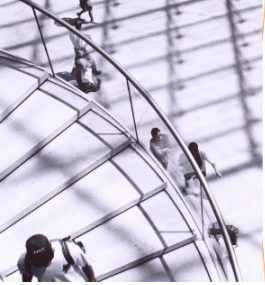# Federating commercial IaaS

SURFnet IaaS cloud developments

Paul.Dekkers@surfnet.nl

TF-MSP, Heraklion, 19 september 2011
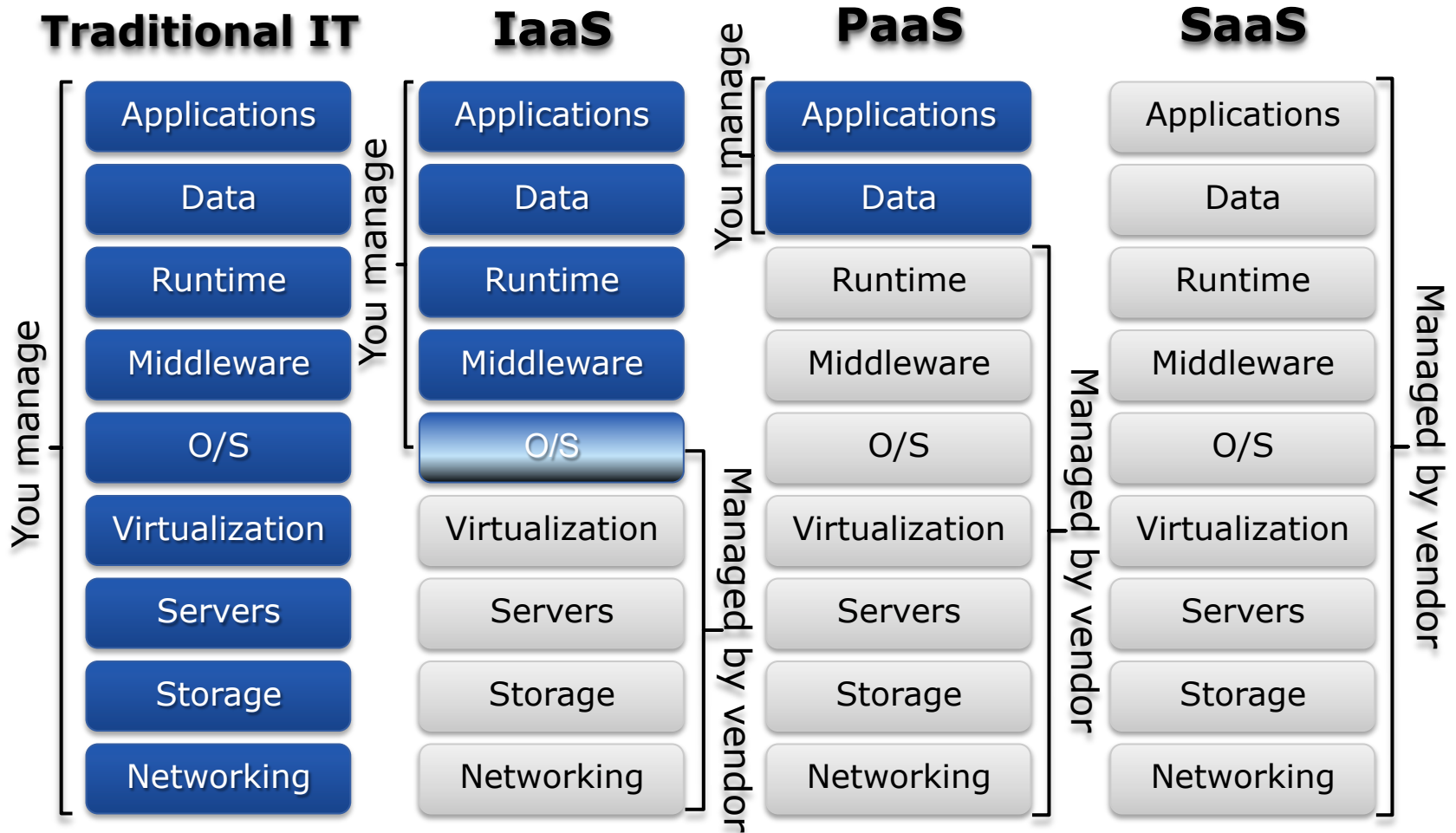
SURFnet & cloud

