Cloud Computing

Alexander Schatten
www.schatten.info

Cloud Computing

Set of complex Technologies, Protocols, Policies & Lot‘s of technical Buzzwords

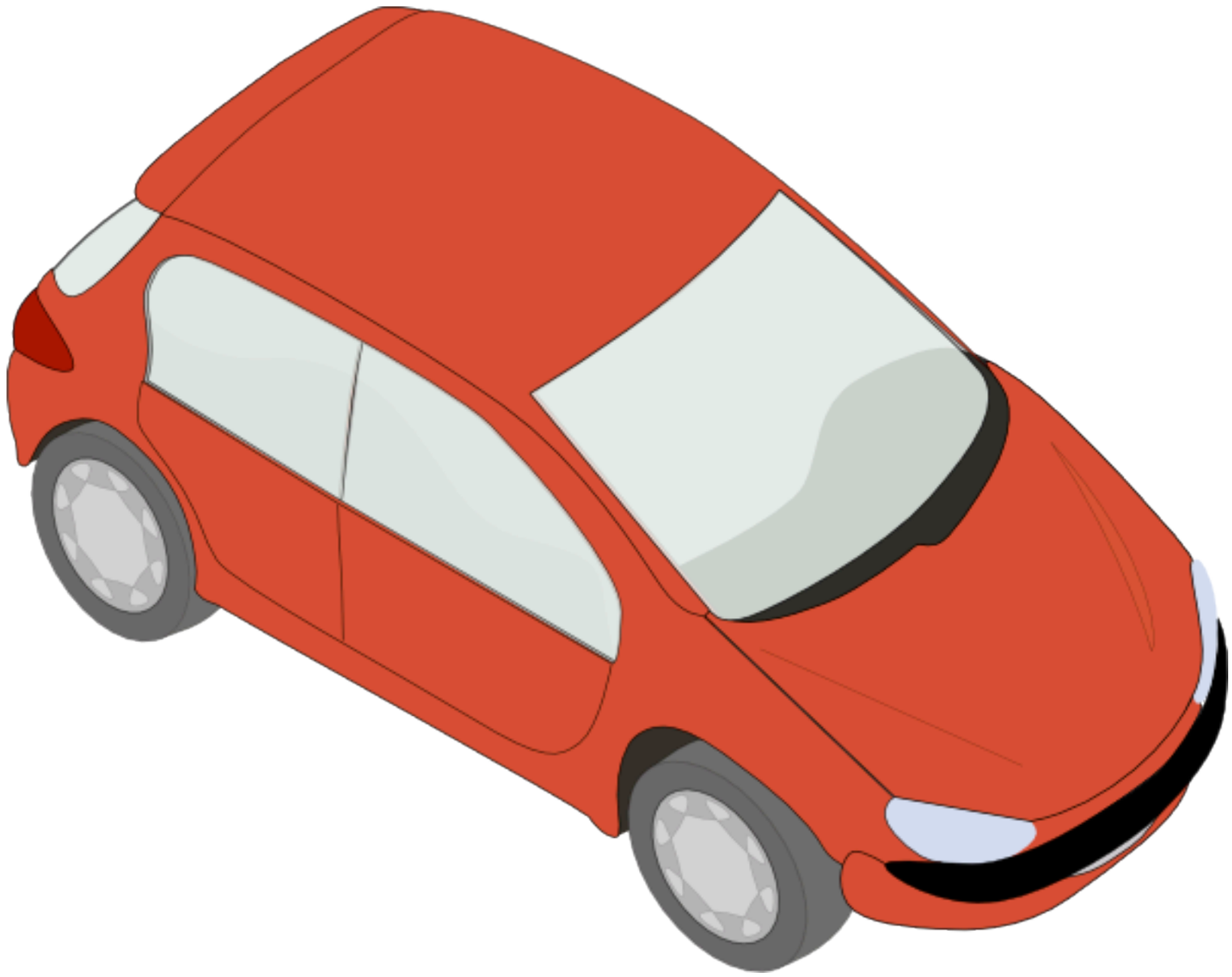
S3
Software as a Service
Standardisation
Content Delivery Networks
Virtualisation
Server Utilisation
Google App Engine
Thin Clients
Amazon EC3
REST
Green IT
WSDL
Webservice
Energy Consumption
Outsourcing

Cloud Computing is often seen from a technical point of view. Some provider also try to use cloud computing as a buzzword to sell available services.

Let‘s Start with an Analogy:

