



X Series Network Requirements

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Document History

Version	Date	Author(s)	Comments
1.0	9/4/2019	Paul S. Chase	Initial Release
1.1	9/10/2019	Paul S. Chase	Added static IP addresses for Required Core Services
1.2	10/1/2019	Paul S. Chase	Add Network Considerations, Update app name/references. Add ContactNow UK Ports for Non-VO softphone. Add additional Domains & IP's
1.3	12/5/2019	Paul S. Chase	Adjust recommendations around conditional forwards, and load balancing. Add details for Zoiper, and Wavcell requirements

Abbreviations

Abbreviation	Meaning
8x8	8x8, Inc.
ALG	Application Layer Gateway
DNS	Domain Name System
DPI	Deep Packet Inspection
DSCP	Differentiated Services Code Point
EF	Expedited Forwarding
FTPS	FTP Secure (FTP over TLS)
GTM	Global Traffic Manager (8x8 DNS)
HTTP(s)	HyperText Transfer Protocol (Secure)
IMAP	Internet Message Access Protocol
IP	Internet Protocol
KB	Knowledge Base System
LAN	Local Area Network
LDAP(S)	Lightweight Directory Access Protocol (Secure)
NTP	Network Time Protocol
POP3	Post Office Protocol version 3
QoS	Quality of Service
SIP(S)	Session Initiation Protocol (Secure)
SPI	Stateful Packet Inspection
(S)RTP	(Secure) Real Time Protocol
TCP	Transport Control Protocol
TLS	Transport Layer Security
UDP	User Datagram Protocol
VCC	8x8 Virtual Contact Center
VLAN	Virtual Local Area Network
VO	8x8 Virtual Office
VOD	Virtual Office Desktop Application
VOM	Virtual Office Mobile Application
WAN	Wide Area Network

Terminology

The following terms are important in understanding your network requirements for 8x8:

- **Jitter:** A measure of the time interval between data packets as they reach their destination. A low degree of jitter indicates a relatively steady stream of data packets.
- **Packet loss:** Data, such as a VoIP transmission, is sent over the Internet in the form of packets. Packet loss occurs when some of these packets do not arrive at their destination. For each packet lost, a small amount of speech is cut out. If the degree of packet loss is high, conversation audio can sound very choppy, delayed, or unclear.
- **MOS score:** The higher your MOS score, the better your VoIP experience will be. A MOS score is measured on a scale of 1 to 5, in which 5 represents the best possible call quality, and 1 represents the worst possible call quality. The scale is subjective, and based on normative data collected from experimental trials.

Introduction

Purpose of this document

This document provides a comprehensive guide to the network requirements necessary to enable 8x8 X Series services (Including Contact Center Applications, Virtual Office Desktop and Mobile UCaaS clients, Video Meetings and current hardware offerings). *The audience for this document is for an X Series customer to 8x8, thus it does not reference to older/previous applications or hardware.*

Network Technical Requirements

Firewall Guidelines

It is advisable to either exempt 8x8 traffic from Deep Packet Inspection (DPI) and Intrusion Protection or ensure that appliances performing these operations can inspect the traffic without inducing measurable delay.

Default Recommendations

DNS

When using a Voice Only VLAN (a Virtual LAN with only Hard Phones, and no computers on it) 8x8 recommends that you set the 8x8 GTMs, 8.28.0.9 and 192.84.18.11 as the Primary and Secondary DNS servers in the VLANs DHCP Scope. An alternate option is to implement conditional forwarding of 8x8.com and packet8.net on your local DNS servers to 8.28.0.9 and 192.84.18.11, which are 8x8's DNS servers. It is not recommended to set conditional forwarding on your Data VLAN, and/or if you have only 1 network. If your network only consists of a single LAN (you are not using VLANS) 8x8 can set the DNS of your hard phones to the GTMs. This ensures proper Geo Routing of your 8x8 traffic to the closest 8x8 data center for each location.

NTP

8x8's recommendation for NTP is to allow the default NTP setting of pool.ntp.org through the firewall. If your internal security requirements do not allow for external NTP, our recommendation is to use Option 42 in your DHCP scope to override the NTP setting to a NTP server of your choice. Should you not have an internal NTP server, please use ntp2.packet8.net.

SIP-Application Level Gateway (ALG)

8x8 recommends that SIP-ALG be disabled on all your Layer 3 Network equipment, as SIP-ALG can cause issues with SIP messaging. Please review and test to ensure that disabling SIP-ALG on your networking equipment will not impact to other

existing services on their network. For more information on SIP-ALG and possible solutions for disabling please see our SIP-ALG help page at https://support.8x8.com/us/Equipment_and_Devices/Network_Devices/How_to_disable_SIP-ALG_in_my_router_or_firewall.

