WORKSHOP: STARTING AN IXP

Part I: The IXP Business

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The topics

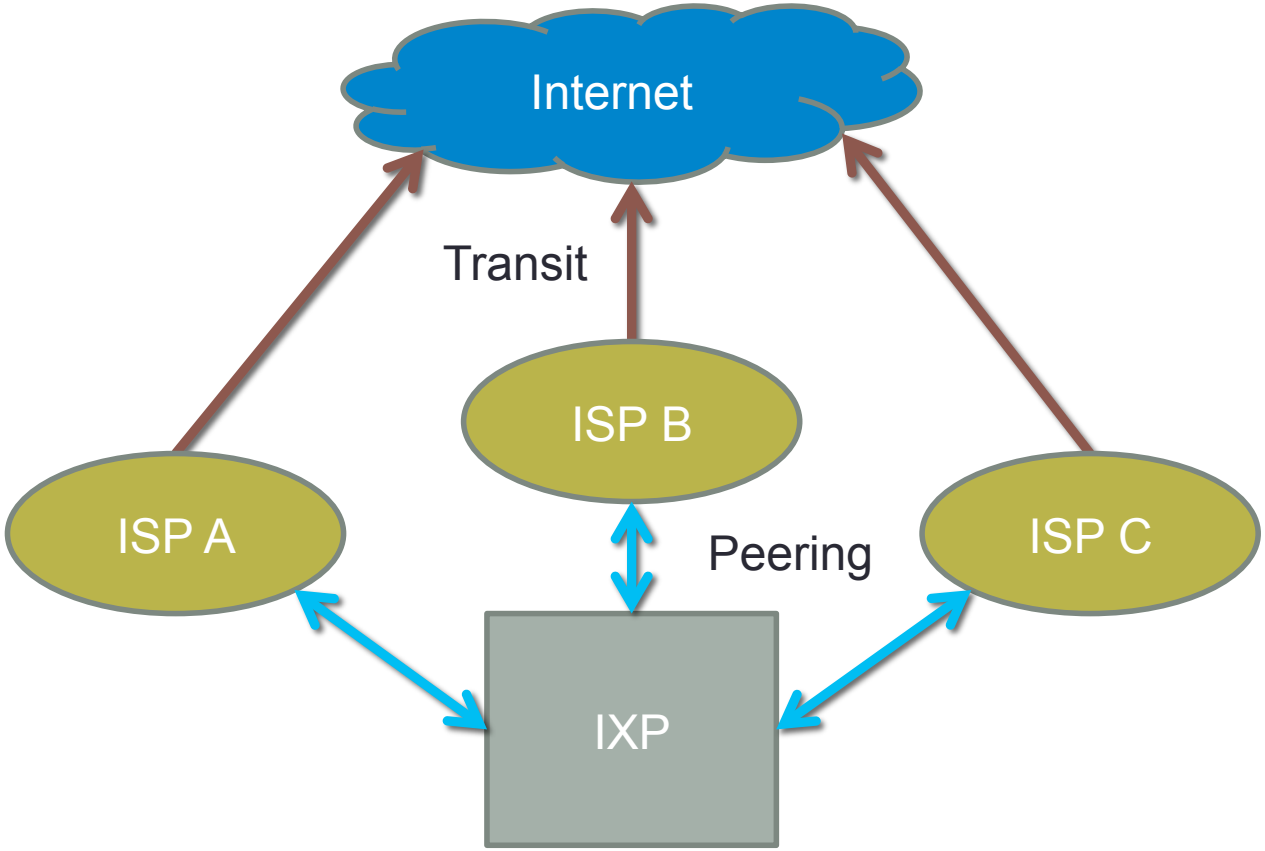
- We will not deal with the technical issues
  - See Part II of this workshop
- We will talk about the general and business part of starting an IXP
  - What is peering, what is an IXP
  - Why ISPs should join (and start one up if there's no IXP in your area)
  - What you should tell your boss to convince him you should join an IXP
  - What you are looking for in an IXP

Who are we?

