

The Peering Simulation Game

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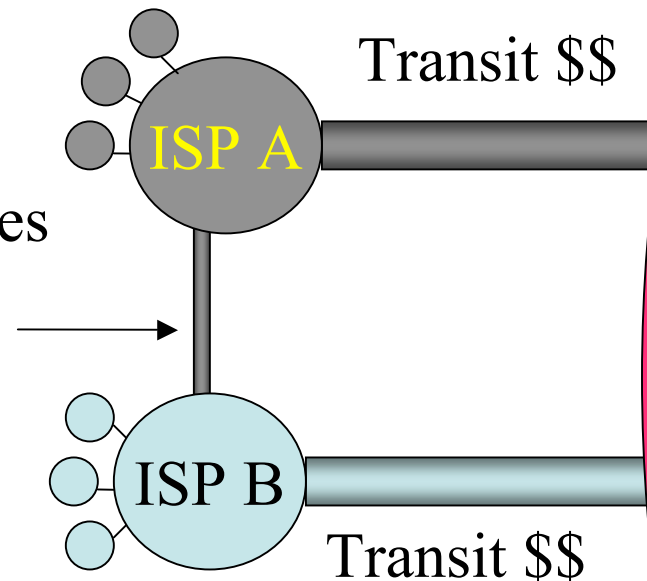
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APRICOT Bali 2007

3 minute Intro to Peering

Peering provides routes only to each others customers



- 1) Transit costs big bucks.
(But it is a convenient plug in the wall that says “Internet → this way”)
- 2) Peering costs very little and reduces transit costs.
- 3) Q: Who to peer with and how to justify costs of peering?

Sound simple? Summary findings.

Like any professional pursuit,



