Classless Inter Domain Routing

- (CIDR) – Classless Interdomain Routing
- Issues address:
  - Large routing table at the backbone
  - Exhaustion of address space
    - Enables aggregation of router
      - A single entry in a routing table
      - Tells how to reach a number of Networks
      - Configures allocation of router

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CIDR (contd.)

– length – number of bits in communication

- Prefixes may be of any length 2-32 bits
- Prefixes might overlap
- Prefixes correspond to longest match

CIDR (contd.)

- **Example**
  - **192.4.16 through 192.4.31**
  - **Top 20 bits are the same**
  - **1100 0000 0000 0100 0001**
  - **Router entry for top 20 bits as Network number**
    - **Basically uses a common network prefix < length, value> pairs**

Border Gateway Routing

- Assumes Internet is organised as an Autonomous system
  - Each under the control of a single administration entity
  - Enables hierarchical aggregation of routing information

Border Gateway Routing

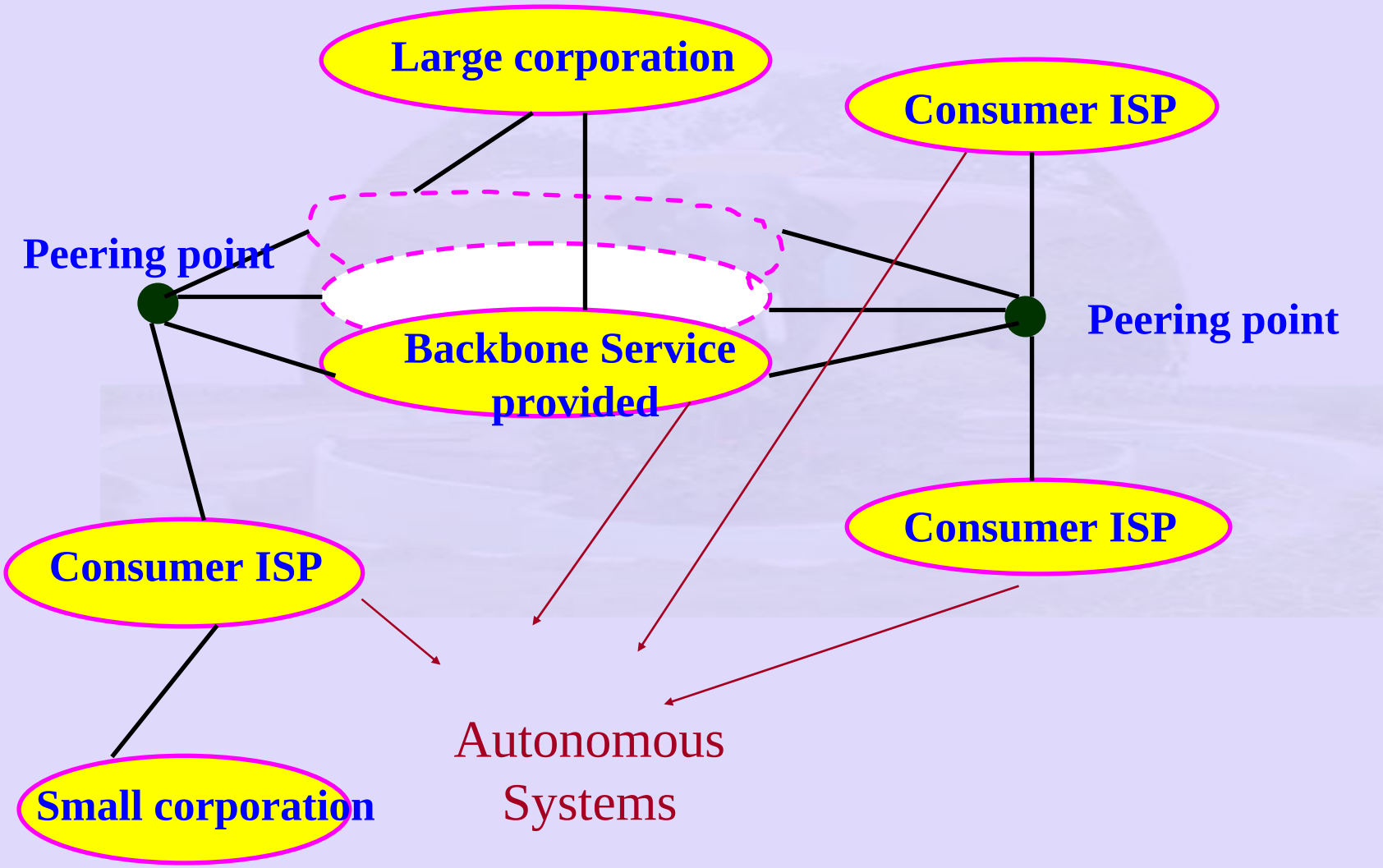
- Routing
  - Routing within a single AS (Intradomain)
  - Routing between ASes (Interdomain)
  - Decouple Intradomain routing in one AS from that in another
  - Each AS can run locally whatever routing algorithm it desires

