

# *Impact of e-Infrastructures on ICT Research*

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*Member of the Board for Large Infrastructures for R&D in CZ*

# Presentation Overview

1. CESNET Basic Data
2. Research Plan Activities
3. e-Infrastructure Concept
4. Large e-Infrastructures in CZ
5. Opportunities in Area of Future Internet Research
6. Concluding Remarks

## *CESNET basic data*

CESNET (Czech Educational and Scientific Network)

- NREN in the Czech Republic

Not for profit legal entity

Association of Legal Entities (z.s.p.o.) . Members:

- 25 Universities
- Czech Academy of Sciences

60 staff members in Prague

More than 180 part-time universities and Academy of Sciences staff working on projects

## *Funding*

- Research plan: „Optical High Speed National Research Network and its New Applications“
- 2004 – 2010
- Funded by Ministry of Education, Youth and Sports of the Czech republic and association members
  - budged cca 14 Mil EURo/year

Research activity annual reports available

[\*www.ces.net\*](http://www.ces.net)

## *Past Funding*

- 1996 – 1998 - Implementation of TEN-34 CZ network  
Budget 515 mil. CZK
- 1999 – 2003 - High Speed National Research and  
Education Network and Its New  
Applications  
Budget 1038 mil. CZK
- 2004 – 2010 - Optical National Research Network  
and Its New Applications  
Expected budget 2432 mil. CZK

# *Research Plan Activities*

CESNET2 backbone network development – Václav Novák (CESNET)

Optical networks – Stanislav Šíma (CESNET)

Programmable hardware – Ladislav Lhotka (CESNET)

Network and traffic monitoring – Tomáš Košnar (CESNET)

Performance monitoring and optimisation – Sven Ubik (CESNET)

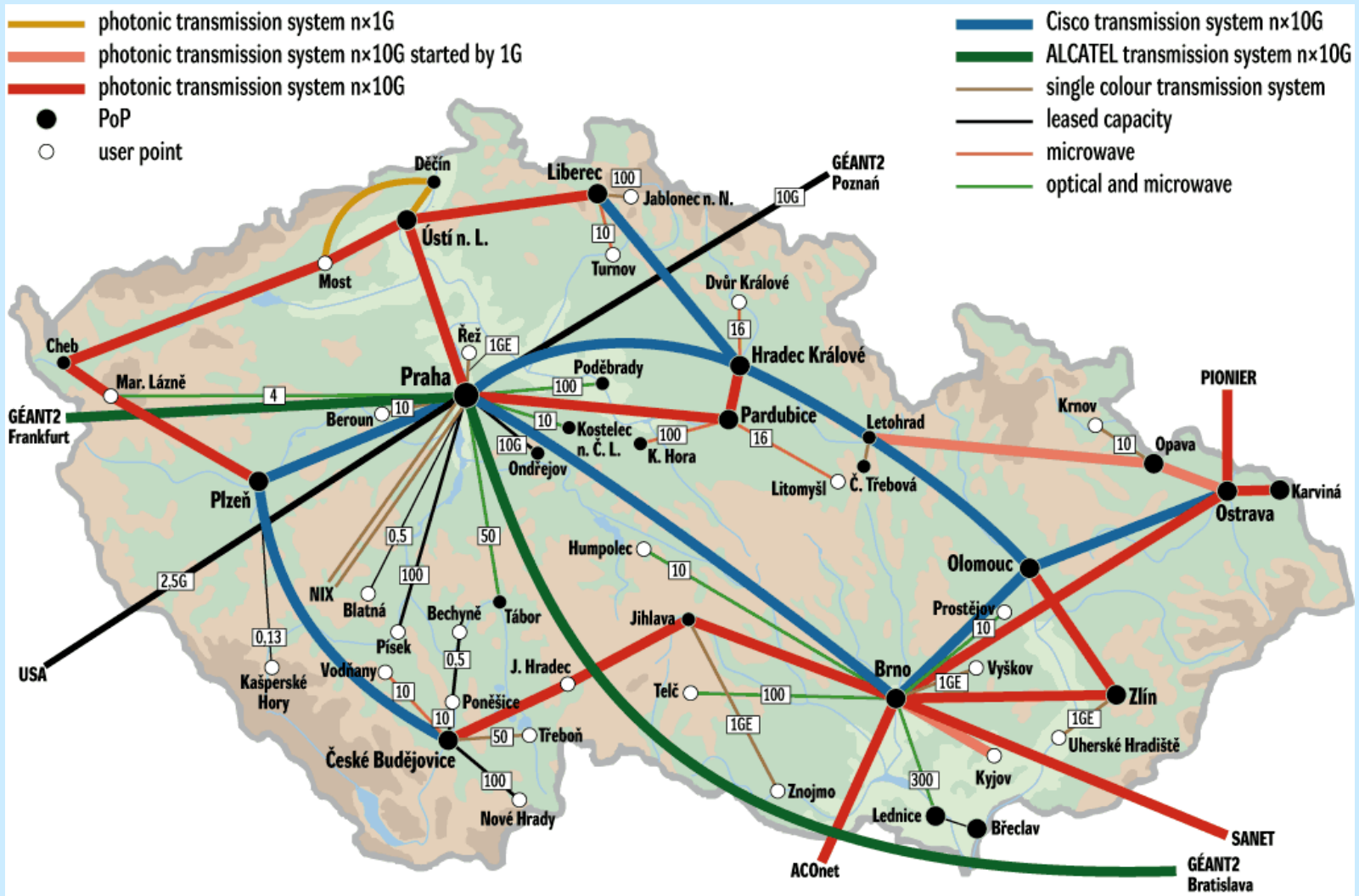
AAI and mobility – Milan Sova (CESNET)

