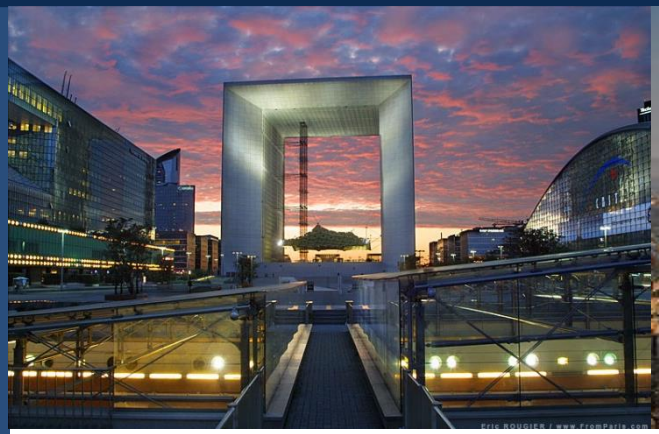
EUROPEAN
TURBINE
NETWORK



ETN AGM & WORKSHOP

2-3 April, Paris La Defense, France

EUROPEAN
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VIRTUAL TESTING INITIATIVE

DAVID SÁNCHEZ

University of Seville

Vision

Virtual Testing Project already presented to ETN members by Prof. Sayma

- To develop a gas-turbine virtual testing environment which should enable:
  - Complete test of a machine with varying degree of modelling fidelity for various components according to needs
  - Primarily flow and heat transfer features, but other features such as structural can be progressively included in the model

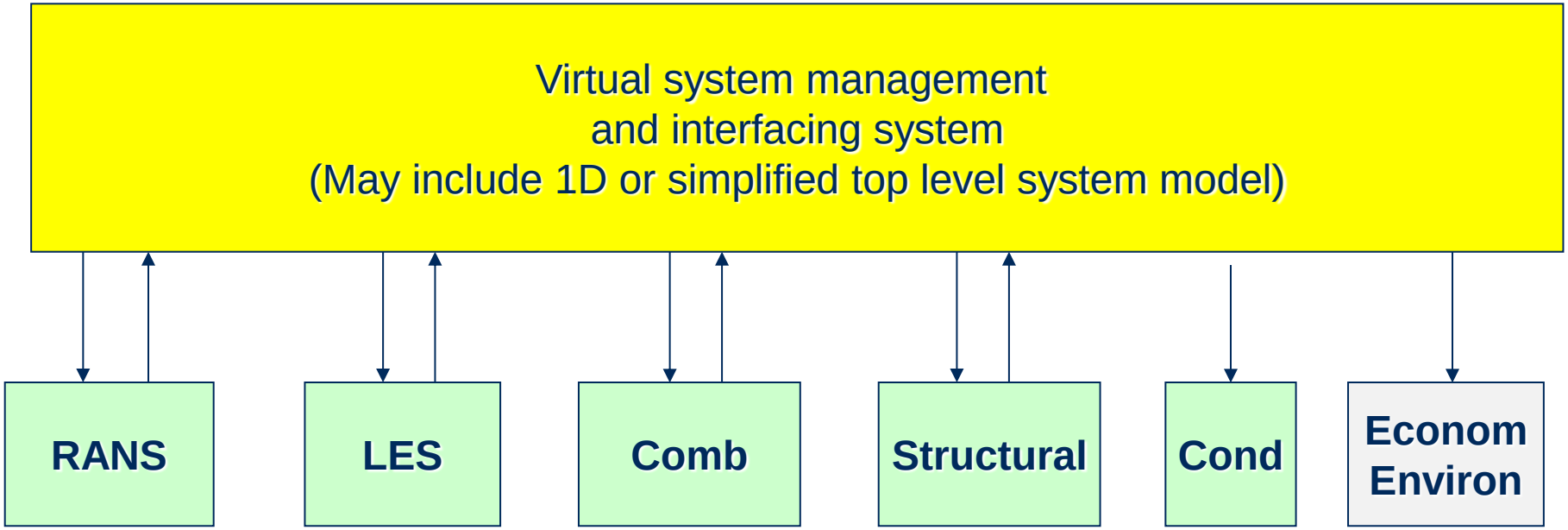
Synergies and added value

Partners would benefit from:

