

# The Internet Interconnection Ecosystem

July 28, 2014



# Internet Interconnection

Basic methods in which Internet interconnection is achieved:

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



# Internet Interconnection: Peering

## Peering

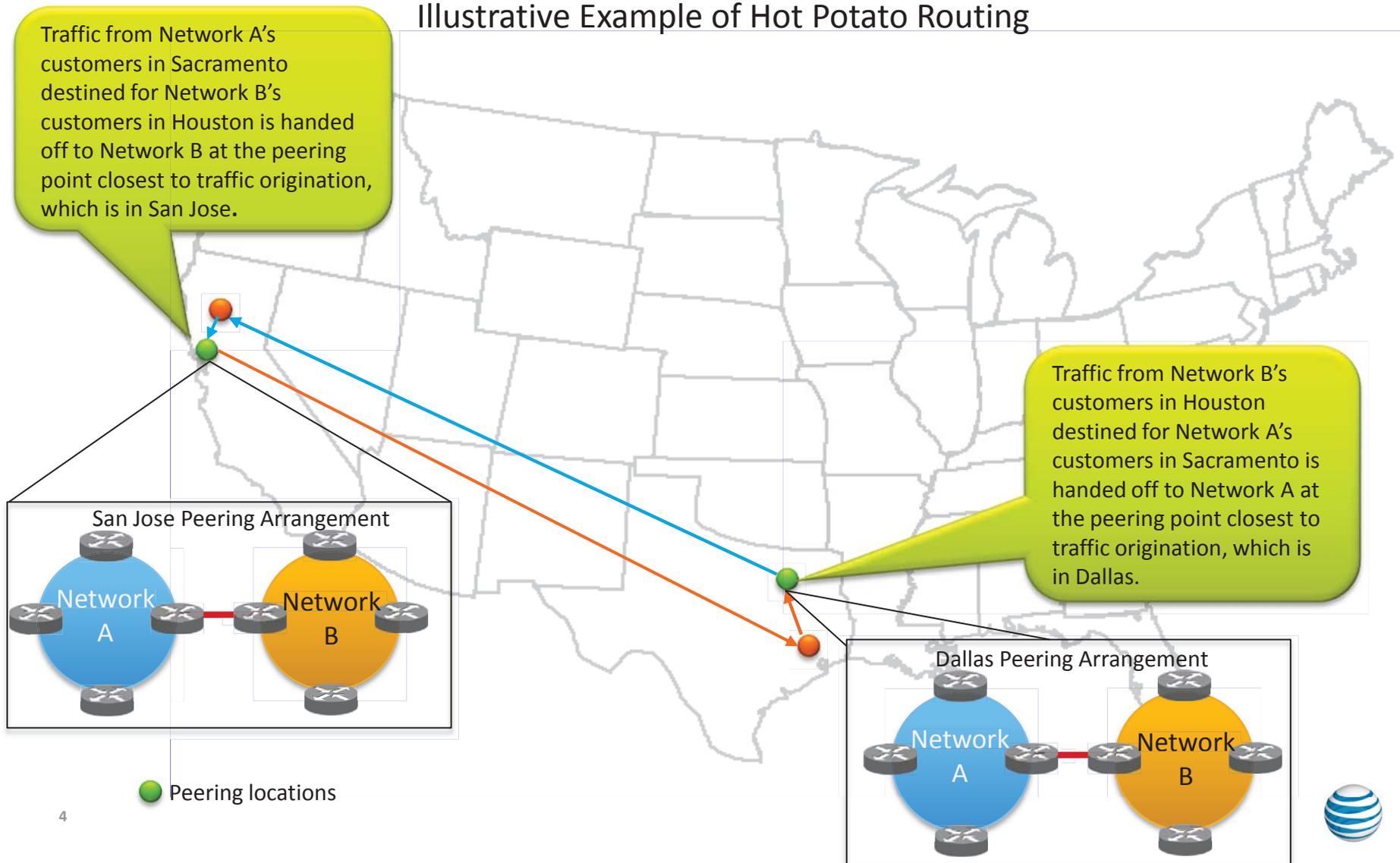
An arrangement where two networks (autonomous systems) voluntarily interconnect to exchange traffic between their customers.

- 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

## Illustrative Example of Hot Potato Routing



# 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

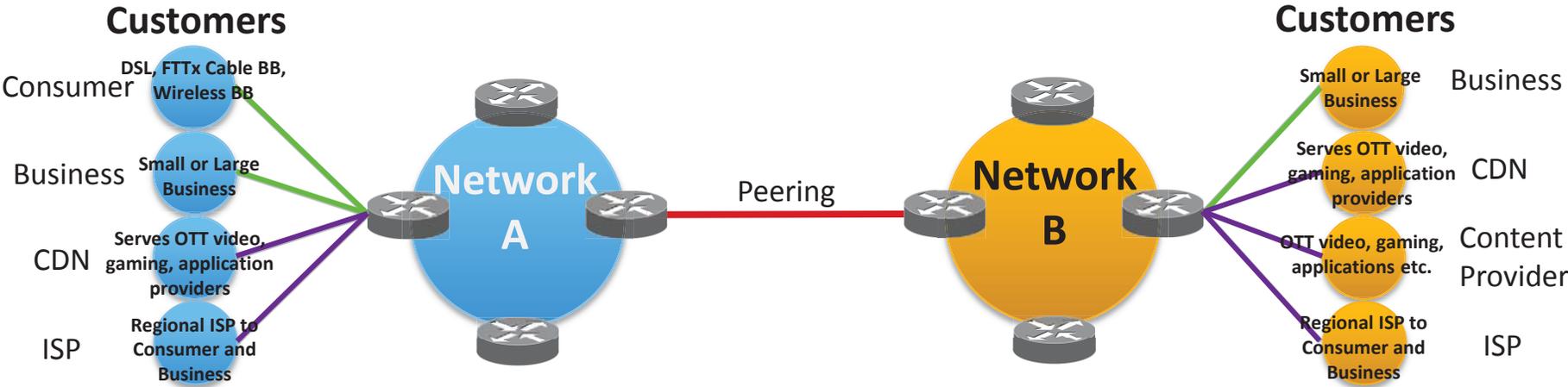
On-net Only connectivity is an optional service whereby a network provides access to only its customers.

