

# ETHERNET DEDICATED INTERNET AND BORDER GATEWAY PROTOCOL POLICY

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COMCAST  
**BUSINESS**

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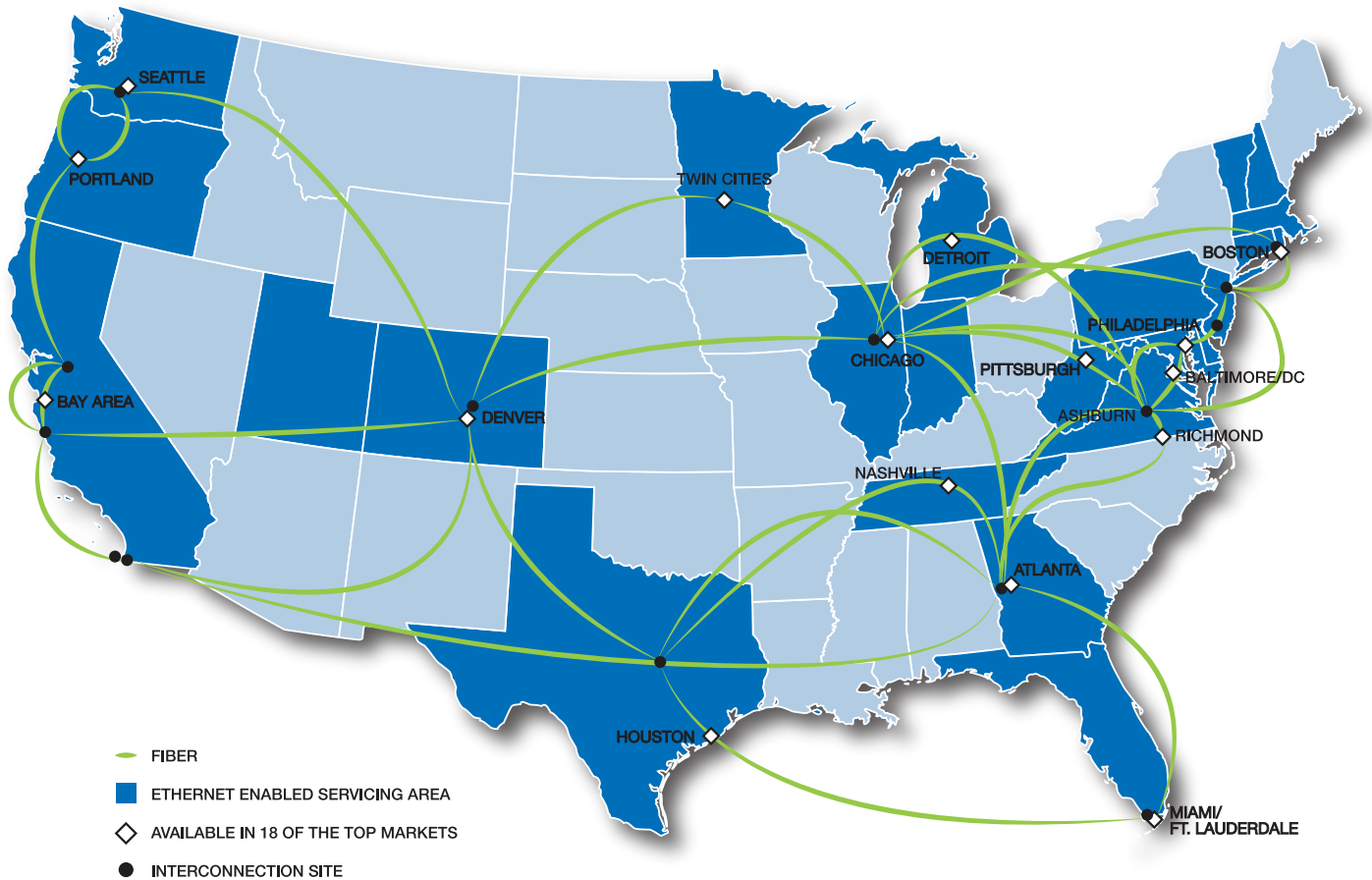
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# INTRODUCTION

This document is intended to provide Comcast's Ethernet Dedicated Internet customers with technical and operational requirements to ensure they get the most from their service. Customers should utilize the information within as guidance for properly configuring their EDI service based upon their business needs. Comcast Business is committed to delivering on the promise of providing customers the most reliable data services that consistently exceed expectations.

# OVERVIEW

Comcast IP Backbone (ASN 7922)



Map routes are for route representation and are subject to change.

# TECHNICAL NETWORK DESCRIPTION

## FEATURES

- Provides unified network connectivity across all the Comcast regional networks nationwide
- Connects and consolidates Settlement Free Interconnect locations with other content and Internet providers nationally
- Supports centralized network management functions
- Very flexible, scalable and cost effective network infrastructure which enables seamless network connectivity

