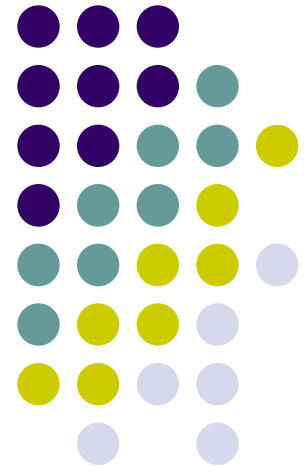
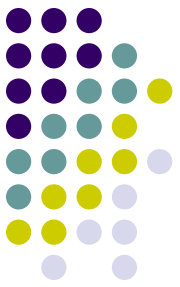

Cloud Computing Adoption: What are the Issues?

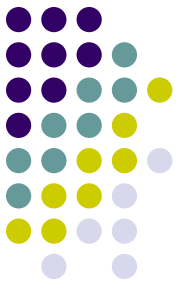
George Feuerlicht,
Lukas Burkon and Michal Sebesta
University of Technology, Sydney
Prague University of Economics



Cloud Computing Research Group @KIT (CCRG)

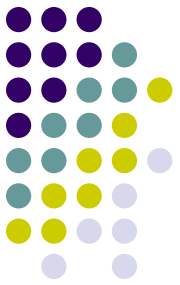


- Objectives
 - Improve understanding of cloud computing issues
 - Development of adoption guidelines
 - Enterprise Architecture for cloud computing
 - Dissemination of outcomes
- Membership
 - Prof. J. Vorisek, Doc. J. Feuerlicht, Dr. J. Donat, Ing. I. Cermak, Ing. L. Burkon, Ing. M. Sebesta, and DP/BP student members
- Research Projects
 - IG406040 (2010)
 - GACR P403/11/0574 (2011-2013)

