

# WOLKEN KOSTEN GELD

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# About the speaker

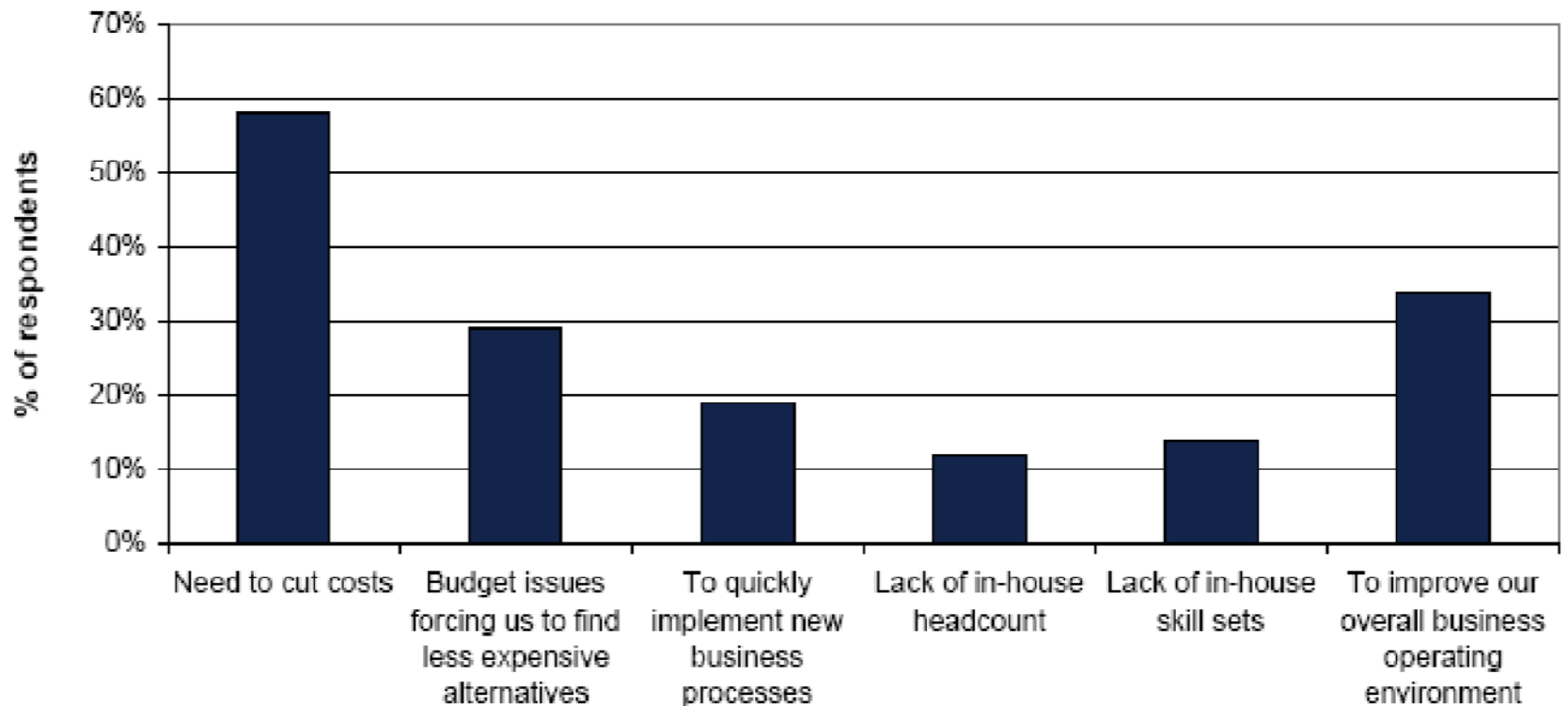
- Professor of Computer Science at ETH Zurich
- Areas of interest: enterprise computing, enterprise application integration, distributed systems, databases
- Industrial experience: IBM, independent consultant, start-ups

# A real prediction

The cloud is to current software companies what computers and the Internet have been to the music and the TV industry.

# Is the cloud for you?

IDC Survey: What Drove Your Organization Toward Using or Considering Cloud Services?