- Mario Klobučar
  - Head of Network Department of SRCE (University Computing Center in Zagreb)
  - Operates CIX, the Croatian Internet eXchange
- Daniele Arena
  - Formerly CTO of NaMeX, IXP based in Rome, Italy
  - Currently consulting for CASPUR in the design of the Albanian Academic Network infrastructure
- Who are you? Show of hands
  - ISPs?
  - Academic Networks?
  - Government/institutions?
  - IXP operators?
  - How many are already present in an IXP?
  - Someone wanting to start an IXP?

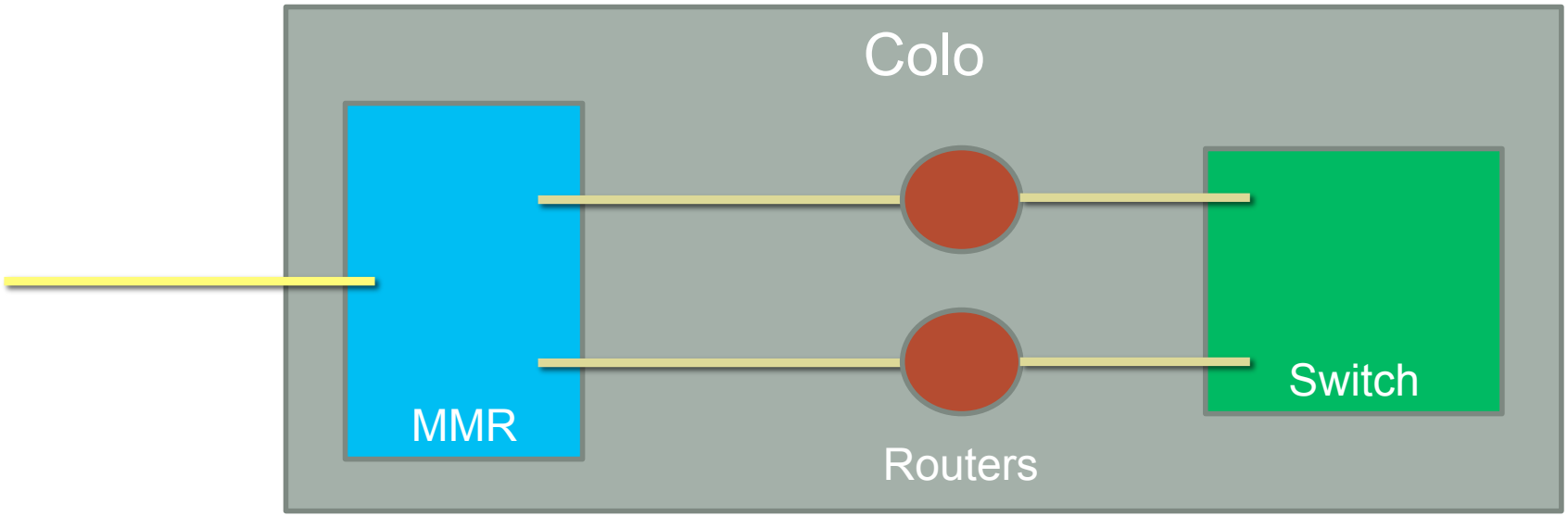
What is an IXP?

- In one line: it is a place where ISPs meet to exchange IP traffic via BGP (peering)
  - Passing through a central switch (or through cross-connects)



IXP Models: infrastructure

- The IXP «environment» is made of:
  - Colocation
  - Fiber landing / Meet-Me Room
  - The actual peering infrastructure: the switch(es)
- An IXP could own/operate just the peering switch, or all of the above
  - Some IXPs do not even allow on-site colocation



