High-Performance
Computing Center
Stuttgart

Competence Centres and Centres of Excellence within the European Strategy

Bastian Koller, Managing Director HLRS

About the National Competence Centres

What are National Competence Centers

H L R S

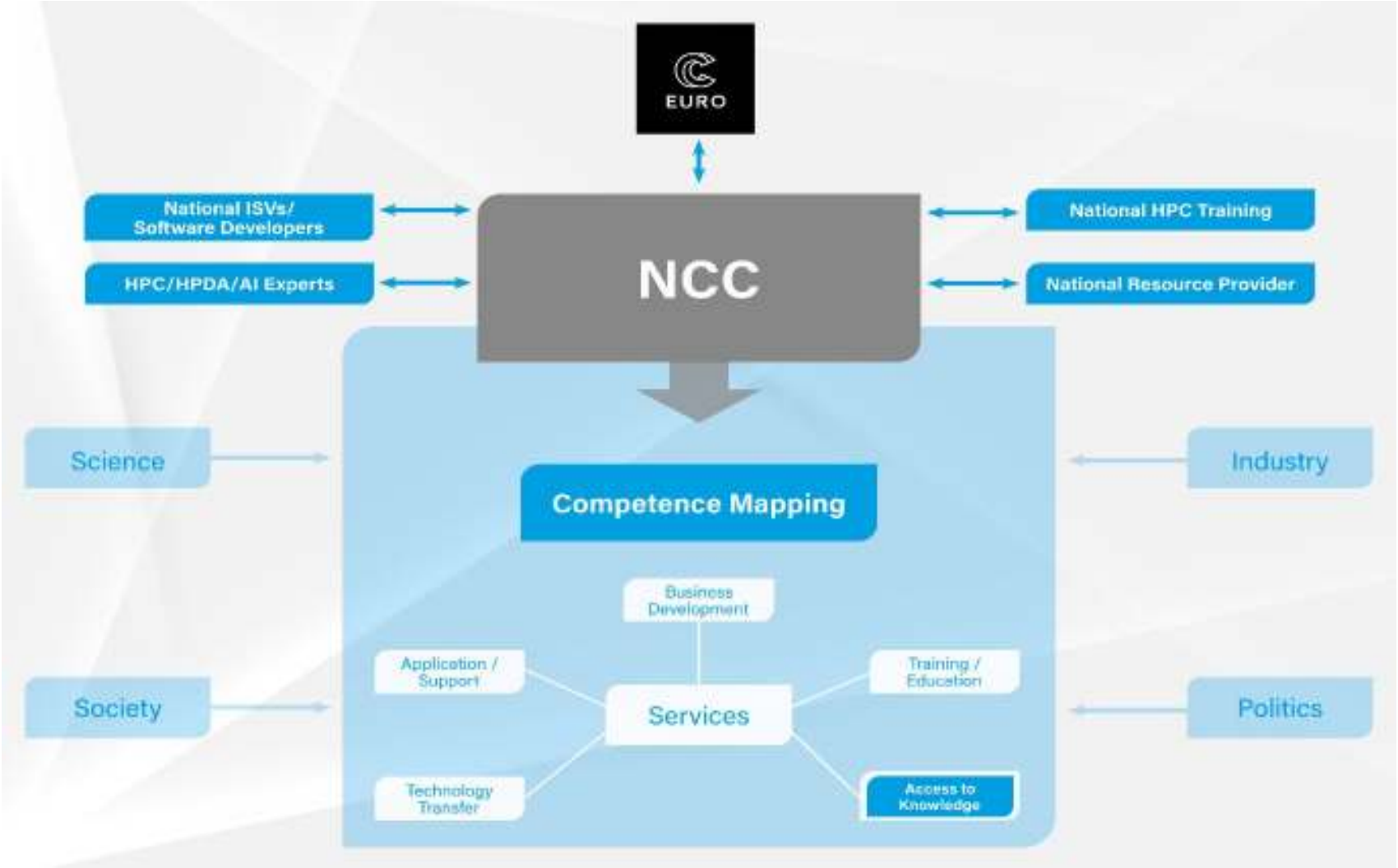
National Competence Centers (NCCs) are organizations or institutions that are designated as experts in a particular field or technology by a national government. The purpose of NCCs is to coordinate and enhance the development of national expertise and capabilities in a specific area. They typically play a key role in promoting research, development, and innovation, and may also be involved in providing training, education, and other services to support the growth of a particular industry or field.

