The Internet Peering Playbook

Understanding the
Internet Transit Playbook

1 Internet Transit Playbook

Tricks of the Trade for Connecting to the <u>Edge</u> of the Internet

Transit Playbook

- "What are the tricks of the trade used when purchasing transit?"

- **Not recommended** – you need to know they exist…

…and helps understand the context

- I lived in Ann Arbor – maneuvers to get across town
  - Drive across parking lots
  - Drive through schools with multiple entrances
  - Drive through gas stations
  - By application you understand the layout of the town better

Problem Set

- You have learned everything you need to do this.
- Can you come up with any "Tricks of the Trade" on your own?
  - ways that reduce the monthly Internet Transit costs?
- Assume you are purchasing Internet Transit in an Internet Region with:
  1. Price Declines Yearly
  2. 95th Percentile Zero Commit for $20/Mbps
  3. 95th Percentile Commits as shown below
  4. Open market for Transit
     - Pricing Varies Widely (20-50%)
     - Terms are negotiable
     - Highly Competitive Market

Commit		Unit Price		MinSpend	
10 Mbps		$12	per Mbps	$120	/month
100 Mbps		$5	per Mbps	$500	/month
1 Gbps		$3.50	per Mbps	$3,500	/month
10 Gbps		$1.20	per Mbps	$12,000	/month
100 Gbps		$0.70	per Mbps	$70,000	/month

The Internet Transit Playbook

1. Optimal Internet Transit
2. Gaming the 95th percentile
3. Multi-home
4. Renegotiate multi-year term contracts every year
5. Play the market
6. Resell Transit
7. Secret Sauce Transit
8. Build into Cheap Transit Internet Region
9. Internet Transit Troughs
10. Capture Content and Access Customers

The Internet Transit Playbook

11. Short-term Transit

12. Deploy Trial Gear into Operational Environment

13. Build into better Transit Market

Tactic 1 – Optimal Transit

Commit		Unit Price		MinSpend	
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Look at 10Mbps commit
& look at 100Mbps commit
across the # of Mbps I might send

Traffic	Commit	Unit Price	Monthly Bill
800Mbps	10Mbps@	$12	$9600
800Mbps	100Mbps@	$5	$4000
800Mbps	1000Mbps@	$3.50	$2800→$3500
800Mbps	10000Mbps@	$1.20	$960→$70,000

Tactic 1 – Optimal Transit

Traffic volume	10Mcommit		100Mcommit
1 Mbps=	$120	/month	$500 /month
2 Mbps=	$120	/month	$500 /month
3 Mbps=	$120	/month	$500 /month
4 Mbps=	$120	/month	$500 /month
5 Mbps=	$120	/month	$500 /month
6 Mbps=	$120	/month	$500 /month
7 Mbps=	$120	/month	$500 /month
8 Mbps=	$120	/month	$500 /month
9 Mbps=	$120	/month	$500 /month
10 Mbps=	$120	/month	$500 /month
11 Mbps=	$132	/month	$500 /month
12 Mbps=	$144	/month	$500 /month

With 10 Mbps commit it is cheaper than 100M commit
if you send a little traffic …

Tactic 1 – Optimal Transit

Traffic volume	10Mcommit	100Mcommit
1 Mbps=	$120 /month	$500 /month
2 Mbps=	$120 /month	$500 /month
3 Mbps=	$120 /month	$500 /month
4 Mbps=	$120 /month	$500 /month
5 Mbps=	$120 /month	$500 /month
6 Mbps=	$120 /month	$500 /month
7 Mbps=	$120 /month	$500 /month
8 Mbps=	$120 /month	$500 /month
9 Mbps=	$120 /month	$500 /month
10 Mbps=	$120 /month	$500 /month
11 Mbps=	$132 /month	$500 /month
12 Mbps=	$144 /month	$500 /month
39 Mbps=	$468 /month	$500 /month
40 Mbps=	$480 /month	$500 /month
41 Mbps=	$492 /month	$500 /month
42 Mbps=	$504 /month	$500 /month
43 Mbps=	$516 /month	$500 /month
44 Mbps=	$528 /month	$500 /month
45 Mbps=	$540 /month	$500 /month
46 Mbps=	$552 /month	$500 /month

Tactic 1 – Optimal Transit

Commit		Unit Price		MinSpend	
10	Mbps	$12	per Mbps	$120	/month
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$$optimalTransitMonthlyBill = \min(T_v * P_c, C_{+1} * P_{c+1})$$

