ENTERPRISE OUTLOOK

FCW

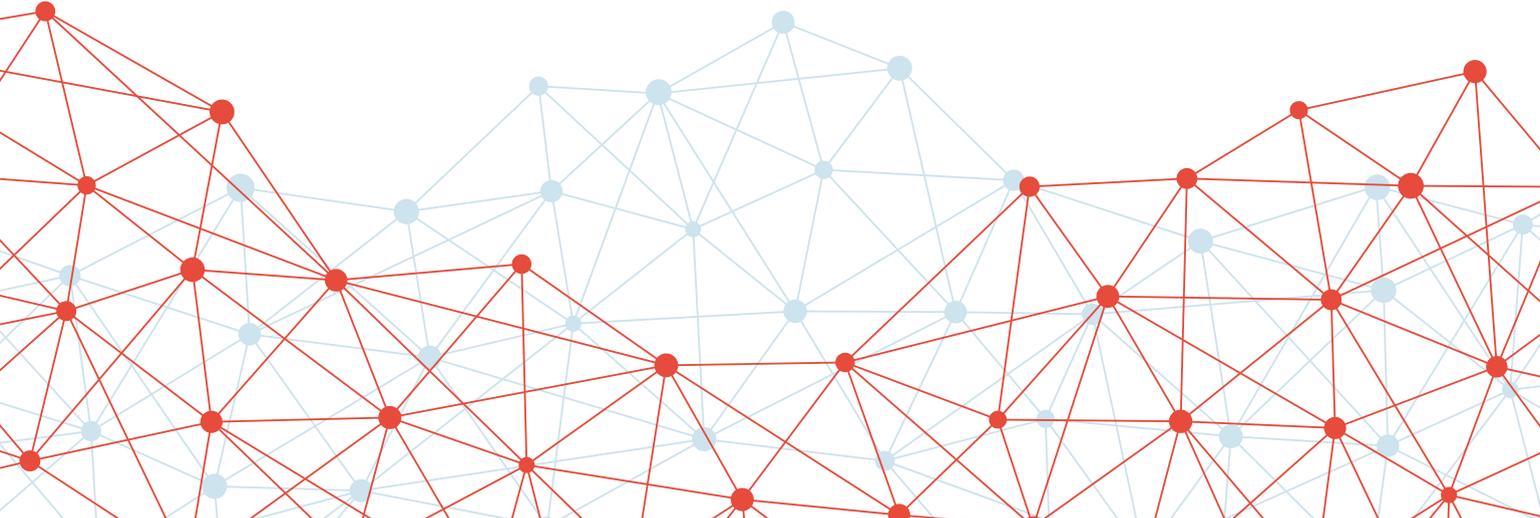# THE RISE OF HYPERCONVERGENCE

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TRACEWELL SYSTEMS

TRUSTED INNOVATION

The Future-Ready Architecture

These days, federal organizations face tremendous pressure to modernize their IT infrastructure. There's a push for greater transparency, higher levels of security, more mobility, improved user experience, and instant access to information.

The current federal IT infrastructure doesn't have the capacity to handle today's data. Federal agencies are concerned about the potential expense of modernization.

In reality, changes required to achieve a future-ready posture are incremental, cost-effective, and will result in dramatic and positive results for the agency. Becoming future-ready means tapping into the institutional knowledge of resident IT leaders, letting them think big, and giving them the tools needed to get the job done. It means a mobile workforce transporting secure data across multiple devices. It means agile, software-based systems seamlessly transferring, securing, and sharing data with older hardware.

"The future-ready government infrastructure incorporates strategies and technologies that support whatever agencies need to accomplish without having to 'rip and replace,'" says Tim Bock, an enterprise technologist for Dell. "It's about being open, flexible, and cost-effective; and able to accommodate needs and requirements as they change."

CONVERGED INFRASTRUCTURE

Drive innovation, reduce costs, and prepare your agency for the future with scalable, flexible converged systems. When you pair the right unified management system with the right converged platform to implement the right solution, you create an agile, future-ready infrastructure.

