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June 30, 2014

Electronic Submission

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *Connect America Fund; Developing a Unified Intercarrier Compensation Regime; Protecting and Promoting the Open Internet*, WC Docket No. 10-90, CC Docket No. 01-92; GN Docket No. 14-28

Dear Ms. Dortch:

On June 26, Bob Quinn, Brent Olson, Philip Bowie and I, on behalf of AT&T, met with Commissioner Pai and the following members of his staff: Matthew Berry, Nicholas Dagani, Brendan Carr, Emily Fitzgerald and Andrew Merson. During the meeting, we discussed the Internet interconnection ecosystem. We explained how that ecosystem developed without any regulation to handle all of the traffic exchanged on the global Internet, the many options available to edge providers to reach consumers and businesses, and the potential ramifications of regulatory intervention in this area. The attached presentation formed the basis of our discussion.

Pursuant to section 1.1206 of the Commission's rules, this letter is being filed electronically with your office for inclusion in the public record of the above-referenced dockets.

If you have any questions, please contact me at: (202) 457-3058.

Sincerely

/s/ Christopher M. Heimann

cc: Commissioner Ajit Pai
Matthew Berry
Nicholas Dagani
Brendan Carr

The Internet Interconnection Ecosystem

June 26, 2014

Internet Interconnection

Basic methods in which Internet interconnection is achieved:

- Peering
- Internet Connectivity
  - Transit
  - On-net Only

Internet Interconnection: Peering

Peering

An arrangement where two networks (autonomous systems) voluntarily interconnect to exchange traffic between their customers.

- Commercially negotiated
- Barter transaction – parties' perceived value of arrangement is equal
- Settlement-free
- Usually includes criteria to ensure arrangement is equitable, which may include:
  - Interconnection locations, quantity and bandwidth
  - Comparable geographic scope of network
  - Traffic volume
  - Traffic balance
- Traffic is limited to that exchanged between each party's customers
  - "Customer" is broadly defined and includes:
    - Consumer broadband Internet access service subscribers
    - Business broadband Internet access service subscribers: small and large business
    - Purchasers of Transit: ISPs, content providers, Content Delivery Networks, Businesses (Enterprise)

Internet Interconnection: Transit

Transit

Transit is a service whereby a network provides access to the entire Internet.

- Offered by backbone networks and ISPs with extensive connectivity with other networks
- Commercially negotiated
- Market-based rates
  - Various pricing models
- Can interconnect in as little as one location
- Many more interconnection location options than peering
- Purchasers include:
  - ISPs
  - Content providers
  - Content Delivery Networks
  - Businesses (Enterprise)

Internet Interconnection: On-net Only

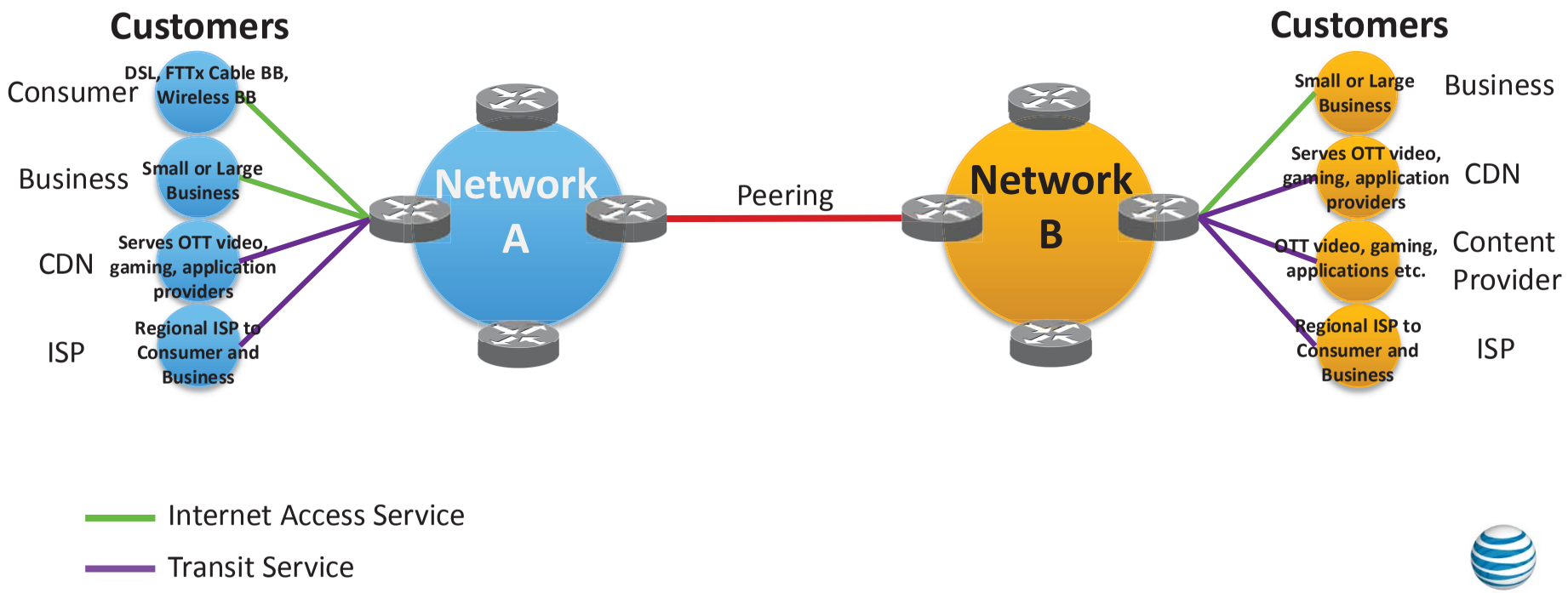
On-net Only

On-net Only connectivity is an optional service whereby a network provides access to only its customers.

