Cisco Expressway
IP Port Usage for Firewall Traversal

Cisco Expressway X8.5.2

April 2015

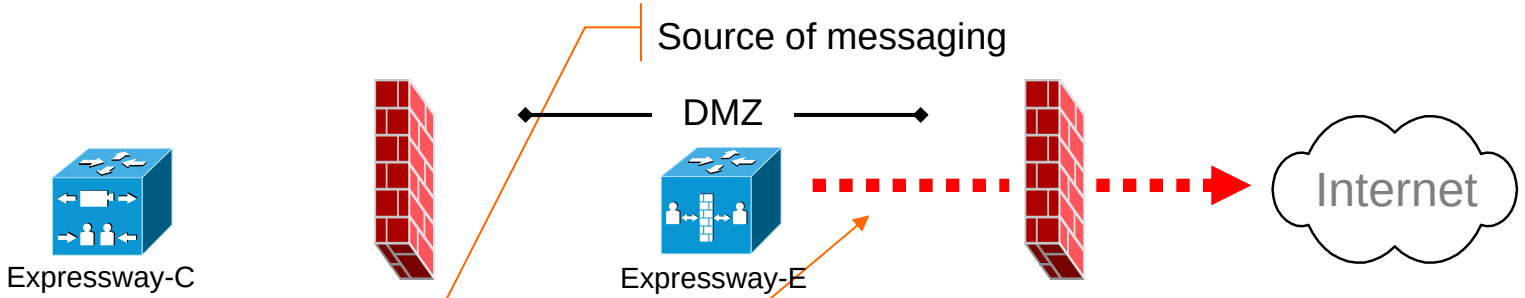
Contents: Cisco Expressway IP port usage

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 **S** *>= 1024*	UDP **53** *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

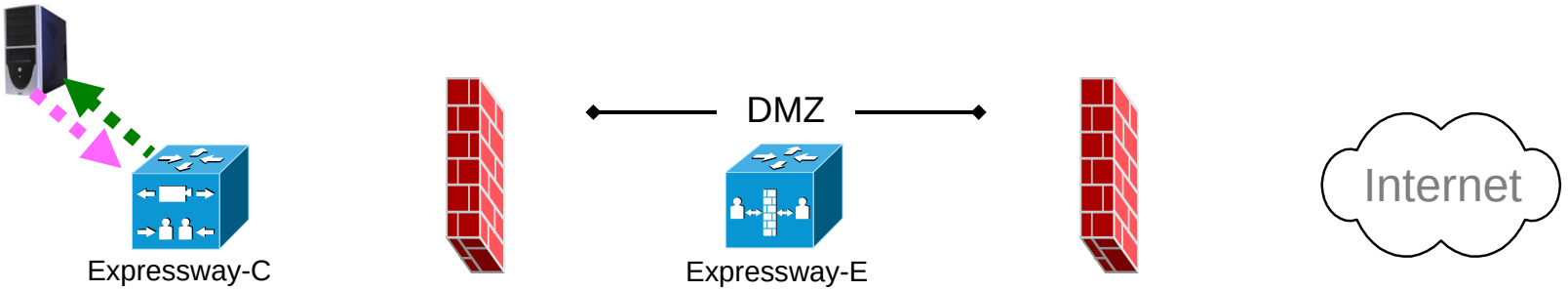
- all source ports at IP address of source

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

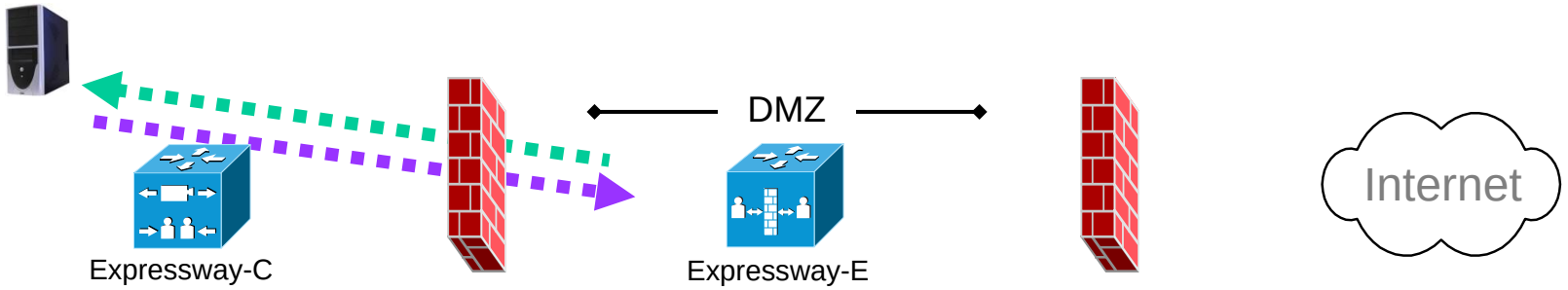


		Management system source port	Expressway-C listening port
Management control		Private network	
Open firewall		n/a	
IP address		IP address of management computer(s)	IP address of Expressway-C
IP Ports	http	TCP **S** *>= 1024*	TCP **80** *80*
	https	TCP **S** *>= 1024*	TCP **443** *443*
	ssh	TCP **S**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

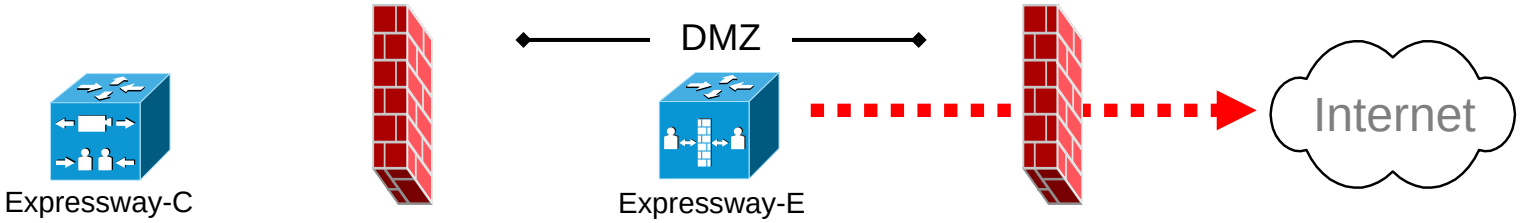
		PC listening port	Expressway-E source port
Management control		DMZ to private	
Open firewall		DMZ to private	
IP address		IP address of management computer(s)	IP address of Expressway-E
IP Ports	NTP	UDP **123** *123*	UDP **123** *123*
	LDAP (for login)	TCP **389 or 636** *389 or 636*	TCP **Ue** *30000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

