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Can SOA solve a bloating University VPC-Farm?

A case study at Centrum För Affärssystem, Gothenburg University, Sweden.

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1. Abstract

This article presents the development of an environment suited for running academic courses in ES/BS on a virtualized pc farm. The study focus on the performance, competence and politics issues surrounding this architectural development. Where other organizations, not governmental funded, the same problem area would differ allot from the current study of this university in Sweden. A departement with this innovation can not compete against other specialist firms that certifies Business Systems users and consultants. The innovation also supports mutliple universities today under the membership of Sante Academy where Enterprise Systems/Business Systems now grow in a rapid speed every semester and it is now potent to look into how that innovation can expand within these problem areas. In order to have a strategy stable enough to change during time a SOA-Model is the most logic suggestion. Centrum För Affärssystem (Center For Business Solutions - CFA) is a growing department within a university that focus on development and course development using Business Systems. The software and workloads change allot during the years and needs to be supported in a matter that a VPC-Farm can expand and also be confined in different areas. To see specifically where the problems persist a FEM-Model to discover usage and areas where the current information consist, after that a SOA-model would be able to cover which those areas should be located if CFA needs a outsourcing strategy. During the analysis it came clear that the portal would work as the broker domain for all members where they would work independently on delivering the right resources but always in collaboration of CFA, thus CFA would have the intellectual property of the initiative and that licensing would always be monitored by the vendors. However in order to that function to advance new political initiatives at the universities would be in order to use these systems, this would mostly be lucrative for the universities that don't have Microsoft Academy Alliance initiatives but would not stop them from using Enterprise Systems/Business Systems remotely, like today. The benefit however would work for all parties, where vendors would seek competence, development platforms and right resources to grow, a membership university could now provide such a VPC-Farm if not interested about a supporting base VPC-Farm with standard Business Systems. Or member Universities would have the opportunity to have their ”own” VPC-Farm with the base software and unload CFA from some resources and optimize the performance of the usage of those systems. The portal would also be the most prominent level of collaboration where vendors, members and teachers in general would discuss and advance together with CFA as the operator for this initiative.

As mentioned by Friberg, Gyllander, Mondésir (2007) some important differences and something to consider when refering to Business Systems and SOA is that the Business Systems are in fact ”Systems” and SOA is a koncept for the way of steering an organization. But even SOA demands a technology in the base to support a service oriented architecture but the end-user is not a factor that needs to be focused on because they don't exist in this meaning.

I base allot of a case study from my thesis on ”Success factors in the process of establishing a TechCenter” (2008), in reflects on the koncept of a TechCenter and how it would work in a university, during that time CFA was involved in the same innovation when running their VPC-Base environment for member Universities. It also reflects the political issues when working with these kinds of innovations within a governmental founded university.

There are no current initatives that work with Business Systems in this magnitude, interlinked and in the same construct with virtualizations within a university at the same time letting other Universities rent from that construct. A outsourcing template was made in order to see how it could function based upon the SOA-Model, where Universities of different interest in their membership towards Sante Academy (CFA) and how vendors or researchers could find the most potent development platform. The portal broker function would become another research of what would be most optimal usage and how it would be used in the future in case of it not being a Sharepoint portal, thus not being the standard version of software for Universities today like ”GUL” or ”Kursportalen”. This would prevent “Information Island” if the now resulted Outsourcing Template is followed.

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2. Introduction

2.1 Background

This article focus on the ability of expanding resources in the form of Virtualizations that run Business Systems. Today that is more and more common to experiment, ever since IBM started with simulation of the IBM370 legacy system on their newer platforms, this was also refered as:

”Hardware -level virtual machines encapsulate all software that runs on the hardare thus giving the VMM the unique ability to manage the hardware resources, as well as manipulate and control the entire software stack” - Rosenblum 2010

The resources acquired are fundings from the Gothenburg University and sponsorships by Business Vendors that saw value of experimenting with an innovation that would make students more used to the real world systems currently running in big organizations. Political problem in this matter is that a government funded university should not compete against the real world educators and companies that certify consultants/workers in Enterprise/Business Systems. Profit made by the department in use of this innovation can only provide courses and agree to “some” sponsorships. If it was a university with the goal of making profit as an organization in use of sponsorships that would be whole other matter. Current case study described in this article is about a department called Centrum För Affärssystem (Center For Business Solutions - CFA) which has this innovation for a non profit organization as Gothenburg University.

CFA has been a department since the spring of 2005 and was a demand from the Näringslivsrådet (The Advisory Council) to produce a quality understanding to the Enterprise Systems/Business Systems now standard in the business world. today being rewarded by organizations like Microsoft and noticed by allot of other vendors even case studies shows that CFA is working with a initiative of great porpotions.

“Younger people like to work in a different way and they have a more contemporary view and experience of the Internet and how to use mobile solutions than we are used to... This is the generation we really want to listen to.” - Magnus Peterson (2008)

There was a bit discussion on how to establish the classes/workshops and what kind of systems that would be involved. A group of three people started this work by contacting several ERP/BI and general Business System vendors in order to start a cooperation with them. This being a strategy in which the sponsorship would cover the expenses of licenses, software and education material (at least some). The focus for CFA would be to showcase the software provided in ordered workshops from the Gothenburg University and later on other Universities in the near area of Gothenburg. During this time the innovation would be to have somewhat of a sponsorship by HP to use their hardware to set up a normal set of installations of these systems now provided. For a time it was enough for building up a unique server-farm with software rarely used by teachers and students during their time in the university. However the partnership provided by the ”Sante Academy” group demanded more resources and another way of providing this ”tech”. This being the time of the first established virtual platform era, most of the provided software was able to me virtualized to small packages to be

provided as ”backup” or ”development” in order to maximize usage of the systems and to unload traffic to the now current servers. This proved to be a very short solution because now the interest grew even higher that there was now ”developing” platforms to be downloaded, which made it much easier for the partner universities to start setting up their own environments. A worry grew during this time as of all time and budget put in these installations where to be slipping out of their hands, CFA was now faced with another problem. It was now not a matter of providing packaged solutions for anyone within the partnership to download but also their hardware wasn't able to adjust the workload at the same time. Most of the partner universities had no education in virtualizing these platforms in a enterprise published way. Another demand was now set, a demand that would change the whole structure of CFA's IT strategy.

A ”virtualized farm” (VPC-Farm) was to be built with all these package solutions provided and configured together with the vendors, where Business systems like these haven’t been virtualized before and some had, was now to co-exist with the rest of the systems in one virtualized environment. All members would have the option now to log on to a application desktop or ”cloud” environment provided by CFA, where all Universities or vendors would have their own set of tools. It could be all provided Enterprise Systems/Business Systems or just a couple of modules where the systems them selves was opened for configuration. This not being possible before now opened a whole new innovation for the partnerships between universities and vendors. Now the platform was so intense in it's usage that vendors and other firms that specialize in their profession around their Business Systems now was looking to develop on CFA's VPC-Farm in order to see value in eduction and of course commercialization of their products. After 6 months the environment showed itself to be very useful and the set of skills now combined by academics, technicians, vendors and educators now grew exponentially out of proportion. The system is currently bloating and it's now important to start planning the usage of this VPC-Farm as a way to improving workloads with SOA-concepts.

2.2 Problem area

Research scope and questioning

The general problem for this article is how to expand the resources now in use when universities have different political agendas, licensing and agreements towards the Gothenburg University and CFA. Using the membership agreement there is now a possibility to outsource this initiative in some way. How does it look and how does it work for a university construct?

One problem to be concerned in this matter is the ability to expand without getting traped in ”informations islands” described by Magoulas (1998) in the end, where CFA would lose some contact and supportability against partners choosing to run their own VPC-Base package without updates and shielded from the rest of the members. Which later would result in the ”spaghetti-syndrome” described by Magoulas (1998) when some sort of future needs towards CFA as their IS-System. This problem would secondly also be described as a ”bloated” server-farm where usage of this innovation gets stuck in one university because of the more stable framework of politics and licensing models, whereas other universities are incapable or restricted to work in the same way as CFA does. Than the architectural point of view is to start looking in to outsourcing innovation based on a SOA-model.

The purpose of this article is how a SOA-model would benefit on a VPC-Farm using Business systems in education where 19 universities need performance? How do one control the bloating within the current structure when vendors need more development space at the same time the partner universities need more base packages to support hundreds of students accessing the coursework online. And what happens if other countries wants to join?

> *“Companies, such as Volvo, SKF, Saab, and KPMG are now interested in increasing their collaboration with the University of Gothenburg because they see the benefit of having a well-educated, technically proficient labour force.” - Johan Magnusson (2008)*

Described by Randy Heffner in IDG (2011) the service architecture SOA is more than a hype today. Accordingly to a research by Forrester 71% of companies today are using that strategy or will start to use it soon. When it comes to small or medium sized organizations it comes up to 50% usage of SOA. Heffner says that it is all good with the fact that smaller companies are generally slower than big companies with adapting to new technologies. Most companies today are satisfied with the results, 77 % of the big corporations and 81% or the smaller companies says that their gain from the SOA project have given them much better opportunities to expand their usage, in the front it's usually telecom companies, energy, finance and insurance agencies. 80 % of the the bigger and 60% of the smaller companies have already used SOA as their method. North america and Europa approximately have the same size of the companies that aim to use SOA, 80 %. 81% of North American companies are satisfied and 73% in Europe. Accordingly to Forrester a company not using SOA today should think about changing their mind, as a friendly suggestion by branch experts that developed SOA in means of integrating software. The SOA strategy may seam unnecessary for companies that consider them selves having control over their software. Other judgmental people makes SOA seam like a very expensive strategy in the beginning but that is not the case accordingly to Heffner.

Naturally one has to view CFA as a company within a university where such strategies are relevant in order to maximize usage and not get incubated with no room to grow. CFA being a department with the main focus of new Business Systems where a constant upgrade is necessary and development never stops is in much need of a SOA strategy. Based on this arguments and this research provided in this article will answer the question if SOA can solve a bloating university VPC-Farm.

2.3 Method

To start the analyze of this current problem for CFA a number of process descriptions must first be stated. Who would provide what and how does the processes between farms look like, where is the broker to control the usage and how should a SOA-Model for CFA look like? This will be formed by the FEM-Model and a traditional SOA-Model to state facts and flow of processes. I will also draw parallels towards Magoulas (1998) descriptions about ”information islands” which would be a normal outcome in cases of outsourcing this kind of innovation.

This article is a case study based on my own case study presented from the thesis ”*Success factors in the process of establishing a TechCenter, Within a Swedish academic organization such as an IT-University with limited hardware and economic resources.” (2008)* where I explain the integration with the IT-University when CFA started using their Tech Center initiative. This was almost the same sort of problem area derived today, where politics towards other Universities and companies must be correct with the right kind of licensing and management which comes from the politics. Important to state here is that this initiative is very unique in it's base of performance, where it exists and why it's so important for other parties involved. Also a case study is the most potent research method in this article because of this ”individuality” evolved around this VPC-Farm.

To explain the situation about complex virtualization technology and it's ability to grow fast, an article assignment was created by me in a course of ”Interactive Teaching”. Where I pointed out how important the symbolic values are in understanding base technology and virtualization, especially by people working with economy which are the most potent users for Enterprise Systems/Business Systems. The article was made to point out how to teach this concept and make the students to act like designers and choosing an IT-Architecture first hand where I, a teacher, would act like an advisor or IT-consultant.

With this methods combined I will form a qualitative research simple enough to understand without to broad technological understanding and to show a map of how to start outsourcing this initiative in the right manner. According to Wikipedia (2011) Qualitative research is the only way in this case study to analyze current events where no relevant values provided are gathered today since there are no academic initiatives concerning VPC-Farm bloating and Enterprise Systems/Business Systems in use by other Universities. Backman (2007) refers to that qualitative research and quantitative research as interviews and forms could also provide more relevant values for this kind of an initiative, but the lack of time to do a extensive research with observations and interviews. Also a qualitative research will harness the political aspects recorded for licensing, adapting and frameworks provided from example Microsoft Academy Licensing Models and Sante Academy. Researching and comparing articles from organizations that have built VPC-Farms in the terms of experimenting new ideas and technical innovations will not help my case study, because they are mostly based on funding from companies wanting to expand with budget estimates and with license models of buying multiple license packages as they grow. The department CFA can only use the provided license amount provided by the Universities and the sponsorships by vendors if the agreements are correct.

2.4 Disposition

Chapter 4 Case Study gives a description of Centrum För Affärssystem (The Center of Business Solutions) the development of the environment and its complexity which is important in order to understand the software usage provided for the universities in Sweden.

Chapter 5 Analysis and discussion highlights key conflicts among parties involved, the importance of directing attention to the VPC-Farm purpose and thus argues for the SOA-Model.

Chapter 6 Conclusion describes the outcome from the research and a new model for a SOA-solution is provided with an outsourcing template.

3. Theoretical framework

To describe what kind of SOA agility is needed an article of *Lundvall, Wallenthin, Ashiq* (2008) describes it in this way;

The SOA architecture is built on loose integrated parts in order to organize the business structure which should be adaptable to change with it's environment dynamically in case of unforeseen circumstances. The whole organization should be able to work effectively, productive and innovative at the same time be able to hold on to the broad view plans as well as the short term plans. A SOA in this structure must be in harmony with the business different operative and strategic parts of the organization, some parts consists of formal structures, processes and information systems. Others reflect more on political structures, goals, costumers expectancy and competence within the field. SOA also explains that from these arguments for a agile SOA makes it stable for both the organizations hard and soft parts in a harmony (alignment). The agile organization shall adapt to SOA because it gives business agility that solves the loose parts of the organization without the hierarchical organization structure. A relationship arrow is located between SOA and the organization which describes the strategic choices made by the organization, and another arrow points between the agile organization and SOA that describes the actions made on a local level after a decision is made from the global level. So instead of hierarchically structure one can organize an organization through network structures which decreases the time from decisions to action when made on a global level and than the action happens on the local level. SOA is the architecture which makes the organization agile and is adaptable to changing situations, without this architecture a organization would become stiff and unable to adapt to the business environment.