SIP-ALG (Application Level Gateway) is a feature in which the layer 3 network equipment can manipulate the payload section of a SIP Packet to change the private addressing to be public address. As the phone or Virtual Office software is not aware of the public address, all payload information references private addressing. Edge devices attempt to "correct" this by opening all SIP packets and manipulating the payload (body) of the packets by replacing private addresses with the public IP of the edge device and the Natted port. Unfortunately many devices do not properly manipulate these packets causing them to be invalid or contain incorrect information. For this reason 8x8 recommends that this function be disabled.

Firewall Rules

Our recommendation is to create an OUTBOUND Policy "Internal to 8x8" rule in your firewall. This is a highly secure action as it is only opening outbound traffic towards a known destinations (8x8 data center(s)). The list of 8x8 subnets (or Domains) are [later in the document](#).

We recommend setting firewall session timers as follows to prevent premature NAT session changes that can cause de-registration, intermittent one way audio, and phones to not pick up or ring when using certain firewalls:

- UDP session timer: 300 seconds
- TCP session timer (TLS connections only, port 5443): 300 seconds

Application and Browser Based Interfaces

Outbound requests made via HTTP over TLS (HTTPS) on port TCP 443 to all 8x8 domains listed in the [Domains section](#) of this document without restriction. 8x8 has implemented HTTP to HTTPS redirection, customers should also allow TCP port 80 towards 8x8 networks as a result.

Proxy Server

8x8 has made every attempt to ensure that the Virtual Office Desktop application will respect the proxy settings of the system VOD is running on. 8x8's web applications (Contact Center Agent Interface, Configuration managers, Analytics and so forth) are by nature proxy aware and will respect the proxy setting of the system/browser.

Physical Instruments:

For all approved telephony devices (endpoints), Outbound requests made via HTTP over TLS (HTTPS) on port TCP 443 to all 8x8 domains listed in the Domains Section of this document without restriction to specific IP address ranges.

Notes about Provisioning: Poly devices can make use of Poly Zero Touch Provisioning (ZTP) and Poly PDMS service. Each of these services require HTTPS traffic to be allowed to Poly. For more details see [How do I Whitelist Zero Touch Provisioning Services for Obihai and Polycom Devices - 8x8 Support](#) in our Knowledge Base.

Network Considerations and Recommendations

The below are Network considerations and recommendations that customers should review and adopt as appropriate, s they may not ally to all installations. .

Parameters	Requirements
Wiring	At least Cat 5 (preferably Cat 6) wiring to each user
PoE (recommended)	See Device Manufacture Data Sheets
Packet loss	0% packet loss
Jitter	<20 ms jitter
Network latency	<100 ms latency to 8x8 data centers. VoIP services are known to work even in higher latency conditions up to 150-200 milliseconds. However, this must be maintained consistently with no packet loss
Bandwidth requirement	<p>Voice UCaaS and CCaaS</p> <ul style="list-style-type: none"> ● G711 Codec: 90 kbps symmetric/call ● G722 Codec: 90 kbps symmetric/call ● G729 Codec: 35 kbps symmetric/call ● CCaaS add an additional 30kbps symmetric/call <p>Video Meetings Upstream:</p> <ul style="list-style-type: none"> ● Up to 3Mbps for video ● 40kbps for audio <p>Video Meetings Downstream:</p> <ul style="list-style-type: none"> ● 2.5 Mbps for "On Stage" video in high quality ● At least 500kbps for one incoming stream in lowest quality ● 200kbps per thumbnail stream (excluding on-stage) ● 40kbps for audio <p>Downstream max bandwidth in a conference of n people would be 2.5Mbps + (n-2)*200kbps + 40kbps</p>

	Please make sure you have 50% of your available bandwidth free to accommodate any spike in usage. Always assume that at least 35% of your users are on call at any time. However, depending on your company's use case, you may have a higher percentage.
Parameters	Considerations
If running a converged network for voice and data	<p>Configure VLANs to separate the traffic. Please ensure that the Phone VLAN has the following DNS and NTP in its DHCP scope:</p> <ul style="list-style-type: none"> • Use 8x8 DNS (Global Traffic Managers) servers 192.84.18.11 and 8.28.0.9 • Use 8x8 NTP server ntp2.packet8.net <p>Note: The recommended DNS do not resolve any other domain except 8x8.com and packet8.net.</p>
DHCP scope	Ensure that there are no rules specified to force any provisioning server or NTP server to deviate from default 8x8 values. For provisioning servers, you must disable Option 66/160.
Maximum Transmission Unit (MTU)	The network must support an MTU of 1500 bytes per packet. The MTU is the size of the largest protocol data unit that the layer can pass onward. This is for Non-SRTP Communications only.
WAN failover	We highly recommend that you use dual WAN connections in a failover state by using WAN link redundancy (Active / Standby). Dual WAN connections in load balancing (Active / Active) may not supported, due to the multiple ways to implement, speak to your 8x8 engineer for supported options, and or recommendations.
VPN use cases	If your remote users or Internet egress use a VPN tunnel, please make sure that the 8x8 traffic does not traverse it. Consider a Split Tunnel to have local Internet egress for 8x8 traffic. In addition, split DNS to resolve 8x8 domain queries locally. Speak to your 8x8 engineer for more information.