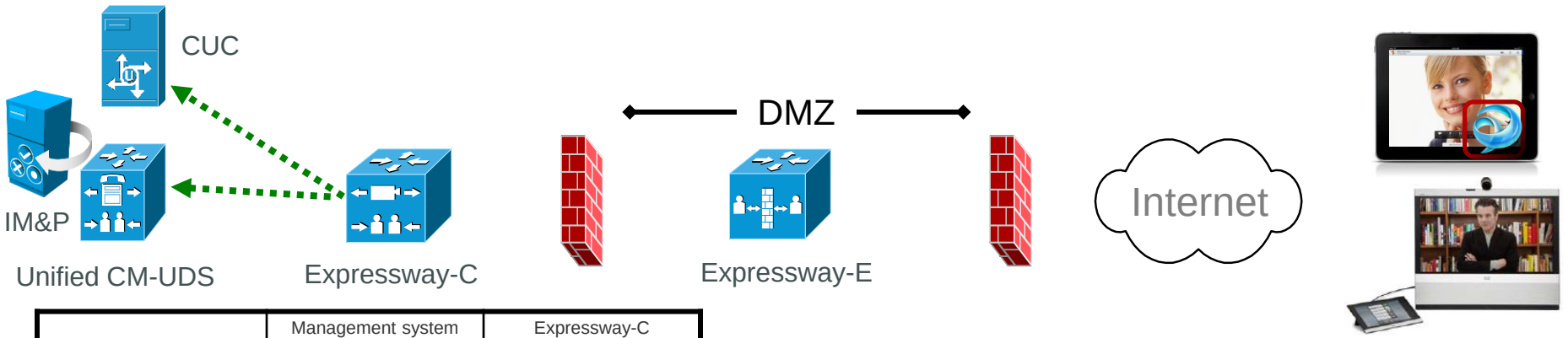
Administration: Cisco Expressway-E



		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

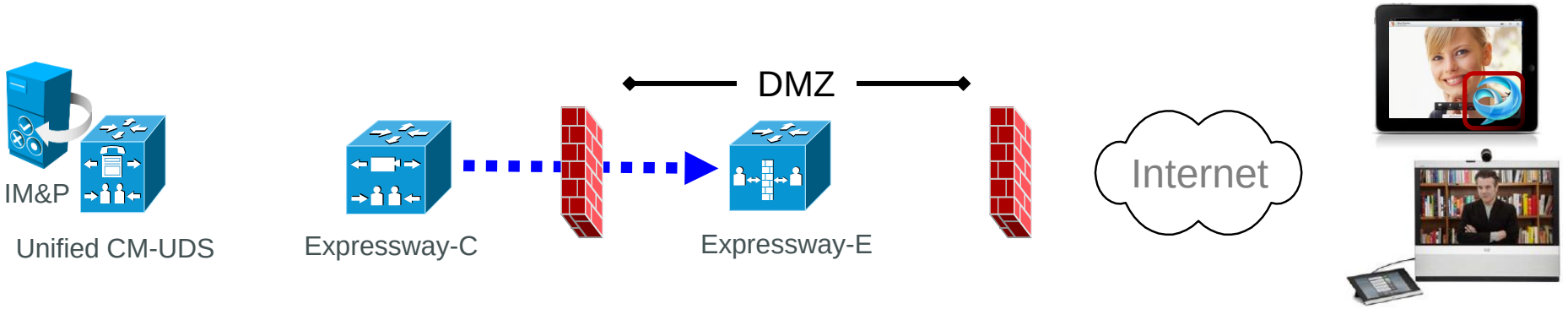
Unified Communications : Expressway-C to Unified CM, IM&P



		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*
	SOAP (IM and Presence Service)	TCP *8443* (IM&P node)	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*
	CUC (MWI)	TCP *7080* (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 **Ue** *30000 to 35999*	TCP 7400
	SSH (HTTP/S tunnels)	TCP **Ue** *30000 to 35999*	TCP 2222
	SIP signaling	TCP & TLS **A** *25000 to 29999*	TCP and TLS **B** *7001*
	SIP media	UDP $\mathbf{Y_C}$ *36002 to 59999 **	UDP $\mathbf{Y_E}$ *36000 / 36001** or *2776 / 2777***
	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 Expressway systems you can configure a range of TURN request listening ports

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

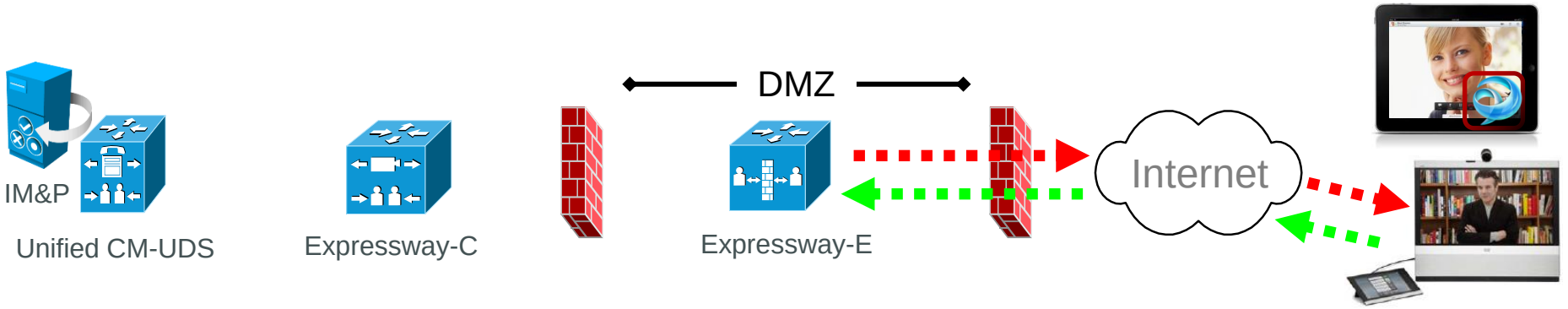
$\mathbf{Y_C}$ = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-C): *default = 36000 to 59999 **

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

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

** From X8.2, the default is to allow explicit configuration of these ports on Small/Medium systems, with those defaults being UDP 2776 and 2777 for RTP and RTCP respectively.