- Offered by networks of various sizes and scope
- Commercially negotiated
- Market-based rates
  - Various pricing models
- Purchasers include content-heavy entities:
  - Content Delivery Networks
  - Content providers

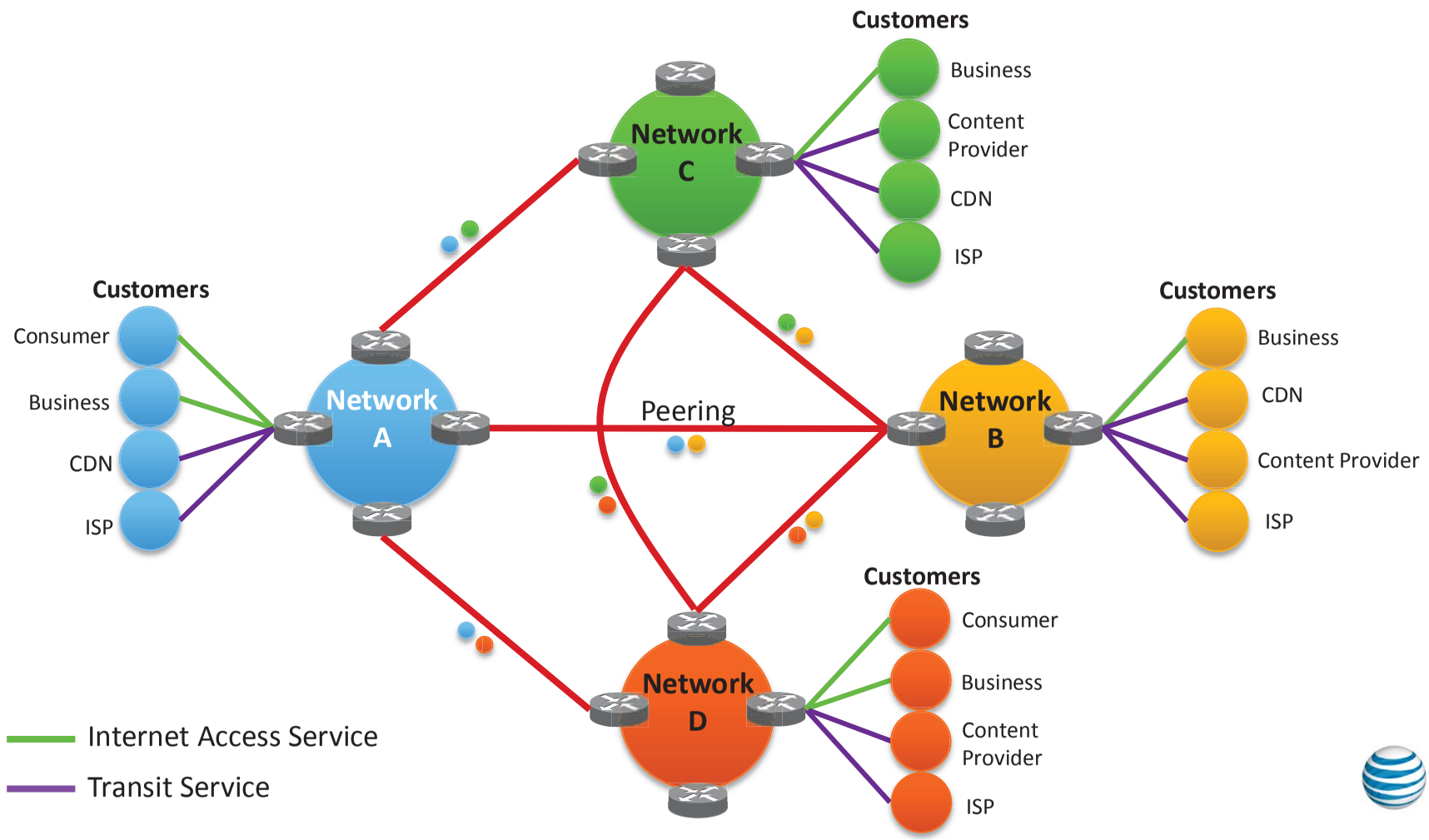
Internet Interconnection: Peering

Peering is an arrangement where two networks voluntarily interconnect to exchange traffic between their customers.