# The cloud through case studies

IT costs

IT provisioning

IT utilization and appliances



# Why worry about cost?

## Oracle and Sun SPARC SOLARIS World Record TPC-C Performance using Flash Technology

Oracle OpenWorld, San Francisco, Calif. – October 11, 2009

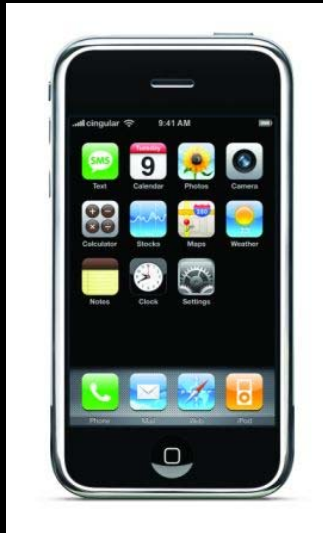
... achieved a record-breaking  
7.7 million tpmC  
at \$2.34/tpmC

# A common setup

The IBM system is a single server while the Sun system is a 12 node cluster. The Sun cluster had a total of 384 processor cores and 3,072 threads compared to 64 cores and 128 threads in the IBM system. With 512GB of memory per node the Sun cluster had a total of 6TB of memory, compared to 4TB in the IBM Power 595 system. The Sun tpmC per core is 20,097; the IBM tpmC per core is 95,080, 4.7 times higher performance.

Elisabeth Stahl (IBM) – developer blog

# Why does it matter?: Case Study 1



The cost of bad weather: the proliferation of mobile phones has resulted in a very significant increase of network traffic to web pages

This makes the cost situation worse:

Peak load provisioning

Gap between normal and peak load increasing (10% utilization)



# Why does it matter?: Case Study 2

- The risk of innovation: new projects that try to take advantage of the growing number of customers on-line have high Cap-ex
- Difficult to address with current models:
  - High capital expenses for project set up
  - No guarantees on ROI
  - Difficult to provision at start (initial bad service may handicap project)

# Why does it matter?: Case Study 3

- The cloud and Father Christmas: ways to better use and capitalize idle IT infrastructure
- An idea is born:
  - Peak load once a year
  - Capacity provisioned for peak load
  - Share that capacity but only when available

# The trend towards appliances

- System complexity is rapidly increasing
- Vendors cannot afford the diversity
- Instead of selling SW, vendors are switching to appliances
  - SW + HW in one bundle
  - Closed box
- From there, it is only one network step to the cloud



# In summary

- Cost of systems is increasing
- Peak load provisioning, average load utilization
- Cost of deploying new services
- Trend towards black box systems (out of the control of the user)
- Cloud computing as a way to rationalize these developments



# An overview of cloud computing public vs. private types of cloud

# Public Clouds

Public clouds are a service offering by a provider that are open to the public and can be used following a contractual agreement

- Advantages:
  - Economies of scale
  - Robustness through numbers
- Disadvantages
  - Legal and security aspects
  - Load separation



# Private Clouds

- Private clouds are virtualized resources made available as a service within one organization
- Advantages
  - No legal and security aspects
  - Your own infrastructure
  - Fast provisioning of resources
- Disadvantages
  - Limited sharing of resources
  - Your own infrastructure

# Today's landscape

- Public clouds:
  - Occasional use
  - Test and development
- Private clouds
  - IT consolidation
  - Interest in hybrid solutions with enterprise cloud providers (appliances)



# IaaS: my hw, your sw

- Infrastructure as a Service
  - Virtualized hardware forming a grid
  - Networking plus load balancers
  - Internet access
- Example IaaS: Amazon's EC2