$$where$$

$$T_v = transitVolume\_in\_Mbps$$

$$P_c = unit\Pr ice\_at\_commitLevel\_in\_\$\_per\_Mbps$$

$$C = transitCommitLevel\_in\_Mbps$$

$$C_{+1} = transitCommitAtNextLevel\_in\_Mbps$$

$$P_{c+1} = unit\Pr ice\_at\_nextCommitLevel\_in\_\$\_per\_Mbps$$
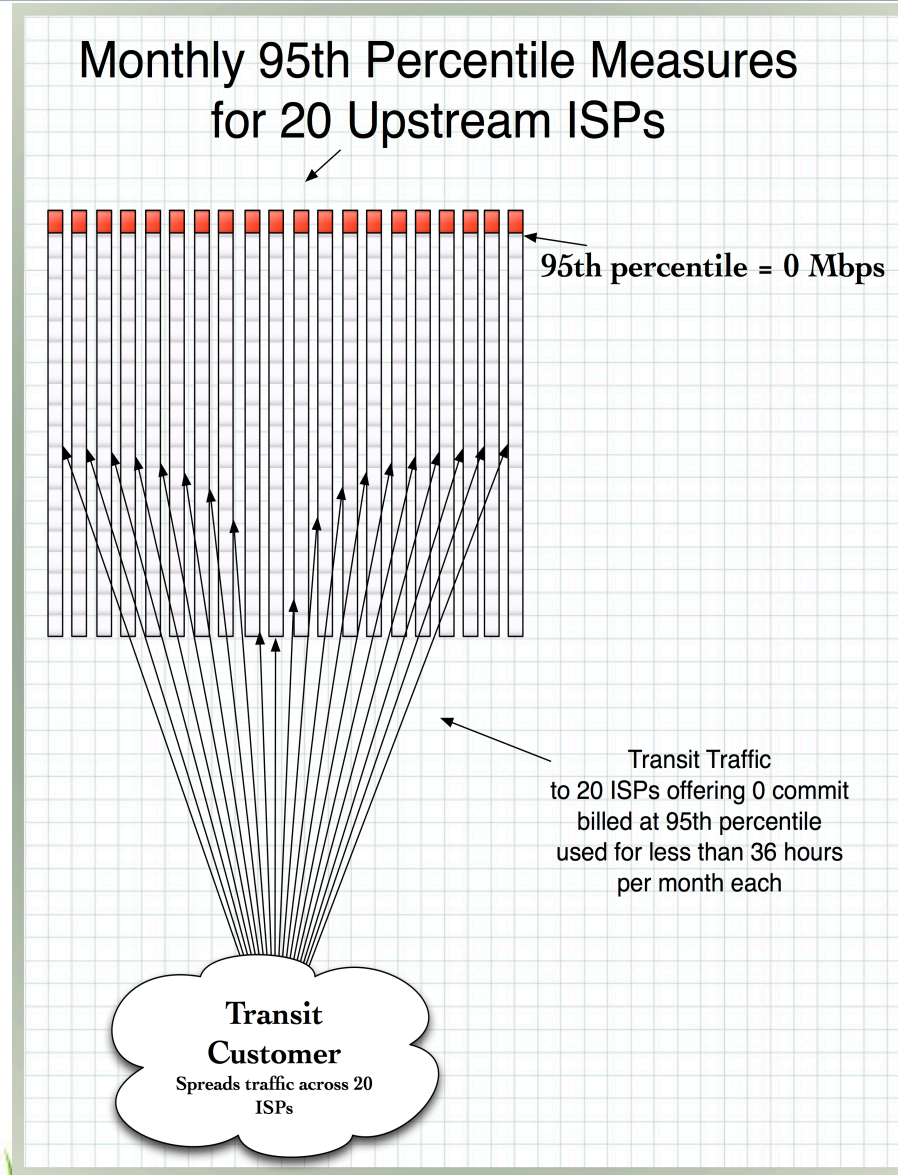
Tactic 2 – Gaming 95th Percentile

- PEERING GEEKY FUN FUN FUN

- In this tactic, an ISP can (theoretically) create a $0 cost Internet Transit service by leveraging two facets of the pricing models discussed so far:

    1) 95th percentile allows one to burst above the 95th percentile mark without any cost, and

    2) there are some ISPs that sell a zero commit Internet Transit service.

    Can you guess it?
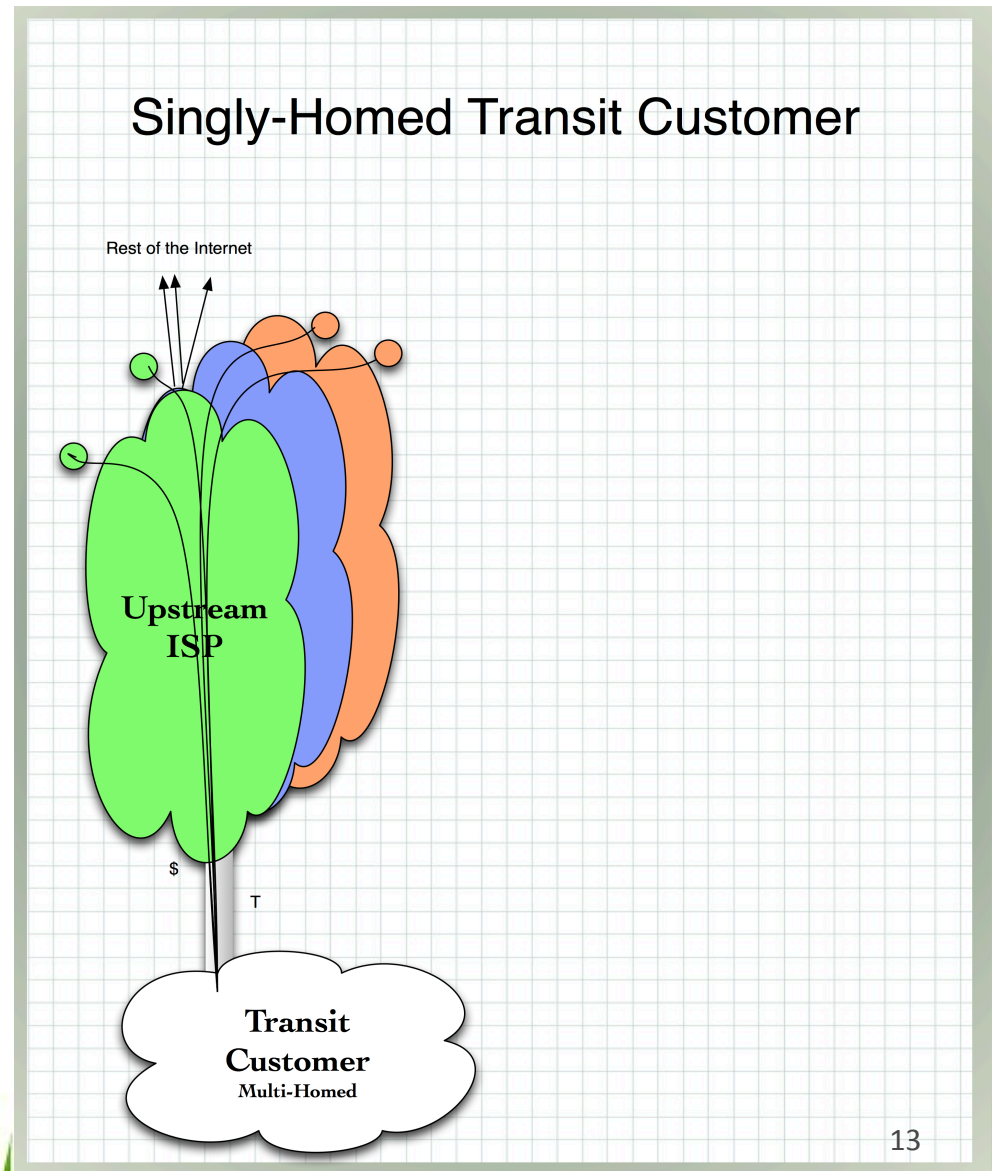
Tactic 2 – Gaming 95th Percentile