BGP (contd.)

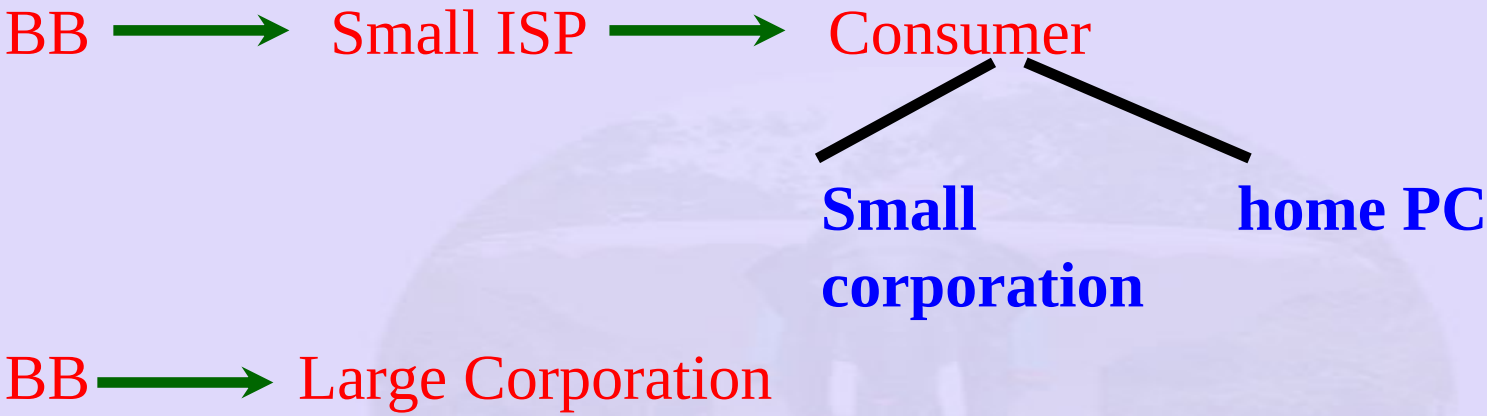
- Interdomain routing problem – ASes share reachability information each other
- Reduces routing information at each AS
  - Use default routes
  - Example tenet Gate Border router – Any packets **destined for outside** (at a router inside tenet) sends to **tenet gateway**
  - Finally reaches a backbone provides who knows how to reach all Networks

Border Gateway Protocol

Assumes Internet is an arbitrary connection of ASes



Border Gateway Protocol (contd)