- **Taskforce cloud**
  Cloud-strategy
  Community cloud

- **Experience with own infrastructure, services, public cloud providers**

- **Experiments with community IaaS**
  - SURFnet provided
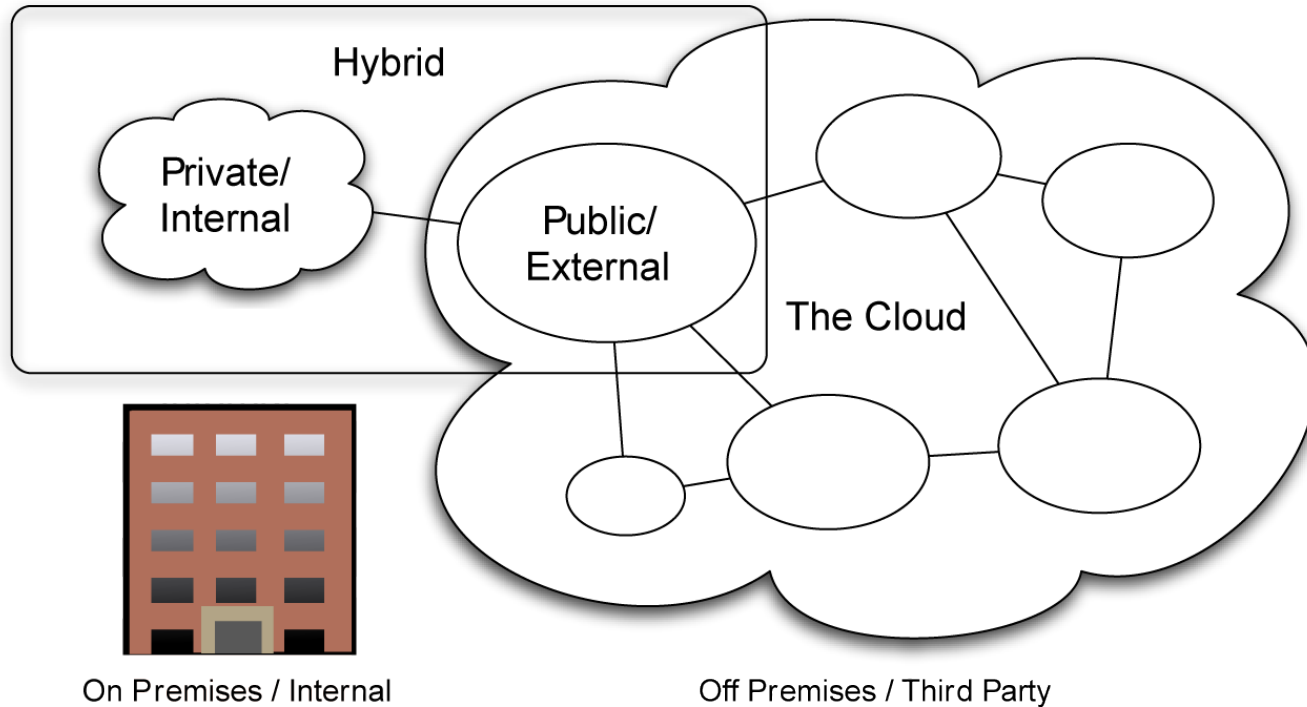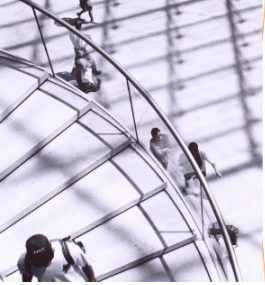 - Commercial operator

- **Green IT**

Cloud spectrum

Traditional IT	IaaS	PaaS	SaaS
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

You manage

You manage

You manage

Managed by vendor

Managed by vendor

Managed by vendor

3

© Microsoft

Cloud deployment models

Hybrid

Private/ Internal

Public/ External

The Cloud

On Premises / Internal

Off Premises / Third Party

Cloud Computing Types

CC-BY-SA 3.0 by Sam Johnston

Community Cloud: external part
(optimal, shared, made available) for specific usergroup
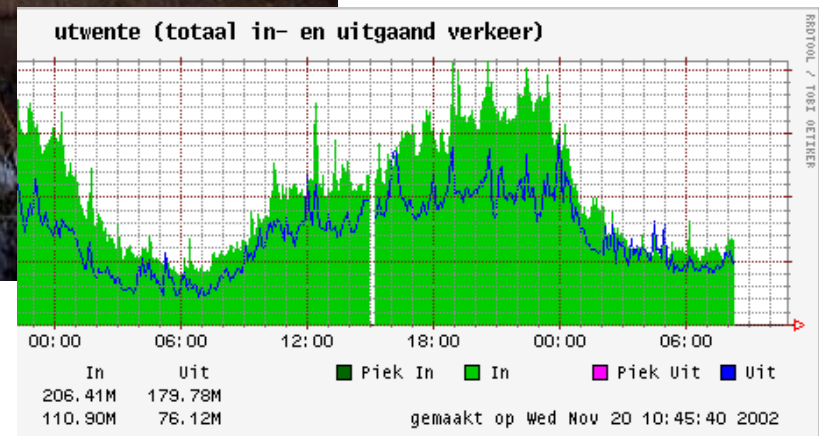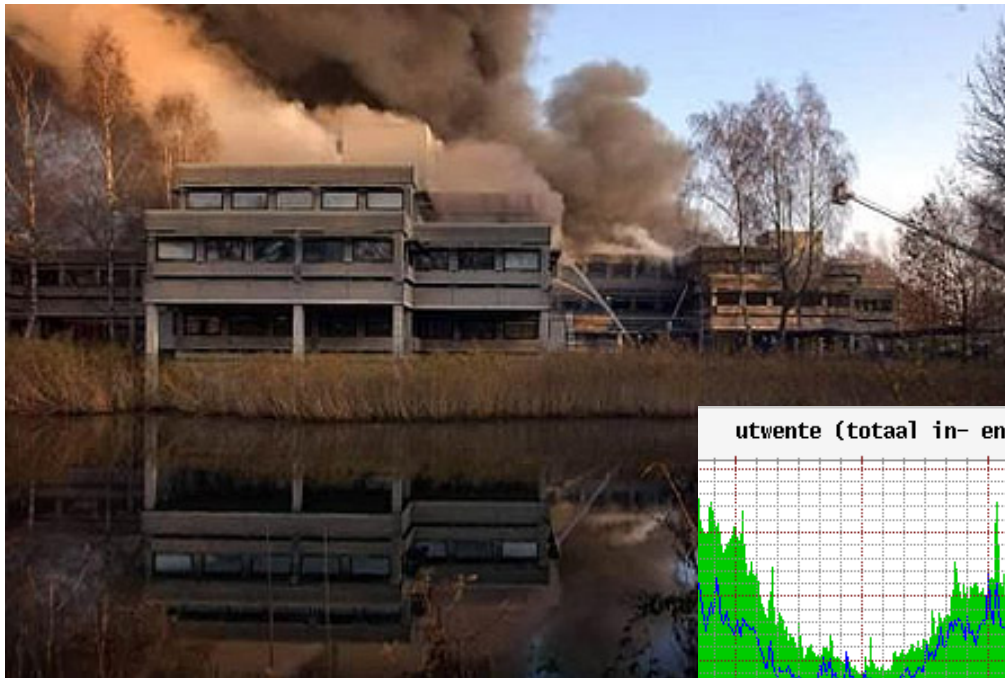
Community cloud drivers

