Italian Research Center on High-Performance Computing, Big Data and Quantum Computing

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Outline

- Introduction

- The project
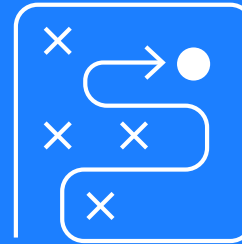
- The organisation

Introduction

The Scenario
Why a National research Center on HPC, BD & QC?

With the current Data explosion...

- An unprecedented amount of data is going to be produced
- The real competitiveness challenge is extracting value from data
- Supercomputing, simulation, AI, high-performance data analytics and Big Data are essential for innovation and growth in a data-driven society

... need for an ambitious Italian strategy ...

- Europe has a clear strategy (e.g. EuroHPC, EOSC, EPI, Chip Act, Quantum Flagship) - European Data Strategy
- People, businesses and organisations should be empowered to make better decisions based on insights from data

... to "close the gap" with best in class

- First actions from 2015: Bologna's Technopole, ECMWF Data Centre, Leonardo pre-exascale supercomputer
- A step forward based on 5 pillars

The ICSC aim and objectives

Create the **national digital infrastructure** for research and innovation, starting from the existing HPC, HTC and Big Data infrastructures …

… evolving towards a **cloud datalake** model accessible by the scientific and industrial communities through flexible and uniform cloud web interfaces, relying on a high-level support team …

… form a globally attractive **ecosystem based on strategic public-private partnerships** to fully exploit top level digital infrastructure for scientific and technical computing and promote the development of new computing technologies
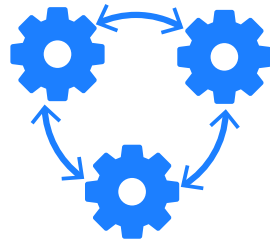
5 pillars of the action plan

- Build a **world-class supercomputing** cloud infrastructure to store, manage and process all the produced data

- Set **up centers of excellence** with teams of high-level experts to develop domain applications

- Set up strong **links** between **Academia, Industry** and **Public Administration**

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- **Train** the next generation of data scientists and managers to become **experts** in the digital transition

- Implement **structural measures for innovation** and for **dissemination**

The project

From Research to Business:
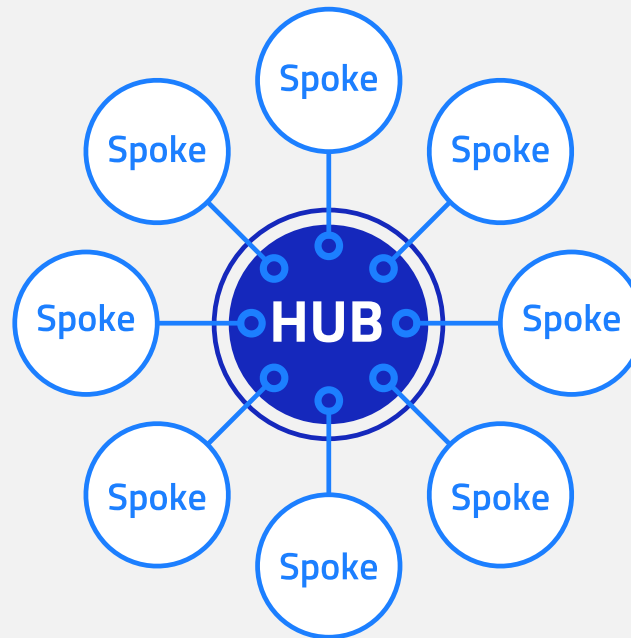## ICSC is one of the 5 «Champions» on Key Technologies

5 National Centres PNRR

1. **ICSC: HPC, Big Data and Quantum Computing**
2. **Agricultural Technology (Agritech)**
3. **Sustainable mobility**
4. **Drugs development with RNA technology and gene therapy**
5. **Bio-diversity**

1,6 B€ from PNRR

(approx. **320M€** for ICSC)

ICSC Working model

Networks of universities, research institutions, public and private entities aggregated in consortia in «HUB&SPOKE» mode

Started: 1/9/2022

Hub & Spoke model

- Governance structure: Hub and Spokes

- Hub purpose: management and coordination

- Spokes purpose: CN activities execution (research, development, infrastructures and research material hosting, etc.).

