

NBN Co Fibre Access Service

UNI-V FUNCTIONAL SPECIFICATION – SECOND RELEASE

2-MARCH29 August 2012



This document forms part ~~of version 1.0~~ of NBN Co's Wholesale Broadband Agreement which is a Standard Form of Access Agreement for the purposes of Part XIC of the Competition and Consumer Act 2010.

NBN Co Limited

NBN Co Fibre Access Service – UNI-V Functional Specification – Second Release

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1. NFAS Telephony Service overview

The NBN Co Fibre Access Service (NFAS) has been designed to support the provision of telephony services by access ~~seekers~~seeker to ~~end-users~~End Users using the UNI-V. The UNI-V has been designed to support carrier grade PSTN equivalent telephony services for the support of complex services by access ~~seekers~~seeker to ~~end-users~~End Users, such as security/medical alarms, fax, EFT, TTY and other voice band data services. ~~It should be noted that the~~The features and functions of the UNI-V have been developed with industry, in the context of current Australian Customer Premises Equipment (CPE) standards.

This approach has been adopted to seek to maximize the extent to which current CPE will interoperate with the UNI-V. ~~It should be noted however that~~However, there may be existing CPE (such as certain legacy equipment) which may not interoperate with the UNI-V. NBN Co is continuing to work with industry on these aspects.

If access ~~seekers~~seeker wishes to provide telephony services (including IP connectivity, signalling and media traffic) to ~~their end-users~~its End Users using the NFAS and UNI-V, access ~~seekers~~seeker will need to acquire and utilise the following product components of the NFAS:

- Network to Network Interface (NNI)
- N:1 Traffic Class 1 Connectivity Virtual Circuit (CVC)
- ~~UNI-D and associated~~ Access Virtual Circuit (AVC)
- UNI-V ~~and associated AVC~~ on the Network ~~Terminal~~Termination Device (NTD)

Where utilised in accordance with the terms of the Wholesale Broadband Agreement, the UNI-V will terminate telephony signalling protocols and functions.

NBN Co has designed traffic handling mechanisms that are tailored toward specific applications. Within the NBN Co ~~network~~Network, Traffic Class 1 is designed to accommodate the deterministic performance required for real-time, conversational applications including telephony services. Capacity within this traffic class is available to access ~~seekers~~seeker via the dedicated AVC that terminates on the UNI-V ~~interface~~ and on the corresponding CVC, ~~ensuring~~facilitating a high quality telephony service experience for ~~end-users~~End Users.

When using the UNI-V, ~~an~~ access seeker utilises the Analogue Telephony Adaptor (ATA) port that is in-built into the NTD, with integrated Session Initiated Protocol (SIP) capabilities for legacy telephony applications. A range of configuration options are available to enable ~~an~~ access seeker to migrate an existing telephony service, and deliver a PSTN-similar telephony service to the UNI-V port of an NTD installed in respect of the ~~end-user's premises~~End User's Premises with minimal impact to in-building wiring or equipment installed at the end user's premises.

Alternatively Access seeker may provide telephony services to End Users using the UNI-D on the NTD. This requires access seeker to provide its own ATA. The scope of this document does not pertain to this service construct. Please refer to the Product Technical Specification.

1.1. Feature support and Roadmap Overview

In the second release of the NBN Co Fibre Access Service UNI-V, there are changes to capability and characteristics of the UNI-V from the first release of the UNI-V. These changes affect how access seeker delivers an IP telephony service to its End Users. As further described in this document, NBN Co will migrate the configuration and interfacing methods of each UNI-V from the first release methods to a TR-069 based solution which utilises access seeker's own Auto Configuration Server (ACS) for the configuration of the UNI-V.

The second release of the UNI-V has, or can support, the following features and capabilities:

- Quality of Service (QoS) support for TC 1 traffic class As described in the Product Technical Specification for the NFAS
- connection to a dedicated AVC per UNI-V
- SIP signalling with RTP stream
- Single SIP UA
- A single RJ11C interface
- G.711 A law companding codec
- 20ms packetisation rate
- TN12 complex impedance support
- Configurable Dial Plan with support for emergency numbers (000/106)
- Voice features
 - Softswitch features such as call forwarding (Busy, No answer and Unconditional)
 - Call hold
 - Call Waiting
 - Suspend Call Waiting
 - Hotline immediate
 - Distinctive ring cadences
- Voice band data using G.711A clear channel
 - Fax up to 9.6 kilobits per second
 - Modem up to 14.4 kilobits per second
 - TTY support
 - Tone detection for the suppression of echo cancellation and Comfort Noise Generation
- Calling Line Identification Presentation (CLIP)
- Calling Line Identification Restriction (CLIR)

- [Calling Number Display](#)
- [Message Wait Indication \(MWI\)](#)
 - [Visual indicator](#)
 - [Audible Stutter Tone](#)
- [Ringer Equivalence Number \(REN\) of up to 3 per UNI-V](#)
- [DTMF Tone in-band pass through](#)
- [Line voltage break of less than one minute during reboots and upgrades](#)
- [Metallic Line Test](#)
- [Battery backup as described in the Product Description for the NFAS](#)
- [Dial Plan up to 1024 characters](#)
- [Additional speed tiers for CVC TC 1 Data Transfer Rates](#)
- [Support for TR-069 standard implementation to allow access seeker's ACS to provision the SIP UAs and replaces the UNI-V first release DHCP/FTP configuration file delivery method subject to the migration provisions set out in section 4 and the Product Technical Specification for NFAS](#)
- [Support of TR-104 standard as the data model format for telephony parameter configuration and will replace the UNI-V first release XML file configuration subject to the migration provisions set out in section 4 and the Product Technical Specification for NFAS](#)

[It is intended that the following additional features will be supported in future releases of the UNI-V \(which is intended to be offered as a product feature of the NFAS\):](#)

- [Dual SIP UAs](#)
- [Two UNI-V interfaces](#)
- [RTCP](#)

1.1.1.2. Scope

This document applies in respect of the ~~first~~[second](#) release of the UNI-V features and capabilities only.

This document does not apply to the UNI-V deployed in the Tasmania Tri-Area Service zone.

This document describes the interface specification for the NFAS telephony services at the NNI and UNI-V ~~interfaces~~. It does not apply in respect of NBN Co services other than the NFAS.

Section 20 describes the ~~layer~~[UNI-V solution, Layer 2 and layer 3](#) connectivity at the NNI and ~~the relevant~~ bandwidth requirements.

Section 3~~2~~ describes the UNI-V ~~in more details~~.

[network connectivity including DHCP negotiation.](#)

Section 3 and 4 ~~describes details of how each UNI-V will be migrated from first release functionality to the second release functionality described in this UNI-V Functional Specification.~~

Sections 5, 6 and 7 describe the [TR-069 \(TR-098/TR-104\) implementation](#) characteristics and operation ~~of the UNI-V interface at the end users' premises, such as the physical and logical interface characteristics and the SIP client design, including telephony features, covering details use case~~

~~scenarios and supported and SIP configuration requirements to allow telephony connectivity between access seekers and their end-users.~~

~~Sections 5, 6 and 7 diagnostic parameters.~~

~~Sections 8 and 9~~ describe the call features supported, the SIP client configuration and the expected SIP flows between the UNI-V ~~interface~~ and ~~the~~ access seeker's softswitch.

~~Section 10 describes TR-098 and TR-104 parameter configuration.~~

This document is intended to provide a technical guide on the functional specification of the UNI-V to access ~~seekers that have signed, or intend to sign, the Wholesale Broadband Agreement.~~seeker.
This document should be read in conjunction with:

- the NFAS Product Technical Specification; and
- the UNI-V Electrical Specification.

Except for explicit statements to the contrary, this technical specification does not exclude the need to satisfy the requirements of other Australian technical standards and/or other NBN Co technical requirements.

1.2.1.3. Purpose

The purpose of this document is to specify the capabilities and characteristics of the UNI-V and NNI interfaces that access seekers interface with to deliver their IP telephony service to their end users.

This document discusses the design principles for each of the interfaces:

- the UNI-V ~~interface~~ in regards to the ~~physical and~~ logical interface characteristics and the SIP client design including telephony features supported and SIP configuration requirements to allow telephony connectivity between access seekers and their end-users; and
- The NNI ~~interface~~ in regards to layer 2, layer 3 and bandwidth requirements.
- ~~_____The TR-069 solution supported on the NTD in relation to the UNI-V, which describes the~~
UNI-V CPE WAN Management Protocol (CWMP) client and its support for TR-069 data model extensions.

1.3.1.4. Intended Audience

This document is intended to be used by access seekers that wish to utilise the UNI-V for the provision of voice or voice band data telephony services to an end user.

~~1.4. NFAS Product Description~~

1.5. Relevant Documents

This document is to be read subject to the latest ~~version~~versions of:

- ~~the NFAS Product Description;~~
- the NFAS Product Technical Specification; and

- the UNI-V Electrical Specification.

If there is any inconsistency between this document and ~~the NFAS Product Description, the NFAS Product Description will prevail to any of the extent necessary to resolve above documents, then~~ that inconsistency will be resolved by giving precedence to documents in the order listed, with this document and the UNI-V Electrical Specification to be given equal precedence.

1.5.1.6. Definitions

The table in section 11 sets out the meaning of certain words, acronyms and abbreviations that are used throughout this document.

Any capitalised words used throughout this document that are not defined in section 11 have the ordinary meaning commonly accepted in the industry.

References to an access seeker will be read as a reference to athe Customer for the purposes of the Wholesale Broadband Agreement.

2. Solution Overview

Delivery of telephony services to the UNI-V utilises an IPoE service model where DHCP is used for direct allocation of an IP address ~~to the NTD installed in respect of the end user's premises. The basic IP carriage will be delivered on the N:1 CVC construct, but with the addition of XML configuration file download information in the DHCP response from the access seeker. This includes the IP address of the XML configuration file download server and the routing information required to reach the server in respect of a UNI-V to the NTD installed at an End User Premises.~~

~~The XML configuration file downloaded contains additional SIP configuration information, such as the username/password of the SIP service, the SIP server details, the dial plan, etc. Once the XML configuration file is downloaded to the NTD in respect of the UNI-V, it will attempt to contact the specified access-seeker SIP server, which will reside in the access seeker's network.~~

~~The NTD SIP client is expected to control the analogue states of the UNI-V, detect and process dialling, generate tones and Caller ID FSK transmissions, while signalling with the softswitch to control the phone call, and establish/tear down the RTP bearer channel associated with the voice path.~~

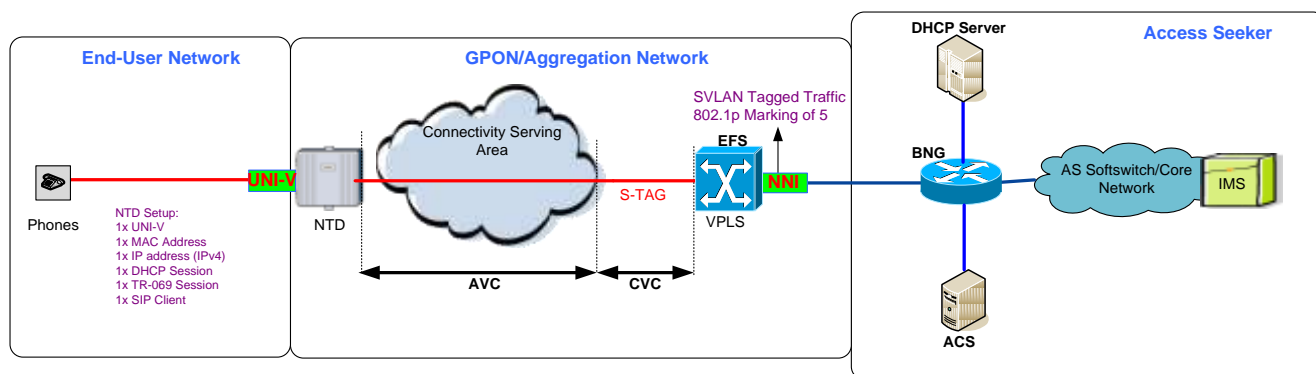


Figure 1 - End-to-End Telephony Service Overview

The UNI-V will provide the following capabilities:

- Unique MAC address
- IP address
- SIP User Agent (UA)
- Dedicated DHCP session
- Dedicated TR-069 session to communicate to access seeker's ACS
- TR-104 object model for voice service provisioning

2.1. UNI-V Contextual Overview

Each UNI-V is located on an NTD as described in the Product Description for the NFAS and the Product Technical Specification for the NFAS. The following characteristics of the NTD are relevant to understanding the functional operation of each UNI-V:

- NTDs have two integrated 2-wire interfaces visible to the End User, but only one of these interfaces is enabled to provide a UNI-V orderable by access seeker. It is currently NBN Co's intention that the second UNI-V 2-wire interface and its configuration will be enabled and made available at a future date, at which time it will be possible for NBN Co to support two UNI-Vs and offer dual SIP UAs. This will also provide the capability to allow two access seekers to offer telephony services to the same NTD.
- Each UNI-V may only be used by access seeker for the purpose of transmitting voice and data traffic in the voice band.
- Each UNI-V supports residential POTS telephones.
- Each UNI-V supports 0.3-3.4kHz audio, with an R-Value in the range 80-93, when used with the G.711 codec.

