The Internet Interconnection Ecosystem

July 15, 2014

Internet Interconnection

Basic methods in which Internet interconnection is achieved:

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

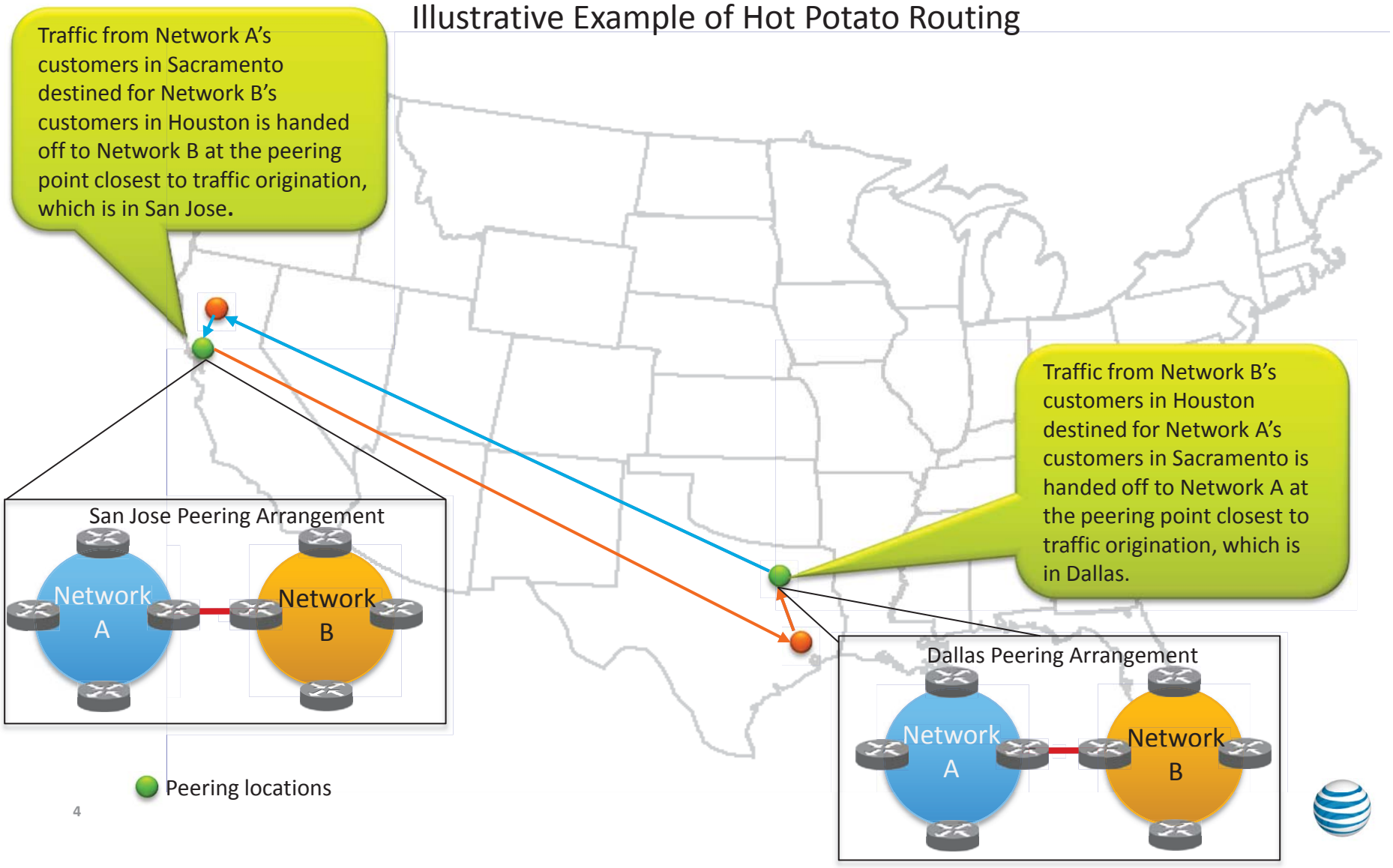
Internet Interconnection: Peering

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
- Without exchange of payment – not 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
- Hot potato routing is the default
- 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: Peering



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

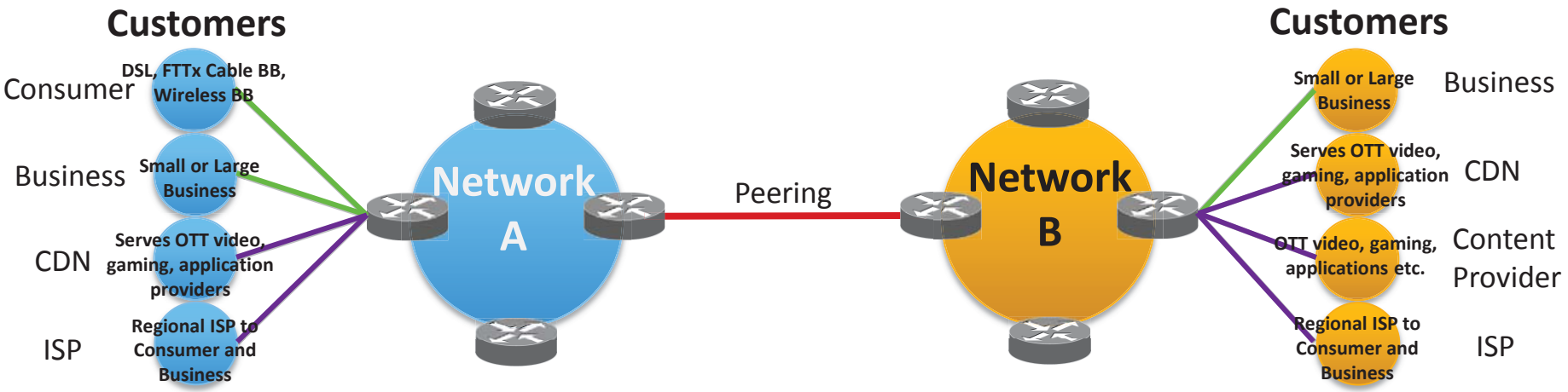
On-net Only

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
- More interconnection location options than peering
- Purchasers include content-heavy entities:
  - Content Delivery Networks
  - Content providers

