



Product Support Notice

© 2013 Avaya Inc. All Rights Reserved.

PSN # PSN003460u

Original publication date: 17-Oct-11, This is Issue #02, published date: 05-Apr-13.

Severity/risk level

Medium

Urgency

Optional

Name of problem Configuring FAX over IP in CS 1000 Release 7.6: An Overview

Products affected

Communications Server 1000M and Communications Server 1000E

Problem description

Introduction

Fax support is a commonly used value addition feature on CS 1000. The CS 1000 provides Fax support on both Analog or PSTN and over VoIP environments.

The CS 1000 supports Standard facsimile operations in an analog or PSTN environment adhering to the ITU published T.30 specification. For complete info on T.30 specification please visit <http://www.itu.int/rec/T-REC-T.30/e>

Modern Fax machines typically support two different standards for data transmission rates. The data rates supported by the Group 3 T.30 compliant machines using V.17 are 14400, 12000, 9600 and 7200 bps. The data rate supported by the Super Group 3 compliant machines using V.34bis is 33600 bps. This bulletin will provide the recommended settings to optimize the system configuration for both fax and modem support

In VoIP environment it is supported on both SIP as well as H.323. On SIP, T.38 UDP fax is supported. The switchover procedure in T.38 ANNEX D (D.2.2.4) is used on SIP to establish a fax channel. On H.323, CS 1000 Virtual Trunks support the voice-to-fax switchover protocol for T.38 fax, by using the mode select signaling. For complete info on T.38 specification please visit <http://www.itu.int/rec/T-REC-T.38/e>

This document describes the Fax over IP support in CS 1000 in release 7.6.

Minimum Vintage Loadware Recommendation

All the firmware in the system should line up with release 7.6.

MGC Loadware	X21 0765P PSWV100
CSP	DC01
MSP	AB02
APP	BA18
FPGA (MGCF)	AA22
BOOT	BA18
DSP1	AB06
DSP2	AB06
DSP3	AB06
DSP4	AB06
DSP5	AB06

CS 1000 Fax over IP Support

NOTE: This next section covers protocols and procedures for faxing that apply to Releases 7.6 and newer.

The Virtual Trunk/IP Trunk (ITG) transfers T.30 protocol (G3 Fax) implementations over the IP network. Near real-time operational mode is supported where two T.30 facsimile terminals are able to engage in a document transmission in which the T.30 protocol is preserved.

H.323 Virtual Trunks

H.323 Virtual trunks supports the voice-to-fax switchover protocol for T.38 fax, by using the mode select signaling.

First, a voice call is established. When the DSP detects the fax tone, H.245 signaling is exchanged to request the far end node to change from voice mode to T.38 mode. The existing voice channels are closed and new channels for T.38 are opened. The fax call then proceeds.

The CS 1000 systems comply with H.323 version 3 with the version 4 extensions necessary for voice-to-fax switchover. This version standardizes the procedures in switching from voice mode to fax mode.

Note: Some third-party H.323 gateways can use different implementations of protocols to switch from voice to fax. Using a third-party gateway requires fax interoperability testing of the system. This can be accomplished through participation in the Avaya DevConnect program (www.avaya.com/devconnect) by the third party gateway manufacturer.

SIP Virtual Trunks

T.38 UDP fax is supported. The switchover procedure in T.38 ANNEX D (D.2.2.4) is used to establish a fax channel.

A SIP INVITE is made to the called party requesting a voice connection using the basic call setup flow. A voice connection is then established. Upon the detection of the fax tone (V.21) at the terminating end, the voice channel is replaced by a fax channel using the offer/answer SDP exchange.

Recommended settings for Best FoIP Performance

The use of the T.38 codec will provide the best Fax performance and success rate on the CS1000 system and is the recommended codec for all Fax communication. To configure a system to guarantee that this codec is selected for all fax calls requires configuration changes to the EM Voice Gateway General settings, the EM Voice Gateway T.38 codec settings and the analog stations class of service.

If V.34 Fax over G.711 pass-through codec must be used due to a V.34 fax machine not falling back to V17 gracefully, the optimum configuration settings are slightly different and will be described in the CS1000 Fax over IP Configuration setting for V.34 and Modems section below.

