

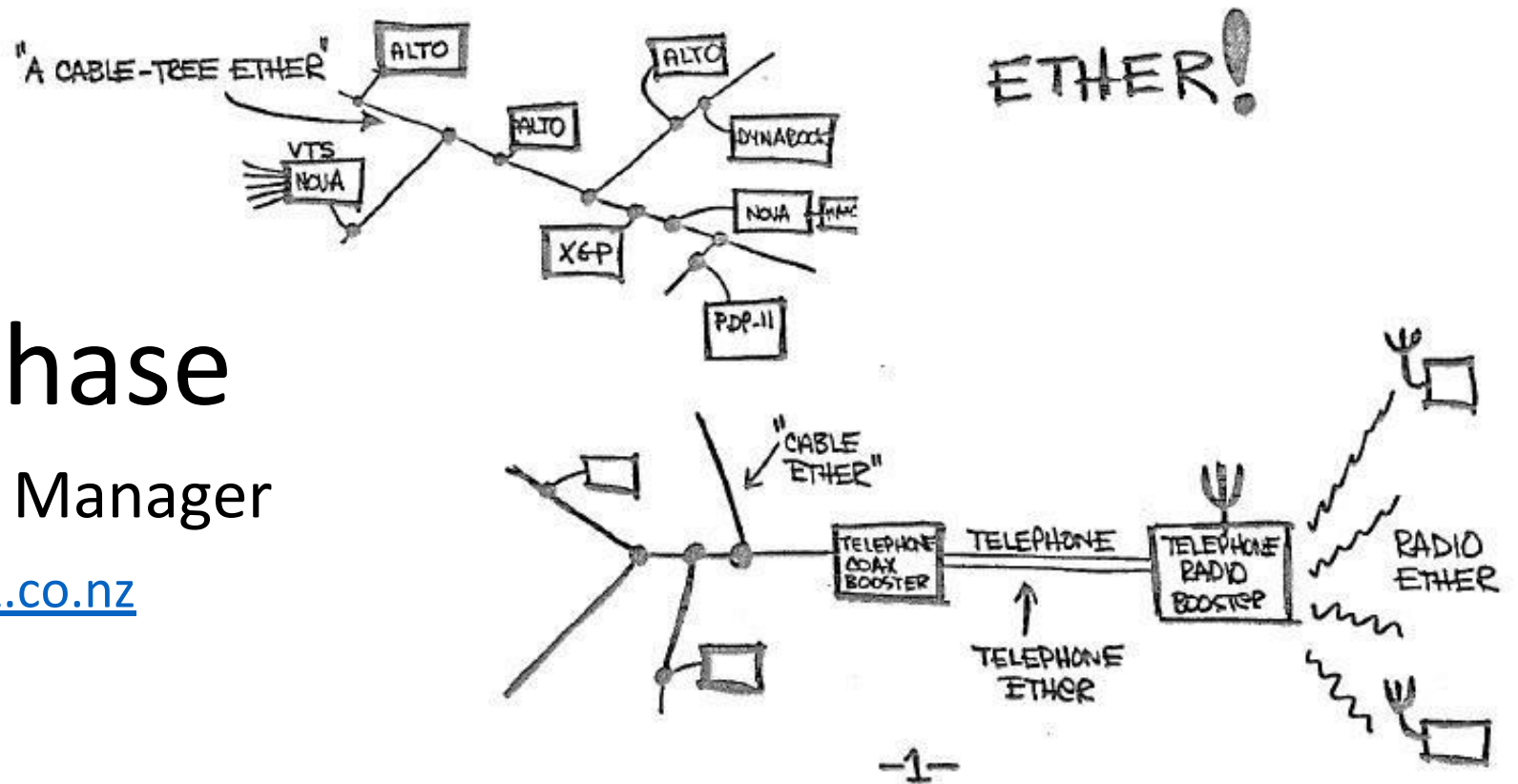
Wallace A. Chase

Technical Engagement Manager

wallace.chase@reannz.co.nz

@bmtfr

REANNZ





Lets use the university campus network as an
example...

The academic network



What makes up an academic network?



**Student
access**

What makes up an academic network?

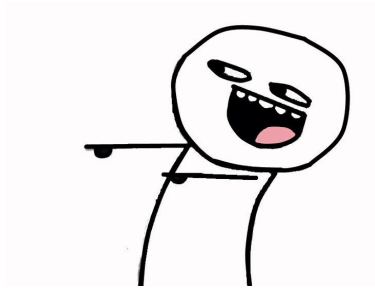


**Student
access**



**Intellectual
Property**

What makes up an academic network?



**Student
access**

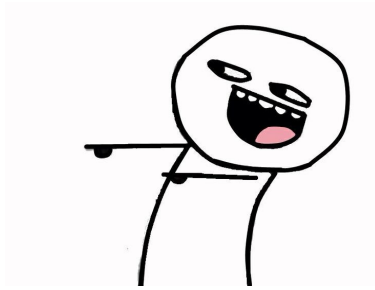


**Intellectual
Property**



**Payroll &
Accounting**

What makes up an academic network?



**Student
access**



**Intellectual
Property**

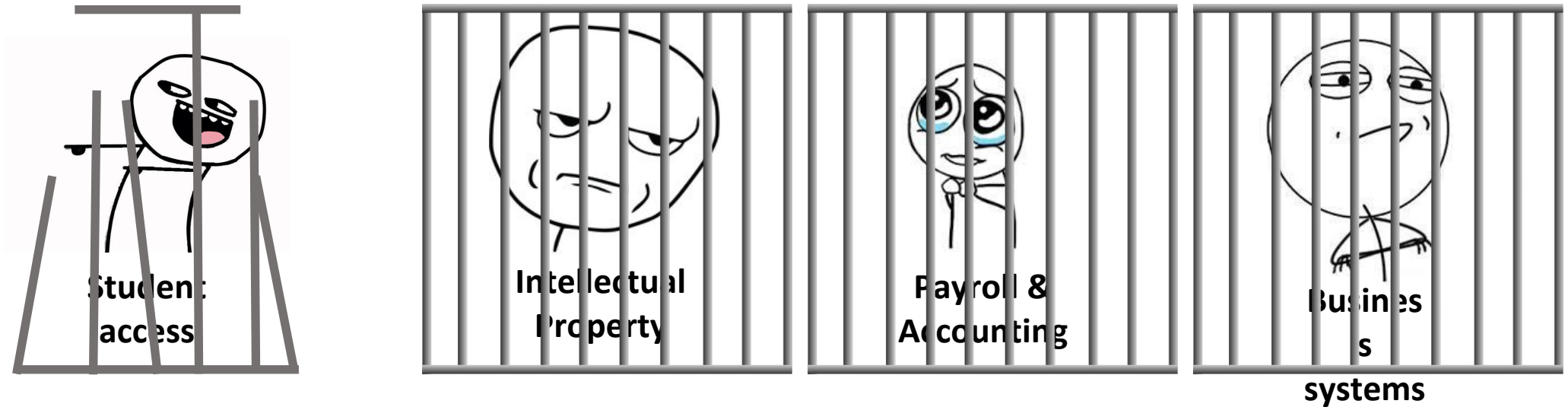


**Payroll &
Accounting**



**Business
systems**

What makes up an academic network?



Firewall all the things!

CAUTION

ANALOGIES AHEAD

PROTECTIVE HEADGEAR MUST BE WORN IN THIS AREA



The academic network...



The academic network...

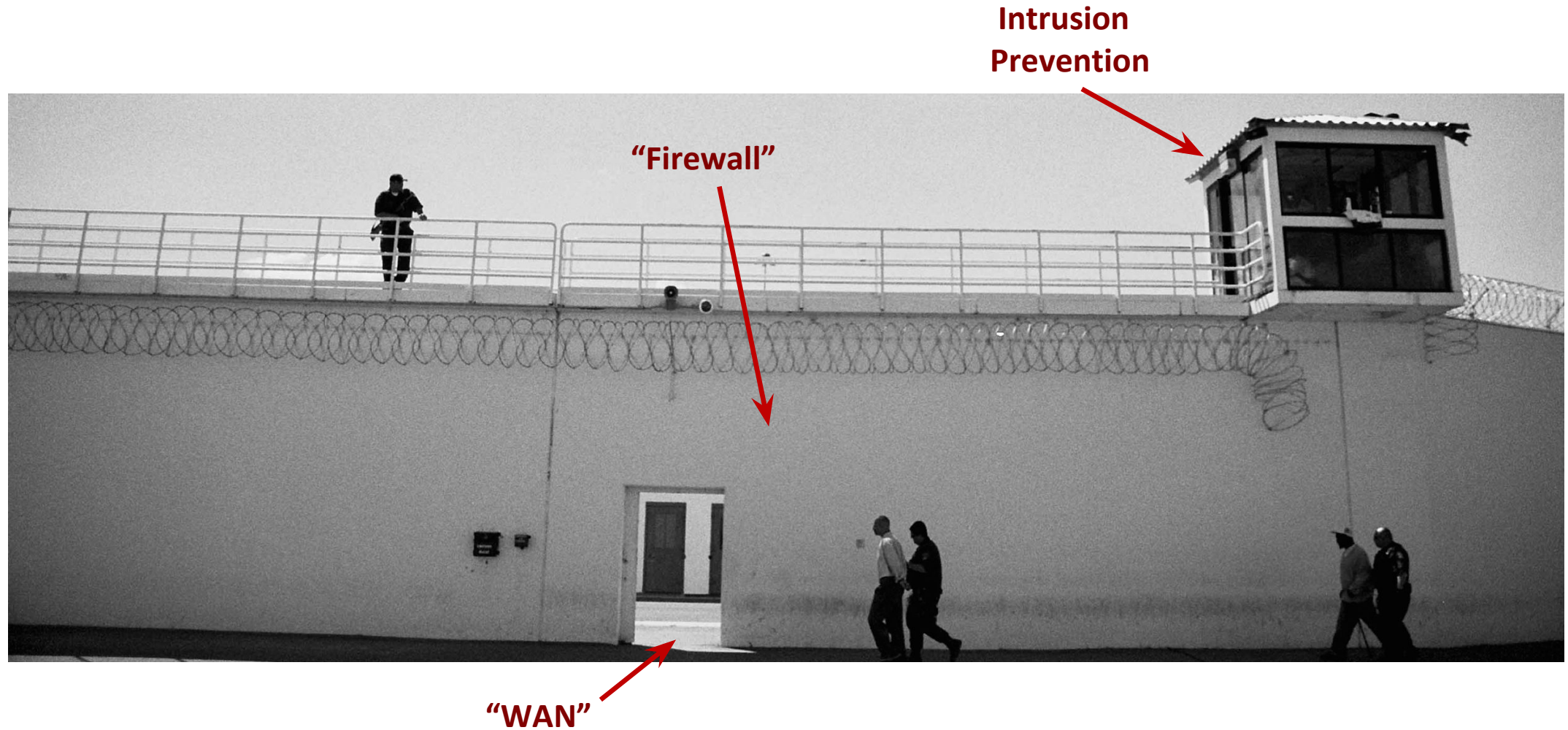


“WAN”

The academic network...



The academic network...



The academic network...

Bureaucracy
(aka "Paperwork")

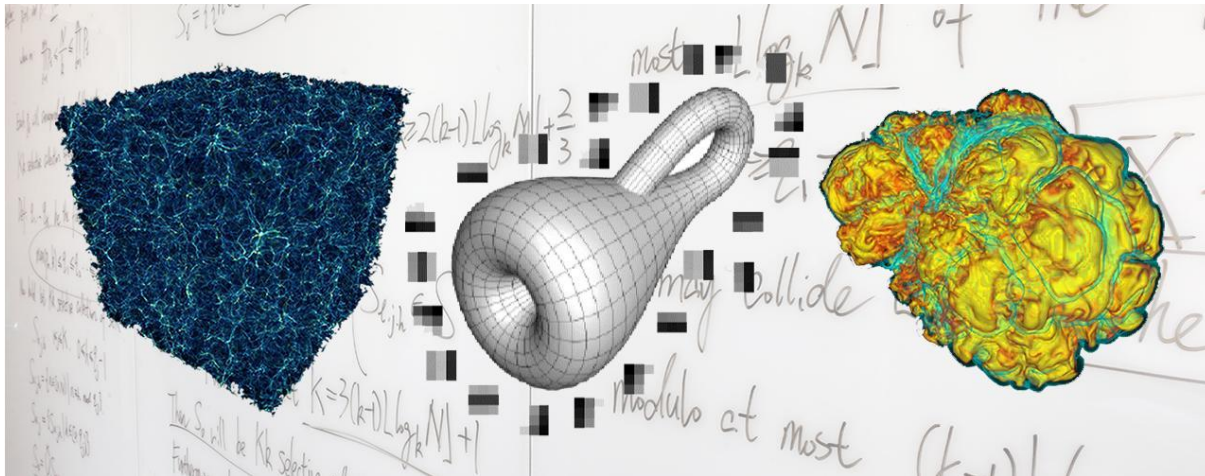
Intrusion
Prevention

"Firewall"



"WAN"

Computational Research, an analogy...



