HP FlexFabric

Virtualize network connections and capacity—from the edge to the core

An HP Converged Infrastructure innovation primer

Data center networking dynamics

The fundamental nature of data center computing is rapidly changing. The traditional model of separately provisioned and maintained server, storage, and network resources are constraining data center agility and pushing budget envelopes to the limit. IT organizations recognize that these static pools of isolated resources are being underutilized, a problem that can be exacerbated when dedicated infrastructure or computer systems are used to support different classes of data center workloads.

One response has been for IT organizations to adopt virtualization and blade technologies, which enable a more flexible and highly utilized infrastructure. These new, more scalable technologies can be dynamically provisioned to meet continuously evolving business requirements. At the same time, these technologies apply new pressures to the multiple networks in the data center, further exacerbating spend issues and the burden on the IT teams that support them.

Among other challenges:

- A proliferation of virtual machines is driving much more frequent changes to network configurations.
- Each data center network change must be coordinated through multiple IT teams.
- Increases in server utilization require more network bandwidth per server.
- Traditional hierarchical network designs cannot scale nor provide the performance and quality of service demanded by a virtualized data center.
- Blade technology is further escalating the number of connections to be managed and increasing bandwidth density.

Network teams are faced with a race to build out data center network capacity and to effectively provision connectivity at an increasing speed. To keep pace, IT organizations need a network architecture that is more coherent, flexible, and agile. But they don't want to give up the stability, high availability, and security offered by the best-in-class compute and storage networks currently installed in their data centers.

HP is creating a new balance by combining the best new standards-based technologies with a modular architecture that fully optimizes virtualized resources, while meeting business requirements for low total cost of ownership, faster time-to-service, and critical requirements for reliability, IT governance, and compliance.

Introducing HP FlexFabric

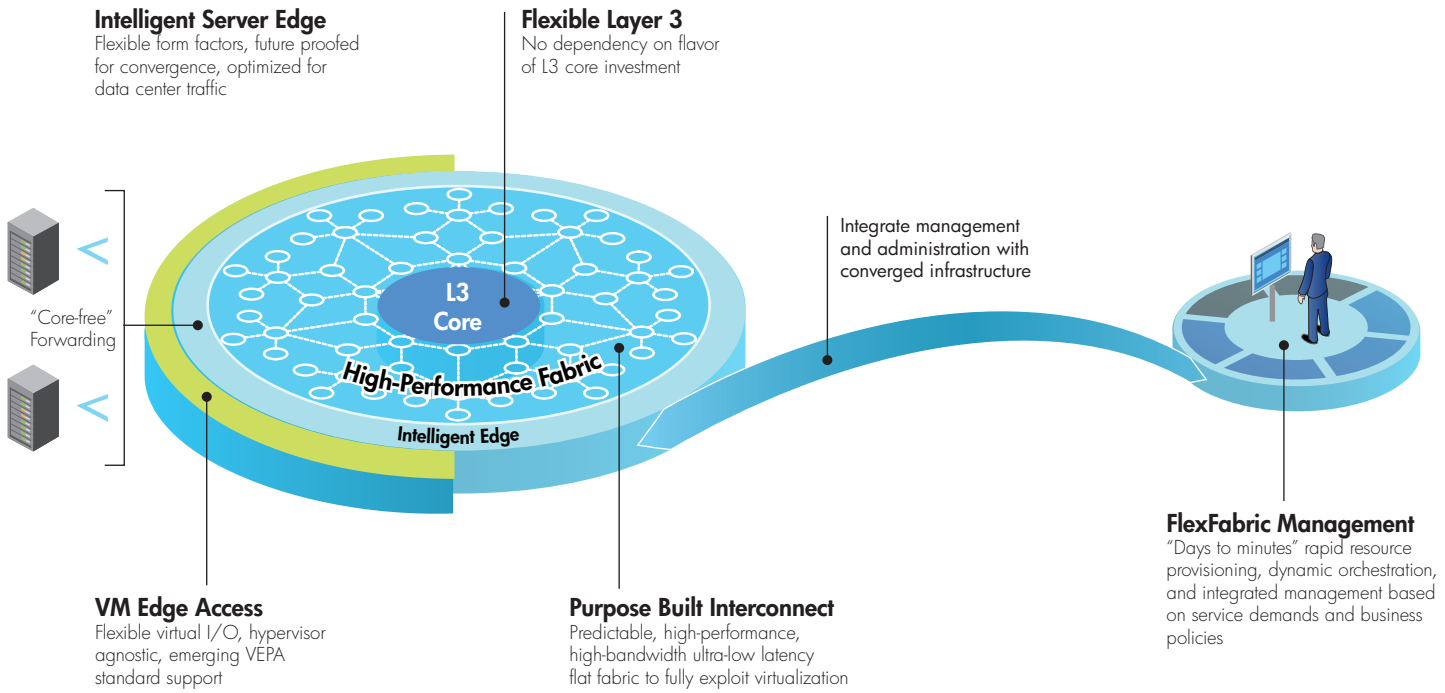
HP FlexFabric is a next-generation, highly scalable data center fabric architecture and a technology layer in the HP Converged Infrastructure. This open architecture uses industry standards to converge storage, server, and network resources and provide seamless interoperability with existing data center core networks. FlexFabric combines intelligence at the server edge with an advanced orchestration and management layer to enable virtualization-aware networking, predictable performance, and rapid, secure, business-driven provisioning of data center resources.

