Agenda

Enterprise Data Centers—SDN at Scale

- Who we are
- Market Perspective
- Example Enterprise Focus
- Defining SDN for Our Use
- Real Life examples of SDN at Scale

Jim Harding

CTO, Sabey Data Centers

President, CODONiS

SABEY
Data Centers

- Largest Private Data Center Business in US
- 3.5M Square Feet

Bridging Healthcare &

Life Sciences Computing

Through Network Cloud Technology

**We are network and cloud services management
for Sabey Data Centers**

Data Center Services

- Financing
- Construction
- Design
- Critical operations
- Network management
- Security

Western Campuses

Eastern Expansion… a national plan

Intergate.Manhattan

Intergate.Ashburn

We Have a Valuable Market Perspective

- We see everything when it comes to data center deployments...
  - Cloud
  - ISPs
  - Financial
  - Software Companies
  - Web 2.0 Companies
  - **Health Care**
  - Life Sciences
  - Government
  - Education

Some of the biggest in all of these categories are in our system

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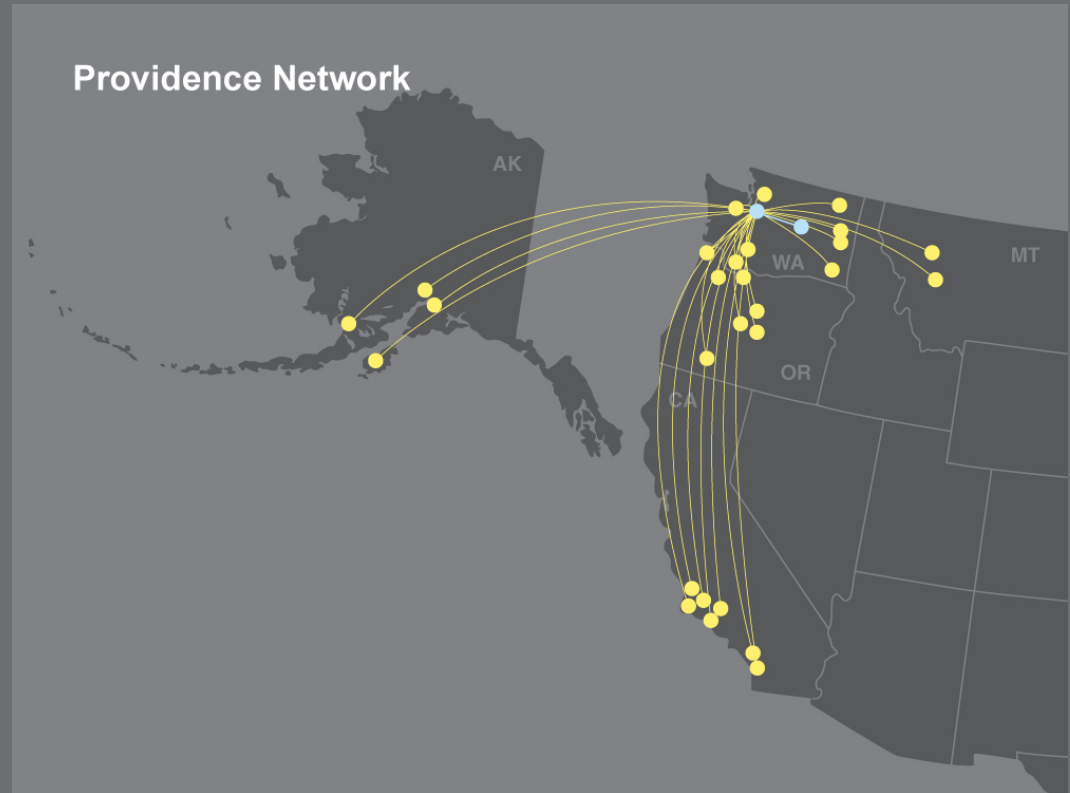   - Government
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Example Enterprise Focus

Providence Health & Services

- 150 years old

- 5 states

- 30 hospitals

- $11.6B revenue

  - Top 10 in US

- 65,000 employees

- 1,800 IT staff

Providence Network

AK

WA

MT

OR

CA

We are helping them consolidate all disparate IT locations into our DR/HA data center platform

In the Process of Consolidating…

- We noticed that they kept their network the same

- …Even though the equipment was now consolidated

- We took a hard look at the big picture and realized this was an opportunity

- What if…
  we could not only manage the data center facility (power, security, cooling), but…

- **What if we managed all of their networks?**

Health Care Market

- $2Trillion in hospital revenue

- 18% of US GDP

- $60Billion spent in IT
  - Staff
  - Hardware
  - Software
  - Services

- 4,000 hospitals

- They are all doing essentially the same things in IT
  It's not a differentiator

Our Solution?

