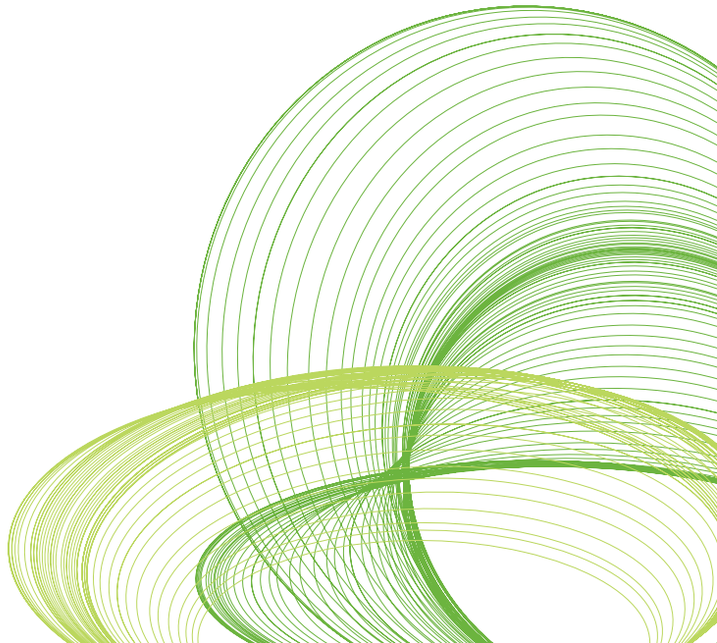
QlikView

WHAT IS THE DIFFERENCE BETWEEN SAN AND NAS AND HOW CAN I USE THEM IN MY QLIKVIEW ENVIRONMENT?

QlikView Technical Brief



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Introduction

This document will highlight some of the conceptual differences between the terms SAN and NAS and describe how they fit into a QlikView Server environment by suggesting some recommended implementations. It will also describe the definition of DAS (Direct-Attached Storage) and how it applies in SAN configurations.

Table of Contents

Definitions

It is important to differentiate between the two terms SAN and NAS. Also, the term DAS will be involved to nuance the usage of a SAN.

SAN – Storage Area Network

A typical definition of a SAN could be;

> "SANs primarily are used to make storage devices (such as disk arrays, tape libraries, and optical jukeboxes) accessible to servers so that the devices appear as locally attached to the operating system." (Wikipedia.org)

SANs are often used in larger virtualization scenarios or where larger areas of high-speed access storage space is required. A SAN typically does not interface with other devices (such as servers) via regular network communication, but shares its resources via a dedicated high-speed data connection that is explicit to its connected clients - hence the use of the word "Network" in this term. This connection can be a variety of types and use different communication protocols, but some of the common ones are (simplified);

- Fibre Channel
- SCSI
- ATA over Ethernet (AoE)
- HyperSCSI

Depending on what type is used, different types of cabling, protocols and routing equipment are used. For example, Fibre Channel is most commonly used via the FCP protocol and transferred over Fibre Channel cables and switches. iSCSI on the other hand, carries SCSI commands over TCP/IP network, making it possible to create a SAN connection over regular (but dedicated) gigabit Ethernet connections.

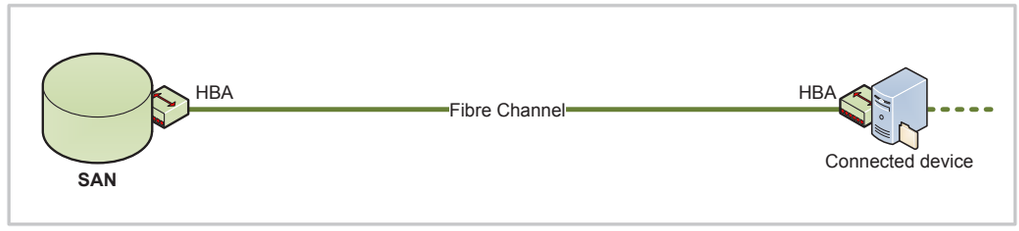
SAN solutions are in almost every scenario considered DAS (Direct-Attached Storage) – more on DAS later.