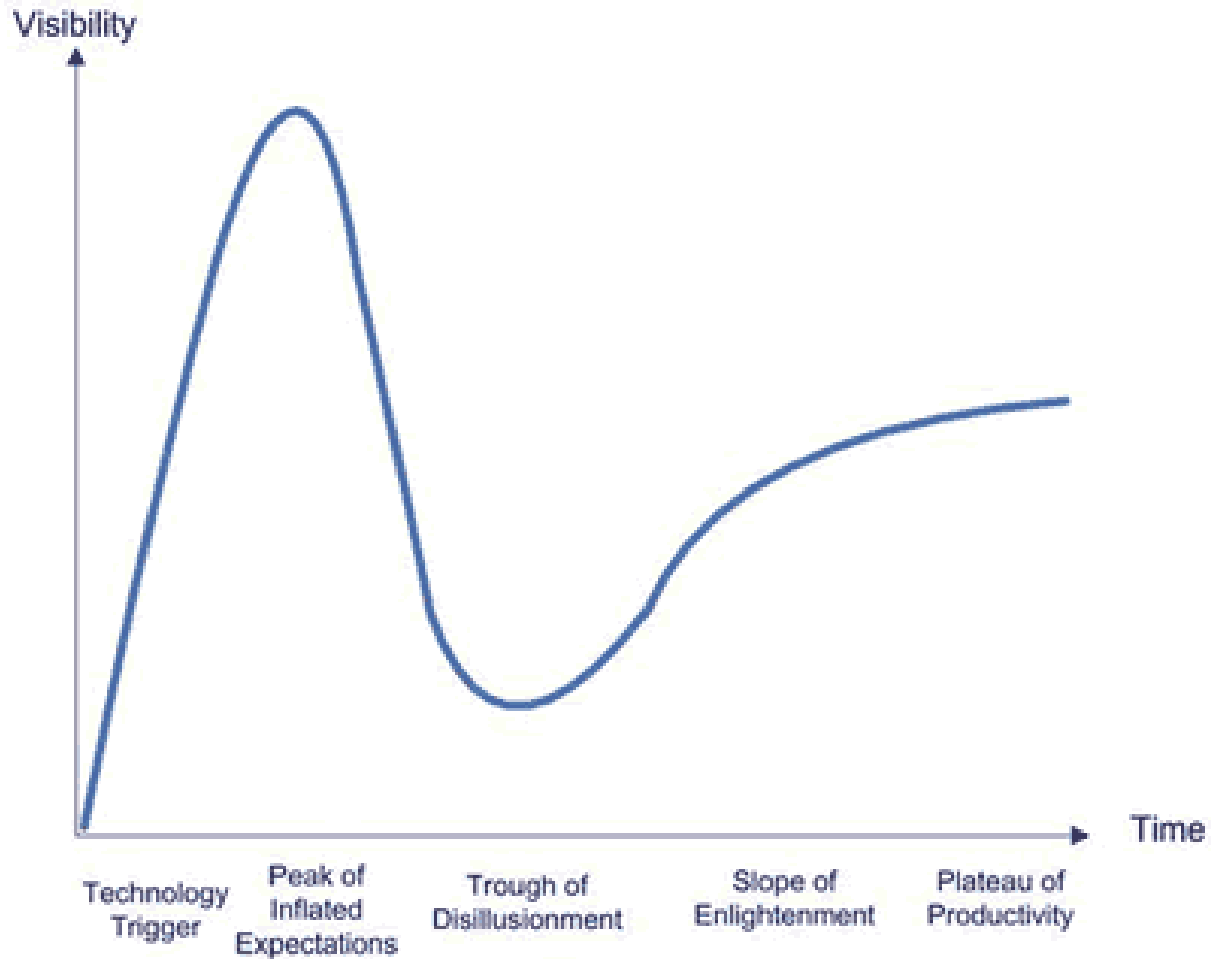


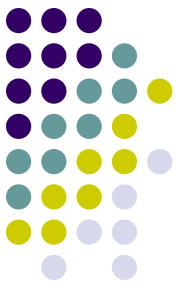
Outline

- Cloud Computing Predictions
- Cloud Computing Benefits and Challenges
- Cloud Computing Adoption Issues
- Conclusions



Gartner Hype Cycle





What are Analysts Saying?

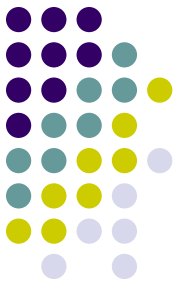
- Cloud computing is becoming a strategic priority for most executives [Ovum 2011]
- 38% of business executives make cloud computing a high or critical priority and 18% have budget allocation for cloud computing services [CIO Magazine]
- Worldwide SaaS revenues in 2011 to reach \$10.7 billion, a 16% increase from 2010 [Gartner]

Cloud Computing Predictions



- Worldwide revenue from public IT cloud services to reach \$55.5 billion in 2014, representing a compound annual growth rate of 27% [IDC]
- Global cloud computing market to grow from \$37.8 billion in 2010 to \$121.1 billion in 2015 at a compound annual growth rate of 26% with SaaS accounting for 73% of the market's revenues 2010 [MarketsandMarkets.com]

Which Services are Popular?



- 59% of surveyed organizations regard cloud computing as the future of IT and 45% of organizations are already using cloud computing services [KPMG]
- Most organizations (39%) are using application hosting services, followed by data storage (32%) and e-mail and messaging services (29%) [KPMG]

Cloud Computing Benefits

[A View of Cloud Computing, Armbrust et al., 2010]



- Reduced cost – minimal up-front cost
- Predictability of costs – “pay-as-you-use”
- Rapid Implementation
- Elasticity – up and down scalability
- Short-term renting of computing resources
- Responsibility for operation and upgrades transferred to the provider
- Reduced demand on skills and IT staff
- Enables new innovative solutions

Cloud Computing Challenges

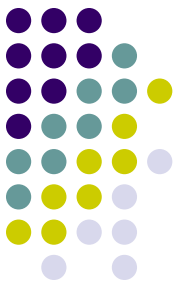
[A View of Cloud Computing, Armbrust et al., 2010]



