SYNC&SHARE NORTH RHINE-WESTPHALIA

Teaching Case

Walter, Nicolai, University of Münster – ERCIS, Münster, DE, nicolai.walter@uni-muenster.de
Öksüz, Ayten, University of Münster – ERCIS, Münster, DE, ayten.oeksuez@uni-muenster.de
Compeau, Deborah, Ivey Business School, London, CA, dcompeau@ivey.uwo.ca
Vogl, Raimund, University of Münster – ZIV, Münster, DE, r.vogl@uni-muenster.de
Rudolph, Dominik, University of Münster – ZIV, Münster, DE, d.rudolph@uni-muenster.de
Distel, Bettina, University of Münster, Münster, DE, bettina.distel@uni-muenster.de
Becker, Jörg, University of Münster – ERCIS, Münster, DE, becker@ercis.uni-muenster.de

Abstract

Raimund Vogl is the project leader of a large-scale project which aims to introduce a university-based cloud storage services to major German universities. The protagonist needs to prepare himself for a meeting with the project sponsors, the Ministry of Science and Research, to convince them to go ahead with the project. The scenario is based on a real case and shows real challenges. The university-based scenario helps students to better put themselves in the context of the case. Also, the case serves to teach the basic principles of cloud computing. The main challenge faced by the protagonist is to come up with a plan for user adoption. Accordingly, several technology-related theories can be used. In addition, this goes along with the need of Sync&Share NRW to be perceived as a trustworthy provider. The case helps to understand the concept of trust, the relationship between trust and cloud computing acceptance and ways to gain trust in the context of cloud computing. Moreover, there are two additional challenges. First, the demand for support needs to be solved with only very limited human resources. Second, illegal file-sharing needs to be strictly prevented in order not to suffer from a loss of reputation.

Keywords: cloud computing, infrastructure as a service, technology acceptance, trust, communication.

Introduction

“Most IT professionals do not trust cloud services.” (Ashford, 2012)

Raimund Vogl sighed at the headline as he put down the newspaper. As leader of the Sync&Share North Rhine-Westphalia (NRW) consortium, Vogl had the mission to form a consortium of research and applied science universities willing to participate in a collaboratively organized cloud service for the academic community in the state of NRW in Germany. The Sync&Share NRW project would provide a cloud storage platform designed to cover up to 500,000 academic users by providing six Petabytes of digital storage volume for study material, research projects and reports.
Vogl knew this was already a challenging project, and the sort of scepticism reflected in the headline would not make things any easier. How could they convince potential users to either adopt their service or switch from existing services that many already used? Even more urgently, he needed to prepare for the next meeting with the Ministry of Science and Research – scheduled for the following week – to convince them to fund the project.

Cloud Computing

Vogl was familiar with the fact that cloud computing related to many different technologies. The term described Internet-based computer services allowing the user ubiquitous on-demand service including servers, storage, networks, software and applications. Prior to the development of these services, organizations built and maintained their own technological infrastructure. Yet, with the proliferation of digital data, the hosting of servers became more and more difficult and costly. To this effect an important factor of cloud computing was that the client or user did not own the hardware thus had not to service the infrastructure. Vogl planned to start the meeting with the Ministry by presenting what kind of cloud solution they intended to set up. He remembered an overview of different cloud deployment models which his colleague Mr. Dominik Rudolph had prepared (see table 1). As cloud services could be deployed in different ways such as private cloud, community cloud, public cloud, and hybrid cloud, Vogl wanted to point out which specific solution Sync&Share had in mind.

