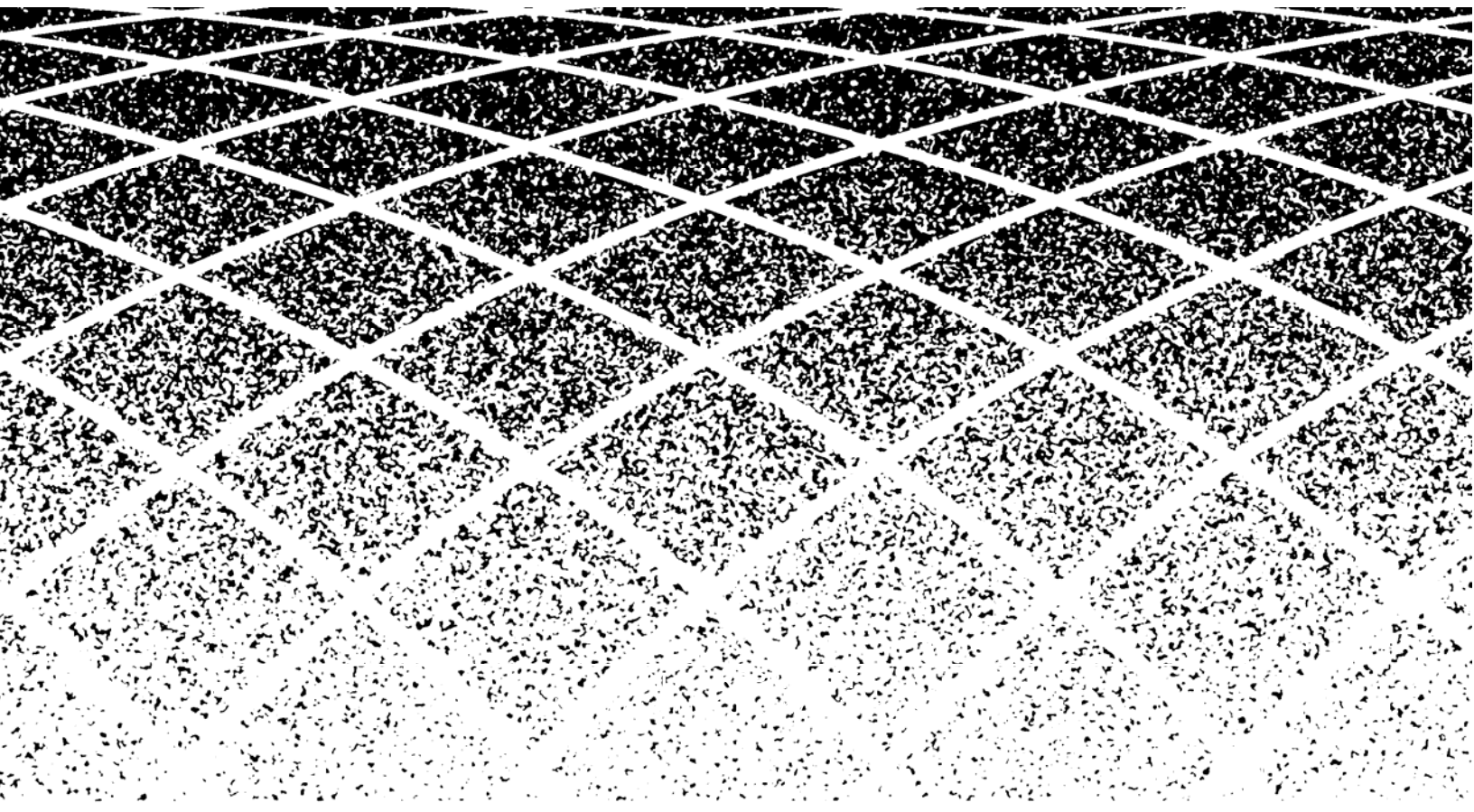


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# **AT&T IP Flexible Reach Branch Office IP PBX Extensions - Customer Configuration Guide**



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**Notice**

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.

