RNP
ORGANIZAÇÃO SOCIAL DO MCTI

Educação, Pesquisa
e Inovação em Rede

The e-Ciber Superfacility Project

Leandro Ciuffo, RNP

with the participation of:

- Klaas Wierenga, Gént
- Eli Dart, ESnet

8 – Dec – 2022

Please feel like you are
sitting round a campfire
How to manage (and sustain) a superfacility?

First, a little context...

SISTEMA RNP 2021

ESTÁ NASCENDO UMA NOVA REDE ACADÊMICA PARA O FUTURO

NORTE CONECTADO

1 SANTARÉM
2 ALENQUER
3 MONTE ALEGRE
4 ALMEIRIM
5 MACAPÁ

AMBIENTES PARA EXPERIMENTAÇÃO

- CLOUDNEXT
- FIBRE
- FIWARELAB
- IDS
- LOFT
- SCIENCE-DMZ
- SDN-MULTICAMADA

VEJA EM DETALHES O NOSSO SERVIÇO DE TESTBEDS

CONEXÕES INTERNACIONAIS

CABO MONET (EUA)
200 Gb/s
CABO ELLALINK (EUROPA)
100 Gb/s
CABO SACS (ÁFRICA)
100 Gb/s
CABO WACS (ÁFRICA)
100 Gb/s
REDCLARA (AMÉRICA LATINA)
100 Gb/s

REDECOMEP

44 CIDADES COM REDES COMUNITÁRIAS

ESTADOS:

AC
RB MetroNet

AL
RAAVE

AM
MetroMAO

AP
MetroAP

BA
RedeVASF (Juazeiro e Petrolina)
Remessa

CE
GigaFOR

DF
Gigacandanga

ES
MetroVix

GO
MetroGyn

MA
Redecomep São Luís

MG
Inconf.edu (Ouro Preto e Mariana)
RMBH

MT
Pantanaira

MS
Redecomep Campo Grande

PA
MetroAlks
Metrobel
Redecomep Castanhal
Redecomep Marabá
Redecomep Santarém

PB
MetroJP
MetroCG

PE
Redecomep Caruaru
Redecomep Garanhuns
Icona

PI
Rede Poti

PR
Redecomep Curitiba
Redecomep Ponta Grossa

RJ
RedeRio Metropolitana
MetroNIT
RMP (Petrópolis)

RN
GigaNatal

RO
Rede Porto

RR
Rede BV

RS
MetroPOA
RECOP
Redecomep Santa Maria

SC
REMEP-FLN

SE
MetroAju

SP
MetroSampa
Redecomep Campinas
Rede Sanca

TO
MetroTins

ORGANIZAÇÕES USUÁRIAS

- INSTITUIÇÕES DE EDUCAÇÃO SUPERIOR E PESQUISA
- AGÊNCIAS DE FOMENTO À PESQUISA
- ESTABELECIMENTOS DE SAÚDE COM ENSINO E PESQUISA
- MUSEUS E INSTITUIÇÕES CULTURAIS
- AMBIENTES PROMOTORES DE IN (PARQUES E POLOS TECNOLÓGIC
- EMPRESAS INOVADORAS