<table>
<thead>
<tr>
<th>Deployment Model</th>
<th>Definition</th>
<th>Ownership, managerial and operational control of the cloud infrastructure</th>
<th>Physical Location of the cloud infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>Exclusive use of the cloud by a single organization comprising multiple consumers</td>
<td>A third Party, the organization, or some combination of them</td>
<td>On or off premises</td>
</tr>
<tr>
<td>Community</td>
<td>Exclusive use of the cloud by a community of consumers from organizations that have shared concerns (e.g., security requirements, policy, and compliance considerations)</td>
<td>A third Party, one or more of the organizations in the community, or some combination of them</td>
<td>On or off premises</td>
</tr>
<tr>
<td>Public</td>
<td>Use by the general public</td>
<td>Business, academic, or government organization, or some combination of them</td>
<td>Off premises</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Composition of two or more distinct cloud infrastructures (private, community, or public)</td>
<td>A third Party, one or more of the organizations in the community, or some combination of them</td>
<td>On or off premises</td>
</tr>
</tbody>
</table>

Table 1. Cloud computing deployment models, adapted from Mell and Grance (2011).

Furthermore, Vogl knew that available cloud computing services were typically grouped into three categories. In one of the first conversations between Vogl and Rudolph about the Sync&Share NRW project, they talked about the cloud service model for Sync&Share NRW. In this context, general differences between cloud service models was also subject of the conversation: “On the lowest layer, the cloud computing provider manages computing resource such as storage or networks, that is, Infrastructure as a Service (IaaS). On the next layer the user deal with a Platform (PaaS) where he can program his own applications. This service model is most relevant to software or web developers. The last layer is the most complete service. The user can rent complete and turnkey Software through the Internet (SaaS) and does not have to buy software licenses or additional infrastructure equipment.”
With regard to Sync&Share NRW, Vogl and the consortium members agreed that for their target audience storage functionalities were of most interest.

He also reviewed the advantages and disadvantages associated with cloud services. In general, the use of cloud computing was thought to bring a number of potential advantages. Not only were there benefits from outsourcing traditional IT resources but the increasing dispersion of mobile devices as well as the required flexibility of employees necessitated new technologies which could often overwhelm an internal IT shop. Services like GoogleDrive or Dropbox made it possible to store and synchronize huge amounts of data and made it available on virtually every Internet-enabled device. Moreover, cloud computing allowed different users to work on the same documents, thereby economising resources such as time and workforce. Cloud computing services facilitated individual IT-solutions, considering the individual requirements of each organization. Another benefit arose from the pay-per-use concept. The costs of IT-infrastructure thus could be reduced and in the long run kept low. At the same time workforce could be more easily organised and focused on their core task so that in the end a faster Time-To-Market for new goods and services could be obtained. By sparing dotcom start-ups to first establish costly infrastructure and recruiting systems administration staff, cloud services essentially became a big business enabler.

While cloud computing had attracted a great number of users by 2014, there were still concerns. Security concerns were often raised as an issue and several recent security vulnerabilities, some involving misuse of personal data of the users, had been reported. Due to the borderless nature of the Internet, legal aspects became more and more important as most cloud services were bound to the law of a certain nation but operate on a global basis. Thus, worries about the confidentiality of data mandated to cloud services arose, e.g. regarding sensitive research data about product developments. Regarding resource planning, another problem occurred: The clients needed a reliable service which could be available nearly 24 hours per day, seven days a week. But some services could not guarantee a high and dependable accessibility.

Cloud computing providers benefitted from the increasing interest and importance in this information technology. Not only businesses had recognized the multiple benefits of using a cloud computing system; academic institutions had also seen potential.

Cloud Computing in Academia

Vogl and his colleagues were certain that cloud computing technology in an academic environment enabled university IT administrators to control much of their resources with more efficiency and with less cost. Furthermore, they saw that due to browser-based access, university teachers, students and staff could access educational tools or files anytime from anywhere, with many internet-based devices. Moreover, cloud computing facilitated collaboration among working groups, researchers as well as among universities and their partner organizations. Multiple users could share their files and work on them collectively, so that cooperation became easier. In addition, cloud computing allowed collaboration not only among researchers within a faculty or university but among researchers from anywhere by inviting externals to a shared folder. This kind of virtual collaboration could become more important since nowadays a lot of research is done interdisciplinary with team members from various universities and countries.

