One of the biggest changes in the IT world over the last few years has been the strong emergence of the private cloud as a contender for the best way to host enterprise IT services. At least in theory, private clouds combine the best aspects of on-premises software (including manageability and control) with those of public clouds (high scalability and relatively low cost). Microsoft has worked steadily to develop Exchange into something that they can host in their own public cloud services, such as Office 365 and Live@EDU; the result is that Exchange 2010 and Exchange 2013 are well suited for use in private clouds as well.

Exchange Virtualization: A Quick History

As befits a mission-critical enterprise application, Exchange can be virtualized and remain fully supported by Microsoft, but this is a fairly recent development. From Exchange 4.0 until Exchange 2007,
Microsoft’s support policy on virtualized Exchange was “don’t do it; we don’t support it.” For Exchange 2007, Microsoft defined its current policy, which remains in effect today (see technet.microsoft.com/en-us/library/cc794548(v=EXCHG.80).aspx). That policy depends on several conditions:

- The hypervisor used must be approved under Microsoft’s Windows **Server Virtualization Validation Program** (SVVP). That still gives you a fairly wide range of options, including Microsoft’s own products (Windows Server 2008 R2’s Hyper-V and Hyper-V in Windows Server 2012), products from VMware, RedHat, and Citrix, and a variety of appliances and blades. Interestingly, the Exchange team doesn’t support the use of Exchange 2013 in Windows Azure, Microsoft’s own public-cloud hosting offering.
- All server roles in Exchange 2010 and 2013 are fully supported for virtualization.
- If you use the disaster recovery or high availability features of the hypervisor, only configurations that result in a cold boot after a failover are supported. In other words, you can use Exchange 2010/2013 DAGs without limitation, but if you depend on the hypervisor, then “[a]ll planned migration must either result in shutdown and cold boot, or an online migration that makes use of a technology like Hyper-V Live Migration.” In practice, that means that if you use a live migration or copy feature of the hypervisor for failover, first-line support responsibility falls to the hypervisor vendor, not Microsoft.
- Microsoft doesn’t support the use of dynamic memory allocation for virtualized Exchange servers.

The importance of server virtualization continues to grow as server hardware continues to become simultaneously cheaper and more powerful.

The good news is that Microsoft’s policy gives you a great deal of flexibility for virtualizing Exchange in your own private cloud. The two market-leading virtualization solutions for Windows, Hyper-V and VMware, are both fully supported, and although there are many strident arguments about their relative merits in the press and on the Internet, for our purposes it doesn’t matter which of them you use to build your cloud. You can take it
as a given that either will be suitable, and that you should choose based on your technology needs, budget, and environmental requirements.

**What’s a Private Cloud?**

There’s a lot of confusion surrounding the term “private cloud,” but the simplest definition is that a private cloud is nothing more than a set of virtual machines running your enterprise software in your own data center. Whereas traditional cloud computing involves buying services from someone else, the private cloud is yours to design, control, and operate—you get the scalability and cost savings potential of virtualization without giving up control. Deploying into a private cloud represents a significant challenge for many organizations, since running a private cloud requires operational and organizational maturity. However, the flexibility and potential cost savings of private cloud operations compared to using commercial cloud offerings can be compelling reasons to insource cloud operations. In addition, organizations that have specialized retention, compliance, security, or confidentiality requirements often find that commercial cloud services don’t meet their needs; private cloud implementations offer such organizations a way to meet their business requirements while still getting the major benefits of cloud implementations.

At the simplest extreme, a private cloud doesn’t have to be anything more than a set of virtual machines running on a physical server or two—but just as economies of scale help drive down costs for commercial cloud providers, expanding your own private cloud can help lower costs. This may seem like a paradox, but the drivers for that cost savings are simple: server consolidation and storage consolidation.

**Server Consolidation and the Private Cloud**

Server consolidation is feasible in many environments thanks to a combination of three things: the Moore’s Law-powered increase in server horsepower, the trend of Microsoft and other major enterprise vendors to build server software into modular roles, and the fact that many enterprise
products can’t be combined on the same server. For example, suppose that you have 25 branch offices and want each of them to have local access to Exchange and Lync. Microsoft’s past solutions would have called for an Exchange server and a Lync server in each branch office—probably overkill for the likely workload. However, Lync and Exchange can’t be combined onto a single server, so a first-cut approach at implementation might still end up with two servers per branch office.

