T1 highlights
Novembre 2022

T1 highlights - stato gare Ottobre 2022

- CPU
  - Aggiudicata su NOVAPA gara da 60kHS06
    - Da installare nel CNAF attuale
    - In arrivo entro fine anno
- Disco
  - Aggiudicata gara da 14PB
    - Da installare nel cnaf attuale - 2 rack
    - Consegnate Q1 2023
  - In approvazione in giunta ~~19 Ottobre~~ ~~11 Novembre~~ 26 Novembre(?!?) AQ per disco 2023 e 2024 (54+14PB)
    - Da Installare al tecnopolo
- TAPE
  - Siamo a pledge 2022 - 130.5PB
- RETE
  - Pubblicate 2 gare su NOVAPA per cablaggio ed apparati attivi del tecnopolo
    - Scadono il 22/11
    - 2M core core switch+mgmt
    - 750k cablaggio

T1 highlights - Stato infrastrutture

- Infrastruttura
  - Nessun intervento importante previsto entro fine anno
  - Individuate azioni per risparmio energia in vista dei rincari
    - I.e. spegnimento di un KS
  - Effort su lavori infrastrutturali al Tecnopolo

- Rete
  - 8/11 down apparati al CINECA per configurazione switch HA
    - In concomitanza aggiornamento kernel per vulnerabilità critica
  - Link LHCONE e GeneralIP passati su GARR-T
    - Contestualmente General IP banda raddoppiata 40Gbit/s
  - Link con CERN 100+100Gbit/s da HA a Load Balancing

The new INFN Data Center at Bologna Tecnopolo

A brand-new data center for CNAF

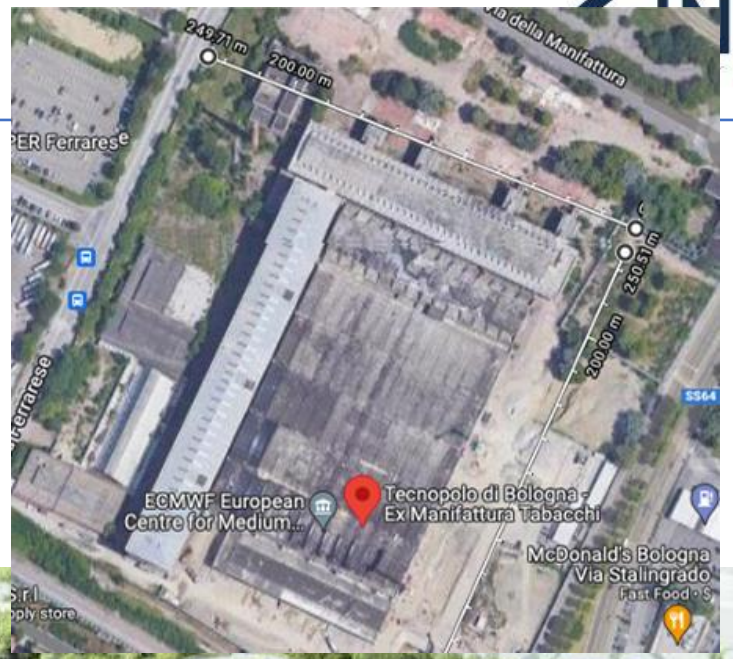
- Renew infrastructures to be ready for the HL-LHC era
  - up to ~ 2035 and beyond
- Use more compact computing
  - from today's ~ 20 kW/rack to 80 kW/rack DLC
  - Integration with CINECA-Leonardo Supercomputer
- Lower the PUE (*power usage effectiveness*)
  - Targeting 1.08-1.10
- Extend and expand networking for a future-proof infrastructure

The opportunities ….