IXP Models: legal/commercial structure

The “American” model

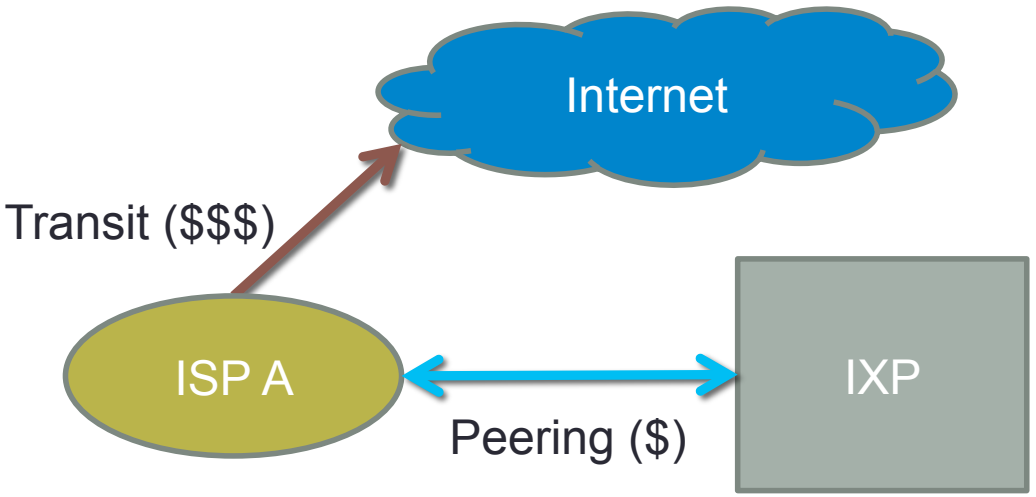
- Colo and IXP have the same owner
- Commercial IXPs
- ISPs are customers
  - ISPs do not have a say in IXP’s decisions
  - IXP can have discretionary pricing policies

The “European” model

- Not-for-profit ISPs
- Managed by trusted third party
  - ISP association/consortium/ co-owned company
  - Academic network
- ISPs are members
  - They can influence the policies
  - Prices are typically public and commonly agreed
    - Harder to make a “special price” to attract an interesting peer

The Business Case for Peering

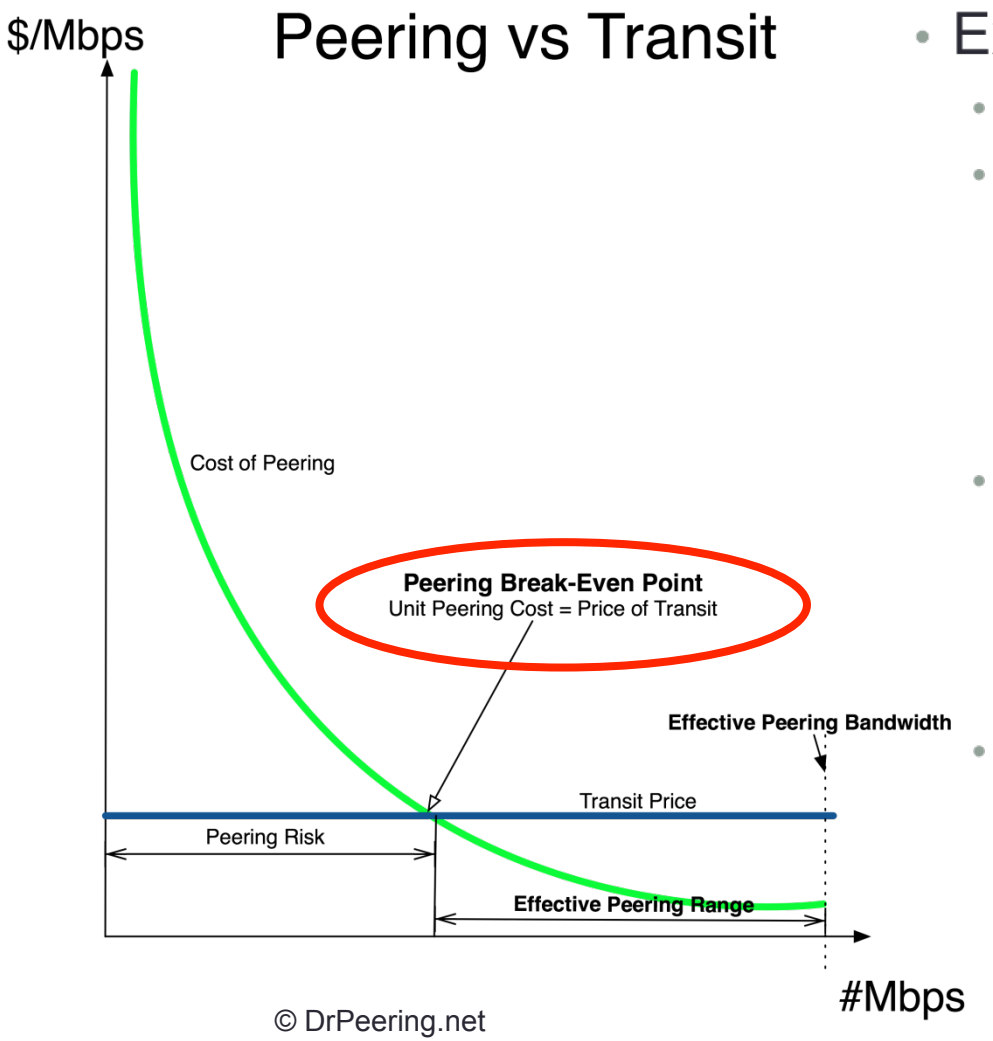
- i.e. why does peering make sense?
  - What you should tell your boss to convince him that you're joining an IXP
- The language bosses understand better is: money
  - How much money do we save/earn if we go to an IXP?
- Main selling point: we save on transit costs