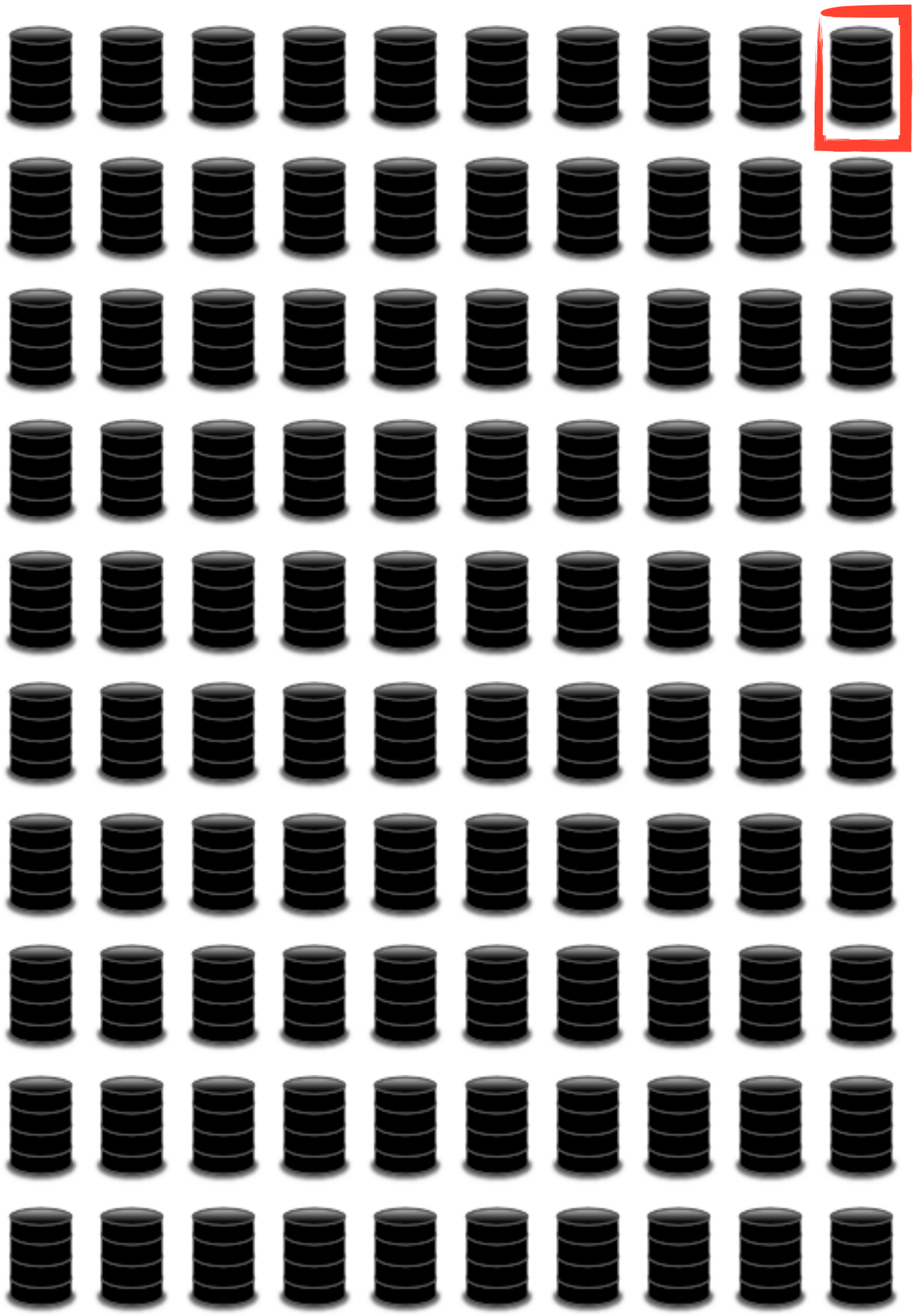
Transportation

Cloud Computing is rather complex from the technical point of view, but conceptually pretty easy to understand. Let‘s start with an non-technical analogy. Transportation is like ICT a core issue of our societies.



only 1/8 of total Energy arrives at wheels

Only 1/8 of the total Energy used in a car arrives at wheels, the rest is „lost“ in the process, e.g. by conversion to heat



< 1 % of fuel is used to move the driver

On average, less then 1% of the fuel consumed is used to move the driver. The rest is lost or used to move the (too heavy) car. "This is not very gratifying after a century of devoted engineering effort", Amory Lovins

http://www.ted.com/talks/amory_lovins_on_winning_the_oil_endgame.html

Numbers by Amory Lovins (Winning the Oil Endgame)

Example: Family Mobility Needs

Needs		Solution ?
Commute to work and school Shopping / City traffic	→	Two „small“ cars 
Holiday trips	→	A large car 
Teenagers visiting friends...	→	Motorcycle 
Transportation of furniture	→	Truck 

How could the „mobility needs“ of an average family with teenagers be fulfilled? For example by using a lot of individual transports. All of them inefficient in themselves. In this case with additional low utilisation and high investment.

+ Large Garage
+ Fuel
+ More Streets
+ High Investments
+ High Maintenance Costs

Considering the „solution“, a lot of additional infrastructure is needed

Better Solutions ?

Photo by CeeKay's Pix (flickr)

Car Pooling Public Transport

Car/Truck Rental

However, to „reduce ownership“ certain conditions have to be met. E.g. public transport has to be accessible, cost-efficient, safe, comfortable... Similar considerations are true for cloud computing.
Photo shows the „Shinkansen“ train in Japan; one of the fastest trains in the world.

Replace

Car

Truck

Motorcycle

With

Server

Storage Units, Router, ...

