UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO
S E C R E T A R Í A G E N E R A L
Dirección General de Cómputo y de Tecnologías de Información y Comunicación

ICT infrastructure to support scientific research

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February 8th, 2011

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Agenda

- Institutional vision, academic requirements and solution design criteria
- Internal strategy
- External strategy

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Institutional vision

*"The **main challenge** of our University today is to go forward in order to respond to the world's dramatic transformation,… [and] to the spreading of the new **information and communication technologies**…"*

DR. JOSÉ NARRO ROBLES (January 2008)

Guidelines to articulate an academic proposal for the 2007-2011 period

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Basic academic requirements

Communication and interaction
(multiple national and international groups)
[email, phone, telepresence, access to grid and high performance computing resources, storage of high volume data,…]

Enhanced capacity and coverage
(voice and data networks)

Greater mobility
(students and academic staff)
[mobile devices]

Multimedia contents
(publication and online access)
[network of digital repositories: RadUNAM]

Technology in the learning spaces

Distance learning

Safe ICT infrastructure

Virtual classrooms and laboratories
[streaming, video-training, podcasts,…]

Operations management continuity
(infrastructure and processes)

Video-surveillance, management efficiency,…

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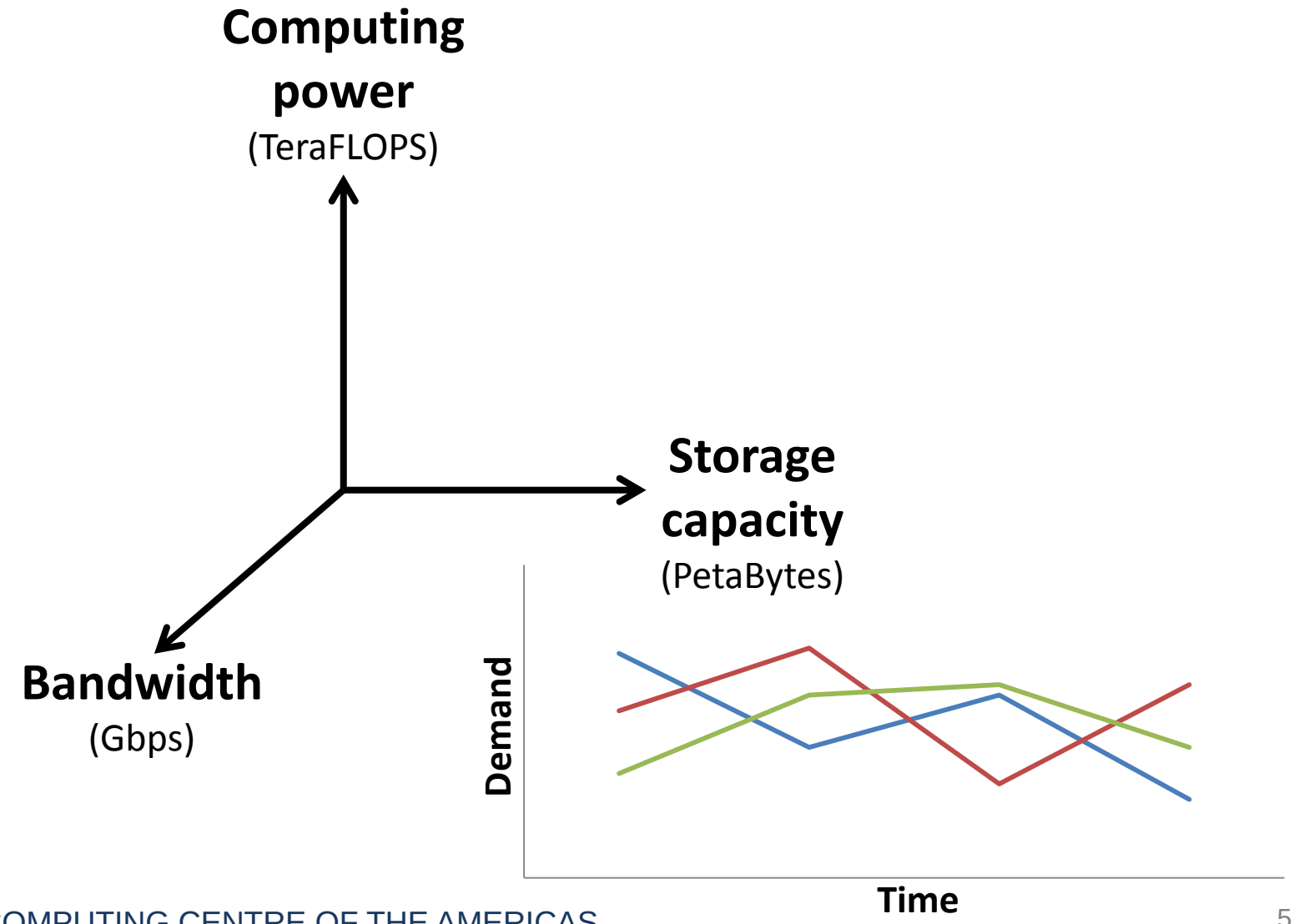
Requirement dimensions