2.2. UNI-V and PSTN Equivalence

The NFAS with a UNI-V Product Component utilising the G.711 A-Law codec (the same codec that is used for the Australian PSTN) is designed to facilitate access seeker using the NFAS to provide an End User with a service which the End User can use to replace a PSTN service in most common scenarios.

A PSTN service may carry telephony services such as dialup modems, fax machines, set-top boxes (with PSTN authentication), TTY and security/medical alarms. The End User may be unaware that some of these devices rely on an existing PSTN connection. NBN Co has not tested all devices that rely on a PSTN service. NBN Co implements the recommended settings in Table 1.

Parameter	G.711 A-Law codec
Voice Quality on local call (G.107 usable range 50-100)	80-93
PSTN-similar Voice Quality	Supported
Support fax/data calls	Supported

Table 1 - Recommendations for G.711

- The voice media bandwidth depends on the codec and packetisation rate.

Codec	Packetisation	Average media bandwidth (kbps)	PSTN-equivalent
G.711A-Law	20msec	101	Yes

Table 2 – G.711 overview

- For incoming calls, the UNI-V will use the packetisation interval offered in the INVITE for both the transmit and receive packetisation interval.

2.1.2.3. Disability Support

- The UNI-V supports the operation of an in-band TTY device.

2.1.1. — The UNI-V supports the use of a telephone in parallel with ~~Access Virtual Circuit~~. For the purpose of this document, an AVC is an Ethernet-based layer 2 virtual connection that carries traffic to a UNI-V on a NTD at a premises connected to the NBN Co fibre network. It has a fixed capacity of 150kbps/150kbps downstream/upstream Traffic Class 1 Committed Information Rate (CIR).

2.1.2. — Connectivity Virtual Circuit

For the purposes of this document, a CVC is an Ethernet-based, layer 2 virtual capacity on the NBN Co fibre network for the transport of access-seeker traffic from multiple AVCs within a Connectivity Serving Area on an aggregated basis and presented at the NNI at the Point of Interconnect (POI) associated with that connectivity serving area. At the time of publishing this document, it has a fixed capacity of 5/5 Mbps Traffic Class 1 CIR to support voice telephony. In the future, other symmetrical TC-1 CVC capacities will be made available.

(b) External TTY for VCO/HCO applications.

2.2.2.4. Network-Network Interface (NNI)

The NNI is a physical interface (and associated ports) between the NBN Co ~~fibre network~~ Fibre Network and ~~the~~ access seekers' network at the POI, as described in the Product Description for the NFAS and the Product Technical Specification for the NFAS.

2.2.1.2.4.1. Layer 2 Addressing Model

The NNI design principles relevant to use of the UNI-V are ~~described~~ as follows:

- NBN Co implements the N:1 forwarding model for telephony services delivered via the UNI-V.
 - At the NNI, ~~end-user~~End User traffic is presented and received as single-tagged 802.1Q (and 802.1ad) compliant frames. The S-TAG represents the CVC, and the individual AVC services are represented by the unique MAC address of the UNI-V.
- At the NNI, ~~the~~ access seeker must set the Service VLAN 802.1P PCP=5 for both signalling and media traffic (in accordance with further details of which are specified in the NFAS Product Technical Specification) before ingress to the NBN Co Network at the NNI. Mismatched or incorrectly set values will cause traffic to be discarded by the NBN Co ~~network~~Network. Please note that the signalling traffic includes protocols such as ARP, DHCP, DNS, ICMP and FTP.HTTP.
- At the NNI, all traffic will be mapped to PCP=5 before being forwarded to access seeker's network.
 - All ~~customer~~-service frames ~~exiting~~egressing the NBN Co Network at the NNI (i.e. from the NBN Co ~~network~~Network ~~to the~~ access seeker's network through the NNI at the POI) must traverse an IP device before being injected back into the NBN Co ~~network~~Network. This is necessary to avoid ~~NTD~~UNI-V MAC addresses from appearing as source addresses on traffic ingress to the NBN Co Network at the NNI. This operating restriction must be observed by ~~the~~ access seeker even if service frames are being switched between VLANs or forwarded via other service provider networks.
 - The Service VLAN ID value at the NNI will be configurable upon request by ~~the~~ access seeker, at the time the CVC is created.
 - Upstream DHCP traffic on an AVC will be marked with an AVC service identifier allocated by NBN Co. This will be inserted in the ~~DHCP~~DHCPv4 request (Option 82 Circuit ID) messages from the NBN Co Network OLT and can be used by ~~the~~ access seeker to authenticate the ~~subscriber~~End User and/or automatically instantiate ~~subscriber~~End User forwarding instances on ~~their~~its edge or BNG devices. The Circuit ID (option 82) set by NBN Co will provide the AVC identifier (format "AVCnnnnnnnnnnnn" where n = digit).
 - A unicast N:1 CVC and a unicast 1:1 CVC can coexist on the same NNI interface by using different S-TAG VID values to differentiate them. ~~The access seeker needs to ensure the MTU is 1500 bytes, as this will safely carry the largest SIP signalling packet.~~
 - Access seeker must ensure the layer 3 MTU size is 1500 bytes to safely carry the largest SIP signalling and TR-069 packets.
 - It is possible for an access seeker to order more than one CVC in a Connectivity Serving Area (CSA). Where this is the case, specific AVCs within that CSA must be carried in the CVC they were originally provisioned against.

- It is ~~the~~ access seeker's responsibility to provide Call Admission Control (**CAC**) on the CVC, so that the number of simultaneous calls does not exceed the capacity of the CVC, otherwise latency, jitter and frame loss will increase, impairing voice and data communications.

2.2.2. Layer 3 Addressing Model

The UNI-V has an IP stack facing the network with a single IP address for use with signalling, media and all management traffic. Once the UNI-V is activated, the UNI-V will send a DHCP discovery message across the NBN Co network as per RFC2131/RFC2132 to the access seeker's network.

During the UNI-V ordering process, the access seeker must specify the XML filename, FTP username and FTP password, on the portal/B2B order form. This information is sent to the UNI-V via NBN Co's management network.

When the UNI-V is activated, the internal ATA will send a DHCP discovery message to the access seeker's network.

It is expected that the access seeker network implement the following DHCP offer messages to the UNI-V:

- DHCP option 1, 3, 6, 51, 53, 54, 55 and 66. Any of the DHCP options will also include the UNI-V IP address. Note that DHCP option 66 will configure the UNI-V with the access seeker's FTP server address to enable the SIP XML configuration file to be downloaded.
- Once the XML configuration file is downloaded and activated, the NTD SIP client will send SIP registration requests to the access seeker's Registrar server to complete registration

The diagram below illustrates the DHCP flow between the UNI-V and the access seeker network to provision the UNI-V with an IP address, network mask and the access seeker's configuration server IP address.

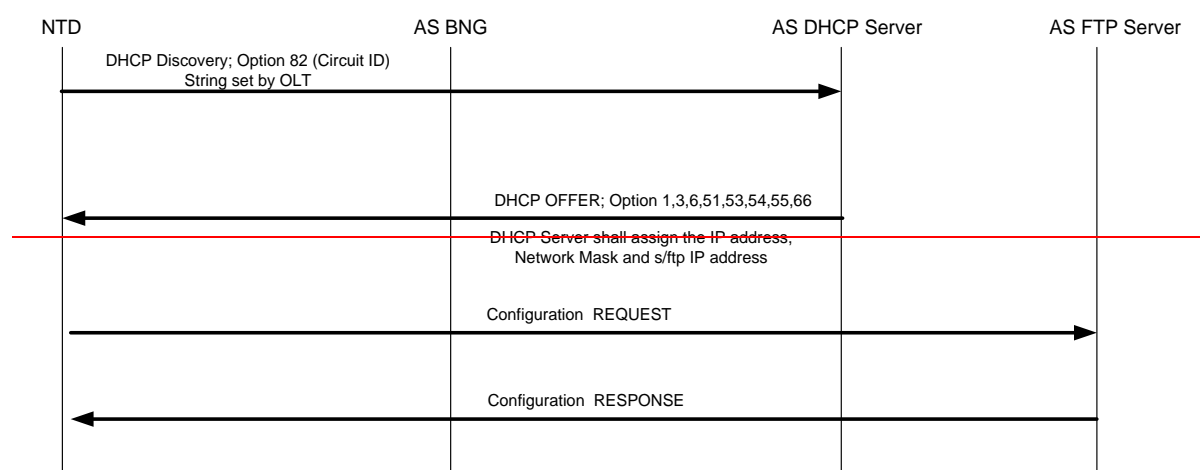


Figure 2 DHCP Flow between NTD and access seeker's DHCP/Configuration Servers

Please note that addresses in the range 192.168.1.0/24 and 192.168.2.0/24 are reserved for NTD internal use and must not be used as part of a VOIP service using the NTD UNI-V.

- Simultaneous frames from different calls may exceed the capacity of the CVC (e.g. as a result of traffic bursts) and hence affect media latency, jitter and frame loss impairing voice and data

communications. An Access Seeker can implement QoS policies within their network to minimise the effects of traffic bursts.

- TR-069 and SIP traffic are allocated Traffic Class 1 (TC-1) Data Transfer Rates. Therefore access seeker should consider TR-069 and SIP traffic (generating bursts) while voice calls are in progress on an AVC.

2.2.3.2.4.2. Bandwidth Distribution

The following are the traffic definitions, guidelines and principles of the bandwidth distribution intended to be provided by the NBN Co ~~network~~Network:

- TC~~__~~1 (802.1P PCP=5) is a high priority traffic class designed for applications that require low latency, jitter and frame delay. Recommended usage is voice and Voice Band Data (VBD).
- Each UNI-V is provisioned in conjunction with ~~ana~~ a minimum AVC bandwidth of ~~150kbps. In the first release of the~~ UNI-V, the NTD supports only one UNI-V. 150Kbps TC-1 (CIR) Data Transfer Rate. For example, if ~~an~~ access seeker supports 500 telephony ~~customers, they end users, it~~ will need to ~~purchase order~~ 500 UNI-V ~~AVCs and AVC Product Components.~~ ICMP echo (and any concurrent signalling e.g. SIP, RTP, DHCP, ARP, DNS and TR-069), when used as a connectivity test, will be subject to the traffic policing of the TC~~__~~1 traffic class service.
- ~~The TC~~__~~1 CVC TC-1 bandwidth is initially fixed at 5Mbps. In subsequent product releases, it is intended (that access seekers will be able to select other tiers of TC~~__~~1 CVC bandwidth to purchase.~~
- ~~Each CVC will aggregate aggregates the AVC TC~~__~~1 UNI-V traffic. TC~~__~~1 traffic class provides a committed level of capacity with no ability to burst above its assigned CIR. TC~~__~~1 is implemented as CIR only at both AVC and CVC level) can be purchased in the increments set out in the WBA Product Catalogue.~~
- On the downstream from the access seeker network towards the NBN Co network, it is recommended that access seekers implement Call Admission Control (CAC) function to determine the amount of bandwidth available weighed against the amount of bandwidth currently in use to be able to control the number of telephony sessions based upon sufficient bandwidth being available. Ongoing capacity management of the orderable components (such as AVC, CVC and NNI) is the responsibility of ~~the~~ access seeker.
- The NBN Co ~~network~~Network will police and drop any access seeker traffic from the access seekers that ~~exceed the exceeds ordered~~ CVC and AVC bandwidth ~~purchased.~~

2.2.4.2.4.3. Security Constraints

At the application level, telephony services offered are transported using transparent OSI layer 2 services and as such, with respect to the UNI-V and the NNI ~~interfaces~~, there are no specific access ~~seeker's~~seeker security constraints.

