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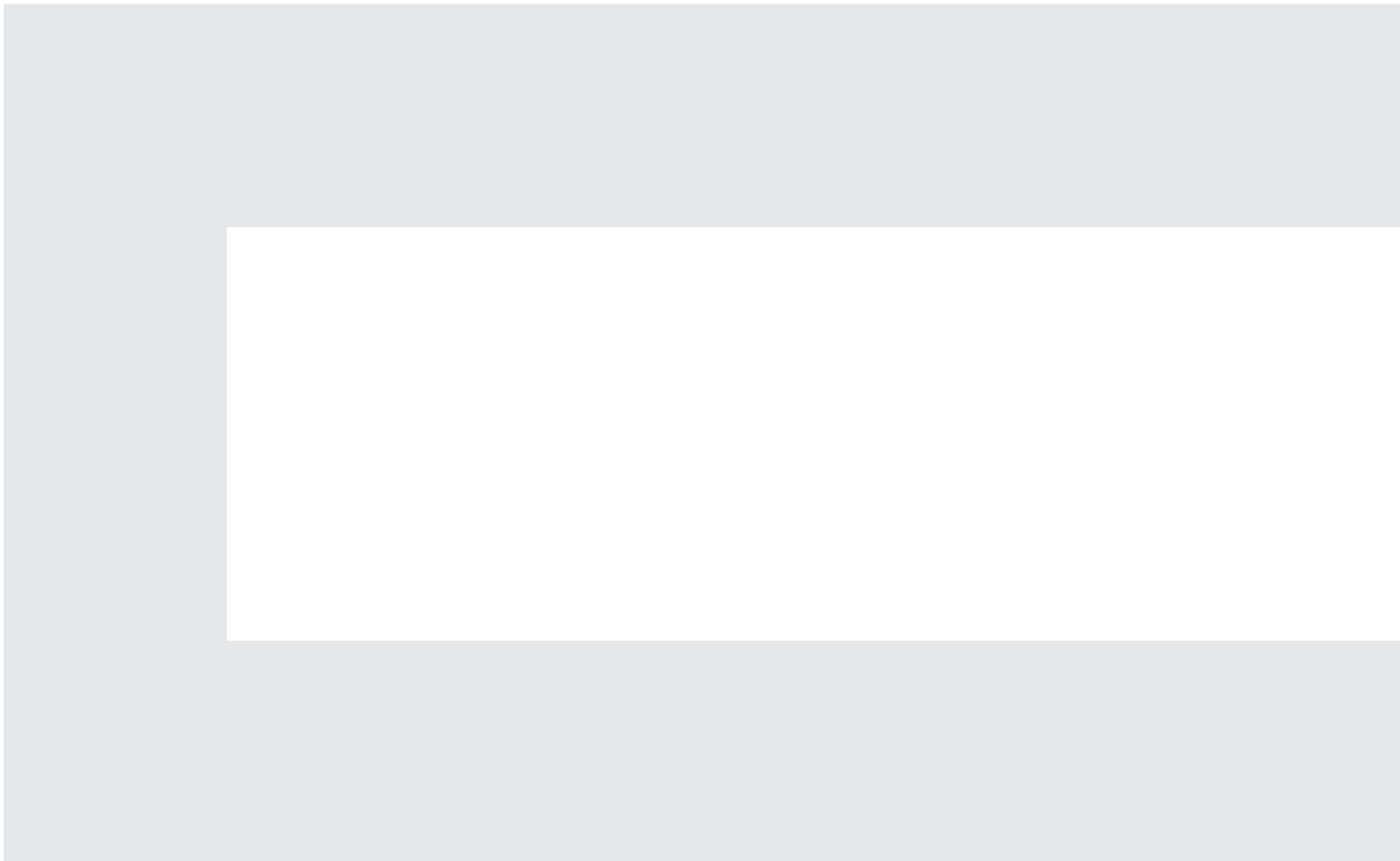
Harness the power of IoT data

Real-time decision-making and control at the edge

The proliferation of connected machines, devices, and things is rapidly transforming the way businesses extract value from data. A growing interconnection of the physical world with computer-based platforms—known as the **Internet of Things (IoT)**—is producing massive data volumes that contain real-time insight, which can help organizations adopt new business models, streamline operational processes, and create more innovative products and services.

