



Eenvoud in ICT

Application and desktop delivery advantages and disadvantages

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1. INTRODUCTION

More and more people are wondering whether to use Virtual Desktop Infrastructure, Server Based Computing and local desktops? Is VDI replacing SBC? Is SBC replacing the local desktop? What about application virtualization and disk streaming technology. How do these solutions fit in the application- and desktop delivery market space?

1.1 PURPOSE OF THIS DOCUMENT

This document will provide benefits and disadvantages for application- and desktop delivery solutions. The Flowchart "Application and desktop delivery decision flowchart" will help in making the decision which application- and desktop delivery solution fits best in your business and technical requirements. Hopefully this document makes sense for your environment!

1.2 ABOUT PQR

It is easy to complicate something that is simple. Fewer people have the ability to simplify something that is complicated. Consider the rubber band created by the British inventor Stephen Perry in 1845, for example. Complex and yet straightforward at the same time. PQR stands for the same straightforwardness. But in a different field, namely ICT infrastructures, with the focus on:

- Server & Storage Solutions,
- Application and Desktop delivery
- Virtualization

"Straightforward in ICT", experience how PQR can make ICT manageable and predictable via solutions that are linked to one another, geared to the future, flexible, inventive and solid at the same time. Work together with a company that likes the result-oriented approach and with personnel who ensure that a solution simply works. ICT has never been this straightforward.

www.pqr.com

1.3 ABOUT THE AUTHOR

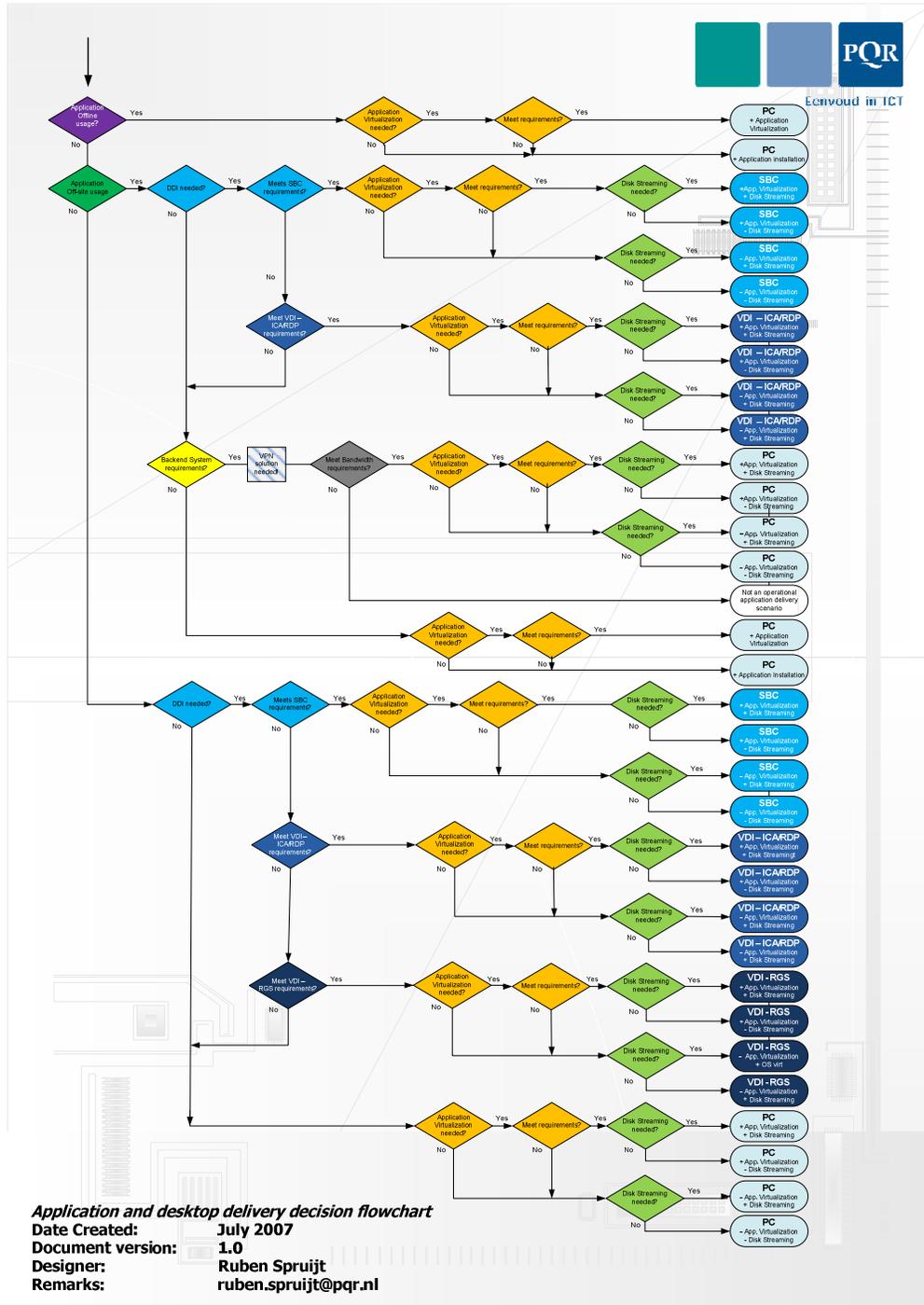
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1.4 WE NEED FEEDBACK