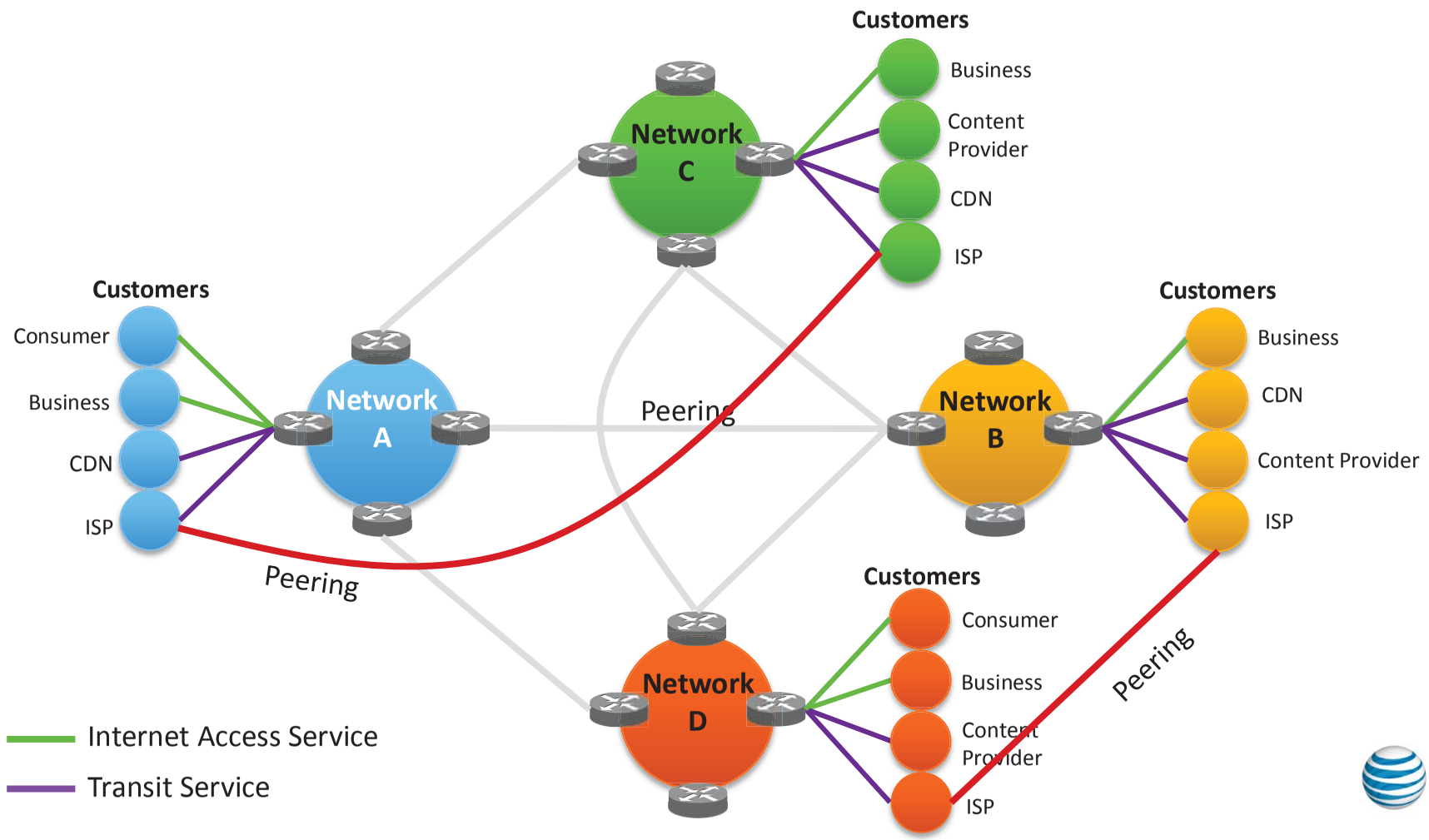
Internet Interconnection: Peering

Multiple Peering Arrangements



