



Cisco Expressway IP Port Usage for Firewall Traversal

Cisco Expressway X8.1

D15066.01

December 2013

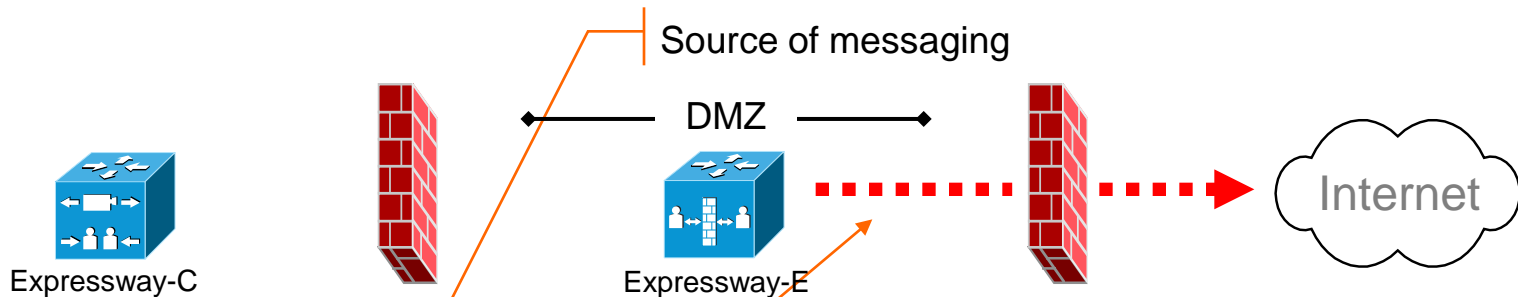
Contents: Cisco Expressway IP port usage

Which IP ports are used with Cisco Expressway?

Which IP ports need to be allowed through firewalls?

- Format of information
- Traversing firewalls
 - Administration
 - SIP calls
 - H.323 calls
- Internal
 - Administration
 - SIP calls
 - H.323 calls

Guide to this document: format of information



	Expressway-E source port	Server listening port
Management control	DMZ to public	
Open firewall	DMZ to public	
IP address	IP address of Expressway-E	IP address of DNS server
IP Ports	DNS UDP <i>S</i> <i>>= 1024</i>	UDP <i>53</i> 53

Direction firewall needs to be opened

Destination of messaging

Direction of management / calls

S = Source port, typically ≥ 1024

Details of what defines the IP port ID / range

Destination of messaging: IP address

Source of messaging: IP address

Destination of messaging: IP port

- letter reference for more details
- default / expected port range in italics

Source of messaging: IP port

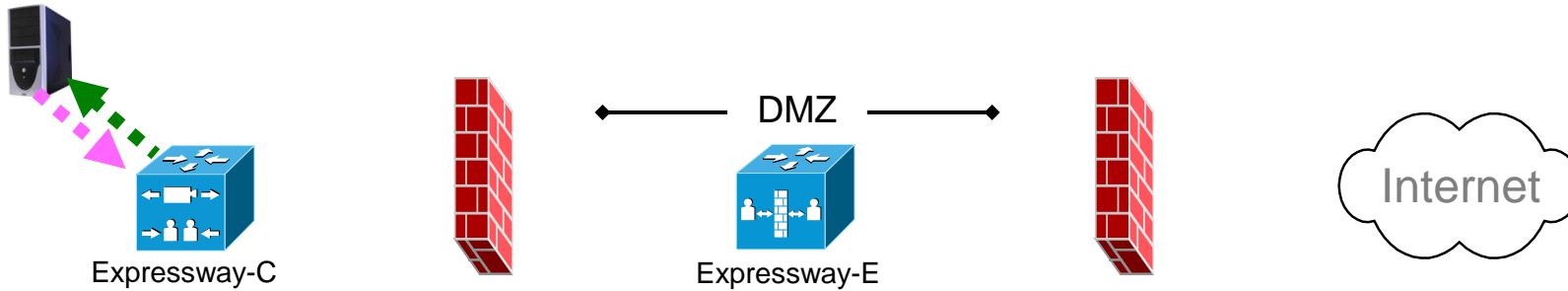
- letter reference for more details
- default / expected port range in italics

Firewall needs to have a pinhole open for at least

- all source ports at IP address of source to
- all listening ports at IP address of listener

When a firewall allows an outbound message through, it is assumed that responses (up to about 20 to 30 seconds after the original send) will be allowed back through the firewall

Administration: Cisco Expressway-C

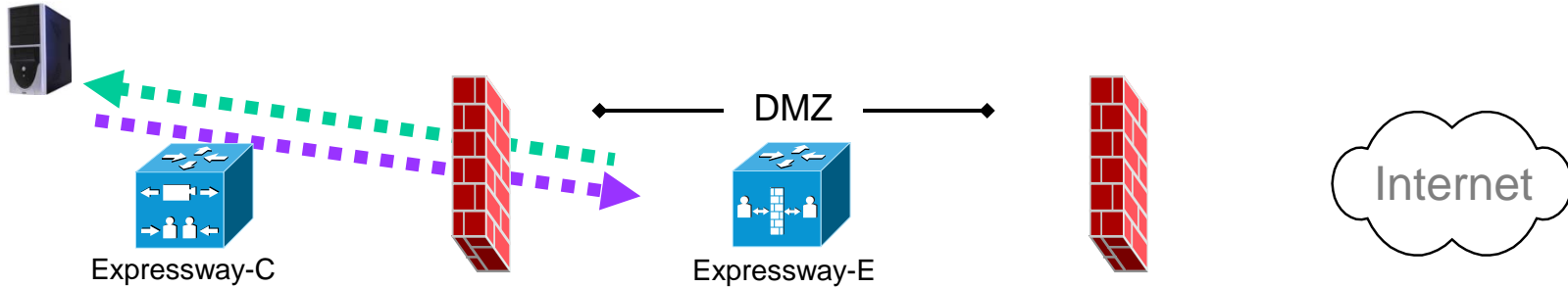


		Management system source port	Expressway-C listening port
Management control		Private network	
Open firewall		n/a	
IP address		IP address of management computer(s)	IP address of Expressway-C
IP Ports	http	TCP S >= 1024	TCP 80 80
	https	TCP S >= 1024	TCP 443 443
	ssh	TCP S >= 1024	TCP 22 22
	SNMP	UDP S >= 1024	UDP 161 161

