Cloud e Datacenter Networking

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The Dropbox network infrastructure

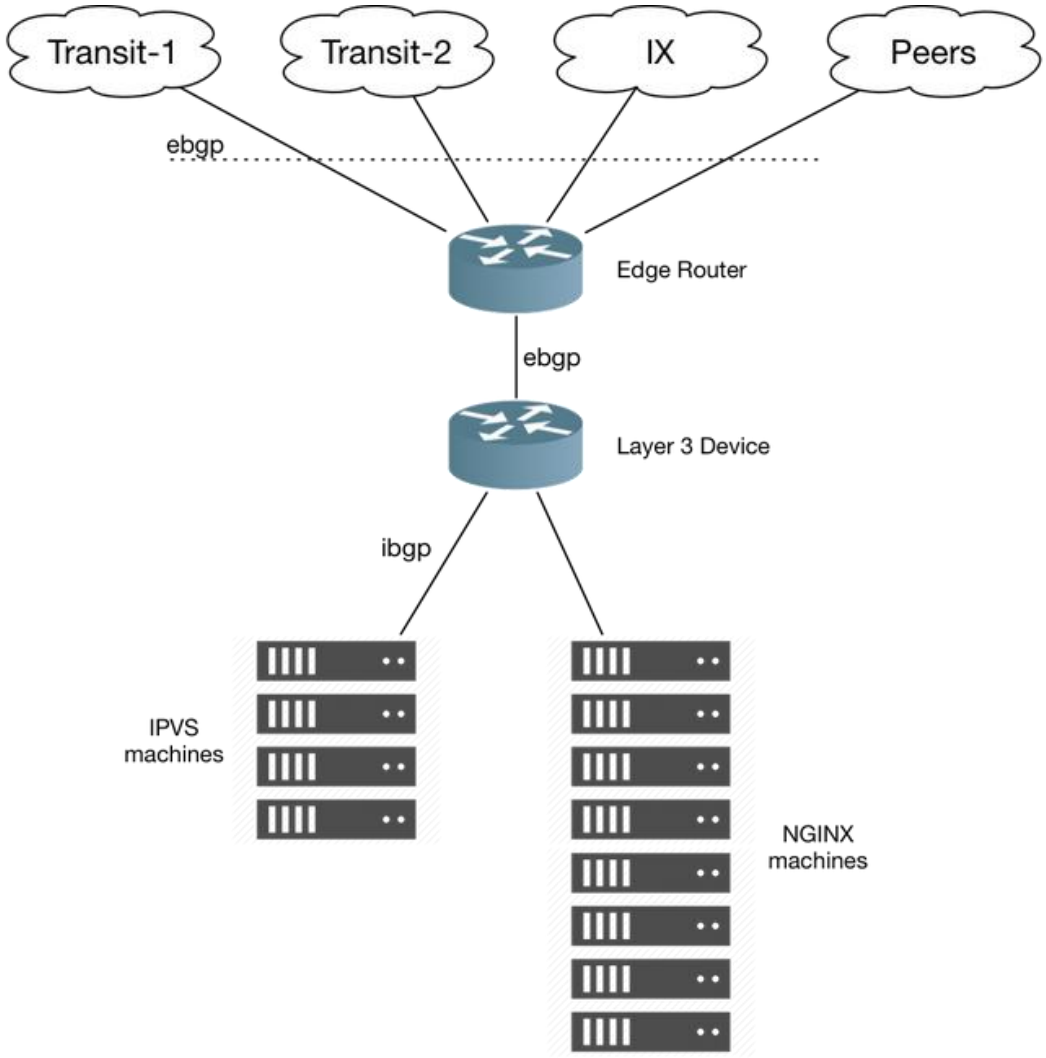
Dropbox's move off the cloud

- Dropbox provides a file storage service to around 500 million users worldwide and 200,000 business customers
- In 2014 Dropbox decided to move the majority of its services from Amazon's AWS into their own data centers
- In order to make this transition, Dropbox moved about 500 PetaBytes away from third party cloud provider into their own servers in six months
- The first stage of the transition consisted in:
  - building 3 datacenters in the US
  - setting-up a number of edge facilities located throughout the world
  - create a backbone network connecting the DCs and the edge facilities
- In this Dropbox reduced its operating costs (OPEX):
  - In 2016: $92.5 million OPEX cost savings - $53 million CAPEX increased costs
    - $39.5 million overall cost reduction
  - In 2017: further $35.1 million cost savings