Different federal agencies have different requirements and challenges, but they

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Small, Light, Efficient and Rugged: Convergence for Demanding Environments

The Dell PowerEdge FX, powered by Intel® Xeon® processors, is a powerful converged platform that combines servers, networking and storage into one complete system. Dell delivers even greater capabilities through its relationship with Tracewell and the company's T-FX2 portfolio of products.

The T-FX2 uses the best features of the Dell PowerEdge FX, but packages it in a much lighter, smaller form factor. Therefore, it's ideal for aircraft and shipboard installations, transit case systems and data center environments. The system is lighter, consumes less power and delivers greater cooling capacity than the standard commercial FX2 – all in a 24 inch footprint from front to back.

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all share a common challenge: Support IT modernization while managing expectations and budgets. Dell's converged solutions are compute-optimized integrated systems built for the software-defined era.

U.S. Federal CIO Tony Scott's priority is for federal agencies to reduce spending on legacy systems support from 80 percent of the annual IT budget down to 20 percent (or less). By moving to a converged infrastructure, an agency has the opportunity to build to its exact mission specifications. Additionally, Dell's solutions provide predictable, reliable, and repeatable results – with no proprietary lock-in.

THE HYPERCONVERGED FUTURE

The FBI updated its legacy infrastructure in one of the largest VDI deployments ever undertaken by the U.S. government. The foundation of this solution is Dell's XC Series appliances, hyper-converged systems that combine compute, storage and virtualization resources in one solution built on preconfigured PowerEdge 13th generation servers with an agent-free systems management solution and appliances integrated with Nutanix software.

The FBI will be able to take advantage of an IT solution that offers simple deploy-

ment and management and also scales-out incrementally, one node at a time, and as demands increase.

Dell's Federal Government solutions are designed to be future-ready, modular, and easily scalable. With more than thirty years' experience working with the federal customer, Dell is uniquely suited, from the infrastructure and services perspective, to help agencies through every stage of the process. Dell's commitment and expertise combined with Tracewell's innovation and leadership, makes them a great combination.

Tracewell is a forward-thinking technology (engineering and systems) company with a long history of providing critical infrastructure platforms to government. By working with Dell OEM Solutions, the two organizations have created a future-ready infrastructure solution to deploy in aircraft, ships and command centers, as well as military data centers. The technology is suitable for multiple situations because of its flexibility, small and rugged form factor and its ability to integrate critical third party technologies.

"We realize the move toward future-ready government is a journey," says Bock. "Our goal is to help agencies move forward in that journey at whatever point they are today and at whatever pace they require."

Beyond the Back Office Computing

Rugged mobile platforms designed to operate in hazardous field environments deliver the same capabilities as office-based systems.

Military and emergency management personnel spend their working hours in the field and on the move. But just because they don't sit at a desk doesn't mean they don't require the same level of access to critical applications and the robust infrastructure they would get in an office building.

In fact, the demand for access to critical data, applications, and collaboration tools is even more critical in an emergency situation. First responders and forward-deployed teams need to have the functionality of a home office without having to be tethered to one location.

One of the challenges of a field environment is the environment in the field: heat, water, dust, dirt, rain, sand, and whatever else the local landscape decides to throw in the mix. If a mobile data center platform exists, the footprint is limited (so that it can be easily transported by truck or helicopter, for example). The solution is build a strong back office that supports workers operating in a wide range of environments and locations.

Federal agencies should see their infrastructure as a hub and spoke system. At the heart, a common architecture and high-performance workloads that can be accessed as easily from disparate spokes as it can from headquarters. Matt Tracewell refers to it as "beyond-the-back-office computing." He adds, "Federal agencies can take workloads they have optimized for the data center and deliver them on an identical platform, engineered to meet specific computing requirements in the field."

