



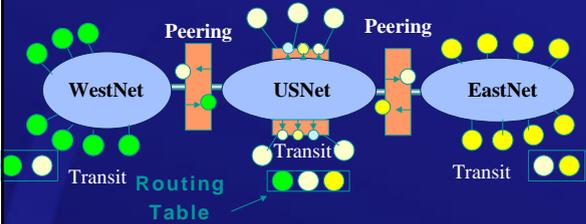
Peering Decision Tree

William B. Norton
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Definitions of Peering and Transit

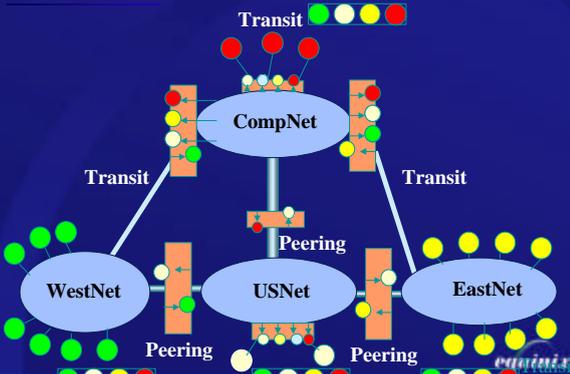
Def: Peering is the business relationship whereby ISPs reciprocally announce reachability to each others' transit customers



Def: Transit is the business relationship whereby one ISP sells access to all destinations in its routing table.

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Example: Peering and Transit



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European Peering Study

Transit	\$\$\$
Partial Transit	\$\$
Paid Peering	\$
Peering	-\$

- Usage-based motivation
- More work to be done here

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Peering Decision Tree Paper

Based on Interviews with 50+ ISP Peering Coordinators, ...
"Validated" at NANOG & LINX meetings

3 General Phases of Peering:

- 1) Identification of Potential Peer
- 2) Initial Contact and Qualification
- 3) Implementation Discussions

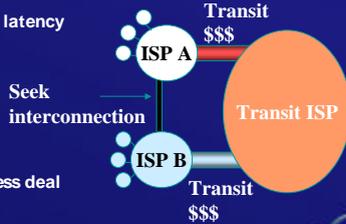
Paper available upon request: wbm@equinix.com
With "Peering White Paper" in Subject

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I. Phase 1: Identification of Peer: Traffic Engineering Data Collection and Analysis

Motivations for peering:

- Financial: Reduce load on expensive Transit service
 - Traffic src/dest
- Measure vs Intuit
- Usage-based Billing
- Engineering: Lower latency
- Result → Top 10 list



- Part of larger business deal
- Transition Strategy

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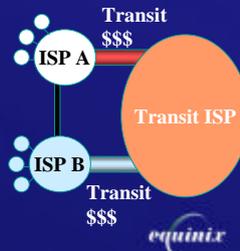
Case Study: Flawed Tier 1 Migration Strategy

Step 1: Buy Transit, Market Services

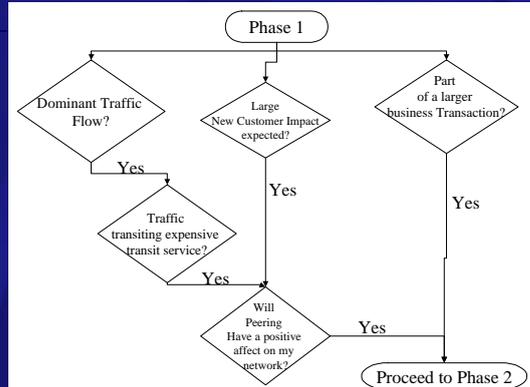
Step 2: Build your own infrastructure, establish Peering to Reduce Transit

Step 3: Convert paid Transit into free Peering

Step 3 difficult. War stories



Phase 1: Identification of Potential Peer



II. Phase 2: **Contact** & Qualification Initial *Peering Discussion*

The most difficult thing...

How to make contact with potential peer ISP?