HOST ADAPTERS

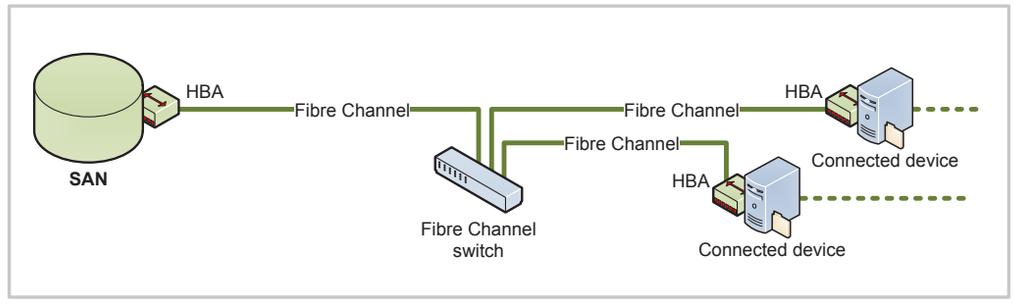
If the SAN is using a kind of connection that requires specific hardware to communicate, the client adapters are usually called Host Adapters, or Host Bus Adapters (HBA). Specific HBAs often (but not necessarily) require the use of compatible switching and/or routing equipment for communication infrastructure within the SAN, like for example FibreChannel switches or Gigabit Ethernet switches in an iSCSI architecture. In iSCSI, the HBA is the network interface that communicates with the SAN.

TYPICAL ARCHITECTURE

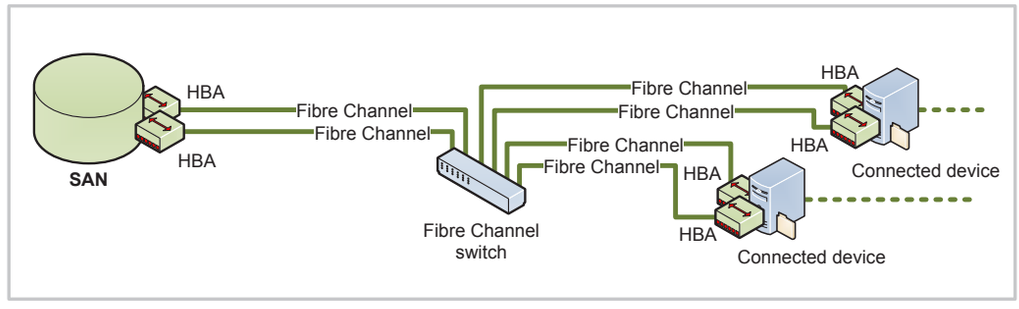
There are a multitude of different configuration possibilities in a SAN. The following images could describe a number of typical SAN architectures using Fibre Channel or iSCSI.



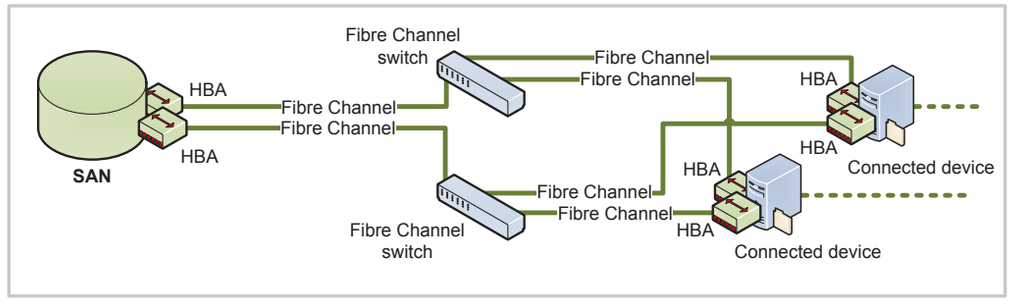
Fibre Channel SAN *- Point-to-point topology*



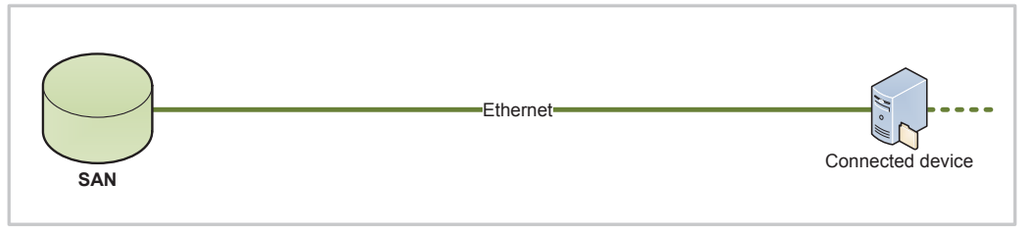
Fibre Channel SAN *- Switched fabric topology*