		Management system listening port	Expressway-C source port
Management control		Private network	
Open firewall		n/a	
IP address		IP address of management computer(s)	IP address of Expressway-C
IP Ports	NTP	UDP 123 123	UDP 123 123
	LDAP	TCP 389 389	TCP S >= 1024
	http (feedback to TMS)	TCP 80 80	TCP S >= 1024
	DNS	UDP 53 53	UDP S >= 1024

S = Source port , typically >= 1024

Administration: Cisco Expressway-E



		Management system source port	Expressway-E (listening) port
Management control		Private to DMZ	
Open firewall		Private to DMZ	
IP address		IP address of management computer(s)	IP address of Expressway-E
IP Ports	http	TCP S >= 1024	TCP 80 80
	https	TCP S >= 1024	TCP 443 443
	ssh	TCP S >= 1024	TCP 22 22
	SNMP	UDP S >= 1024	UDP 161 161

S = Source port , typically >= 1024

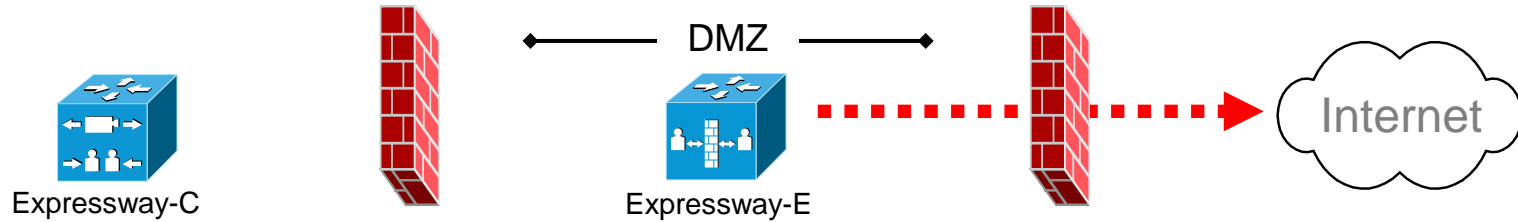
		PC listening port	Expressway-E source port
Management control		DMZ to private	
Open firewall		DMZ to private	
IP address		IP address of management computer(s)	IP address of Expressway-E
IP Ports	NTP	UDP 123 123	UDP 123 123
	LDAP (for login)	TCP 389 or 636 389 or 636	TCP Ue 30000 to 35999
	Syslog	UDP 514 514	UDP Ve 30000 to 35999

Ue = Expressway TCP ephemeral port range defaults to 30000 to 35999

Ve = Expressway UDP ephemeral port range defaults to 30000 to 35999

Open ports only for the management methods to be used

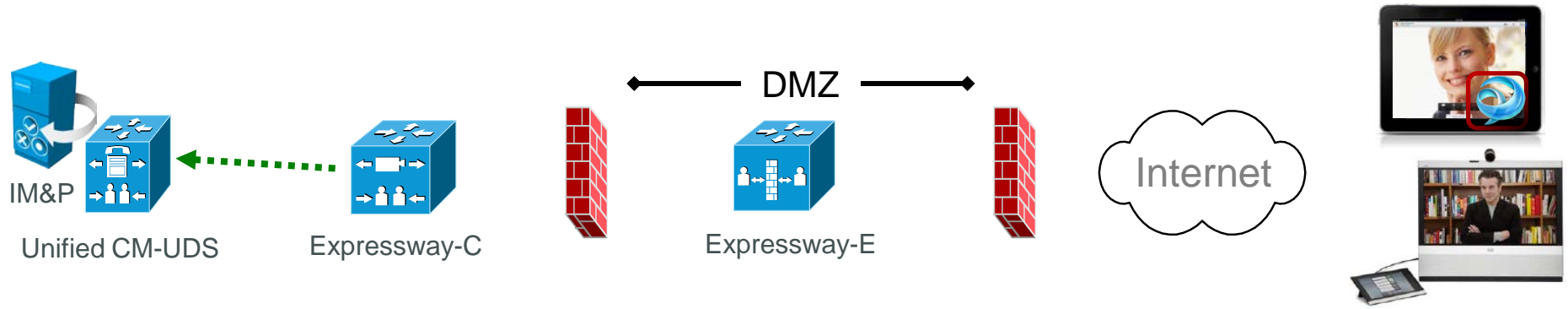
Administration: Cisco Expressway-E



		Expressway-E source port	Server listening port
	Management control	DMZ to public	
	Open firewall	DMZ to public	
	IP address	IP address of Expressway-E	IP address of DNS Server
IP Ports	DNS	UDP S >= 1024	UDP 53 53

S = Source port , typically >= 1024

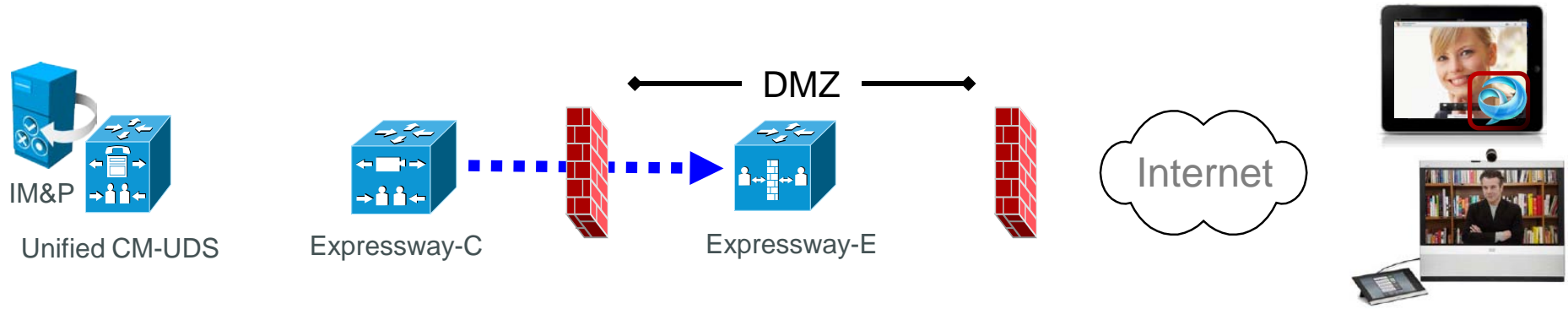
Unified Communications : Expressway-C to Unified CM, IM&P