Widespread adoption of the IoT is driving a shift toward **perpetual connectivity**, or an organization's ability to be continuously connected to their consumers, processes, and products. This notion of perpetual connectivity carries with it far-reaching implications and opportunities for businesses, from being able to better monitor product usage in a particular market, to proactively maintaining devices and facilities, to motivating customers to purchase a product. Those that are able to fully realize and capitalize on the value of perpetual connectivity will be positioned to ask not **what can we do** but **what can't we do**.

A few disruptive trends are accelerating the demand for computing technologies expressly designed for the IoT. First, organizations are recognizing that there are vast quantities of data pent-up inside things, everything from vehicles to pumps, wind turbines, tractors, robotic arms, thermostats, or even human beings. Second is the realization that tremendously valuable business, engineering, and scientific insight can be derived from this data, and used to improve many business processes. Finally, in order to fully capitalize on that insight we must be able to take immediate action, making faster time to insight a critical goal of any end-to-end IoT solution.

To reap the benefits of these new data sets, organizations of every size and industry are seeking new ways to capture and analyze the data created at a growing number of IoT endpoints. Gartner estimates that **20.8 billion IoT endpoints** will be in service by 2020[1], making it a business imperative to exploit this unique opportunity to derive value from IoT data.

This drive to extract immediate insight from data is causing high-end compute functions and data analytics to increasingly migrate closer to the edge of the network where the **things** are. Edge computing **shifts left** the processing power and knowledge generation away from the data center (Figure 1), streamlining access to relevant data, lowering the risk and cost of transporting data across the network, and ultimately accelerating time to insight and resulting actions.
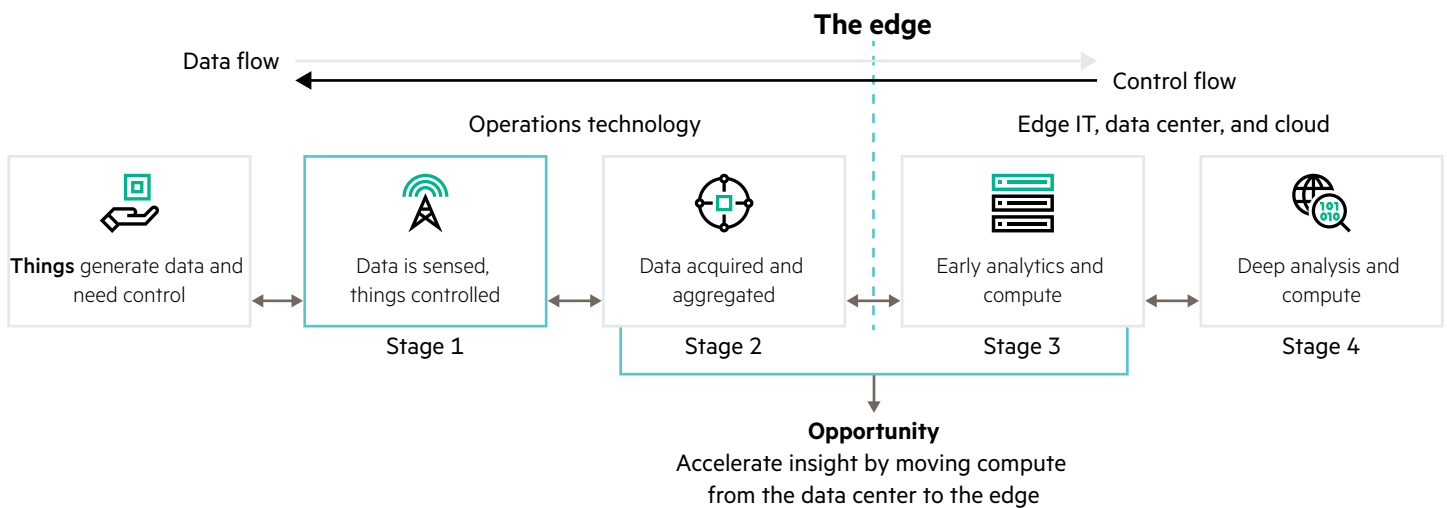

Figure 1. Our shift left to the edge

[1] "Gartner Says 6.4 Billion Connected **Things** Will Be in Use in 2016, Up 30 Percent From 2015," Gartner Symposium/ITxpo, November, 2015, **gartner.com/newsroom/id/3165317**

Enhance decision-making at the edge

Still, many organizations continually struggle to collect data from their IoT devices and rapidly convert it into actionable intelligence. A growing number of IoT endpoints is heightening the complexity of the edge and raising concerns about data security. Data reliability is also a key challenge since data that is moved across the network is more likely to become compromised or corrupted. Even with the edge computing technologies currently on the market, organizations are still seeking ways to further simplify IT at the edge.