It may seem easy, but...

Peering Coordinators role is more than just walking the walk...

Peering Negotiation takes practice



Because, sometimes things just don't work right the first time.

Especially in an industry running at full speed...

And our industry is running at full speed!



It takes skill and technique to overcome the hurdles we face.

Particularly when we try and negotiate peering with larger networks...

To get Peering, Cajoling may seem like a good idea at the time...



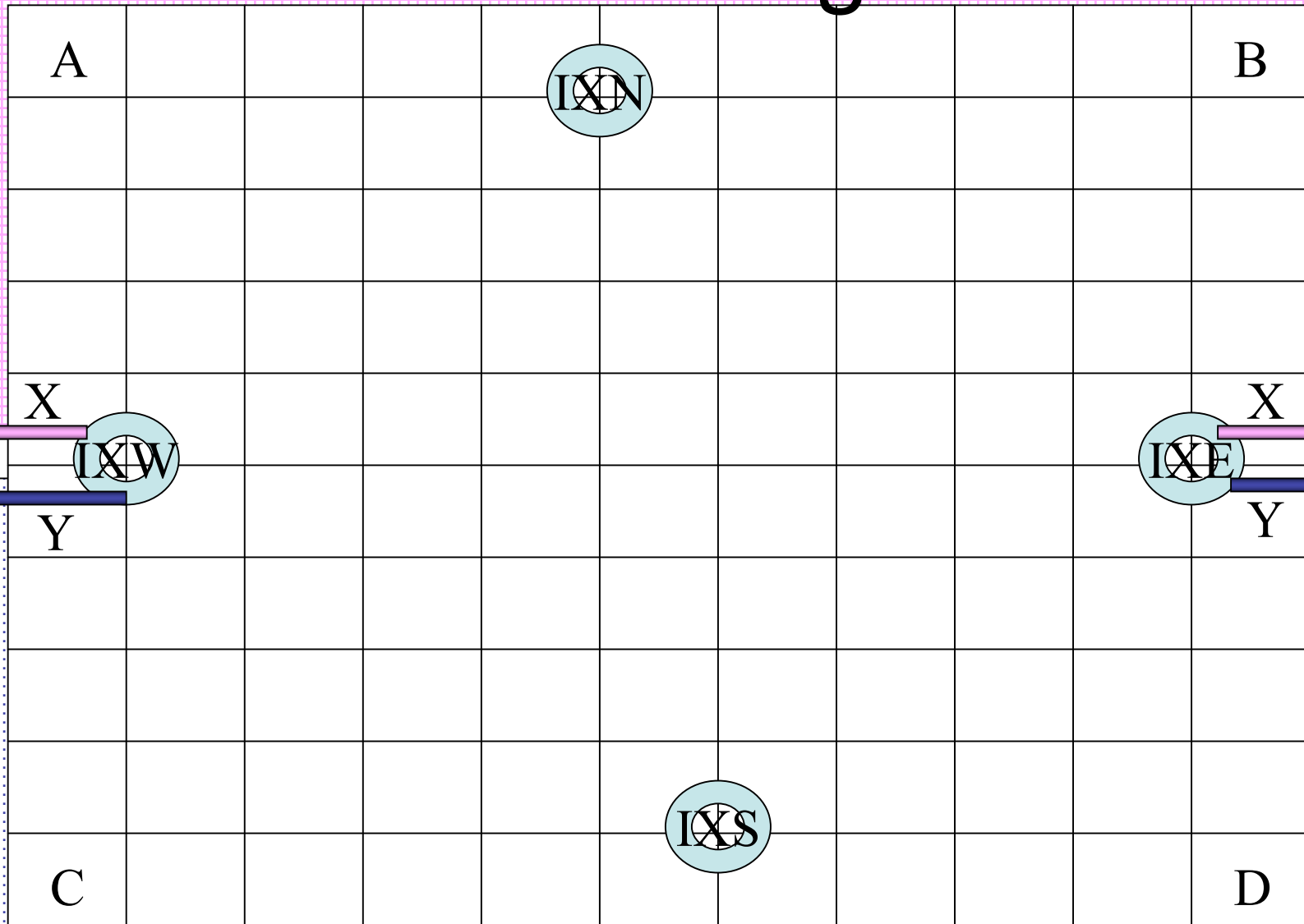
But larger ISPs may see things differently...