~~The solution design prevents IP communication directly between NTDs. The solution design prevents IP communication directly between NTDs.~~ All IP traffic from a UNI-V will need to traverse ~~the~~ access seeker's NNI and layer 3 devices before reaching another UNI-V.

3. NTD UNI-V Overview

Indoor and outdoor NTDs that are used in connection with the supply of the NFAS will offer the following functionality:

- Indoor and outdoor NTDs will have two UNI-V interfaces on the end-user side, but only one of these UNI-V interfaces will initially be enabled and available for use by access seekers. It is NBN Co's intention that the second UNI-V port that is not originally enabled or available will be enabled and made available at a future date, at which time it will be possible for NBN Co to support dual SIP user agents (UAs). This will also provide the capability to allow two access seekers to offer telephony services to the same NTD.
- The UNI-V has an integrated ATA port. The UNI-V may only be used by access seekers for the exclusive purpose of delivering telephony services.
- The UNI-V interface supports residential POTS telephones.
- In the current product release, one SIP UA is supported on each NTD.
- NTDs support 0.3-3.4kHz audio, with an R-Value in the range 80-93, when used with G.711 codec.
- NTDs will provide an inter-working function from the analogue UNI-V interface into VoIP using SIP signalling protocol.
- Only IPv4-based SIP services are initially provided on the UNI-V interface. It is intended that IPv6-based SIP services will be supported by the UNI-V in the future.

3.1. ~~UNI-V Roadmap Overview~~

The first release of the UNI-V (which is offered as a product feature of NFAS) has the following features and capabilities:

- ~~Quality of Service (QoS) support for TC1 traffic class~~
- ~~Separate AVC per UNI-V within the NBN Co network~~
- ~~SIP signalling with RTP stream~~
- ~~Single SIP UA~~
- ~~Single RJ11C interface~~
- ~~G.711 A law companding codec~~
- ~~20ms packetisation rate~~
- ~~TN12 complex impedance support~~
- ~~XML will initiate a TR-069 configuration file via the request to the ACS with the HTTP password being hashed using the MD5 algorithm. However, when access seeker's FTP server~~
- ~~Configurable Dial Plan with support for emergency numbers (000/106)~~
- ~~Voice features~~
 - ~~Softswitch features such as call forwarding (Busy, No answer and Unconditional)~~
 - ~~Call hold~~
 - ~~Call Waiting~~
 - ~~Suspend Call Waiting~~
 - ~~Hotline immediate~~
 - ~~Distinctive ring cadences~~
- ~~Voice band data using G.711A clear channel~~
 - ~~Fax up to 9.6 kilobits per second~~
 - ~~Modem up to 14.4 kilobits per second~~
 - ~~TTY support~~
 - ~~Tone detection for the suppression of echo cancellation and Comfort Noise Generation~~
- ~~Calling Line Identification Presentation (CLIP)~~
- ~~Calling Line Identification Restriction (CLIR)~~
- ~~Calling Number Display~~
- ~~Message Wait Indication (MWI)~~
 - ~~Visual indicator~~
 - ~~Audible Stutter Tone~~
- ~~Ring Equivalence Number (REN) of up to 3 per UNI-V~~
- ~~DTMF Tone in band pass through~~
- ~~Line voltage break of less than one minute during reboots and upgrades~~
- ~~Metallic Line Test~~
- ~~Battery backup~~

It is intended that the following additional features will be supported in future releases of the UNI-V (which is intended to be offered as a product feature of the NFAS):

- ~~Dual SIP UAs~~
- ~~Two UNI-V interfaces~~
- ~~RTCP~~
- ~~Support for TR-069 standard implementation. ACS initiates a TR-069 will allow access seeker's Auto-Configuration Server (ACS) to provision the SIP UAs and would replace the DHCP/FTP configuration file delivery method.~~
- ~~Support of TR-104 standard as the data model format for telephony parameter configuration and would replace the XML file configuration.~~
- ~~Additional TC_1 traffic class speed tiers~~
- ~~Dial Plan up to 1024 characters~~

4. session with a UNI-V Physical Specification

This section describes the physical characteristics and operation of the UNI-V interface at will authenticate the end-user's premises.

Please note that, where applicable, references to the "Communications Alliance AS/CA S003.1:2010 Customer Access Equipment for connection to ACS with a Telecommunications Network" standard are assuming an "on-premises" local port.

4.1. Physical Interface Specification

There are two UNI-V interface ports on each NFAS NTD, but for the first release of the UNI-V, only the first UNI-V interface port is enabled for the delivery of telephony services. For more information, please see section 3.

The NTD has a miniature 6-position jack (as specified in section 6.1.1.2 of ANSI/TIA 968-A (2002)) for each of the UNI-V interfaces. The UNI-V interface jacks are wired according to RJ11C (as specified in section 6.2.2 of ANSI/TIA 968-A (2002)).

Outdoor NTDs have screw-down connections for each of the UNI-V ports. The screw-down connections are wired to the RJ11 jacks by an adaptor cable.

The following table describes the UNI-V RJ11 jack pin-outs and the associated screw-down terminal colours. Additionally, the D.C. polarity for each of the connections is provided.

NTD-miniature-jack-pin	Contact designation	Outdoor-NTD (screw-down connection)	Idle-D.C.-polarity
1	N.C.	N/A	
2	N.C.		
3	R1	Blue	-
4	T1	White	+
5	N.C.	N/A	
6	N.C.		

Table 1 NTD UNI-V pin-out

The miniature 6-position plug (as specified in section 6.1.1.1 of ANSI/TIA 968-A (2002)) is recommended for termination at the NTD UNI-V port. This plug may be of the 6P2C, 6P4C or 6P6C variety.

Figure 3 illustrates the Indoor NTD UNI-V and UNI-D physical port layout:

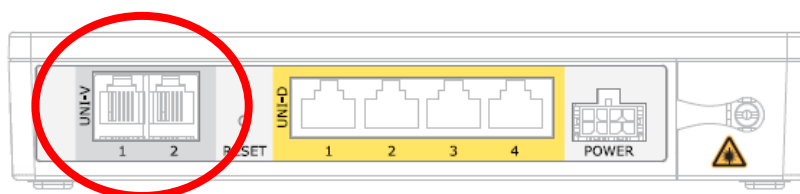


Figure 3 Indoor NTD port layout

Figure 4 below illustrates the Outdoor NTD UNI-V and UNI-D physical port layout:

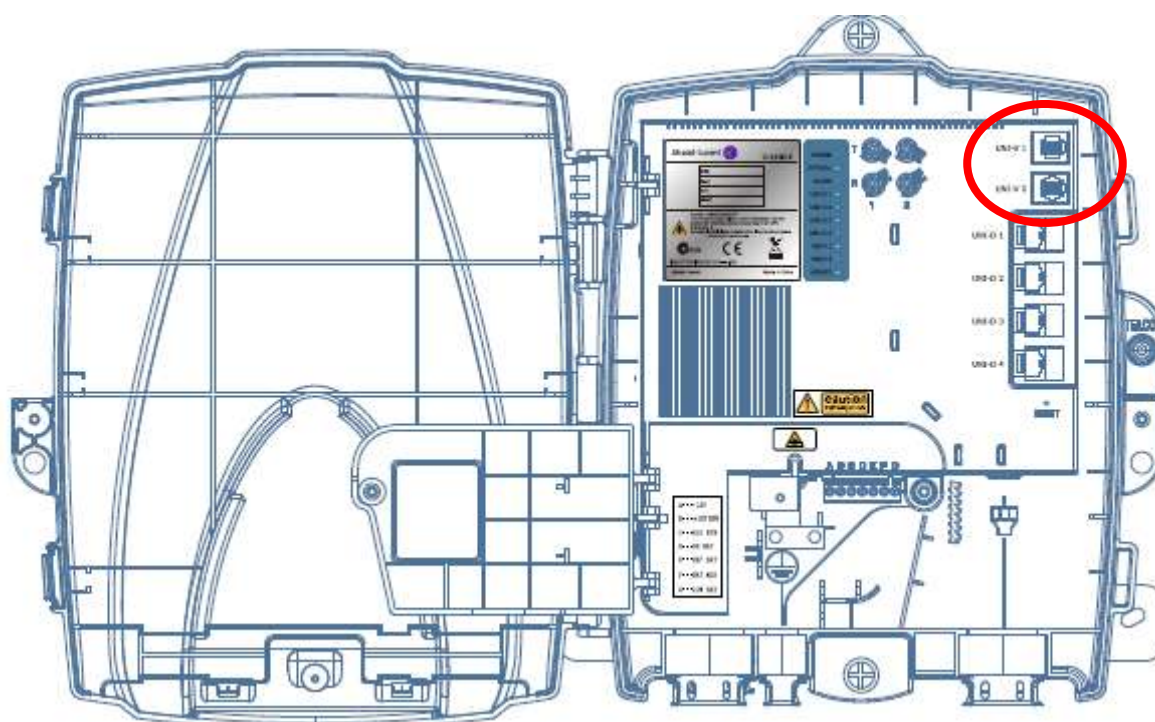


Figure 4 Outdoor NTD port layout



Figure 5 Outdoor NTD port layout – close up

4.2. Electrical Interface Specification

It should be noted that the features and functions of the UNI-V have been developed in the context of current CPE Standards. In relation to the UNI-V specifications, these standards include those referenced below. It is important to note that these are CPE and not network standards:

- “Communications Alliance AS/CA S003.1:2010, Requirements for Customer Access Equipment for connection to a Telecommunications Network – Part 1: General” standard
- “Communications Alliance AS/CA S003.3:2010, Requirements for Customer Access Equipment for connection to a Telecommunications Network – Part 3: Packet and cell based technologies” standard
- “Communications Alliance AS/CA S002:2010, Analogue interworking and non-interference requirements for Customer Equipment for connection to the PSTN” standards unless noted otherwise.

Parameter	Typical value	Standard value (Aust)	Notes / standards
Line feeding			
Loop-DC feeding voltage (on-hook Vdc)	42 Vdc to 56Vdc	N/A	
Loop feeding current	22mA (nom) 20 to 25mA	≥18mA	Ref: AS/CA S003.1:2010 5.3.2.2 (a) (ii)
Maximum loop resistance (off-hook)	700-ohm ¹	≥600-ohm 1200-ohm (rec.)	Ref: AS/CA S003.1:2010 5.3.2.2 (a) (i)
Impedance			
UNI-V Impedance [Zin]	220-ohm+(820 ohm//120nF)	220 ohm+(820 ohm//120nF)	Ref: AS/CA S003.1:2010 5.5.1.2, Table 4
Hybrid balance impedance [Zb]	220-ohm+(820 ohm//120nF)	220 ohm+(820 ohm//120nF)	Ref: AS/CA S003.1:2010 5.5.1.2, Table 4

Table 2 UNI-V Electrical Specifications

The total loop resistance capability for the UNI-V is 700 ohms. This, for example, would support typical phones with an off-hook resistance of less than 500 ohms (at 25mA) plus 150 ohms allowance for a series device plus 50 ohms allowance for home wiring (for example, 150m of 0.5mm diameter copper cable is approximately 25ohms) leaving a margin of approximately 25 ohms.