		Management system listening port	Expressway-C source port
		←-----→	
Management control		Private network	
Open firewall		n/a	
IP address		IP address of Unified CM, IM and Presence servers and CUC	IP address of Expressway-C
IP Ports	XMPP (IM and Presence)	TCP 7400 (IM&P server)	TCP Ue 30000 to 35999
	UDS (provisioning and phonebook)	TCP 8443 (Unified CM server)	TCP Ue 30000 to 35999
	HTTP (configuration file retrieval)	TCP 6970 (Unified CM server)	TCP Ue 30000 to 35999
	CUC (voicemail)	TCP 443 (CUC server)	TCP Ue 30000 to 35999

Ue = Expressway TCP ephemeral port range defaults to 30000 – 35999

Unified Communications : Control (private) to Expressway (DMZ)



		Expressway-C source port	Expressway-E server (listening) port
Message direction		Inbound and outbound calls	
Open firewall		Private to DMZ	
IP address		IP address of Expressway-C	IP address of Expressway-E
IP Ports	XMPP (IM and Presence)	TCP U_e 30000 to 35999	TCP 7400
	SSH (HTTP/S tunnels)	TCP U_e 30000 to 35999	TCP 2222
	SIP signaling	TCP & TLS A 25000 to 29999	TCP and TLS B 7001
	SIP media	UDP Y_C 36002 to 59999 *	UDP Y_E 36000 to 36001 *
	TURN server control	UDP >= 1024	UDP 3478 (to 3483) R

A = Protocols > SIP > TCP Outbound port start to end: *default = 25000 to 29999*

B = Zones > Traversal Client > SIP port, typically 7001 for first traversal zone, 7002 for second etc.

R = On Large VM server deployments you can configure a range of TURN request listening ports

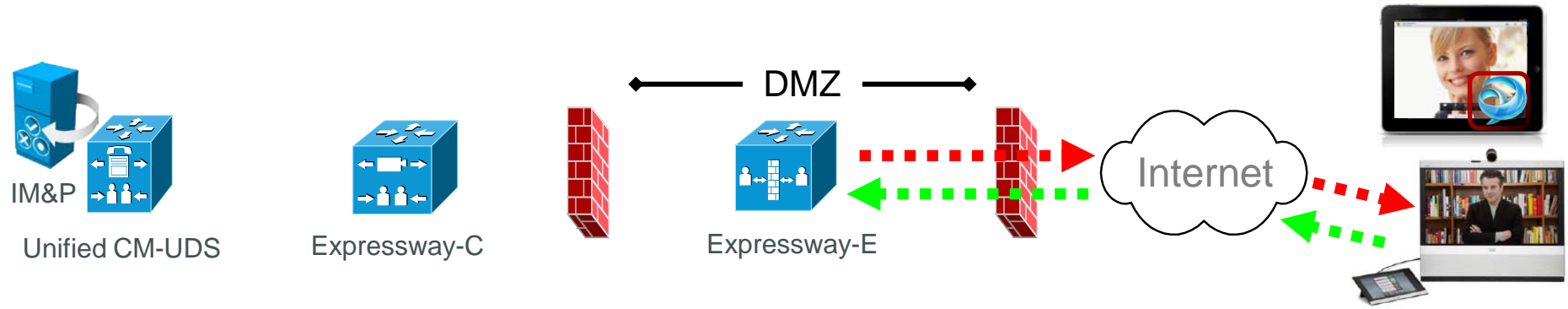
U_e = Expressway TCP ephemeral port range defaults to 30000 to 35999

Y_C = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-C): *default = 36000 to 59999 **

Y_E = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-E): *default = 36000 to 59999 **

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

Unified Communications: Expressway (DMZ) to public internet



		Expressway-E source port	Internet endpoint server (listening) port	Expressway-E server (listening) port	Internet endpoint source port
Message direction		Outbound to an endpoint in the Internet		Inbound from an endpoint in the Internet	
Open firewall		DMZ to Internet		Internet to DMZ	
IP address		Address of Expressway-E	Any IP address	Address of Expressway-E	Any IP address
IP Ports	XMPP (IM and Presence)	n/a	n/a	TCP 5222	TCP S ≥ 1024
	UDS (phonebook and provisioning)	n/a	n/a	TCP 8443	TCP S ≥ 1024
	TURN server control / media	n/a	n/a	UDP 3478 (to 3483) R / 24000 to 29999	UDP S ≥ 1024
	SIP signaling	TLS 25000 to 29999	TLS S ≥ 1024	TLS 5061	TLS S ≥ 1024
	SIP media	UDP Y_E 36002 to 59999 *	UDP N ≥ 1024	UDP Y_E 36002 to 59999 *	UDP N ≥ 1024

N = Expressway waits until it receives media, then it sends its media to the IP port from which the media was received (egress port of the media from the far end non SIP-aware firewall): any port ≥ 1024

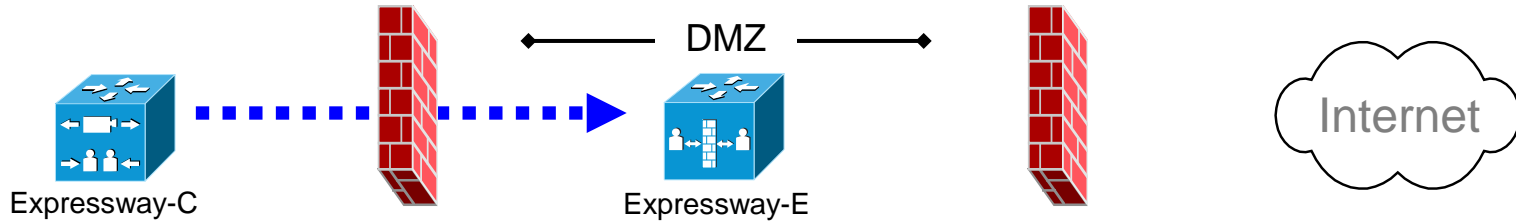
R = On Large VM server deployments you can configure a range of TURN request listening ports

