

# Goals of the Presentation

- Arm you with a basic understanding of computer networks so that you can provide justification for your “unique” requirements to your fellow IT staff.
- Provide you with a common set of nomenclature that you can use when conversing with research peers regarding data exchange.

If it doesn't  
challenge you,  
it won't  
change you.

# The Definition of Science DMZ

## Wikipedia Definition:

“The term Science DMZ refers to a computer subnetwork that is structured to be secure, but without the performance limits that would otherwise result from passing data through a stateful firewall. The Science DMZ is designed to handle high volume data transfers, typical with scientific and high-performance computing, by creating a special DMZ to accommodate those transfers. It is typically deployed at or near the local network perimeter, and is optimized for a moderate number of high-speed flows, rather than for general-purpose business systems or enterprise computing.”

[http://en.wikipedia.org/wiki/Science\\_DMZ\\_Network\\_Architecture](http://en.wikipedia.org/wiki/Science_DMZ_Network_Architecture)

# The “Wordly” of Science DMZ



# The Evolution of Science DMZ

Corporate Environment:



Offer Goods  
and Services

# The Evolution of Science DMZ (cont.)

Corporate Environment:



Lock them away in an “online” experience.

# The Evolution of Science DMZ (cont.)

Corporate Environment:



And make them available when  
someone is willing to pay...



# The Evolution of Science DMZ (cont.)

Corporate Environment:



“It’s just good business...”

# The Evolution of Science DMZ (cont.)

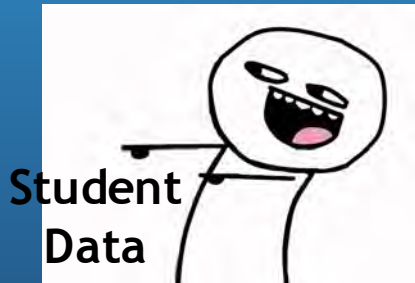
Academic Environment:





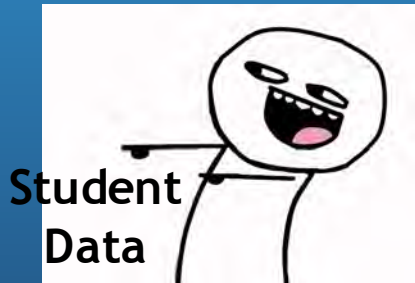
# The Evolution of Science DMZ (cont.)

Academic Environment: A stark contrast...



# The Evolution of Science DMZ (cont.)

Academic Environment: A stark contrast...



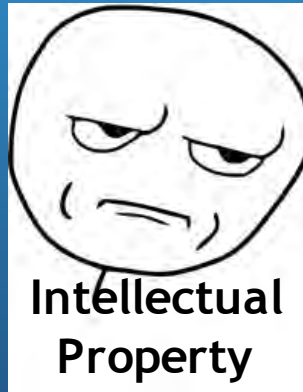
# The Evolution of Science DMZ (cont.)

Academic Environment: A stark contrast...

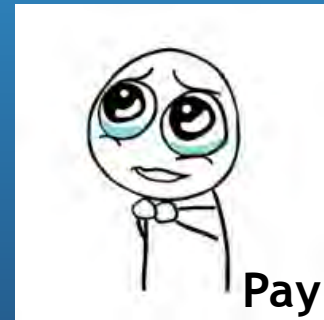
Student  
Data



Intellectual  
Property



Payroll &  
Accounting



# The Evolution of Science DMZ (cont.)

Academic Environment: A stark contrast...



# The Evolution of Science DMZ (cont.)

Academic Environment: A stark contrast...



# The Evolution of Science DMZ (cont.)

Academic Environment: A stark contrast...



“WAN”



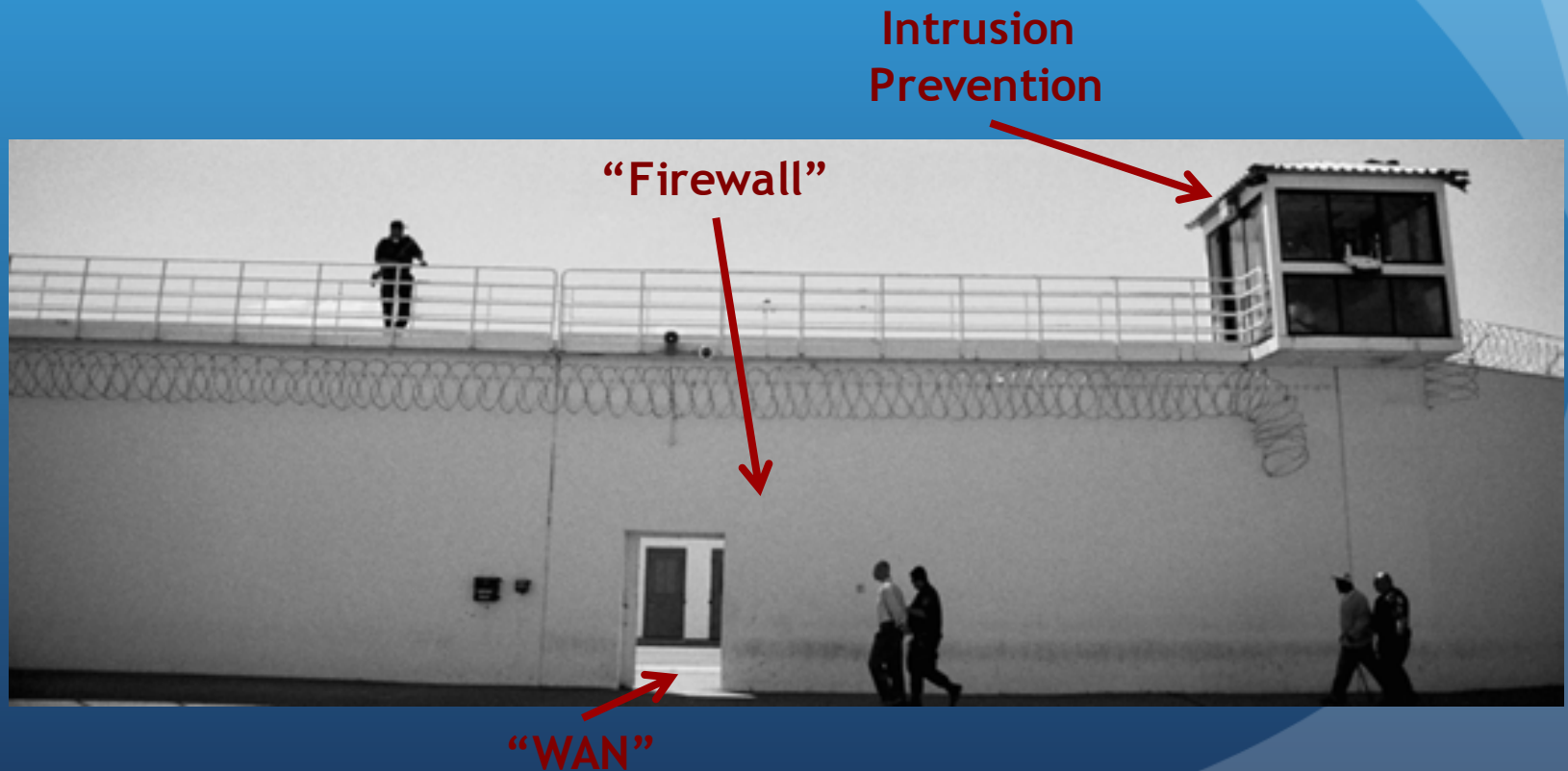
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Academic Environment: A stark contrast...



