Routing III (Slide set #7): Informal Quiz
Routing III: BGP

- All routers in the Internet participate in both intra-domain and inter-domain routing protocols.
- Inter-domain routing processes AS-level route information, but its goal is ultimately to enter to next-hop values to destination prefixes in forwarding tables.
- The core (inter-domain) routers in the internet may have default route entries in their forwarding table.
- Core routers must have explicit forwarding table entries for any part of the public IP address space.
- The Internet has only one global “core” network administered by a single entity.
- Like RIP, EGP and BGP send out full routing tables to their neighbors periodically.
- BGP finds inter-AS routes, and then resolves it to find the physical next-hop.
- All default-free routers on the Internet speak BGP.
- Path-vector based distance vector algorithms have a full map of the network like Link state algorithms.
- The Bellman-Ford algorithm is used in policy-based distance-vector routing for BGP.
- Link-state based policy routing is less preferred to vectoring protocols (like BGP) because local policies need to be announced globally, and convergence of the flooding protocol is problematic in link-state.
The goal of EGP is to provide the shortest path from the source AS to the destination AS. EGP is restricted to a tree topology because it is incapable of comparing path lengths. Currently core routers have about 100000 routes, which suggests poor address aggregation. EGP declares that a neighbor is down when a single Hello message is unacknowledged. Any route between two nodes in an AS cannot touch nodes outside the AS. The AS number is the same as the area ID and sub-network address. Today’s inter-AS topology is complex, but it still has a roughly hierarchical structure embedded in its complexity. An AS number can be encoded into an IP address just like a network ID. BGP uses a fixed tree structure to propagate reachability information from AS to the core. Like the telephony protocols, BGP requires explicit signaling to setup an AS-PATH when IP connections arrive.
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- Policy routing refers to an arbitrary preference (not just shortest path) from a menu of available routes.
- A stub AS could carry traffic that neither originates nor terminates at the AS.
- Peer ASes provide transit services to other peers.
- An AS can be internally disconnected, and use an inter-AS route to reach a destination within the AS.
- A public ASN assignment to an AS means that it can formulate its own routing policy.
- A transit-AS differs from a peer-AS primarily in the fact that one party necessarily pays in a transit relationship.
- Just like OSPF, IS-IS and RIP, we have multiple widely deployed exterior gateway protocols on the Internet today.
- Like OSPF, BGP operates directly over IP without an intervening transport protocol.
- Like RIP, BGP sends periodic updates about all routes to its neighbors.
- Policy routing is based upon the various attributes of routes: ultimately one route is selected to any destination prefix.
- A BGP router should announce a route to a destination prefix only when it is actively using that route to reach the destination prefix.
- iBGP and eBGP are the same protocol, and the same as any IGP protocol.
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- iBGP is a BGP route synchronization protocol using within an AS.
- AS confederations and route reflectors are two ways of addressing the same problem: the scaling problems due to the iBGP full mesh requirement.
- The route-reflector concept converts a full-mesh of iBGP sessions to a tree-structure of iBGP sessions.
- CIDR solves the router-table size explosion problem by allocating only contiguous blocks of addresses which are summarizable.
- The CIDR part of BGP-4 allows address aggregation
- Deaggregation or punching of holes in an address prefix essentially subverts the CIDR address aggregation process and may lead to larger routing tables in the Internet
- Subverting the CIDR aggregation by punching a hole and advertising it to a different ISP may lead to some inbound load-balancing benefit, at the expense of the entire Internet
- CIDR introduces the need for longest-prefix-match forwarding instead of a simple prefix match forwarding.
- BGP controls inbound and outbound routes by filtering them based upon the attributes.
- An ORIGIN attribute of “INCOMPLETE” indicates that the routes were injected dynamically into BGP by IGPs.
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- The routes in Adj-RIB-Out are likely to be different from Adj-RIB-In because BGP does policy-based route filtering.
- The Loc-RIB is used to announce routes within an AS (i.e. using IBGP).
- One of the steps of the BGP “tie-breaker” algorithm prefers the lowest ORIGIN attribute because statically injected routes are likely to be more stable than dynamically injected routes.
- The AS path length attribute cannot be used by IBGP for loop-detection because the IBGP operates within a single AS.
- Default routing works because there exists a set of “core” routers which do not use default routing.
- The MED and LOCAL_PREF attributes in BGP can be used for load-balancing.
- Recursive lookup in BGP guarantees loop-free paths.
- Policy routing essentially allows an arbitrary choice between available set of paths.
- MED allows outbound load-balancing.
- LOCAL-PREF allows inbound load-balancing.
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- AS-path Padding is used as a rough way to control inbound load, but it may not work, if the AS is providing the only path to the destination prefix.
- Hot-potato routing refers to carrying traffic in the same AS as far as possible before letting it cross AS boundaries.
- Multi-homed ASes have exactly one outbound link to the external Internet.
- An AS may be multi-homed to a single transit provider, and MED is useful in this situation.
- Since the MED field is sometimes the IGP routing metric, it could lead to route-flapping and a lot of eBGP update traffic.
- A community attribute allows arbitrary coloring and processing of routes. But the community values (colors) have to be agreed upon by the set of ASes involved.
- The first 16 bits of the community attribute is just the AS number.
- The BGP decision process is a simple tie-breaker set of rules, with the recursive lookup and local-pref rules being the highest priority.
- A stateful route flap dampening algorithm has been used to dramatically reduce the average number of updates sent by BGP.
- BGP often takes a long time to converge after route changes.