APLICAÇÕES DE TIC

- INTELIGÊNCIA ARTIFICIAL
- BIG DATA
- BLOCKCHAIN
- INTERNET DAS COISAS
- GESTÃO DE IDENTIDADE

ABRANGÊNCIA

1,7 MIL PONTOS CONECTADOS
800 ORGANIZAÇÕES
140 UNIDADES DE SAÚDE INTEGRADAS
27 PONTOS DE PRESENÇA ESTADUAIS

~800 organizations

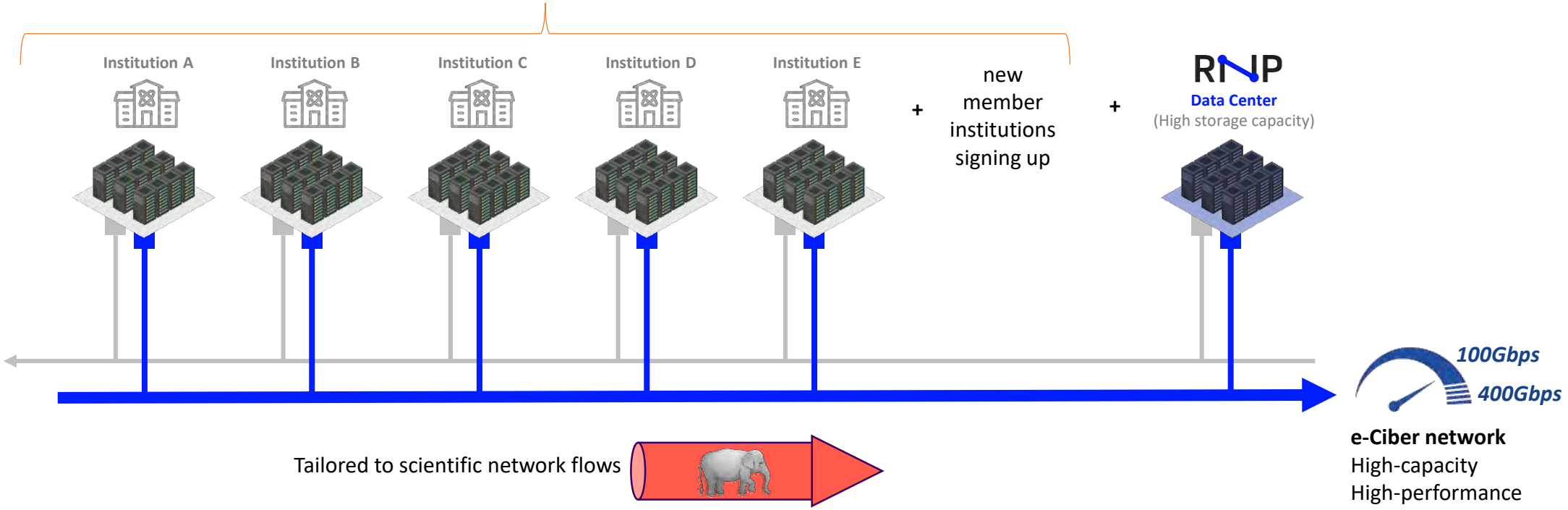
~1700 connected points

44 Metro networks

27 Points of Presence

e-Ciber project: conceptual superfacility model

Most infrastructure-demanding research centers in Brazil and supercomputing centers (“big consumers and big providers”)



e-Ciber network
High-capacity
High-performance
Scalable

Service Layer

Cibersecurity & Network Operation Center

Secure cloud storage, Co-location for HPC

Pool of experts / Consultancy for new projects and R&D

R&D projects in collaboration with academia and/or startups

Procurement negotiation with suppliers / cloud services

“Trials” / data challenges with vendors and startups

Vision (moonshot)

Aiming for 10x improvement in the data-driven research proccess
(in performance, usability, resilience and/or security)

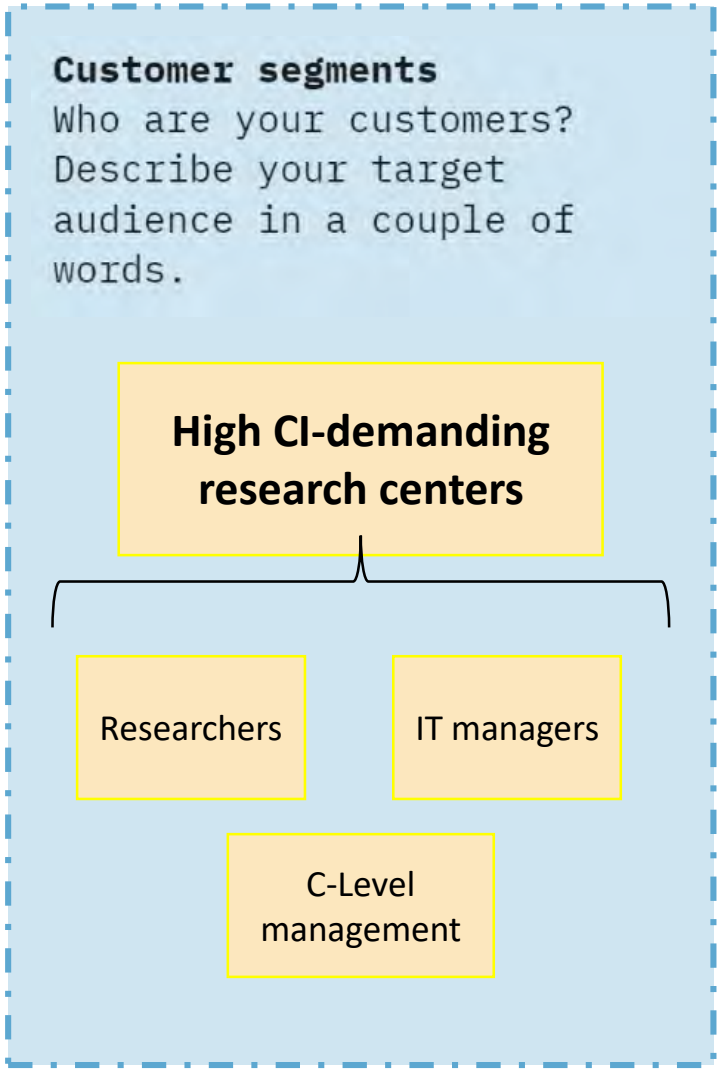
Additional goals:

Building a collaboration network of institutions keen to share knowledge and computation resources in order to ensure readiness and predictability of the computational resources needed for research.

Building a superfacility that will become essential for the most demanding data-driven research in Brazil, able to influence public policies for investments in ICT.

Some initial hypothesis

- Customer facilities serve a community of researchers that require reliable, secure and high-performance remote access to research infrastructures.
- Customer facilities need access to additional reliable computing power and/or data storage on demand, with high performance and security.
- IT managers have a shortage of technical staff to assist researchers to improve their data workflows.
- Customer facilities need specialized help to make their research facilities more secure against cyber-attacks.
- Customer facilities' campus network are not ready to support 100 Gbps throughput.
- Ensuring security is key for establishing trust between institutions to enable resource sharing.



Layered model

Governance	Build a consortium of member institutions. Develop a joint business operating model.
Relationship management and sustainability	Ensure customer's perception of value (benefits, usefulness, and importance). Prospect funding opportunities / partnership with the private sector.
Service Discovery and Science Engagement	Identify and develop valuable services for Researches and IT managers. Identify and develop cross-facility workflows.
High capacity / perfomance Data Center	High-capacity storage as-a-service. High-performance co-location services.
Monitoring + Security Operation Center	Active monitoring: network performance + cybersecurity.
Campus network	Deploy / upgrade Science DMZ architecture and DTNs. Avoid bottlenecks inside the campus.
Network Infrastructure	Upgrade to 100Gbps all network path: backbone, metro networks and last mile

Layered model

Governance

Relationship management and sustainability

Service Discovery and Science Engagement

High capacity / perfomance Data Center

Monitoring + Security Operation Center

Campus network

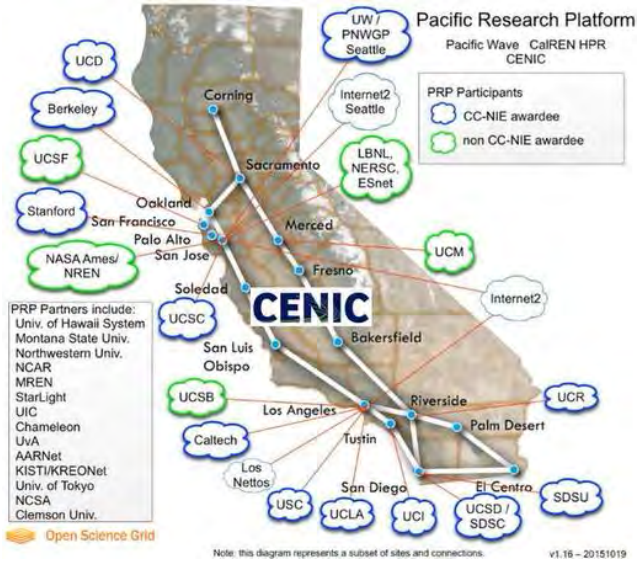
Network Infrastructure

Build a consortium of member institutions.
Develop a joint business operating model.