Hewlett Packard Enterprise is doing its part to make IoT data more accessible, actionable, secure, and reliable by introducing a new product category, Converged IoT Systems. The first system of its kind to integrate in one box—data capture, control, compute, storage, and HPE iLO data center class systems management—the **HPE Edgeline EL1000** and **HPE Edgeline EL4000** Converged IoT Systems quickly deliver insights at the edge and help organizations capitalize on real-time, data-driven decision-making. These Edgeline Converged IoT Systems are designed to thrive in hardened environments and optimized to conveniently capture data, deliver heavy-duty data analytics and insights, offer graphically intense data visualization, and enable rapid response at the edge.

HPE Edgeline Converged IoT Systems combine the five basic functions of an IoT solution, including data capture, control, systems management, storage, and compute. Traditionally, these functions procured as separate components are connected by cables and deployed independently. Hewlett Packard Enterprise has integrated key functions into a single box to deliver the entire value of a complete IoT solution. This eliminates much of the complexity of purchasing and deploying multiple disparate systems, uses less space and less energy, and increases reliability at the edge.

Higher performance, security, and reliability at lower costs

Immediacy of insight is critical for many industrial IoT environments. For example, balancing energy consumption on a power grid or using temperature data to determine if a tram's rotating wheels are malfunctioning requires immediate computing power—even the slightest delay can put personal safety and equipment at risk. HPE Edgeline Converged IoT Systems eliminate the need to send this critical data across the network for analysis, reducing the amount of latency between the moment of data capture and the moment of insight.

Data that travels across the network to the data center or cloud is at an increased likelihood of corruption, making data reliability one of the chief concerns surrounding the IoT. Migrating compute power directly to the edge reduces the compute and storage requirements at the data center, and avoids cloud lock-in. This significantly reduces the issues surrounding data duplication, data corruption, compliance, and connectivity. The system's form factor converges major functions into one chassis, reducing cabling and the probability of failure. And the simplicity of having only one box to purchase and deploy helps to streamline the procurement process and speed time to value for your new IoT investment. As a result, the HPE Edgeline Converged IoT Systems can be procured and maintained at a lower cost than many as-is IoT solutions.

World-class security for IoT devices

The HPE Edgeline Converged IoT Systems are built on open industry standards such as the Intel® Xeon® processor architecture, PCIe I/O, and PXI data capture and control. This affords the capability of running numerous x86 applications and infrastructure management software. For example, the edge can be a hostile, insecure, and vulnerable place for data. As the number of IoT endpoints continues to surge, the simple act of onboarding new things to the network can introduce new security threats and points of vulnerability. This makes securing enterprise networks for an onslaught of new IoT devices among the top concerns for organizations when choosing an IoT solution. **Aruba ClearPass**, our secure network access control software, is an essential security ingredient complementing the HPE Edgeline Converged IoT Systems hardware platform.

To help organizations safeguard themselves against the security and connectivity challenges of the IoT, networks must be able to automatically add, detect, profile, and secure new and unknown IoT devices without manual intervention. The Aruba ClearPass Policy Manager includes a device profiler to help networks distinguish between different IoT endpoints, and then control how each device accesses and uses the network based on IT-defined policies. This feature delivers world-class security while unburdening the user, using flexible security features and policy enforcement that are specific to each device. ClearPass also easily integrates with existing network infrastructures from any vendor, enabling IT teams to easily automate and scale rather than letting security become an inhibitor for new digital transformation initiatives.

Deeper collaboration between OT and IT

The edge is increasingly viewed as the **intersection where operational technology (OT) meets information technology (IT)**. In a typical IoT network data flow (Figure 1), data is generated, detected, and collected on the OT side before being passed to the IT organization for analysis, either at the edge or in the data center.

As previously discussed, traditional IoT solutions require each stage of this journey to occur independently and in separate boxes, with many times the data traveling over cables, and then sent to the data center or cloud. However, HPE Edgeline Converged IoT Systems are seamlessly blending these two different worlds for the first time, making data collected from OT devices a valuable source of decision-making insight for IT processes.