- In **2017**, Bologna won a bid to host the datacenter of the "*European Centre for Medium-Range Weather Forecasts*" - ECMWF

- The Emilia Romagna region decided to repurpose the "*Manifattura Tabacchi*" area to host a technology district, hosting ECMWF and more

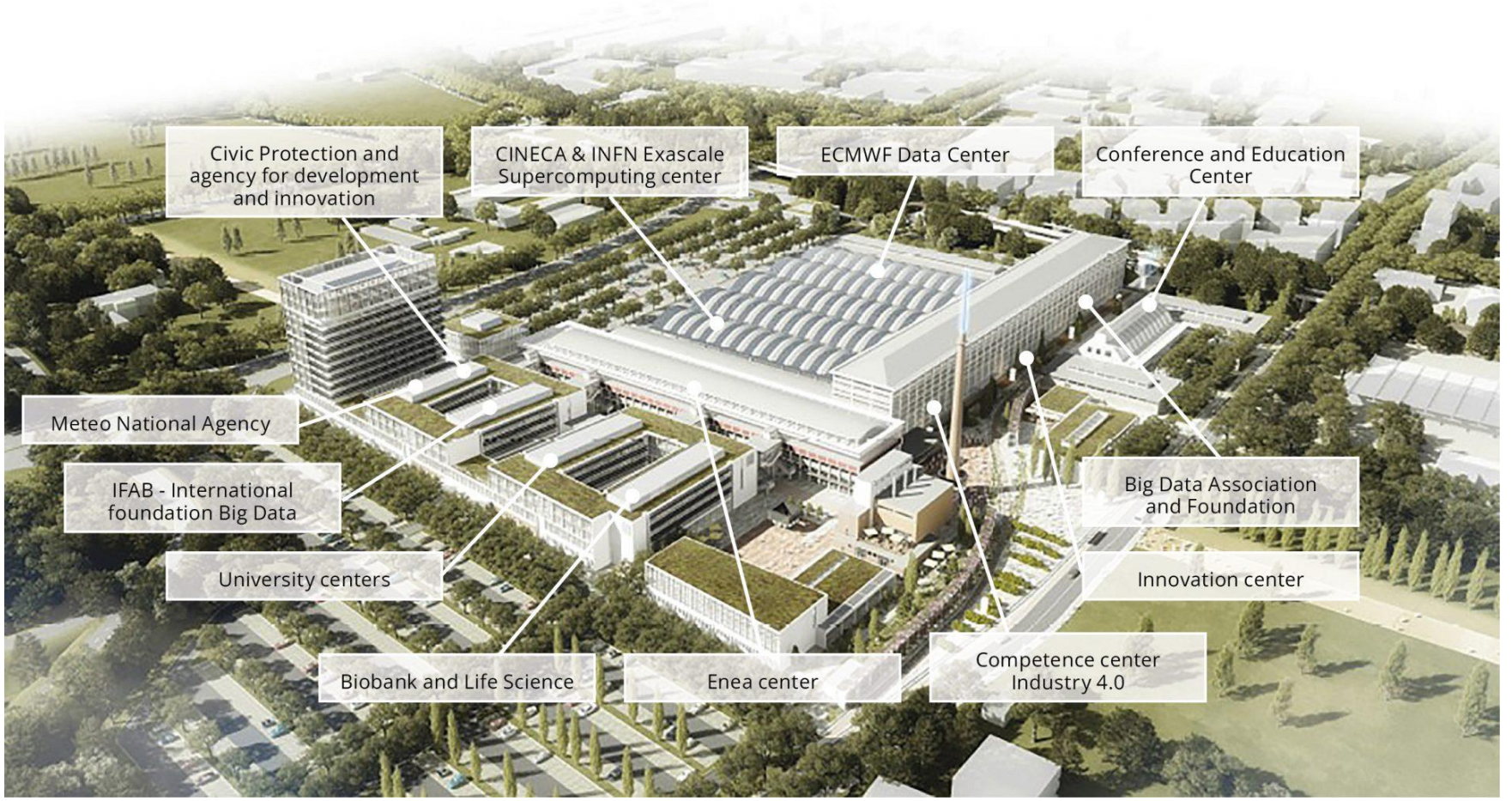
Roughly 250x250 m²