Tracewell Systems, a pioneer in the emerging field of forward-deployed converged computing, specializes in re-engineering commercial off-the-shelf data center computing and enabling it to work in a variety of fixed and mobile locations and in form factors adapted to specialized environments.

Tracewell teamed with Dell OEM to transform its powerful, new FX2 converged computing architecture and data center products – featuring Intel® Xeon® powered compute, networking and storage all in one complete system — into platforms that meet the size, weight and power requirements for environments well outside of the back office.

The resulting product, called the Tracewell T-FX2, works well on airplanes, aboard ships, and in field locations, both fixed and mobile – while still being fully compatible with Dell's FX2 data center architecture. This creates a seamless workflow between the back office and field operations.

The T-FX2 is designed specifically to work well in harsh environments or in places where standard Dell FX2 products cannot fit due to space constraints. Tracewell re-engineered the standard Dell FX2 to be lighter, use less power and deliver more cooling capacity than standard Dell FX2 products.

Agencies can also work with Dell and Tracewell to specify additional size, weight, power and other environmental requirements for these systems – while still maintaining compatibility with off-the-shelf Dell products. Tracewell engineers can even integrate an agency's critical technology – such as full size, full power PCIe cards – into the Dell-based architecture ensuring the systems will work with whatever existing technology still exists in the environment. This is precisely the type of platform military and emergency personnel need to perform in the field.

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From Converged to Hyperconverged: It's all About the Software

Infrastructure is evolving to a flexible, lower cost, modular system controlled entirely by software.

Government **agencies** are on a quest to increase the efficiency and lower the cost of their IT infrastructure, and manage growing stores of data and server sprawl. And they're trying to do it while wrestling with unwieldy legacy systems and programs. To update the old and integrate the new, agencies have discovered the value of the converged infrastructure model. But there's yet another step, an entirely new frontier: hyperconverged.

Setting up a converged infrastructure provides agencies the freedom to add small, modular blocks that combine compute, storage, and networking capacity. As each block is added, it is automatically recognized by the system and immediately scalable. Costs stay low and flexibility is high. Agencies that have successfully deployed the model are eager to continue reaping the rewards of their new-found efficiency.

Hyperconverged provides a virtual platform for heritage and new systems and solutions to communicate with each other and expand and contract to meet mission needs, leaning on the fastest systems first and then distributing the workload. Software-defined infrastructures are also faster to deploy and offer a simplified, centralized dashboard management system.

The savings from software-defined infrastructures are already being realized. According to the Government Accountability Office, the Defense Department alone saved $260 million through virtualization and related efforts over four years.

"The value really shines through when you compare it to the way things have traditionally been done in the data center, says Tim Bock, an enterprise technologist for Dell. "If you can view and manage storage, servers and networking as one entity, there are a lot of benefits, but you can only do that with software."

In order for federal agencies to take advantage of the benefits of the new software-defined computing era they require converged systems featuring storage-intensive capabilities. Dell predicted the demand for and potential value of this type of next-generation capability, when it developed the Intel® Xeon® powered PowerEdge FX2 modular server, storage and networking blocks. To fulfill similar requirements in space-constrained environments, Dell partnered with Tracewell to develop the Tracewell T-FX2.

But a truly hyperconverged software-defined environment requires significantly greater storage density. To meet this need Tracewell developed the next generation server: the T-FX2e. It's developed to power the limitless, software-defined future. The T-FX2e provides storage density that rivals and often surpasses rack-and-stack, adding as many as 32 drives into a converged system. Showcasing the benefit of this storage intensive approach, one federal agency was able to reduce the number of transit cases it uses in the field from six down to a single one. And with Dell a leader in converged and hyper-converged systems the biggest names in software-defined computing, such as VMware, Microsoft, Red Hat and others, support the Tracewell T-FX2e platform with the goal of delivering go-anywhere software defined systems.

The software-defined infrastructure is the most flexible and efficient way to prepare for an unpredictable future. It offers federal agencies the highest degree of flexibility, scalability and agility possible. "It's about protecting your environment for what's coming and being ready for the opportunities the future holds," says Bock.