Just as good communication between the plumber and the carpenter is required to build a house, IoT projects have a greater chance of success when the OT and IT organizations collaborate. The HPE Edgeline Converged IoT Systems compels these two organizations to work more efficiently together, resulting in better outcomes and increased benefits for the business. OT and IT committing to work together has the potential to transform operations, improve data security and reliability, and increase system interoperability. Organizations can advance their IoT initiatives through a deeper collaboration between OT and IT, and the new HPE Edgeline Converged IoT Systems can be a material factor in promoting this collaboration.

Let us help you harness the business potential of the IoT

Hewlett Packard Enterprise leverages a track record of industry-leading computing, networking, and security solutions to provide organizations the critical tools they need to overcome their most difficult IoT challenges. With the opportunity to convert IoT insights into positive business outcomes more present than ever, it is crucial to select a technology partner who can fuel your IoT transformation. HPE continues to demonstrate IoT market leadership with the announcement of the HPE Edgeline Converged IoT Systems, which not only create a new product but also a completely new product category for the achievement of IoT initiatives. HPE is a leader in compute technology in the data center and in the cloud. With HPE Edgeline Converged IoT Systems, HPE is taking that capability and shifting it left out to the edge.

The HPE Edgeline Converged IoT Systems provide organizations the freedom to choose the optimal approach for their IoT system, whether that approach includes the cloud or not. These converged systems can help avoid cloud lock-in by not needing to send data back to the cloud or data center for analysis. However, if using the cloud makes the most sense for your business, Hewlett Packard Enterprise can deliver that too. With the HPE Edgeline Converged IoT Systems, customers can choose either approach or both—and that level of deep choice is not offered by any other vendor in the IoT space today.

Hewlett Packard Enterprise's partnerships with industrial IoT leaders like PTC, GE Digital, and National Instruments, are part of their long-term commitment to deliver best-of-breed IoT solutions to customers. These joint solutions combine the very best of OT and IT to address the most specific industrial use cases in the aerospace, oil and gas, manufacturing, automotive, and energy industries. The **HPE IoT Transformation Workshop (TW)** is an interactive opportunity to help customers define their IoT vision and strategy and gain business technology alignment. Our full suite of services is designed to help customers successfully implement IoT solutions based on their individual business needs and industry parameters.

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Dr. Tom Bradicich is vice president and general manager at Hewlett Packard Enterprise, leading the global business unit dense scalable servers and IoT Systems, with P&L, worldwide product development, and customer experience ownership. He and his team direct the HPE Discovery Labs and IoT Innovation Labs in the U.S. Europe, and Asia, for partner and customer collaborations.

Tom was named in Computer Reseller News' (CRN) Top 25 Disrupters of 2016, and in the Top 100 Executives of 2016. With first of a kind innovation, Tom's products received an InfoWorld's 2015 Technology of the Year Award, the ARM® TechCon Best of Show, a CRN 2015 Product of the Year Award, a 2016 IT Brand Pulse Leader Award sweeping all categories, and the furthest on the Gartner Magic Quadrant, Modular Servers. Tom and his team incepted HPE's first corporate IoT strategy and launched the HPE Edgeline product line, creating the industry first product category Converged IoT Systems, and the first line of systems expressly designed for the IoT.

Prior to his current role, Tom was vice president, Server Engineering at HP, responsible for global R&D and delivery of HP's workload optimized, converged server product line. Tom and his staff directed several worldwide engineering teams, releasing over 20 products and integrated solutions stacks. They pioneered the first Intel Xeon server with on-chip integrated graphics, and the first 64-bit enterprise ARM server.

Tom and his team regularly engage customers such as the federal governments of several countries, major universities, and global industry leaders in banking, media, entertainment, manufacturing, and healthcare. In addition, Tom serves as an advisor to his companies' corporate legal teams on acquisition, IP, and business contracts.

The beginning of his career was spent at IBM, where he became a corporate IBM Fellow, R&D vice president, engineering director, distinguished engineer, and CTO for IBM's x86 server line. Early on, he worked in PC R&D where he led the design of IBM's first prototype notebook computer, which catalyzed a new product category, and managed the development of the first mainstream x86 system with memory error correction and external cache memory. Tom managed the worldwide VGA graphics and PCTV software and hardware product R&D, embedded server virtualization, and the development of IBM's System Migration Assistant (SMA) software. He and his team conceived and led IBM's X-Architecture server strategy, conceived the architecture for the IBM BladeCenter and PureFlex/PureSystems. Leading cross company and industry teams, Tom led the development of corporate strategies for IBM's CEO, on home networking, product usability, data center networking, Entry Power servers, blade servers, and x86 virtualization.