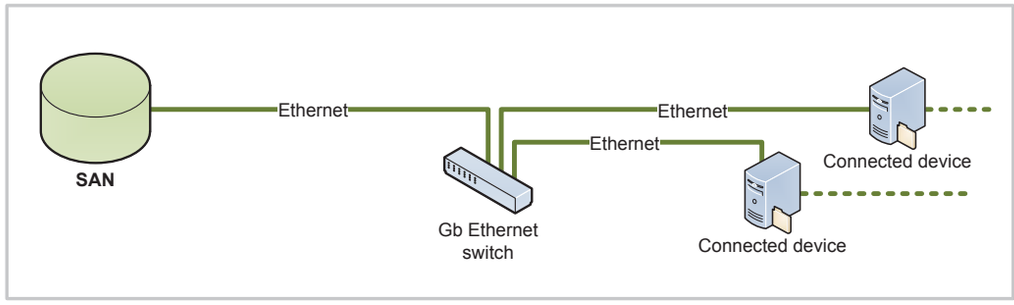
Fibre Channel SAN *- Switched fabric topology, arbitrated loop, scenario 1*



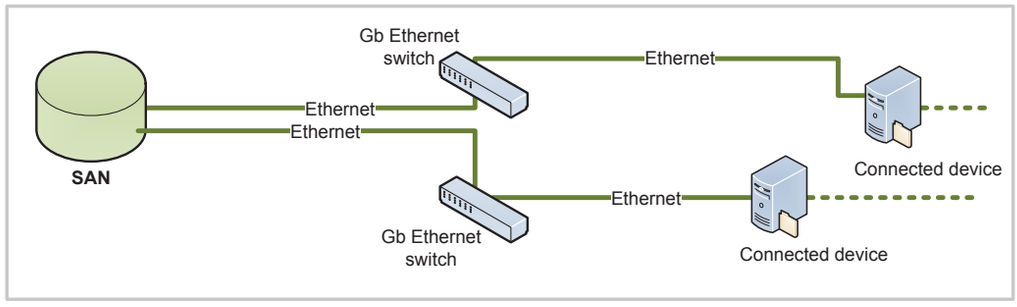
Fibre Channel SAN *- Switched fabric topology, arbitrated loop, scenario 2*



iSCSI SAN *- Point-to-point topology*



***iSCSI SAN** - single or multiple client devices*



***iSCSI SAN** - Multipathing topology*

NAS – Network Attached Storage

A NAS per definition is;

> "Network-attached storage (NAS) is file-level computer data storage connected to a computer network providing data access to heterogeneous clients. [..]" (Wikipedia.org)

or;

> "NAS devices [..] are typically storage arrays with direct attached storage that communicate with application servers using file-level protocols, such as CIFS or NFS." (Wikipedia.org)

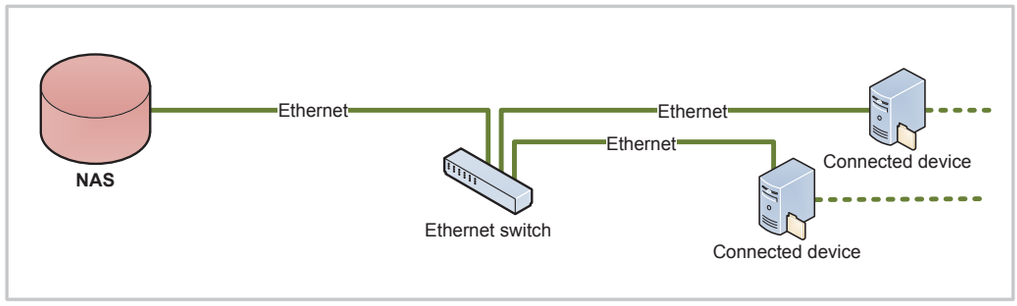
NAS units differ from a SAN in the way they distribute storage to other devices. Unlike a SAN, the NAS shares its storage with standard network protocols, and thus are in no need of specific host adapters other than the standard ones to reach the network. Sharing of the data on the storage is then performed under the governing rules of the NAS file system. Authentication is usually performed on the same level.