NCCs may be established in a variety of fields, such as advanced manufacturing, biotechnology, renewable energy, or information technology. They may work with universities, research institutes, and private sector companies to support the development of new technologies, products, and services. NCCs are often funded by the national government or through partnerships with industry and academia, and may have a variety of goals, including improving the competitiveness of national industries, promoting economic growth, and advancing scientific and technological knowledge.

From concepts to implementation

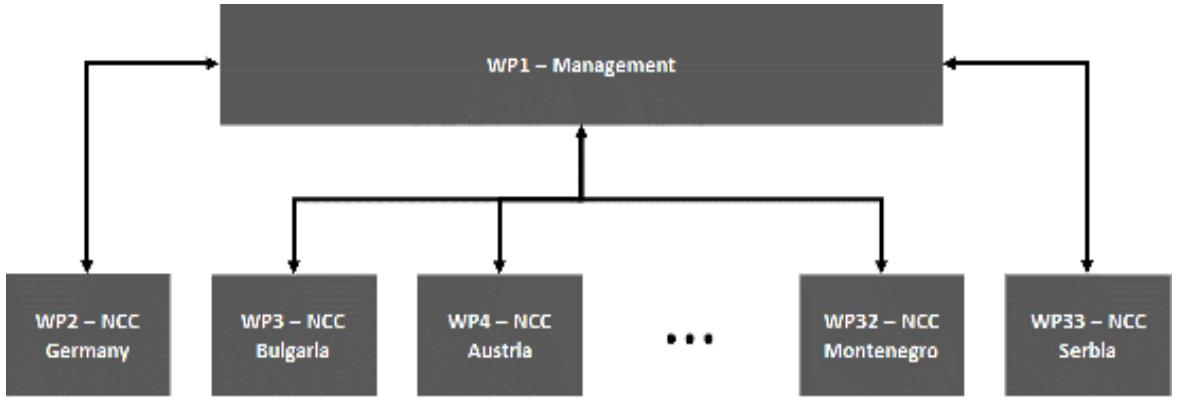
- EuroCC kicked-off as Research & Innovation Action in September 2020 (End of Phase 1: 31.12.2022)
  - Phase 2 just started (duration 3 years)
- 36 Beneficiaries – 33 nations
- https://www.eurocc-access.eu/
- LinkedIn: EuroCC, Twitter: @EuroCC_project
- Germany, Bulgaria, Austria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Lithuania,
  Latvia, Poland, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom, France, Netherlands, Belgium, Luxembourg, Slovakia, Norway, Switzerland, Turkey, Republic of North Macedonia, Iceland, Montenegro
- Funding: 50% EuroHPC JU, ~50% from the respective states

NCCs in EuroCC



Focusing on the target user groups

Old Tasks in EuroCC		**New Tasks EuroCC 2**	
X.1	*(National Competence Centre) - Management*	X*.1	NCC Management
X.2	*Training and Skills Development*	X.2	Training and Skills Development
X.3	*Technology Transfer/Business Development*	X.3	Services to and Interaction with Industry
X.4	*Collaboration with Industry*	X.4	Services to and Interaction with Academia and Public Administration
X.5	*Mapping of HPC/Big Data/AI Technical Competences*	X.5	Service Portfolio and Competence Management, Additional Services
X.6	*Facilitation of access to scientific and technical expertise and knowledge pools*	X.6	Collaboration
X.7	*Awareness Creation and Collaboration*	X.7	Awareness Creation and Communication