- Spoke Leader/Co-Leader: lead the scientific activities coordination. The initial set of Spoke Leader e Co-leader will remain in charge for 4 years and each person could be nominated again only once

The ICSC will include
10 thematic Spokes and 1 Infrastructure spoke

0 SUPERCOMPUTING CLOUD INFRASTRUCTURE
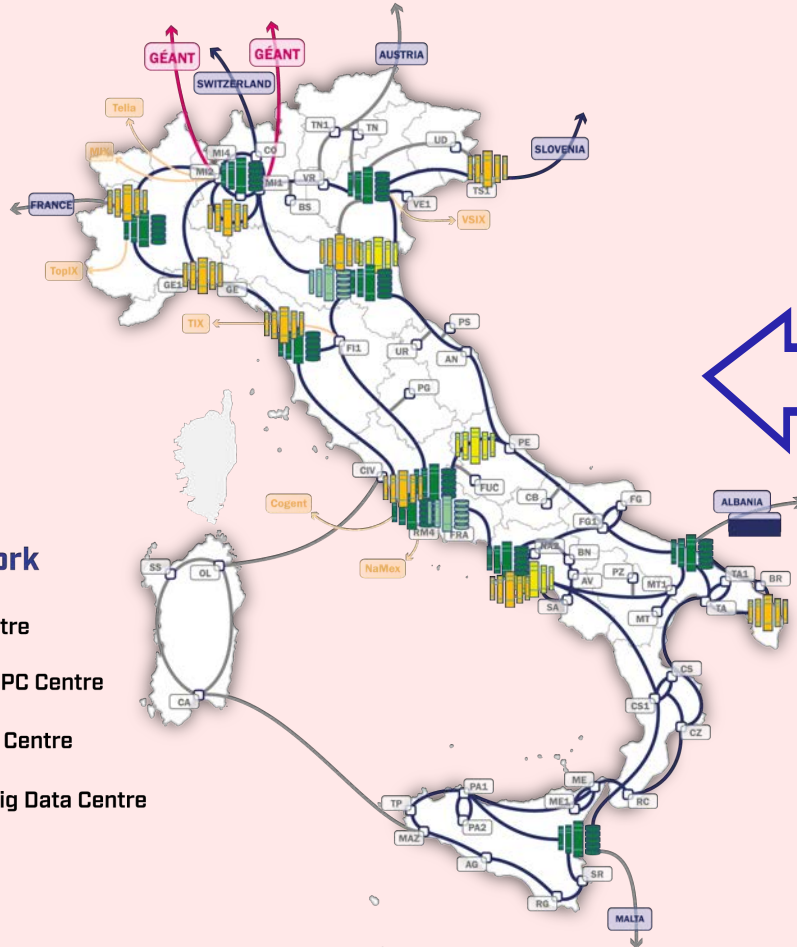
Garr Network

- HPC Centre
- Future HPC Centre
- Big Data Centre
- Future Big Data Centre

equipped with high-level teams of experts integrating the Spokes working groups (mixed cross-sectional teams)

EDUCATION & TRAINING, ENTREPRENEURSHIP, KNOWLEDGE TRANSFER, POLICY, OUTREACH

1 FUTURE HPC & BIG DATA

2 FUNDAMENTAL RESEARCH & SPACE ECONOMY

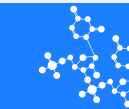**3 ASTROPHYSICS & COSMOS OBSERVATIONS**

4 EARTH & CLIMATE

5 ENVIRONMENT & NATURAL DISASTERS

6 MULTISCALE MODELING & ENGINEERING APPLICATIONS

7 MATERIALS & MOLECULAR SCIENCES

8 IN-SILICO MEDICINE & OMICS DATA
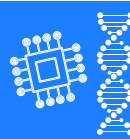
9 DIGITAL SOCIETY & SMART CITIES

10 QUANTUM COMPUTING
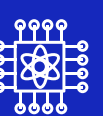
The Big Data Technopole, Bologna

Bologna

ECMWF Data Center

CINECA & INFN Exascale Supercomputer Center

Big Data Association and Foundation

Civic Protection and agency for development and innovation

ICSC

Conference and Educational Center

Meteo National Agency

Innovation Center

IFAB - International foundation Big data

Competence Center Industry 4.0

University Center

Biobank and Life Science

ENEA Center

ICSC Founding Members:
a public private partnership

25
Universities

12
Research
Institutes

14
Strategic
private companies

Public Research Institutions
Founding members:
a widespread initiative throughout Italy