Peering Break-Even Point

- How much do we actually save on transit?
- "Easy" equation: Peering Break-Even Point
  - Source: William B. Norton, «The Internet Peering Playbook», http://drpeering.net/
    - Also reference/inspiration for the next slides and for much stuff I learned on IXPs :-)
  - Three variables:
    - Transit price (€/Mbps monthly)
    - Monthly cost of peering (circuit to IXP, colocation in IXP premises, peering fees, equipment cost)
    - How much traffic can I offload from transit to peering?
  - $Peering\ BreakEven\ Point = \frac{Monthly\ cost\ of\ peering}{Transit\ price}$
  - The Break-Even Point is the minimum amount of traffic you should offload from transit to start saving money

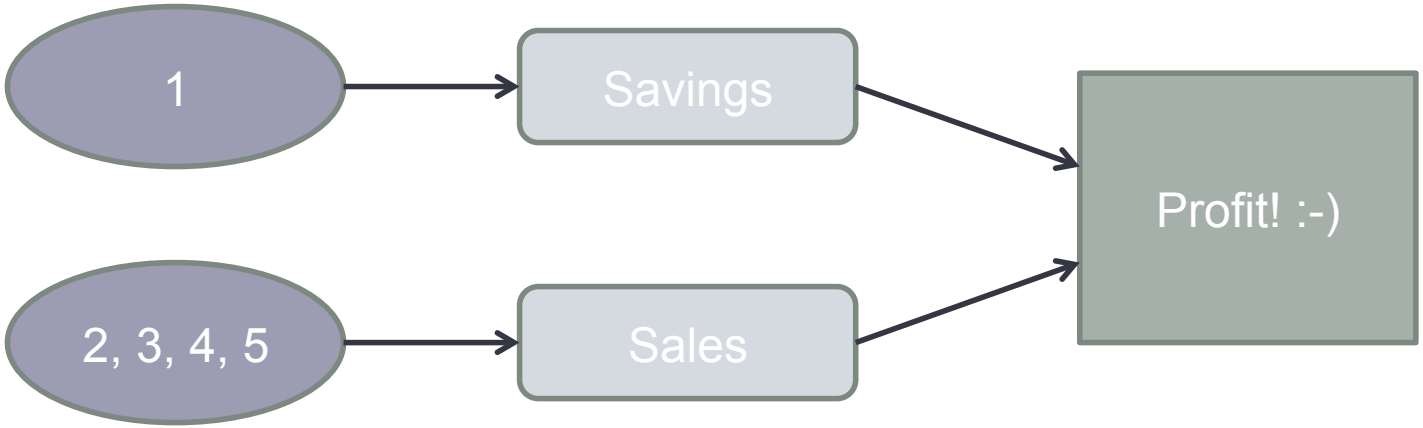
Peering Break-Even Point



- Example:
  - Transit cost is € 40/Mbps/month
  - Monthly cost of peering is 10.000€
    - 5.000€ 1Gbps circuit to IXP
    - 1.000€ colocation fees
    - 2.000€ peering fees (1 Gbps port)
    - 2.000€ equipment cost
  - Peering break-even point is
    - $\frac{10.000€}{40\ €/Mbps} = 250\ Mbps$
    - You should peer at least 250 Mbps to start saving money
  - The more expensive the transit and the less expensive the IXP connection, the more peering makes sense economically