We try to provide accurate, clear, complete, and usable documentation. If you have any comments, corrections, or suggestions for improving this document, we would like to hear from you! Please send an e-mail to rsp@pqr.nl. Include the product name and version number, and the title of the document in your message.

1.5 FLOWCHART

This flowchart can be used as a guideline to determine which application and desktop delivery scenario fits your business needs and requirements.



This flowchart is downloadable at <http://www.virtuall.eu/articles/applicationanddesktopdelivery/flowchart.jpg>

1.6 MATRIX

This matrix is a summary of the benefits and disadvantages of the Server Based Computing, Virtual Desktop Infrastructure and PC desktop delivery solutions. The solutions, benefits and disadvantages are described in the following chapters.

● = Not applicable, ● = It depends, ● = applicable

	SBC	VDI	VDI RGS	PC
Functions				
Rapidly deliver applications/desktops	●	●	●	●
Centralized deployment of applications	●	●	●	●
Consolidate and centralize IT	●	●	●	●
Strengthen security and compliance	●	●	●	●
Improve the roaming user experience	●	●	●	●
Consistent user access experience	●	●	●	●
Extending access to business-critical applications	●	●	●	●
Lowest TCO	●	●	●	●
Graphically intensive applications	●	●	●	●
Resource intensive applications	●	●	●	●
Usage of peripherals	●	●	●	●
Application compatibility issues	●	●	●	●
Freedom within workspace environment	●	●	●	●
Offline application usage	●	●	●	●
Legacy applications usage	●	●	●	●
Less client/desktop management	●	●	●	●
Easy client/desktop deployment	●	●	●	●
Less hardware for providing centralized desktops	●	●	●	--
Mixed Operating Systems scenarios	●	●	●	●
Robust resource allocation	●	●	●	●
High availability	●	●	●	●
Scalability	●	●	●	●
Client device independence	●	●	●	●
Easy backup	●	●	●	●
No Single point of failure	●	●	●	●

2. APPLICATION- AND DESKTOP DELIVERY SOLUTIONS

Deliver application functionality to end users, to make them more effective and productive, is one of the key reasons for having an ICT infrastructure. Deploying applications is one thing, bringing them to the users can impose many constraints.

Depending on your situation we see three prime application and desktop delivery solutions, individually implemented or in a carefully selected combination:

- Shared Desktop, Server Based Computing, refer to chapter 2.2
- Personal Desktop, Virtual Desktop Infrastructure, refer to chapter 2.3
- Local Desktop, Personal Computer, refer to chapter 2.4

This combination is called a Dynamic Desktop Infrastructure (DDI).

DDI is a Windows-based desktop that is delivered over any network, any connection to any device and optimized for office workers' tasks from simple to complex. Dynamic desktops provide the best TCO, security, performance and flexibility provided by shared or dedicated/personal desktops within the datacenter.