National Institutes

INFN — Istituto Nazionale di Fisica Nucleare
CINECA
ENEA
Consiglio Nazionale delle Ricerche
INAF — Istituto Nazionale di Astrofisica
Istituto Nazionale di Geofisica e Vulcanologia
Consortium GARR

HUBs

UNIMORE — Università degli Studi di Modena e Reggio Emilia
Università di Parma
OGS

Annual Members Budget Contribution:
6.325 M€

Private companies
Founding members:
strategic players for digital transformation

enel

ENGINEERING
THE DIGITAL TRANSFORMATION COMPANY

eni

FERROVIE DELLO STATO ITALIANE

FINCANTIERI

Highly-qualified group of large leading companies covering most of the strategic industrial sectors involved by digital transformation in Italy

fondazione innovazione urbana

autostrade per l'italia

HUMANITAS RESEARCH HOSPITAL

iFAB
INTERNATIONAL FOUNDATION
BIG DATA AND ARTIFICIAL INTELLIGENCE
FOR HUMAN DEVELOPMENT

INTESA SANPAOLO

LEONARDO

sogei

ThalesAlenia Space
a Thales / Leonardo company

Terna Driving Energy

UnipolSai ASSICURAZIONI

fondazione innovazione urbana

Strategic partner to implement and develop the digital twin pilot case of an urban complex system
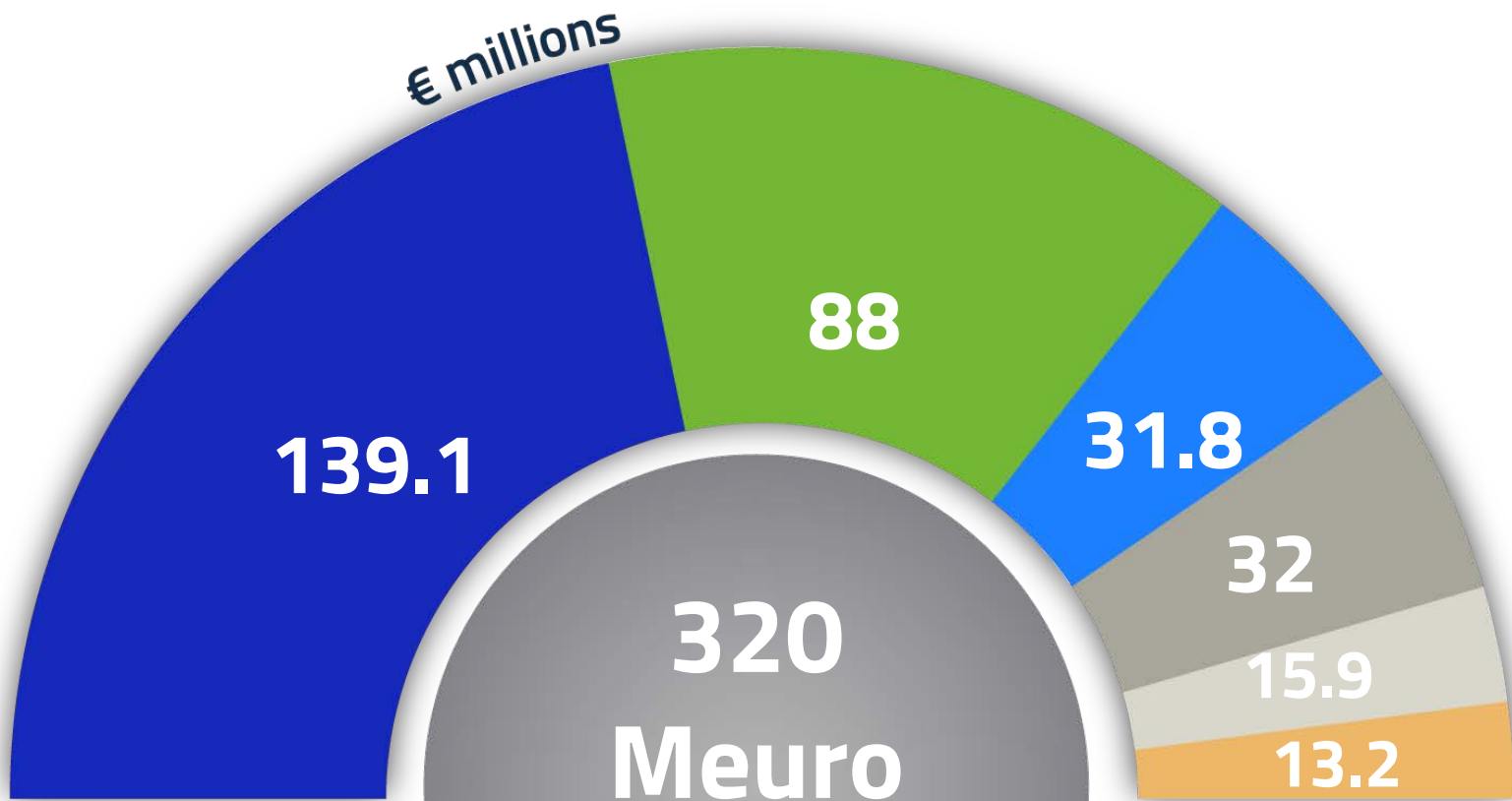
iFAB
INTERNATIONAL FOUNDATION
BIG DATA & ARTIFICIAL INTELLIGENCE
FOR HUMAN DEVELOPMENTE