How it will be

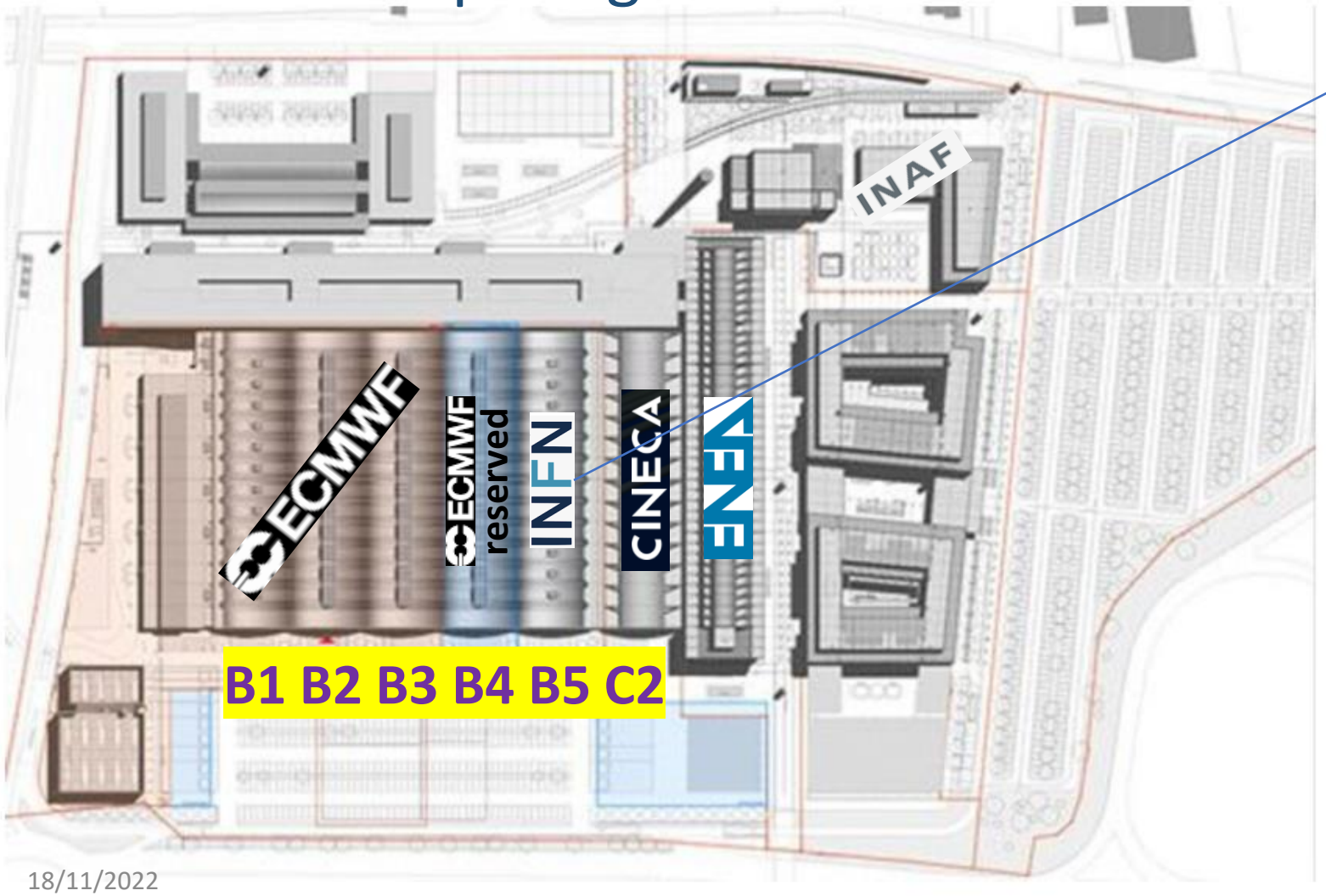
What can the Tecnopolo host?

- Not only research infrastructures and supercomputers
- Areas for
  - Technological institutions
  - university
  - innovation hubs
  - technology transfers
  - Industry 4.0
- Restaurants



What can the Tecnopolo host?