META Centre – Luděk Matyska (MU in Brno)

Virtual collaborative environments – Eva Hladká (MU in Brno)

CESNET CSIRT – Andrea Kropáčová (CESNET)

Applications Support – Jiří Navrátil (CESNET)



DWDM in CESNET2+

# *Participation in International Networking Activities*

GN3 – from April 2009, total budget for 4 years 181 mil. EUR

[www.geant.net](http://www.geant.net)

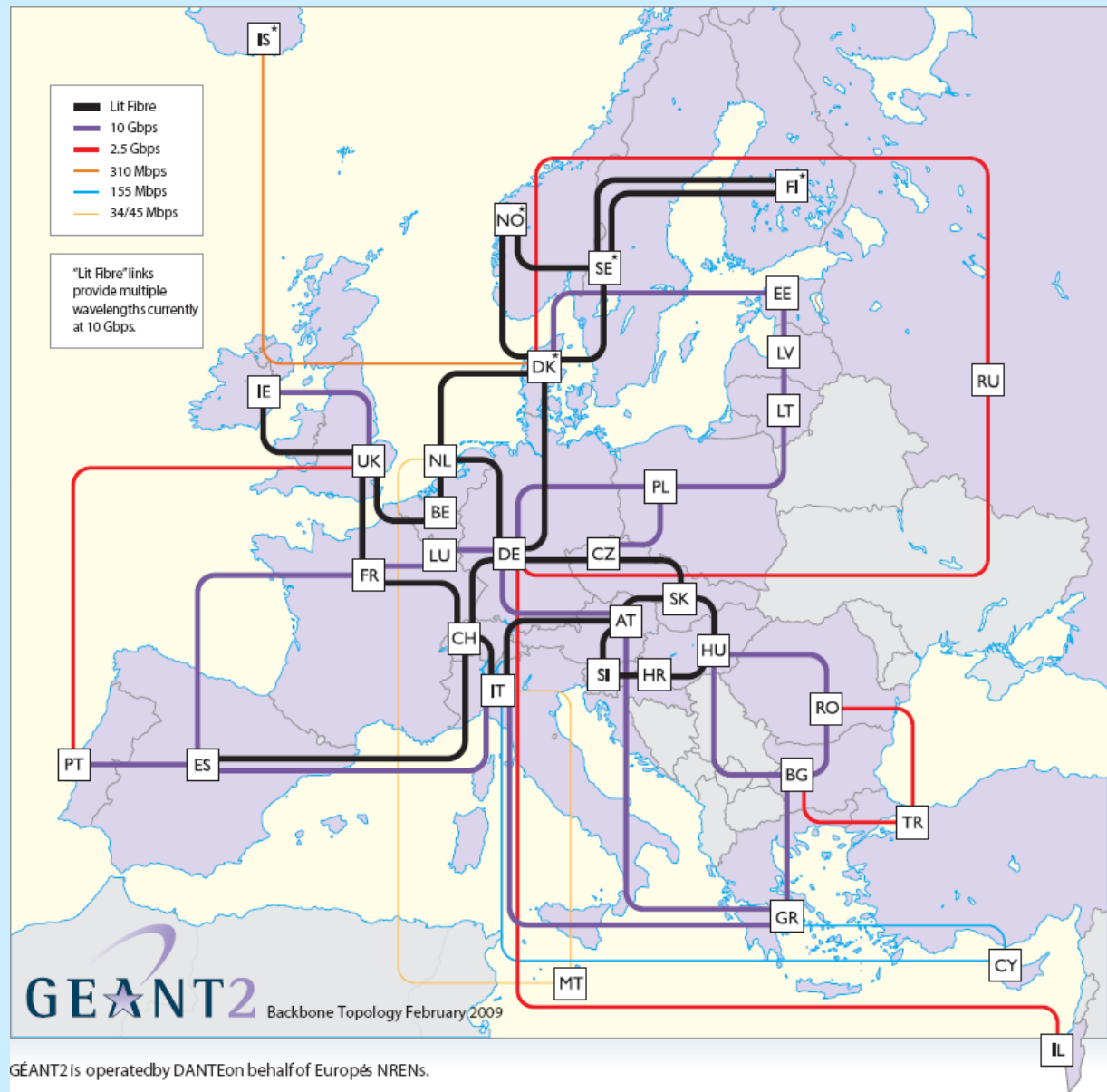
FEDERICA – Federated E-infrastructure for European Researchers Innovating in Computing Network Architectures, total budget 5.1 mil. EUR

[www.fp7-federica.eu](http://www.fp7-federica.eu)

GLIF – Global Lambda Integrated Facility

[www.glif.is](http://www.glif.is)

