F5 White Paper

The VDC Maturity Model—Moving Up the Virtual Data Center Stack

Defining the baseline and process of virtualization maturity for the data center.

by Alan Murphy
Technical Marketing Manager, Management and Virtualization

Contents

Redefining Virtualization

In 2007, F5 embarked on the challenge of redefining the data center within the scope of virtualization, and specifically designing the Virtual Data Center (VDC) of tomorrow. While there were, and still are, many different virtualization technologies available to solve any number of problems, none of those solutions regarded the data center as a single entity; today, almost all virtualization technologies seek to solve just one problem. OS virtualization, network virtualization, storage virtualization…each of these categories has numerous vendors providing various solutions. But none of these solutions has been designed to combine efforts to achieve the shared data center goal: to deliver applications to users. Data centers only exist to host and deliver applications, yet no existing virtualization solution addresses the cohesive application delivery needs of a business.

The first step in this paradigm shift came when defining each unique virtualization category. While that may seem to be a daunting task, there are ultimately only eight types of virtualization technologies that exist in any data center:

1. Network Virtualization
2. Application Server Virtualization
3. OS Virtualization
4. Management Virtualization
5. Storage Virtualization
6. Application Virtualization
7. Hardware Virtualization
8. Service Virtualization

All virtualization solutions fall into one of these eight categories.

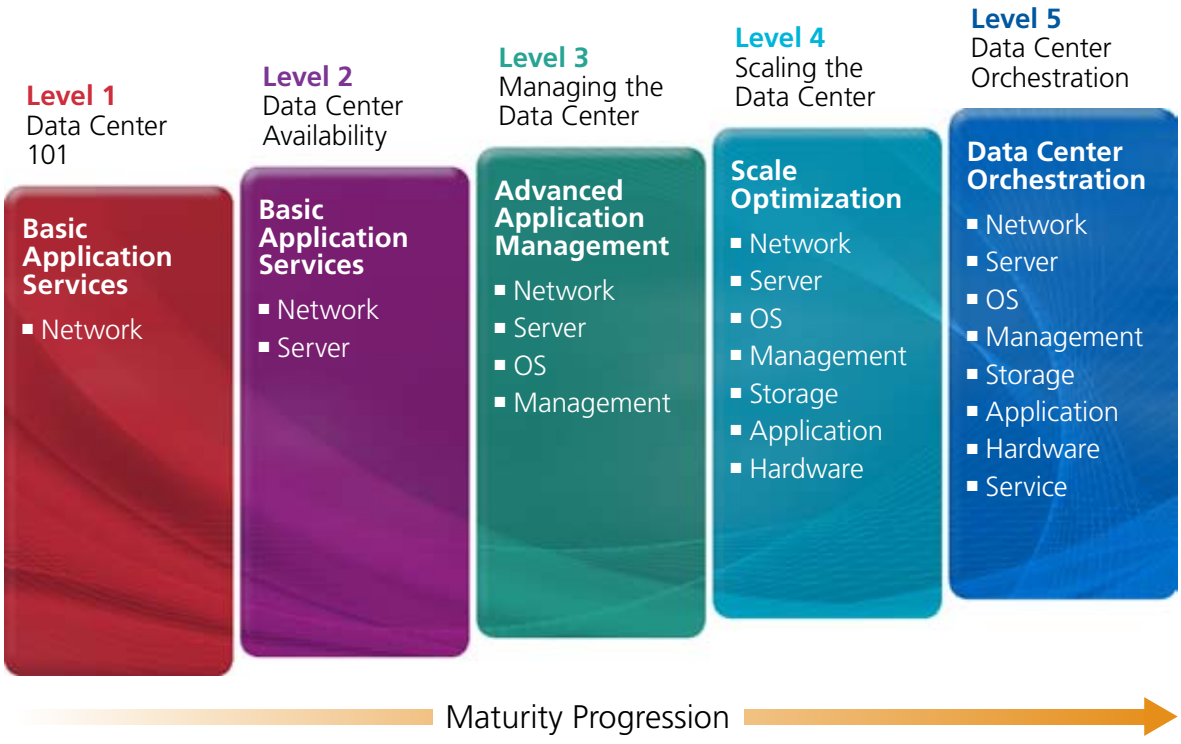
- Hyper-V and VMware: OS Virtualization.
- NAT and VLANs: Network Virtualization.
- Application Delivery Controllers and Load Balancers: Application Server Virtualization.
- Data Center Orchestration: Service Virtualization.