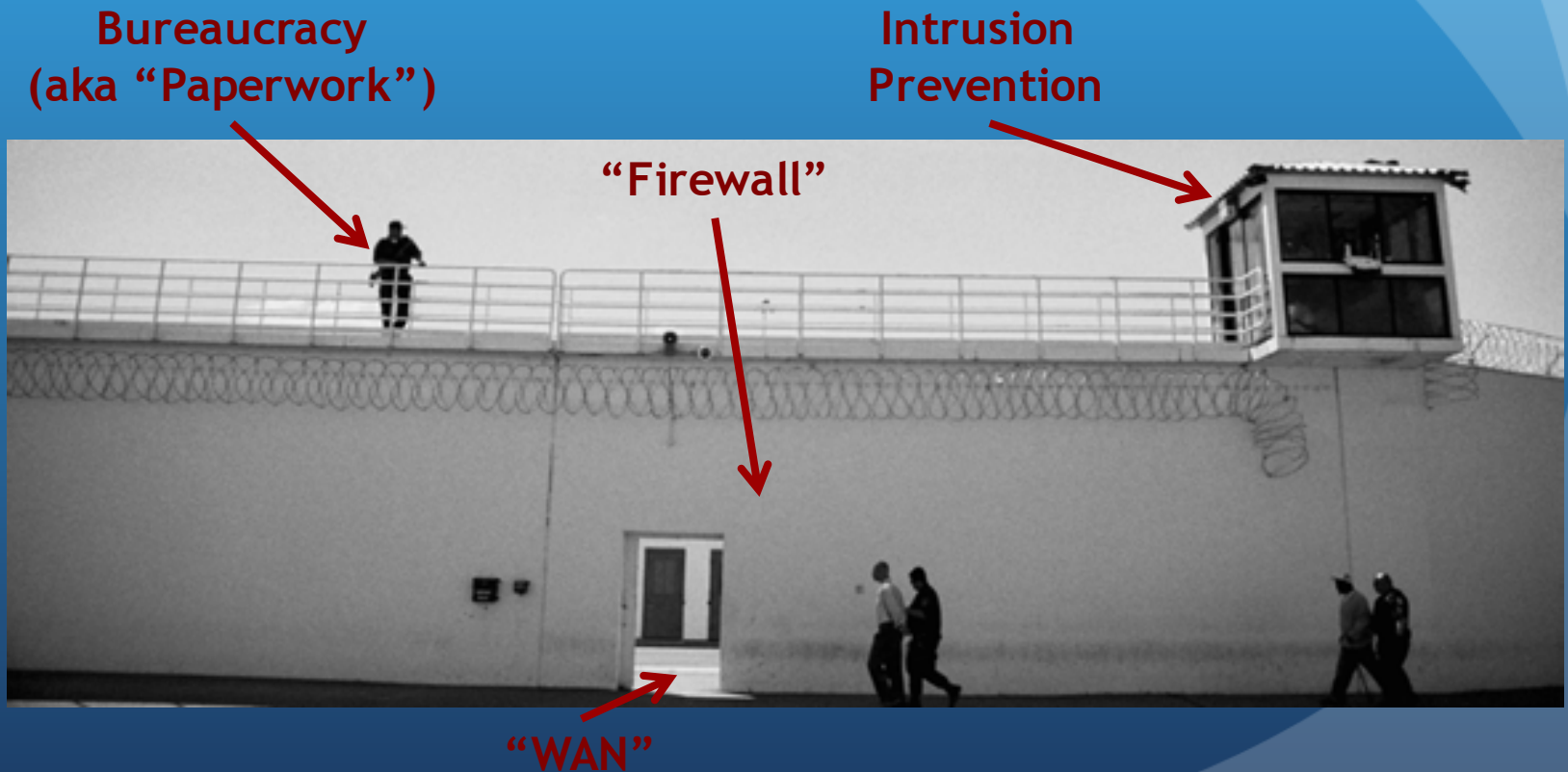
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Academic Environment: A stark contrast...



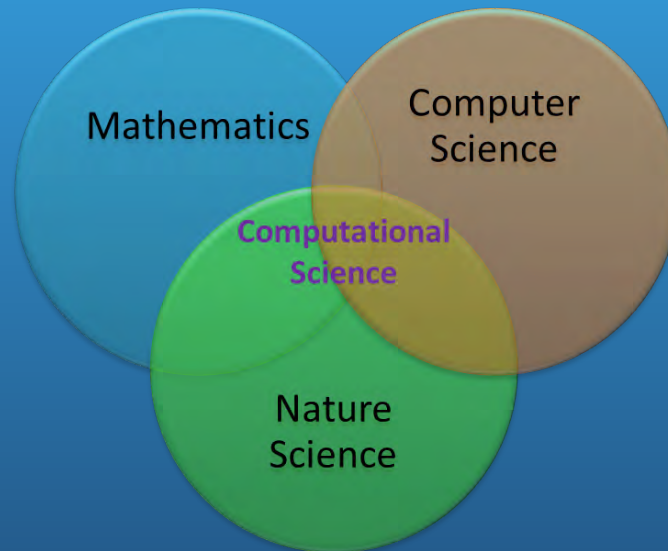
# The Evolution of Science DMZ (cont.)