CS 1000 Fax over IP Configuration Setting for T.38 (Recommended Settings for all Fax)

Element Manager Configuration Parameters

The CS 1000 uses Element Manager to configure parameters for VoIP and T.38 Fax transmission. The following parameters must be configured for successful FoIP communications. Additionally, disabling unused voice codecs should be considered a best practice.

V.21 Fax Tone Detection

This option is no longer used. The parameter has been left in EM but can be ignored. The switch over behavior is controlled with the analog station MPTA/MPTD class of service in combination with the Modem/Fax Pass-through setting.

Modem/Fax Pass-through

This option is configured per gateway and must be selected in order to detect modems or V.34 fax machines. When selected, the gateway will properly detect and process the V.34 Fax and modem call as over a G.711 codec that has been optimized for modem pass-through if the analog station has the MPTA class of service. Failing to check this option in a gateway with modems will force the calls to traverse the network over a non-optimized voice codec and the modem/V.34 Fax calls will fail. Please see [Table 1](#) for a comprehensive matrix that defines the behavior of the gateway based on these settings.

Fax Maximum Rate

This option determines the maximum rate supported via T.38. Currently 14,400 is the highest level supported on Avaya T.38 fax calls.

Fax TCF Method

This option determines where the Training Check function will negotiate with the far end fax machine. Method 2 is the recommended setting since this transmits the TCF information to the far end fax machine to complete the negotiation. Method 1 uses a local negotiation and has a lowers the probability of a successful fax transmission.

Fax Playout Nominal Delay

The jitter buffer parameters directly affect end-to-end delay. Lowering the Fax playout settings decreases one-way delay, but there is less waiting time for voice packets that arrive late.

Note: The default setting for this parameter is 100ms. Complex FAX environments often require this setting to be much lower. Please consult your Avaya Design and Engineering team for further assistance in determining the optimal setting for Fax Playout Nominal Delay in your specific network environment.