Defining these categories was paramount to addressing all the problems and solutions that virtualization brings to the data center; however, this was simply the first step. Once these concepts were defined, they needed to be both applied

to real data centers and then brought together to work as one unit. The concept behind the Virtual Data Center is simple: a data center made up of each of the eight virtualization technologies, with all of the virtualized components working together to deliver applications. However moving from the Define and Design phases to Developing and Deploying a complete VDC does present real, challenges.

Virtualization Maturity: Defining Growth Steps

The VDC Maturity Model



Once each individual virtualization technology was defined, the next step was to apply these established categories to the evolution of the data center.Enter the Virtual Data Center Maturity Model. Like any good maturity model (also often referred to as an "agility model") planning tool, the VDC maturity model seeks to create a baseline self-evaluation tool and progression meter to guide the data center from one level to the next. The VDC maturity model contains a clustering of virtualization technologies that are divided into five individual phases, with each phase providing a "snapshot" of the current state of the data center.

Starting with level 1 and progressing up through the model to level 5, the goal is to assess at what stage your data center is today, how each of your specific virtualization technologies map to this level, and how to advance to the next level simply through increased virtualization components. While the maturity model is an excellent analysis tool in itself, it, too, has a larger goal: to help drive your data center to a state where virtualization can be used to deliver your applications, not just a single-point solution to replace physical hardware. Ultimately, the goal of the maturity model is to achieve the Virtual Data Center level appropriate for the application delivery needs of that specific data center.

Maturity Model Levels

The VDC Maturity Model is divided into five levels, from the most basic data center (Level 1) to a completely virtual, automated, and orchestrated data center (Level 5). The level that applies to each individual data center will relate directly to unique customer needs. Although the maturity model aims to help progress the data center forward with virtualization technologies, there's no requirement that every data center has to reach Level 5 status. One of the benefits of the VDC Maturity Model is the ability to quickly asses the goals of the data center. One enterprise may need to become a Level 5 data center, while another enterprise may only need to achieve Level 3. The level evaluation will be unique for every enterprise.

Level 1: Data Center 101

Virtual Components: Network

Benefit: Basic application availability

How to get here: Basic server "closet" in the corporate office

Level 1 is where all data centers begin. This is literally the first step in building a data center designed to deliver applications. Level 1 data centers have all of the basic physical requirements (room, HVAC, at least one server, one switch, one router, and cabling) and there is typically very little, if any, virtualization at this level. Virtualization at this level is limited to basic network virtualization: S/NAT is typically as sophisticated as these data centers get. Every day and every function is a firefight, and every decision is a reactive one. There is no application availability, optimization, or security. This is a "hands-on" data center, requiring constant attention and full-time servicing.

Level 2: Data Center Availability

The next step towards a mature data center—Level 2—introduces the idea of basic application availability, using more sophisticated Application Delivery Controllers (ADC) to provide web and application server virtualization. Although a Level 2 data center has introduced the ADC, it is typically used to provide basic load balancing functionality. Advanced features such as application intelligence and full benefits from the proxy architecture of the ADC aren't seen at this level. Basic security is also introduced in this level, with the use of VLANs on the network layer and the basic proxying at the application layer. While some small amount of defensive firefighting is beginning to take shape, there is still no future planning or intelligent management of the data center components.

Virtual Components: Network, Application Server

Benefit: Ability to begin managing different parts of the data center for different tasks and purposes.

How to get here: Begin looking into higher-end Application Delivery Controllers and segmenting applications by need.

Level 3: Managing the Data Center

Level 3 of the maturity model introduces a new way of thinking about the data center. Rather than focusing on the individual components, Level 3 looks at the data center from the point of view of the applications. More advanced application management, availability, optimization, and security is introduced. Basic user management is also introduced at this level, factoring in how and where users are accessing applications in the data center and applying Authentication, Authorization, and Accounting (AAA) of user transactions. User experience also becomes a factor at this level; application service offloading, such as SSL and caching, appear at Level 3 to help deliver this new concept of application optimization. Planning becomes more a part of the data center than day-to-day fire drills.

Virtual Components: Network, Application Server, Operating System, Management

Benefit: Begin to move the data center away from "speeds and feeds" to managing it with the goal of outbound application access.

How to get here: Enable advanced features in the ADC, such as SSL offloading and content caching. Add user-based application security policies for application access. Begin looking into single-point management solutions.