- We created a Joint Venture between CODONiS and Providence

- Its Focus: building a multi-tenant healthcare cloud

- Essential Objectives:
  - Rearchitect existing Providence Network and applications to support a multi-hospital/tenant operation
  - Run all applications in Providence on the new network
  - Sell all applications as services on the new network back to Providence
  - Reduce the cost of Healthcare IT significantly (65-75%)
  - Allow new customers to join our new network as an extension of theirs (e.g. add Disaster Recovery modules for EHR)
  - Manage DR/HA as a fraction of the cost at scale
  - Become their *overall* network as a service provider

What Do We Mean By "New Network"

- We call it a 'clinical cloud fabric'
- Started with Juniper's Qfabric to give uniform latency as we grow
- We are partnering with the Qfabric team to consider our needs on SDN management for scale
- Generalized TOR as a Service
- Putting TORaaS in all data centers and between data centers
- Extending TOR services to customer prem
- Need to Provision customers quickly/conveniently in our network
- Integrating it into our overall cloud architecture—orchestration and provisioning of all resources
- In addition to Providence and we are signing up other health care services providers and life sciences companies/institutions
- Scale to hundreds/thousands of hospitals

SDN Definition for Our Needs

SDN will be the programmatic orchestration and provisioning of network resources and optimal, secure flow between application services.

SDN will allows for the creation of new network types and applications.

SDN is how we manage networks at scale.

Our Next-Gen Network Cloud

- Existing clouds are First-Gen
  - *Centralized* resource pools
  - Exclusively in large data centers

- The Next-Gen Cloud
  - Interconnected network of networks and resources
  - A *Distributed*, Scalable, Managed fabric of Data Centers, Networks, and Resources
  - SDN-based
    - Programmable
    - Adaptive
    - Secure
  - Orchestration and provisioning of network resources (not just compute/storage)

- Healthcare requires a distributed model
  - Consolidated server resources in data centers
  - Distributed locations of hospitals and clinics
  - Distributed edge resources (video, laptops, ipads, desktops)
  - One network needs to serve all users and resources, securely
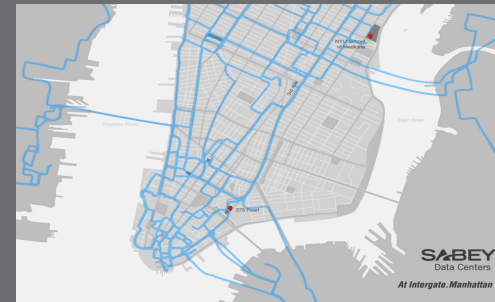
Managed Services—Next-Gen Platform