With DDI, desktops can be delivered simple and fast, personal and versatile, with high power and performance using the latest application and desktop delivery solutions.

2.1 SBC, VDI AND LOCAL PC EXPLAINED

This chapter will briefly explain the different solutions mentioned above.

2.1.1 Server Based Computing

SBC is a solution for accessing desktops or single applications which are running on Terminal Servers in a datacenter.

Access to the desktop or application is location and end-user device independent, program execution and data processing occurs central on the Terminal Servers. Data storage occurs on a fileserver. The client receives the screen information through RDP or ICA. SBC exists of several infrastructure components which can handle management, load balancing, session control and support.

2.1.2 Virtual Desktop Infrastructure

In essence Virtual Desktop Infrastructure (VDI) is a solution for accessing Windows XP/Vista or Linux desktops which are running within a Virtual Machine or physical (Blade)-workstation in the datacenter.

Access to the personal desktop is location and end-user device independent. Each end-user will have a unique dedicated desktop environment. Program execution, data processing and data storage occurs centrally on a personal desktop. The client receives the screen information through RDP/ICA/VNC or RGS. The protocol for displaying the correct information depends on Operating System, bandwidth, application characteristics, technical or business requirements.

Just like other desktop delivery solutions VDI exists of several infrastructure components which can handle management, load balancing, session control, support and secure access of machines.

2.1.3 Personal Computer

Every user has his own personal computer, program execution and data processing occurs locally on the pc. Data storage can be done locally or on a fileserver / SAN on the network. Tools will be needed to control, manage and support pc's. Applications must be installed on every pc by hand or with some kind of tooling.

2.2 SHARED DESKTOP, SERVER BASED COMPUTING

2.2.1 Benefits

- **Rapidly deliver applications;** You can deliver applications, including mission-critical and office automation solutions, far more quickly using Server Based Computing (SBC), than the traditional approach installing them locally on each or selective desktops. Most enterprise applications will also perform better on central hardware and behave more predictable and stable. You save on local resources while significantly reducing deployment costs. Users get the latest versions right away, so they can work more productively. Applications can be delivered and managed on relatively few servers.
- **Centralized deployment of applications;** With Server Based Computing, all program execution, data processing, and data storage occur on the terminal server, centralizing the deployment of applications. Terminal Server ensures that all clients can access the same version of an application. Software is installed only once on the server, rather than on every desktop throughout the organization, reducing the costs associated with updating and supporting individual computers.
- **Consolidate and centralize IT;** SBC makes it easier to achieve consolidation and centralization of IT resources for greater efficiency and cost savings. SBC delivers a highly scalable, centrally managed solution that allows for a large number of applications and users on each server reducing IT costs and increasing IT productivity. Applications can be delivered and managed on relatively few servers. Hardware resource utilization is efficient.
- **Strengthen security and compliance;** SBC secures IT systems and aids in regulatory compliance with a multi-pronged approach. Applications and data are kept on the server instead of the local desktop to minimize risk of exposure from theft or loss. Centralized control of application deployment insures consistency across the organization and prevents installation of unwanted programs. SBC supports multi-factor authentication to validate user credentials, and protects data traversing the network between client and server with encryption.
- **Improve the user experience;** Keeping your users satisfied and productive is a breeze with SBC. Everyone enjoys flexible application/desktop access from any location or device, rich functionality, and high performance over Web and wireless networks. Users can roam between devices and locations, staying connected to their sessions.
- **Consistent user access experience;** IT Managers want to enable efficient access for users who roam from device to device on wireless networks, partners and employees are demanding access from devices outside the control of the IT Manager.
- **Extending access to business-critical applications;** Dispersed users, regardless of connection, location or device will be able to run applications at any location either inside or outside corporate networks. Users can access applications from any device over any connection.
- **TCO;** Compared to a local personal desktop and VDI desktop the TCO of a Server Based Computing shared desktop will be much lower.

2.2.2 Disadvantages

- **Graphically Intensive applications;** SBC doesn't meet the end-user experience when delivering graphically intensive applications with the RDP/ICA protocol.