4.3. Line Signals

4.3.1. Ringing

Ring-signal characteristics	Value	Notes / standards
Frequency	25 Hz	Ref: AS/CA S003.1:2010 5.3.2.1 (a)
Ring Noise level	≤ 774 mV (psophometric)	Ref: AS/CA S003.1:2010 5.3.2.1 (b)
Ringing AC voltage	≥ 50 Vrms into 100 Ohm in-series with 3 REN	Ref: AS/CA S003.1:2010 5.3.2.1 (c)
Maximum number ringer equivalents ²	3 REN ¹	Ref: AS/CA S003.1:2010 5.3.2.1 (c)
Ringing Waveform	Sinusoidal	
Injection	Balanced	
DC Offset	18 \pm 2V	

Table 3 Line Signal Specifications

¹ Ringer equivalent: 4000 ohm + 1 μ F as per AS/CA S003.1:2010 5.3.2.1 (c).

² Measured at UNI-V while still meeting 50Vrms Ringing AC voltage requirement.

Ring Cadence sequence types 0,1,3,6 and 7 (as per AS/CA S002:2010 Appendix D2.4) are supported by the UNI-V. The following diagram describes the detail of the available Ring Cadences.

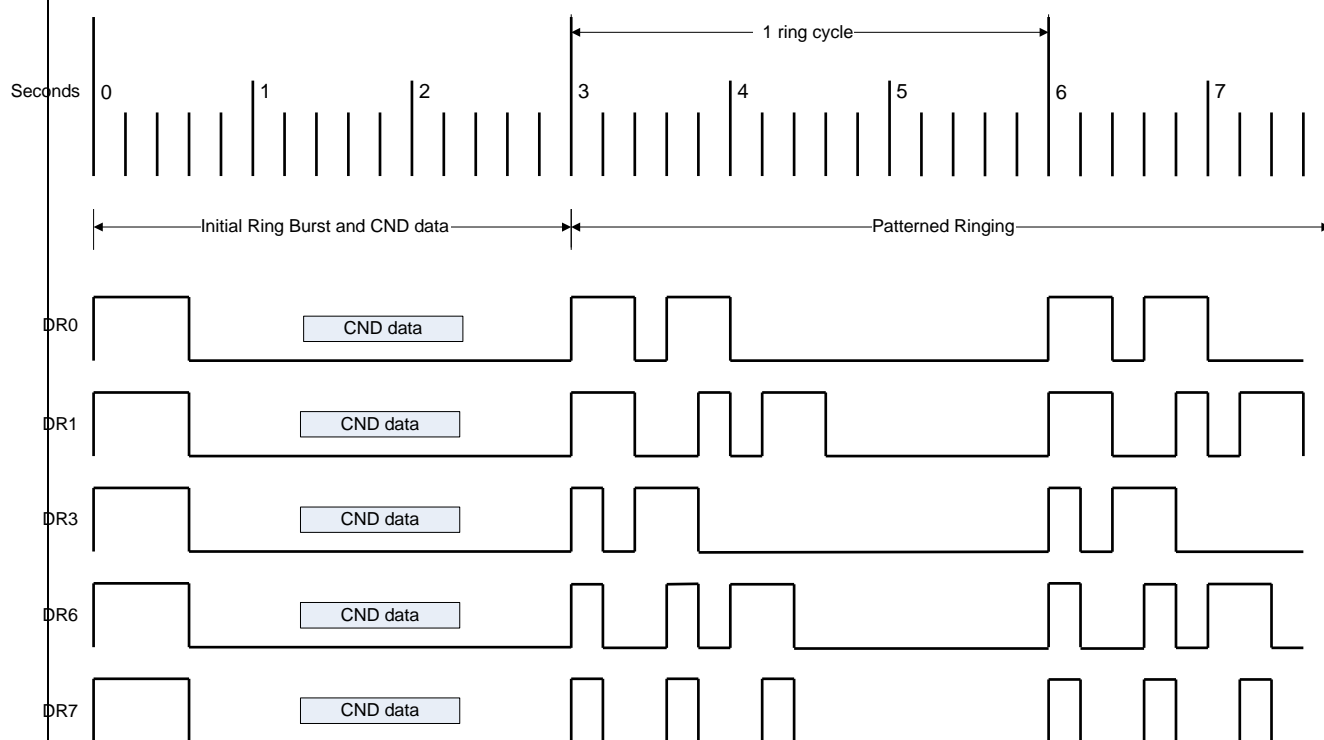


Figure 6 Supported Ring Cadences

When CND is enabled, there is an initial burst of Ringing for approximately 600ms followed by a period of up to 2300ms during which a burst of FSK signalling occurs and the requested cadence is initiated. Typically, the burst of FSK will be maintained for approximately 1000ms in duration. This will occur regardless if the network sends CND data or not.

4.3.2. Hook Signals

Loop-supervision characteristics	Value
Must seize current UNI-V transitions to off-hook state with currents greater than or equal to:	10mA \pm 1mA
Clear signal (threshold current) UNI-V transitions to on-hook state with currents less than or equal to:	8mA \pm 1mA

Z-Interface	Value	Standard value (Aust)	Notes / standards
Off hook minimum validation time	200-ms	\leq 300ms	Ref: AS/CA-S003.1:2010 5.3.2.2 (a) (i)
On hook minimum validation time (Register recall enabled)	400-ms	N/A	
Register recall	80–140ms	40ms to 140ms	Ref: AS/CA-S003.1:2010 5.3.2.4
Call priority	Originating	N/A	

Table 4 Hook Signal

4.4. Address Signals

4.4.1. DTMF Signals

DTMF-dialling	Value	Standard value (Aust)	Notes / standards
Supported digits	1234567890*#	1234567890*#ABCD	Ref: AS/CA-S002:2010 5.5.1.9 Table 5
Max DTMF signal	0dBm	-20dBm to 0dBm	Ref: AS/CA-S003.1:2010 5.3.3.2 (a) (ii)
Break	\geq 50ms	70ms	Ref: AS/CA-S003.1:2010 5.3.3.2 (a) (iii)
Valid tone signal	\geq 30ms	40ms	Ref: AS/CA-S003.1:2010 5.3.3.2 (a) (iv)
Maximum invalid tone duration	20ms	20ms	Ref: AS/CA-S003.1:2010 5.3.3.2 (b) (i)
Maximum invalid tone level (both frequencies)	-40dBm	-40dBm	Ref: AS/CA-S003.1:2010 5.3.3.2 (b) (ii)

Table 5 DTMF Signal Parameters

DTMF signals are carried in-band in the RTP using the G.711 A law codec.

4.4.2. Dial and Service Tones

The following Dial and Service Tones are available on the UNI-V.

The tones generated by the NBN Co NTD are designed to conform to those described in “AS/CA S002:2010 Appendix A, PSTN Service Tone Characteristics” for maximum compatibility with conformant (to AS/CA S002:2010) CPE.

Tone	Frequency/nominal approximate level	Cadence
Dial Tone	400Hz at -22.5dBm 425Hz at -22.5dBm 450Hz at -22.5dBm	Continuous for up to 12s
Ringing (Ringback) Tone	400Hz at -22.5dBm 425Hz at -22.5dBm 450Hz at -22.5dBm	On 400ms, Off 200ms, On 400ms, Off 2000ms, repeated
Special Dial Tone (message waiting)	400Hz at -22.5dBm 425Hz at -22.5dBm 450Hz at -22.5dBm	On 100ms, Off 40ms, repeated for up to 12s
Busy Tone (Disconnect* Tone)	425Hz at -16dBm	On 375ms, Off 375ms, repeated for up to 60s
Call Waiting Tone	425Hz at -16dBm	On 200ms, Off 200ms, On 200ms, Off 4400ms, repeated for up to 45s
Vacant /Number Unobtainable Tone	425Hz at -16dBm	On 2500ms, Off 500ms, repeated
Howler Tone	1500Hz -20dBm then 1500Hz -18dBm then 1600Hz -16dBm	The Howler Tone steps are presented for 1500ms at -20dBm then 1500ms at -18dBm then 15each and then 1500ms at -16dBm. This sequence is repeated for 60 seconds.

Table 6 Dial and Service Tone Specifications

* The busy Tone is presented when an incoming call is terminated by the originator.

The Dial Tone (or Special Dial Tone) is presented for 12s (+/- 0.5 seconds) or until a digit is pressed. If a digit is not pressed, the UNI-V presents the Busy Tone for sixty seconds before transitioning to Howler Tone for 60 seconds (+/- 1.0 second) followed by silence. The sequence is terminated if the user places the CPE in on-hook state.

Call Waiting is presented for up to 60 seconds (+/- 1.0 second) or until the calling (3rd) party terminates the call or the receiving party executes a recall sequence.

The levels in the table above are referenced at the nominal -3dB/-9dB gain settings and may not apply when gain is configured otherwise.

4.5.— Feature Signals

4.5.1.— Calling Number/Name Display

The UNI-V uses FSK signalling to convey the CND and other information to compatible CE.

CND signalling operates in one of two modes depending on whether the line is in “on-hook” or “off-hook” state. Each of the modes is described below.

Mode 1 On-Hook reception associated with an incoming call during Ringing

- Used for CND for a new incoming call when the line is “on-hook” (idle) state.
- CE receives information during the first long silent period between two Ringing patterns. A Ringing pattern may consist of one or more Ringing pulses separated by short silent periods (Ring Cadence).

Mode 4 Off-Hook reception during conversation phase of the call

- Used for CND during Call Waiting.
- The CE should be able to reliably detect the CPE Alerting Signal (**CAS**) in the presence of voice signals in accordance with the procedures specified in Telecordia GR-30 core [7].

The Multiple Data Message Format is used to convey the call setup message (and the Visual Message Waiting Indication).

The following table describes the supported message types:

Message-type	Value (Hexadecimal)
Call Setup	0x80
Message Waiting Notification	0x82

The following table describes the level of support for the standard parameter types:

Value (Hex)	Meaning	Supported
0x01	Parameter Type—Date and Time	No
0x02	Parameter Type—Calling Number	Yes
0x07	Parameter Type—Calling Name	Yes
0x0B	Parameter Type—Visual Indicator	Yes

4.5.2. Visual Message Waiting Indication

The UNI-V can also convey the Visual Message Waiting Indication status using the FSK signalling and message format described above. There is a special message type reserved for this purpose and is conveyed when the line is in the “on-hook” state.

4.6. Fax and Modem Support

This section describes the capabilities and behaviours on the NTD UNI-V port for the carriage of facsimile and VBD services.

It should be noted that the performance of these services is also very much dependent on the performance of the end-to-end telephony connection. In particular, the negotiated (and renegotiated) sync rates and stability of any connection will be dependent on the performance of the end-to-end connection and the capabilities and behaviours of the modems themselves.

The UNI-V may be capable of sustaining fax and modem speeds in excess of those listed in this section.

4.6.1. VBD triggers

VBD mode is triggered upon detection of any of the following tones:

Trigger	Freq.	Detection level	Notes
ANS	2100 Hz	-26 to 0 dBm0	ANS is defined in ITU-T Rec V.25
/ANS	2100 Hz	-26 to 0 dBm0	1.0S ON (phase reversals each 450ms) ANS is defined in ITU-T Rec V.25
ANSam	2100 Hz	-26 to 0 dBm0	amplitude modulation ANSam is defined in ITU-T Rec V.8
/ANSam	2100 Hz	-26 to 0 dBm0	phase reversal and amplitude modulation /ANSam is defined in ITU-T Rec V.8
T.30-CNG	1100Hz	-26 to 0 dBm0	ON for 0.5 second, OFF for 3 seconds As per ITU-T Rec T.30
T.30-CED	2100Hz	-26 to 0 dBm0	As per ITU-T Rec T.30
T.30-Preamble	N/A	N/A	Series of FLAGS (01111110) as per ITU-T Rec T.30

Table 7 VBD transition triggers

The answer tone must be presented within 3000ms of the answering.

4.6.2. Modem/fax pass-through support

Negotiation of the audio mode and handling answer tones are implemented during call setup. When transitioning to VBD mode the UNI-V disables the echo-canceller and locks the jitter buffer size. G.711A is required for services using the VBD mode.

4.6.3. T.38 Fax support

T.38 is not supported by the UNI-V.

