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Application Notes
Grandstream GXP2000 / GXP2020 and VCX v7.1.11c and 7.2.56.56

Issue: Revision 1.4

Date: June 20, 2007

Abstract: This application note describes the configuration procedures required to configure the Grandstream GXP2000 4-line Enterprise SIP phone and GXP2020 6-line Enterprise SIP Phone with the 3Com VCX platform. The GXP2000 and GXP2020 share the same SIP stack and F/W.

The GXP Series offers power-over-Ethernet (PoE), dual 10/100 auto-sensing Ethernet ports, multi-lines with individual SIP accounts and XML capabilities. The GXP Series is expandable using a 56 button expansion car, offers MLS (multi-language support) in 5 languages, AES encryption and remote configuration for quick deployment over a large network.

The GXP2020 offers more advanced features than the GXP2000 including 4 programmable XML capable buttons, 6 lines each with individual SIP accounts, 5-way conferencing, two headset jacks (RJ22/2.5mm) and a large (320 x 160 pixels) high-resolution backlit LCD display and an elegant new design.

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Authors: Marianne Rocco, Soumil Vora, Bob Blair

Revision History

Revision	Date	Author	Reason for change
1.0	25 Apr 07	Marianne Rocco & Soumil Vora	Initial revision
1.1	4 June 07	Marianne Rocco & Soumil Vora	Added tested observations
1.3	6 June 07	Marianne Rocco & Soumil Vora	Added topology map, marketing materials and new test cases
1.4	6 June 07	Bob Blair	Formatting, Added 3Com Specific data

References

Date	Document Name	Revision	Company
25 Apr 07	GXP User's Manual GXP Release Notes		Grandstream Networks
25 Apr 07	GXP2020 Release Notes		Grandstream Networks

Objective

Configure the Grandstream Enterprise SIP Phones (GXP2000, GXP2020 and GXV3000) for use with the 3COM VCX IP Call Processor v7.1.11c and 7.2.56.56.

Grandstream Networks Company and Product Details

Grandstream Networks is a leading designer and manufacturer of innovative, affordable, and high quality IP voice and video products for the worldwide broadband telephony market. Our products are fully compatible with the SIP industry standard, field proven with large and rapidly growing deployed base, and have broad interoperability with the majority of 3rd party SIP products on the market today.

The Grandstream IP voice & video products offer the best price-performance point in the industry. Each is based on SIP standard and is feature rich – supporting both traditional and advanced features - support a broad range of voice codecs, and are easy to manage and deploy through web-based GUI interfaces.

Grandstream continues to bring innovation to the IP communications market with exciting products of compelling values and differentiations. Grandstream Networks is headquartered in Brookline, Massachusetts with offices in Dallas, Los Angeles and Shenzhen/China.

GXP2000 Features at a Glance

Open Standards Compatible	SIP 2.0, TCP/IP/UDP, RTP/RTCP, HTTP/HTTPS, ARP/RARP, ICMP, DNS (A record and SRV), DHCP (both client and server), PPPoE, PoE, TFTP, NTP, Telnet, and TLS.
Network Interfaces	Dual 10/100mbps Ethernet ports; 2 USB (2.0) host ports, headset jack (2.5mm).
Superb Audio Quality	Advanced Digital Signal Processing (DSP), Silence suppression, VAD, CNG, AGC.
Feature Rich	Traditional voice features including caller ID, call waiting, hold, transfer, forward, block, mute, autodial, off-hook dial, and click to dial.
Advanced Features	Tilt screen, multi-line support, 5 navigation keys, duplex speakerphone/hands-free, individual SIP accounts, multi-language support (MLS), XML enabled, SRTP & TLS
Advanced Functionality	Custom down-loadable ring-tones, multi-line support, multi-party conferencing, up to 112 additional extensions with side-car, headset enabled, intercom, AES encryption.

GXP2020 Features at a Glance

Open Standards Compatible	SIP 2.0, TCP/IP/UDP, RTP/RTCP, HTTP/HTTPS, ARP/RARP, ICMP, DNS (A record and SRV), DHCP (both client and server), PPPoE, PoE, TFTP, NTP, Telnet, and TLS.
Superb Audio Quality	Advanced Digital Signal Processing (DSP), Silence suppression, VAD, CNG, AGC.
Network Interfaces	Dual 10/100mbps Ethernet ports; 2 USB (2.0) host ports, 2 headset jacks (RJ22 and 2.5mm jack).
Feature Rich	Traditional voice features including caller ID, call waiting, hold, transfer, forward, block, autodial, off-hook dial, and click to dial.
Advanced Features	Multi-line support with dual-color LED, multi-party conferencing, line extension interface, large back-lit graphic LCD, 5 navigation keys, eleven (11) dedicated buttons for hold, send, speakerphone, headset, transfer, conference (for up to 4 party), mute, message, do-not-disturb, phone book, intercom/paging.
Advanced Functionality	Custom down-loadable ring-tones, TLS & SRTP, multi-language support, XML soft keys, 3 adjustable positioning angles, wall mountable, AES encryption.

Technical Summary for GXP2000 and GXP2020

GXP2000 Technical Specifications

Lines	4 direct lines with 7 speed dial keys; up to 11 line calls (with an additional 112 lines with 2 daisy-chained GXP-2000 Ext)
Protocol Support	Support SIP 2.0, TCP/UDP/IP, PPPoE, RTP/RTCP, SRTP by SDES, HTTP, ARP/RARP, ICMP, DNS, DHCP, NTP/SNTP, TFTP, SIMPLE/PRESENCE protocols. Support multiple SIP accounts and up to 11 media channels concurrently Support SIP PUBLISH method (RFC 3903), SIP Presence package (RFC 3856, 3863) for use of 7 MFKs and GXP-2000EXT, SIP Dialog package (RFC 4235) Support for SIP MESSAGE method (RFC 3428)S Stores up to 100 incoming IM messages (drops IM message 101 plus)
Display	8 line x 22character, 64 rows x 130 column in pixels
Feature Keys	8 dedicated keys: Message Button, Hold, Transfer, Conference, Speakerphone, Send, Mute/Del, 5 display/menu navigation keys, dual color LEDs
Device Management	NAT-friendly remote software upgrade (via TFTP/HTTP) for deployed devices including behind firewall/NAT, Auto/manual provisioning system, GUI Interface, Address Book Support Layer 2 (802.1Q, VLAN, 802.1p) and Layer 3 QoS (ToS, DiffServ, MPLS) Support for GXP-2000 Extension console and diagnostic mode for keys on GXP-2000 Extension console
Audio Features	Full-duplex hands-free speakerphone, headset enabled Advanced Digital Signal Processing (DSP) Dynamic negotiation of codec and voice payload length Support for G.723,1 (6.3K), G.729A/B, G.711 µ/A, G.726 (40K/32K/24K/16K), G.728, G.722 (wide-band), GSM and iLBC codecs In-band and out-of-band DTMF (in audio, RFC2833, SIP INFO) Silence Suppression, VAD (voice activity detection), CNG (comfort noise generation), ANG (automatic gain control) Acoustic Echo Cancellation (AEC) with Acoustic Gain Control (AGC) for speakerphone mode Support side tone, Adaptive jitter buffer control (patent-pending) and packet delay & loss concealment
Telephony Features	Intuitive graphic user interface (GUI), downloadable phone book (XML, LDAP), MLS (multi language support) Voice mail indicator with indicator, downloadable custom ring-tones Call hold, call transfer (attended/blind) Do-Not-Disturb (DND), call forwarding, call waiting, call waiting caller ID, mute, redial, call log, and volume control, caller ID display or block Transfer, hold, forward, multi-party conferencing, dial plans, off-hook auto dial, auto answer, early dial and speed dial. Support for anonymous call using privacy header
Network and Provisioning	Via kepad/LCD, Web browser, or secure (AES encrypted) central configuration file, manual or dynamic host configuration protocol (DHCP) network setup Support NAT traversal using IETF STUN and Symmetric RTP Support for IEEE 802.1p/Q tagging (VLAN), Layer 3 TOS
Firmware Upgrades	Support firmware upgrade via TFTP or HTTP, Support for Authenticating configuration file before accepting changes User specific URL for configuration file and firmware files
Advanced Server Features	Message waiting indication, support DNS SRV Look up and SIP Server Fail Over, Support customizable idle screen via downloading XML by HTTP/TFTP

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Security	DIGEST authentication and encryption using MD5 and MD5-sess, SRTP over TLS