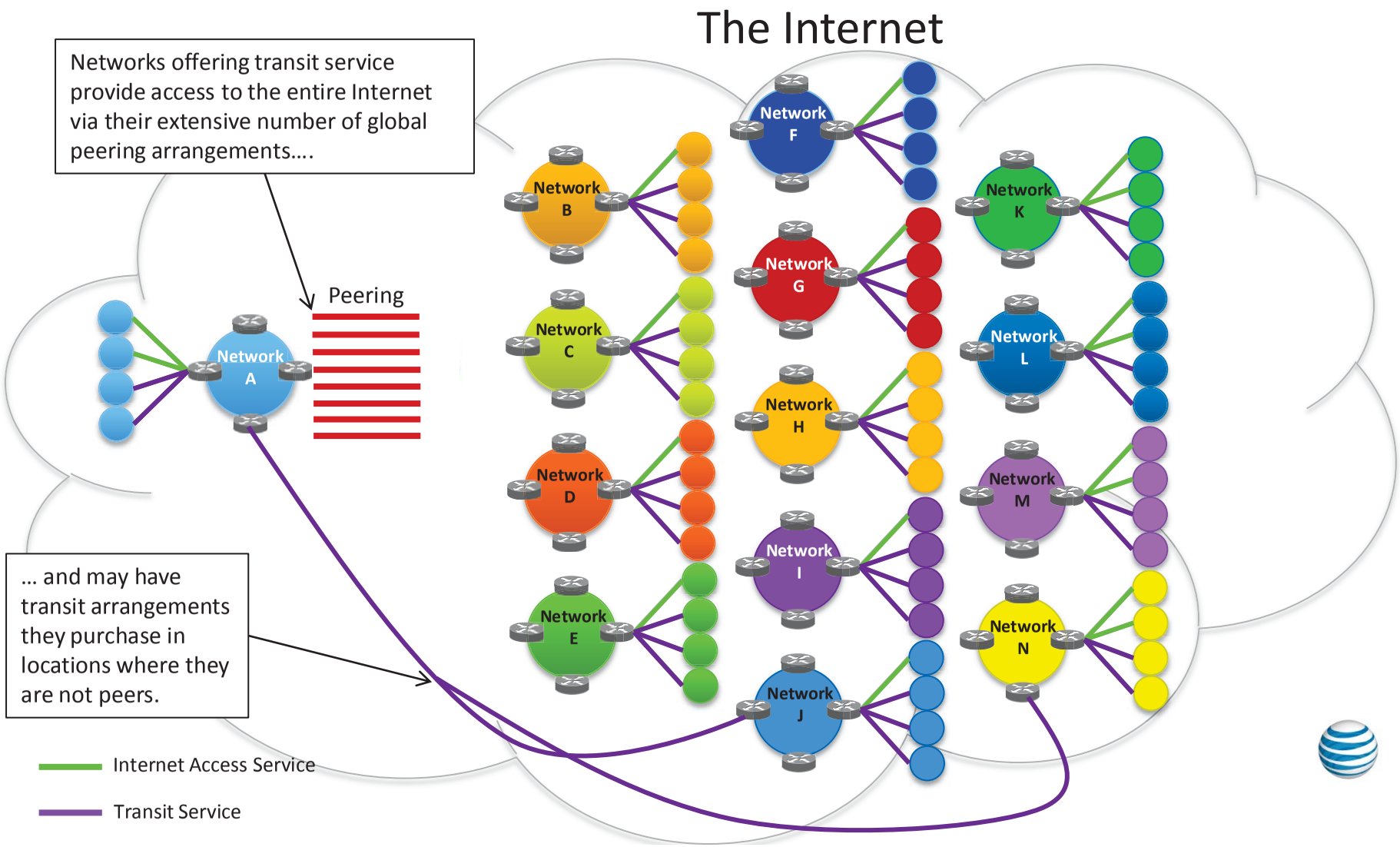
Internet Interconnection: Peering

Peering arrangements are not limited to large networks.