# GÉANT2+ Network Topology

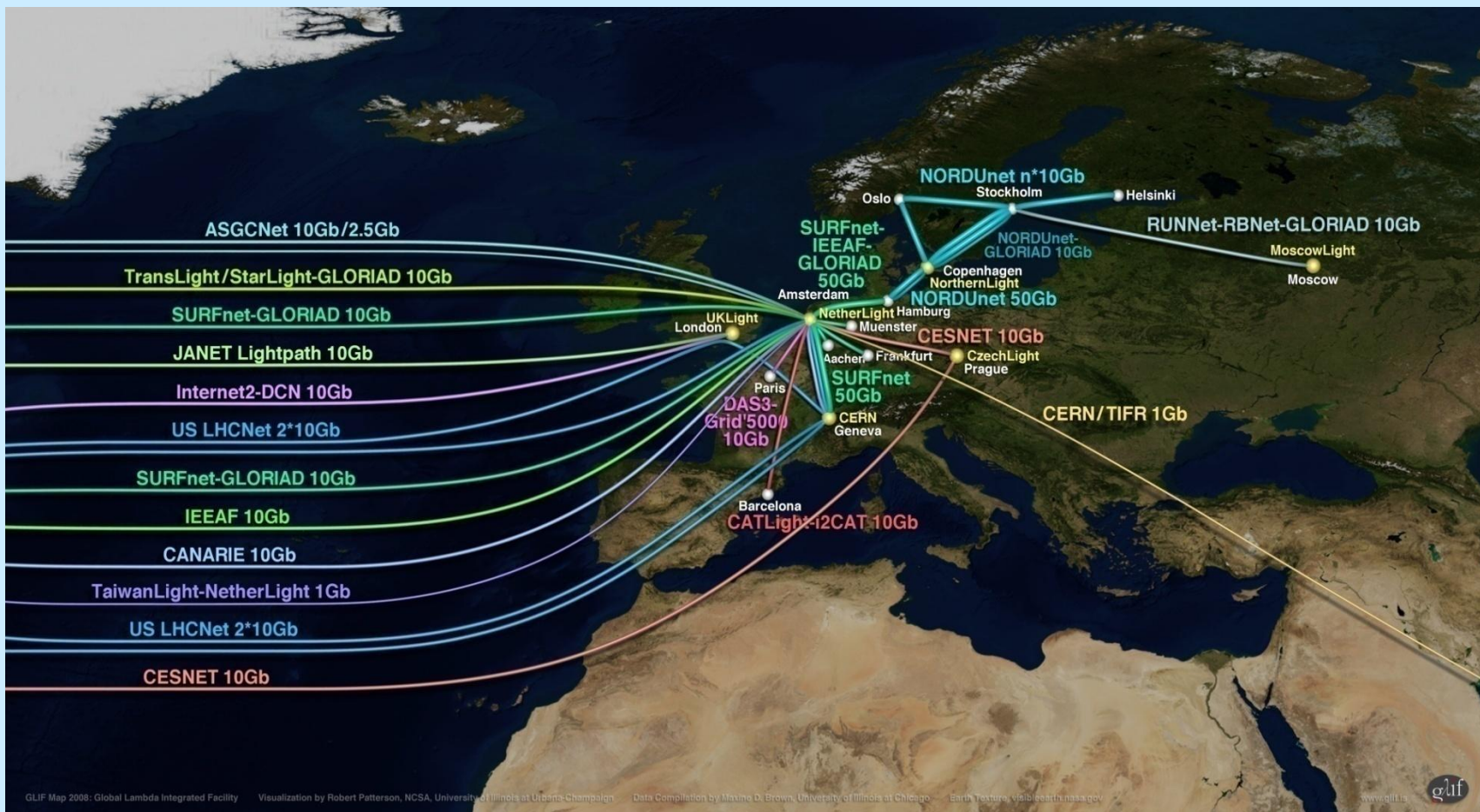


GÉANT2 is operated by DANTE on behalf of Europe's NRENs.

AT Austria	CZ Czech Republic	ES Spain	HR Croatia	IS Iceland*	LV Latvia	PL Poland	SE Sweden*
BE Belgium	DE Germany	FI Finland*	HU Hungary	IT Italy	MT Malta	PT Portugal	SI Slovenia
BG Bulgaria	DK Denmark*	FR France	IE Ireland	LT Lithuania	NL Netherlands	RO Romania	SK Slovakia
CH Switzerland	EE Estonia	GR Greece	IL Israel	LU Luxembourg	NO Norway*	RU Russia	TR Turkey
CY Cyprus							UK United Kingdom

\*Connection between these countries are part of NORDUnet (the Nordic regional network)





GLIF Europe map

## *Participation on Grid activities*

DataGrid, EGEE, EGEE II, EGEE III

- design of European common Grid
- middleware development
- Grid incident response team
- Virtual organization support