GXP2020 Technical Specifications

Lines	6 direct lines with independent SIP accounts, 7 programmable speed dial keys, 4 XML programmable soft-keys
Protocol Support	Support SIP 2.0, TCP/UDP/IP, PPPoE, RTP/RTCP, SRTP by SDES, HTTP, ARP/RARP, ICMP, DNS, DHCP, NTP/SNTP, TFTP, SIMPLE/PRESENCE protocols Support multiple SIP accounts and up to 11 media channels concurrently Support SIP PUBLISH method (RFC 3903), SIP Presence package (RFC 3856, 3863) for use of 7 MFKs SIP Dialog package (RFC 4235) Support for SIP MESSAGE method (RFC 3428) Stores up to 100 incoming IM messages (drops IM message 101 plus)
Display	Back-lit 240x160 graphic LCD with 32-level grey scales 8 line x 22character, 64 rows x 130 column in pixels
Feature Keys	11 dedicated keys: hold, send, speakerphone, headset, transfer, conference (up to 4 parties), mute, message, Do-not-disturb, phone book, intercom/paging, 5 display/menu navigation keys, dual color LEDs
Device Management	NAT-friendly remote software upgrade (via TFTP/HTTP) for deployed devices including behind firewall/NAT, Auto/manual provisioning system, GUI Interface, Address Book Support Layer 2 (802.1Q, VLAN, 802.1p) and Layer 3 QoS (ToS, DiffServ, MPLS) Key expansion interface
Audio Features	Full-duplex hands-free speakerphone, headset enabled. Advanced Digital Signal Processing (DSP). Dynamic negotiation of codec and voice payload length Support for G.723,1 (6.3K), G.729A/B, G.711 µ/A, G.726 (40K/32K/24K/16K), G.722 (wide-band), GSM and iLBC codecs. In-band and out-of-band DTMF (in audio, RFC2833, SIP INFO) Silence Suppression, VAD (voice activity detection), CNG (comfort noise generation), ANG (automatic gain control) Acoustic Echo Cancellation (AEC) with Acoustic Gain Control (AGC) for speakerphone mode Adaptive jitter buffer control (patent-pending) and packet delay & loss concealment, Support side tone
Telephony Features	Intuitive graphic user interface (GUI), downloadable phone book (XML, LDAP), support for anonymous call using privacy header, MLS (multi language support) Voice mail indicator with indicator, downloadable custom ring-tones, call hold, call transfer (attended/blind), Do-Not-Disturb (DND), call forwarding, call waiting, caller ID, mute, redial, call log, and volume control, caller ID display or block Multi-party conferencing (up to 4), dial plans, off-hook auto dial, auto answer, early dial and speed dial
Network and Provisioning	Via kepad/LCD, Web browser, or secure (AES encrypted) central configuration file, manual or dynamic host configuration protocol (DHCP) network setup Support NAT traversal using IETF STUN and Symmetric RTP Support for IEEE 802.1p/Q tagging (VLAN), Layer 3 TOS
Firmware Upgrades	Support firmware upgrade via TFTP or HTTP, Support for Authenticating configuration file before accepting changes. User specific URL for configuration file and firmware files
Advanced Server Features	Message waiting indication, support DNS SRV Look up and SIP Server Fail Over, Support customizable idle screen via downloading XML by HTTP/TFTP
Security	DIGEST authentication and encryption using MD5 and MD5-sess, SRTP over TLS

Datasheets

- Datasheet
  http://www.grandstream.com/resources.html (GXP2000)
  http://www.grandstream.com/gxp2020.html

- Features, Functions, and Benefits
  http://www.grandstream.com/gxp2020.html
  http://www.grandstream.com/gxp2000.html

GXP2000

GXP2000 w/Extension Module

GXP2020

Picture 1: Grandstream GXP Product Photos

Grandstream Networks Overview

Grandstream designs and manufactures IP terminal endpoints for broadband networks. Grandstream IP products enable businesses to create a competitive advantage when selling a total IP Solution. They are simple to install, easy to manage, and offer advanced feature sets. Our price competitive products have recently been certified with leading SIP platforms and service providers. Grandstream SIP phones will help maximize your margins without compromising the quality of the 3Com VCX solution.

The Grandstream product portfolio includes Consumer ATAs and IP Phones, Enterprise Multi-line SIP phones (PoE powered), Analog FXO/FXS Gateways, and IP Video Phones. For more information, please visit www.grandstream.com. Grandstream Networks is headquartered in Brookline, Massachusetts with offices in Dallas, Los Angeles and Shenzhen/China.

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Configuration Technical Details

Grandstream Enterprise SIP Phones are standards-compliant SIP phones which are interoperable with most 3rd party SIP platforms, service providers, and traditional and IP-PBXs. The Grandstream SIP Phones interoperate easily with the 3Com VCX platform.

How it Works

Grandstream Enterprise SIP Phones require a TFTP, FTP or an HTTP server to download firmware and configuration files. All configuration and provisioning information is detailed in these files. The standard web-GUI interface for each model guides the end-user through individual line configuration and basic / advanced set-up requirements.

Hardware Revisions

- Grandstream GXP Series HV 1.1
- VCX V7000 IBM 306m Platform
- VCX Series i IBM 520 Server Platform
- 3102B Hard Phones
- 3COM PRI Digital Gateway V7122
- 3COM 5500G-EI Gigabit Ethernet Switch
- 3COM IP Telecommuting Module V7005

Software Revisions

- Grandstream GXP Series Firmware release 1.1.4.8
- VCX v7.1.11c
- VCX 7.2.56.56 with IBM i5R4 O.S.
- Convergence Client v2.4 App3.1 Client-9
- 3COM OS v3.03.00s168c03 5500G Firmware
- 3CTM v4.4.3

Installation Overview

Installation of Grandstream phones requires configuring the 3COM platform for additional phone lines/users, creating user-specific Grandstream configuration files, and provisioning the Grandstream phones with appropriate Grandstream configuration files.

Network Topology

3Com VCX / Grandstream Network Topology

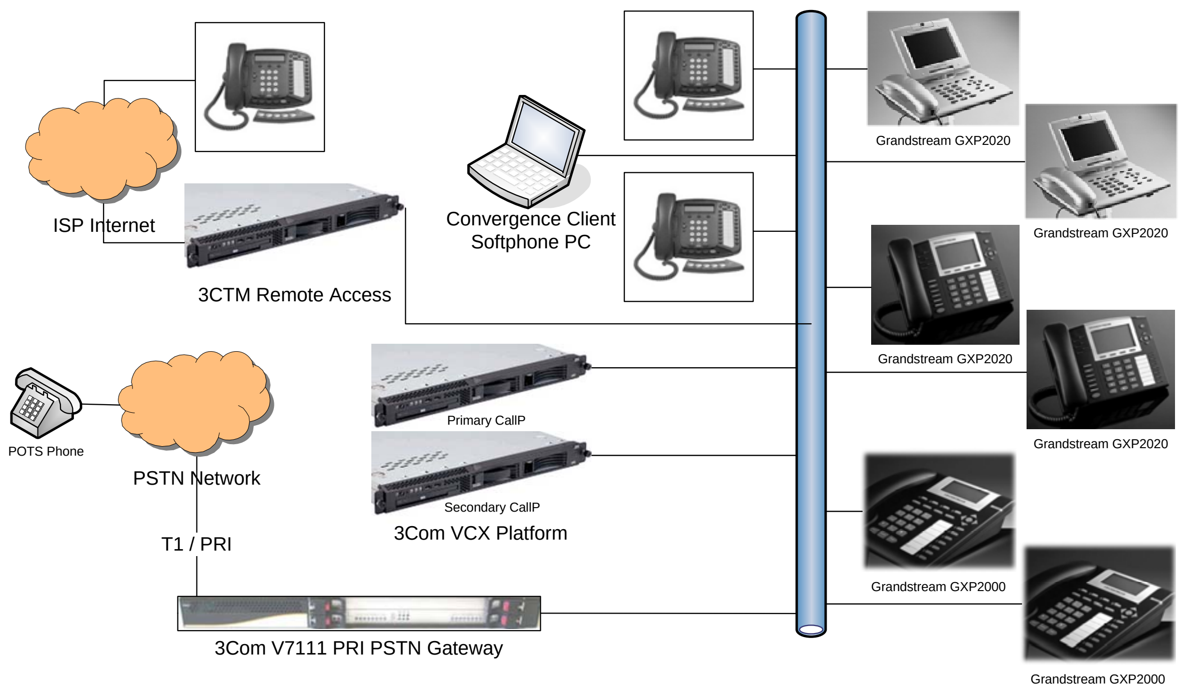

Figure 1: Test Network Topology Diagram

Basic Setup

- The setup included 3 GXP Series IP Phones configured with static IPs powered by PoE and/or external Power Supplies.

- User accounts registering to the 3COM VCX system were created for each phone.
  Each phone extension had a unique user created and extension associated to the user. No special settings were needed for these users and extensions.

- PCs on the same network were used to remotely configure the phones as well as capture network traces for analysis and troubleshooting.
  Standard Windows XP O.S. and Linux PCs were available on the network to perform Web Based configuration of the phones, monitoring via a mirror port traffic with Wireshark, and for Convergence Client calls.

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3COM Configuration Details

The 5500G switch configuration is presented below. The VLAN id 2 was used as the vlan for the phone testing. The default qos-profile was used. By adding the Grandstream Mac Address ranges into the switch configuration as a rule we can be sure that the Grandstream VoIP traffic is handled appropriately. To do this we added a new rule between rules 7 and 8 of the default switch configuration.

The following data is a subset of the complete switch configuration as tested.

```
#
 poe legacy enable
#
 igmp-snooping enable
#
 multicast routing-enable
#
acl number 3997
 rule 0 permit IP dscp ef
 rule 1 permit TCP destination-port eq www
 rule 2 permit UDP destination-port eq snmp
 rule 3 permit UDP destination-port eq snmptrap
 rule 4 permit IP dscp cs6
 rule 5 permit IP dscp cs7
#
acl number 4999
 rule 0 permit type 8868 ffff
 rule 1 permit source 00e0-bb00-0000 ffff-ff00-0000
 rule 2 permit source 0003-6b00-0000 ffff-ff00-0000
 rule 3 permit source 00e0-7500-0000 ffff-ff00-0000
 rule 4 permit source 00d0-1e00-0000 ffff-ff00-0000
 rule 5 permit source 0001-e300-0000 ffff-ff00-0000
 rule 6 permit source 000f-e200-0000 ffff-ff00-0000
 rule 7 permit source 0006-b900-0000 ffff-ff00-0000
 rule 8 permit source 0008-b200-0000 ffff-ff00-0000  ← Grandstream MAC entry
 rule 9 deny dest 0000-0000-0000 ffff-ffff-ffff      ← Original rule 8 edited to be rule 9
#
qos-profile default
 packet-filter inbound link-group 4999 rule 9        ← Changed rule 8 to rule 9
 traffic-priority inbound ip-group 3997 rule 0 cos voice
 traffic-priority inbound ip-group 3997 rule 4 cos network-management
 traffic-priority inbound ip-group 3997 rule 5 cos network-management
 traffic-priority inbound link-group 4999 rule 0 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 1 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 2 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 3 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 4 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 5 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 6 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 7 dscp ef cos voice
 traffic-priority inbound link-group 4999 rule 8 dscp ef cos voice  ← New rule 8
#

#
interface GigabitEthernet1/0/1
 poe enable                    ← We must turn on Power of Ethernet
 broadcast-suppression pps 3000
 port access vlan 2            ← Port is associated to Vlan id 2
 apply qos-profile default     ← QOS profile definition
```

Grandstream Configuration Details

- Phones were by default configured to DHCP. Using remote HTTP access on the PC, the web configuration screen was accessed at the IP address shown on phone LCD display.