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The Case for VDI

Converged Systems Deliver a Powerful Architecture for Next-Generation VDI

Virtual Desktop Infrastructure (VDI) helps government agencies improve security, enhance backup and recovery, increase flexibility, and ensure regulatory compliance. VDI also supports BYOD and mobility initiatives, benefits the FBI is realizing as part of what will be one of the largest VDI deployments in history.

The concept is simple. Instead of providing users with standalone networked PCs or workstations, they use thin or zero clients. These clients access the user's virtual machine (VM), which runs on a centralized server. All VMs share compute, memory, networking and storage resources. Since they are run as a separate VM, nothing is shared. Nothing is stored on the client – adding a significant level of security for data intensive applications.

Mordor Intelligence reports the desktop virtualization market will enjoy rapid growth over the next five years. The enthusiastic adoption of VDI by federal agencies is further testament to its success.

A successful VDI deployment requires a properly configured and provisioned network. Lacking that backbone, a deployment risks straining an agency's infrastructure. Network traffic naturally increases as more VM users repeatedly access data center resources. Likewise, agencies can face physical space constraints and increased power demand from servers housing the VMs.

But there is a way to reduce the heavier load – by running VDI deployments on a converged infrastructure.

A converged infrastructure uses small blocks of combined compute, storage and networking power, allowing agencies to easily manage the amount of networking required. Scaling up or down is simple. Because the blocks are smaller with more compute density per rack, space is less of an issue, and it's easy to add capacity as needed. It also significantly reduces power consumption because it requires fewer switches.

Dell has created a number of hyper-converged appliances that are optimized for workloads like VDI. Instead of spending a lot of time and money procuring new workstations or upgrading data center infrastructure, agencies can deploy different workloads and VMs as their needs change. The software-based infrastructure makes deployment easy and fast. It's therefore much easier to respond to changing requirements and workloads.

One challenge that has been particularly difficult has been finding a way to deploy VDI for users with heavy graphic requirements, such as computer-aided design. Agencies with these types of requirements, such as intelligence operations, emergency management, research and engineering, haven't been able to take advantage of VDI. They lack the resources required to view and manipulate large 3D models without lag time. They also face challenges in delivering VDI capabilities in space-constrained environments, such as on ships, in the air or on the ground in harsh or unusual locations.

To address those specific issues, Dell turned to Tracewell, an expert in engineering Dell-based platforms for businesses and federal agencies that need to address a variety of challenges that cannot be met by standard computing systems.

Using Dell's Intel® Xeon® powered FX2 products as a base Tracewell re-engineered the platform to create the T-FX2s, which makes it possible to plug full-size, high-power PCIe cards (such as Nvidia) directly into a system based on Dell's FX architecture. One federal agency sees the

> ## A converged infrastructure uses small blocks of combined compute, storage and networking power, **allowing agencies to easily manage the amount of networking** required.

value of this approach. Its VDI solution takes advantage of all the benefits of converged computing while also seeing the performance benefits of the latest Nvidia card, all in plug-and-play integration.

"There's no question VDI offers tremendous benefits to federal agencies looking to increase performance and security while significantly reducing cost and management of their IT systems," says Matt Tracewell of Tracewell Systems. "With Dell, our platform provides a solid foundation for VDI solutions. Agencies get a high-performance converged solution with a long-term roadmap. And there's long-term flexibility – as high-end, high-power third-party products become available they can immediately be plugged into the system."

Innovation Gets Smart

Moving to a flexible and scalable converged infrastructure supports technological innovation.

nnovation is defined as "the act or process of introducing new ideas, devices, or methods." Innovation takes invention and uses it as a building block to something bigger. The Internet of Things (IoT) then, is the ultimate innovation; connecting our greatest inventions and allowing them to communicate and collaborate to make the world a better place.

