

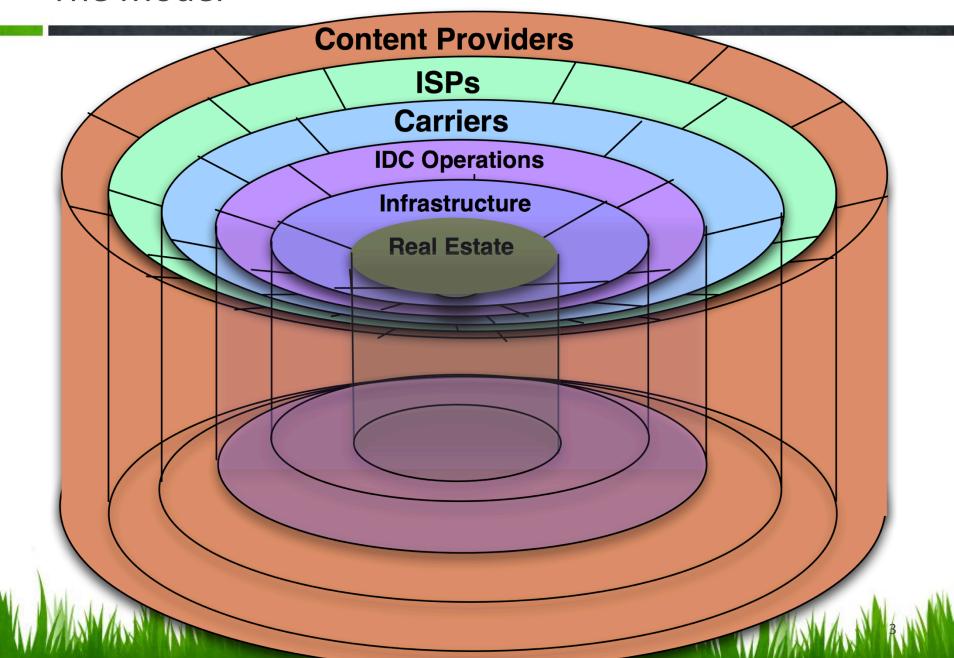
The Taxonomy of Internet Data Centers

©2012 DrPeering International Licensed material – sales@DrPeering.net http://DrPeering.net

This framework will describe any IDC

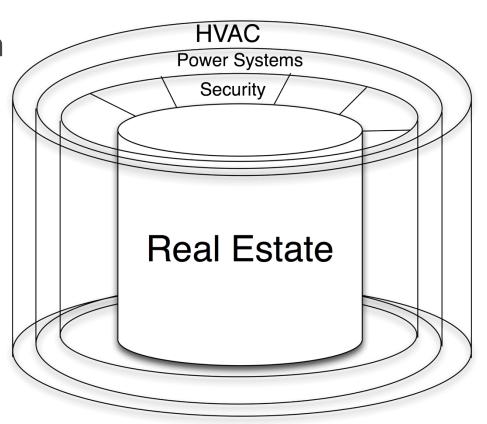
- Cluttered marketplace for Internet Data Centers (IDC)
- How do you compare colo company X with IDC Y?
- Model for categorizing any IDC
- Very helpful abstraction