- By default the administrator login password is admin. Upon logging in, **ADVANCED SETTINGS** page is viewed. There are **STATUS, BASIC SETTINGS,** and the **ACCOUNT 1-6** pages (GXP2020 has 6 configurable accounts while GXP2000 has 4 accounts)

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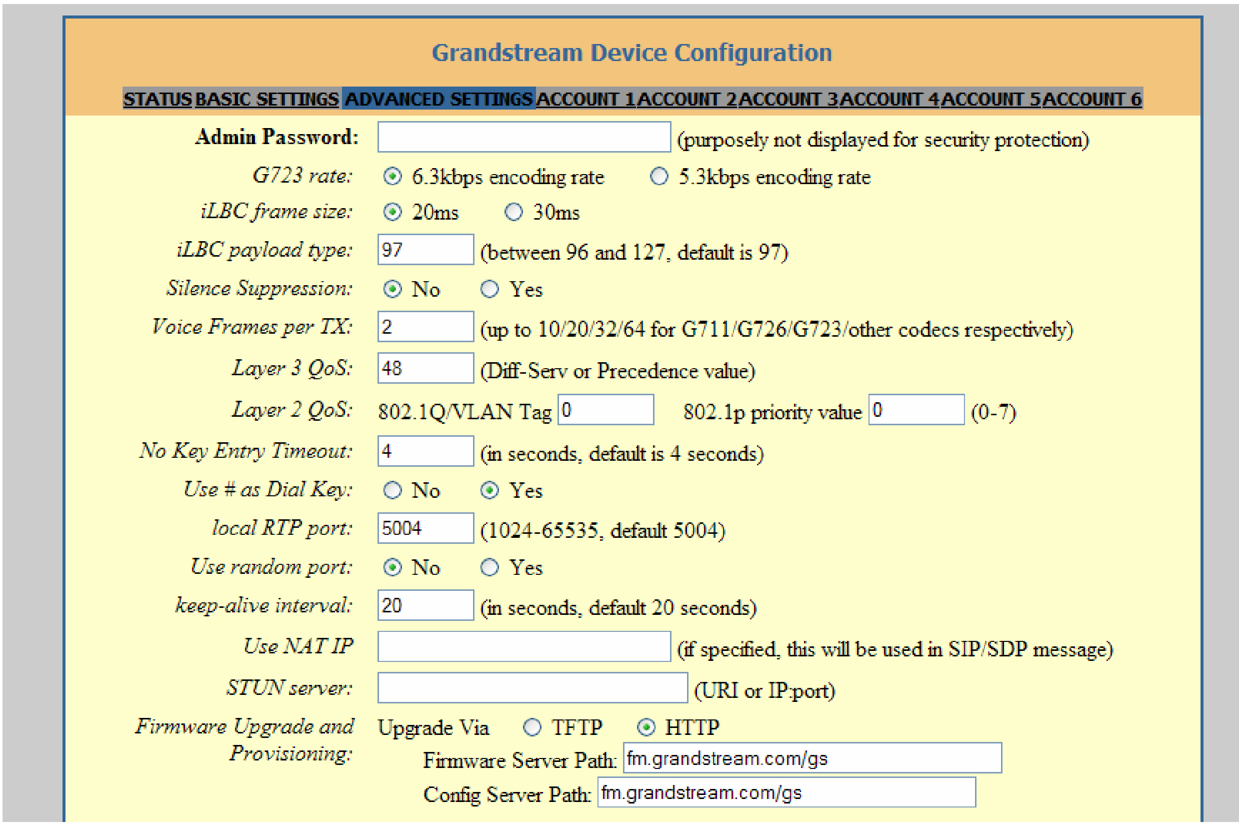

- For testing basic calls this page was kept to default settings. However, for testing VLAN capabilities we later configured Layer 2 QoS settings. Apply the appropriate L2 and L3 QOS values to match the network infrastructure. 3COM Voice products default to using Layer 3 QOS DSCP of 46.

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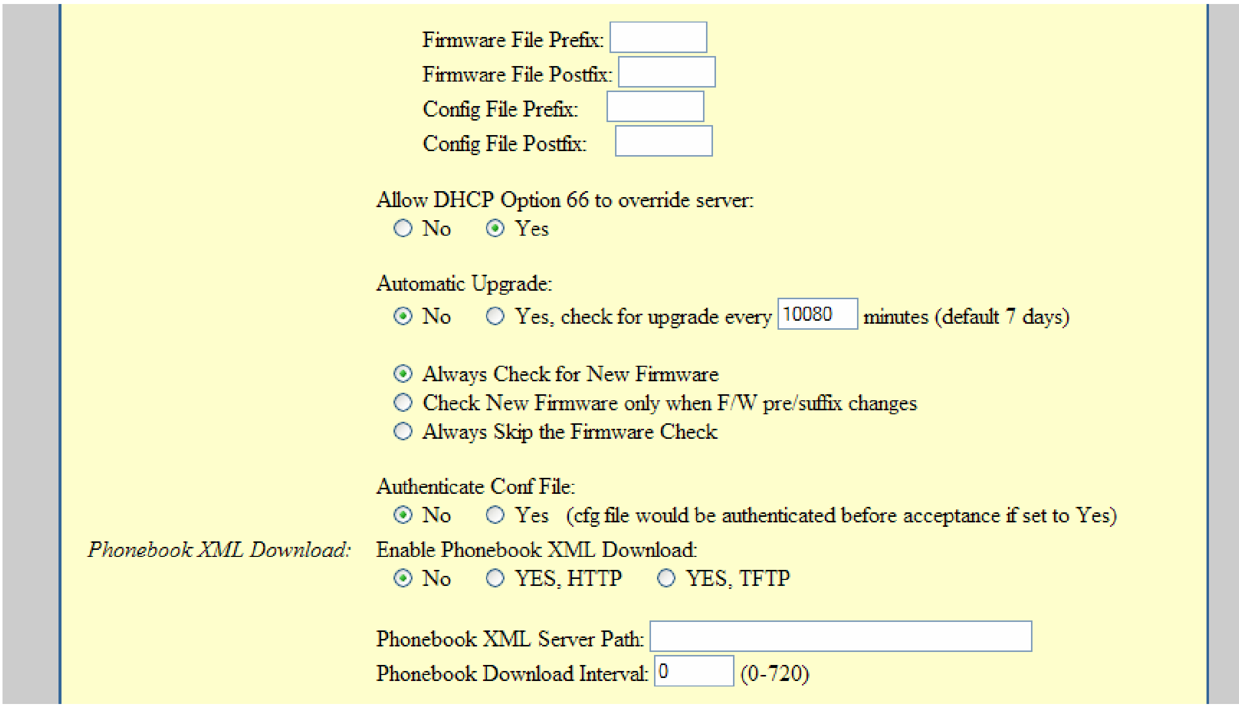
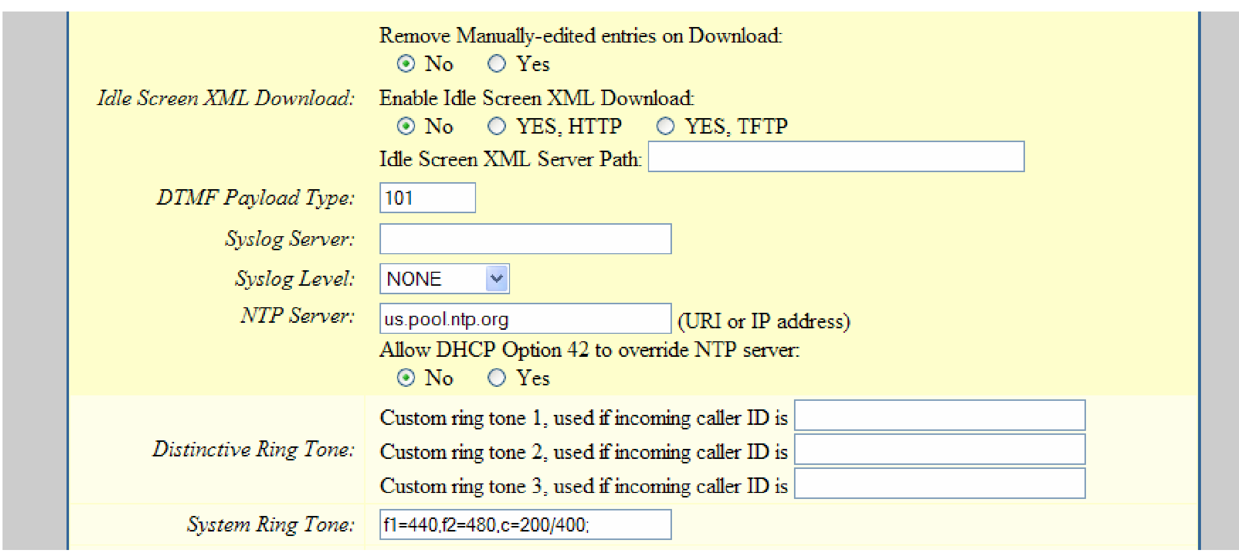

Firmware File Prefix:
Firmware File Postfix:
Config File Prefix:
Config File Postfix:
Allow DHCP Option 66 to override server:
No Yes
Automatic Upgrade:
No Yes, check for upgrade every 10080 minutes (default 7 days)
Always Check for New Firmware
Check New Firmware only when F/W pre/suffix changes
Always Skip the Firmware Check
Authenticate Conf File:
No Yes (cfg file would be authenticated before acceptance if set to Yes)
Phonebook XML Download:
Enable Phonebook XML Download:
No YES, HTTP YES, TFTP
Phonebook XML Server Path:
Phonebook Download Interval: 0 (0-720)