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 $\mathbf{Y_E}$ *36002 to 59999 **	UDP **N** *>= 1024*	UDP $\mathbf{Y_E}$ *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*

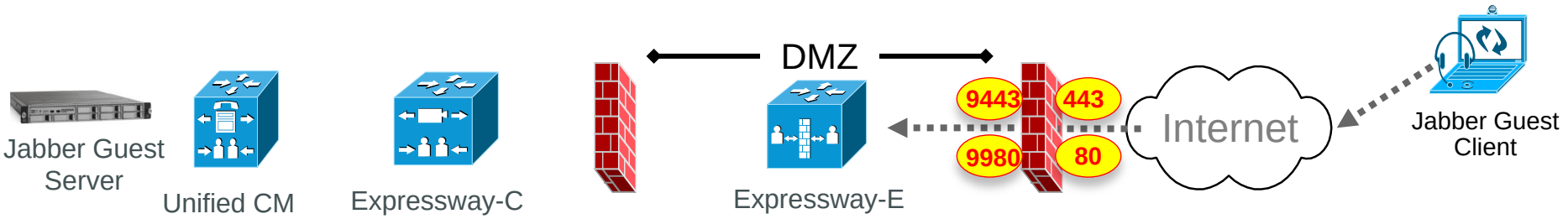
R = On Large Expressway systems you can configure a range of TURN request listening ports

S = Source port , typically >= 1024

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

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

Unified Communications: Jabber Guest (internet to Expressway-E)

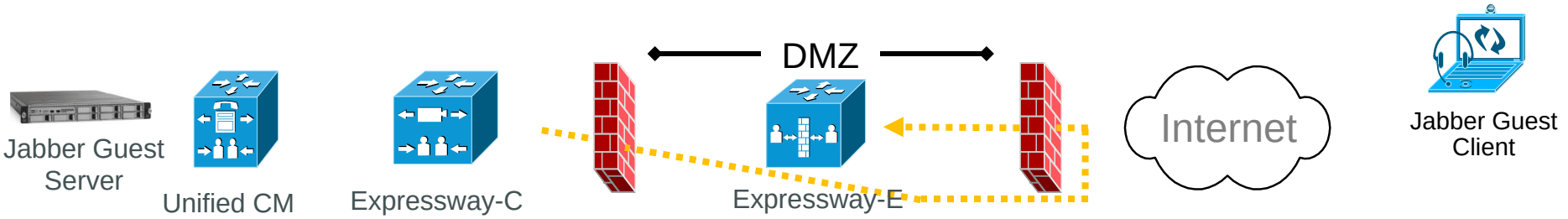


		Expressway-E Listening Port	Internet SIP UA Source Port
Management Control		Inbound from SIP UA in the Internet	
Open Firewall		Internet to DMZ	
IP Address		IP address of - Expressway-E	IP address of - Any (or specific IP)
IP Ports	HTTPS traffic	**TCP 9443**	TCP **S** **(to TCP 443)**
	HTTP traffic	**TCP 9980**	TCP **S** **(to TCP 80)**
	TURN Server Control	UDP 3478 (to 3483)	UDP **S** >= 1024

S = Source port, typically >=1024

Must translate the destination port of 443 to 9443 for all HTTPS (and 80 to 9980 for HTTP) traffic that targets the Expressway-E address from Jabber Guest clients.

Unified Communications: Jabber Guest (Expressway-C to Expressway-E)



		Expressway-C Source Port	Expressway-E Listening Port
Management Control		Outbound from Expressway-C to Expressway-E	
Open Firewall		Private to Public NAT'd	
IP Address		IP address of - Expressway-C	IP address of - Expressway-E (Public)
IP Ports	SSH (HTTP/S tunnels)	TCP **E** 30000 to 35999	SSH 2222
	Traversal Zone SIP signal	TLS $\mathbf{T_C}$ 25000 to 29999	TLS $\mathbf{T_E}$
	Media	UDP $\mathbf{Y_C}$ 36002 to 59999	UDP $\mathbf{Y_E}$ 24000 to 29999

E = TCP ephemeral port range (on Expressway-C)

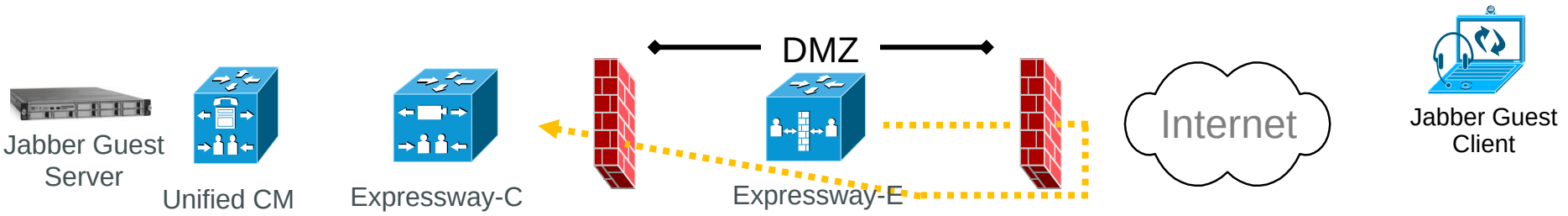
$\mathbf{T_C}$ = TCP outbound port range (on Expressway-C)

$\mathbf{T_E}$ = SIP port for Unified Communications traversal zone between Expressway-C (on Expressway-E)

Yc = Traversal media ports range (on Expressway-C)

$\mathbf{Y_E}$ = TURN relays media ports range (Expressway-E)

Unified Communications: Jabber Guest (Expressway-E to Expressway-C)

