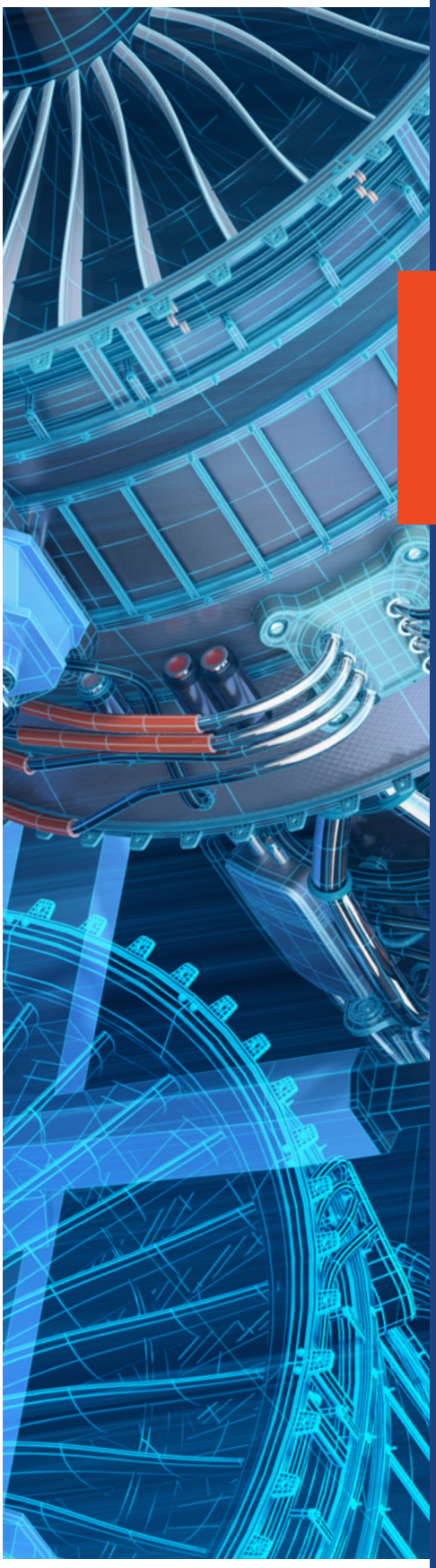
7 With hardware and software technologies being introduced all the time, edge computing and IoT deployments have met with challenges supporting continuous-integration-and-continuous-deployment (CI/CD or CICD, in this white paper we use "CI/CD").

12%
of IoT projects are fully successful

65%
of projects are unsuccessful

As a result of these challenges many edge computing and IoT projects are late, don't deploy, or fail after release. It is not surprising that only a very small fraction of IoT projects are fully successful. 65% of IoT projects are unsuccessful and only a mere 12% of IoT projects are fully successful.[3] Overcoming these challenges would require a prescient solution.

[3] Why do IoT projects fail and how to beat the odds: An executive summary. Software AG. 2020.



Prescient Designer: **A Prescient Solution**

With Prescient Designer™, anyone can design, develop and deploy IoT edge computing projects and include support from system integrators, IT/OT engineers and data scientists.

Prescient Designer has six discrete features and systems which go above and beyond the existing state of the art to address the challenges identified and described above:

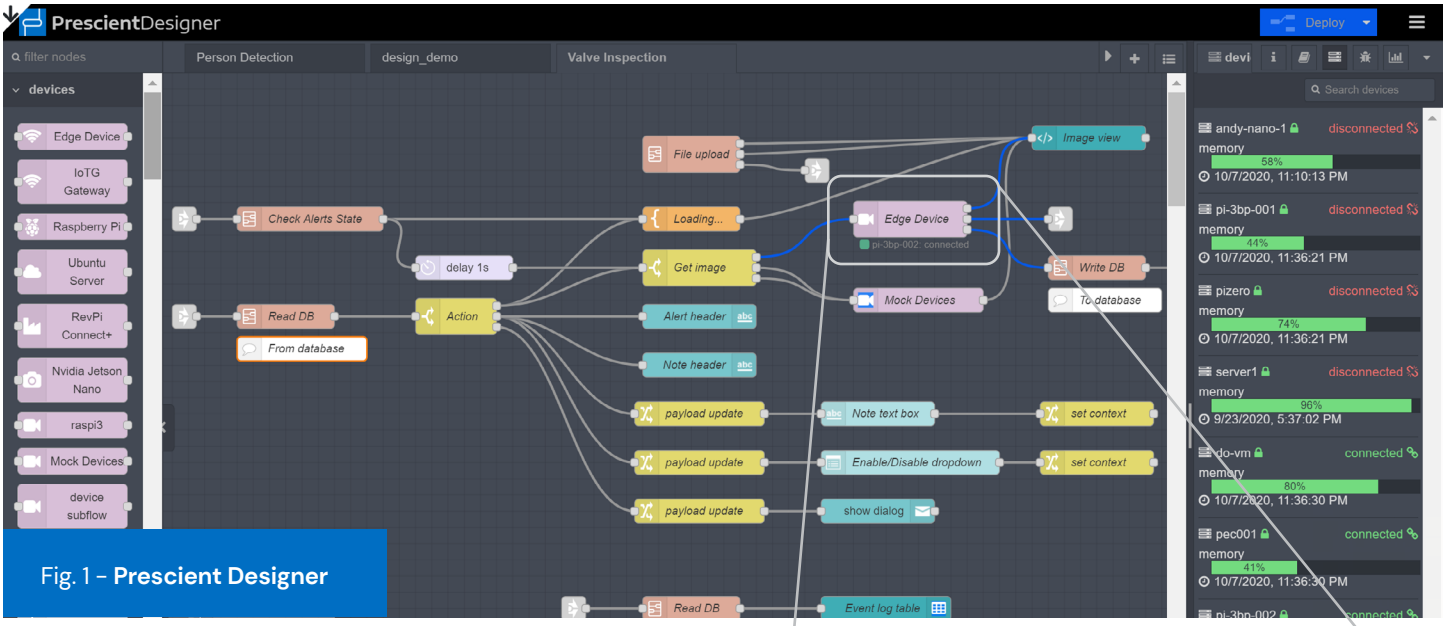
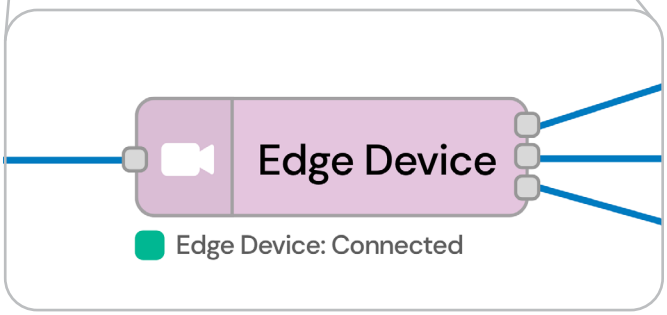


Fig. 1 - **Prescient Designer**

1

A **graphical approach** edge computing and IoT device programming that includes two dimensional symbolic representations of sensor arrays, IoT devices, network and edge computing resources and much more. In contrast to conventional text-based software programming which uses lines of code, Prescient Designer's graphical programming approach uses symbols to reduce or eliminate software development complexity as it applies to a physical environment.



Edge App

Users can program edge devices' functionalities directly within Prescient Designer (Fig. 1). A low-code graphical approach provides seamless integration for distributed IoT systems from the edge to the cloud.

2

Seamless integration of edge apps into cloud apps without the usual and customary runtime errors or other cloud/data center complications. The User simply draws wires to move data between edge devices and cloud apps, with secure and reliable data communication taken care of behind the scenes. Functions such as data processing and machine learning can be moved between the edge devices and the cloud apps via cut-and-paste, enabling easy optimization of computing resources.