- 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.

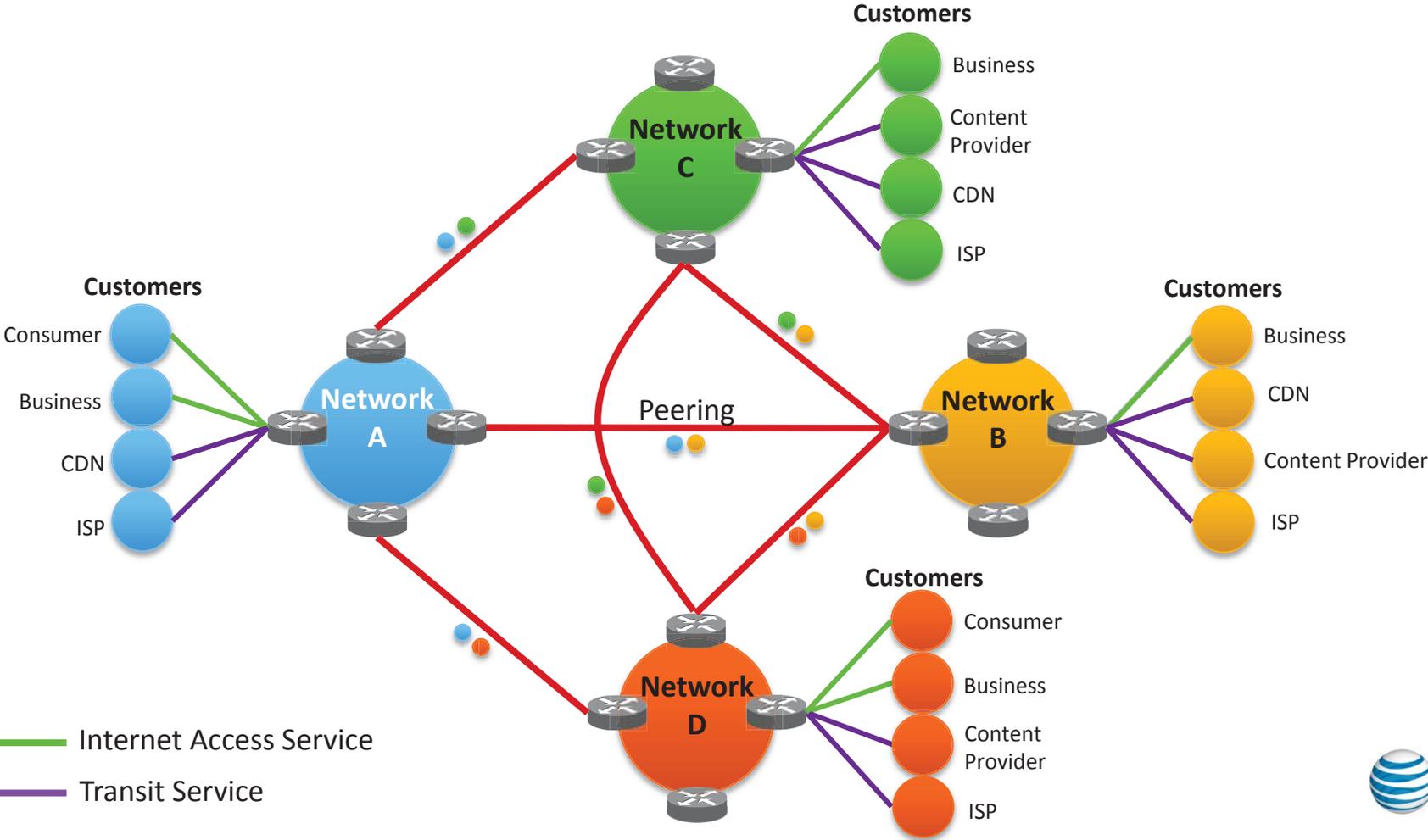


- Internet Access Service
- Transit Service



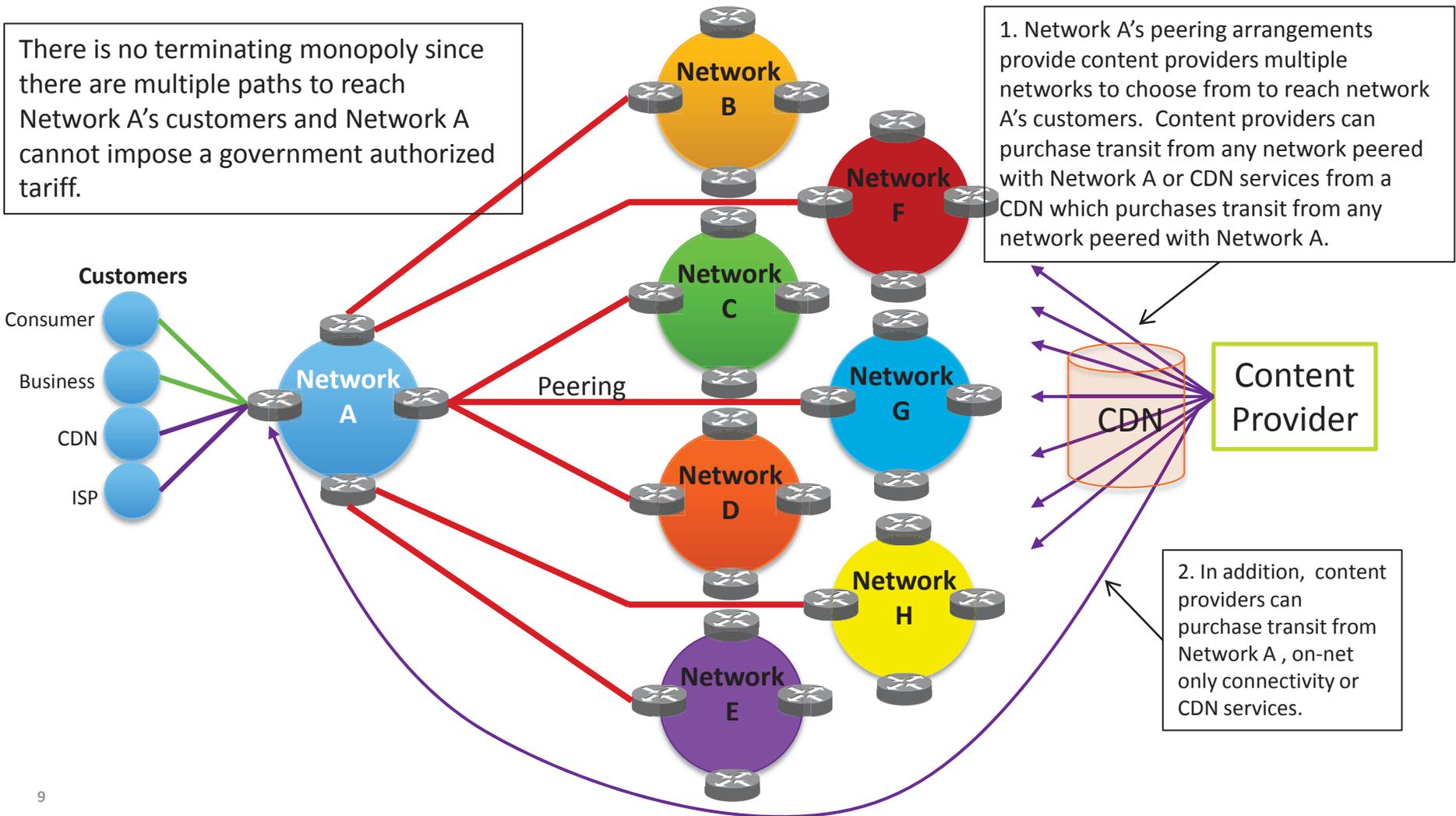