- Reduced rig and engine tests during the design cycle (OEMs)
- Post design and in-operation investigation of problems (OEMs/Users)
- Investigation of operational issues (Users)
- General research and development (R&D institutions)

Concept already developed in the aero industry with successful results

Proposed layout



Areas of R&D

The following issues are envisaged:

- Industrial partners thought to be interested in using existing validated models
- R&D required to build the top level system to manage the Virtual Testing environment
- This requires standardising interfaces and data structures, managing data transfers, computer load balancing...
- Validation mandatory

Previous initiatives

MIT: Aerospace Computational Design Laboratory (ACDL)

- Application of computational engineering for design and optimisation of aerospace systems.
  - Advanced CFD
  - Quantification of uncertainties and control
  - Simulation-based design techniques

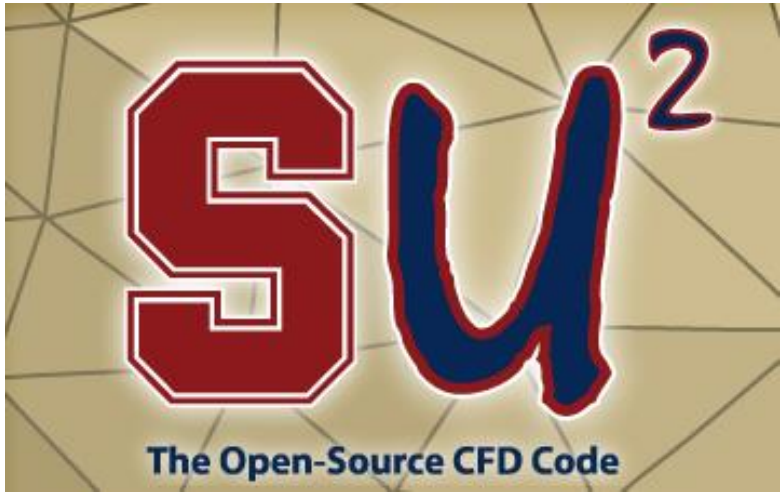
http://acdl.mit.edu/

Previous initiatives

Stanford University: Aerospace Design Lab (ADL)

- Research in aerospace systems applications: transonic, supersonic and hypersonic aircrafts, helicopters, turbomachinery, and launch and re-entry vehicles.
- Development of an open-source CFD code, ***SU²***.

