

Everything under control at Fontys University

The new IT infrastructure which has been delivered about three months ago at Fontys University has led to increased functionality and to more freedom for the users, without resulting in an unmanageable environment for the IT department. How has that been accomplished? Key words here are virtualisation, centralisation and user freedom.

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In the LanVision edition of January 2005 I already discussed the project at Fontys University and ended that article with the words "To be continued ...". It has been over a year since then and the workplace at Fontys is no longer called "The New Workplace", but "The Fontys Workplace". Also the backend infrastructure has been completely renewed, hardware virtualisation with VMware ESX and operating system portability with PlateSpin is operational. So the time has come to update the readers of LanVision on what has happened in the meantime, what the results are and how Fontys has managed to prevent that the freedom of users has become a burden to the IT department.

Fontys, as many other organisations, was suffering from problems arising from the quantity of different applications, multiple locations, various operating systems, dependency on the workplace, too few workplaces, users with different needs and IT skills. From this situation everything within IT needed to be professionalized: centralizing, standardizing, unifying, controlling, managing and securing. For the users at Fontys (students and employees) professionalizing meant something completely different, namely flexibilization, letting go and experimenting. All these wishes seem incompatible ...

Changing the IT landscape

Fontys wants its IT services to follow their strategic policies of the 'learning community'. This vision implies:

- Learning communities that contain personal education paths and programs, portals, e-learning;
- Web enabled education, delivery of services independent of time, place, location and where possible independent of platform;
- Flexibility for the institutes: choices from available services and accompanying levels of standardisation and flexibility at the institute locations;
- Internationalisation, multi lingual services.

To realise this vision a new IT landscape is required that offers the following:

Who is Fontys?

Fontys as the largest college in the Netherlands offers over 200 full-time and part-time higher professional education programs at bachelor's and master's level. The Fontys education programs are offered spread over 36 locations throughout the Netherlands. Major locations are Eindhoven, Tilburg, Sittard, Venlo, Roermond, Zwolle, Veghel, Amsterdam and 's Hertogenbosch. There are three large campus areas, A-locations and 33 smaller B-locations. Every day more than 37000 students and 4500 employees use 7000 Fontys Workplaces. There is also an increasing number of students that use over 5000 personal laptops which can also be used on-campus.

- Central, standardised IT infrastructure;
- Improved desktop and application deployment;
- Workplace independent functionality;
- Central server, desktop and application management;
- Workplace independency;
- Mobility;
- Standardised up-to-date operating systems;
- Employees and students must have access to the IT systems from within and outside all locations and institutes.

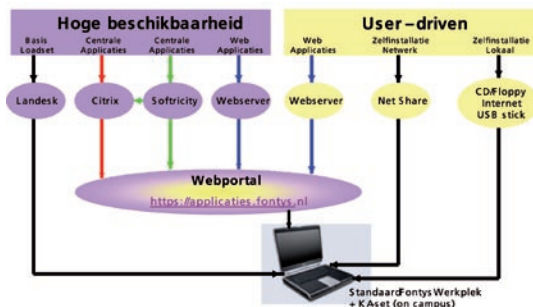
Purple and Yellow

The workplace is a standard laptop or desktop pc within the Fontys network (on-campus) or outside of the network (off-campus) and after logging on to the system an application portal is presented. The on-campus workplaces contain a basic software set.

The applications are divided into so called purple and yellow applications (purple and yellow are corporate colours of Fontys). Purple applications are immediately available to the users and are fully supported by the IT organisation and IT staff of

Fontys. There are about 300 purple applications which are presented on the application portal through Citrix Presentation Server and / or Softricity SoftGrid. Sixty percent of the 300 purple applications are made available through Citrix Presentation Server using the Server Based Computing (SBC) model. The remaining forty percent of the purple applications are mainly multimedia and graphic applications that do not operate well in a SBC environment. These applications are being streamed directly to the workplace by using Softricity SoftGrid. Yellow applications (approximately 600) are not being supported by Fontys and are not installed on the workplace, but are only being licensed. Installing and using yellow applications is the user's own responsibility. Purple applications are also made available off-campus through the application portal, yellow applications are not available off-campus.