To convince the Ministry of the project, Vogl needed to present a plan how to reduce the reluctance to adopt cloud computing at universities – not only on the part of the staff but also on the part of the students. The user adoption of the planned cloud service could be at risk due to general concerns as well as competing products. Thinking about these concerns and how he could overcome them reminded Vogl of an informal talk at one of the first meetings where all interested universities came together. While some universities were convinced, others were sceptical about the project and its
potential outcomes. In the end, not all of the universities in NRW decided to take part in the project. A colleague from one of the universities would later explain his decision:

“It is true, researchers or students who store research data in a public cloud of a commercial provider risk losing the copyright not only of their own work, but also of data made available by professors. I know that your cloud service would be different in this respect and students as well as staff members would benefit from your concept. However, the real problem is that most students, and even researchers don’t know that they’re losing the copyright or, even worse, don’t care about this fact. So it will be hard, if not impossible, to get the majority of them to switch from existing cloud services to this new one of yours.”

Vogl had tried to discuss this issue:

“But employees of universities storing sensitive data of their students in those public clouds face legal penalties, as at least Germany has a quite strict data privacy act. In some cases, universities have even officially banned the use of public cloud storage services. At least, such an approach could work as an incentive to make users switch.”

“I didn’t know about the legal penalties. But it still seems a tough task to control the compliance to such bans or to raise awareness for this issue!”

Another colleague joined the conversation. Her university considered to join the consortium:

“Yes, you’re absolutely right. But that’s mostly because most of the universities’ IT departments are not able to provide satisfactory alternatives compliant with data security policies. So, such bans are likely to be difficult to enforce. A lot of students and researchers still use services such as Dropbox not only for private use, but also to organise their projects and group work, or synchronise their notebooks with their PCs. I know that from my own students and colleagues. So this project is a big chance to handle those problems. Besides, I’m pretty sure that the latest public discussions about data privacy increase misgivings towards commercial cloud providers. Just as Raimund pointed out: The university-based cloud is a real chance for us. I’ll advise my university to join the consortium!”

“Well, I won’t. I still don’t see the exceeding benefits. The universities won’t be able to manage and enforce sufficient contract terms. At least, potential users would expect this to be fulfilled, I guess. Which leads me to another, more practical problem: The universities shall bear a part of the expenses. But our budgets and personnel resources are already very limited. We are not able to provide extensive user support. Also, after the duration of five years, the federal state possibly won’t support this project anymore. I don’t see how we can finance this without charging for the use of the service. I don’t think any student would be willing to pay for something he or she can get for free.”

Even though there were some concerns, Vogl was optimistic, as there was clear evidence that the use of cloud computing at universities was on the rise. An examination of cloud computing in education showed an increase of their IT budgets spending on cloud solutions of up to 24% in the next 5 years (Alexander, 2012). New York University had adopted Google Apps for education and for collaboration tools. The University of Oxford provided its employees, research assistants and students a simple, secure and resilient storage option (IaaS) enabling an easy exchange among collaborating partners (Jones, 2013). Cloud computing projects were also underway at universities in Germany (e.g., Technical University of Berlin) and showing some positive effects. Still, there was no state-wide operating cloud service.

In NRW, surveys among academic users regarding cloud storage services conducted at the University of Münster in 2012 and 2013 and at four other universities in 2013 (Aachen, Bonn, Hagen, Ruhr-West) with a total of about 10,000 responses showed very strong demand among both researchers and students for an on premise service alternative provided by the university’s computing centre, and high
awareness of data security issues connected with public cloud services hosted in non-EU countries. Given these results and the mentioned problems associated with the use of commercial cloud solutions, the idea arose to create a cloud computing system only for university purposes.