Services

From transportation to cloud computing: just change the „variables“

Replace

- Garage
- Fuel
- Streets

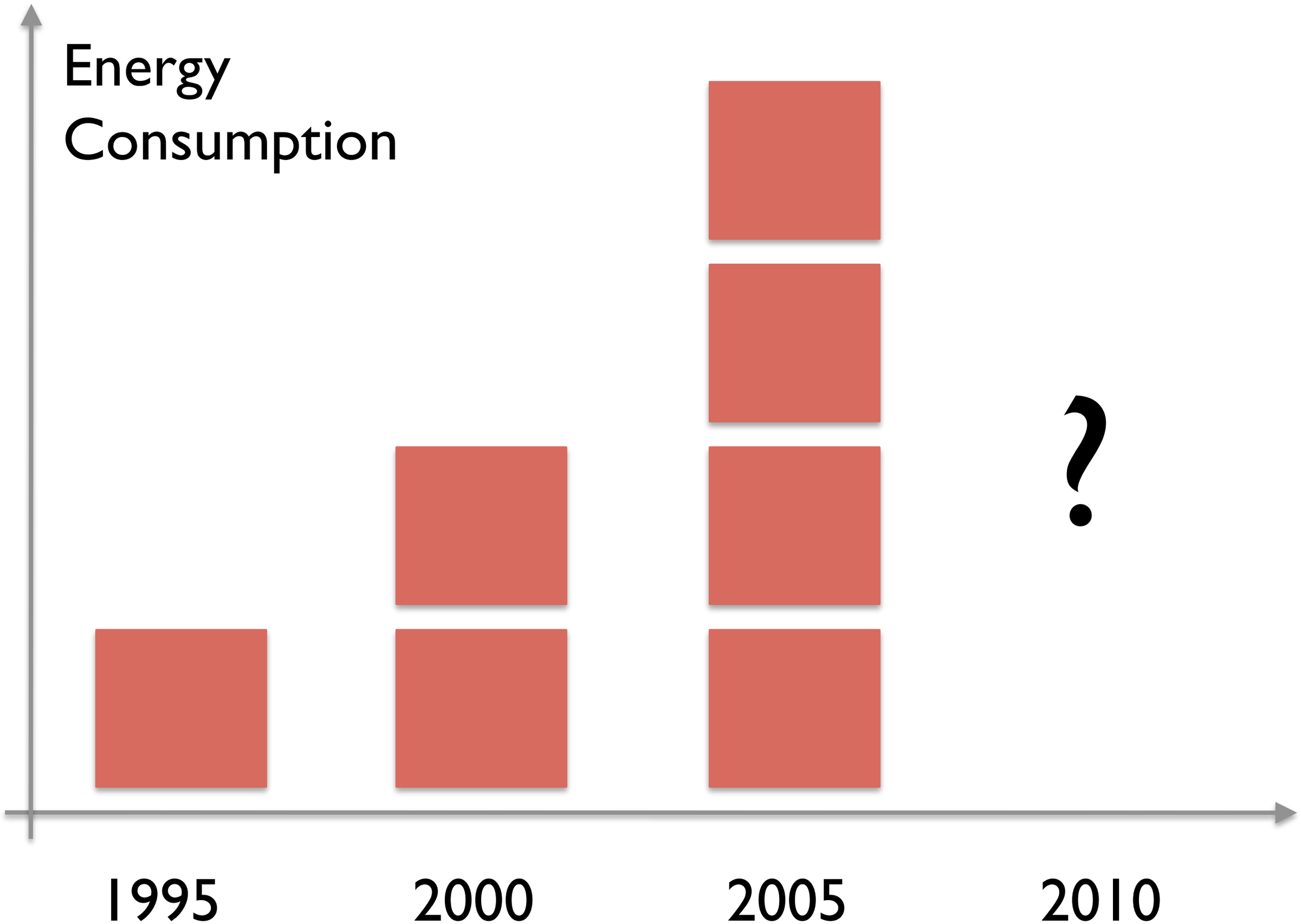
With

- Datacenter
- Energy
- Cooling

In many datacenters, servers, storage... is not well operated (inefficient), and utilisation is often low. Specialised machines are bought for projects that do not efficiently use them. Commodity services are operated in-house, allthough outsourcing would be easy. Synergies between projects are not used.

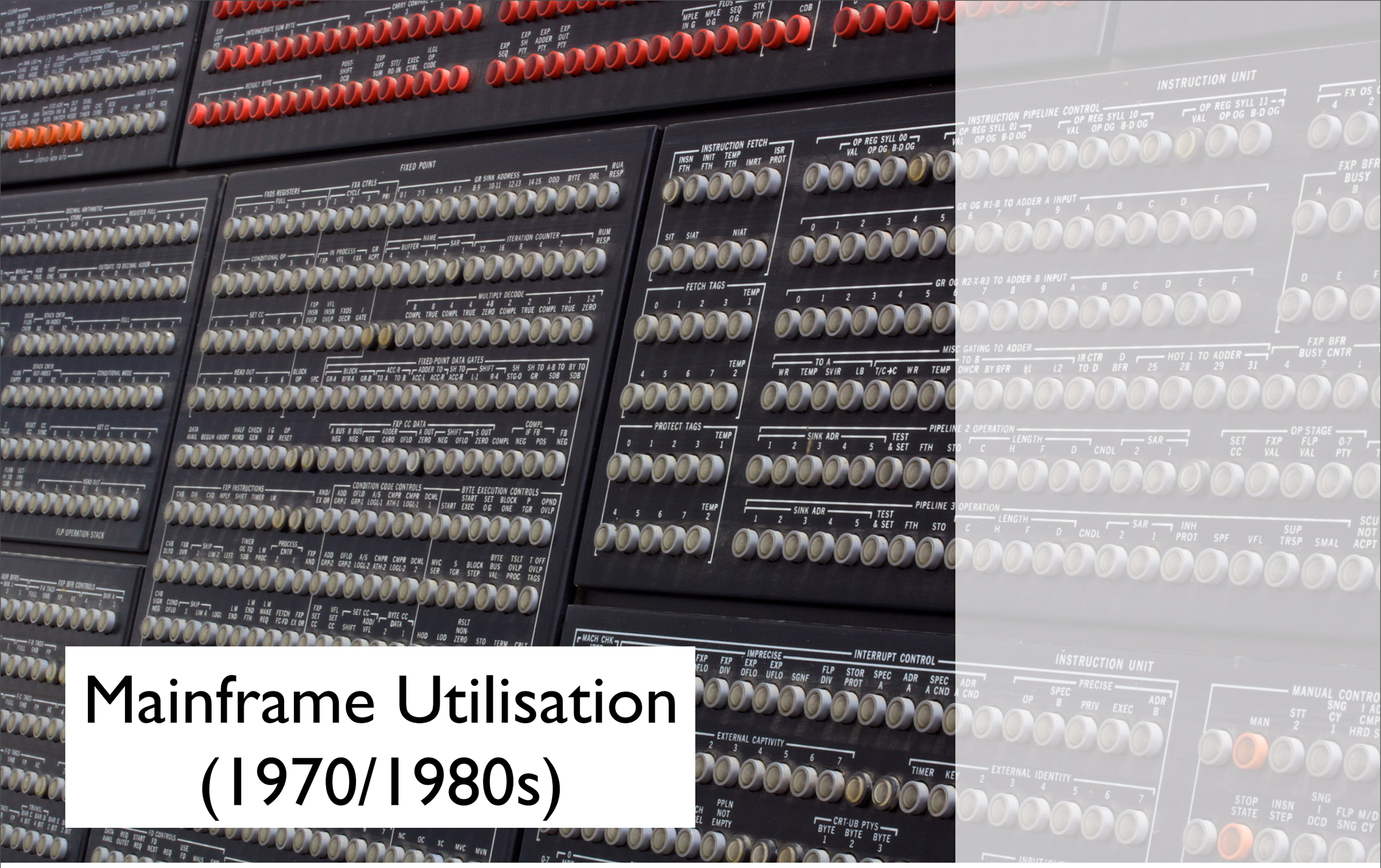
And ICT Efficiency ?