- **Resource intensive applications** that require a lot of internal memory won't be the best type of application for executing on an x86 Terminal Server environment. When an application claims a lot of CPU resources these applications aren't the best type of applications for a SBC environment. The solution is to designing a Terminal Server infrastructure with multiple CPU's, multiple cores and using x64 Terminal Services which can solve this disadvantages.
- **Peripherals;** Access to peripherals within your terminal sessions is limited. This limitation depends on the type of peripheral, client Operating System, usage of additional software on top of Terminal Services. PDA synchronization, scanning, Bi-directional audio and printing are peripherals which are difficult to access within a terminal server session.
- **Application compatibility;** Application conflicts can occur when multiple applications or sub-components are installed on a Terminal Server. Regression testing is needed to address this risk. Applications must be terminal server aware. Application Virtualization can address these conflicts and provide a dynamic application delivery platform.
- **Freedom within workspace environment is limited;** A shared desktop doesn't offer a 'PC-like' Windows XP/Vista experience. The freedom of installing applications and changing desktop configuration settings is limited. In a shared desktop infrastructure this is implemented because of performance, reliability and stability reasons.
- **No offline application delivery scenario;** All program execution, data processing, and data storage occur centrally on a terminal server in the datacenter. The client sends mouse movements and keystrokes to the Terminal Server. A reliable and available network connection for application delivery is required.
- **Legacy applications;** Legacy applications, DOS and Win16 on an x86 terminal server platform or Win32 application on an x64 platform, will consume much more system resources. Maybe it's not a disadvantage, more a fact, it's important to design a SBC infrastructure with these types of application are being used.

2.2.3 Server Based Computing advantages over VDI

- **Less client/desktop management;** Server Based Computing provides probably 35-50 desktop sessions on a single terminal server. That machine has one instance of Windows to manage. When using VDI your 35-50 desktops have the same amount of Windows XP operating systems to configure, manage, patch, update.
- **Less server hardware is required;** A dual core terminal server with 4 GB internal memory will probably provide between 35-50 desktop sessions. With VMware, the hypervisor platform for VDI, you can provide probably between 10-15 Windows XP desktops on the same hardware.
- **Cost;** The costs of each VDI desktop will be much higher than the costs of a personal local or shared SBC desktop.

2.3 PERSONAL DESKTOP, VDI

2.3.1 Benefits

- **Rapidly delivery of desktops;** You can deploy, recover, support and maintain personal desktops far more quickly than local desktops using VDI.
- **Improve the user experience;** Keeping your users satisfied and productive is a breeze with VDI. Everyone enjoys flexible desktop access from any location or device, rich functionality, and high performance over Web and wireless networks. Users can roam between devices and locations.
- **Extending access to business-critical applications;** Dispersed users, regardless of connection, location or device will be able to run applications at any location either inside or outside corporate networks. Users can access applications within a personal desktop from any device over any connection.

- **Consistent user Access Experience;** IT Managers want to enable efficient access for users who roam from device to device on wireless networks, partners and employees are demanding access from devices outside the control of the IT Manager.
- **Strengthen Security and Compliance;** VDI secures IT systems and helps in regulatory compliance with a multi-pronged approach. Applications and data are kept on the datacenter instead of the local desktop to minimize risk of exposure from theft or loss.
- **Deliver mixed operating system or version within a single VDI environment;** Personal desktops can be delivered with a Windows XP/Vista or even Linux based Operating System.
- **Application compatibility;** With VDI, each backend Windows XP/Vista desktop is a full standalone workstation. This means that you don't have to worry about applications that are not terminal services compatible.
- **Freedom within workspace environment;** A VDI solution offers a 'PC-like' Windows XP/Vista experience. The end-user can install applications and change application- and configuration settings within their isolated desktop environment.
- **Robust Resource Allocation DRS;** VMware Distributed Resource Scheduler monitors utilization across resource pools and allocates available resources for an amount of desktops (and servers) based on rules that reflect the business requirements. When a resource is constrained, additional capacity is made available by migrating live desktops to a different physical server using VMotion.
- **High Availability;** VMware High Availability (HA) provides cost-effective HA for any desktop (and server) running in a virtual machine, regardless of its operating system or underlying hardware configuration.