4.6.4. V-Series Modem Base Level Support

The following V-Series modem protocols are supported by the NTD UNI-V interface:

Modem technology	Bit rates (bps)
V.21	300
V.22	1200
V.22bis	1200, 2400
V.23 (for FSMS)	1200
V.32	4800, 9600
V.32bis	Up to 14400
V.34	Up to 14400

Table 8 ITU-T V-Series Modem Base Level Support

4.6.5. T.30 Fax Support Base Level Support

The UNI-V supports fax machines that are compliant with ITU-T T.30 using the following V-Series modem technologies and bit rates:

Modem technology	Bit rates (bps) ¹
V.27	4800, 2400
V.29	9600, 7200
V.17	9600
V.34	9600
V.21 (for protocol signalling) ²	300

Table 9 ITU-T Fax V-Series Modem Support

1. Note: If connection at these speeds is unsupported the UNI-V allows successful negotiation to a lower speed.

2. Note: This modulation is inherent in the other modem technologies.

4.7.—Configuration of Electrical interface parameters.

In general, the UNI-V interface electrical parameters and behaviours of the UNI-V described above are fixed and not configurable by the access seeker, subject to the following exceptions.

Tx and Rx gain can be modified by NBN Co only and can be changed on request by access seekers.

The table below explains the default gain settings implemented on the UNI-V and the configurability range supported.

Line gain	Default value	Range	Notes / standards
Tx path (input gain)	-3 dB (i.e. +3dB _r)	-12dB to +3dB	AS/CA-S003.2:2010 5.3.2.2, Table 1
Rx path (output gain)	-9 dB (i.e. -9dB _r)	-12dB to -3dB	AS/CA-S003.2:2010 5.3.2.2, Table 1

Table 10 Receive and Transmit Level

When an access seeker requires line gain to be modified from the values listed in Table 10, the access seeker must raise a HTTP connection request with NBN Co in accordance with to the following rules: password.

- 1) Gain settings configuration should not be implemented from the XML configuration file.
 - a. The XML has a fixed gain level set to Tx=-30 and Rx=-90 (i.e. Tx=-3dB and Rx=-9dB).
- 2) Gain setting configuration is only configured using NBN Co's management systems.
- 3) The resultant gain (for each Tx and Rx) is equal to the sum of NBN Co's management systems and XML (reference) configured gains. For example, to increase the overall transmission gain from Tx=-3dB to Tx=0dB, the transmission gain using NBN Co's management systems needs to be configured to Tx=+3dB.

It should be noted that the Service Tones and detection levels (e.g. DTMF signal detection levels) do not automatically adjust for changes in gain configuration.

4.8.—NTD UNI-V LED behaviours

The UNI-V LEDs behave differently for indoor and outdoor NTDs. The following table describes the behaviours:

SIP registration state	Port status	LED state for indoor NTD	LED state for outdoor NTD
Not registered	On-hook	Off	Off
	Off-hook	Off	Off
Registered	On-hook	Off	On
	Off-hook	On (flashes if off-hook for more than one hour)	Flashing

Table 11 NTD UNI-V LED status indication

4.9.—UNI-V DC Voltage Feed Interruption

The UNI-V will temporarily suspend the loop DC feed voltage during some maintenance operations.

Activity	DC Loop voltage interruption (seconds)
General maintenance (software upgrade, remote reset etc.)	<60s

Table 12 UNI-V DC Loop Voltage Interruption due to NTD maintenance

A battery backup power supply is available in respect of the UNI-V on the NTD (but not in respect of any UNI-Ds on the NTD). It is designed to ensure that DC loop voltage is maintained in respect of the UNI-V for approximately 5 hours during power outages, subject to the capacity, condition and status of the battery installed within the battery backup unit for the NTD. Please refer to the NFAS Product Description for further information in relation to the battery backup power supply. Information in relation to battery run-time is set out below.

4.10.—Battery run-time

The run-time of the battery during a mains power outage is directly related to, among other things, the power consumption of the NTD and the environment in which the Battery Backup Power Supply Unit (BBPSU) is located. Despite the fact that only the UNI-V is supplied with battery backup power, overall service configuration and usage patterns will influence the power consumption of the NTD and affect run-time of the battery.

Factors which will influence the battery run-time include (without limitation):-

- the number of UNI-V services in use on the NTD
- the usage patterns of each UNI-V during the mains power outage — including the amount of time spent in an active call and the number of inbound calls which cause the telephone handsets to ring; and
- the environment the battery is located within (for example, temperature extremes will reduce battery run-time.)

The BBPSU Unit features an “emergency” power reserve. The BBPSU will turn off the NTD when approximately 30-40% of battery capacity remains. By pressing an “emergency” button located on the BBPSU, end-users can re-activate the NTD and access the emergency power reserve if required. After this reserve is exhausted, the battery will be completely flat. Like all lead-acid batteries, if the battery is left in this state for an extended period it may be damaged.

It is not possible to provide an accurate battery run-time as the overall service configuration and usage patterns will vary for each end-user. Table 13 Typical Battery Run Time) provides indicative run-time figures based on (what NBN Co considers to be) “typical” usage scenarios.

The scenarios and results will be affected by a number of factors including (without limitation):

- ~~service configuration and usage patterns (as noted above);~~
- ~~battery age;~~
- ~~battery average temperature over does not support SSL or TLS in its lifetime;CWMP client.~~
- ~~time (hours) since last discharge of the battery;~~
- ~~number of discharges of the battery from new; and~~
- ~~temperature during discharge of the battery.~~

Usage scenario	Approximate power consumption	Approximate run-time*
Low usage — occasional short telephone calls	6 Watts	8 Hours
High usage — regular telephone calls of short duration	7 Watts	6 Hours
Upper limit usage — single UNI-V in use (long held calls)	9 Watts	5 Hours

Table 12 Typical Battery Run Time

* Note: The approximate run time is inclusive of the emergency battery capacity, which requires the user to press the 'Battery Emergency Use' button to access the last 30%–40% of capacity.

5. ~~UNI-V and PSTN Equivalence~~

In many cases, it is likely that telephony services supplied using the NFAS and UNI-V will be used to directly replace telephony services supplied using the PSTN. In such cases, it is possible that the existing PSTN line may carry telephony services such as dialup modems, fax machines, set-top boxes (with PSTN authentication), TTY and security/medical alarms. The end user may be unaware that some of these devices operate with reliance on the existing PSTN connection.

In general, these telephony services can be supplied using the NFAS and UNI-V where the G.711 A-Law codec is used (identical to the Australian PSTN).

Parameter	G.711 A-Law codec
Voice Quality on local call (G.107 usable range 50-100)	80-93
PSTN-similar Voice Quality	Supported
Support fax/data calls	Supported

Table 14 Recommendations for G.711

- ~~The voice media bandwidth depends on the codec and packetisation rate.~~

Codec	Packetisation	Avg media bandwidth (kpbs)	PSTN-equivalent
G.711A-Law	20msec	101	Yes

- ~~It should be noted that for incoming calls, the UNI-V will use the packetisation interval offered in the INVITE for both the transmit and receive packetisation interval.~~

5.1.2.5. ~~Disability Support~~

- ~~(b)(c) The UNI-V supports the operation of an in-band TTY device.~~
- ~~(c) The UNI-V supports the use of a telephone in parallel with a TTY for VCO/HCO applications.~~

6.3. UNI-V Network Configuration

The UNI-V provides an analogue 2-wire POTS interface ~~capable of providing~~ intended to provide a similar performance to the PSTN (when paired with gateways of similar quality, selecting suitable codecs and echo canceller modes, and allocated sufficient bandwidth).

6.1.3.1. IP Addressing

At the network level, the UNI-V supports the ~~following~~ IP addressing parameters ~~as shown~~ set out in the table below.

Network parameter	Description
IP address of UNI-V	Used for all SIP signalling, bearer traffic, and management functions. Each UNI-V has a unique IP address. Configured using DHCP
<u>IP address of UNI-V</u>	<u>Used for all SIP signalling, bearer traffic, and management functions. Each UNI-V has a unique IP address which is configured using DHCP</u>
IP subnet mask	Configured using DHCP
Default IP router	Configured using DHCP
FTP server's IP address	Used for XML configuration file download. Obtained using DHCP option 66. The IP address of the FTP server must be provided as an IP address (not a fully qualified domain name) in the DHCP offer
IP address of Registrar	Configured in the Registrar route parameter in SIP Provisioning data. Either an IP address or a domain name may be configured along with a port number. The address configured in this parameter must be the same as the address configured in the SIP server address discussed below
<u>DNS IP address</u>	<u>Optional DNS server IP address. This is obtained using DHCP option 6.</u>
<u>ACS IP address</u>	<u>For ACS dynamic configuration of the UNI-V. Obtained using DHCP option 43. The IP address of the ACS can be provided as an IP address or a fully qualified domain name in the DHCP offer.</u>
<u>IP address of Registrar</u>	<u>Configured in the Registrar route parameter in SIP Provisioning data. Either an IP address or a domain name may be configured.</u>
IP address of SIP server	This is the address of the softswitch and is configured in the outbound proxy parameter. Either an IP address or a domain name may be configured along with a port number
<u>IP Proxy Server</u>	<u>This is the domain name or IP address of the SIP proxy server. If the outbound proxy parameter is not configured, the UNI-V will use this parameter to forward SIP signalling traffic to.</u>

Table 3_- UNI-V IP addressing parameters

Addresses in the range 192.168.1.0/24 and 192.168.2.0/24 are reserved for UNI-V internal use and must not be used as part of a telephony service using the UNI-V.

6.2.3.2. DHCP Options supported

<u>DHCP option</u>	<u>Function</u>
<u>1</u>	<u>IP subnet mask</u>
<u>3</u>	<u>Default IP router</u>
<u>6</u>	<u>DNS server address</u>

6.3.3.3. DHCP Options supported

<u>DHCP option</u>	<u>Function</u>
<u>1</u>	<u>IP subnet mask</u>
<u>3</u>	<u>Default IP router</u>
<u>6</u>	<u>DNS server address</u>
<u>51</u>	<u>IP address lease time of the UNI-V</u>
<u>43</u>	<u>Vendor specific information</u>
<u>51</u>	<u>IP address lease time of the UNI-V</u>
53	DHCP message type
54	DHCP server identifier
55	Parameter request list
<u>66</u>	<u>FTP server's IP address which is used for XML download</u>
<u>82</u>	<u>Circuit ID will be added to DHCP request by the OLT</u>
<u>60</u>	<u>Vendor Class Identifier (contains string "dslforum.org" for ACS server address query)</u>
<u>82</u>	<u>Circuit ID (will be added to DHCP request by the NBN Co Network)</u>

Table 4_- DHCP Options ~~Supported~~supported on the UNI-V

6.4. ~~UNI-V Configuration file (XML)~~

After the ~~The~~ DHCP process is completed, the UNI-V obtains an ~~server should normally extend the existing IP lease, as a change in IP address and the IP address of the access may disrupt calls or TR-069 sessions in progress. Access seeker FTP server. The UNI-V should consider the effect of DHCP lease times. NBN Co recommends that DHCP leases should be approximately a day in length.~~

3.3.1. DHCP Option 43

In the DHCP discovery message initiated by the UNI-V at boot up, the DHCP discovery message will then download the XML configuration file from that FTP include a DHCP Option 60 - Vendor Class Identifier value. The value for DHCP Option 60 consists of a string "dslforum.org". This can be used by access seeker's DHCP server. ~~NBN Co intends to change~~ to identify that the UNI-V supports the TR-069 based solution. The DHCP server will then send the DHCP Offer with the **Vendor Specific Information** (DHCP option 43) containing CWMP information.

This option allows access seeker's DHCP servers to send the vendor specific parameters to the UNI-V, encoded in the form "option_code/value_length/value". CWMP specifies two parameters:

- Option code 1 for ACS URL which will consist of the ACS FQDN (or IP) and port
- Option code 2 for the ProvisioningCode.
- Option code 254 for provisioning the logical ID of the UNI-V configuration file format method in the future. The contents of this option code will be used as the value of the parameter **"InternetGatewayDevice.DeviceInfo.SerialNumber"** in TR-069 messages generated by the UNI-V.

Note that the XML configuration file name supports a maximum of 25 characters including the ".xml" extension.

If configuration changes are required, the access seeker will need to generate a new XML configuration file and notify NBN Co of the new XML configuration file name. NBN Co will then populate the new XML configuration file name to the UNI-V. This will trigger the UNI-V to download the new file from the access seeker's FTP server and apply the new configuration.