For example, a NAS might be a regular Windows server that is using storage space in a SAN, and then sharing it on the network for other devices to use. A NAS might as well be using internal storage like local disk arrays or similar.

NAS solutions might be considered DAS (Direct-Attached Storage) in certain configuration scenarios.

TYPICAL ARCHITECTURE

The following image could describe a typical NAS configuration.



***NAS** - single or multiple client devices*

DAS – Direct-Attached Storage

When talking about DAS, it is important to understand that it can be a multitude of different things, but mainly comes down the following definition;

> "A typical DAS system is made of a data storage device [..] connected directly to a computer through a host bus adapter (HBA)." (Wikipedia.org)

So, a DAS can describe both a SAN and a NAS configuration, dependant of the architecture used.

For example, when configuring a SAN to communicate with one or more clients' devices that has HBAs, and that is directly attached to the SAN, that storage is considered DAS. A NAS can also be considered DAS if for example attached to only one device via a dedicated network connection (usually a dedicated network interface) - which means this device is the only one attached to the storage.

So, in conclusion; DAS is more a concept than it is a type of storage and can be applied in scenarios with both NAS and SAN configurations, and in scenarios where only one device or many access the storage.

Using SAN/NAS and QlikView Server

QLIKVIEW SERVER AND DISTRIBUTION SERVICE CLUSTER INTER-COMMUNICATION

The two main cluster technologies in QlikView Server that we will discuss in this document, are;

1. QlikView Server clustering
2. QlikView Distribution Service clustering

QLIKVIEW SERVER (QVS) CLUSTERING

A QVS cluster routes inter-communication between cluster nodes via the server PGO (Persistent Global Object) files. The master PGO files reside in the QVS document root folder. A synchronized backup of the PGO files are always kept in the local QVS app data on each server.

In a QVS cluster, the document root folder must be the same on all nodes. The master PGO files for the cluster will reside in this folder. Since the clustered services rely on instantaneous read and write access to the PGO files, this shared location must be accessible all the time and with high resilience.

QLIKVIEW DISTRIBUTION SERVICE (QDS) CLUSTERING

The inter-communication between the nodes in a QDS cluster is via files on a shared location. The QDS cluster does not utilize any PGO files and does not share any like resources with QVS, but keeps its own set of files that are in XML format and only has one location where the files reside - the cluster root folder configured for the QDS cluster.

The root folder for the QDS cluster must be configured the same on all nodes. Since the QDS cluster services rely on instantaneous read and write access to the XML files, this shared location must be accessible all the time and with high resilience.

QLIKVIEW SERVER NON-WINDOWS NAS CONFORMITY

Because of different methodologies in interaction with the file system, different versions of QlikView Server will allow different SAN/NAS configurations.

The table below describes what file types in QlikView Server that can be stored on non-Windows NAS units, and which ones are supported in different Service Releases.

QLIKVIEW FILE TYPES EXPLAINED

.qvw
The QlikView Document. An on-disk resident file for holding data model, sheets, sheet objects, document settings and document objects such as document bookmarks and reports.

.shared
Server object container for the .qvw file. Contains server objects such as collaboration objects and server bookmarks. Is always located in the same folder as the .qvw file it belongs to. This file is only used by QlikView Server.

.meta
Meta data container for the .qvw file. Contains .qvw category assignment and other meta data. This file is only used by QlikView Server and is regenerated at .qvw document distribution.

.pgo
Persistent Global Object files for QlikView Server(s). Contains license CAL data and server/ cluster global settings. Used when a cluster contains data and settings that need to be shared amongst all QVS nodes in the cluster.