Source: McKinsey and Company, part of a report titled "Revolutionizing Data Center Efficiency",
Malone, C. and Belady, C. (2006) Metrics to Characterise Data Centre & IT Equipment Energy Use. Proc. Digital Power Forum, Richardson, TX, USA, September.
InfoWorld, Ted Samson (2008)
Smart2020 Report
Borderstep Institute



Currently, energy consumption of ICT doubles approximately all 5 years; at the same time strong growth in number of servers globally.

Mainframe Utilisation (1970/1980s)



70 – 80 %

Photo by Marcin Wichary (Flickr)

The utilisation of mainframe computers in the 70s and 80s was usually between 70–80%; thus mainframes provided relatively efficient IT services by exploiting the available computing power.

~ 30 % of Servers used in Datacenters Today

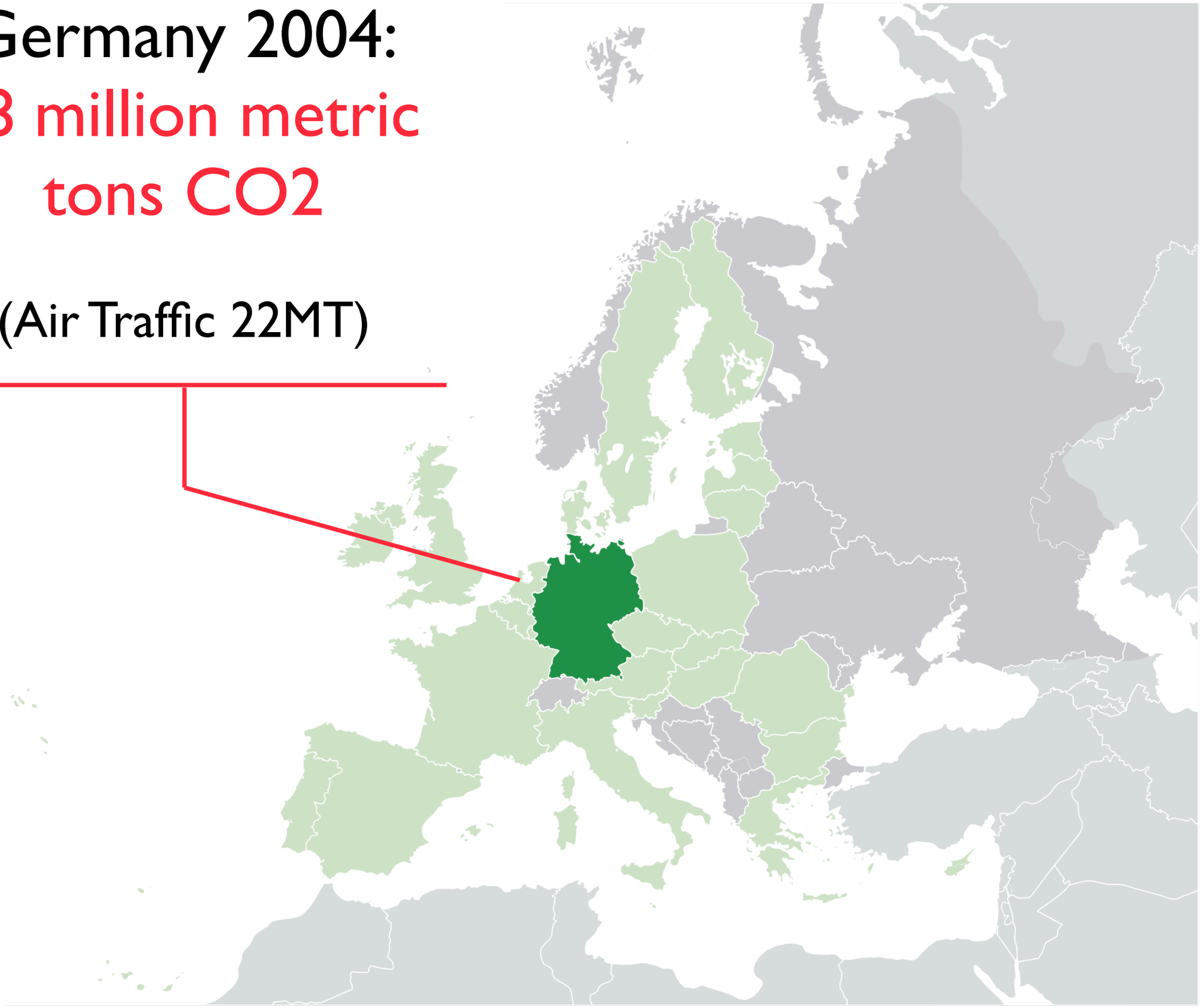
< 3 Utilisation %

Photo by JohnSeb (Flickr)

In many current datacenters, a lot of IT hardware is hardly used, still consumes resources. However, there are large Differences between specialised and large datacenters like: Google, Strato, Host Europe and the „average“ small company / business datacenter

Germany 2004:
28 million metric tons CO2

(Air Traffic 22MT)



In many OECD countries Carbon Emissions due to ICT activities have outgrown air traffic emissions! In OECD countries total ICT is responsible for 10% of total energy consumption.

ICT: Asset or Legacy ?

ICT has been seen as a major asset for many companies in the last decades. Is the focus changing?