- Data Security and Confidentiality
- Service Availability
- Business Continuity
- Data Lock-In
- Auditability
- Data Transfer Bottlenecks
- Performance Unpredictability
- Reputation Fate Sharing

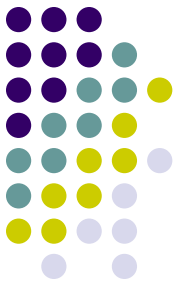
User Concerns

[IDC, 2010]



- Security (87% of respondents)
- Service availability (83% of respondents)
- Performance (83% of respondents)
- Higher costs (when compared to on-premise implementation) (81% of respondents)
- Lack of interoperability standards (80% of respondents)
- Data lock-in (80% of respondents)
- Difficult integration (77% of respondents)
- Limited customization (76% of respondents)

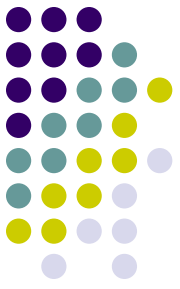
Provider Liability – Small Print



- “We will have no liability to you for any unauthorized access or use, corruption, deletion, destruction or loss of Your Content or Applications”
[Customer Agreement, AWS]
- “Salesforce.com shall not be responsible or liable for the deletion, correction, destruction, damage, loss or failure to store any customer data”

Amazon Cloud Outage

April 2011



- On 21/4/2011 human error during system upgrade caused overloading of network traffic in the U.S. East Region
- Some customers without services for days
- 0.07% of the data could not be restored to a consistent state
- Amazon EC2 SLA guarantees 99.95% availability
- *Affected users received a 10-day usage credit*

Cloud Computing Adoption in CR - KIT MIS Survey (2010)



- MIS Survey 600 Czech organisations
- Only 4% of respondents indicated that they are currently using cloud computing services
- Only 6% of respondents indicated that they are planning to use cloud computing services within the next two years

Motivations for Cloud Computing Adoption



- Cost reduction (26%)
- Rapid deployment (20%)
- Improved scalability (19%)
- Improved flexibility (17%)
- Improved support for business objectives (13%)

Barriers to Cloud Computing Adoption



- Dependence on external providers (17%)
- Increased cost of subscription models (15%)
- Security concerns (14%)

KIT Cloud Computing Survey



- Pilot survey in November 2010 using an online questionnaire
- 135 organizations surveyed 38 responses received (response rate of 28%)
- 62% local companies
- 77% SMEs (headcount < 250)
- 69% ICT sector
- *Small sample – no statistical significance*

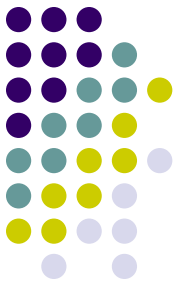
Cloud Computing Definition (NIST)



“Cloud computing is a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

[The National Institute of Standards and Technology
(NIST), Information Technology Laboratory]

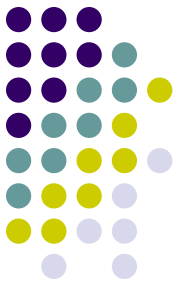
Cloud Computing Definition (KIT)



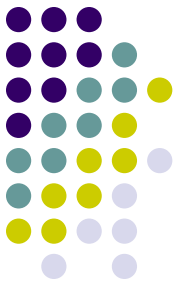
Cloud Computing involves the delivery virtualized IT resources as services over the Internet. Cloud Computing services are delivered in a scalable and secure manner from a remote data center on a “pay as you use” basis, and are categorized into infrastructure services (IaaS), platform services (PaaS) and software services (SaaS).