Remove Manually-edited entries on Download:
No Yes
Idle Screen XML Download:
Enable Idle Screen XML Download:
No YES, HTTP YES, TFTP
Idle Screen XML Server Path:
DTMF Payload Type: 101
Syslog Server:
Syslog Level: NONE
NTP Server: us.pool.ntp.org (URI or IP address)
Allow DHCP Option 42 to override NTP server:
No Yes
Distinctive Ring Tone:
Custom ring tone 1, used if incoming caller ID is
Custom ring tone 2, used if incoming caller ID is
Custom ring tone 3, used if incoming caller ID is
System Ring Tone: f1=440,f2=480,c=200/400;

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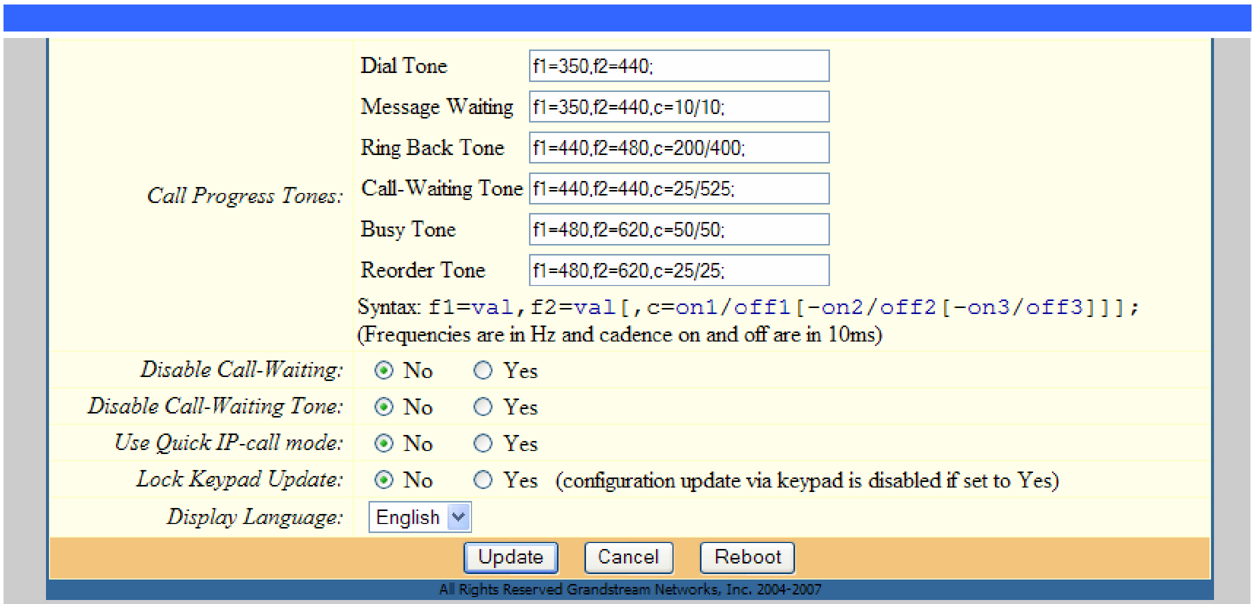
Call Progress Tones:
Dial Tone
f1=350,f2=440;
Message Waiting
f1=350,f2=440,c=10/10;
Ring Back Tone
f1=440,f2=480,c=200/400;
Call-Waiting Tone
f1=440,f2=440,c=25/525;
Busy Tone
f1=480,f2=620,c=50/50;
Reorder Tone
f1=480,f2=620,c=25/25;
Syntax: f1=val,f2=val[,c=on1/off1[-on2/off2[-on3/off3]]];
(Frequencies are in Hz and cadence on and off are in 10ms)
Disable Call-Waiting:
No
Yes
Disable Call-Waiting Tone:
No
Yes
Use Quick IP-call mode:
No
Yes
Lock Keypad Update:
No
Yes
(configuration update via keypad is disabled if set to Yes)
Display Language:
English
Update
Cancel
Reboot
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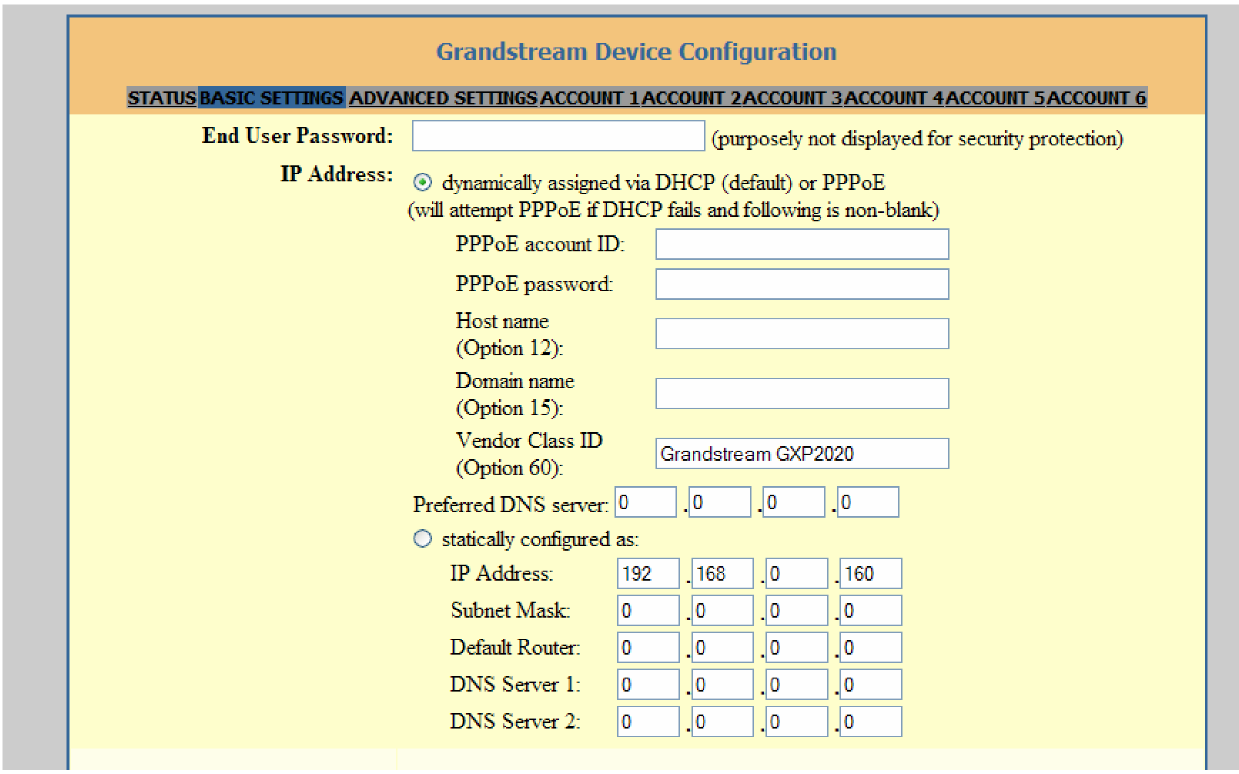
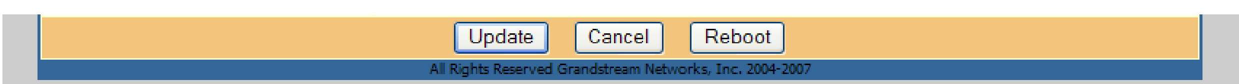
- In order to configure Static IP address click on **BASIC SETTINGS** tab (at the top).

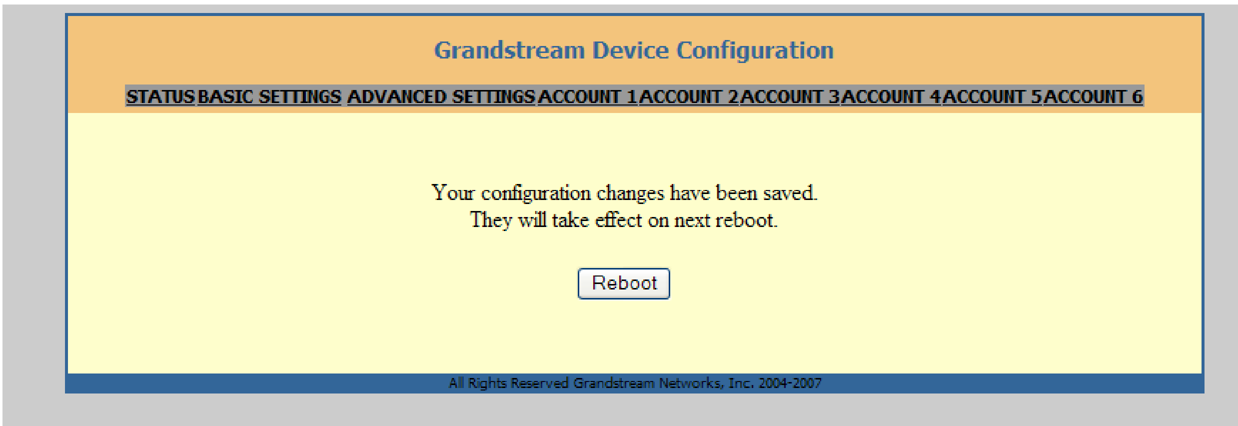


- As you can see by default it is set to DHCP. Click on the '**statically configured as'** radio button and enter the appropriate Static IP information.

- After entering this information, click on **UPDATE** at the bottom to save the changes.



- Upon clicking **UPDATE**, the following screen will be viewed. Allow for the reboot and log back in.