The Model



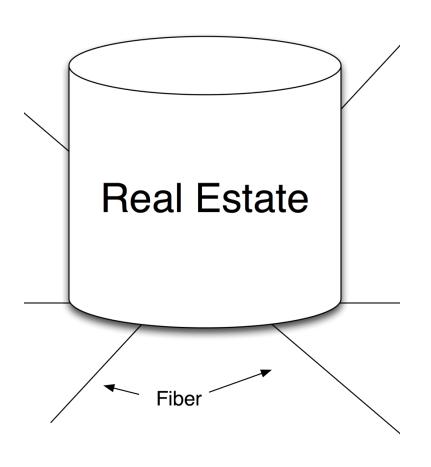
Data Center Operations

 Start with the basic data center



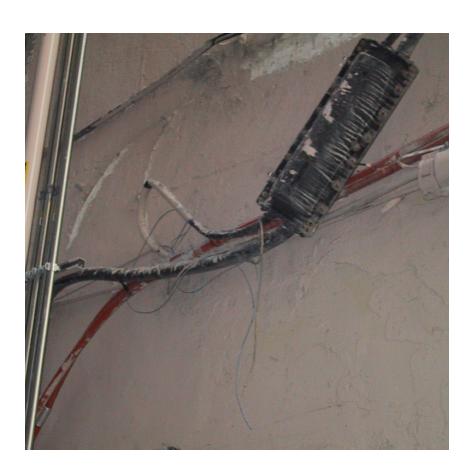
Real Estate

- Physical space and fire suppression systems
- Desirability of real estate-NJ?
- Travel incognito story
 - Rights of way railroad
- Cost per sq meter
- Ease of access
- Price of power in area
- Proximity to fiber
- Floor loading
- Local gov't support
- ..hundreds of selection criteria



Fiber Entrance

 Fiber entrance facilities vary in quality



Secured Fiber Entrance

- Conduits
- concrete





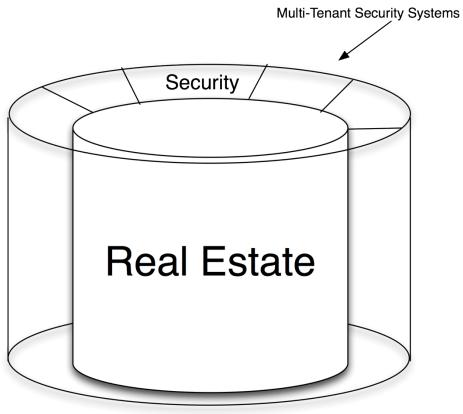
Real Estate and Fiber Entrance

Inter-floor ducts



Security





Multi-tenant vs. single tenant shown in ring

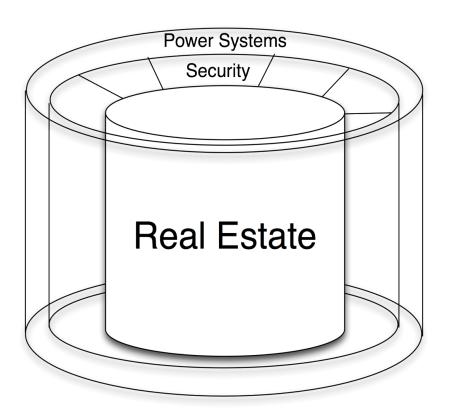
Security

- Guard gates
- Mote
- Man Traps
- Bullet proof glass
- Authentication system
 - Multi-tenant challenges
- Underground bunker
- Surveillance cameras
- Cage access logs



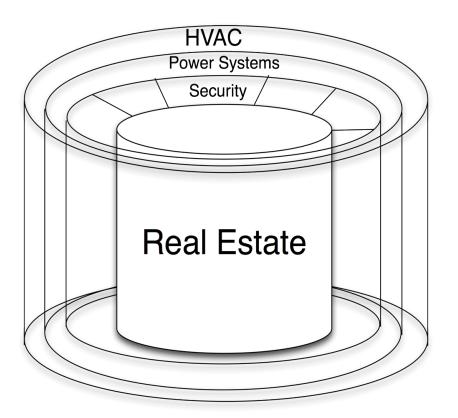
Power systems

- Conditioned Power
 - Reliable Power
 - Brownouts, cutovers
- Generators vs. Flywheel
- UPS
- Power Distribution
- Tradeoffs / religion here
- Availability and price are key



HVAC

- Heating, Venting, Air Conditioning (HVAC)
- Humidity controlled
- Ambient Temperature
- Stable environment for equipment (65°-85°F)
 45% relative humidity
 Source: IBM
- Economies of scale



