VegaStream Information Note

## T.38 protocol interactions

Introduction.

This document provides details of the signalling used for transmitting faxes across a VoIP link.

With Vega products, all calls are initiated as voice calls whether they are going to be fax calls or remain voice calls; all the normal VoIP interactions to set up the voice call are carried out and a voice connection is made. When a fax modem tone is detected then the call is converted to a fax call.

The following explanations assume a configuration where a standard telephony fax machine is connected to a VoIP gateway which bridges the call to another VoIP gateway which then routes the call to the destination fax machine. E.g. a fax machine directly connected to a VoIP gateway that makes a call through another VoIP gateway and then the PSTN and to the destination fax machine.
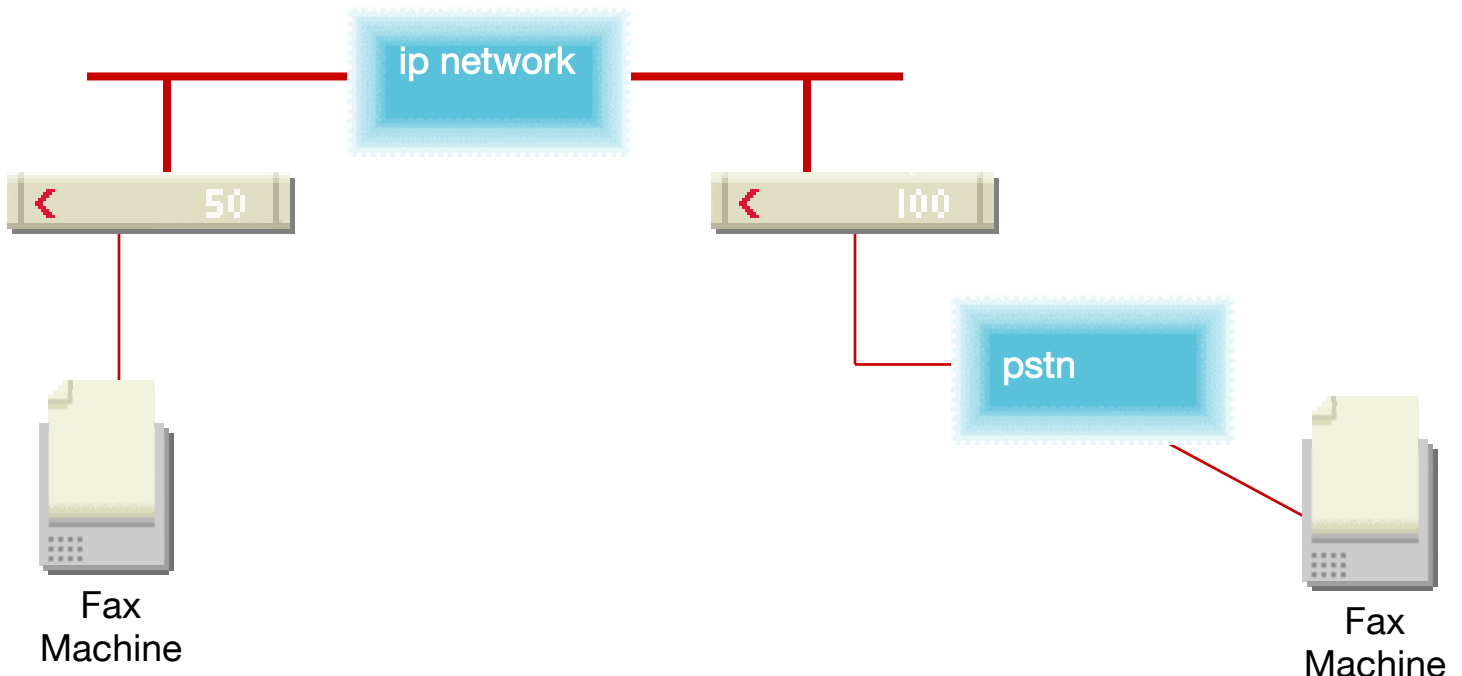
For a call directly to a fax machine:

When a Vega gateway makes a call to a fax machine, the fax machine will answer the call and will play the CED tone ("I am a fax machine in receive mode" tone). The Vega will receive the tone and pass it as audio data across the VoIP link. If the VoIP gateways are configured to look for fax tones then they will detect the tone and initiate converting the call to a fax call. Typically one of the gateways will detect the fax tone before the other, though if both initiate the change to fax mode simultaneously, the protocols handle this.