2.3.2 Disadvantages

- **Graphically Intensive applications;** VDI doesn't meet the end-user experience when delivering graphically intensive applications with the RDP/ICA/VNC protocol.
- **Peripherals;** Access to peripherals within VDI desktops is limited. This limitation depends of type of peripheral, client Operating System. PDA synchronization, scanning, Bi-directional audio and printing are peripherals which are difficult to access within a VDI desktop.
- **No offline application delivery scenario;** All program execution, data processing, and data storage occur centrally in the datacenter. The client sends mouse movements and keystrokes to the centralized desktop. A reliable and available network connection for delivering applications is required.
- **Scalability;** VDI does not scale as well as a terminal server, which often can host 35-50 users per dual CPU server. VDI will likely scale from 10 to 15 VMs per dual CPU server, depending on how each VM is configured.
- **Cost;** The cost of each VDI desktop will be much higher than the cost of a personal local or shared SBC desktop.

2.3.3 VDI advantages when using HP Remote Graphics Software (RGS) and/or Blade workstation

- **Access to graphical intensive applications;** VDI in combination with HP Remote Graphics Software will meet the end-user performance experience when delivering graphically intensive applications.
- **Using resource intensive applications;** VDI running on a Blade workstation infrastructure will meet the end-user high performance experience when the desktops are running on Blade workstations.

2.3.4 VDI advantages over local desktop

- **Security;** VDI secures IT systems and helps in regulatory compliance with a multi-pronged approach. Applications and data are kept on desktops in the datacenter instead of the local desktop to minimize risk of exposure from theft or loss.
- **Desktops run on server-class hardware;** Since desktop computers are distributed throughout an organization, they don't have the same redundancy as server-class hardware. A single power supply, drive, or memory failure can take down a desktop computer. Of course the same also applies to servers. However, since there are many fewer servers in an organization than desktops, it's okay from a financial and risk standpoint to spend money on redundant power, RAID, memory, and other technologies to ensure that server hardware doesn't have the same potential hardware failures.
- **Client device independence;** In a VDI environment, the ultimate "client" device is essentially nothing more than a screen, a mouse, a keyboard, and a transport mechanism RDP, ICA, VNC or RGS for connecting to remote desktops.
- **Ease of Management;** Client desktops are all in the datacenter which can have a profound effect on management, patching, backups, provisioning, etc. This results in reduction of desktop support costs.

2.3.5 VDI advantages over Server Based Computing

- **Users have access to their personal desktops from anywhere;** With VDI each user can have a totally customized and personalized desktop, with a unique set of installed applications and configurations. With SBC users share a common set of application per Terminal Server, and there are limitations on personalized configurations.
- **Application compatibility;** With VDI, each backend Windows XP/Vista desktop is a full standalone workstation. This means that you don't have to worry about applications that are not terminal services compatible.
- **Easier security;** Since each user would have his own standalone Windows XP desktop, you don't have to worry as much about locking down each user's session. If a user screws something up, it won't affect other users.
- **Higher Availability;** Based on VMware HA (vMotion) personal desktops running within a virtual machine can be higher available than shared desktops.
- **Freedom within workspace environment;** A VDI solution offers a 'PC-like' Windows XP/Vista experience. The end-user can install applications and change application- and configuration settings within their isolated desktop environment. A shared desktop doesn't offer a 'PC-like' Windows XP/Vista experience. The freedom of installing applications, changing desktop- and configuration settings is limited. In a shared desktop infrastructure this is implemented because of performance, reliability and stability reasons.
- **Users can take their desktop with them when they go offline;** If your backend VDI infrastructure is based on VM desktops, you can do cool things since the VM software makes the Virtual Machine hardware independent. In an environment where all users' desktops are provided to them as VMs, they could use centralized backend servers when they are in the office and then use laptops with VMware when they need to run offline. The applications within the desktop environment must be standalone applications.
- **Easier backups;** For VM-based VDI solutions, all you would have to do is to backup the disk image files for all the user's workstations. If a user lost something it would be simple to "roll back" their laptop to whenever they wanted. You could even take this a step further and provide an automatic snapshot service to backup the workstations every hour.