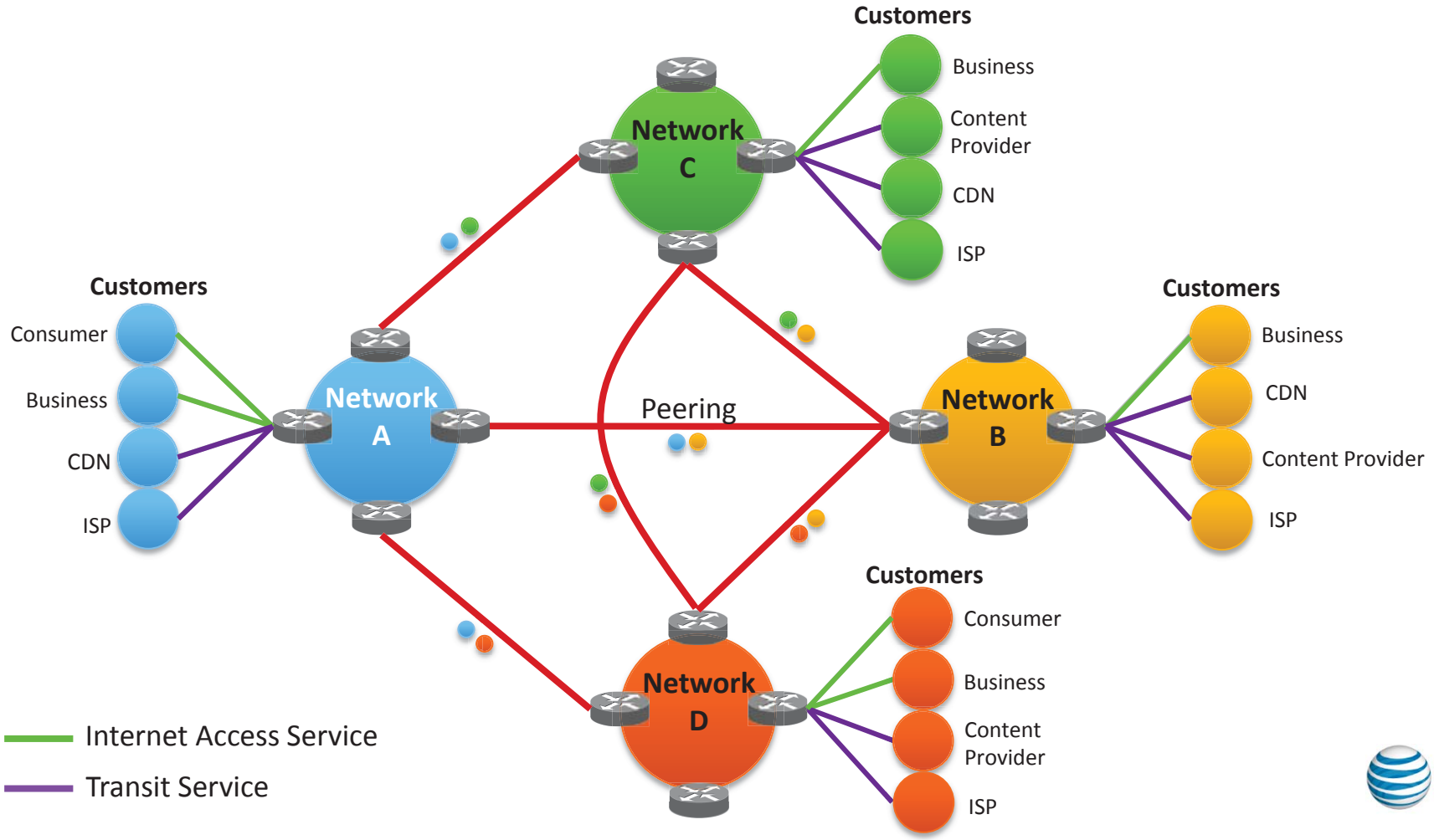
Internet Interconnection: Peering

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



Internet Interconnection: Peering

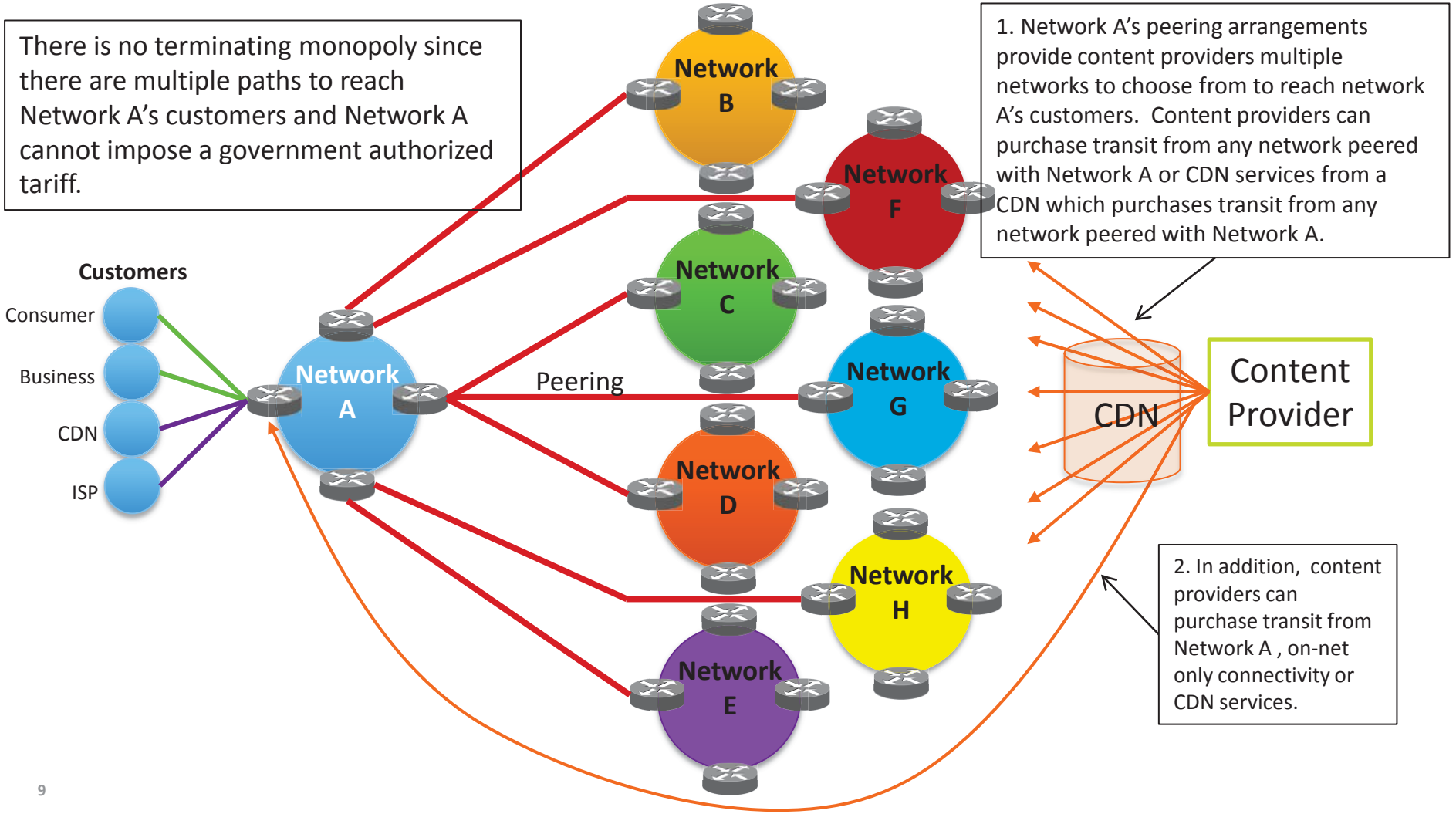
Multiple Peering Arrangements



Internet Interconnection: Peering

Peering Arrangements Enable Connectivity Options

There is no terminating monopoly since there are multiple paths to reach Network A's