Academic Environment: A stark contrast...



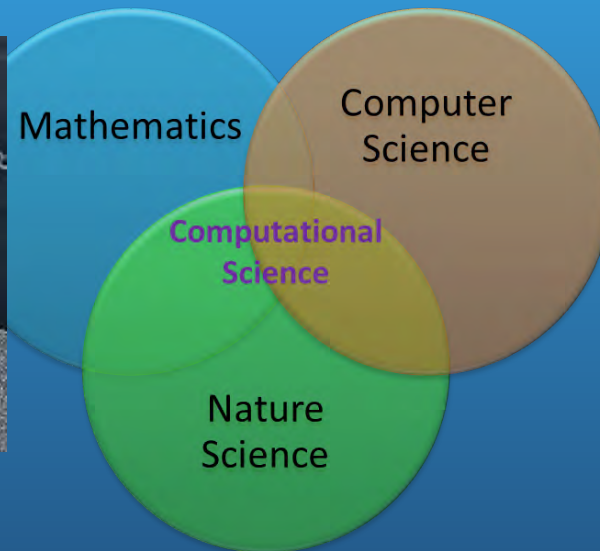
# The Evolution of Science DMZ (cont.)

Academic Environment: Enter Computational Research...



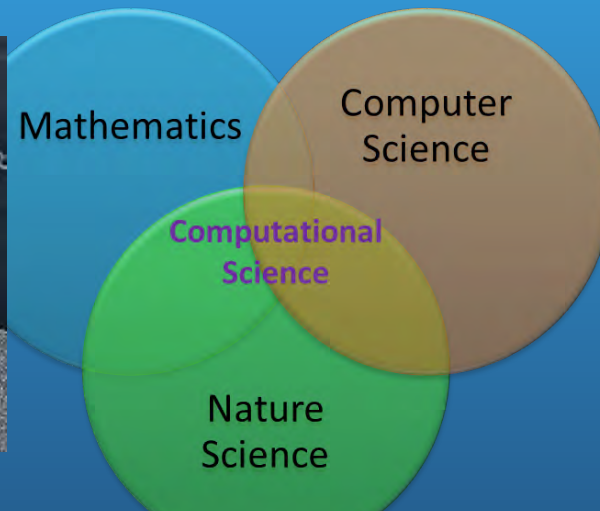
# The Evolution of Science DMZ (cont.)

Academic Environment: Computational Research...



# The Evolution of Science DMZ (cont.)

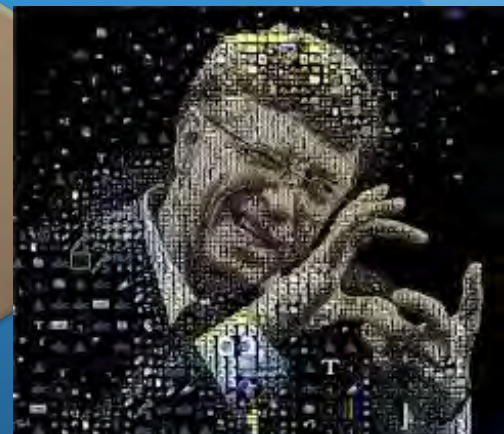
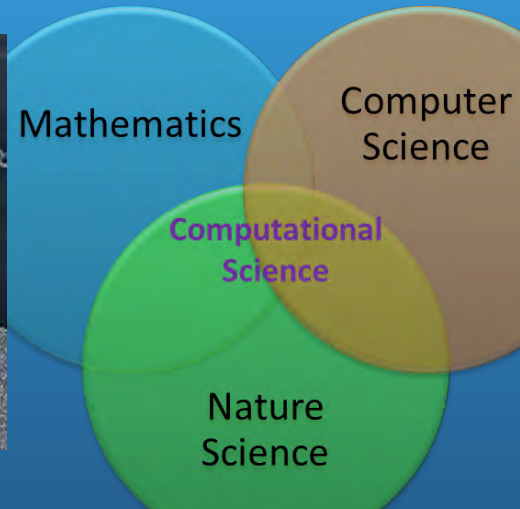
Academic Environment: Computational Research...





# The Evolution of Science DMZ (cont.)

Academic Environment: Computational Research...



# The Evolution of Science DMZ (cont.)

# CAUTION

## ANALOGIES AHEAD

**PROTECTIVE HEADGEAR MUST BE WORN IN THIS AREA**



# The Evolution of Science DMZ (cont.)

Computational Research and an Analogy...



Computational  
Research

# The Evolution of Science DMZ (cont.)

Computational Research and an Analogy...



Computational  
Research

=

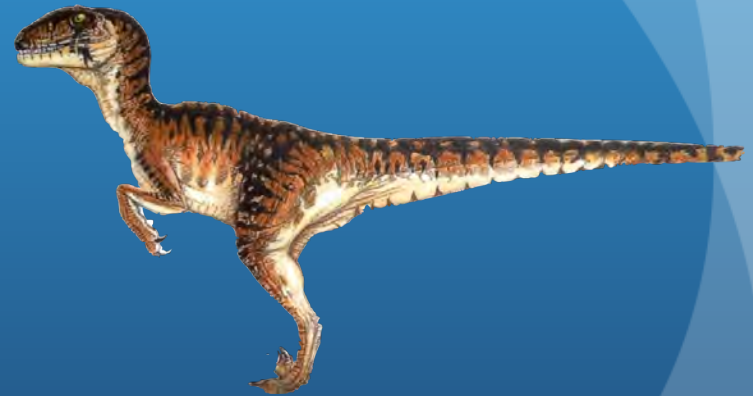
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Computational Research and an Analogy...



Computational  
Research

=



Velociraptor



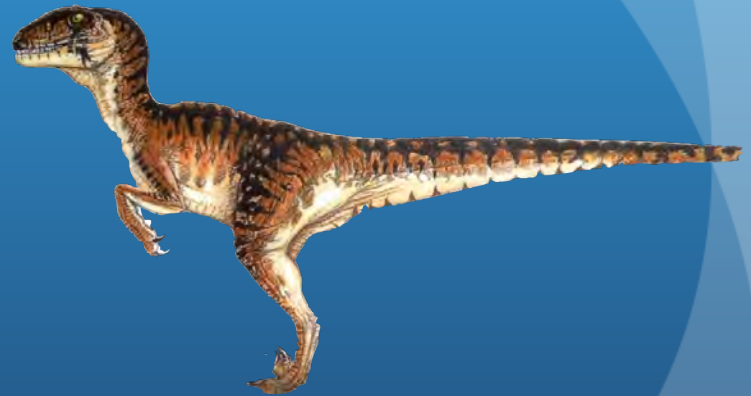
# The Evolution of Science DMZ (cont.)