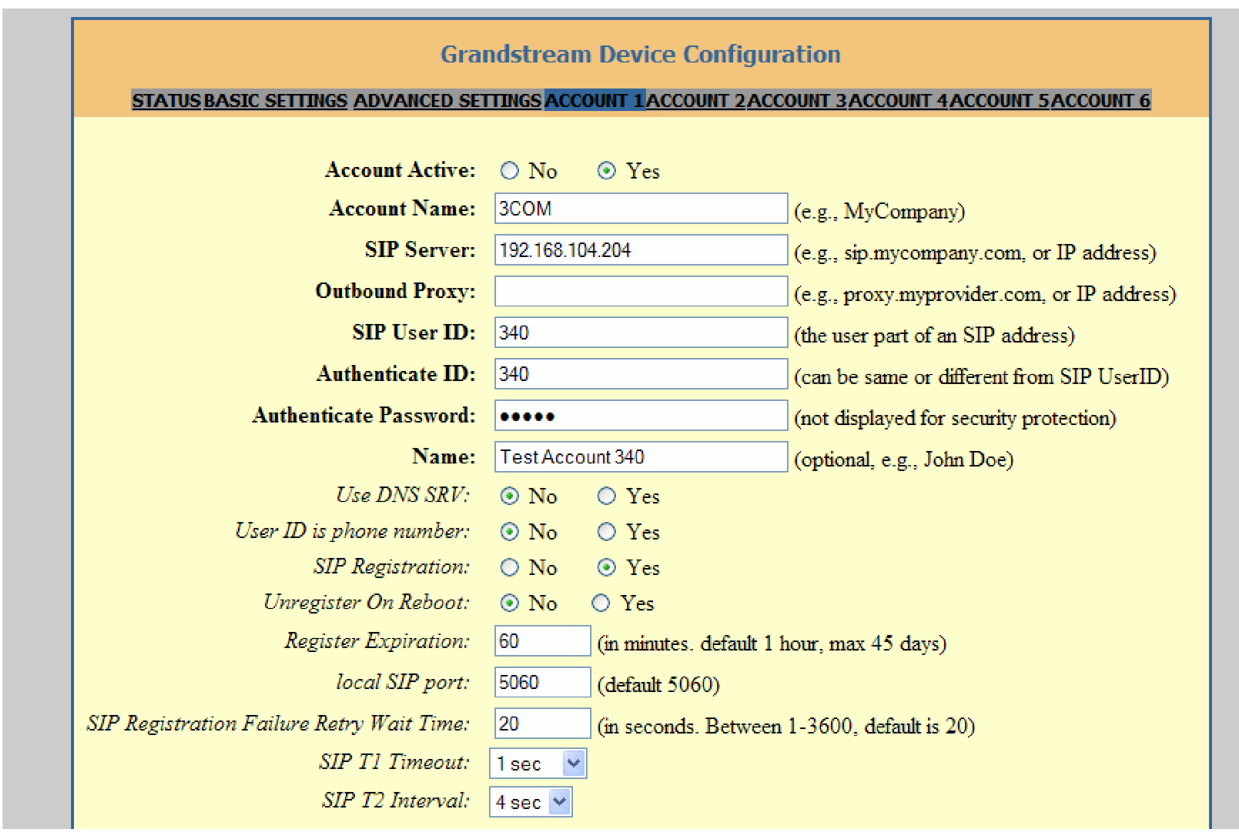
- Log back into the phone and click on **Account 1** tab to configure the user account, created on the 3COM VCX.

Enter the appropriate information as shown below:

VCX Primary Call Processor IP: **192.168.104.204**	**← VCX Primary**
Phone Extension: **340**	**← Phone Extension**
Phone Password: **12345**	**← Phone Password**

192.168.104.204 is the IP Address of the VCX Call Processor as given by 3COM. The User account for this phone is 340 and password 12345 (hidden) was entered under **Authenticate Password**.

The **Account Name** and **Name** are optional fields and can be set as per user.


Grandstream Device Configuration

STATUS BASIC SETTINGS ADVANCED SETTINGS ACCOUNT 1 ACCOUNT 2 ACCOUNT 3 ACCOUNT 4 ACCOUNT 5 ACCOUNT 6

Account Active:	○ No ⦿ Yes	
Account Name:	3COM	(e.g., MyCompany)
SIP Server:	192.168.104.204	(e.g., sip.mycompany.com, or IP address)
Outbound Proxy:		(e.g., proxy.myprovider.com, or IP address)
SIP User ID:	340	(the user part of an SIP address)
Authenticate ID:	340	(can be same or different from SIP UserID)
Authenticate Password:	•••••	(not displayed for security protection)
Name:	Test Account 340	(optional, e.g., John Doe)
Use DNS SRV:	⦿ No ○ Yes	
User ID is phone number:	⦿ No ○ Yes	
SIP Registration:	○ No ⦿ Yes	
Unregister On Reboot:	⦿ No ○ Yes	
Register Expiration:	60	(in minutes. default 1 hour, max 45 days)
local SIP port:	5060	(default 5060)
SIP Registration Failure Retry Wait Time:	20	(in seconds. Between 1-3600, default is 20)
SIP T1 Timeout:	1 sec	
SIP T2 Interval:	4 sec	

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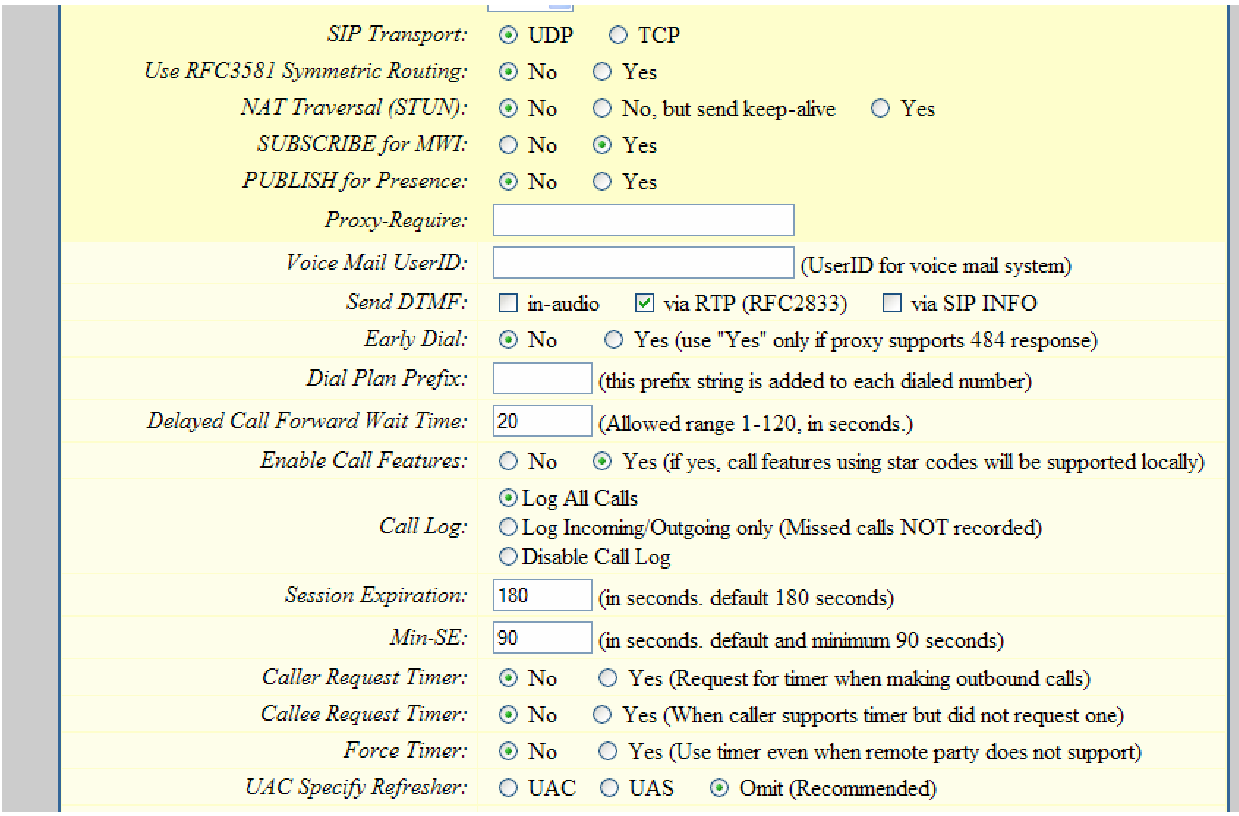
- Set **Subscribe to MWI** to **Yes** to allow voice mail notifications from the VCX. **Send DTMF** set to **via RTP (RFC2833)**.



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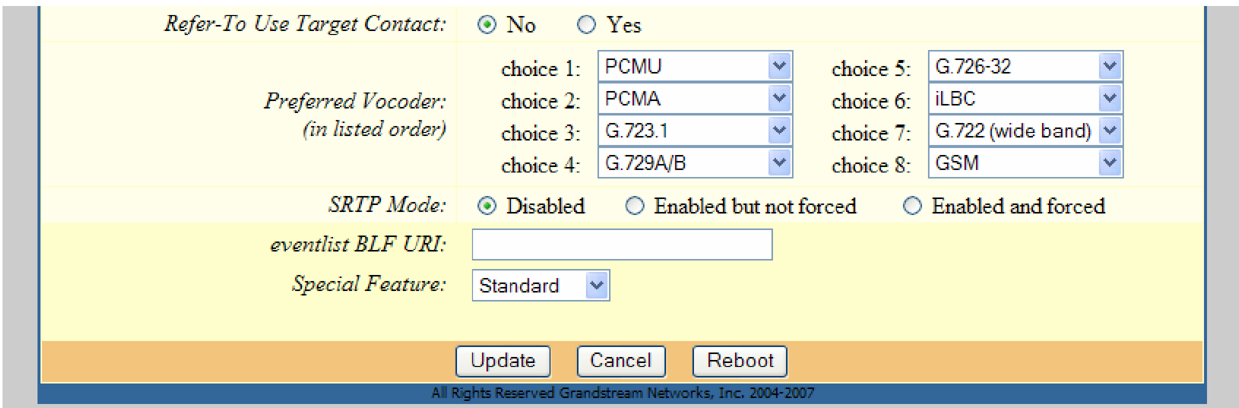
- You may change the preferred codec used for calls. By default all codecs will be available in the order seen below. You may select all choices to a single codec if you want to force usage of only that codec. Once again, after entering all information, click on **UPDATE** at the bottom to save the changes.