- E-mail person or peering@ispdomain.net
- Exchange point participant list
- Tech-c/admin-c from DNS/ASN registries
- Engineering Forums NANOG, IETF, RIPE, etc.
- Trade shows: speakers and booth staff
- Target ISP sales force
- Target ISP NOC

Peering Contact Database

- Initiated at NANOG 17 : [Get me your card](#)
 - Handwrite: PeeringEmailTo: peering@ispdomain.net if avail
 - Handwrite: AS Number
 - Cross out stuff you don't want in spreadsheet
 - This process = ISPs Will Peer
- I e-mail Peering Contact Database to all ~monthly
- Peering White Paper? Write 'PWP' on card or E-mail: wbn@equinix.com

II. Phase 2: **Contact** & Qualification, Initial *Peering Discussion*

Once contact is made...

- Sometimes Mutual NDA
- Exchange BiLateral Peering Agreement (BLPA)
- Traffic Data justification shared

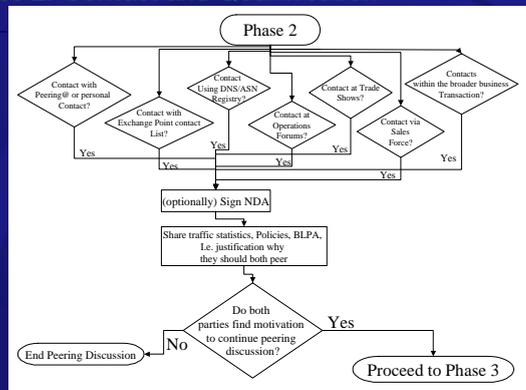
One basis: Peering iff PeeringCost < TransitSavings?

- Requirements Exchange (e.g. Must be at n Public Peering Points, xMbps, private peering migration strategy, etc.)

Either Party may walk away....

If still interested, implementation discussion...

Phase 2: Contact and Qualification



III. Phase 3: Implementation Discussions

How to interconnect?

Direct Circuit-based Interconnection
VS.
Exchange-Based Interconnection

White Paper available:

"Interconnection Strategies for ISPs"

Email request to: <wnb@equinix.com>



Cost Comparison at n=5

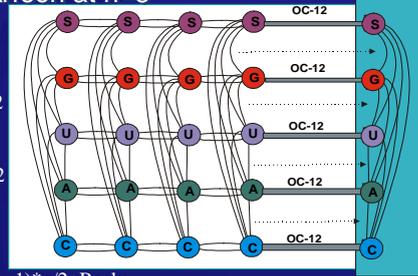
$$\text{costDCfn}() = (n-1) * C/2$$

$$C = \text{OC-3 @ } \$11,400$$

$$n = 5$$

$$\text{costDC} = (4) * \$11,400 / 2$$

$$\text{costDC} = \$22,800/\text{mo}$$



$$\text{costExchfn}() = \text{BDC} + (n-1) * x/2 + \text{Racks}$$

$$\text{BDC} = \text{OC-12 @ } \$23,000$$

$$n = 5, 1 \text{ Rack @ } \$1500$$

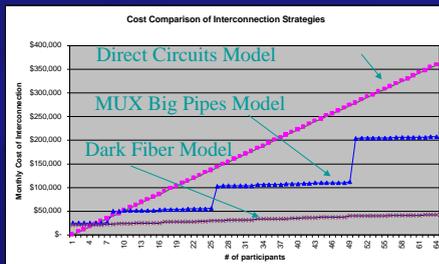
$$\text{costExch} = \$23,000 + (4)(200/2) + \$1500$$

$$\text{costExch} = \$24,900/\text{mo}$$

More expensive to use Exchange-Based Interconnection Strategy at n=5. N>5?



