

Internet exchange points and best practices for international internet connectivity



Workshop on Cost Models for Data Services and International Internet Connectivity Cost, 8-9 April 2024

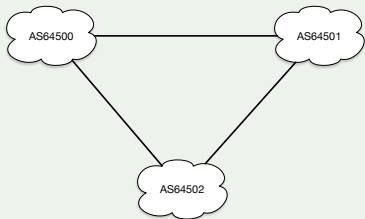
Talking point - Outline

- Background
 - Private vs Public Peering @ IXP/IX
 - Concept of Transit
- Aspects impacting cost
 - Distance
 - Local IXP/IX
 - Hosted Caches (Pros & Cons)
 - Availability of Local content

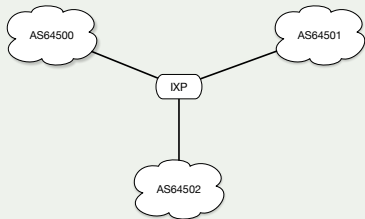


Background - Private Peering & Public Peering

- Direct links between peers
- Works for 3/few peers...
- ... but does not scale
- The solution: establish an IXP/IX

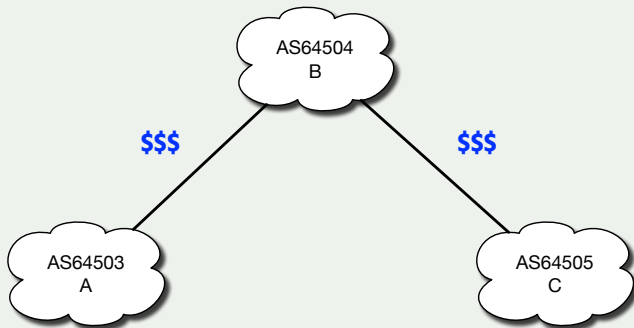


- Public peering via an IXP (or IX)
- A Layer-2 infrastructure (no routing)
- Routing policy remains under the control of the peers/networks



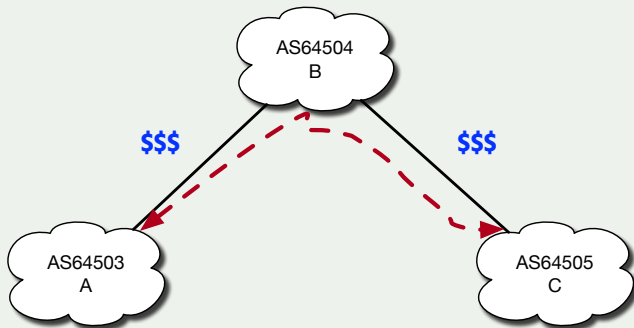
Background - Transit Relationship

- Transit: Traffic between A and C is through B
- Commercial agreement/relationship
- A and C pays B to exchange traffic
- Metered service/usage



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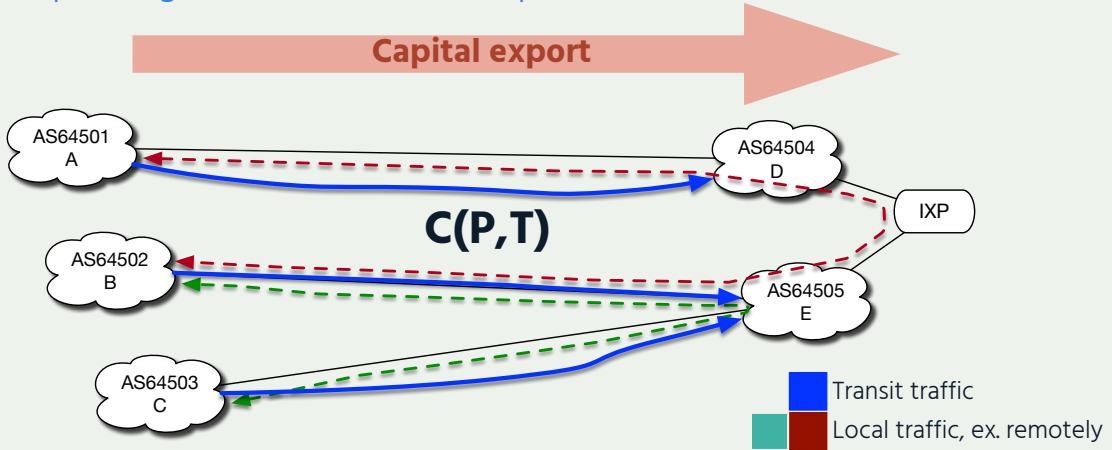