QoS/Priority

The basic approach of handling QoS for 8x8 traffic within your network is by DSCP markings as provided by the applications and approved devices. When configuring QoS, on circuits that support QoS, external to your network 8x8's recommendation is to identify 8x8 traffic based on source/destination network, (i.e. not by DSCP markings, ports, channels, etc). RTP will make up 90+% of your traffic. That way any of your traffic that is sourced/destined to any of the 8x8 networks should be treated with the highest priority.

If the majority of your users are on Wi-Fi rather than Ethernet, please make sure you follow the best practices in Wi-Fi deployment to ensure plenty of coverage.

Virtual Office Meetings does not currently mark the meetings traffic, our recommendation is to set priority (EF) on the predictable port of UDP/TCP 10000.

8x8 DSCP /CoS Values Applied:

Endpoint Type	Traffic Type / Application	COS Value (Decimal)	DSCP (Decimal)	Name
Windows /Non Admin	Voice Media - Real Time	CS7	DSCP 56	
Windows /Non Admin	SIP Signalling	CS5	DSCP 40	
Windows /Admin	Voice Media - Real Time	EF	DSCP 46	Expedited Forwarding
Windows /Admin	SIP Signalling	AF31	DSCP 26	Assured Forwarding
Mac / iOS	Voice Media - Real Time	EF	DSCP 46	Expedited Forwarding
Mac / iOS	SIP Signalling	AF31	DSCP 26	Assured Forwarding
Android	Voice Media - Real Time	EF	DSCP 46	Expedited Forwarding
Android	SIP Signalling	AF31	DSCP 26	Assured Forwarding

8x8 Datacenter Ports

Traffic requiring outbound connections from within the customer network to the 8x8 Cloud.

Traffic Source & Purpose	Applies To	Protocol(s)	Destination Port(s)
Device -Provisioning -Configuration -Software Update	All Certified Physical Phones & ATAs	HTTP HTTPS	TCP 80,443
Device -Secure SIP Signalling	All Certified Physical Phones & ATAs	SIPS (Secure SIP)	TCP 5443
Device -Corporate Directory	Certified Physical Phones	LDAPS	TCP 636
Device -Network Time	All Certified Physical Phones & ATAs	NTP	UDP, TCP 123 <i>Can be provided locally via DHCP Option 42</i>
Device -Domain Name System	All Certified Physical Phones & ATAs	DNS	UDP 53 TCP 53 <i>Can be provided locally via DHCP Option</i>
Device - SIP Activation - SIP Signalling	All Certified Physical Phones & ATAs	SIP	UDP 5060 (Activation only) UDP 5199,5299,5399
Softphone Application & Browser -Authorization -Messaging -Presence -Configuration -Administration -Reporting -Quality Management	- Virtual Office Mobile & Desktop -Config Manager -Analytics -Virtual Contact Center Agent, Supervisor -Quality mgmt	HTTPS	TCP 443

-Microservices			
Softphone Application -Secure SIP Signalling	-Virtual Office Mobile & Desktop	SIPS (Secure SIP)	TCP: 5401,5443
Real Time Audio - Voice Call Audio	-Physical Phones -Virtual Office Mobile & Desktop	SRTP (Secure RTP)	UDP 24000:30999 UDP 38000:44999 UDP 52000:58999 UDP 50000:65535
8x8 Video Meetings	-Mobile App -Browser -Desktop App	HTTPS RTP/WebRTC RTP/WebRTC	TCP 443 UDP/TCP 443 UDP 10000

Optional Services/Applications:

The following are optional items that may not be required. Consult your 8x8 team to validate whether these scenarios are applicable to your specific use cases.

Traffic Source & Purpose	Applies To	Protocol(s)	Destination Port(s)
Quality Management Screen Recording -Streaming screens	Screen Recording Client in Quality Management	HTTPS	TCP 443
VCC FTPS Call Recording Download	Downloads of contact centre call recordings using FTP over TLS (FTPS).	FTPS Note: FTPS is not the same as SFTP (SSH Based).	Control Connection: TCP: 21, 2121, 990 Data XFER Ports: UDP:30000-30999
Bria Softphone	Standalone contact center softphone	SIP RTP	UDP 5060, 5061 UDP High Ports (1024 - 65535)
Zoiper Softphone	Standalone contact center softphone	SIP RTP	UDP 5060, 5061 UDP High Ports (32000 - 65535)