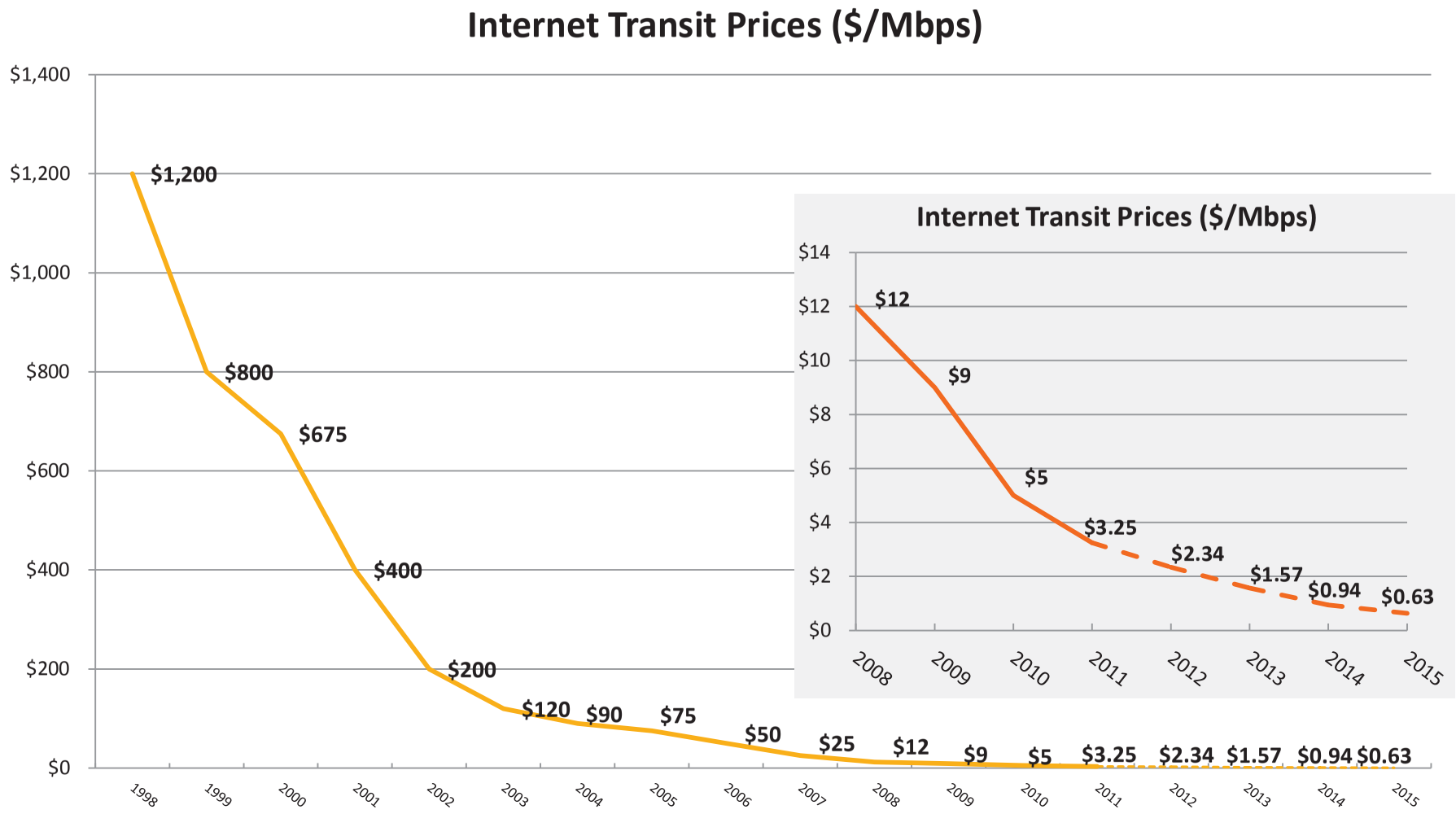


Internet Interconnection: Transit

Transit is a service whereby a network provides access to the entire Internet.



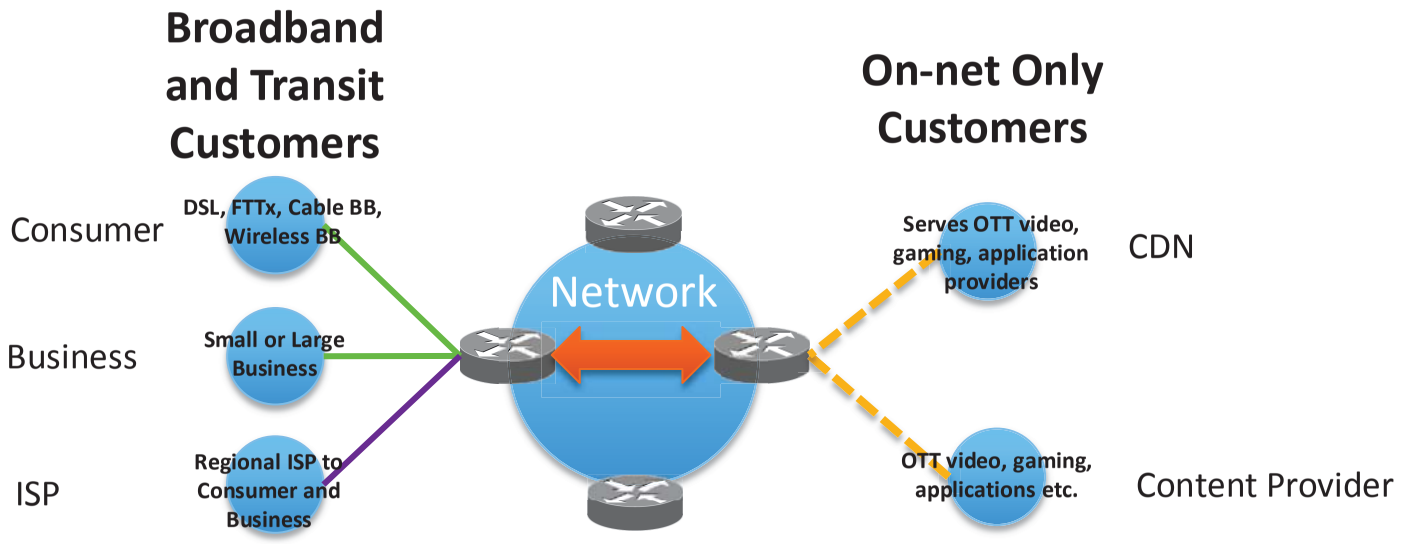
Competition is Driving Lower Transit Prices



Source: drpeering.net

Internet Interconnection: On-net Only

On-net Only connectivity is an optional service whereby a network provides access to only its customers.



On-net Only arrangements are typically provided to content-rich entities.