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Solution design criteria

Availability	• 7/24
Reliability	• No information loss
Security	• No malware • No spam
Flexibility	• Multiple configurations
Capacity	• ≥ 50 TeraFLOPS • ≥ 10 PetaBytes • ≥ 1 Gbps
Coverage	• Central • Metropolitan • National • International

Internal strategy

Current infrastructure

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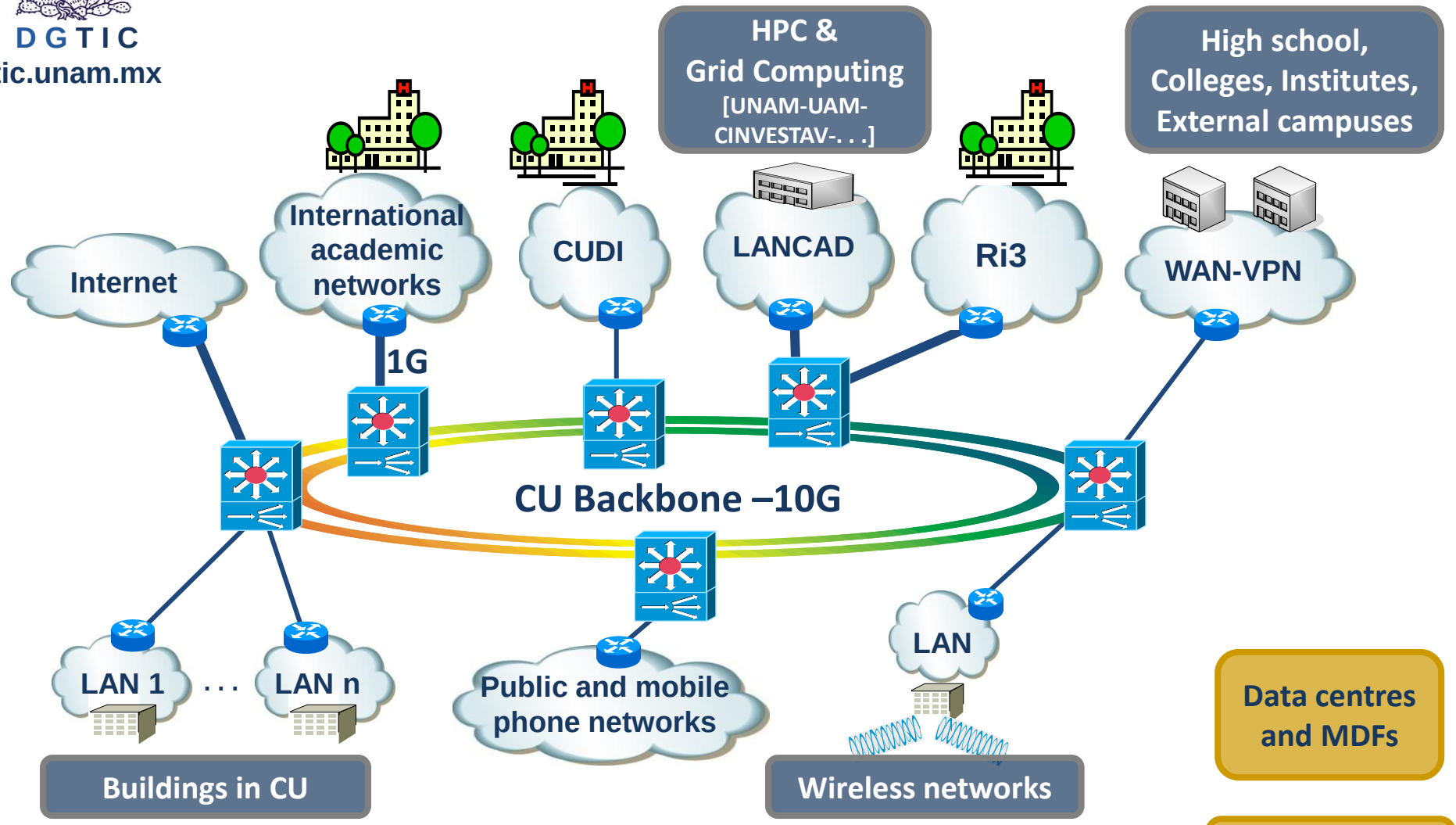