Printing is possible from any application on all workplaces within the Fontys buildings. Outside of the Fontys buildings printing is possible from purple applications to locally attached printers. For example at home from a private pc to the printer. To recover the workplace to its original state, every user has the option of doing a full system recovery. Within 15 minutes the workplace is fully operational again. LANDesk Client Management arranges for the maintenance of the workplace.



Application Virtualisation

Softricity SoftGrid enables Fontys to give users on demand access to applications in a much faster way. This is implemented by virtualisation of the purple applications. By using the application virtualisation technology, applications are no longer physically installed on the Terminal Servers of workplaces themselves. Application virtualisation offers Fontys the following advantages:

- Applications are made available on user demand without installation or image techniques. After workplace recovery applications are available again immediately.
- Applications operate without any conflicts or problems, regardless of other applications installed on the same computer. 210 Different applications run on a Terminal Server without any problems.
- Applications can be updated without any form of dependency tests.
- Applications are available anywhere throughout the network; fast or slow, even without a network connection.
- Availability of applications is not longer bound to a personal device.
- Change management is arranged centrally, users have instant access to the latest applications.

- Application usage and license management can be organised centrally.
- Reduction of standard costs, like installation costs, regression tests and application management costs.
- Applications can be made available, updated and removed much quicker.
- Reduction of helpdesk costs, since Softricity prevents application conflicts to occur. At Fontys helpdesk facilities are outsourced: less calls immediately reduces costs!
- Less user downtime, as applications run independent of the operating system.

The Softricity infrastructure consists of the following parts: *SoftGrid Virtual Application Server (VAS)*. The applications are made available and execute on the workplace or Terminal Server. Authentication, authorisation and license metering are handled by VAS. The VAS-server sends the required code to the client and this code is then executed by the desktop, laptop or terminal server. The application is cached locally for fast access and is also available without a network connection. *SoftGrid Sequencer*. This part of the infrastructure does the actual application virtualisation. The Sequencer packages an application and segments the code into a file that is stored on the Virtual Application Server.

SoftGrid Management Console. This module has a MMC snap-in for central management of the Virtual Application Server.

SoftGrid Client. This client is being installed on the workplace or Terminal Server and takes care of executing the application within the virtual environment. SystemGuard, a filter driver within the SoftGrid client acts as an intermediary between the application and the client. SystemGuard prevents from application conflict problems and operating system changes caused by applications.

Hardware Virtualisation

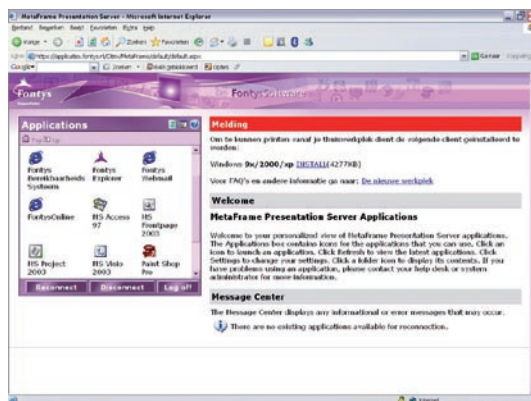
The 10 VMware ESX servers are being used for different environments within Fontys. Besides the production systems there are also development, testing and acceptance and management environments. Within these environments over 150 Virtual Machines are in use. VMware Virtual Center is being used for easy management of the virtual machines and ESX hosts.

Platespin PowerConvert enables easy operating system portability. For Fontys this implies easy and fast conversion of physical servers into Virtual Machines. Virtual Servers can also easily be re-converted back into physical servers, which can be a practical solution for troubleshooting purposes. By usage of hardware virtualisation adding server functionality is just a matter of hours instead of weeks.

Citrix Access Infrastructure

Citrix Presentation Server, Web Interface and Secure Gateway make it possible that users safely have access to purple applications, anywhere and at anytime, with all possible systems like Apple, Linux and Windows and through any possible connection type. The applications are executed on the Citrix Presentation Servers. Display information, keyboard taps and

mouse clicks are communicated with the workplace in a very efficient and safe way through the ICA protocol.