aerospacedesignlab

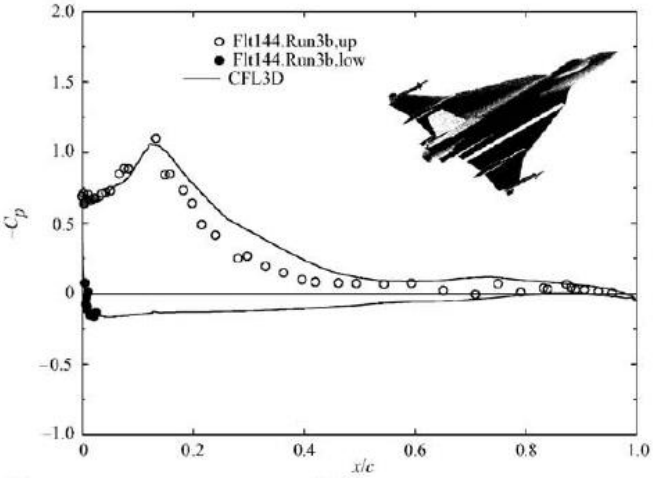


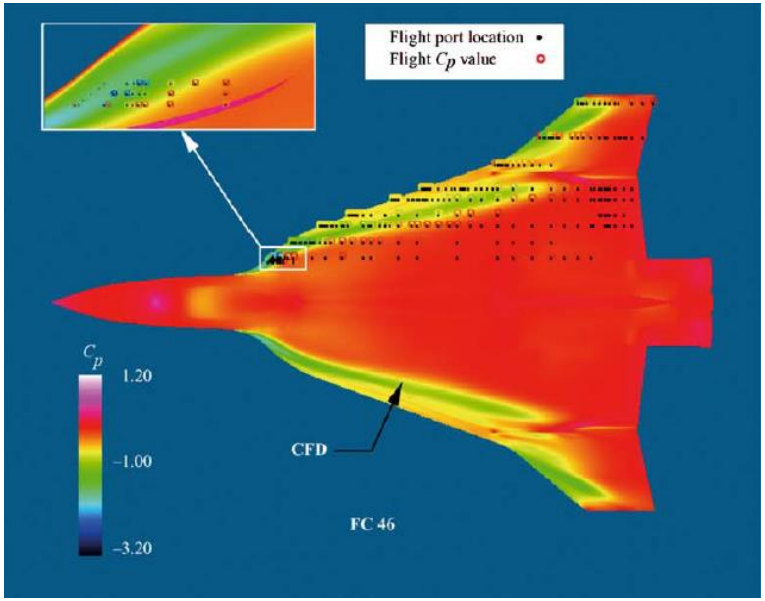
http://adl.stanford.edu/

Previous initiatives

NASA: Virtual Laboratory (VL) at NASA Langley

- Open-access experimental data on the surface of the F-16XL-1 airplane at subsonic and transonic speeds.





Previous initiatives

EU: PAGEIN project (January 1992 - December 1995)

(Pilot Applications in a Gigabit European Integrated network)

- Importance of cooperation in Aerospace industry
- European partners developing powerful simulation tools that cannot be transferred (hardware dependent, local data structures…)
- A working environment should be established, which fulfils the needs of the upcoming scenario
- A remote access tool open to authorised cooperative teams was identified as a solution.

Previous initiatives

EU: PAGEIN timeline

(Pilot Applications in a Gigabit European Integrated network)

- 1987: Karl-Heinz Narjes (CEC Vice President) invites European aeronautical firms to cooperate. → EASNet (European Aeronautical Supercomputing Network)
- 1988: Aeronautical companies show interest
- 1990-1991: EASNet Consortium funded by CEC-DGXII.

- Steps were devised for the development of the initiative.
  - 1992: Project PAGEIN (Pilot Applications in a Gigabit European Integrated network) created

Previous initiatives

EU: PAGEIN project (January 1992 - December 1995)

(Pilot Applications in a Gigabit European Integrated network)

- Abstract (progress report):