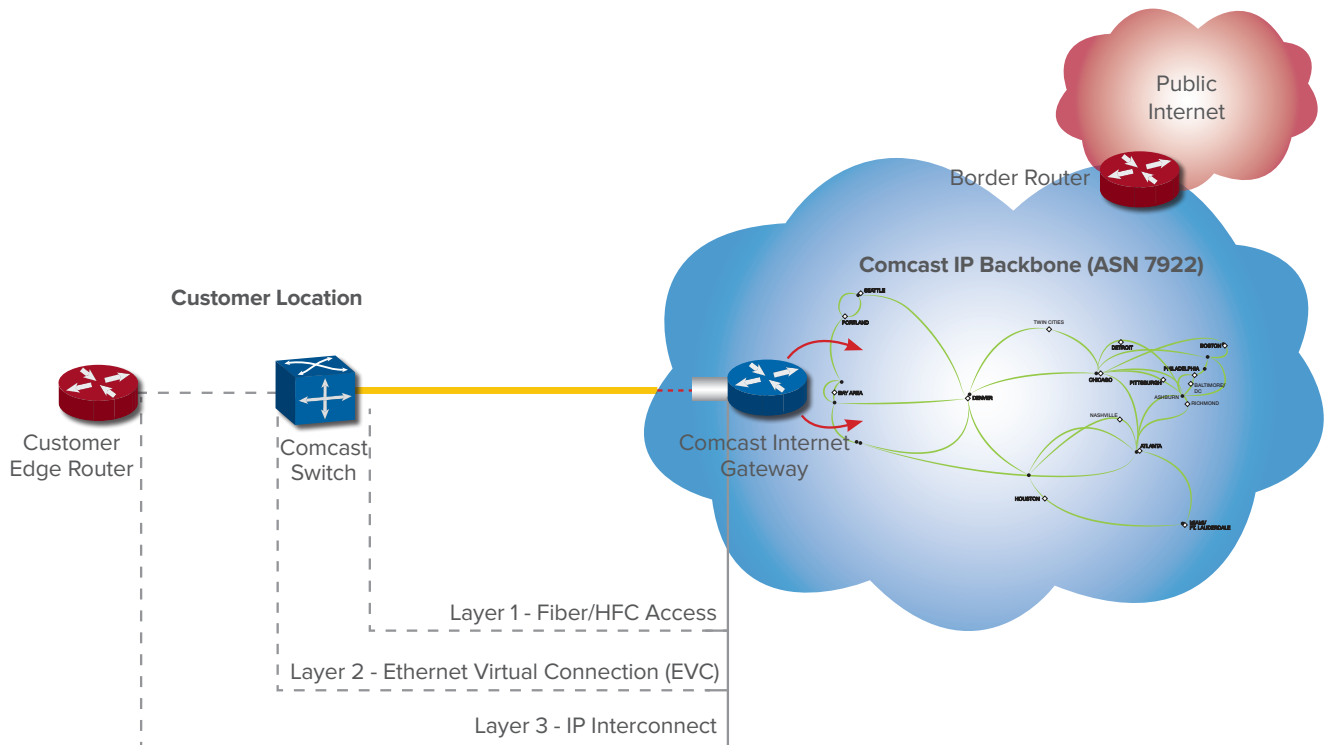
## SPECS

- Over 30,000 route miles of national fiber
- Covers 95+% of Comcast Homes Passed
- All major Settlement Free Interconnect points
- Transport capability of >8800+Gbps YE2011
- All 100G core network with 10G,100G Handoff capabilities
- QoS based voice, video and data-transport over IP

# SERVICE DESCRIPTION

Comcast's Ethernet Dedicated Internet (EDI) Service provides a reliable, simpler, more flexible, and higher bandwidth options than T1 or SONET-based dedicated Internet access services. The service is offered with a 1Gbps or 10Gbps Ethernet User-to-Network Interface (UNI) in speed increments from 1Mbps to 10Gbps subject to available capacity. The service provides an Ethernet Virtual Connection (EVC) from the customer premises location to a Comcast Internet Point of Presence (POP) router.

- IP Interconnect guidelines
  - How we build our Dedicated Internet Service:
    - Interconnect link between the provider and customer edge router layer 3 interface
    - Link is allowed to be /30 with routed customer IP spaces or /29 with routed customer space via a single IP on the customer usable portion of the /29.
- High Availability for Interconnect
  - Each Comcast EDI service is for ONE layer 3 logical connection
  - Comcast will only establish a single BGP peering relationship with or statically route customer usable IP blocks to a single customer edge gateway IP address for each EDI service
  - Comcast supports static routes to customer High Availability VIP address (Customer must supply own switch beyond single Comcast UNI port)
  - Comcast will not support BGP peering with customer VIP address