Tom cofounded and directed the IBM Personal Systems Institute, a management system for accelerating technology from IBM's Research labs to the market place. He was elected to the IBM Academy of Technology by his peers, received several IBM Management and Technical awards, including the IBM Chairman's award for the BladeCenter converged system, which catalyzed a new product category, becoming a multibillion dollar industry segment. Tom managed the IBM/Intel® Alliance, served as a key technical advisor on the legal agreements for the sale of the IBM PC business to Lenovo, and was the IBM technical executive sponsor for the finance sector and the IBM R&D Labs in India. During his tenure, the IBM x86 business grew from several $100 million to multi-$ billion.

Prior to joining HP, Tom worked for National Instruments (NI) as an R&D Fellow and officer, where he conceived and led NI's corporate Big Data strategy, Big Analog Data solutions. He led teams developing end-to-end solutions for the IoT and Industrial Internet, comprising embedded data analysis systems and IT infrastructures. Tom conceived and led the NI corporate strategy for reliability, availability, serviceability, and manageability (RASM) for NI's test and embedded computer systems products.

Tom is active in marketing and external messaging, including incepting and driving technical marketing events, and conceived the trademarks HPE Edgeline Converged IoT Systems, IBM X-Architecture systems, IBM MXT Memory, and NI Big Analog Data solutions. He frequently consults with corporate marketing and sales, and develops and delivers sales content and training. Tom is also active in supporting and mentoring early tenure employees and served as the executive sponsor for the Women Inventors Network.

With many customer collaboration successes, Tom incepted and led projects pioneering Linux® on x86, blade servers, converged systems, VDI, open source virtualization, and cloud computing. Tom has extensive experience working with global product development teams across the U.S., and in Asia and Europe, and has served as the technical executive sponsor for the finance industry. He cofounded seven technical industry standards, and served as a director, cofounder, or executive sponsor for many industry trade associations, including The Green Grid, Blade.org, the PCI-SIG, VESA Net2Display, the RDMA Consortium, Distributed Management Task Force (DMTF), Systems Management Architecture for Server Hardware (SMASH), Intelligent Platform Management Interface (IPMI), the InfiniBand Trade Association, IEEE 1394 Trade Association, PCI Industrial Computer Manufacturers Group (PICMG), HyperTransport Consortium, the Ethernet Alliance, Open Virtualization Format, Advanced Telecommunications Computing Architecture (ATCA), Organization for the Advancement of Structured Information Standards (OASIS), STAC Benchmark Council, and the Industrial Internet Consortium.

Regularly sought after by the media, Tom has been interviewed by MSNBC, the Wall Street Journal, USA Today, EE Times, Network World, Gigaom, CRN, Forbes, and many others. He blogs and authors articles on the business of technology, sustainability, people management, and technology trends and directions. He has received the Telly Award for his video on IT infrastructure, the Intel Award for the Most Read Article in the Intel Embedded Innovator magazine, and the IEEE TestCon Best Paper Award. Tom is currently writing the book, The First Mover, which discusses his extensive experiences in technical business leadership and first of a kind innovation.

Tom has delivered and appeared in numerous keynotes for customer, investor and analyst events, IT trade associations, and major industry conferences of Intel, Citrix®, IBM, VMware®, AppliedMicro, QLogic, Schneider Electric, Bosch, NI, HPE, Linley Group, Bank of America, Government of India, DataStax, Open Server Summit, Carbon Disclosure Project (CPD), Smart Cities Summit, Aspen Ideas Festival, the Industrial Internet Consortium, and Gartner Inc.

Tom holds several U.S. patents in PC, server, and converged systems design, the BSEE, MSEE, and PhD degrees, serves on the Dean's Advisory Board of the College of Engineering, University of Florida. He is a sought after guest lecturer on leadership, business innovation, and technology trends and directions, and served as the adjunct faculty at several universities, teaching courses in the departments of electrical and computer engineer and management of information systems.

Conclusion

The increasing interconnectivity of everything requires that enterprises invest in high-end computing solutions that are able to quickly capture, process, analyze, and take action on IoT data for enabling real-time control and decision-making. The HPE Edgeline Converged IoT Systems accelerate time to insight by moving compute power out to the edge, while offering a one-stop-shop IoT solution that allows businesses to harness the business potential of the IoT. Organizations that quickly learn how to exploit vast IoT data sets and run deep compute and analytics at the edge will be positioned to optimize business processes, improve operational efficiency, and ultimately, become digital disrupters within their industries.

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