After pouring millions of dollars into in-house data centers, companies may soon find that it's time to start shutting them down.

IT is shifting from an asset companies own to a service they purchase.

Nicolas G. Carr

„The End of Corporate Computing"
MIT Sloan Business Review (2005)

In the 19th/20th century, many industries started to get rid of own electrical powerplants and connected to power grids. Industrial production was linked to production of electricity.

Overcapacity
combined with
redundant functionality.

Nicolas G. Carr

„The End of Corporate Computing“
MIT Sloan Business Review (2005)

Similar trend now in IT: from own services to grid services. Many similar applications in different companies. x-times multiplication of the same. Combined with the fact, that scaling up services is usually not a problem any more.

Cloud Computing, in Depth

Let‘s dive deeper into some technical and organisational aspects of cloud computing and discuss potential advantages.

Cloud Computing:
Building Blocks

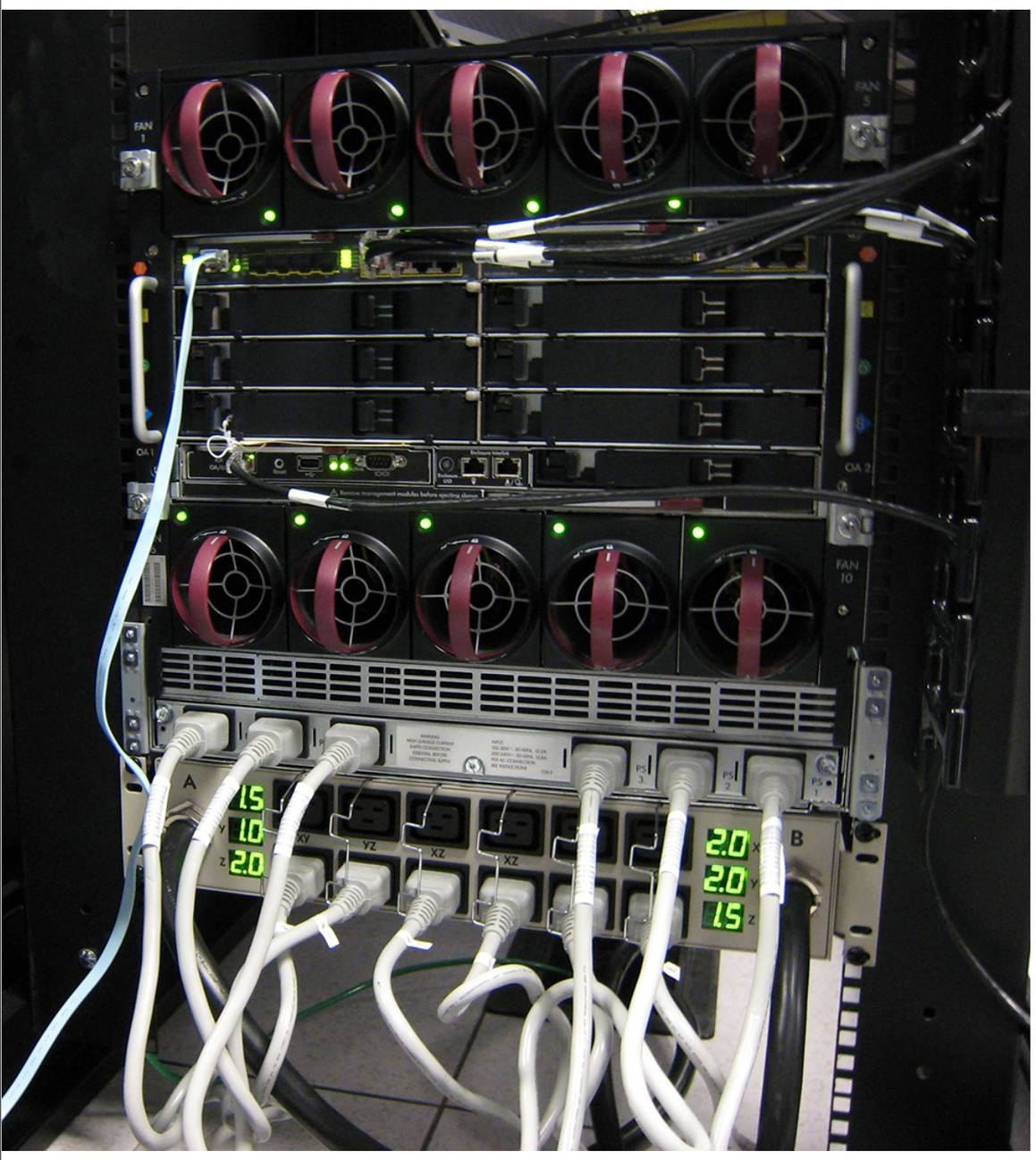


Photo by bugeaters (flickr)