Testing Observations

The 3COM VCX and Grandstream GXP Series phones work correctly with each other for the tested call features and functionalities as mentioned on this document.

Verification Tests

Not all VCX supported features will be available to users through Grandstream phones and vice versa. Some VCX phone features are restricted to 3Com Phone software implementations.

> **Note: The support for Primary and Secondary VCX is not available. These phones only maintain registrations with the primary VCX.**

The features that were shown to operate properly are as follows:

- Basic IP Calls
- Basic IP - PSTN gateway calls
- Call Conference
- Call Hold
- Call Transfer (Blind)
- Call Transfer (Attended)
- Call Waiting
- Caller ID
- Do Not Disturb
- Last Number Redial
- Message Waiting Indication
- Missed Call Indicator
- Mute
- Speed Dial
- Calls to/from 3Com 3102 stations
- Convergence Client
- Multi-Way conference calls
- Interoperability with VCX 3CTM

The following tests passed but required using *XXX codes.

- Automatic Call Back (Camp On)
- Call Forward All
- Call Forward Busy
- Call Forward No answer
- Call Park/Retrieve
- Caller ID Block

Troubleshooting Tips

Basic troubleshooting technique should suffice for this solution. The integration was very simple and intuitive for a VoIP user/technician.

1. Simply Ping the phone's IP address from a client PC. This will test basic IP connectivity.

2. Double check the phone IP and SIP acct. settings for accuracy. Verify the correct IP network is assigned and default gateway is correct. Ping the default gateway to test for reachability from the client PC. Verify the extension and password are correct.

3. Verify phone registration.
   a. On the VCX Admin screen navigate to the Phones screen, locate the phone extension associated to the phone and select the Registration link in the left side of the screen. This will report the phone's SIP registration. If its not present the phone is failing to register with the VCX. If it is present the registration is successful.

4. Perform a Wireshark trace of the phone registration.
   a. Locate an Ethernet hub. Plug the phone line from the wall into the hub, a second Ethernet cable tot eh phone, and a PC running wireshark into the third port.
   b. Start the capture. And initiate the registration. Use an external power supply to power the phone.
   c. Compare the registration fields to the registration sample in Appendix A.
   d. Alternatively a switch mirror group may be provisioned and include the VCX, and Phone port as members of the mirror group. The port the Client PC is connected to will be the monitor port.

Product Support

Product support can be obtained from the respective product suppliers.

3COM product support:

Main 3COM Support link:
http://www.3com.com/products/en_US/support/index.html

3COM Product Specific Link
http://www.3com.com/products/en_US/detail.jsp?pathtype=purchase&tab=features&sku=WEBBNGVCXV7000

Asia Pacific
Telephone: +65 6543 6645
Fax: +65 6543 6518
E-mail: ap_service@3com.com

Europe, Middle East and Africa
Telephone: +44 (0)1442 435529 (Option 4)
Fax : +44 (0)1442 435811
E-mail: focalpoint_services@3com.com

North America and Latin America
Telephone: 866-326-6222 (Option 3)
Fax : 408-326-7140
E-mail: ecso_contracts@3com.com

Grandstream Product Support:

http://www.grandstream.com/gxp2020.html
http://www.grandstream.com/gxp2000.html

Grandstream Networks
Support Web page: http://www.grandstream.com/customersupport.html

Support:
617-566-9300 x2
support@grandstream.com

Conclusion

The GXP series is the choice for business customers looking for an affordable, simple and feature rich VoIP phone when using the 3Com VCX platform. For system integrators, the Grandstream SIP phone portfolio will help maximize margins and increase the customer value of the 3Com VCX / Grandstream solution. Choose the 3Com VCX platform and Grandstream SIP phones for the most cost-effective VoIP solution for your customers.

Appendix A: Phone Registration

```
Frame 1 (565 bytes on wire, 565 bytes captured)
    Arrival Time: May 30, 2007 10:51:19.697352000
    [Time delta from previous packet: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Packet Length: 565 bytes
    Capture Length: 565 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17), Dst: Ibm_22:1a:1c (00:11:25:22:1a:1c)
    Destination: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.246 (192.168.104.246), Dst: 192.168.104.204 (192.168.104.204)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00)
        1100 00.. = Differentiated Services Codepoint: Class Selector 6 (0x30)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 551
    Identification: 0x0000 (0)
    Flags: 0x00
        0... = Reserved bit: Not set
        .0.. = Don't fragment: Not set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 255
    Protocol: UDP (0x11)
    Header checksum: 0x65f2 [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.246 (192.168.104.246)
    Destination: 192.168.104.204 (192.168.104.204)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 531
    Checksum: 0x394c [correct]
Session Initiation Protocol
    Request-Line: REGISTER sip:192.168.104.204 SIP/2.0
        Method: REGISTER
        [Resent Packet: False]
    Message Header
        Via: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bKa2e550de098cde1e
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bKa2e550de098cde1e
        From: "3COM 341" <sip:341@192.168.104.204>;tag=ca166cec5a6f785a
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: ca166cec5a6f785a
```

```
        To: <sip:341@192.168.104.204>
            SIP to address: sip:341@192.168.104.204
        Contact: <sip:341@192.168.104.246:5060;transport=udp>
            Contact Binding: <sip:341@192.168.104.246:5060;transport=udp>
                URI: <sip:341@192.168.104.246:5060;transport=udp>
                    SIP contact address: sip:341@192.168.104.246:5060
        Supported: path
        Call-ID: b81cd92cb36fd519@192.168.104.246
        CSeq: 10001 REGISTER
            Sequence Number: 10001
            Method: REGISTER
        Expires: 3600
        User-Agent: Grandstream GXP2020 1.1.4.6
        Max-Forwards: 70
        Allow: INVITE,ACK,CANCEL,BYE,NOTIFY,REFER,OPTIONS,INFO,SUBSCRIBE,UPDATE,PRACK,MESSAGE
        Content-Length: 0
```

Frame 2 (325 bytes on wire, 325 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.698256000
    [Time delta from previous packet: 0.000904000 seconds]
    [Time since reference or first frame: 0.000904000 seconds]
    Frame Number: 2
    Packet Length: 325 bytes
    Capture Length: 325 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Ibm_22:1a:1c (00:11:25:22:1a:1c), Dst: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
    Destination: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.204 (192.168.104.204), Dst: 192.168.104.246 (192.168.104.246)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00)
        1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 311
    Identification: 0x0000 (0)
    Flags: 0x04 (Don't Fragment)
        0... = Reserved bit: Not set
        .1.. = Don't fragment: Set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (0x11)
    Header checksum: 0xe5ea [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.204 (192.168.104.204)
    Destination: 192.168.104.246 (192.168.104.246)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 291
    Checksum: 0xe7df [correct]
```

Blue

```
Session Initiation Protocol
    Status-Line: SIP/2.0 100 Trying
        Status-Code: 100
        [Resent Packet: False]
    Message Header
        v: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bKa2e550de098cde1e
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bKa2e550de098cde1e
        f: "3COM 341"<sip:341@192.168.104.204>;tag=ca166cec5a6f785a
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: ca166cec5a6f785a
        t: <sip:341@192.168.104.204>
            SIP to address: sip:341@192.168.104.204
        i: b81cd92cb36fd519@192.168.104.246
        Cseq: 10001 REGISTER
            Sequence Number: 10001
            Method: REGISTER
        Date: Wed, 30 May 2007 13:50:07 GMT
        Content-Length: 0
```

Frame 3 (657 bytes on wire, 657 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.699148000
    [Time delta from previous packet: 0.000892000 seconds]
    [Time since reference or first frame: 0.001796000 seconds]
    Frame Number: 3
    Packet Length: 657 bytes
    Capture Length: 657 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Ibm_22:1a:1c (00:11:25:22:1a:1c), Dst: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
    Destination: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.204 (192.168.104.204), Dst: 192.168.104.246 (192.168.104.246)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00)
        1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 643
    Identification: 0x0000 (0)
    Flags: 0x04 (Don't Fragment)
        0... = Reserved bit: Not set
        .1.. = Don't fragment: Set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (0x11)
    Header checksum: 0xe49e [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.204 (192.168.104.204)
```

```
    Destination: 192.168.104.246 (192.168.104.246)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 623
    Checksum: 0x11ed [correct]
Session Initiation Protocol
    Status-Line: SIP/2.0 401 Unauthorized
        Status-Code: 401
        [Resent Packet: False]
    Message Header
        v: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bKa2e550de098cde1e
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bKa2e550de098cde1e
        f: "3COM 341"<sip:341@192.168.104.204>;tag=ca166cec5a6f785a
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: ca166cec5a6f785a
        t: <sip:341@192.168.104.204>;tag=820f614
            SIP to address: sip:341@192.168.104.204
            SIP tag: 820f614
        i: b81cd92cb36fd519@192.168.104.246
        Cseq: 10001 REGISTER
            Sequence Number: 10001
            Method: REGISTER
        Date: Wed, 30 May 2007 13:50:07 GMT
        Allow: INVITE,ACK,BYE,CANCEL,REFER,SUBSCRIBE,NOTIFY,UPDATE,OPTIONS,MESSAGE,FEATURE
        k: path
        Expires: 3600
        User-Agent: 3Com VCX 7210 IP CallProcessor/v7.1.42
        WWW-Authenticate: Digest realm="3Com", domain="3Com",
nonce="aLaLaSaKaPaNaNaKaKaRaUaLaTaMaIaLaQaSaIaLaKaOaIaMaOaQaUaPaKaQaK", stale=FALSE,
algorithm=MD5
            Authentication Scheme: Digest
            Realm: "3Com"
            Authentication Domain: "3Com"
            Nonce Value: "aLaLaSaKaPaNaNaKaKaRaUaLaTaMaIaLaQaSaIaLaKaOaIaMaOaQaUaPaKaQaK"
            Stale Flag: FALSE
            Algorithm: MD5
        Content-Length: 0
```