[public clouds only]

Cloud Computing Motivations



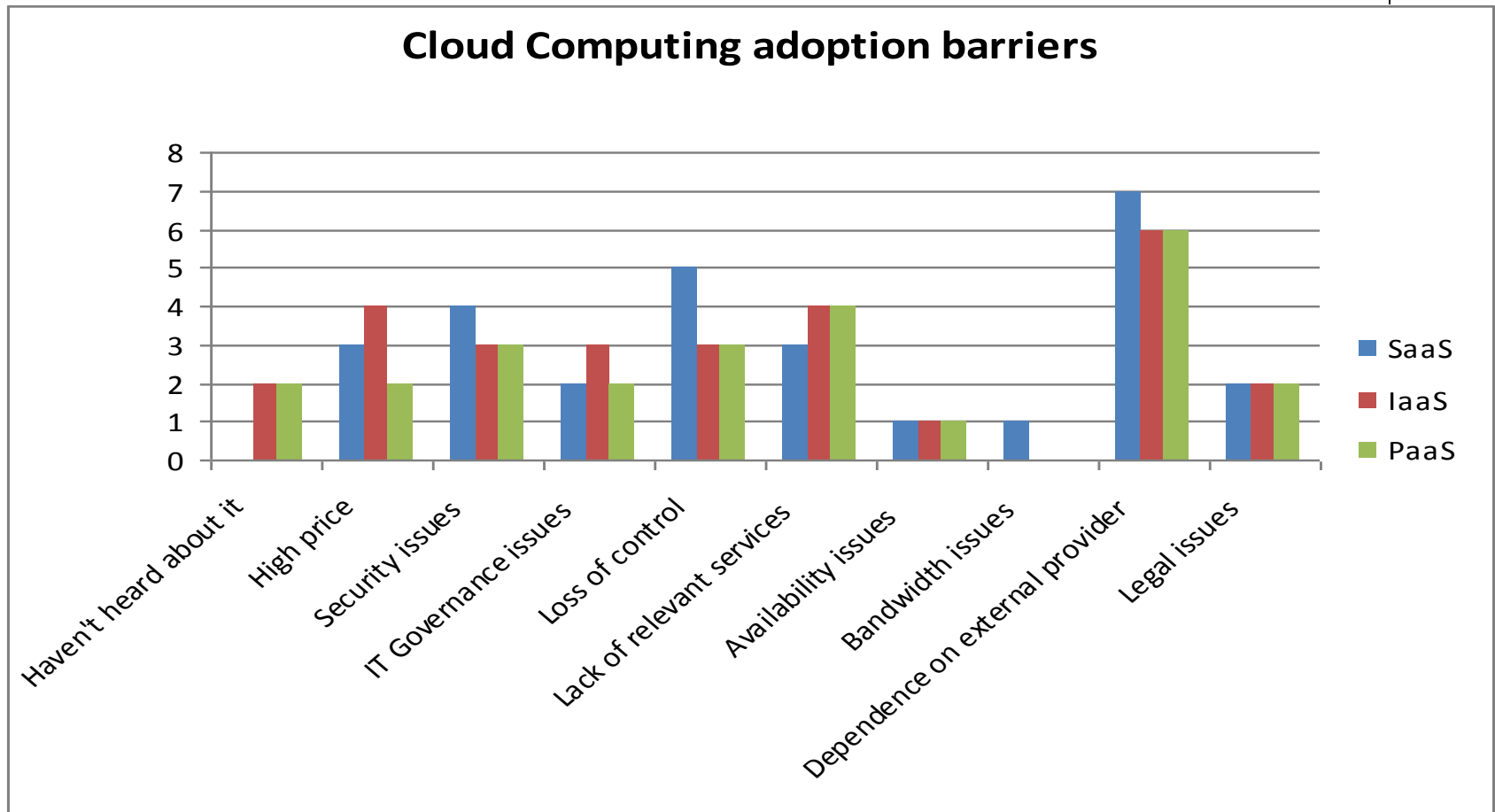
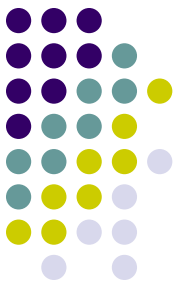
- SaaS motivations: ***cost reduction*** and rapid implementation
- IaaS and PaaS motivations: ***improved scalability*** and rapid implementation