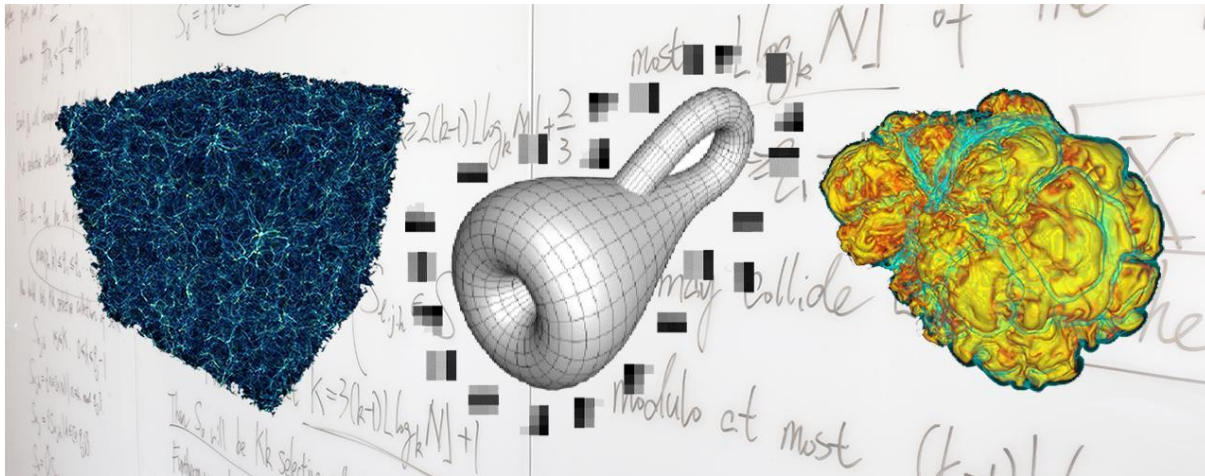
Computational Research

=



Velociraptor

Computational Research, an analogy...



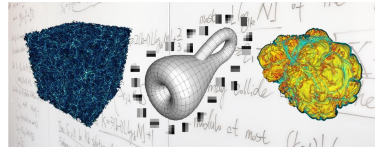
Computational Research

211



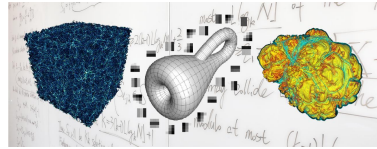
Velociraptor

Computational Research, an analogy...

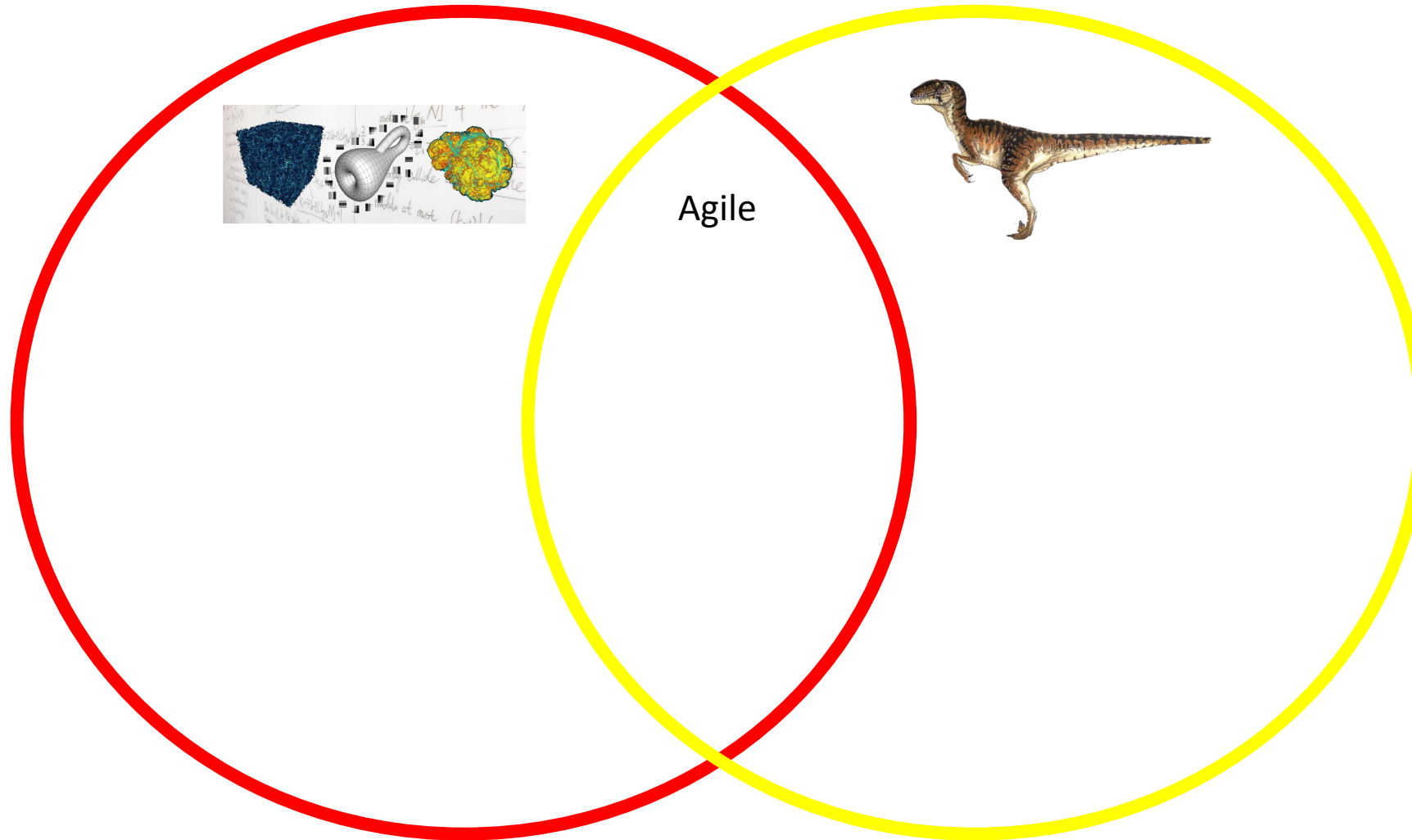


Irrefutable proof the analogy is valid...

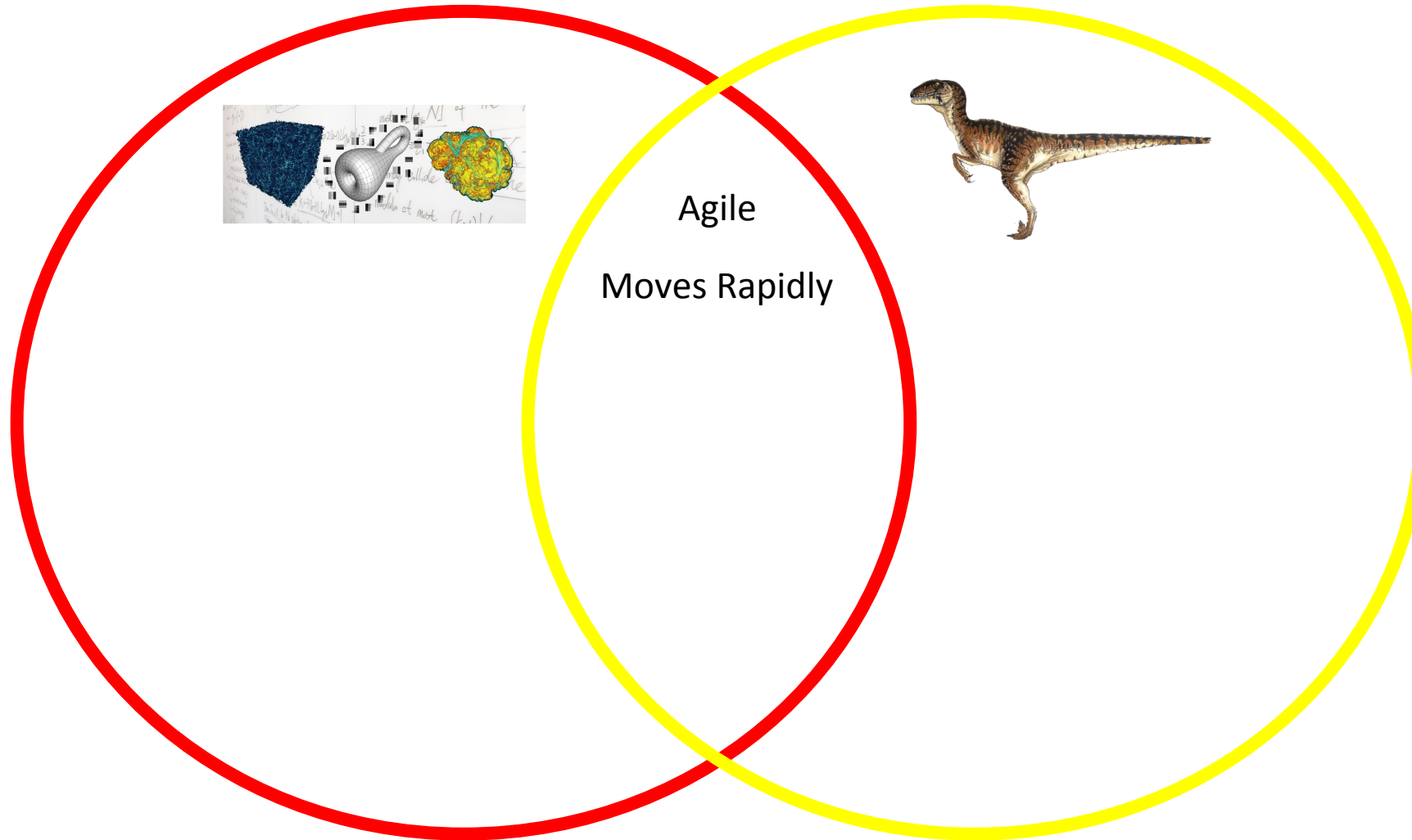
Computational Research, an analogy...