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# AT&T IP Flexible Reach Branch with Branch Office IP PBX Extensions Capability – Customer Configuration Guide

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# **AT&T IP Flexible Reach Branch with Branch Office IP PBX Extensions Capability – Customer Configuration Guide**

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## **1. About This Guide**

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This guide was created to assist with the preparation and installation of the AT&T IP Flexible Reach with Branch Office IP PBX service. AT&T IP Flexible Reach provides local, US long distance and international voice and fax calling over the AT&T Global MPLS Network. This service gives customers the ability to more efficiently manage their voice services and allows emerging IP applications such as conferencing, messaging and multi-media onto their data networks, as they become available.

### **1.1 Audience**

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This guide will assist the customer (or partners installing the service in conjunction with customer personnel) to prepare the premises work and data network including LAN/WAN. This guide assumes that the reader understands how to make network connections and understands basic networking concepts.

## 1.2 Contents

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This guide is organized as follows.

- **About This Guide** — This section provides information about the audience and document contents.
- **Introduction to AT&T IP Flexible Reach** — This section provides a brief overview of the AT&T IP Flexible Reach service and features.
- **AT&T Flexible IP Reach Branch Office Installation and Activation Process** — This section describes at a high level the tasks to perform in the installation and activation of the service.
- **Network Configuration** — This section provides information on typical network configuration scenarios, details on customer premises setups, and various notes on network planning considerations.
- **CPE Configuration** — This section provides configuration information.
- **Emergency Services** — This section describes 911/E911 expectations.
- **Branch Office Minimum Requirements** — This section provides voice codec bandwidth guidelines for bandwidth capacity planning activities.
- **Troubleshooting and Maintenance Procedures** — This section provides guidelines if there are problems with the service.
- **Glossary** — This section provides definitions of terms used in this document.
- **Index** — This section provides an alphabetical list of words and related page number(s) for easy access to terms in this guide.



## 2. Introduction to AT&T IP Flexible Reach with Branch Office IP PBX Extensions

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AT&T IP Flexible Reach is the service within the AT&T Business VoIP product portfolio designed to deliver any-distance outbound and inbound (local) calling over AT&T's IP and VPN services. It also provides US long distance and international voice and fax calling over the AT&T Global MPLS Network.

AT&T supports integration of customers' voice and data applications by leveraging their data services including MIS (Managed Internet Service) or MPLS PNT (Service MPLS Private Network Transport).

While the AT&T IP Flexible Reach service offers three calling plans, the Branch Office IP PBX Extensions capability is supported with two calling plans: Local and Long Distance (plan B) and Local and Long Distance Package (plan C).

### 2.1 AT&T IP Flexible Reach with Branch Office IP PBX Extensions

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The AT&T IP Flexible Reach with Branch Office IP PBX Extensions option provides the capability to deliver telephone numbers for all the Branch Office sites supported by customer's single centralized IP PBX. This configuration uses the IP PBX to support IP phones in a "plug-and-play" manner and does not require any additional premises-based hardware. The customer is able to use their existing data network to distribute calls to their branch office sites and normal local calling capability can be assigned. Only Branch Office sites with fixed locations are supported by the option.

AT&T collects the address data on the Branch Office site so the appropriate directory listing, taxing, regulatory fees, E911 and telephone number (TN) assignments can be associated with the Branch Office site. Branch office sites must be within the footprint of AT&T's BVoIP local service area for AT&T IP Flexible Reach with Calling Plans B or C. The customer must provide correct information to AT&T regarding the address and telephone numbers of its Branch Offices and customer's IP PBX must transmit the necessary address information to permit AT&T to route Branch Office E911 calls to the proper PSAP.

AT&T IP Flexible Reach supports voice traffic that is converted to data packets, allowing customers to use their MIS or MPLS PNT connection for data, voice and fax traffic. Customers choose the calling capacity they require in units of **Concurrent Calls** which are similar to simultaneous calls and can be engineered using standard voice traffic tools (including Class of Service considerations or by using the customer's existing voice channel capacity), providing a flexible solution for any enterprise from large to small. AT&T IP Flexible Reach Service supports both traditional digital TDM PBXs as well as AT&T certified IP PBXs.

**Outbound** voice and fax calling is supported between:

- US VoIP-enabled locations (On-net)
- PSTN connected locations (Off-net)

**Inbound** service from the PSTN is supported with Calling Plans B or C.

Note that the management and maintenance of the Branch Office site and router is not included in the IP Flexible Reach Service Support (see Section **8.3 Maintenance Support**). The customer must provide all coordination between the AT&T Business VoIP Maintenance Center and their Branch Office site data service provider. AT&T support for data transmission for AT&T Flexible Reach ends at the customer's IP PBX.