EGI- DS

- European Grid Initiative – CESNET is Design Study project co-ordination

EUAsiaGRid

- EGI-Inspire

# Research Infrastructures

## Relevant policy bodies

European Strategy Forum  
on Research Infrastructures

ESFRI



## *Research Infrastructures – definitions (1):*

The understanding of research Infrastructures (RI) follows the definition of the FP7 Capacities proposed in the Work Programme 2010 – Capacities Part 1. Research Infrastructures:

*..the term „research infrastructures“ refers to facilities resources and related services that are used by the scientific community to conduct top-level research in their respective fields. This definition covers: major scientific equipment or set of instruments; knowledge based-resources such as collections, archives or structured scientific information; enabling ICT-based e-Infrastructures such as Grid computing, software and communication networks; any other entity of a unique nature essential to achieve excellence in research. Such infrastructures may be „single-sited“ or „distributed“ (a network of resources).*

## *Research Infrastructures – definitions (2):*

ESFRI (European Strategy on Research Infrastructures) in its **Roadmap 2008** proposes a similar definition:

*They are facilities, resources or services of a unique nature that have been identified by pan-European research communities to conduct top-level activities in all fields.*



# Roadmap for Large Research, Development and Innovation Infrastructures in the Czech Republic

Ministry of Education, Youth and Sports

# B

## Distribution of Large Infrastructures According to Research Focus



### 1. Social Sciences and Humanities (SSH)

1.1. Current Status | 1.2. SWOT Analysis | 1.3. High-priority Projects | 1.4. Promising Projects



### 2. Environmental Sciences (ENV)

2.1. Current Status | 2.2. SWOT Analysis | 2.3. High-priority Projects | 2.4. Promising Projects



### 3. Materials Physics and Space

3.1. Current Status | 3.2. SWOT Analysis | 3.3. High-priority Projects | 3.4. Promising Projects



### 4. Energy

4.1. Current Status | 4.2. SWOT Analysis | 4.3. High-priority Projects | 4.4. Promising Projects



### 5. Biomedicine

5.1. Current Status | 5.2. SWOT Analysis | 5.3. High-priority Projects | 5.4. Promising Projects



### 6. Informatics/e-Infrastructure

6.1. Current Status | 6.2. SWOT Analysis | 6.3. High-priority Projects | 6.4. Promising Projects

## 6.3 High-priority Projects

### Large infrastructure CESNET – national partner GÉANT and EGI.eu

The aim of the project “Large infrastructure CESNET” is to establish a comprehensive large e-infrastructure for research, experimental development and innovations. The infrastructure will include all general components of an e-infrastructure necessary for participation of the CR in the European Research Area and allowing connection to other e-infrastructures described in the ESFRI Roadmap. The main components included in this infrastructure will be as follows: a national communication infrastructure with data transmission efficiency and a national grid infrastructure (NGI) with added instruments and services for controlling access to e-infrastructure resources, instruments for ensuring security of communication and data protection, and instruments for effective cooperation between distributed users and teams. With regard to the communication infrastructure, the project aims to ensure adequate transmission band for the

continuously increasing volumes of transmitted data, in particular in view of the expected emergence of research centres such as IT4I, CERIT, BIOCBV, CBTEC and participation of our scientists in international research infrastructures. Connection to similar international infrastructures will be ensured mainly through the GÉANT network. The role of the NGI lies in providing basic computing and storage grid services, integration of significant computing and storage capacities of other entities in these grids and coordination of sharing and utilisation of these capacities. The cooperation with European grid infrastructures will be ensured by the emerging organisation EGI.eu and participation in the EGI project.

The created e-infrastructure will serve not only as a joint transparent communication environment for cooperation of entities active in research, experimental development and innovation across all sectors in the CR, but also as a testing and development environment for new technologies and applications in information and communication technologies.