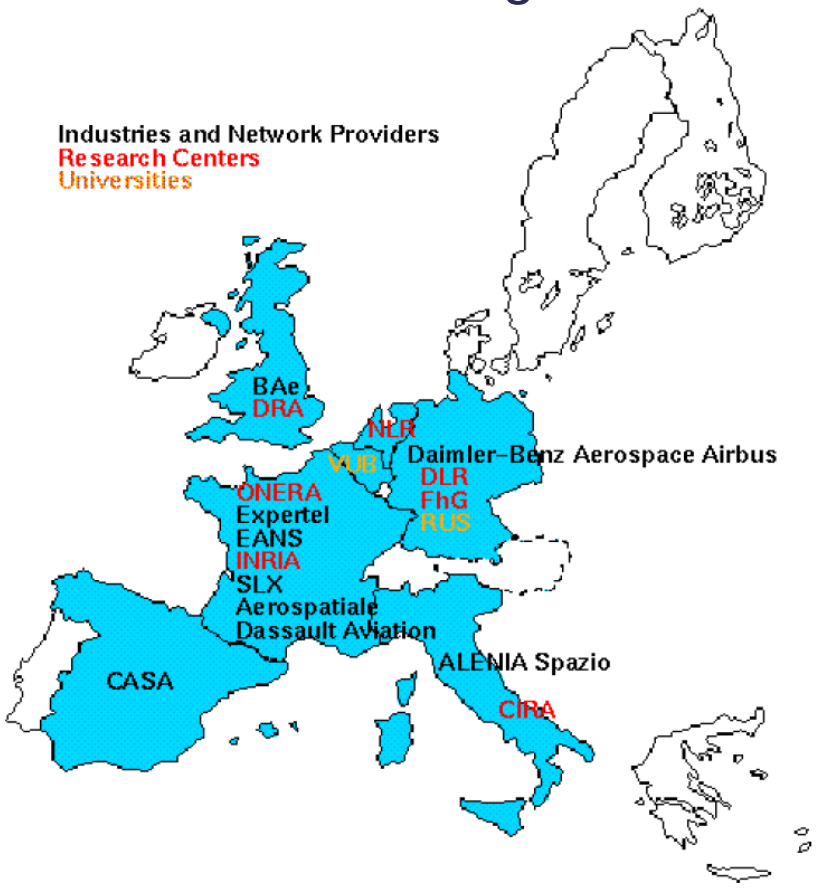
> “The PAGEIN project, initiated in January 1992, has gathered a total of 18 partners from the aerospace community, to set-up and evaluate environments for distributed Computer Supported Collaborative Work, in a High Performance Computing and Networking context”

Previous initiatives

EU: PAGEIN project (January 1992 - December 1995)

- The PAGEIN consortium was aimed at attracting industrial interest (18 partners)
- Supported by CEC RACE programme
- Congress participations
  - CeBIT'93 (Hannover)
  - Interop'93 (Paris)
  - HPCN'94 (Munich)

✓ Budget: 5-10 MEcu
✓ Funded by CEC-DGXII



Previous initiatives

EU: PAGEIN project (January 1992 - December 1995)

(Pilot Applications in a Gigabit European Integrated network)

- Work programme:

  - Year 1: First evaluation of users needs, and preliminary studies of available hardware and software tools. Implementation of simple early prototype platforms, evaluated on Local Area Networks.
  - Years 2 and 3: Integration and development of software environments, demonstrations on international high-speed infrastructures, performance evaluations, dissemination through publications and participation in large events (exhibitions, conferences,..)
  - Year 4: New workpackages for cost/benefits analysis with industrial partners, and for evaluation of the PAGEIN tools on the International ATM Pilot.

Previous initiatives

EU & Canada: SPOCK project (from October 1996 to September 1998)

- Schnelle Produktentwicklung durch Optimierte Computerbasierte Kommunikation - Rapid Prototyping via Optimised Computer-based Communication.
- This project is the continuation of the PAGEIN project.
- Conceived for aerospace design and optimisation through a collaborative network.
- It was introduced at Airbus Industries (AI) and partners.

Previous initiatives

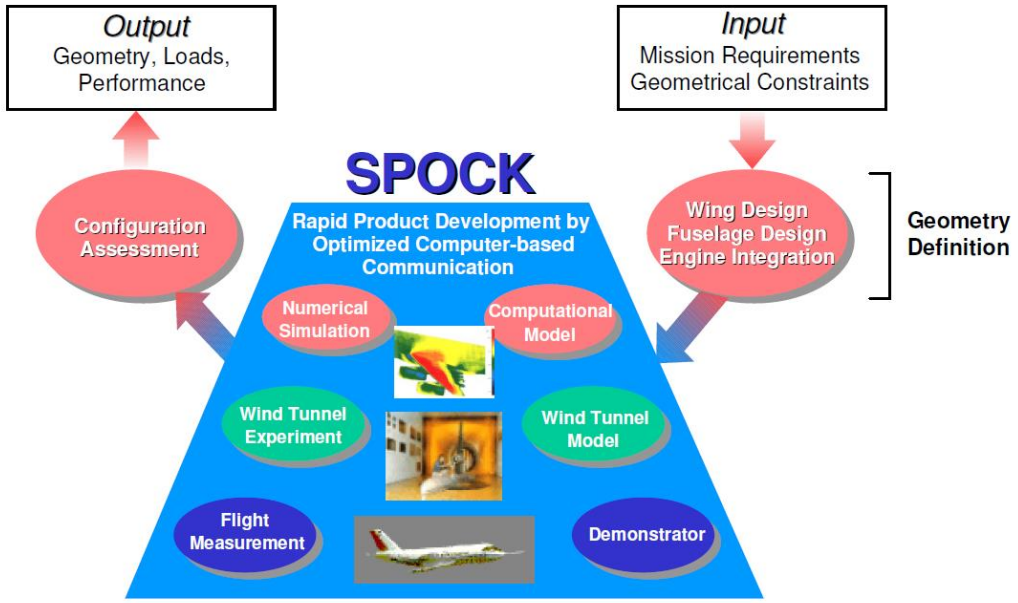
EU & Canada: SPOCK project (from October 1996 to September 1998)