The Business Case for Peering (2)

- There are other reasons why peering makes sense
  - (Even if you don't reach the breakeven point)
- Bill Norton, "Top five motivations to peer"
  - 1: Saving on transit (see previous slides)
  - 2: End-user experience is better
    - Peering gets your target closer: latency and packet loss are reduced
  - 3: Control over routing is strategic
    - Your routing is not completely in the hands of your upstream provider
  - 4: Your customers' traffic billing is usage-based
    - The better the performance, the more your customers will use the network
  - 5: Marketing benefits
    - Customers like a well-connected, performance-conscious ISP

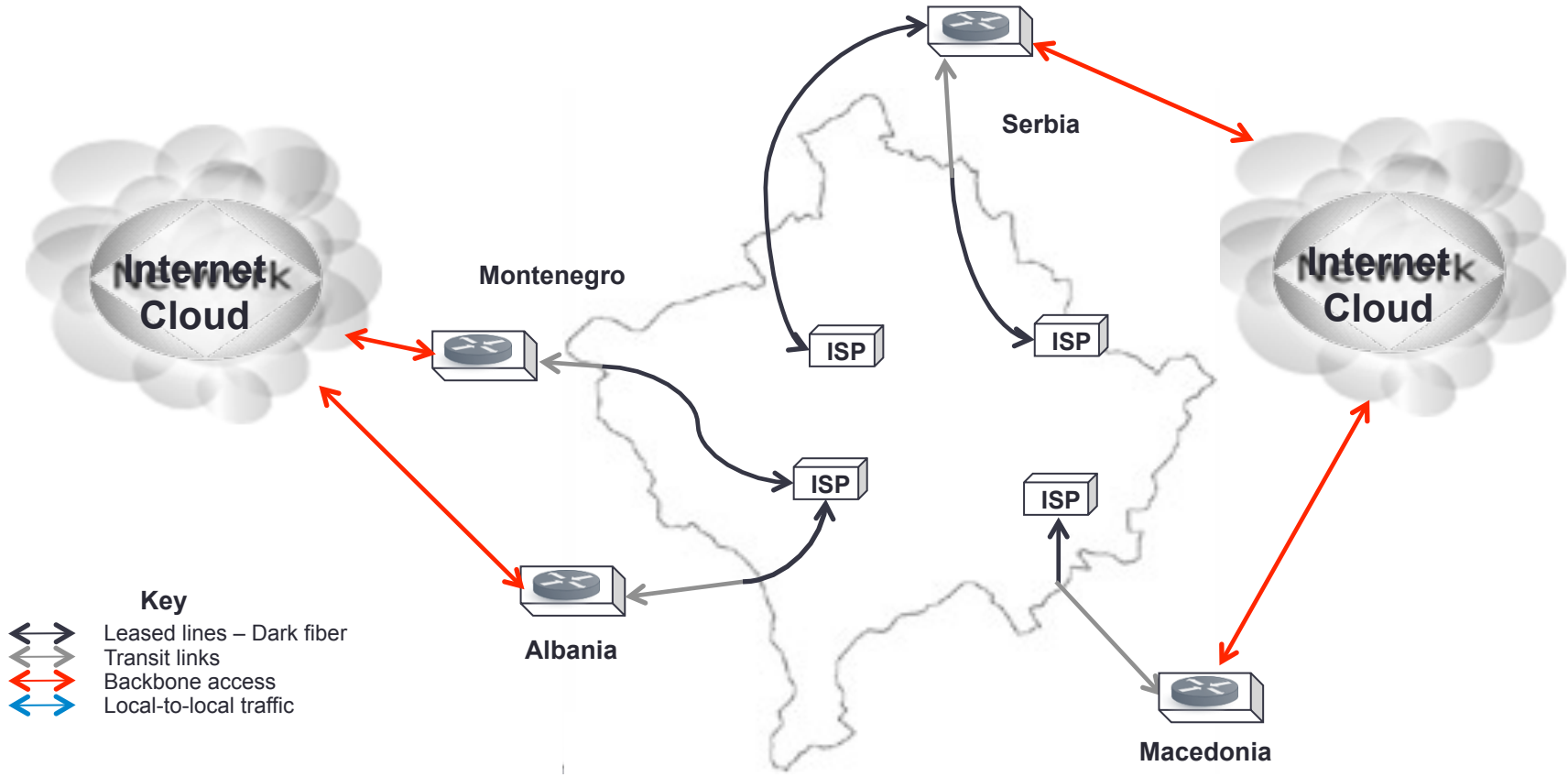


Why join/start a regional IXP?