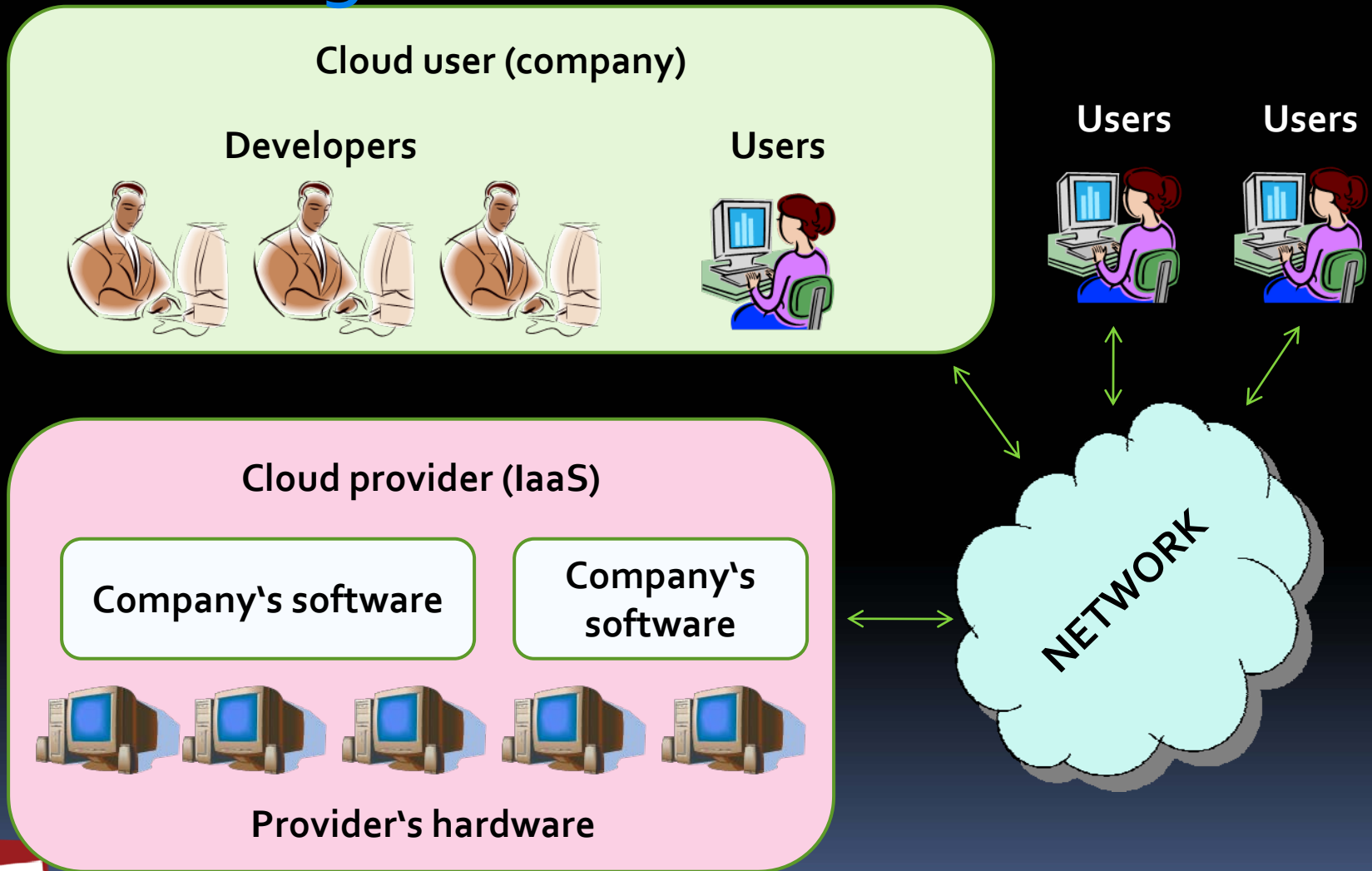
SaaS

PaaS

IaaS



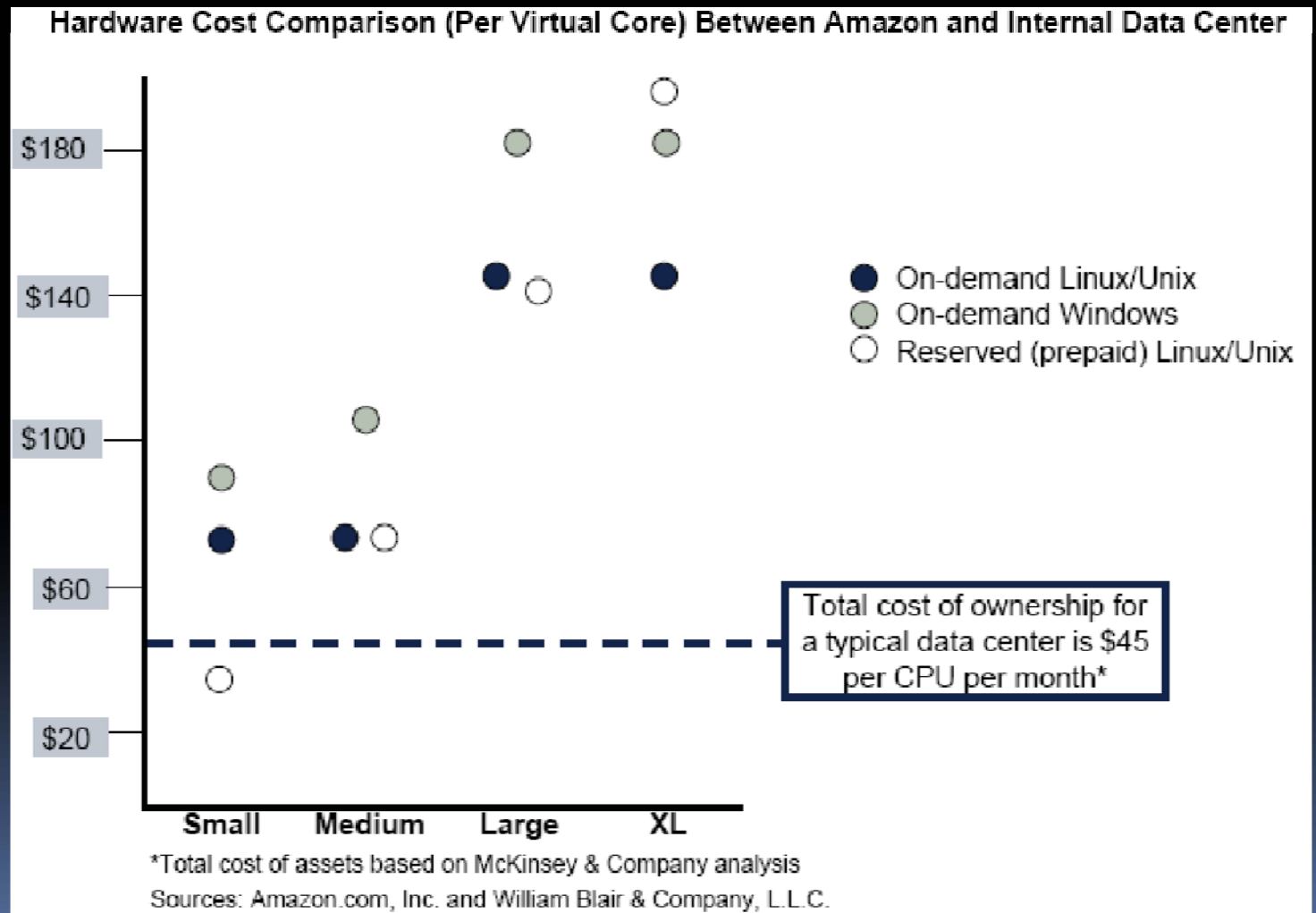
# IaaS configuration



# IaaS: pro and against

- Advantages
  - Fast provisioning
  - Reduced CapEx
  - Large scale resources for small companies
  - You control the software that runs
  - Least vendor lock-in
- Disadvantages
  - Hardware CapEx not the dominant factor
  - Development and Maintenance costs remain
  - Model with lowest margins for provider