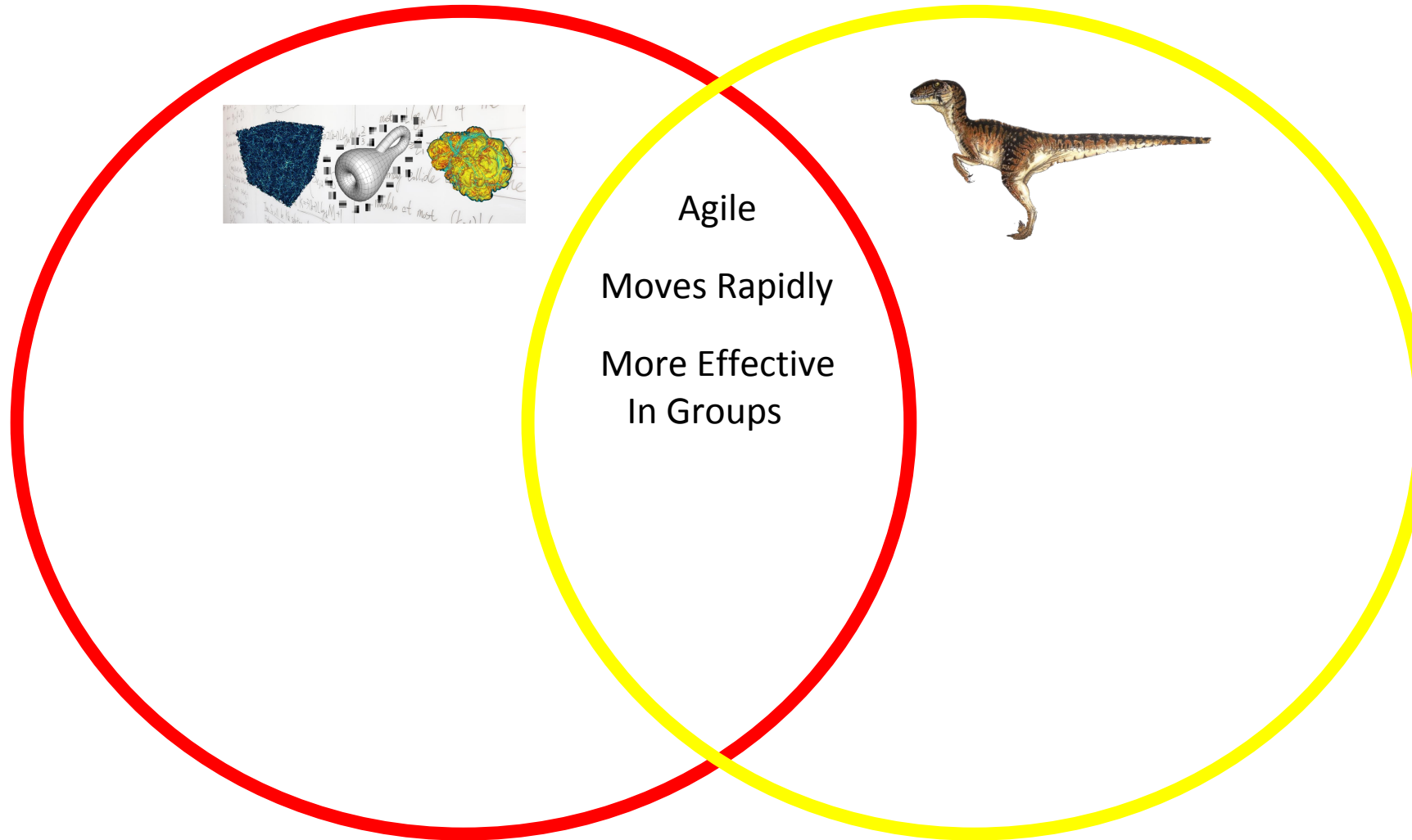
Computational Research, an analogy...



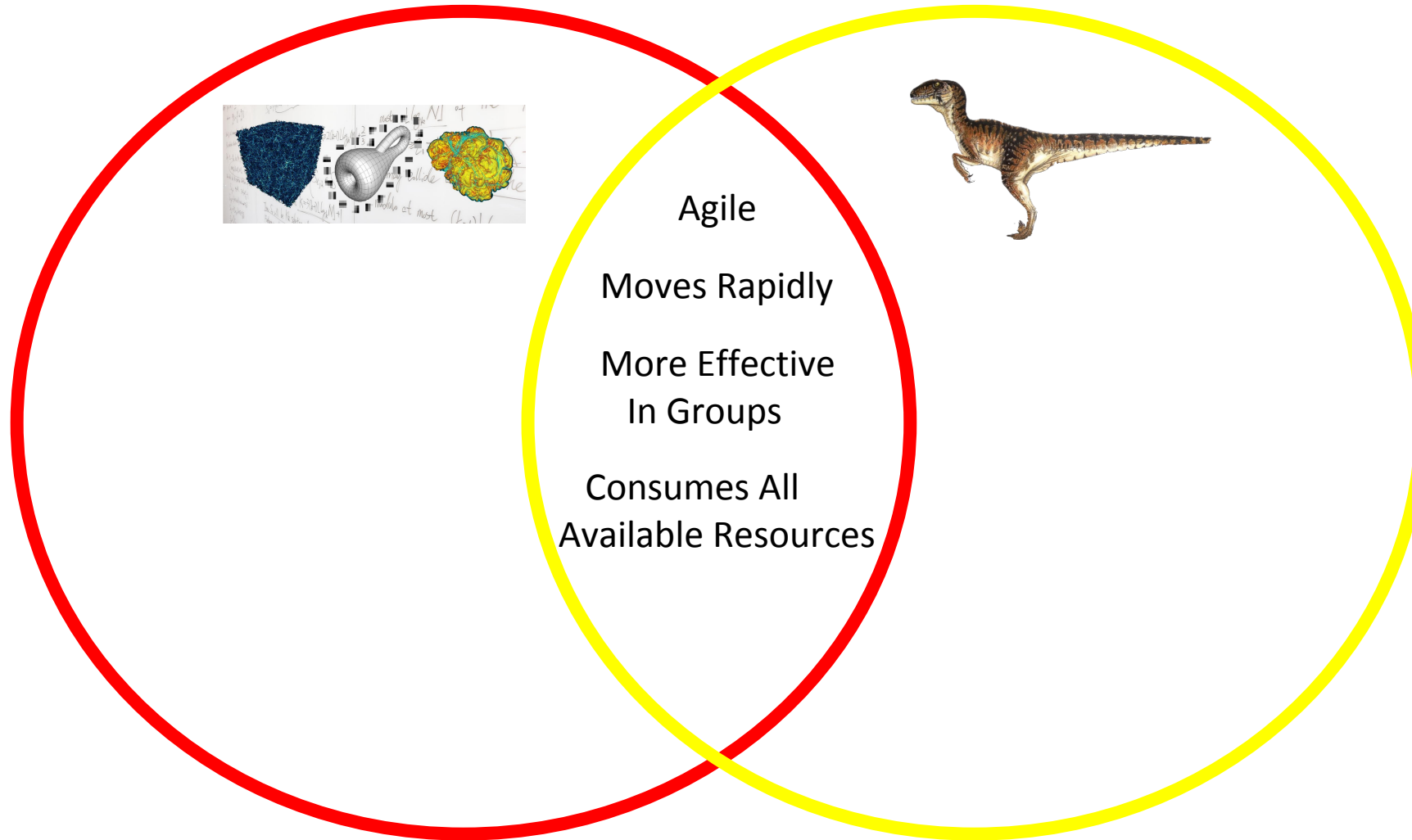
Computational Research, an analogy...



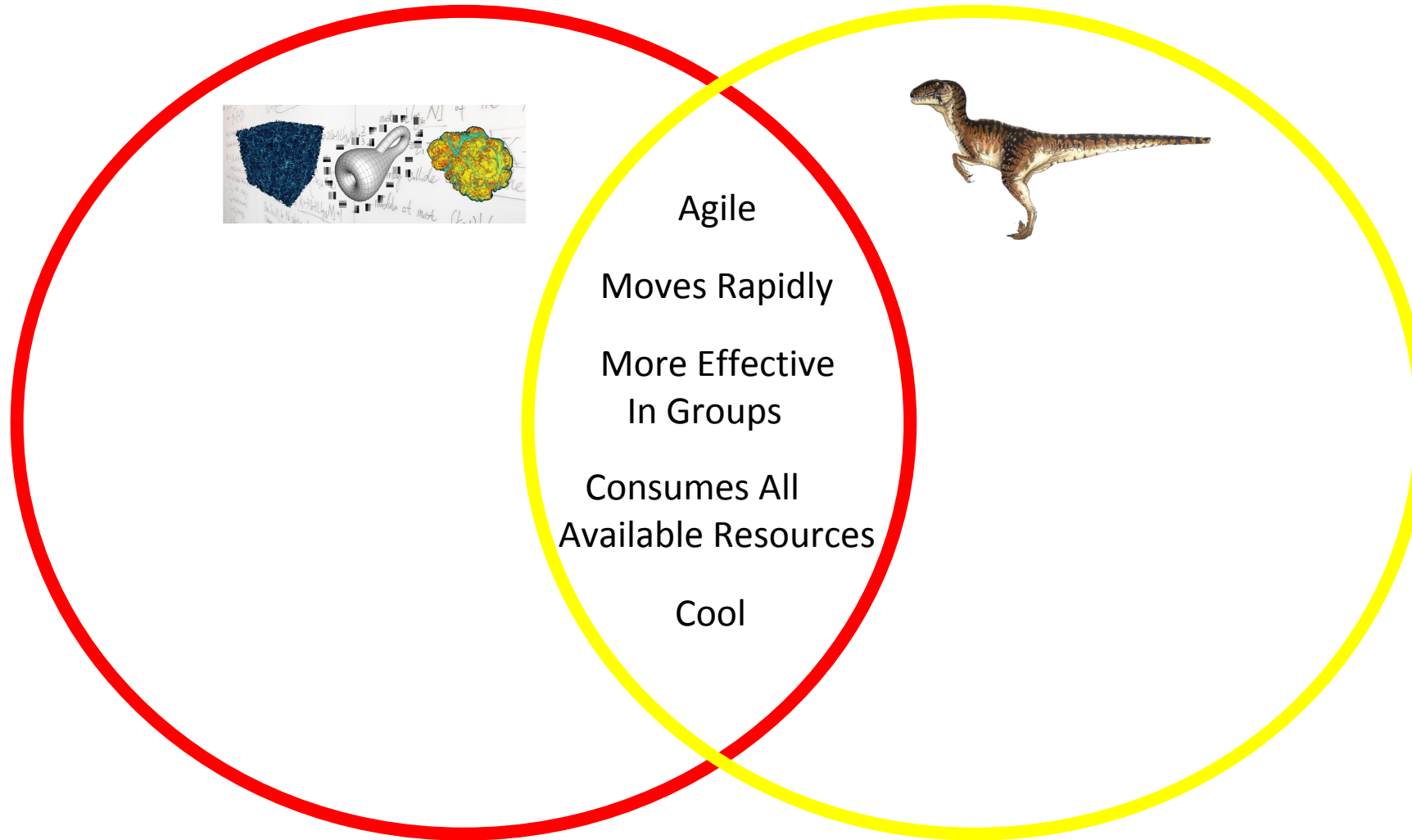
Computational Research, an analogy...



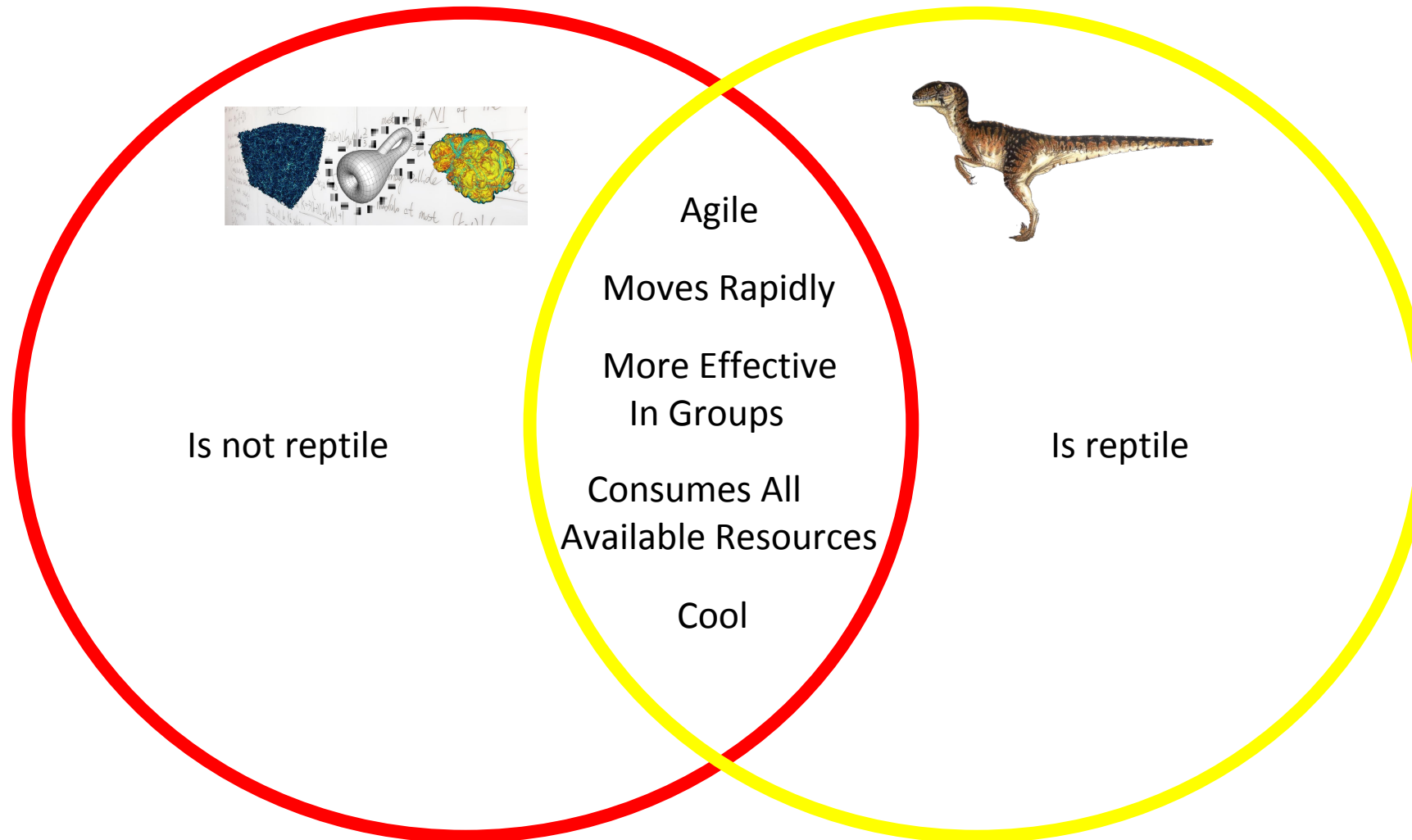
Computational Research, an analogy...



