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# e-Infrastructures

Rosette Vandenbroucke

# Overview



- Introduction
- e-infrastructures
- Cloud
- Data infrastructures
- Virtual Research Environments
- e-infrastructure policy

# Introduction



Rosette Vandenbroucke

Computer Scientist

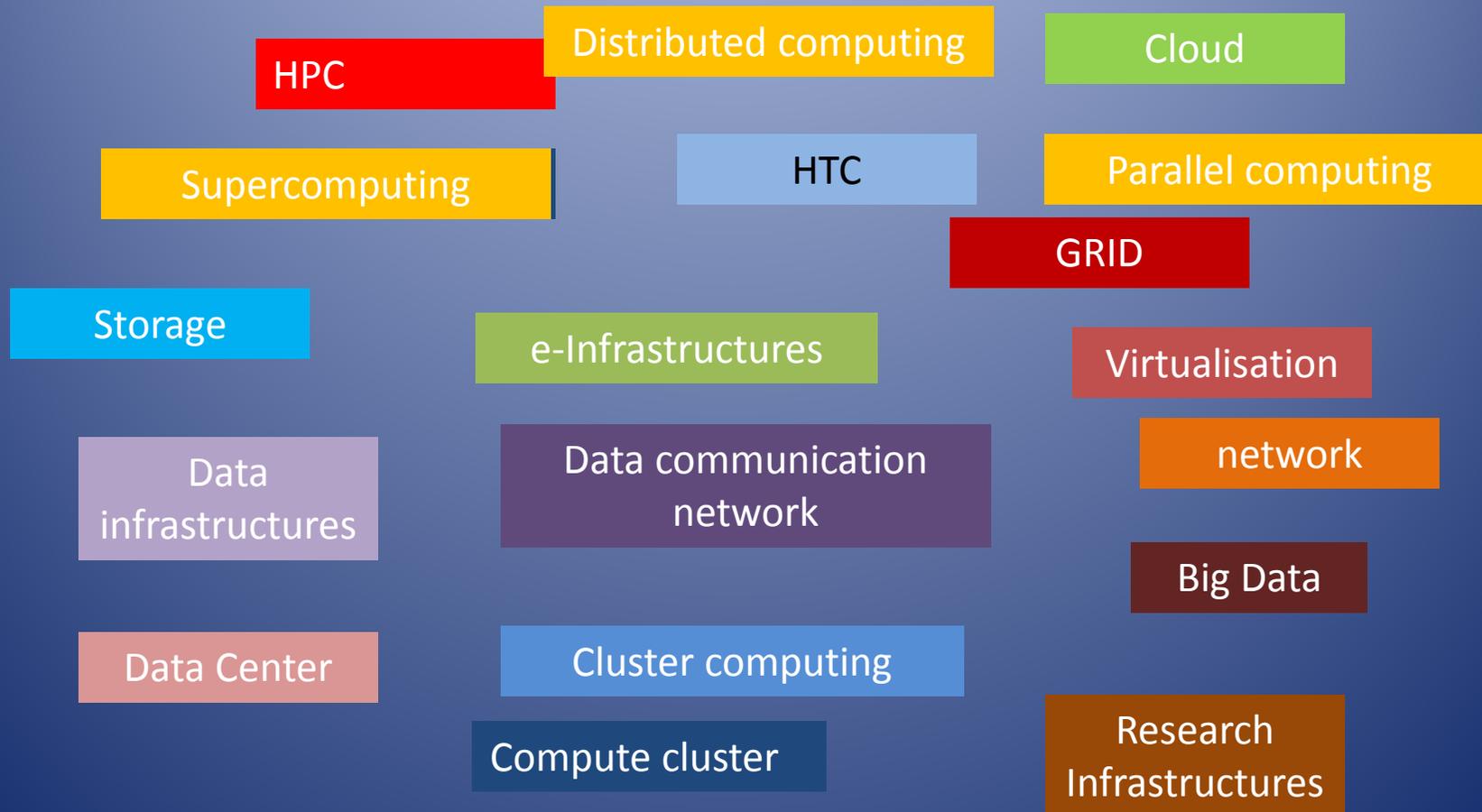
Employed by the Vrije Universiteit Brussel