FlexFabric will enable your IT organization to build a wire-once data center that responds to application and workload mobility and provides resource elasticity. Network Connections can move with workloads as they migrate across or between data centers, and the fabric can stretch and reclaim pools of resources to meet rapidly changing needs. Dynamic provisioning capabilities fully exploit virtualization technologies to achieve new levels of data center efficiency and meet decreasing time-to-service constraints. The FlexFabric orchestration and management layer helps align the fabric with governance policies and service-level agreements (SLAs), while reducing the cost of operations.

HP FlexFabric benefits

- Improved business agility, faster time-to-service and higher resource utilization by dynamically scaling capacity and provisioning connections to meet application demands "on the fly"
- Breakthrough cost reductions by converging and consolidating server, storage, and network connectivity onto a common fabric with a flatter topology and fewer switches
- Predictable performance and low latency to support the most demanding application workloads
- Modular scalability to connect thousands of server and storage devices using industry-standard building blocks
- Protection for investments in existing Layer 3 data center core networks with seamless compatibility and support for open standards

HP FlexFabric overview
HP FlexFabric brings together storage, server, and network resources, and combines intelligence at the server edge with an advanced orchestration and management layer.



- Flexibility to manage and administer server, storage, and network resources in any organizational model—from completely separate to fully integrated—while consistently enforcing governance, security and SLA policies
- Elimination of costly and time-consuming change management processes, while reducing the number of error-prone or conflicting configuration steps
- Support for a wide range of data center deployment models

FlexFabric will deliver true "networking-as-a-service" to the various consumers of connectivity within the data center. It will provide a unified connectivity infrastructure—across servers, storage, and networking—that will dynamically adapt to the demands of the heavily virtualized and more flexible data center architectures of tomorrow, while meeting increasing pressures for price/performance and time-to-service.

The key attributes of HP FlexFabric

By radically simplifying, flattening, and using emerging data center networking standards, HP FlexFabric creates a dramatically more robust, flexible, and efficient data center. Rather than relying on a traditional hierarchical networking architecture, FlexFabric offers a flatter data center topology with edge intelligence designed to complement the intelligent virtualized network interfaces offered by the latest HP data center servers and storage systems. This flat fabric interconnect is more fungible and provides superior network performance and quality of service.

With FlexFabric, network connections can be fully virtualized to deliver dynamic resource provisioning from the edge to the core and support for application mobility, enabling connections to move with workloads as they migrate across the fabric. This allows compute resources to be created, moved, and scaled from centralized connection pools "on the fly," using the integrated management layer.

FlexFabric is designed to support a much wider set of data center architectures, workloads, and requirements than is otherwise possible with traditional data center networking approaches. It supports specialized back office, cloud, web, or high-performance computing models. Instead of locking organizations into a proprietary end-to-end solution, FlexFabric gives them the flexibility to deploy a heterogeneous data center network that meets their workload needs and protects existing investments.