Aspects impacting Cost - Equation

$$\text{Speed} * \text{Distance} = \text{Cost}$$



Aspects impacting Cost - Economic implications



- Local traffic is exchanged **REMOTELY** - Internet capacity cost is driven by local and international traffic

Aspects impacting Cost - The Equation

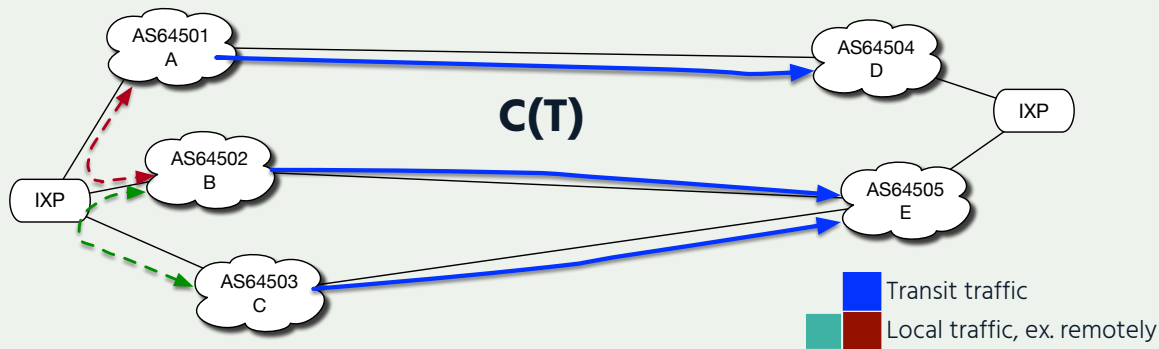
$$\text{Speed} * \text{Distance} = \text{Cost}$$



Reduce the DISTANCE, to affect/reduce the COST element



Aspects impacting Cost - Local IXP/IX

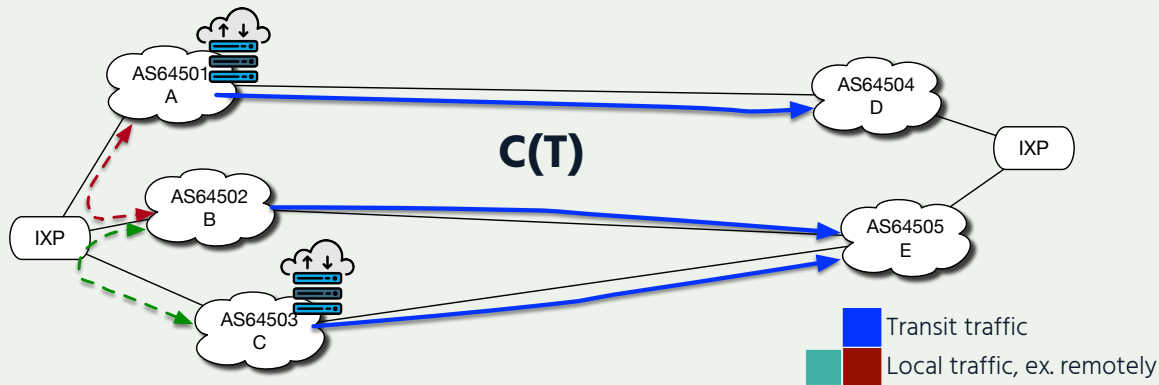


- Local traffic is exchanged **LOCALLY** - Internet capacity cost is driven by International traffic...
- Cost reduction
- Improved End-user experience by Increased Peering capacity



- Improved Security (no third-party transit network)

Aspects impacting Cost - Locally, in-Network hosted Caches



- **International Content** - Caches are hosted **LOCALLY** within Networks
- Cost reduction (Ingress - Egress Ration)
- Improved **in-Networks End-user experience** through locally hosted caches

• **Cache-fill Capacity** remains a challenge (Caches need to be filled on a regular basis)

- **Negative** Impact at National Level (Capacity to fill the Caches times the Number of Caches in-country)



Aspects impacting Cost - The Equation (Impact at National Level)