Involved in national and international projects

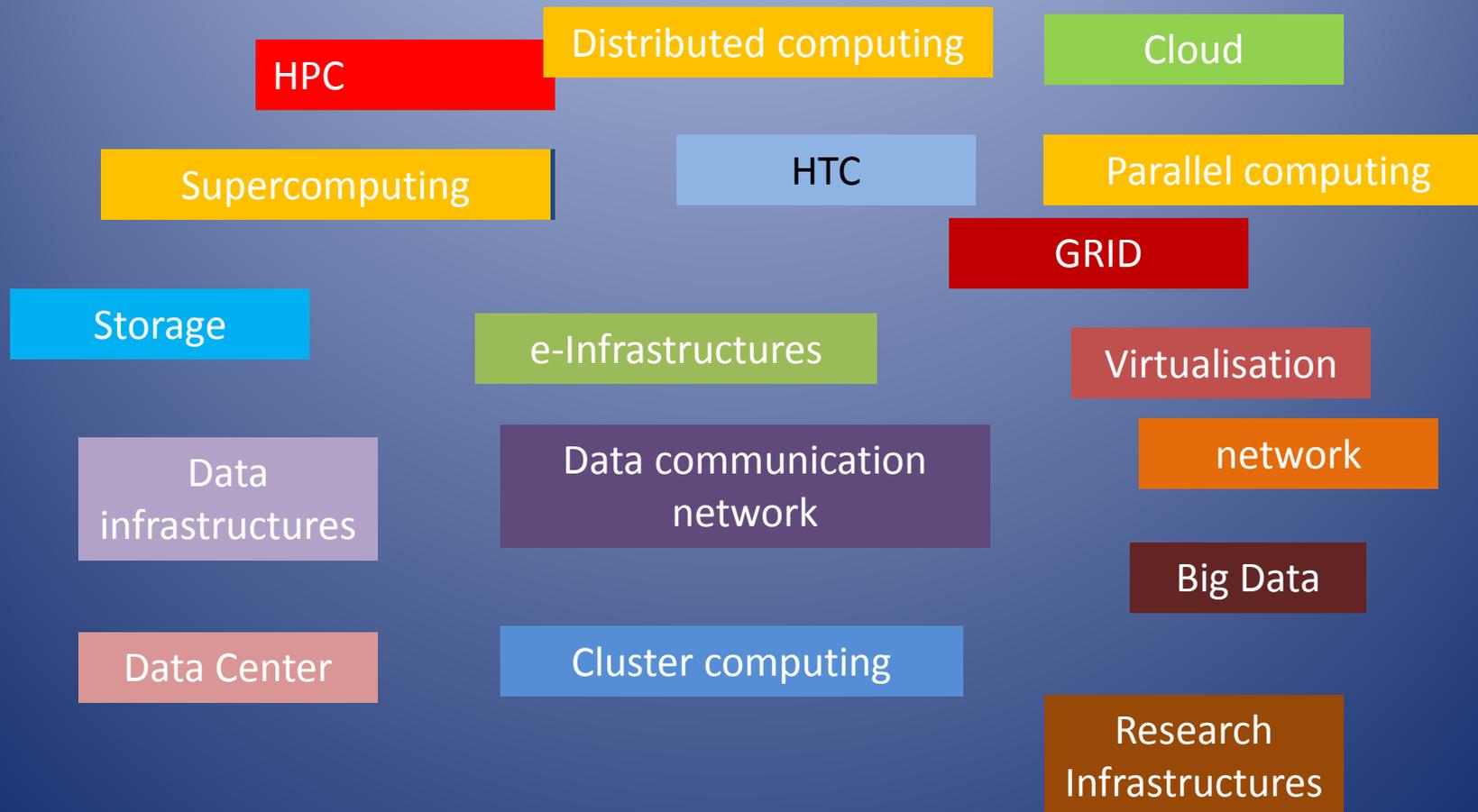
Belgian delegate to e-IRG

Working on/with e-infrastructures before  
they were called e-infrastructures

# Some Words



# Some Words



# Some explanations



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High Performance  
Computing (HPC)