- There are many IXPs around
  - Large ones (e.g. AMS-IX, LINX; DE-CIX) where I can find lots of peers
  - Why should I join/build a local IXP?
- Especially in a small regional environment with a common language, much local traffic stays local
  - Many smaller ISPs
  - Local content – portals – peer-to-peer
- Without a regional IXP, traffic could cross the ocean twice to go next door
  - Performance issues become critical
- In an IXP, you can meet local operators
  - IXPs often organize periodic events
  - The local community can talk about local issues
    - Network problems can be fixed more easily if you know the other network engineers personally
- IXPs can become clearinghouses where ISPs develop their business
  - In some IXPs, you can sell transit, circuit, services
  - For smaller ISPs, an IXP can be a big leap to improve its infrastructure and make it more resilient

Example: Kosovo – KOSIX

- (Thanks to Agron Fazliu, who allowed me to use his slides)
- Before KOSIX: all traffic between local ISPs went through the Internet



Traceroute
Kujtesa -> Artmotion

Before

Tracing route to 84.22.48.99 over a maximum of 30 hops

1	1 ms	1 ms	1 ms	192.168.1.1
2	132 ms	102 ms	23 ms	10.255.31.254
3	146 ms	100 ms	102 ms	10.20.30.254
4	24 ms	22 ms	21 ms	82.114.64.185
5	25 ms	62 ms	19 ms	79.101.105.229 [Telekom Srbija]
6	23 ms	19 ms	18 ms	212.200.227.225
7	24 ms	19 ms	109 ms	212.200.232.90
8	218 ms	22 ms	24 ms	212.200.17.45
9	103 ms	104 ms	102 ms	79.101.96.130
10	122 ms	102 ms	103 ms	84.22.63.109
11	126 ms	102 ms	106 ms	84.22.63.25
12	114 ms	100 ms	103 ms	84.22.32.198
13	118 ms	102 ms	102 ms	84.22.48.99

Trace complete.

After

Tracing route to 84.22.48.99 over a maximum of 30 hops

1	1 ms	1 ms	1 ms	192.168.1.1
2	40 ms	84 ms	22 ms	10.255.31.254
3	44 ms	17 ms	10 ms	10.20.30.254
4	12 ms	23 ms	24 ms	82.114.64.185 [Kujtesa]
5	22 ms	16 ms	12 ms	192.168.100.12 [KOSIX]
6	31 ms	24 ms	12 ms	84.22.32.198 [Artmotion]
7	27 ms	11 ms	21 ms	84.22.48.99

Trace complete.

Improvement:
- Drop from 13 to 7 hops
- Average 3-packet delay drop from 75ms to 22ms

Ping
Kujtesa -> Artmotion

Before

Pinging 84.22.48.99 with 32 bytes of data:
Reply from 84.22.48.99: bytes=32 time=131ms TTL=245
Reply from 84.22.48.99: bytes=32 time=143ms TTL=245
Reply from 84.22.48.99: bytes=32 time=181ms TTL=245
Reply from 84.22.48.99: bytes=32 time=199ms TTL=245

Ping statistics for 84.22.48.99:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 131ms, Maximum = 199ms, **Average = 163ms**