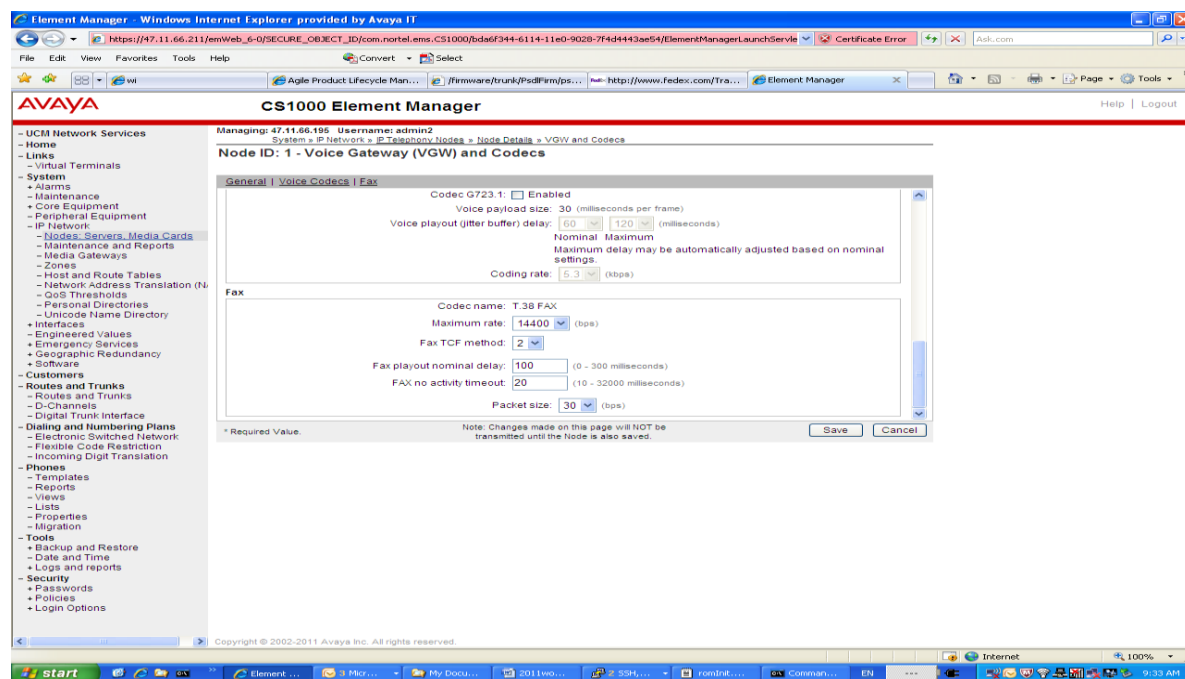
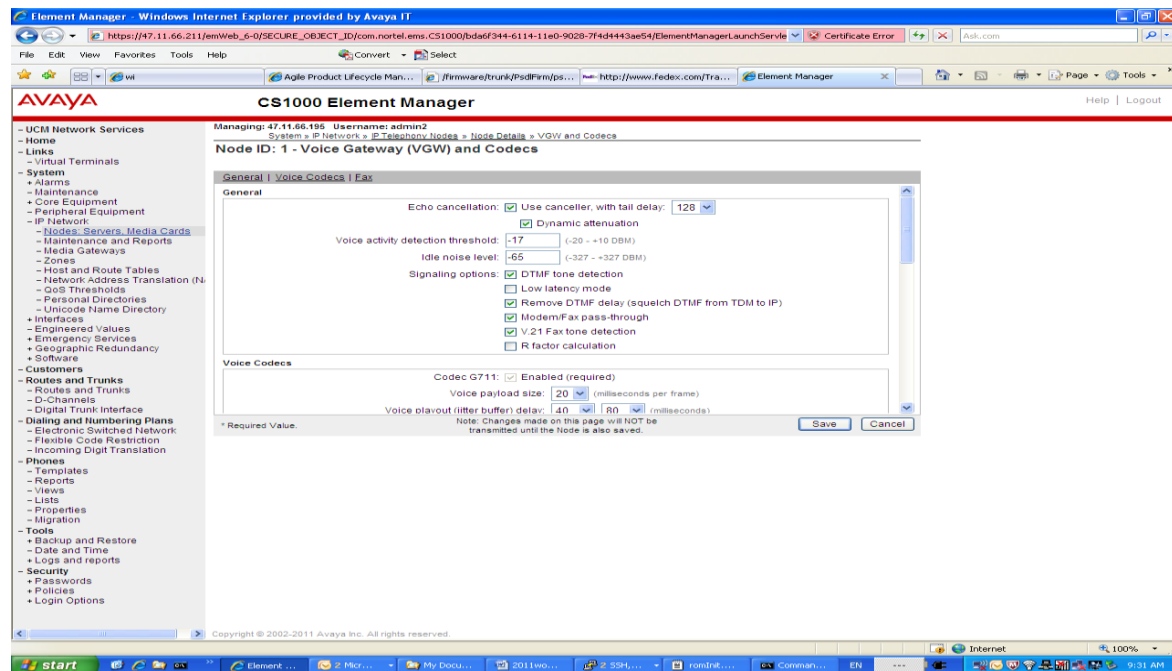
Fax No Activity Timeout

This timer designates how long the V.21 Fax Tone Detector will look for a fax tone on a specific call. Once this timer has expired, and no fax tone is detected, the call is switched back to a voice call over the original codec.

Fax Packet Size

Each CODEC can use a specific packet size for the data packets transmitted. This parameter sets the packet size for Fax T.38 data packets. Avaya recommends that the network be engineered and set to the default of 30 ms.

Settings for each of these prompts are shown below



Analog Station Provisioning for T.38

Fax devices are provisioned as analog devices on the CS 1000. There are two specific options that are required in a Fax over IP environment in order to detect and pass Fax traffic on T.38

DTN class of service is required for standard DTMF Touch Tone detection.

TN 006 0 00 00.....Terminal Number

TYPE 500 Analog Station Type

DN 3500.....Extension Number

CLS DTN Digitone (DTMF)

CLS MPTD.....Will force T.38 codec selection when FAX V.21 preamble, ANS or ANSam is detected

Fax Machine Provisioning for T.38

Error Correction Method (ECM).....Disable ECM on fax machines

Negotiation Timeout.....Set to 4000 ms

CS1000 Fax over IP Configuration setting for V.34 and Modems

Note that these settings can be used in conjunction with the T.38 settings described above to create a system that supports both T.38 Faxes, modems, and point-of-sale terminals. Please pay particular attention to the Analog station CLS of service differences and Fax machine provisioning differences. Additionally, disabling unused voice codecs should be considered a best practice.