File Type	QlikView Server version			
	10 IR	10 SR1-	9 IR-SR6	9 SR7-
.qvw	Supported	Supported	Supported	Supported
.shared	Not Supported	Not Supported	Not Supported	Not Supported
.pgo	Not Supported	Supported	Not Supported	Supported
.meta	Supported	Supported	Supported	Supported

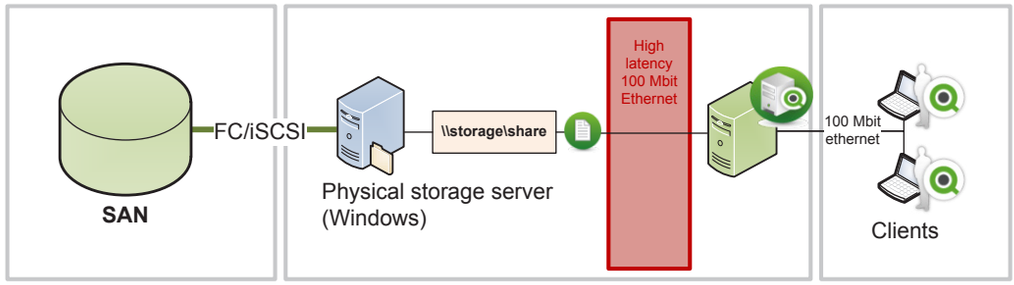
As an example; we can see from this table that if you are planning to use a non-Windows NAS unit, you should not allow Collaboration on the server, since that means using .shared files, which is not supported on this storage. Also, to use a non-Windows NAS unit to store QVS cluster files, .pgo files, you need at least QlikView Server 10 SR1 or 9 SR7 or later.

CONSIDERATIONS

Also, when using an external storage like a SAN/NAS to host QlikView Server resources, it is important to make sure that access times to the storage is on acceptable levels. QlikView Server and Distribution Service clustering requires fast access to files and documents on storage to operate properly. If, for some reason, connection to the storage is rendered unavailable or is experiencing delays or latency, functionality in the cluster will be severely impacted. For example, if a SAN is directly connected to a physical share server (NAS, in this case), which in turn is connected to the QlikView Server via regular network, it is not only the DAS connection that needs to be considered. Speed and stability of the network connection between the QVS and the share (NAS) must also be secured to maintain cluster inter-communication and QVS I/O operations.

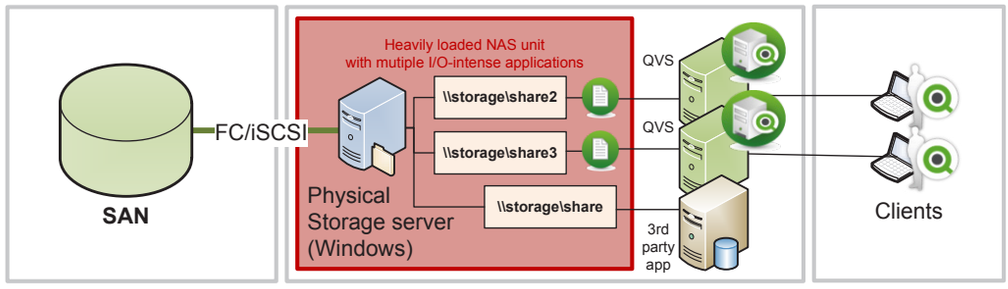
Furthermore, if using a SAN (and consequently one or more NAS units) for multiple QVS or QDS clusters, make sure that the underlying storage itself does not become overloaded. Having two busy QVS/QDS clusters using separate NAS units as share, but where both configurations use the same physical storage location (disk) in the SAN, might cause a performance impact in the form of I/O overload or system choke on the NAS.
It is also important to note that the QVS cluster root and the QDS cluster root should not be configured to reside in the same folder.

For example, if one theoretically has a 100 Mbit/sec network connection with high latency or packet loss between a QVS and NAS, the bottleneck of that configuration would likely be the area marked in red in the design below.



Example of network bottleneck

Likewise, if a SAN is overloaded with I/O or requests, it might become a bottleneck as well.