## **2.2 Branch Office Web Sites, Tools, and User Guides**

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- AT&T Business Voice over IP (VoIP) Services – Service Guide
  - <http://new.serviceguide.att.com/voip.pdf>
- BusinessDirect
  - <https://businessdirect.att.com/portal/index.jsp>
- AT&T Business Voice over IP Customer website
  - <http://www.att.com/dna/support/>

## **3. Installation and Activation Process**

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### **Definitions for Architecture Diagram:**

#### **Branch Office site**

The Branch Office site is defined as a site on the customer data network with IP Phones. If the IP phones at the Branch Office site need access to the AT&T IP Flexible Reach, then the Branch Office will be defined as having as having Branch Office IP PBX Extensions service.

#### **Hub site**

The hub site (client's centralized IP PBX Flexible Reach site) is defined as the site with two routers. One is the AT&T VoIP managed router which connects to customer's IP PBX and the second is a customer managed router that provides connectivity to the customer data network.

### 3.1 Service Architecture

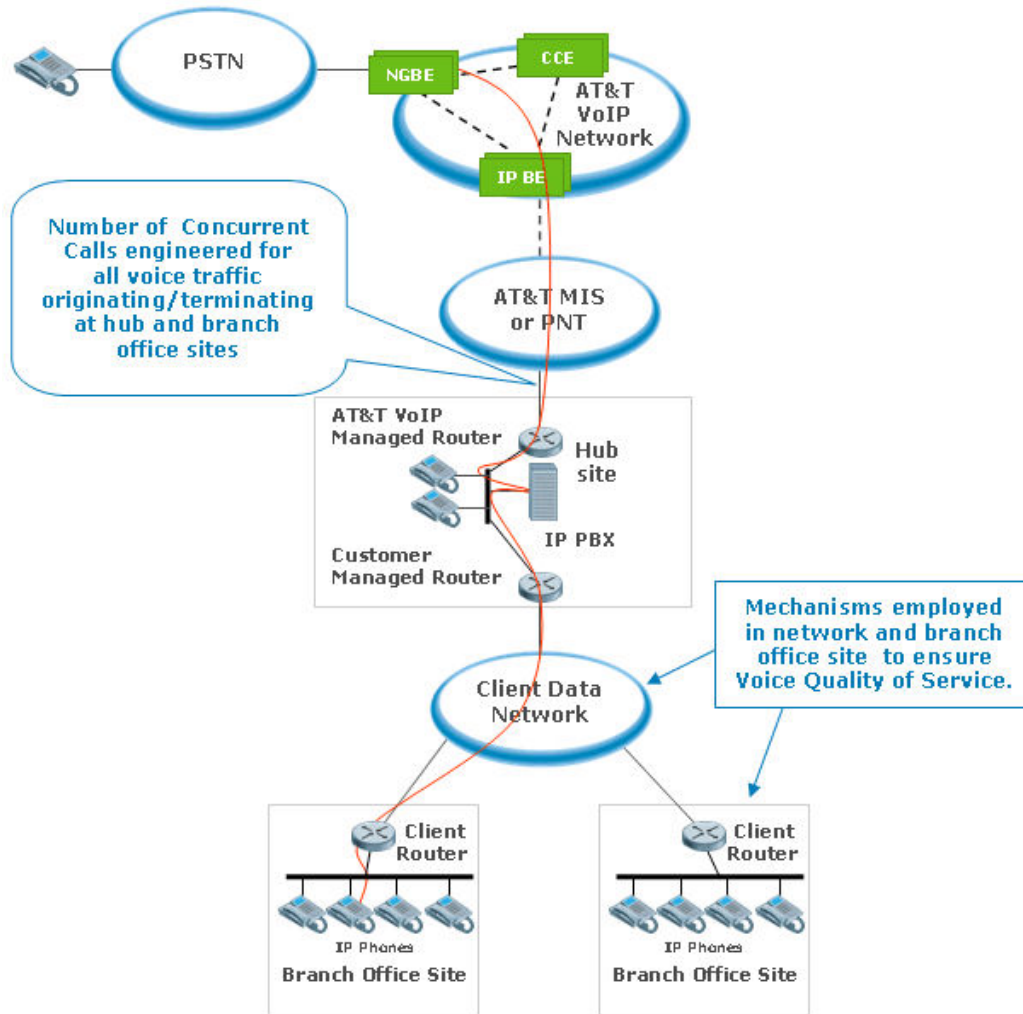


Figure 1. Architecture Diagram

#### Important Considerations:

- Number of Concurrent Calls must be engineered for all voice traffic originating/terminating at the hub and Branch Office sites. Concurrent Calls are the number of VoIP calls expected to occur at the same time at the AT&T IP Flexible Reach hub site. Refer to Section 7.1 **Supported Concurrent Calls** for more information.
- Mechanisms are employed in the network and Branch Office site to ensure Voice Quality of Service.
- Service Guide at: <http://new.serviceguide.att.com/voip.pdf>

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## 3.2 Infrastructure

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### 3.2.1 AT&T IP Flexible Reach Branch Office Site Planning Activities

This section outlines the AT&T IP Flexible Reach Branch Office activities involved in preparing, installation, activation, and test of the site for the service. The components required for the service include:

- An existing AT&T VoIP managed router at the hub site.
- An IP PBX at the hub site.
- An existing customer managed, third party or AT&T VoIP managed router at the hub site that is connected to the Branch Office site via any data network.

### 3.2.2 Ordering Checklist

The following is an Ordering checklist for the Customer Point of Contact (CPOC)/Customer Administrator:

- Place an order for each Branch Office site with AT&T by contacting your sales representative.
  - a. Must have AT&T IP Flexible Reach service with Calling plan B or C at the hub site prior to initiating order for Branch Office.
  - b. Must have an IP PBX at the hub site.
  - c. Broadband data service must be in place between the hub site and the Branch Office site prior to the service activation at the Branch Office site.
    - i. The broadband service must adhere to the requirements found in Section **7. Voice Bandwidth Minimum Requirements at the Branch Office Site.**
    - ii. Voice Tunneling may be required on some broadband applications, DSL, Cable Modem, and Internet Service.