Exchange-based vs. Direct Circuit Interconnection

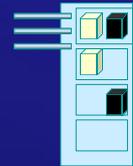


For "Interconnection Strategies for ISPs" e-mail wnb@equinix.com
See <http://www.nanog.org/mtg-9905/norton.html> for slides



9 Exchange Selection Criteria

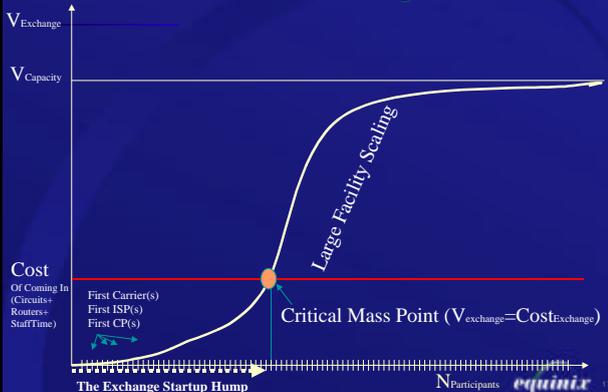
- Telecommunications Access Issues
- Deployment Issues (getting in & up)
- ISP Current Presences (there yet?)
- Operations Issues (restrictions?)
- Business Issues (neutrality/alignment)
- Cost Issues (\$\$)
- Credibility Issue (backing, attraction) →
- Exchange Population (side effect)
- Existing vs. Emerging Exchange?



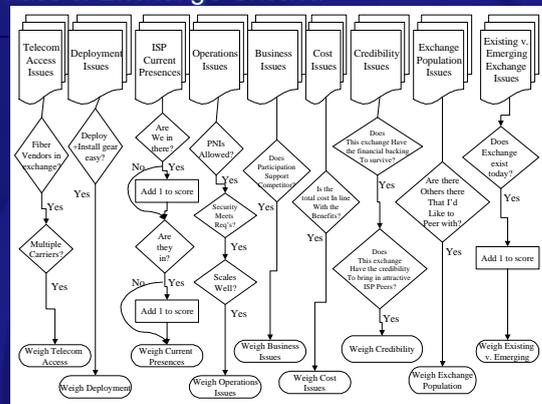
Exchange



Value of the Internet Exchange



Phase 3: Exchange Criteria



IV. Summary

Findings from Interviews

Three phases to peering:

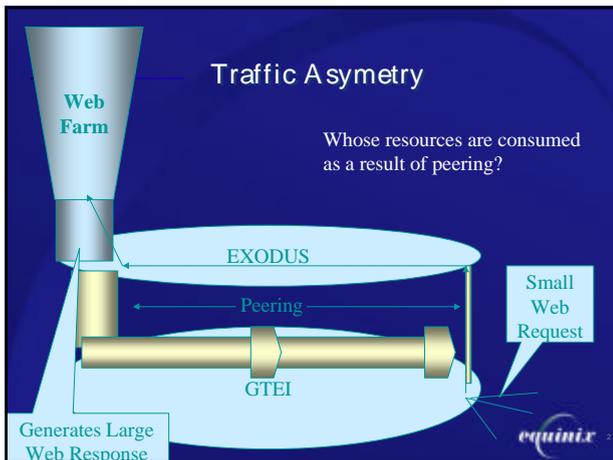
- 1) Identification of Potential Peers
- 2) Contact & Qualification
- 3) Implementation Discussions

9 Selection Criteria for Exchanges
(Vary in relative weighting of criteria)



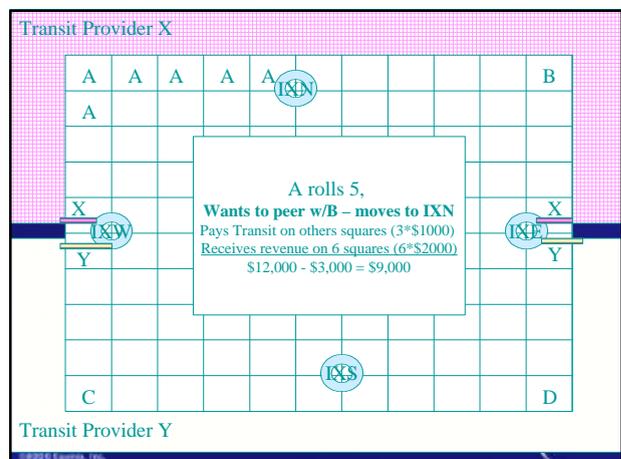
Thanks to!