- 95th percentile
- 5% of month=36hrs
- 20 ISPs*35.9 hrs=1 mo

- Whoopie:
  - Free Transit!
- Gotchas?

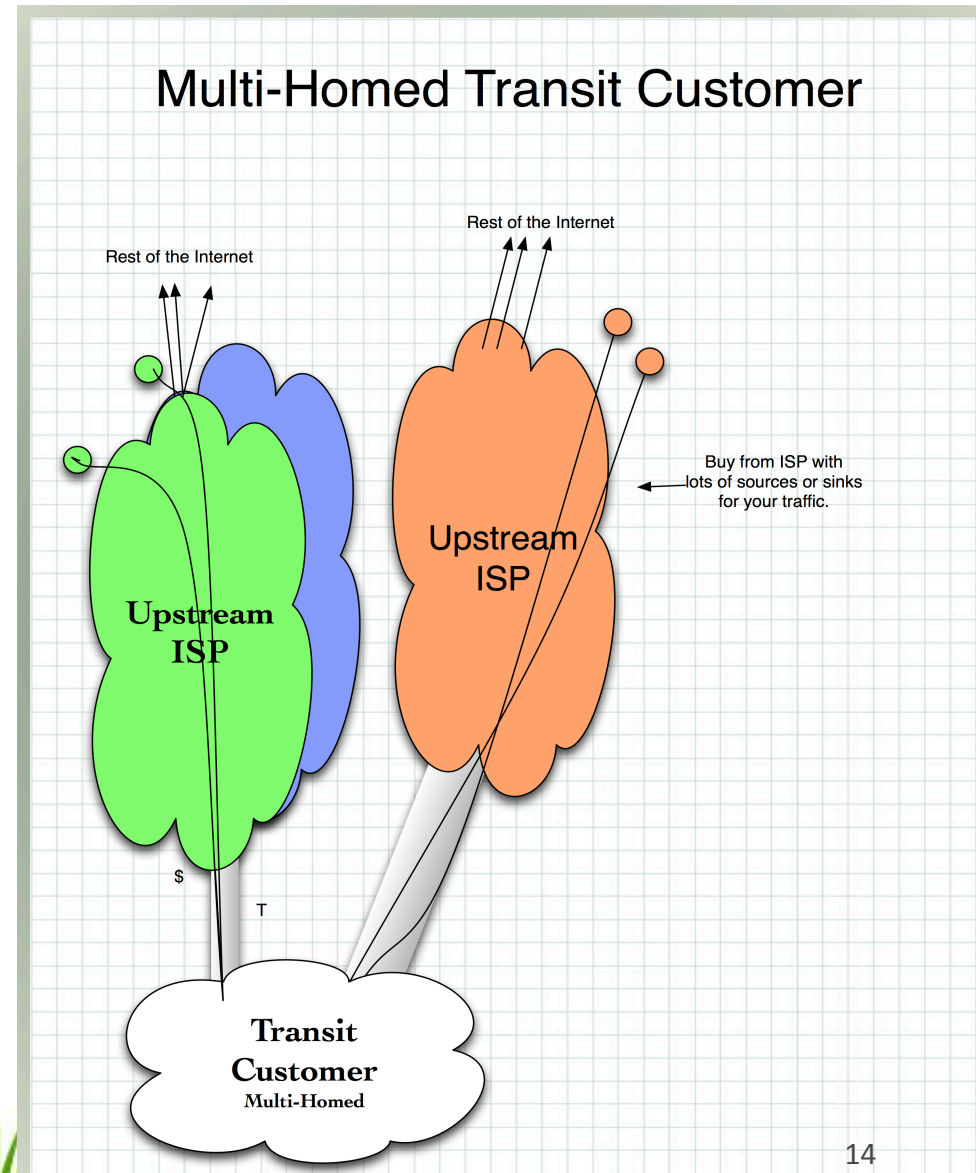Monthly 95th Percentile Measures
for 20 Upstream ISPs

95th percentile = 0 Mbps

Transit Traffic
to 20 ISPs offering 0 commit
billed at 95th percentile
used for less than 36 hours
per month each

Transit
Customer
Spreads traffic across 20
ISPs

Tactic 3 – Multi-Home

- ## Many are singly homed
  - "is negligent"
  - "doesn't buy you much"

- ## No redundancy

- ## Conceptual Hurdle

Singly-Homed Transit Customer

Rest of the Internet

Upstream ISP

$

T

Transit Customer
Multi-Homed

13

Tactic 3 – Multi-Home

- Lock it down story
- Benefits to Multi-Homing:
  - Migration to Peering
  - Open Market at home
  - Open Market at IX
  - Path to open market at colo

Multi-Homed Transit Customer

Rest of the Internet

Rest of the Internet

Buy from ISP with lots of sources or sinks for your traffic.

Upstream ISP

Upstream ISP

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Transit Customer

Multi-Homed

Tactic 4 – Renegotiate multi-year agreement every year

- Highly Competitive Market

- Lock-in for 3 yr. commit?