Frame 4 (776 bytes on wire, 776 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.741527000
    [Time delta from previous packet: 0.042379000 seconds]
    [Time since reference or first frame: 0.044175000 seconds]
    Frame Number: 4
    Packet Length: 776 bytes
    Capture Length: 776 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17), Dst: Ibm_22:1a:1c (00:11:25:22:1a:1c)
    Destination: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
```

Blue

```
Internet Protocol, Src: 192.168.104.246 (192.168.104.246), Dst: 192.168.104.204 (192.168.104.204)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00)
        1100 00.. = Differentiated Services Codepoint: Class Selector 6 (0x30)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 762
    Identification: 0x0001 (1)
    Flags: 0x00
        0... = Reserved bit: Not set
        .0.. = Don't fragment: Not set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 255
    Protocol: UDP (0x11)
    Header checksum: 0x651e [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.246 (192.168.104.246)
    Destination: 192.168.104.204 (192.168.104.204)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 742
    Checksum: 0xb941 [correct]
Session Initiation Protocol
    Request-Line: REGISTER sip:192.168.104.204 SIP/2.0
        Method: REGISTER
        [Resent Packet: False]
    Message Header
        Via: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bKe0b2f10bbb83f87a
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bKe0b2f10bbb83f87a
        From: "3COM 341" <sip:341@192.168.104.204>;tag=ca166cec5a6f785a
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: ca166cec5a6f785a
        To: <sip:341@192.168.104.204>
            SIP to address: sip:341@192.168.104.204
        Contact: <sip:341@192.168.104.246:5060;transport=udp>
            Contact Binding: <sip:341@192.168.104.246:5060;transport=udp>
                URI: <sip:341@192.168.104.246:5060;transport=udp>
                    SIP contact address: sip:341@192.168.104.246:5060
        Supported: path
        Authorization: Digest username="341", realm="3Com", algorithm=MD5,
uri="sip:192.168.104.204",
nonce="aLaLaSaKaPaNaNaKaKaRaUaLaTaMaIaLaQaSaIaLaKaOaIaMaOaQaUaPaKaQaK",
response="2f2391ee4abaf89dd3b29f3832979227"
            Authentication Scheme: Digest
            Username: "341"
            Realm: "3Com"
            Algorithm: MD5
            Authentication URI: "sip:192.168.104.204"
            Nonce Value: "aLaLaSaKaPaNaNaKaKaRaUaLaTaMaIaLaQaSaIaLaKaOaIaMaOaQaUaPaKaQaK"
            Digest Authentication Response: "2f2391ee4abaf89dd3b29f3832979227"
        Call-ID: b81cd92cb36fd519@192.168.104.246
        CSeq: 10002 REGISTER
            Sequence Number: 10002
            Method: REGISTER
        Expires: 3600
        User-Agent: Grandstream GXP2020 1.1.4.6
        Max-Forwards: 70
```

```
        Allow: INVITE,ACK,CANCEL,BYE,NOTIFY,REFER,OPTIONS,INFO,SUBSCRIBE,UPDATE,PRACK,MESSAGE
        Content-Length: 0
```

Frame 5 (325 bytes on wire, 325 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.742283000
    [Time delta from previous packet: 0.000756000 seconds]
    [Time since reference or first frame: 0.044931000 seconds]
    Frame Number: 5
    Packet Length: 325 bytes
    Capture Length: 325 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Ibm_22:1a:1c (00:11:25:22:1a:1c), Dst: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
    Destination: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.204 (192.168.104.204), Dst: 192.168.104.246 (192.168.104.246)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00)
        1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 311
    Identification: 0x0000 (0)
    Flags: 0x04 (Don't Fragment)
        0... = Reserved bit: Not set
        .1.. = Don't fragment: Set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (0x11)
    Header checksum: 0xe5ea [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.204 (192.168.104.204)
    Destination: 192.168.104.246 (192.168.104.246)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 291
    Checksum: 0xaf1e [correct]
Session Initiation Protocol
    Status-Line: SIP/2.0 100 Trying
        Status-Code: 100
        [Resent Packet: False]
    Message Header
        v: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bKe0b2f10bbb83f87a
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bKe0b2f10bbb83f87a
        f: "3COM 341"<sip:341@192.168.104.204>;tag=ca166cec5a6f785a
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: ca166cec5a6f785a
```

```
        t: <sip:341@192.168.104.204>
            SIP to address: sip:341@192.168.104.204
        i: b81cd92cb36fd519@192.168.104.246
        Cseq: 10002 REGISTER
            Sequence Number: 10002
            Method: REGISTER
        Date: Wed, 30 May 2007 13:50:07 GMT
        Content-Length: 0
```

Frame 6 (528 bytes on wire, 528 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.793395000
    [Time delta from previous packet: 0.051112000 seconds]
    [Time since reference or first frame: 0.096043000 seconds]
    Frame Number: 6
    Packet Length: 528 bytes
    Capture Length: 528 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Ibm_22:1a:1c (00:11:25:22:1a:1c), Dst: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
    Destination: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.204 (192.168.104.204), Dst: 192.168.104.246 (192.168.104.246)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00)
        1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 514
    Identification: 0x0000 (0)
    Flags: 0x04 (Don't Fragment)
        0... = Reserved bit: Not set
        .1.. = Don't fragment: Set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (0x11)
    Header checksum: 0xe51f [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.204 (192.168.104.204)
    Destination: 192.168.104.246 (192.168.104.246)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 494
    Checksum: 0x1391 [correct]
Session Initiation Protocol
    Status-Line: SIP/2.0 200 OK
        Status-Code: 200
        [Resent Packet: False]
    Message Header
        v: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bKe0b2f10bbb83f87a
            Transport: UDP
            Sent-by Address: 192.168.104.246
```

```
            Sent-by port: 5060
            Branch: z9hG4bKe0b2f10bbb83f87a
        f: "3COM 341"<sip:341@192.168.104.204>;tag=ca166cec5a6f785a
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: ca166cec5a6f785a
        t: <sip:341@192.168.104.204>;tag=821a584
            SIP to address: sip:341@192.168.104.204
            SIP tag: 821a584
        i: b81cd92cb36fd519@192.168.104.246
        Cseq: 10002 REGISTER
            Sequence Number: 10002
            Method: REGISTER
        Date: Wed, 30 May 2007 13:50:07 GMT
        m: <sip:341@192.168.104.246:5060>
            Contact Binding: <sip:341@192.168.104.246:5060>
                URI: <sip:341@192.168.104.246:5060>
                    SIP contact address: sip:341@192.168.104.246:5060
        Allow: INVITE,ACK,BYE,CANCEL,REFER,SUBSCRIBE,NOTIFY,UPDATE,OPTIONS,MESSAGE,FEATURE
        k: path
        Expires: 3600
        User-Agent: 3Com VCX 7210 IP CallProcessor/v7.1.42
        Content-Length: 0
```

Frame 7 (650 bytes on wire, 650 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.794411000
    [Time delta from previous packet: 0.001016000 seconds]
    [Time since reference or first frame: 0.097059000 seconds]
    Frame Number: 7
    Packet Length: 650 bytes
    Capture Length: 650 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Ibm_22:1a:1c (00:11:25:22:1a:1c), Dst: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
    Destination: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.204 (192.168.104.204), Dst: 192.168.104.246 (192.168.104.246)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00)
        1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 636
    Identification: 0x0000 (0)
    Flags: 0x04 (Don't Fragment)
        0... = Reserved bit: Not set
        .1.. = Don't fragment: Set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (0x11)
    Header checksum: 0xe4a5 [correct]
        [Good: True]
        [Bad : False]
```

```
    Source: 192.168.104.204 (192.168.104.204)
    Destination: 192.168.104.246 (192.168.104.246)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 616
    Checksum: 0x5be0 [correct]
Session Initiation Protocol
    Request-Line: NOTIFY sip:341@192.168.104.246:5060 SIP/2.0
        Method: NOTIFY
        [Resent Packet: False]
    Message Header
        v: SIP/2.0/UDP 192.168.104.204;branch=z9hG4bK8011f557-220d-dc11-887a-b53b2d69a9ca
            Transport: UDP
            Sent-by Address: 192.168.104.204
            Branch: z9hG4bK8011f557-220d-dc11-887a-b53b2d69a9ca
        f: <sip:192.168.104.204>;tag=b3e667d4
            SIP from address: sip:192.168.104.204
            SIP tag: b3e667d4
        t: <sip:341@192.168.104.204>
            SIP to address: sip:341@192.168.104.204
        i: 80b690e7-750c-dc11-a771-d53e931519da
        Cseq: 51 NOTIFY
            Sequence Number: 51
            Method: NOTIFY
        Timestamp: 1180533007
        Date: Wed, 30 May 2007 13:50:07 GMT
        Max-Forwards: 70
        m: <sip:3ComCallProcessor@192.168.104.204>
            Contact Binding: <sip:3ComCallProcessor@192.168.104.204>
                URI: <sip:3ComCallProcessor@192.168.104.204>
                    SIP contact address: sip:3ComCallProcessor@192.168.104.204
        Event: message-summary
        User-Agent: 3Com VCX 7210 IP CallProcessor/v7.1.42
        Subscription-State: active;expires=3600
        c: application/simple-message-summary
        Content-Length: 66
    Message body
        Messages-Waiting: no\r\n
        Message-Account: sip:341@192.168.104.204\r\n
        \r\n
```