customers and Network A cannot impose a government authorized tariff.

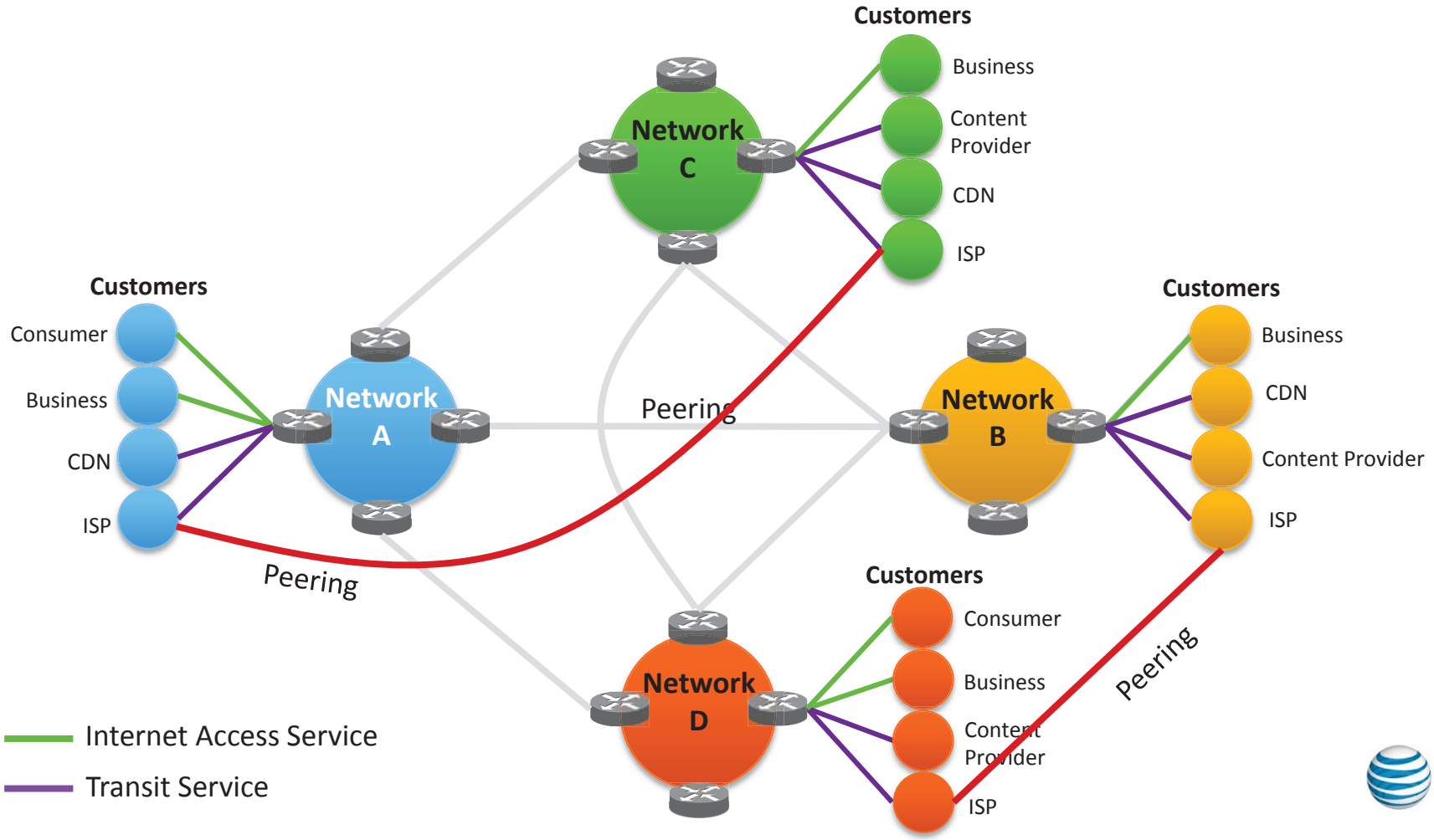


1. Network A's peering arrangements provide content providers multiple networks to choose from to reach network A's customers. Content providers can purchase transit from any network peered with Network A or CDN services from a CDN which purchases transit from any network peered with Network A.