Peering is a game of relationships



Transit Provider X

The Peering Game



Transit Provider Y

3 Rules

1. Goal: **Maximize bank holdings**. Make money by acquiring customers and reduce transit costs by peering
2. Play: Roll the dice and expand your network by selecting that many adjacent “squares” of customers

Gain transit revenue of \$2000 for each customer square you own

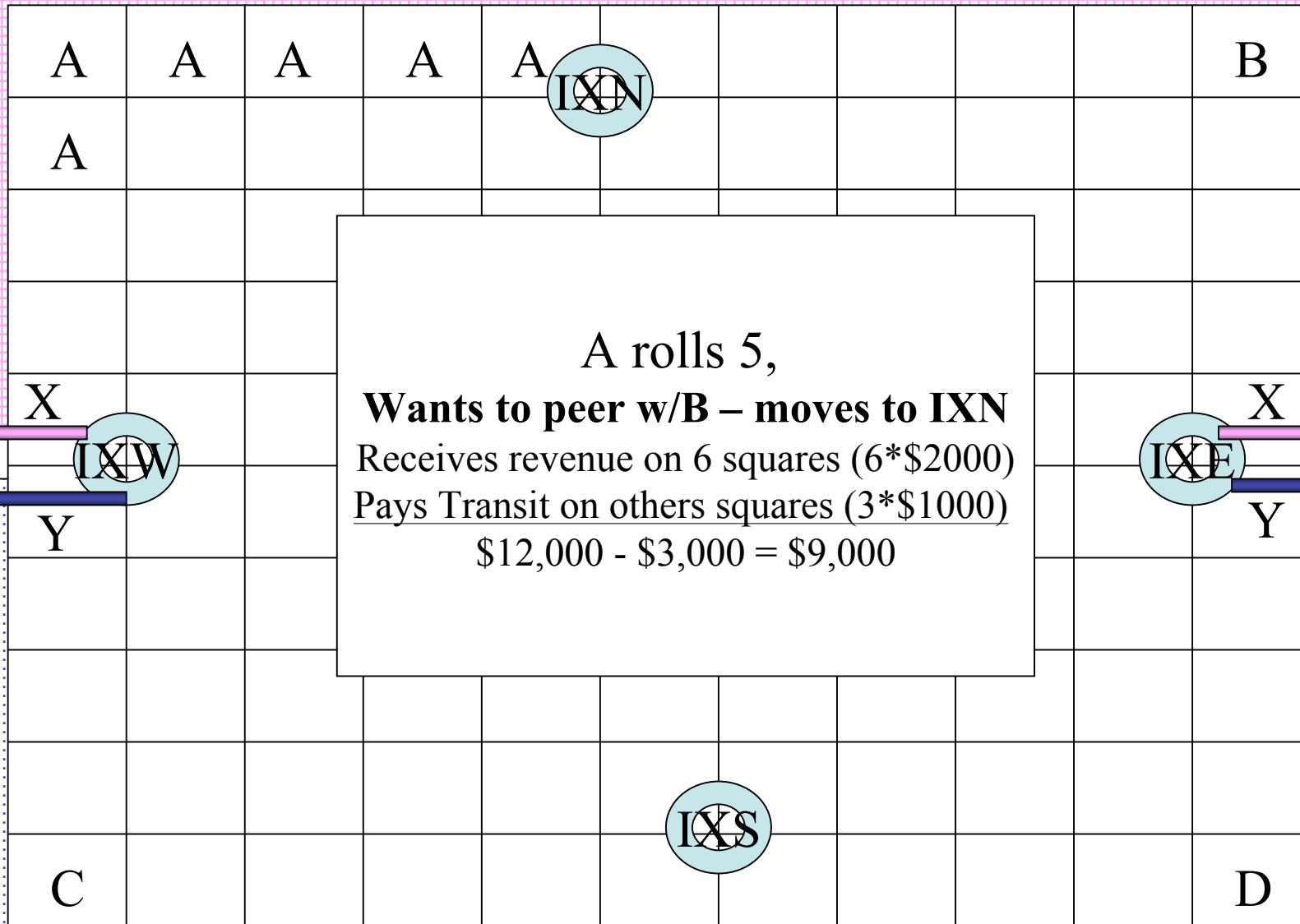
Pay transit fees of \$1000 for each square of traffic that **other** ISPs own

3. If at Exchange Point, two ISPs can **negotiate peering**:

- \$2000 recurring cost and loss of 2 turns, ISPs negotiates who covers the costs of peering

Quick round...