The computing infrastructures

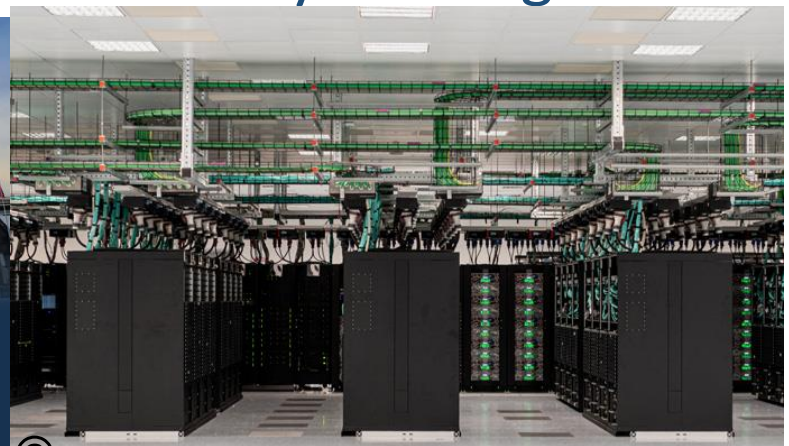


Each of the 6 “botti” (barrels) is ~5000m^2 of usable IT space

Same architect and design of the ”Sala Nervi” in the Vatican

The INFN+CINECA project

- The ECMWF is already running!



©https://www.ecmwf.int/en/computing/our-facilities/supercomputer-facility

- CINECA Leonardo was commissioned in October 2022
  - 4th in top500.org Nov22

- CNAF “B5” Barrel expected to be ready by mid 2023
- Two phases expected
  - **Phase-1 (2023-2025)**
    - Leonardo + T1-CNAF ➔ 13 MW
  - **Phase-2 (2025+)**
    - infrastructure up to 25 MW ready for post-exascale and for HL_LHC

Current status…..