Predictable performance supports diverse workloads
A highly scalable, flat network domain enables HP FlexFabric to deliver flexible provisioning, ultra-low latency, high performance and fast workload mobility. The architecture provides breakthrough cost structures by eliminating layers of switch hierarchy and complexity and applying new technologies, including higher speed Ethernet links, active load balancing, and link aggregation within the server edge. Core network switches are clustered for high availability, scalability, and flexibility to handle virtualized workloads with very high throughput. Capacity can be dynamically scaled or divided.

FlexFabric networks are designed to meet the security, resiliency, and reliability requirements expected in today's data center.

Open and standards-based for investment protection
FlexFabric is designed to work with existing third-party core data center network infrastructure without requiring a forklift upgrade. This standards-based approach removes the risk of vendor lock-in and gives your organization access to best-in-class third-party data center solutions offered by HP partners. You can mix and match existing operational processes with new approaches using industry-leading HP products to coordinate IT teams. Finally, it helps your organization manage the high purchase, support and operations costs associated with proprietary environments.

HP FlexFabric will utilize the latest emerging industry standards, including higher speed Ethernet links, Virtual Ethernet Port Aggregation (VEPA), Fiber Channel over Ethernet (FCoE), and Converged Enhanced Ethernet (CEE). The CEE standard enables Ethernet to deliver a "lossless" transport technology with congestion management and flow control features needed in storage environments. HP is championing many of these standards in the IEEE and other organizations in order to give its customers a data center fabric that protects their technology investments instead of proprietary approaches that can cause organizational disruption and wholesale equipment replacement.

Integrated management for business agility
With management integrated down to the component level—including networking and virtual I/O—HP is revolutionizing data center provisioning and operation. Integrated FlexFabric management capabilities dramatically reduce time to service and the chance of costly errors while accelerating IT alignment with business demands and goals.

FlexFabric will enable administrators to specify high-level network environment attributes that can be dynamically matched to workloads and provisioned "on the fly" from pools of available resources. The FlexFabric workflow allows a "design once, replicate many" approach to provisioning that supports workload mobility and vastly reduces the number of error-prone, or possibly conflicting, configuration steps that make change management time-consuming and costly.

FlexFabric removes a major barrier to automation and orchestration—the "all-or-nothing" proposition organizations face with other data center management frameworks. Designed to support a wide range of IT organizational models, FlexFabric offers interfaces designed specifically for each operator type found in IT teams. Network administrators can provision resources in advance and make them available to server and storage teams to utilize instantly when needed, saving time and speeding service.

FlexFabric management will integrate seamlessly across the entire spectrum of HP data center management systems to streamline the activities of your data center IT teams without requiring extensive overhauls of organizational structure and processes. This powerful system will automate and coordinate network services with application deployment, and free up data center administrators from repetitive operational activities that drain IT budgets.

FlexFabric will provide open interfaces for third-party functionality that integrates application delivery and virtualization engines. Finally, FlexFabric management is fully integrated with HP's industry-leading IT orchestration and management systems, giving your IT staff unprecedented control that spans networks, servers, applications, and even physical plant attributes.

The FlexFabric evolution path

Deliver "networking as a service" to the Converged Infrastructure

Today

Early on, HP realized the need to provide blade server edge connectivity that was wire-once and change-ready. We responded to this need by introducing HP Virtual Connect in 2006. Two million ports later, Virtual Connect, in combination with ProCurve networking technology, has become the foundation for HP's FlexFabric strategy. From the server edge through the top-of-rack and end-of-row, HP offers a range of data center networking aligned with the FlexFabric pillars.

Virtual Connect virtualizes server edge I/O, enabling server administrators to provision Local Area Network (LAN) and Storage Area Network (SAN) resources in advance, and then enable them when needed. Virtual Connect enables server administrators to move workloads and virtual machines, or add, move, or replace servers transparently to LANs and SANs in minutes without having to engage LAN and SAN administrators.