Back-end Infrastructure

The back-end infrastructure is situated within three data centres in Eindhoven. Two of the three centres contain HP Proliant blade servers, HP EVA Storage Area Network and Cisco network equipment. The Enterprise Backup solution is situated in the third data centre. The three data centres are interconnected through 2 Gbps dark fiber connections. The A-locations have a 150/280 Mbps WAN-connection. Most of the B-locations have a 40 Mbps connection with the Eindhoven environment.

The product back-end consists of the following items:

- 10 Microsoft Windows 2003 Domain Controllers, 1 Root Domain and 2 Child Domains;
- DHCP/WINS Microsoft Cluster Server;
- 14 Exchange 2003 Servers, Microsoft Clustering, Front/Back-end configuration;
- Print Servers, 1 Microsoft Printing, 1 ThinPrint printserver;
- Windows 2003 File Server, student and employee data;
- Microsoft SQL Cluster Server, for back-end infrastructure databases;
- 2 Softricity SoftGrid Virtual Application Servers;
- 45 Citrix MetaFrame Presentation Server 3.0 Enterprise Edition servers, based on Windows 2003;
- 4 Citrix Web Interface Servers;
- 2 Citrix Secure Gateway Servers;
- 10 VMware ESX Servers;
- 8 TB storage per Storage Area Network;
- CommVault Galaxy backs up to a third fall-back location;
- A number of servers for McAfee, Norton, HP Rapid Deployment, LANDesk, WebInterface, SecureGateway, Microsoft Operations Manager 2005, SharePoint and others.

Project progress

The vision of Fontys has been described by Rens van der Vorst and Adri Cornelissen of Fontys. The document "Changing IT landscape" defines the requirements. The Technical Design up to version 0.6 has been developed by Fontys together with an external organisation. This process failed completely in February 2004. PQR already had a long-term relationship with Fontys and in April 2004 we officially started with the project called "The New Workplace". The existing Technical Design was completely to be rewritten by PQR and was presented to

Fontys in July 2004. The Proof of Concept (PoC) started in June 2004 and was setup using 17 servers and 20 workplaces. The outcome of this PoC, the vendor support and the reference cases was a GO for continuation of the project.

AD&M and DT are two groups within Fontys that use the development environment. AD&M for instance prepares the application availability. The DT group takes care of the workplace development and support. The development environment is setup as 14 virtual servers hosted on a VMware ESX server. The development of this environment started in June 2004. After completion of the PoC writing the Technical Design version 2.0 was the next challenge. Besides the results of the PoC, more in-depth workplace security and access infrastructure were added to this version of the design. Various subjects of other sub-projects like SAN, EBS, Exchange and Active Directory have been reviewed and added to the Technical Design 2.0. The document has been presented to Fontys in March 2005, after which the Test and Acceptance (TA) environment could be constructed.

The TA environment is setup using 32 servers. These are both physical servers as virtual machines on VMware ESX. The complete functionality as available in the production environment is also available in the TA environment. While building the TA environment many general information sessions on the total solution and the details were organised for Fontys users, employees and management.

At the end of the setup period a stress test was performed on the Citrix Presentation Server platform. The outcome of this test was an extra guarantee for the steering committee of Fontys. During the stress test the maximum number of concurrent users on the Citrix Presentation Server was monitored and the conclusion was that even under the heaviest load the systems performed well.

The production environment was built by Fontys employees themselves. Two Senior Consultants of PQR were present to maintain a technical overview and to act as technical advisors for the Fontys people. The Storage Network and Enterprise Backup Solution were built with the assistance of PQR.

After setup of the production environment production phase 1 started. Phase 1 was the migration of both an A-location as a B-location, in total about 1500 workplaces. Per day a maximum of 100 workplaces can be migrated because of user support. After the first phase some amendments have been made to the Technical Design 2.0 and version 3.0 was presented. After a short time of rest, used to evaluate the outcome of the first phase, production phase 1 finished in September 2005. Production phase 2, migrating the remaining locations and 5500 workplaces finished successfully in January 2006.