### Table

Name of large infrastructure	Brief description	Infrastructure type	Year of completion
CESNET	Communication e-infrastructure and the National Grid Infrastructure	National part of the European (GÉANT, EGI)	Existing, Restoration 2015

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## 6.4 Promising Projects

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### ■ IT4Innovations (IT4I) – national partner of the PRACE project

The global objective of the IT4Innovations (IT4I) project is to establish a national centre for excellent research in information technologies in the Czech Republic. The project will involve creation of a research environment, including an adequate infrastructure, focused mainly on research and development of computing methods jointly referred to as High Performance Computing (HPC), with a special emphasis on their usability in applied sciences and development of the information society. Therefore, the aim of the project is to use a highly effective computer infrastructure at the level of TOP 100 most powerful supercomputers to create a broad portfolio of services ranging from research and development of new methods, software support for parallel algorithms, and design and implementation of highly demanding tasks of a multidisciplinary character to providing computing capacities.

It is assumed that in addition to making the HPC services available to national research programmes, the IT4I centre will also be included in European structures for highly demanding computation, which is currently given by its membership in PRACE (Partnership for Advanced Computing in Europe).

### ■ CERIT-SC

The CERIT-SC supercomputer centre will be a highly performing centre included in the wider CERIT project, and in conjunction with the supercomputer centre IT4I will form the National Supercomputer Centre of the CR integrated in the EU project PRACE. CERIT-SC will be equipped with a highly performing supercomputer (of a standard between TOP 100 and TOP 200), which will be complemented by a system of highly effective clusters, whose performance will be offered through a grid and a cloud interface with a high level of adjustment to users and their immediate needs – interconnection of the two systems will be one of the main development focuses on the centre. 10PB rate storage capacities will allow users medium and long-term storage of extensive sets of data. CERIT-SC has prearranged cooperation and utilisation of the constructed capacities with large newly planned centres of excellence such as CzechGlobe, CBTEC, BIOCEV, RECAMO, ADMAS and through these centres also with significant ESFRI projects in which the CR participates.



## Large Infrastructures (LI) for R&D

- large research infrastructures defined by law amendment about R&D&I support
  - built from EC structural funds (85%) and national funds (15%)
  - operation from dedicated support of large infrastructures
- LI must be established and operated by research organization
- LI must be approved by the government

## Large e-Infrastructures in CZ

- CESNET
  - communication infrastructure
  - NGI (basic services of computing and storage grid, involvement capacities of another subjects, VC services, .....)
  - approved by Czech government in March 2010
- IT4Innovation
  - HPC services (supercomputing centre)
- CERIT SC (Scientific Cloud)
  - grid computing

# Project „Extension of National Information Infrastructure for R&D in Regions“ - (eIGer - e-Infrastructure and Grid for e-Regions)