Example of NAS overload

Conclusions

- It's important to take the following into consideration when using shared or remote storage like SAN/NAS configurations
- QlikView Server 9 and 10 do not support having .shared files on non-Windows NAS units
- Do not point the QVS cluster root and QDS cluster root in the same folder
- Inter-communication between QVS and QDS clustered services/machines go via the shared storage – make sure that the connection does not have low throughput, packet loss, high latency or I/O overload
- Most SAN types, manufacturers and hardware specifications will work in accordance to QlikView requirements – but it's the NAS layer's compatibility that's important
- Heavy load on multiple NAS shares that inherit from the same storage space in a SAN might affect QVS performance if multiple QVS or QDS clusters (or other services) use the same resources

SOME SUGGESTIONS

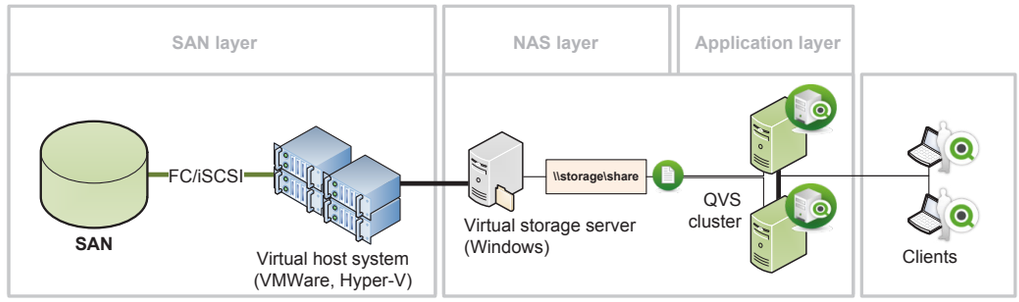
- If there exists a high load in the communication between QVS and the NAS, consider using teamed network adapters or upgrade to gigabit speed interfaces.
- Verify duplex modes on NAS and QVS network interfaces to verify that they are either in a compatible (and highest possible) negotiation duplex mode or set fixed over all connected devices
- Consider the benefits of separating the cluster inter-communication and the client data communication on separate network adapters – routing the clients on one interface and the QVS/QDS communication on another might lighten the load on one or both interfaces. This configuration may also be combined with teaming of network adapters, under extremely high load.
- Monitor the throughput of all network interfaces and do scheduled reviews of traffic peaks

QlikView Server Configurations

To demonstrate how SAN, NAS and DAS may be combined in different QlikView scenarios, we are going to take a look at some configurations where they are all applied in different ways. All configurations describe scenarios where Windows NAS units are used.

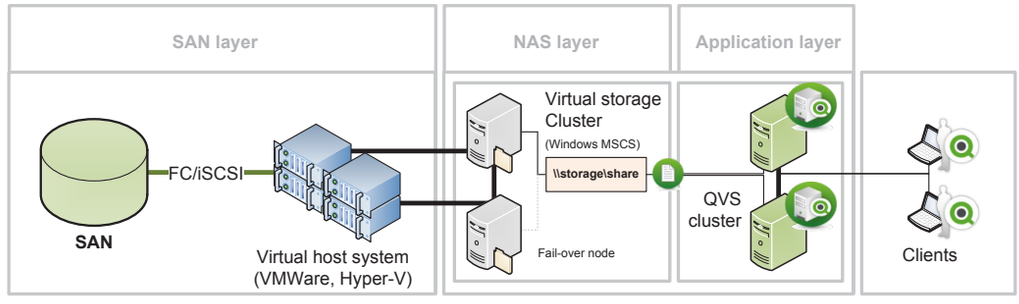
QLIKVIEW SERVER CLUSTER UTILIZING A VIRTUAL NAS USING A SAN

The following configuration shows how a SAN is utilized by multiple devices, in this case physical virtualization hosts. They in turn host a virtual Windows Server that via the virtualization hypervisor uses disk space in the SAN, that they share on the regular network. The QlikView Server cluster is then configured to use the shared disk space to host QlikView documents and cluster data, which the QlikView clients then access via QlikView Server.