Historical Internet Transit Pricing Data
Source: http://DrPeering.net

Year	Internet Transit Price	
1998	$1,200.00	per Mbps
1999	$800.00	per Mbps
2000	$675.00	per Mbps
2001	$400.00	per Mbps
2002	$200.00	per Mbps
2003	$120.00	per Mbps
2004	$90.00	per Mbps
2005	$75.00	per Mbps
2006	$50.00	per Mbps
2007	$25.00	per Mbps
2008	$12.00	per Mbps
2009	$9.00	per Mbps
2010	$5.00	per Mbps
2011	$3.25	per Mbps
2012	$2.34	per Mbps
2013	$1.57	per Mbps
2014	$0.94	per Mbps
2015	$0.63	per Mbps

- ## Max 18 mo commit

- ## Clever Burst Strategy
  - ### Min commit/ monthly burst compeition

Historical Internet Tr
Source: http://DrPee
Year   Internet Tr
    1998 $1,2
    1999 $8
    2000 $6
    2001 $4
    2002 $2
    2003 $1
    2004 $
    2005 $
    2006 $

    2007 $
    2008 $
    2009
    2010
    2011
    2012
    2013 $1.57   per Mbps
    2014 $0.94   per Mbps
    2015 $0.63   per Mbps

Re-Negotiate multi-year Internet Transit Agreements every year

$/Mbps

Market price for Internet Transit

Negotiated three year commitment

Re-Negotiated three year commitment

Re-Negotiated three year commitment

Re-Negotiated three year commitment

Re-Negotiated two year commitment

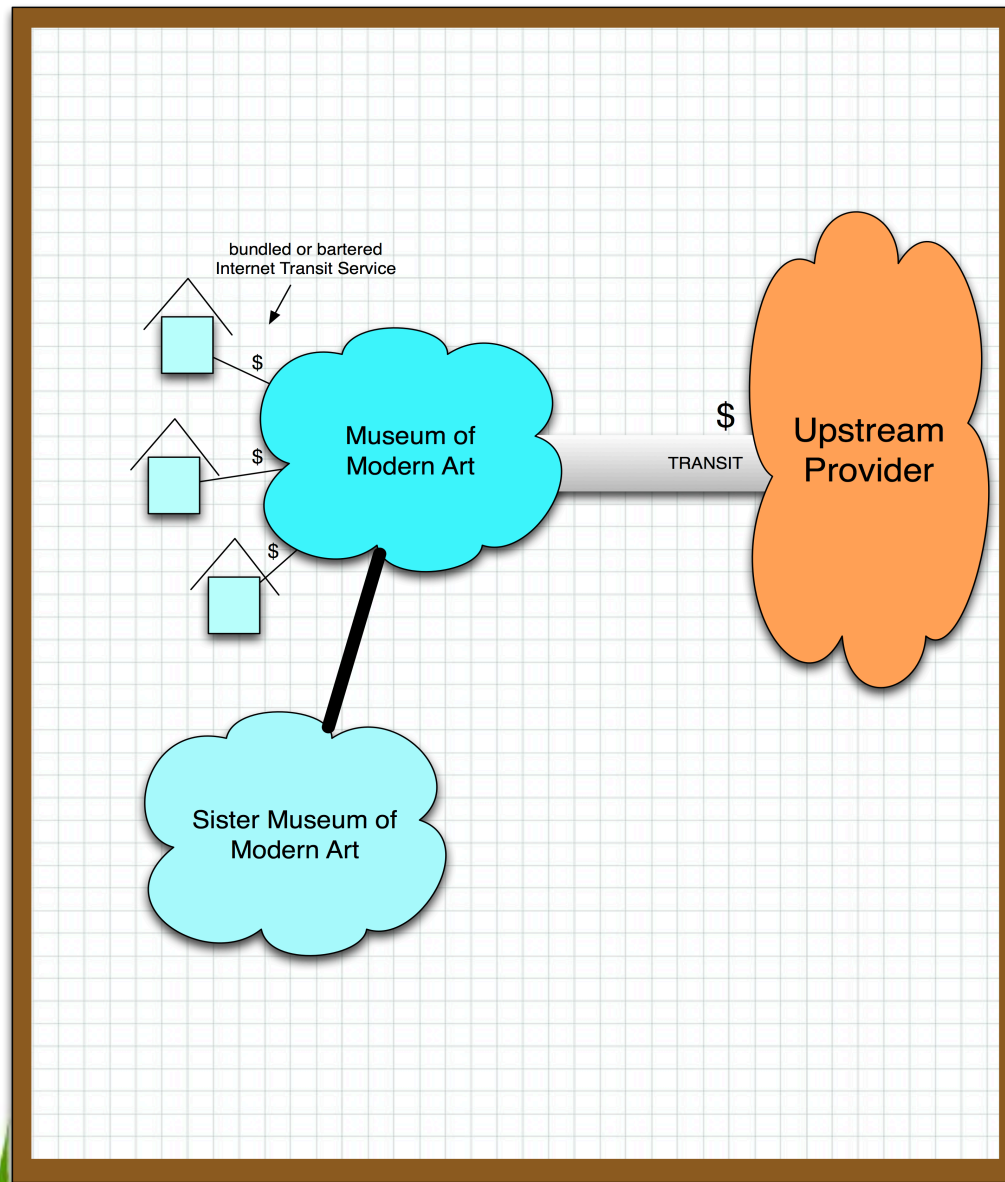year 1   year 2   year 3   year 4   year 5   year 6   year 7   time
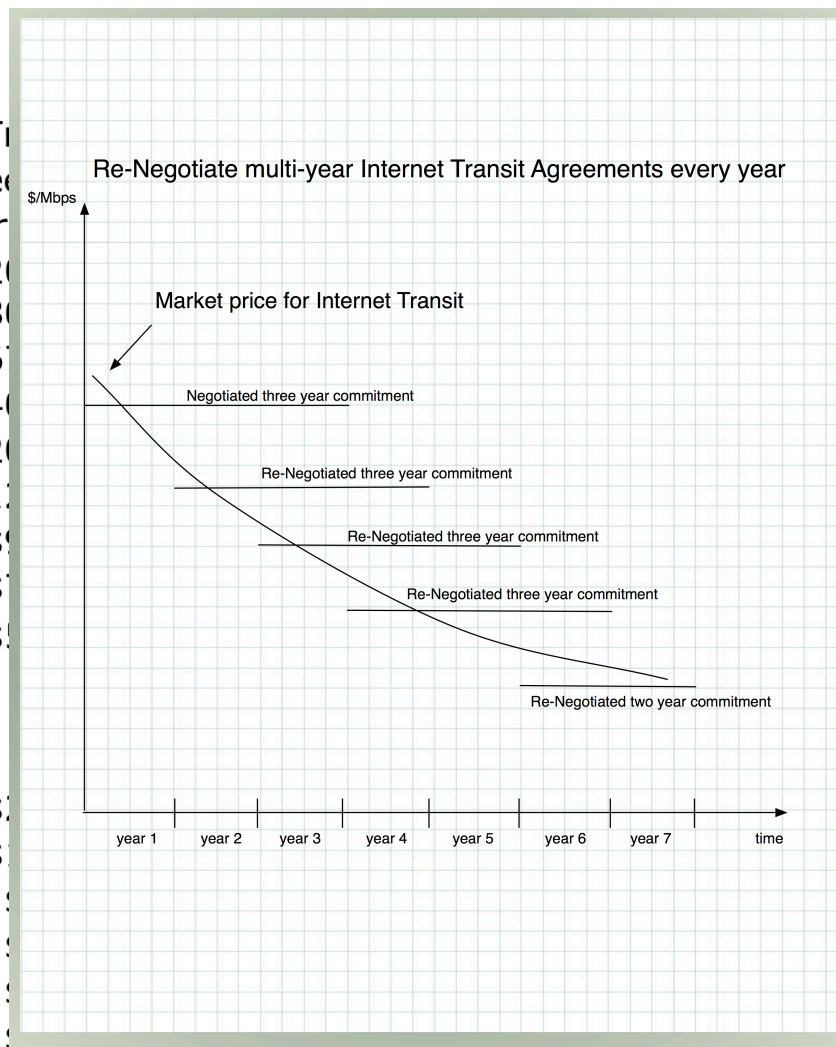
Tactic 5 – Play the Market

