From Tier-2 to Tier-1

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Tier structure

◉ Tier 0
- ◉ CERN and Wigner Research Center (Hungary)
- ◉ First copy data
- ◉ First pass reconstruction
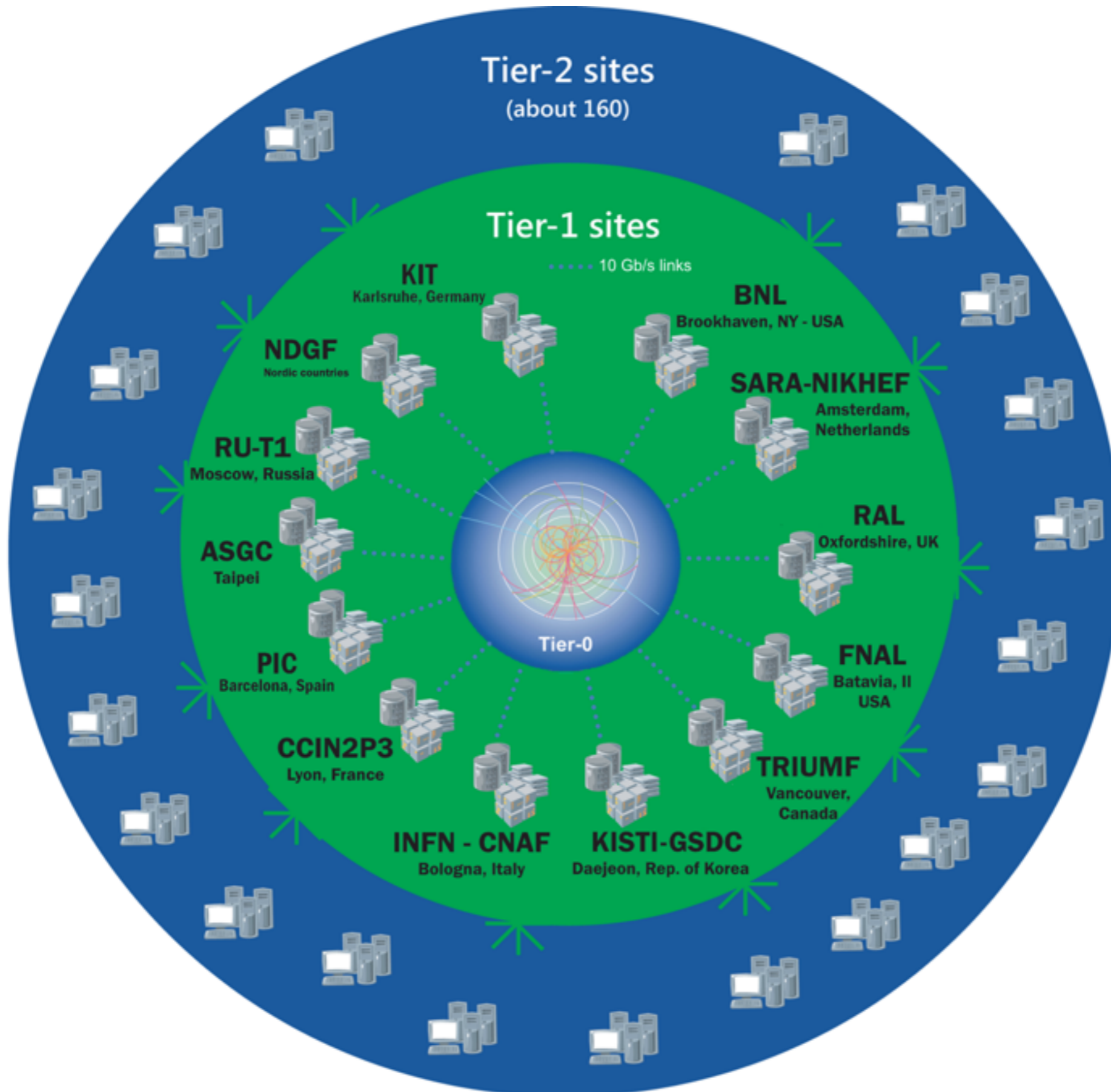- ◉ Data distribution to Tier 1 centers

◉ Tier 1
- ◉ 13 centres worldwide, 7 for ALICE, **none in the Americas**
- ◉ Data copy
- ◉ Reconstruction and simulation
- ◉ Data distribution to Tier 2 centers

