# Designing a Reference Architecture for Virtualized Environments Using IBM System Storage N series

**IBM Redbooks Solution Guide**

The IBM® System Storage® N series Reference Architecture provides deployment guidelines, workload estimates, and preferred practices for clients who want a proven IBM technology stack for VMware environments. The result is a Reference Architecture for Virtualized Environments (RAVE) using VMware vSphere, IBM System x® or BladeCenter® server, IBM System Networking, and IBM System Storage N series as a storage foundation.

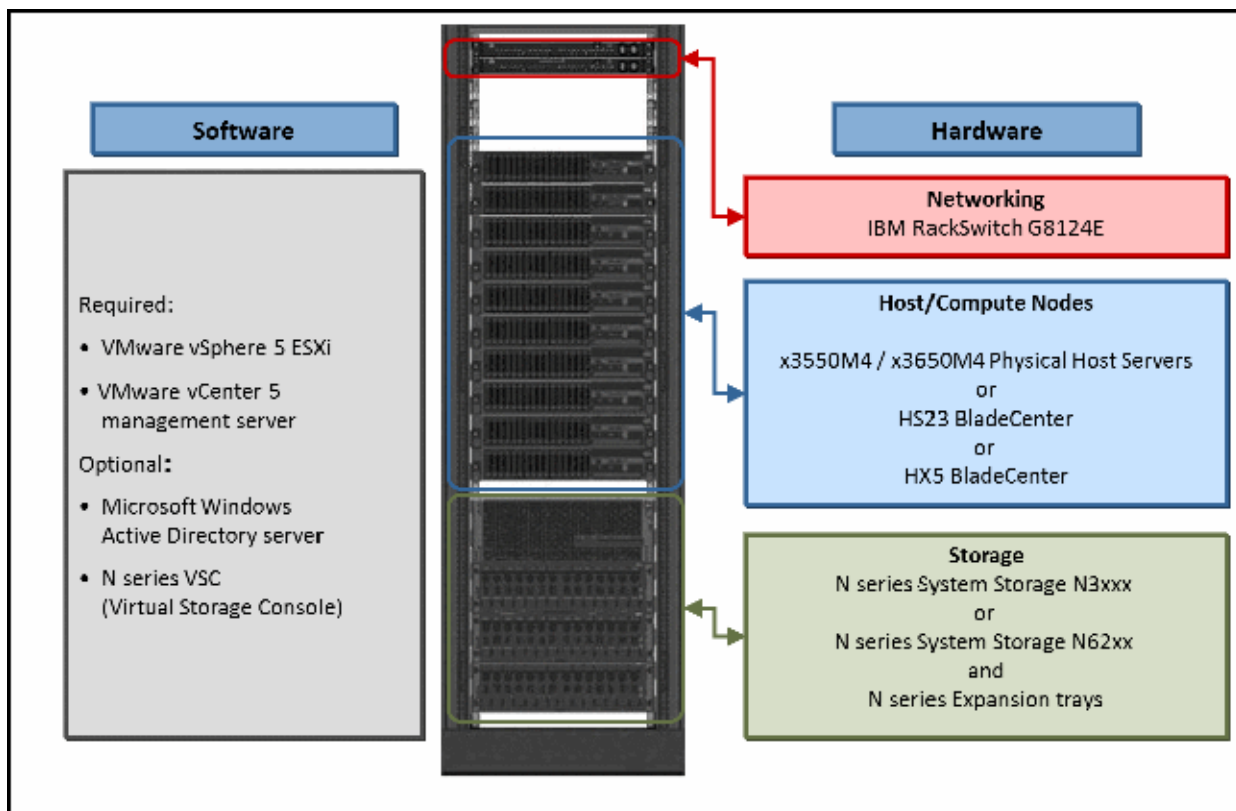Figure 1 illustrates the Reference Architecture solution stack.



Figure 1. Reference Architecture solution stack

## Did you know?

The Reference Architecture can be also be used as a foundation to create dynamic cloud solutions and make full use of underlying storage features and functions. This solution guide provides a blueprint that illustrates how clients can create a virtualized infrastructure and storage cloud to help address current and future data storage business requirements. It  explores the solutions that IBM offers to create a storage cloud solution addressing client needs.

## Business value

The Reference Architecture for Virtualized Environments and the extensive experience of IBM in cloud computing, services, proven technologies, and products support a Smart Storage Cloud solution designed for your storage optimization efforts.

Clients face many common storage challenges, and some clients have variations that make them unique. With RAVE, a proven and scalable solution has been created that consists of a rack of servers, storage, and networking components. Thus, we have carefully sized three scenarios, *Entry*, *Mainstream*, and *Advanced*, each based on preferred practices for real world workloads.

The IBM System Storage N series used as the storage foundation offers unified storage solutions that provide industry-leading technologies in the areas of storage efficiencies, instantaneous virtual machine and data store cloning for virtual servers and virtual desktops, and virtual data center backup and business continuance solutions.