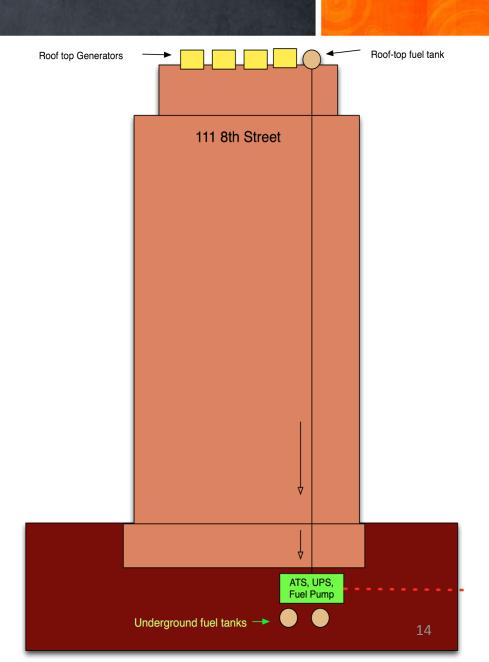
We expect the lights will stay on

- Notification
- Data Center Operations
- Processes and people

• 111 8th street story illustrates this

The 111 8th street story

- New York City
- Major Carrier Hotel
- Power outage
- Genset failures
- What happened?



The 111 8th street story

• What happened?

Pressure increasing

Roof top Generators

Fuel tank was empty – fixed polarity and upper fuel tanks filled up Up on roof – generators not running – why?

Starter motors burned out.

Went across town to supply store. Replaced starter motors. Up on roof – generators not starting – why?

Fuel filters clogged from sludge at bottom of tank Replaced fuel filters – generators up.

24 hours + without notifications

ATS, UPS, Fuel Pump

Underground fuel tanks

15

h Street

Roof-top fuel tank

What we should learn from this outage

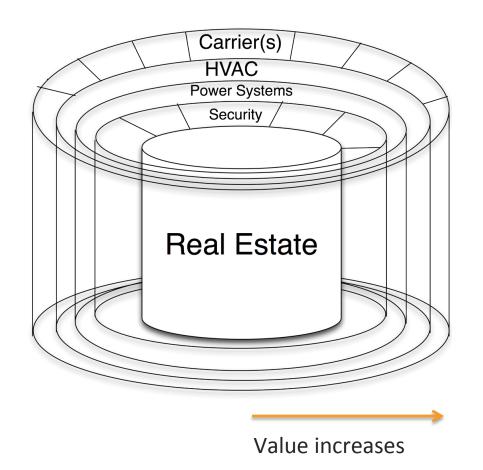
- #1 Things break
- #2 Everyone recognizes #1
- #3 How the IDC keeps participants informed is more important than the outage



Data Center + Carrier -> Not an Island

Data Center Island

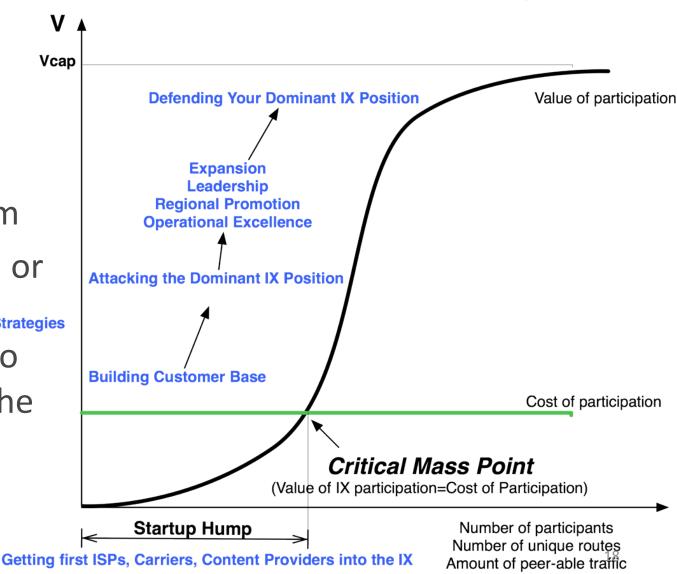
- Add carrier(s)
 - "Lit building"
- Carrier-owned
 - 1 carrier: Carrier POP
 - 1 carrier + hosting:Carrier Hosting Facility
- Carrier-Neutral
 - Which carriers are there
 - Key Selection criteria
 - Multiple carriers: carrier neutral colocation