Virtual host environment with SAN as DAS, with single virtual NAS

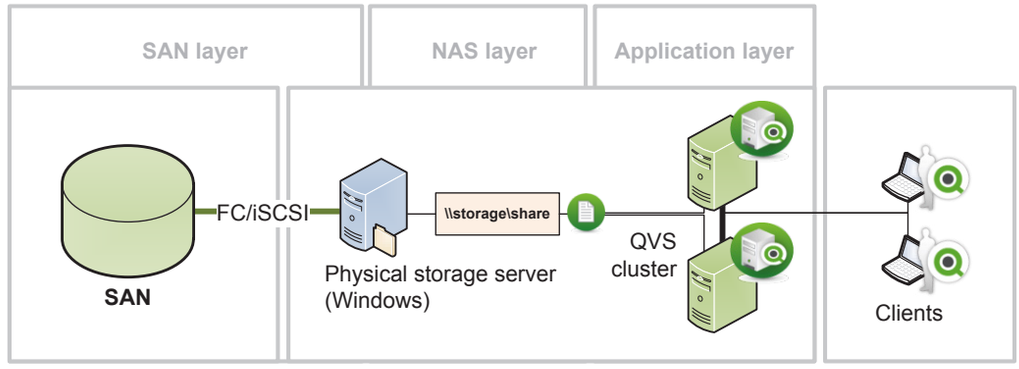
In this same configuration, you can also for example increase redundancy on the storage even further, by using clustering services to create a fail-over NAS unit in the form of an additional virtual Windows machine and Microsoft Clustering Services (MSCS).



Virtual host environment with SAN as DAS, with virtual fail-over clustered NAS

QLIKVIEW SERVER CLUSTER UTILIZING A PHYSICAL NAS USING A SAN

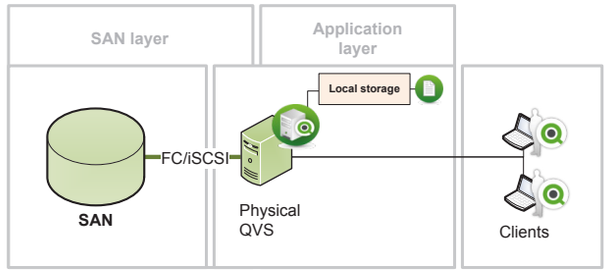
This configuration shows how a physical storage server uses the SAN. This will imply that the storage server has the appropriate HBA and is directly connected to the SAN – hence this configuration can be classified as a DAS configuration. The physical storage server uses disk space in the SAN, that it shares on the regular network. The QlikView Server cluster is then configured to use the shared disk space to host QlikView documents and cluster data, which the QlikView clients then access via QlikView Server.



Physical NAS with SAN as DAS

SINGLE QLIKVIEW SERVER USING A SAN AS LOCAL STORAGE

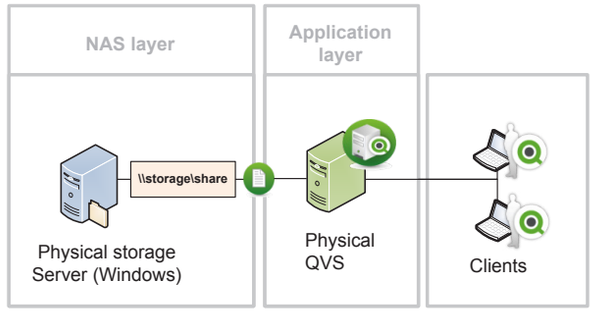
Not very common, but in this configuration the QVS is physical and directly connected to the SAN via a HBA, and again may classify as DAS. The QVS has no shared storage on the network (no NAS), but has document on local disk hosted on the SAN. Clients access data via the QlikView Server.



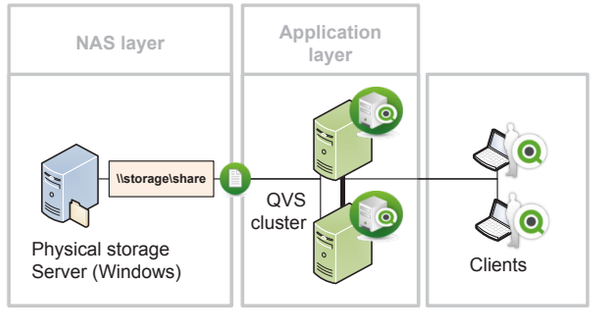
Physical QVS with SAN as DAS, no NAS

QLIKVIEW SERVER USING A PURE WINDOWS NAS AS LOCAL STORAGE

In this configuration, a physical storage machine is used as NAS, and no SAN is involved. The NAS is a Windows machine with local disks which shares a folder on the network, that QVS use for documents and cluster files (if clustered).



Physical Windows storage server as NAS



Physical Windows storage server as NAS with QVS cluster