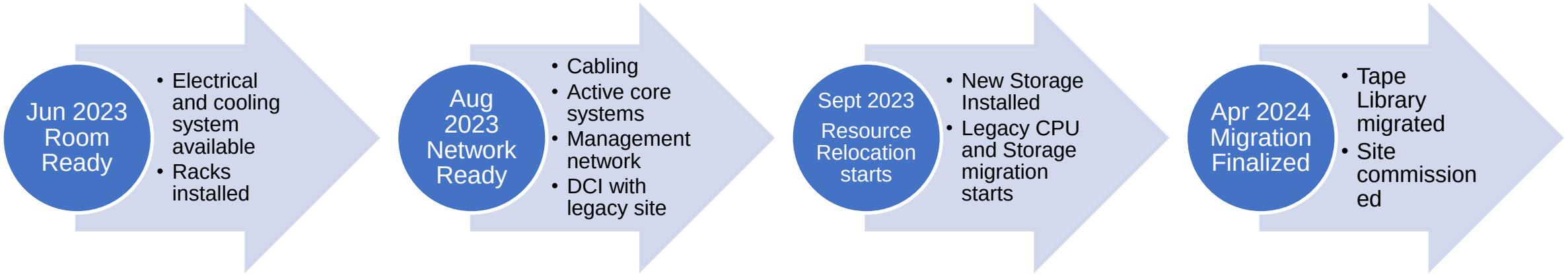

Data Valley
Emilia-Romagna
Data Valley
Emilia-Romagna


CIFA


MOLLO
Genie GS-1932

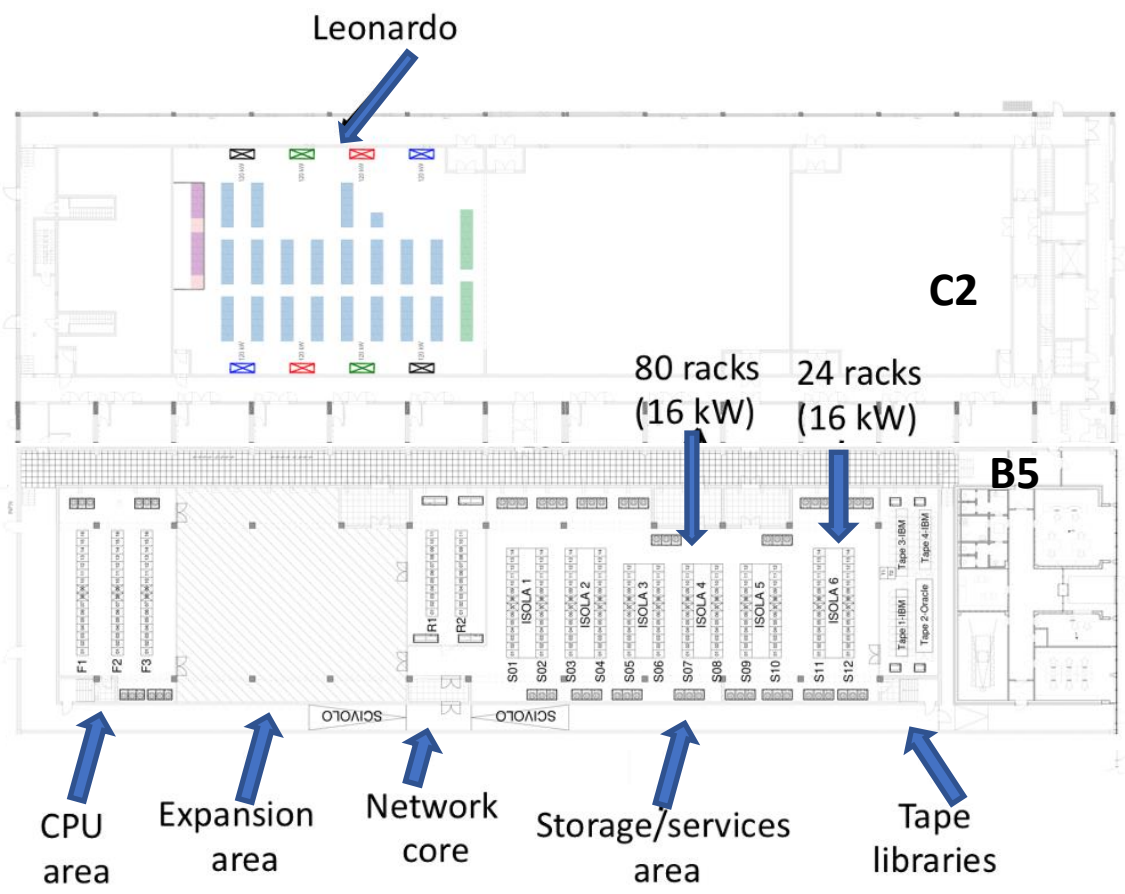

yale

Live Relocation Timeline



- **Live Migration**
  - Legacy site “extended” through a DCI channel 1.2Tbit/s
  - Data moved to a new storage
  - CPUs moved in chunks
- Down only for tape libraries
  - Need dismantle and re-assembling

CNAF and CINECA data halls



- The new CNAF Datacenter will feature the following main areas
  - High Density – 2-3 rows for 80kW racks
  - Low density – 80+24 16kW racks
  - Expansion area
  - Tape libraries areas
    - Up to 4 libraries
- The CPU area can host up to 3MW of CPUs via 42 DLC high density racks
- The low-density area will be used to host
  - Storage systems
  - CNAF Cloud Infrastructures
  - ISO certified Cloud racks
- Cooling
  - Air cooled Cold Corridor aisles
  - Direct Liquid in High Density
- 3+1 redundancy in all the infrastructure facilities