The Value of an Internet Exchange

Value of the Internet Exchange Point

- Network Externality
- Economists term
- Value or a good or service
 Strategies
 proportionate to
 who else uses the good or service

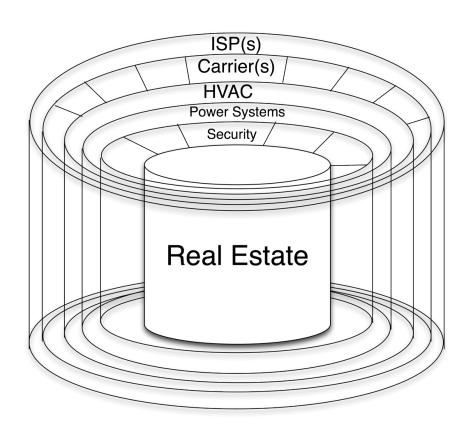


Neutrality

- Qwest won't POP Level 3 Gateways
- Level 3 won't be allowed into Qwest Cyber Centers
- Some customers won't POP a building without multiple carriers
- Some customers won't POP a building without a specific carrier being present
- Terremark acquired by Carrier is it still carrier neutral?

Connected DC + ISP = Internet Data Center

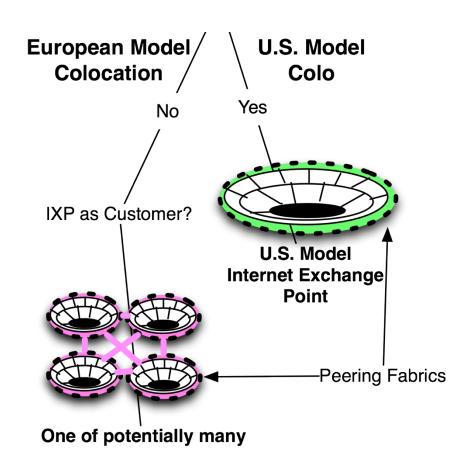
- ISP-owned Data Center
 - ISP POP if for self
 - ISP Hosting Facility if it hosts others
- Carrier and ISP-Neutral Data Center
 - Neutral Colocation Center
 - "carrier-neutral"
- Why is neutrality important?
 - Turkey story.



Wholesale data center space – sell for resale "Telco Hotel"

Internet Exchange Points

- 2 Models
 - European Model
 - US Model
- Challenge:
 - After I explain the difference, tell me the benefits and drawbacks of each



European IXP Model

European Internet Exchange Point Model

European IXP Colocation Company Neutrality

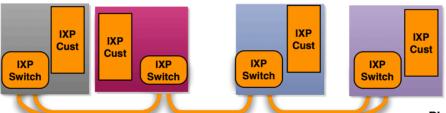
IXP Customers can choose colocation facility that meets their facilities needs. Separate contracts with colocation and IXP Operator

European IXP
Operated by
formal
association
typically founded
by a set of ISPs

European IXP
Operator is typically
a not-for-profit
organization

Prices approximate cost.

Everyone pays the same published fees.



European IXPs spread across multiple colocation facilities interconnected with fiber.

In the "classic LINX model", the colocation provider may subsidize or pay for the elements of having the IXP within the facility (space, power, fiber, equipment costs, etc.).

Massive amounts of public peering traffic (the largest have several 100s of Gbps of publicly peered traffic.)
Traffic stats are public at Euro-IXP

Q: Why does colo operator pay for IXP to be in building?
A: Colocation space more valuable with IXP access there.

See "Value of an Internet Exchange" article for discussion of IXP value IXPs across Europe tend to cooperate more with each other and share information. (Competition creeping in now for largest European IXP) Physical cross connects relatively inexpensive (maybe \$1000 non-recurring install fee) within building.