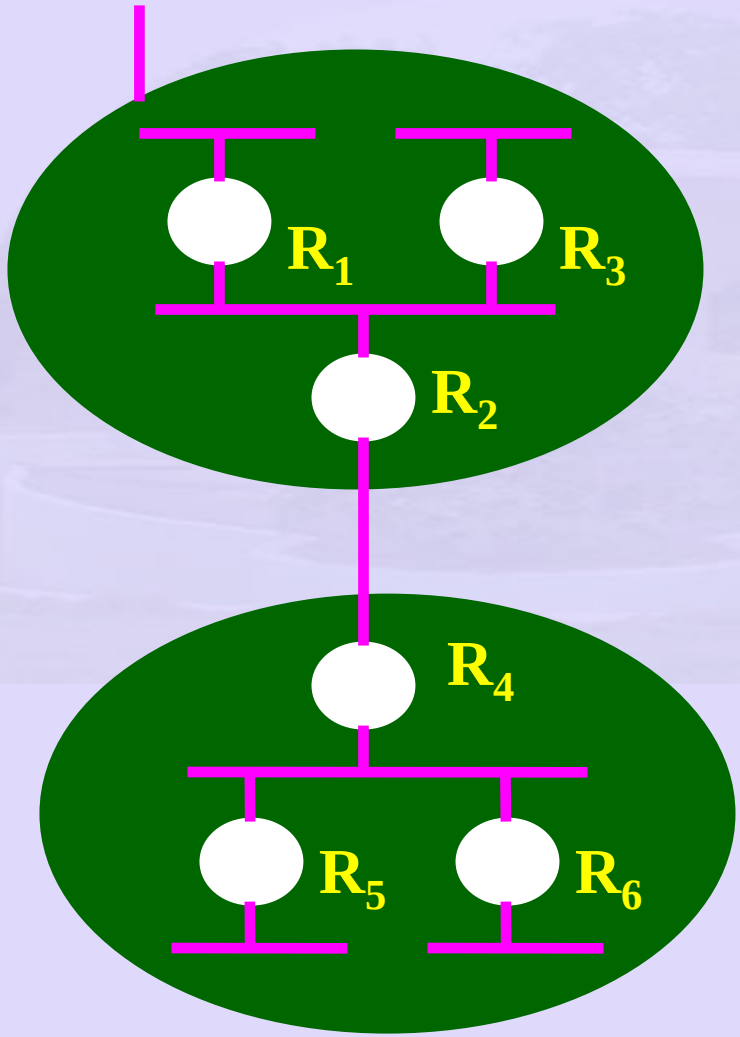
Classification of traffic:

- Local traffic
  - Traffic originates and terminates within an AS
- Transit traffic
  - Passes through an AS

BGP (contd.)

- Types of ASes:
  - Stub AS: Single connection to one otheAS
    - Example: Small Corporation
      - only local traffic
  - Multihomed AS: AS has connections to multiple Ases
    - but does not carry transit traffic
    - Example: large corporation
  - Transit AS: Connection to more than one AS
    - - carries both transit and local traffic
    - - backbone provider

Border Gateway Protocol (contd.)



BGP Goals:

Find any path to intended destination

Border Gateway Protocol (contd.)

- Address issues of flexibility
  - Policy based routing
    - Preferred Ases
    - But only ASes
- Advantage
  - Use “good” paths rather than optimal path

Border Gateway Protocol (contd.)

- Configuring BGP:
  - BGP speaker
    - Spokesperson for entire AS
    - Establish session with other BGP speakers
    - Identify border “Gatewa
    - Routers through which packets enter/ leave A
    - Example R_2, R_4
- “Gateway” – An IP router forwarded packets between ASes