This option should only be used for V.34 Fax machines that are not falling back to V.17. The preferred and recommended settings for all fax communications is T.38 as documented in the previous section.

Element Manager Configuration Parameters

The CS 1000 uses Element Manager to configure parameters for VoIP and T.38 Fax transmission. The following parameters must be configured for successful FoIP communications using Modem Pass through.

Modem/Fax Pass-through

This option is configured per gateway and must be selected in order to properly detect modems or V.34 fax machines. When selected, the gateway will detect and process the V.34 Fax and modem call as over a G.711 codec that has been optimized for modem pass-through if the analog station port has been configured with the MPTA class of service. Failing to check this option in a gateway with modems will force the calls to traverse the network over a non-optimized voice codec and the modem/V.34 Fax calls will fail. Please see [Table 1](#) for a comprehensive matrix that defines the behavior of the gateway based on these settings.

Analog Station Provisioning for V.34 Fax and Modem

Fax devices are provisioned as analog devices on the CS 1000. There are two specific options that are required in a Fax over IP environment in order to detect and pass Fax traffic over an optimized G.711 codec.

DTN class of service is required for standard DTMF Touch Tone detection.

MPTA designates this device as a modem or V.34 Fax device to the system that allows for proper CODEC usage over an IP or ISDN network.

TN 006 0 00 00.....Terminal Number

TYPE 500 Analog Station Type

DN 3500.....Extension Number

CLS DTN Digitone (DTMF)

CLS MPTA.....Will use the G.711 codec with optimizations when V.34 modem tones are detected

Note: the MPTA feature is only supported when a Mindspeed DSP is used.

Fax Machine Provisioning for V.34 Fax

Error Correction Method (ECM).....Enable ECM on fax machines

Negotiation Timeout.....Set to 4000 ms

DSP and codec selection Behavior

The tables below describe the Codec vs Fax/Modem baud rates supported on both Mind Speed and Telogy DSPs. Note that CLS MPTA must be configured on units with where modem/V.34 faxes need to be supported. In addition, MPTA is only supported on Mindspeed DSPs:

Table 1: Mindspeed DSP Solution (NTDW62, NTDW64, NTDW65, NTDW78, NTDW56, NTDW59, NTDW20)

Setting		V.34 Fax ANS/ANSam 33600		V.17 Fax V.21 14400		Modem ANS/ANSam	
		MPTD	MPTA	MPTD	MPTA	MPTD	MPTA
Node Bandwidth Management and Codec (BB/BQ)	EM Modem Detect						
G.729a (BB)	N/A	Negotiate down to 14400 over T.38 Fax	G.711 MPT	T.38 Fax	G.711 PT	Not Supported	G.711 MPT
G.723.1(BB)	N/A	Negotiate down to 14400 over T.38 Fax	G.711 MPT	T.38 Fax	G.711 PT	Not Supported	G.711 MPT
G.711 (BQ)	ON	Negotiate down to 14400 over T.38 Fax	V.34 speed via MPT	T.38 Fax	G.711 PT	Best Effort over G.711	V.34 supported via MPT
G.711 (BQ)	OFF	Negotiate down to 14400 over T.38 Fax	V.34 speed via MPT	T.38 Fax	G.711 PT	Best Effort over G.711	V.34 supported via MPT

Table 2: Telogy DSPs (NTVQ01)

Codec	EM Modem Detect	EM V.21 Fax Detect	Switch to T.38	V.34 Fax	V.17, Fax 14400	Modem
G.729a	N/A	N/A	V.21	Not Supported	T.38	Not Supported
G.723.1	N/A	N/A	V.21	Not Supported	T.38	Not Supported
G.711	N/A	On	V.21	Not Supported	T.38	Not Supported
G.711	N/A	Off	Never	Not Supported	Best Effort over G.711	Not Supported

Recommendations

Once a VoIP Fax network is deployed, verification of the initial installation must be performed to make certain the application is functioning correctly.

The ITU has published for sale under their T.22 specification specific images for use in testing fax transmissions. Avaya recommends that customers utilize these standard images in all testing to ensure consistent results.

Customers wishing to obtain full size copies of these images should contact the ITU directly.