# 1. SERVICE OPTIONS

- Physical interface types
  - 1000 Base T (RJ-45 Copper)
  - 1000 Base SX-MMF
  - 1000 Base LX-SMF
  - 10G Base SR-MMF
  - 10G Base LR-SMF
- Comcast IPv4
  - Supports Static and BGP Routing
    - One of the following will be provided to Comcast customers to enable the use of direct allocations or provider independent IPv4 allocations
      - ▶ IPv4 /30 for point to point interfaces with layer 3 customer equipment
      - ▶ Option to support /29 for P2P interface if customer wishes to use HSRP or like protocol on their side for edge router redundancy.
      - ▶ Provider Dependent
    - Default for all dedicated Internet access customers supporting the following IPv4 allocation sizes of Comcast provided address spaces:
      - ▶ IPv4 /30 for point to point interfaces with layer 3 customer premise equipment
      - ▶ IPv4 /29 for customer premise network connectivity
      - ▶ Provider Independent
    - Direct allocations or provider independent allocations must be no longer than /24
      - ▶ Comcast may originate Provider Independent prefixes on behalf of the customer in case of static routing
- Comcast IPv6
  - Supports Static and BGP Routing
    - One of the following will be provided to Comcast customers to enable the use of direct allocations or provider independent IPv6 allocations:
      - ▶ IPv6 /126 for point to point interfaces with layer 3 customer equipment
      - ▶ Option to support /125 for P2P interface if customer wishes to use HSRP or like protocol on their side for edge router redundancy.
    - Allocations other than those documented above may be supported upon request.
  - Provider Dependent
    - Default for all dedicated Internet access customers supporting the following IPv6 allocation sizes of Comcast provided address spaces:
      - ▶ IPv6 /126 for point to point interfaces with layer 3 customer premise equipment
      - ▶ IPv6 /48 for customer premise network connectivity. If a customer requires less IPv6 address space, the customer can simply utilize a portion of the space allocated by Comcast to meet their needs. If a customer requires more IPv6 address space, it is recommended that the customer request an IPv6 allocation from ARIN, the RIR for North America.
  - Provider Independent
    - Direct allocations or provider independent allocations must be no longer than /48
  - Comcast may originate Provider Independent prefixes on behalf of the customer in case of static routing
- Comcast will support either Static Routing or eBGP peering with customers
  - Static Routing: Comcast will route all customer usable IP blocks to a single IP address on customer router over the p2p link
  - Border Gateway Protocol Version 4 (BGPV4)
    - Private peering with Comcast
      - ▶ If the customer is Multi-Hop to Comcast only
      - ▶ Comcast will provide a private AS number if customer doesn't have an allocated AS number
    - Public peering with Comcast
      - ▶ Requires ARIN assigned AS number
      - ▶ Comcast supports 4-byte AS number

*Please refer to Section 5 for BGP Routing details.*

## 2. IP ADDRESSING AND ALLOCATIONS

### OVERVIEW

Comcast assigns IP addresses to customers based on RFC7020, RFC6177, ARIN guidelines, and customer-supplied, detailed documented need.

Comcast adheres to ARIN requirements for our allocation policies, and we must maintain documentation that demonstrates efficient utilization. As a result, customers are required to provide the same information to Comcast that Comcast provides to ARIN.

Customers demonstrate efficient usage of IP addresses by filling out an IP Justification form. The IPJ needs to be filled out in its entirety, including the section devoted to the customer's current IP assignments.

### ARIN

ARIN is the (North) American Registry for Internet Numbers. Every U.S.-based Provider has to demonstrate to ARIN that they have efficiently utilized their IP addresses, including the efficient assignment to downstream users. Efficient utilization is shown by collecting information from each customer on how they are implementing the resources on their network. ARIN, and Comcast, requires this detail for every assignment and allocation /29 and larger.

IP assignments are based on a customer's utilization history, and other information that illuminates networking configurations. If the customer cannot justify a large IP assignment, the initial assignment may be relatively small, i.e., a "slow start". In some cases, customers will need to renumber from their initial "slow start" assignment into their larger subsequent assignment. Unfortunately, Comcast cannot reserve contiguous ranges in anticipation of a customer's subsequent request.

Customers are encouraged to bring their own IP resources into Comcast service. Comcast will route and announce these prefixes as if they were Comcast's own. Examples of customer-provided IP resources are:

- Direct Allocations to the customer from an internet registry such as ARIN.
- Customer's existing space from another provider with whom the customer has service.

Comcast will need a Letter of Authority (LOA) from the customer's other provider permitting Comcast to originate this Provider's IPs.

Please refer to ARIN's website, <https://www.arin.net/policy/nrpm.html>, for further information on policies Comcast adheres to.

### IPV4

Routers or other Layer-3 Devices will connect to Comcast via a /30. If a second router/firewall is needed for hardware level redundancy on the customer end for an Ethernet interface a /29 may be assigned, with the allocated block size routed to the second IP address in the /29.

Customers must use 80% of the last-assigned block and 100% of all previous blocks before Comcast will issue additional IPs. The existing blocks of IPs must respond to ping (or be otherwise documentable), and existing hosts must have forward and reverse DNS. Customer's IP assignment strategy may need to be discussed and defended prior to issuing additional IP space.

Multi-homed, multi-vendor BGP requires a /24 or more. However, if the customer already has a /24 or more from the other provider with whom BGP will be run, then Comcast will use that /24 or greater for the customer's Comcast service. Comcast does not need to assign its own prefix if the end user already has adequate network resources. Customers do not need multiple /24 or more from each provider in order to participate in multi-vendor BGP sessions.

Comcast will need a Letter of Authority (LOA) from the customer's other provider permitting Comcast to originate this Provider's IPs.

For IP Requests of a /22 (1024 IPs) or larger, please contact your Account Executive. Requests of this size are handled on a case-by case basis, and will require extensive documentation, including network engineering plans.

If you are a multi-homed customer and you have utilized a /22s worth of IP addresses, you might be able to obtain a block directly from ARIN based on their criteria.

In many cases, customers requiring larger blocks of IPs have already met the ARIN requirements necessary to get their own independent block.

Many customers with multiple Comcast EDI circuits want to run BGP privately with Comcast to load-balance, provide redundancy, or for other Traffic Engineering needs. For this, Comcast customers will need to be assigned a Private ASN, and a /28 or more of IPs.

Comcast cannot assign resources based on relatively indefinite plans. If the customer is not ready for public BGP sessions at the time of IP assignments, and if the customer does not actually have a public ASN with which to participate in BGP sessions, then Comcast will assign IP space based solely on the detailed breakdown, and not on any future BGP plans. Neither Comcast nor any other provider has the resources to cover every customer's potential networking needs.