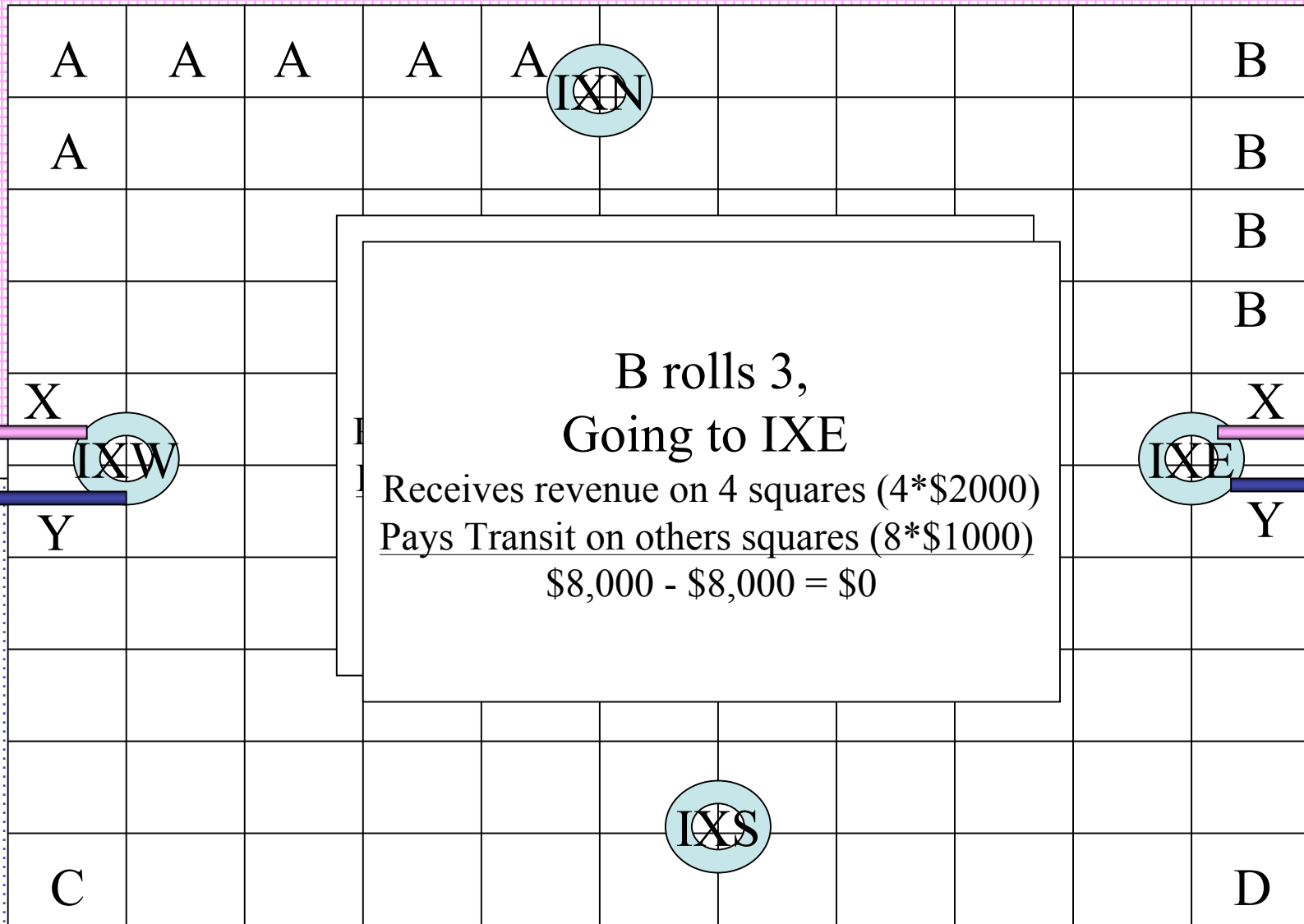
Transit Provider X



A rolls 5,
Wants to peer w/B – moves to IXN
Receives revenue on 6 squares (6*\$2000)
Pays Transit on others squares (3*\$1000)
 $\$12,000 - \$3,000 = \$9,000$

Transit Provider Y

Transit Provider X



Transit Provider Y

Transit Provider X

A	A	A	A	A	IXN						B
A											B
											B
											B
X											X
IXW											IXE
YC											Y
C											
C											
C											
C	C	C				IXS					D

C rolls 6,
 Can get to IXW, likes IXS
 Receives revenue on 7 squares (7*\$2000)
 Pays Transit on others squares (11*\$1000)
 $\$14,000 - \$11,000 = \$3,000$

Transit Provider Y

Transit Provider X

A	A	A	A	A	IXN						B
A											B
											B
											B
X											X
IXW											IXE
YC											Y
C											
C											
C											D
C	C	C			IXS						D

D rolls 1,
Late entrant heading to IXE
 Receives revenue on 2 squares (2*\$2000)
 Pays Transit on others squares (17*\$1000)
 $\$4,000 - \$17,000 = -\$13,000$

Transit Provider Y

Scoreboard after Round 1

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

Transit Provider X

A	A	A	A	A	IXN						B
A											B
A											B
A											B
XA											X
IXW											IXE
YC											Y
C											
C											
C											D
C	C	C	C								D