- **Demand** for IaaS services
- **Service improvement**
  - Ease of use
  - Federated authentication
  - No vendor lock-in
- **Cost reduction**
  efficiency, procurement
- **Legal aspects**
- **Integration with network**

- Emphasis on **Green computing**

- For full or hybrid use, disaster recovery, …
- Customize to our community

- This scared many in 2002:

- It's still a "hot topic"
(But how do we ensure continuity best?)

IaaS pilots

- **Little commitment to use existing overcapacity** (and legally complicated?)

- **Pilot with institutions:**
  - in the Netherlands:
    - VMware vCloud director
    - Use platform from GreenQloud
  - Commercial cloud outside Netherlands (GreenQloud)
    - Different characteristics / use-cases
    - Focus on Green, energy, cooling, equipment
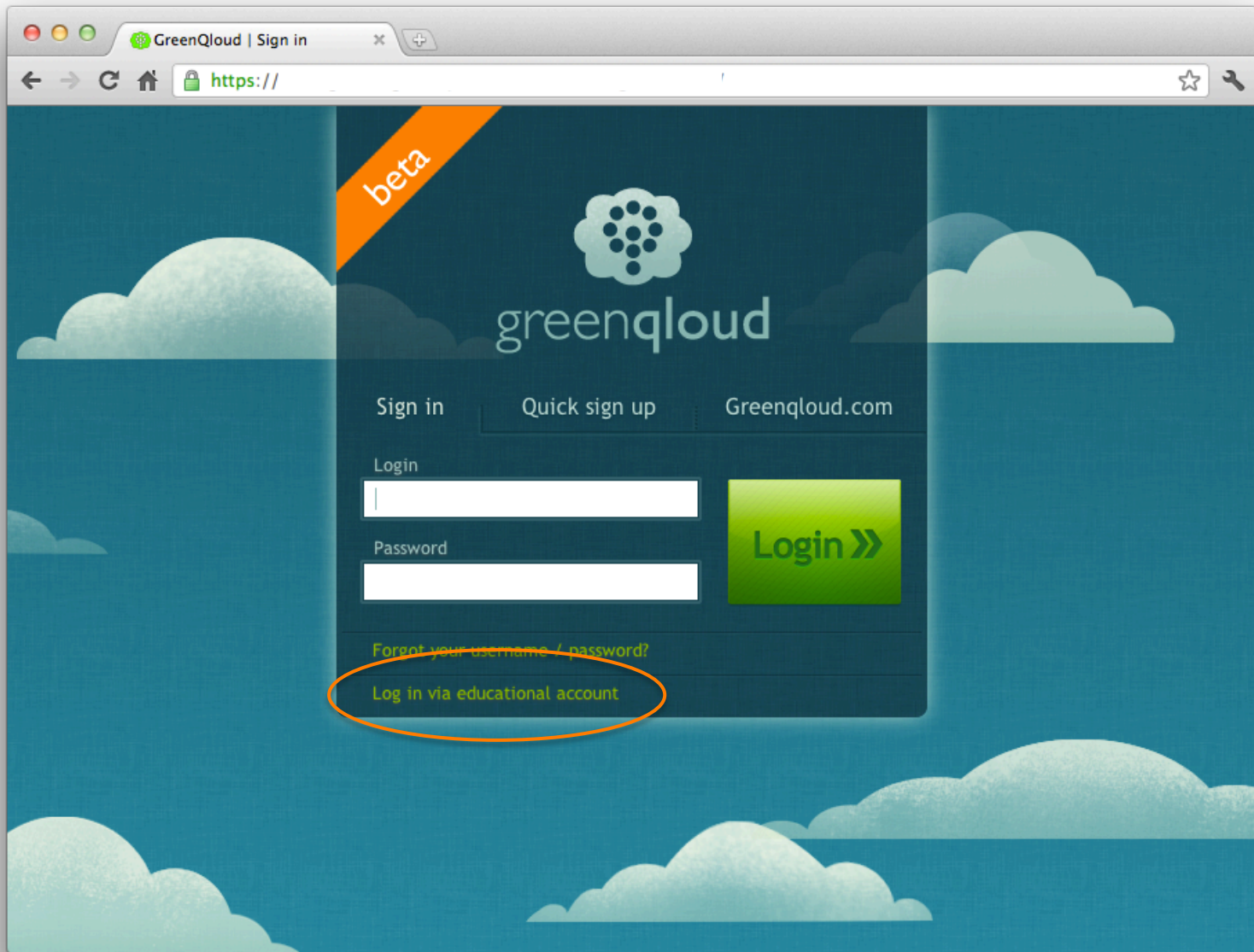   - Network aspects (inter domain, latency)