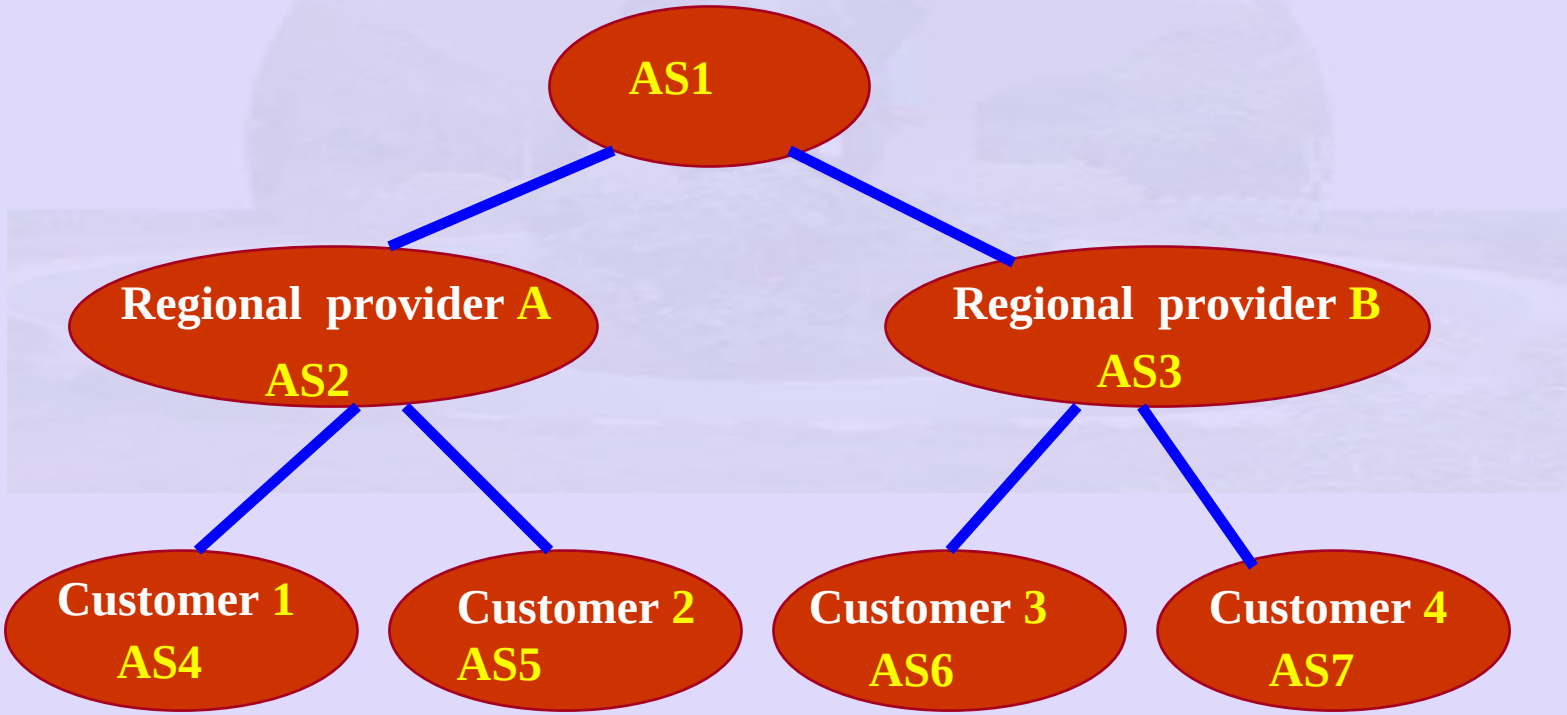
Border Gateway Protocol

- BGP – Neither DV or LSP
  - Advertises complete paths
  - Enumerated list of ASes
    - To reach a network
  - Enable policy decisions
  - Enable detection of routing loops

Border Gateway Protocol(contd)

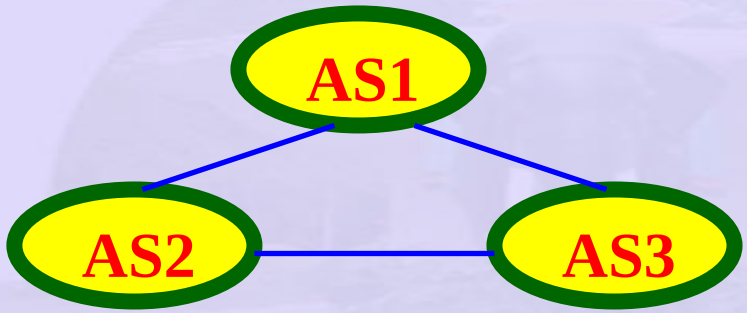
- BGP speaker for A
  - Advertises reachability to customers 1 and 2 networks(Each and every NW in customers 1, 2)
- BGP speaker for AS1
  - Advertised reachability to customers 1 and 2 (AS1, AS2)
  - Advertised reachability to customers 3 and 4 (AS3, AS4)

Border Gateway Protocol(contd.)