Future plans

Project "The New Workplace" has come to an end, but Fontys wants to move on. The purple applications need to become even more flexible and the yellow workplaces must be running even more stable. By using hardware virtualisation Fontys wants to offer students the option of having their own personal testing environment. Microsoft Windows Vista is welcome; through the new flexible infrastructure migrating to a new operating system has become a 'piece of cake' compared to the earlier days.

Lessons learned

- In the introduction it was already mentioned that professionalizing IT can result in a seemingly contradiction between the IT department and the users. **Lesson 1: By defining the objectives as one entire organisation and being ambitious, without being held back by technical (im)possibilities you end up in having everyone's wishes and requirements clearly formulated and in thinking 'out of the box'.**
- The concept that Fontys was aiming for was technically very challenging. **Lesson 2: Take enough time for the implementation, select the right tools and visit similar reference cases.**
- Looking at the size of the project it was clear that Fontys wanted to run the project management themselves and leverage where possible their own resources. But not all required knowledge was available. **Lesson 3: Use your own resources and knowledge and integrate the cooperation with the right partner into your project.**
- Many sub-projects have shared their input into the Technical Design, by the ever changing insight and understanding of the project, changes had to be made to the original design. **Lesson 4: Build your technical design modular, so it remains manageable, readable and flexible.**
- While offering much freedom to the users, security becomes extremely important and the two must be well balanced. **Lesson 5: Take enough time for defining the security policies and do extensive tests.**
- Originally server management and workplace / application management were different responsibilities within Fontys. By implementing Server Based Computing and Softricity these worlds merged into one. **Lesson 6: Adjust your management organisation to the new environments and have the IT staff equipped to their new tasks.**
- The total project time was around 21 months. In the meantime the existing IT services and facilities needed to remain in place and at the same time the staff needed to be prepared for the upcoming situation. **Lesson 7: Build and maintain bridges between the existing organisation and the project organisation.**
- Accepting the new techniques within the (IT) organisation is crucial to the success of the project. There have been many workshops for all teams within the organisation, there were poster campaigns, a website, regular newsletters and the migration team was easy to recognise by their yellow and orange shirts. **Lesson 8: Use all possible ways to communicate about the status and progress of your project, make the project "visible" within the entire organisation.**



The above mentioned lessons are most probably already well known to you, but in many cases other interests (like time pressure and costs) play important roles that have a direct impact on the most commonly known best practices.

Finally

The problems and challenges that Fontys faced are well known to many other educational institutes, but the dilemma between user freedom and manageability is ubiquitous. The Fontys project indicates clearly that an extensive and complex process can be successful when it is handled correctly and no concessions are needed. The IT environment facilitates different kinds of users, workplaces, access schemes and services, without compromising the manageability. Freedom of use and manageability may sound like a 'fata morgana', but it is business as usual at Fontys.

Fast facts

Features:

Migration Server Windows 2000 Server and Novell to Windows Server 2003
 Migration workplaces Windows 98 to Windows XP
 Proof of Concept servers: 17
 Development servers: 10
 Test and Acceptance servers: 32
 Production servers: 350
 Citrix Presentation Servers (TS): 45
 Printers: 500
 Workplaces: 7000
 Student laptops: 5000
 WAN: B-locations 40 Mbps, A-locations 70/150/280 Mbps
 Workshops: 25+
 Students and employees: 60000
 Purple applications: 300
 Yellow applications: 1000

Solutions:

Microsoft Windows Server 2003 Enterprise Edition SP1;
 Microsoft Operations Server 2005;
 Softricity SoftGrid v3;
 VMware ESX 2.5;
 VMware Virtual Center;
 Platespin PwoerConvert;
 Citrix MetaFrame Presentation Server 3;
 Citrix Web Interface, Secure Gateway;
 RES PowerFuse v7;
 ThinPrint;
 Windows XP SP2;
 LANDesk Client Management Suite v8;
 CommVault Galaxy;
 McAfee / Symantec Antivirus;

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