- Play ISPs off each other

- Beyond the 11th hour
- Beyond the signing

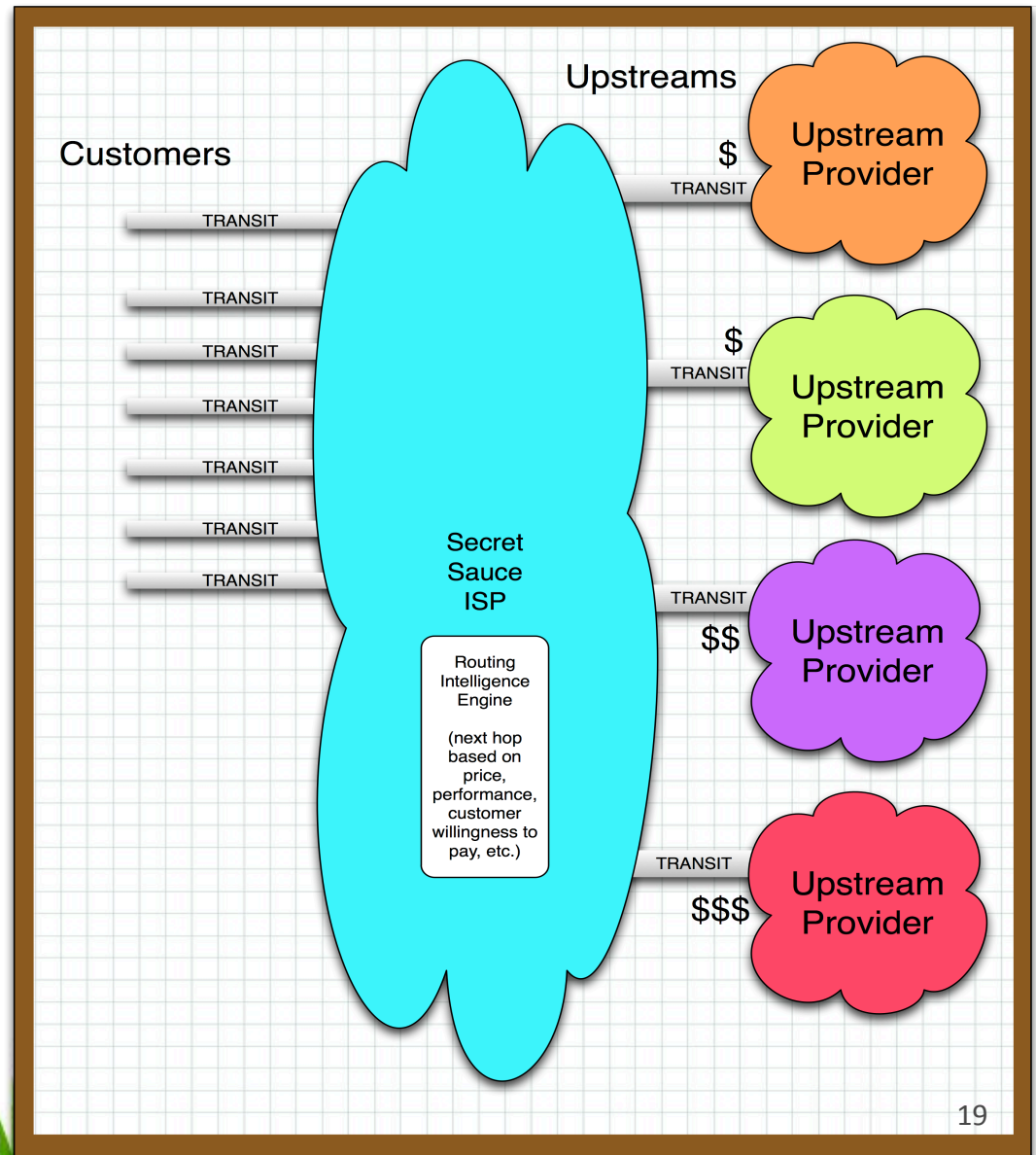- Trench warfare? Unethical?