Computational Research, an analogy...



Computational Research, an analogy...



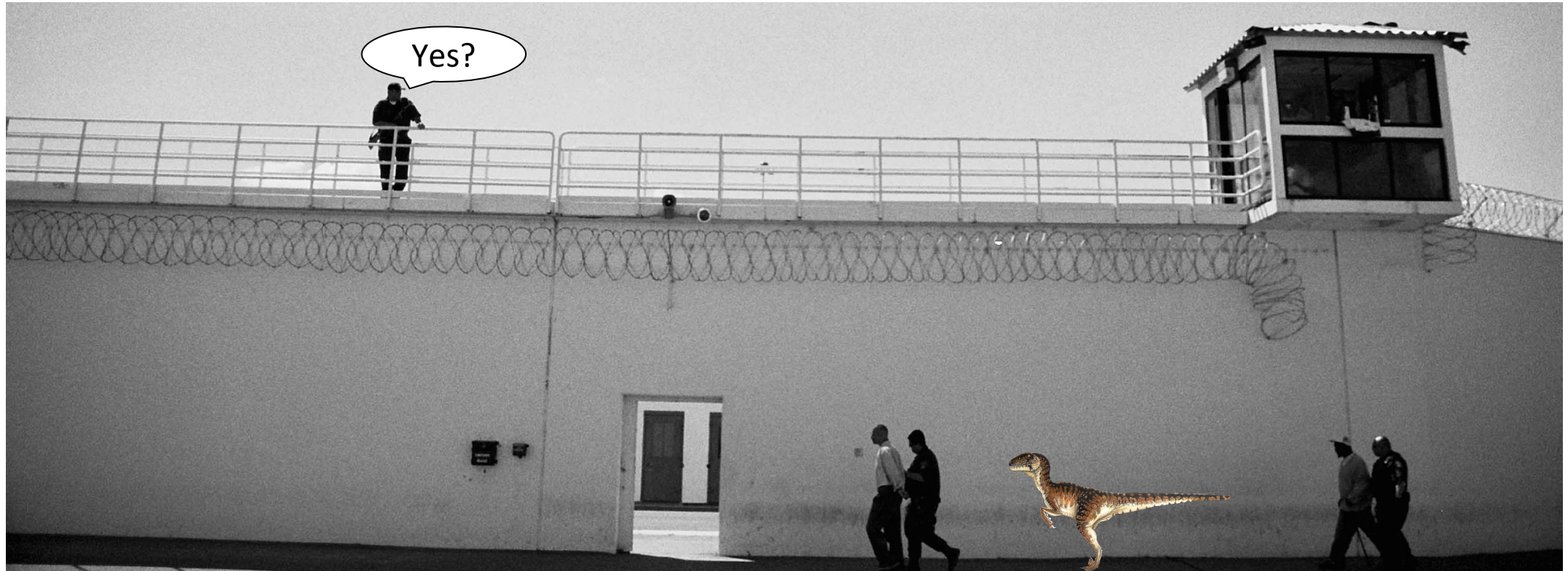
When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks

...that is highly important to myself, the educational community, and all of mankind as a whole. It is imperative that this data be *reasonably secured*; yet, *available* to my research peers. The *datasets are rather large*, and they may need to be shared across institutions.



When Computational Science Meets Traditional Networks

Would it be possible to place this in a *secure, reliable, flexible, accessible*, as well as *high performing* infrastructure?



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks

Something about
security and
connectivity I think...



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks

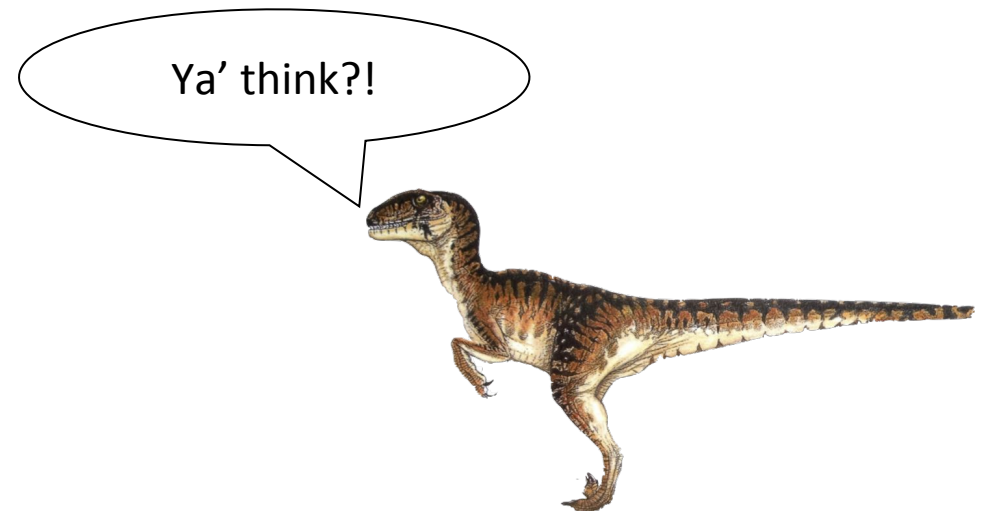


When Computational Science Meets Traditional Networks



When Computational Science Meets Traditional Networks

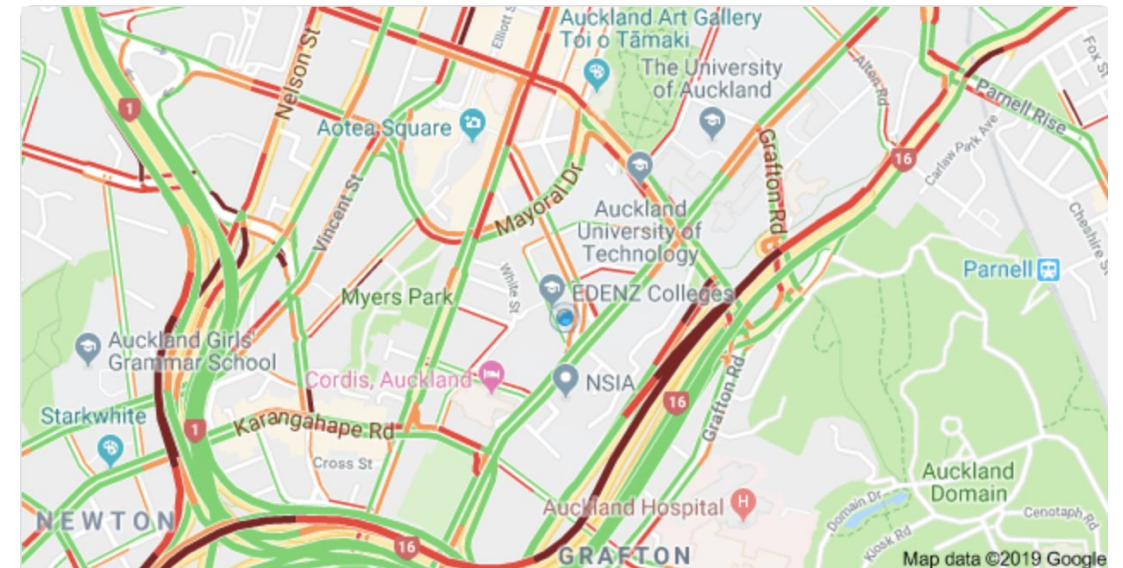
OBSERVATION: The **requirements** of the computational researcher and the **service profile** of the traditional campus computer network (or other "commodity" networks) do not always align!



When Computational Science Meets Traditional Networks

This can result in adverse consequences:

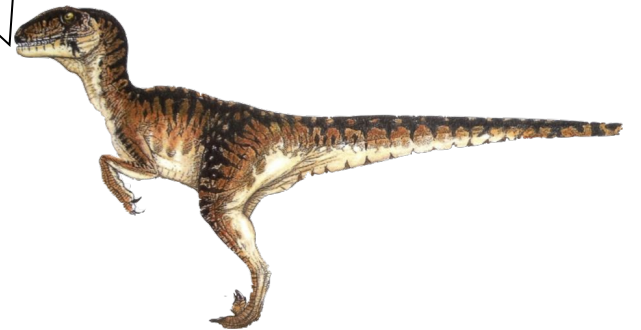
- Network performance issues for the researcher
- Network performance issues for everyone else
- Frustration for the researcher
- Frustration for IT staff



When Computational Science Meets Traditional Networks



Sigh. I guess
cancer cures can
wait.