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Current status

- **Main drawbacks**
  - Servers: Widespread infrastructure among several locations
  - Data storage: High disintegration and fragmentation. No datacenter available
  - Services: hardly any virtualization
- **Consequences**
  - Idle capacity (TeraFLOPS, PetaBytes)
    - Storage: mainly 1 to 1 associations between physical processors and data storage resources. Example: 50K PCs x 100GB = 5 Pbytes. (use: 30%)
    - Processing: Underused. High percentage of CPU power on stand by
  - Multiplication of the same information. Example: attachments in emails
  - High management costs: air conditioning, electric power consumption, training,…
  - High software costs
  - Greater information security challenges

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New approach: UNAM cloud

- Goals:
  - Investments redeploying to get optimal ICT architecture and use
  - High availability and flexibility in ICT services
  - Increase and diversification of ICT installed capacity and services

Model A

Centralized processing

Cluster @ DGTIC

Hardware:
- Hundreds or thousands of CPU's
- Hundreds or thousands of GPU's
- Tens of TeraFLOPS
- Tens of TeraBytes RAM

Software:
- Servers virtualization
- Operating Systems images (Win, Lnx, Mac)
- Optimizers / Balancers

Centralized data storage

Hardware:
- TeraBytes / PetaBytes
- 15 KRPM / 7 KRPM
- SAN / NAS
- RAID n

Filesystems:
- NFS
- EXT1 / EXT2/ EXT3 / EXT4
- NTFS
- HPFS
- OS independent (RAW)

Datacenter @ DGTIC

RedUNAM

Physical infrastructure layer

Virtual services and infrastructure layer (SaaS, IaaS)

UNAM cloud

TIER 1 / GRID

E-mail

VPN access

ID management

Print services

Webcast / podcast

Databases

WWW services

Administrative apps

Institutional repositories

Other apps

Unified communications

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Model B

Centralized processing

Cluster @ DGTIC

Hardware:
- Hundreds or thousands of CPU's
- Hundreds or thousands of GPU's
- Tens of TeraFLOPS
- Tens of TeraBytes RAM

Software:
- Servers virtualization
- Operating Systems images (Win, Lnx, Mac)
- Optimizers / Balancers

Distributed data storage

Hardware:
- TeraBytes per venue
- 15 KRPM / 7 KRPM
- SAN local / NAS global
- RAID n

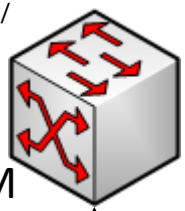
Filesystems:
- NFS
- EXT1 / EXT2/ EXT3 / EXT4
- NTFS
- HPFS
- OS independent (RAW)

Datacenter DF

Datacenter MOR

Datacenter QRO

Datacenter MICH



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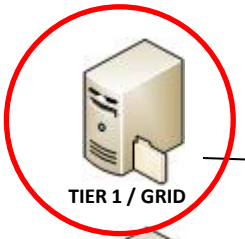
Physical infrastructure layer

Virtual services and infrastructure layer (SaaS, IaaS)