The XML configuration file comprises three different categories with different levels of access by each access seeker:

- 1) ~~**Not configurable by access seeker:**~~ Configuration parameters including Country POTS line parameters:
 - Used to customize the POTS line physical interface of the UNI-V.
- 2) ~~**Only configurable by access seekers during on-boarding process:**~~ These parameters will be validated once for each access seeker. The validation of these parameters is achieved during the end-to-end UNI-V on-boarding testing phase. Please refer to the Wholesale Broadband Agreement and the NBN Co Operations Manual for further information regarding the on-boarding phase. At that phase access seekers are eligible to configure these parameters. At the end of the on-boarding phase, the configuration parameters will be fixed and not accessible to the access seeker during production deployment. Configurable parameters include the following:
 - Parameter to define Voice Service behaviour, etc.
- 3) ~~**Configurable at any time by access seeker:**~~ These are user specific parameters (e.g. username, password etc.). Access seekers will be able to configure these parameters for their own customer configurations.

In the following sections, all configurations for the UNI-V interface will be described in table formats. Each parameter will be defined as whether it is categorized as:

- ~~“Not configurable by access seeker”;~~
- ~~“Only configurable by access seeker during on-boarding process”; or~~
- ~~“Configurable by access seeker at any time”.~~

6.4.1. XML Configuration File Management.

When access seekers complete the editing of the XML configuration file, they need to provide the following information so that NBN Co can implement the XML download accordingly:

- 1) If an access seeker edited an existing XML file and retained the same file name, the access seeker must request NBN Co to configure a dummy file name (a file that need not exist on the FTP server) for re-downloading. After committing that change, NBN Co will then reconfigure the filename back to the original name.

When the UNI-V receives the URL it can start the standard CWMP connection and operations with the given ACS.

The DHCP Option 43 payload has a maximum length of 255 bytes (characters) due to being an 8-bit length field. This will be distributed between option code 1 (ACS URL), option code 2 (ProvisioningCode), option code 254 (logical ID) and a 2-byte sub-option headers for each option code.

3.3.1.1. Option Code 254 Logical ID

When values in Option 43, option code 254 are present, these details will be used instead of the default TR-069 “SerialNumber” parameter for TR-069 transactions. This is intended to allow the access seeker to create their own ID population or reuse the AVC-ID as it suits them. When Option 43, option code 254 data is not present, the UNI-V will fall back to using the default TR-069 “SerialNumber” parameter derived from the NTD’s own serial number.

An example of the NTD serial number is ALCL12345678.

An example of the default TR-069 serial number is ALCL1234567801 (i.e. “NTD serial number” appended with “01”).

An example of the AVC-ID is AVC000000012345.

Option code 254 is a sub-option in DHCP Option 43 that is configured by access seeker’s DHCP server. The value provided by this option code should be unique to each End User service and, when present, will be used by the UNI-V to populate the “SerialNumber” field under “InternetGatewayDevice.DeviceInfo”.

This value, in addition to the “DeviceInfo” parameters (i.e. Manufacturer, OUI and ProductClass), can be used by access seeker’s ACS to uniquely identify the UNI-V and allow for pre-provisioning of the ACS prior to the UNI-V initial connectivity.

NBN Co recommends that access seeker configures DHCP Option 43 option code 254 with the same value as the AVC ID, as it is unique for each End User service

The following paragraphs set out characteristics of option code 254 and its limitations:

1. To avoid conflict with potential future option codes that may be added to TR-069, option code 254 is implemented after URL option code 1 and ProvisioningCode option code 2.
2. If access seeker decides to implement option code 254, it is then essential that the DHCP server include the same valid option code 254 at every DHCP negotiation (e.g. DHCP Offer, ACK etc.) with the UNI-V, otherwise a "0 BOOTSTRAP" event will occur (see paragraph 7 below). DHCPNAKs generally do not trigger a change in the Serial Number in use or trigger a "0 BOOTSTRAP" event, but following DHCP OFFERs or ACKs may do so.
3. The maximum length supported for option code 254 is 63 characters/bytes.
4. The value provided to the UNI-V in option code 254 should only use characters from the character set: {'0'..'9'}, {'a'..'z'}, {'A'..'Z'} to be configured. Presence of characters outside this set will cause the value to be treated as invalid by the UNI-V, resulting in a default TR-069 SerialNumber being used.
5. Option code 254 is considered invalid in the following failure scenarios:
 - a. If the DHCP server configures the UNI-V with option code 254 that has a 0 length (i.e. empty).
 - b. If the DHCP server configures the UNI-V with option code 254 greater than 63 characters/bytes.
 - c. If an access seeker the DHCP server configures the UNI-V with option code 254 that contains characters outside the allowed character set above.
6. When the UNI-V is first created/activated the UNI-V will proceed with an initial DHCP lease acquisition and, if present, use the value conveyed in DHCP Option 43, option code 254 for the TR-069 SerialNumber. If option code 254 is not present or invalid the UNI-V will use the **default TR-069 serial number** when communicating with the ACS.

7. In subsequent DHCP negotiations (e.g. during DHCP lease renewal), the following alternatives are available:
- a. If a valid option code 254 value is received:
 - i. If the value received is the same as the serial number currently being used, the UNI-V will take no action.
 - ii. If the value received is different to the serial number currently being used, the UNI-V will trigger a “0 BOOTSTRAP” message to the ACS that includes the new option code 254 value.
 - b. If an invalid option code 254 value is received:
 - i. If the current serial number being used matches the default TR-069 serial number, the UNI-V will take no action.
 - ii. If the current serial number being used does not match the default TR-069 serial number, the UNI-V will trigger a “0 BOOTSTRAP” message to the ACS that includes the default TR-069 serial number.
 - c. If option code 254 is not present:
 - i. If the current serial number being used matches the default TR-069 serial number, the UNI-V will take no action.
 - ii. If the current serial number being used does not match the default TR-069 serial number, the UNI-V will trigger a “0 BOOTSTRAP” message to the ACS that includes the default TR-069 serial number.
8. The UNI-V, whether using the default TR-069 serial number or one received in option code 254, stores the serial number state such that an UNI-V does not unnecessarily trigger a “0 BOOTSTRAP” event when the NTD is power cycled.
9. If access seeker is disconnecting a UNI-V so that another access seeker can place an order for that UNI-V, or if access seeker is connecting to the UNI-V after another access seeker has disconnected from that UNI-V (i.e. a churn event), the UNI-V configurations will be deleted, and NBN Co will re-provision the UNI-V with new default configuration details as described in this UNI-V Functional Specification. In this case, the UNI-V state and configuration will be cleared and the UNI-V will behave as in the “first created/activated” case in paragraph 6 above.

3.3.2. DHCP Option 43 Server Configuration

NBN Co recommends that access seeker configure its **DHCP Server with option 43** using the **option vendor-encapsulated-options** option shown in the “dhcpd” configuration script example below. There are three fields in this option as follows:

- Option code
- Value length
- Value

```
subnet 192.168.0.0 netmask 255.255.255.0 {
    option routers 10.1.1.1;
    range 10.1.1.100 10.1.1.105;
    append dhcp-parameter-request-list 43;
    option vendor-encapsulated-options 01:26:68:74:70:3a:2f:2f:31:32:2e:30:2e:30:2e:34:32:3a:38:31:38:31:2f:64:70:73:2d:64:69:67:65:73:74:2f:54:52:30:36:39;
```

As an example, if the ACS URL to be used is <http://12.0.0.42:8181/dps-digest/TR069>, the option will contain 0x01 (CWMP option for ACS URL), 0x26 (hexadecimal of decimal 38 = length of the URL) then the other 38 bytes will form the URL value.

01:26:68:74:70:3a:2f:2f:31:32:2e:30:2e:30:2e:34:32:3a:38:31:38:31:2f:64:70:73:2d:64:69:67:65:73:74:2f:54:52:30:36:39:

Option code 2, the ProvisioningCode, is included in the **option vendor-encapsulated-options** option (representing the credentials ABCDE). This specifies the credentials used by the UNI-V to authenticate for the first time with access seeker’s ACS. The hexadecimal value for the option 2 is **02:05:41:42:43:44:45.**

Option code 254 will include the logical ID of the UNI-V (e.g. AVC123456789123) and will also be included in the **option vendor-encapsulated-options**. This specifies the SerialNumber value in the TR-069 messages initiated by the UNI-V. The hexadecimal value for option code 254 is **FE:0F:41:56:43:31:32:33:34:35:36:37:38:39:31:32:33**

Note that DHCP Option 43 on the DHCP server must have the option codes configured in exact sequential order. That is, access seeker must configure DHCP Option 43 with option code 1 (URL) followed by option code 2 (ProvisioningCode) followed by option code 254 (Logical ID). The UNI-V will only accept the option codes if they are received in this specific order.

4. UNI-V Migration Strategy

Access seeker must consider the following information for configuration of each UNI-V during NBN Co's migration of UNI-Vs from the XML file, the configuration method to the TR-069 configuration method:

- 1) The UNI-V migration will be executed on a per-OLT basis in accordance with migration plans provided by NBN Co, with all UNI-Vs connected to a given OLT upgraded concurrently.
- 2) Access seeker must have both ACS and FTP servers configured and simultaneously operational during the migration period. Once the relevant NBN Co Equipment is upgraded, affected NBN Co Products connected to a UNI-V are no longer capable of FTP/XML-based UNI-V configuration and the UNI-V will not function unless it is fully reconfigured via TR-069.
- 3) Access seeker must also have its DHCP server configured with DHCP option 43 to configure the affected UNI-Vs with access seeker's ACS URL and ProvisioningCode and Option Code 254 (logical ID). UNI-Vs functioning in accordance with the first release of the UNI-V Functional Specification (i.e. the XML-based solution) will safely ignore the Option 43 field.
- 4) Once the relevant NBN Equipment has been upgraded, each affected NTD and UNI-V will be rebooted, issue a DHCP discover message and use Option 43 in the DHCP offer to start an ACS session.
- 5) The upgraded UNI-V will continue to use the originally allocated associated AVC-ID.

If an upgrade in relation to an OLT is abandoned or reverted, UNI-Vs connected to that OLT will be restored to function in accordance with the first release of the UNI-V Functional Specification and affected access seekers will be notified. Access seeker must ensure that its FTP/XML based systems remain online and operational until further notice by NBN Co. even though TR-069 based UNI-V services may have been activated in other locations.

As described in this section 4, access seeker must support both FTP and ACS configuration solutions simultaneously during the migration of UNI-V functionality. Such support includes DHCP server support for the corresponding DHCP options, such that each UNI-V can be provisioned by either of the two methods.

If an Emergency Call (as defined by access seeker's dial plan as described in section 8.2.1.13) is found to be in progress immediately before the migration begins, the NTD firmware upgrade will be postponed. Firmware will only be upgraded once the emergency call is terminated. Other call types may be terminated by migration activities. Access seeker has responsibility for communicating potential service interruptions to its End Users.

5. TR-069 Overview

UNI-V management in accordance with TR-069 is performed through the communication between a UNI-V and the Auto-Configuration Server (ACS). The ACS task is to manage subscribed UNI-Vs in a flexible and systematic way. An ACS in general is a server machine running a manager application.

Following migration, TR-069 will provide access seeker with a one common platform to manage all UNI-Vs which NBN Co is supplying to access seeker. It commonly uses HTTP or HTTPS as transport for communication between each UNI-V and the ACS.

UNI-V support for TR-069 provides access seeker's ACS the following functions:

- Auto Configuration and dynamic service provisioning; the protocol allows the ACS to perform auto-configuration and to provision the UNI-V with services based on a variety of criteria. The provisioning of a UNI-V might be done when the UNI-V initiates a connection to the access seeker network or when the UNI-V initiates re-provisioning at any subsequent time. The identification mechanism allows provisioning based on specific requirements of a UNI-V; group criteria such as vendor, model, software version, or other criteria.
- Diagnostic parameters supported by TR-069 (as set out in section 7) allow access seeker's ACS to retrieve status information from the UNI-V in order to help resolve connectivity or service issues.