# Internet Interconnection: Peering

## Multiple Peering Arrangements



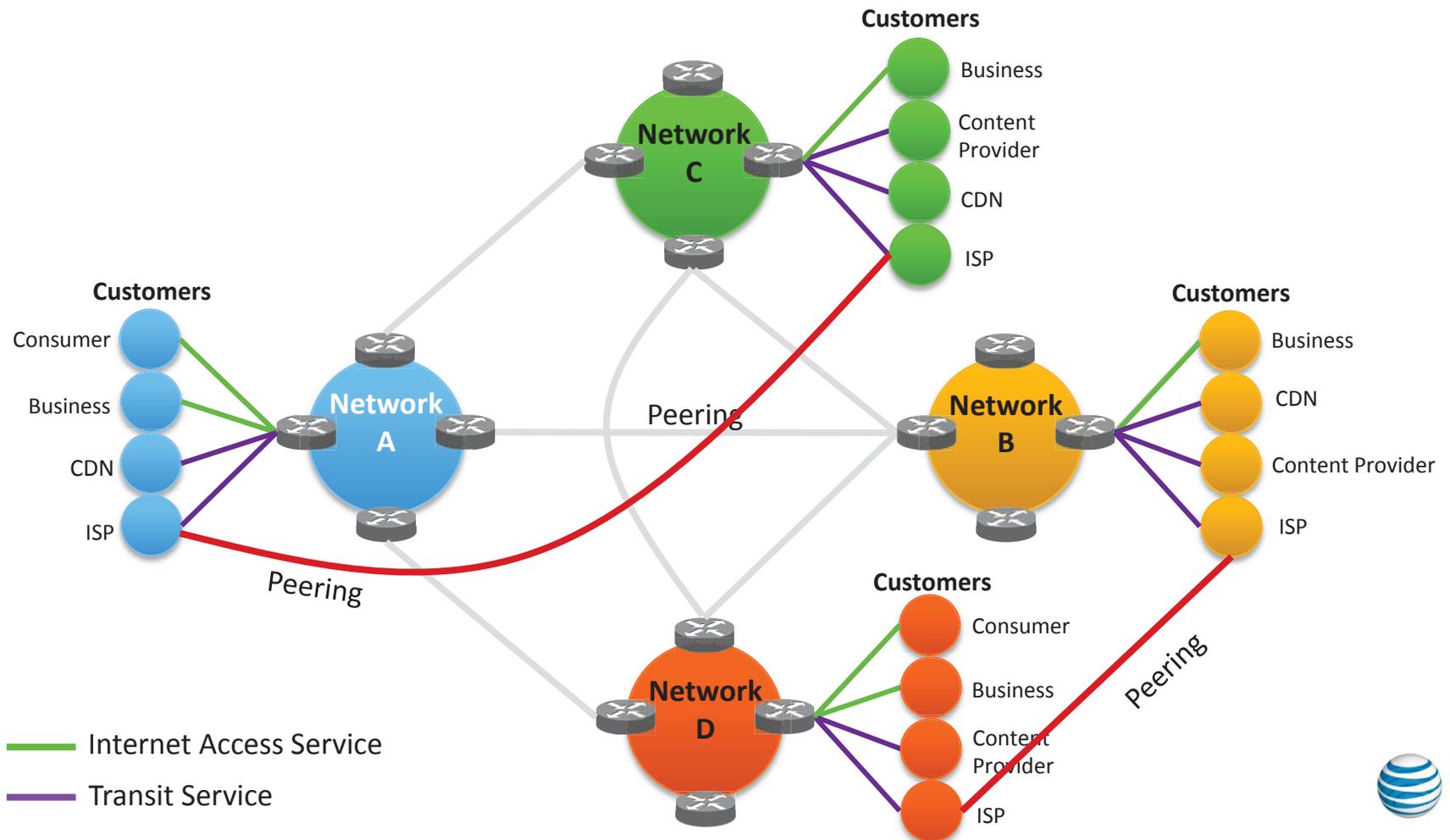
# Internet Interconnection: Peering

## Peering