3.1 FEM-Model

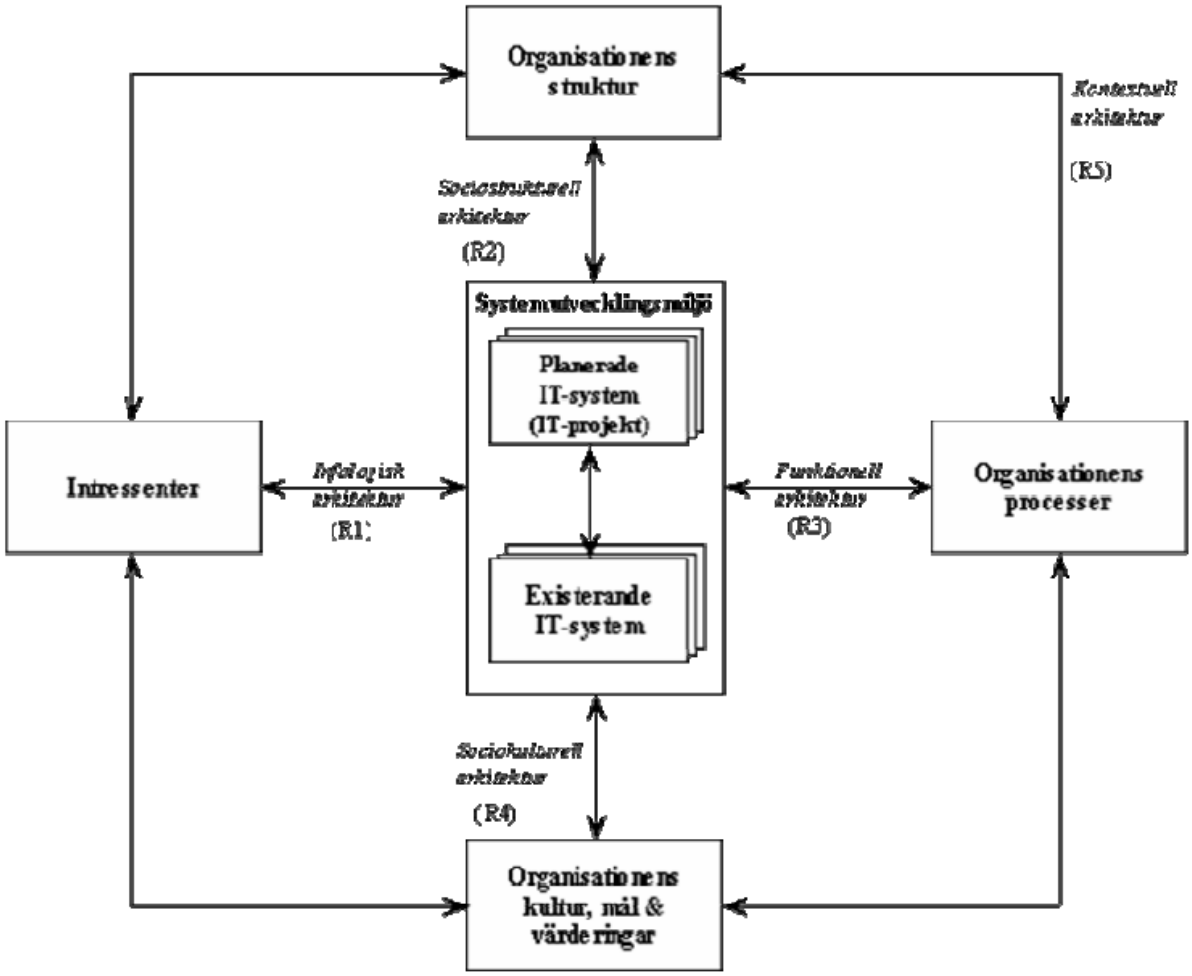

Fig 1: The FEM model (Magoulas, Pessi, Svärdström 2006)

The article mentioned focuses on the FEM-Model from Magoulas Pessi and Svärdström (2006) to establish a framework for agile organizations. This model is used for analyzing to potential areas of relevant information, to group it and to explain the workflow between those areas. Aspects as for example the sociocultural architectures as well as an Organizations culture, goals and worth combines the workflow in a model and explains the relevance or it's usage.

3.2 SOA-Model

Elliot (2007) describes the traditional SOA-Model presented in 24x7as the primary building blocks of SOA, SOA uses a distributed network architecture design approach that partitions service providers from service consumers using service discovery brokers to manage the process.

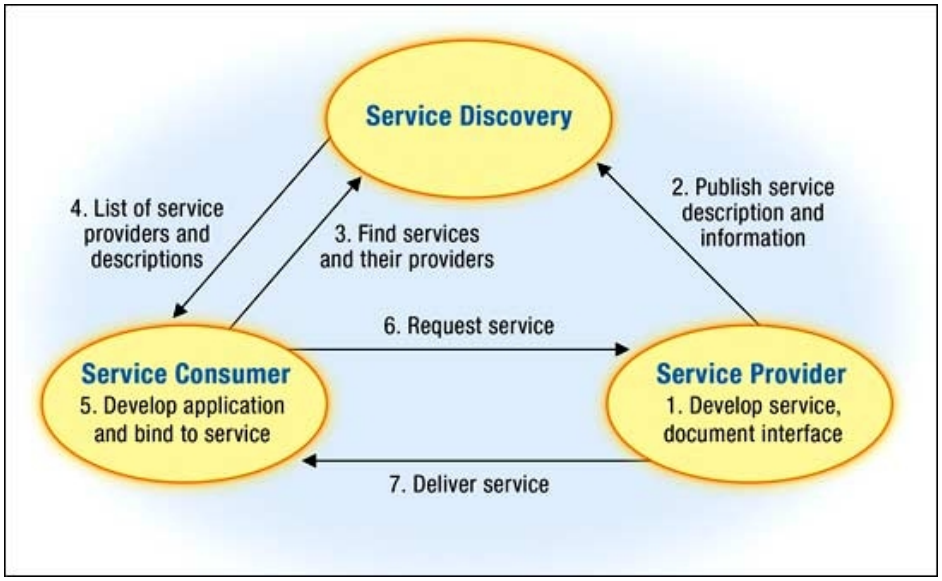

Fig 2: Traditional SOA model, Elliot (2007).

Elliot (2007) continues the explanation of SOA as self-contained services communicate with each other when required; yet they do not depend on the state of other services, creating a loosely coupled architecture that is easily reconfigurable. The SOA approach is attractive for complex System of Systems (SoS) designs because of its flexibility and reusability, and its isolation of functionality from the details of implementation. The roles commonly described in SOA are service provider, service consumer, and service discovery broker. The service provider offers services, making them available by publishing service interfaces in a service registry. The service consumer uses service provider services based on published service interface rules. The service discovery broker component manages the registry for both providers and consumers.

So how would the traditional SOA-model look like when based from the FEM-model in CFA's case. As CFA provides a service as a service provider and the partners being the Service Consumer (as well as the vendors and developers). Would than the portal solution of CFA be the Service Discovery section of this SOA-model? As a broker concept it would benefit the strategy on dividing workloads and sharing updates between systems, however it would also mean that the portal solution would strictly exist within the university structure and not the ”private” server-farm provided by CFA or the partner university. Or would it? Is it proper design to lift out the portal solution as the broker? In the article by Lundvall, Wallenthin, Ashiq (2008) a case described about Libris as the broker function would provide information towards the consumer who rents books. The broker function is parent for the SOA-model in these cases.

4. Case Study

A broader case study of how CFA grew from just a couple of servers in a university with people supporting it with course work and software became something allot larger with time. During this case study based allot upon first hand experience in this work since my position here as the second “Head of Technology” gave me some important self awareness. My 15 years of working with IT has been my framework as being prepared for innovation and new technology which made me chose to explain why SOA would help CFA in this matter. This case study also focus on what has happened during this last 3 years since the virtualization technology became more stable and standard in todays organizations. CFA being one of those companies that started early with this now saw the opportunity to expand and package their solution in a way that would make it more user friendly than ever. But user friendliness comes with a price, workloads and bloating server farms. This study will be reflecting on articles such as the thesis I worked with when the IT-University was starting up a Tech Center (TC), which supported CFA with workloads of Business Systems and also from a newly written article about how to teach people that work with economy and Business Systems, how to chose technology and understand it's complexity.

4.1 New FEM-Models

Two models can than be based from this conclusion using the FEM-Model:

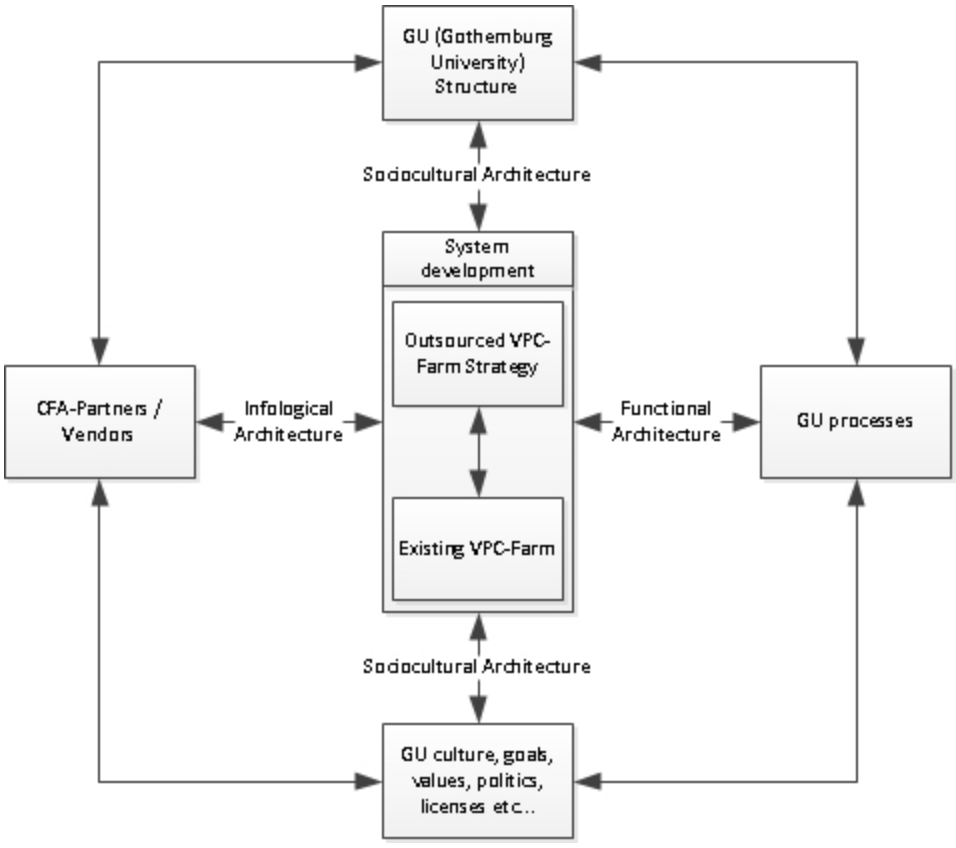

Fig 3: How it looks for CFA in order to advance in development to achieve the outsourced VPC-Farm.

Fig describes how the FEM-Model could look like for CFA's case, where the next stage for development is to aim the VPC-Farm to different locations which would result in outsourcing. However the facts still remains that rules, regulations, politics and processes for a university still applies in this matter. Looking towards the Functional Architecture processes like licensing, user rights and courses are one of the main functions. The Sociocultural Architecture would describe the courses involved with CFA where the politics for who has the right to access these resources and if licensing is one of the main providing processes for supporting CFA software than only ”paying” costumers, in this case students, should be able to take advantage of the systems. The Infological Architecture would be the part where partners towards CFA supplies knowledge and software (from vendors), this being the source for CFA as in what they can produce for courses and other partner universities.

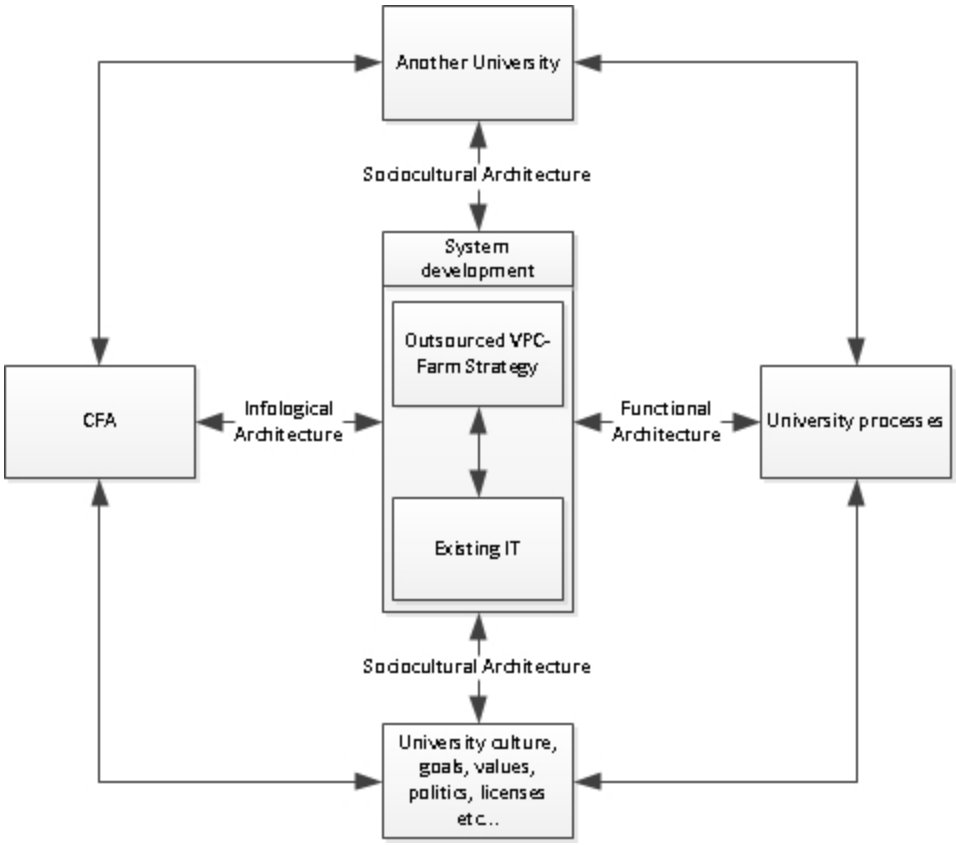

Fig 4: How it looks for the partner university if they establish a FEM-Model on their development in order to advance their IT with a VPC-Farm provided by CFA.