3

A **low-code** software development approach that requires little-to-no coding in order to build edge computing and IoT applications. Prescient Designer's low-code development platform supports a graphical and drag-and-drop approach instead of extensive coding languages for compiling, network and data applications and analysis, and other technical uses. On the other hand, the platform supports full-code application and web development for advanced users, making it adaptable in an enterprise environment.

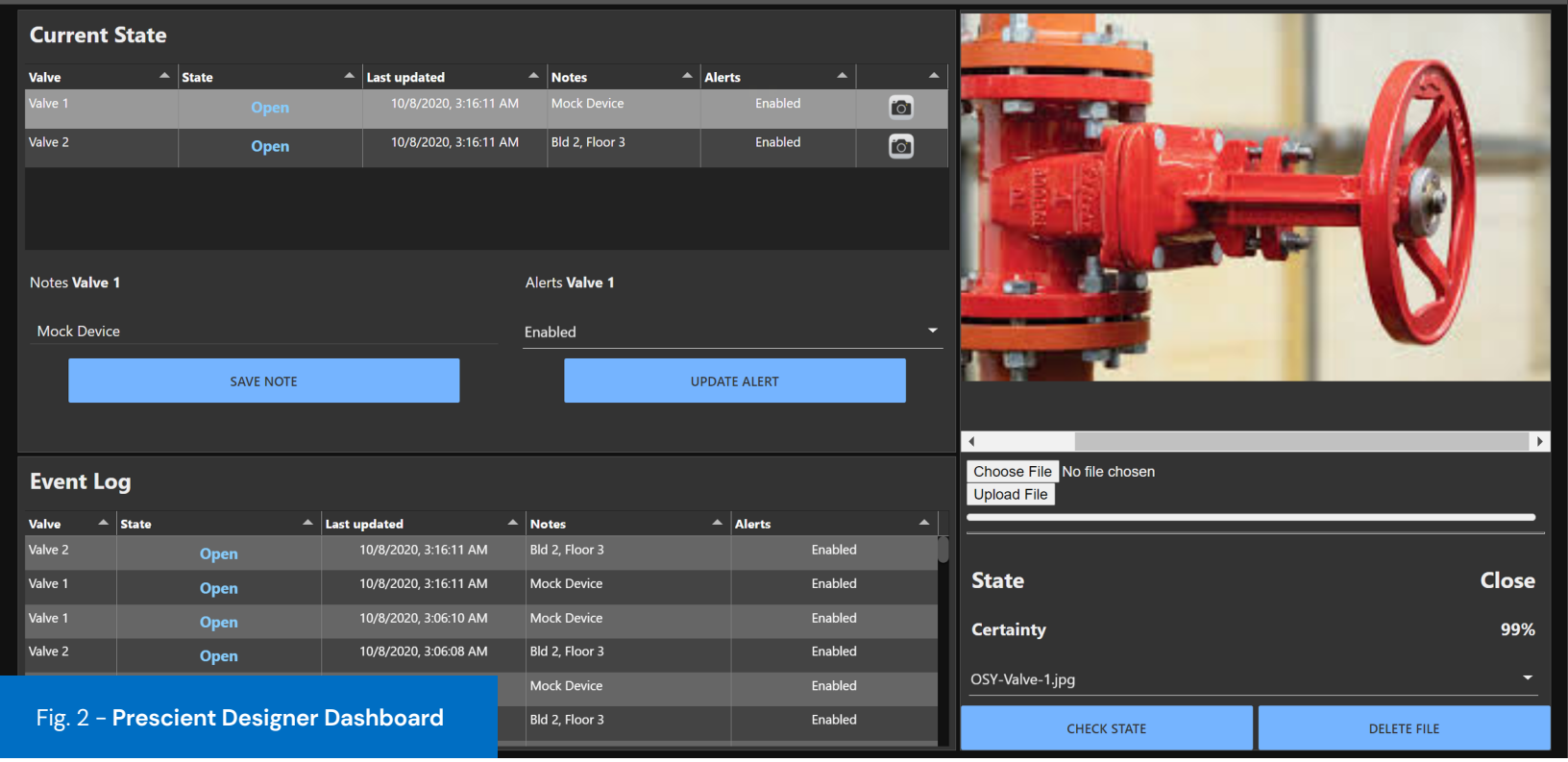


Fig. 2 - **Prescient Designer Dashboard**

4

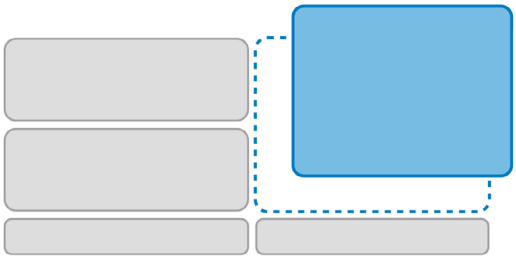
Enhanced security and enterprise reporting/ auditing features through real-time monitoring of threats and changes in the application code of all devices inside the system. Prescient Designer's proprietary security technology seals off edge devices and enables content-based application monitoring and complete tracking of every action that happens in the system for every device for unprecedented security and observability.

5

Support for **continuous development** through automated orchestration, deployment, and CI/ CD that bridges the gaps between development and operation activities. It is typically a challenge for users to build an efficient and flexible CI/ CD pipeline for IoT systems, but in Prescient Designer, all the automation is taken care of behind the scenes so the user only needs to focus on her application development.

6

A **dashboard** with a drag-and-drop approach that enables users to build sophisticated functionality, access and visualization. The dashboard can include interactive components such as buttons, forms, dialogue boxes, etc. and these can be integrated seamlessly with edge or cloud apps without needing to build separate APIs. The platform also supports fully customized html/CSS dashboards for power users.