For calls to a phone/fax machine:

When the far end device is a fax/phone, initially there will be an audio connection between the two ends and the two parties will be able to talk to one another. When the fax is to be transmitted both fax machines will be set into fax mode and the receiving fax machine will play the CED tone ("I am a fax machine in receive mode" tone). As with the call directly to a fax machine this tone will be passed over the VoIP interface as audio data. If the VoIP gateways are configured to look for fax tones then they will detect the tone and initiate converting the call to a fax call.

Today the Vega does not support the making or receiving of T.38 VoIP calls without connecting as a Voice call first.

Below are some ladder diagrams showing the sequence of events used to convert Voice VoIP calls to Fax calls for both H.323 and SIP.
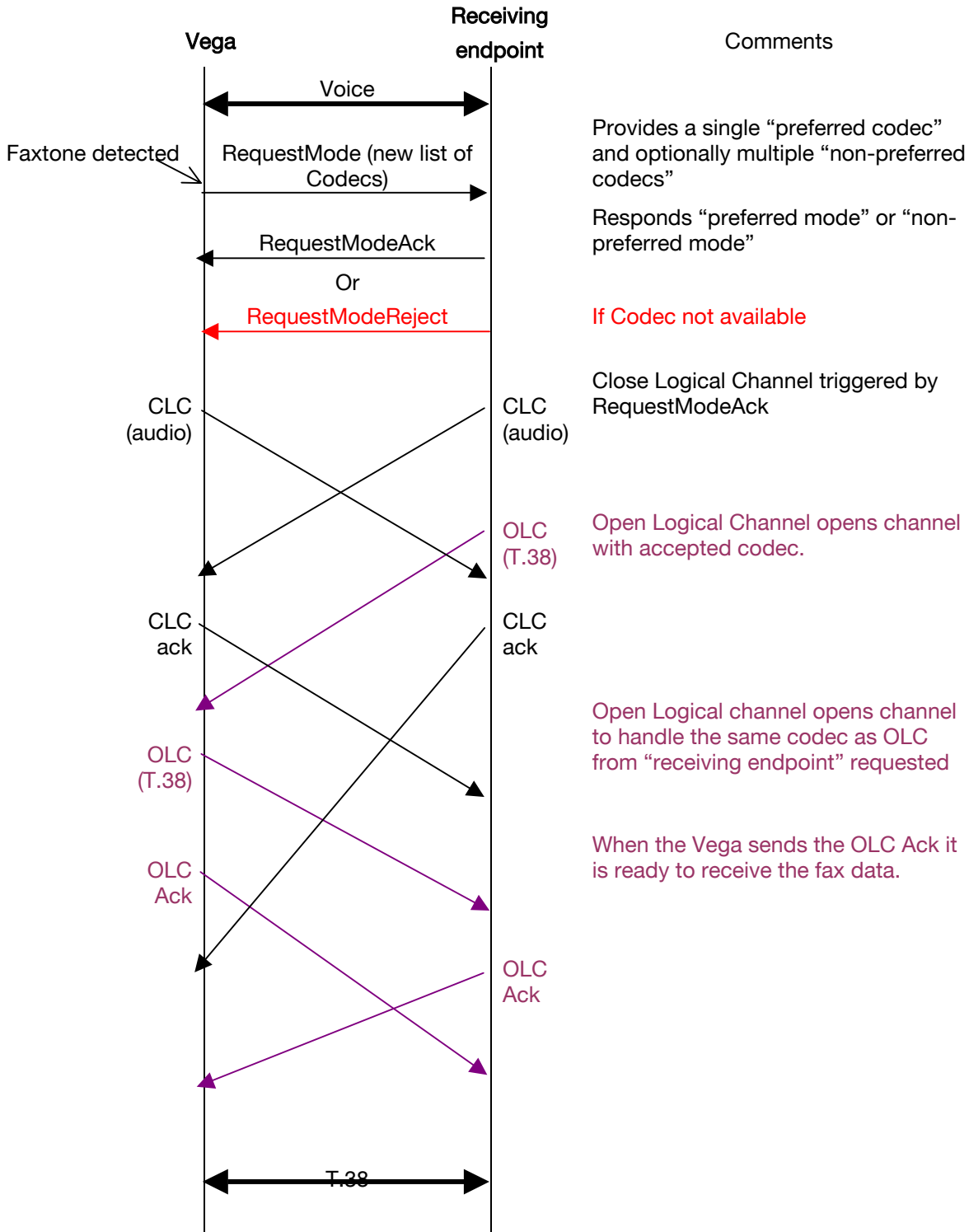
H.323

The process used to convert from a voice call to a fax call depends on how the call is initially set up.