When Computational Science Meets Traditional Networks

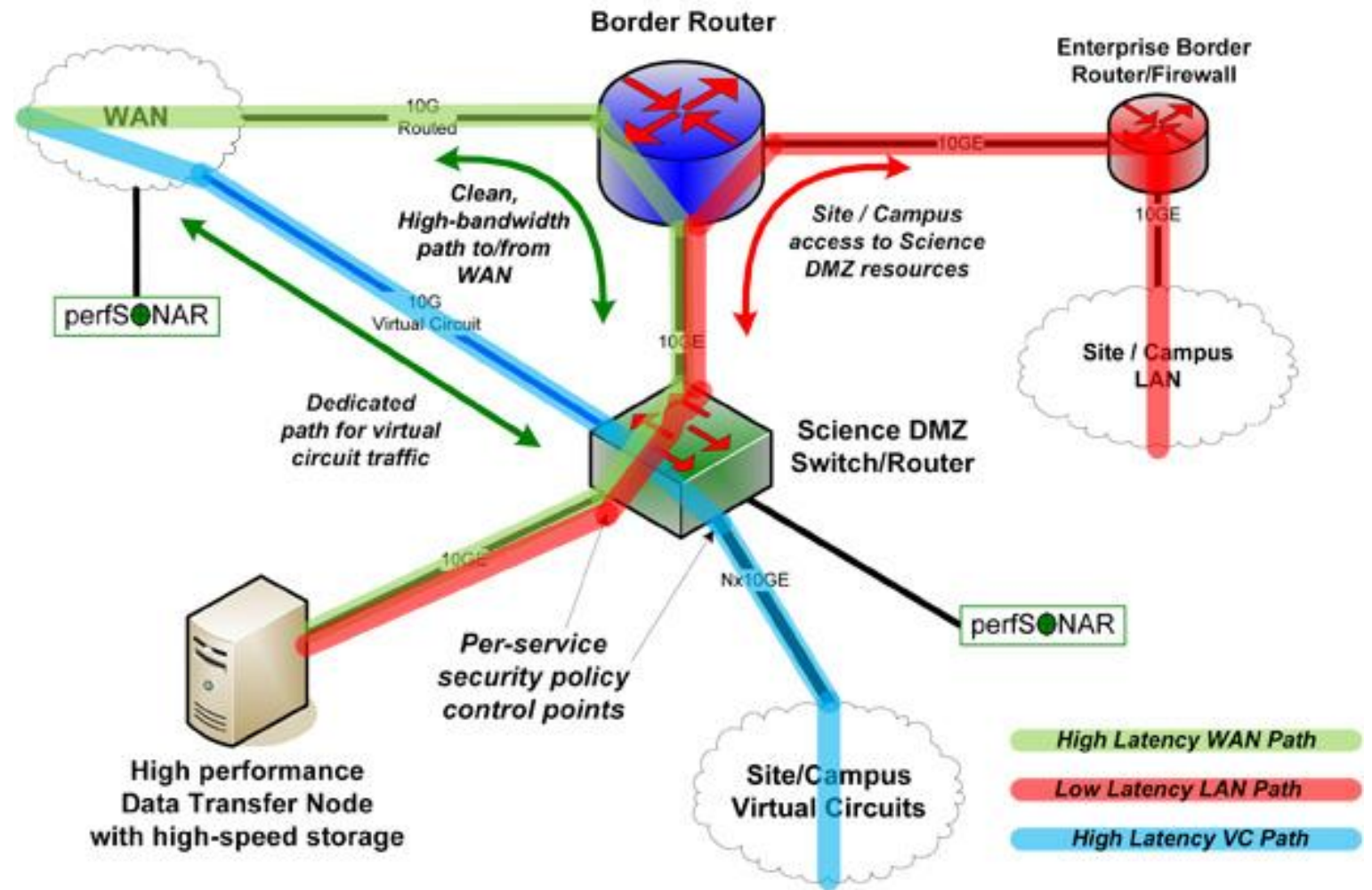
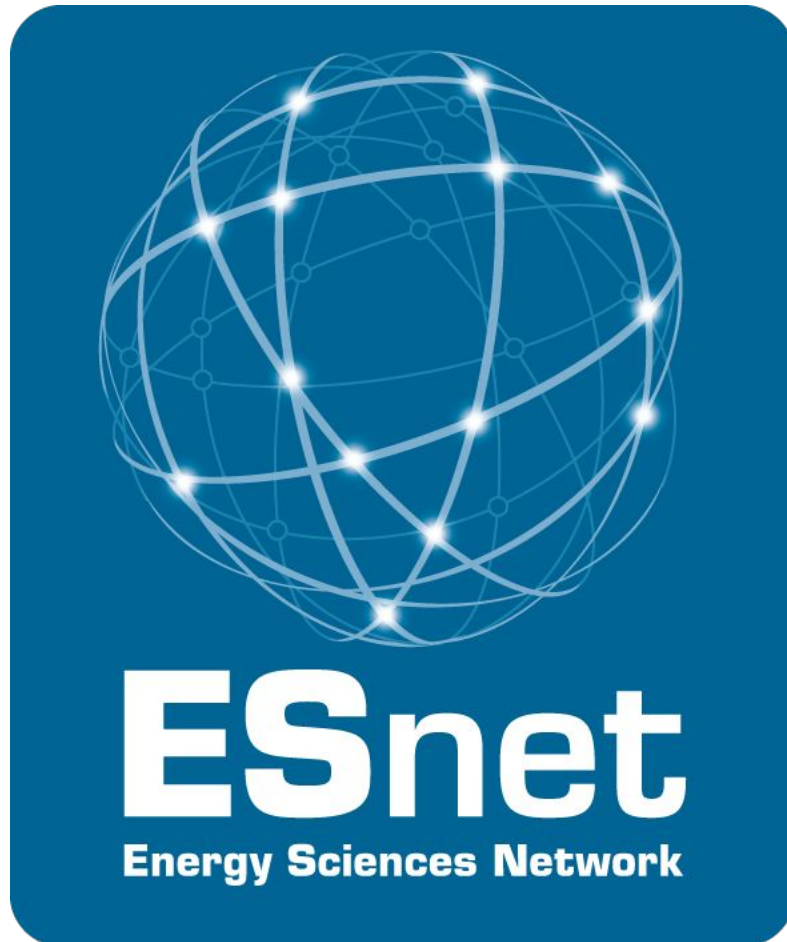
But how do we overcome this? *I*
can't stop my research just
because **the network can't keep**
up! Being able to collaborate is
the future!



So what makes this so complex anyway?



SciDMZ – a history





ESnet

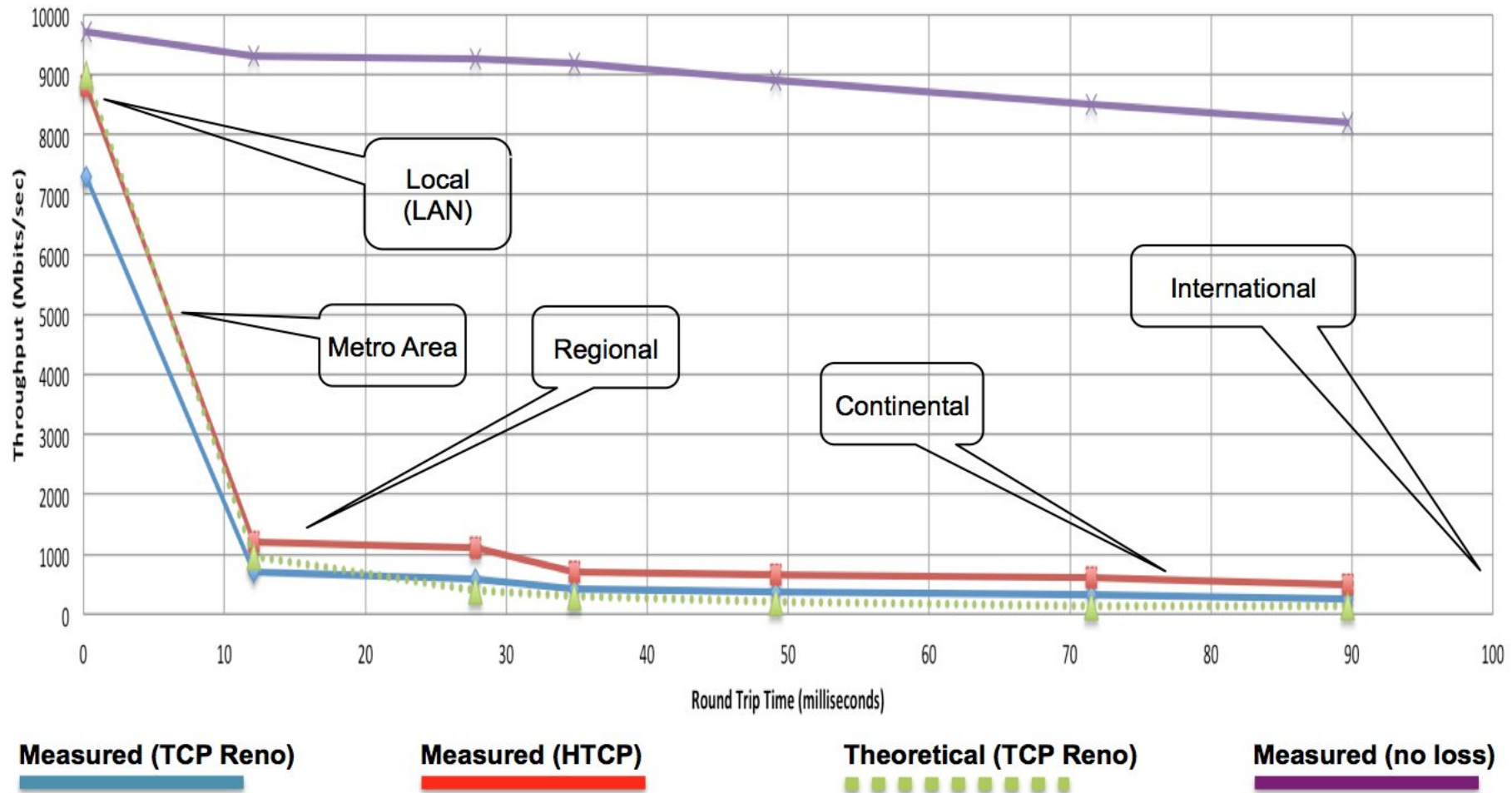
ENERGY SCIENCES NETWORK

• Department of Energy Office of Science National Labs

AMN Ames Laboratory (Ames, IA)
ANL Argonne National Laboratory (Argonne, IL)
BNL Brookhaven National Laboratory (Upton, NY)
PNL Pacific Northwest National Laboratory (Richland, WA)
JLAB Thomas Jefferson National Accelerator Facility (Newport News, VA)

LSNL Lawrence Berkeley National Laboratory (Berkeley, CA)
ORNL Oak Ridge National Laboratory (Oak Ridge, TN)
PNNL Pacific Northwest National Laboratory (Richland, WA)
PPPL Princeton Plasma Physics Laboratory (Princeton, NJ)
SLAC SLAC National Accelerator Laboratory (Menlo Park, CA)

Throughput vs. increasing latency on a 10Gb/s link with 0.0046% packet loss



All hosts are connected by a 10G NIC, and no paths were congested. The MTU was set to 9000bytes.

Note the with default MTUs of 1500, the impact of packet loss is even greater.

2012-2014 National Science Foundation CC-NIE & CC-IIE Awardees



Campus Cyberinfrastructure - Infrastructure, Innovation and Engineering Program (CC*IIE)

PROGRAM SOLICITATION

NSF 14-521

REPLACES DOCUMENT(S):

NSF 13-530



National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Advanced Cyberinfrastructure
Division of Computer and Network Systems

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 20 to 35

Anticipated Funding Amount: \$18,000,000 to \$20,000,000

\$18,000,000 to \$20,000,000 total funding for the CC*IIE program, dependent upon the availability of funds for FY 2014. Data Driven Networking Infrastructure for the Campus and Researcher awards will be supported up to \$500,000 total for up to 2 years. Network Design and Implementation for Small Institutions awards will be supported at up to \$350,000 total for up to two years. Network Integration and Applied Innovation awards will be supported up to \$1,000,000 total for up to 2 years. Identity and Access Management Integration awards will be supported up to \$300,000 total for up to 2 years. Campus CI Engineer awards will be supported up to \$400,000 total for up to 2 years. Regional Coordination and Partnership in Advanced Networking awards will be made at up to \$150,000 for up to 2 years.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

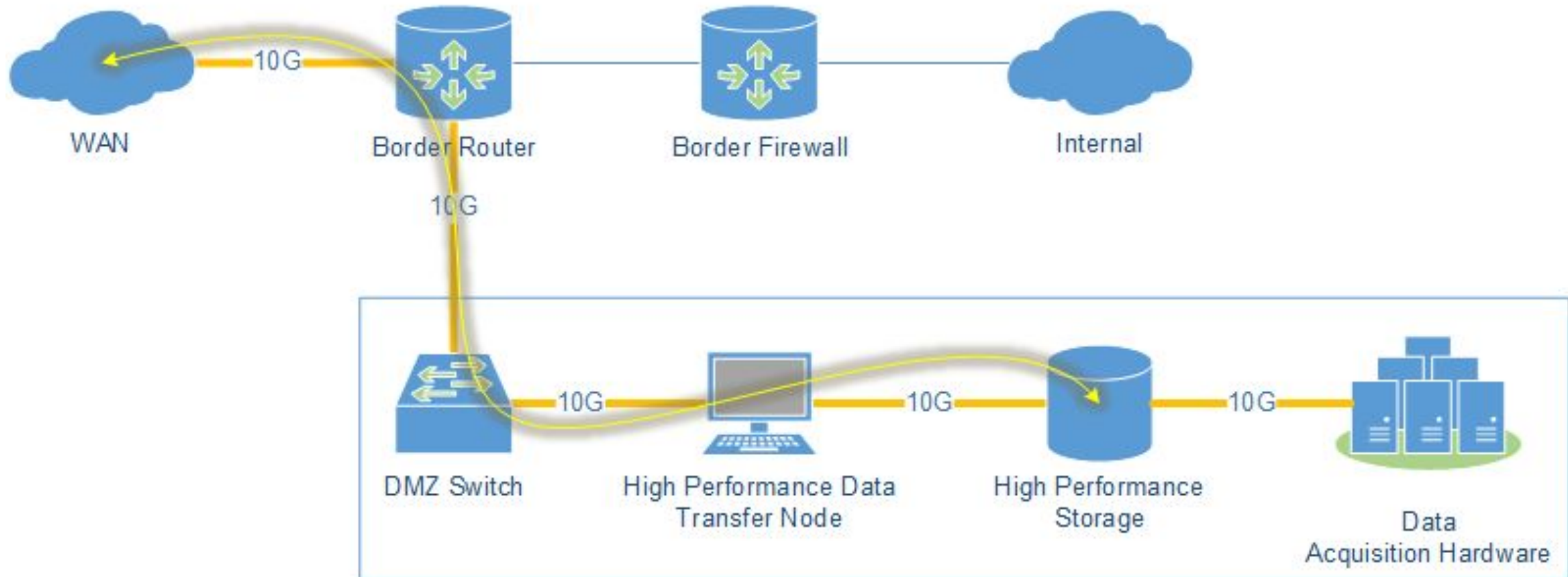
Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI:

There are no restrictions or limits.