S = Source port, typically ≥ 1024

Y_E = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-E): default = 36000 to 59999 *

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

SIP traversal call



		Expressway-C source port	Expressway-E listening port
Call direction		Inbound and outbound calls	
Open firewall		Private to DMZ	
IP address		IP address of Expressway-C	IP address of Expressway-E
IP Ports	SIP signaling	TCP & TLS A 25000 to 29999	TCP and TLS B 7001
	Assent RTP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36000 to 36001 *
	Assent RTCP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36000 to 36001 *

A = Protocols > SIP > TCP Outbound port start to end: *default = 25000 to 29999*

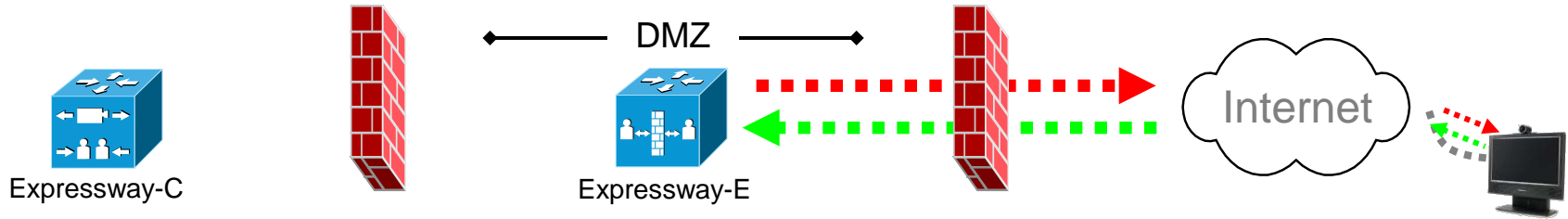
B = Zones > Traversal Client > SIP port, typically 7001 for first traversal zone, 7002 for second etc.

Y_C = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-C): *default = 36000 to 59999 **

Y_E = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-E): *default = 36000 to 59999 **

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

SIP call to endpoint with public IP address

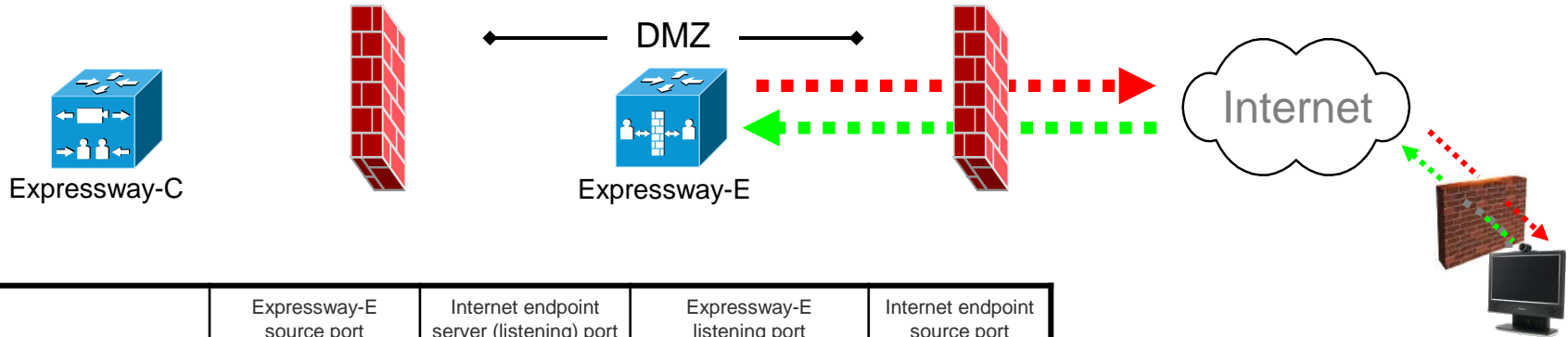


		Expressway-E source port	Internet endpoint server (listening) port	Expressway-E listening port	Internet endpoint source port	
Call direction		Outbound to an endpoint in the Internet			Inbound from an endpoint in the Internet	
Open firewall		DMZ to Internet			Internet to DMZ	
IP address		IP address of Expressway-E	Any IP address	IP address of Expressway-E	Any IP address	
IP Ports	SIP signaling	UDP C 5060 TCP & TLS A 25000 to 29999	UDP & TCP & TLS F 5060 or >= 1024	UDP: C 5060 TCP: K 5060 TLS: L 5061	UDP G 5060 or >= 1024 TCP & TLS H >= 1024	
	RTP	UDP Y_E 36002 to 59999 *	UDP E >= 1024	UDP Y_E 36002 to 59999 *	UDP E >= 1024	
	RTCP	UDP Y_E 36002 to 59999 *	UDP E >= 1024	UDP Y_E 36002 to 59999 *	UDP E >= 1024	

- C** = Protocols > SIP > UDP port: *default = 5060*
- A** = Protocols > SIP > TCP Outbound port start to end: *default = 25000 to 29999*
- F** = IP port is defined by DNS lookup; any port >= 1024, often 5060 for UDP
- K** = Protocols > SIP > TCP port: *default = 5060*
- L** = Protocols > SIP > TLS port: *default = 5061*
- G** = any port >= 1024, often 5060 for hard endpoints
- H** = any port >= 1024
- Y_E** = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-E): *default = 36000 to 59999 **
- E** = Endpoint media port range; value used is specified in the SDP:
 - = any IP port above 1024
 - = 36000 to 59999 * for another Expressway
 - = 2326 to 2385 for MXP static setting
 - = 11000 to 65000 for MXP dynamic setting

