ACCELERATING DATA INSIGHTS AND ACTIONS ACROSS THE ENTERPRISE

HEWLETT PACKARD ENTERPRISE EDGELINE CONVERGED EDGE SYSTEMS CAN DELIVER BENEFITS OF INTEGRATED OPERATIONAL TECHNOLOGY AND INFORMATION TECHNOLOGY

SUMMARY

Edge computing is one of the newest trends driving excitement in the industry, but there is significance and depth to it unlike other trends. Edge computing offers greater operational efficiency through the promise of real-time insight and action to organizations of all sizes and types. To achieve greater operational efficiency, organizations should look to adopt an edge deployment where Operational Technologies (OT) are physically integrated into the same edge Information Technology (IT) systems. Organizations can then leverage the power of the advanced analytics platforms and methods that emerged in IT organizations. This provides not only new levels of insight, but also control and action using platforms with functional, physical, and virtual convergence.

Moor Insights & Strategy (MI&S) believes the organizational goal of IT- OT convergence should be:

- Intelligent and secure **connectivity** via industrial-grade networks and interfaces for all assets to provide data ingest and instrumentation of the entire operation.
- Deliver pervasive and appropriately sized **compute** on the edge and collect raw data from every device to feed into advanced analytics engines that can turn streamed data into operational intelligence in real time.
- Informed **control** and management of operational assets utilizing insights derived to actuate the equipment that drive the industrial edge to optimize the operation.

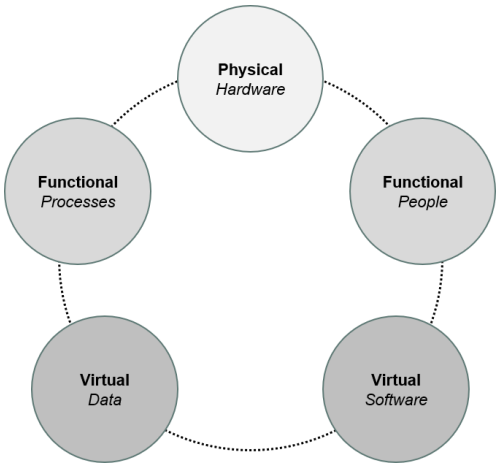
There are two barriers to IT-OT convergence. Organizationally, IT and OT are separate functions staffed by resources that, while technical in nature, have limited cross-function capabilities. Technically, IT and OT are seemingly worlds apart. While similar in function, the networking, control, and acquisition systems that drive an industrial environment are monitored and controlled by systems that have traditionally not integrated with IT networks and systems.

THE DIMENSIONS OF CONVERGENCE

We believe successful OT-IT convergence stands on three interdependent elements:

- Functional –Edge deployments will fall short of success until IT and OT develop a unified approach to the deployment, management, and utilization of the edge and its interaction to the connected devices.
- Physical – Data acquisition and control systems convergence into one enterprise-class converged platform. Simply put, the physical merging of OT and IT hardware systems, management systems, and security systems.
- Virtual – The convergence of equipment and machine data with fully functioning enterprise-class analytics software that can scrub, analyze, and act on terabytes of data in real time.

FIGURE 1: THE INTERDEPENDENCIES OF OT-IT CONVERGENCE



(Source: Moor Insights & Strategy)

Each of these three pillars is critical to the success of deploying intelligence at the edge and are interdependent. The ability to aggregate data and perform real-time analysis (virtual) requires enterprise-grade processing systems and industrial ingest capabilities (physical), which can only be deployed, secured, and maintained through a cooperative approach between IT and OT organizations (functional).

Organizations face significant, but not insurmountable challenges in deploying intelligence at the edge so choosing the right technology partner is critical. MI&S

believes organizations should consider a number of factors when considering technology partners for edge deployments:

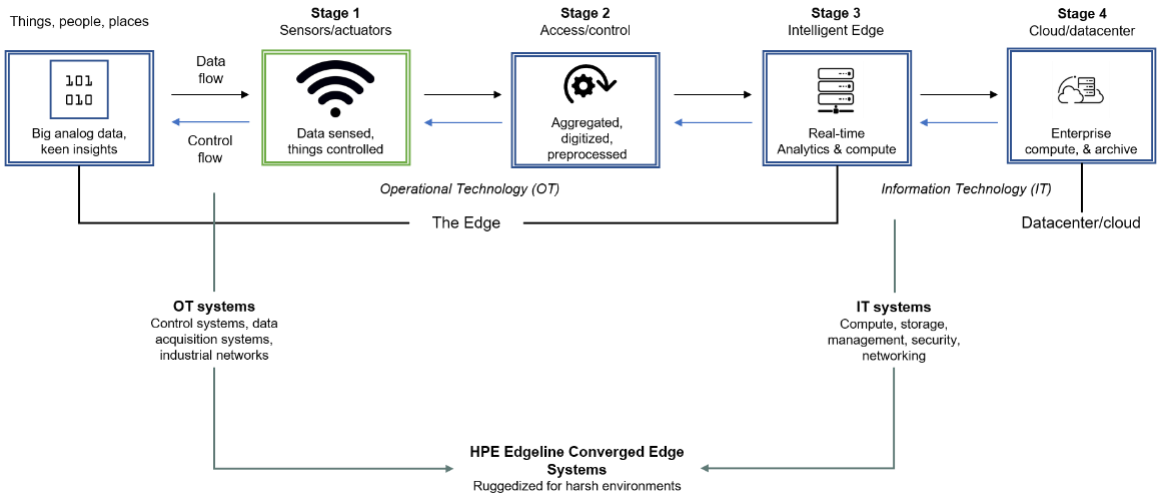
- *Product portfolio*. Not just components, but the hardware and software that achieves the physical and application/data level integration of IT and OT systems.
- *Depth of ecosystem*. OT and IT are two different markets. Seek out IT vendors that have deep, established partnerships with the technology that drives your industrial environment, not simply an interlocked logo, but actual product level integration.
- *Breadth of experience* (a track record of success). Look for vendors that have demonstrated success in implementing convergence in your industry.

We believe larger enterprise technology providers like Hewlett Packard Enterprise (HPE) bring experience to both the IT and OT markets. Because of this, they should be well-positioned to deliver and support the intelligent edge.

HPE CONVERGES OT AND IT AT THE EDGE

The convergence of OT and IT at the edge results in many operator benefits. The real-time acquisition, transformation, and analysis of data collected from sensors and devices that run the machinery in an industrialized or campus environment should provide faster insight for the operator to transform into real action. As previously discussed, convergence includes functional processes, physical systems, and virtual software.

FIGURE 2: OT- IT CONVERGENCE SUPPORTED BY HPE



(source: HPE)

We believe the HPE product portfolio that supports edge is compelling as it includes fundamental elements such as:

- Enterprise-grade performance with Intel Xeon technology
- Fully functioning enterprise software with middleware that ingests OT- generated data directly from the OT industrial networks and sensors
- Network address translation software that enables easy onboarding of siloed proprietary OT systems into a unified converged OT-IT framework.

PHYSICAL CONVERGENCE WITH HPE EDGELINE EL300, EL1000, AND EL4000

We believe the physical convergence of OT and IT at the edge begins with enterprise-class hardware that enables the sharing of resources. Enterprise-class systems with enterprise-class performance that can withstand harsh environments are a necessity to support the demands of both the IT and OT environments. HPE's Edgeline EL300, EL1000, and EL4000 appear to deliver on this requirement and are certified to a variety of standards such as network equipment building system (NEBS) and MIL-STD-810G.

The EL300 Converged Edge System is a dense fanless system providing robust I/O and communications options and includes HPE's next generation of physical OT convergence called Edgeline OTLink.

The EL1000 Converged Edge System is HPE's compact offering with multiple mounting options making it suitable for placement outside of the datacenter. However, the EL1000 is also robust enough to deliver enterprise-level compute with one Intel Xeon-based compute blade and allows for the physical integration of OT systems via PXI/PXIe modules.

The EL4000 Converged Edge System is a more traditional rack system form factor offering that delivers considerably more resources, richer convergence options, and can be deployed in non-datacenter environments, such as on a wall in a factory. This 1U system can house up to four compute blades with Intel Xeon processors, rich storage, and I/O that enables flexible networking options and comprehensive support for converged OT Systems via PXIe modules.

Both systems support HPE's integrated Lights Out (iLO) remote systems management and security controller providing an IT-compatible system for administering these systems at the edge.