High Throughput  
computing (HTC)



Supercomputing

# Computing (1)



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## HPC

Typically a cluster of computing nodes with 4 to 12 cores per node and typically between 2 and 4 Gbyte per core

Nodes are interconnected at high speed (Infini band)

Aimed at parallel computing

# Computing (2)



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HTC

Typically a cluster of computing nodes with 4 to 12 cores per node and typically between 2 and 4 Gbyte per core (more is possible)

Interconnection between nodes is high speed ethernet (1 Gbps – 10 Gbps)

Use aim is execution of many independent processes

used in **Grid Computing**

# Computing (3)



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## Supercomputer

One or more steps up  
compared to HPC

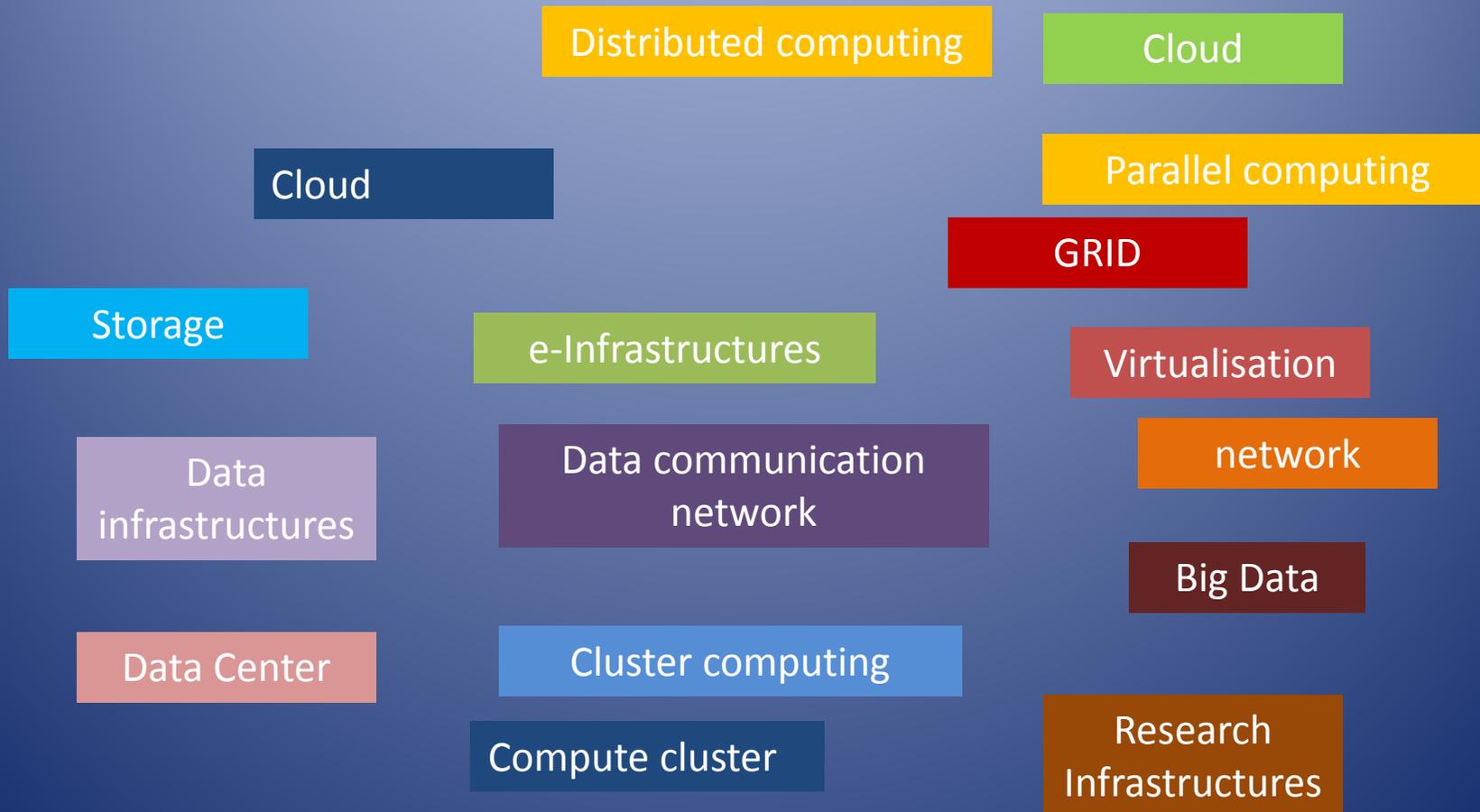
Can be about the same  
equipment as HPC but much  
more