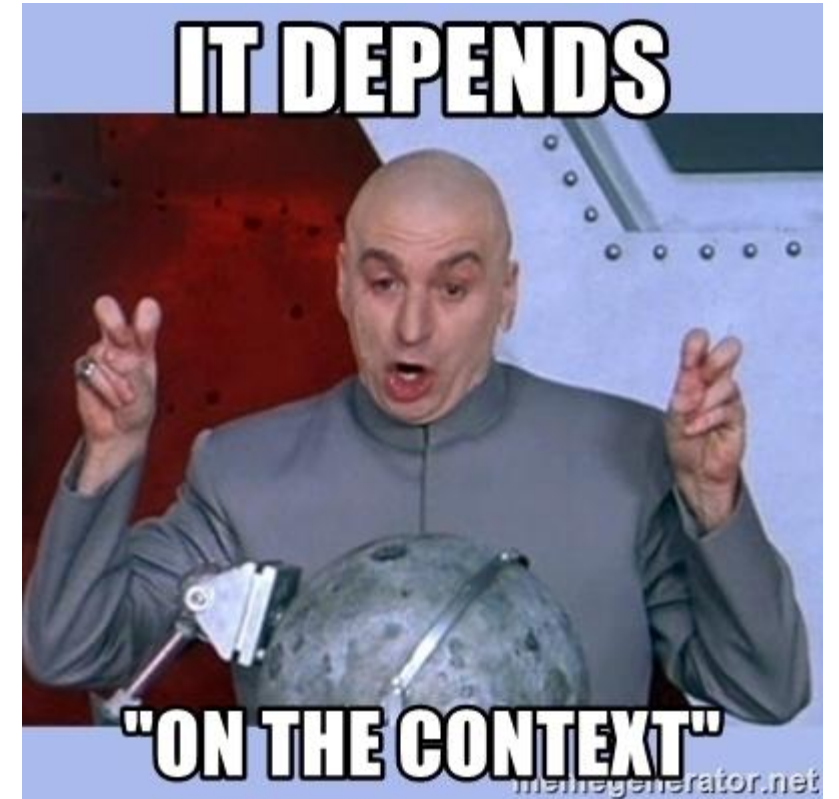


Does everyone need one?



Different SciDMZ architectures

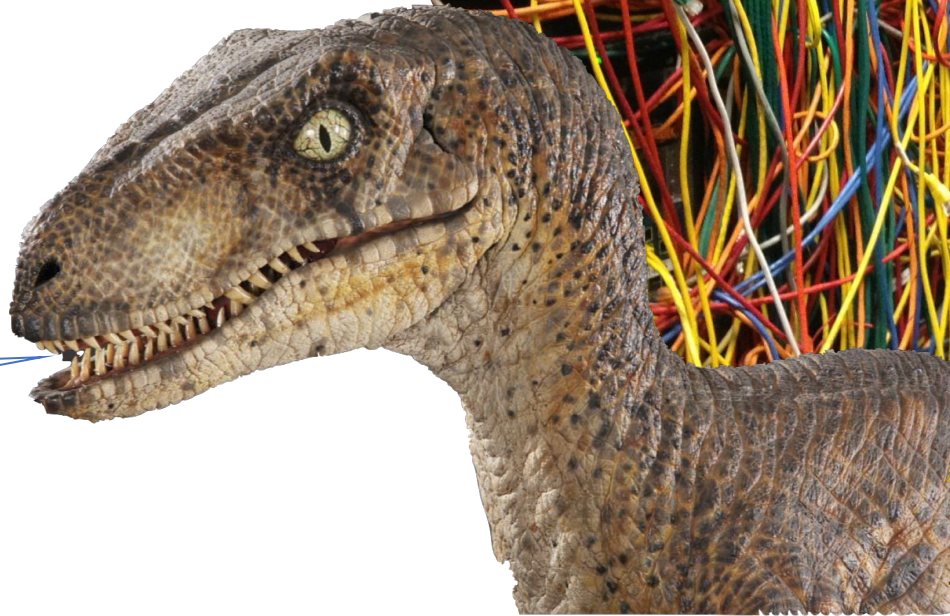
- Brute force method
- Apply money method
- Help me help you method
- Get fancy method
- Special snowflake method
- Come to me method



Brute force method...

- Fiber to the end user
- Build to demand
- Sustainability issues
- Bang for buck issues
- Looong lead time issues

You expect me to wait for how long?

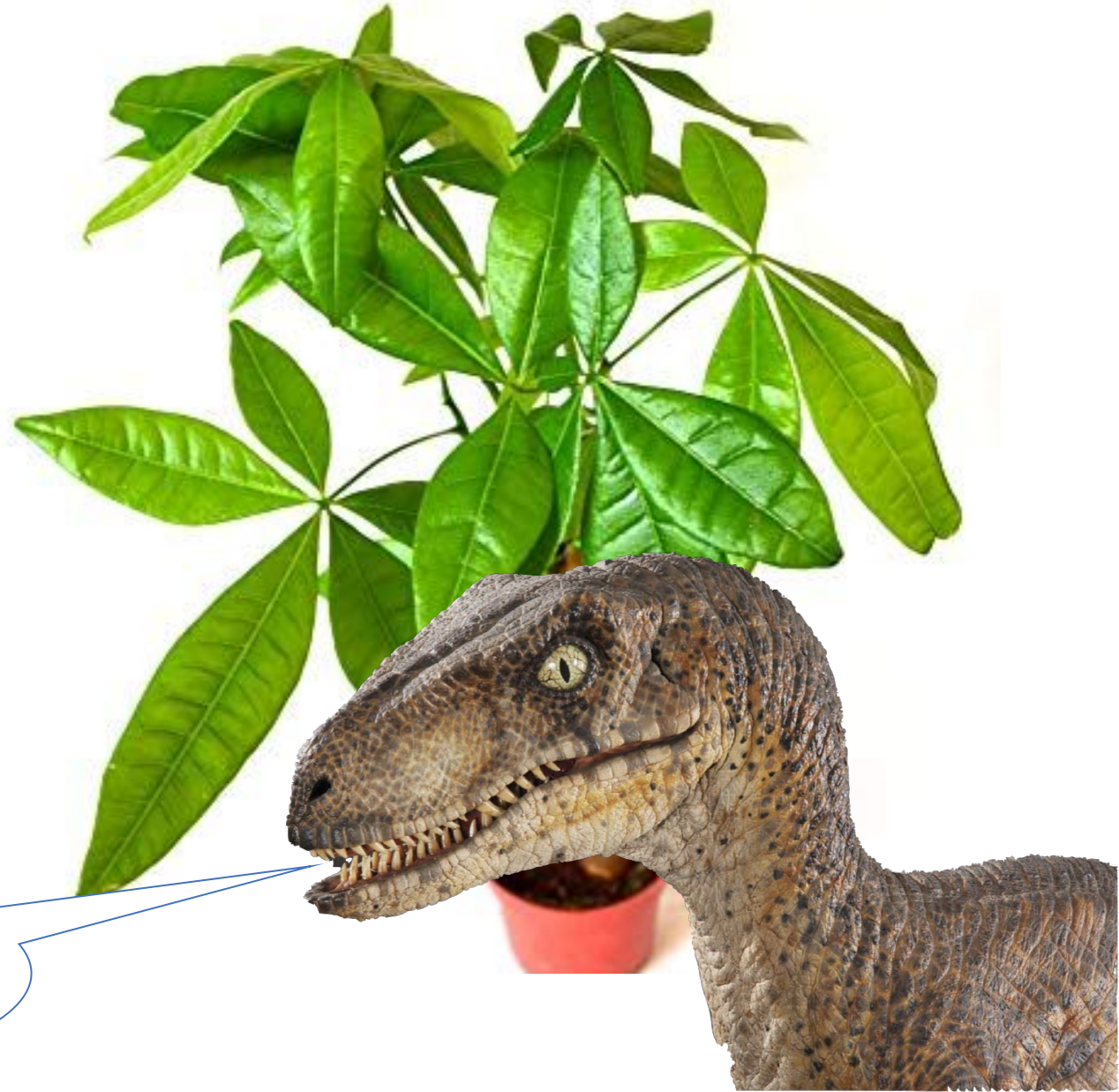


Apply money...

- Full hardware designs
- Sometimes just to the buildings
- Sometimes all the way to the jacks

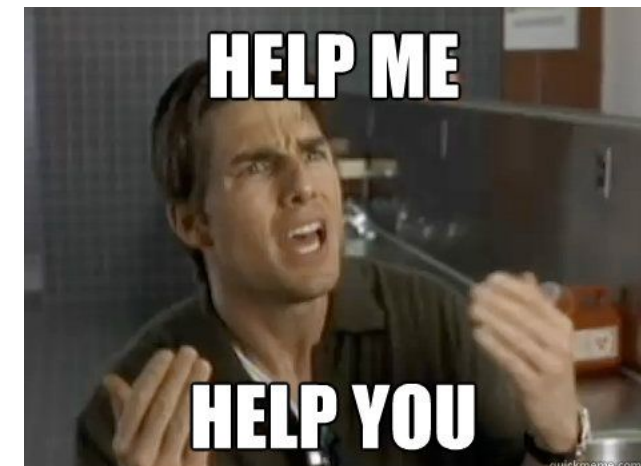
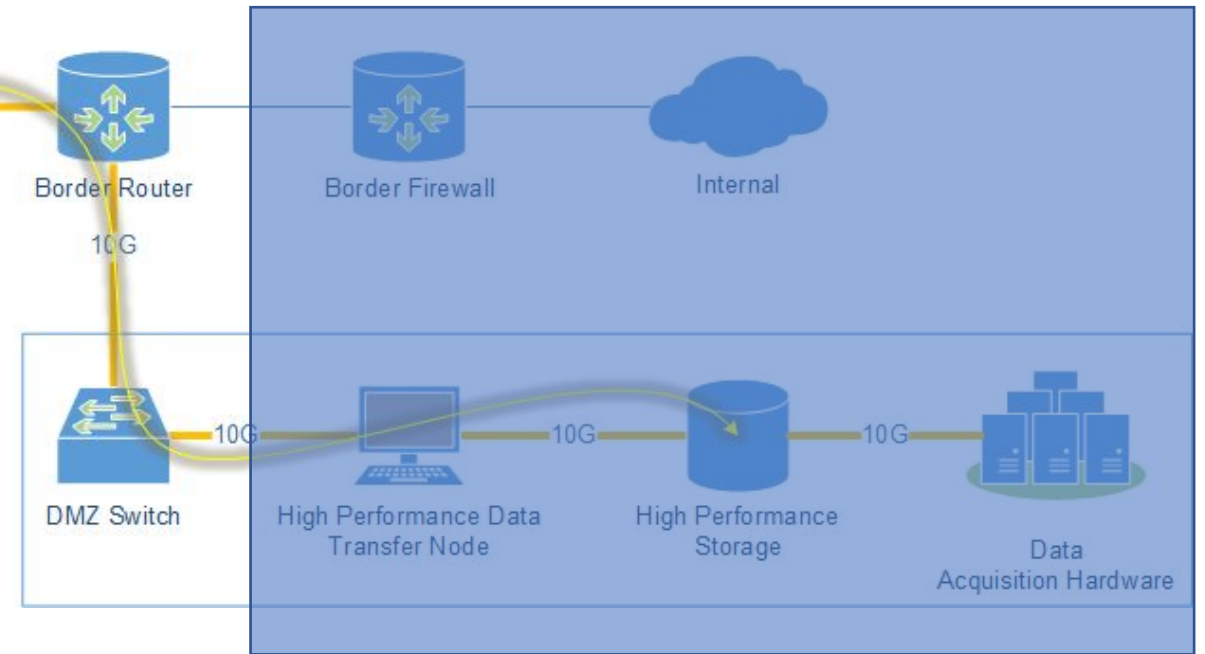
- Sustainability issues
- Bang for buck issues
- Loop anyone?