In TR-069, the UNI-V acts as the HTTP client and the ACS acts as the HTTP server. A SOAP request from an ACS to the UNI-V is sent over an HTTP response, while the UNI-V's SOAP response to an ACS request is sent over a subsequent HTTP Post.

The table below sets out the TR-069 CWMP protocol stack including a description of each layer.

Layer	Description
<u>UNI-V /ACS Management Application</u>	The application uses the CPE WAN Management Protocol on the UNI-V and ACS, respectively. The application is locally defined and not specified as part of the CPE WAN Management Protocol.
<u>RPC Methods</u>	The specific Remote Procedure Call methods that are defined by the CWMP. Remote Procedure Calls are encoded in SOAP. All messages exchanged between the UNI-V and ACS are RPCs. RPCs are methods that allow one program on a host machine to use the services of another program in a remote machine. The calling program sends a message and data to the remote program, which is executed, and results are passed back to the calling program.
<u>SOAP</u>	A standard XML-based syntax used to encode remote procedure calls. SOAP 1.1 is used to configure the UNI-V.
<u>HTTP</u>	HTTP 1.1 as specified in RFC 2616.
<u>SSL/TLS</u>	The standard Internet transport layer security protocols. The UNI-V does not support SSL/TLS for configuration using the TR-069 protocol.
<u>TCP/IP</u>	Standard TCP/IP.

Table 5 - Brief description of protocol layers

5.1. TR-098 and TR-104 Data Model Extensions

The CWMP client on each UNI-V supports those CWMP parameters that are defined in the following two technical reports and set out in sections 10.1 and 10.2:

- 1) TR-098: Internet Gateway Device data model for TR-069; this defines the parameters related to IP network configuration on the UNI-V. The UNI-V supports the subset of parameters in the following objects which are described in sections 10.1 and 10.2:
 - a. DeviceInfo; Providing information about the UNI-V
 - b. ManagementServer; Providing required parameters to associate the UNI-V with the ACS
 - c. WANIPConnection; Providing information about the WAN interface (facing the ACS) on the UNI-V.
- 2) TR-104: Voice over IP provisioning data model; this defines the VoiceService and VoiceProfile on the UNI-V.

Details of each parameter supported by the UNI-V for the above data models are described in detail in sections 10.1 and 10.2.

5.2. DHCP and TR-069 Authentication

When the UNI-V boots up (e.g. first time boot, reboot etc.), the following are discussed:

- UNI-V will initiate a DHCP discovery message across the NBN Co Network to access seeker's network.
- Once the DHCP discovery phase is complete, the UNI-V on the NTD is configured with its IP address and the ACS URL (other DHCP options are supported as set out above).
- UNI-V initiates communication with the ACS via TR-069 implementation.
- The UNI-V will initiate a TR-069 HTTP POST request to the ACS with HTTP password being hashed using the MD5 algorithm.
- Once the ACS confirms the identity and credentials of the UNI-V, a TR-069 session is established.
- Once the TR-069 session is established, the ACS can then make any other Remote Procedure Calls (RPC) that it requires to the UNI-V during this particular CWMP session (e.g. ACS uses SetParameterValues RPC to configure the UNI-V).

The TR-069 implementation on the UNI-V supports the use of HTTP basic or HTTP digest authentication (using MD5 digest algorithm). The authentication can occur in both directions as follows:

- The UNI-V authenticates the ACS's Connection Requests.
- The ACS authenticates the UNI-V's session initiation.

Figure 2 illustrates an overview of DHCP and TR-069 traffic flow between the UNI-V and access seeker ACS.

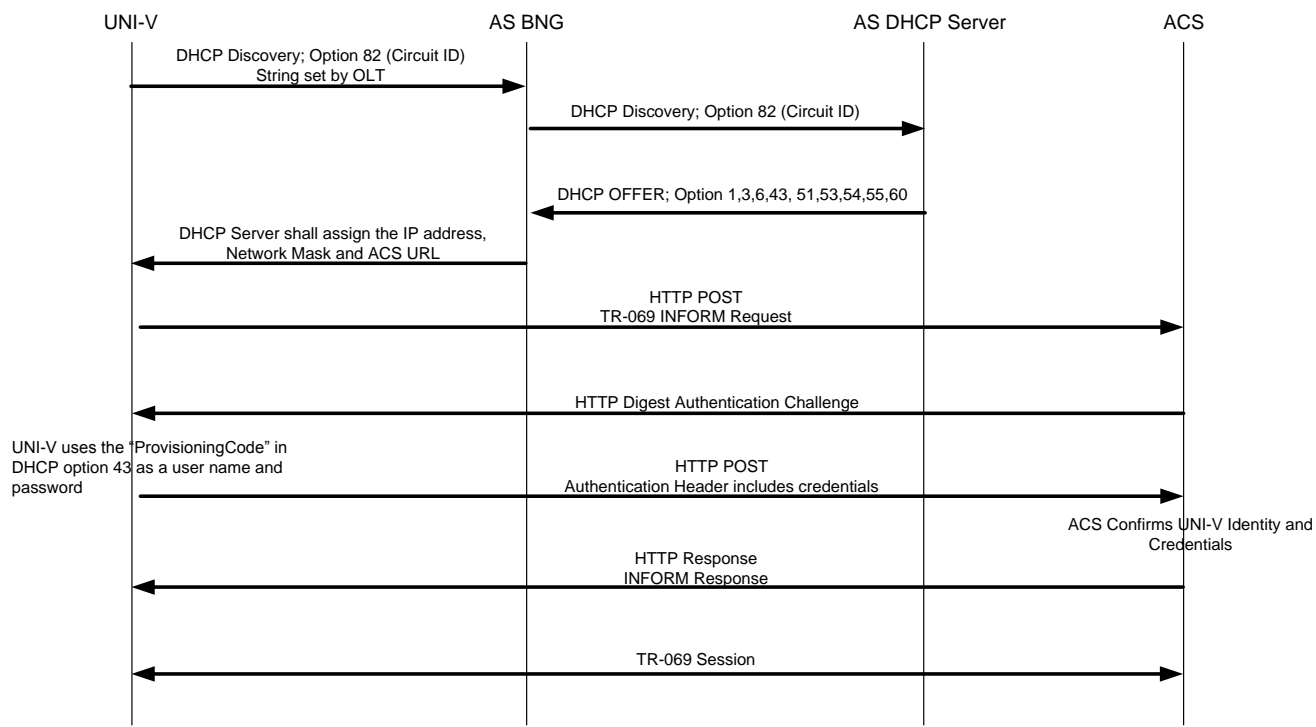


Figure 2 - DHCP and TR-069 authentication overview

5.2.1. ACS Discovery and Fail over Mechanism

The ACS URL and ProvisioningCode can be re-configured on the UNI-V through DHCP renewals. For example, if the ProvisioningCode that is initially configured on the UNI-V by access seeker (via DHCP Option 43) was incorrect, the UNI-V will not successfully authenticate with the ACS. To recover from this scenario, access seeker can correct the ProvisioningCode served by the DHCP server and wait for the next lease renewal. It is therefore important for access seeker to choose the DHCP lease time carefully to balance the DHCP server load and the time required to recover from configuration errors.

If access seeker configures the UNI-V with an incorrect ACS URL through the DHCP server or ACS, the UNI-V will retry to connect to the incorrect ACS URL for 300 seconds before it considers the ACS unreachable and fails back to the DHCP server by sending a DHCP REQUEST message. The DHCP server can configure the UNI-V with DHCP Option 43 that has the correct ACS URL.

Figure 3 describes the traffic flow when an UNI-V is configured with an incorrect ACS URL.

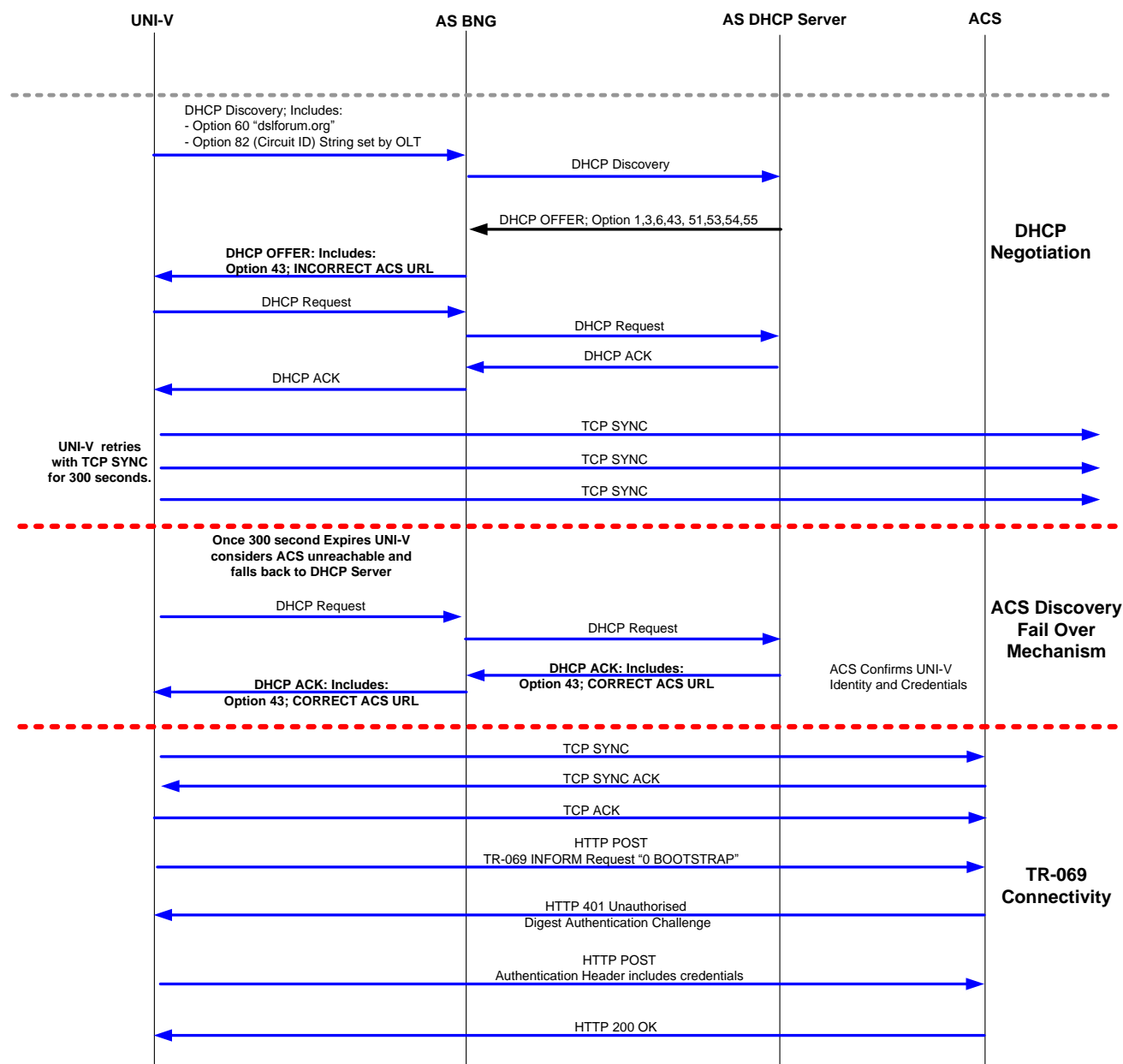


Figure 3 - ACS Discovery and Fail over Mechanism

5.3. Remote Procedure Call (RPC)

The CWMP client on the UNI-V uses RPC for communication between the ACS and the UNI-V (RPC can be used in both directions).