This would state the case for another university for using the FEM-Model in their advancement towards ”upgrading” their IT with the CFA VPC-Farm package. The same rules and regulations with the university politics still applies and licensing in this matter can not change in order for the contracts to be correct. However it also states for example that a Academic Alliance towards Microsoft makes this possible, but to others it will not, this will also pose a problem for CFA vendors if licensing becomes an issue if not centralized within the Gothemburg University. The Infological Architecture points out that CFA will be the source of that information in the case of advancing the ”other” university IT structure.

4.2 CFA SOA-Model

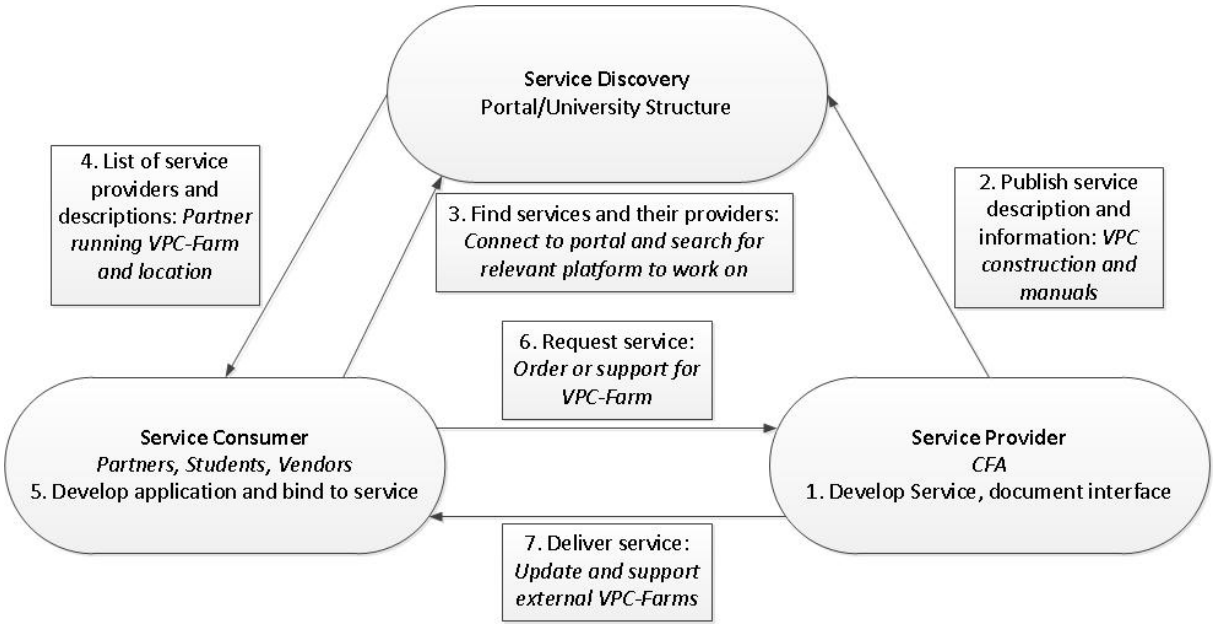

Fig 5: CFA SOA-model.

Focus in this model is where the provider as a broker would exist and it could also mean that it doesn't really matter where it is. The portal solution of CFA could stay within the Business school and make it possible to point out where each system is provided as the same time that the partners would be able to provide updates and operate that portal as CFA would. The processes are still the same in this matter where the ”costumer” would order a service of a course and depending on location it would never matter. A vendor could also order a service of having a new VPC to develop and even here it would not matter as long as it can be provided and if the vendor can find relevant resources from the portal.

4.3 Centrum för Affärssystem - CFA

Fig 6: Where it all starts.

CFA in the Business School of Gothenburg University has it's own ”laboratory” which runs both online and current courses about Business Systems. From here allot of ”standards” for how courses should look like gets established. Vendors uses this facility allot to test their new products and in the same turn get feedback both from CFA staff for installing and providing it for the students, but also from the students which are using the software in a coursework mostly depending on a current case problem. One of these competition is ERP-Simulation where students compete in groups on how to optimize a organizations income using SAP. There is also a online competition within 2 weeks called BI-Marathon where students analyze a real company. The winning group is awarded with 25 000 kr. This is a collaboration with QlikView, SAP Business Object and Systeam which are some of the main vendors CFA has a partnership with.

4.4 The first environment

Fig 7: Application-view MK1.

The first application-view was made in simple .net language where the base Business systems was provided towards physical servers in a server room. All these shortcuts in the above figure are actual servers dedicated to just run one system at a time.

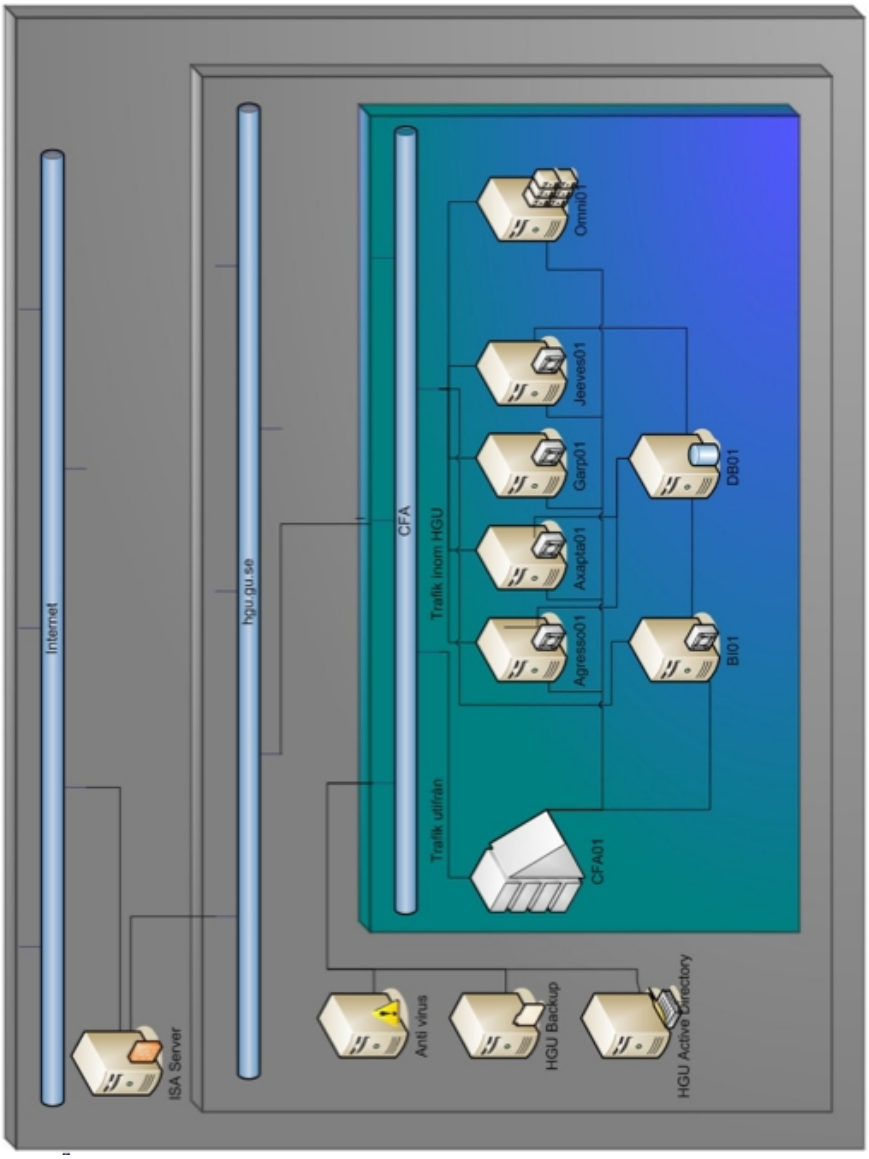

Fig 8: First Server Net.

From this view we can clearly see how the normal server park was constructed from the more traditional aspect of providing the Business Systems from CFA. The Application-view MK1 was running from CFA01 in this map and was the only platform to be reached from the outside. All servers here are physical and no virtualizations was used during this time, this is considered a best practice in constructing a server-farm.

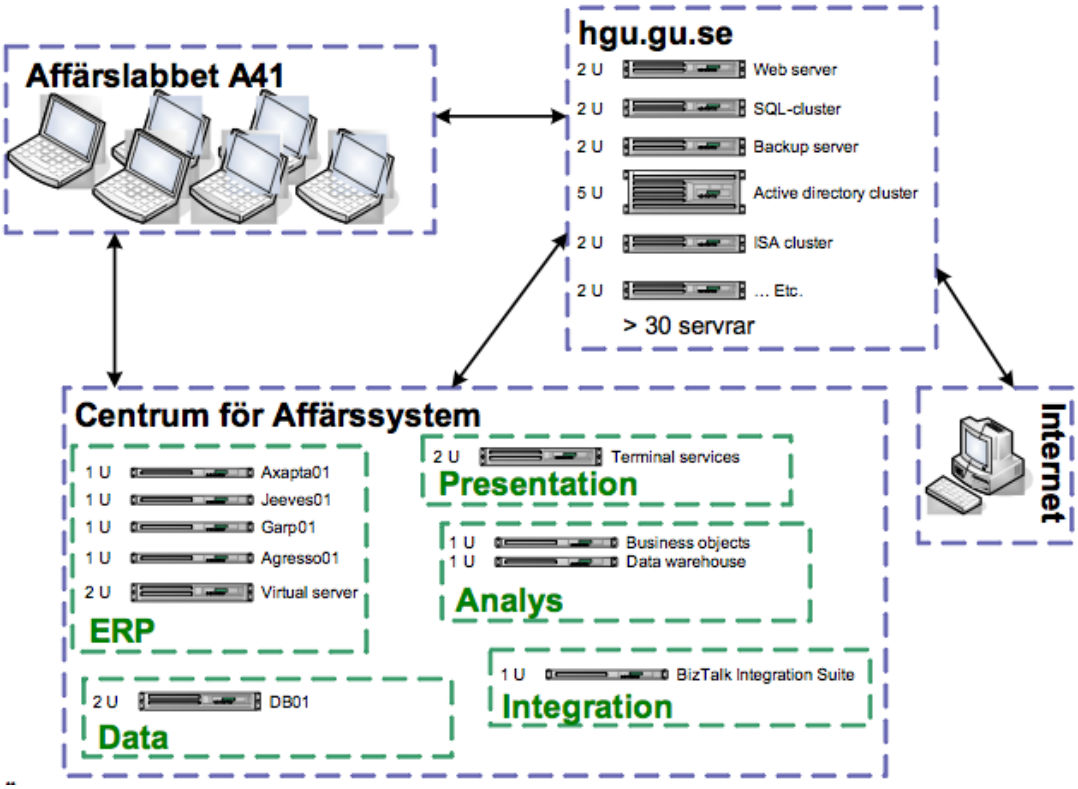

Fig 9: Network Map For the First Server Net.

This network map shows how CFA's servers was interlinked with the Business School's network and Domain tree. Even plans for a Virtual Server is provided in this map for future installations. The Virtual Server was never used in this structure however.

4.5 The second environment

When CFA grew and was forced to expand their resources to more intelligent platform and virtualization methods, the IT-University (ITU) had a project in the works for constructing a ”Tech Center” to provide an environment for supporting this kinds of initiatives. During this time a project started for CFA as well to form the first joined membership platform for using Business Systems and the IBM systems at the same time. This was to be the first initiative for future partnership constructs of the same kind in other universities.

Description

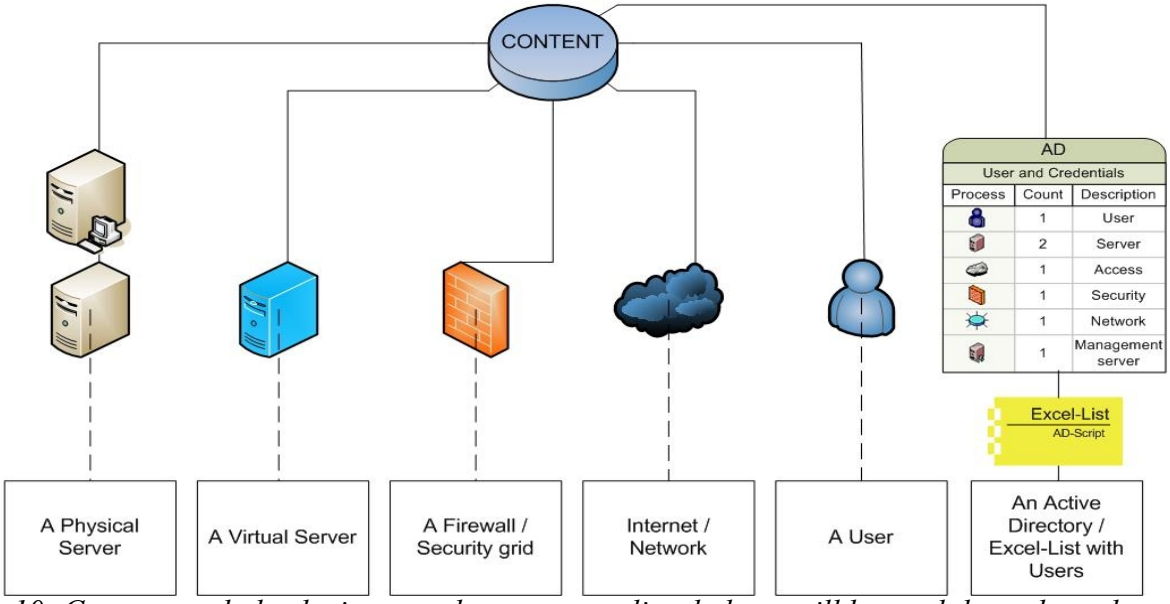

Fig 10: Content symbols, the icons and components listed above will be used throughout the models below.