Frame 8 (649 bytes on wire, 649 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.821276000
    [Time delta from previous packet: 0.026865000 seconds]
    [Time since reference or first frame: 0.123924000 seconds]
    Frame Number: 8
    Packet Length: 649 bytes
    Capture Length: 649 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17), Dst: Ibm_22:1a:1c (00:11:25:22:1a:1c)
    Destination: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.246 (192.168.104.246), Dst: 192.168.104.204 (192.168.104.204)
```

```
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00)
        1100 00.. = Differentiated Services Codepoint: Class Selector 6 (0x30)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 635
    Identification: 0x0002 (2)
    Flags: 0x00
        0... = Reserved bit: Not set
        .0.. = Don't fragment: Not set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 255
    Protocol: UDP (0x11)
    Header checksum: 0x659c [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.246 (192.168.104.246)
    Destination: 192.168.104.204 (192.168.104.204)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 615
    Checksum: 0x198c [correct]
Session Initiation Protocol
    Request-Line: SUBSCRIBE sip:341@192.168.104.204 SIP/2.0
        Method: SUBSCRIBE
        [Resent Packet: False]
    Message Header
        Via: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bK1970f9f3a5f432e4
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bK1970f9f3a5f432e4
        From: "3COM 341" <sip:341@192.168.104.204>;tag=4095e80fe1fe02eb
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: 4095e80fe1fe02eb
        To: <sip:341@192.168.104.204>
            SIP to address: sip:341@192.168.104.204
        Contact: <sip:341@192.168.104.246:5060;transport=udp>
            Contact Binding: <sip:341@192.168.104.246:5060;transport=udp>
                URI: <sip:341@192.168.104.246:5060;transport=udp>
                    SIP contact address: sip:341@192.168.104.246:5060
        Supported: eventlist, path
        Call-ID: c3343d56b4d8503f@192.168.104.246
        CSeq: 1001 SUBSCRIBE
            Sequence Number: 1001
            Method: SUBSCRIBE
        User-Agent: Grandstream GXP2020 1.1.4.6
        Max-Forwards: 70
        Allow: INVITE,ACK,CANCEL,BYE,NOTIFY,REFER,OPTIONS,INFO,SUBSCRIBE,UPDATE,PRACK,MESSAGE
        Event: message-summary
        Expires: 3600
        Accept: application/simple-message-summary
        Content-Length: 0
```

Frame 9 (325 bytes on wire, 325 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.822030000
    [Time delta from previous packet: 0.000754000 seconds]
    [Time since reference or first frame: 0.124678000 seconds]
    Frame Number: 9
    Packet Length: 325 bytes
```

Blue

```
    Capture Length: 325 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Ibm_22:1a:1c (00:11:25:22:1a:1c), Dst: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
    Destination: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.204 (192.168.104.204), Dst: 192.168.104.246 (192.168.104.246)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00)
        1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 311
    Identification: 0x0000 (0)
    Flags: 0x04 (Don't Fragment)
        0... = Reserved bit: Not set
        .1.. = Don't fragment: Set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (0x11)
    Header checksum: 0xe5ea [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.204 (192.168.104.204)
    Destination: 192.168.104.246 (192.168.104.246)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 291
    Checksum: 0x716a [correct]
Session Initiation Protocol
    Status-Line: SIP/2.0 100 Trying
        Status-Code: 100
        [Resent Packet: False]
    Message Header
        v: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bK1970f9f3a5f432e4
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bK1970f9f3a5f432e4
        f: "3COM 341"<sip:341@192.168.104.204>;tag=4095e80fe1fe02eb
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: 4095e80fe1fe02eb
        t: <sip:341@192.168.104.204>
            SIP to address: sip:341@192.168.104.204
        i: c3343d56b4d8503f@192.168.104.246
        Cseq: 1001 SUBSCRIBE
            Sequence Number: 1001
            Method: SUBSCRIBE
        Date: Wed, 30 May 2007 13:50:07 GMT
        Content-Length: 0
```

Blue

```
Frame 10 (573 bytes on wire, 573 bytes captured)
    Arrival Time: May 30, 2007 10:51:19.822956000
    [Time delta from previous packet: 0.000926000 seconds]
    [Time since reference or first frame: 0.125604000 seconds]
    Frame Number: 10
    Packet Length: 573 bytes
    Capture Length: 573 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Ibm_22:1a:1c (00:11:25:22:1a:1c), Dst: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
    Destination: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.204 (192.168.104.204), Dst: 192.168.104.246 (192.168.104.246)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00)
        1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 559
    Identification: 0x0000 (0)
    Flags: 0x04 (Don't Fragment)
        0... = Reserved bit: Not set
        .1.. = Don't fragment: Set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (0x11)
    Header checksum: 0xe4f2 [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.204 (192.168.104.204)
    Destination: 192.168.104.246 (192.168.104.246)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 539
    Checksum: 0x934a [correct]
Session Initiation Protocol
    Status-Line: SIP/2.0 200 OK
        Status-Code: 200
        [Resent Packet: False]
    Message Header
        v: SIP/2.0/UDP 192.168.104.246:5060;branch=z9hG4bK1970f9f3a5f432e4
            Transport: UDP
            Sent-by Address: 192.168.104.246
            Sent-by port: 5060
            Branch: z9hG4bK1970f9f3a5f432e4
        f: "3COM 341"<sip:341@192.168.104.204>;tag=4095e80fe1fe02eb
            SIP Display info: "3COM 341"
            SIP from address: sip:341@192.168.104.204
            SIP tag: 4095e80fe1fe02eb
        t: <sip:341@192.168.104.204>;tag=b3e36d3c
            SIP to address: sip:341@192.168.104.204
            SIP tag: b3e36d3c
```

```
        i: c3343d56b4d8503f@192.168.104.246
        Cseq: 1001 SUBSCRIBE
            Sequence Number: 1001
            Method: SUBSCRIBE
        Date: Wed, 30 May 2007 13:50:07 GMT
        m: <sip:3ComCallProcessor@192.168.104.204>
            Contact Binding: <sip:3ComCallProcessor@192.168.104.204>
                URI: <sip:3ComCallProcessor@192.168.104.204>
                    SIP contact address: sip:3ComCallProcessor@192.168.104.204
        Allow: INVITE,ACK,BYE,CANCEL,REFER,SUBSCRIBE,NOTIFY,UPDATE,OPTIONS,MESSAGE,FEATURE
        k: eventlist, path
        Expires: 3600
        Event: message-summary
        User-Agent: 3Com VCX 7210 IP CallProcessor/v7.1.42
        Content-Length: 0
```

Frame 11 (533 bytes on wire, 533 bytes captured)

```
    Arrival Time: May 30, 2007 10:51:19.843818000
    [Time delta from previous packet: 0.020862000 seconds]
    [Time since reference or first frame: 0.146466000 seconds]
    Frame Number: 11
    Packet Length: 533 bytes
    Capture Length: 533 bytes
    [Frame is marked: False]
    [Protocols in frame: eth:ip:udp:sip]
    [Coloring Rule Name: UDP]
    [Coloring Rule String: udp]
Ethernet II, Src: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17), Dst: Ibm_22:1a:1c (00:11:25:22:1a:1c)
    Destination: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        Address: Ibm_22:1a:1c (00:11:25:22:1a:1c)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Source: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        Address: Grandstr_0e:e1:17 (00:0b:82:0e:e1:17)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    Type: IP (0x0800)
Internet Protocol, Src: 192.168.104.246 (192.168.104.246), Dst: 192.168.104.204 (192.168.104.204)
    Version: 4
    Header length: 20 bytes
    Differentiated Services Field: 0xc0 (DSCP 0x30: Class Selector 6; ECN: 0x00)
        1100 00.. = Differentiated Services Codepoint: Class Selector 6 (0x30)
        .... ..0. = ECN-Capable Transport (ECT): 0
        .... ...0 = ECN-CE: 0
    Total Length: 519
    Identification: 0x0003 (3)
    Flags: 0x00
        0... = Reserved bit: Not set
        .0.. = Don't fragment: Not set
        ..0. = More fragments: Not set
    Fragment offset: 0
    Time to live: 255
    Protocol: UDP (0x11)
    Header checksum: 0x660f [correct]
        [Good: True]
        [Bad : False]
    Source: 192.168.104.246 (192.168.104.246)
    Destination: 192.168.104.204 (192.168.104.204)
User Datagram Protocol, Src Port: 5060 (5060), Dst Port: 5060 (5060)
    Source port: 5060 (5060)
    Destination port: 5060 (5060)
    Length: 499
    Checksum: 0x12f9 [correct]
Session Initiation Protocol
```

Blue

```
    Status-Line: SIP/2.0 200 OK
        Status-Code: 200
        [Resent Packet: False]
    Message Header
        Via: SIP/2.0/UDP 192.168.104.204;branch=z9hG4bK8011f557-220d-dc11-887a-b53b2d69a9ca
            Transport: UDP
            Sent-by Address: 192.168.104.204
            Branch: z9hG4bK8011f557-220d-dc11-887a-b53b2d69a9ca
        From: <sip:192.168.104.204>;tag=b3e667d4
            SIP from address: sip:192.168.104.204
            SIP tag: b3e667d4
        To: <sip:341@192.168.104.204>;tag=06e5defe37feec1f
            SIP to address: sip:341@192.168.104.204
            SIP tag: 06e5defe37feec1f
        Call-ID: 80b690e7-750c-dc11-a771-d53e931519da
        CSeq: 51 NOTIFY
            Sequence Number: 51
            Method: NOTIFY
        User-Agent: Grandstream GXP2020 1.1.4.6
        Contact: <sip:341@192.168.104.246:5060;transport=udp>
            Contact Binding: <sip:341@192.168.104.246:5060;transport=udp>
                URI: <sip:341@192.168.104.246:5060;transport=udp>
                    SIP contact address: sip:341@192.168.104.246:5060
        Allow: INVITE,ACK,CANCEL,BYE,NOTIFY,REFER,OPTIONS,INFO,SUBSCRIBE,UPDATE,PRACK,MESSAGE
        Supported: replaces, timer
        Content-Length: 0
```