Network Utility -Media Tests -Fragmentation Test -BufferBloat Test	Network Assessment	RTP	UDP 3478-3480
Wavecell API	Video API	HTTP HTTPS WSS	UDP 10000 - 20000
SIP Trunks -SIP(S) Signalling -(S)RTP	See customized Statement of Work for the unique implementation		

Optional Services/Applications requiring incoming connections

Traffic Source & Purpose	Applies To	Protocol(s)	Destination Port(s)
Contact Center Email -POP3/IMAP email access	Contact Center Email Queueing	POP3 POP3S IMAP IMAPS SMTP SMTP TLS SMTP SSL	TCP 110 TCP 995 TCP 143 TCP 993 TCP 25 TCP 587 TCP 465 Note custom ports can be configured
SIP Trunks -SIP(S) Signalling -(S)RTP	See customized Statement of Work for the unique implementation		

8x8 Datacenter IP Ranges

IP Ranges

Below is a list of IP Ranges that are used by 8x8 products and applications.

Geographic Region	Address Ranges
Cloudflare CDN (8x8 employs third-party security measures against cyber-attacks, which require traffic to be routed through that service's IP addresses)	104.16.110.61 104.16.109.61
US East	8.28.0.0/22 162.221.238.0/23
US West	8.5.248.0/23 8.21.164.0/24 63.209.12.0/24 162.221.236.0/23 192.84.16.0/22
Canada	67.225.14.144/28 142.165.219.0/24
UK	217.163.57.0/24 216.59.136.0/21 91.236.117.0/24 109.70.58.0/24
Asia Pacific (HK)	103.252.162.0/24
Australia	103.239.164.0/24
Netherlands	64.95.100.96/28
Brazil	168.90.173.112/28
Singapore	117.20.40.192/28
India	124.124.82.224/28

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Reserved for Future Use	209.94.72.0/22
8x8 Video Meetings	13.232.101.208 3.0.167.49 54.66.154.44 35.182.147.109 3.122.28.43 63.32.210.13 35.176.73.125 54.233.170.124 54.167.244.60 18.220.195.182 54.214.212.235 13.248.132.124 76.223.3.109 13.248.142.92 76.223.9.91
Required Core Services	US-East-1 (Virginia) 3.219.176.32/27 US-East-2 (Ohio) 3.14.30.96/27 US-East-2 13.248.140.87 & 76.223.9.159 US-East-2 13.248.132.105 & 76.223.4.132 US-West-2 (Oregon) 34.223.80.128/27 EU-Central-1 (Frankfort) 3.123.12.160/27 EU-West-2 (London) 3.9.41.96/27 EU-West-2 3.9.159.0/27 EU-West-2 13.248.145.116 & 76.223.18.166 EU-West-2 13.248.140.65 & 76.223.14.171 AP-Southeast-1 (Singapore) 18.139.118.128/27 AP-Southeast-1 (Singapore) 13.251.201.173 AP-Southeast-2 (Sydney) 3.106.23.128/27 AP-Southeast-2 13.248.132.108 & 76.223.7.179 AP-Southeast-2 13.248.138.121 & 76.223.13.178 SA-East-1 (São Paulo) 18.229.100.64/27 CA-Central-1 (Canada Central) 13.248.132.114 & 76.223.2.173 CA-Central-1 13.248.142.126 & 76.223.16.174 Global 13.248.142.77 & 76.223.15.160 Global 13.248.145.23 & 76.223.20.131

Domains

Below is a list of domains that are used by 8x8 products and applications.

Notes about Provisioning: Poly devices can make use of Poly Zero Touch Provisioning (ZTP) and Poly PDMS service. Each of these services require HTTPS traffic to be allowed to Poly. For more details see [How do I Whitelist](#)

[Zero Touch Provisioning Services for Obihai and Polycom Devices - 8x8 Support](#) on our Knowledge Base.

Use	Domain
8x8 Core Domains	<ul style="list-style-type: none"> *.8x8.com 8x8.vc *.jitsi.net *.packet8.net *.p8t.us *.cloud8.net *.dxi.eu *.easycallnow.net *.easycontactnow.com *.wavecell.com
8x8 Media Domains	<ul style="list-style-type: none"> *.packet8.net *.8x8.com
3rd Party Domains	<ul style="list-style-type: none"> *.cloudflare.net *.okta.com *.segment.io submit.backtrace.io *.callstats.io api.amplitude.com www.gravatar.com www.google-analytics.com *.gstatic.com *.googleapis.com *.google.com *.googleusercontent.com *.youtube.com *.microsoft.com *.microsoftonline.com *.msauth.net *.live.com *.microsoftonline.com *.dropboxapi.com *.dropboxstatic.com *.dropbox.com *.dropboxusercontent.com dropboxcaptcha.com