Level 4: Scaling the Data Center

Level 4 addresses the need to scale the data center to support business needs, and typically balloons into a "need to have" more than designating one data center for any specific task. This is where larger concepts like disaster recovery and application security begin to appear. Advanced ADC features and branch-to-branch transport and management systems are introduced as optimization becomes more a part of the business need and overall ROI issues. Data storage virtualization and optimization become critical issues for the applications in the data center, and managing those new storage solutions become as important as moving to de-centralized storage. More sophisticated technologies become part of the data center fabric, such as virtually segmented hardware for switching and routing, software switching, virtual OS image management, etc.

Data center and automated system management tools become a necessity, although their breadth and technology support may be limited (such as basic

Virtual Components: Network, Application Server, Operating System, Management, Storage, Application, Hardware

Benefit: Scale and flexibility. Independent components of the data center can be managed discretely and together by solution-oriented task. Applications take primary focus, not individual technologies that support applications.

How to get here: Build out a fully virtual infrastructure, beginning with operating system virtualization platforms and VDI solutions. Move from a reactive to a pro-active design pattern.

server configuration management, patch management, automated user AAA tasks, and so on). Management becomes almost exclusively about designing for future growth and disaster planning; minor day-to-day issues are managed by these new automated systems and the alert/monitoring tools. A Level 4 data center is a sophisticated, well-managed application delivery data center.

Level 5: Data Center Orchestration

A Level 5 data center is the epitome of a complete Virtual Data Center, where the data center has moved from individual components to a fully orchestrated "service" that uses each virtual category together to seamlessly provide application delivery in and out of the of the data center. Data center tasks become workloads (a clustering of multiple tasks in sequence to achieve a single goal); as workload demands increase, a fully configured management sub-system allocates the necessary resources to support the business needs. Resource and workload management includes all forms of virtualization, from operating system to network to storage, culminating in service virtualization.

Service Virtualization is synonymous with a Level 5 data center. All parts and individual components of the data center are managed together to provide application availability, optimization, security, and ultimately, delivery outside the data center. Level 5 data centers also introduce new concepts and technologies that are "macro virtualization" technologies (those that incorporate more than one single virtualization category) such as an Enterprise Service Bus (ESB) and application policies for provisioning entire data centers on-the-fly. Reactive and proactive management of the data center become the same thing; future planning for future issues is always happening in parallel with solving current issues. A Level 5 data center is a completely dynamic, self-provisioning, orchestrated data center. It is literally the Virtual Data Center.

Virtual Components: Network, Application Server, Operating System, Management, Storage, Application, Hardware, Service

Benefit: A fully orchestrated data center that supports dynamic application provisioning for growth, not repair.

How to get here: Today, this architecture requires a "build from the ground up" approach, and typically is a completely custom-designed data center built on internal solutions rather than off-the-shelf products. The VDC of tomorrow begins to bring standard components into a Level 5 data center. Application Delivery Controllers and segmenting applications by need.

Conclusion

The goal of virtualization in the data center is to help the enterprise achieve a business goal, whether that goal is consolidation, reduced management and head count costs, disaster recovery, or even "going green." And with this, the pinnacle of virtual solutions is to architect and deploy the complete Virtual Data Center. But before that goal can be achieved, the current state of any data center needs to be assessed and goals for where that data center need to be defined. F5's Virtual Data Center Maturity Model provides a means to achieve both of these goals, while also creating a firm map of what virtual technologies help move the enterprise through the level progression. While most enterprise data centers won't need to reach Level 5, moving up the model to the point where virtualization is implemented to achieve the business goal of application delivery is paramount to any enterprise.

F5 Networks, Inc.
Corporate Headquarters
401 Elliott Avenue West
Seattle, WA 98119
+1-206-272-5555 Phone
(888) 88BIGIP Toll-free
+1-206-272-5556 Fax
www.f5.com
info@f5.com

F5 Networks
Asia-Pacific
+65-6533-6103 Phone
+65-6533-6106 Fax
info.asia@f5.com

F5 Networks Ltd.
Europe/Middle-East/Africa
+44 (0) 1932 582 000 Phone
+44 (0) 1932 582 001 Fax
emeainfo@f5.com

F5 Networks
Japan K.K.
+81-3-5114-3200 Phone
+81-3-5114-3201 Fax
info@f5networks.co.jp

WP-VDC-MATURITY-MODEL 04/08
© 2008 F5 Networks, Inc. All rights reserved. F5, F5 Networks, the F5 logo, BIG-IP, VIPRION, FirePass, and iControl are trademarks or registered trademarks of F5 Networks, Inc. in the U.S. and in certain other countries.