Arrangements Enable Connectivity Options



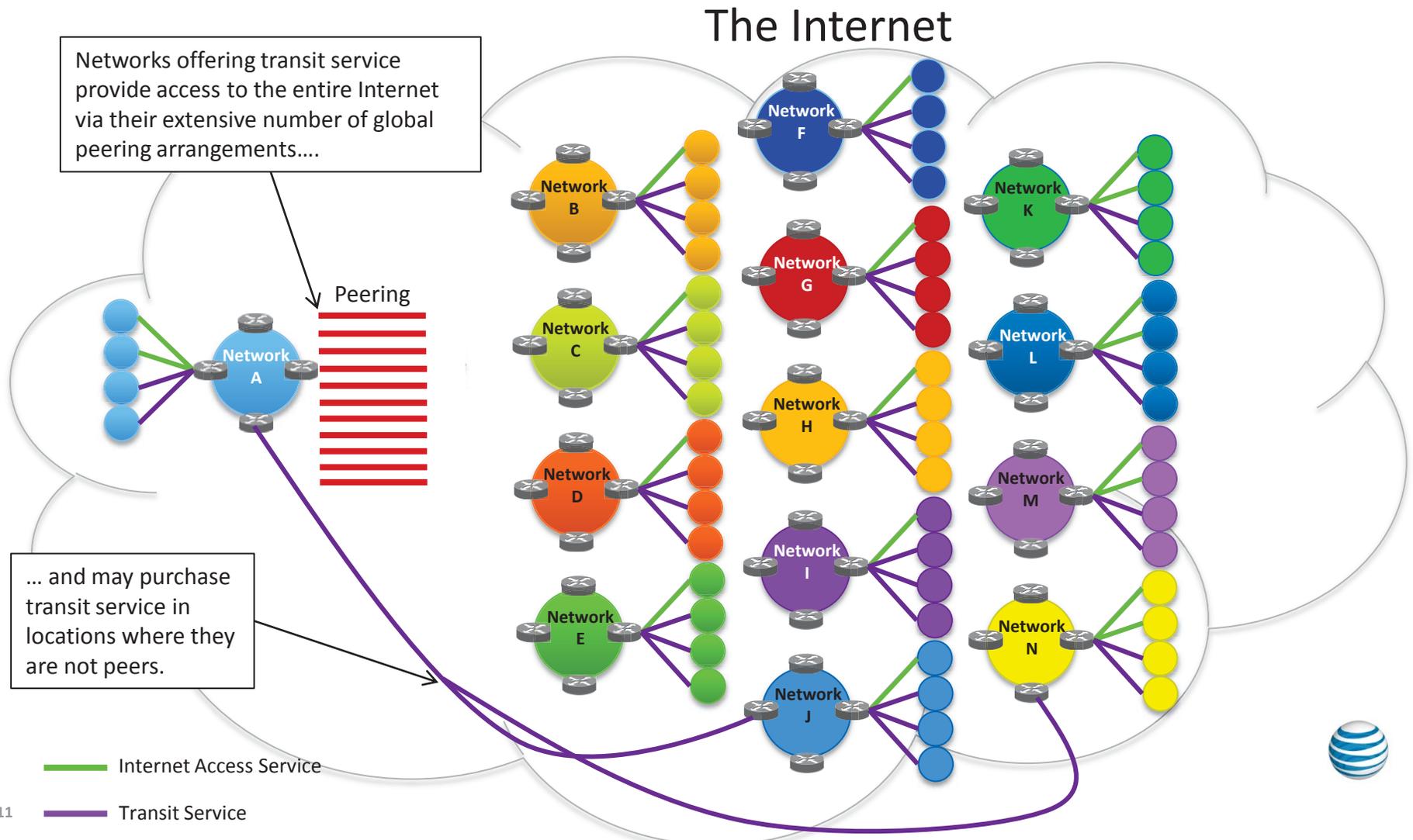
# Internet Interconnection: Peering

Peering arrangements are not limited to large networks.