Managed Data Centers

- Power

- Cooling

- Security
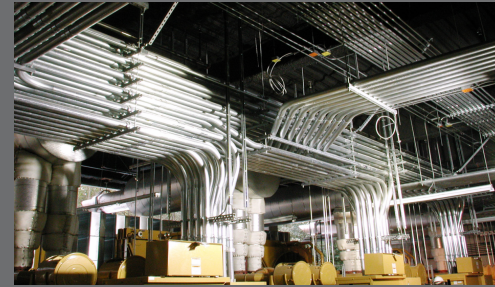
Managed Networks

- One, programmable, virtual extended network

- Layers 1-3 (optical xconnect to TOR service)
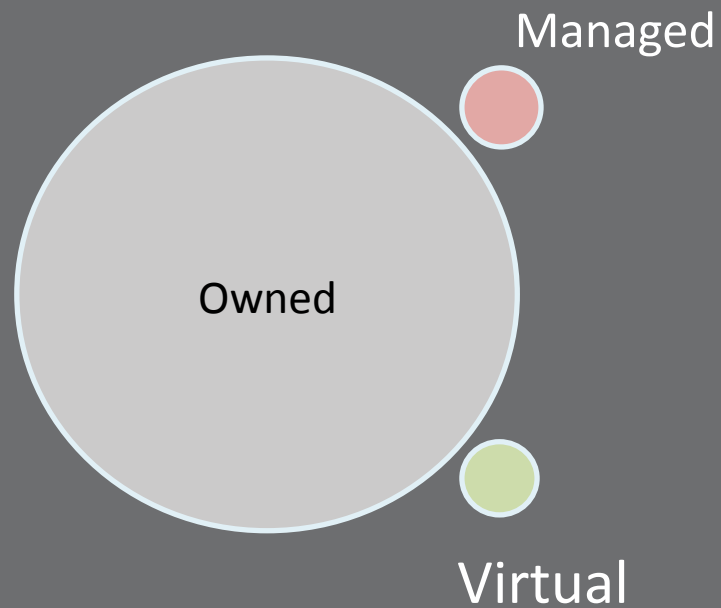
- DR/HA

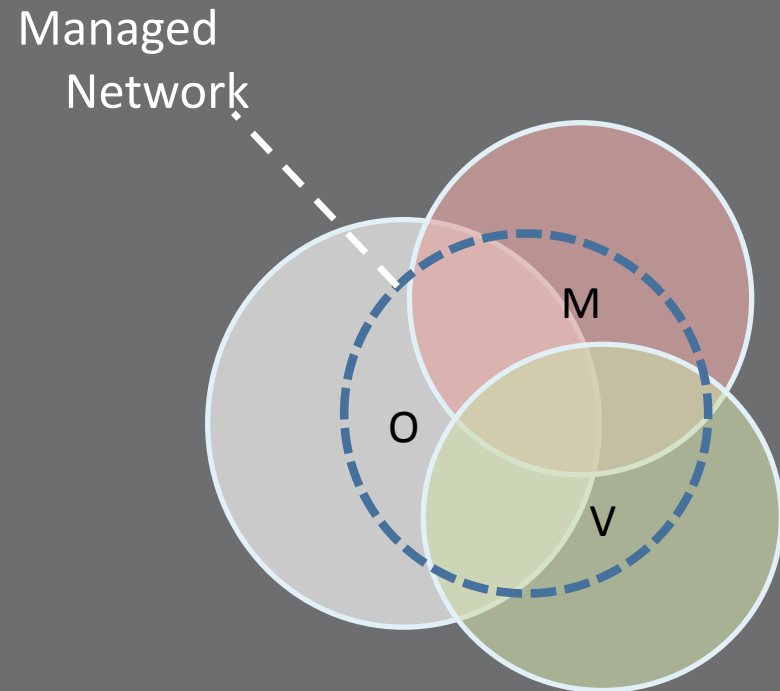**Managed Resources**

- Cores, Storage, Ports

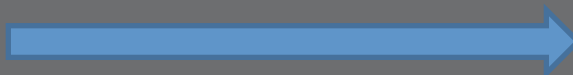| 3 Buckets	1. Owned
	2. Managed
	3. Virtual

Healthcare IT Transformation Transition

Managed

Owned

Virtual

{ note: this is not a transformation to the first gen cloud (e.g. amazon) }

Managed Network

M

O

V

Today ➡ Tomorrow

Next-Gen = Distributed, Scalable, Managed (DSM)

DSM Data Centers

- Large, Tier3 data centers (primary, DR/HA)

- "Data centers" on premise in hospital

- Small Clinic "Data centers", nodes in effect, wherever a router/firewall can be located

DSM Networks

- A hospital system can run on one network, distributed across all nodes

- Managed layer 1—aggregates all carriers, leases, connectivity into a single service

- Managed layer 2---top of rack service (layer 2 carried across to HA and DR locations)

- Managed layer 3—replicated, migratable IP service to ensure running from any location

DSM Resources

- Owned—deployed capital, legacy systems, hard to repurpose, sunk cost

- Managed—your core and storage under a managed service (you orchestrate)