# Cost analysis is crucial



# PaaS: you do the tailoring

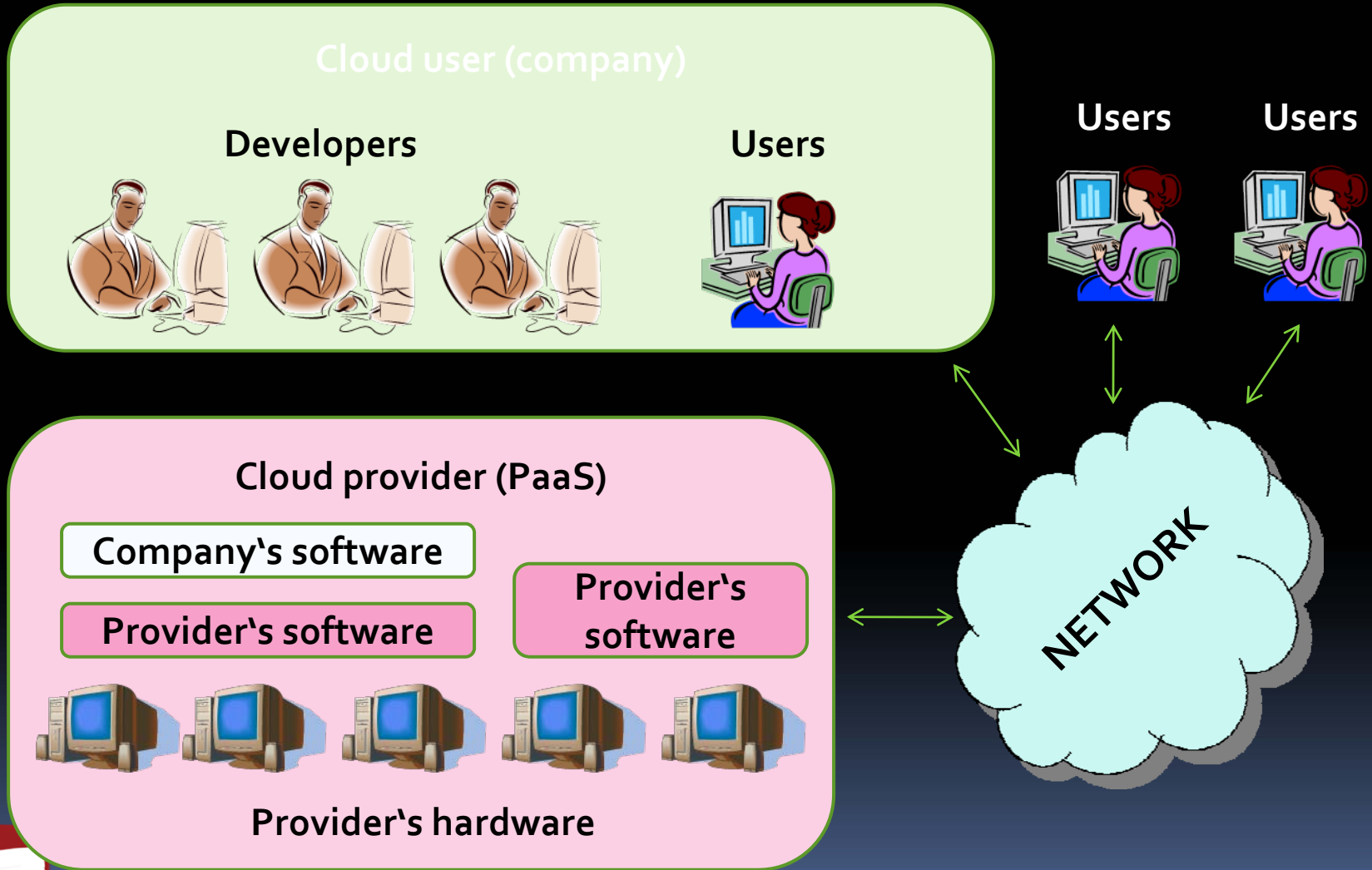
- Platform as a Service
  - (Virtualized) Hardware resources
  - Basic software
    - databases or programming platforms
  - Networking
  - Internet access
- Example PaaS: Google Application Engine, Microsoft Azure