DLC 80kW

The cooling system and the PUE

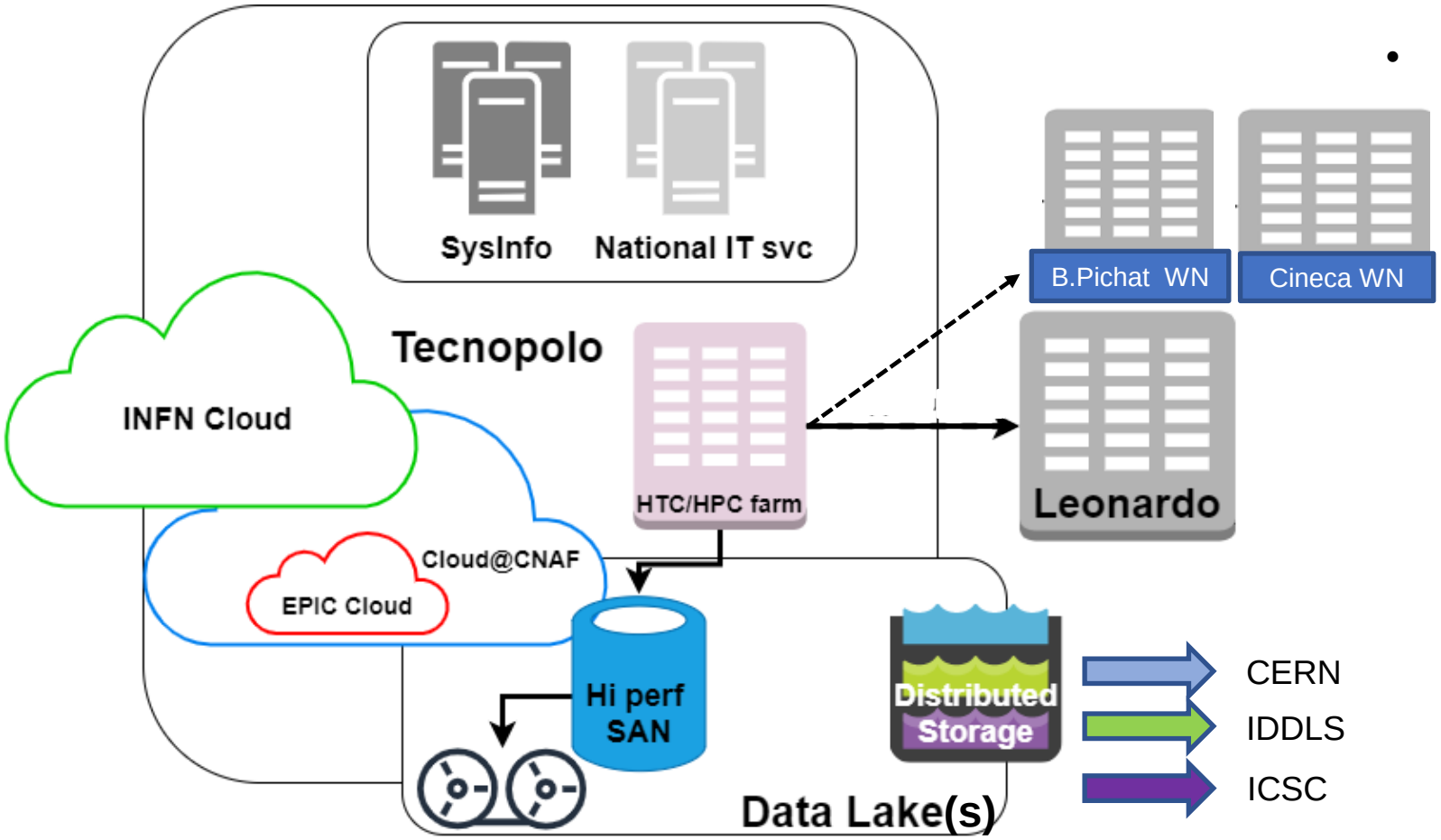
- 4 central refrigerator Units
  - 3+1 redundancy
- Chilled water 19-26 °C for the low density air cooled racks
  - 2 MW Chillers
  - Total/partial free cooling is possible
- Warm water 37-47 °C for DLC racks
  - 2,25 MW Chillers
- To be doubled in the second phase