FIGURE 3: COMPARING THE EL 300, EL1000, AND EL4000

	HPE Edgeline EL300	HPE Edgeline EL1000	HPE Edgeline EL4000
Primary Customer Needs	Ultra compact and ruggedized converged OT – IT system with edge optimized remote management and wireless connectivity	Compact and ruggedized converged OT – IT system with remote management and wireless connectivity	Rackable (1U), ruggedized and highly available enterprise OT-IT converged system with remote management
Core Features	• Intel Atom (Core i5, i7) • Up to 32 GB RAM • Up to 3 TB SSD storage • HPE iSM for edge-optimized remote management • Converged OT via OTLink for integrated control systems, data acquisition, and industrial networks • Support for Wi-Fi, Bluetooth, LTE	• Up to 16 Intel Xeon class cores • Up to 128 GB RAM • Up to 16 TB NVMe SSD storage • HPE iLO • Support for add-in accelerators • Converged OT via industry PXIe modules for integrated control systems, data acquisition, and industrial networks • Support for Wi-Fi, Bluetooth, LTE	• Up to 64 Intel Xeon class cores • Up to 512 GB RAM • Up to 48 TB NVMe SSD storage • HPE iLO • Support for add-in accelerators • Converged OT via industry PXIe modules for integrated control systems, data acquisition, and industrial networks
Target Environment	Space constrained and embedded system locations requiring wired/wireless connectivity and good analytics performance with OT – IT convergence	Space constrained locations requiring robust wired/wireless connectivity and high performance enterprise analytics with OT – IT convergence	Highly reliable, multi-node and high performance analytics with OT – IT convergence

(Source Moor Insights & Strategy)

HPE's Edgeline product portfolio is compelling with robust hardware that physically merges IT and OT combined with software tools to drive real integration of data and insights. However, its depth and breadth of ecosystem support is what makes the Edgeline portfolio work in the real world. Organizations should realize precision data acquisition and control over industrial environments by delivering tight integration with OT solutions vendors.

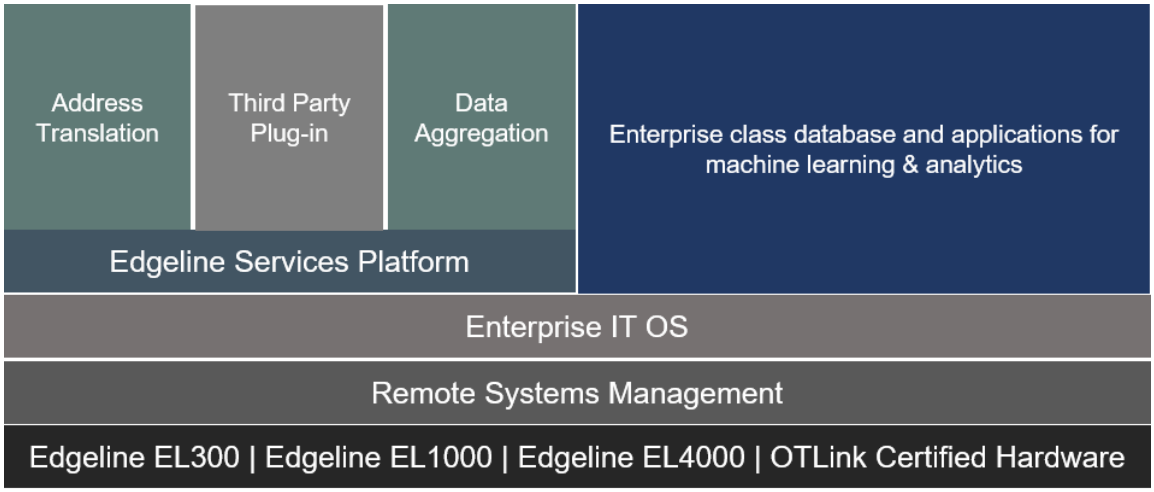
SOFTWARE DEFINED OT THROUGH HPE OTLINK PLATFORM

The ability to collect and store large amounts of OT data and control facilities, equipment, or "Things" in the IoT is impressive and being able to do so on a single system is even more impressive. What makes HPE's edge IP portfolio atrractive is the level of convergence at the software layer. The real benefit of enterprise level hardware and where OT efficiencies are gained is at the software layer.

HPE's Edgeline OTLink Platform is the combined hardware and software used by HPE and partners to build Industrial Internet of Things (IIoT) solutions and is comprised of two main components that enable the acquisition and control of OT environments.

Programmable Logic Controllers (PLC), Supervisory Control and Data Acquisition (SCADA) systems, and other assets generate raw performance and monitoring data used for real-time control. The HPE OTLink software ingests data from these systems for Mission Analytics (real-time industrial data stream analysis) and makes this data available for analysis by traditional IT analytics (e.g., SAP HANA).

FIGURE 4: HPE CONVERGENCE OF OT AND IT ON EDGELINE



(Source: Moor Insights & Strategy)

One of the challenges of managing complex OT environments is the ability to precisely control a function of a machine or piece of equipment that resides on a floor filled with machinery. For instance, being able to quickly identify and control a specific manufacturing line on a factory floor can seem impossible. HPE's Edgeline OTLink software is designed to simplify this process by removing the need for specialized equipment to connect specialized subnets to the larger network.