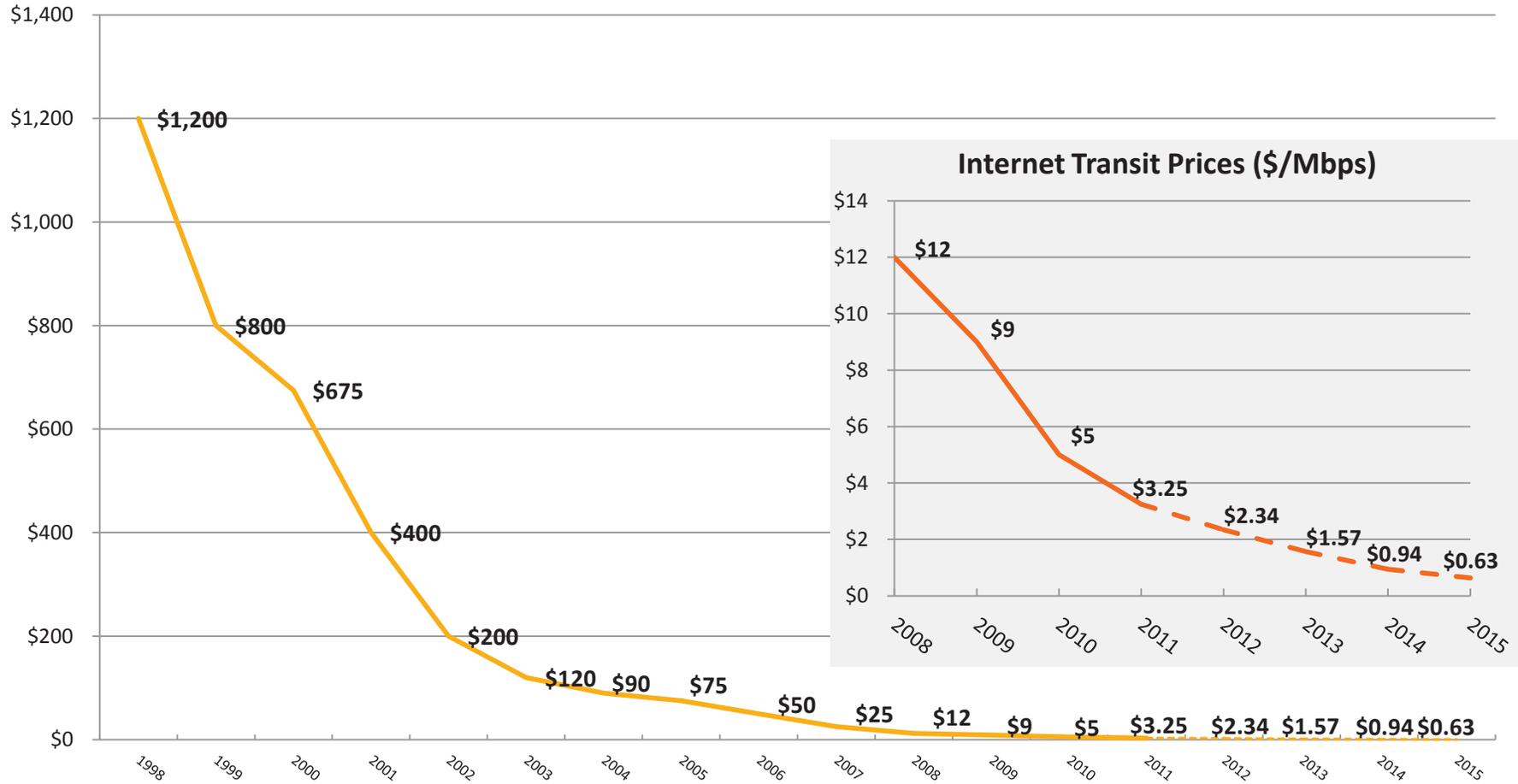
# Internet Interconnection: Transit

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



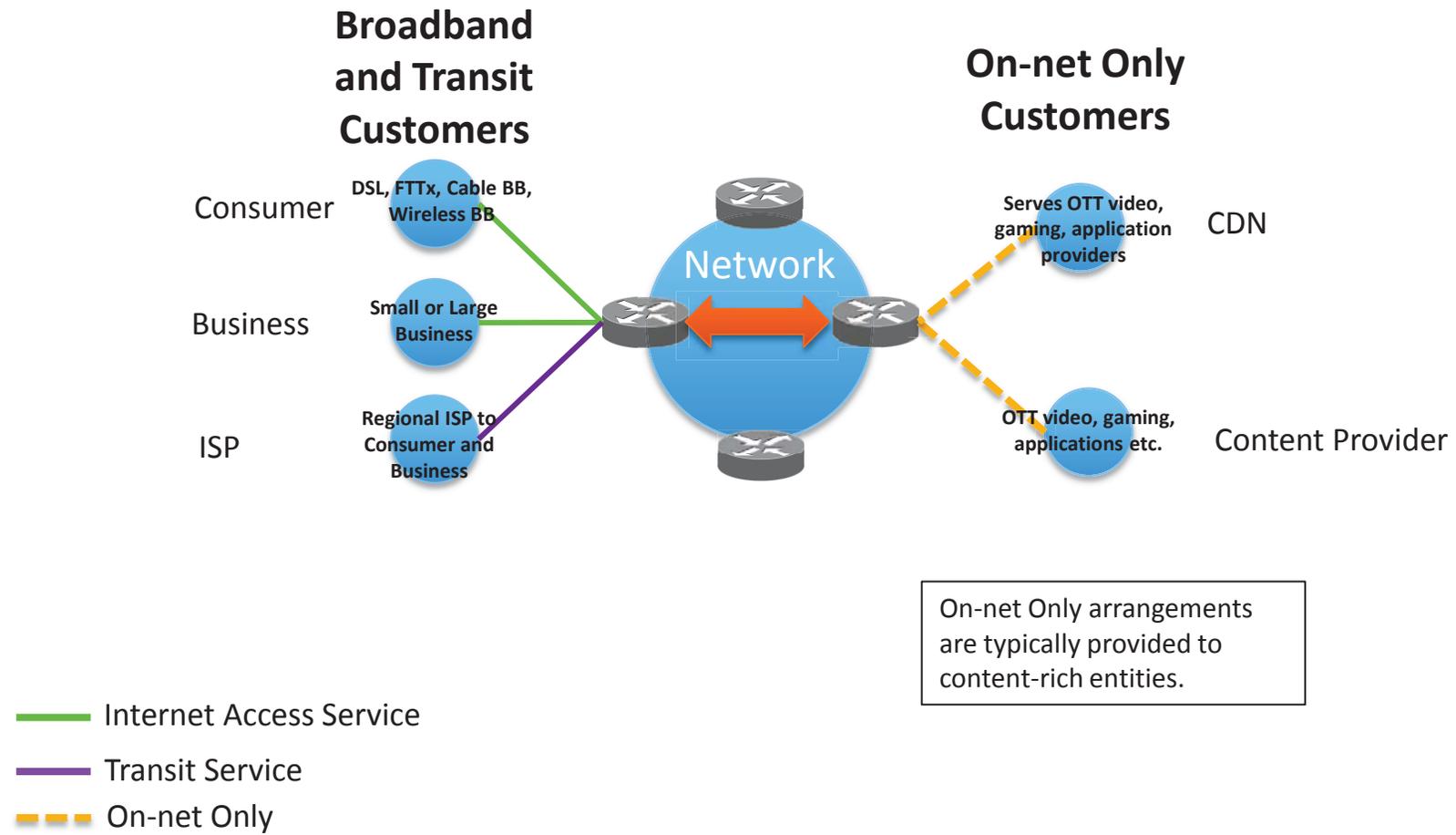
# Competition is Driving Lower Transit Prices