2. In addition, content providers can purchase transit from Network A , on-net only connectivity or CDN services.

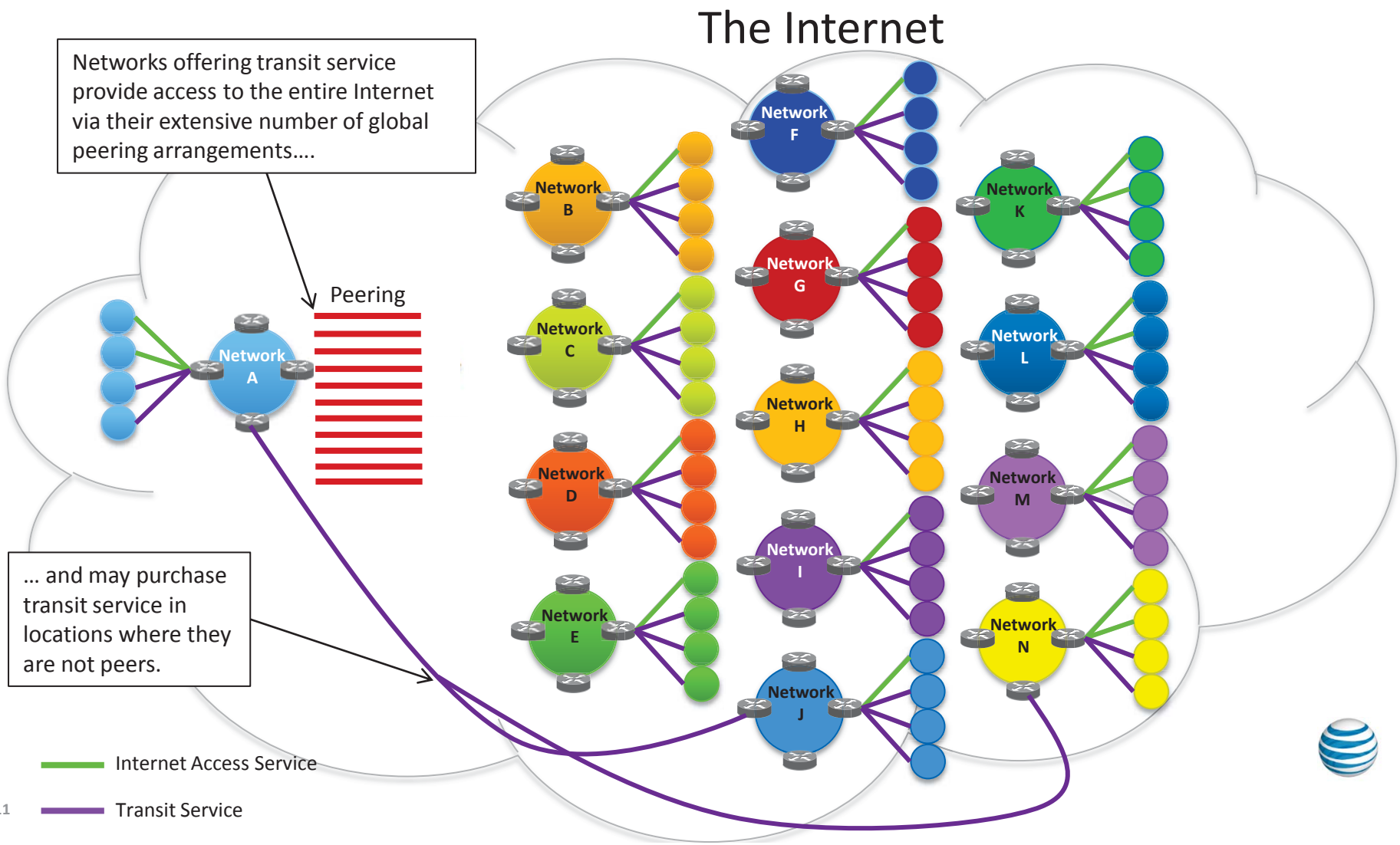
Internet Interconnection: Peering

Peering arrangements are not limited to large networks.