2.4 LOCAL DESKTOP, PERSONAL COMPUTER

2.4.1 Benefits

- **Offline application access;** In a local desktop scenario applications can be used offline. The lack of offline application access is probably one of the biggest downsides to SBC or VDI. In a SBC or VDI environment with everything running in the datacenter, if the network link goes down between the client device and the datacenter, or if the user wants to be mobile with a laptop, then the whole SBC or VDI solution doesn't fit.
- **Graphically Intensive applications;** Local desktops meet the end-user experience when graphically intensive or multimedia applications are locally delivered and executed.
- **Resource intensive applications;** Local desktops meet the end-user experience when the application requires much system resources. The available resources aren't shared with other users or system components.
- **Peripherals;** Access to peripherals within your local desktop isn't a problem. PDA synchronization, scanning, Bi-directional audio and printing peripherals can be available when the software is installed and supported locally.
- **Application compatibility;** With a local desktop all applications can be installed and executed as expected.
- **No single point of failure;** If one PC fails, that user is out of luck, but the other users can still work.
- **User freedom;** The user freedom of installing applications and changing desktop configuration settings is available. A local desktop offers the Windows XP/Vista experience.

2.4.2 Disadvantages

- **No Rapidly application delivery;** You can deploy applications in a traditional approach by installing them locally on each or selective desktops. This can be time consuming and isn't the most predictable and efficient way.
- **Less Strengthen security and compliance;** Applications and data are kept on the local desktop. This maximizes the risk of exposure from theft or loss.
- **Access to business-critical applications is limited;** Users can't access applications from any device over any connection either inside or outside the corporate networks. Applications which require a high-speed network connection won't operate or doesn't meet the user experience.
- **TCO;** Compared to SBC the TCO of the local desktop will be much higher.

3. APPLICATION VIRTUALIZATION SOLUTIONS

By using application virtualization, you can use Windows applications without having to change anything in the local operating system, you don't even have to install application software at the workstation. In other words: the application is executed, stores data and prints as if it has been installed locally, without having to modify the local client. Sources such as the CPU, memory, hard disks, and network cards are used for the execution of the application.

3.1 BENEFITS

- **Accelerate Application Availability;** Transform the way new applications and updates are deployed – making everything much simpler and faster.
- **End Application Conflicts and Regression Testing;** Prevent applications from conflicting with each other or the underlying OS and eliminate time-consuming regression testing.
- **Simplify OS Migrations and Patching;** Turn time-consuming, tedious migration and patching projects into largely automated, conflict-free processes.
- **Secure Your Applications;** Reduce the likelihood and severity of malware infections and security breaches, and lock down application access and license compliance.
- **Stabilize Windows Profiles;** Separate application preferences from the Windows user profile, preventing profile corruption and proliferation.
- **Build Business Continuity for Applications;** Replicate your virtualized applications like any other enterprise data to maintain an instant-on failover plan for your applications.
- **Enable Roaming and Free Seating;** Free your workforce to work wherever, whenever they want, while having instant and consistent access to all of their applications.
- **Consolidate and Standardize OS Images;** Streamline OS image management by decoupling applications from the OS.
- **Manage Software Assets;** Manage application assets in real time over the network without a separate system.
- **Reduce the Costs of Application Management;** Cut the cost of deploying, updating, supporting and terminating applications.
- **Create a dynamic application delivery infrastructure;** Application Virtualization limits the number of departmental templates that need to be maintained, further simplifying user management and template inventory.

3.2 DISADVANTAGES

- **Different way of troubleshooting applications;** You will need to fully understand the virtualization process of applications to be able to trouble shoot any application problems.
- **Not all applications can be virtualized;**
 - Applications with build-in drivers;
 - Applications which are directly integrated in the OS;
 - Applications with hardware dependency;
 - Application licensing which is machine specific;

4. DISK STREAMING SOLUTIONS

Ardence makes it possible for computers to boot and run from an image file stored on the network.

The Ardence clients may be physical or virtual workstations or servers using a Windows or Linux operating system. The operating system and the applications are executed on the workstation or server. Ardence Software streaming platform is also known as disk streaming technology, disk virtualization, OS streaming, network boot or a diskless-boot solution.