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

SIP call to endpoint behind non SIP-aware firewall



		Expressway-E source port	Internet endpoint server (listening) port	Expressway-E listening port	Internet endpoint source port
Call direction		Outbound to an endpoint behind a firewall		Inbound from an endpoint behind a firewall	
Open firewall		DMZ to Internet		Internet to DMZ	
IP address		IP address of Expressway-E	Any IP address	IP address of Expressway-E	Any IP address
IP Ports	SIP signaling	UDP C 5060 TCP & TLS A 25000 to 29999	UDP & TCP & TLS F 5060 or ≥ 1024	UDP: C 5060 TCP: K 5060 TLS: L 5061	UDP, TCP & TLS: Q ≥ 1024
	RTP	UDP Y_E 36002 to 59999 *	UDP N ≥ 1024	UDP Y_E 36002 to 59999 *	UDP N ≥ 1024
	RTCP	UDP Y_E 36002 to 59999 *	UDP N ≥ 1024	UDP Y_E 36002 to 59999 *	UDP N ≥ 1024

C = Protocols > SIP > UDP port: *default = 5060*

A = Protocols > SIP > TCP Outbound port start to end: *default = 25000 to 29999*

F = IP port is defined by DNS lookup; any port ≥ 1024 , often 5060 for UDP

K = Protocols > SIP > TCP port: *default = 5060*

L = Protocols > SIP > TLS port: *default = 5061*

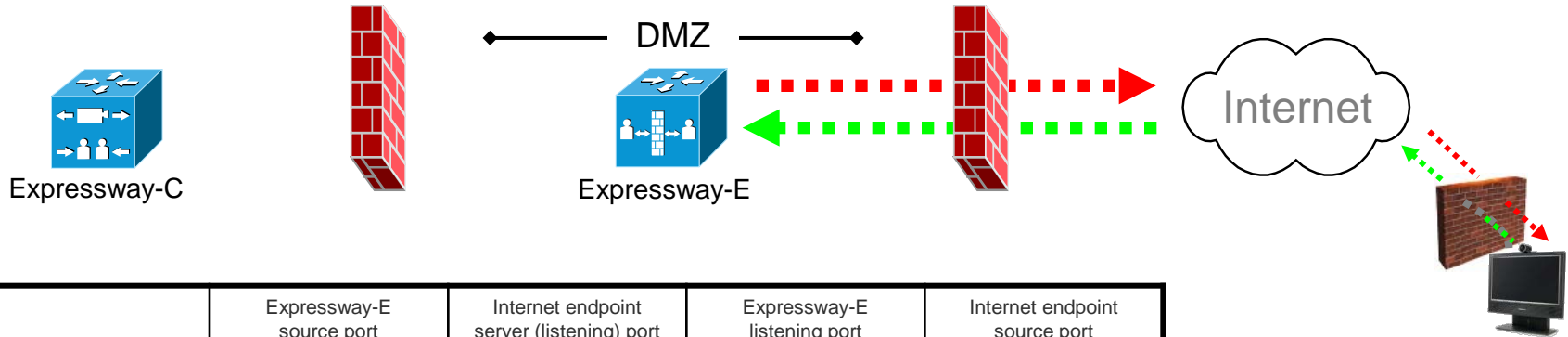
Q = Egress IP port from far end non-NAT aware firewall: any port ≥ 1024

Y_E = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-E): *default = 36000 to 59999 **

N = Expressway waits until it receives media, then it sends its media to the IP port from which the media was received (egress port of the media from the far end non SIP-aware firewall): any port ≥ 1024

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

SIP – additional ports for ICE



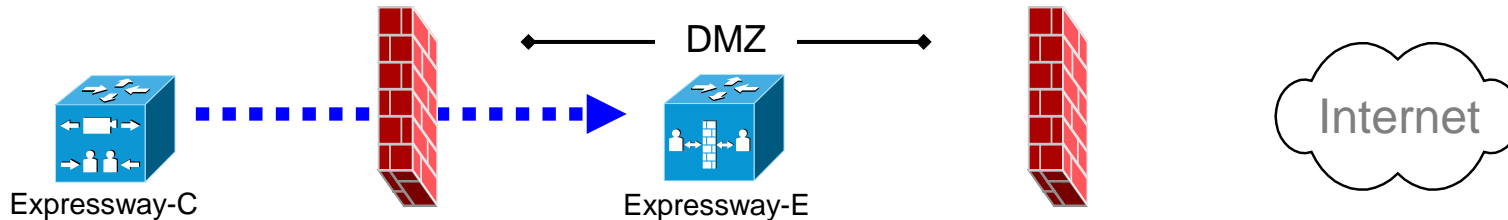
		Expressway-E source port	Internet endpoint server (listening) port	Expressway-E listening port	Internet endpoint source port
message direction		Outbound from Expressway to endpoint in internet		Inbound from an endpoint in internet to Expressway	
Open firewall		DMZ to Internet		Internet to DMZ	
IP address		IP address of Expressway-E	Any IP address	IP address of Expressway-E	Any IP address
IP Ports	TURN server control	N/A	N/A	UDP R 3478 (to 3483)	UDP M >= 1024
	TURN server media	UDP 24000 to 29999	UDP N >= 1024	UDP 24000 to 29999	UDP N >= 1024

M = IP port of signalling from endpoint – may be ephemeral IP port of endpoint (if no firewall), or IP port of the outside firewall :
= any IP port above 1024

N = IP port of relevant ICE candidate – host IP port, Server reflexive IP port (outside firewall port) or TURN server port:
= any IP port above 1024

R = On Large VM server deployments you can configure a range of TURN request listening ports

H.323 traversal call using Assent



		Expressway-C source port	Expressway-E listening port
Call direction		Inbound and outbound calls	
Open firewall		Private to DMZ	
IP address		IP address of Expressway-C	IP address of Expressway-E
IP Ports	Initial RAS connection	UDP 1719	UDP D 6001
	Q 931 / H.225 signaling	TCP P 15000 to 19999	TCP T 2776
	H.245	TCP P 15000 to 19999	TCP T 2776
	Assent RTP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36000 to 36001 *
	Assent RTCP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36000 to 36001 *

P = Protocols > H.323 > Gatekeeper > Call signaling port range start to end:
default = 15000 to 19999

D = Zones > Traversal Zone > H.323 port, typically 6001 for first traversal zone,
6002 for second etc.