SaaS

PaaS

IaaS

# PaaS configuration

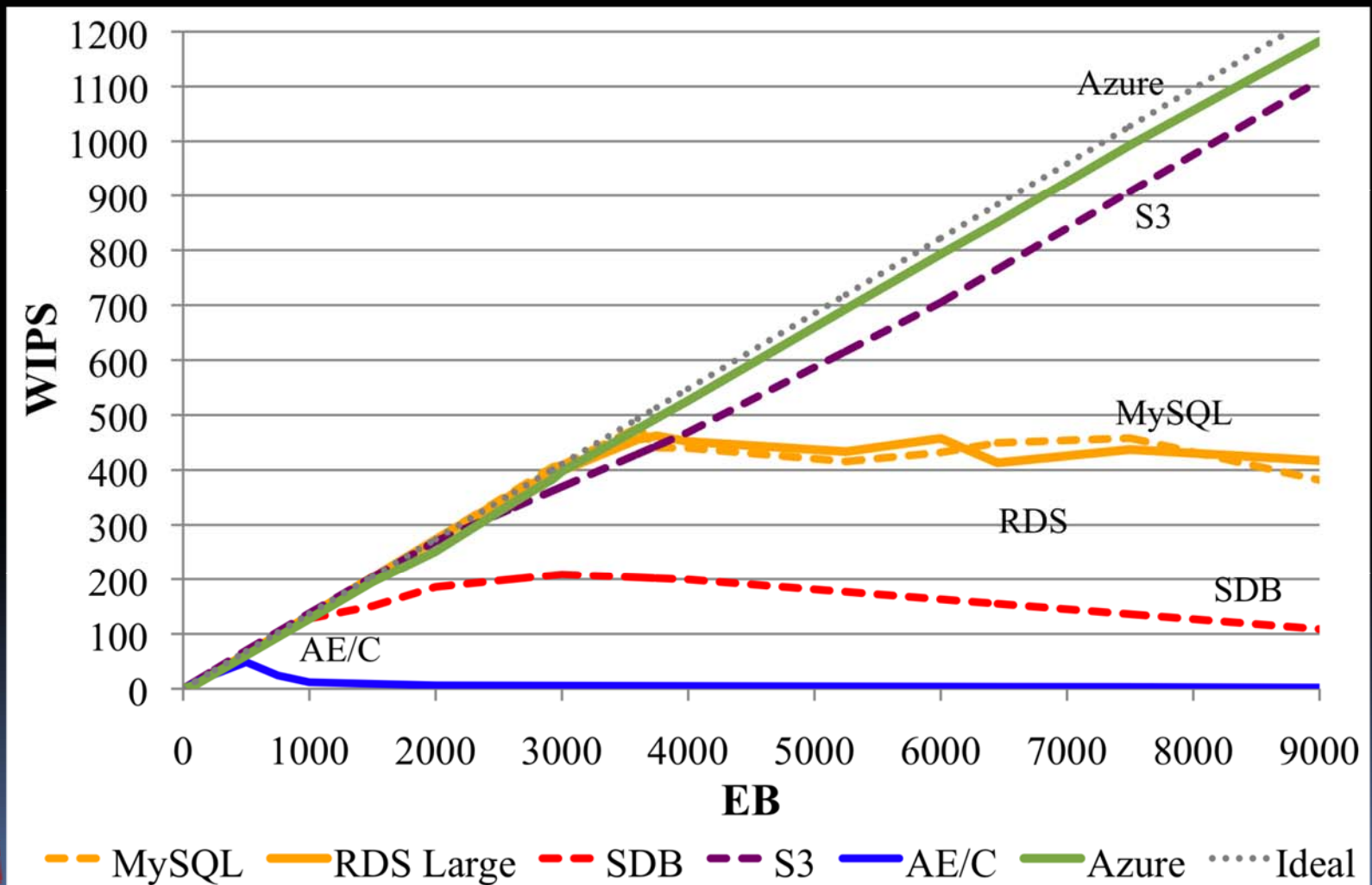


# PaaS: pro and against

- Advantages
  - Platform software already installed
  - Simplified maintenance of platform software
  - Control of the application and data
  - Reduced CapEx for hardware and key software
- Disadvantages
  - Some development and maintenance costs
  - Often inflexible in what can be done and deployed
  - Vendor lock-in at the platform level

# Choosing the right platform

Work by Donald Kossmann et al.