Brokered model

Institution A

Institution B

Institution C

IaaS Broker / Operator

IaaS provider X

IaaS provider Y
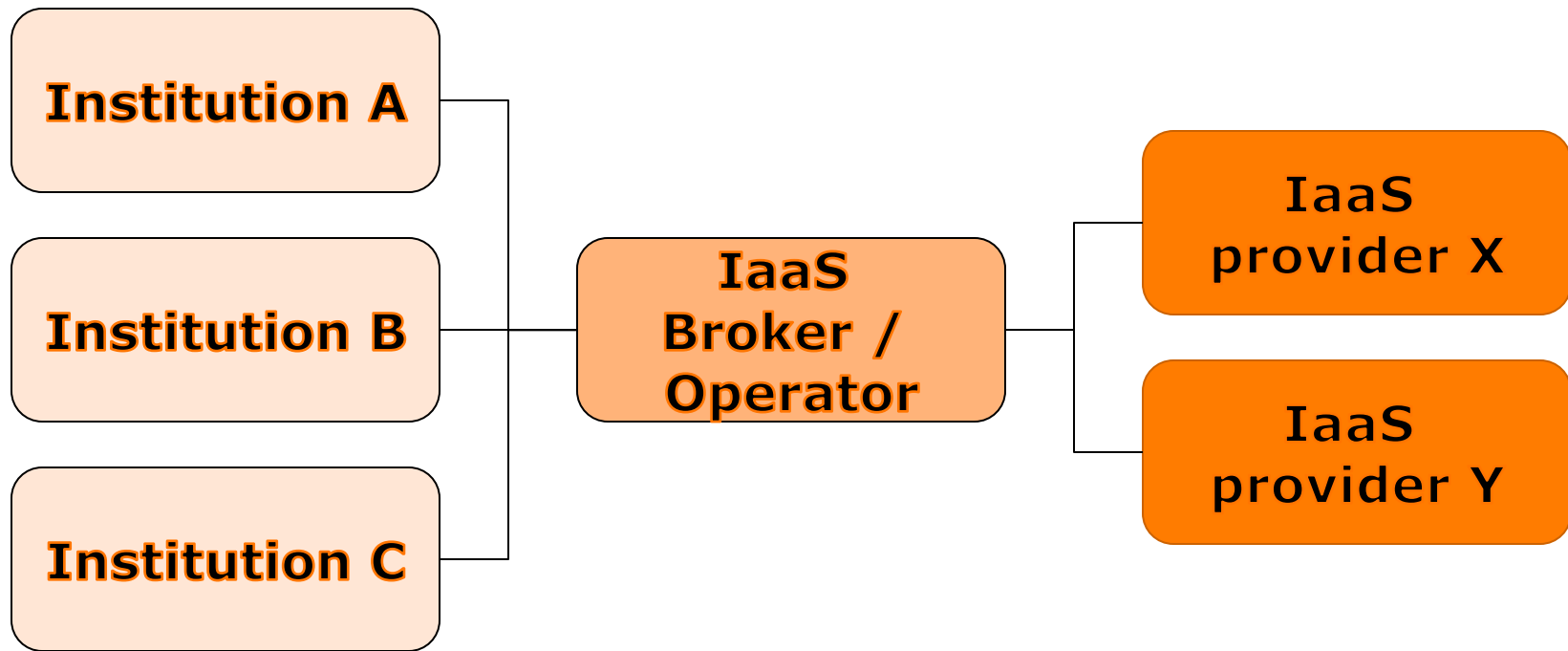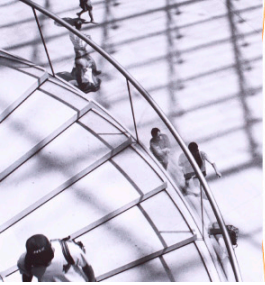
Ease of use
SAML authentication

- **SAML authentication in GreenQloud**
  - SURFnet (SURFfederatie)
  - SUNET

- **Run GreenQloud instance in the Netherlands**

- SAML in open source

- Use groups, VOs (unique to our community?)

- Integrate in SURFconext gadget

- Use existing tools (GreenQloud is Amazon compatible)

SAML authentication

GreenQloud, friendly portal

Network integration

- Networking to commercial IaaS cloud
  - Via Netherlight, NORDUnet, …
  - Use NREN-network capabilities (lightpaths)
    - Start machines behind own firewall?
    - Use NREN IP-space?
- Reduce networking cost
- Investigate latency impact
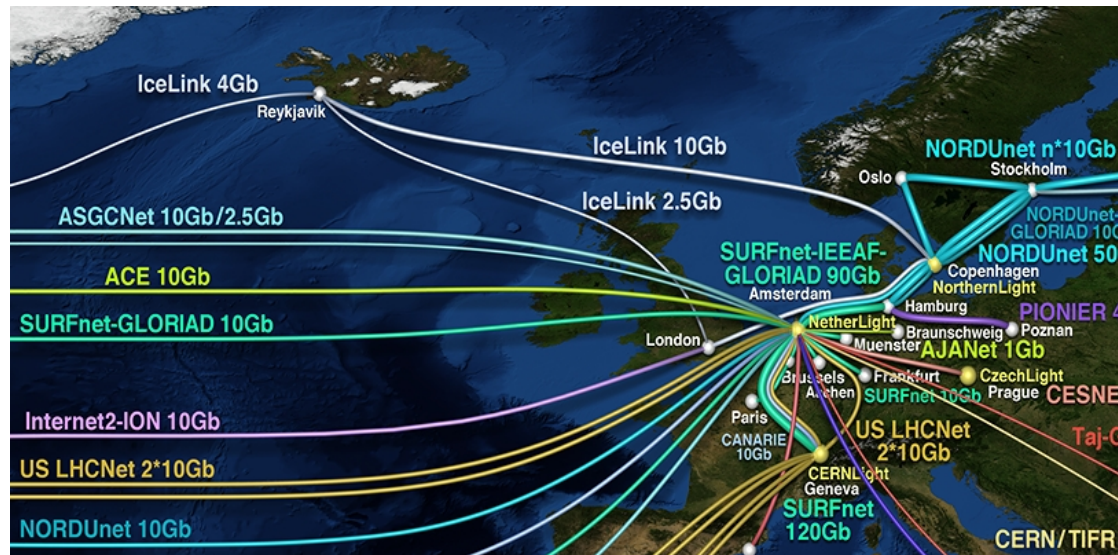
(part from glif.is maps)