- This is the ISP market today.

Play the Market

Round 1

| $1.90 | $1.75 | $1.50 | $2.50 | $1.25 | $2.25 |

Round 2

| $1.50 | $1.75 | $1.25 | $2.50 | $1.25 | $1.25 |

Round 3

| $1.00 | | $1.25 | | $1.25 | $1.25 |
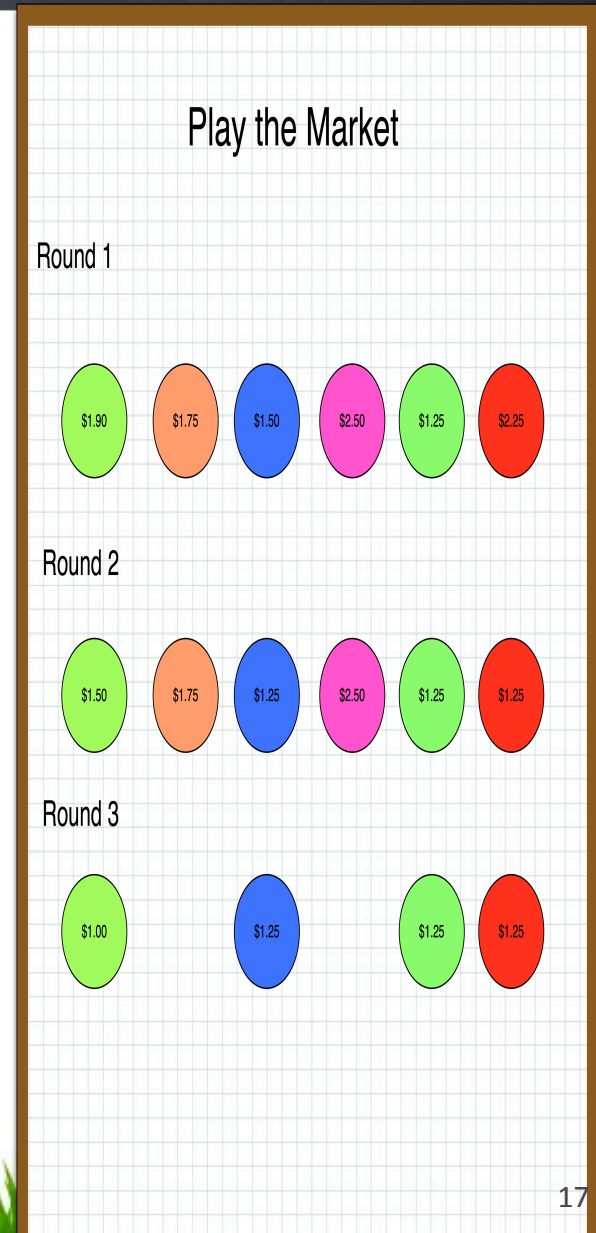
Tactic 6 – Resell Transit

- Share expense
- No service
- Friends
- Office parks

bundled or bartered
Internet Transit Service

$

$

Museum of
Modern Art

$

TRANSIT

Upstream
Provider

Sister Museum of
Modern Art

Tactic 7 – Secret Sauce Transit

- BGP Doesn't use price for routing decisions
  - Blend Transit
  - Requires Expertise
  - "Secret Sauce"
  - Long sales cycle
- Example: InterNAP

Customers

Upstreams

TRANSIT

TRANSIT

TRANSIT

TRANSIT

TRANSIT

TRANSIT

TRANSIT

Secret Sauce ISP

Routing Intelligence Engine

(next hop based on price, performance, customer willingness to pay, etc.)