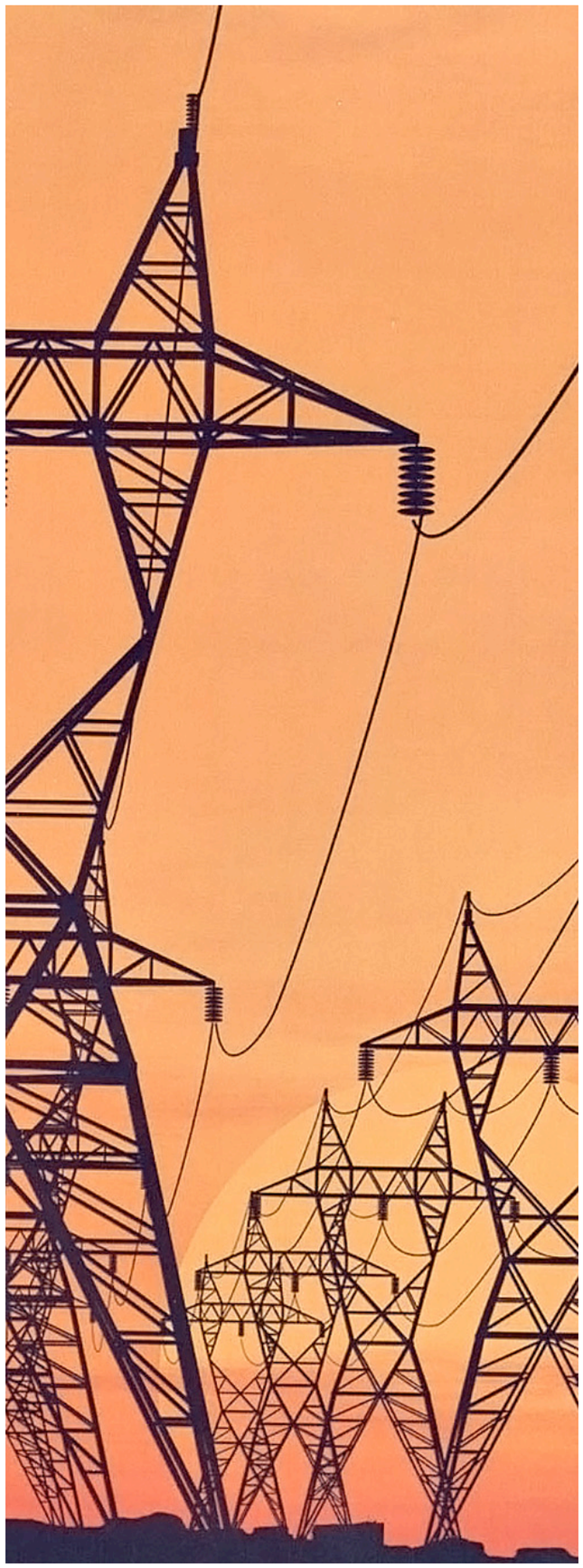
- Virtualisation
- Distribution
- Commodification of IT Services
- Sharing of Resources
- Outsourcing
- Business Plans and Contracts
- Unification of Protocols
- Software as a Service

Each of these Building Blocks is „nice“

Combination makes Cloud Computing

Ideas and concepts come in waves; Early waves often fail due to limitations in certain technologies, because supporting technologies are not available or mature enough, or simply because markets are not yet ready.

Example: "Video on Demand (End of 90s)" --> "YouTube (2005)"



Cloud Computing is ICT Equivalent to Power Grid

Simplified: Cloud computing can be seen as the ICT equivalent to power grids for providing of electricity. E-Grid is used because of standardised interfaces and reliable services. Cloud Computing could be on the same track.

Cloud Computing: Advantages

Pay Usage ...

... not Peak Load

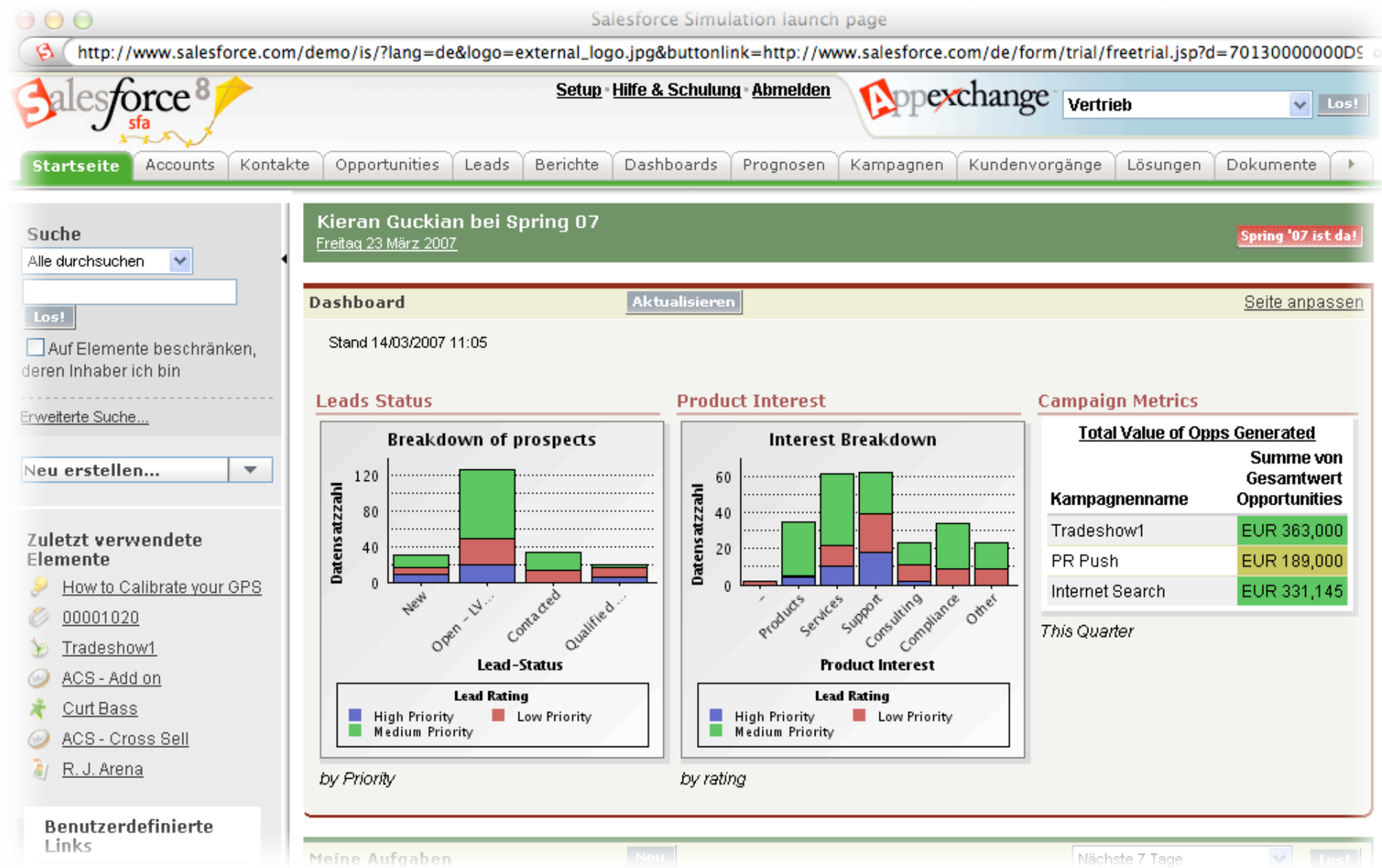
Get Rid of Complex IT

Large-Scale Efficiency

In house ICT services become complexer every year, leading to higher maintenance costs. Also licensing schemes can benefit from outsourcing. Eventually, outsourcing services in the cloud will save money in many use-cases.