◉ Tier 2
- ◉ Institutions, Universities: ~160 centers

WLCG tier hierarchy

Motivation for setting up a Tier 1 data center

⦿ Needed

⦿ Challenging

⦿ Possible

The need for a new Tier 1 for ALICE

◉ Second copy data storage

- ◉ Tier-1 centres responsible for safe-keeping of raw data
- ◉ More space needed to hold backup copies

◉ No data center in the Americas

- ◉ Support regional distribution

◉ Additional processing power for the collaboration

- ◉ Collaborators are expected to contribute
- ◉ Will be the Mexican contribution in computing

Challenges

- New step in advanced computing in Mexico
    - Data intense science
    - Intense network usage

- Motor to drive development of infrastructure
    - Network
    - Data centres
    - Attract new users

- Provide high-level, reliable service
    - High uptime
    - Short response time to problems
    - Under international scrutiny

Project possible

- DGTIC-UNAM experience in providing advanced computing services

- ICN-UNAM experience in providing grid services

- Have trained personnel

- Network infrastructure improving

- Political support for the project

Hardware expansion

◉ Expand storage
- ◉ Currently about 570TB available
- ◉ Cross the 1PB threshold
- ◉ Will need continuous expansion
  - ◉ LHC will produce data for 20 years

◉ Expand processing power
- ◉ Currently 512 Hyper-threaded cores 1024 job slots
- ◉ 4900 HEP-SPEC 06
  - ◉ in the center of the playing field
  - ◉ room to move up

Network upgrades

- ⦿ UNAM operates 1Gbps link to US
  - ⦿ Upgrade technically possible
  - ⦿ Looking into funding

- ⦿ CUDI (Mexican NREN) network expanding
  - ⦿ UNAM has 10Gbps connection capability
  - ⦿ Alternative connection

- ⦿ Links shared for now
  - ⦿ Evaluate need for exclusive link

Backup system

◉ Have to back up data
  ◉ prepared for multi-PB scale

◉ Traditionally: Tape
  ◉ Additional technology
  ◉ Not presently in use at the UNAM

◉ New possibility: Disk
  ◉ Hierarchical storage
  ◉ Build on local knowledge

◉ Evaluation options
◉ Looking for funding

Operational challenges

- ◉ Need short response time
  - ◉ More personnel needed
    - ◉ **Have trained** experts
    - ◉ **Lack operators** for routine monitoring and first level attention to problems

- ◉ High uptime expected
  - ◉ Stability
  - ◉ Spares
  - ◉ Maintenance
  - ◉ Stricter than for most (all?) academic computing centers in Mexico

Network for steady operations

◉ Bandwidth: 10Gbps
  ◉ based on previous experience and data challenges

◉ Reliability
  ◉ Achieved by redundant links
  ◉ More than one provider, if possible

Regular upgrades and expansions

- ◉ Storage has to keep up with data
  - ◉ Expand storage
    - ◉ primary and secondary storage has to grow
  - ◉ 20 years of operation expected
  - ◉ Possible long-term storage of scientific, LHC data required

- ◉ Computing power
  - ◉ expand
  - ◉ modernise servers

Operations costs

◉ Personnel
  - ◉ operators
  - ◉ experts

◉ Travel
  - ◉ Meetings of data center operators
  - ◉ Expert workshops
  - ◉ Training

◉ Existing funding schemes can cover some, but not all, cost of operations
  - ☛ Need special budget

Occasionally asked questions

- ◉ Why Tier-1 in Mexico
  - ◉ Can be done: Proof of Mexico's technological abilities.
  - ◉ Each country contributes to the computing power of the collaboration, it is one of the contributions expected from a mature country.

- ◉ Why not use commercial computing, e.g., cloud services?
  - ◉ Rule of thumb: running your own installation more economic if you manage to get more than ~75% use.
  - ◉ Local installation provides opportunity to train new experts in computing.

Local synergy / spin-off

- ◉ HAWC
  - ◉ primary data center
  - ◉ ~500TB on disk, preparing to cross 1PB threshold

- ◉ Dark Energy Spectroscopic Instrument
  - ◉ Mexican collaborators staring
  - ◉ Approached us for support

- ◉ Pierre Auger Observatory
  - ◉ Grid node, supporting production

Grid projects

- ◉ Participation in Latin-American grid collaborations
  - ◉ EELA, GISELA
  - ◉ ROC-LA

- ◉ Creation of a Certification Authority

Training

◉ Support and train staff in other data centres

◉ Certified tutors for EGI middle-ware

Conclusions

- Moving from Tier 2 to Tier 1 is
  - challenging
  - possible

- Front line projects provide stimulus for development
  - Expand infrastructure
  - Attract and support new users and communities