- Virtual—similar to current cloud model, except, it's part of your existing network
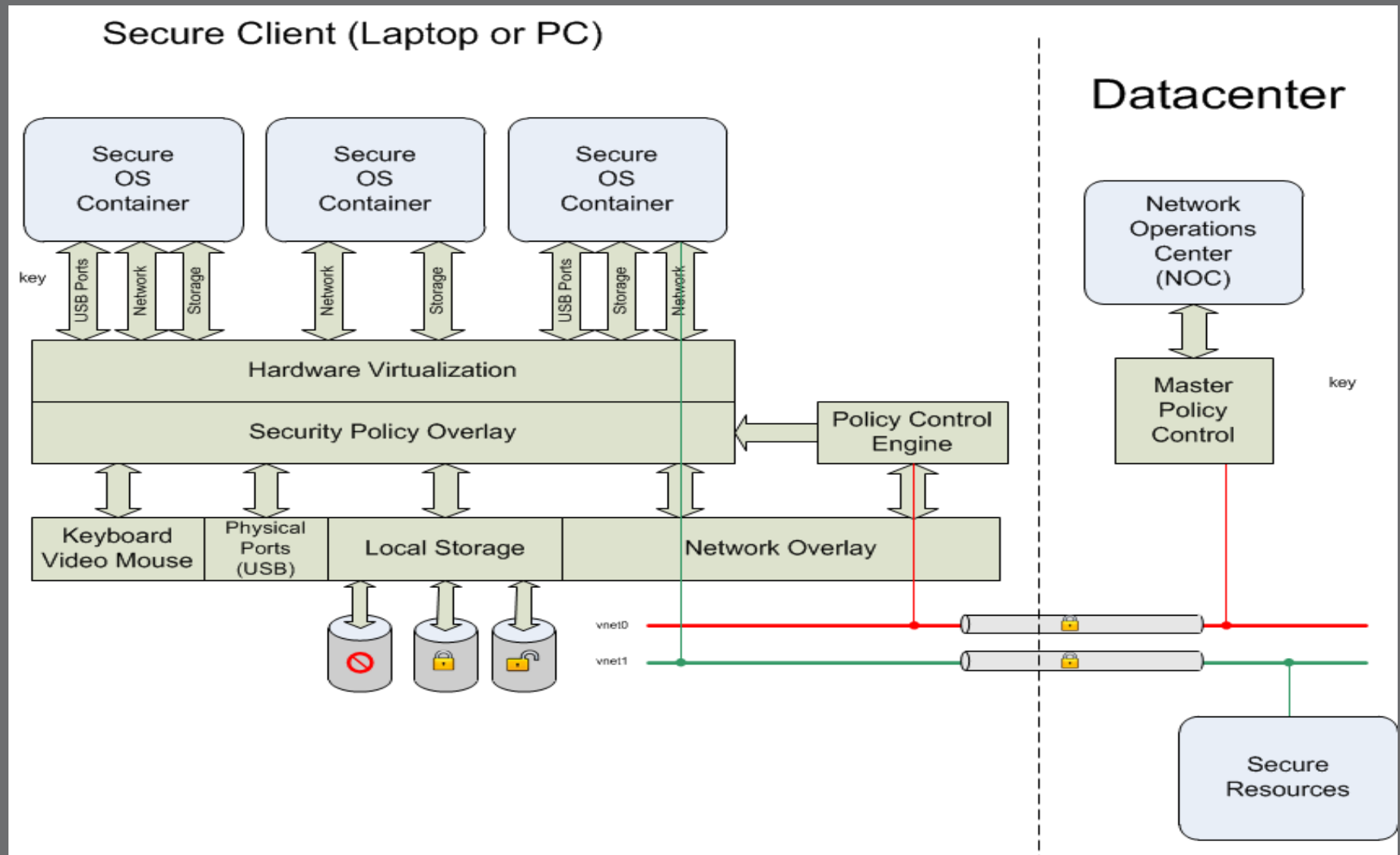
Example Healthcare Industry Problem

Sutter Health had computers stolen that made it liable for $1.6B in regulatory violation fines

Providence asked us to ensure security across 75,000 laptops, desktops, ipads, and other devices.