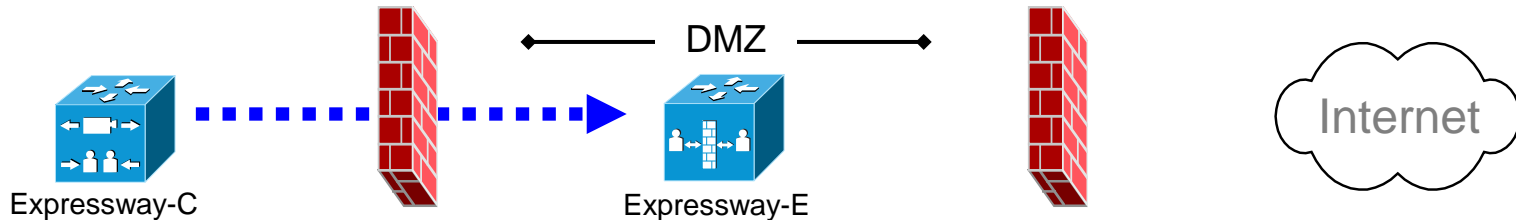
T = Traversal > Ports > H.323 Assent call signaling port: *default = 2776*

Y_C = Local Zone > Traversal Subzone > Traversal Media port start to end
(configured on Expressway-C): *default = 36000 to 59999 **

Y_E = Local Zone > Traversal Subzone > Traversal Media port start to end
(configured on Expressway-E): *default = 36000 to 36001 **

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

H.323 traversal call using H.460.18 / 19 non-muxed media



		Expressway-C source port	Expressway-E listening port
Call direction		Inbound and outbound calls	
Open firewall		Private to DMZ	
IP address		IP address of Expressway-C	IP address of Expressway-E
IP Ports	Initial RAS connection	UDP 1719	UDP D 6001
	Q 931 / H.225 signaling	TCP P 15000 to 19999	TCP M 1720
	H.245	TCP P 15000 to 19999	TCP U 2777
	Assent RTP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36002 to 59999 *
	Assent RTCP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36002 to 59999 *

P = Protocols > H.323 > Gatekeeper > Call signaling port range start to end:
default = 15000 to 19999

D = Zones > Traversal Zone > H.323 port, typically 6001 for first traversal zone,
6002 for second etc.

M = Protocols > H.323 Call signaling TCP port: *default = 1720*

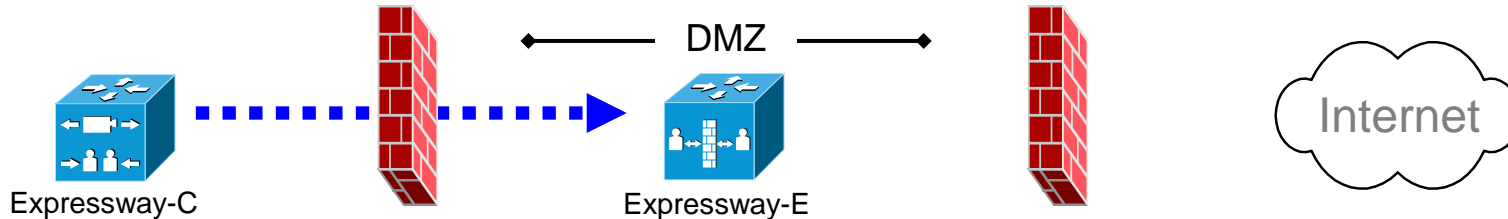
U = Traversal > Ports > H.323 H.460.18 call signaling port: *default = 2777*

Y_C = Local Zone > Traversal Subzone > Traversal Media port start to end
(configured on Expressway-C): *default = 36000 to 59999 **

Y_E = Local Zone < Traversal Subzone > Traversal Media port start to end
(configured on Expressway-E) : *default = 36000 to 59999 **

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

H.323 traversal call using H.460.18 / 19 multiplexed media



		Expressway-C source port	Expressway-E listening port
Call direction		Inbound and outbound calls	
Open firewall		Private to DMZ	
IP address		IP address of Expressway-C	IP address of Expressway-E
IP Ports	Initial RAS connection	UDP 1719	UDP D 6001
	Q 931 / H.225 signaling	TCP P 15000 to 19999	TCP M 1720
	H.245	TCP P 15000 to 19999	TCP U 2777
	Assent RTP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36000 to 36001 *
	Assent RTCP (traversal media)	UDP Y_C 36002 to 59999 *	UDP Y_E 36000 to 36001 *

P = Protocols > H.323 > Gatekeeper > Call signaling port range start to end:
default = 15000 to 19999

D = Zones > Traversal Zone > H.323 port, typically 6001 for first traversal zone,
6002 for second etc.

M = Protocols > H.323 Call signaling TCP port: *default = 1720*

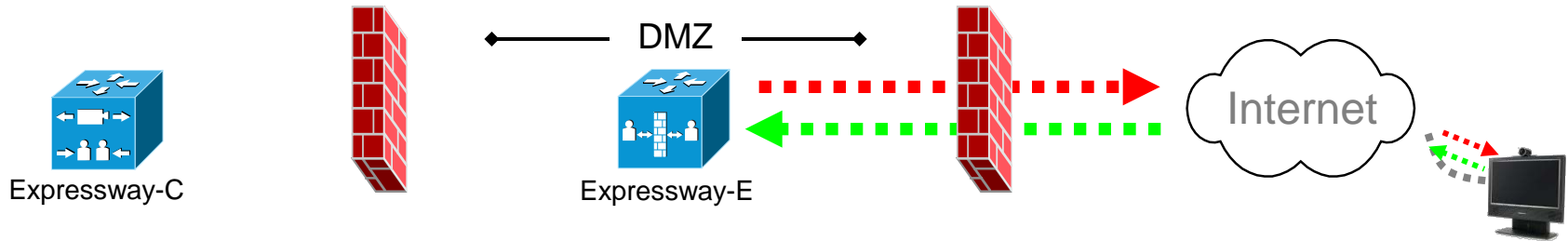
U = Traversal > Ports > H.323 H.460.18 call signaling port: *default = 2777*

Y_C = Local Zone > Traversal Subzone > Traversal Media port start to end
(configured on Expressway-C): *default = 36000 to 59999 **

Y_E = Local Zone < Traversal Subzone > Traversal Media port start to end
(configured on Expressway-E) : *default = 36000 to 59999 **

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM
deployments the first 12 ports in the range – 36000 to 36011 – are used).