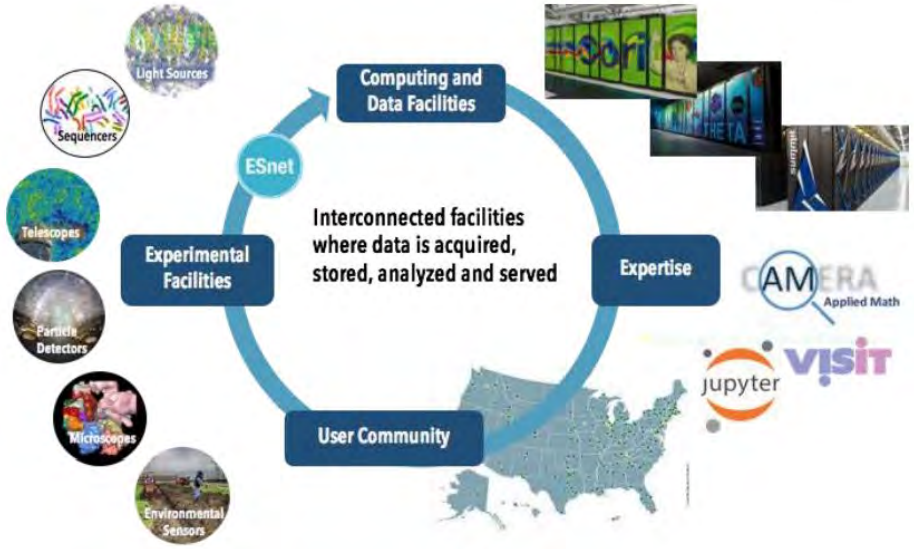
Ensure customer's perception of value (benefits, usefulness, and importance)
Prospect funding opportunities / partnership with the private sector

I Know... We are in a **Technology Exchange** meeting. You probably want to discuss something about the usage of SDN, SENSE, Science DMZs, Jupyter, HDF5, RUCIO, PerfSONAR, Federated Identity technologies, Science gateways, Research Data Repositories ...

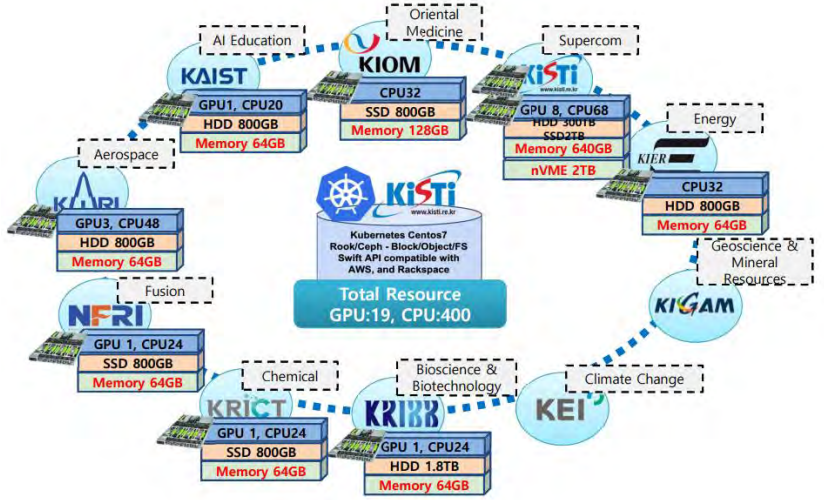
…but there is a lot of lessons learned from other initiatives



Pacific Research Platform



Superfacility@ LBLN, NERSC, ESnet and CRD



Korea Research Platform

XSEDE ACCESS GNA-G Global Network Advancement Group PRACE EUROPEAN OPEN SCIENCE CLOUD

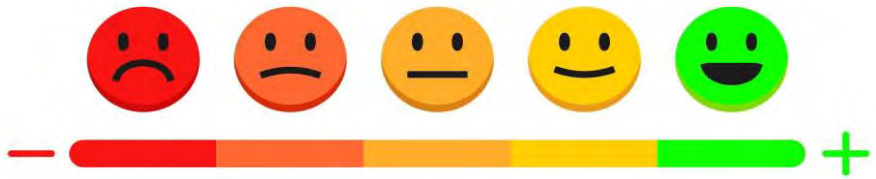
Main challenges / Issues

- How to succeed in the absence of substantial governmental investment?
  (e.g.: no NSF or EC funding)
- How to engage institutions which are subordinated to different ministries and belong to (very) different research areas? (e.g. Oil & Gas, Agriculture, Astronomy)
- How to integrate and work together with different Help Desk systems and teams?
- How to sustain a pool of experts?
- How to offer cybersecurity as a service to large research facilities?
- The role of a NREN in fostering a Superfacility.

e-Ciber project: Success metric

- This is more than simply a model of connected research facilities at 100Gbps bandwidth. The proposed model encompasses the full ecosystem of infrastructure, services, software tools and expertise needed to make HPC facilities secure and easy to use remotely.