# SaaS: you use the service

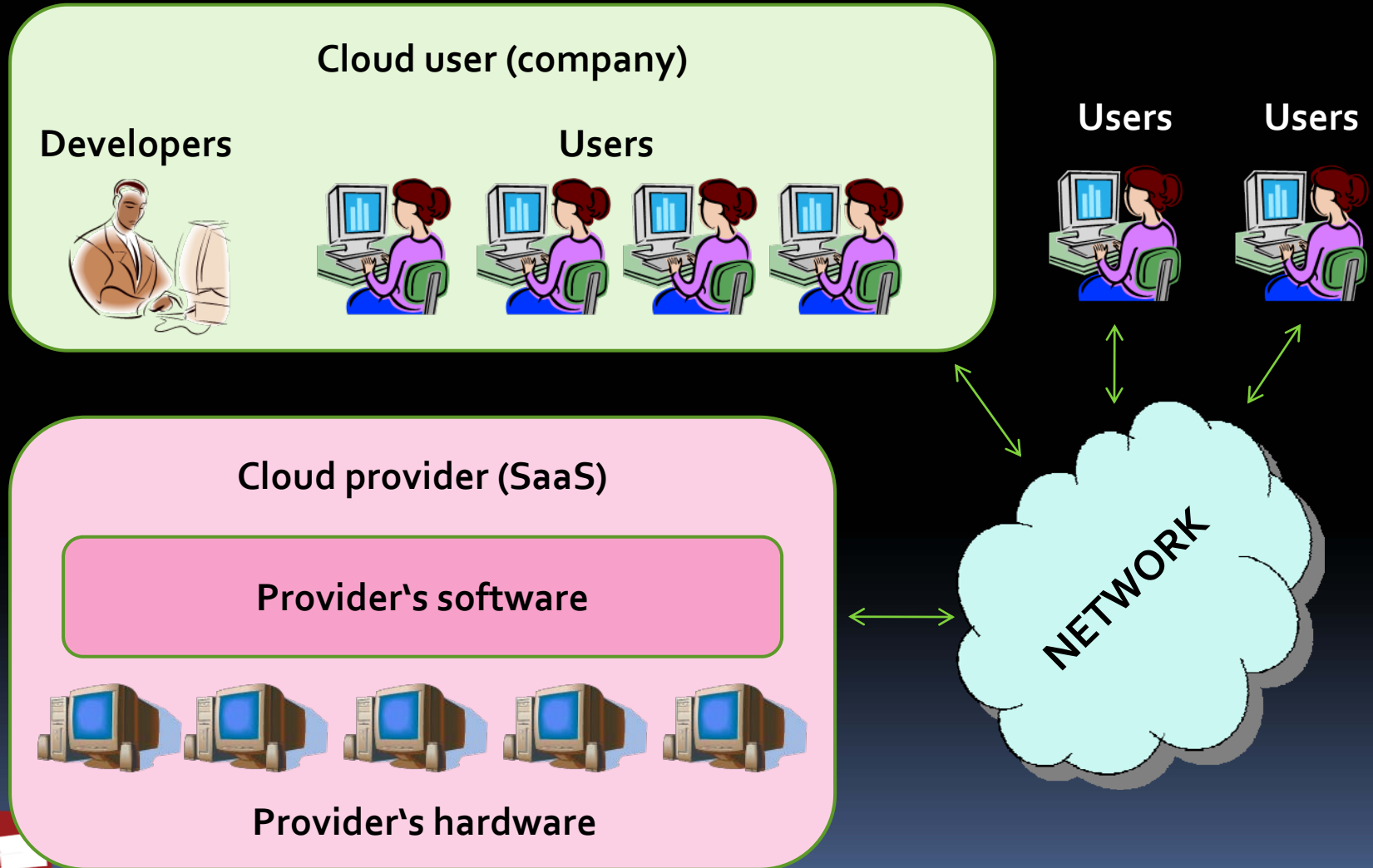
- Software as a Service
  - Full application
  - Available through a web browser
  - Internet access
- Example SaaS: Salesforce, Google Apps