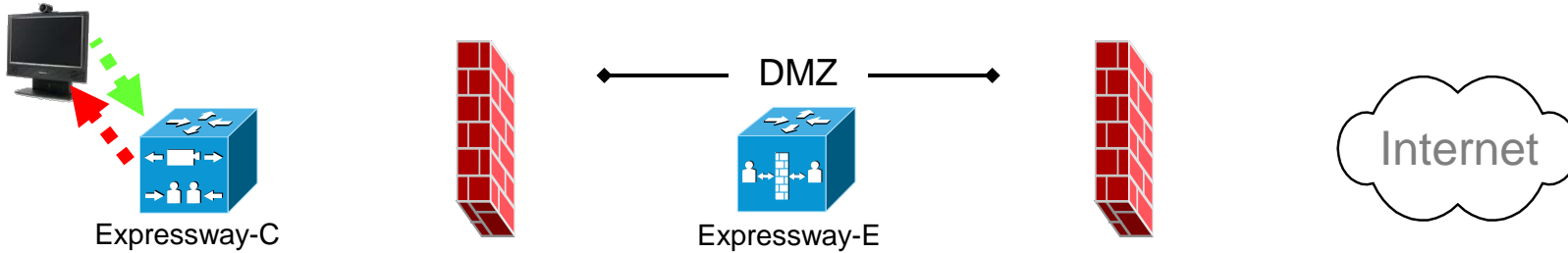
H.323 call with a non-registered endpoint with public IP



		Expressway-E source port	Internet endpoint server (listening) port	Expressway-E listening port	Internet endpoint source port	
Call direction		Outbound to an endpoint in the Internet		Inbound from an endpoint in the Internet		
Open firewall		DMZ to Internet		Internet to DMZ		
IP address		IP address of Expressway-E	Any IP address	IP address of Expressway-E	Any IP address	
IP Ports	Initial RAS connection	-	-	-	-	
	Q 931 / H.225 signaling	TCP P 15000 to 19999	TCP G 1720	TCP M 1720	TCP K 1720	
	H.245	TCP P 15000 to 19999	TCP H ≥ 1024	TCP P 15000 to 19999	TCP H ≥ 1024	
	RTP	UDP Y_E 36000 to 59999	UDP E ≥ 1024	UDP Y_E 36000 to 59999	UDP E ≥ 1024	
	RTCP	UDP Y_E 36000 to 59999	UDP E ≥ 1024	UDP Y_E 36000 to 59999	UDP E ≥ 1024	

- P** = Protocols > H.323 > Gatekeeper > Call signaling port range start to end: *default* = 15000 to 19999
- G** = Endpoint signaling port, specified by
 - a) IP Port in call request
 - b) DNS lookup for URI to call
 - c) 1720 if IP address but no port specified
 Can be: any port ≥ 1024, typically 1720
- M** = Protocols > H.323 Call signaling TCP port: *default* = 1720
- K** = Endpoint signaling port: any port ≥ 1024, typically 1720
- H** = Endpoint H.245 signaling port:
 - = any IP port ≥ 1024
 - = 15000 to 19999 to another Expressway
 - = 5555 to 5574 for MXP static setting
 - = 11000 to 65000 for MXP dynamic setting
- Y_E** = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-E): *default* = 36000 to 59999 *
- E** = Endpoint media port range; value used is specified in codec negotiations:
 - = any IP port above 1024
 - = 36000 to 59999 * for another Expressway
 - = 2326 to 2385 for MXP static setting
 - = 11000 to 65000 for MXP dynamic setting

SIP: internal

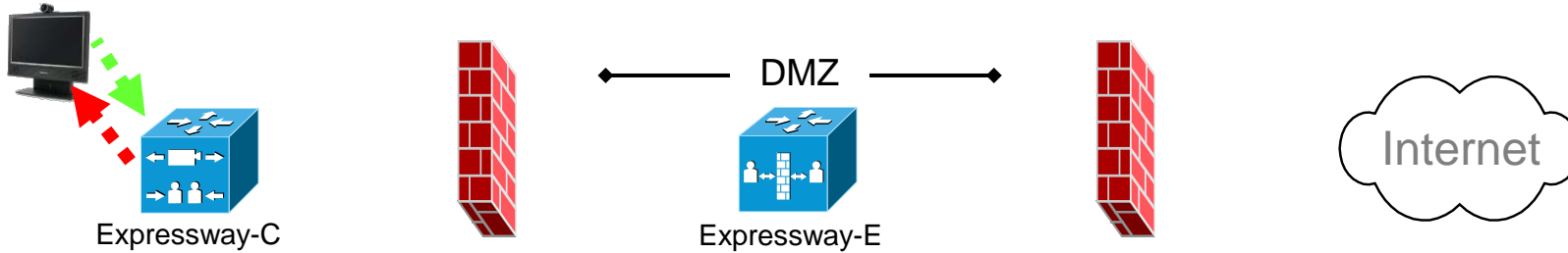


		Expressway-C source port	Endpoint listening port	Expressway-C listening port	Endpoint source port
Call direction		Expressway-C to endpoint		Endpoint to Expressway-C	
Open firewall		n/a		n/a	
IP address		IP address of Expressway-C	IP address of endpoint	IP address of Expressway-C	IP address of endpoint
IP Ports	SIP signaling	UDP C 5060 TCP & TLS A 25000 to 29999	UDP & TCP & TLS F 5060 or >= 1024	UDP: C 5060 TCP: K 5060 TLS: L 5061	UDP G 5060 or >= 1024 TCP & TLS H >= 1024
	RTP	UDP Y_C 36002 to 59999 *	UDP E >= 1024	UDP Y_C 36002 to 59999 *	UDP E >= 1024
	RTCP	UDP Y_C 36002 to 59999 *	UDP E >= 1024	UDP Y_C 36002 to 59999 *	UDP E >= 1024