The Centres of Excellence

Third Wave of Centres of Excellence in HPC Applications

Computational Biomolecular Research

ChEESE

CoE for Exascale in Solid Earth

Computational methods for biomedical applications

CoE for Engineering Applications

CoE of the CECAM community

Energy oriented CoE : toward exascale for energy

HiDALGO

HPC and Big Data Technologies for Global Challenges

Performance Optimisation and Productivity

JU funded Centres of Excellence

Topic #1: Applications Exascale

- **MAX, SPACE, Plasma-PEPSC, CEEC**

Topic #2: Applications Science & Innovation

- **ChEESE-2P, BioExcel-3, EXCELLERAT P2, ESiWACE3, HiDALGO2,MulitXscale**

4 more CoEs coming (2023 call)

CEEC
Exascale CFD

Materials design at the exascale

Astrophysics and cosmology

Engineering Applications

ChEESE
Solid Earth

HiDALGO
Global Challenges

CoEs Areas of Expertise

- CoEs develop strong expertise in their specific application fields as well as more transversal HPC skills needed to achieve science at exascale
- Key application codes in key domains
- Developing exascale-ready applications
- Supporting supercomputing applications and communities for Science and Innovation

Disciplinary Expertise

- Energy production (wind, hydro, fusion,…)
- Engineering (automotive, aerospace,…)
- Combustion
- Plasma physics
- Material science
- Material for energy (batteries, PV cells,…)
- Chemistry
- Climate sciences and weather forecasts
- Global challenges (health-relevant social habits, green growth, dynamics of global urbanisation.)
- Solid earth physics
- Molecular biology
- Personalized medicine
- Biomedical applications (Cardiovascular Medicine, Neuro Musculoskeletal Medicine,…)
- Astro physics

HPC expertise

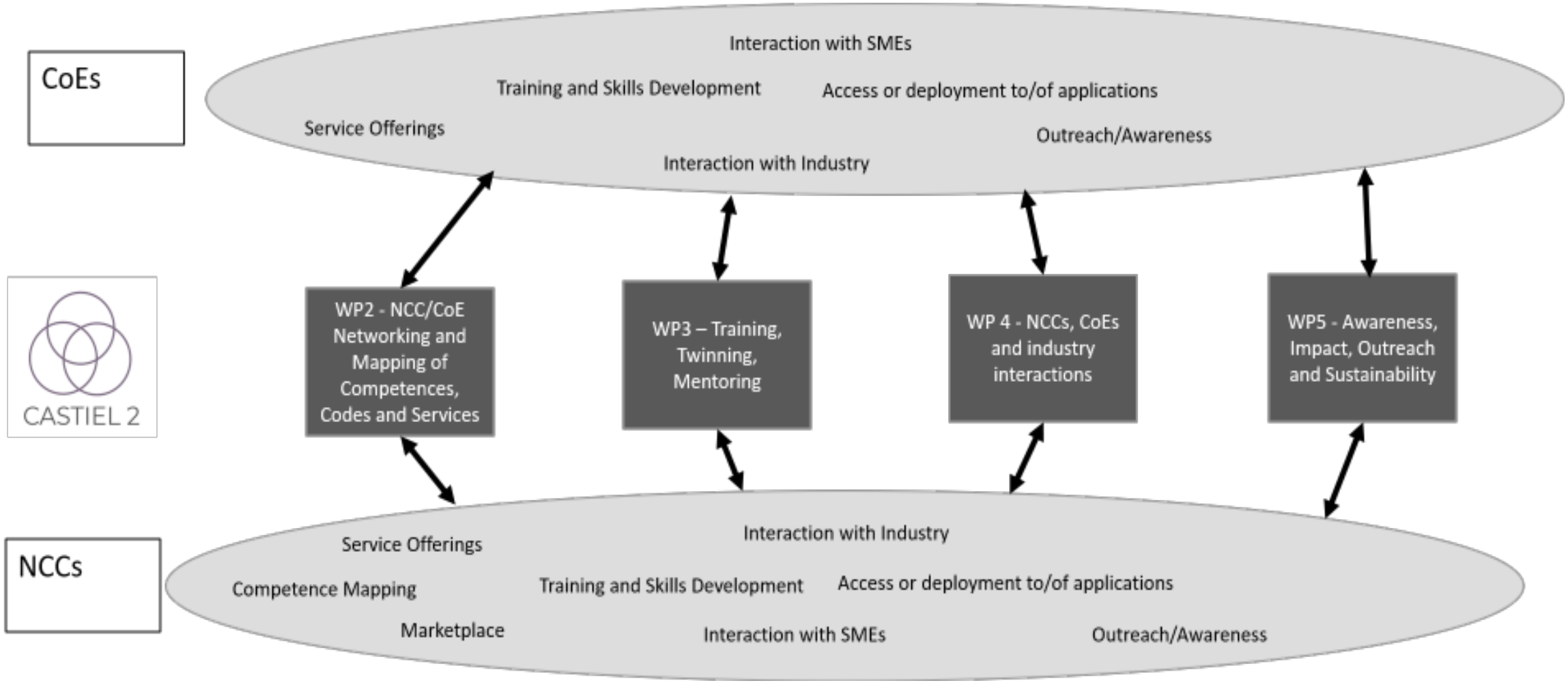
- Programming models for exascale
- Performance monitoring, optimization and scalability
- Tools for HPDA in complex workflows
- Workflows
- Scalable solvers, linear algebra
- Data flow, in-situ data analysis and I/O
- Ensemble runs
- Implementing co-design and technology integration