Since Exchange 2003, Microsoft has steadily increased the number and size of mailboxes that can be supported on a single Exchange server. Given adequate network connectivity, a set of 25 branch offices could easily be supported by a single Exchange server in a centralized location; the same is true with Lync (although for HA reasons you might choose to use survivable branch appliances, SBAs, instead of centralizing all Lync roles).

Server consolidation helps power the private cloud in two ways. First, it reduces overall risk and cost by bringing mission-critical data and applications under centralized control. To get a sense for why this is so, you can compare the risk and cost of trying to maintain 25 Exchange servers (including keeping them patched, backed up, and protected against tampering and data loss) versus the risk and cost of running a two- or three-node DAG as part of the overall enterprise IT service load. Second, there are direct capital and operating expense reductions related to having a smaller number of servers: fewer servers means less money spent on hardware purchases and maintenance, power (and possibly cooling), Windows Server licenses, and server licenses for Exchange or other enterprise products.

You can think of virtualization as a refinement of the basic idea of server consolidation. Traditional Exchange server consolidation revolves around pulling in Exchange data from the periphery of the network and concentrating it onto a smaller number of centralized servers, but these centralized servers don’t have to be physical. Consolidating disparate workloads from different physical locations onto centralized virtual hosts often delivers better utilization of the physical servers, with attendant lower management and operating costs in addition to the other benefits of consolidation.
Storage and the Private Cloud

Consolidated storage has long been a staple of enterprise data center deployments. Although the cost to acquire a gigabyte of storage has dropped steadily over the last ten years, the cost to provision, manage, back up, and protect that GB of data hasn’t. That’s because, like buying a pony or a puppy, the initial acquisition cost is only a small fraction of the total lifecycle cost. To try to deal with this cost imbalance, many organizations have sought economies of scale through building pools of highly available storage on storage area networks, then dividing that storage among the servers and applications that need storage. This strategy has proven quite effective when coupled with other approaches to large-scale deployment, including server consolidation and now virtualization.

Microsoft’s approach to high availability in Exchange 2010 and Exchange 2013 has led some organizations to deploy Exchange exclusively on JBODs, using lower-cost, higher-capacity direct attached disks coupled with Exchange’s native data protection mechanisms. While this is a great solution for many use cases, taking advantage of it means giving up the benefits of consolidated storage, including centralized management and provisioning, hardware-based, application-independent redundancy, and performance monitoring and optimization that goes beyond what Windows natively provides. Virtualized Exchange servers on appropriately sized physical hosts and consolidated storage provide a powerful combination of high performance, low operating cost, and enterprise control.

Exchange and the Private Cloud

Exchange is a great candidate for private cloud deployments for a number of reasons. First, Microsoft explicitly designed Exchange 2010 and Exchange 2013 to support large, low-cost mailboxes at very high scale. Aggressive I/O optimization from version to version has led to reductions of up to 90 percent in the number of IOPS required to support a given workload; architectural changes to the client access server and mailbox roles in Exchange 2013 lead to the possibility of further large-scale consolidation. Microsoft
uses this capability, along with Exchange’s multi-tenant abilities, to host their own Exchange Online cloud offering by consolidating onto physical hardware and operating it at high loads. You can take advantage of the same scalability features in a different way by deploying Exchange servers as virtual hosts in your private cloud alongside other virtualized workloads, with the mix determined by your business requirements.

Second, Exchange is storage-intensive. The massive reduction in IOPS requirements is counterbalanced against relentless user demand for larger mailboxes. Consolidated storage in the private cloud offers the possibility of gaining efficiency through deduplication, as well as reducing or eliminating the risk of data loss and downtime associated with reseeding during failovers or other continuity-related operations.

