Business from technology

User experience and Security in the Cloud
– An Empirical Study in the Finnish Cloud Consortium

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Background

- A large Cloud Software Program on-going in Finland through years 2010-2013
- Launched by the Finnish Strategic Centre for Science, Technology and Innovation TIVIT Plc., formed for the advancement of the Finnish ICT sector
- The program brings together a prominent portion of the Finnish industry and academia dealing with the cloud and cloud services

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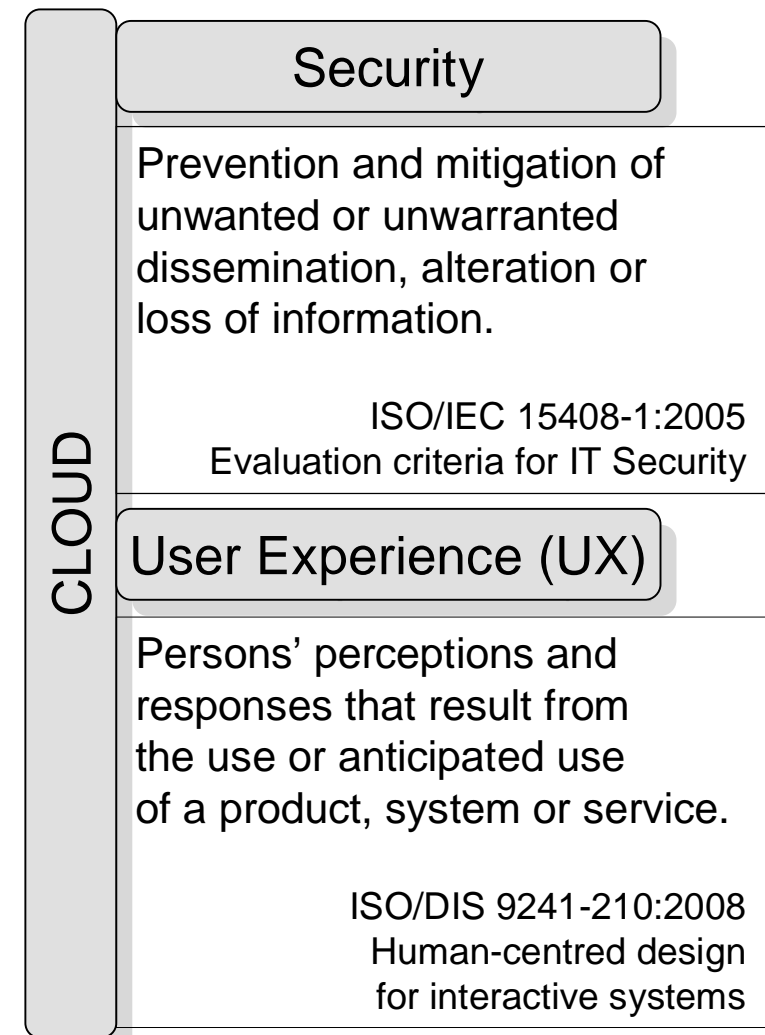VTT - Technical Research Centre of Finland

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Introduction

- In addition to wide-spread use of cloud service in industrial sectors, they are also today's reality in consumers' life; typical web users use cloud services daily whether they know it or not

- Majority of current research on cloud services takes the industry perspective

- A less studied, but equally important, area of cloud research – end-user perceptions

- From user's perspective security can be considered boring, complex, scary and/or geeky = difficult to use

Research Themes & Method

- Methodology
  - Semi-structured theme interviews
  - Thematic analysis
- Standard interview questions
  - *Background, experience*
    - Education, work history, current occupation
    - Length of experience in the field
    - Field of expertise
  - *Basic definitions*
    - Information security
    - User experience
    - Cloud environment
  - *Themes*
    - Information security advantages and challenges in the cloud from the user point of view
    - User experience advantages and challenges in the cloud from the user point of view
    - Choosing the cloud service provider
    - User awareness of cloud and security, presenting the security level in the cloud
    - Responsibilities between the user and the cloud service provider

CLOUD

Security

Prevention and mitigation of unwanted or unwarranted dissemination, alteration or loss of information.