## Internet Transit Prices (\$/Mbps)



# Internet Interconnection: On-net Only

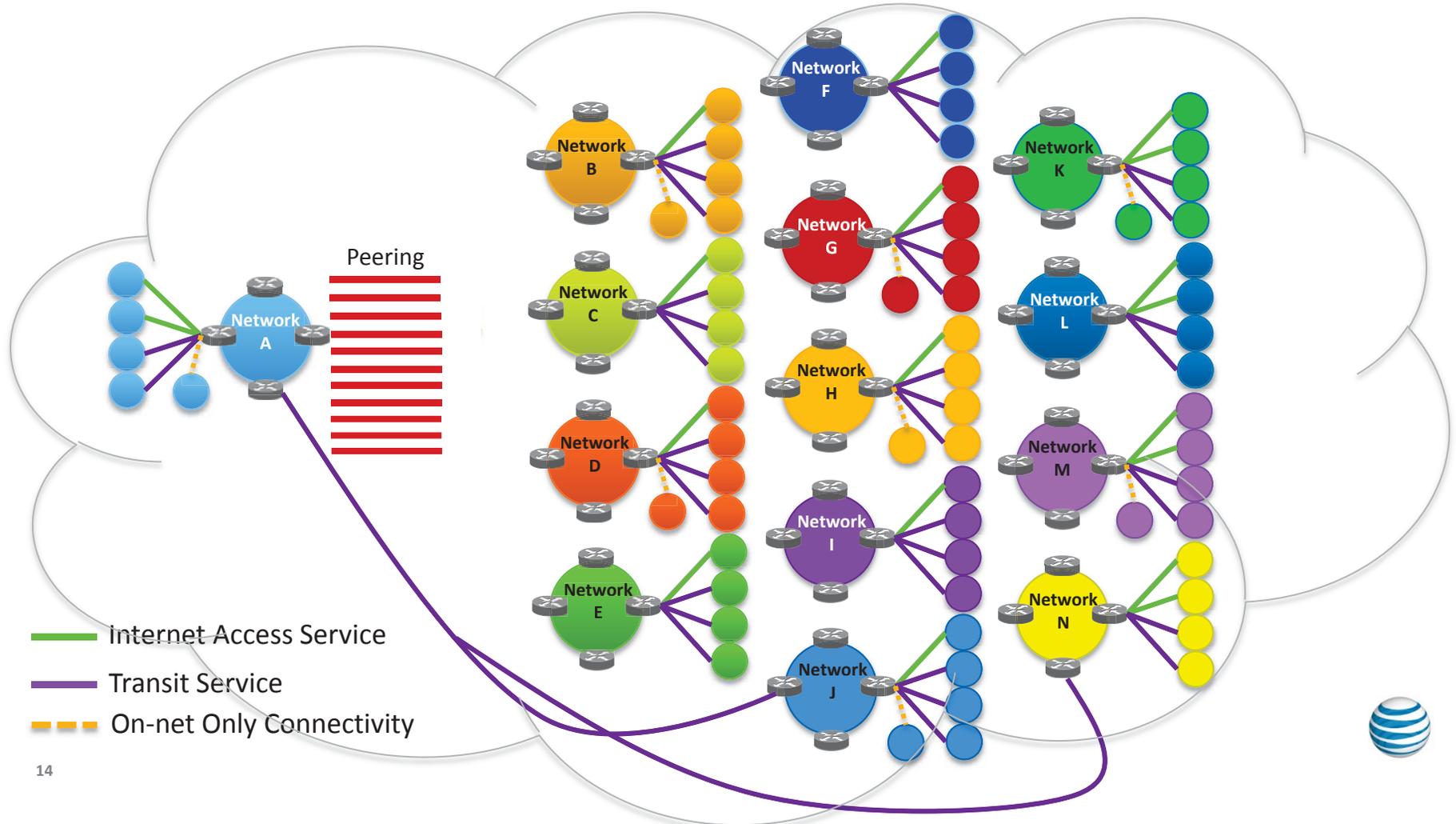
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# Internet Interconnection: Putting It All Together

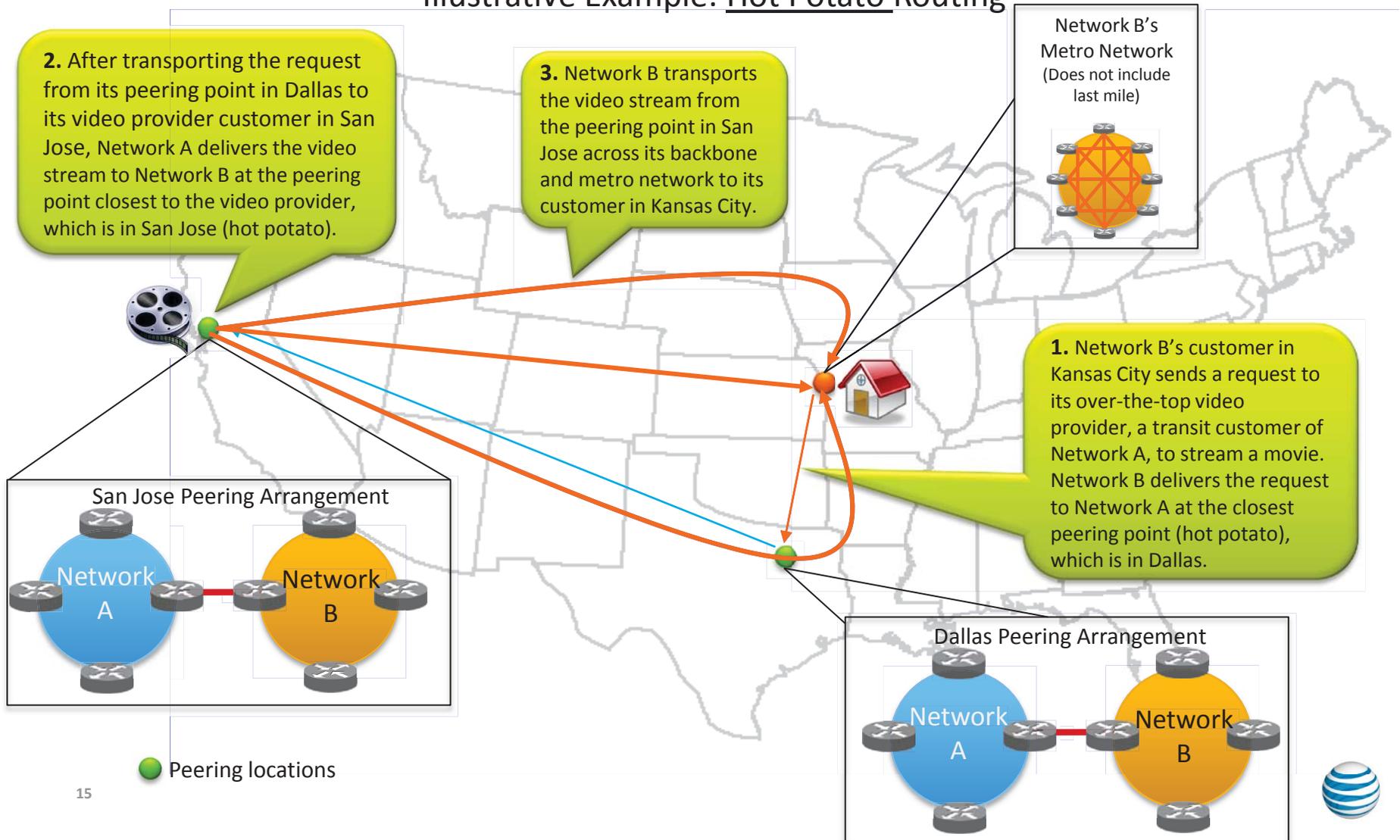
The global Internet is comprised of a variety of interconnection options.