TIER 1 / GRID

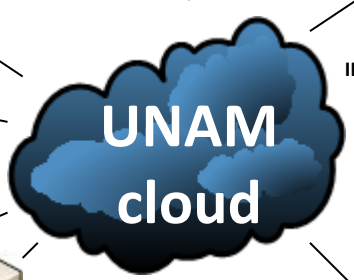
E-mail

VPN access

ID management

Print services

Webcast / podcast



UNAM cloud

Databases

WWW services

Administrative apps

Institutional repositories

Other apps

Unified communications

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Model C

Distributed processing
UNAM GRID

Cluster DF

Cluster MOR

Cluster QRO

Cluster MICH

Hardware:
- Hundreds of CPU's per venue
- Hundreds of GPU's per venue
- Local TeraFLOPS
- Local TeraBytes RAM

Software:
- Local services virtualization
- Operating Systems images (Win, Lnx, Mac)
- Local optimizers / balancers

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Distributed data storage

Hardware:
- TeraBytes per venue
- 15 KRPM / 7 KRPM
- SAN local / NAS global
- RAID n

Filesystems:
- NFS
- EXT1 / EXT2/ EXT3 / EXT4
- NTFS
- HPFS
- OS independent (RAW)

Datacenter DF

Datacenter MOR

Datacenter QRO

Datacenter MICH

Physical infrastructure layer

Virtual services and infrastructure layer (SaaS, IaaS)

UNAM cloud

TIER 1 / GRID

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Central network

External strategy

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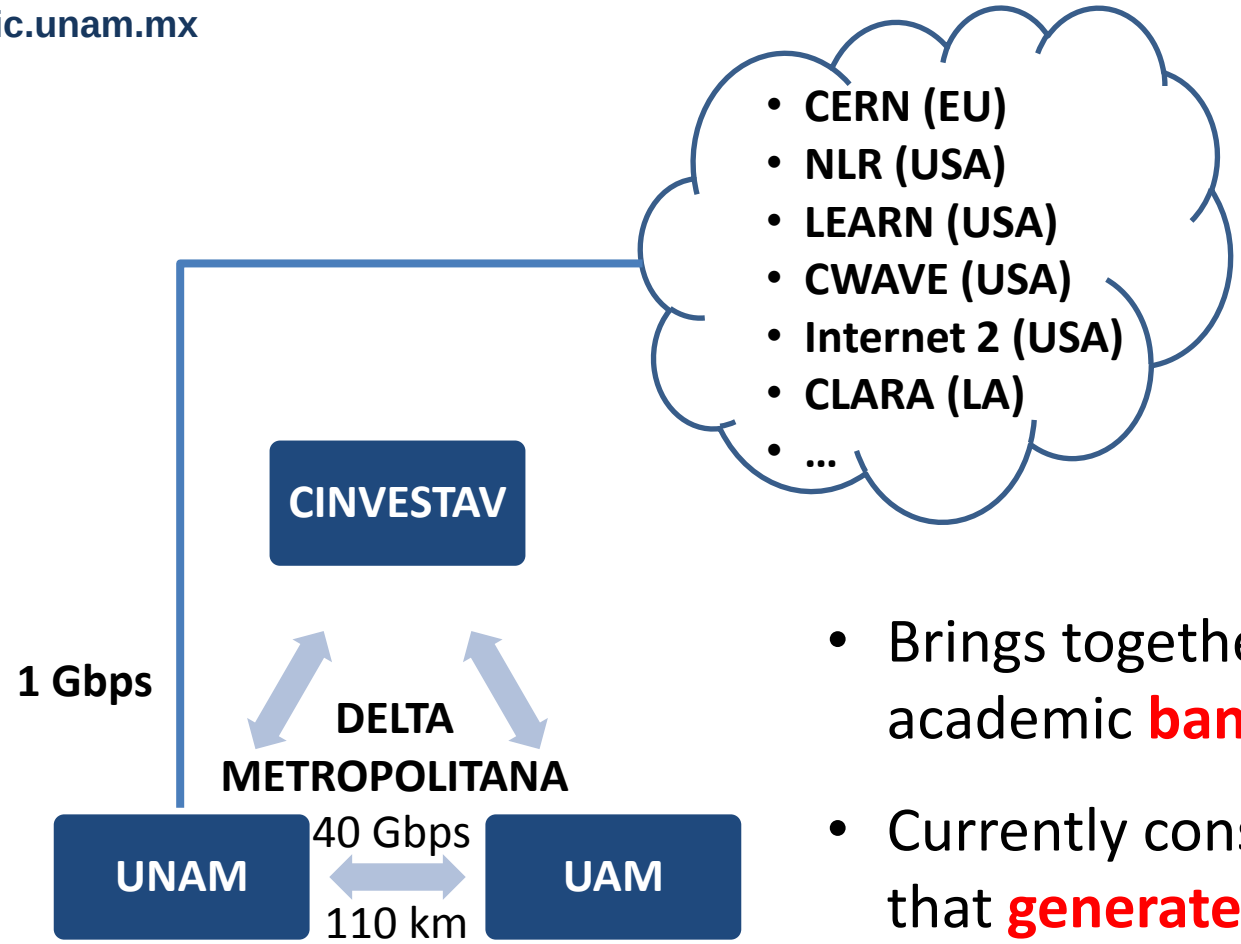
LANCAD