You expect me to fund what? Some kind of tubes?



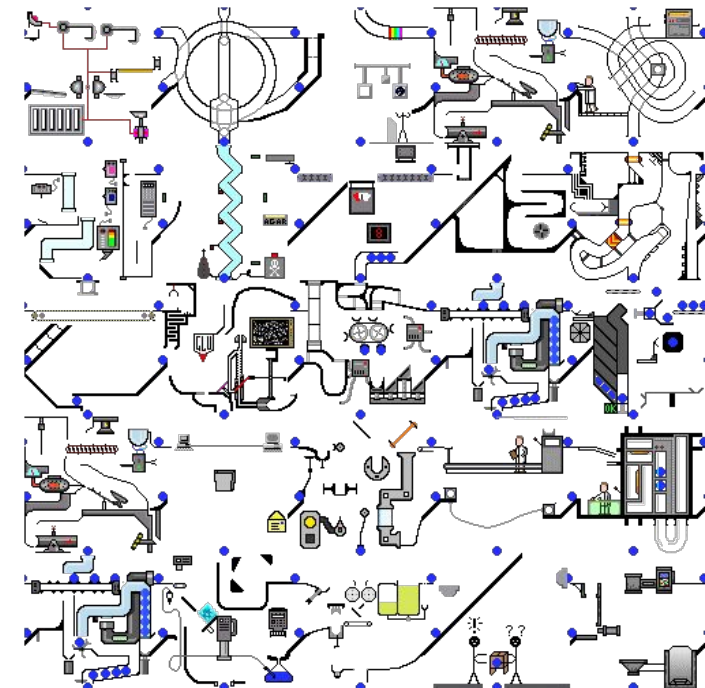
Help me help you...

- Replacement of border routers with more powerful boxes
- Often a L2 switch in a central location
- Good starting point
- Is the science driver located where the DMZ is?
- What about the labs?
- Only a start



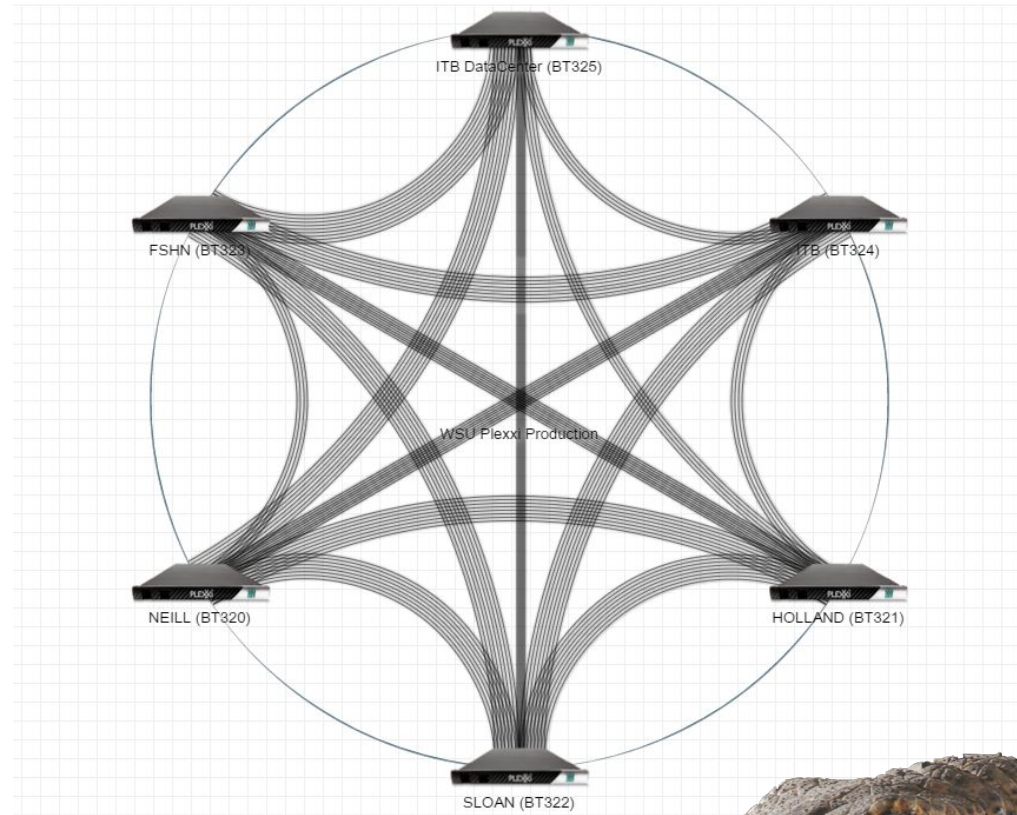
Get fancy...

- Virtualize all the things
- VRF or other such segmentation of existing network gear
- At its most basic – VLANs
- Low cost – as sustainable as the network is
- ~~Can be~~ is complex
- Will IT set this up in a reasonable amount of time?
- Congestion still an issue for large flows
- More readily sustainable



Special snowflake method...

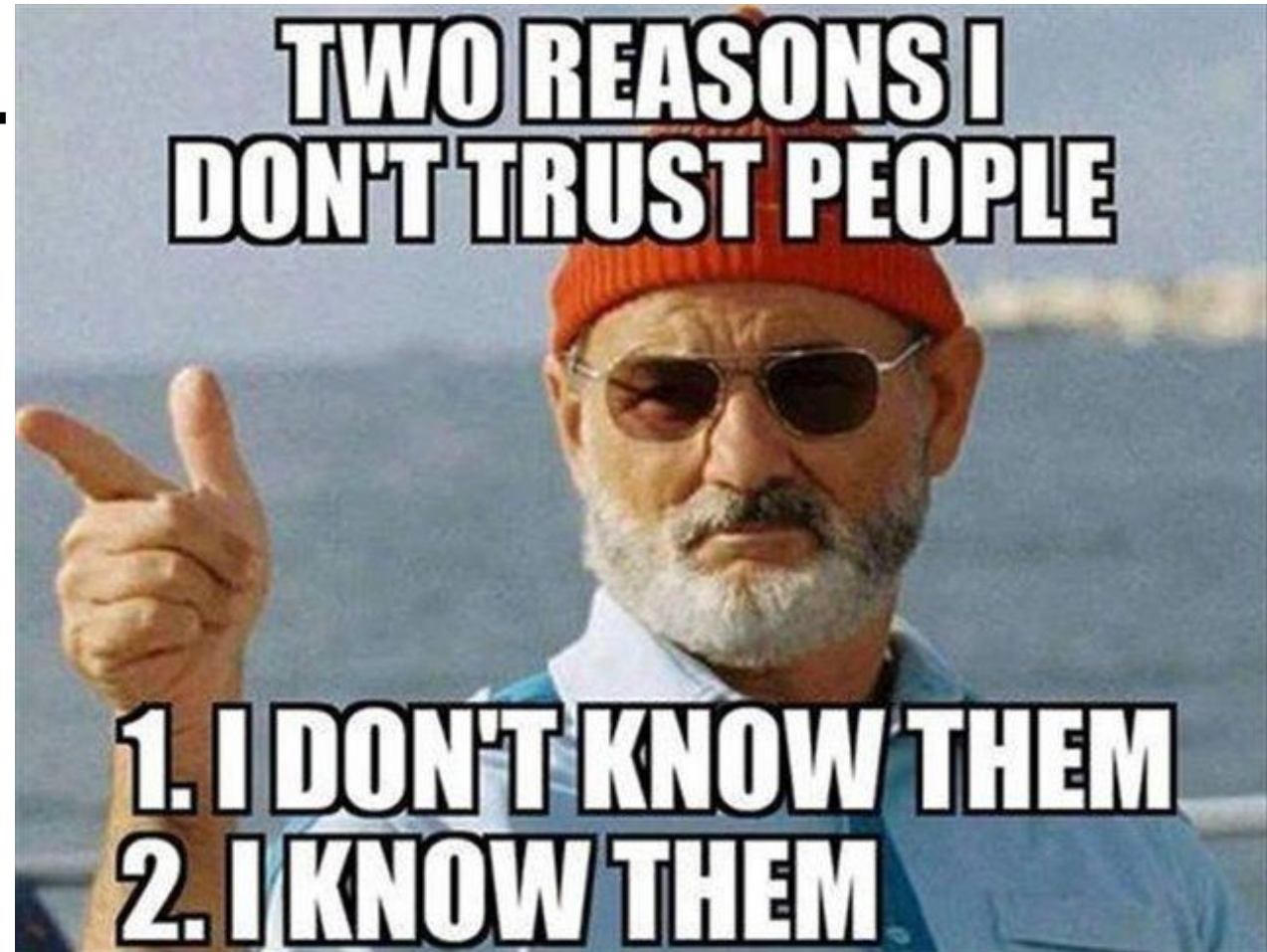
- Unique design
- Can be overly complex
- Will IT set this up in a reasonable amount of time?
- Is it sustainable?
- Supporting research or doing research?



Ice ages have not gone well for my kind...

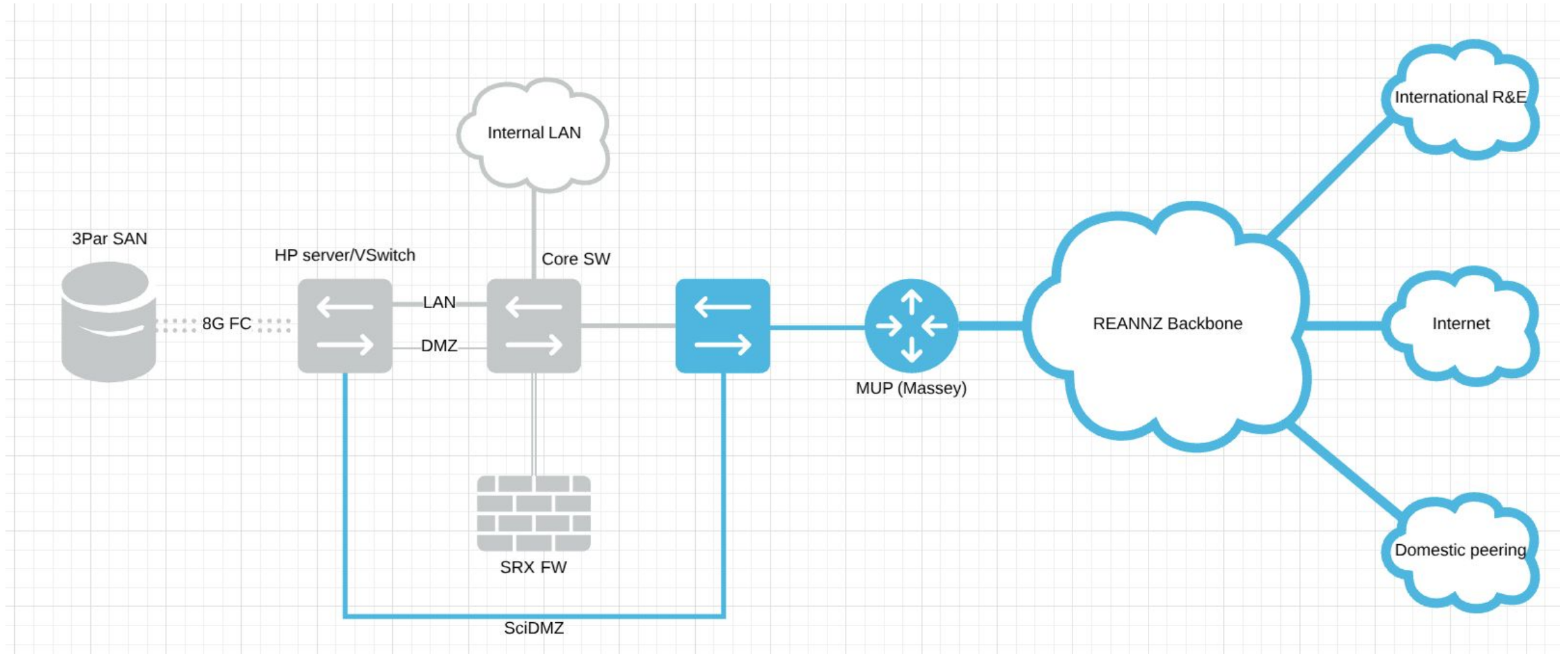
Come to me method...