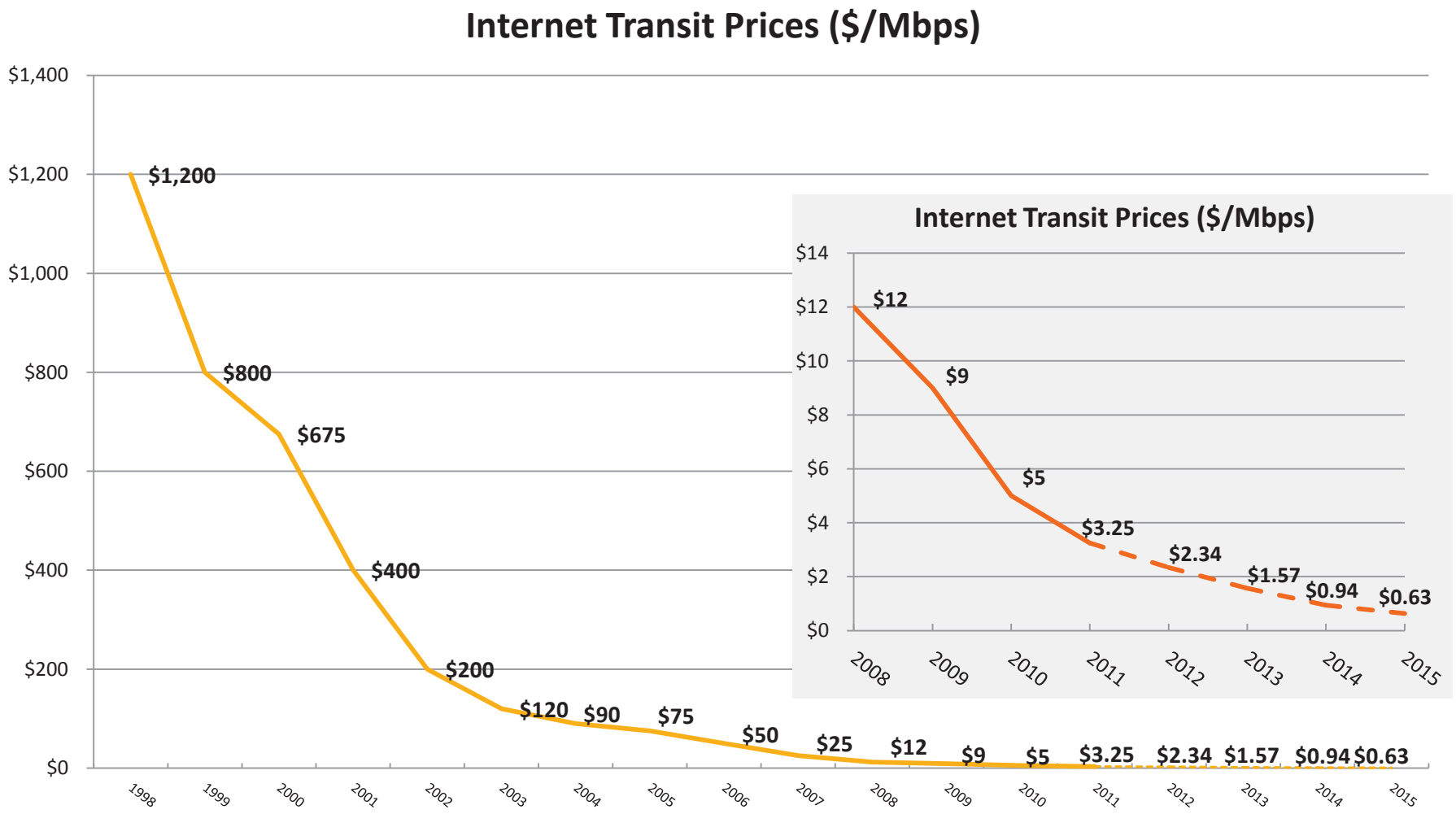


Internet Interconnection: Transit

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



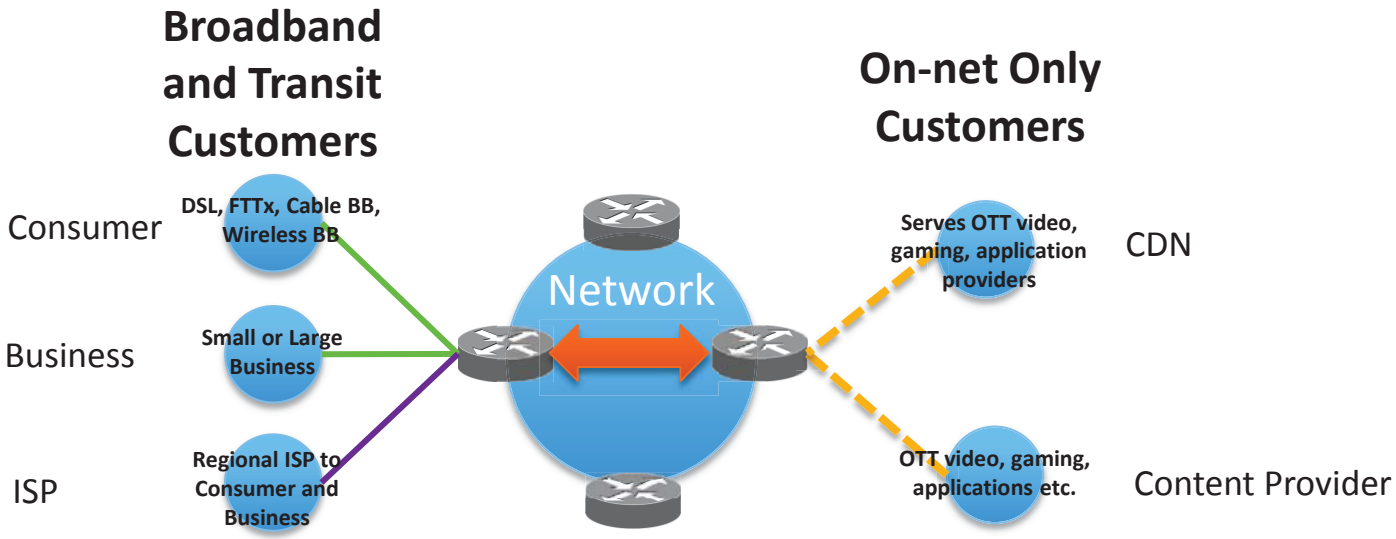
Competition is Driving Lower Transit Prices



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.