Laboratorio Nacional de Cómputo de Alto Desempeño



- Brings together the **main** Mexican academic **bandwidth consumers**
- Currently consists of 3 institutions that **generate more than half of the scientific papers** produced in Mexico

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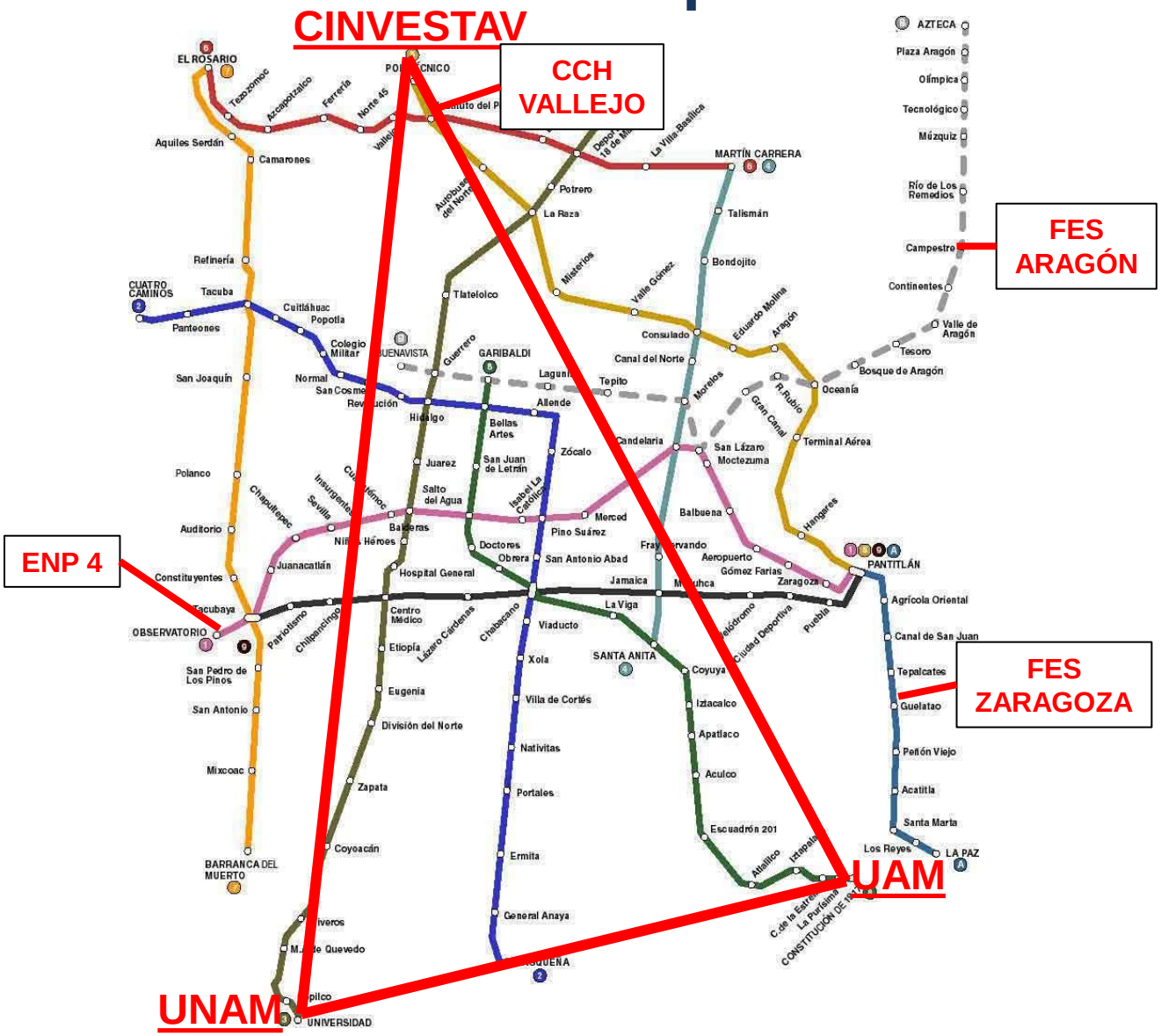
LANCAD's metropolitan network