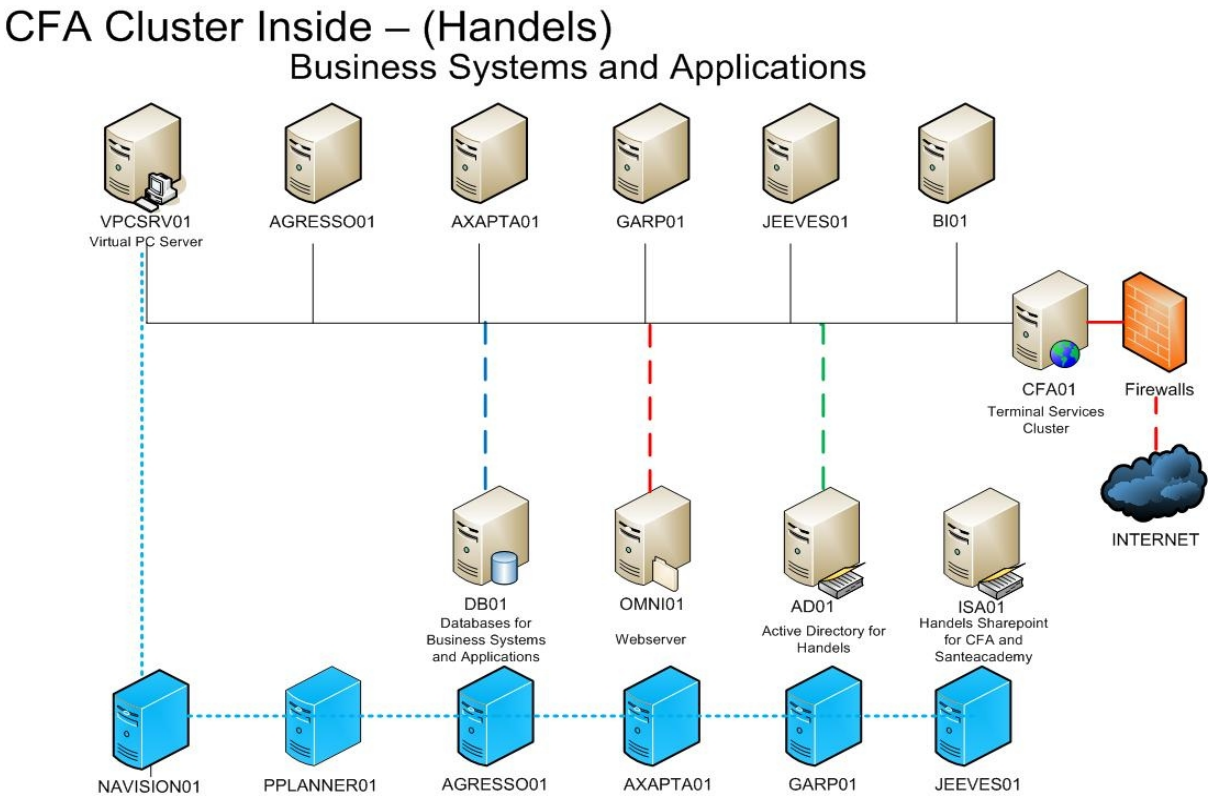

Fig 11: VPC-Farm 2009.

The model above illustrates the environment hosted by the Centre for Business Solutions (CFA) during 2009, where the blue icons represent virtualized copies of the physical environments. These will solely be hosted on VPCSRV01, which is built on Microsoft Virtual Server 2005. Each virtualization represents an enterprise system, which after testing has proven itself qualified to be installed on a virtualization. A virtual farm (VPC farm), like the one above, can host approximately 1000 simultaneous users, evenly divided over the different enterprise systems. Virtualization on VPCSRV01 constitutes a live validation process where the system's, for example NAVISION01, suitability for installation on a virtualization is evaluated. If proven suitable, the system is approved for, if necessary, relocation to another VPC farm, conceptually illustrated below.

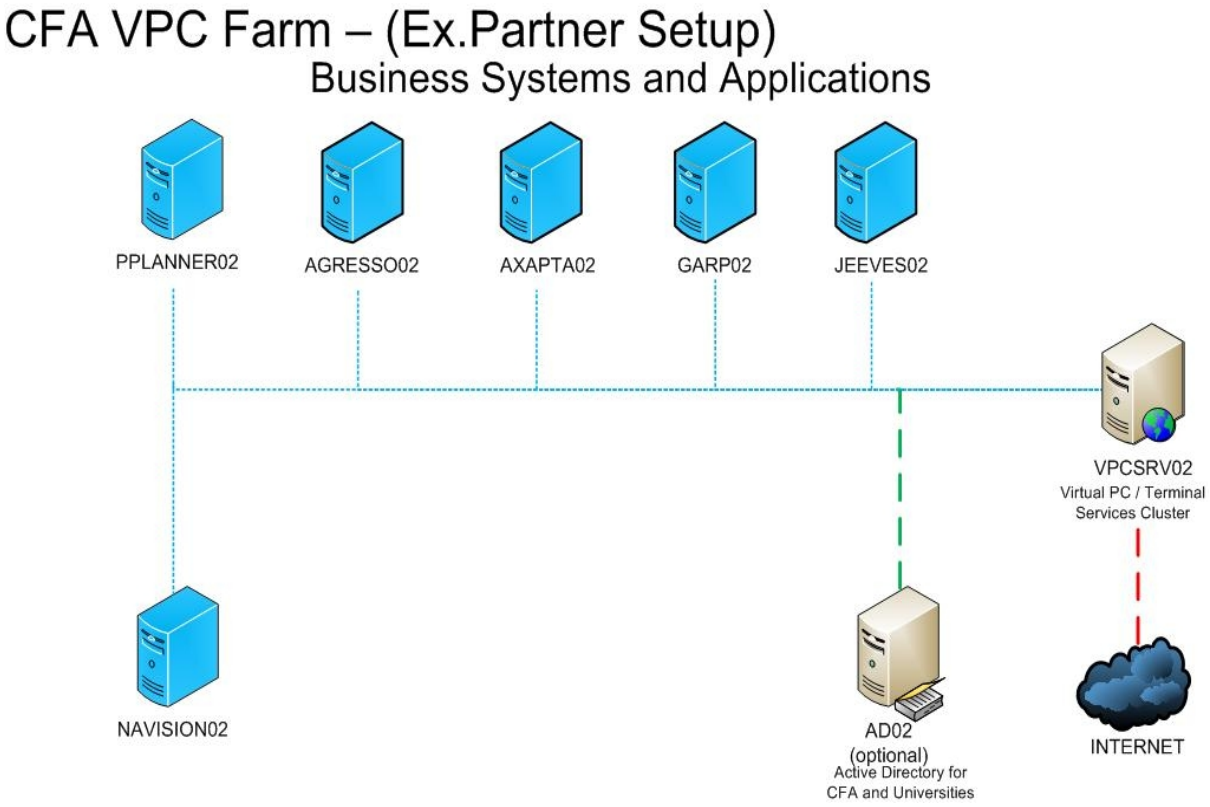

Fig 12: Example of partner VPC-Farm.

The model above consists of two physical servers; a virtualization server (VPCSRV02) and an optional AD server (user directory; AD02). The virtualization server hosts the enterprise systems approved in the validation process described above. Following the prior example, NAVISION01 has now been duplicated to NAVISION02. When maximum load balance has been reached, and the enterprise systems consequently are perceived slow, another VPC farm with the same specifications can be built at another external partner. The next model represents a VPC farm constructed at the external partner IT-University.

This was the first step towards a construct at a partner with our systems, this is where a SOA-model could be established as the first version of a framework.

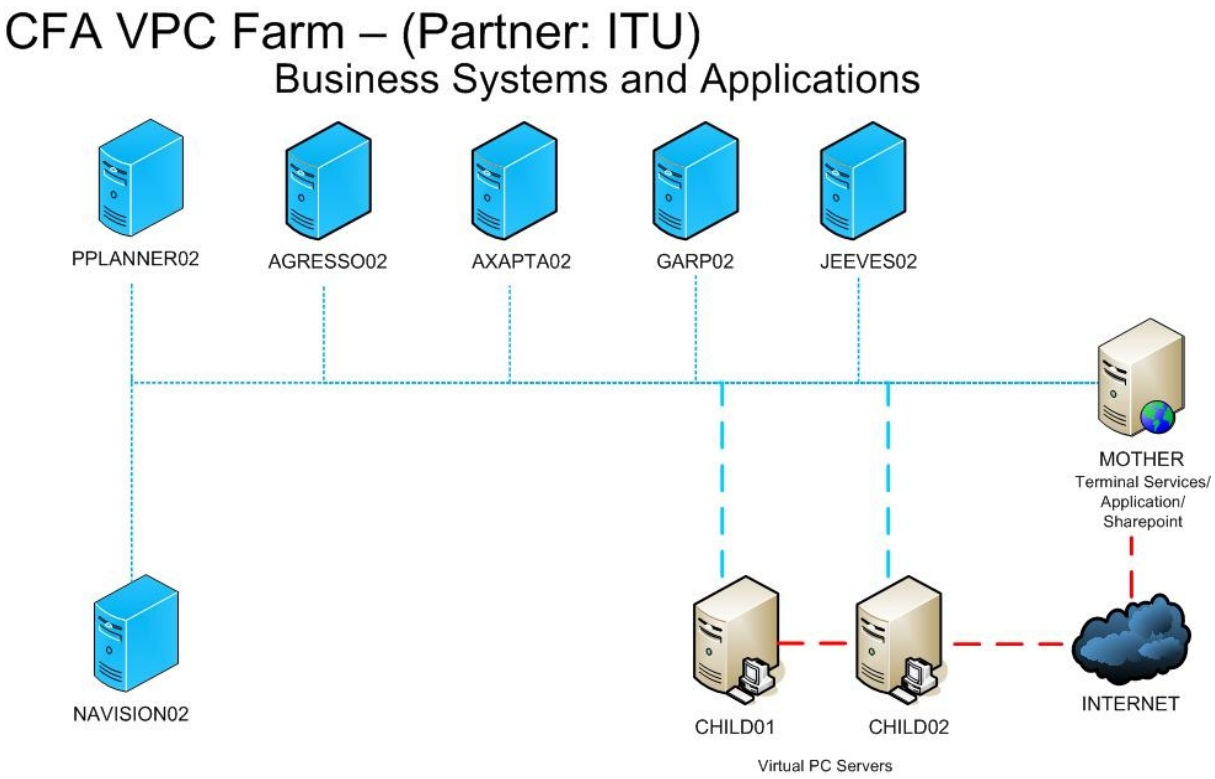

Fig 13: Partner VPC-Farm at IT-University during project time 2009-2010.

This model illustrates how the environment at the IT-University (ITU) looked like. In this case, the load balance was divided between two physical virtualization servers (CHILD01-02). MOTHER was used for application access and presentation interface for the enterprise systems in the farm.

One of the partnerships towards our members was a Mainframe construct located at the ITU. Due to my first hand experience of the courses provided on this mainframe I also got the chance to try some virtualization methods to provide CFA with server power. ITU is one of our members which a small course of business systems are used to simulate normal company usage of the most common systems. The mainframe IBM I5OS machine provided a virtualized environment for Windows Server 2003 as the Terminal Services provider for the students to access the MK2 Application Platform. Next to the mainframe there was two HP-Rack mounted servers running Virtual Server 2005 which was a early stage of the Virtualized software by Microsoft for server-farm usage. The problem was that the workload on the normal PC machines on 32 bit platform was a bit unstable and not so potent for max usage, however the combination with the mainframe the usage proved stable and workloads kept steady. During the time of 2009 -2010 when this project had grown into a normal state the students and teachers didn't know what they accessed during their courses, the common thought was that CFA ran everything within the Business School. This project was supported by the local computer club (SKIP) located within ITU as the main support group for CFA and was the source of all the clever configuration of this system integration. The mainframe system was provided by Will Sullivan due to his contacts on IBM to sponsor ITU with IBM software, hardware and course materials for the System I Operator courses.

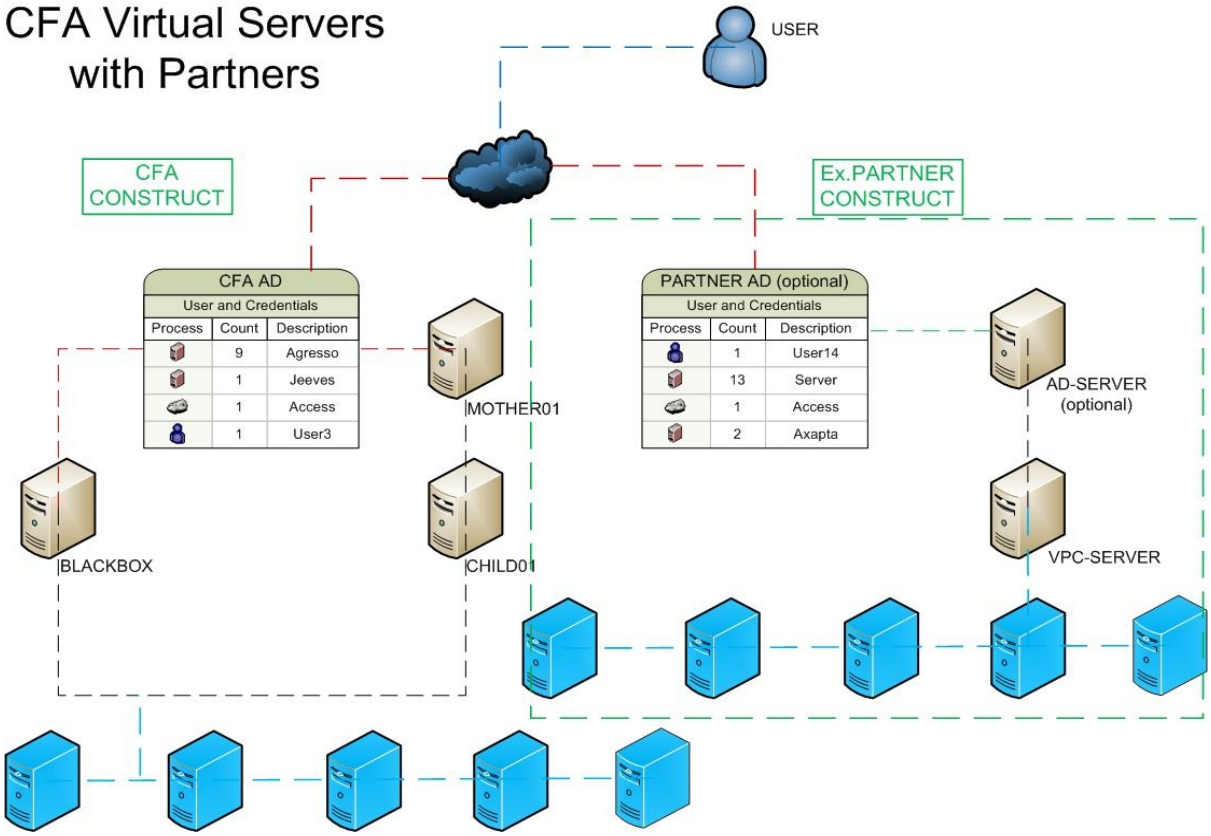

Fig 14: Partnership account control and Virtualization locations.