If the initial call setup does not use faststart then a single Logical Channel will be opened to carry the voice data. To convert to a fax call this Logical channel must be closed and a new one opened which supports the appropriate fax protocol.

If the initial call setup uses faststart then both the voice and fax codecs will be offered. The destination gateway may accept both a voice and a fax codec. If so then 2 Logical Channels will be opened for the duration of the call, one to carry the voice (audio) data and one to carry the fax data. If only the voice codec is accepted, then only a Logical Channel for the voice (audio) data will be opened.

When a fax tone is detected, if only one logical channel is open (a voice logical channel), then it will be closed and an attempt will be made to open a new logical channel to handle the fax data; if two logical channels are already open then the system just needs to send the fax data on the appropriate (other) logical channel.

H.323 Protocol flow – Start with a single voice logical channel, close it and open a new one for fax.

| | Receiving | |
| Vega | endpoint | Comments |

Voice

Faxtone detected — RequestMode (new list of Codecs)

Provides a single "preferred codec" and optionally multiple "non-preferred codecs"

RequestModeAck

Responds "preferred mode" or "non-preferred mode"

Or

RequestModeReject

If Codec not available

CLC (audio) — CLC (audio)

Close Logical Channel triggered by RequestModeAck

OLC (T.38)

Open Logical Channel opens channel with accepted codec.

CLC ack — CLC ack

OLC (T.38)

Open Logical channel opens channel to handle the same codec as OLC from "receiving endpoint" requested

OLC Ack

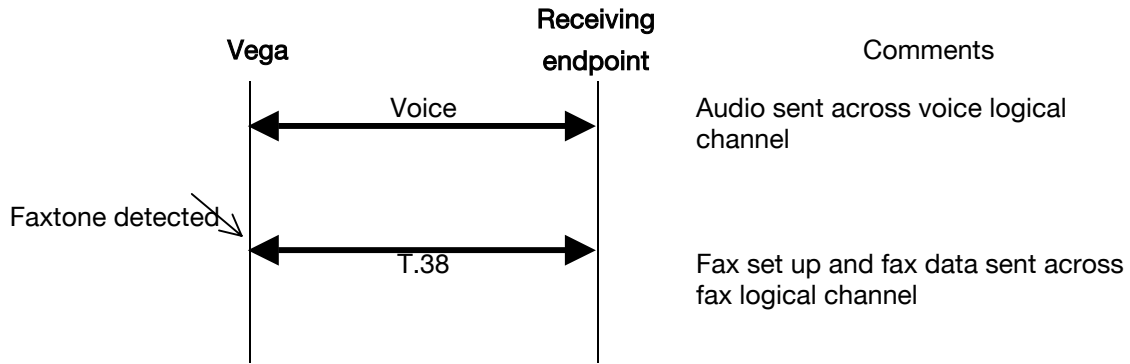When the Vega sends the OLC Ack it is ready to receive the fax data.

OLC Ack

T.38

H.323 Fax tone detection race-condition.

If there is a race condition, with both endpoint devices detecting the presence of the fax tone near simultaneously, then both endpoints will initiate the switch to fax. A VegaStream gateway will handle the

conflict according to the result of the earlier Master-Slave Determination process. A VegaStream gateway that has been determined to be the slave end will accept the requestMode and a VegaStream gateway determined to be master will reject the requestMode so that only one change protocol sequence is actioned."

H.323 Protocol flow – FastStart has opened two logical channels one for audio and one for fax.

Vega	Receiving endpoint	Comments

Voice — Audio sent across voice logical channel

Faxtone detected

T.38 — Fax set up and fax data sent across fax logical channel

See the H.323 specification h323v4-ncm for further details.

For use with Vega firmware R4 and above

SIP

When a SIP call is made a single RTP session is set up to carry the voice traffic. The process used to convert from a voice call to a fax call requires a new codec (the codec that will be used to carry the fax data) to be negotiated and a new RTP session set up to carry this.

SIP Protocol flow.