Influence on applications

- Applications run outside network, different firewall or behind own firewall
- Latency

graph from Equinix
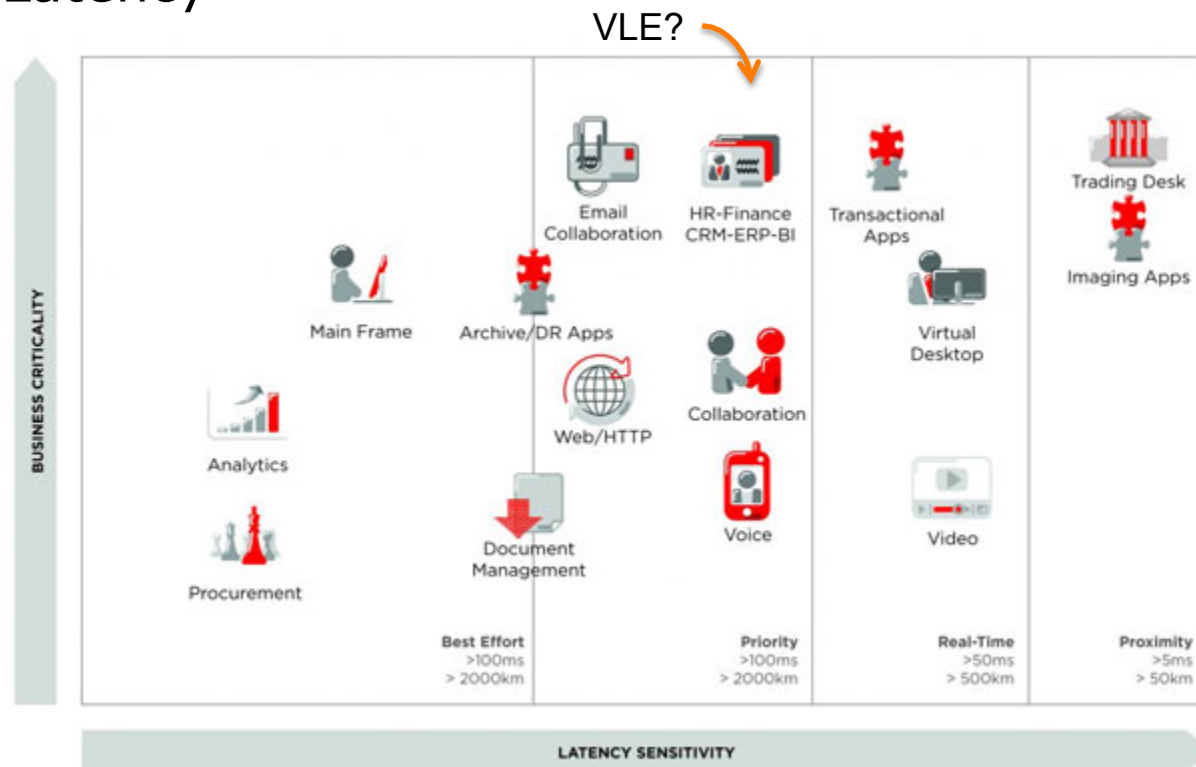
- Efficiency of cloud services (containers, pay-per-use stimulus)
- Power source / mix is important, not only about PUE