- **High Density CPU Area**
  - 4 CRAH - 200 kW each (3+1)
- **Network Area**
  - 4 CRAH - 75 kW each (3+1)
- **STORAGE Area**
  - 16 CRAH - 200 kW each (12+4)
  - Cold corridor aisles
- **TAPE Area**
  - 4 CRAH - 25 kW each (3+1)

$$PUE_{DLC} \approx 1.08$$

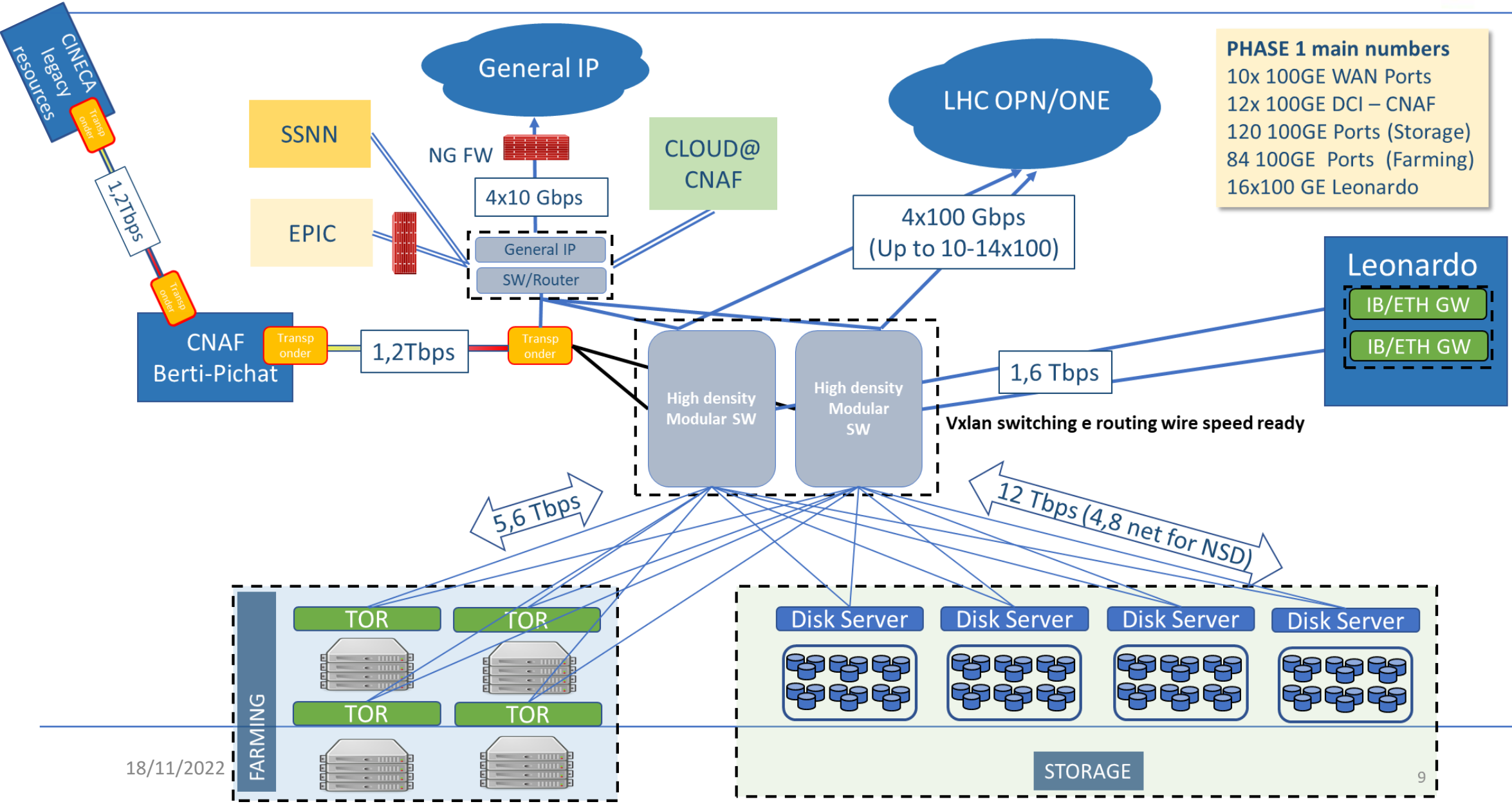
$$PUE_{Tot} \approx 1.2 - 1.3$$

A “distributed” datacenter

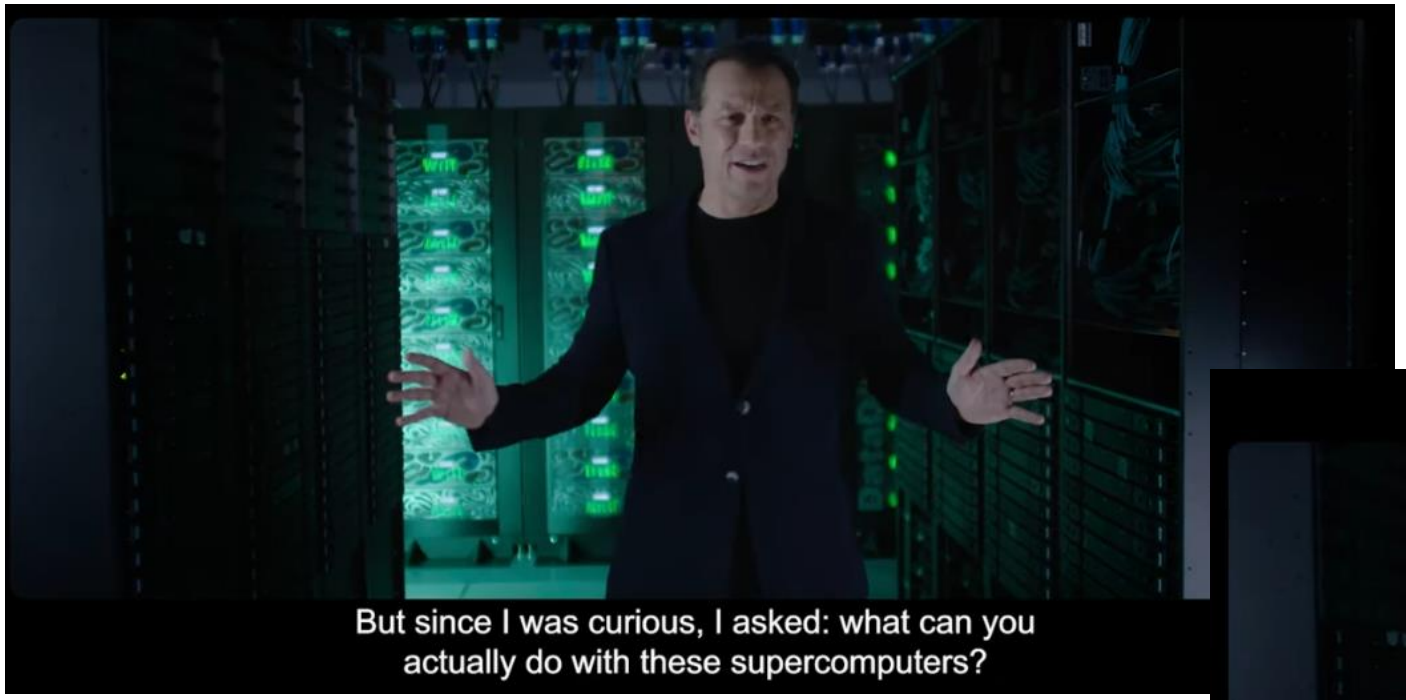


- Multiple “locations”
  - CNAF Technopole
  - CINECA Leonardo CPU access
  - INFN-CLOUD federated cloud
  - Data-lake(s)
    - DCI with INFN sites
    - DCI with CERN
    - New national data lake for the ICSC project
      - The ICSC headquarter will be at the Technopole

A Complex Networking Infrastructure



Communication



Data Valley:

https://www.youtube.com/watch?v=96TfXHCWxf8