This model illustrates the VPC farms co-existing with the main resource provider, in this case, ITU and another external partner.

During the construction of ”Virtual Servers with Partners” it got allot more clear that a combination towards other partners AD constructs and server parks was more realistic to establish. Other universities where more interested about ensuring their usernames etc stayed in their own standards, this being a way to keep track of students and ensuring workloads from every university. This turned out to be a good plan in using ”Federated Services” my Microsoft, the only problem would be the competence to run it, some universities had an AD and some had not. Members ordering access to the environment would always ask for new accounts that would be exactly the same as the current ones in their university construct. The project at ITU would now be the base for this configuration and a case to be shown to other partners or members.

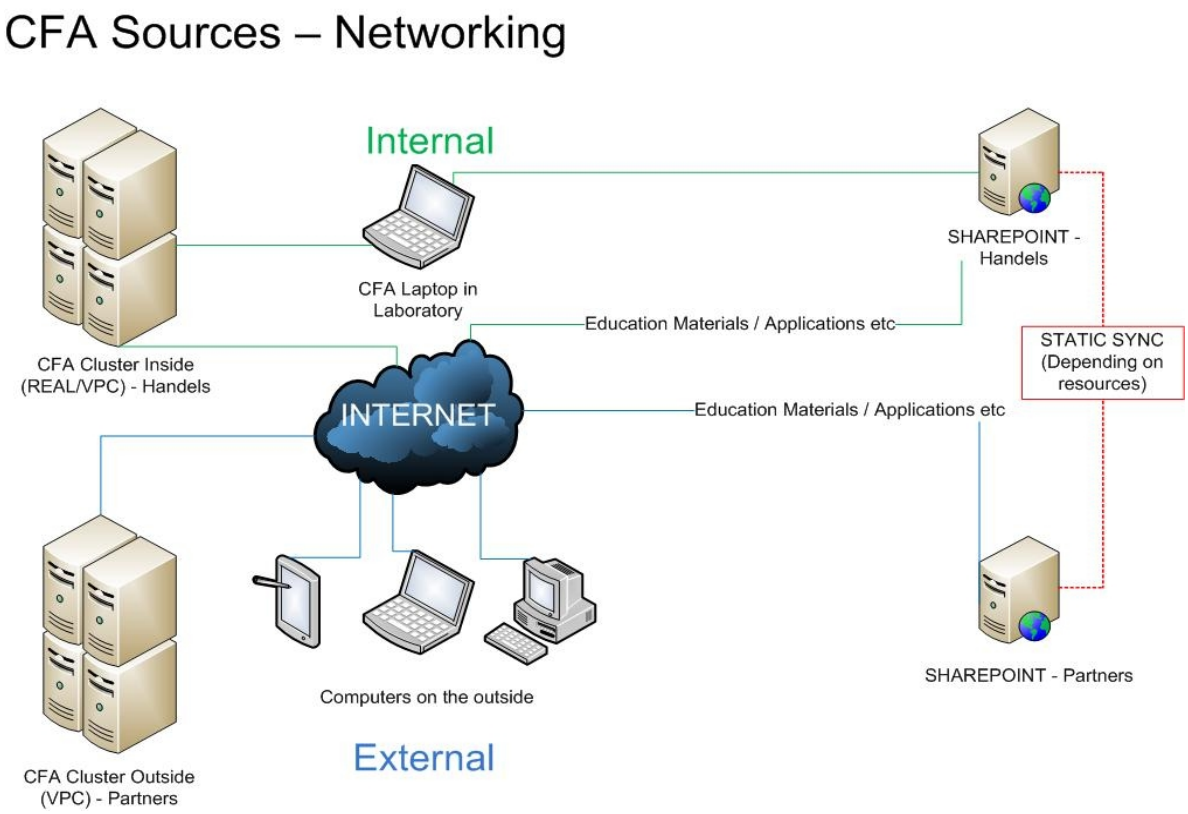

Fig 15: Source overview from the users perspective.

The model above describes the prior models from a higher level. The two layers are connected via the Internet, the external layer can be located anywhere and is not dependent on the internal. Regardless of location of the external layer, the structure is the same. Another component illustrated in this model is the SANTE Academy portal. Updates are by default static, due to member university and portal content needs, This also includes AD integration. Consequently, no automatic mirroring is performed without request.

Usability proves itself reliant and stable on the System I platform

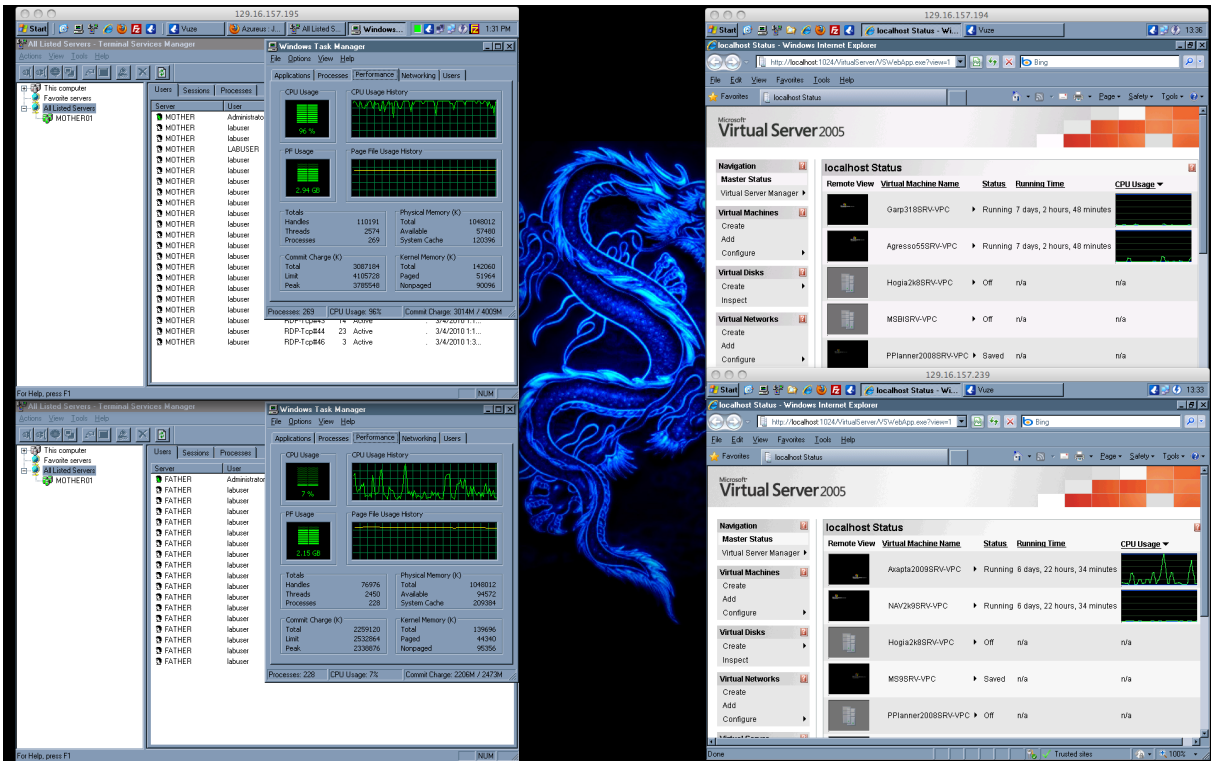

Fig 16: Students from Gothenburg, Lund and Chalmers using SAP, GARP and more, at the same time.

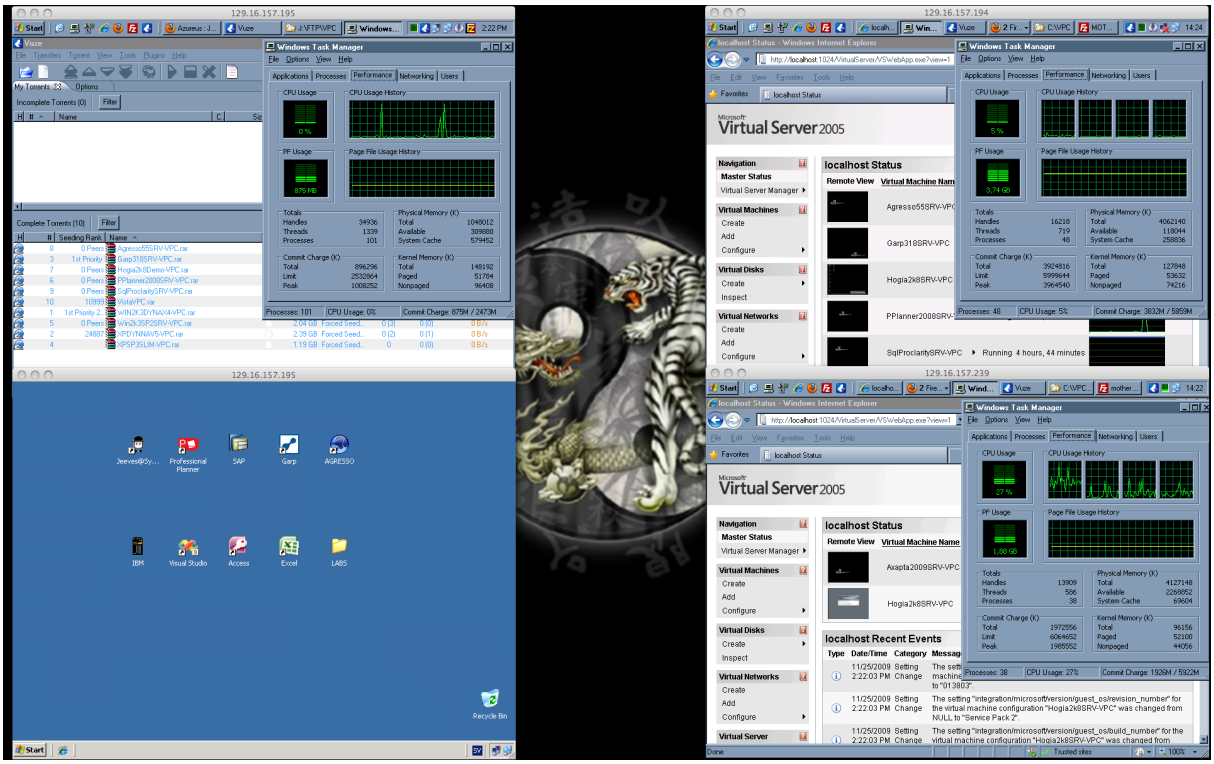

Fig 17: The Torrent share system provided for packaged solutions ran on 4 servers also providing the VPC-Farm, system balance was at max 25%.

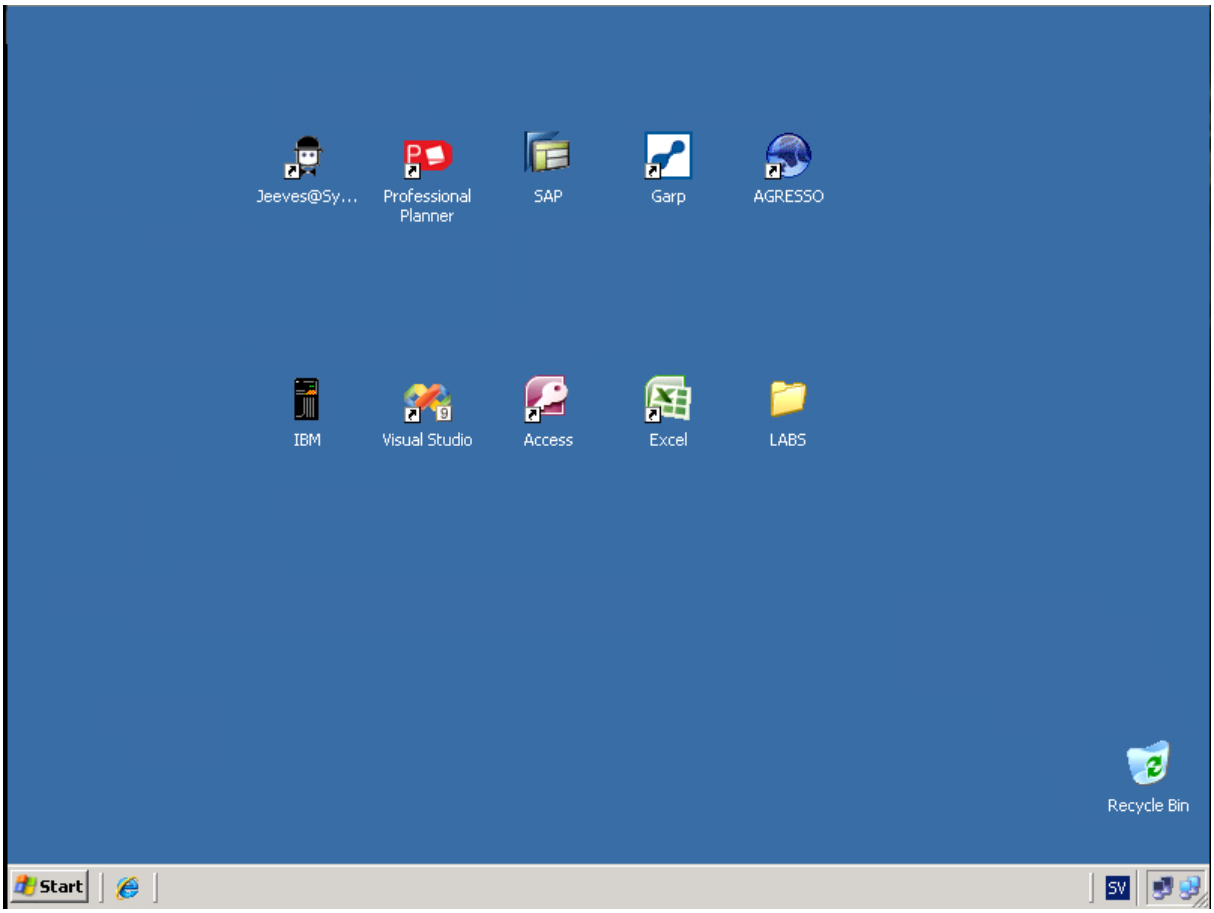

Fig 18: The Application-view MK2.