$ TRANSIT — Upstream Provider

$ TRANSIT — Upstream Provider

TRANSIT $$ — Upstream Provider

TRANSIT $$$ — Upstream Provider

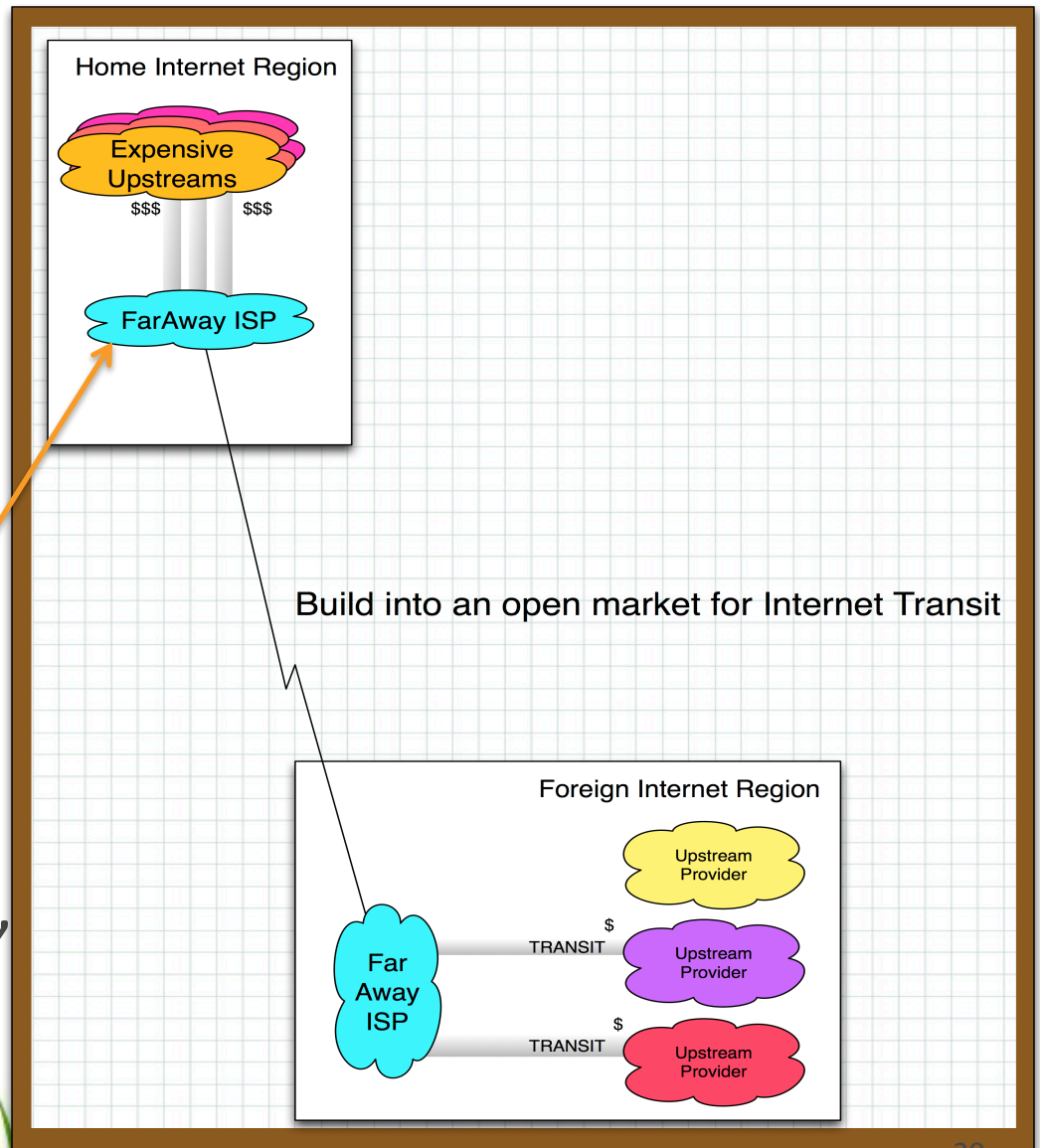# Tactic 8 – Build into Cheap Transit Internet Region

Expensive Ecosystems

- Africa
- Middle East
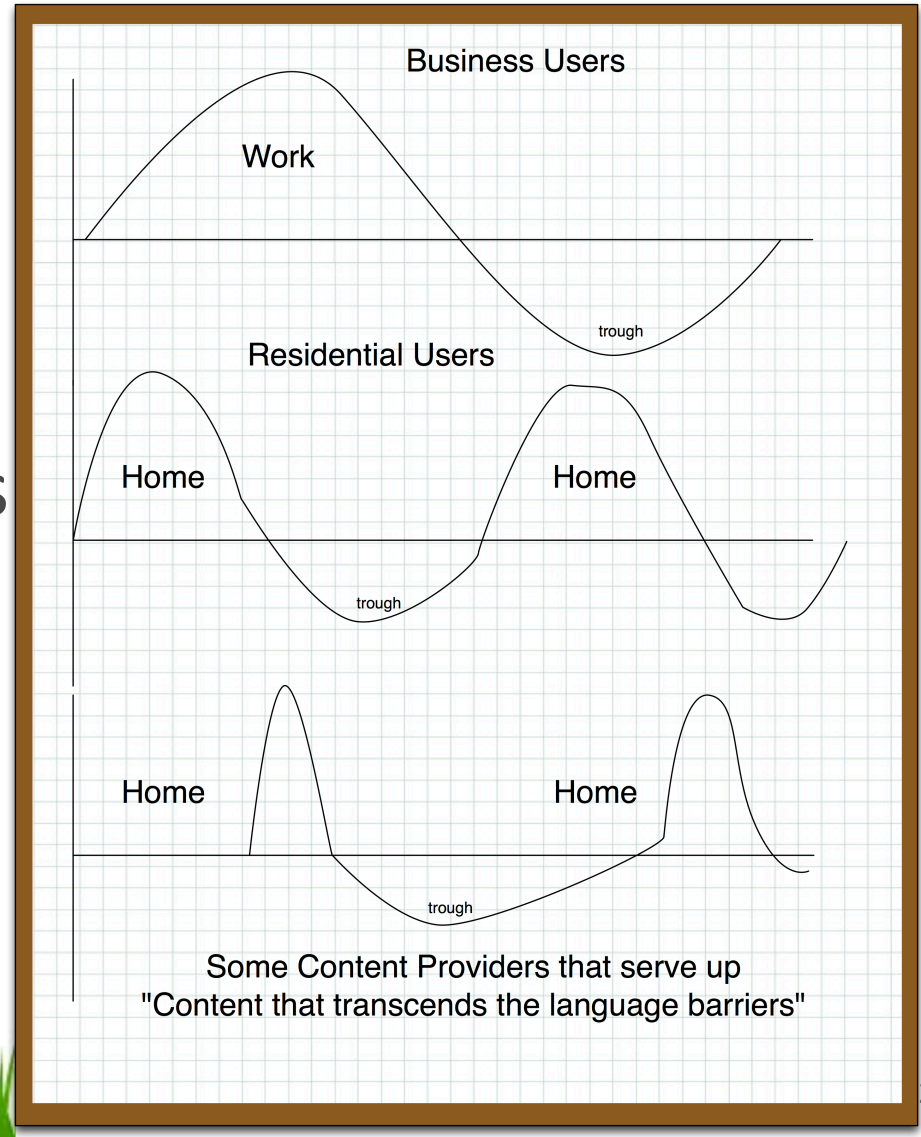- Eastern Europe

You are here
And you pay too much for transit

Cheap Ecosystems

- London, Amsterdam, Frankfurt, U.S., etc.