Can be very specialised  
processors

Aimed at “massive”  
parallel processing

(e.g. using 500+ cores  
simultaneously)

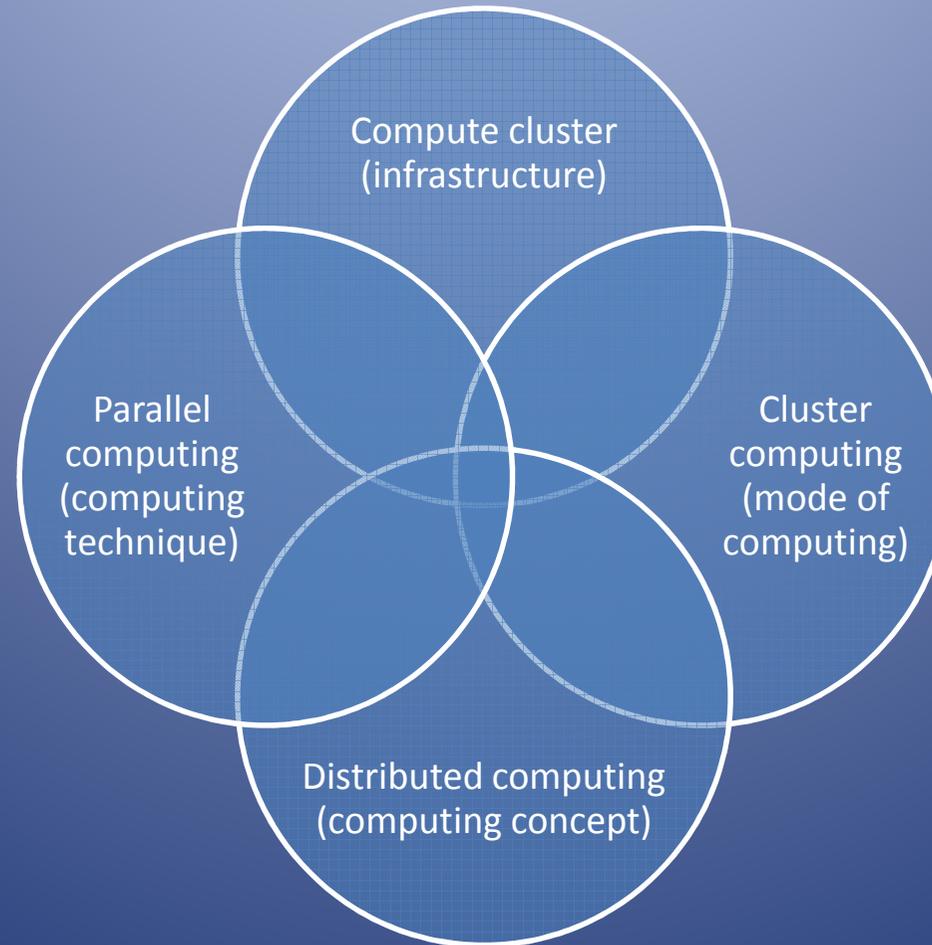