After

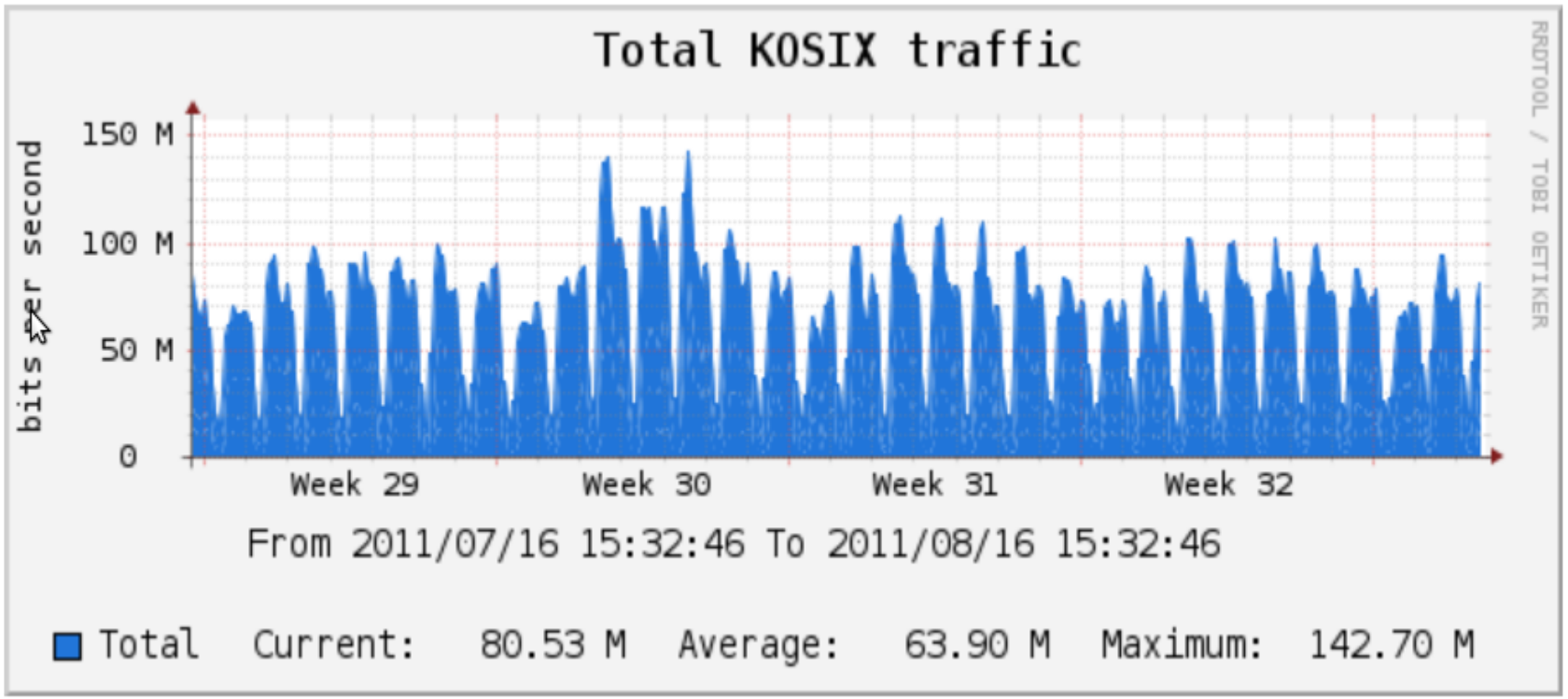
Pinging 84.22.48.99 with 32 bytes of data:
Reply from 84.22.48.99: bytes=32 time=16ms TTL=249
Reply from 84.22.48.99: bytes=32 time=14ms TTL=249
Reply from 84.22.48.99: bytes=32 time=14ms TTL=249
Reply from 84.22.48.99: bytes=32 time=13ms TTL=249

Ping statistics for 84.22.48.99:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 13ms, Maximum = 16ms, **Average = 14ms**