    - iii. Quality of Service (QoS) is highly recommended to ensure VoIP traffic is treated as a real time application and has priority over the other data traffic. For more information see Section **7.2 Quality of Service Details.**
    - iv. If the broadband service does not exist or is not sufficient for the Branch Office site, please make arrangements with your data service provider to order or upgrade the service.
    - v. Confirm that the Branch Office site is within the footprint in which AT&T Flexible Reach is provided, and that appropriate telephone numbers are to be used at the Branch Office site.
  - d. The customer must determine if the number of concurrent calls at the hub site is adequate to accommodate both inbound and outbound traffic for the hub and Branch Office sites. Should the number of concurrent calls need to be increased, a separate order must be placed and completed prior to initiating the Branch Office order. Refer to Section **7. Voice Bandwidth Minimum Requirements at the Branch Office Site** for more information.
  - e. There should be no Network Address Translation (NAT) for the LAN to LAN traffic between the hub site and the Branch Office site.

### 3.2.3 Implementation Checklist

The following is an implementation checklist for the CPOC/Customer Administrator

1. Broadband service is in place and meets the minimum technical requirements.
2. Must provide private network IP addresses of Branch Office site. For example,
  - a. 10.x.x.x
  - b. 192.168.x.x
  - c. 172.16.x.x
3. Must register the phones at the Branch Office site to the IP PBX using the Private network address.
4. Coordination of data network and associated routers.
  - a. Coordination is the responsibility of the customer.
5. Default routes have been set.
  - At the hub site, the customer managed router should be configured with a default route to the AT&T VoIP managed router for proper connectivity of the phone to the AT&T voice elements.
  - Configure the customer managed router with the following static routes pointing to the AT&T VoIP managed router:
    - 12.194.177.0/24
    - 12.194.180.0/24
    - 12.194.253.0/28
    - 12.194.254.0/28
    - 12.194.255.0/28
6. If porting in telephone numbers from another carrier, please ensure that site(s) will be ready on the date of the scheduled service activation.
  - a. Failure to ensure that the site is ready on the activation date will result in an out-of-service condition for the ported telephone numbers.
  - b. If a delay in activation is required for any reason, contact AT&T at least five business days prior to the service activation.
7. The CPOC/Customer Administrator should verify that the Branch Office site can communicate to the hub site by placing test telephone and fax calls.
  - a. Ensure that the Branch Office is able to make a call to the hub site.
    - If this does not work, the customer needs to contact their local or third-party data and voice network administrator.
  - b. Ensure that the hub site is able to make a call to the Branch Office.
    - If this does not work, the customer needs to contact their local or third-party data and voice network administrator.
  - c. Ensure that the hub site is able to make a Long Distance call.