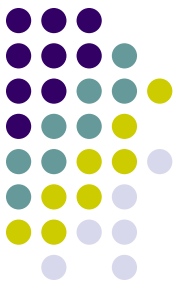


Adoption Challenges

- Companies that have not adopted cloud computing were concerned about increased ***dependence on external providers, lack of availability of suitable services, and security***
- Companies that have adopted cloud computing services were mainly concerned about ***security and in the case of SaaS about high costs.***

Adoption Barriers

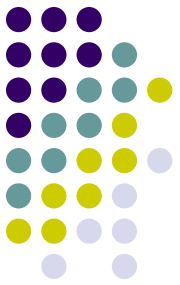




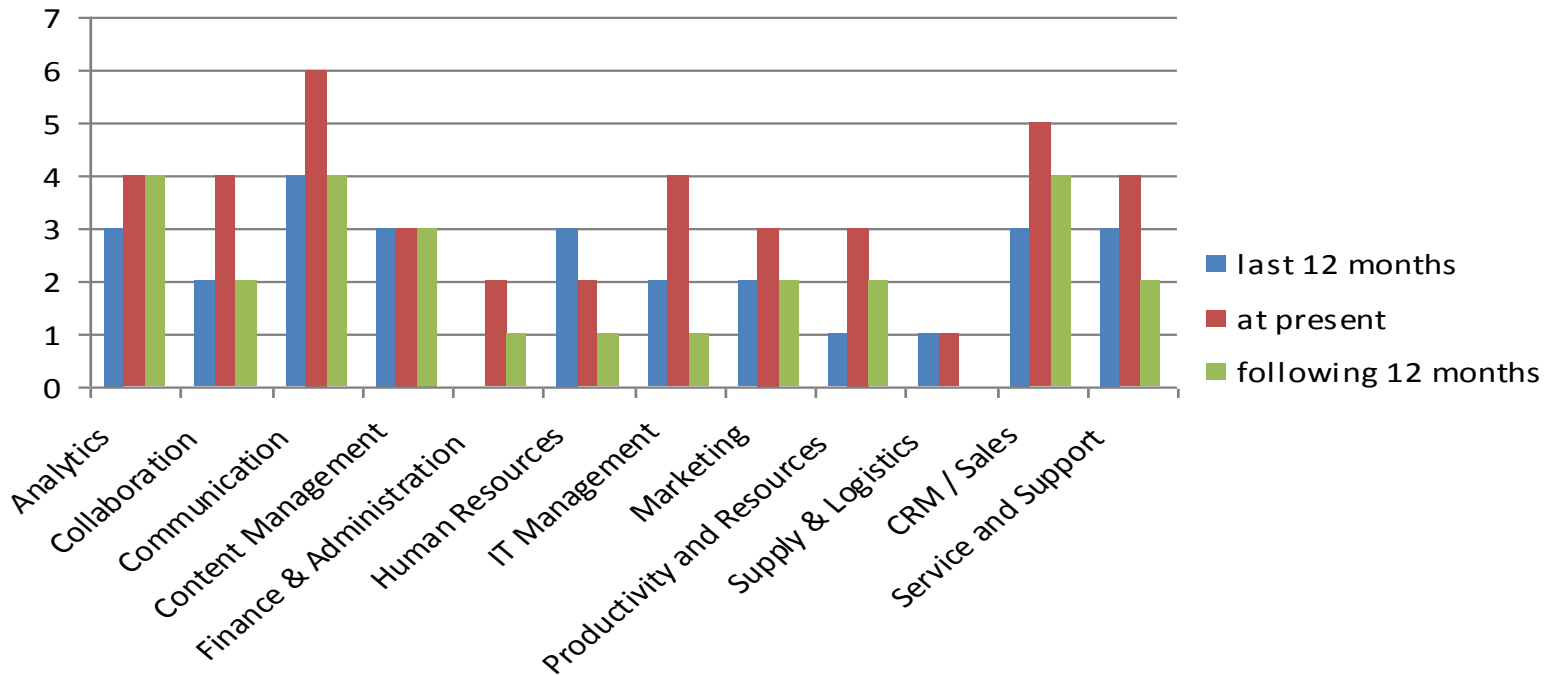
Which Services?