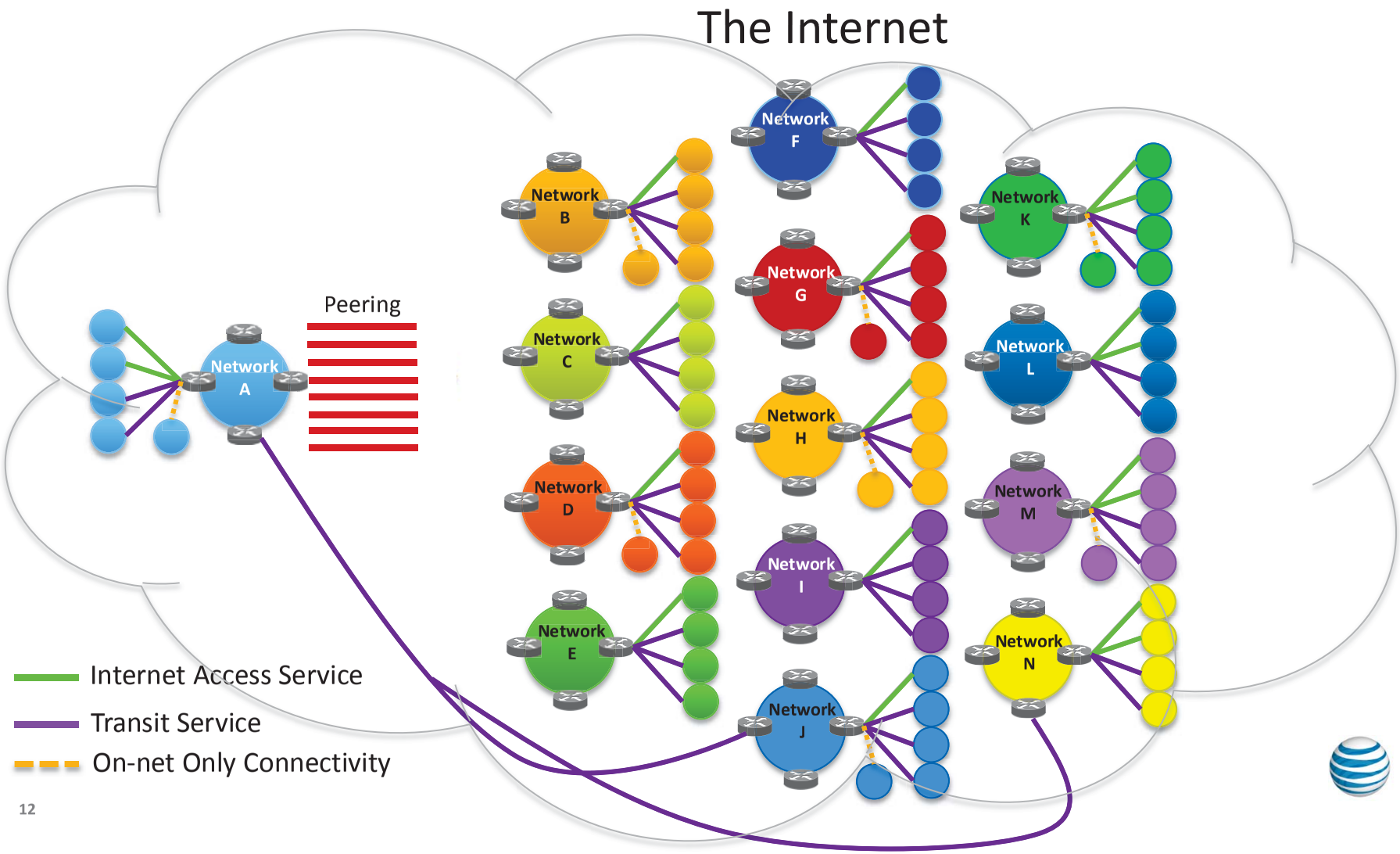
Internet Access Service

Transit Service

On-net Only

Internet Interconnection: Putting It All Together

The global Internet is comprised of a variety of interconnection options.



Carriage of Traffic is Not Without Cost

Illustrative Example: Hot Potato Routing

3. Network A delivers the over-the-top video stream from its customer in San Jose (who may be in the same building where Network A and Network B have a peering connection) to Network B at the peering point closest to the video provider, which is in San Jose.

2. Network A transports the request to its transit customer, the over-the-top video provider located in San Jose.

1. Network B's customer in Kansas City sends a request to its over-the-top video provider (served by Network A) to stream a movie. Network B delivers the request to Network A at the closest peering point (hot potato), which is in Dallas.

Network B's Metro Network (Does not include last mile)

5. Network B transports the video stream over its Kansas City metro area network to central offices or cell sites serving its customer.

San Jose Peering Arrangement

Network A

Network B

4. Network B transports the video stream across its backbone network to Kansas City using its transport paths and routers.