A rolls 3,
Attaches to IXW

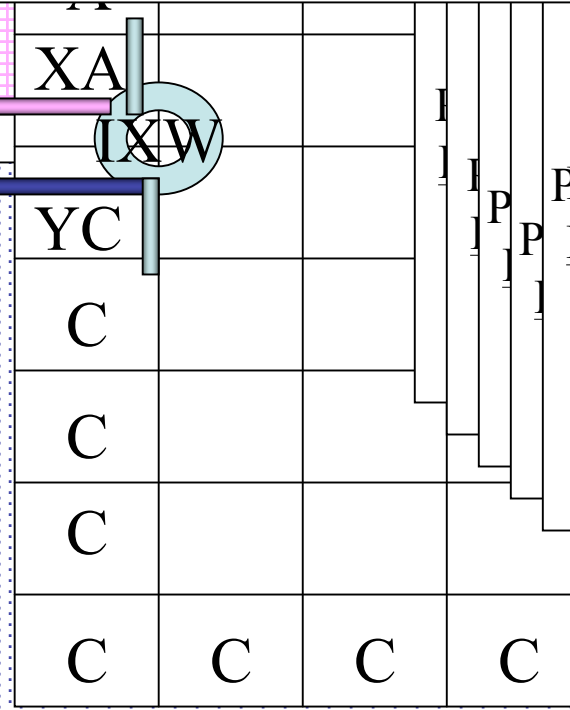
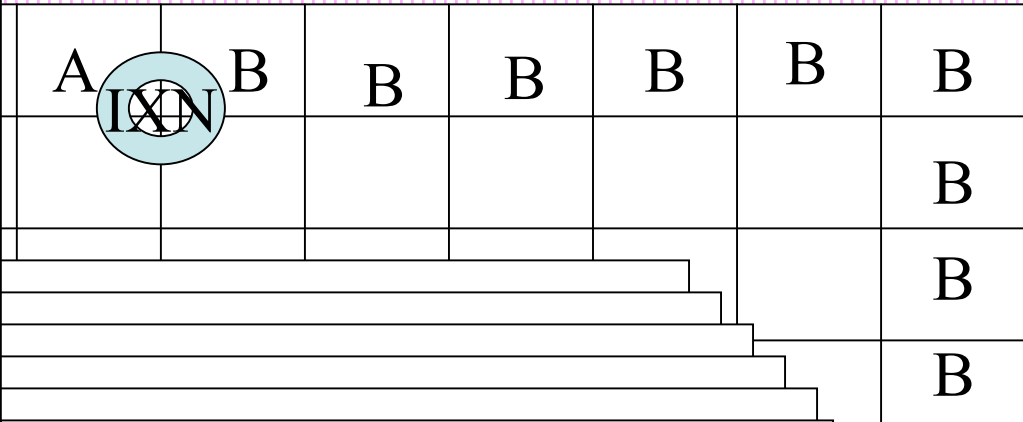
Receives revenue on 9 squares (9*\$2000)
Pays Transit on others squares (13*\$1000)
\$18,000 - \$13,000 = \$5,000

Wants to peer with C – split costs?
YES: -\$1,000 + both lose a turn
Neither has to pay transit to each other!

Transit Provider Y

Transit Provider X

A Position
 9 Revenue squares
 1 lost turn
 Peering w/C
 reduced cost \$8000/turn



B rolls 6,
 Attaches to IXE*IXN
 Receives revenue on 10 squares (10*\$2000)
 Pays Transit on others squares (21*\$1000)
 $20,000 - 21,000 = -\$1,000$
 Wants to peer with A – split costs?
 NO: You pissed me off,
 Yes: if \$0 & B lose both turns
 Both walk away



Transit Provider Y

Let's play!

WELCOME TO **BILLAND**

4 ISPs that have never played before

Open Board

~~\$35,000 VC Funding~~

\$25,000 VC Funding – HARD Economic Times

We want to hear your thought process and
peering negotiations

Winner - prize

Play Game

Internet Service Provider **Starting Point**

Get **\$2000 revenue** for each square you own

Pay **\$1000 transit fee** to your upstream for each square others own

Internet Exchange Point East

Reduce transit fee by peering with other ISPs at exchange point; \$2000 per round and loss of 2 turns, split how ISPs see fit **peering costs**