In some cases, ISPs can run their own wires depending on colocation operator rules

U.S. Model Internet Exchange Point

U.S. Internet Exchange Point Model



(one contract)

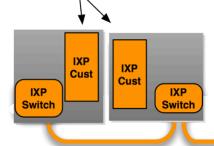
Colocation space is more valuable with well populated IXP access there

U.S. IXP/Colo Operator is typically a for- profit corporation.

Strategic differential pricing.

Prices set strategically. At steady state they approximate what the market will pay.

Multi-tenant building (e.g. infomart in Dallas)



IXP Cust



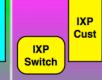
When multiple U.S. colo operators are cohabitants

in a multi-tenant building there are sometimes

conflicts getting inter-colo interconnections since

both competing colo operators have to agree to

their respective customers interconnnections.



U.S. IXP may be spread across multiple colocation facilities interconnected with fiber, but typically this is limited to their own colo facilities within a single metro market.

Colocation Provider/IXP
Operator pays for IXP switch
(es), fiber between and within
their own facilities, then
resells fiber capacity to
customers in their buildings
for private peering.

IXPs across the U.S. primarily compete, cooperate only when customers push for it (i.e. gpf displaced IXP meetings.) Small amounts of public peering traffic comparably (10s of Gbps publicly peer at the larger IXPes.)

Much more private peering.

Traffic stats typically private.

The costs of **private** peering between two IXP buildings (owned by the same IXP Operator) are borne by the ISP. This makes the more densely populated colo more valuable and sough after since the in-building cross connects are generally less expensive than inter-building circuis.

Physical cross connects comparably extensive. (\$250/mo recurring within colocation center.

Only colo operator can run cross connects. Exception: The Seattle Internet
Exchange (SIXP) is perhaps the
largest IXP that more closely
resembles the European model.
It is housed in the Westin building
in Seattle, and is run on a shoe
string budget by and for its
membership. It is the chief
competitor for PAIS Seattle.
There are a few other smallish
non-commercial IXPs in the U.S.
and Canada.

- What are some of the pro's and con's of the U.S. and European Internet Exchange Point models?
- Why are these differences important?



- Zaid Telekom, a large telco, opens a data center for its customers. They claim they will sell to anyone. The encourage their competitors to come and be customers there.
- This data center is best described as a
- A) carrier-neutral IXP?
- B) U.S.-model IXP?
- C) telco hotel?
- D) carrier hosting facility

- Zig Real Estate Holdings converts a very large building into a multifloor data center. They do not operate a network of any kind. They sell only floors and suites.
- This data center is best described as a
- A) U.S.-model IXP
- B) ISP POP
- C) telco hotel
- D) European-model IXP

- IXion builds data
 centers across Africa
 and does not own a
 carrier or ISP network.
 They encourage carriers
 and ISPs to build in, but
 IXion does not buy any
 services from them.
- This data center is best described as a
- A) European-model IXP?
- B) carrier-neutral colocation center?
- C) U.S.-model IXP?
- D) ISP data center

- Central Internet

 Facilities builds data
 centers around the
 world and purchases
 bulk Internet Transit for
 resale inside its data
 center to its tenants.
- This data center is best described as a
- A) hosting company?
- B) carrier-neutral colocation center?
- C) U.S.-model IXP?
- D) carrier POP

- NIX Centre builds a colocation data center complete with a peering fabric in Nigeria. It sells rack space to anyone but markets itself to the ISP community as a peering point. It does not operate a network and does not buy or resell any network.
- This data center is best described as a
- A) European model IXP?
- B) carrier-neutral colocation center?
- C) U.S.-model IXP?
- D) carrier POP

- Ninter operates a shared peering fabric across multiple colocation buildings.
 Other than this LAN, it does not operate a network.
- This data center is best described as a
- A) European-model IXP?
- B) carrier-neutral colocation center?
- C) U.S.-model IXP?
- D) ISP data center