Computational Research and an Analogy...



Computational  
Research

~



Velociraptor



# The Evolution of Science DMZ (cont.)



Proof that the analogy is valid...

# The Evolution of Science DMZ (cont.)



# The Evolution of Science DMZ (cont.)



Agile



# The Evolution of Science DMZ (cont.)



Agile  
Moves Rapidly



# The Evolution of Science DMZ (cont.)



Agile

Moves Rapidly

More Effective  
In Groups



# The Evolution of Science DMZ (cont.)



Agile

Moves Rapidly

More Effective  
In Groups

Consumes All  
Available Resources





# The Evolution of Science DMZ (cont.)



Agile

Moves Rapidly

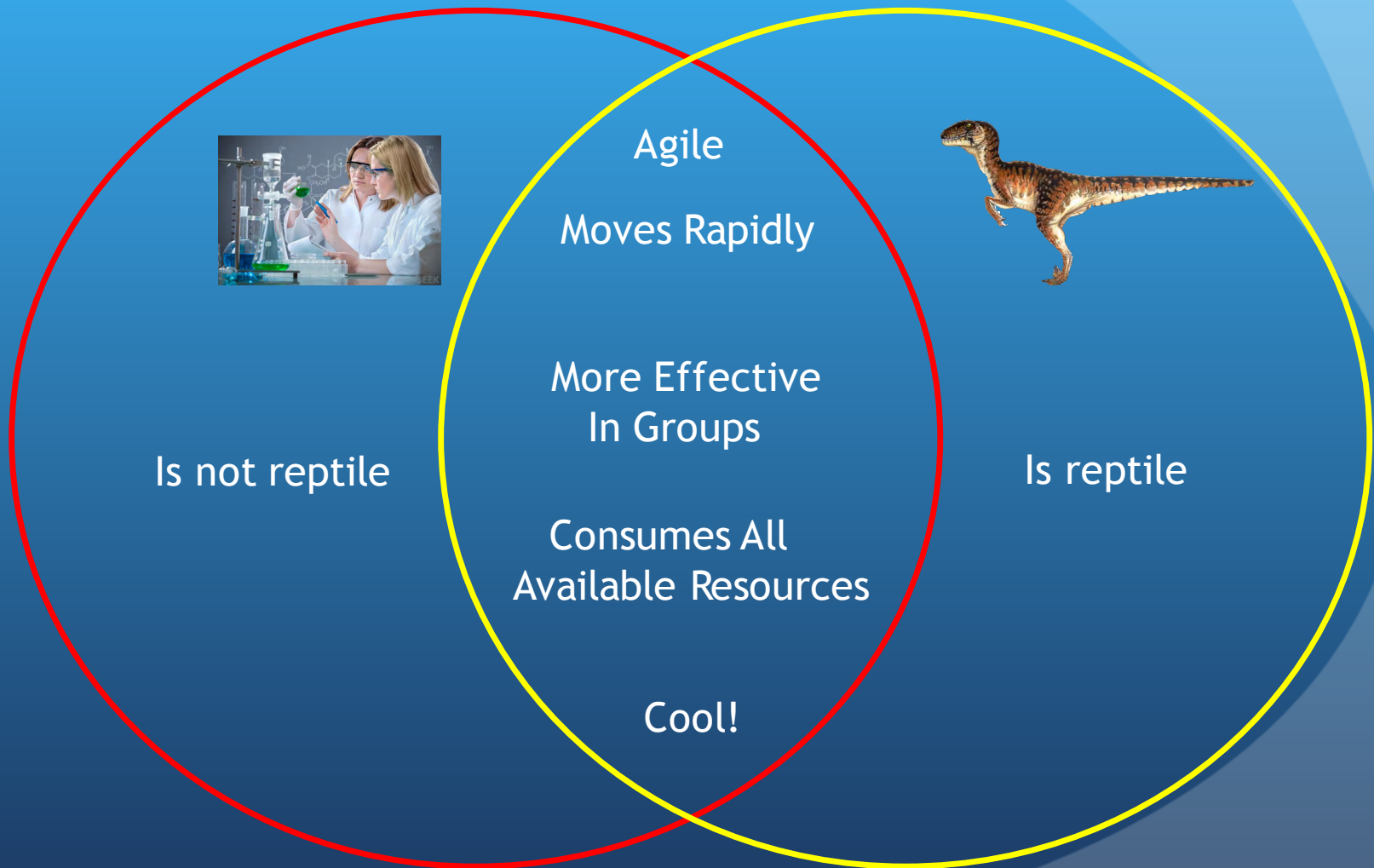
More Effective  
In Groups

Consumes All  
Available Resources

Cool!