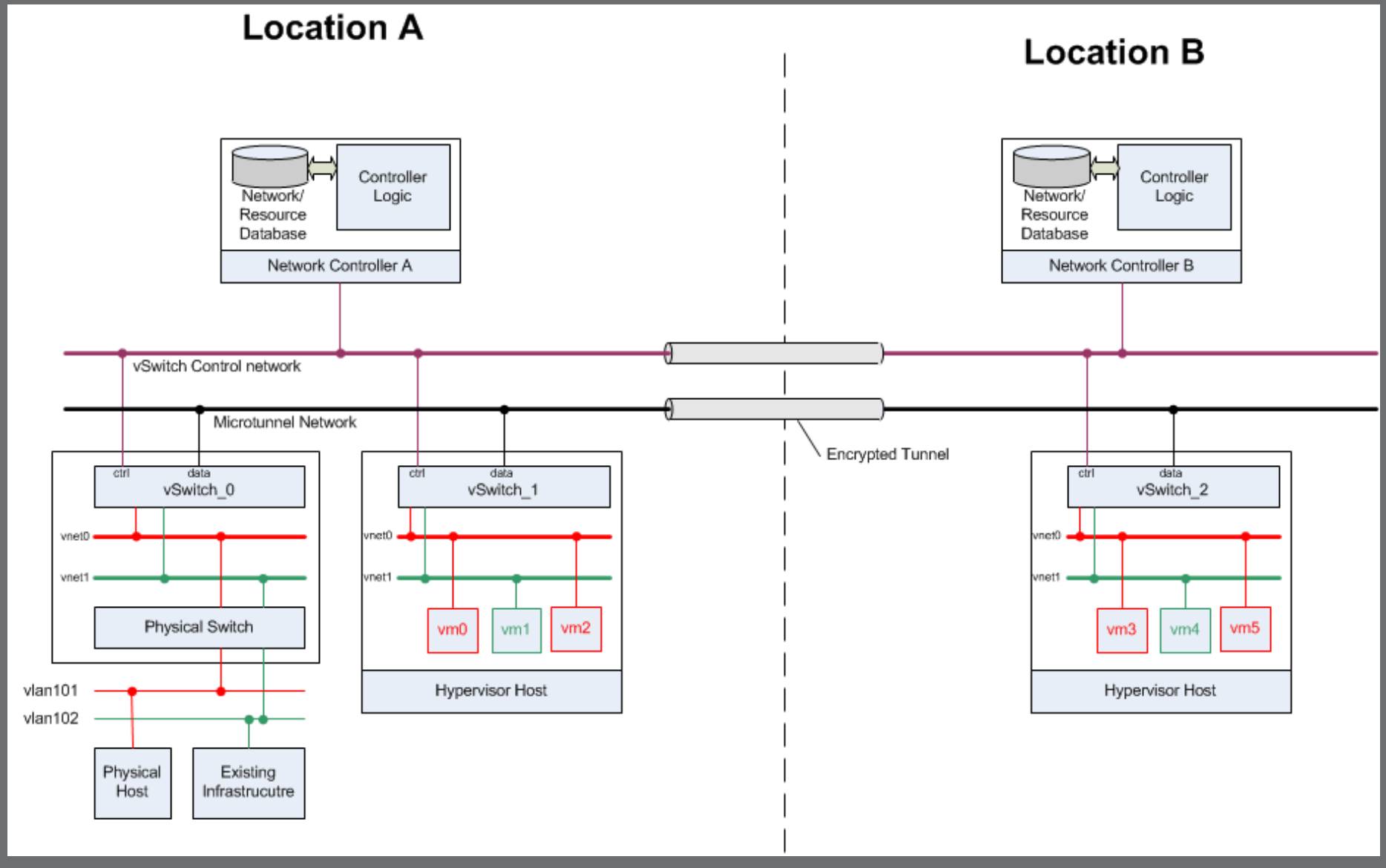Solution: Distributed Virtual Isolation Using SDN