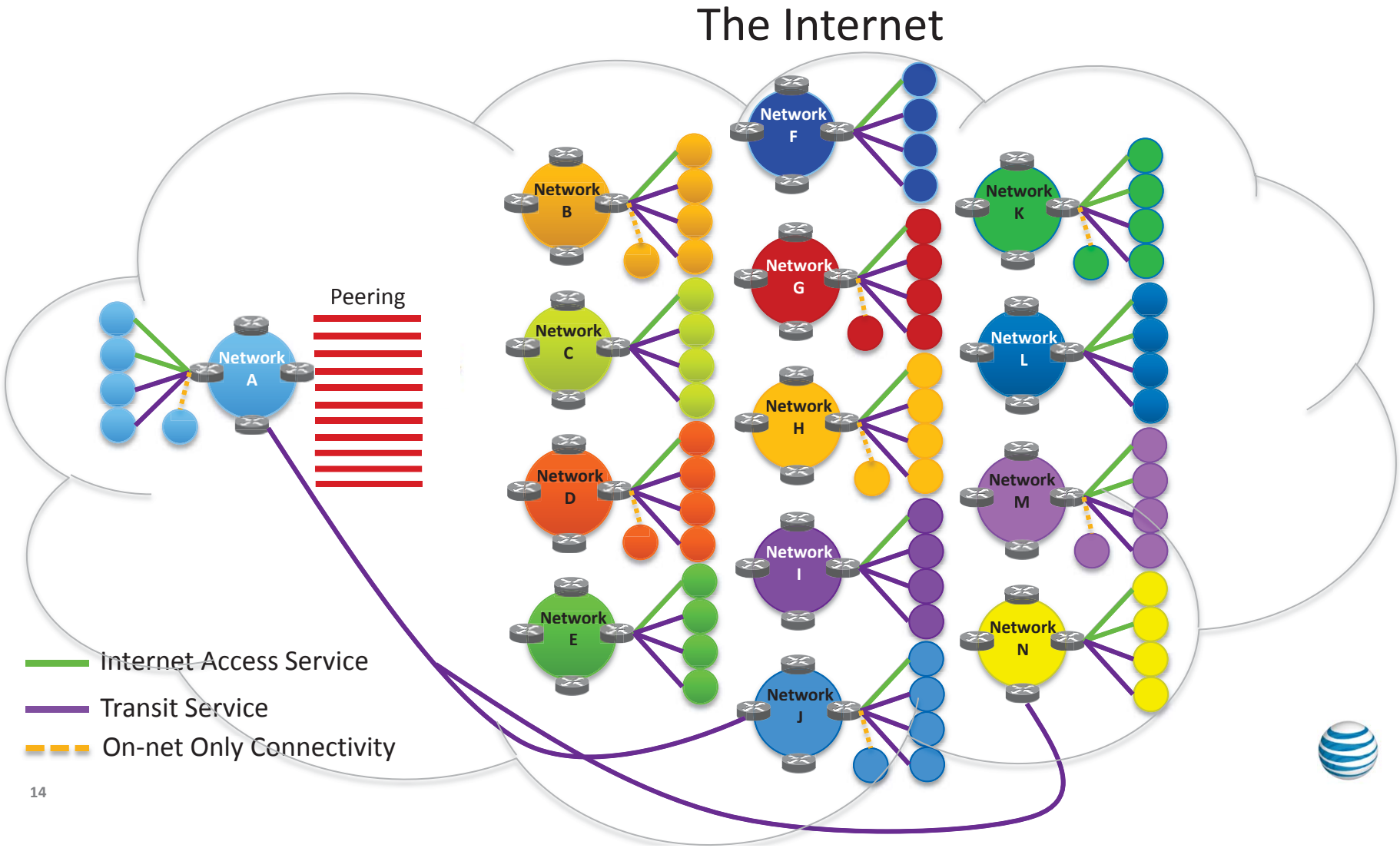
Internet Access Service

Transit Service

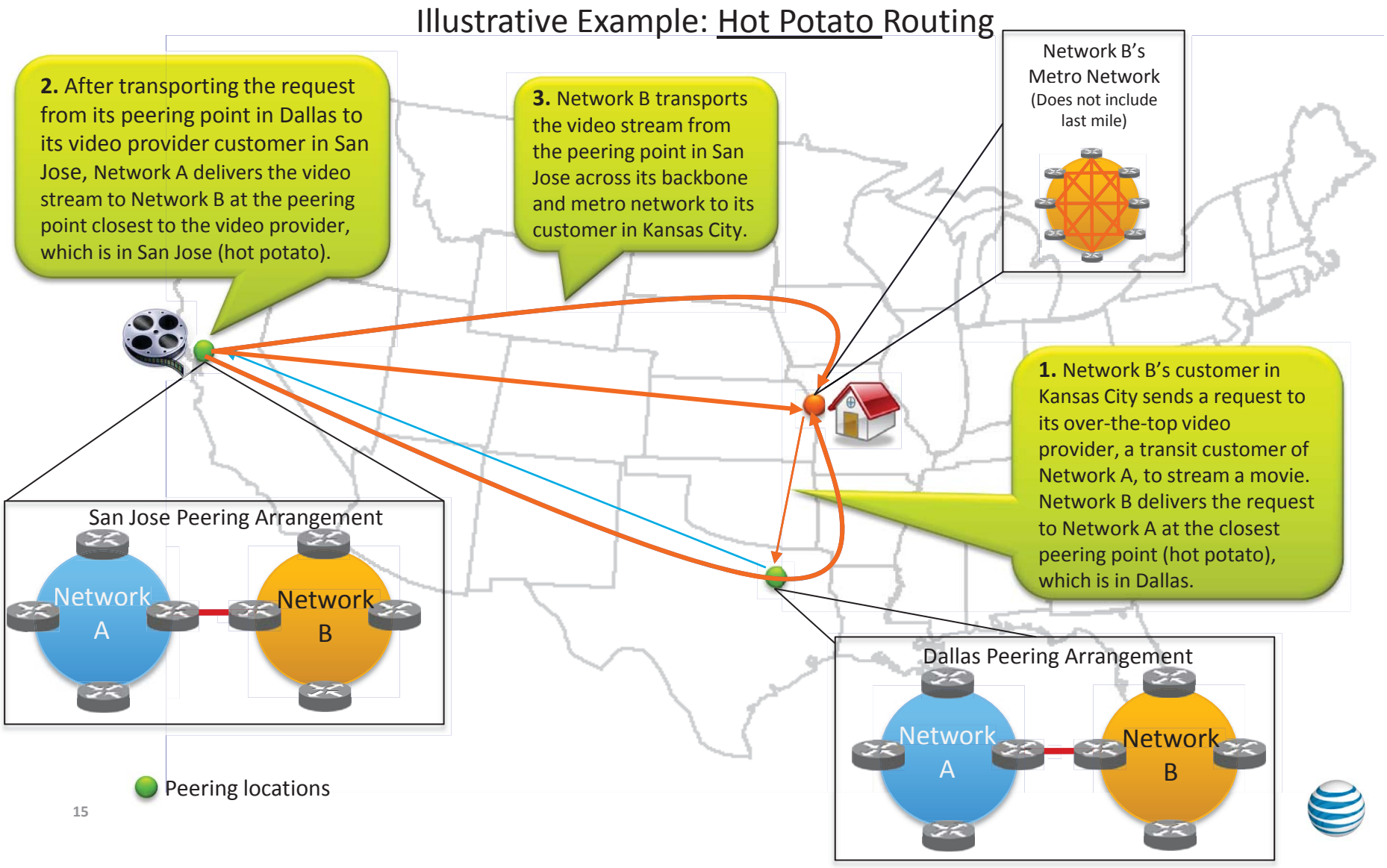
On-net Only

Internet Interconnection: Putting It All Together