Attacking head-on the expensive proliferation of Ethernet connections caused by increased network capacity requirements for virtual machines, Virtual Connect Flex-10 converges up to four NICs over a 10Gb server connection, and bandwidth limits can be dynamically configured on each NIC, on the fly. Virtual Connect Flex-10 also converges the number of blade interconnect modules required, reducing the number by up to 75 percent. Further, Virtual Connect Enterprise Manager can manage the setup and migration of server connections for up to 12,800 servers from a single console.

For organizations preferring a more traditional data center, network management and design methodology, HP ProCurve today offers a strategy that is seamless from the data center across the enterprise. Complementing Virtual Connect, HP ProCurve switches provide proven technology at the data center edge and aggregation layers, and offer industry-leading total cost of ownership supported by a lifetime warranty. Customers routinely select HP ProCurve because of HP's commitment to open standards and interoperability. These data center networking products include the 6600 Layer 2 and Layer 3/4 Top of Rack and end-of-row/aggregation switches, the 5400 and 8200 Layer 2/Layer 3/4 scalable chassis for data center aggregation, the 6120 family of blade switches at the server edge, and the new Data Center Connection Manager (DCM) appliance.

The Data Center Connection Manager begins to implement the HP FlexFabric dynamic provisioning approach today. DCM allows network architects to pre-configure server connection policies that are enforced at the network edge through common RADIUS and DHCP standards. Virtual and physical server interfaces are individually associated or subscribed to connection profiles from a pool of resources by the server administrator at build time, allowing rapid, secure provisioning and workload mobility without the repetitive manual tasks and turnaround time associated with provisioning today.

These policies can drive events directly to the HP BSA Network Automation software product suite, enabling deep levels of dynamic automation to provision firewalls or application delivery controllers in response to server provisioning, de-provisioning or configuration changes. These capabilities give network administrators the power to flexibly deploy, manage, and evolve server connectivity quickly and in line with business policy and demands.

Tomorrow

HP is committed to serving the diverse needs of modern data centers without imposing a specific operating model, proprietary architecture, or network fabric. HP is building upon its convergence leadership with the addition of storage network protocols to its Virtual Connect Flex-10 technology. This will combine the capabilities of Virtual Connect and Flex-10 with Converged Enhanced Ethernet (CEE) and Fiber Channel over Ethernet (FCoE) technologies to enable BladeSystem customers to use a single Virtual Connect server connection to access storage and server networks. As customers are ready to converge their Ethernet and storage networks across the data center, FlexFabric will be there with full support for a variety of models.

FlexFabric will allow your organization to build single, large Layer 2 domains with thousands of direct 10 Gbps Ethernet connected servers, in virtual or non-virtual, rack mount or blade environments, all with equal ultra-low latency paths. The fabric will support Converged Enhanced Ethernet (CEE) either from the server edge or through the aggregation layers, offer full support for Fiber Channel over Ethernet (FCoE), and be capable of using distributed trunking at multiple layers to provide active load balancing.

FlexFabric will use emerging industry standards to build and support virtual switches and virtual I/O adapters. HP has co-authored the IEEE Virtual Ethernet Port Aggregator (VEPA) proposal, which will provide multi-vendor, standardized discovery, configuration, and forwarding for virtual switching. FlexFabric will be capable of managing VEPA and other virtual I/O components from day one. This standards-based approach will give your IT organization a choice of virtualization vendors and approaches.

Most importantly, FlexFabric will allow the rest of the data center infrastructure to exploit the benefits of server, storage, and network virtualization going forward. The nature of I/O buses and adapters will change dramatically in the next five years; as the portion of server deployments whose I/O is completely virtualized increases, the nature of server I/O itself will evolve. No vendor is better positioned for this new world—from a skill set and intellectual property perspective—than HP, because HP is the only company with deep intellectual property in servers, blade servers, networking, storage, and virtualized I/O.

Ultimately, HP's goal is to allow IT to plug new systems into a converged infrastructure that will automatically discover capacity, add it to resource pools, and put it to work to support the needs of business applications. As IT takes advantage of application convergence and uses cloud computing, HP will be a comprehensive partner to help you drive down maintenance costs, change economics, and ensure that the data center network and IT staff can help your organization thrive and respond to business demands.

Your next step

To learn more about the HP vision of converged infrastructure and how the HP FlexFabric plays a key role in it, visit **www.hp.com/go/convergedinfrastructure**.

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