ISO/IEC 15408-1:2005
Evaluation criteria for IT Security

User Experience (UX)

Persons' perceptions and responses that result from the use or anticipated use of a product, system or service.

ISO/DIS 9241-210:2008
Human-centred design
for interactive systems

The study

- An empirical analysis of security and UX issues in the cloud environment from user-centric perspective
  - A highly selective sample - the perceptions of experts who have used and are knowledgeable of cloud services
  - Interviews of eleven experts who are participating in the Finnish Cloud Software Program Consortium and who were registered to the mailing lists of either the Superior UX or Integrated Security themes
- Basic demographics of the interviewees:

Organization		Education		Task		Expertise	
Multinational companies	8	MSc	6	Expert	7	Security	4
University or Research organizations	3	Lic./ PhD	5	Mgmt	1	User Experience	3
				R&D	3	Cloud Computing	4

Results - User experience in the cloud

- Interviewees' definition: The issues that cover an overall experience from the service or a product in the cloud; from aesthetic characteristics such as look and feel to ease of use and how a user can get their whole desired activity done in the most trouble-free way

- Aspects that affect the user experience in the cloud:
    - Trust, and how do users choose between different service providers
    - Liability issues between the user and service provider
    - User comprehension of the cloud
    - Security awareness

UX affectors in the cloud	Mentioned by % of interviewees
Trust	100 %
Liability between cloud user and provider	63 %
Users' comprehension of cloud	45 %
Security awareness	36 %

Results - User experience in the cloud: Trust

- Trust identified as a key to enriched user experience
- How do users lay confidence in the cloud services of their choice?
    - established brand
    - referral by a friend
    - social networking
- The actual functionality of the service will build real user experience and create trust in the long run

Trust creators	Mentioned by % of interviewees
Brand reputation, image and name	91 %
Friends' opinions	45 %
A critical mass of users	36 %
Open source sw, transparency	27 %
Own experiences	27 %
Search engine results	18 %
Understandable EUL agreements	18 %
Price	18 %
Ease of use, good functionality	18 %
Nationality of the company	9 %
Language	9 %
Visual image of the service	9 %

Results – User experience in the cloud: Liability issues

- The division of liabilities = who has what responsibilities in the cloud environment, between a Cloud Service Provider and user
- One of the main challenges: different jurisdiction within each country
  - *"If you are in USA and click "Yes" on the disclaimer which puts all the responsibility to you, it is legally binding, but if you do the same in Finland, the service provider may still have some responsibility."*
- The responsibilities depend heavily on the specific situation; either the user, the network operator, the CSP or any combination of these three
  - The network operator should ensure that connections are up and running
    The CSP should guarantee that the data is safe and kept private
    The user should always maintain some degree of common sense
  - *"The responsibilities are shared, definitely. You as a user, if you use a password that is, very easy, like your name or your birth date, or 1234 or something like this. But definitely the service provider is responsible also to a certain extent; that the network is secure, that there is no way that a third person is accessing the network from a back door for instance."*

Results – User experience in the cloud: User comprehension of the cloud

- The basic principles of cloud are not thought to be very clear to the users in general

- How to explain cloud computing in such a level that it would not create more insecure feelings towards this new technology?

- Marketing focus on the services cloud enables and not on the technological aspect

- Simplicity and automation are needed, to protect the end user so that he can safely carry out his operations.

  - *"Theoretically speaking, if the security is well handled, and the programs are robust and secure enough, for the user, the user shouldn't care. If there is a browser and there is a process underneath and there is an operating system, he shouldn't care about that."*

Results – User experience in the cloud: Security awareness

- Average users would need to be more aware of security issues in general, and within the cloud

- At the moment there are great differences on the security awareness level of users, probably mostly based on the age and education of the user
  - *"Age range could be forty; people under forty are interested but over forty don't care?"*

Results - Security in the cloud

- Interviewees' definition:
  - Having a safe, authentic and reliable access to the data
  - Ensuring the continuity of the service
  - Sharing of the security threats transparently

