



# The Software-defined Data Center in the Enterprise

A Cloud Report by Ben Kepes

*This report underwritten by: NIMBOXX*

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# 1 Executive Summary

The software-defined data center lets users control their data center resources with software instead of hardware. It does so by moving organizations from physical storage, networking, and compute to a programmatically accessible infrastructure that offers the flexibility and efficiency to tailor infrastructures to suit specific needs and applications.

The rise of virtualization introduced the software-defined data center. Three pillars—server virtualization, software-defined networking and software-defined storage—created a new paradigm in which software took control of the entire data center operation thanks to its much more flexible and adaptable nature. The move empowered companies with speed and nimbleness that was unfathomable before, leaving them adequate time and resources to concentrate on the applications that drive business while the agile software layer did all the heavy lifting for them. It also allowed them to deliver the fourth pillar of a software-defined data center—a modernized security model.

Key highlights from this report include:

- Software-defined data center architecture enables companies like Google and Facebook to expand and contract their webscale infrastructures seamlessly while delivering a reliable service.
- Non-webscale enterprises are increasingly looking to replicate this approach for their own data center infrastructures.
- Regulatory compliance mandates, performance, and security considerations may prevent some organizations from using the public cloud for some or all of their applications.
- In applying the software-defined approach to private infrastructure, organizations have two choices: build their own solutions from individual components or leverage a turnkey solution.

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## 2 Why Enterprises Need the Software-Defined Data Center

As is well-known today, Google, Facebook, Amazon, Microsoft, and other massive users of computing infrastructure architected their data centers by leveraging software-defined principles.

Engineers realized early on that traditional approaches to the data center were both prohibitively expensive for their applications and didn't give them the level of flexibility they required. They began to experiment with software controllers sitting on top of commodity hardware and enjoyed the cost savings and flexibility that approach brought. While these massive vendors can arguably push proprietary vendors to supply them at competitive prices, the flexibility of the software-defined approach enabled them to deploy, maintain, and upgrade their infrastructures and deliver cloud services with greater agility and efficiency at a much lower total cost of ownership.

Google was probably first to popularize the notion of using "cheap 'n deep" commodity hardware at massive scale. Long the stuff of legends, Google is able to leave a faulty piece of hardware in place, secure in the knowledge that its automatic and programmatic systems will ensure that the work that server was doing is effortlessly moved somewhere else.

Until recently, the software-defined data center approach was only available to these massive vendors. But enterprises have taken note and want to enjoy the same benefits. Products are appearing on the market which deliver the software-defined data center to mainstream and sometimes far more modest organizations, too.

The reason for this is clear. Enterprises today face significant challenges as well as shortcomings in their traditional architectures. On the one hand, businesses are demanding IT to become ever more agile and to deliver on the need for quick and flexible infrastructure that can allow the business to innovate. On the other hand, enterprise IT faces budgetary constraints, so the expectation is that enterprise IT will do more but often with less.

To complicate matters even further, many organizations (especially those in the medical, governmental, or financial sectors) face increasing requirements around regulatory, geographic, and service compliance, as well as security and privacy. Some of these requirements preclude organizations from running all or even part of their IT operation in the public cloud.

These conflicting drivers—the need for agility, budget constraints, and compliance mandates—create the need for the same software-defined principles that the largest web

properties use, but in a private configuration. These organizations wish to enjoy the benefits that the webscale public cloud providers enjoy—scalability, elasticity, resiliency, availability, and agility—without the associated risks.

IT also works within an increasingly complex world and is striving to find ways to break down the siloes of technology and the business. While an unashamedly technical solution, the software-defined approach has broad organizational benefits as well. By enabling IT to be more agile, and hence respond to the business needs, the often-fractious relationship between IT and the business can be improved. Instead of the business seeing IT as the “department of no” and IT seeing business as the biggest barrier to good technology practice, these two parts of the organization can find more common ground.

### 3 Focusing on Agility

The demand for organizations to be increasingly more nimble and innovative has led to a parallel demand on data centers to respond quickly to the needs of the organization. Historically a data center housed a somewhat homogeneous application stack. The modern data center is far more complex than that, with diverse workloads running on both virtualized and traditional infrastructures and serving highly unpredictable loads.

Organizations are looking for technologies that allow them to respond to those demands for agility in a way that adheres to compliance and regulatory requirements. The software-defined data center helps them reach that goal in several ways:

- By allowing the organization to innovate unconstrained by any hardware barriers, proof-of-concept and prototype applications can be created and deployed rapidly.
- Allowing the data center to be more responsive to the opportunities that mobile computing and big data raise increases the ability to pursue broader opportunities.
- By optimizing assets, organizations can “right size” their infrastructures, secure in the knowledge that they will not over-provision or run the risk of service degradation.
- Security and compliance can be governed from a central location rather than on a per-device basis. This increases both efficiencies and overall compliance.
- The software-defined data center allows an organization to map its networking, compute, and storage, making dynamic migration of workloads less problematic.
- By lowering both OpEx and CapEx software-defined data centers free up finances to focus on core strategic initiatives.
- “Single pane of glass” allows management of storage, compute, networking, and security for fault detection, isolation, mitigation, day-to-day monitoring, as well as detection of inefficiencies and conflicts across the entire enterprise infrastructure landscape.