CASTIEL/CASTIEL 2 – the European Network

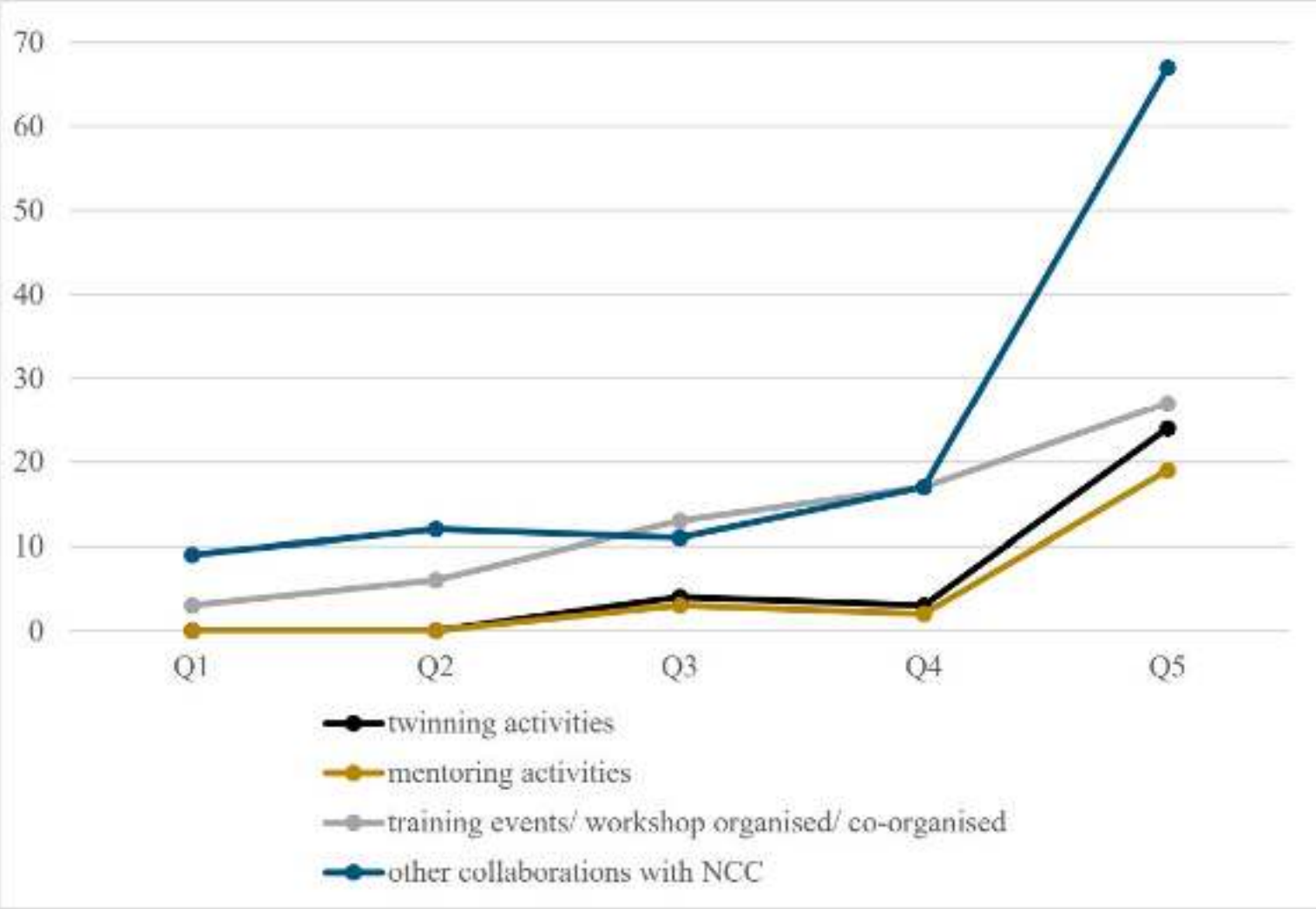
About CASTIEL 2

- JU strategy is to also focus on the new CoEs
  - CASTIEL originally as CSA for the National Competence Centres
  - CASTIEL 2 now CSA for NCCs and CoEs
- Collaboration Paths
  - CoEs – CoEs
  - NCCs-CoEs
  - NCCs-NCCs
- Diverse topics for collaboration/knowledge exchange
  - Training
  - Industry
  - Best practices
- Main topic given (high expectations): Continuous Integration and the C2ISS