Peering Array

ROUND	PLAYER	Roll	Bonus Content Squares # Squares Owned	Revenue (Squares * \$2000)	# Others Squares	Transit Cost (*\$1000)	Peering Costs	Net	Running Total	XpeerY	PLAYER	Pay for Transit to A?	Pay for Transit to B?	Pay for Transit to C?	Pay for Transit to D?	Sum of Transit \$\$\$ paid to X	Sum of Transit \$\$\$ Paid to Y
0	A	##	1	\$0	3	\$0	\$0	\$0	\$0		A	1	1	1	1	\$	
0	B	##	1	\$0	3	\$0	\$0	\$0	\$0		B	1	1	1	1	\$	
0	C	##	1	\$0	3	\$0	\$0	\$0	\$0		C	1	1	1	1	\$	
0	D	##	1	\$0	3	\$0	\$0	\$0	\$0		D	1	1	1	1	\$	
copy	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$25,000	\$25,000	A	1	1	1	1	\$	
copy	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$25,000	\$25,000	B	1	1	1	1	\$	
copy	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$25,000	\$25,000	C	1	1	1	1	\$	
copy	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$25,000	\$25,000	D	1	1	1	1	\$	
Jan	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$24,000		A	1	1	1	1	\$	3,000
Jan	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$24,000		B	1	1	1	1	\$	6,000
Jan	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$24,000		C	1	1	1	1	\$	3,000
Jan	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$24,000		D	1	1	1	1	\$	6,000
Feb	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$23,000		A	1	1	1	1	\$	9,000
Feb	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$23,000		B	1	1	1	1	\$	12,000
Feb	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$23,000		C	1	1	1	1	\$	9,000
Feb	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$23,000		D	1	1	1	1	\$	12,000
Mar	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$22,000		A	1	1	1	1	\$	15,000
Mar	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$22,000		B	1	1	1	1	\$	18,000
Mar	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$22,000		C	1	1	1	1	\$	15,000
Mar	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$22,000		D	1	1	1	1	\$	18,000
Apr	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$21,000		A	1	1	1	1	\$	21,000
Apr	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$21,000		B	1	1	1	1	\$	24,000
Apr	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$21,000		C	1	1	1	1	\$	21,000
Apr	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$21,000		D	1	1	1	1	\$	24,000
May	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$20,000		A	1	1	1	1	\$	27,000
May	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$20,000		B	1	1	1	1	\$	30,000
May	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$20,000		C	1	1	1	1	\$	27,000
May	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$20,000		D	1	1	1	1	\$	30,000
Jun	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$19,000		A	1	1	1	1	\$	33,000
Jun	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$19,000		B	1	1	1	1	\$	36,000
Jun	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$19,000		C	1	1	1	1	\$	33,000
Jun	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$19,000		D	1	1	1	1	\$	36,000
Jul	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$18,000		A	1	1	1	1	\$	39,000
Jul	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$18,000		B	1	1	1	1	\$	42,000
Jul	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$18,000		C	1	1	1	1	\$	39,000
Jul	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$18,000		D	1	1	1	1	\$	42,000
Aug	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$17,000		A	1	1	1	1	\$	45,000
Aug	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$17,000		B	1	1	1	1	\$	48,000
Aug	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$17,000		C	1	1	1	1	\$	45,000
Aug	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$17,000		D	1	1	1	1	\$	48,000
Sep	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$16,000		A	1	1	1	1	\$	51,000
Sep	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$16,000		B	1	1	1	1	\$	54,000
Sep	C	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$16,000		C	1	1	1	1	\$	51,000
Sep	D	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$16,000		D	1	1	1	1	\$	54,000
Oct	A	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$15,000		A	1	1	1	1	\$	57,000
Oct	B	##	1	\$2,000	3	(\$3,000)	\$0	(\$1,000)	\$15,000		B	1	1	1	1	\$	60,000

Notes:

Can only move adjacently and diagonally

Hint: Calculate cost of NOT peering vs. Cost of peering

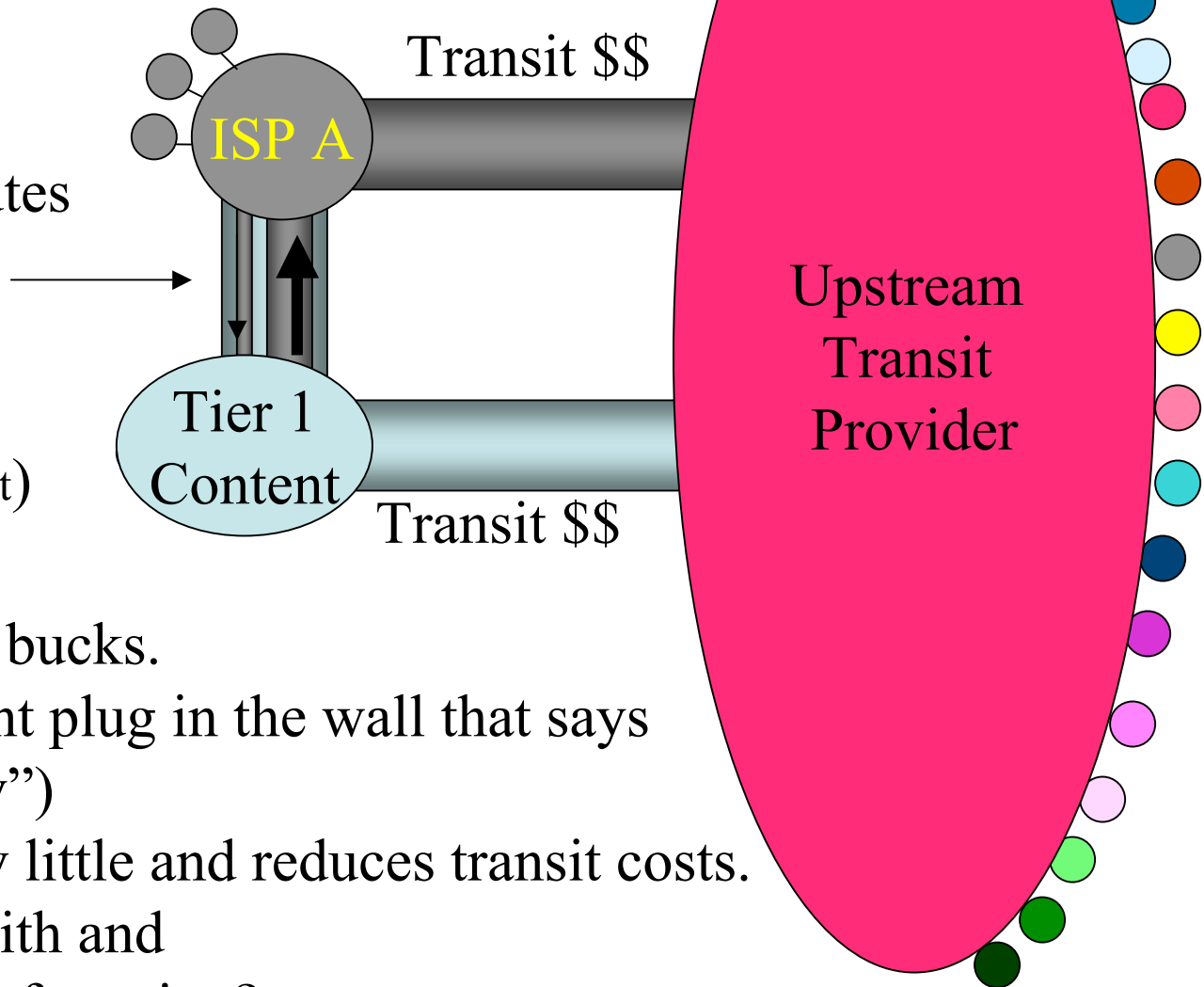
At end of game we assume all roll a 3 for remaining rolls