Cloud security threats	Mentioned by % of interviewees
Profiling, identity thefts	45 %
Privacy threats	45 %
Availability breaches	36 %
Liability, data ownership and copyright	27 %
Data sanitation problems	18 %
Access rights	9 %
Backward compatibility	9 %

Cloud security promoters	Mentioned by % of interviewees
Reliable data storage	63 %
Ubiquitous data access points	45 %
Professional security management	36 %
Threat analysis possibilities	9 %

Results - Security in the cloud: Positive effects

- Users not need to worry about losing the data if their personal computer is damaged or stolen; automatic backups

- Opportunity to access the data from several locations and with several devices
  - *"Everything is centralized, you can access your information from any terminal, doesn't matter where you are, it doesn't matter the type of terminal."*

- Information security handled by professional experts within the cloud
  - *"Good thing is that you can have really professional companies managing your security in the cloud. When you're handling your data locally, you can have a lot of potential threats in your machine, because you are not an expert. However, someone who is really expert in that, well, I really believe that they can handle the risks much better than you do."*

- Security companies will be able to receive big samples from a large number of computers easily and quickly

Results - Security in the cloud: Threats 1/2

- Identity theft by a third party easier with the massive amount of personal data in the cloud
  - *"If I have access to your social networking account, it's not only the data I have from your account, but also lots of your personal information can be extracted from those you are connected with."*
- Profiling and possible exploitation of user information by CSP: the user's personal space in virtual cloud environment should not be breached
  - *"Cloud will raise profiling possibilities to a new level, when you can interconnect where the person moves, where and what he buys, whom he sends which kind of messages, what he updates to Facebook etc. Pretty much anyone can be profiled that way."*
- Privacy questions: cloud expands the risks and the effects of the incidents
  - *"It's not only the threat of your person, your information, but also your friends' information, and the people who is in your network."*

Results - Security in the cloud: Threats 2/2

- Loss of availability to the data stored in the cloud environment: connection, capacity and bandwidth problems possible

- Liability and data ownership issues: who owns the data - liability, privacy legislation and copyright issues

- Access rights and data sanitation: how can the user be sure that his data is available for only to the group of people it should, or that the data is really removed when the user asks it to be removed

- Backward compatibility problem: all the data is handled within the cloud, with the updated software existing in the cloud, what happens when the user wants to handle his old data that was stored in an old format which the newest software does not support anymore?

Results - Presentation of the security effectiveness level

- The presentation of security within the cloud services should cover wider scope of users, ranging from those who want to have options to choose and build customized security to those who neither understand nor want to understand security issues, but just want to have a safe experience
  - *"Security should be invisible, unnoticeable, flavorless and odorless; so that it just would be there and work but would not disturb everyday life too much."*
- There should be a way to give each different user group a safe and secure feeling of the cloud
- Secured connection and good security level of a service should be presented clearly
- Suggestion: security could be transferred to a great UX for example by visualizing the security effectiveness level with different colors; a cloud service could notify users in user-centric sentences whether the content accessed by the user is safe or not

Results - Marrying security and user experience

- Success of a cloud service may depend on finding the right way of combining good security and superior user experience
- Good UX can forgive security risks, even for a security expert:
    - *"When Gmail came, I remember thinking that I am never going to use it because Google will read all my mails. Well, when I tried it once with a test id, I was like, wow, everything works really well here, and this is by far the best made webmail ever. Then I started to use it, and thought that ok, Google can not be so interested in me as an individual person, and did not care about that any more. It just works; it is so much better than anything similar I have ever tried."*
- Marrying security and UX seems mostly be about providing the highest security to cloud service users in a non-intrusive manner

Summary

- Providing non-intrusive security with reliable access to the data is crucial for users

- Our study is one of the initial ones in a four year Finnish Cloud Software Program. We aim to further examine user experience and security perspectives in more detail during this and the following year

- Results of this study have outlined the area and given deeper understanding about the challenges

- Long term challenges:
    - Understanding what creates good user experience of security in the cloud environment
    - Understanding what is the user vision of security in the cloud, how it is formed, and how it can be improved

Thank you!

Questions?

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