Vega	Receiving endpoint	Comments
	Voice	
Faxtone detected	Re-INVITE →	Offers T.38 UDP in the SDP
	← OK	If T.38 is supported it will get an OK response
	ACK →	
	Or	
	← 606 not acceptable	Media type offered not acceptable (could also be a 488 Not Acceptable Here)
	ACK →	
	Re-INVITE →	Offers g.711 Alaw and Ulaw in the SDP
	← 200 OK	
	ACK →	
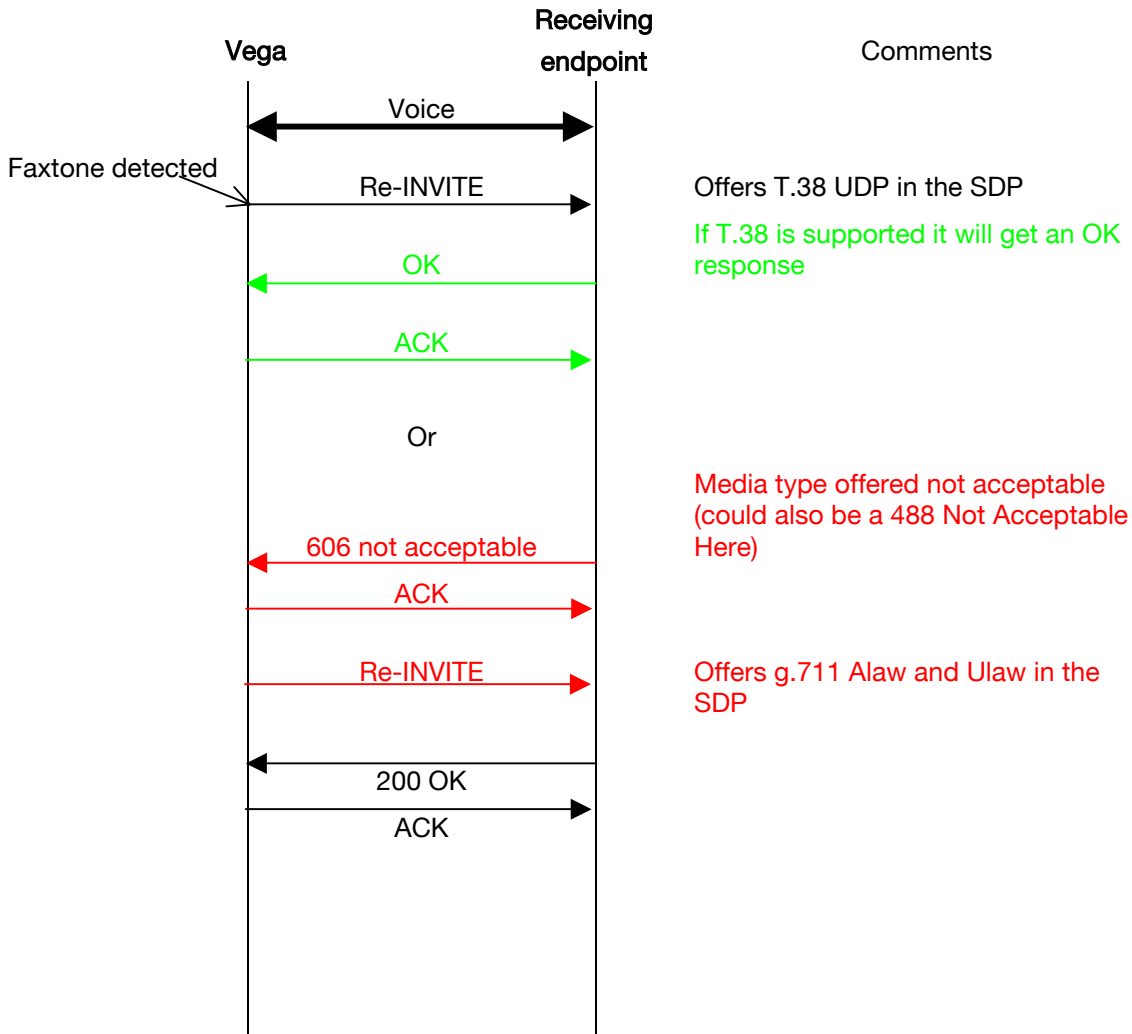
This diagram assumes that enable_fax and enable_t38 are both enabled, i.e. attempts are made to connect using both T.38 and G.711.

Contact Details
Email: support@vegastream.com
Web: http://www.vegastream.com

EMEA Office
VegaStream Limited
Berkshire Court
Western Road
Bracknell
Berks RG12 1RE
UK

+44 (0) 1344 784900

USA Office
VegaStream Inc.
3701 FAU Boulevard
Suite 200
Boca Raton
FL 33431
USA

+1 561 995 2300