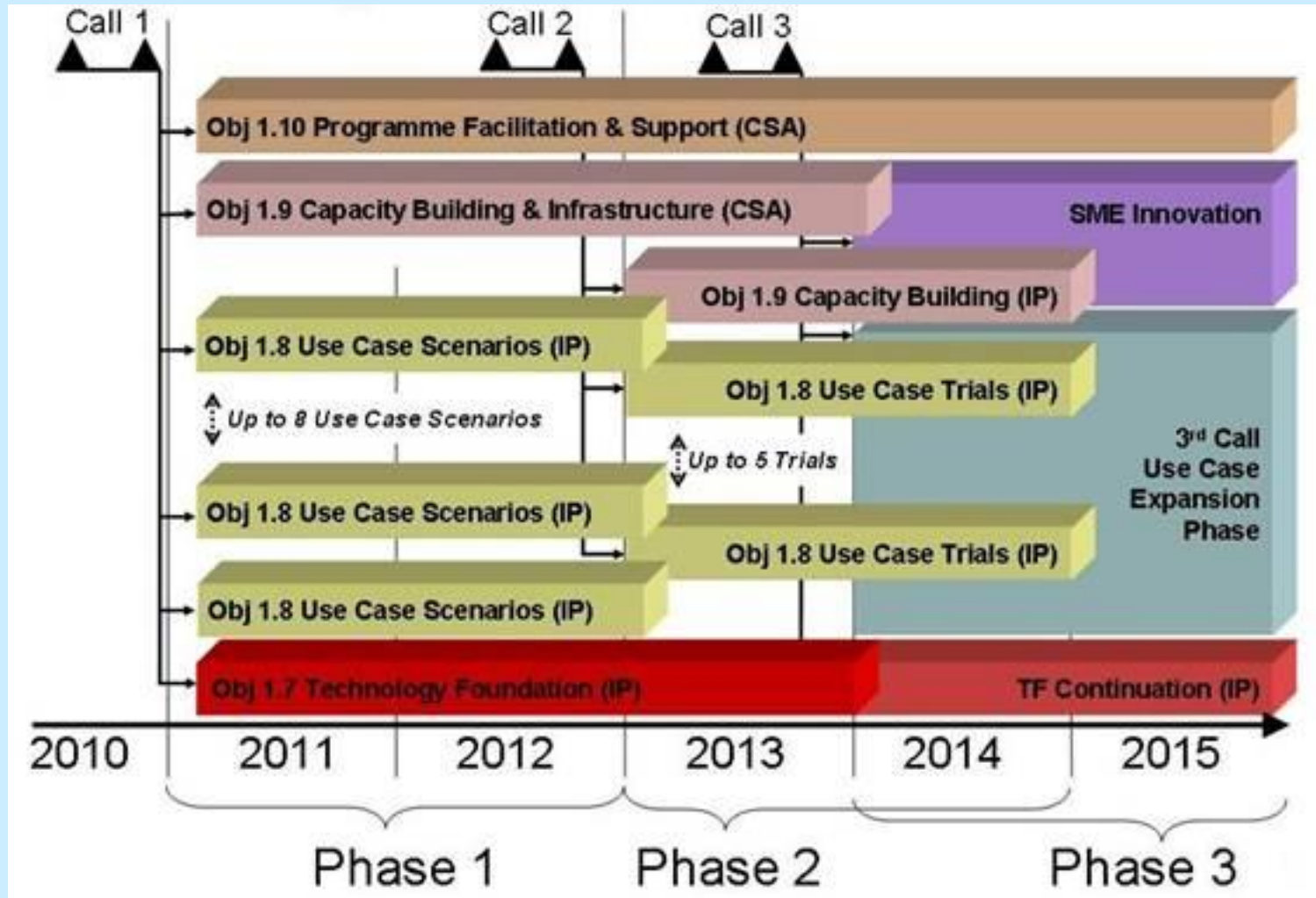
- upgrade of communication infrastructure
- NGI extension, coordinating role for Grids
- building storage centres (services)
- collaboration services (VC)

# *Future of the Internet*

# European research - FI PPP

## (Future Internet Public Private Partnership)

### Programme architecture



## Implementation roadmap

### **Call 1 (20 July – 2 December 2010) – budget 90 MEuro**

- Technology Foundation (one IP, 41 MEuro, 3 years, 30% flexible)
- Use Case Scenarios – Phase 1 (7-8 areas, IP, 5 MEuro, 2 years)
- Capacity Building (one CSA, 3 MEuro, 3 years)
- Programme support (one CSA, 6 MEuro, 5 years)