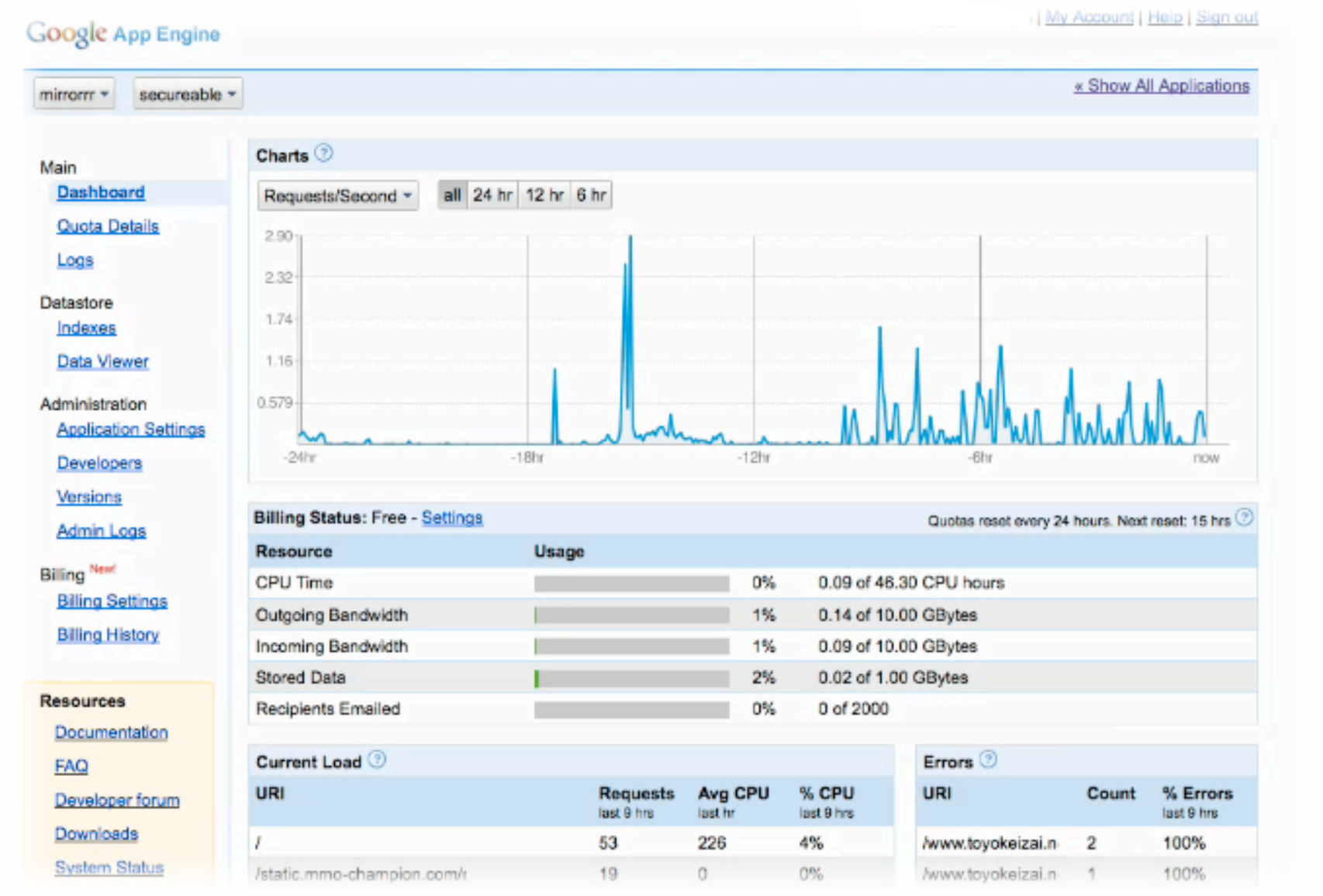
Cloud Computing, Examples

Enterprise Services



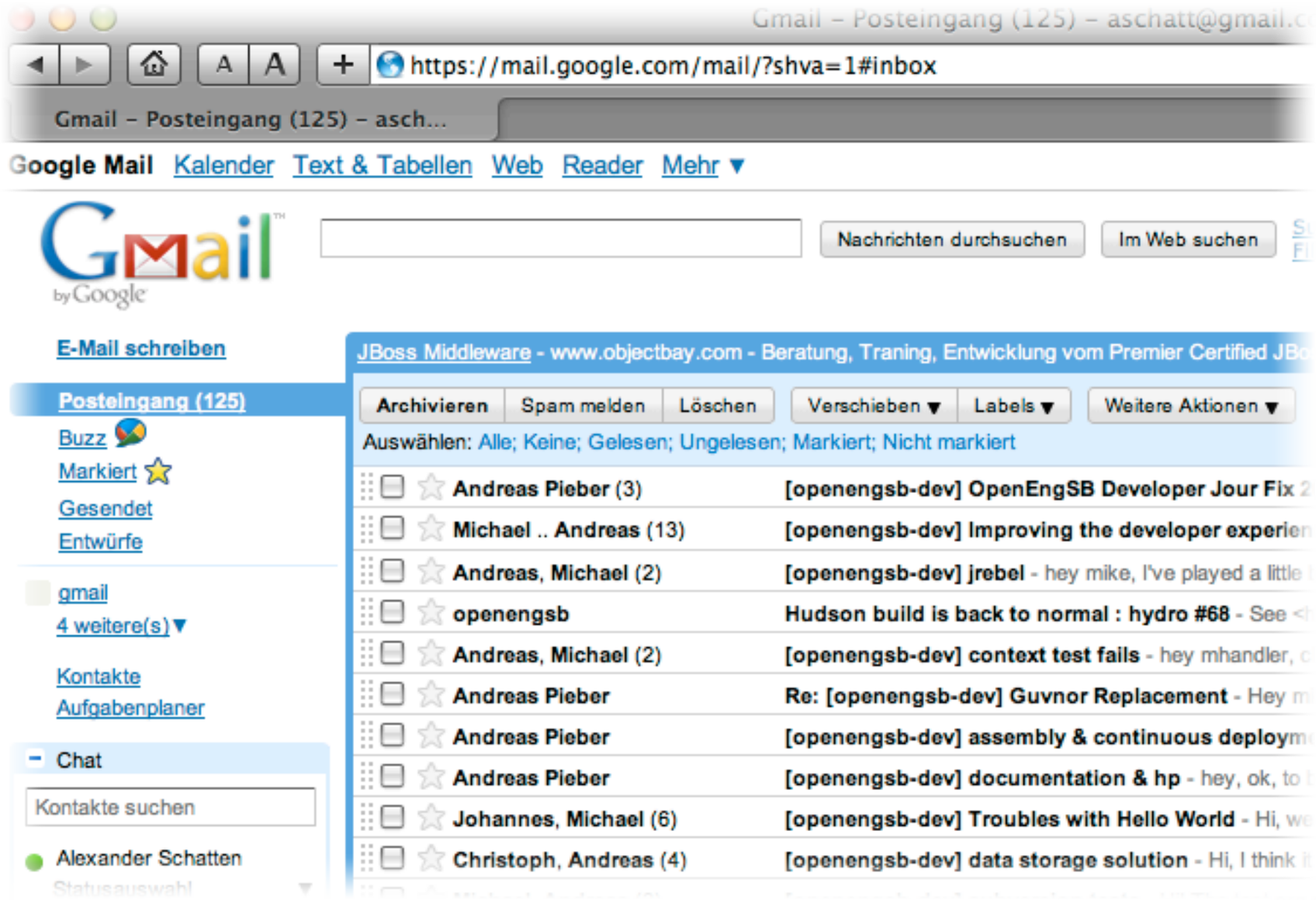
Salesforce

Platforms

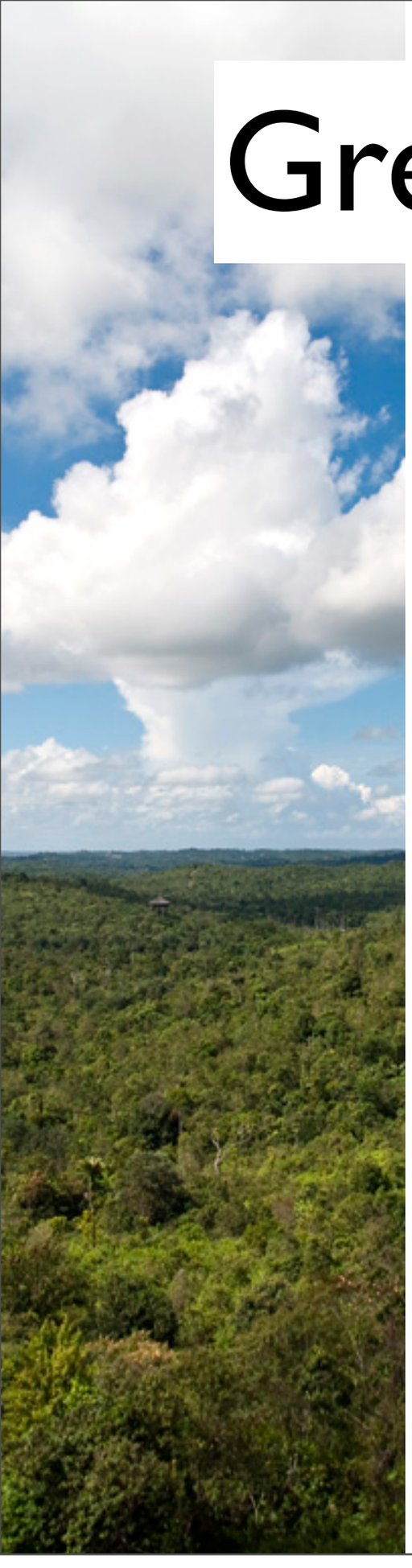


Google AppEngine,
Amazon S3, EC2, Paypal, ...

Office & Communication



Google Mail,
Amazon S3, EC2, ...



Green IT in the Cloud

- Resource Pooling
- Reduction of Hardware
- Higher Datacenter Efficiency
- Target/Demand oriented Performance

Cloud Computing can be one building block towards a „greener“ and more efficient IT

Issues

Standardisation

Young Technology

Legal & Privacy Issues

Particularly legal aspects seem to be a problem for companies in Europe (plus the conservative nature of our enterprises). Many cloud computing providers are not European companies, hence data protection and lack of trust is hindering the inception of cloud services.

Conclusion

- Cloud Computing is not (only) a Buzzword
- Transformation of IT landscape
- ICT Services as Scalable Commodities
- Advantages in many Use-Cases
- Green IT
- But also many unsolved Issues

www.schatten.info

Twitter: alex_buzz

Dr. Alexander Schatten

Thank‘s for the attention, please contact me in case of questions. Looking forward to communicate with you via Twitter too!