Network QoS

QoS is a significant factor in FoIP networks. Since T.38 FoIP technology is significantly affected by the overall packet loss, latency and jitter experienced on a fax call, a network experiencing a degradation of QoS will also experience a degradation of successful FoIP transmissions. Fax quality starts to degrade when packet loss exceeds 2%. Avaya recommends that fax services be supported with Virtual Trunk/ IP Trunk 3.0 (or later) operating at the Excellent or Good QoS level used for Voice over IP.

CS 1000 QoS Measurement Tools

These tools are used in the post-installation, day-to-day activities of maintaining an acceptable QoS level for the VoIP network. Passive tools are used to monitor and report on real-time VoIP traffic metrics gathered from network devices that already collect and gather RMON information.

To adequately assess the data network on an on-going basis, other more intrusive tools are used to generate synthetic VoIP traffic. The more intrusive tools are similar to those used to perform pre-sales network assessments.

Avaya recommends customers use a mechanism that provides notification of QoS policy breaches through email, alarm, or page.

CS 1000 Support for FAX Models

Avaya utilizes various test equipment as well as actual Fax machines from various vendors to establish proper Fax inter-working.

It should be noted that some Fax machine manufacturers do not entirely adhere to the published ITU T.30 fax recommendation. Because of this, fax inter-working cannot be guaranteed 100%.

CS 1000 Support for Modem/Other Models

Avaya utilizes various test equipment as well as actual modems from various vendors to establish data communications. Avaya recommends all modems be hard-modems (e.g. physical modem or point-of-sale terminal) as opposed soft-modems due to the superior echo cancellation capabilities of hard-modems.

Resolution

Not Applicable

Workaround or alternative remediation

Not Applicable

Remarks

This bulletin replaces and obsoletes Nortel bulletin number DTR-2007-0280-Global

Patch Notes

Backup before applying the patch

Not Applicable

Download

Not Applicable

Patch install instructions

Service-interrupting?

Not Applicable

No

Verification

Not Applicable

Failure

Not Applicable

Patch uninstall instructions

Not Applicable

Security Notes

The information in this section concerns the security risk, if any, represented by the topic of this PSN.

Security risks

Not Applicable

Avaya Security Vulnerability Classification

Not Susceptible

Mitigation

Not Applicable

For additional support, contact your Authorized Service Provider. Depending on your coverage entitlements, additional support may incur charges. Support is provided per your warranty or service contract terms unless otherwise specified.

Avaya Support Contact	Telephone
U.S. Remote Technical Services – Enterprise	800-242-2121
U.S. Remote Technical Services – Small Medium Enterprise	800-628-2888
U.S. Remote Technical Services – BusinessPartners for Enterprise Product	877-295-0099
BusinessPartners for Small Medium Product	Please contact your distributor.
Canada	800-387-4268
Caribbean and Latin America	786-331-0860
Europe, Middle East, and Africa	36-1238-8334
Asia Pacific	65-6872-8686

Disclaimer: ALL INFORMATION IS BELIEVED TO BE CORRECT AT THE TIME OF PUBLICATION AND IS PROVIDED “AS IS”. AVAYA INC., ON BEHALF OF ITSELF AND ITS SUBSIDIARIES AND AFFILIATES (HEREINAFTER COLLECTIVELY REFERRED TO AS “AVAYA”), DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND FURTHERMORE, AVAYA MAKES NO REPRESENTATIONS OR WARRANTIES THAT THE STEPS RECOMMENDED WILL ELIMINATE SECURITY OR VIRUS THREATS TO CUSTOMERS’ SYSTEMS. IN NO EVENT SHALL AVAYA BE LIABLE FOR ANY DAMAGES WHATSOEVER ARISING OUT OF OR IN CONNECTION WITH THE INFORMATION OR RECOMMENDED ACTIONS PROVIDED HEREIN, INCLUDING DIRECT, INDIRECT, CONSEQUENTIAL DAMAGES, LOSS OF BUSINESS PROFITS OR SPECIAL DAMAGES, EVEN IF AVAYA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

THE INFORMATION PROVIDED HERE DOES NOT AFFECT THE SUPPORT AGREEMENTS IN PLACE FOR AVAYA PRODUCTS. SUPPORT FOR AVAYA PRODUCTS CONTINUES TO BE EXECUTED AS PER EXISTING AGREEMENTS WITH AVAYA.

All trademarks identified by ® or ™ are registered trademarks or trademarks, respectively, of Avaya Inc.
All other trademarks are the property of their respective owners.