In certain situations, Comcast may request a customer to revisit their network topology before Comcast assigns IP resources. In rare cases, an end user may be deploying network resources based on resource criteria from years ago, when IPv4 resources were more plentiful. Many times, simple inertia rather than hard networking needs are dictating customer IP requests. Comcast encourages VARs, consultants, and other intermediaries to revisit the customer's networking needs, and determine if their current setup utilizes resources in a conservative manner.

## **IPV6**

The longest IPv6 prefix that will be directly connected to a Comcast interface is a /64. The shortest IPv6 prefix that Comcast will support for point to point prefixes is /126.

The standard v6 assignment to all EDI customers for their internet traffic is a single /48. Customers will need to subnet this on their end if they want smaller prefixes.

All other policies that pertain to IPv4 also pertain to IPv6. Customers can bring their own IPv6 with them into service; we can participate in BGP sessions with v6 assignments, etc.

Please see <https://www.arin.net/policy/nrpm.html#four22> for details on ARIN's Provider Independent Allocations for single- and multi-connected end users.

## **NAT, FIREWALLS, AND PRIVATE IPS**

If a proxy firewall or other means that prevents Internet traffic from bidirectionally connecting to internal LAN hosts will be used, the machines behind the "filter" are considered hosts that do not require globally routable IPv4 addresses. A good example of this would be customer internal PCs and printers - these do not require, and for security reasons, should not have globally routed IPv4 addresses. In this instance, the customer should use an RFC-specified Private Network (see RFC-1918) for internal networking. Comcast will assign an appropriately sized net block according to the customer's needs for publicly visible servers in the firewall DMZ (email, www, FTP, etc.).

If you need to use NAT (1:1 IP mapping of internal to external addresses) instead of PAT (1 external IP used by many internal ones), please explain why in the IPJ. There are several applications that don't support PAT properly. If you have run into this simply explain the issue.



### 3. DOMAIN NAME SERVER (DNS)

Comcast provides primary and secondary Domain Name Service (DNS). DNS is the basic network service that translates host domain names into corresponding IP addresses, and vice-versa.

1. Host forward look up zone/records
  - a. Hostname and IP address lookup
2. Host reverse lookup zone if IP space belongs to Comcast
  - a. IP address to hostname lookup
3. Forward zone delegations
  - a. Customer hosting their own forward lookup zone data
4. Reverse zone delegations if IP space belongs to Comcast
  - a. Customer hosting their own reverse lookup zone data

Comcast operates IPv4 and IPv6 Domain Name System (DNS) servers:

Primary IPv4: 75.75.75.75

Secondary IPv4: 75.75.76.76

Primary IPv6: 2001:558:FEED::1

Secondary IPv6: 2001:558:FEED::2

Comcast's DNS resolvers support DNSSEC (Domain Name System Security Extensions) validation.

Comcast follows DNS Request for Comments (RFC) documents published by the Internet Engineering Task Force (Internet Standards). For more information, refer to IETF RFC 882 (<https://tools.ietf.org/html/rfc882>) and 883 and (<https://tools.ietf.org/html/rfc883>).

#### AUTHORITATIVE DNS CONFIGURATION

For DNS activation please contact the Enterprise Customer Care team any time after the circuit is in-service to add/change/delete entries.

- For Metro-E EDI Customers:
  - Customers should call the ECC (Enterprise Care Center) 1-800-741-4141, option 2, option 1 to request setup DNS (Forward/Reverse records).
  - Customers may also log into the Customer Support & Care site at <https://businessclass.comcast.net/>
- For Legacy EDI customers:
  - Customers should call the BNOC 1-888-262-7300, option 2, option 2 to request setup DNS (Forward/Reverse records)

**Note:** If a customer chooses to run their own DNS server locally, they must set up a query access control list (ACL) to ensure the server is not an open resolver. For more information, see <http://openresolverproject.org>.

#### REVERSE DNS

- The Reverse DNS Form includes sections that must be completed. To request a form please contact your Customer Project Manager or the Enterprise Care Center.

**Note:**

- If requesting Reverse DNS and Comcast will be managing the IP Address space, the form cannot be completed until Comcast provided IP addresses have been provisioned.
- If using your own address space please fill out the IP Address Information section to allow for adding your address space to DNS ACL's.
- Email completed Reverse DNS form to your Customer Project Manager (CPM).
- Any technical questions about Reverse DNS should be sent to your Sales Engineer.

## 4. SECURITY AND ABUSE

### INFORMATION SECURITY PROGRAM

Our Program includes controls and practices across key information security domains, ranging from Access Control to Infrastructure Security to Systems Development. As a result of these measures, Comcast Business customers can derive associated information security benefits. For example, state-of-the-art Identity & Access Management platforms help ensure that only authorized individuals have access to business systems or data. Mission-critical computing equipment is housed within geographically diverse data centers leveraging sophisticated physical and environmental security strategies. Furthermore, all new security measures undergo extensive field assessments prior to going live.

Additionally, Comcast Business maintains distinct operations teams monitoring our network and infrastructure on a 24x7x365 basis. From the Network Operations Center (NOC) to the Security Response Center (SRC), our team members work round the clock protecting the network. We are committed to staying proactive about information security and encourage you to bring relevant items to our attention. Your business and ours rely on Comcast information security.

### SECURITY OR ABUSE INCIDENT REPORTING

Notify Customer Security Assurance in the event of a network or application layer attack.

By Phone: 877-807-6580 or email: [abuse@comcast.net](mailto:abuse@comcast.net)

**Note:** Be prepared to give a full description of the incident, including time and date, any relevant examples or log files, and any other information that may be useful to the investigation of the report.