The IoT provides massive amounts of data generated by its interconnected sensors and systems. Using powerful analytics, federal agencies can turn massive amounts of data into new insights and opportunities. The first step is to gather information. Data acquisition occurs at the hardware level – information captured from a network of sensors embedded in smart devices. Think of devices worn by runners, attached to buildings, trains, or aircraft, and on packages moving through an assembly line.

And just like on an assembly line, all those packages of data must be transported; from the sensor level to a central location for processing. Wireless networks, Bluetooth, and broadband cellular act as data highways. In a converged infrastructure, those disparate connections are managed on a single platform, which also supports the next step – data aggregation.

Data aggregation depends on network support to collect, process, and output data to consumers. This is an area where converged infrastructure can be a real enabler. "Because of the way converged systems are architected, it's easy to tailor compute and storage modules based on anticipated traffic patterns and amount," says Tim Bock, an enterprise technologist for Dell. "If it's going to be IOPS-intensive, you can configure for that. If you know you'll

need lots of nodes running small jobs or bigger nodes running bigger jobs that don't need as much separation, you can plan for that, and you can change the configuration at any point."

Analysis and action are the next two elements of an IoT system. In such a data-intensive environment, effective analysis depends on a system's ability to ingest, process, and learn from large and often continuous volumes of source data. Successful organizations assimilate data from the environment and use it to improve their own performance.

"Say you have 50 states' worth of traffic sensor data to collect and analyze on a continuing basis. With this technology, you can deploy a powerful converged system in each state, all with the exact same architecture, to do the collection and some basic analysis, and then it can be sent to be backed up in a master database," says Bock. That's the kind of practical innovation an IOT-based converged infrastructure supports.

There are many practical applications of the IoT. A "smart" building, for example, is a concept that introduces a standardized approach to energy utilization. Using a custom-built gateway to connect a variety of sensors embedded in and around company properties, building owners and managers gain actionable insights into energy use,
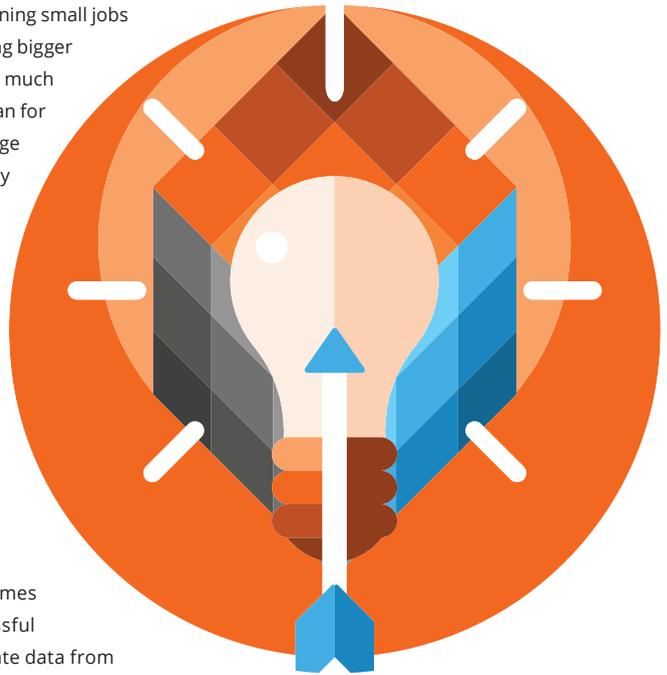
temperature trends, and equipment run times. A NASCAR team relies on the IoT to analyze data from in-car systems, using real-time data to improve its race results. A Japanese university manages its Smart City strategy based on real-time data analysis of local traffic and congestion patterns.

Dell is one of the few tier one IT suppliers with assets in each of the critical categories of an IoT solution, including security, data acquisition, transport, aggregation, analytics and deployment services.

The IoT is limited only by our imagination. With the rise of cloud computing, IT infrastructure can scale as quickly as data grows. Advances in familiar technologies, tied together with new software and applications, provide the fundamental building blocks for achieving the promise of the Internet of Things.

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