Industry-driven not-for-profit international organization aimed at: (1) aggregating companies, including SMEs, to engage with ICSC through a structured partnership, (2) funding research and innovation projects, (3) promoting the Big Data Technopole

ICSC: resources to bring **Research results to Business**

1.500
Personnel shared by partners

250+
New researchers

250+
New PhDs

32 M€
Open calls

32 M€
Innovation grants

ICSC Open Calls

SCOPES

A) Promoting access to computing resources of Academia, Industry and Public Administration

B) Stimulating the research potential of Academia

C) Stimulating the innovation potential of Industry, including Smes and innovative start-ups, and Public Administration

MODALITIES

• open Research and Innovation

• free of charge by opportunely mixing depending on the target: computing resources, high level support, research support and training

• with or without grants

ACTIVITIES

A) Access on advanced computing

B) Optimization, scaling and testing

C) Use-cases

D) Research and software development

E) Attracting and engaging top-class international scientists

ICSC: Innovation grants

SCOPES

A) Fostering technology scale-up and transfer

B) Supporting new start-ups and spin-offs

C) Addressing skill gaps

D) Creating ISCS community and promoting entrepreneurial culture
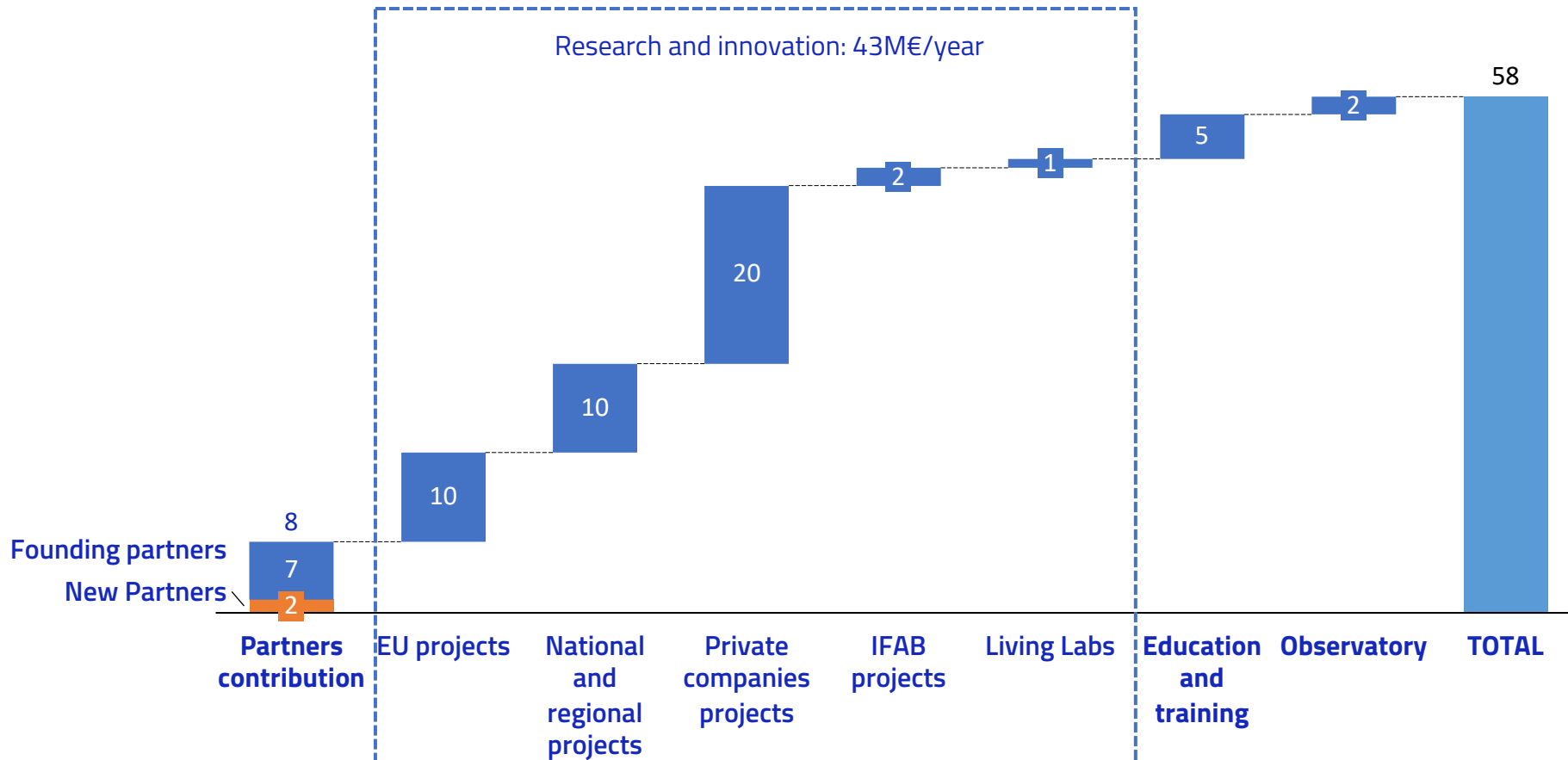
MODALITIES

- Exploitation plans

- Call for ideas and business plans

- Contests and challenges

- Innovation grants

ACTIVITIES

- Deployment of demonstrators

- Scale-up grants

- Proof fo concepts

- Pilot applications

- Pre-seed funds

- Life long learning

- Training

- Industrial PhD projects

The revenue profile at steady state (beyond 2026): ~58M€/year

Research and innovation: 43M€/year

Founding partners
New Partners

| Partners contribution	EU projects	National and regional projects	Private companies projects	IFAB projects	Living Labs	Education and training	Observatory	TOTAL
8 (7 / 2)	10	10	20	2	1	5	2	58

- The current esteem of 58M€/y is slightly higher than the BSC benchmark (50 M€/y)

- According with the sensitivity analysis a worst case can be an yearly revenue of c.ca 43M€ and in the best case c.ca 73 m€/year

SPOKES
Costs sustained directly by the Spokes/Affiliates on their own budget to support ICSC
(i)   Shared researchers with ICSC
(ii) At least 10 permanent positions per spoke
(iii) Operational costs for PNRR infrastrucuture investment
(iv) Co-funding of new infrastucture investment