For more information on security and abuse go to <http://business.comcast.com/landingpage/info-security>.

### BLACKHOLE

The use of this community should only be done in an extreme circumstance. This allows a customer to force traffic destined to any prefixes tagged with 7922:666 to be black holed ingress to the Comcast Backbone. In order to protect our infrastructure and the Internet from misuse of this, Comcast will only allow a customer to blackhole traffic to a specific /32 that is already permitted by the customer's existing ingress prefix filter. This is typically used when a customer is under a DDOS attack, causing congestion on their links from Comcast.

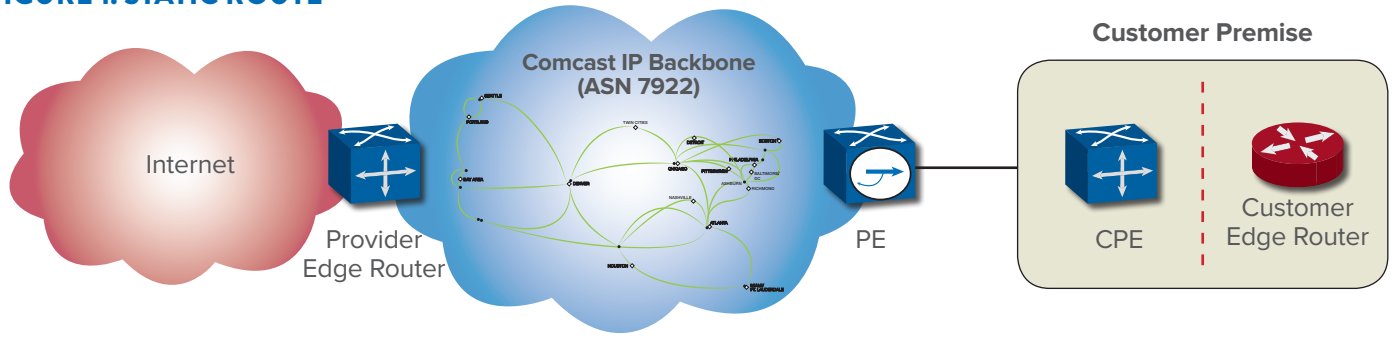
COMMUNITY	EFFECT
7922:666	Blackhole traffic (only allowed on /32 routes)

Reference Appendix A for BGP Set Community Black Hole Template.

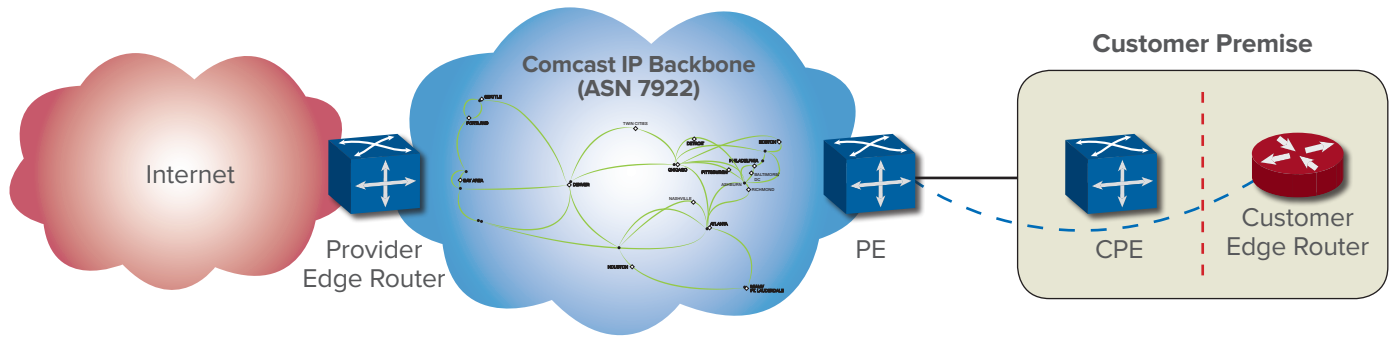
## 5. BGP PEERING

- BGP Route Options: Comcast will always advertise default route to downstream customer as part of standard configuration
  - Customer can choose to receive additional routes from Comcast with the following options:
    - Comcast local market routes and downstream customer routes - See Figure 1 on page 11 for diagram
    - Comcast national aggregates and downstream customer routes (requires multi-hop BGP session to Comcast route server) - See Figure 2 on page 11 for diagram
    - Comcast national aggregates and downstream customer routes, plus Full Internet routes (requires multi-hop BGP session to Comcast route server) - See Figure 3 on page 11 for diagram
- EDI Multi-Hop BGP Session
  - BGP customers that receive the full Internet routing table are required to configure an additional BGP session in order to receive Full or Comcast routes. BGP customers who desire the full Internet table or Comcast National routes are required to configure additional BGP session to Comcast route server. These BGP implementations will consist of 2 components, the primary BGP session to Comcast PE router, and a second Multi-Hop BGP session to Comcast route server.
- Customers will send their route announcements and receive their default and Comcast local aggregate and downstream customer route on the primary BGP session.
- The customer will receive the full Internet routing table and Comcast National aggregate and downstream customer route via the second Multi-Hop BGP session to our Ibone PE backbone router. Note: this session requires a static route to the PE to be configured on the customer router. Reference Appendix B for Route Configuration Options.