# The Evolution of Science DMZ (cont.)



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



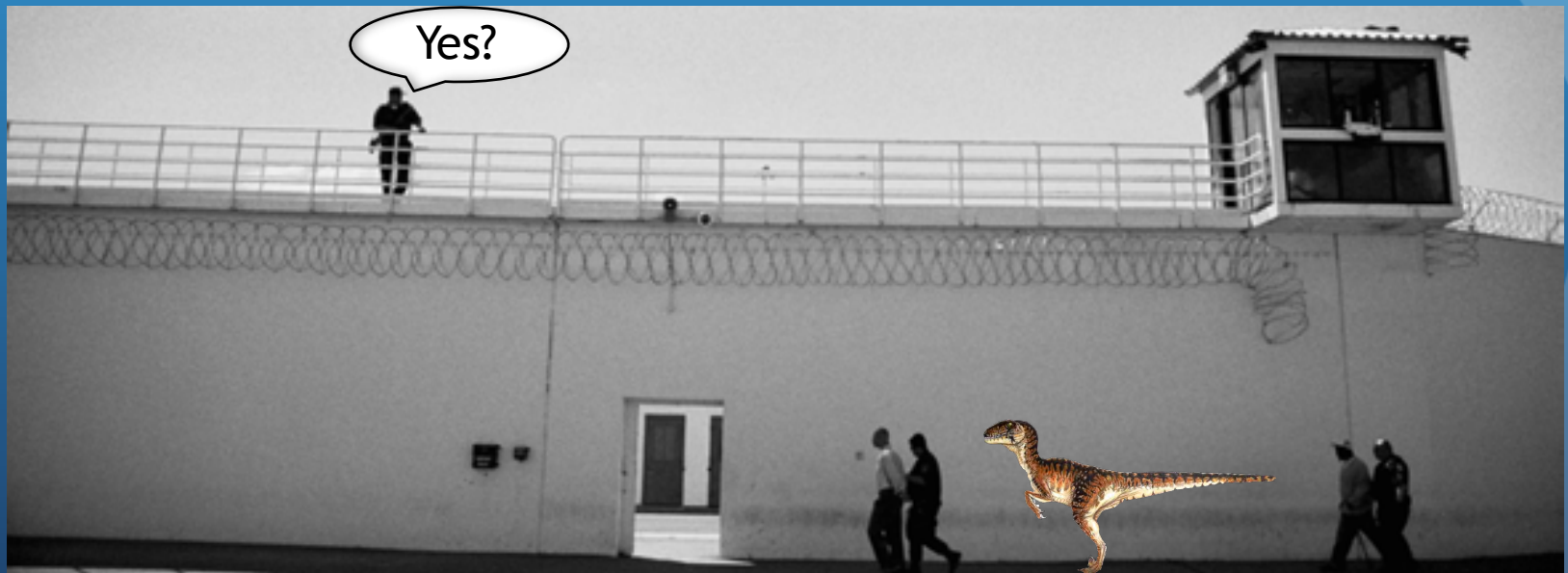
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When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

...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*, as they have been collected over a number of years.





# The Evolution of Science DMZ (cont.)

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



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

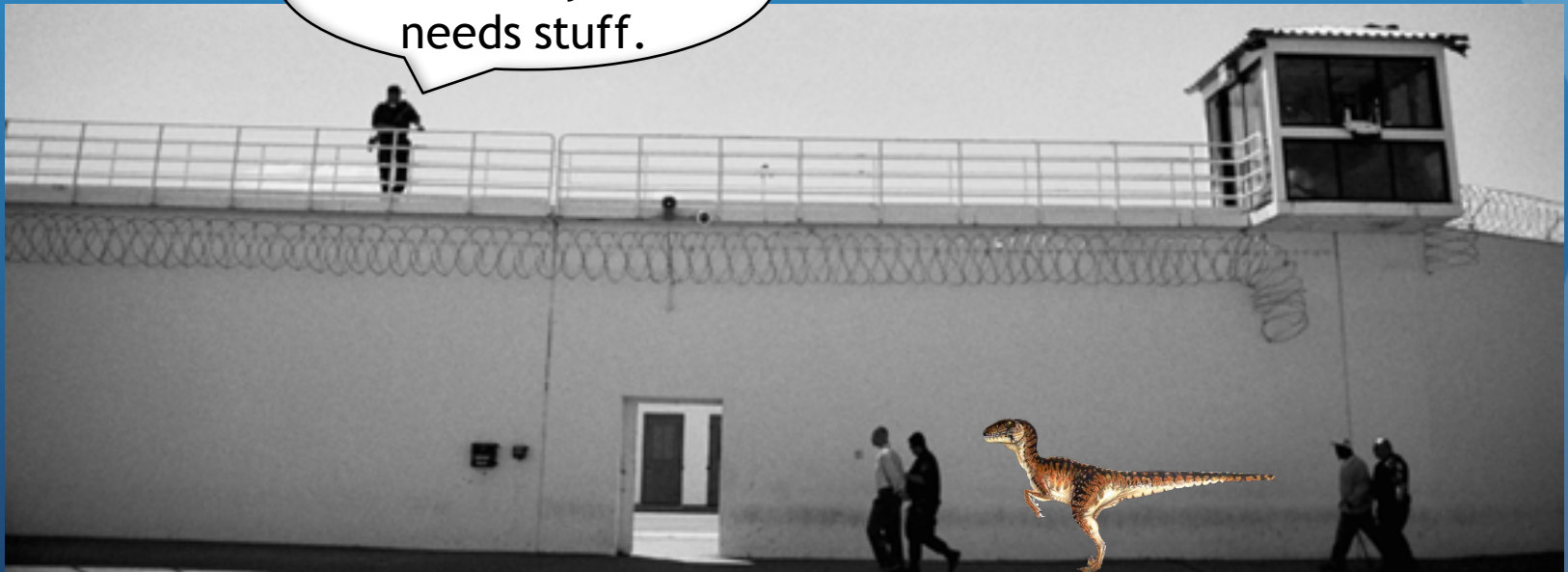
When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks

Gotta guy  
here. Says he  
needs stuff.





# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks

What kinda  
stuff?