## 4 Two Approaches: Turnkey or DIY

Organizations looking to leverage a software-defined approach to their infrastructures have two main options: turnkey or DIY.

A turnkey solution, as the name implies, takes the various pieces of the infrastructure puzzle and converges them into one consistent and integrated whole. Organizations that leverage the turnkey approach are looking to buy a “cloud in a box” from a vendor. These are building blocks that serve as the essential units of an extensible pool of resources.

Proponents of the turnkey approach point out that cloud computing is all about abstracting the responsibility for low-level hardware and software away from the customer. If this is the case, a turnkey solution, which is already integrated and tested, is optimal.

The DIY approach requires an organization to build the different component parts it needs for its particular use case. These component parts will include various pieces of software plus the underlying hardware they control.

Supporters of the DIY method suggest that, given the complexity of modern organizations, only this approach will let organizations achieve a solution with the flexibility that really meets their specific needs.

Whichever solution an organization chooses should be readily implemented without requiring massive organizational change. In fact, any data center solution that dictates terms and requires the users to adapt to it rather than it adapting to the needs of the users is sub-optimal.

Organizations should also look for a solution that has a low entry cost but ease of scaling. Modular solutions that allow an organization to start with as little as a single node and then to scale are optimal.

Note that since the implementation of a DIY solution is more technologically demanding, organizations without significant technical expertise or the resources will likely opt for a simpler, more modular, turnkey solution.

## 5 Issues to Think About

Any organization must balance a number of different factors when implementing a private-cloud solution. Following are five factors an organization should think about when choosing a hyper-converged platform:

1. If an organization wishes to build a high-performance elastic compute platform, it must look for software that has direct access to the hardware. While abstracting hardware away with a software layer could bring benefits in terms of flexibility, thinking about any potential performance impacts caused by inefficiencies in the process is important. Solutions focused on gaining the maximum performance out of a particular piece of hardware are often preferable to less refined, abstracted solutions that suffer performance loss.
2. Management and visibility. Organizations must think about gaining end-to-end visibility and manageability of their entire software-defined data center environment. This visibility and management needs to cover the various parts of the infrastructure across compute, storage, networking, and security. The monitoring and management layer should ideally be accessed through a “single pane of glass” for all alerts and configuration options of the platform being used. Regardless of whether organizations use a DIY or turnkey method, they should look for a single and consistent fabric for the monitoring and management of their infrastructure.
3. An organization should consider a near-term and long-term view of expenditure. The DIY approach often entails a significant investment up front, while the turnkey approach typically allows an organization to start small and scale out. That said, the long-term expense depends on the workloads, the environment and the in-house expertise.
4. Redundancy with economics. The reason Google, Facebook, and other webscale companies demonstrate such high reliability for services is that their economies of scale allow for multiple levels of redundancy. A private cloud implementation, without the same economies of scale, should seek to balance the need for data resilience with associated costs. Features such as physical redundancy, data replication, and disaster recovery are critical for ensuring availability of critical data. Achieving this redundancy is far out of the economic ability of most organizations.
5. The software-defined data center is about preparing for future scenarios in the enterprise and ensuring that IT is aligned to the needs of the business. In part this means eeking out the maximum from any piece of hardware. The flexibility that the software-defined data center brings, along with the fact that end users can often provision their own services, allows for that increased level of alignment between the business and IT. Any solution chosen by an organization should therefore be as flexible as possible and should embrace self-service to ensure end-users have the ability to control their own infrastructure.



## 6 Key Takeaways

Without a doubt, the software-defined approach to building a data center is increasingly becoming the de facto method, but several reasons mandate that the software-defined approach will need to be adopted within the context of either a fully private or a hybrid delivery model. Those reasons include security, performance, and compliance.

Organizations wishing to deploy a private software-defined data center have the option of following a DIY or a turnkey approach. The DIY approach is more flexible, but is often more complex and requires more technical skills when compared to a turnkey approach.

Utilizing a turnkey approach for building a software-defined data center will often be preferable to DIY for those organizations wanting to start small and scale out, to get the quickest time-to-value, and to avoid the up-front costs and resource investments required to build the entire deployment.

## 7 About Ben Kepes

Ben Kepes is an Analyst for Gigaom Research. He covers the convergence of technology, mobile, ubiquity and agility, all enabled by the cloud. His areas of interest extend to enterprise software, software integration, financial/accounting software, platforms and infrastructure as well as articulating technology simply for everyday users. He is a globally recognized subject matter expert with an extensive following across multiple channels.

Ben currently writes for Forbes. His commentary has previously been published on ReadWriteWeb, The Guardian and a wide variety of publications – both print and online. Often included in lists of the most influential technology thinkers globally, Ben is also an active member of the Clouderati, a global group of Cloud thought leaders and is in demand as a speaker at conferences and events all around the world.

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