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



Carriage of Traffic is Not Without Cost



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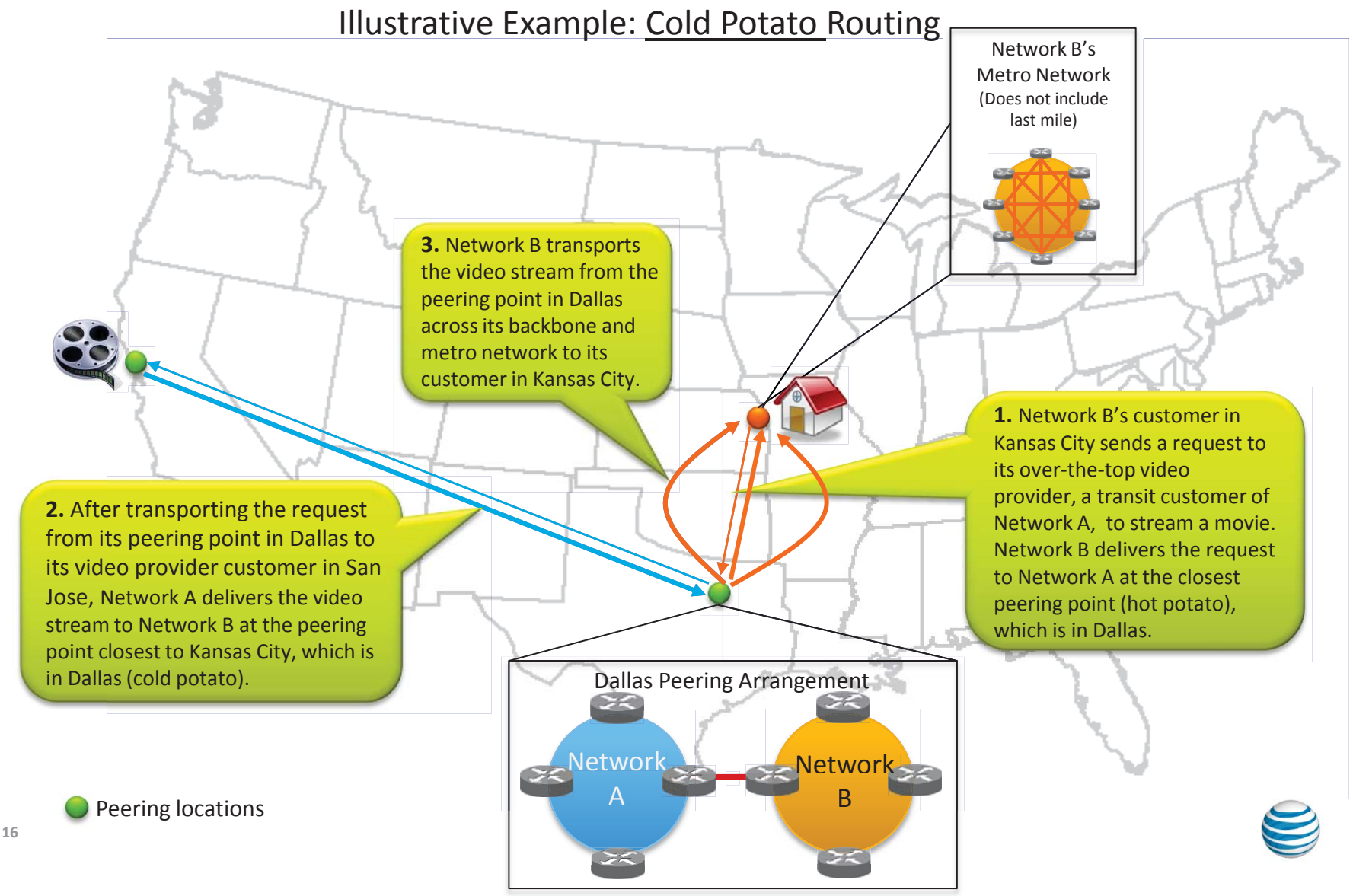