Commonalities for Collaboration

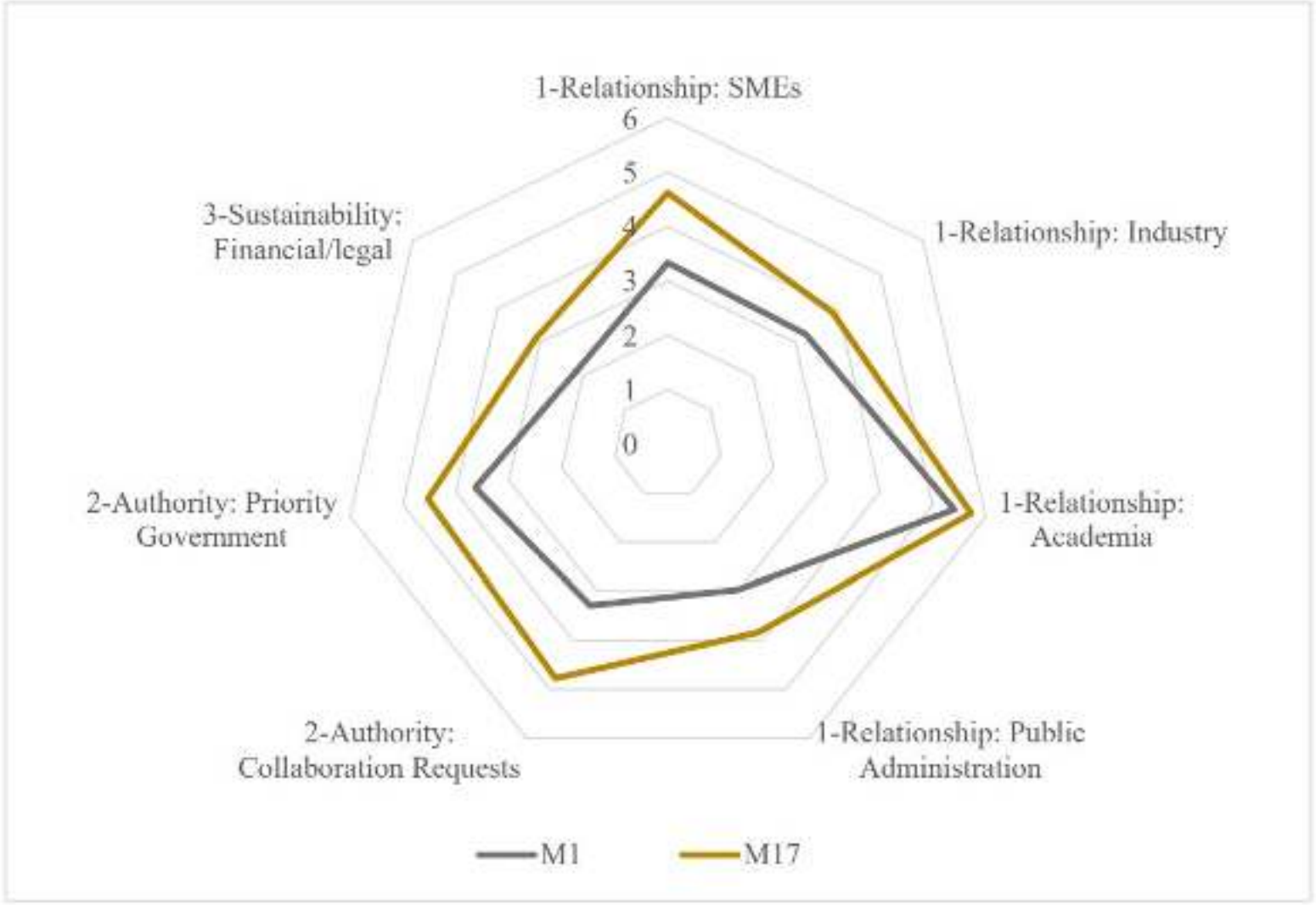


How did CASTIEL 1 work out



How to measure the evolution of the NCC

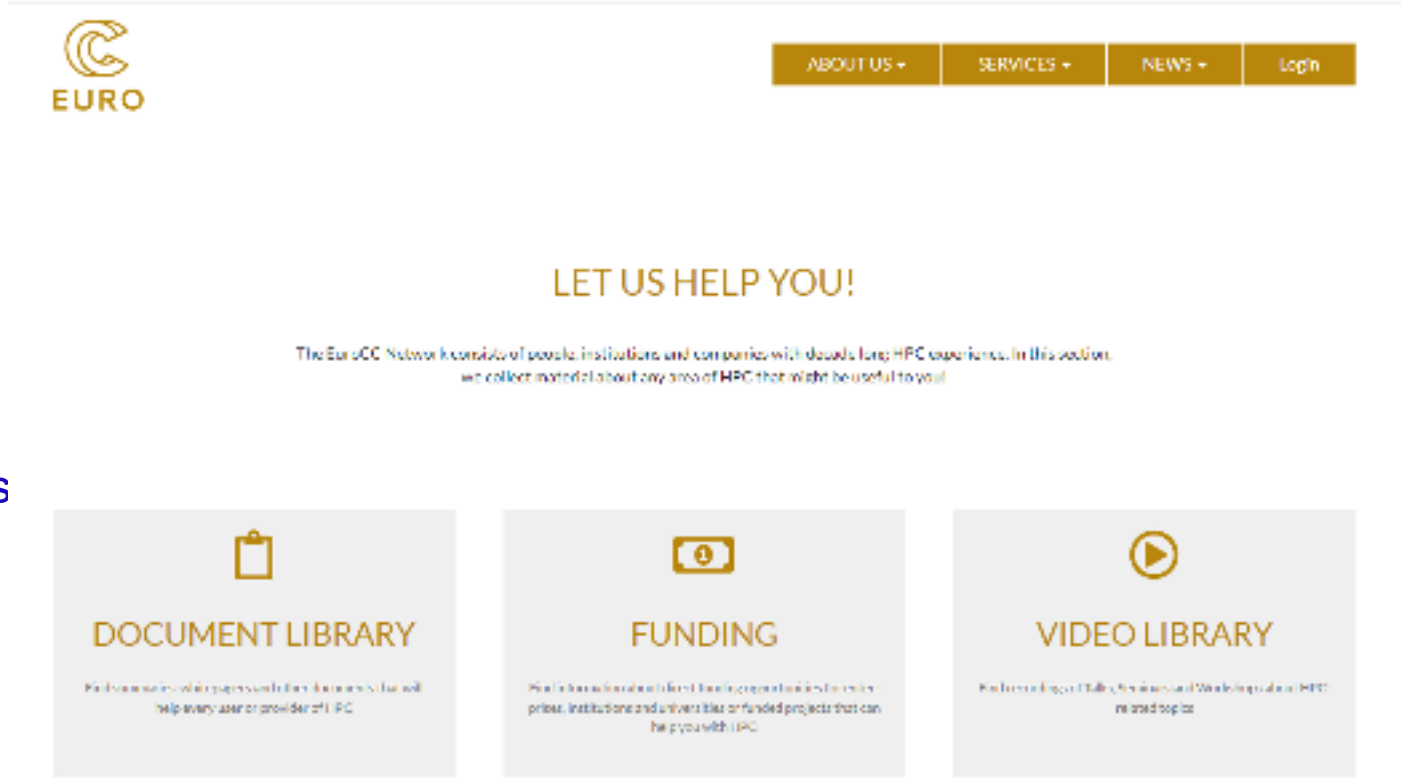
1– Idea given
2 – Concept developed
3 – Pilots started
4 – Experience < 1 year
5 – Experience 1-5 years
6 – Experience > 5 years



EuroCC Access

- The online portal to access
  - NCCs
  - Information
  - Competences
  - Trainings
  - Events
  - Contents
    - Documents as results of workshops
    - Funding opportunities
    - Videos from events and workshops
  - …

  https://www.eurocc-access.eu/



Example: Competences

YOUR EXPERIENCE LEVEL

Please select your experience, you can leave it empty if you are in doubt on your level.