Infrastructure-only:
Last-mile capacity upgraded to 100Gbps

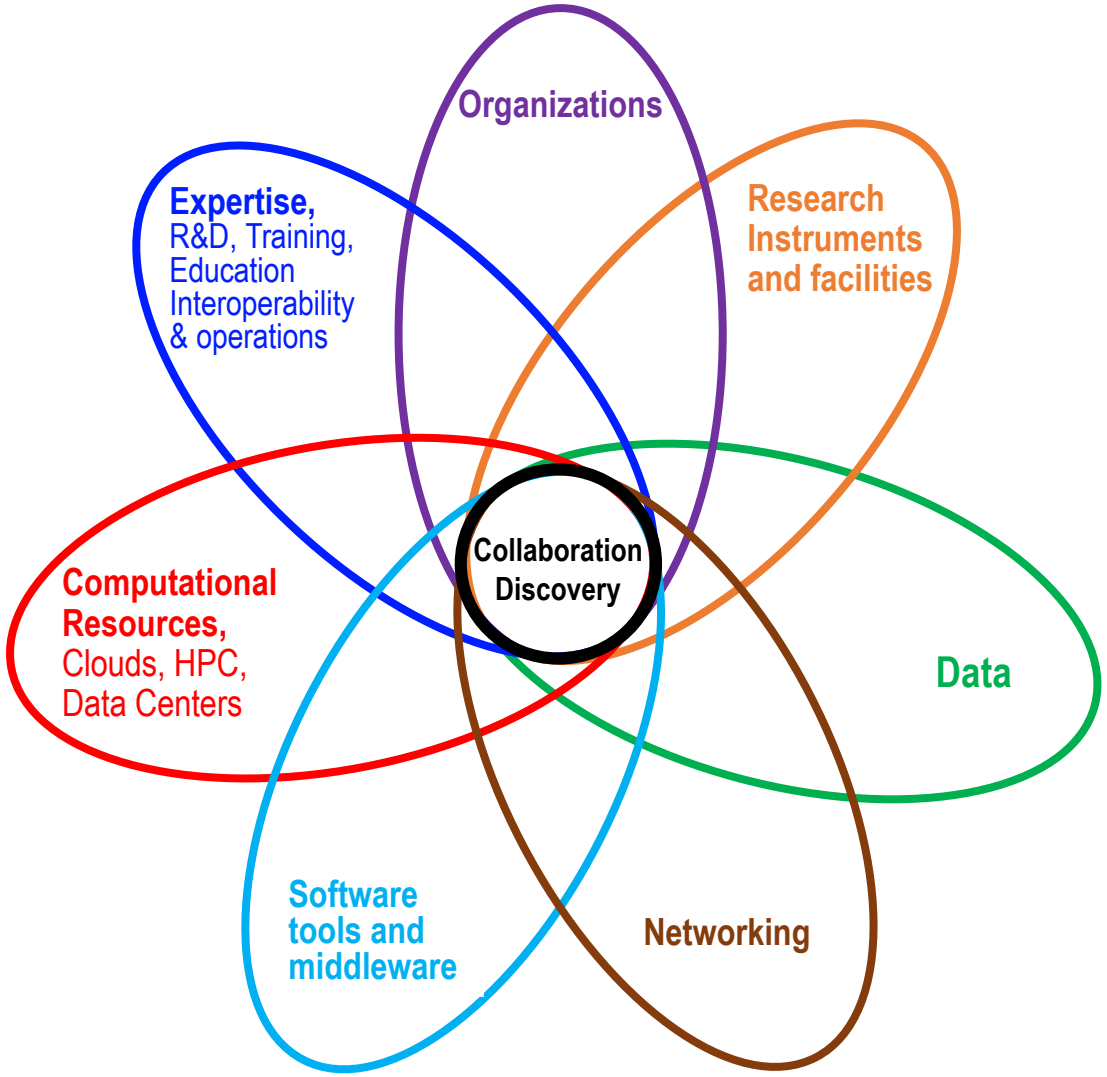


Superfacility with shared business model
(sharing and integrating computing resources, knowledge, decisions, help desks...)

Initial Funding

CAPEX: Government funding (FNDCT) + RNP + contribution from cooperation agreements on R&D (initially Petrobras and Embrapa)

Elements of a well developed Cyberinfrastructure Ecosystem



Inspired by Colin Wright's slide on Southern African Development Community (SADC) Cyber-infrastructure framework

Thank you
Obrigado

leandro.ciuffo@rnp.br