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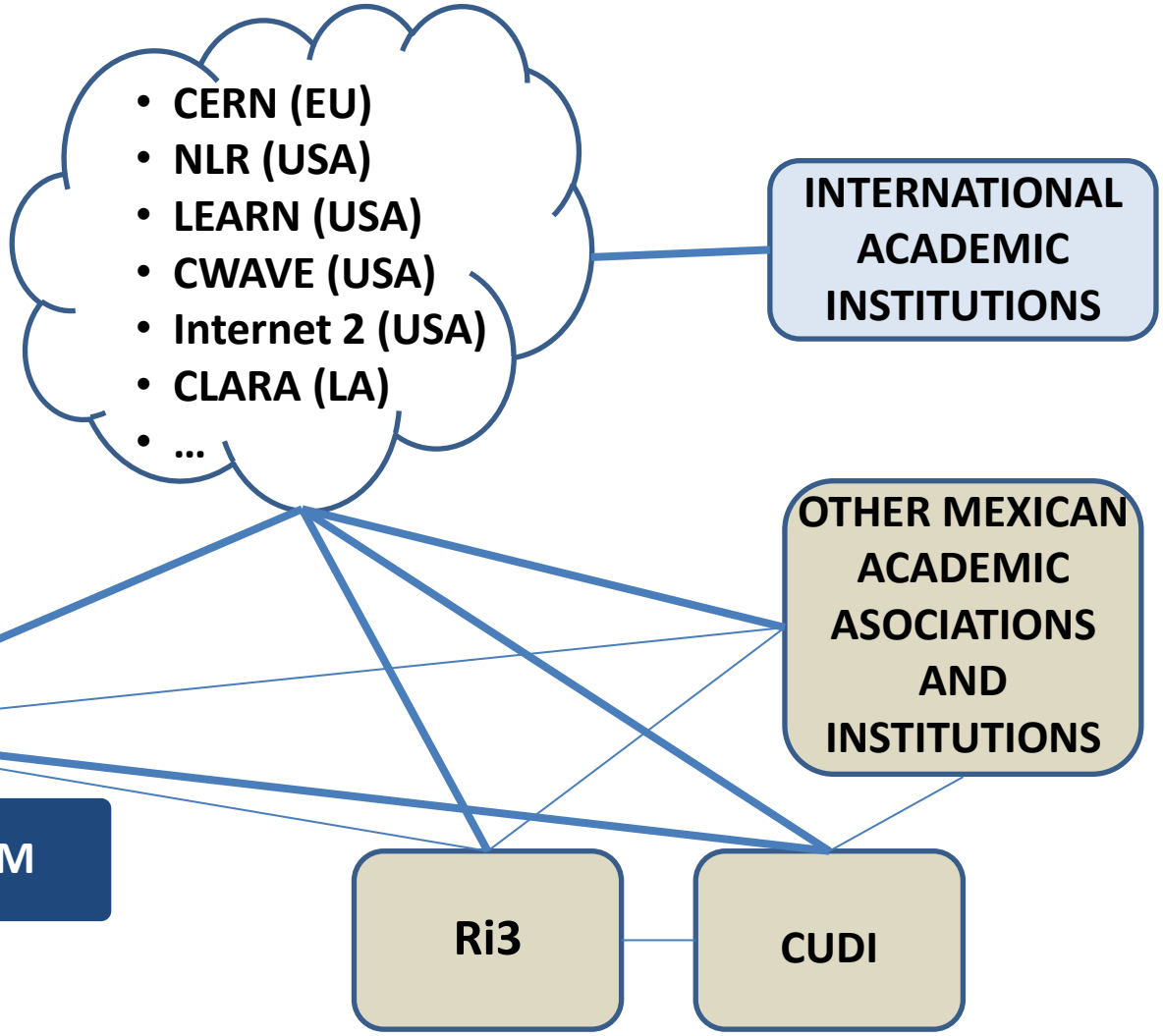
Envisioned network