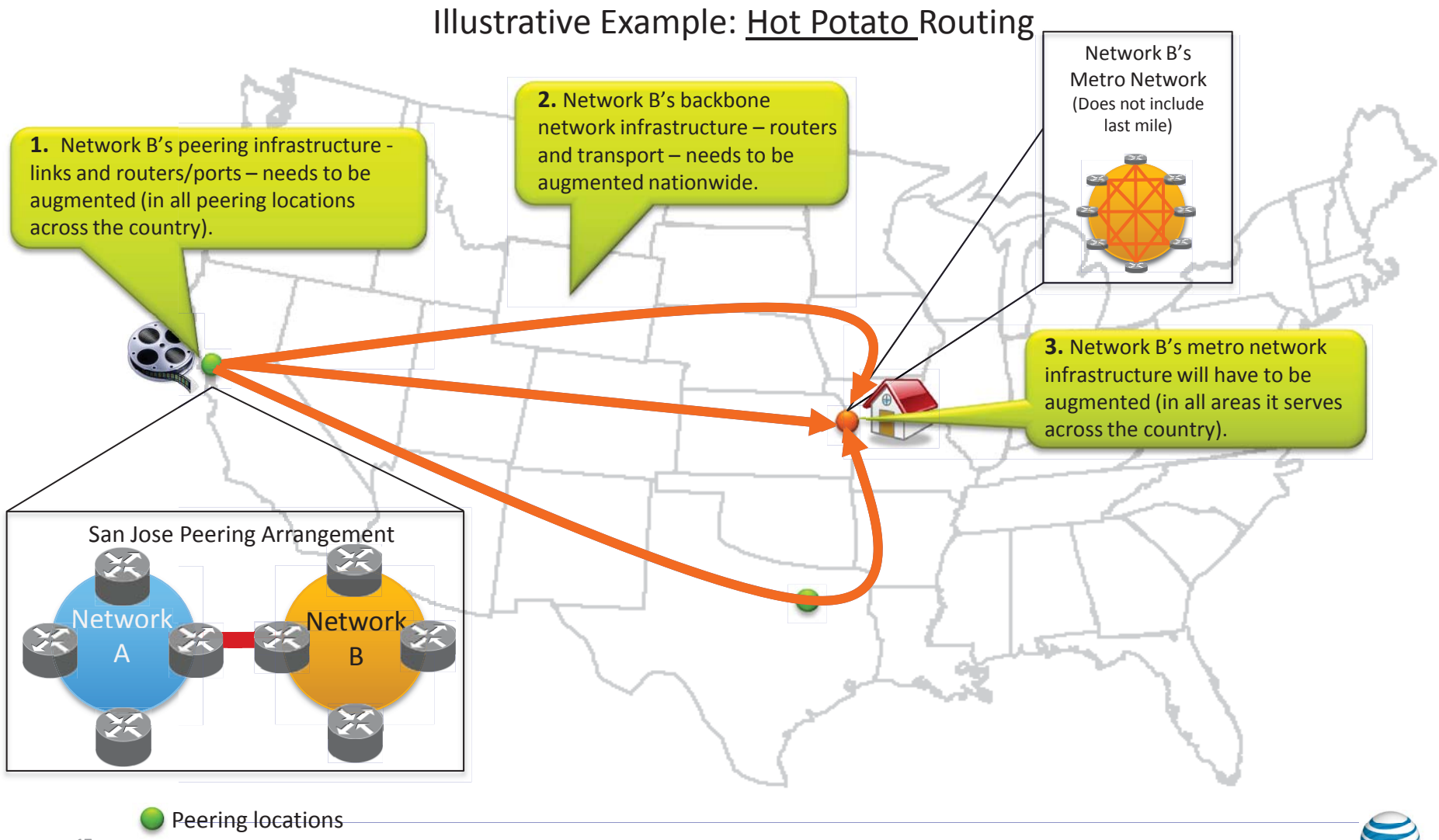
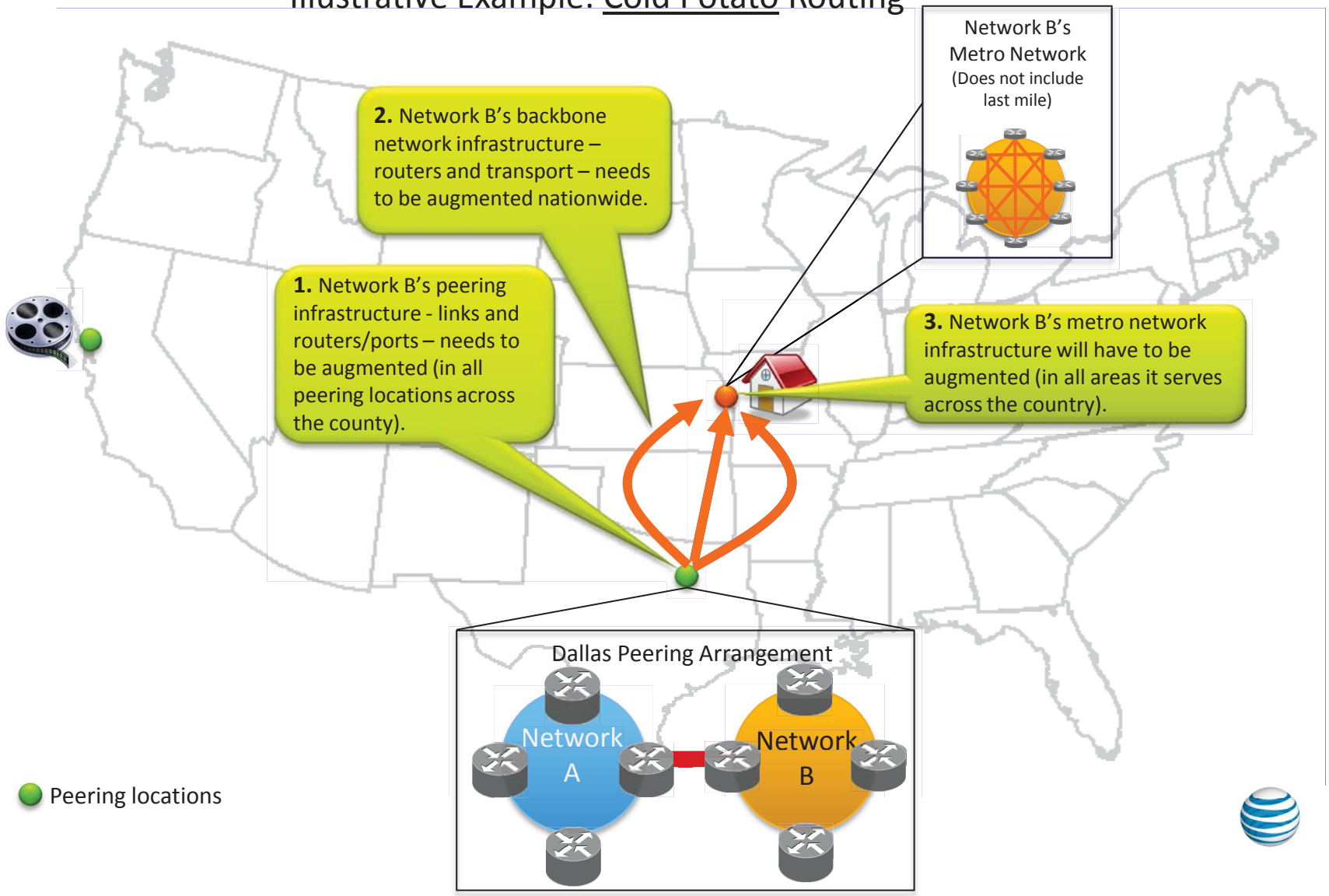


Cost Implications of Carrying Additional Traffic



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.