Sync&Share NRW

Sync&Share NRW was formed by the board of IT managers of 16 research universities in Germany’s most populated state North Rhine-Westphalia (NRW), as a project to set up a cooperatively operated cloud storage platform. Headed by the University of Münster, the consortium filed a funding proposal for a 5-year period with the Ministry of Science and Research in NRW in 2013. After the initial period, further development of the project would depend on its success and further financing opportunities. To keep resource consumption for data centres and network bandwidth at an acceptable level, a distributed deployment of the storage system at three major universities was a key aspect of the project, underlining the cooperative character of this endeavour. As a consequence for the organizational setup, besides the project management team at University of Münster, there would be staff members located at each of the three data centres responsible for the local hardware and connectivity.

The consortium covered approximately 60 percent of the academic community in NRW. The cloud storage platform was targeted towards both students and researchers; a potential pool of 500,000 users. However, participating universities were free to choose if they wanted to make this jointly operated service available for their researchers, their students or all their affiliates. Sync&Share NRW believed that the most relevant service for universities would be the provision of web-storage (IaaS). For example, students could store and share their study-oriented project files. Moreover the university administrations might also be able to use this platform for their own data storage needs. To ensure adequate storage quotas for both individual use and project group collaboration, storage space of six Petabyte was envisioned.

Figure 1. Simplified concept of Sync&Share NRW.

The service was to be provided free of charge for students and researchers, but the costs of developing and providing the service were not trivial. The participating universities were each committed to provide annual financial contributions to cover personnel expenses for the operation of the system. Even though comprehensive system maintenance was being purchased for the whole 5-year period of operation in advance, a position for one staff person taking care of project and operations affairs was to be established and jointly financed. The financial contribution for each university was to be on a per user basis, with the cost per staff member set to 10 times the cost per student. This structure was designed to reflect the prospectively higher utilization by staff members (due to their longer tenure and the amount of research related materials) and the will to have an incentive for participating universities to make this service also available for students. Due to substantial financial support by the Ministry to
foster this collaborative multi university project the pricing was expected to be modest, making it an easy decision for universities to join the consortium.

In order to make the cloud storage platform attractive to participating universities, researchers, and students, Rudolph was assigned to identify the needs of potential users by conducting a survey among participating universities. Furthermore, Vogl had consulted another colleague who was responsible for the technical implementation of the project. When the results of the survey came out, Vogl and Rudolph had a meeting in which they discussed the functionalities of the Sync&Share NRW cloud services.

“The most important and indisputable factor is the high compatibility of the cloud with existing software at the universities – a criterion which any university in-house software will be expected to fulfill.”

Regarding the technical details, Vogl elaborated:

“In order to protect against potential data loss, the cloud should be based on the latest storage solutions such as declustered RAID (Redundant Array of Independent Disks) or RAIN (Redundant Array of Independent Nodes). However, due to the potentially high volume of data and the intrinsic security of the storage system, I don’t intend to use further backup mechanisms. We will provide large storage capacities to accommodate large student projects, doctoral theses, and other research needs.”

Rudolph looked at the survey report and showed it to Vogl.

“The data from the survey indicates that we should provide 30 Gigabytes of storage volume for single users and up to 400 Gigabytes for working groups and projects.”

“This is quite a lot of storage capacity. We should definitely make this point one of the major arguments, at least among students!”

“Sure. Just as the survey results show: Students will see this as a benefit”.

“Furthermore, the cloud will automatically synchronize folders on the different devices and is to include an un-delete-function ensuring that data will not be lost and can be restored without administrator intervention. Thus, the stored data will be available anytime from anywhere, with many internet-based devices.”

“That’s another good point to advertise, since the survey results show that especially students require such functionalities.”

Rudolph was curious:

“Is there going to be any kind of agreement to ensure things like this? People want to have certainty. Even though the universities are mostly considered as upright reliable unit, this doesn’t mean that students or staff will automatically trust us with respect to sensitive data, I guess.”