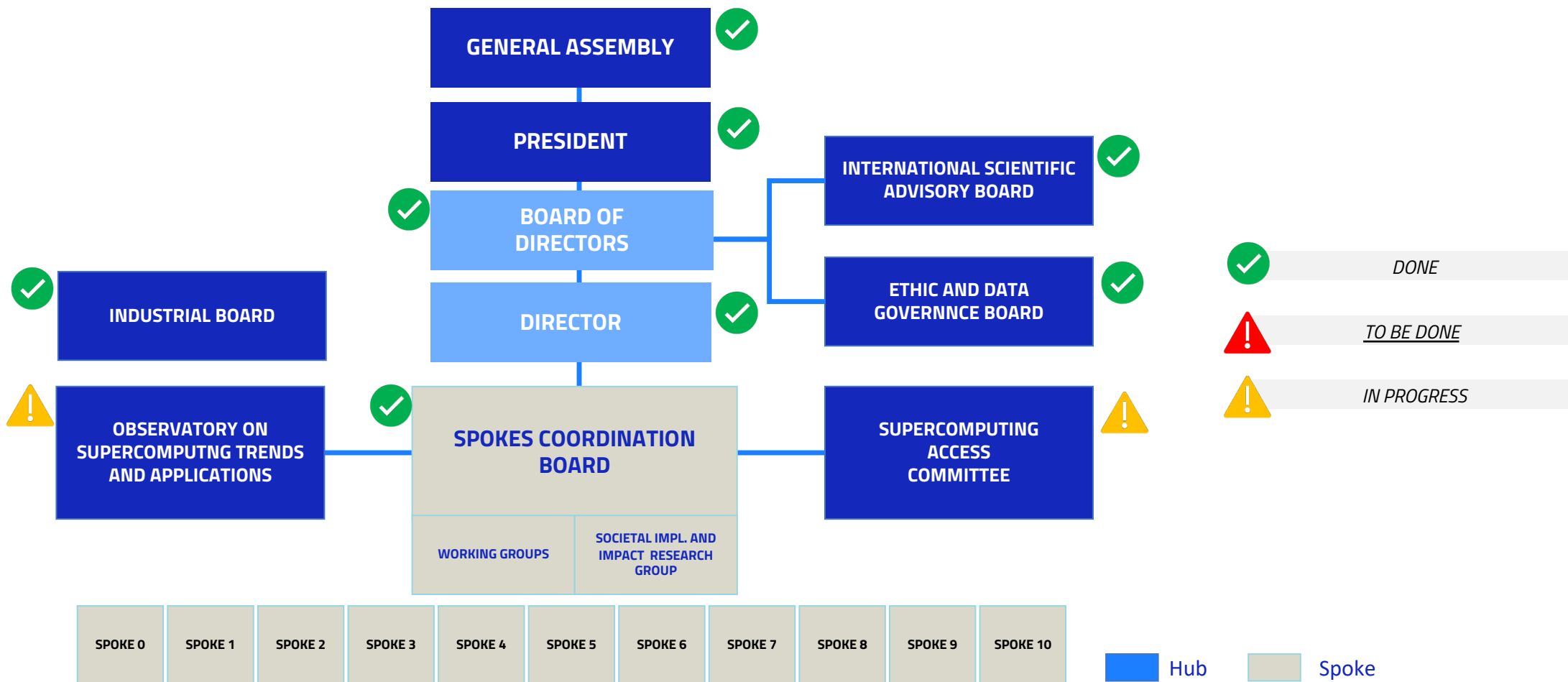# The cost profile at steady state (beyond 2026): ~58M€/year
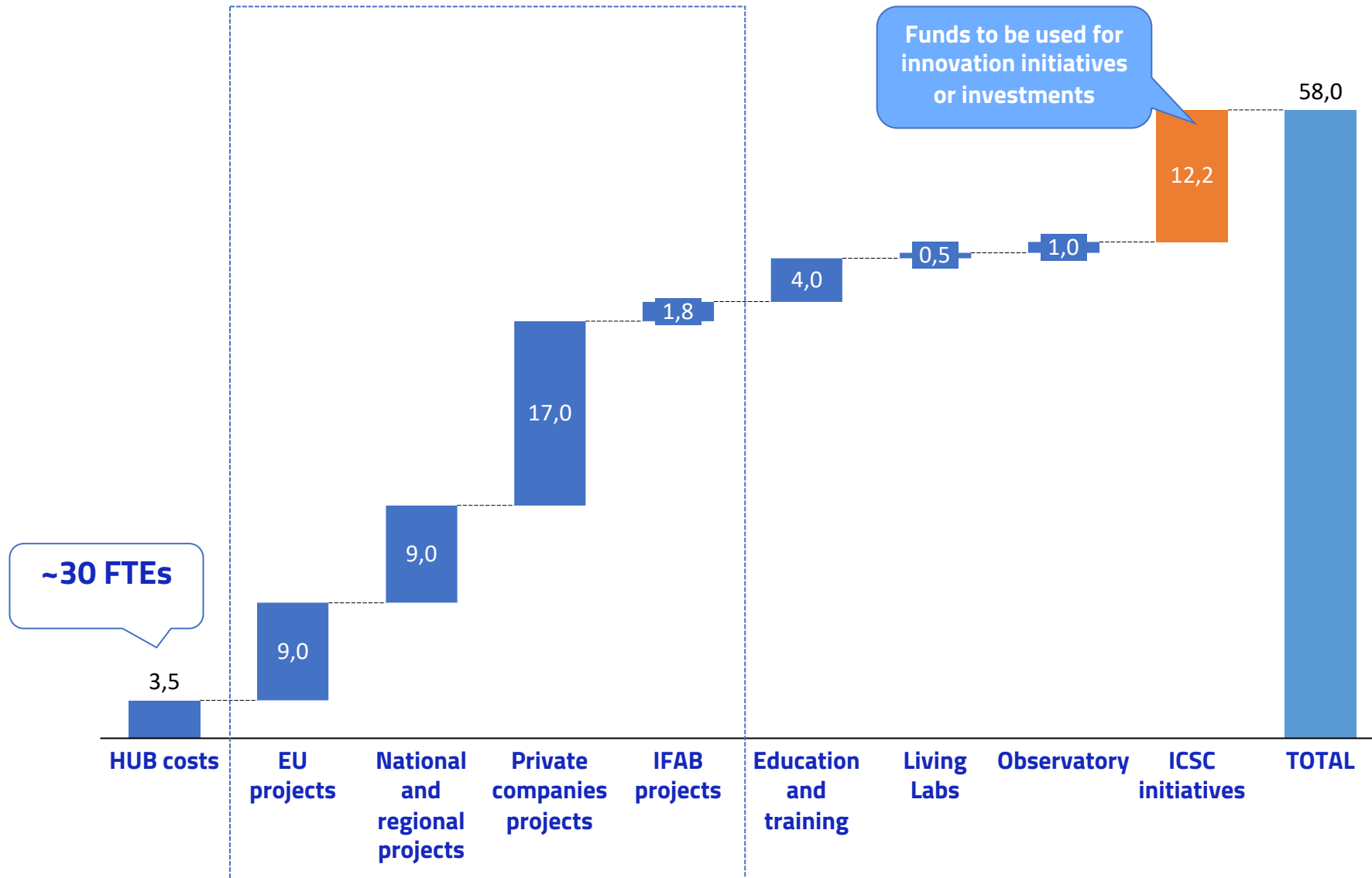
▶ ICSC can support its own initiatives for a total of 12.2 MEur per year (21% of the value of production), in addition to the 2 MEur of IFAB-projects indirectly related to the Centre.