Winner is the ISP will the largest bank account at the end

Calculate

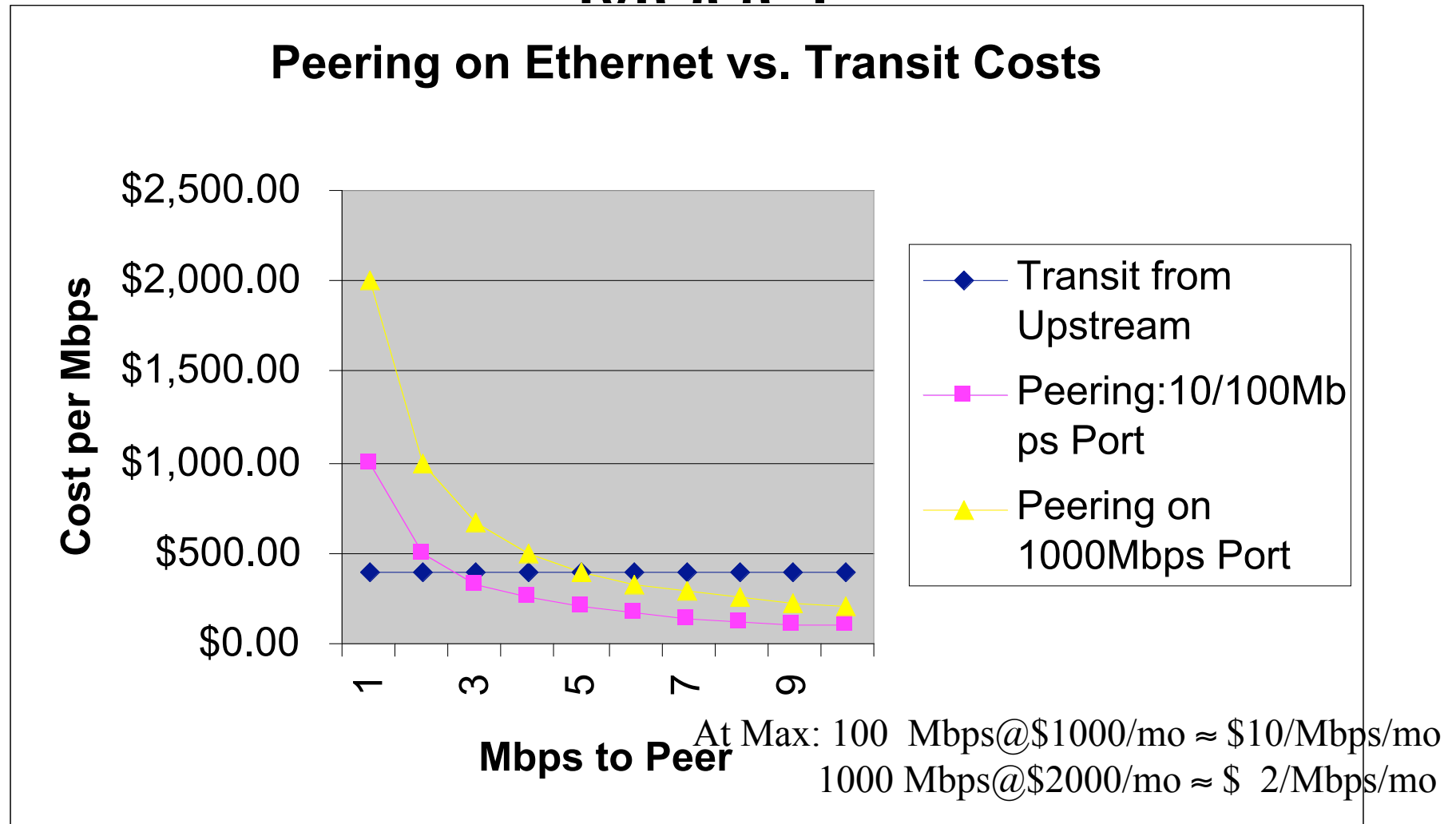
Content Peering

Peering provides routes only to each others customers (asymmetric traffic, true,... But, both companies benefit)



- 1) Transit costs big bucks.
(But it is a convenient plug in the wall that says “Internet → this way”)
- 2) Peering costs very little and reduces transit costs.
- 3) Q: Who to peer with and how to justify costs of peering?

Content Peering Financial Model



Source: Qwest/L3 quotes for OC-3 Transit@\\$60K/mo=\\$388/Mbps/mo
 Equinix GigE Peering Package (LINX/AMS-IX similar)

Summary

- Cost of peering insignificant relative to long term savings of transit costs
- Peering Simulator vs. Peering Reality?
- White Papers Available (wbn@equinix.com)
 - “Interconnection Strategies for ISPs”
 - “Internet Service Providers and Peering”
 - “Cost Saving Strategies for ISPs”
 - Soon: “Content Peering” and “Build vs. Buy Internet Datacenters”
- Let’s talk over BEER(s)!