Home Internet Region

Expensive Upstreams

$$$ $$$

FarAway ISP

Build into an open market for Internet Transit

Foreign Internet Region

Upstream Provider

Far Away ISP

$ TRANSIT   Upstream Provider

$ TRANSIT   Upstream Provider

Tactic 9 – Leverage Traffic Troughs

- Manage Traffic
- Customer Mix
- Timing
- Night Bulk Transfers
- Slow Bleed – Grid Networks
- Wrong Direction traffic is free

Business Users — Work — trough

Residential Users — Home — Home — trough

Home — Home — trough

Some Content Providers that serve up
"Content that transcends the language barriers"

Tactic 10 – Capture Content and Access Customers

- Keep Traffic On-Net
- 3 Scenarios

- Build Data Centers
- Cheap Transit
- Free Parking
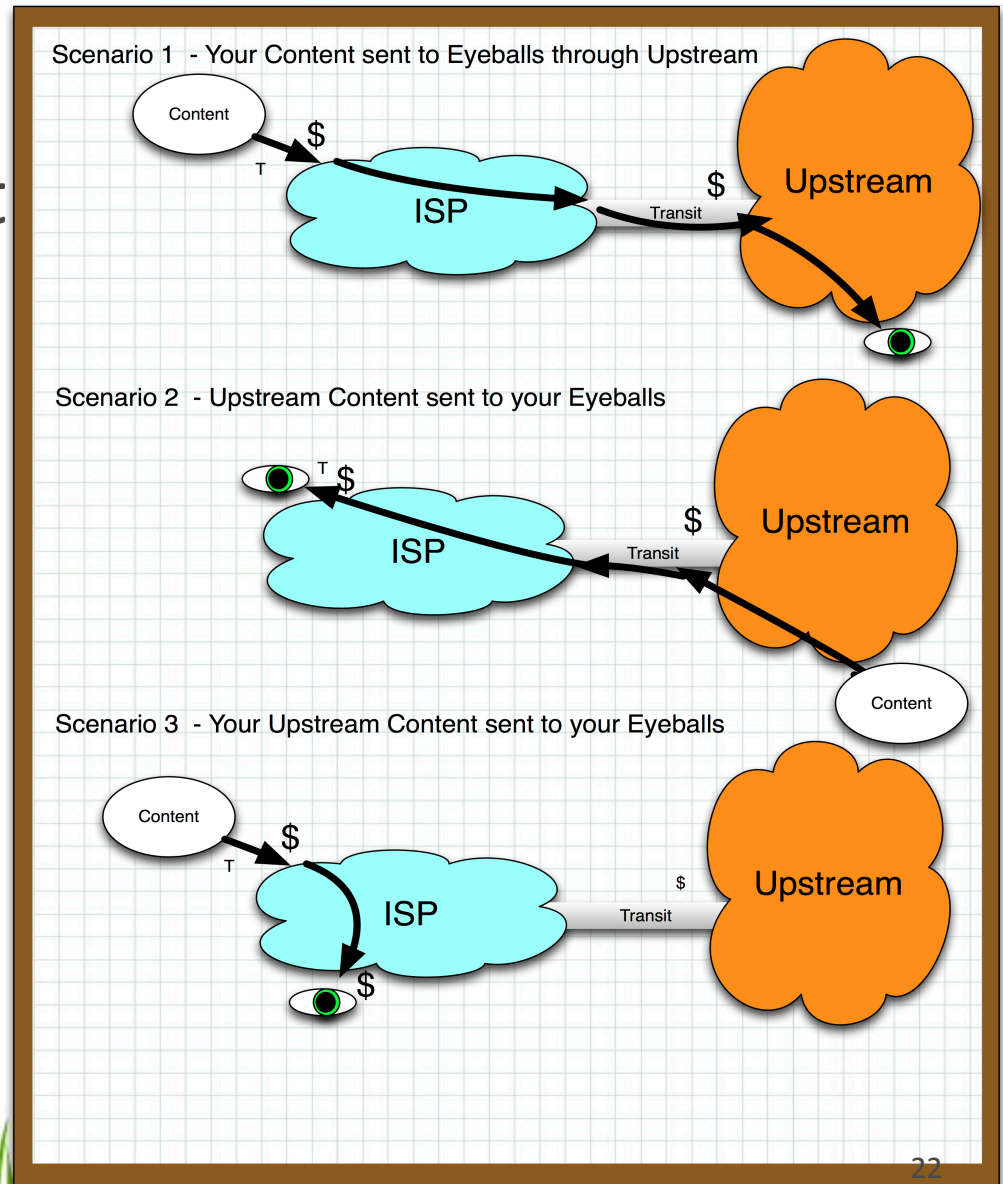
11. Short-term Transit

- 0 commit
- Month-to-month
- 6 month
- Assumption: Prices will continue to drop yielding better deals if you wait.

12. Deploy Trial Gear into Operational Environment

- Cisco loaner gear actually
- Sales guy shows up – "coming back from testing next month"
- Next month – "problems with the scripts, rerunning this weekend"
- Next month – "shipped back – should be here tomorrow"
- Next week – "can't get ahold of shipping"
- Next week – "on vacation"

Observations: Internet Transit

- Simple Service
- Customer-Supplier Relationship
- May have SLAs (joke)
- Transit Commits and Discounts
- Contract Terms
- Is a Commodity
- Metered Service

...And yet still able to do creative maneuvers

Questions?

- What other mechanisms have you seen?

- Any ideas of ones you would do?

- Monthly Auctions – automate buy from who ever has the lowest price, until that is no longer true

- Equinix Direct – facilitating the purchase of transit on monthly commit…

Break

Coming up next:

Internet Peering: Connecting to the Core of the Internet