- Collaborative project for aerodynamic design:
  - The SPOCK project aims at the prototypal introduction of distributed, collaborative work in aerodynamic design at Airbus industries, and to test the effectiveness of the integration between Computational Fluid Dynamics (CFD), Wind Tunnels (WT), and Free Flight Tests (FT) as well by employing latest CSCW tools used on high-speed ATM networks.

Previous initiatives

EU & Canada: SPOCK project (from October 1996 to September 1998)

- Collaboration at 3 levels.
  - CFD simulations
  - Wind tunnel tests
  - Free flight tests



Previous initiatives

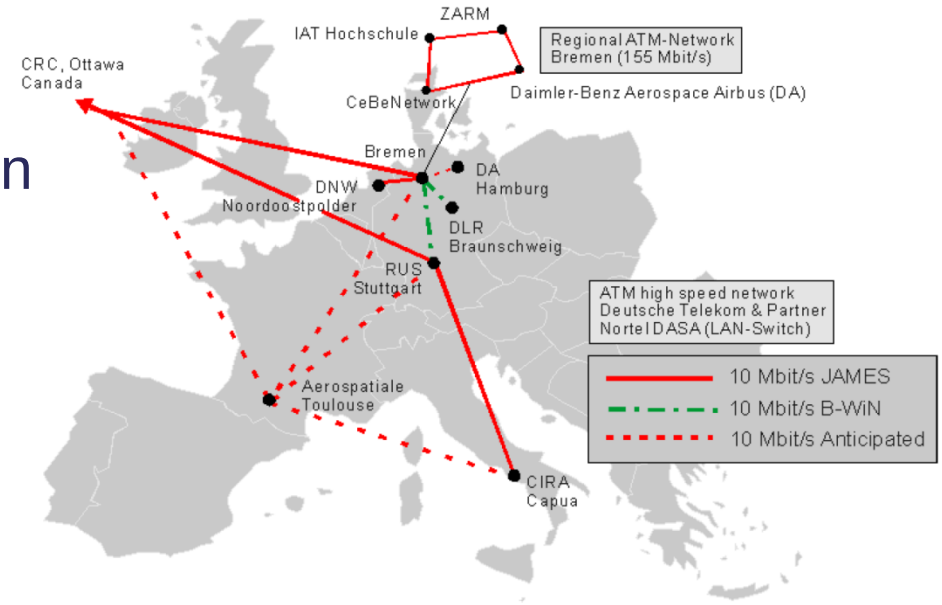
EU & Canada: SPOCK project (from October 1996 to September 1998)

- Partners:
  - Airbus consortium partners, aerospace research centers, universities, supercomputing centres, wind tunnel service providers and experts in computer-supported engineering.
  - Network links sponsored by the Deutsch Telecom and other European telecom carriers