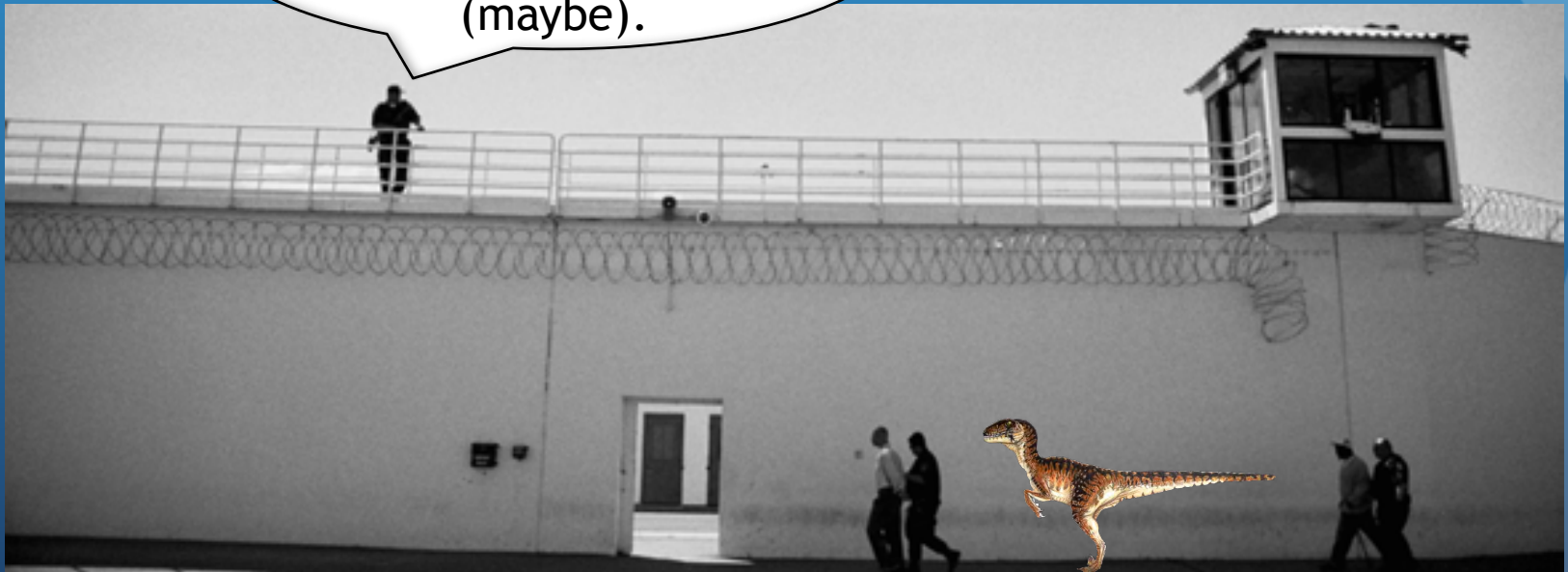




# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks

Something about  
security and  
connectivity  
(maybe).



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks

We got plenty  
of that! Send  
'em in.



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks

Ye gads!



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks





# The Evolution of Science DMZ (cont.)

When Computational Science Meets Traditional Networks



# The Evolution of Science DMZ (cont.)

OBSERVATION: The **requirements** of the computational researcher and the **capabilities** of the traditional campus computer network do not always align!

Ya' think?!



# The Evolution of Science DMZ (cont.)

This can result in adverse consequences:

- Poor network performance for production systems
- Poor security performance for the campus as a whole
- Bandwidth congestion
- Overutilization of available resources
- Increased Help Desk calls
- General grumbling and complaining



# The Evolution of Science DMZ (cont.)

This can result in adverse consequences:

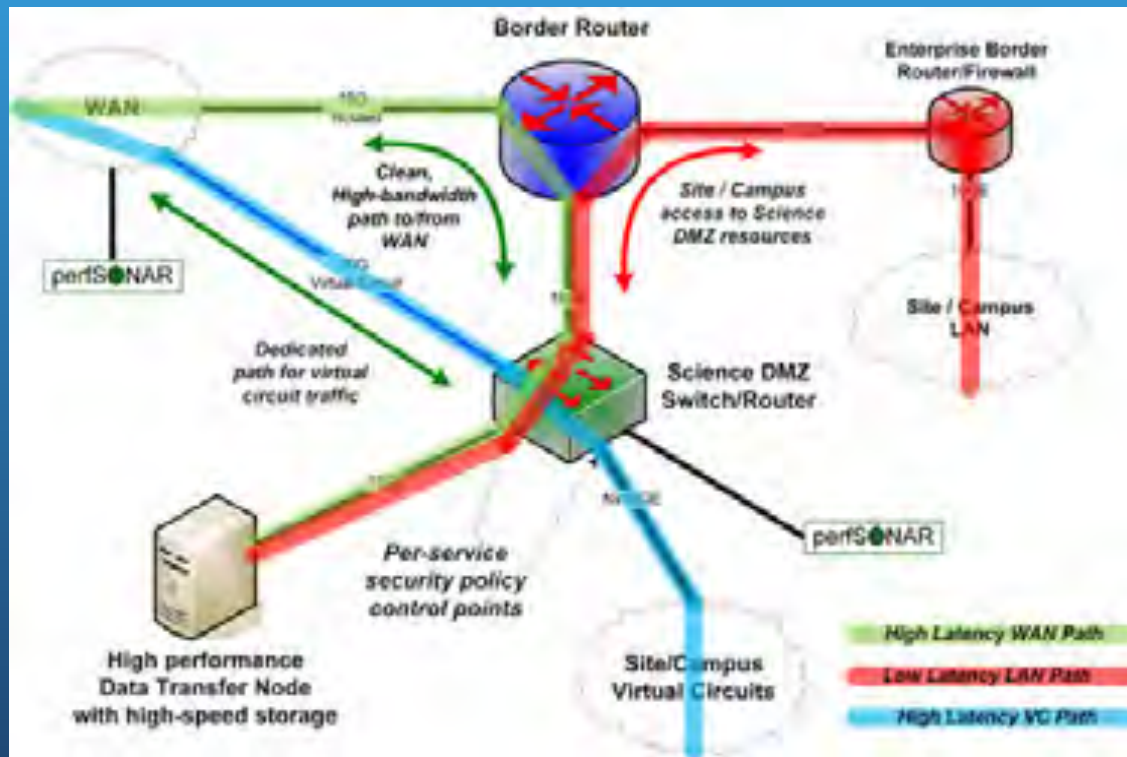
- Poor network performance for production systems
- Poor security for the campus as a whole
- Barriers to research
- Overhead
- Increased Help Desk calls
- General grumbling and complaining

But how do we overcome this? *I can't stop my research* just because **the network can't keep up!**



# The Evolution of Science DMZ (cont.)

- Enter the Science DMZ!



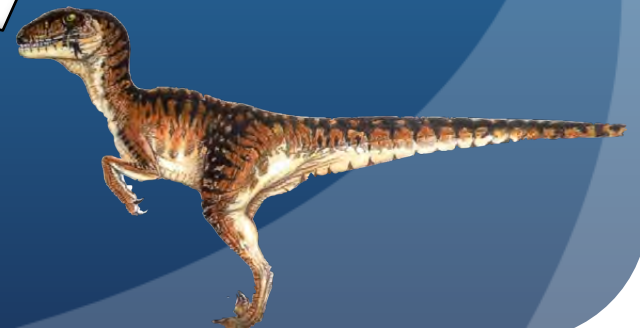
# The Evolution of Science DMZ (cont.)

- What makes the Science DMZ important
  - Dedicated Data Transfer Node to ship datasets
  - Dedicated network resources outside of the campus
  - Dedicated, high-speed capacity (typically 10-Gig)
  - Dedicated “circuits” between research sites
  - “Programmable”

# The Evolution of Science DMZ (cont.)

- What makes the Science DMZ important
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  - Dedicated network resources outside of the campus
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  - Dedicated “circuits” between research sites
  - “Programmable”

Sounds like it meets  
my requirements!