Improvement :
Average RTT drop from 163 ms to 14 ms

Traffic offloaded

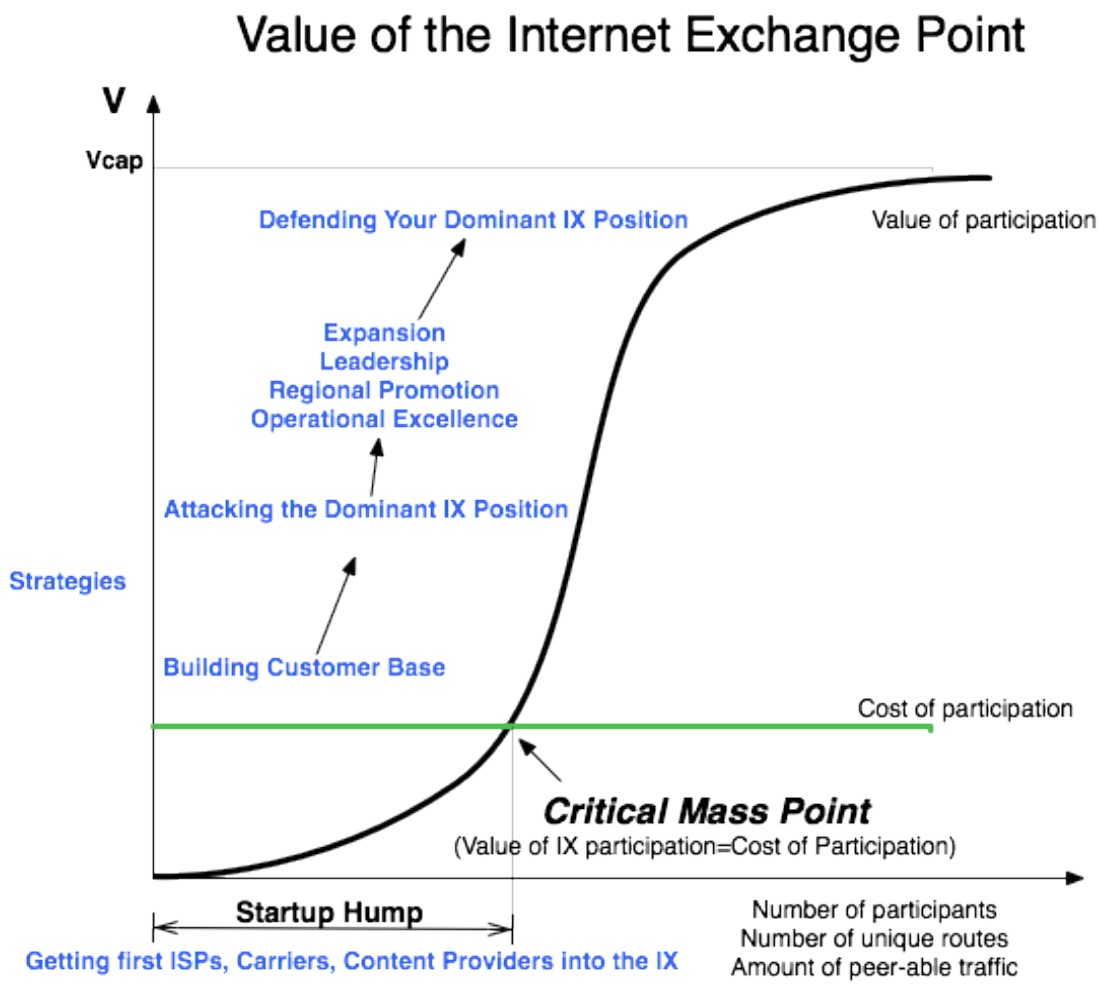
- 100-150Mbps have been offloaded from transit



What are you looking for in an IXP?

- Ease of deployment
  - Is the colocation well-served by fiber providers?
    - More choices = less cost for a circuit
  - How good is the colocation? (space, power, air conditioning, security)
  - What is the total deployment + monthly cost?
- Support
  - Operations handling, outage notifications
  - Is there a 24/7 NOC?
- Credibility
  - Is the IXP operator a trusted party?
  - Is it neutral? Am I subsidizing a competitor?
- Who will I meet?
  - Are some interesting peers already present at the IXP?
    - Content providers
    - Academic networks
  - Can I buy/sell traffic from/to other ISPs?
    - IXPs can be an attractive meeting point to exchange services
  - “Critical mass” to make an IXP significant

Value of an Internet Exchange Point



- If you want to start an IXP in your area
  - Find a well-connected spot and a good colocation
    - Or build it :-)
  - Start to bring ISPs together
    - Create critical mass
    - Find attractive members
  - Decide what model you want for your IXP
    - American (for-profit, ISPs are customers)
    - European (not-for-profit, ISPs are members)
  - Put the engineers to work
    - Reliable, redundant infrastructure
    - Good support
    - Shared rules for IXP members
    - See next part of the Workshop

THANK YOU!

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