The combination of application virtualization and disk streaming technology creates a powerful dynamic application and desktop delivery platform.

4.1 BENEFITS

- **Easy Operating System Deployment for VDI and SBC environments;** Ardence offers a completely new meaning to Operating System Deployment for Servers and workstations. Deploying new servers takes mere minutes - the time it takes a client computer to boot. Switching to another operating system is also a matter of minutes - a computer's reboot time. It is also possible to offer the user a boot menu so that there is a choice of different operating systems.
- **Client computers are always 100% identical;** which is very important in a Citrix Presentation Server, Terminal Server environment or in standardized workstation environments. All systems are restored to their original state after a reboot. This results in a more stable and manageable environment.
- **Security;** Local hard disks are no longer needed with Ardence technology, no more data on a hard disk means fewer embarrassments. Ardence port blocker ensures that remote storage devices such as USB sticks are also completely blocked. This means that there is no data present locally and no data can be removed. A special version, Ardence Secure Edition, ensures that client computers access the vDisks in a secure manner and provides permanent encryption (128bit-3DES) of the communication between client and Ardence servers. Various security services use Ardence specifically because of its security application.
- **Flexibility;** Servers can be Terminal Servers by day and play another role at night.
- **Simplicity of administration;** Changes to the operating system and/or applications are made from 1 environment.
- **Secure and simple migration and upgrade;** Migrations and upgrades can be carried out securely and more easily. If it is found that the migration or upgrade has not succeeded, the client computer can go back to working with the previous image or local hard disk after a reboot. If a migration from - for example - Windows Server 2000 with Citrix Metaframe XP to Windows Server 2003 and Presentation Server v4.5 has to be reversed because of problems, it is possible to run from the original configuration on the local hard disk with a reboot.
- **Disaster Recovery for physical and virtual computers;** A vDisk is a file that can easily be replicated to another location. At the alternative location, you only need to turn a client computer on and launch the DR network and the machine is operational again.
- **Support for different images for each system including boot menu;** This can be very useful in environments where various operating systems need to be used. The client boots, is offered a choice of 8 different operating systems and selects, for example, Windows Vista. When another configuration is needed the client reboots and selects, for example, Linux Red Hat.

- **Saving on storage costs;** If VDI/DDI are used Ardence can deliver a significant saving on (expensive) storage costs.
- **Lowering TCO;** Reduction in maintenance, administration and deployment costs and increase in flexibility.
- **When used in concert with VDI solutions;** Ardence can facilitate “on demand” dynamic desktop images for backend VMware servers.

4.2 DISADVANTAGES

- **No work off-line capability;** Desktops or servers who are using Ardence need a connection with a high-speed network. Offline usage isn't possible yet.
- **High speed LAN recommended;** Desktops or servers that who are using Ardence need a high-speed, 100Mb network connection to operate as expected.

5. USAGE SCENARIOS

Applications can be used in several different scenarios. Onsite and Offsite, Online and Offline.

It's important that the definitions of these terms are clear.

Onsite: The end-user client device has a high-speed connection with the trusted corporate datacenter(s). The device has access to centralized backend systems which are required for authentication, authorization, application data and content.

Offsite: The end-user client device has a low speed connection with the trusted corporate datacenter. The connection can be secured and controlled to limit network access to centralized applications, desktops or backend systems which are required for authentication, authorization, application data and content.

Online: The end-user client device is connected with any network, the device can have access to backend systems which are required for authentication, authorization, application data and content. Security, bandwidth, access scenarios, performance expectation, management, business and technical requirements stipulate the application and desktop delivery solution.

Offline: The end-user client device isn't connected with any network, the device hasn't any access to backend systems which are required for authentication, authorization, application data and content.

6. KNOWLEDGE CENTER

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Ron Oglesby (video) VDI a year later... <http://media.brianmadden.com/briforum2007.asp?id=169>

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http://www.virtuall.nl/articles/ProductInformation/PQR%20-%20Application%20Virtualization_Isolation%20Feature%20Matrix.pdf



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