This became the standard where the feeling of having a ”Desktop” for a user would prove more flexible to operate between the Business Systems. It was now possible to run office software and save work, have a session online 24/7 without interruptions when doing coursework online. During this time allot of different parties started looking towards this platform as a new way of teaching online where even the teachers became the administrator overlooking the progress of the students work when being done and thus being able to help interactively. This is now a standard at CFA when teaching online or physically in a classroom. SAP and the IBM courses became the primary courses online which was the most active during this period.

Fig 19: Mobility became a bonus.

Mobile devices could run this application-view with the same performance based on internet connection, as minimum required by 5.56 modem if necessary. Today a normal cellphone with a OS (operating system) able to use RDP software (Remote Desktop Protocols) are able to run this on GPRS, 3G and so on.


Fig 20: The sponsored IBM platform that ran the Application-view and Torrent Share.

4.6 The Current environment

The Portal

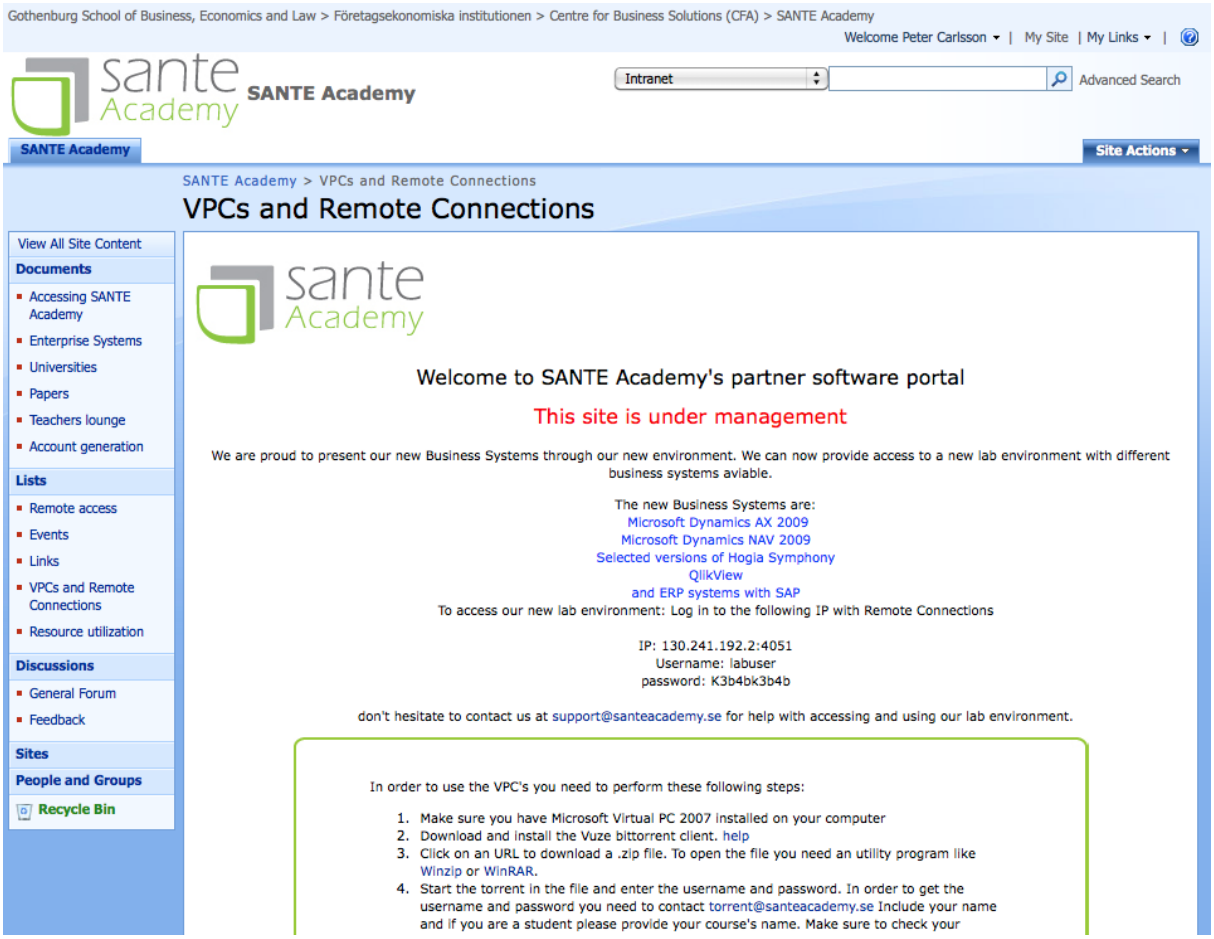

Fig 21: The Sharepoint Portal ”Sante Academy”.

Here starts the process of accessing the environment within CFA. In order to shape some control of the usage, the portal for Sante Academy works as a collaboration and support area for members. Todays focus has mainly been to involve teachers, developers and vendors to access this portal in order to order, construct or collaborate with Business Systems. Sorry to say this is the only control available due to the already increasing usage of the VPC-Farm. The packages solution CFA provided during the 2008 period wasn't enough for the membership Universities to develop on, mainly because of hardware issues on their side but also the lack of technical skills, on both parts it was easier for CFA to construct by order and to let members form the virtualization until completeness until deploy for users. Today there is 3 people forming these virtualizations at the CFA office.

Why this is important to show is that from here the usability on ”where the system is” get's blurry. If presenting every connection within this ”online menu” the users only focus on one thing; which system and how much power is needed to use it. Where the system is doesn't matter anymore as proven by the case of the ITU project where the users didn't realize they where using ITU resources.

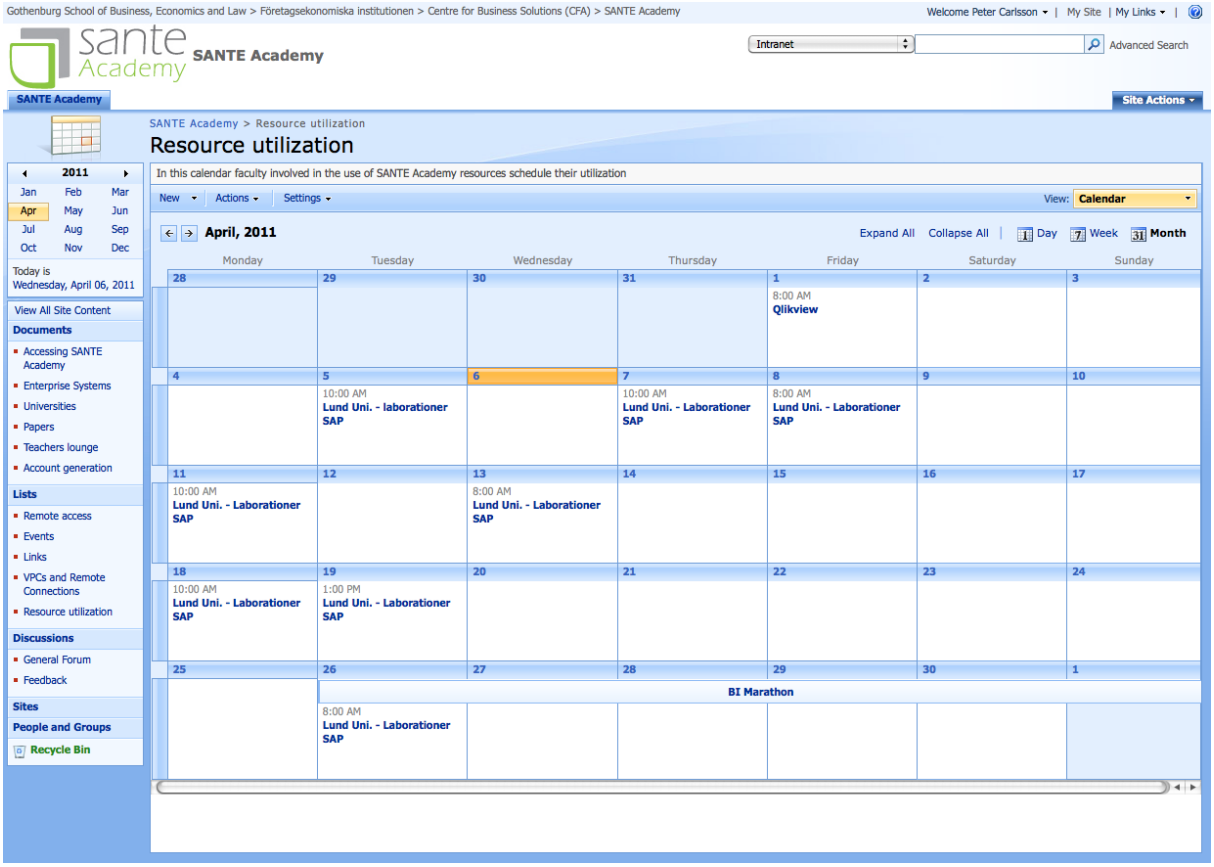

Fig 22: Booking system.

The newly acquired booking system has shown itself to be very useful for all parties in this matter, at least for the understanding of workload but also for the supporters to track usage on the system and be ready for remote support during classes. The is a recently recognized trend that through this system other partners will experience the sense of ”awareness” like;

* Shouldn't we have these courses?
* What is that user using and why don't I use it?
* Should we contact that university and ask how their curriculum looks like?
* Etc...

As mentioned before, allot of human aspect of usage of systems and the planning combined forms new trends in interaction of our systems. Some systems during the first virtualized packages was more or less basic hand outs to members because it said so in the context of the portal, but later on showed that when they saw other systems in use they got curious and started to explore more and more (one of the big reasons of bloating systems).

The VPC-Farm 2011

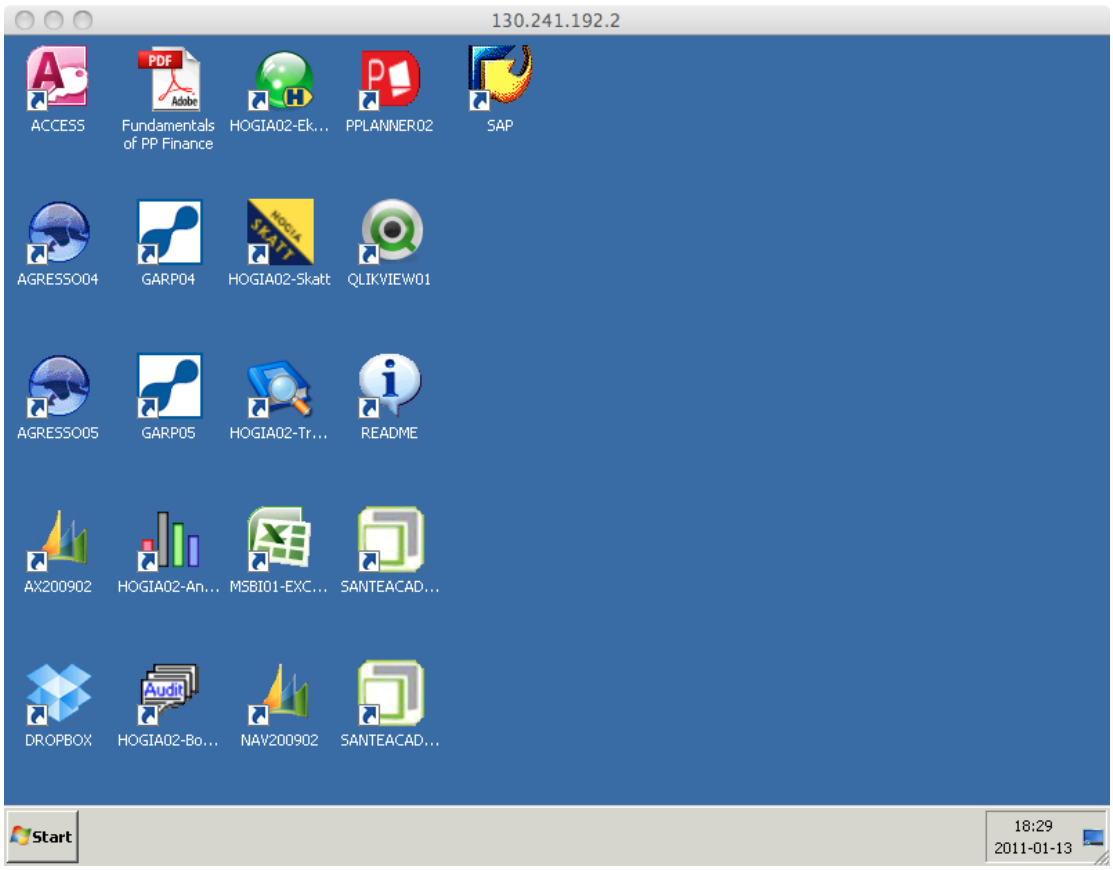

Fig 23: Application-view MK3.