The Mexican academic institutions **evolve and become stronger** by collaborating in projects that use a **shared and strong infrastructure**



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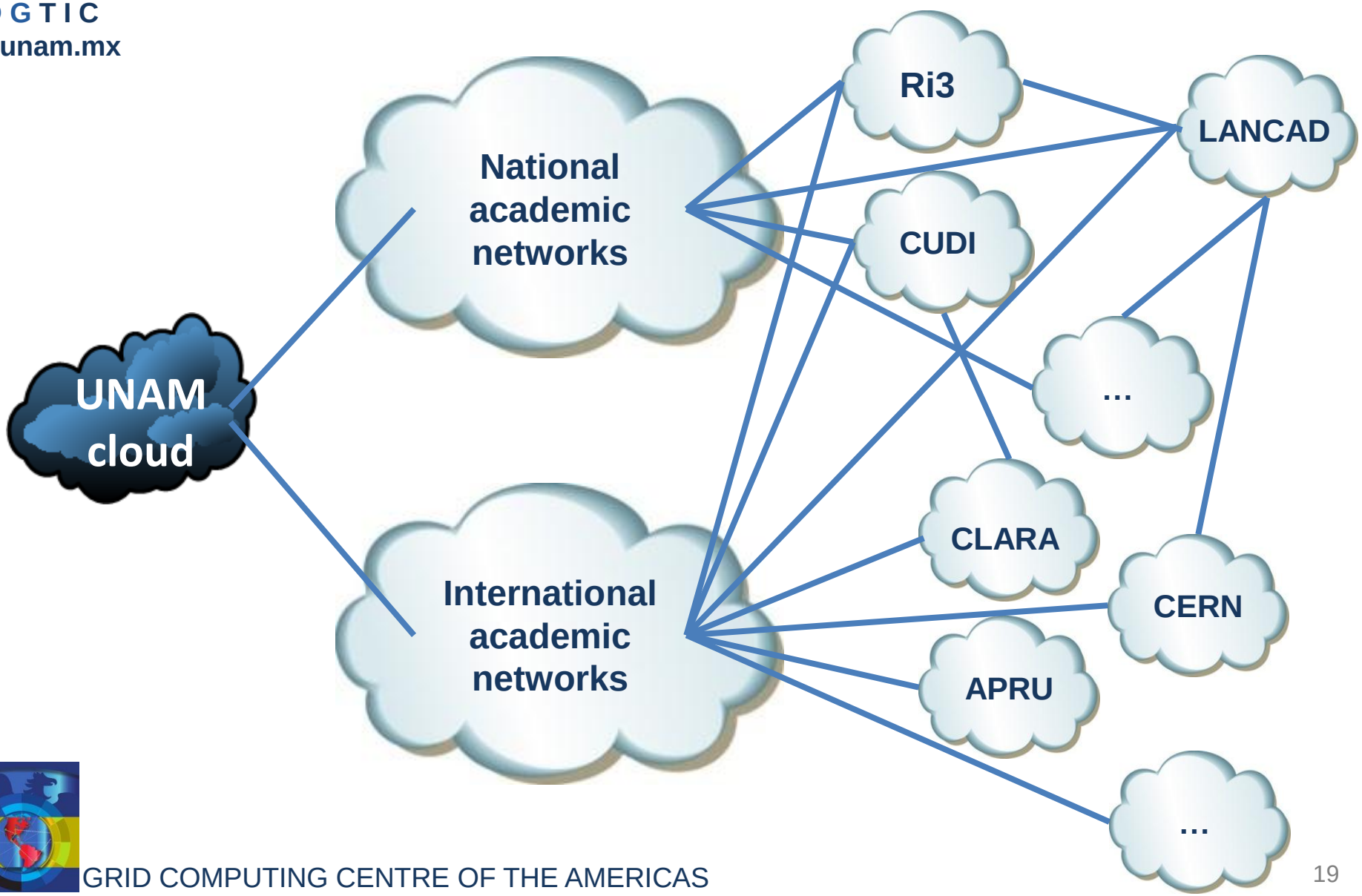
Collaboration and interoperation