Evolution of Dropbox's network infrastructure

- Network infrastructure in 2014:
  - datacenters in only two US regions (east and west US coast)
  - 5 network PoPs in major cities
  - each PoP also connected to a local Internet Exchange (IXP), peering with multiple end-user networks also connected to the same IXP
    - Peering relastionships with only about 100 networks
  - internal routing via OSPFv2 (not supporting IPv6), interdomain routing via BGP
- Network infrastructure in 2015:
  - 3 new network PoPs in the US
  - internal routing via IS-IS to facilitate IPv6 roll-out
  - traffic engineering in their internal backbone performed though MPLS-TE
- Network infrastructure in 2016:
  - new network PoPs in Europe (London, Frankfurt, and Amsterdam) and Asia (Tokyo, Singapore, and Hong Kong)

Dropbox PoP Architecture

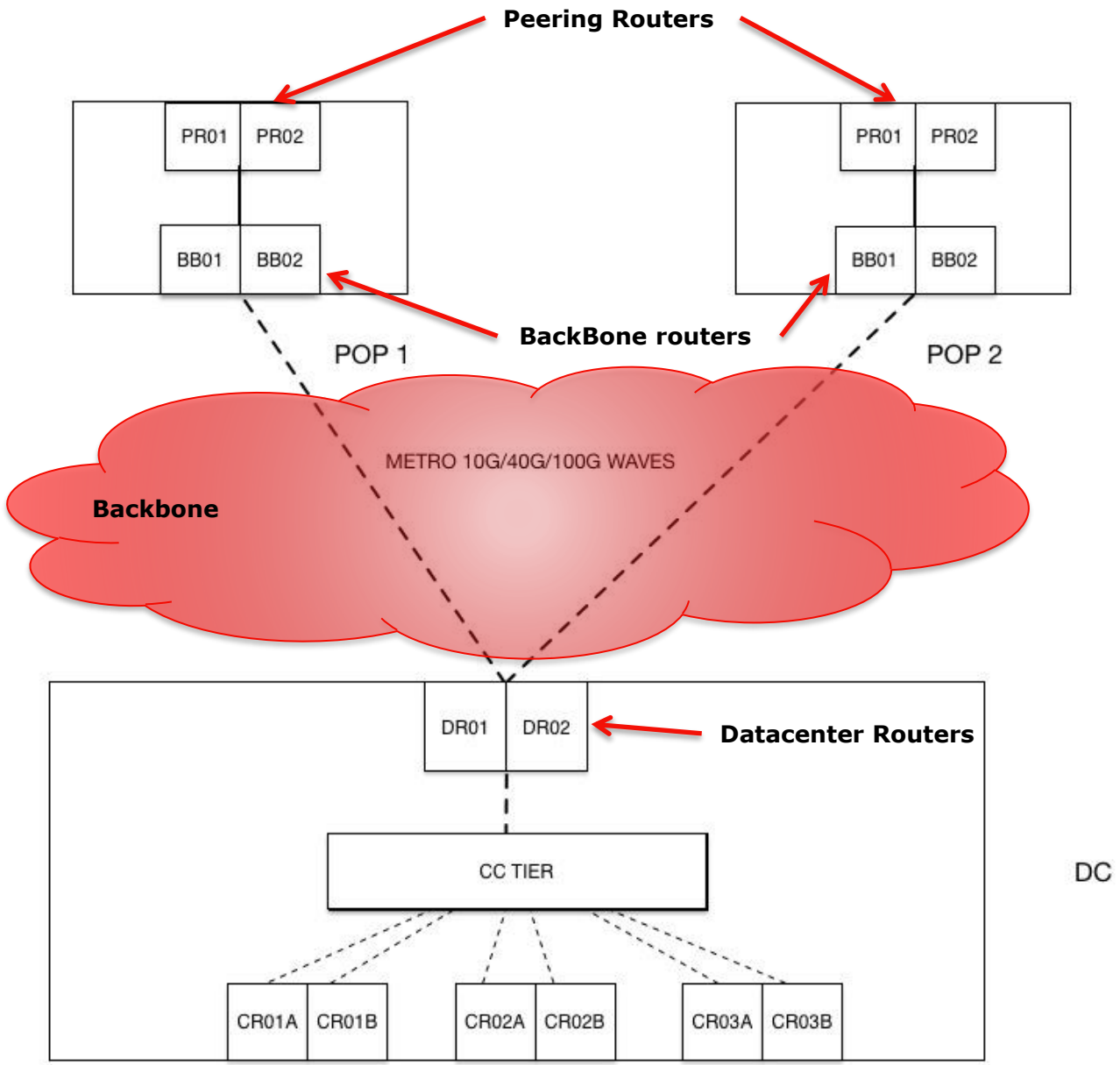


Source: https://blogs.dropbox.com/tech/2017/06/evolution-of-dropboxs-edge-network/