- If the above steps are not successful or additional support is needed, please engage AT&T Professional Services by contacting your sales representative.
8. Confirm the activation date with your AT&T VoIP Order Manager.
  9. The customer is responsible for testing all the Branch Office locations after the service activation is done.

**⇒NOTE:**

The only additional configuration required by the customer is to add the static routes (if no default route is defined on the customer managed router).

### **3.2.4 Activation of the Branch Office Service**

On the agreed Activation Date:

1. Your AT&T VoIP Order Manager will activate your service on the agreed date and time.
2. The CPOC/Customer Administrator is responsible for performing self testing that will include placing test telephone and fax calls to on-net VoIP sites and to off-net numbers. For self testing procedures, refer to the AT&T IP Flexible Reach with Branch Office IP PBX Extensions Service Activation Day Checklist. This document is located on the AT&T Business Voice over IP Customer website (<http://www.att.com/dna/support/>).
3. AT&T will add the provided Branch Office private network to the managed router NAT ACL.
  - a. If all the customer performed test requirements are met, then the customer will be able to make off-net calls from the branch. The number of simultaneous calls from Branch Office and hub site are subject to the purchased Concurrent Call limit.
  - b. If an off-net call is not possible, then perform the following steps:
    - Ping and trace from the Branch Office to the AT&T VoIP managed router at the hub site. Check to see where the trace stops and contact the local Administrator to check ACL on corresponding routers and/or firewalls.

## **3.3 Phone and User Setup**

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No additional phone or user setup is required.

## **4. Network Configuration**

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The AT&T IP Flexible Reach with Branch Office IP PBX capability provides support for telephone numbers at the Branch Office site that interconnect to the IP Flexible Reach hub site via a customer provided network. All voice traffic (signaling and media) is delivered by the AT&T network to the hub site. Beyond the router at the hub site, the customer is responsible for installation and configuration of customer premises equipment and customer data network to ensure call completion to the Branch Office site while maintaining voice quality performance.

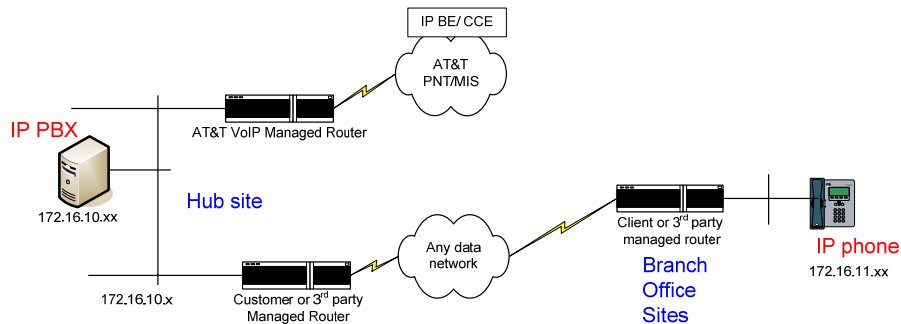
### **4.1 Fax Support**

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VoIP supports fax transmission from G3 and Super G3 fax machines using G711 at 80 Kbps.

## 5. CPE Configuration at the Branch Office Site

The following information provides CPE details.



Note: IP Addresses are for illustrative purposes only

**Figure 2. CPE Branch Office Configuration Scenario**

This scenario shows that any customer data network based on Private line, MPLS enabled data network, FR, ATM or end-end IP VPN between hub and Branch Office sites can be supported. Examples of these networks are AT&T FR, ATM, PNT, IPeFR, and ANIRA. A Branch Office site with Internet access (including MIS) is not supported unless end-end IP VPN tunneling is used. The main requirement is that no NATing takes place between the IP phone at a Branch Office site and the hub site. In case of the IP PBX at the Branch Office site, the requirement is that no NATing takes place between the IP PBX and the site with the AT&T VoIP managed router.