## The Internet



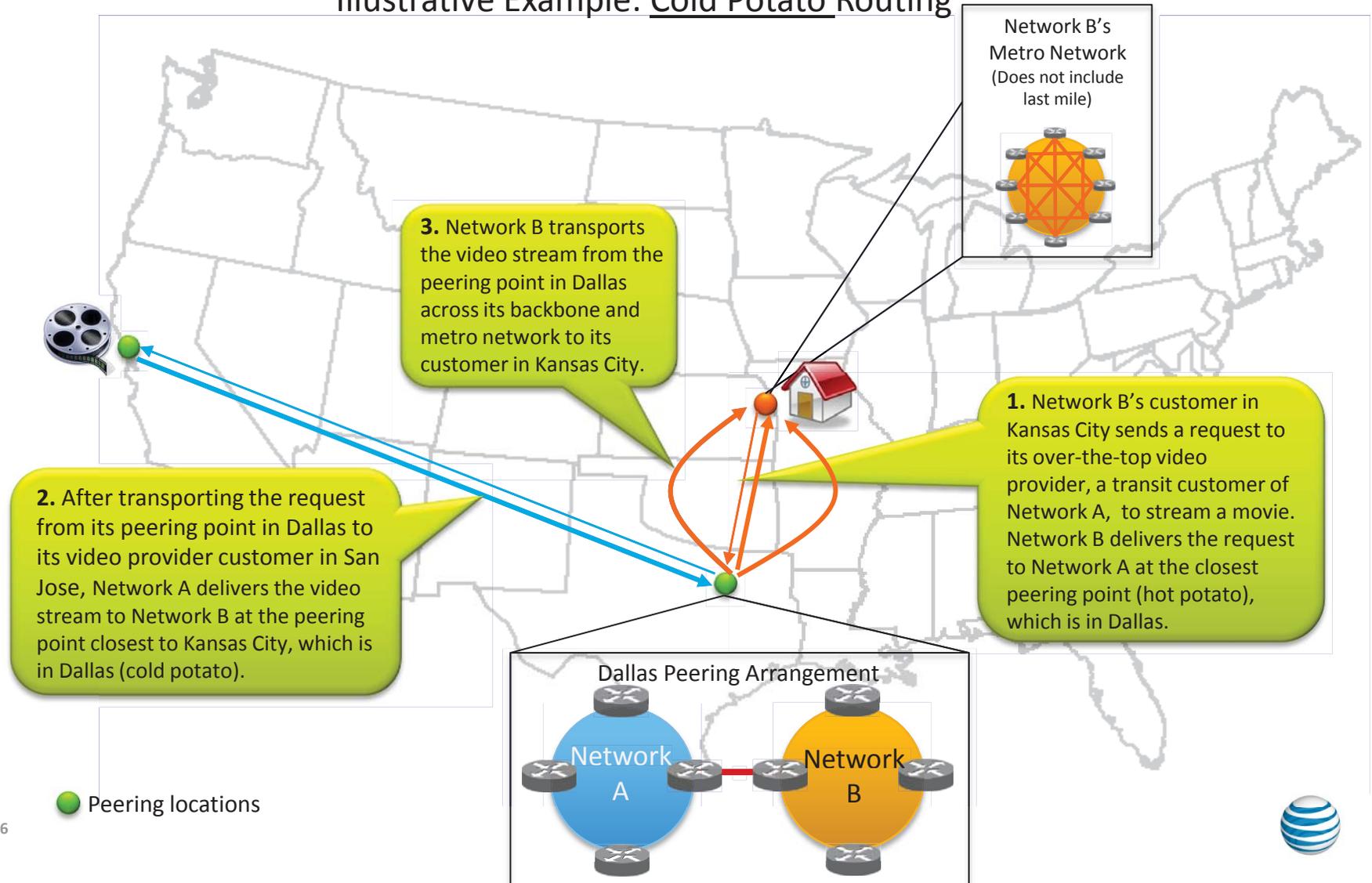
# Carriage of Traffic is Not Without Cost