Distributed Virtual Isolation (DVI)
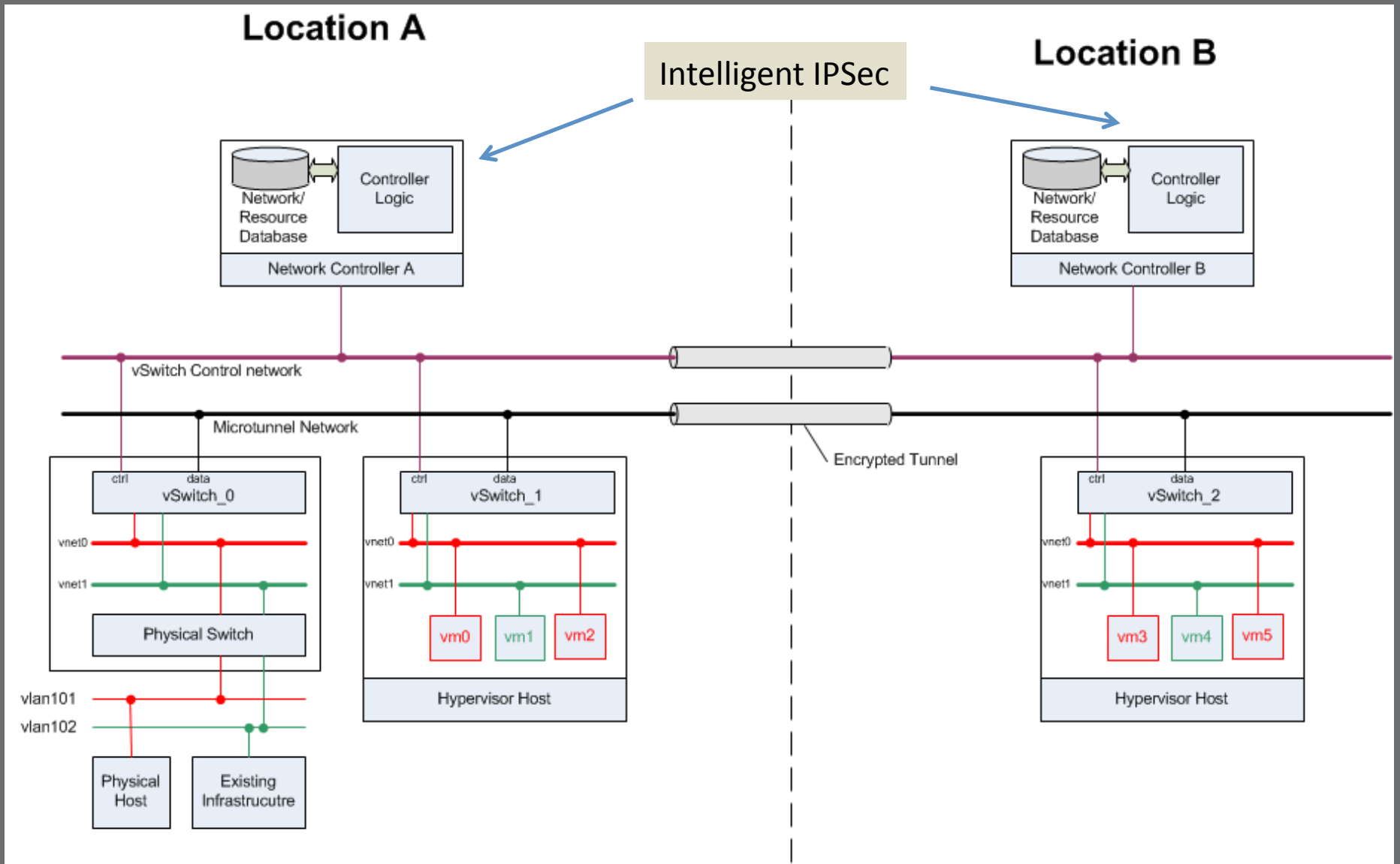## Securing all Resources through SDN Control

Distributed Virtual Isolation (DVI)
Securing all Networks through SDN Control

Distributed Virtual Isolation (DVI)
Securing all Networks through SDN Control

Real Life Example

- Life is not hard wired
- Life is instruction-based, dynamical
  - Symbols   (nucleobases)
  - Codes   (codons)
  - Instructions   (organized codons)
  - Functional Units   (proteins, organelles)
  - Functional Systems   (cells, organs, firewalls)
  - Functional Networks   (optical, electrical, protocols)
  - Organism   (mycoplasma, human)
  - Ecosystems   (SDN network conferences)

Digital Correlation

- DNA   (still v1.0, 3.6B years later)
- x8086   (has evolved slightly, 33 years old)

- x8086   base 2 (binary)
- DNA   base 4 (quaternary)
- Proteins   base 64 (?-ary)

- Digital networks—we are just beginning to provision dynamically
- Life networks—have been dynamical since the beginning

Life Networks at Scale

- 100 Trillion Cells
- Our extended DNA wraps around the earth 4M times
- All cells need blood and oxygen, now
- 40 billion proteins per cell doing work and providing structure
- Millions of machine runtime modifications in each DNA per second

- Virtual Networks—PPI
- Dynamic Networks—Microtubules (on the fly provisioning)
- Optical Networks—Optic Nerve
- Cross connects—CNS to PNS
- Broadcast networks--ADH
- Autonomic networking--SNS

Life is nothing if not Software Defined

Enabling Enterprise SDN

Like Life It needs to be…

1. Instructionable
2. Orchestratable
3. Provisionable
4. Securable
5. Distributable