# Some Words



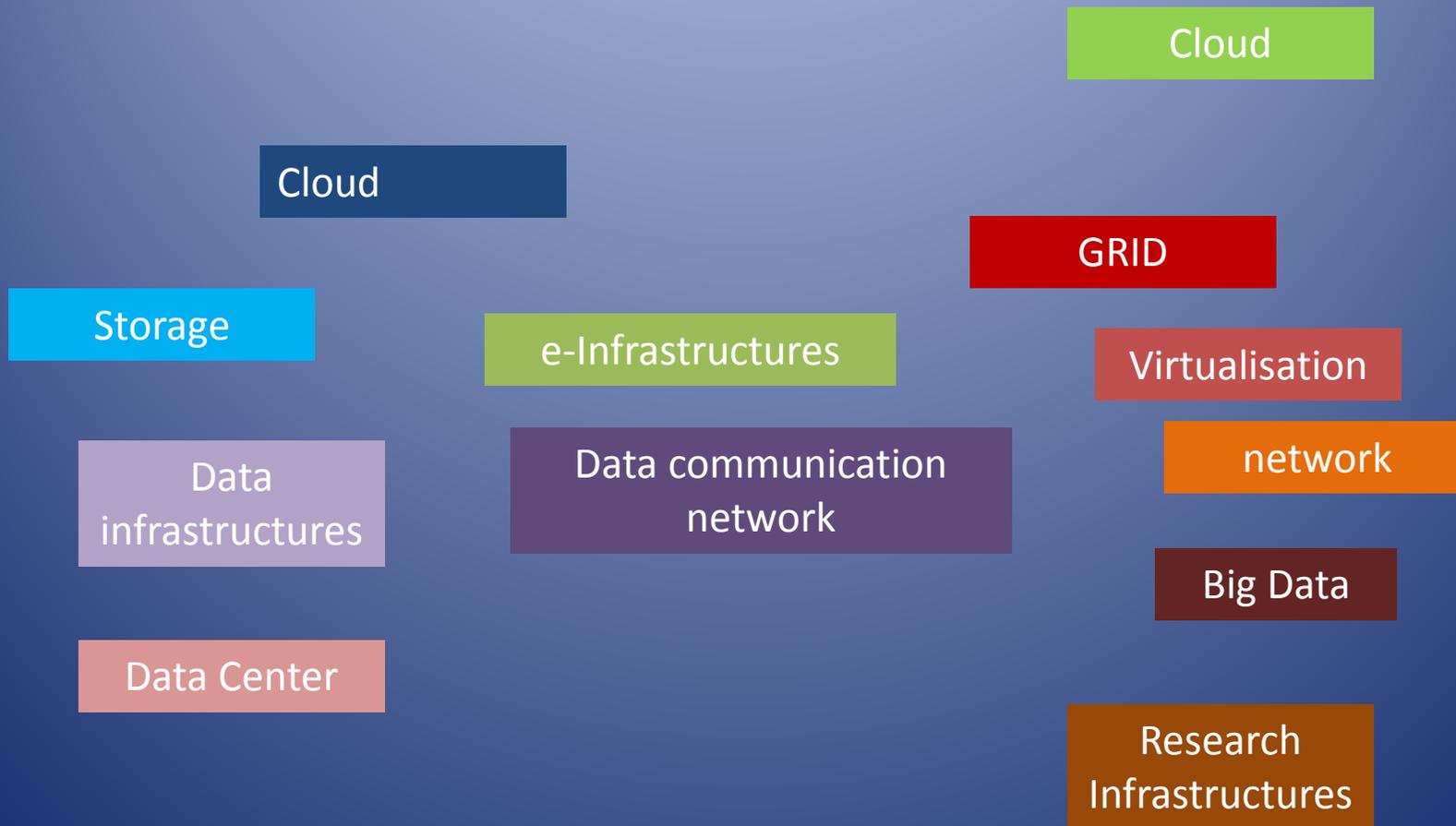
# Computing (4)



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# Some Words





## Data Center

- Compute clusters
- Storage
- Network
- ...