“I know, but right now, we don’t plan any Service Level Agreements (SLA) or something like that. But of course, the cloud will comply with the university in-house privacy regulations. Another point of discussion in the last meeting with the consortium was the access to the cloud. Some argued that beside current members of the university also alumni should have access right, especially regarding possible research collaborations. But the opponents of this idea were in majority – mainly for legal reasons, so access will only be provided for current university members. Our colleague who is responsible for the technical implementation suggested that the user authentication should be based on the existing authentication systems of the universities. Thus, user management will be in the hand of each university respectively.”
Rudolph replied:

“Well, I like the idea to provide access not only for university affiliates but also for external research collaboration members. To date, researchers are virtually forced to use services like Dropbox to share their research data with scientist from other universities or with professionals.”

“I agree. To prevent the use of commercial cloud services and the linked risks, the consortium came up with the idea to support collaborative work by including options for sharing files also with persons outside the academic community in NRW, like project partners from industry. Moreover, users can apply for additional storage capacity for projects and grant limited access to the shared work environment for external, non-university project members.”

“I think this is a good idea. This could be one key issue for promoting the cloud service and facilitate its use especially among the university staff. I can imagine that this is not particularly relevant for students. But for researches, this is crucial, isn’t it?”

**Current Challenges of Sync&Share NRW**

With key design decisions made, Vogl’s main concern now was to convince the Ministry that their project could succeed which entailed having a clear plan of how potential users would be attracted. What could be worse than setting up a platform that nobody uses? This would lead to a huge loss of reputation for all members of the consortium and even for the sponsors, the Ministry of Science and Research in NRW. Vogl remembered a survey which members of the project team and some other colleagues had conducted at their university a few weeks previously. The results showed that students as well as researchers did consistently utter strong demand for cloud storage service. However, more than 80% of potential users of Sync&Share NRW already used competitive products such as Dropbox. Vogl was well aware of the fact that convincing the Ministry included an idea of not only how to gain new users but also how users of competitive products could be attracted. Moreover, he worried that students, academic and administrative users might had different expectations and concerns. He felt a great challenge to gain everyone’s trust in the project and its services.

The survey gave more information that was relevant to Vogl. Most respondents believed that universities, in contrast to private organizations, were not driven by profit interests and, thus, would not give their personal or stored data to third parties. In that way, universities and public organizations were generally perceived as more dependable service providers than private organizations. However, a few of the respondents mentioned that they perceived universities not to be as good as private cloud computing providers when it came to the capabilities needed for securing data from hackers. Vogl, as the director of IT at the University of Münster, was surprised about these statements since he knew that the security measures they had implemented were at least as good as the security standards of private cloud computing providers. Given the fact that implementing adequate measures to ensure data security and data privacy were among the main requirements imposed on cloud computing providers, Vogl wondered whether this could be problematic for a university-based cloud service. What worried him additionally was the fact that a significant amount of respondents indicated that personal support were important to them – how could he deal with this demand since end-user administration and support have to be kept at a minimum due to restricted human resources?

One other concern was bothering Vogl. As a publicly funded project, it was clear that the service should be primarily used for university related purposes. But he was unsure of the best ways to ensure this was happening. Moreover, he remembered the early days of peer to peer file sharing systems for music (such as Napster.com) and the struggles of universities to block such copyright protected content. Any copyright infringements could lead to substantial reputational damage and it was imperative to find means to prevent this without challenging the usability for and liberty of the
academic community. What was the responsibility of Sync&Share NRW to manage this content? And what were the best mechanisms to try to promote responsible use? What a pity it would be, to put so much effort and resources in such a cloud service to foster academic research and teaching, but end up in ill repute due to abuse by its users.

Raimund Vogl’s quest

Less than a week remained before Vogl was expected to present his recommendations to the Ministry, and he knew there were many unresolved questions. He was convinced that the project could become a huge success for the potential users, stakeholders, and for his project team. It was on him to lead the project in a promising direction. However, before he could start with the implementation, he had to convince the sponsors to fund the project. The Ministry required a clear plan of how potential users could be attracted and was likely to challenge him on how he would deal with the other hurdles. How would he convince the Ministry that this project can succeed?

References