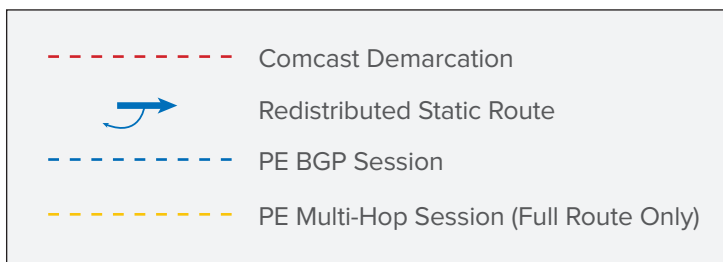
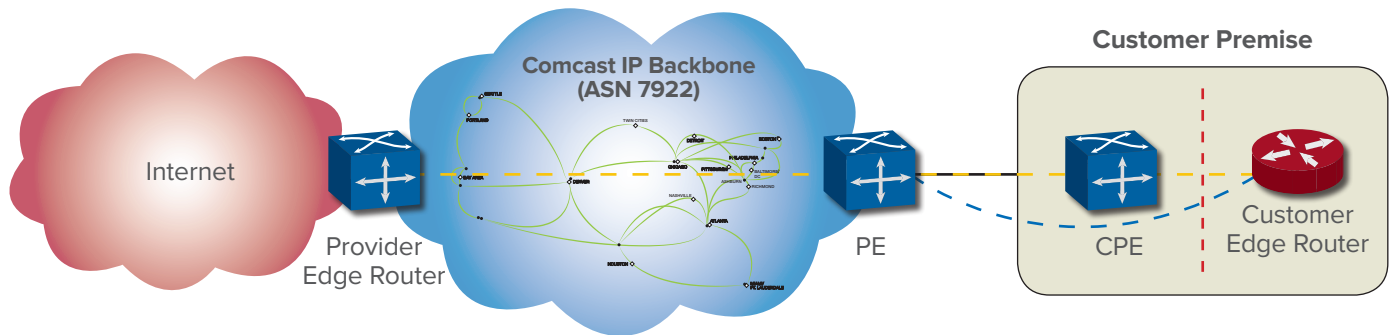
**FIGURE 1. STATIC ROUTE**



**FIGURE 2. BGP DEFAULT/LOCAL ROUTES**



**FIGURE 3. BGP FULL + DEFAULT ROUTES**



## 6. ROUTING

- Implementation of routes
  - Comcast will support static or utilize BGP version 4
    - Static Routes – Comcast may static route either Comcast assignment or customer owned spaces, the latter must be /24 or greater
    - BGP version 4 routes
      - ▶ Comcast will support multi-home /28 or larger blocks if they route to Comcast only.
      - ▶ Comcast will support /24 or greater if customer assigned routes if the customer multi-homes to Comcast and other providers.
      - ▶ Comcast will always announce Default Route to the customer.

**Note:** Comcast will not support routing static customers toward two distinct customer edge routers. Comcast service will not establish multiple BGP peering sessions to different edge gateways with a single EDI service.

### ROUTING POLICY - INBOUND

- The customer must notify their Comcast Operations tech support organization for any modifications. Requests for modifications will be addressed within 2 business days.
- Comcast filters all inbound route announcements from customers based on a list of prefixes provided and maintained by the customer including more-specifics up to a length of /24.
- Comcast will permit a customer to de-aggregate announcements up to /28 in size for load balancing purposes only.
  - Anything smaller than a /24 will not be announced to anyone outside of the Comcast Backbone.
  - Customers should make every effort to aggregate route announcements sent to Comcast where possible.

All customer route advertisements must be covered by entries in the Internet Routing Registry - IRR ([www.irr.net](http://www.irr.net)). An example registrar to use for this purpose is RADB ([www.radb.net](http://www.radb.net)). If you have registered your routes with your origin AS, please let us know what origin AS that is. If you have a registered as-set object which covers your announcements and downstream ASes, please let us know that on the form. If you don't currently manage your own entries in the IRR, let us know and Comcast can manage them on your behalf.

**Note:** Comcast does not do automated updating of our prefix filters based on IRR/RADB data and doesn't have particular plans to do so.

- To help protect Comcast's network from accidental leaking of routing information, Comcast configures an upper limit on the total number of prefixes a customer can send. This number is usually based on the number of routes configured in the neighbors prefix list plus a small overhead.
- There should be AS-PATH filters preventing leakage of routing information from Customer's other service provider to Comcast and vice versa. Those filters should be inclusive, rather than exclusive (i.e. AS-PATH should list the customer AS and AS paths the customers would like to announce and deny all instead of denying the AS's of external peers the customers have)
- If the customer intends to provide transit to other ASNs, Comcast reserves the right to use filters to limit routes to an explicit list of downstream transit ASNs provided and maintained by the customer.
- Comcast will only accept BGP Community tags specifically mentioned in this document. All other community tags will be removed when the routes are received.
- Comcast does not allow customers to set the BGP communities. Except, the communities in the traffic engineering list below.
- Comcast will honor any AS Path padding that a customer chooses to use.
- Comcast allows customers the ability to traffic engineer route announcements in a variety of ways. These are detailed in the traffic engineering section of this document.