# Some Words



Cloud

GRID

Virtualisation

Big Data

e-Infrastructures

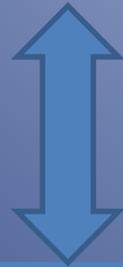
Research Infrastructures

Data infrastructures



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## e-Infrastructures ?



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## Research Infrastructures

# e-Infrastructures (2)



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## e-Infrastructure

= Term used for the **ICT technologies** and organisations that **support research** and **integrate** (part of) the following components:

- at the hardware level: networks, computing infrastructures, storage infrastructures, data centers
- At the software level: middleware
- At the service level: single sign-on, certificate authorities, help desk, training

# e-Infrastructures (3)



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e-Infrastructures are not set up for the sake of ICT research

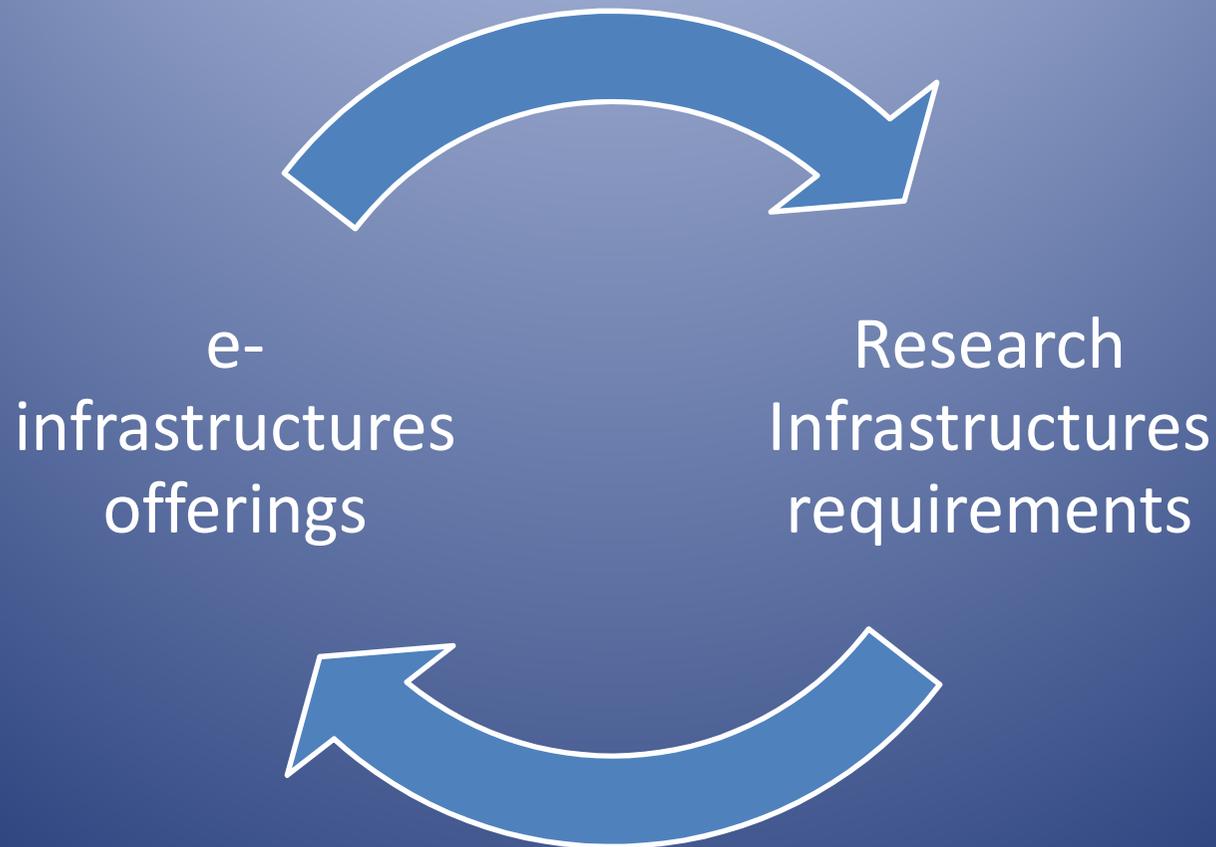
but

Serve the research (research infrastructures, researchers, ...)

# e-Infrastructures (4)



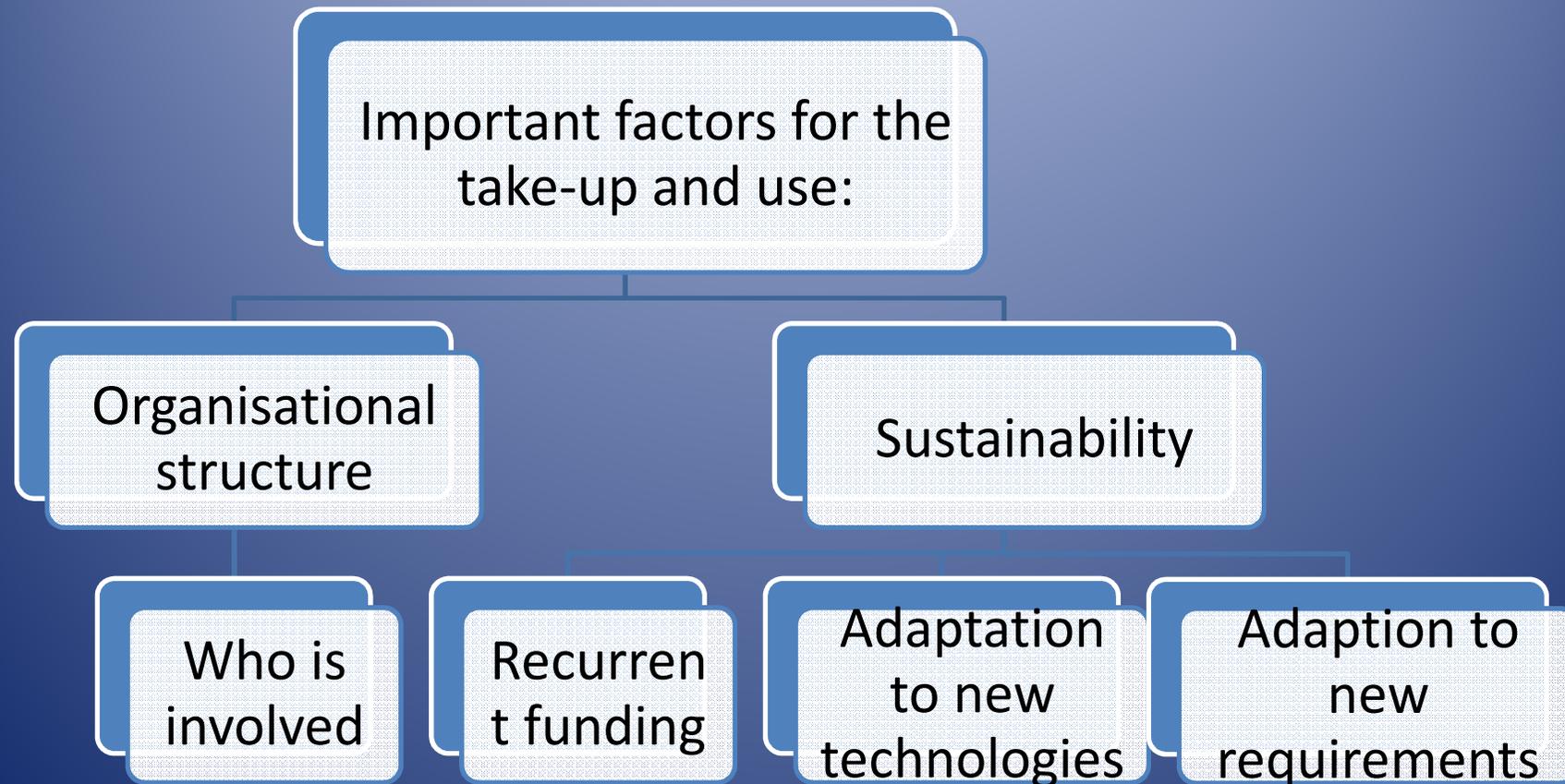
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# e-Infrastructure (5)