# The Evolution of Science DMZ (cont.)

- Sort of like an Interstate highway... no stop lights, and dedicated on and off ramps:



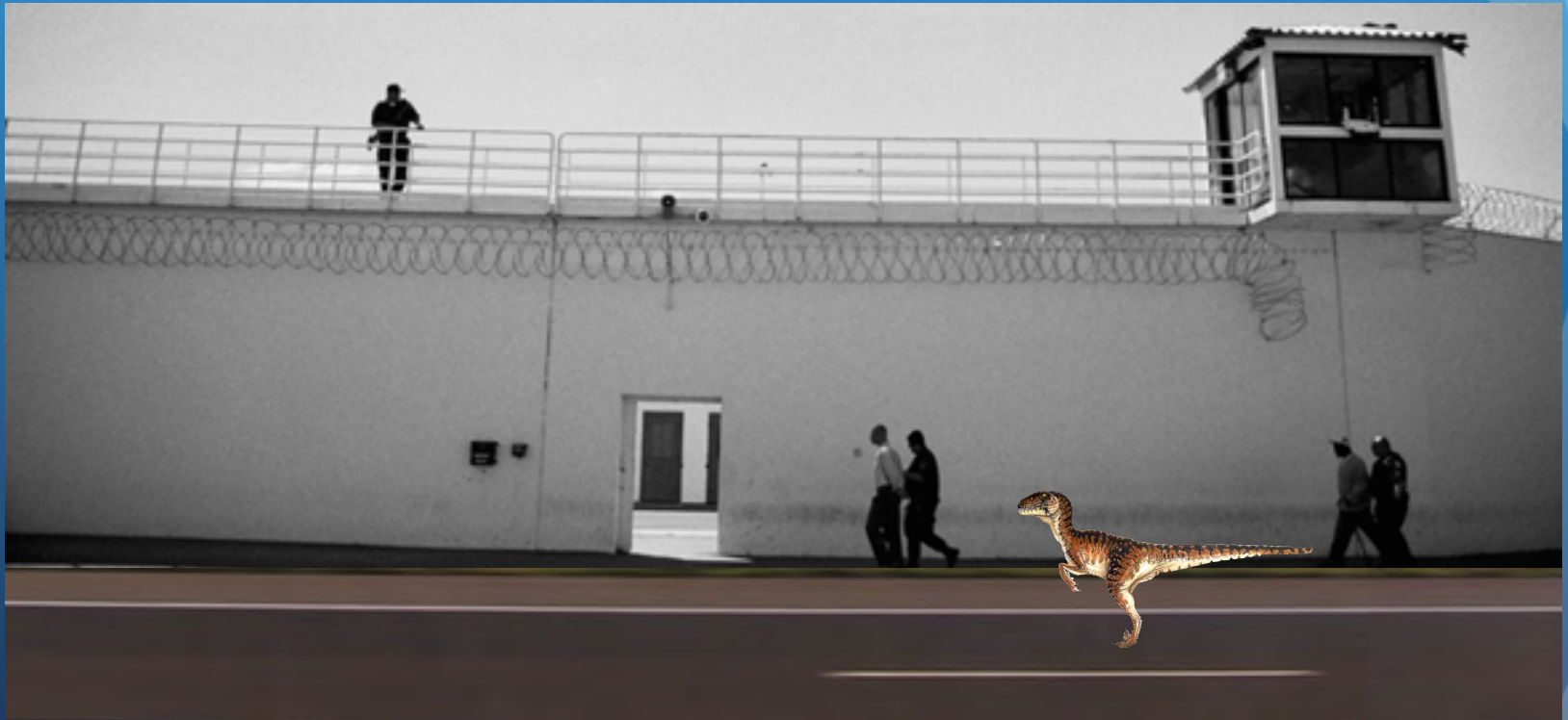
# The Evolution of Science DMZ (cont.)

Science DMZ and the Campus Network...



# The Evolution of Science DMZ (cont.)

Science DMZ and the Campus Network...



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Science DMZ and the Campus Network...



# The Evolution of Science DMZ (cont.)

Science DMZ and the Campus Network...



# The Evolution of Science DMZ (cont.)

Science DMZ and the Campus Network...





# ANALOGY RECAP...



Corporate  
Network



Sealed  
Vault



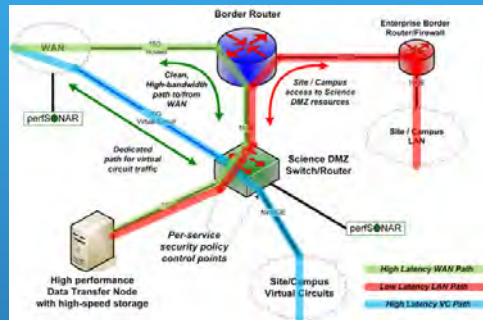
Campus  
Network



Prison



# ANALOGY RECAP...



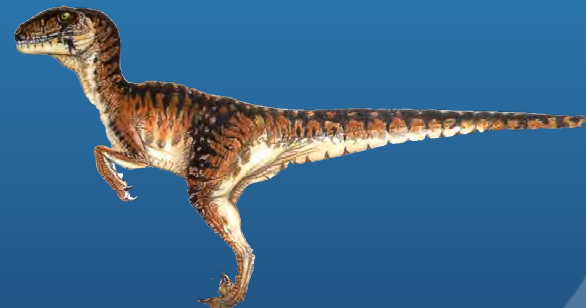
Science  
DMZ



Interstate



Computational  
Research



Velociraptor

Science DMZ is like...

Science DMZ is like...



An onion!