▶ This annual capacity has been declined in the economic simulation into: 3.0 MEur for ICSC Initiatives (for example: ICSC Fellowships, ICSC PhD and ICSC Innovation grants) and 9.2 MEur (16% of the production value) for investments for the evolution of the infrastructure

Status and next steps

ICSC Organisation Status

GENERAL ASSEMBLY ✓

PRESIDENT ✓

BOARD OF DIRECTORS ✓

INTERNATIONAL SCIENTIFIC ADVISORY BOARD ✓

DIRECTOR ✓

ETHIC AND DATA GOVERNNCE BOARD ✓

INDUSTRIAL BOARD ✓

OBSERVATORY ON SUPERCOMPUTNG TRENDS AND APPLICATIONS ⚠

SPOKES COORDINATION BOARD ✓

WORKING GROUPS

SOCIETAL IMPL. AND IMPACT RESEARCH GROUP

SUPERCOMPUTING ACCESS COMMITTEE ⚠

✓ DONE
⚠ TO BE DONE
⚠ IN PROGRESS

SPOKE 0 | SPOKE 1 | SPOKE 2 | SPOKE 3 | SPOKE 4 | SPOKE 5 | SPOKE 6 | SPOKE 7 | SPOKE 8 | SPOKE 9 | SPOKE 10

Hub   Spoke

Kick-off Meeting Centro Nazionale – 25/11/22

Thank You