Dallas Peering Arrangement

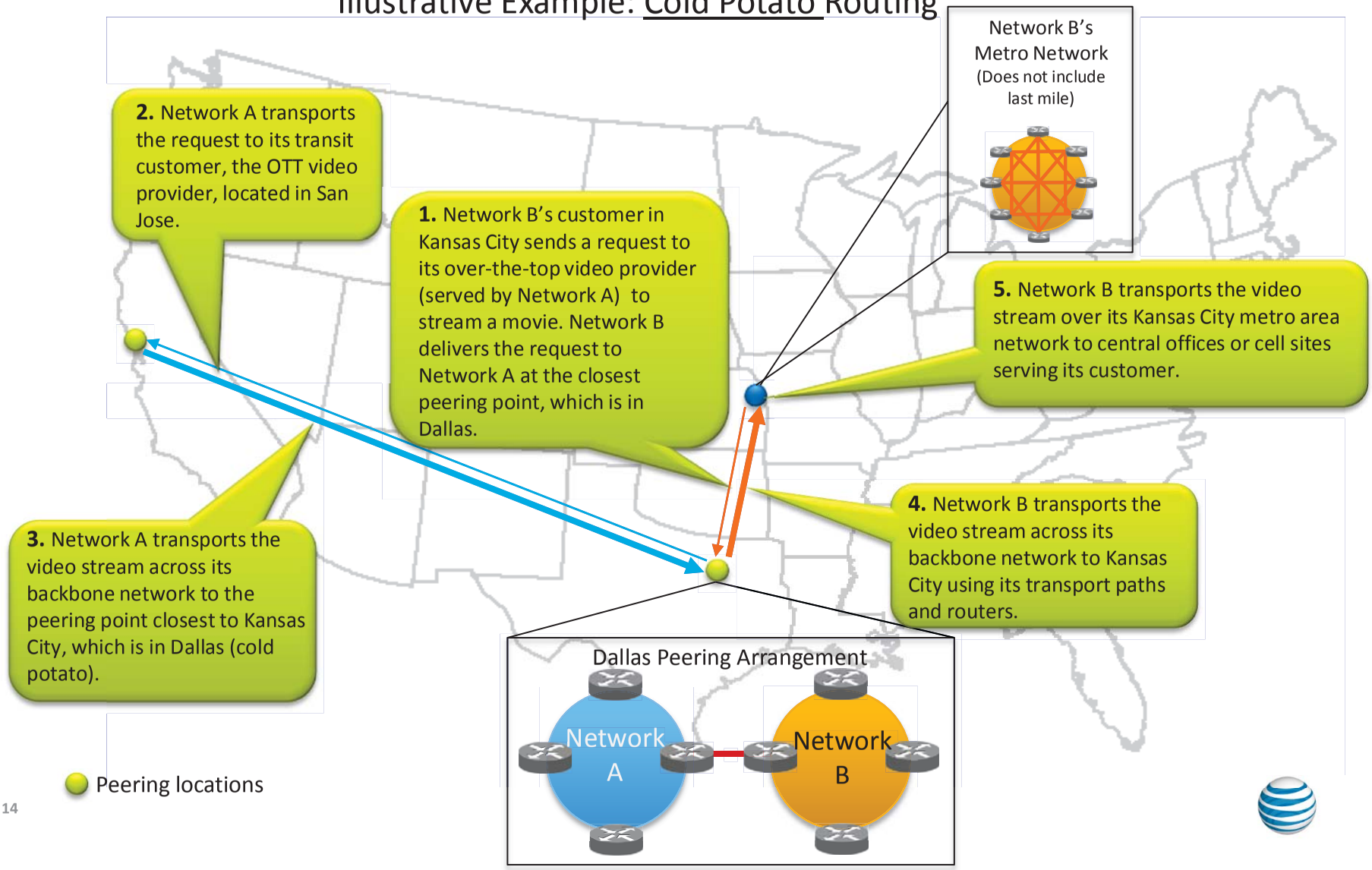
Network A

Network B

Peering locations

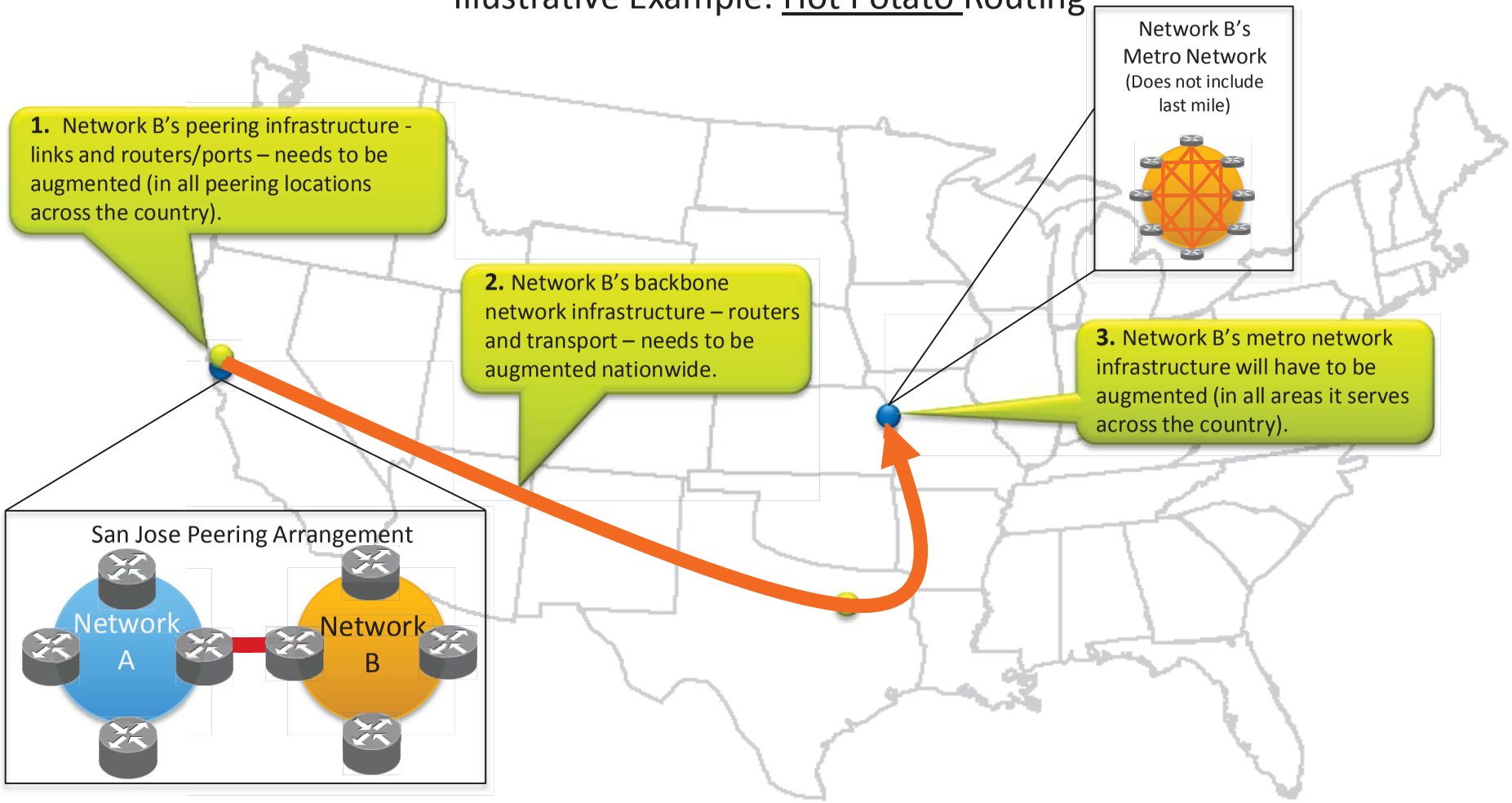
Carriage of Traffic is Not Without Cost

Illustrative Example: Cold Potato Routing



Cost Implications of Carrying Additional Traffic

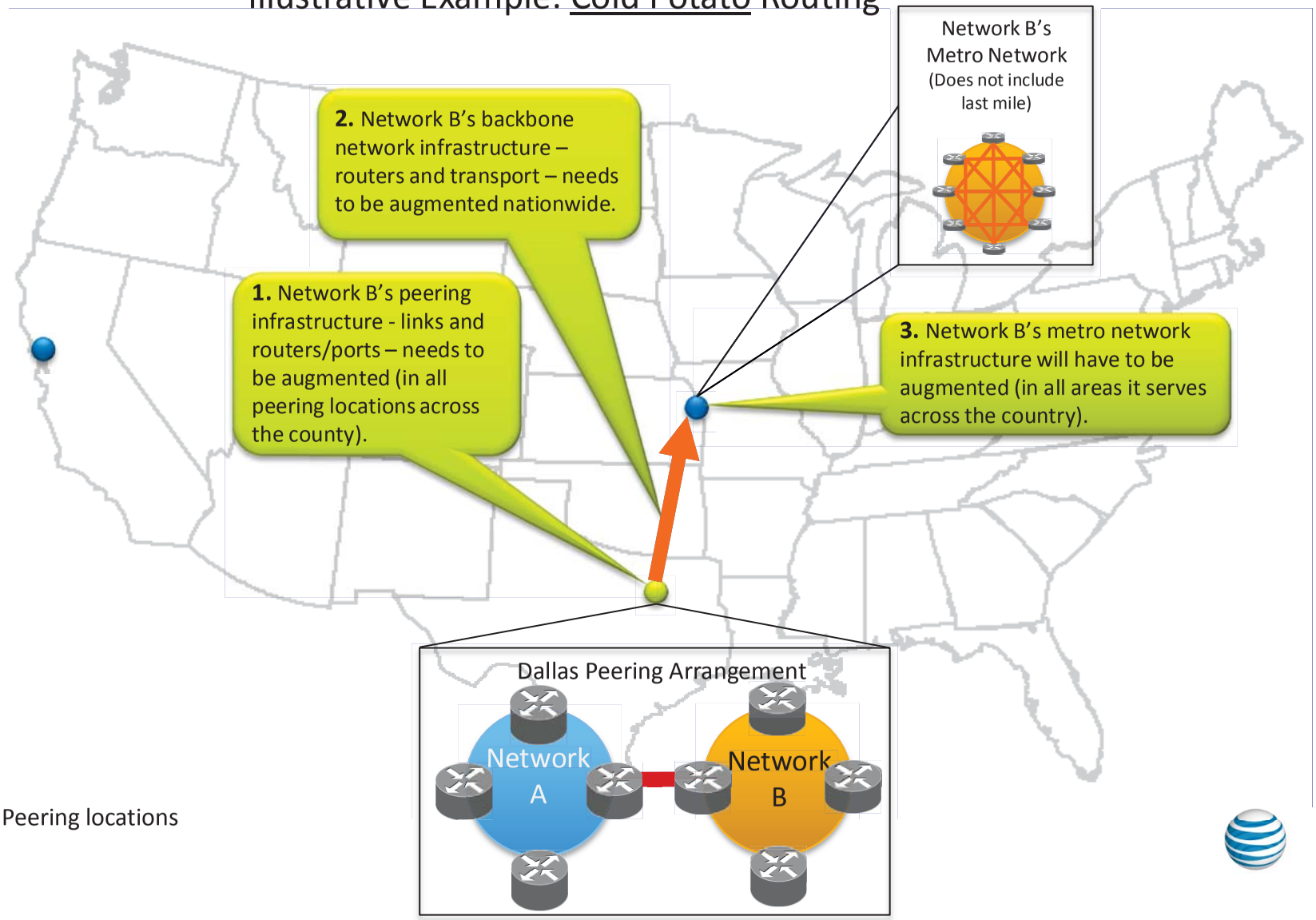
Illustrative Example: Hot Potato Routing



Peering locations

Cost Implications of Carrying Additional Traffic

Illustrative Example: Cold Potato Routing



Internet Interconnection: Key Takeaways

- The Internet interconnection ecosystem is competitive.
- Networks have options for interconnection: the ecosystem is flexible in accommodating various business models.
- Internet interconnection is fundamentally different from PSTN interconnection: there is no terminating monopoly.
- Internet interconnection is global and isn't limited by state or national boundaries.
- Internet interconnection imposes substantial costs on network providers that involve far more than the simple meet-point between networks, that are unrelated to "last mile" Internet access costs, and that are not end user specific.