This version is the current setup on a virtualized server within the farm, it's called TSSRV01 (Terminal Services Server 01) and with this construct of supporting VPC's with business systems it's now possible to duplicate the environments and just change address to every host server-farm. As described in this figure you have all of the common used systems and tools used in the courses of the Sante membership construct. This Application-view MK3 can be accessed with computers, mobile devices and web-browsers.

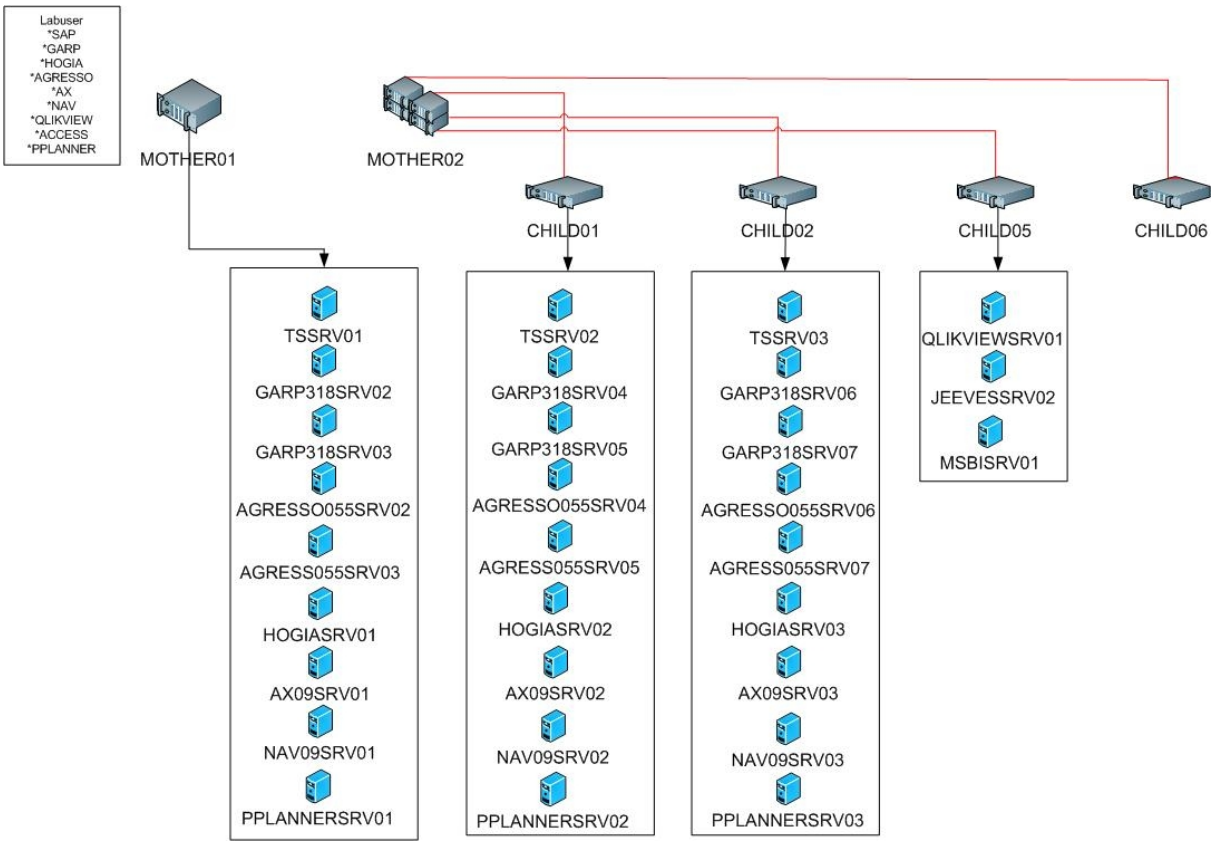

Fig 24: VPC-FARM and locations.

This figure explains the content of MOTHER01 for example which was the second virtualized setup from the ITU project where HyperV was used which is the next generation from the Virtual Server 2005 software. This system proved itself very stable and able to maintain more VPC's at the same time, which made it possible to form a setup to be ”mirrored”. MOTHER01 was the first ”VPC-Farm” in the chain, after 6 months runtime where courses where centralized within this machine it proved itself reliant enough to start making more. A more advanced ”blade-server” was purchased to support the newly obtained ”VPC-Farm” to be a standard construct for all machines, as described in the figure there is now CHILD01 and CHILD02 which runs the base construct like MOTHER01. Today, when a new system is introduced, it now get's connected within this VPC-Farm construct and later ”mirrored” in to several VPC's if it's needed in many courses or setups depending on workloads as seen in CHILD05. After a period of runtime with the new system it later gets to be a standard in the base construct if it's necessary.

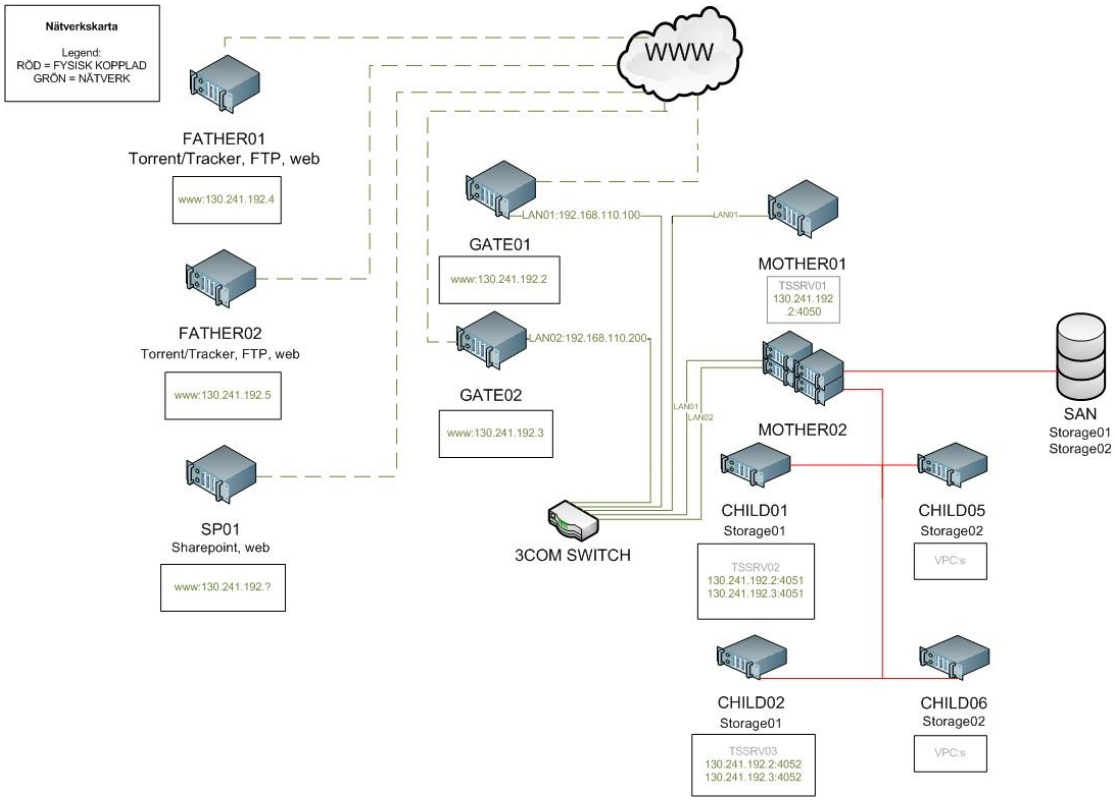

Fig 25: Network Map within the VPC-Farm.

Every virtual server has at least 2 separate connections towards the Internet, primary in this case is GATE01 with it's address, if the connection is down a user just choose the next address for GATE02. Every environment of VPC's has fixed port numbers after this address when you connect with a RDP client. In the figure we also see how the connections are made between the systems, external and internal. The general base and development VPC's are stored in a seperate SAN (Storage Area Network) so a dynamic clustering method works independently between server blades located on MOTHER02. FATHER01 and FATHER02 works as ”seeders” and trackers with torrent technology for the package solution of the VPC-farm, this is where developers, teachers and even students are able to download a base version of for example GARP to run for itself as a VPC on a desktop computer. This works also as a backup if the system would be compromised in any case like corruption of data, hacks, system failures etc. The newly acquired strategy through this torrent solution would now be that partnerships with other universities could result in them downloading the whole base package from CFA and run it within a day thus supporting CFA with workload issues directly, but connecting this package towards the internet as already provided is another matter.

4.7 Planned and established partnerships

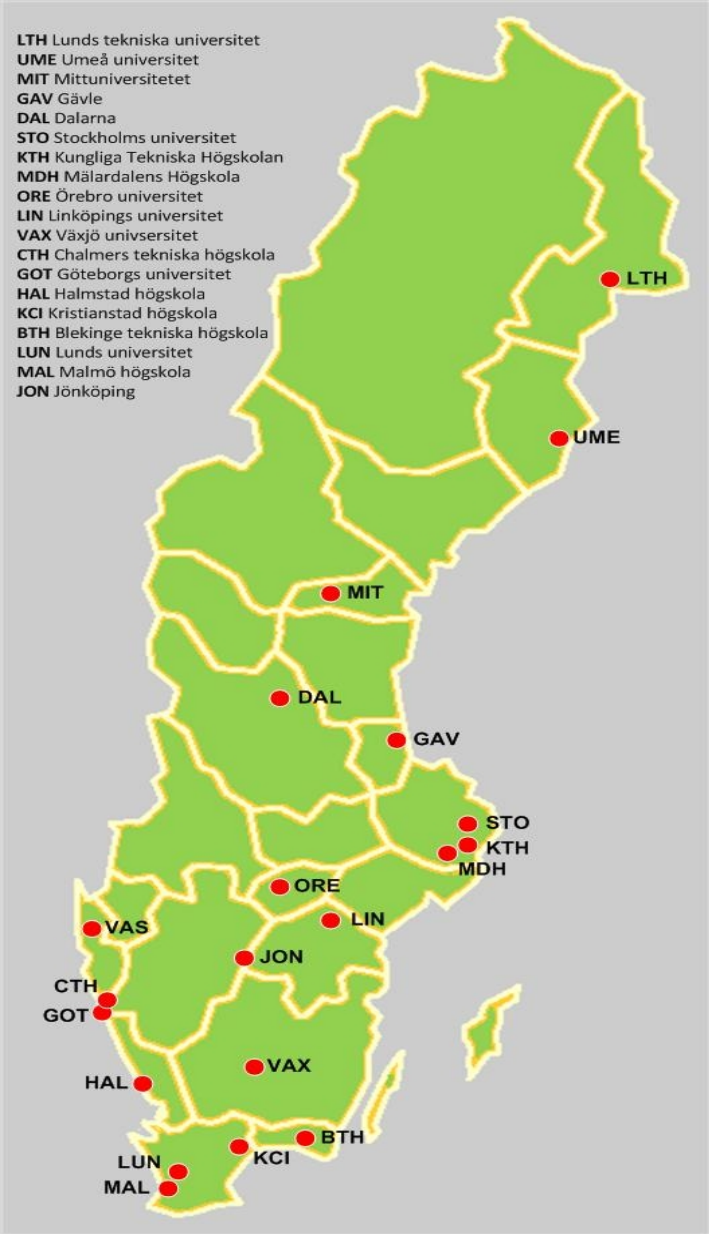

Fig 26: Partnership map for Sweden.

Every part of the university structure in partnership with CFA has it's own user profile set up. Usually as a base it comes with all systems provided, however every system provided also has it's on user account. To obtain this chain of accounts one has to access that information from the portal. The control of over usage is somewhat controlled as long as the different Universities don't sign up for the total package and use it all, all at the same time with maximum number of users. This being good and all solely contained within Sweden, other partnerships have been showing interest outside of the Swedish boarders already, this also being one of the critical usability factors of system bloating.

5. Analysis and discussion

So in order to set some form of control for outsourcing our package base of a VPC-Farm, it would only result in 3 major problems:
* Network issues: Can a connection be made public towards the partner VPC-Farm, do they allow it, what rules and regulation are required?
* Competence and performance issues: How fast must the computers/server be in order to support that university depending on size and do competence for supporting this exist?
* Politics?

5.1 Networks

The first issue could be explained as such, that this is the most common problem especially when establishing what is called a ”cloud” setup within organizations. All organizations has their own standards and regulations towards Internet usage, everything can't simply be accessed and would be a potent security breach straight in a university structure in this case. However a VPC-Farm of this kind can be confined withing a lab or a specific house if that's interesting, but it would not support CFA with bigger workload issues, it would only be a potent usage for the partner university itself. This would directly result in ”Information Islands” described by Magoulas (1998). We would like them to be connected but it opens more issues if the architecture isn't well thought through.