## Illustrative Example: Hot Potato Routing



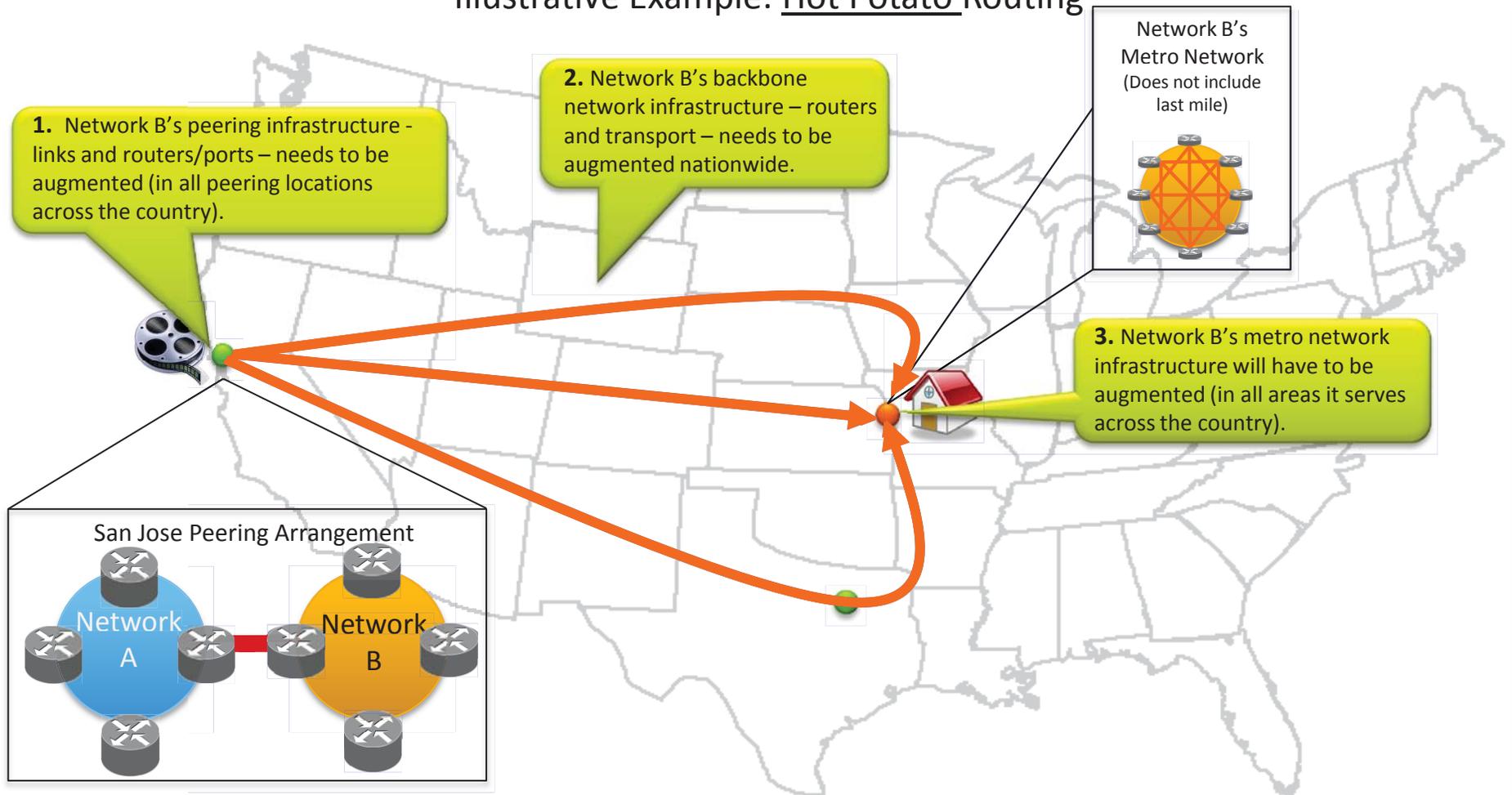
# Carriage of Traffic is Not Without Cost

## Illustrative Example: Cold Potato Routing



# Cost Implications of Carrying Additional Traffic

## Illustrative Example: Hot Potato Routing

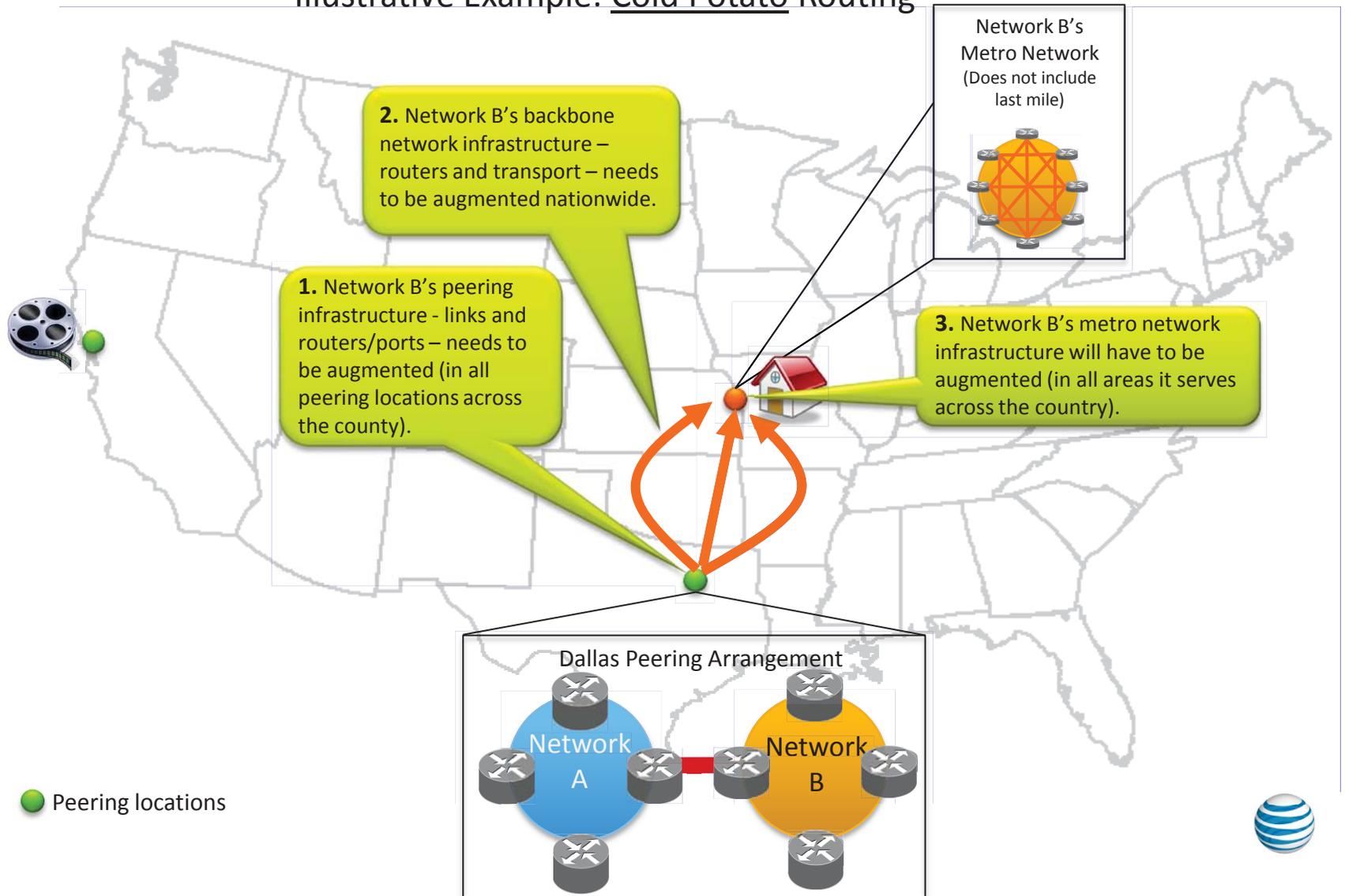


● Peering locations



# 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.