UNAM's (inter)national connectivity

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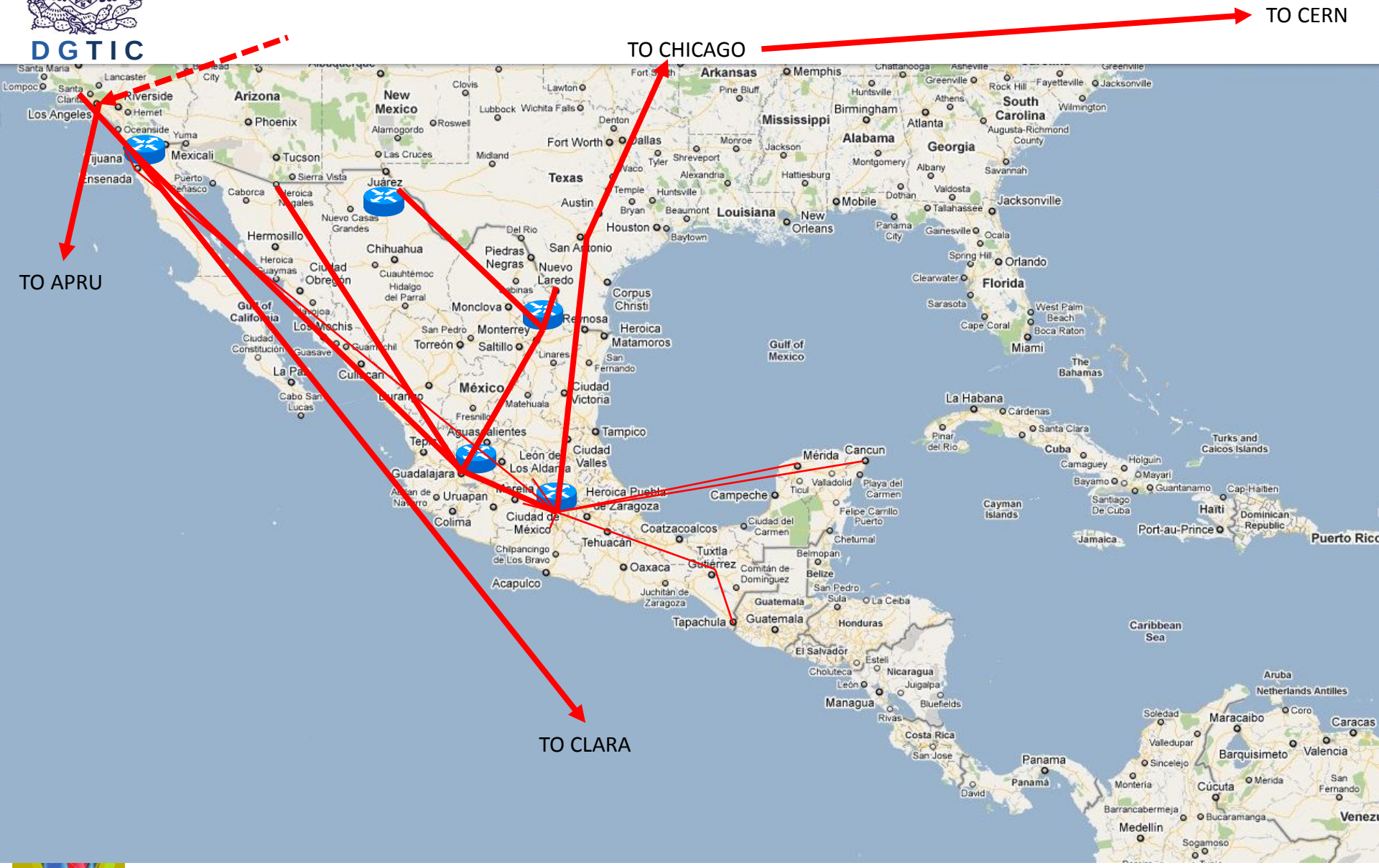

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Grid Computing Centre of the Americas

- UNAM has many resources and characteristics that make this project feasible:
  - People
  - Infrastructure
  - Knowledge
  - Experience
  - Strategy
  - Leadership
  - Vision
  - Interest

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¿Questions, comments?

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