Third is that Exchange includes a number of management features that make it ideally suited for private cloud deployments in large organizations. Enterprise IT departments can offer Exchange as a hosted service to business units, or even external entities such as foreign subsidiaries or business partners. Role-based access control makes it possible to give each stakeholder precisely the administrative access they need; self-service message tracking, mobile device management, and user provisioning allow many operations to take place without involving centralized IT staff; and reporting and monitoring (plus integrated support for System Center Operations Manager) enable global monitoring and control for all Exchange servers.

**Building Your Own Private Cloud**

Because Microsoft’s support policies call for full support of virtualized Exchange environments, there are relatively few unique issues to worry about when building a private virtualized cloud. The primary issues you face in such a deployment are largely similar to the issues you’d face in a physical deployment:

- How many servers will you use, hosting how many mailboxes?
- How will you partition your mailbox data across servers, mailbox databases, and geographies?
• Will you use database availability groups (DAGs)? What about RAID? Is there a role for storage-level replication or other technologies?
• What measures will you take to ensure continuity in case of a failure or disaster?
• Is there special business or operational issues to take into account? Examples might include specific requirements for compliance, SLAs for availability and service quality, or other business-driven requirements that go beyond the technical boundaries of a typical Exchange deployment.

Some of the issues you’d normally face in a traditional deployment, such as where servers will be physically located, aren’t relevant to the private cloud. Others, such as which hypervisor you use, have no analog in the traditional-deployment world. Virtualized private cloud deployments can take advantage of management tools such as Microsoft’s System Center Virtual Machine Manager (SCVMM) to speed up testing and deployment, too.

Rookies Beware: Potential Mistakes to Avoid
The ubiquity and service quality of public-cloud solutions sets a high bar for private cloud implementations. End users and business stakeholders may have high expectations based on their experience with services such as Outlook.com, Dropbox, and Salesforce. The biggest potential mistake you may make during private cloud planning is to underestimate the difficulty of providing a robust service that takes full advantage of the private cloud paradigm to provide good availability while still saving money compared to traditional deployments. Here are a few tips to keep in mind as you go through this process:
• Be mindful of what you’re promising to deliver, and ensure that your planning is adequate to meet the commitments you make.
• Pilot, pilot, pilot. Because all Exchange servers within an AD forest can interoperate seamlessly, you can easily pilot private-cloud operations by setting up a small number of servers and using them to gain experience during the early phases of your service rollout.
• Don’t put all of your Exchange VMs on the same physical host. This may seem obvious, but for smaller deployments it can be tempting to buy a powerful server and use it to host all the members of an Exchange DAG. While the hypervisor and Exchange can work together to prevent data loss caused by a VM-related failure, they can’t help you much if the physical server itself fails.

• Use RAID where it makes sense. Microsoft recommends that you deploy RAID for any database that has less than three copies in a DAG, but you may be able to do without DAGs by relying on a combination of RAID for data protection plus hypervisor or storage-based clustering for HA and VSS to provide point-in-time backups.

• Validate your storage configuration. Whether you use a small number of large physical servers, a blade architecture for high-scale virtualization, or something in between, it’s critical to validate that your chosen storage design will provide adequate IOPS, throughput, and resilience under load. Use Jetstress and Loadgen to thoroughly test your storage design in advance, and fix any problems you find with it before proceeding with your deployment.

**Getting the Right Help**
Deploying Exchange in a private cloud requires different, and more advanced, skills than managing Exchange operations—the ongoing operations phase is largely the same as it would be for a conventional deployment. Most organizations find that retaining outside experts, in the form of professional services teams with private cloud experience and leveraging documented reference architectures and best practices, is a smart move because it reduces risk and overall cost while helping to transfer skills and knowledge to the team who will be running the deployed systems. You should evaluate potential service providers based on their experience in all sizes of projects, their demonstrated expertise with Exchange, their competence with the hypervisor you plan to use, and their library of best practices.

EMC offers both design and implementation services, as well as integrated
solutions Like EMC VSPEX that leverage EMC’s extensive experience with Microsoft Hyper-V. EMC’s Information Infrastructure Solutions for Microsoft Virtualization offers a broad spectrum of hardware, software, and services support for Hyper-V and integration Microsoft System Center (ex., SCVMM) and Native Exchange functionality, ensuring you obtain the agility, performance, and cost advantages virtualization can deliver. EMC specializes in wide-area, cross-site business continuity and disaster recovery, and is a Microsoft Geographically Dispersed Hyper-V Solutions partner.