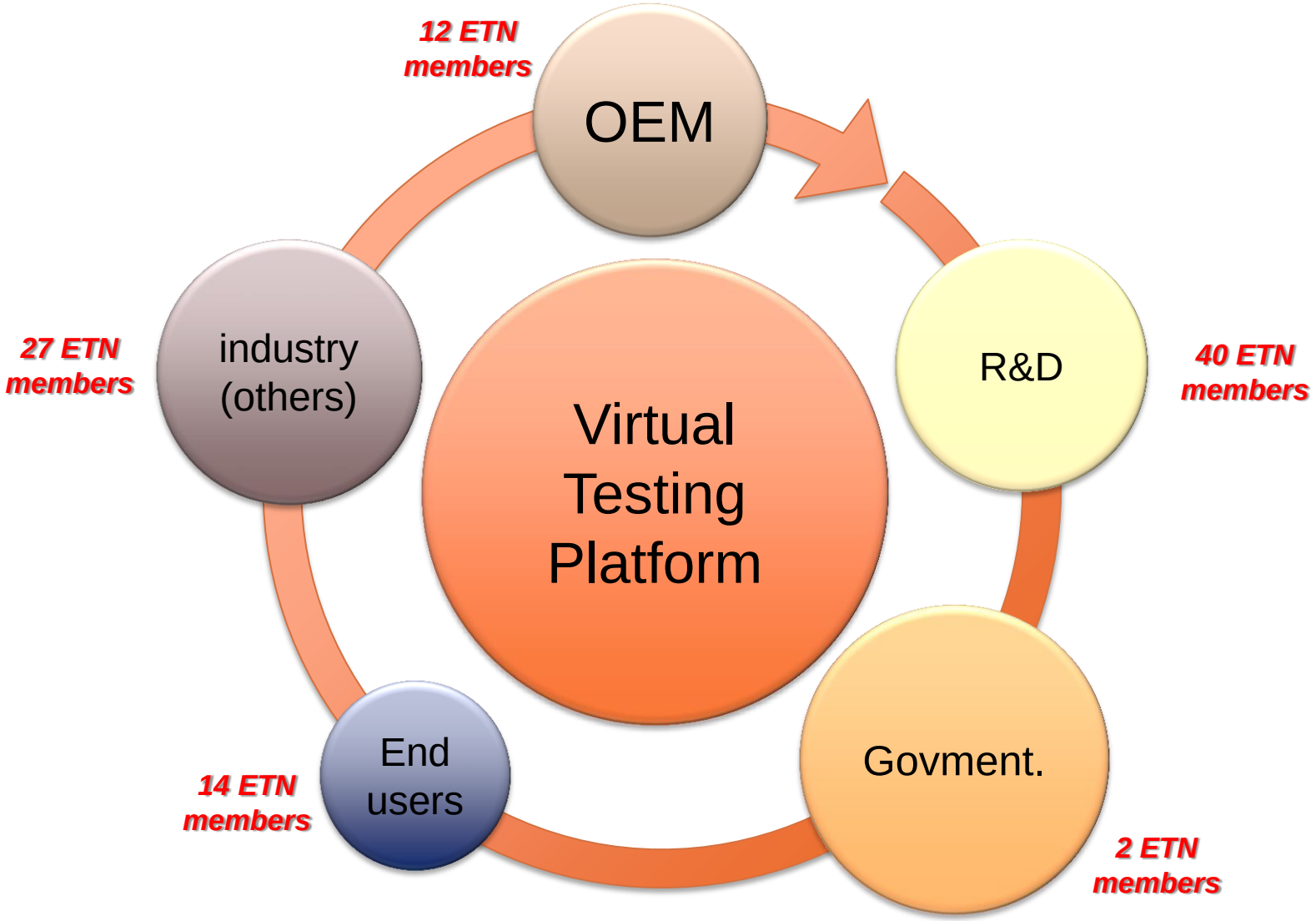
Previous initiatives

EU & Canada: SPOCK project (from October 1996 to September 1998)