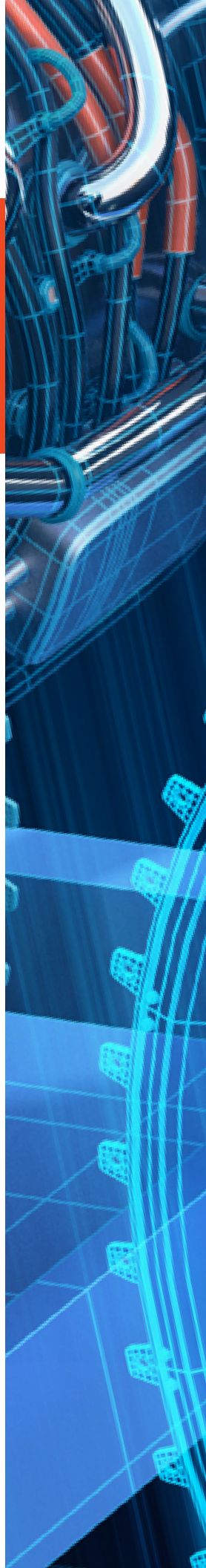


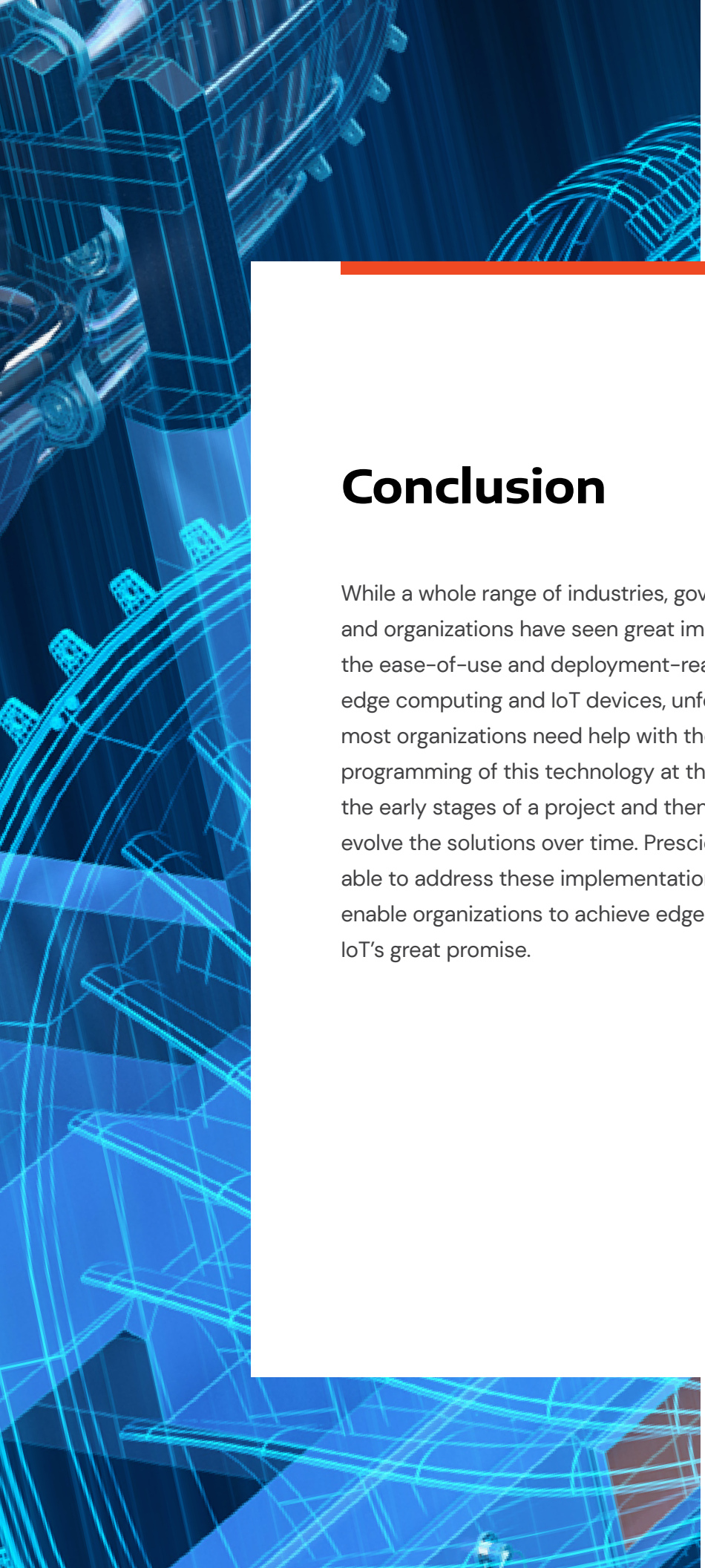
Drag-and-Drop Dashboard

Users can build their own dashboards in Prescient Designer (Fig. 2) to easily access and monitor numerous edge devices directly from within the platform.

Prescient Designer provides the only solution to design and manage complete edge computing and IoT systems from the sensor to the cloud.

Prescient Designer is based on Node-RED, an open source software project. Prescient Devices' engineering team has developed significant capabilities beyond Node-RED's basic tooling functions. Node-RED is used by thousands of integrators and engineers, and it is adopted by major corporations including IBM, Siemens, Samsung, Intel, GE, Fujitsu, Schneider, Cisco, and Hitachi. It has a strong open-source community which has contributed thousands of solutions ranging from MODBUS to machine learning. Furthermore, Node-RED is built on Node.js, which is a Javascript runtime used by more than 98% of Fortune 500 companies and is one of the most powerful, reliable, and battle-tested software in existence.





Conclusion

While a whole range of industries, governments and organizations have seen great improvements, the ease-of-use and deployment-readiness of edge computing and IoT devices, unfortunately most organizations need help with the design and programming of this technology at the edge during the early stages of a project and then the flexibility to evolve the solutions over time. Prescient Designer is able to address these implementation challenges and enable organizations to achieve edge computing and IoT's great promise.

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Learn more about IoT and Prescient Designer at
prescientdevices.com

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