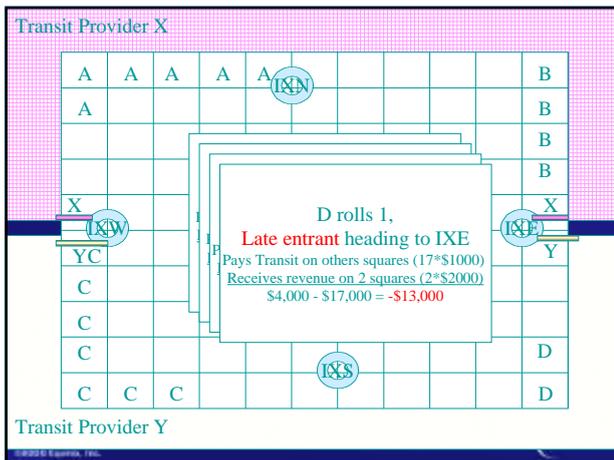
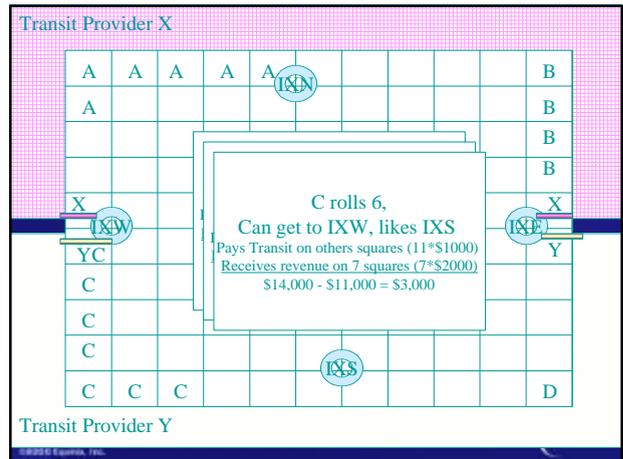
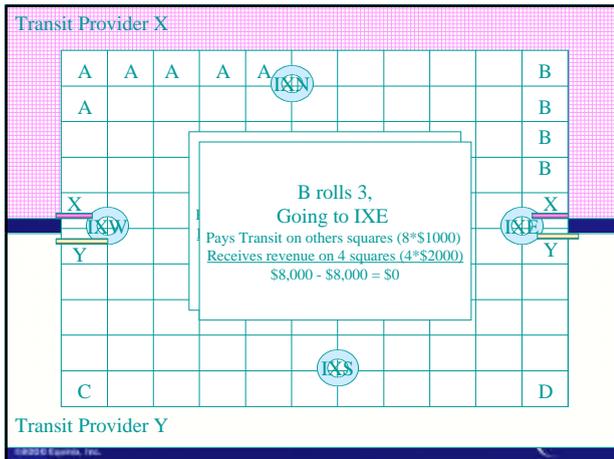
Thanks to those who helped with the latest draft (1.3): Ren Nowlin (Onyx), Joe Payne (IXC), Dave Diaz (NetRail), Jake Khuon (Frontier GlobalCenter), Patricia Taylor-Dolan (Level 3 Communications), Cathy Wittbrodt (Excite@Home), John Curran (NextLink), Jeff Rizzo and Dan Gisi (Equinix), Tom Ryan (NewEdge), Alex Bligh (GX Network), Steve Meuse (GTE), Keith Mitchell (LINX), Aaron Dudek (Sprint), Waqar Kahn (Qwest), Brian Dickson (TeleGlobe)



The Peering Simulation Game Rules

- Goal: Maximize bank holdings. Make money by acquiring customers by expanding ISP network and reduce transit costs by peering
- Play: select a card and expand your network by selecting that many adjacent "squares" of regional customers
- Gain transit revenue of \$2000 for each customer square
- Pay transit cost of \$1000 for each square of traffic that other ISPs own
- If at Exchange Point, two ISPs can negotiate peering:
 - \$2000 recurring cost and loss of 2 turns, ISPs negotiate cost sharing
 - Peering ISPs do not have to pay transit for each others squares





Scoreboard after Round 1

- ISP A: \$9,000
- ISP B: \$0
- ISPC: \$3,000
- ISPD: -\$13,000

• On to Round 2 →