This information is intended for anyone who wants to learn how to successfully deploy a virtualized environment, and to understand how IBM addresses data storage and compute challenges with IBM System Storage N series solutions in conjunction with IBM servers and networking solutions. It is suitable for IT Architects, Business Partners, IBM clients, storage solution integrators, and IBM specialist sales representatives.


## Solution overview

IBM System x and IBM System Storage N series with VMware vSphere as virtualization software offers an architecture that can be easily sized to fit the needs of the SMB to enterprise clients. Each selected architecture is a predefined, robust solution with immediate usability.

System x and N series with VMware vSphere 5 is a tested architecture and end-to-end solution that comprises all parts of a future-ready data center in a modular, extensible, flexible, and scalable rack server format. This format optimizes value in terms of providing dynamically changeable capability based on changing user needs, ease of deployment, administration, support, expansion, and most importantly, affordability. To support business agility, IT teams must have the ability to add or reduce resources such as memory and disk storage capacity when required, to accommodate business demands by users. IBM System x and IBM System Storage N series support this dynamic scaling of resources. Furthermore, the combination of System x, N series, and VMware vSphere creates mutual benefits and enables the creation of a dynamic cloud computing architecture.

In addition to VMware vSphere, the following key infrastructure components provide the foundations for this cloud computing architecture:

- IBM System x3650M4, HS23, and HX5 servers are optimized to meet the virtualization management and advanced workload demands of private cloud data centers.

- The IBM N series N3xxx and N62xx Storage Systems were selected to bring high performance SAN and NAS features in a unified system with efficiency features including deduplication and thin provisioning. In addition, N series products offer data protection features for vSphere such as no-performance-impact snapshots and thin replication for enabling and supporting disaster recovery and business continuity.

- IBM Storage Networking Gbps Ethernet components form the backbone for data and network connectivity. The combination of high performance adapters and low latency, cut-through switches enables the high-speed infrastructure that is critical for resource utilization and load balancing within the cloud. To provide additional flexibility, clients can choose either IBM Fibre Channel (FC) or Ethernet switches for their deployment.

Performance is a key consideration to support the virtualization and elasticity requirements. Reliability and high availability are of paramount importance when designing architectures that offer cloud services. The following section provides information about three reference configurations, all based on a common architecture, that incorporate these critical requirements for the successful delivery and ongoing operation of various solutions. The three reference configurations are Entry configuration, Mainstream configuration, and Advanced configuration.

## Solution architecture

The set of components consists primarily of software from VMware and hardware from IBM. The Entry and Mainstream configurations use IBM System x3650 M4 compute nodes. The Entry configuration is approximately half the compute capacity of the Mainstream configuration. Businesses starting with the Entry configuration can scale up to the Mainstream configuration in response to an increase in demand. The Advanced configuration uses IBM System HX5 compute nodes for higher performance and support for a larger number of virtual machines.

The hardware building blocks consist of:

- Networking components
- Compute nodes
- Storage subsystem

As infrastructures become increasingly complex and heterogeneous, the need for more cost-effective end-to-end solutions that are easier to manage is also growing. IT organizations are seeking solutions that can manage and scale across the entire infrastructure. So it is important to develop an architecture that easily adapts to clients' businesses needs and supports dynamic growth.

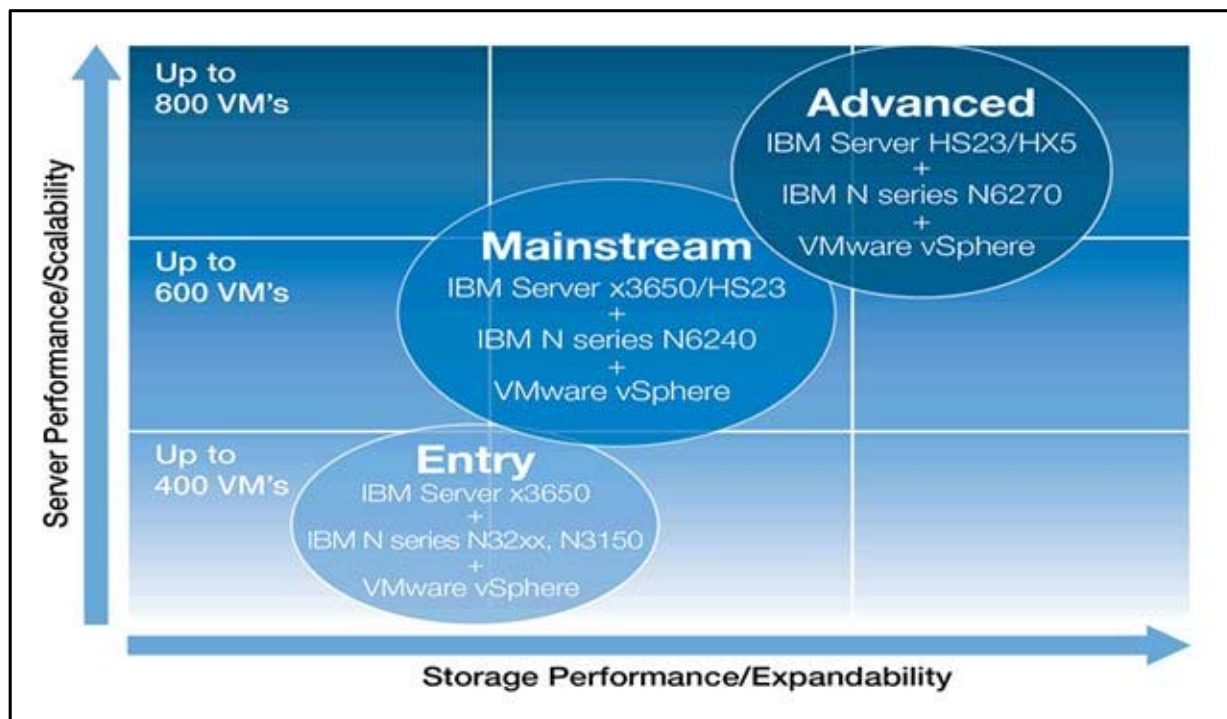Figure 2 provides an overview of the reference architecture that enables clients to handle today's IT demands.