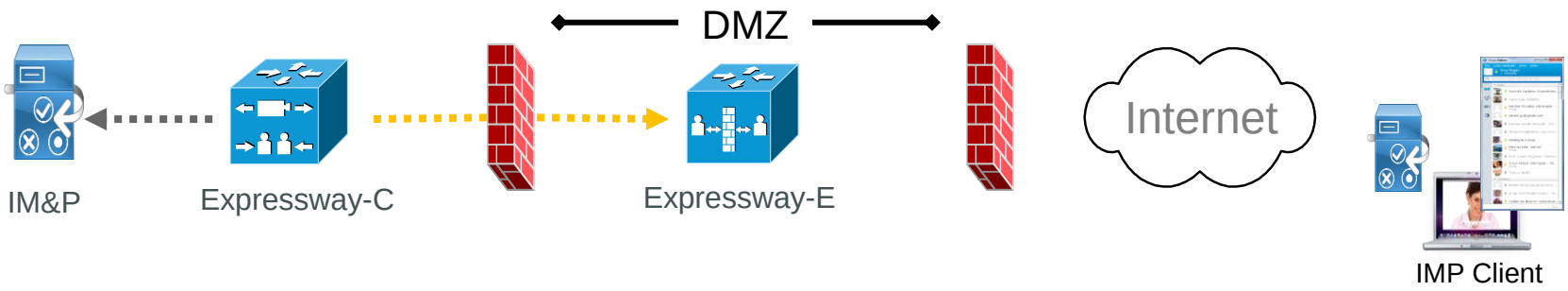


		Expressway-C Listening Port	Expressway-E Source Port
Management Control		Inbound from Expressway-E (public) to Expressway-C	
Open Firewall		Public NAT'd to Private	
IP Address		IP address of - Expressway-C	IP address of - Expressway-E (public)
IP Ports	Media	UDP **Y_C** 36000 to 59999	UDP **Y_E** 24000 to 29999

Yc = Traversal media ports range (on Expressway- C)

Y_E = TURN relays media ports range (on Expressway-E)

Unified Communications: XMPP federation (Expressway-C and Expressway-E / IM&P Server)

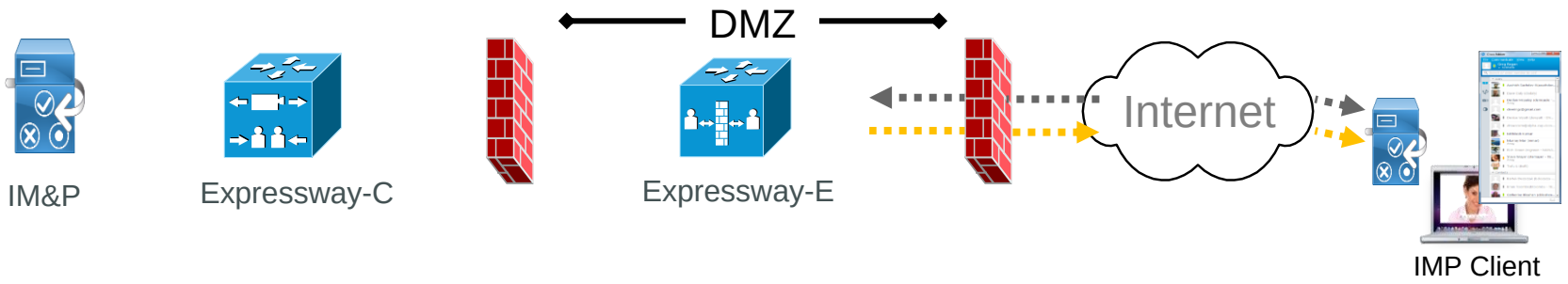


		Expressway-C Source Port	Expressway-E Listening Port
XMPP		Outbound from Expressway-C to Expressway-E (DMZ)	
Open Firewall		Private to DMZ	
IP Address		IP address of - Expressway-C	IP address of - Expressway-E
IP Ports	XMPP	TCP **E** (Ephemeral port)	TCP 7400

		IM&P Server Listening Port	Expressway-C Source Port
XMPP		Outbound from Expressway-C to IM&P Server	
Open Firewall		-	
IP Address		IP address of - IM&P Server	IP address of - Expressway-C
IP Ports	XMPP	TCP 7400	TCP **E** (Ephemeral port)

E = TCP ephemeral port range defaults to 30000 to 35999

Unified Communications: XMPP federation (Expressway-E and Internet)

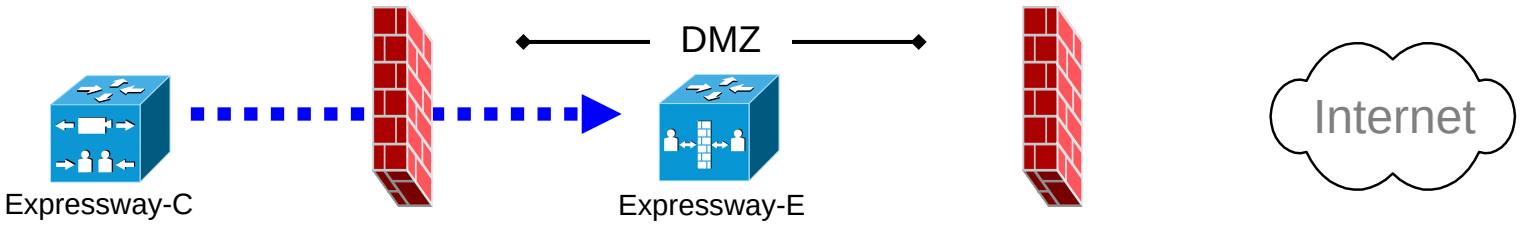


		Expressway-E Listening Port	Federated XMPP Server Source Port
XMPP		Inbound from public internet to Expressway-E (DMZ)	
Open Firewall		Internet to DMZ	
IP Address		IP address of - Expressway-E	IP address of - Federated XMPP Server
IP Ports	XMPP	TCP 5269	TCP Ephemeral port

		Expressway-E Source Port	Federated XMPP Server Listening Port
XMPP		Outbound from Expressway-E (DMZ) to public internet	
Open Firewall		DMZ to Internet	
IP Address		IP address of - Expressway-E	IP address of - Federated XMPP Server
IP Ports	XMPP	TCP **E** (Ephemeral port)	TCP 5269

E = TCP ephemeral port range defaults to 30000 to 35999

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 $\mathbf{Y_C}$ *36002 to 59998* *	UDP $\mathbf{Y_E}$ *36000** or *2776***
	Assent RTCP (traversal media)	UDP $\mathbf{Y_C}$ *36003 to 59999* *	UDP $\mathbf{Y_E}$ *36001** or *2777***

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.