## **6. Emergency Services**

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For more complete information on 911/E911, refer to Service Guide located at:

<http://new.serviceguide.att.com/voip.pdf>

AT&T Flexible Reach service plans B and C, including AT&T IP Flexible Reach Branch Office IP PBX Extensions, are limited to locations where AT&T can provide 911/E911 service. The 911 service provided is based on the site registered location information provided to AT&T by the customer. The customer must provide AT&T with the correct business name and address information for each IP Flexible Reach location including all Branch Offices. The customer must also ensure that IP Flexible Reach telephone numbers are assigned to the appropriate service location (identified during service ordering) and not assigned or used from another service location.

The customer premises equipment should be configured to use the telephone number of the phone device making the 911 call as the calling party number. This ensures both, AT&T will route the call to the appropriate public emergency service agency and that the correct address information will be displayed to emergency service agent handling the call. In addition, should the call be terminated inadvertently the agent will have a call back number to re-establish communication with the person seeking emergency services.

Should the customer choose to configure premises equipment to send a single telephone number as the calling party number on all 911 calls originating from a particular site, the customer must ensure the calling party number used is an AT&T IP Flexible Reach telephone number assigned to the site and the telephone is manned to handle potential call back from the emergency service agent.

## 7. Voice Bandwidth Minimum Requirements at the Branch Office Site

The following table provides voice codec bandwidth guidelines for bandwidth capacity planning activities when designing a data network to carry voice traffic that provides good voice quality.

**Table 1. Voice Call Minimum Bandwidth Requirements**

Access	Codec G. 729		Codec G.711	
	w/o cRTP	with cRTP	w/o cRTP	with cRTP
DSL/Cable (with IPSEC VPN Tunnel)	50.4	N/A	108	N/A
PPP/FR	26.4	11.2	82.4	67.2
Ethernet	31.2	N/A	87.2	N/A

### **Bandwidth Calculation Formula**

Bandwidth = Total packet size \* Packets Per Second (PPS)

PPS = code bit rate/payload size

Total Packet Size = L2 protocol header + 40 (IP/UDP+RTP) + payload

Total Packet Size with cRTP = L2 protocol header + 2 byte (IP/UDP/RTP) + payload

### **Assumptions Made:**

1. 6 bytes Multilink Point to Point or Frame Relay header
2. 18 bytes for Ethernet Header (including 4 byte CRC)
3. 40 header bytes for (IP/UDP/RTP), (20 bytes IP) + (8 bytes UDP) + (12 bytes RTP)
4. cRTP compresses IP/UDP/RTP to 2 bytes
5. G.729 20 byte payload
6. G.711 160 byte payload

### **7.1 Supported Concurrent Calls**

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The customer determines the number of Concurrent Calls needed at an AT&T IP Flexible Reach site based on the customer's monthly busy hour traffic. If the customer does not order enough Concurrent Call capacity, VoIP calls may be blocked if customer or users attempt more than the number of Concurrent Calls purchased by the customer, unless the customer has sufficient alternative routing to the PSTN.

The Concurrent Call Table (Table 2) provides information regarding the bandwidth and the associated number of Concurrent Calls supported.

**Table 2. Concurrent Call Table**

<b>Bandwidth</b>	<b>IP PBX (single increments)*</b>
T1	6 to 48
T3	6 to 360
Note*: Custom orders may allow for up to 700 Concurrent Calls for IP PBX certified configurations (T3).	

### **7.2 Quality of Service Details**

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Typically, networks operate on a best-effort delivery basis, which means that all traffic has equal priority and an equal chance of being delivered in a timely manner. When congestion occurs, all traffic has an equal chance of being dropped. When you configure QoS, you can select specific network traffic, prioritize it according to its relative importance, and use congestion-management and congestion-avoidance techniques to give preferential treatment. Implementing QoS in your network depends on the QoS features offered by your networking devices, traffic types, network patterns and the granularity of control that you need over incoming and outgoing traffic.