Figure 2. Reference Architecture solution classification

## Usage scenarios

Figure 3 provides a more detailed view for different load characteristics based on the solution components introduced earlier.

| | Entry | Mainstream | Advanced |
|---|---|---|---|
| IBM Networking | IBM G8124E | IBM G8124E or<br><br>BladeCenter | IBM G8124E or<br><br>BladeCenter |
| IBM Server Platform [a] | x3550M4 or<br><br>x3650M4 | x3650M4 or<br><br>HS23 | HS23 or<br><br>HX5 |
| IBM System Storage [b] | N3150 , N3220<br><br>or N3240 | N6240 | N6270 |
| Range of VMs [c]<br><br>(estimated) | Up to 250 for N3150 [d]<br><br>Up to 400 | Up to 600 | Up to 800 |

a) To provide additional flexibility, clients can choose either IBM Fibre Channel (FC) or Ethernet switches for their deployment.
b) All N series attachments are via FCP and/or NFS
c) Range of VM's are based on mixed workload deployments
d) N 3150 iSCSI and/or NFS

Figure 3. Reference Architecture usage scenarios

## Integration

The three main configurations in the reference architecture are detailed here.

### Entry configuration

The Entry configuration is suitable for small organizations with dynamic IT infrastructure needs. In our reference, IBM Redpaper™ *IBM System Storage N series Reference Architecture for Virtualized Environments*, REDP-4865, the Entry configuration supports about 300 users and uses a System x3550M4 or x3650M4 server. This provides seamless scale-up capabilities such as VM support or storage.

This configuration can consist of the same components as the Mainstream configuration, but with half the number of computer servers and with entry level storage, the N3150 or the N3220/N3240. These choices are more economical for small organizations because they offer the same unified architecture with the full range of features at a low price point.

### Mainstream configuration

The Mainstream configuration is a superset of the Entry configuration, with a seamless scale up of the Entry configuration for environments that require additional resources. The Mainstream configuration is suitable for larger organizations than the Entry configuration. In our reference we show an example of a workload that supports 1500 users.

The component building blocks of the Mainstream and Entry configurations are the same. However, the Mainstream configuration can also be composed using the HS23 server. The N6240 is the suggested storage model for this configuration.

### Advanced configuration

The Advanced configuration is suitable for larger organizations with increased demands regarding capacity, speed, and concurrent users. The Advanced configuration uses HX5 servers as the host node servers. It supports about four times the number of VMs as the Mainstream configuration.

As a stand-alone implementation, the Advanced configuration uses the latest N6270 storage system. The N6270 offers the second highest capacity and performance in the N series line (second only to the N7950T). In addition to scalability and performance, the Advanced configuration offers greater flexibility in terms of consolidating multiple different workloads into a single, highly available storage platform.

## Related information

For more information, see the following documents:

- *IBM System Storage N series Reference Architecture for Virtualized Environments*, REDP-4865
  http://www.redbooks.ibm.com/abstracts/redp4865.html?Open

- *IBM System Storage N series Software Guide*, SG24-7129
  http://www.redbooks.ibm.com/abstracts/sg247129.html?Open

- *IBM System Storage N series Hardware Guide*, SG24-7840
  http://www.redbooks.ibm.com/abstracts/sg247840.html?Open

- IBM System Storage N series product page
  http://www.ibm.com/systems/storage/network/n6000/appliance/index.html

- IBM Offering Information page (announcement letters and sales manuals)
  http://www.ibm.com/common/ssi/index.wss?request_locale=en

  On this page, enter `IBM System Storage N series Reference Architecture for Virtualized Environments`, select the information type, and then click **Search**. On the next page, narrow your search results by geography and language.

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