Border Gateway Protocol (contd.)

Issues in looping:



Example:

AS1 learns it can reach network 1 via AS2

→ Advertises (AS1, AS2) to AS3

Now AS3 advertises to AS2

- (AS3, AS1, AS2) to reach network P

AS2 – see it → ignores

Border Gateway Protocol (contd.)

- Facility for withdrawing routes
  - Example: Failed links
    - Negative route information
- AS number must be unique
    - 16 bit unique AS number
    - does not cover stubs

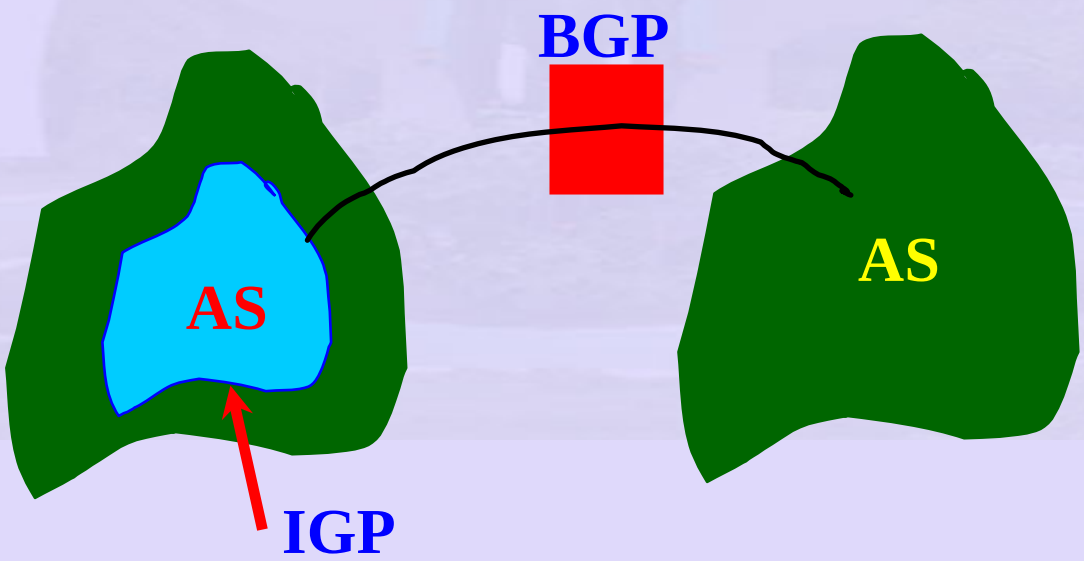
Border Gateway Protocol (contd.)

- BGP – designed to cope with classless addresses
  - Networks advertised in BGP are actually prefixes of any length
  - Addresses contain prefix and length 142.4.16 /20
- Complexity of BGP
  - Depends on number of ASes

Border Gateway Protocol (contd.)

- Issues backbone routers:
  - Inject prefixed learnt from another AS into its intra domain
    - Complex
- Overcome this?
  - IBGP (Interior Border Gateway Routing Protocol)

Border Gateway Protocol (contd.)



Border Gateway Protocol (contd.)

- Redistribute information it learnt between routers in a given AS
- Each router in a AS – knows best/ border router to route information
- Each router uses intradomain routing to decide which is best border router

Border Gateway Protocol (contd.)

- Additional hierarchy:
- Routing Areas
  - Partition routing domain into subdomain
  - Area border routers

Repeaters,Bridges, Routers, Gateways

- Physical layer - Repeaters
- DLL – Bridges
- Network Layer – Multiprotocol router
- Transport Layer – Transport Gateways
- Application Layer – Application Gateways

Multiprotocol Converter