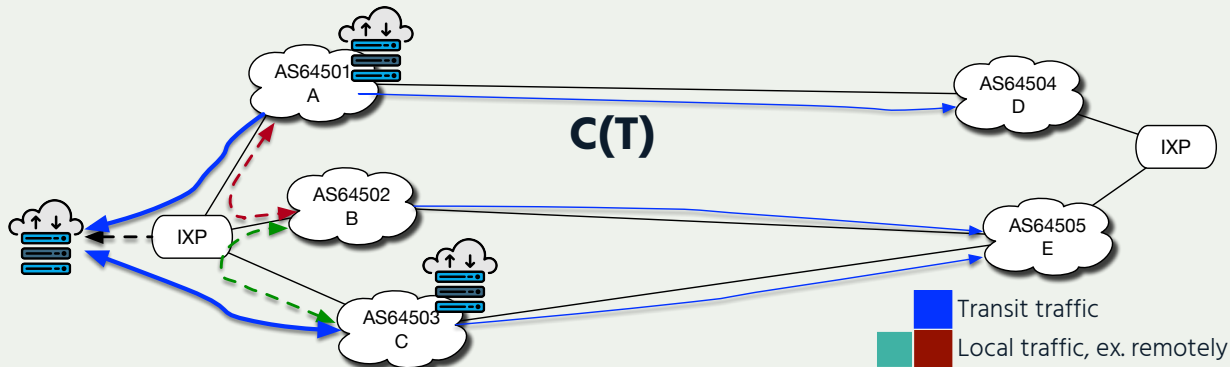
$$\mathbf{X\ Mbps * Cost * \underline{Number\ of\ Caches} = N.\ Cost}$$



- N. Cost = Combined costs incurred by country or market
- Cost = is Cost of transit. It reduced due to competition in the country or market



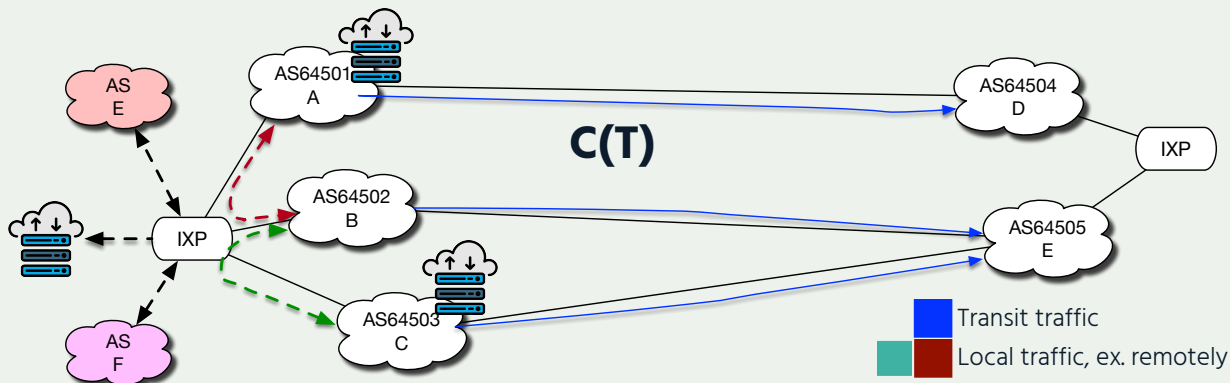
Aspects impacting Cost - Impact peering of CDN-Cache @ IXP/IX



- **International Content** - Caches are hosted **LOCALLY AT THE IXP/IX**
- The In-Network caches are filled from the Cache @ the IXP/IX
- Improved **in-Networks End-user experience** through locally hosted caches
- **International Capacity** is only used for non-cached content
- **At National Level** - Overall cost reductions



Aspects impacting Cost - Development of Local content



- The **Local Peering Ecosystem** is **maturing** (with Locally developed and hosted content)
- Regional and International networks join the ecosystem (IXP/IX, Data centers, etc.)
- Country or Market **attracts Foreign investment**
- **Impact on:** Job creation, Infrastructure development, etc.



Conclusions & Recommendation

- Policy & Regulation - Enabling a vibrant Peering ecosystem
- Infrastructure Development - Attract investments (Domestic or Foreign)
- Local content - Encourage local solutions and services
- International content - Served locally



Thank you!

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