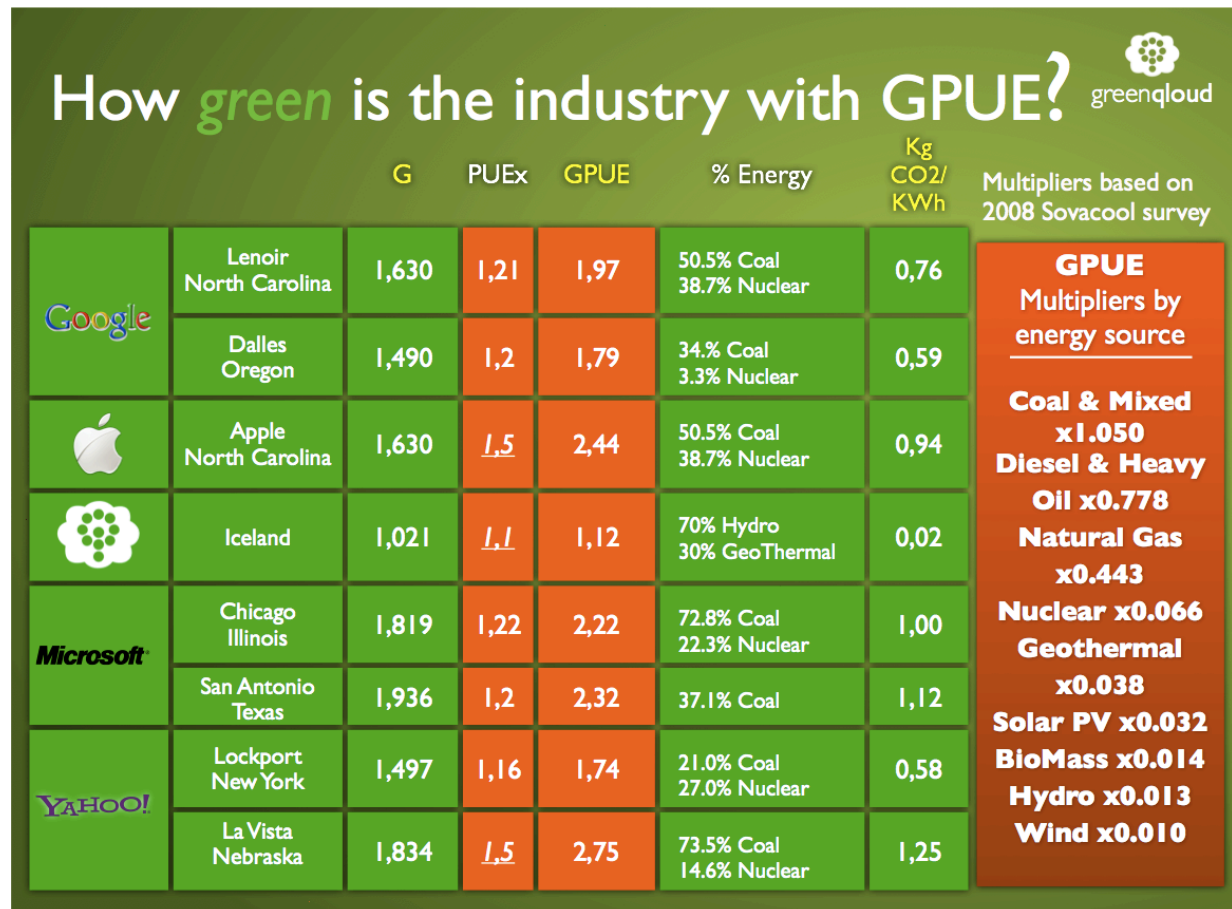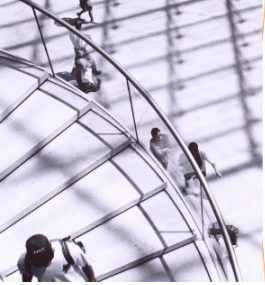| Energy source	g CO2/KWh
Wind	9
Hydroelectric reservoir	10
Wind	10
Biogas	11
Hydroelectric river	13
Solar thermal	13
Biomass	14
Solar PV	32
Geothermal	38
Nuclear	66
Natural gas	443
Diesel	778
Heavy oil	778
Coal	960
Coal no scrubbing	1050

Green IT (2)

- GreenQloud's focus on Green (not just energy source)
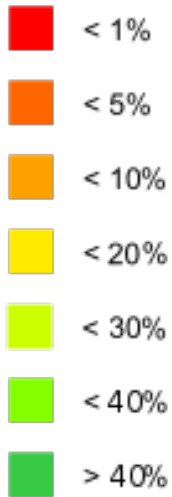- Use other countries strengths

Energy source	g CO2/KWh
Wind	9
Hydroelectric reservoir	10
Wind	10
Biogas	11
Hydroelectric river	13
Solar thermal	13
Biomass	14
Solar PV	32
Geothermal	38
Nuclear	66
Natural gas	443
Diesel	778
Heavy oil	778
Coal	960
Coal no scrubbing	1050

How *green* is the industry with GPUE? greenqloud

		G	PUEx	GPUE	% Energy	Kg CO2/KWh
Google	Lenoir North Carolina	1,630	1,21	1,97	50.5% Coal 38.7% Nuclear	0,76
	Dalles Oregon	1,490	1,2	1,79	34.% Coal 3.3% Nuclear	0,59
Apple	Apple North Carolina	1,630	1,5	2,44	50.5% Coal 38.7% Nuclear	0,94
greenqloud	Iceland	1,021	1,1	1,12	70% Hydro 30% GeoThermal	0,02
Microsoft	Chicago Illinois	1,819	1,22	2,22	72.8% Coal 22.3% Nuclear	1,00
	San Antonio Texas	1,936	1,2	2,32	37.1% Coal	1,12
YAHOO!	Lockport New York	1,497	1,16	1,74	21.0% Coal 27.0% Nuclear	0,58
	La Vista Nebraska	1,834	1,5	2,75	73.5% Coal 14.6% Nuclear	1,25

Multipliers based on 2008 Sovacool survey

GPUE Multipliers by energy source

Coal & Mixed x1.050
Diesel & Heavy Oil x0.778
Natural Gas x0.443
Nuclear x0.066
Geothermal x0.038
Solar PV x0.032
BioMass x0.014
Hydro x0.013
Wind x0.010