- Comcast will apply the following common import policies to every customer peering session:
  - Default-route is not accepted
  - Prefixes in the RFC1918 and other reserved network blocks are not accepted
  - Prefixes with reserved ASN (64512-65535) in the path are not accepted
  - Prefixes shorter than /8 are not permitted
  - Local\_pref will be set to 300 by default, subject to modifications based on the received communities as outlined in the Traffic Engineering section.
  - Prefixes must be registered in the IRR as mentioned above.
  - Prefixes longer than /24 are not accepted unless special arrangements have been made for traffic-engineering purpose; these prefixes will be marked with the well-known “NO-EXPORT” community

## **ROUTING POLICY – OUTBOUND**

- Comcast will not overwrite or alter AS Path information on any routes advertised.
- Comcast will not propagate BGP MED information on any advertisements. The MED is set to zero on all advertisements.
- Comcast will only propagate BGP Community tags that provide useful information to a customer. These are detailed later on in this document.
- Comcast will apply the following export policies to every customer peering session
  - Prefixes in the RFC1918 and other reserved network blocks are not announced
  - Prefixes shorter than /8 or longer than /24 are not announced
  - Private ASN will be removed before advertising to any peer
  - More specific prefixes within Comcast CIDR blocks may or may not be announced.
  - Suppression and AS-path prepend actions as outlined in the Traffic Engineering section are taken for announcements to non-customer peers

Reference Appendix C for current Route Server Information.

## 7. TRAFFIC ENGINEERING

Comcast provides customers with the ability to manipulate various routing policies within the Comcast Backbone by the use of BGP Communities.

### LOCAL PREFERENCE

By default all received customer routes are assigned a local preference of 300 in the Comcast Backbone. Customers have the ability to alter this local preference using the following BGP communities:

COMMUNITY	LOCAL PREFERENCE	EFFECT
7922:290	290	Used for customer backup when multi-homed to Comcast
7922:250	250	Sets local preference equal to peer routes
7922:150	150	Sets local preference equal to transit routes
7922:100	100	Lowest possible value. Used for backup when multi-homed to multiple providers

### ROUTE SUPPRESSION

The use of these communities allows a customer to prevent their prefixes from being advertised to specific peers. Only those ASs that have a peering relationship with Comcast are available for suppression. An AS that is a customer of Comcast is not enabled for route suppression. Given that this list changes on a regular basis, the best way to verify what ASs are available for route suppression, a customer should look at the full Internet feed received from Comcast and look for routes tagged with 7922:3000. Any AS directly connected to AS7922 and is tagged with 7922:3000 or 7922:3050 is a candidate for route suppression.

COMMUNITY	EFFECT
7922:999	Prefixes are not sent to anyone. They are contained entirely within AS7922 only.
7922:888	Prefixes are not sent to ALL peers. Prefixes still sent to customers.
65100:XXX	Do not announce prefixes to AS XXX.
65200:XXX	Announce to AS XXX if 7922:888 is also set.

### ROUTE PREPENDING

The use of these communities allows a customer to send AS Path Pad advertisements to all or a subset of Comcast Peers. As with route suppression, only those ASs with a peering relationship with Comcast are available for prepending.

COMMUNITY	EFFECT
65101:0	Prepend x1 to ALL PEERS
65101:XXX	Prepend x1 to AS XXX
65102:0	Prepend x2 to ALL PEERS
65102:XXX	Prepend x2 to AS XXX
65103:0	Prepend x3 to ALL PEERS
65103:XXX	Prepend x3 to AS XXX
65104:0	Prepend x4 to ALL PEERS
65104:XXX	Prepend x4 to AS XXX

## 8. EDI CUSTOMER RESPONSIBILITIES

Comcast provides CPE for provisioning its services and the delivery of the UNI. Comcast will retain ownership and management responsibility for this CPE. As a result, the CPE must only be used for delivering Comcast services. Customers are required to shape their egress traffic to the contracted CIR.

Customers have the following responsibilities related to the installation, support, and maintenance of the Service:

- Provide an operating environment with temperatures not below fifty-five (55) or above eighty-five (85) degrees Fahrenheit. Humidity shall not exceed ninety (90) percent at eighty-five (85) degrees Fahrenheit.
- Provide secure space sufficient for access to one (1) standard, freestanding, equipment cabinet at each of the customer facilities, no further than fifty feet from the customer router or switch interface.
- Provide outside cable entry conduit(s), entry cable ground point, and internal building conduit to allow Comcast the ability to rod/rope a fiber optic cable to the point of demarcation.
- Locate and mark all private underground utilities (Water, Electric, etc.) along path of new underground placement not covered by utility companies.
- Provide a pull rope in any existing duct that Comcast is to use and ensure existing duct is serviceable for Comcast use.
- Obtain 'right-of-way' entry easement for Comcast facilities and equipment from property owners at each customer location.
- The customer is responsible for coring of the building's outside wall and internal walls. Upon request, Comcast can perform this activity on an 'as needed' basis for an additional one-time fee.
- Provide UPS AC power equipment, circuit sizing to be determined, if applicable.
- Emergency local generator backup service, if applicable.
- Provide access to the buildings and point of demarcation at each customer location to allow Comcast and its approved Contractors to install fiber for service installation. Provide access to each location for regular (8am - 5pm) and emergency (24 hour) service and maintenance of Comcast's equipment and facilities.
- Provide, install and maintain a device that is capable of routing network traffic between the Service and the customer's Local Area Network (LAN).
- Customer must provide a point of contact (POC) for installation, service activation and any maintenance activities.



**DISCLAIMER** - This generic configuration is intended for reference only! It does not take into account variations of syntax due to the many possible combinations of a customer's router hardware and/or OS. The primary purpose of this example is to allow IT teams to assess what the change requires and make preparations. Customers should refer to the release notes for their vendor's router specific version of OS when preparing for their configuration change.