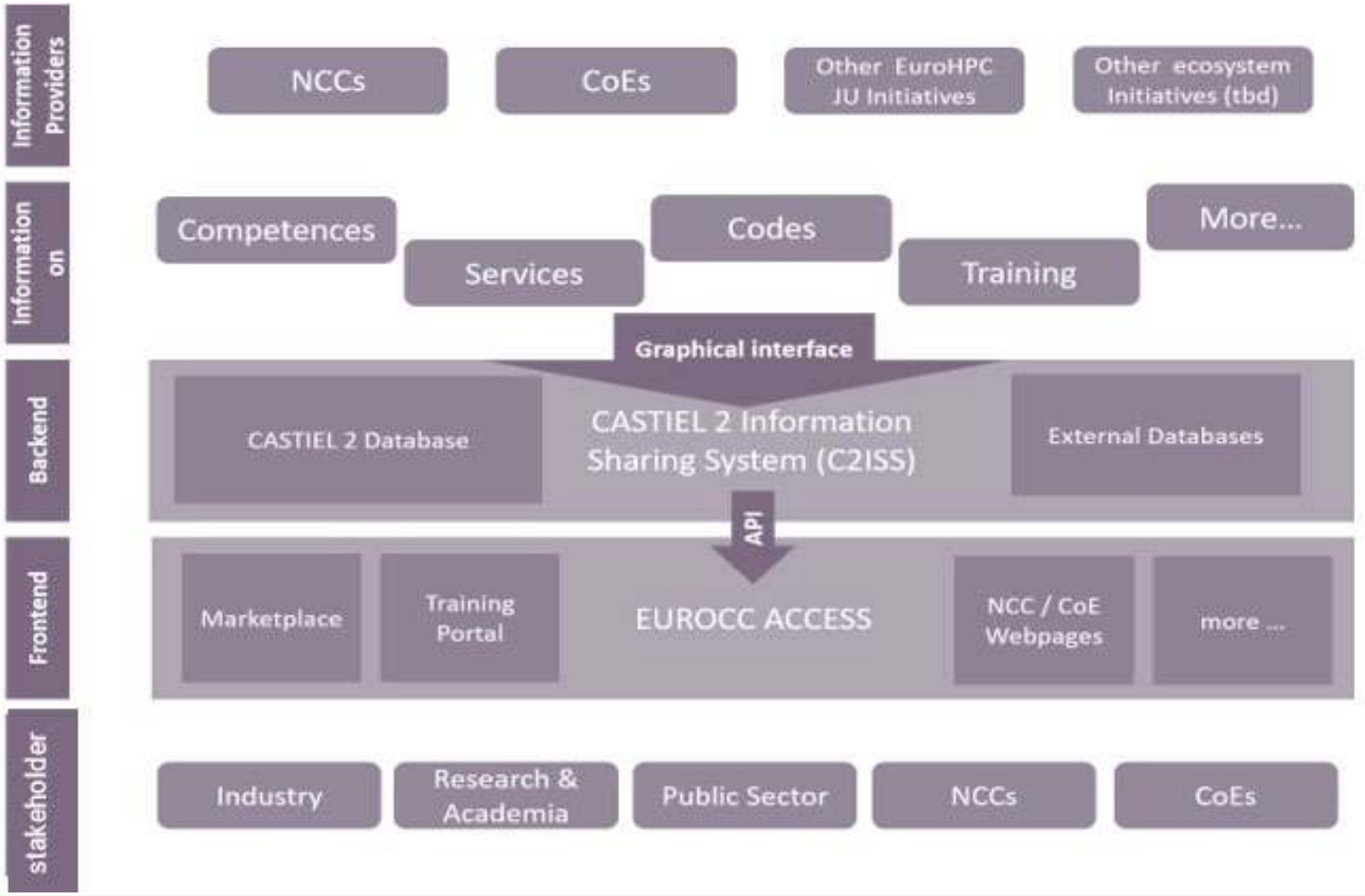
- [x] Digitalization Needed
- [ ] Digitally Ready
- [ ] HPC Ready
- [ ] HPC Users
- [ ] HPC Champions

THE COMPETENCE CATEGORIES

Changes will be visible when competences are selected. Please drill down the category to be more selective in your search.

- [ ] Awareness Creation
- [ ] Expert Technical Consultancy
- [ ] Business & Project Consultancy
- [ ] Products & Services

Updates on EuroCC Access – The NCC (and soon CoE) portal



Concluding remarks

- The successful further manifestation of the NCCs and the European exchange will
  - promote the use of HPC+ in Europe
  - create numerous success stories
  - provide guidance to ensure the best possible use of Peta-, Pre-Exascale and Exascale systems and
  - their capabilities
- NCCs need now to leave their comfort zone and to integrate further national stakeholders
- CoEs as a complementary source of competence (on European level)
  - Synergetical interaction of benefit
- Work should always focus on extension of existing bits, not re-inventing the wheel

Thank you for your attention!