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# e-Infrastructures (6)



A few examples:

- GÉANT
- EGI
- PRACE

# Some Words



Cloud

Virtualisation

Data infrastructures

Big Data

# Cloud (1)



## Definition

- Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the Internet) with flexibility and adaptability.

# Cloud (2)



- can be considered as a service on an existing e-infrastructure
- the cloud service on an ICT infrastructure can turn it into an e-infrastructure
- It is not necessary to build a new hardware platform to provide for cloud services

# Cloud (3)



- SaaS (Software as a Service)
- IaaS (Infrastructure as a Service)
- PaaS (Platform as a service)

# Common need



to all e-infrastructures and services

- As transparent use as possible
- The user interface (portal) adapted to the research environment

# Some Words



Data infrastructures

Big Data

# Data infrastructures (1)



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- = e-Infrastructure +
  - Storage
  - metadata (to enable data localisation, data search, data content, ...)
  - Access to data (who wan access what)
  - IPR (Intellectual Property Right)
  - Data ownership

# Data infrastructures (3)

## Some considerations



- Metadata
  - Standardisation (many standards)
  - Common metadata format for using data interdisciplinary
- Distance from computing infrastructures
- Can be “ented” on existing e-infrastructures

# Virtual Research Environments (1)



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A **virtual research environment (VRE)** is an online system helping researchers collaborate.

Can include:

- collaboration support (Web forums and wikis)
- document hosting
- discipline-specific tools (use of e-infrastructures, visualisation, data analysis, ...)
- Publication management
- Teaching tools

# VRE (2)



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The purpose of a Virtual Research Environment (VRE) is to help researchers from all disciplines to work collaboratively by managing the increasingly complex range of tasks involved in carrying out research on both small and large scales.

# Virtual Research Communities



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- VRC or Virtual Research Communities is a group of researchers that collaborate using an e-infrastructure or a VRE.
  - Can be discipline related
  - Can be interdisciplinary (e.g. several disciplines working on the same data)
  - Can have a global membership

# e-Infrastructures policy



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Essentially 2 groups: e-IRG and eIPF

e-IRG: e-Infrastructure Reflection Group

eIPF: e-Infrastructure Policy Forum

# e-Infrastructures policy (2)



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## e-IRG

- Created at the start of grid computing
- Country delegates appointed by the national governments
- Takes care of policies of all aspects related to e-infrastructures
- Gives recommendations to e-infrastructure stakeholders (national governments, EC, national funding bodies, e-infrastructures, researchers, ...)

# e-Infrastructures policy (3)



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## eIPF

- Advisory body to the EC
- Set up by the EC
- Members are appointed by the national governments

# e-IRG work



- Policy papers
  - 2 yearly White paper (WP 2013 available)
  - Blue papers on specific topic
  - Task Force reports
  - 2 yearly Roadmap

<http://www.e-irg.eu/publications.html>

<http://www.e-irg.eu>

E-IRG is on LinkedIn, Twitter and Facebook.

# Thanks



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