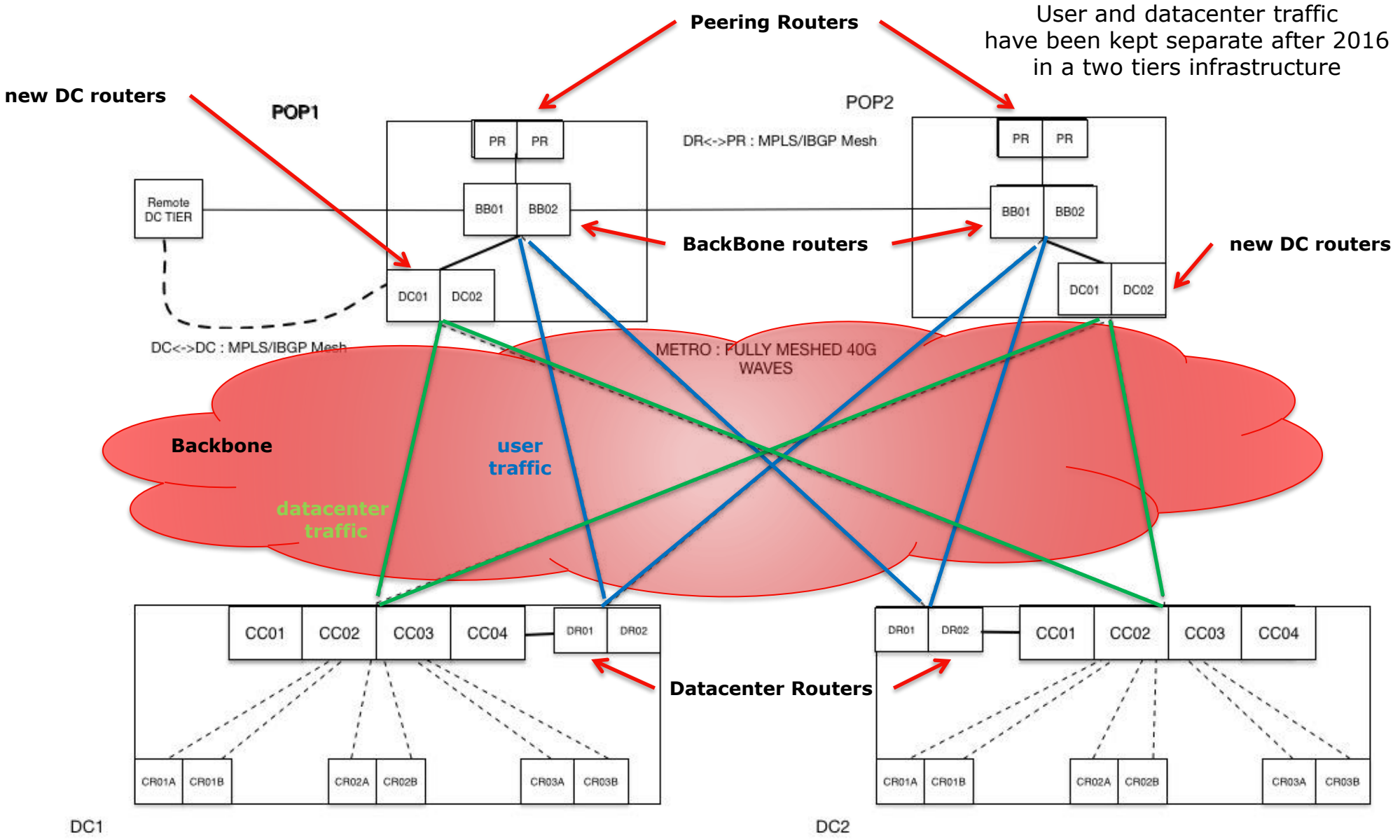
Different kinds of L3 devices in Dropbox network

- Until 2016, Dropbox backbone network consisted of routers with 3 distinct roles:
  - **Data center Routers** (DR), with a primary function of connecting the data center to the backbone network
  - **BackBone routers** (BB), which act as a termination point for long-haul circuits and also as an aggregation devices for DRs in regions where data centers existed
  - **Peering Routers** (PR), with a primary function of connecting Dropbox to external BGP peers to provide connectivity to the Internet
- The Dropbox network has two types of traffic:
  - "user traffic" which flows between Dropbox and the open Internet, and
  - "data center traffic" which flows between Dropbox data centers
- Datacenter traffic accounts for about twice as much as user traffic
- The two types of traffic have different characteristics
- Until 2016, there was a single network layer, and both traffic types were using the same architecture, passing through the same set of devices

Different kinds of L3 devices in Dropbox network (2)



Different kinds of L3 devices in Dropbox network (3)



Evolution of Dropbox's network infrastructure after 2016

- Network infrastructure in 2017:
  - reached 19 network PoPs in North America, Europe, Asia and Australia
  - new network PoPs in US, Europe (Madrid, Rome, Paris) and Australia (Sidney)
- Network infrastructure in 2018:
  - ongoing creation of 6 new PoPs across North America (Atlanta, Denver, Toronto) and Europe (Berlin, Stockholm and Oslo)