## APPENDIX A

### BGP SET COMMUNITY BLACKHOLE TEMPLATE

Comcast recommends staging BGP Blackhole Communities prior to experiencing an attack.

#### Cisco Blackhole - 666

```
access-list xxx permit ip host 1.2.3.4 host 255.255.255.255
```

```
route-map yyy permit zz
```

```
    match ip address xxx
```

```
    set community 100:666
```

```
exit
```

#### Juniper Blackhole - 666

```
Policy options – community blackhole members 100:666; policy-statement from-blackhole; from community blackhole;
```

```
then
```

```
Metric 2; preference 100; next policy
```

```
Community outbound-blackhole [100:666 <<others>>]; set export provider_blackhole
```

```
<<other option>>
```

```
policy-statement provider_blackhole
```

```
term match_666
```

```
from protocol static; tag 666; then
```

```
origin igp; community set provider_blackhole; accept;
```

```
set community provider_blackhole members AS###:COM###
```

```
set export provider_blackhole
```

```
edit routing-options static
```

```
    set route a.b.c.d/cidr tag 666
```

# APPENDIX B

## ROUTE CONFIGURATION INFORMATION

### !Physical CPE port

```
Interface gige x/x
  Description Connection to Comcast CPE
  No ip address
  No shut
```

### !Logical interface used to connect with CPE

```
interface gige x/x.<vlan-id>
  description Connection to Comcast network
  encaps dot1Q <vlan-id>
  ip address <other side of /30> 255.255.255.252
  mtu 1500
  < Add other interface parameters as needed>
```

### !Static route needed for FULL-ROUTE customer to build MH-BGP session with Ibone PE \*\*\*

```
ip route <ip address of PE loopback1(Comcast to provide)> 255.255.255.255 <interface.<vlan-id>> <SUR interface ip address(Comcast to provide)>
```

### !Used to aggregate prefixes to advertise via BGP

```
ip route <ip address agg> /<mask> null0
```

### ! Used to limit routes announced to SUR

```
ip prefix-list PERMIT-TO-COMCAST seq 5 permit <agg to announce>
```

### !Used to NOT announce anything to the 2nd BGP session.

```
ip prefix-list DENY-TO-COMCAST seq 5 deny 0.0.0.0/0
```

### !Primary bgp session with SUR

```
router bgp <customer ASN>
  no synchronization
  bgp router-id <loopback0>
  network <ip address agg/mask>

  neighbor <SUR interface ip address> description Peering Session with Comcast
  neighbor <SUR interface ip address> remote-as 7922
  neighbor <SUR interface ip address> send-community
  neighbor <SUR interface ip address> prefix-list PERMIT-TO-COMCAST out
```

### !Second FULL-ROUTE customer session

```
neighbor <PE Loopback ip address> description Peering Session with Comcast
neighbor <PE Loopback ip address> remote-as 7922
neighbor <PE Loopback ip address> ebgp-multihop 255
neighbor <PE Loopback ip address> send-community
neighbor <PE Loopback ip address> prefix-list DENY-TO-COMCAST out
```

# APPENDIX C

## ROUTE SERVER INFORMATION

Route servers are used to view BGP routes on the Internet and are specifically helpful in conducting trace routes and general network troubleshooting. The route server located on the Comcast network is available via telnet at:

route-server.newyork.ny.ibone.comcast.net

Log in to the router with the user account 'rviews'. This route server maintains active BGP sessions with:

- 68.86.80.0 - McLean, VA
- 68.86.80.2 - New York, NY
- 68.86.80.5 - Chicago, IL
- 68.86.80.7 - Denver, CO
- 68.86.80.10 - San Jose, CA
- 68.86.80.11 - Los Angeles, CA
- 68.86.80.13 - Dallas, TX
- 68.86.80.15 - Atlanta, GA

The following commands are supported on Comcast's Route Server

- ping <ip>
- traceroute <ip>
- show ip bgp <ip>
- show ip bgp <ip> <mask>
- show ip bgp <ip> <mask> longer-prefixes
- show ip bgp ipv4 unicast <ip><mask>
- show ip bgp ipv4 unicast <ip><mask> longer-prefixes
- show ip bgp ipv6 unicast <ip/length>
- show ip bgp ipv6 unicast <ip/length> longer-prefixes

# APPENDIX D

## DNS RECORD TYPES AND EXAMPLES

**TYPE** fields are used in resource records. Note that these types are a subset of QTYPES.

<b>TYPE</b>	value and meaning
<b>A</b>	a host address
<b>NS</b>	an authoritative name server
<b>CNAME</b>	the canonical name for an alias
<b>SOA</b>	marks the start of a zone of authority
<b>PTR</b>	a domain name pointer
<b>MX</b>	mail exchange
<b>TXT</b>	text strings

The following is an example file which might be used to define the EXAMPLE.COM:

```
@1D IN SOA ns1.example.com.hostmaster.example.com. (  
    2002022401 ; serial  
    3H ; refresh  
    15 ; retry  
    1w ; expire  
    3h ; minimum  
)  
    IN NS      ns1.example.com.      ; nameserver record  
    IN MX      10 mail.example.com.   ; mail provider  
ns1  IN A      192.168.0.1           ; name server definition  
    IN AAAA    2001:DB8::1           ; IPv6 address for name server  
www  IN A      192.168.0.2           ; web server definition  
    IN AAAA    2001:DB8::2           ; IPv6 address for web server  
mail IN A      192.168.0.3           ; mail server definition  
    IN AAAA    2001:DB8::3           ; IPv6 address for mail server
```