### **Call 2 (18 May – 29 October 2012) – budget 80 MEuro**

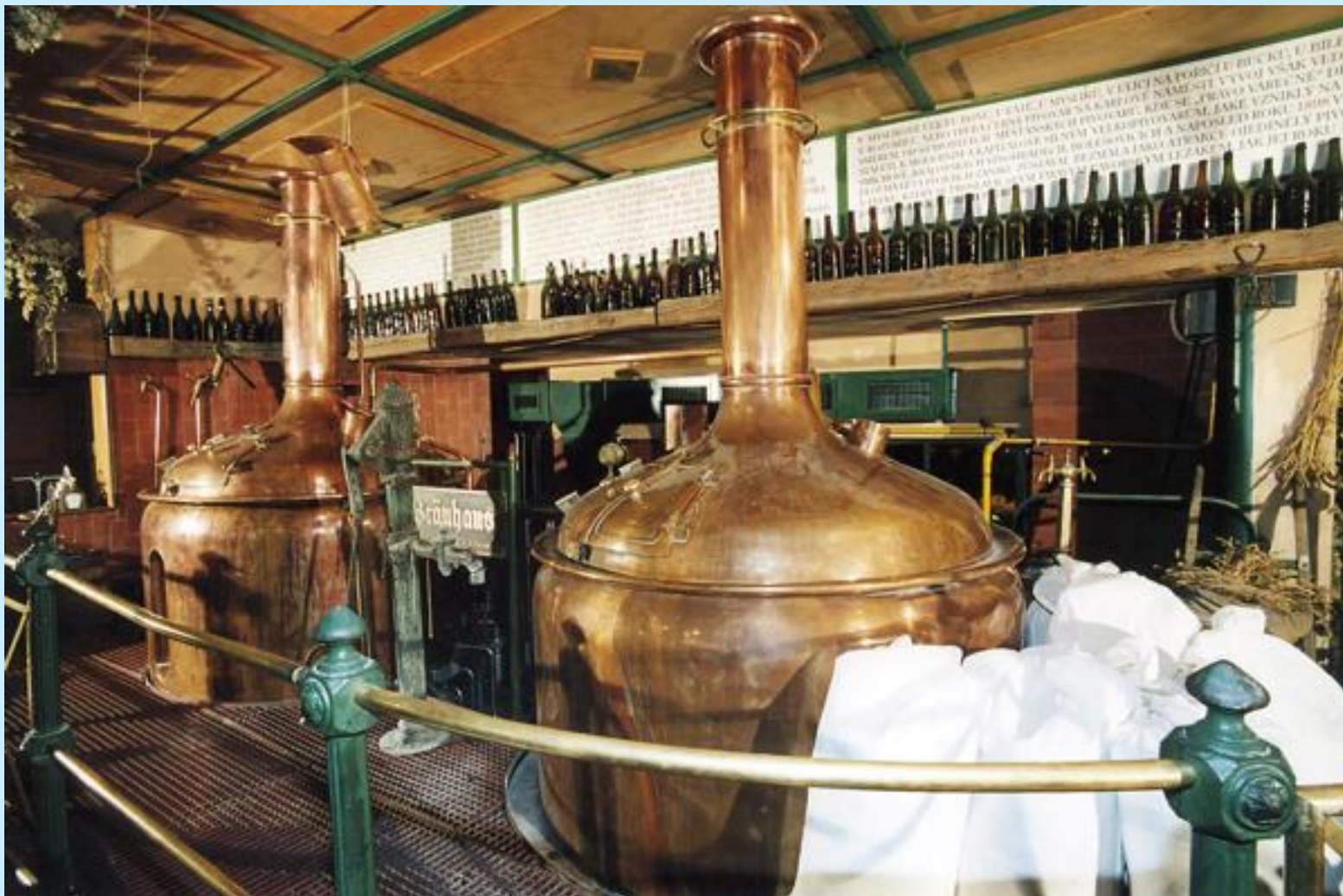
- Use Case Scenarios Pilots – Phase 2 (5 areas, 13.5 MEuro, 2 years)
- Capacity Building (one IP, 12.5 MEuro, 2 years)

### **Call 3 (later 2013) – budget 130 MEuro**

- Devoted to the expansion and enlargement of many testbeds and pilots (several areas, ~100 MEuro, 2 years)

## Concluding Remarks

- new challenges and opportunities for researchers to join activities in areas of e-Infrastructure
- e-Infrastructures have significant research elements
- opportunities also in very broad area of Future of the Internet
- .....



Have a nice stay in Prague!