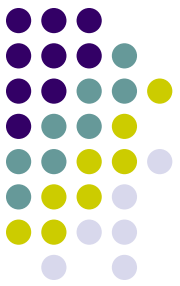
- SaaS accounts for 71% of systems in use
- Email and CRM are the most popular SaaS services
- 5% of respondents are running IaaS and PaaS pilot projects, with none in production use
- Most organizations use local cloud computing providers; this could indicate a lack of localized versions of SaaS

SaaS Services



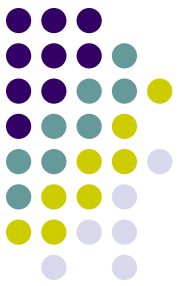
What types of SaaS services do you use at present or plan to use in the near future?





Some Observations

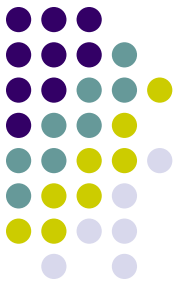
- Cloud computing is difficult to define (data storage and hosting services - multitenant SaaS applications)
- Results of different surveys are difficult to compare and in some cases not easy to interpret
- Private (and hybrid) clouds are associated with different benefits and have different adoption characteristics



Cloud Computing Adoption

- SaaS, IaaS and PaaS have different adoption rates and business benefits
- Adoption rates vary according to
 - company type
 - company size
 - industry sector
 - territory

Cloud Computing Adoption ...



- Detailed cost-benefit analysis is needed to maximize the benefits and minimize the risks associated adoption of cloud computing
- Considerations of utilization patterns
- Considerations of data sensitivity
- Suitability of the service
- Suitability of the service provider
- Integration issues



Adoption Prerequisites

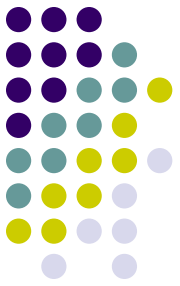
- Understand cloud computing requirements
- Suitable enterprise architecture for cloud computing adoption (SOA)
- Understand organizational impact of introducing cloud services

Identifying Cloud Computing Opportunities



- Good solution for unpredictable or variable demand on compute and storage resources (events – e.g. Olympics)
- Batch processing application – can take advantage of parallelism
- Suitable for new startup operations – avoiding IT ownership
- Companies with large existing IT investment face more complex decisions
 - security and economic consideration may favour private cloud
 - data and application integration issues

Selecting Cloud Computing Provider



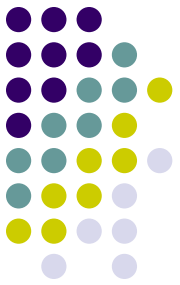
- Stability and track record of the provider are of paramount importance
- Pricing model - on-going costs need to be evaluated
- Level of dependence on the provider
- Data migration options



Conclusions

- Major shift in enterprise computing paradigm is taking place at present leading to re-distribution of responsibilities over IT infrastructure and services
- Cloud computing presents significant opportunities and challenges
- Urgent need to improve our understanding of cloud computing and for comprehensive adoption guidelines

Impact of Cloud Computing



Client

Innovative Business Services

Provider

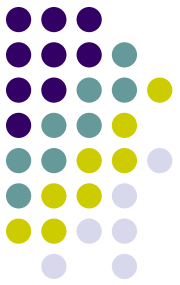
Standard Software Services

Provider

Standard Platform Services

Provider

Standard Infrastructure Services



Future Work

- Currently conducting a large-scale survey of more than 1,000 Czech organizations
- Comparative studies with other countries
- Development of adoption guidelines

- *SI 2011 survey*
- *Collaboration opportunities*