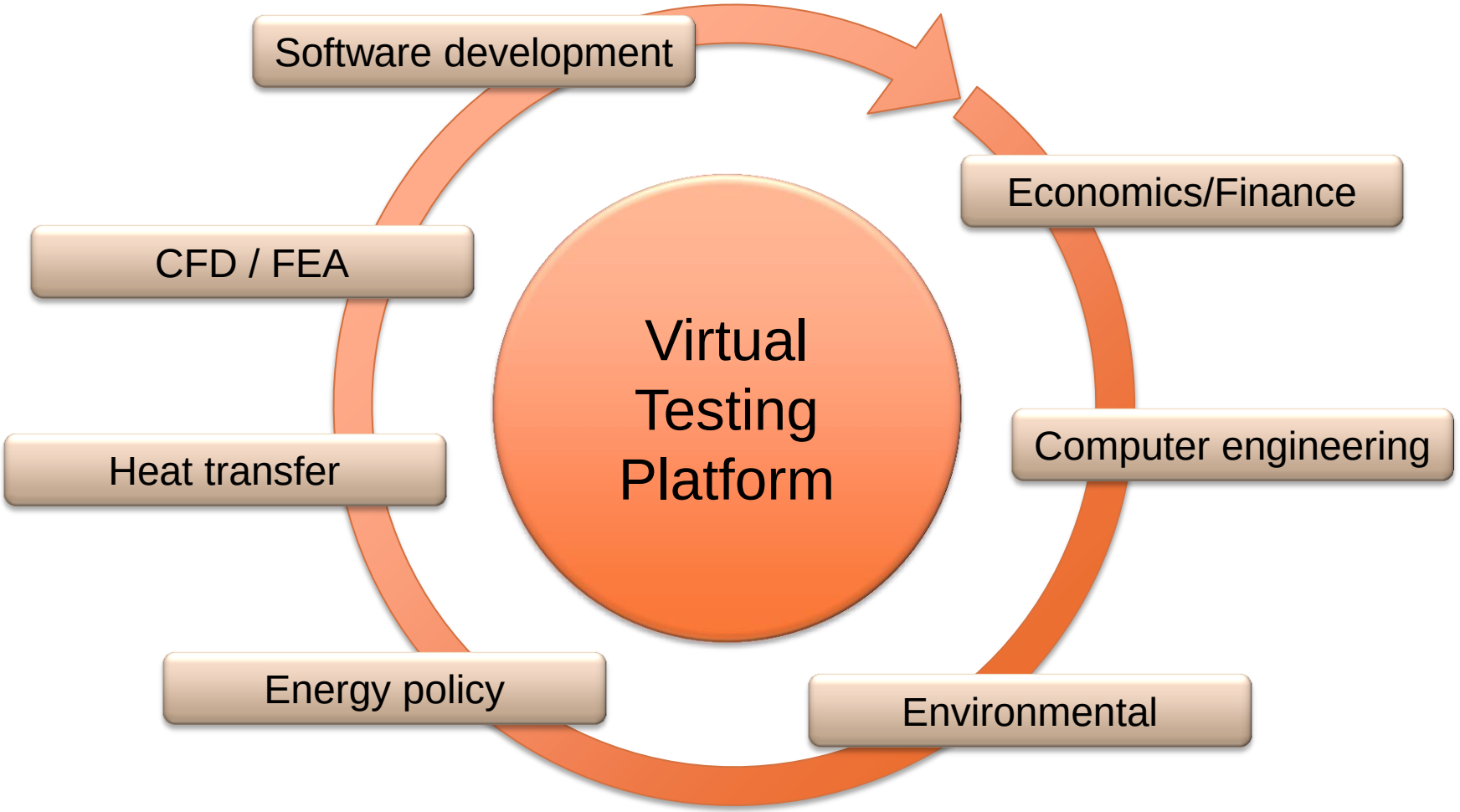
- The SPOCK Network, a combination of various networks:
  - JAMES G7
  - ATM Network of Deutsche Telekom & partners
  - B-WIN
  - ATM Network Bremen



Institutions in ETN



Core competences



Funding opportuntitiess

Horizon 2020 calls

- E-infrastructure for virtual research environments (VRE) EINFRA-9-2015

  - ✓ Budget: 2-8 M€ (42)
  - ✓ Deadline: 2015-01-14
  - ✓ Single stage

  Specific challenge (summary): The objective is to support capacity building in interdisciplinary research communities to empower researchers through development and deployment of service-driven digital research environments, services and tools tailored to their specific needs. These VREs should integrate resources across all layers of the e-infrastructure, and foster cross-disciplinary data interoperability allowing data citation and promoting data sharing and trust.