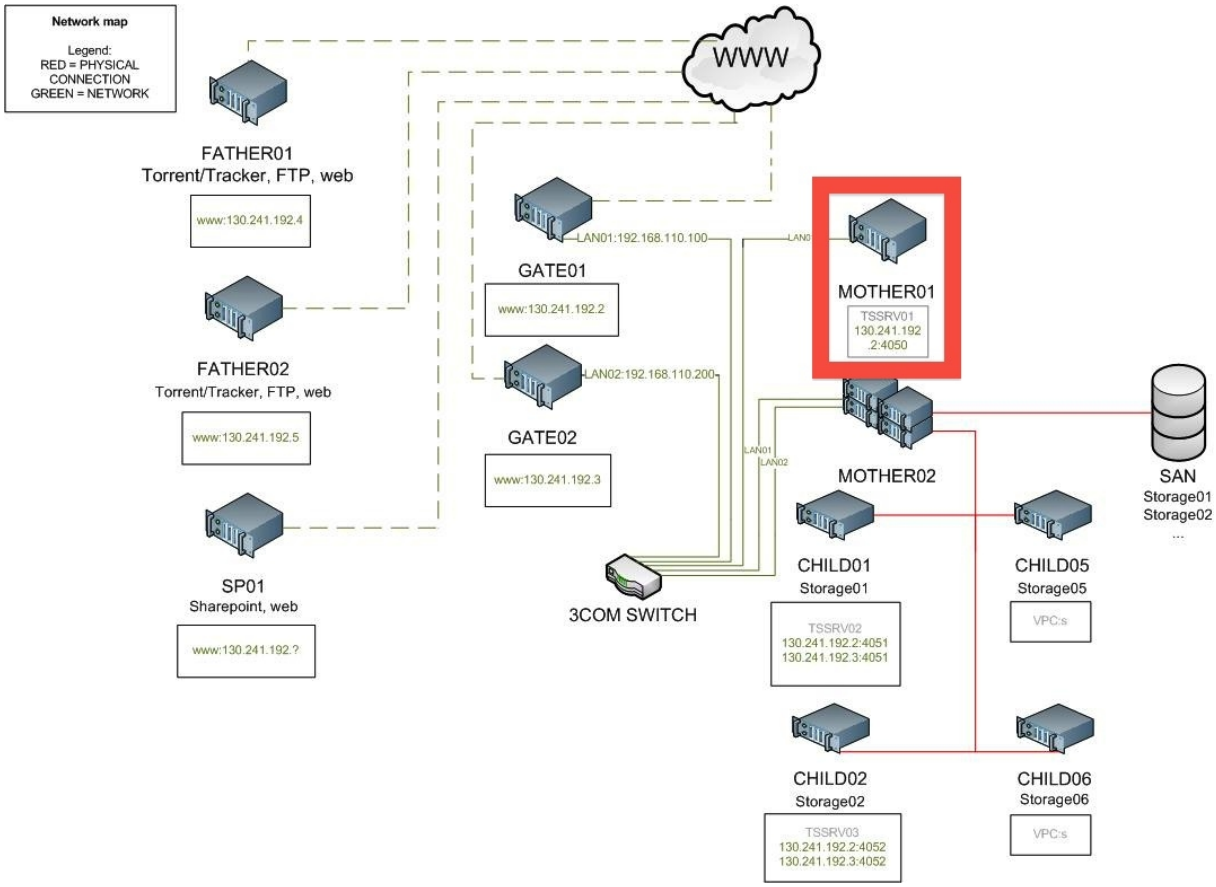

Fig 27: Confined VPC-Farm at Partners, the very safe method.

What the more supported version would look like could differ allot, networks are constructed in many ways, but in all base a relevant node of some kind like CFA's GATE01 is enough to provide access in a controlled way. Doesn't have to be computers or advanced switches like Cisco hardware. It could just as well be low end technology that only acts to open the ports for a RDP tunnel which is enough to provide the software for the users ”waiting” outside. The only control that would be interesting is what happens inside the VPC-Farm at the Partner side, and if corruption, hacks or any miss use of the system could just result in a recover after each period of courses.

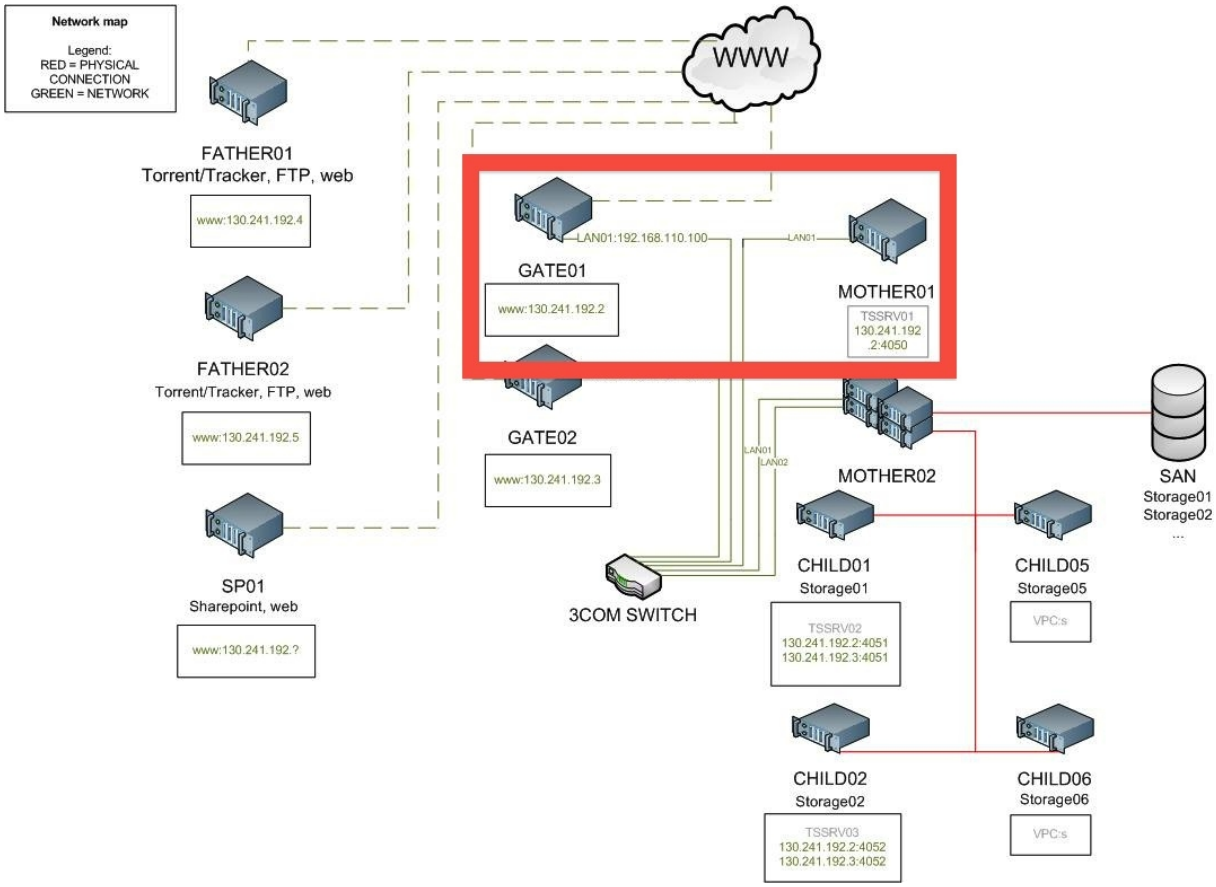

Fig 28: Public VPC-Farm at Partners, not the safest method.

5.2 Competence and performance

The second issue of computer performance to run a VPC-Farm in this magnitude demands a person or support group that understands basic virtualization techniques. There are allot of ways to make a low budget server to run a setup of VPC's in an order that dynamically distribute memory and CPU usage in a way so costs are minimized. If look back at the project in ITU the servers provided during that time was simple server PC's with a IBM mainframe boosting the performance, thus getting rid of allot of performance issues, this is something that allot of hardware vendors develop everyday and it get's faster for lesser money.

5.3 Politics

The third issue is Politics, this meaning the way everything should be distributed, can a school run this software CFA provide? Is the software is ”OK” to use at their own benefits if they are connected with Sante Academy Alliance and the Microsoft Academic Alliance? All systems provided within Universities are in almost all cases bought at Microsoft through their Academic initiative of license distribution, if rules and rights are signed with this MSEULA (Microsoft End User License Agreement) systems can't just be ”copied” to other universities outside of this agreement. However CFA's server systems provided with these license agreement can because of the centralization of usage, the systems are used within that university the license dictates (in this case GU). Even the business systems have license periods where a fixed number of usage in times it can be used or end dates, in CFA's case the VPC-Farm get's unique license due to sponsorships and in the case of expanding/outsourcing this would require more licenses.

“Each company in an industry is in an individual situation determined by its history and current competitive strategy. For smaller organizations within an industry dominated by one or two large companies, the actions of the major companies will often produce new and significant problems for the smaller companies.”(Rockart 1979)

Also the rights of distribution would be very controlled, because the torrent technique would distribute base packages from the VPC-Farm and than lose control to a third party distributor, these licenses contained in this package would mean that the periods must be controlled and temporary to not void contracts with vendors/sponsors. CFA has no control over the third party if they decide to copy all the material/data and use same technology strategy for their own benefit and not support CFA due to the fact that it's a non profit organization within a university which only compete against similar organizations with their brand and intellectual property.

5.4 Information Islands

One problem that would occur from this initiative which almost always happens when outsourcing systems in this magnitude is the control. Magoulas (1998) describes this as Information Island, where systems and users gets confined for allot of different reasons. Who does what? Is the systems working and what current data is stored? These are to most common problems in operation of systems and in CFA's case being updated with the current data for courses is important if the teaching is supposed to be correct. But not only that, as the systems get updated by vendors the coursework also changes in order to match the new frameworks the Business Systems now provides. Since CFA's packaged VCP initiative allot of member Universities today in use of them now still focus on using the exact same version they had years ago and in some cases asking CFA to still support those versions in case of workloads, support and teachings. Some parties just choose not to stay updated because the resources they use are enough to pursue their schedules. Which in CFA's case make information islands where no control over existing VPC's now in operations at member Universities are running since the beginning. If members of all factions now would concentrate on using a broker system as the Portal, they would stay updated and CFA would have the possibility to support those versions now current for the curriculum that exist and to provide choices of helping with outsourced VPC-Farms or just packages of VPC's potent for

the members to use in controlled environments. The trend however shows that more members now seek to work online with every course provided so that they don't have to support CFA.

6. Conclusion

The question of this article was, ”Can SOA solve a bloating university VPC-Farm? A case study of a Virtualized Farm and how to control it from bloating in a university innovation?” and yes it is possible to form a framework of outsourcing based from the case study of the IT-University TechCenter initiative. The rules that became parent to apply to the SOA-solution before outsourcing this VPC-Farm innovation is that it would not be possible for all Universities to form the same sort of framework depending on politics, licensing etc. Vendors would also have some difficulty to work towards dedicated Universities in development if they all had to have the base-package a.k.a “VPC base”. The construct than became a VPC Base and Development. Development can still reside within a university running the VPC Base but it can also be the only initiative for that university if they only focus on research, this makes it possible for vendors to look towards that university with special license models that fits them specifically. The broker system as the portal would prevent information islands in the end where Universities would choose not to keep themselves updated with current events/updates when licensing gets restricted and also preventing the spaghetti-syndrome to just connect bits and pieces towards other IS-Systems.

This construct would need this basic rules to work:
* A base network with common rule settings
* A base performance machine with common technology
* A controlled and monitored License period with a yearly update

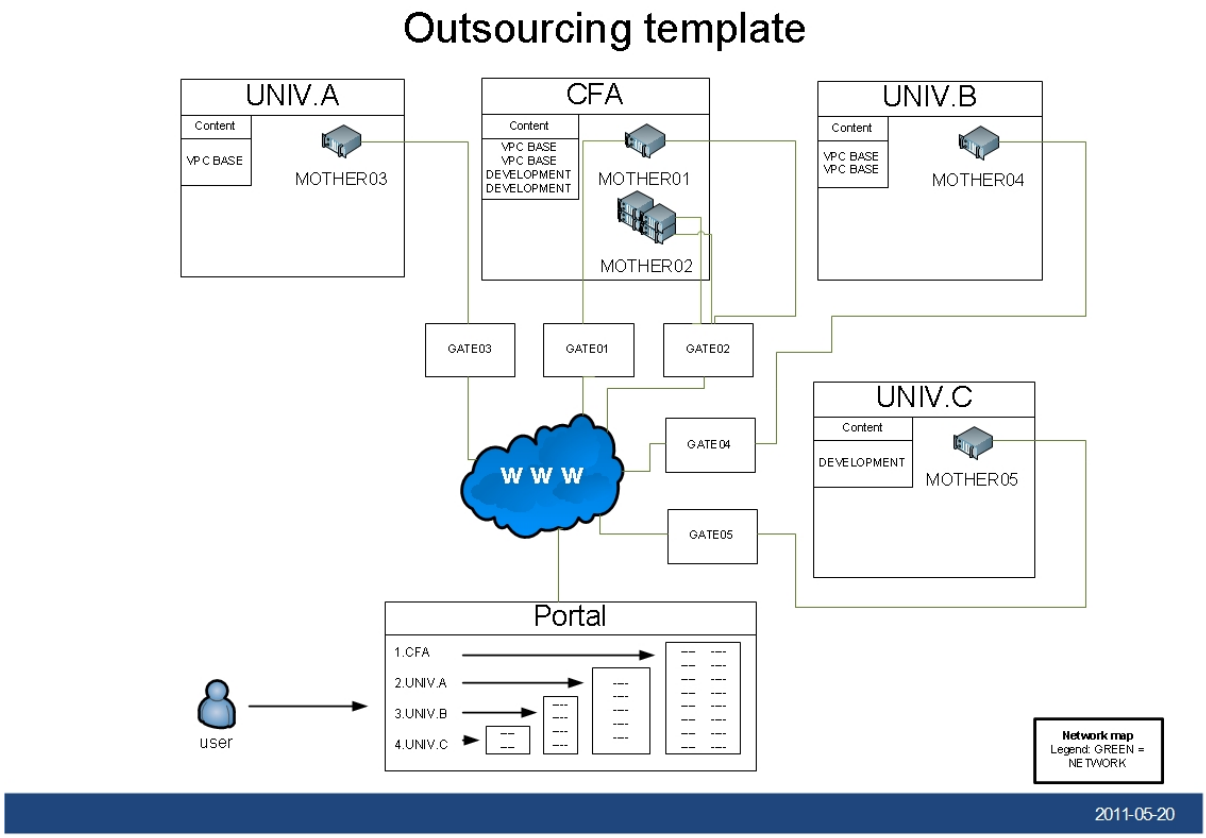

Fig 29: Outsourcing template for specific innovations based by the SOA-model for CFA.

This could prove to be a more productive outsourcing initiative if the VPC Base package containing the Business Systems in need of supporting performance and another VPC Development are located in different partnerships. Mostly based upon the fact that licensing will always be an issue and that a university only can provide ”research” usage of their system, not sell them. Vendors would find resources to advance on, maybe just specifically in a partner university where you focus the Business Systems for research or development. Also the portal would also be able to be centered and not specifically be maintained within CFA, it will work as a broker where you find relevant resources available for usage. If the portal acts like this function, all partnerships would need to update and specify current strategies. A case was also provided in this article where the project of IT-University proved itself reliant as a outsourced initiative, with this statistics and good architectural planing it would now be possible to grow with controlled measures.

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