SPEEDING UP EDGE AND IOT DEPLOYMENTS

Implementing an IoT solution from scratch can be difficult, often marred by false starts, unexpected barriers, and failed efforts that result in projects never successfully reaching production. HPE OTLink is designed to resolve this issue, ensuring a fast, simple, and secure path for implementing IoT projects.

It starts with the **OTLink hardware modules**, which facilitates acquiring data from a variety of different industrial devices that are found in many industrial operations environments (e.g. factories, refineries, oil rigs). The OTLink Platform provides a software layer that simplifies the movement of data from the physical world into the digital domain via an intuitive drag-and-drop workload flow designer. Once in the digital domain, a variety of data processing and advanced analytics applications can be leveraged to convert data from the physical world into actionable information that can be used to transform the operations world. This is all centrally managed and orchestrated using the **Edgeline Workload Orchestrator** software.

WHY THE CONVERGENCE OF OT AND IT MATTERS

The real-world benefits of converged OT and IT are significant and the impact may be felt immediately. Those benefits span both direct and indirect costs through:

- Space savings due to consolidated hardware platforms (smaller physical footprint)
- Consumption of less energy
- Lower capital and operational expenditures
- Better performance with datacenter grade computation and less data movement
- Less cabling which simplifies deployment and management
- Reduced time to operations through faster deployment models

Why is enterprise level compute such a critical component to convergence at the edge? OT environments have existed for decades and the process of automation continues to drive efficiencies in industrialized environments. The ability to utilize enterprise level application stacks to drive machine learning and advanced analytics for things like predicting failures is what makes convergence invaluable. Some of the tangible benefits of deploying systems such as HPE's Edgeline on the edge are:

- Reduced latency due to the locality of compute (analytics) to data
- Less reliance on bandwidth with data management performed locally
- Higher levels of compliance around data sovereignty and privacy
- Increased data security via HPE Silicon Root of Trust, Trusted Platform Module (TPM), and systems management with HPE iLO and HPE Edgeline Integrated Systems Management (iSM)
- Reduction in operational costs (bandwidth, administration costs, operational efficiencies)
- Removing duplication of data across multiple locations as analytical results and anomalies are transferred as opposed to complete data volumes
- Assurance that organizations are managing data and intelligence free of corruption (driven by the proximity of data and compute to the operation)

HPE'S STRATEGY IN ACTION

The OT market is both diverse and deep. Each industry seems to have its own ecosystem of technology providers, systems integrators, and specialists. Because of this, it is important that organizations wanting to converge OT and IT fully consider the

breadth and depth of experience of each technology provider. We believe HPE has the breadth and depth of vertical solutions.

FIGURE 5: HPE SUPPORT FOR OT-IT CONVERGENCE BY INDUSTRY

(source: Moor Insights & Strategy)

While HPE shows depth in all of the above industries, the strength of its support for OT-IT convergence has deep roots in manufacturing, oil and gas, and energy and utilities. Working with OT technology partners such as National Instruments, ABB, Schneider Electric, PTC, Keysight, OSISoft, and GE, HPE claims systems integrators have or are seeking to deploy HPE Edgeline-based solutions around the globe.

It is this level of OT depth, married to HPE's strength of IT ecosystem, that makes the company's edge IP portfolio compelling.

CALL TO ACTION

The era of digital transformation, in which organizations demand finer levels of control over the machines and devices that create their products or deliver their services, demands edge computing and the convergence of OT and IT. This convergence is an enabling step in the evolution of data ingestion and analytics to create better outcomes across an organization.

OT-IT convergence considers both organizational and technical elements with three distinct pillars:

- Convergence of processes – people, operating procedures, cultures.
- Convergence of physical systems – hardware that houses enterprise IT systems and OT systems.
- Convergence of data and applications – acquiring data, analyzing data, controlling systems.

For organizations that are beginning the journey of OT-IT convergence, MI&S recommends assessing the needs of your organization and mapping to the offerings from the major technology providers. There is no "one size fits all" when it comes to OT-

IT convergence. Those vendors that can demonstrate a record of success in your industry with your OT solutions providers should be top considerations.

MI&S believes HPE to be a company worthy of consideration for a number of reasons:

- An edge portfolio with enterprise-class performance, manageability, and security designed for the most extreme conditions
- Strength of vision and execution and reliability of edge systems
- Breadth and depth of the OT ecosystem partnerships and enablement
- Software that converges OT data with enterprise IT analytics
- World class professional consulting and delivery services with Pointnext with consumption-based business models

To find more detailed information on HPE's vision of edge computing and the Edgeline product lineup, click here.

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