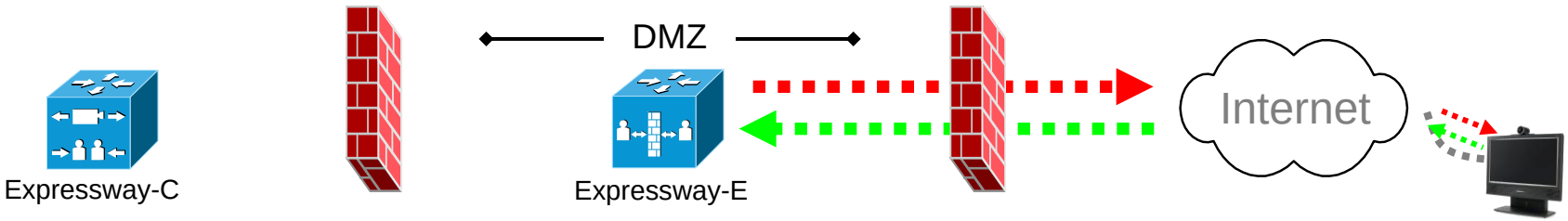
$\mathbf{Y_C}$ = Local Zone > Traversal Subzone > Traversal Media port start to end (configured on Expressway-C): *default = 36000 to 59999* *

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

* The default media port range of 36000 to 59999 applies to new installations of X8.1 or later. In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

** From X8.2, the default is to allow explicit configuration of these ports on Small/Medium systems, with those defaults being UDP 2776 and 2777 for RTP and RTCP respectively.

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 59998 **	UDP **E** *>= 1024*	UDP **Y_E** *36002 to 59998 **	UDP **E** *>= 1024*
	RTCP	UDP **Y_E** *36003 to 59999 **	UDP **E** *>= 1024*	UDP **Y_E** *36003 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

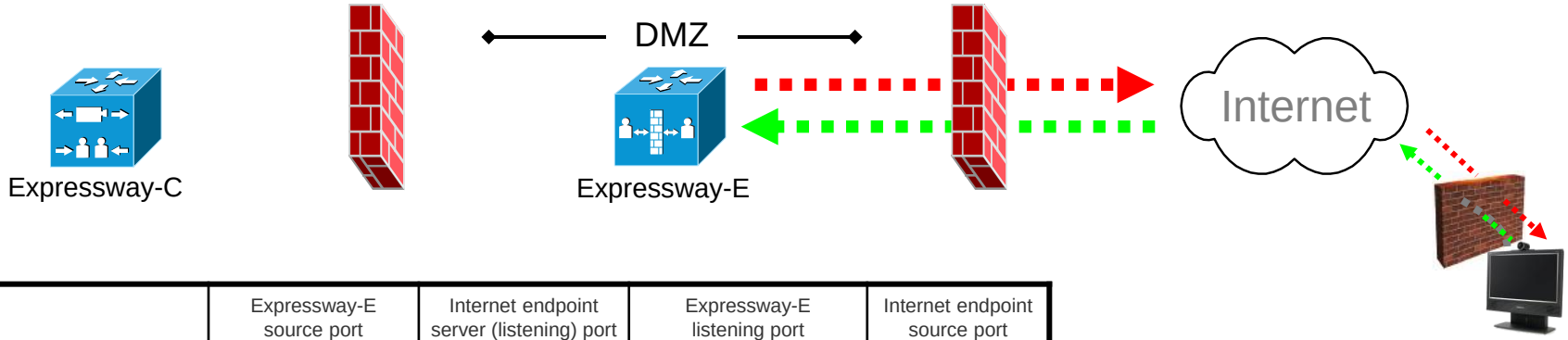
H = any port >= *1024*

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

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

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 59998 **	UDP **N** *>= 1024*	UDP **Y_E** *36002 to 59998 **	UDP **N** *>= 1024*
	RTCP	UDP **Y_E** *36003 to 59999 **	UDP **N** *>= 1024*	UDP **Y_E** *36003 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*

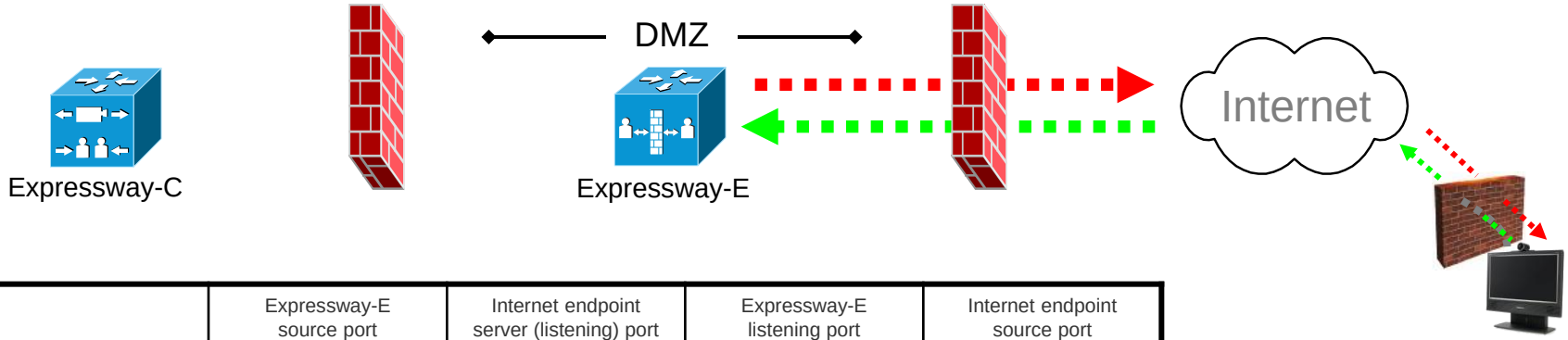
Q = Egress IP port from far end non-NAT aware firewall: any port >= *1024*