- C** = Protocols > SIP > UDP port: *default = 5060*
- A** = Protocols > SIP > TCP Outbound port start to end: *default = 25000 to 29999*
- F** = IP port is defined by DNS lookup; any port >= 1024, often 5060 for UDP
- K** = Protocols > SIP > TCP port: *default = 5060*
- L** = Protocols > SIP > TLS port: *default = 5061*
- G** = any port >= 1024, often 5060 for hard endpoints
- H** = any port >= 1024
- Y_C** = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-C): *default = 36000 to 59999 **
- E** = Endpoint media port range; value used is specified in the SDP:
 = *any IP port above 1024*
 = *36000 to 59999 ** for another Expressway
 = 2326 to 2385 for MXP static setting
 = 11000 to 65000 for MXP dynamic setting

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

H.323: internal

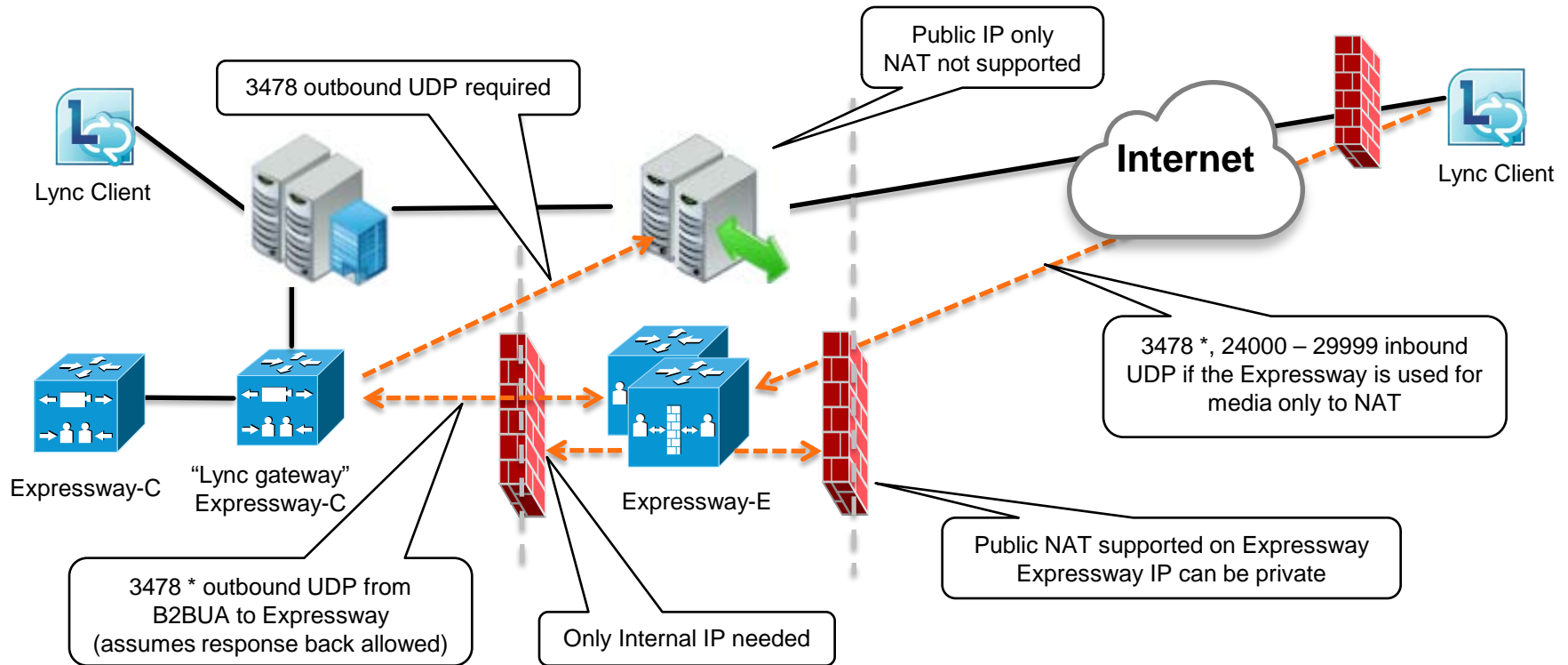


		Expressway-C source port	Endpoint listening port	Expressway-C listening port	Endpoint source port
Call direction		Expressway-C to endpoint		Endpoint to Expressway-C	
Open firewall		n/a		n/a	
IP address		IP address of Expressway-C	Any IP address	IP address of Expressway-C	Any IP address
IP Ports	Initial RAS connection	-	-	UDP 1719	UDP J 1719
	Q 931 / H.225 signaling	TCP P 15000 to 19999	TCP G 1720	TCP M 1720	TCP K 1720
	H.245	TCP P 15000 to 19999	TCP H ≥ 1024	TCP P 15000 to 19999	TCP H ≥ 1024
	RTP	UDP Y _C 36002 to 59999 *	UDP E ≥ 1024	UDP Y _C 36002 to 59999 *	UDP E ≥ 1024
	RTCP	UDP Y _C 36002 to 59999 *	UDP E ≥ 1024	UDP Y _C 36002 to 59999 *	UDP E ≥ 1024

- J** = Endpoint RAS source port, typically 1719
- P** = Protocols > H.323 > Gatekeeper > Call signaling port range start to end: *default* = 15000 to 19999
- G** = Endpoint signaling port, any port ≥ 1024 , typically 1720
- M** = Protocols > H.323 Call signaling TCP port: *default* = 1720
- K** = Endpoint signaling port: any port ≥ 1024 , typically 1720
- H** = Endpoint H.245 signaling port:
 - = any IP port ≥ 1024
 - = 15000 to 19999 to another Expressway
 - = 5555 to 5574 for MXP static setting
 - = 11000 to 65000 for MXP dynamic setting
- Y_C** = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-C): *default* = 36000 to 59999 *
- E** = Endpoint media port range; value used is specified in codec negotiations:
 - = any IP port above 1024
 - = 36000 to 59999 * for another Expressway
 - = 2326 to 2385 for MXP static setting
 - = 11000 to 65000 for MXP dynamic setting

* The first 2 ports in the range are used for multiplexed traffic only (with Large VM deployments the first 12 ports in the range – 36000 to 36011 – are used).

SIP B2BUA and Microsoft Lync



* On Large Expressway VM server deployments you can configure a range of TURN request listening ports (3478 to 3483) .

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