# Science DMZ Layers

## Science DMZ

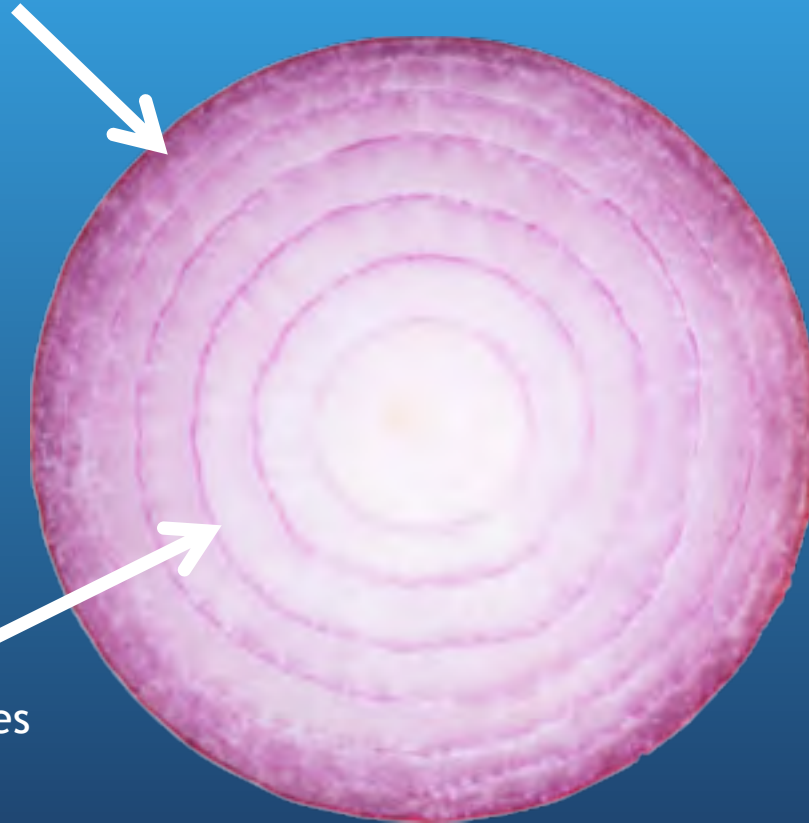
Dedicated Paths  
Transfer Nodes  
perfSONAR



# Science DMZ Layers

## Science DMZ

Dedicated Paths  
Transfer Nodes  
perfSONAR



## SDN

Controller  
Network Switches

# Science DMZ Layers

## Science DMZ

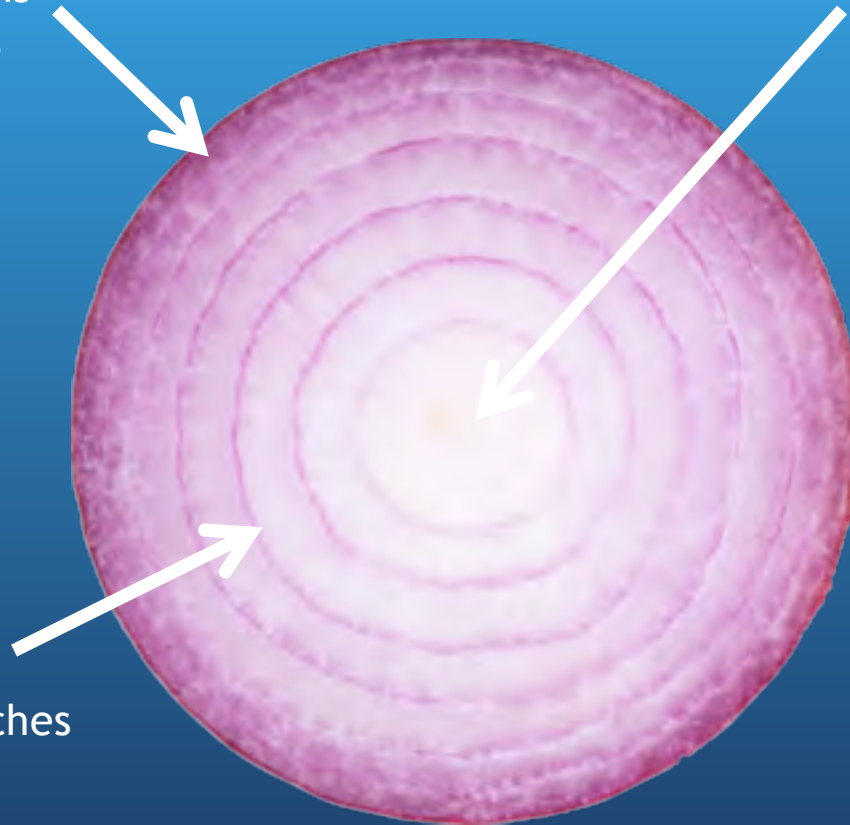
Dedicated Paths  
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## SDN

OpenFlow  
Northbound APIs  
East-West Monitoring

## SDN

Controller  
Network Switches



# Science DMZ Layers

## Science DMZ

Dedicated Paths  
Transfer Nodes  
perfSONAR

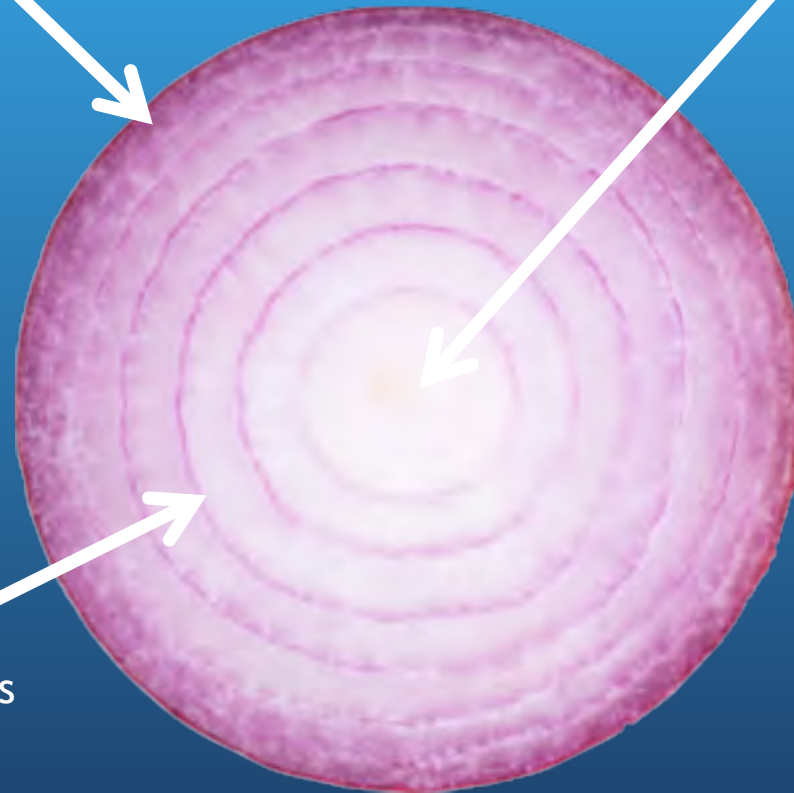
## SDN

OpenFlow  
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East-West Monitoring

## SDN

Controller  
Network Switches

## Campus Network





# Thank You!



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