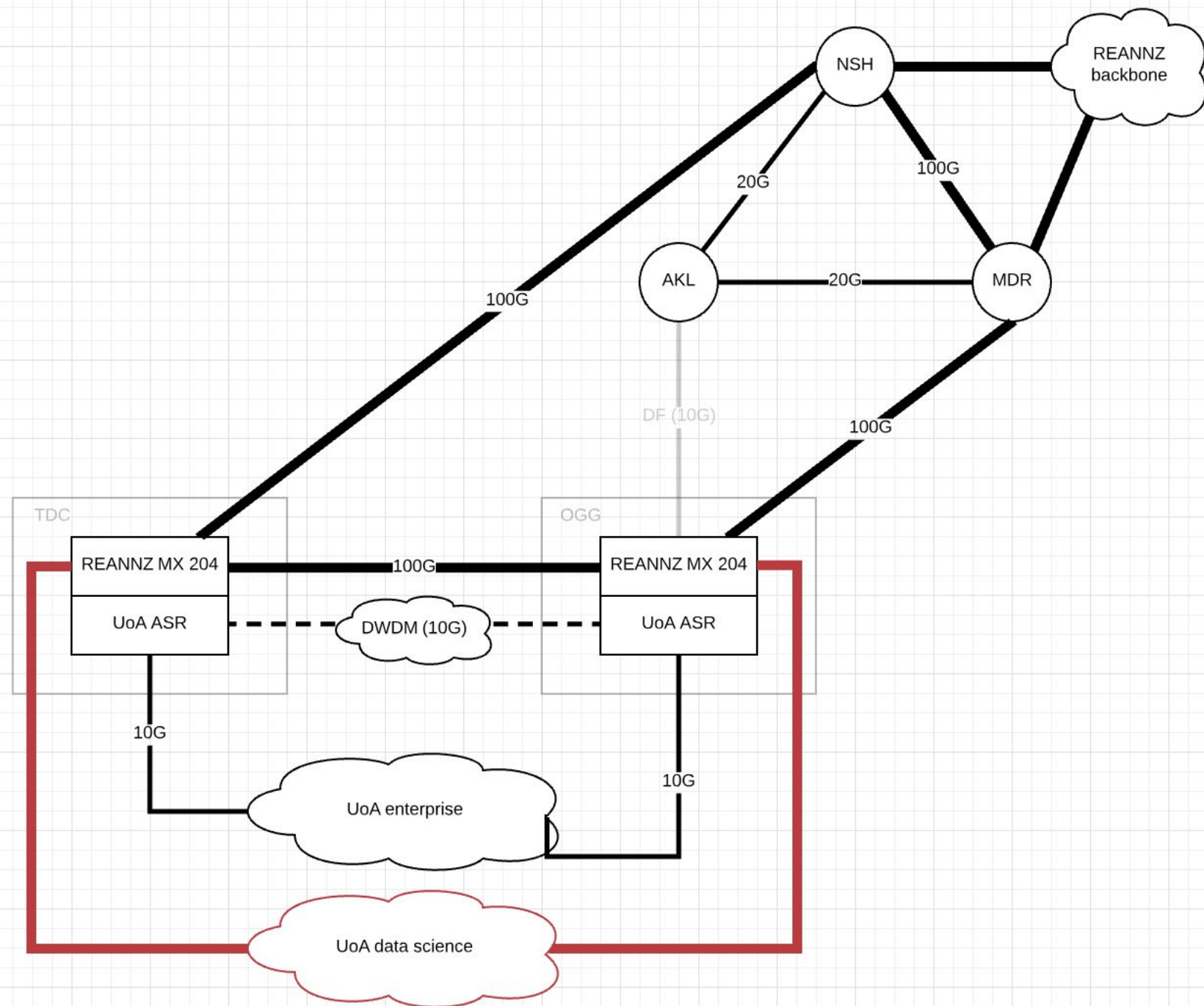
- Centralization!
- Less hardware and complexity
- Must have trust
- Will IT set this up in a reasonable amount of time?
- Is it sustainable?
- Start with one

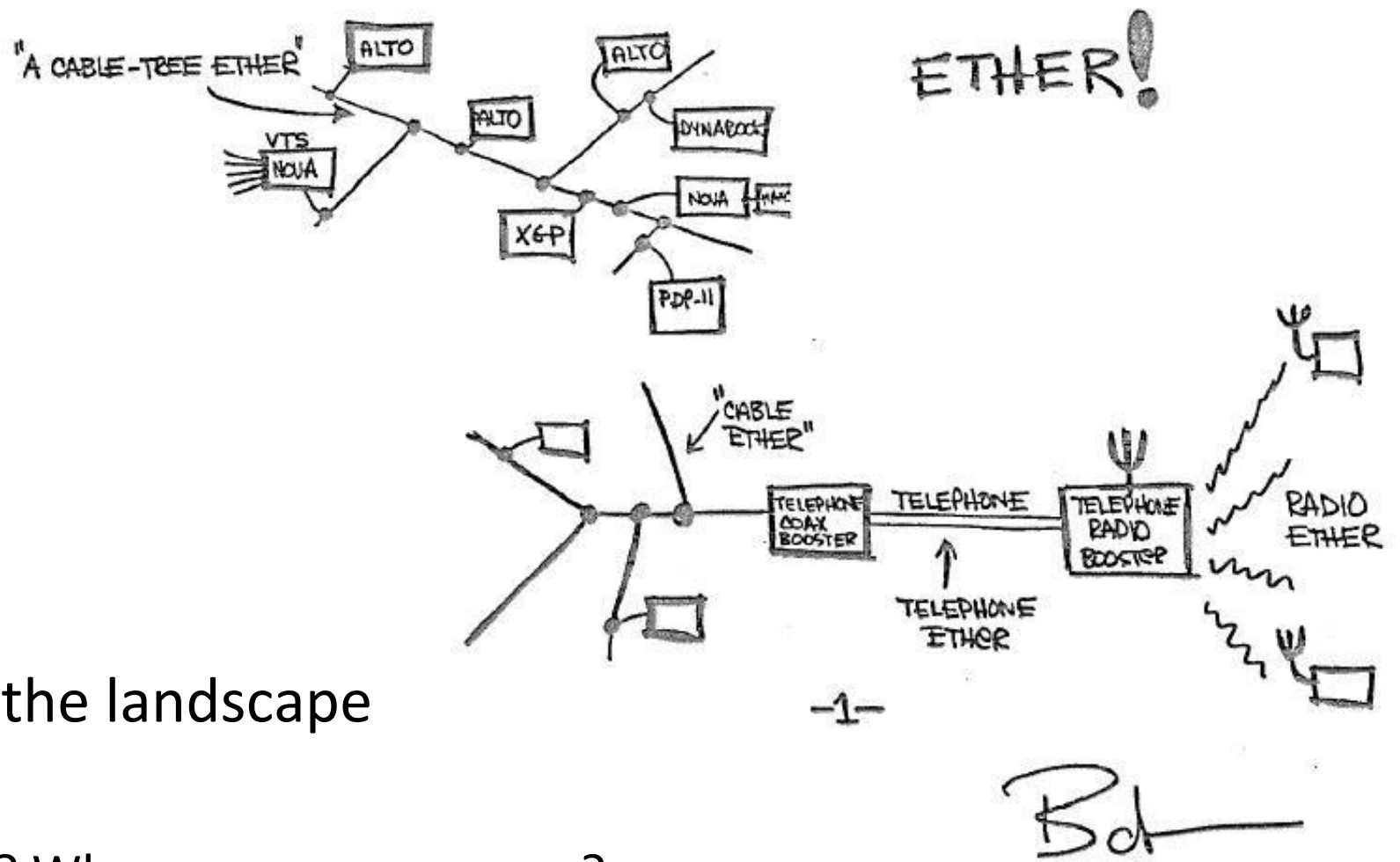




Manaaki Whenua
Landcare Research







Build yourself a picture of the landscape

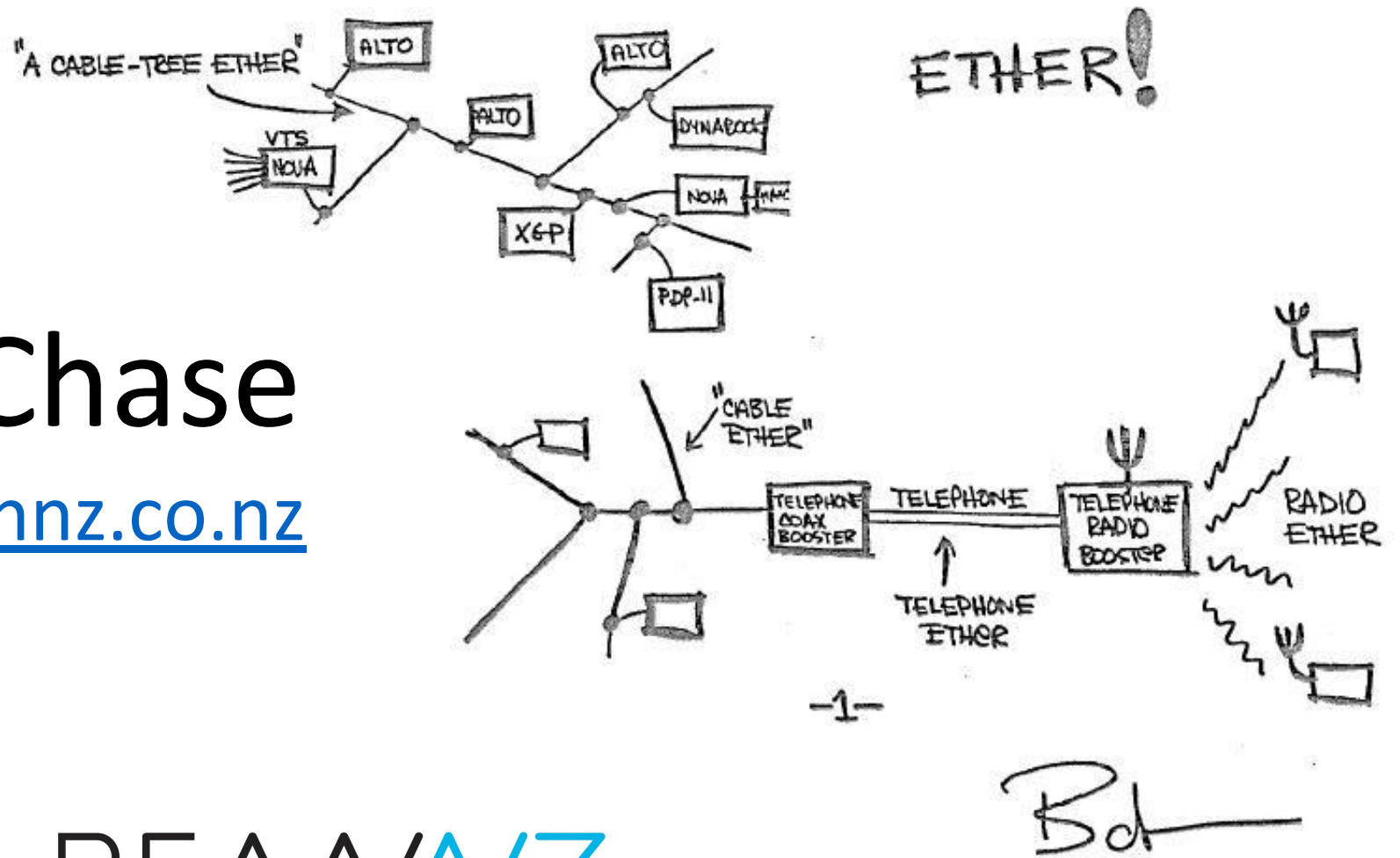
- What are your resources? Who are your resources?
- How well do you know your business?
- Who are your researchers? Where are they? Where is their data?
- If you don't know, how will your researchers know what the possibilities are?
- REANNZ has FREE resources to help you!

REANNZ supplies the shark, can you get your researchers on board?



* RPG sold separately. May not ship to New Zealand, check with your courier company for details

Wallace A. Chase
wallace.chase@reannz.co.nz
@bmtfr



REANNZ

A very special thanks to Matt Younkins at OU, as the raptors are on loan from him!