Proportion renewable

100% (70% hydro, 30% geo)
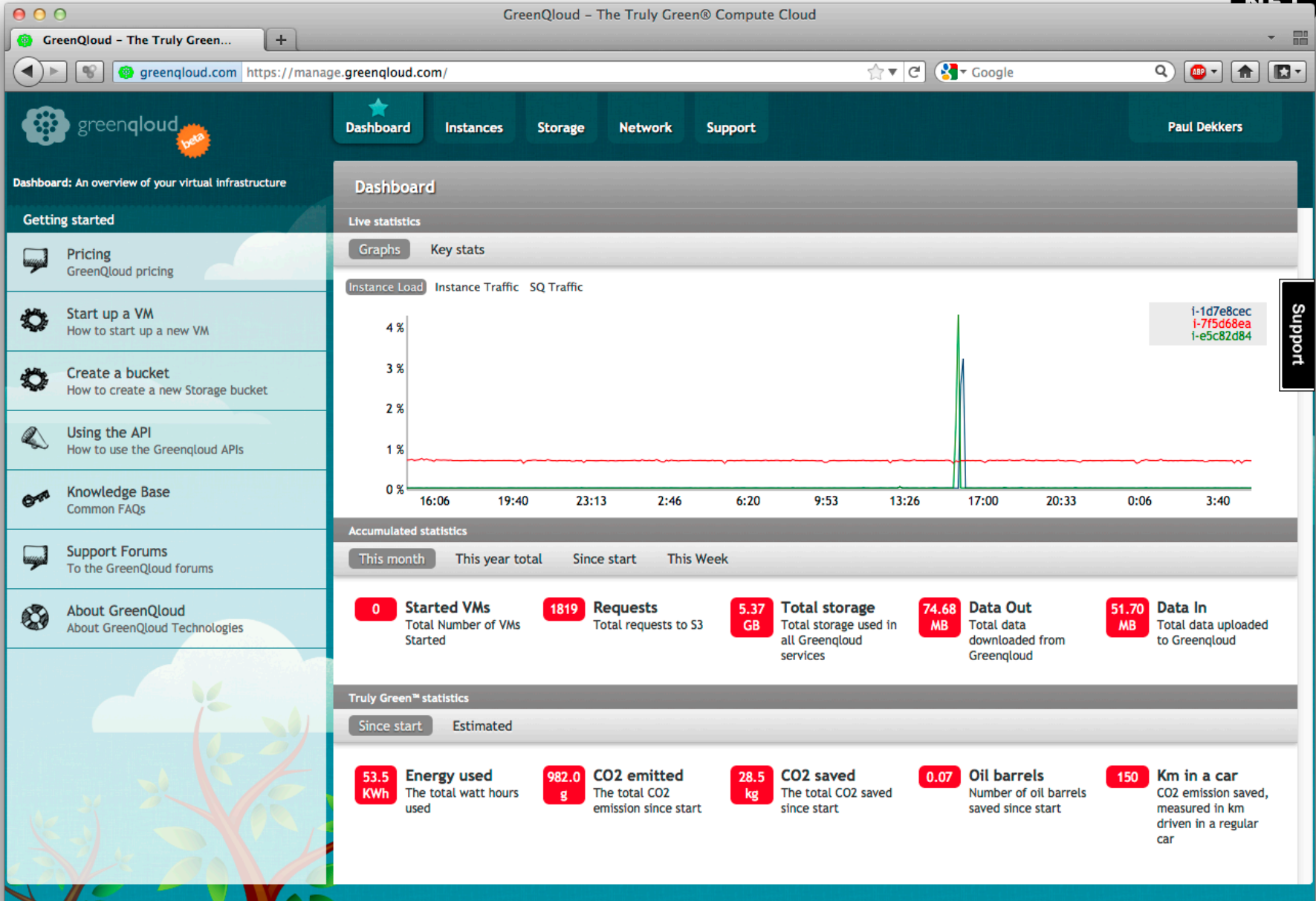(and cheap)

54%

62%

Eurostat, 2007
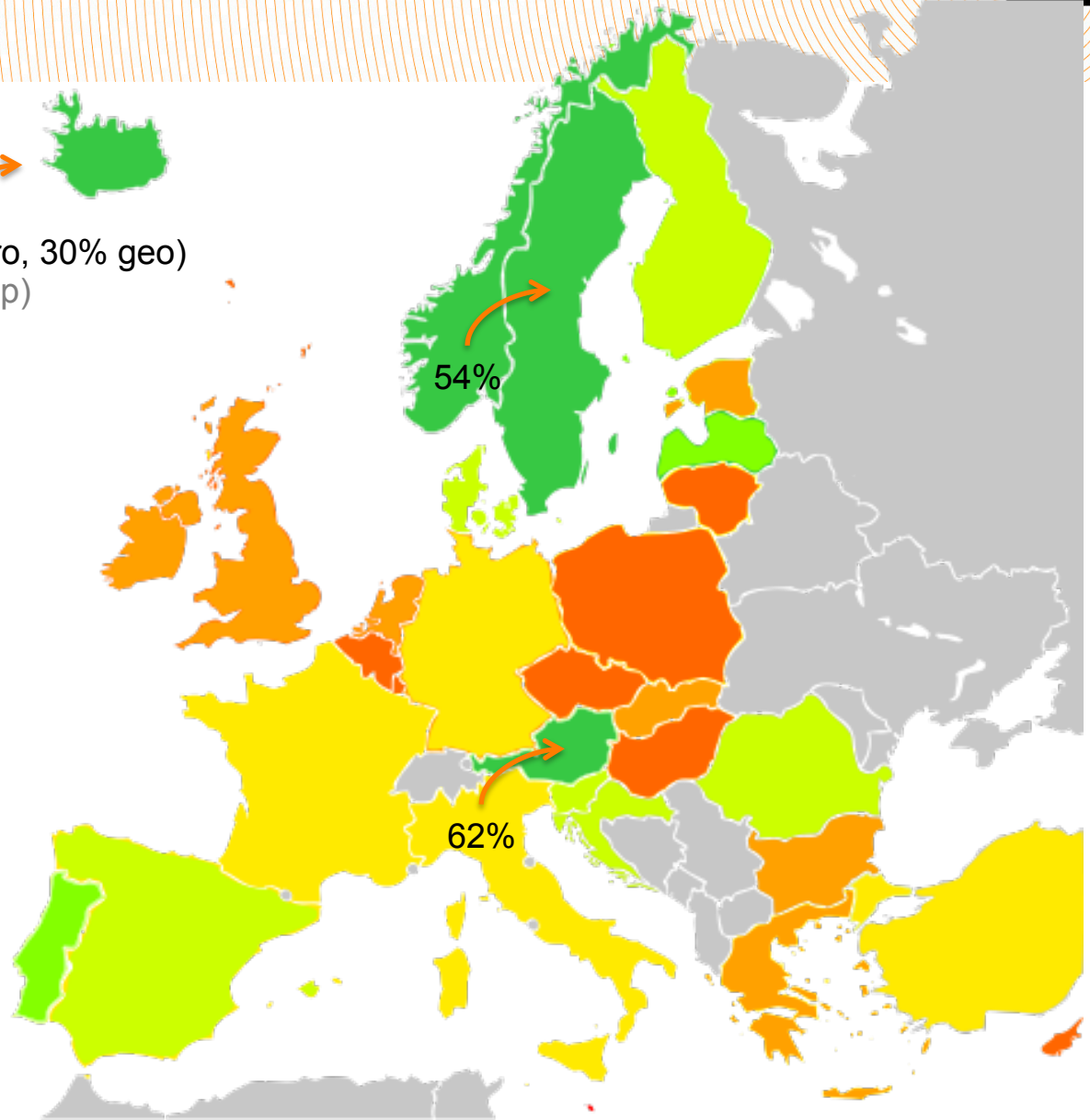
http://bit.ly/GSR2010 figures for 2010 electro, not heating