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*

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

SIP – additional ports for ICE



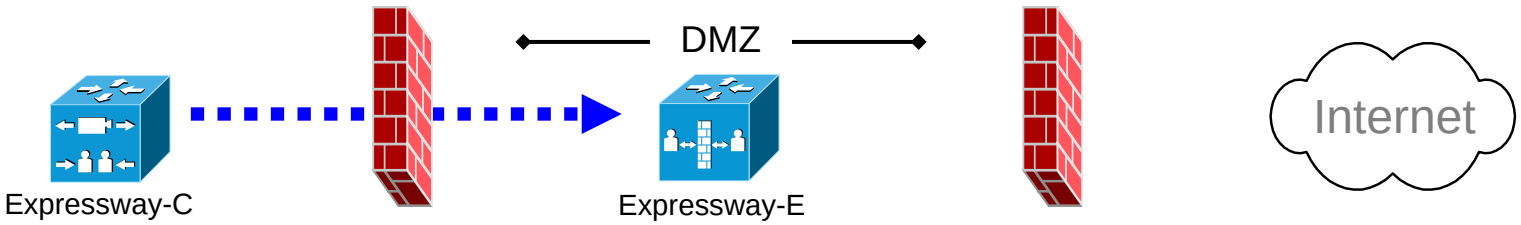
		Expressway-E source port	Internet endpoint server (listening) port	Expressway-E listening port	Internet endpoint source port
message direction		Outbound from Expressway to endpoint in internet		Inbound from an endpoint in internet to Expressway	
Open firewall		DMZ to Internet		Internet to DMZ	
IP address		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 Expressway systems 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 $\mathbf{Y_C}$ *36002 to 59998 **	UDP $\mathbf{Y_E}$ *36000 **
	Assent RTCP (traversal media)	UDP $\mathbf{Y_C}$ *36003 to 59999 **	UDP $\mathbf{Y_E}$ *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.

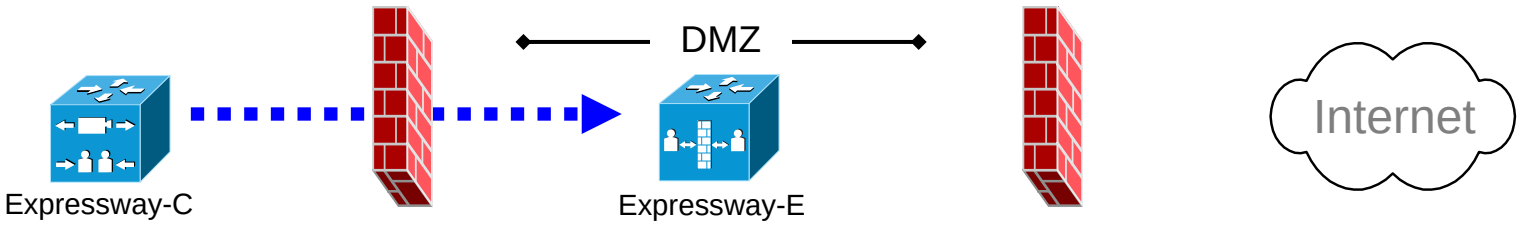
T = Traversal > Ports > H.323 Assent call signaling port: *default = 2776*

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

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

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

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 $\mathbf{Y_C}$ *36002 to 59998 **	UDP $\mathbf{Y_E}$ *36002 to 59998 **
	Assent RTCP (traversal media)	UDP $\mathbf{Y_C}$ *36003 to 59999 **	UDP $\mathbf{Y_E}$ *36003 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*

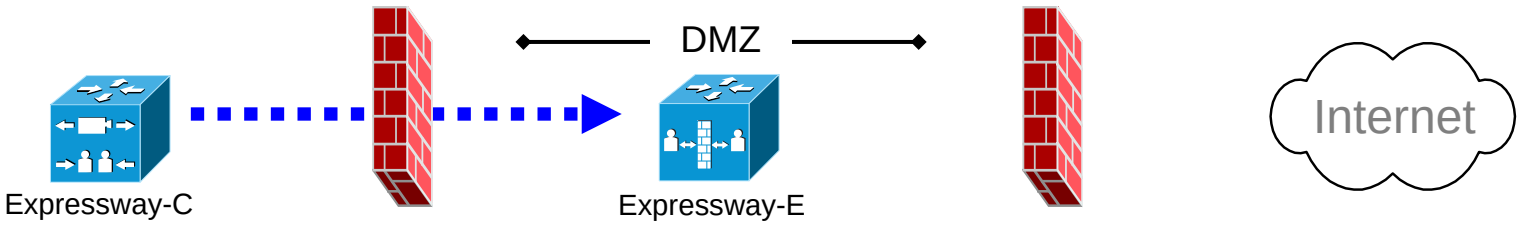
U = Traversal > Ports > H.323 H.460.18 call signaling port: *default = 2777*

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

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

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

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 $\mathbf{Y_C}$ *36002 to 59998 **	UDP $\mathbf{Y_E}$ *36000 **
	Assent RTCP (traversal media)	UDP $\mathbf{Y_C}$ *36003 to 59999 **	UDP $\mathbf{Y_E}$ *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*

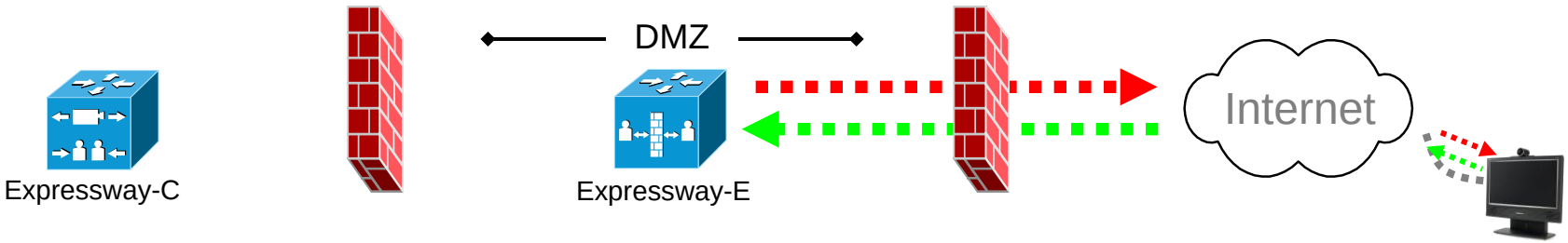
U = Traversal > Ports > H.323 H.460.18 call signaling port: *default = 2777*

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

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

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

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 59998*	UDP **E** *>= 1024*	UDP **Y_E** *36000 to 59998*	UDP **E** *>= 1024*
	RTCP	UDP **Y_E** *36001 to 59999*	UDP **E** *>= 1024*	UDP **Y_E** *36001 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*

