# CCIE Service Provider v4 Advanced Technologies Class

## Core BGP Routing

# Basic BGP Workflow

- Establish TCP Transport
- Establish BGP Peerings
- Negotiate Address Families
- Advertise NLRI
- Apply BGP Policy

# Establishing TCP Transport

- Unlike IGP, BGP does not use its own transport
  - Uses TCP Port 179
- Within our scope, typically implies either…
  - Peers are directly connected
  - IGP transport is already established
  - Label Switch Path (LSP) transport is already established
- TTL is a transport consideration
  - iBGP, EBGP, Multihop EBGP

# Establishing BGP Peerings

## BGP peers must agree upon…

- AS numbers
  - Global, local, private, confed sub-as, etc.
- Update source
  - Loopback is MPLS tunnel destination
- Address Families
  - IPv4 Unicast, VPNv4 Unicast, etc.
- Misc.
  - Authentication, TTL Security, etc.

# Negotiating Address Families

- BGP transport is independent of NLRI
  - E.g. IPv4 transport can be used to advertise IPv6 NLRI
- AFI/SAFIs define which NLRI is exchanged
  - IPv4 Unicast, VPNv4 Unicast, VPLS, etc.
- In IOS, IPv4 Unicast is default
  - Can be disabled globally or per-neighbor
- In IOS XR, AFI/SAFIs must be explicitly defined

# Advertising NLRI

- Once peering is established and AFI/SAFIs are negotiated, BGP updates are exchanged
- Updates (NLRI) can be originated multiple ways
  - Network statement, Redistribution, Conditional Advertisement, Conditional Route Injection, etc.
- Key NLRI attributes
  - Prefix/len
  - Next-hop
  - VPN Route Distinguisher (RD)
  - VPN Route Target (RT)

# NLRI Advertisement Rules

- Advertisement rules change depending on peering type
  - EBGP
  - iBGP
  - iBGP RR Client
  - iBGP RR Non-Client
  - Confed EBGP
- Next-hop rules change depending on peering and AFI/SAFI
  - EBGP to iBGP in IPv4/IPv6 Unicast
  - EBGP to iBGP in VPNv4/VPNv6 Unicast
  - iBGP to iBGP
  - Multihop EBGP in VPNv4/VPNv6 Unicast

# Applying BGP Policy

- Path selection rules generally the same between AFI/SAFIs
  - Next-hop
  - Weight
  - Locally originated
  - Local Preference
  - AS-Path
  - Origin
  - MED
  - External over Internal
  - IGP Metric to Next-Hop
  - Multipath

# Applying BGP Policy (cont.)

- How do we change attributes to affect path selection?
  - IOS route-maps
  - IOS XR routing policy language (RPL)
- IOS XR RPL is required for EBGP
  - Even if policy just say “pass”

# Applying BGP Policy (cont.)

- Which attributes do we generally use?
- Inbound policy affects outbound path selection
  - Weight
  - Local preference
- Outbound policy affects inbound path selection
  - AS-Path
  - MED
  - Communities (RFC 1998)

# Q&A