SaaS

PaaS

IaaS

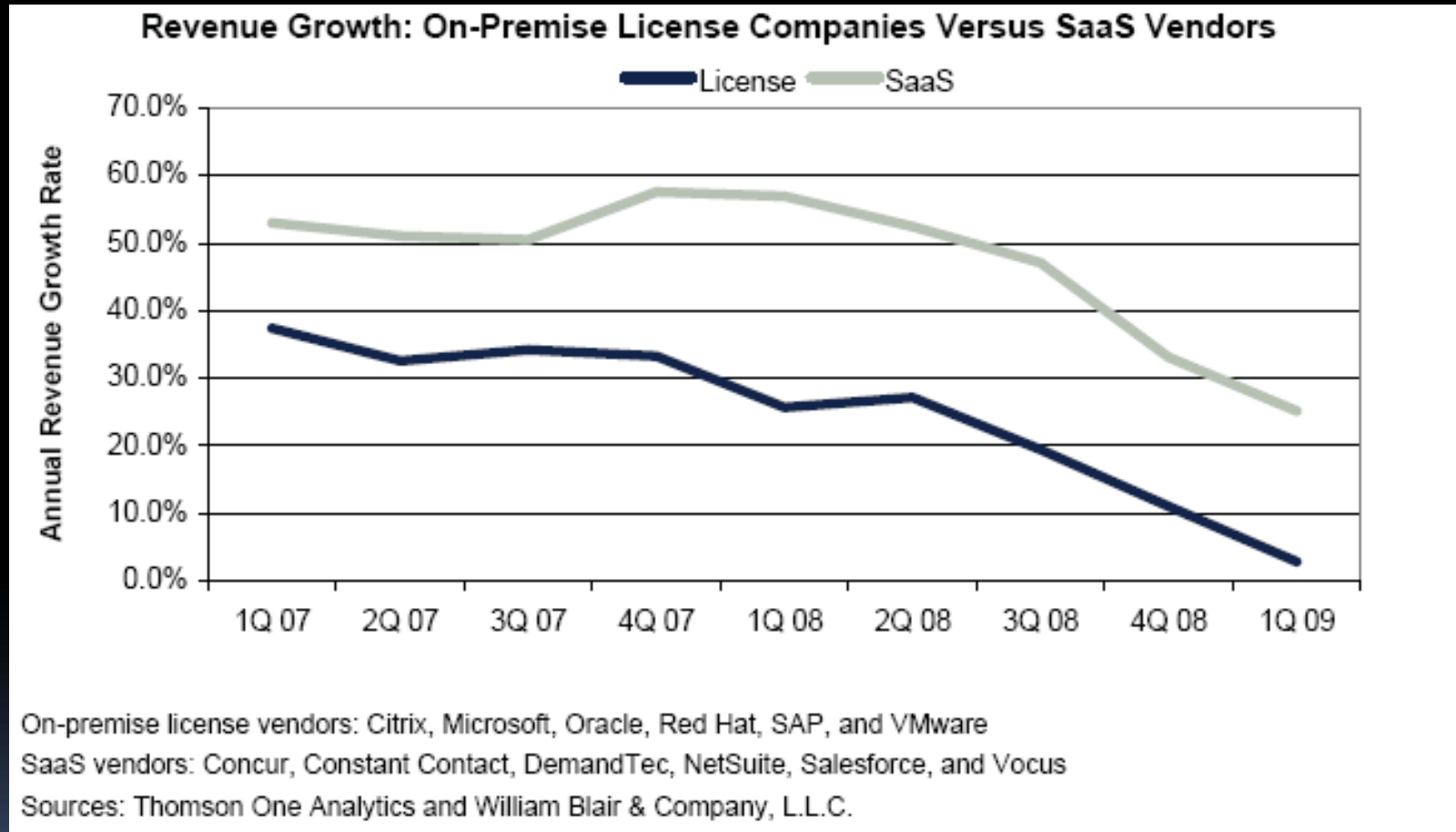
# SaaS configuration



# SaaS: pro and against

- Advantages
  - No CapEx or OpEx
  - Cost related to use
  - No maintenance or development
  - Model with highest margins for provider
  - Larger software markets (no differentiation)
- Disadvantages
  - Vendor lock-in at the application level
  - Availability

# Cloud vs standard software



Industry report William Blair & Company, L.L.C., June 8, 2009

# Example use cases

- IaaS: A company establishes a pool of resources available across department and branches
- PaaS: Pool of database servers for rapid provisioning of extra capacity
- SaaS: centralization of resources and services made available through a web interface

# Conclusions

- Clouds are here to stay
- Key driver is cost
- Clouds enable but also require
  - Tight alignment with business processes
  - Strong governance
  - More agile processes