With the viability of your entire private cloud deployment hinging on correct engineering, training, and ongoing operational management, EMC professional services are one of the most cost-effective means of ensuring a successful project.

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Top Reasons Why Customers Virtualize Exchange with EMC Solutions

Your business depends on messaging and communications to be productive and successful
EMC is the strategic partner of choice with our proven, industry-leading expertise and solutions across the many critical dimensions of a robust information infrastructure. Our expertise and solutions leverage the best of EMC, Microsoft Exchange, and industry-leading virtualization and management technologies from both Microsoft and VMware to enable you to confidently manage, protect, and optimize a virtualized Exchange Infrastructure.

You want to ensure flexibility and agility over the long term to respond to changing messaging and communication requirements
You have seen how Exchange has become integral to your business and also how the application has evolved over the years. You need to ensure that your infrastructure can respond to changes in both business and IT requirements.
EMC offers a range of best practices and infrastructure solutions to help you accelerate deployments, leverage the latest functionality, and simplify overall management. EMC’s breadth of storage platforms, including VNX, VMAX, and our integrated offerings like VSPEX, provide cost effective scalability and performance for any size Exchange and Unified communication environment.

You want to confidently leverage the benefits of virtualizing Exchange in a Private Cloud environment
Email growth is resulting in increasing cost and management complexity. EMC can help you eliminate the isolated Exchange silo’s with proven solutions for virtualizing Exchange. EMC’s virtualization capabilities span the desktop to the datacenter. EMC also has industry-leading expertise in both Microsoft and VMware technologies and is the recognized leader in Exchange storage. We have the expertise and solutions to help you transform Exchange to a virtualized, private cloud environment that works for you and your users.

You want to simplify management and empower your Exchange and Infrastructure Administrators with more automation and integrated tools
EMC can help you give control and empowerment back to your administrators. EMC’s tools like EMC Storage Integrator (ESI) can help your admins provision and replicate your exchange infrastructure quickly and efficiently. Additionally, EMC’s support and integration with Microsoft System Center helps you to leverage the existing tools and knowledge to manage both physical and virtual infrastructure from single console.

You need to enable the level of recovery that your business and users require—addressing all levels of granularity from email to data center
EMC can help you simplify backup and recovery for Exchange and all of your Microsoft applications. EMC can help your admins take backups in a split second, recovery instantly to infinite points–in-time, and also recover single-item, individual messages, mailboxes, data base and data centers. EMC’s industry-leading portfolio including Data Domain, Avamar, Networker, RecoverPoint, AppSync, and ItemPoint provide the range of backup and recovery options your business mandates for Exchange and messaging.

It is essential to your business to provide increasing levels of Exchange data protection
Exchange is critical to how your business communicates and operates. You need to ensure you can restart operations quickly after a disaster or unplanned outage. Your requirements have evolved where you need to provide
both local and remote recovery options. EMC’s depth of expertise and replication solutions including RecoverPoint and VPLEX can help you ensure the highest levels of Exchange protection.

You need to address governance and e-discovery requirements that incorporate Exchange archiving
EMC SourceOne Email management can help you promote compliance, define message retention policies, respond to eDiscovery requests, and reduce IT operational requests.

You want to confidently upgrade or migrate to latest the latest email and unified communication technologies
With thousands of global consultants, EMC Global services organization offers a broad portfolio of strategic consultation, planning, delivery, and support across the Exchange lifecycle. EMC has helped thousands of Exchange users migrate, upgrade, and virtualize Exchange—transforming their Microsoft Applications to the Cloud.

You want to ensure that any solution you deploy leveraging EMC technology will provide expected performance based on your set of requirements
With a broad portfolio of EMC Proven Solutions you can be sure that any solution you choose to deploy will provide outstanding performance, because it was rigorously tested and validated in the EMC Proven Solution labs across multiple Solution Centers of Excellence across the globe. Every Proven Solution provides set performance results so you can confidently expect the same level of performance when Exchange is deployed in your datacenter.
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