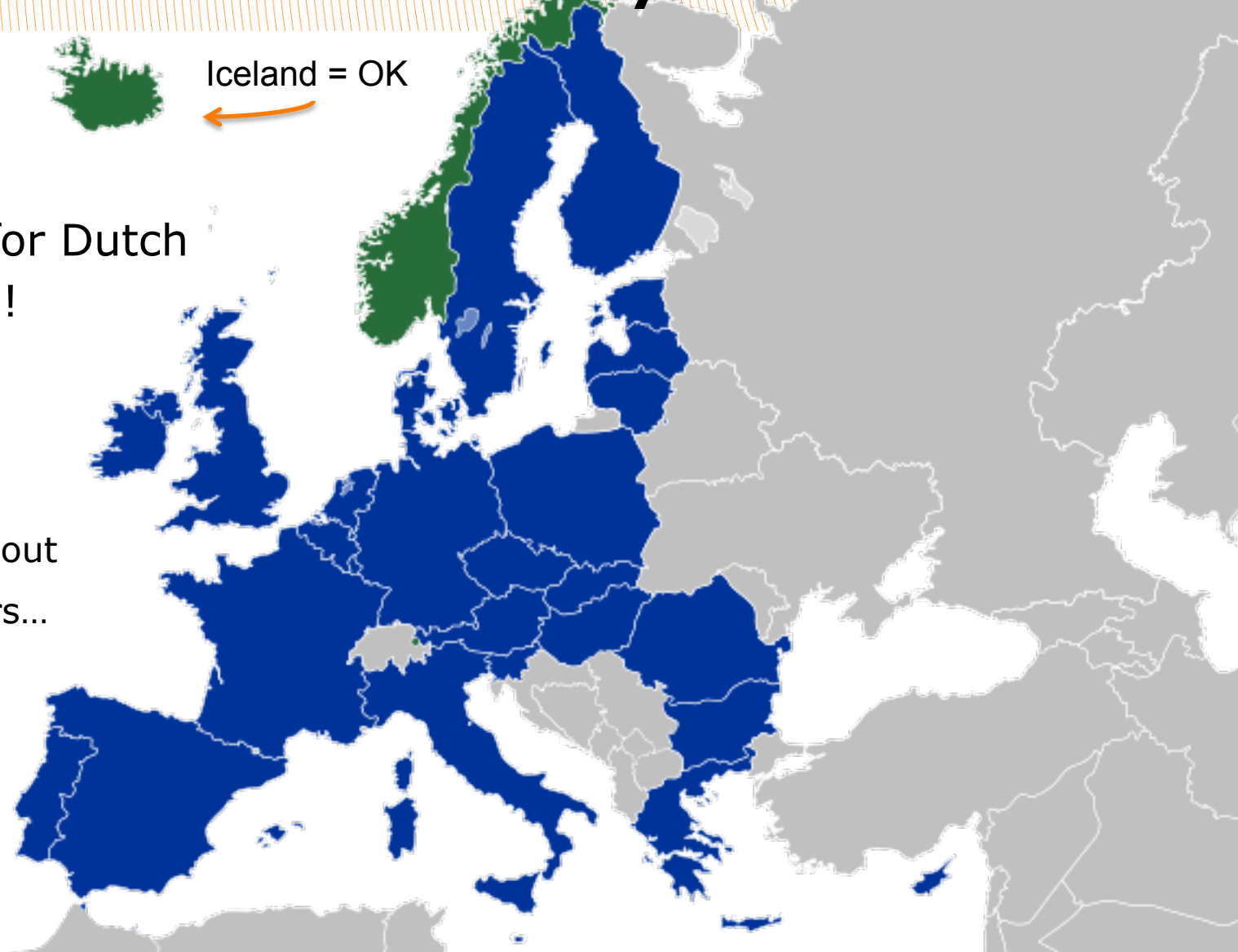# GreenQloud (report on energy)

European Economic Area
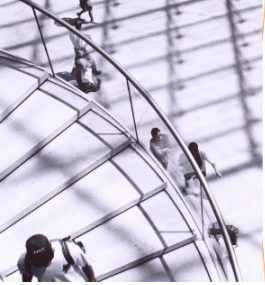## Personal data must stay inside

Iceland = OK

Important for Dutch privacy law!

so… what about US suppliers…
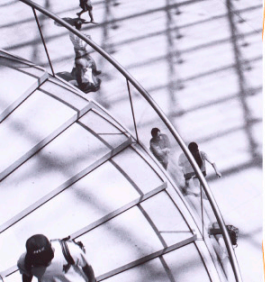
Demo

Questions

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Paul.Dekkers@surfnet.nl