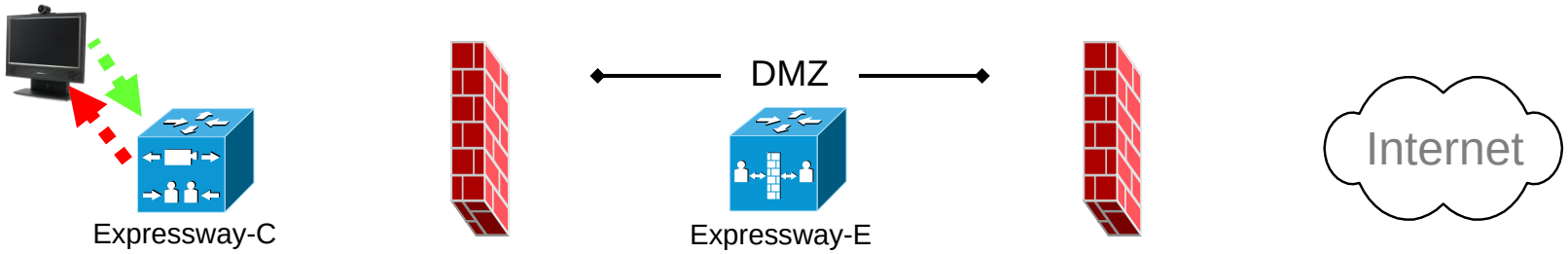
K = Endpoint signaling port: any port >= 1024, typically *1720*

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

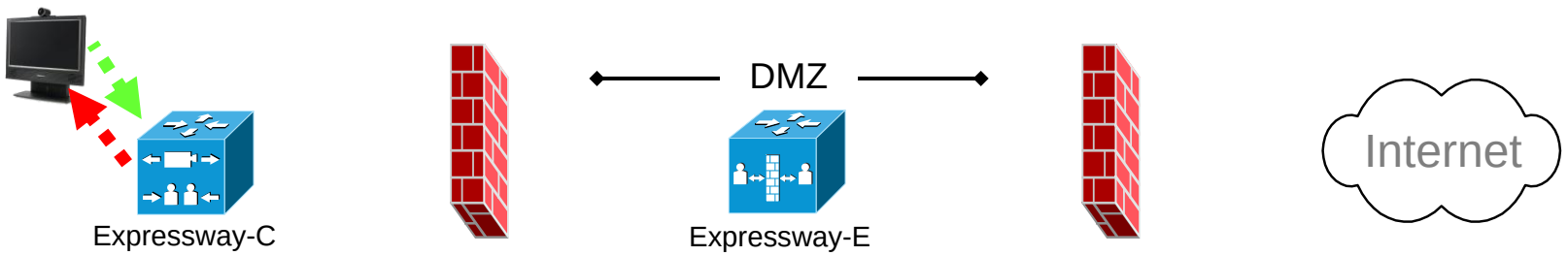


		Expressway-C source port	Endpoint listening port	Expressway-C listening port	Endpoint source port
Call direction		Expressway-C to endpoint		Endpoint to Expressway-C	
Open firewall		n/a		n/a	
IP address		IP address of Expressway-C	IP address of endpoint	IP address of Expressway-C	IP address of endpoint
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 59998 **	UDP **E** *>= 1024*	UDP **Y_C** *36002 to 59998 **	UDP **E** *>= 1024*
	RTCP	UDP **Y_C** *36003 to 59999 **	UDP **E** *>= 1024*	UDP **Y_C** *36003 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

* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

H.323: internal

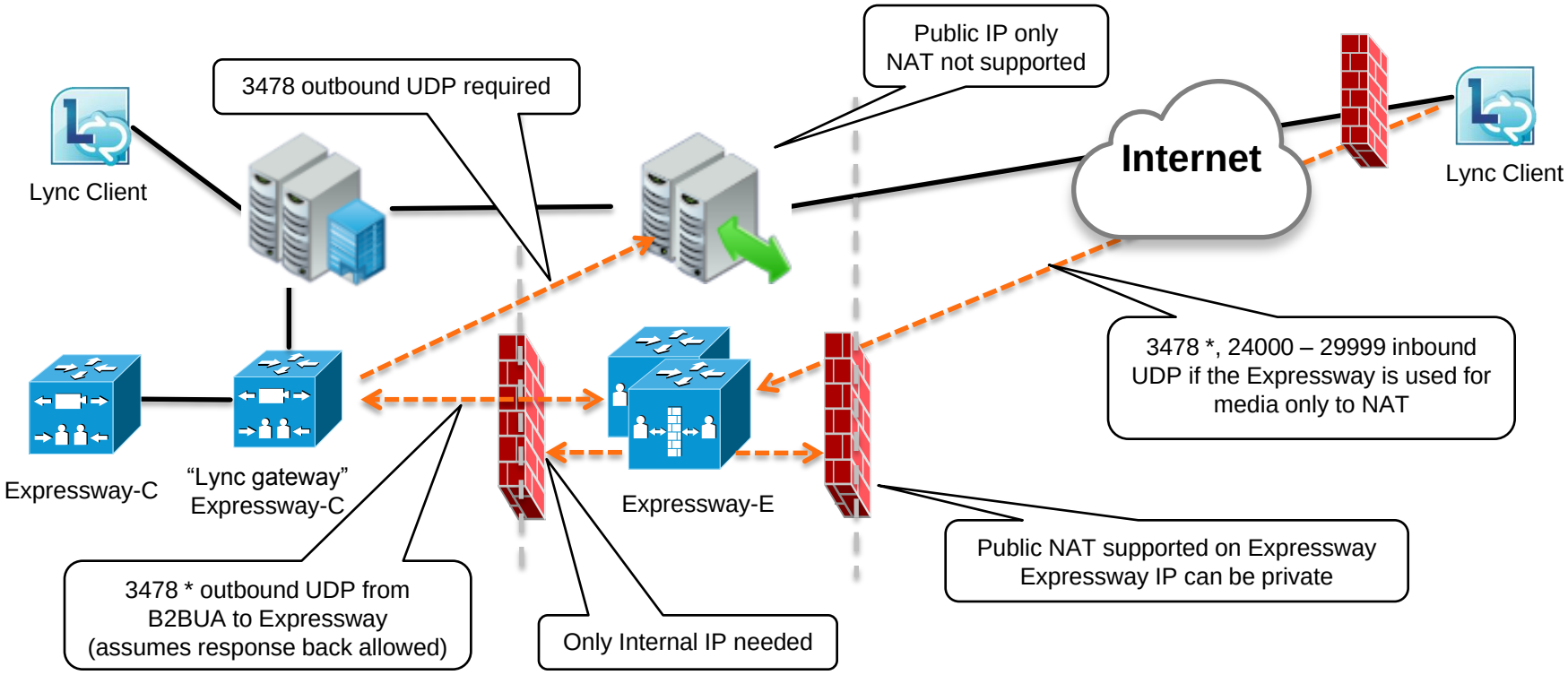


		Expressway-C source port	Endpoint listening port	Expressway-C listening port	Endpoint source port
Call direction		Expressway-C to endpoint		Endpoint to Expressway-C	
Open firewall		n/a		n/a	
IP address		IP address of Expressway-C	Any IP address	IP address of Expressway-C	Any IP address
IP Ports	Initial 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 59998 **	UDP **E** *>= 1024*	UDP **Y_C** *36002 to 59998 **	UDP **E** *>= 1024*
	RTCP	UDP **Y_C** *36003 to 59999 **	UDP **E** *>= 1024*	UDP **Y_C** *36003 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

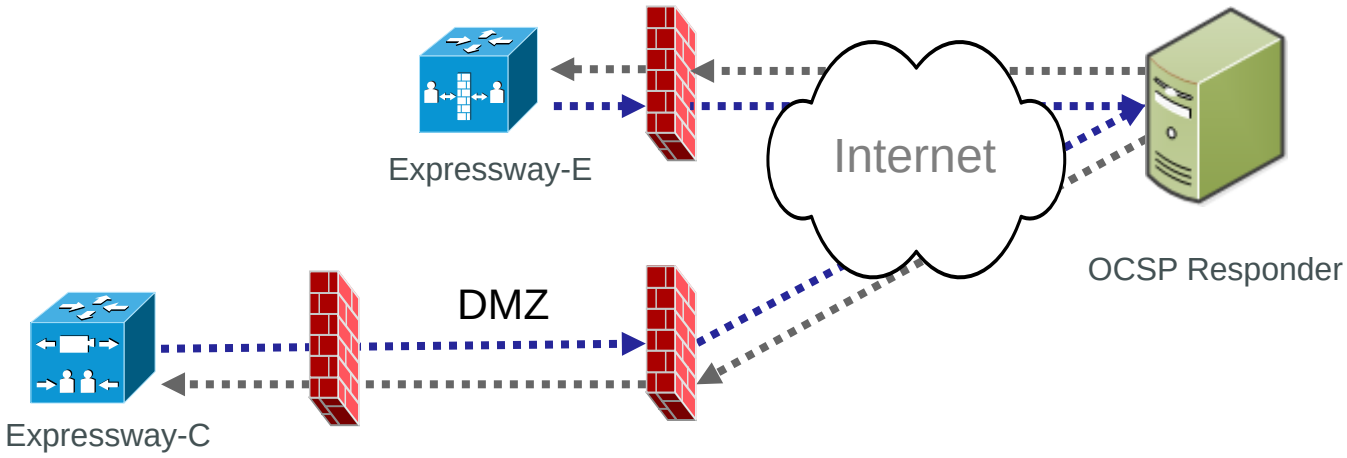
* In Large systems the first 12 ports in the range – 36000 to 36011 – are used for multiplexed traffic only. In Small/Medium systems you can either explicitly specify the 2 ports to use for multiplexed traffic or use the first 2 ports from the media port range.

SIP B2BUA and Microsoft Lync



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

Certificate revocation: OCSP responders (Expressway and Internet)



		Expressway Source Port	OCSP Responder Listening Port
OCSP request		Outbound from Expressway-E to public internet and/or** Outbound from Expressway-C to public internet	
Open Firewall		Outbound to Internet	
IP Address		Expressway-E or Expressway-C	OCSP responders, specified in the certs being checked
IP Ports	HTTP, HTTPS†	TCP **E** (Ephemeral port)	TCP 80, 443

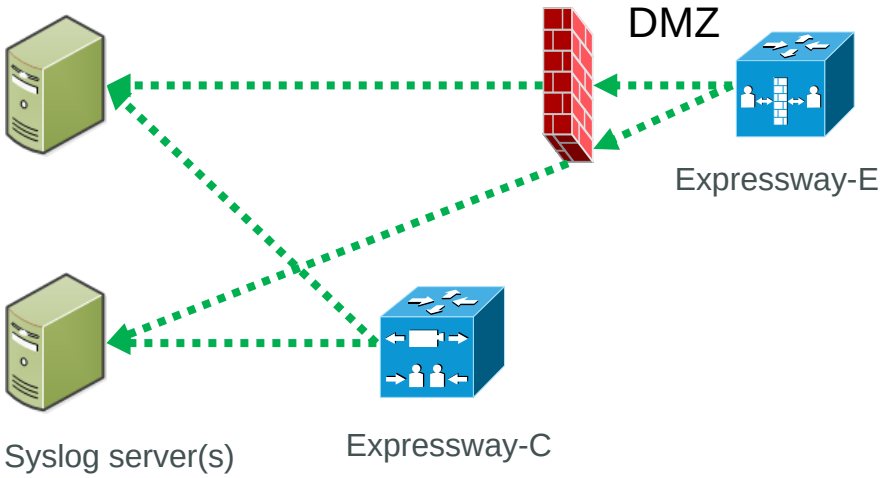
OCSP response	Inbound HTTP/S† responses from OCSP responders

** You can enable OCSP on Expressway-E and Expressway-C. Expressway-C tries to go directly to the OCSP responder.

† The RFCs (RFC6960, RFC2560) do not specify a transport protocol, but HTTP/S are common implementations.

E= Expressway TCP ephemeral port range

Serviceability: Syslog publishing (internal)



		Expressway Source Port	Syslog remote server Listening Port
Syslog Messages		← Inbound from Expressway-E to syslog server and/or** Inbound from Expressway-C to syslog server	
Open Firewall		Inbound to syslog server	
IP Address		Expressway-E or Expressway-C	Up to four remote syslog servers
IP Ports	UDP†	UDP **E** (Ephemeral port*)	514
	TCP†	TCP **E** (Ephemeral port*)	514
	TLS†	TCP **E** (Ephemeral port*)	6514

** You can enable syslog publishing on Expressway-E and Expressway-C.

† The transport protocol and destination port depends on the syslog mode you choose. You can also specify the protocol and port if you select “Custom” syslog mode.