## 8. Troubleshooting and Maintenance Procedures

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### 8.1 Troubleshooting

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If the customer is not able to make calls, then perform the following steps:

- Ensure that the Branch Office is able to make a call to the hub site.
  - If the above step is not successful, the customer needs to contact their local or third-party data and voice network administrator.
- Ensure that the hub site is able to make a call to the Branch Office.
  - If the above step is not successful, the customer needs to contact their local or third-party data and voice network administrator.
- Ensure that the hub site is able to make a Long Distance call.
  - If the above step is not successful, the customer needs to contact AT&T Professional Services by contacting your sales representative.
- Ensure that the Branch Office is able to make an offnet call.
  - If the above step is not successful, then ping and trace from the Branch Office to the AT&T VoIP managed router at the hub site. Check to see where the trace stops and contact the local Administrator to check ACL on corresponding routers and/or firewalls.
- If the above test calls work, the customer will be able to make off-net calls from the Branch Office. The number of simultaneous calls from Branch Office and hub site are subject to the purchased Concurrent Call limit.

**⇒NOTE:**

If the above steps are not successful or additional support is needed, please engage AT&T professional services by contacting your sales representative.

### 8.2 AT&T CPE, Service Monitoring, Maintenance, and Management

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AT&T's Customer Care is responsible for monitoring and maintaining AT&T IP Flexible Reach equipment on a 24/7 basis. This comprehensive technical support includes:

- Proactive monitoring of CPE routers provided by AT&T as part of AT&T VoIP service.
- Maintenance of routers, modems, CSU/DSUs provided by AT&T as part of AT&T VoIP service.
- Surveillance and fault monitoring of the VoIP network elements
- Surveillance and fault monitoring of the AT&T IP network and access routers.

### 8.3 Maintenance Support

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The customer **MUST** provide all coordination between the AT&T Business VoIP Maintenance Center and their data service provider.

- AT&T management responsibility extends to the LAN port on the AT&T VoIP managed router. In the case of voice troubles from the Branch Office site, AT&T will verify that the Service is working satisfactorily from the AT&T VoIP managed router into the AT&T VoIP network. It is the customer's responsibility to coordinate and verify connectivity and configurations from the AT&T VoIP managed router to the Branch Office site router.
- AT&T expects that the client will contact their appropriate data service provider, including AT&T, to ensure that their client data network has the appropriate class of service, TFTP flow through, and all appropriate ports (Port 69 for TFTP and 2000-32767 for SIP) open for VoIP service.
- AT&T expects the client to ensure appropriate phone assignment and registration to phones at the hub site and any Branch Office sites. The client is expected to test continuity and connectivity between the phones at the Branch Office and the hub site before AT&T IP Flexible Reach test and turnup.



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# Glossary

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## B

### **Branch Office site**

The Branch Office site is defined as a site on the customer data network with IP Phones. If the IP phones at the Branch Office site need access to the AT&T IP Flexible Reach, then the Branch Office will be defined as having as having Branch Office IP PBX Extensions service.

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## F

### **Flexible Calling Plans**

AT&T offers options of both a "flat rate" like plan with included US minutes per Concurrent Call to provide the cost certainty of a flat rate service, or a per minute plan to allow customers the flexibility to choose the optimal calling plan that best meets their calling patterns.

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## H

### **Hub site**

The hub site (client's centralized IP PBX Flexible Reach site) is defined as the site with two routers. One is the AT&T VoIP managed router and the second is a customer managed router that provides connectivity to the customer data network.

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## L

### **Local inbound and outbound**

Calling using AT&T's Business VoIP Local Footprint with full local service feature/functionality including: new telephone number assignments, local number portability, Direct Inward Dialing (DID) and Direct Outward Dialing (DOD), E911, Directory Listing, Directory Assistance, originating 8YY, Operator Assistance, Blocking options and more.

---

## N

### **NATing**

NAT (Network Address Translation)

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## O

### **Off-net**

Defined as calling from AT&T IP Flexible Reach customer sites to any U.S. or non-U.S. location not equipped with the AT&T Flexible Reach service. There are three categories of Off-net calling: Local, Long Distance and International.

**Off-net Long Distance**

Calling via AT&T's network-based hop-off gateways, which are connected to the PSTN for calling termination to any location.

**Off-net International calling**

From AT&T's network-based hop-off gateways provides International per minute calling at competitive rates.

**On-net**

Defined as calling between customer locations that have AT&T IP Flexible Reach service. On net calls between customer IP PBX sites will only complete on net if the vendor, model and software version are the same.

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## P

**PPP**

Point to Point Protocol

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## Q

**QoS**

QoS (Quality of Service) is the idea that transmission rates, error rates, and other characteristics can be measured, improved, and, to some extent, guaranteed in advance.

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## R

**RTP**

Real Time Protocol



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