  Complementary with INFRADEV-4-2014/2015.

Funding opportuntitiess

- ✓ Budget: 2-8 M€ (42)
- ✓ Deadline: 2015-01-14
- ✓ Single stage

Horizon 2020 calls

- E-infrastructure for virtual research environments (VRE) EINFRA-9-2015

  Expected impact: VREs are expected to result in more effective collaboration between researchers and higher efficiency and creativity in research as well as in higher productivity of researchers thanks to reliable and easy access to discovery, access and re-use of data. They will accelerate innovation in research via an integrated access to potentially unlimited digital research resources, tools and services across disciplines and user communities and enable researchers to process structured and qualitative data in virtual and/or ubiquotous workspaces. They will contribute to increased take-up of effective collaborative research and data sharing by new disciplines, research communities and institutions

  Complementary with INFRADEV-4-2014/2015.

Funding opportunities

Horizon 2020 calls

- Implementation and operation of cross-cutting services and solutions for clusters of ESFRI and other relevant research infrastructure initiatives INFRADEV-4-2014/2015

  - ✓ Budget: 55.00 (2014) + 25.00 (2015) M€
  - ✓ Deadline: 2014-09-02
  - ✓ Single stage

  Specific challenge (summary): If different research infrastructure initiatives are developed and operate in isolation, there is a risk of fragmentation and parallel development of divergent solutions to same problems. In order to avoid this, there is a need in Europe to coordinate common activities and to implement common and efficient solutions.

  Complementary with EINFRA-1-2014 and EINFRA-9-2015.

Funding opportunities

Horizon 2020 calls

- Pan-European High Performance Computing infrastructure and services EINFRA-4-2014

  - ✓ Budget: 15.00 M€
  - ✓ Deadline: 2014-09-02
  - ✓ Single stage

Specific challenge (summary): The HPC resources in Europe need to be further pooled, integrated and rationalized. This topic contributes to the implementation of the EU strategy on HPC, by providing access to supercomputing facilities and services for both industry and academia, and complements the activities of the Public-Private Partnership (PPP) in HPC.

The infrastructure should provide services in coordination with other e-infrastructure providers to promote interoperability and a seamless user experience, in accordance with topic EINFRA-7-2014.

Funding opportunities

Horizon 2020 calls

- Provision of core services across e-infrastructures
  EINFRA-7-2014

  ✓ Budget: 6.00 M€
  ✓ Deadline: 2014-09-02
  ✓ Single stage

  Specific challenge (summary): Support to harmonize and/or deploy core e-infrastructure services is crucial for their effective use by both production e-infrastructures and e-infrastructures under development. Core services are considered those that 1) enable e-infrastructure interoperation and 2) are common across a broad range of e-infrastructures and research communities.

Funding opportunities

Horizon 2020 calls

- Managing, preserving and computing with big research EINFRA-1-2014

  - ✓ Budget: 55.00 M€
  - ✓ Deadline: 2014-09-02
  - ✓ Single stage

  Specific challenge (summary): Development of integrated e-infrastructures incorporating advanced computing resources are essential in order to increase the capacity to manage and analyze extremely large datasets.

EUROPEAN TURBINE NETWORK

David Sánchez - ds@us.es

Sign up for free subscription on the ETN website

Chaussee de Charleroi 146-148/20,
1060 Brussels, Belgium

Tel: +32 (0)2 646 15 77 info@etn-gasturbine.eu

www.etn-gasturbine.eu