<u>RPC Methods supported on UNI-V</u>	<u>ACS Requirement</u>	<u>Description</u>
<u>GetRPCMethods</u>	<u>Optional</u>	<u>Sent by the ACS to find out about the methods supported by the UNI-V.</u>
<u>GetParameterNames</u>	<u>Required</u>	<u>This method is used by the ACS to discover the UNI-V supported parameters.</u>
<u>GetParameterValues</u>	<u>Required</u>	<u>This method is used by the ACS to obtain the value of one or more UNI-V Parameters.</u>
<u>GetParameterAttributes</u>	<u>Required</u>	<u>This method is used by the ACS to read the attributes associated with one or more UNI-V Parameter. Note that parameter attributes cannot be configured.</u>
<u>SetParameterValues</u>	<u>Required</u>	<u>This method is used by the ACS to modify the value of one or more of the UNI-V Parameters.</u>
<u>AddObject</u>	<u>Optional</u>	<u>Adds a new VoiceProfile object instance on the UNI-V.</u>
<u>DeleteObject</u>	<u>Optional</u>	<u>Deletes a VoiceProfile object instance on the UNI-V.</u>

Table 6 - Brief description of protocol layers

The table below sets out an example of the calling arguments of each of the RPC methods supported by the UNI-V and how access seeker may encode these arguments.

<u>RFC Method</u>	<u>Encoded Message</u>
<u>GetRPCMethod</u>	<u>This RPC method has no calling arguments.</u>
<u>GetParameterNames</u>	<u><cwmp:GetParameterNames xmlns:cwmp="urn:dslforum-org:cwmp-1-0"> <ParameterPath>InternetGatewayDevice.Services.VoiceService.1.VoiceProfile.1.SIP.RegisterExpires</ParameterPath> <NextLevel>0</NextLevel> </cwmp:GetParameterNames></u>
<u>GetParameterValues</u>	<u><cwmp:GetParameterValues xmlns:cwmp="urn:dslforum-org:cwmp-1-0"> <ParameterNames SOAP-ENC:arrayType="xsd:string[1]" xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"> <string>InternetGatewayDevice.Services.VoiceService.1.VoiceProfile.1.SIP.RegisterExpires</string> </ParameterNames> </cwmp:GetParameterValues></u>
<u>GetParameterAttributes</u>	<u><cwmp:GetParameterAttributes xmlns:cwmp="urn:dslforum-org:cwmp-1-0"> <ParameterNames SOAP-ENC:arrayType="xsd:string[1]" xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"></u>

	<code><string>InternetGatewayDevice.Services.VoiceService.1.VoiceProfile.1.SIP.Regis terExpires</string> </ParameterNames> </cwmp:GetParameterAttributes></code>
<u>SetParameterValues</u>	<code><cwmp:SetParameterValues xmlns:cwmp="urn:dslforum-org:cwmp-1-0"> <ParameterList SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"> <ParameterValuesStruct> <Name>InternetGatewayDevice.Services.VoiceService.1.VoiceProfile.1.SIP.Regis terExpires</Name> <Value xsi:type="xsd:unsignedInt">3600</Value> </ParameterList> <ParameterKey></ParameterKey> </cwmp:SetParameterValues></code>
<u>AddObject</u>	<code><cwmp:AddObject xmlns:cwmp="urn:dslforum-org:cwmp-1-0"> <ObjectName>InternetGatewayDevice.Services.VoiceService.1.VoiceProfile.</O bjectName> <ParameterKey>SyncAdd</ParameterKey> </cwmp:AddObject></code>
<u>DeleteObject</u>	<code><cwmp>DeleteObject xmlns:cwmp="urn:dslforum-org:cwmp-1-0"> <ObjectName>InternetGatewayDevice.Services.VoiceService.1.VoiceProfile.1.</ ObjectName> <ParameterKey>SyncAdd</ParameterKey> </cwmp>DeleteObject></code>

Table 7 – Examples of RPC Method encodings

5.3.1. Session Retry

The UNI-V will retry failed sessions to attempt to redeliver events or messages that it has previously failed to deliver and to allow the ACS to make additional requests in a timely fashion.

When a session fails, the UNI-V chooses the wait interval by randomly selecting a number of seconds from a range given by the post-reboot session retry count set out in Table 8.

The UNI-V will execute the session retry table below in the following scenarios:

- UNI-V cannot establish a session to the ACS after a “0 BOOTSTRAP” has been successfully delivered.
- If the UNI-V failed to authenticate with the ACS with the correct username and password:
 - InternetGatewayDevice.ManagementServer.Username.
 - InternetGatewayDevice.ManagementServer.Password.

<u>Post Reboot Session Retry Count</u>	<u>Wait Interval Range (Minimum-Maximum Seconds)</u>
<u>#1</u>	<u>5-10</u>
<u>#2</u>	<u>10-20</u>
<u>#3</u>	<u>20-40</u>

Table 8 – Session Retry Wait Interval

5.4. INFORM events Supported

Each event is an 'INFORM' message sent from the UNI-V to the ACS. An event is an indication of an occurrence that requires the UNI-V to notify the ACS via an Inform request. The UNI-V will attempt to deliver every event at least once. If the UNI-V is not currently in a session with the ACS, it will attempt to deliver the event immediately; otherwise, the UNI-V will attempt to deliver the event after the current session terminates. The UNI-V will not consider an event successfully delivered unless it receives confirmation from the ACS. Once the UNI-V has delivered an event successfully, the UNI-V will not send the same event again.

When the UNI-V sends an INFORM event to the ACS and does not receive a response back, after a time interval the UNI-V will re-send the event again as described in Table 8. Therefore access seeker must ensure the ACS is prepared to receive the same event more than once.

5.4.1. 0 - BOOTSTRAP

The “0 BOOTSTRAP” event code is supported on the UNI-V once a session is established between the UNI-V and ACS to specify the event of a first-time NTD installation, UNI-V activation or a change to the ACS URL.

This event code will be triggered in the following use case scenarios:

- Upon the connection of a new NTD or the replacement of a current NTD with a new one.
- Upon the user manually setting the NTD to “factory reset” (using factory reset button on the NTD). Note the UNI-V does not allow the ACS to execute a factory reset remotely.
- Upon connection between the UNI-V and ACS after access seeker has modified the ACS URL address.

On “0 BOOTSTRAP”, the ACS may configure the UNI-V with the username and password which is then stored and used for future digest authentication of ACS Connection Requests.

5.4.2. 1 - BOOT

The “1 BOOT” event code is supported on the UNI-V when a session is established between the UNI-V and ACS specifying NTD system reboot. This event code will be triggered in the following use case scenario:

- Upon manual reboot of NTD by the End User.

The “Reboot” Remote Procedure Method and the “M Reboot” event code are not supported by the UNI-V.

5.4.3. 2 - PERIODIC

The “2 Periodic” event code is supported on the UNI-V when a session is established. It specifies that the session was initiated due to Periodic Inform Interval attribute being set by the ACS. Access seeker can enable/disable the periodic interval attribute and set its value via the ACS meaning the UNI-V will contact the ACS periodically.

5.4.4. 4 - VALUE CHANGE

The “4 Value Change” event code specifies that a session was established due to a change or modification in one or more parameters with passive or active notification enabled.

Disable Notification (0) = the UNI-V will not notify the ACS of a change to a specified parameter/s.

Passive notification (1) = the UNI-V will notify the ACS of a change to a specified parameter/s in values at the next Periodic Inform.

Active Notification (2) = the UNI-V will notify the ACS of a change to a specified parameter/s as soon as the value has changed.

The UNI-V will include a “4-VALUE CHANGE” in TR-069 Inform messages with the event code “0 BOOTSTRAP”.

5.4.5. 6 - CONNECTION REQUEST

The “6 Connection Request” event indicates that the session was established due to a connection request initiated by the ACS.

This event is a very important code as it will be utilised in every use case scenario where the ACS initiates a connection to the UNI-V. The event uses HTTP GET destined to the UNI-V URL and the UNI-V will use digest authentication to authenticate the ACS before sending a 200 OK response.

Access seeker must ensure that the ACS supports the connection request method to prompt the UNI-V to immediately contact the ACS. This may be required when a voice service parameter needs changing e.g. modification of a voice service.

5.4.6. Advertising UNI-V IP Address to ACS

The UNI-V advertises its current IP address to ACS under the following scenarios:

- The first time it connects to the ACS (“0 BOOTSTRAP” inform)
- On subsequent connections from a power up or reboot (“1 BOOT” inform)
- On every “PeriodicInformInterval” (periodic inform)
- On every “6 CONNECTION REQUEST” triggered by the ACS.

5.5. Unsupported INFORM events

The following event codes specified in TR-069 are not supported by the UNI-V:

- 3 - SCHEDULED
- 7 - TRANSFER COMPLETE
- 8 - DIAGNOSTICS COMPLETE
- 9 - REQUEST DOWNLOAD
- M -REBOOT
- M - DOWNLOAD
- M - UPLOAD
- M - VENDOR SPECIFIC METHOD
- M - VENDOR SPECIFIC EVENT
- M – SCHEDULEINFORM

5.6. UNI-V Responses to ACS Requests

The UNI-V will respond to the ACS requests with message responses. The type of response is dependent on the use case. Table 9 sets out the responses that the UNI-V will generate depending on the request received by the ACS.

UNI-V Response Messages Supported	Request by the ACS	Description
Event code: <u>BOOTSTRAP</u> , <u>BOOT</u> , <u>PERIODIC</u> and <u>CONNECTION REQUEST</u> . All these event codes will include <u>"Authorisation" header</u>	ACS challenges the UNI-V with <u>"HTTP 401 Unauthorized"</u> .	When the ACS sends a challenge to any of the event codes generated by the UNI-V, the UNI-V will respond with the same event code (being challenged) including an <u>"Authorization" header</u> that has the username and password.
<u>6 CONNECTION REQUEST</u>	ACS sends a HTTP GET to trigger the UNI-V to communicate to the ACS	The UNI-V will always respond with <u>CONNECTION REQUEST</u> . This is used, for example, if the ACS requires the configuration of a parameter on the UNI-V.
<u>HTTP POST- empty</u>	ACS authenticates the UNI-V successfully by sending HTTP <u>200 OK</u> .	The UNI-V has no further requests to send to the ACS and the UNI-V has issued an empty HTTP POST to the ACS. The ACS will respond (if there are no further requests to implement) with HTTP <u>204 NO CONTENT</u> .
<u>HTTP POST SetParameterValuesResponse</u> <u><Status>0<Status></u>	ACS sends HTTP response with <u>"SetParameterValues"</u> method for one or multiple of parameters.	The UNI-V has acted upon the <u>"SetParameterValues"</u> sent by the ACS and hence will send a response to confirm successful execution.
<u>HTTP POST GetParameterValuesResponse</u> <u><Name>"parameter_name"</Name></u> <u><Value>parameter_value_set</Value></u>	ACS sends HTTP response with <u>"GetParameterValues"</u> method for one or multiple of parameters.	The UNI-V responds by transmitting all requested parameter names and the value setting of each parameter.
<u>HTTP POST GetParameterNamesResponse</u> <u><Name>"parameter_name"</Name></u> <u><Writable>"Read-Or-Write"</Writable></u>	ACS sends HTTP response with <u>"GetParameterNames"</u> method for one or multiple of parameters.	The UNI-V responds by displaying all requested parameter names and whether each parameter can be configured using the <u>SetParameterValues</u> method.
<u>HTTP POST AddObjectResponse</u> <u><InstanceNumber>New_Object_Number</InstanceNumber></u> <u><Status>Creation_Status</Status></u>	ACS sends HTTP response with <u>"AddObject"</u> method to create the VoiceProfile Object.	The UNI-V responds with the instance number of the newly created VoiceProfile object and the status specifying that the VoiceProfile has been created successfully.
<u>HTTP POST DeleteObjectResponse</u> <u><Status>Deletion_Status</Status></u>	ACS sends HTTP response with <u>"DeleteObject"</u> method to delete the VoiceProfile Object.	The UNI-V responds with the status specifying that the VoiceProfile has been deleted successfully or has been committed but not yet applied.

Table 9 - Response Message Codes supported on the UNI-V TR-069 Protocol Layer

6. TR-069 Use Case Scenarios

This section illustrates possible use cases and the requests/responses which the UNI-V supports in each use case.

The following use cases are described in this section:

- NTD First time boot (i.e. at initial installation), eg, because of:
 - Manual factory reset (i.e. by the End User or remote reset by NBN Co).
 - NTD Replacement.
- NTD manual reboot (i.e. by the End User).
- Change voice service on NTD.
- Cancel voice service on NTD.
- TR-069 Authentication failed - Incorrect HTTP Password.

6.1. Use Case 1: NTD First Time Boot.

At initial boot up, the NTD will only have the factory default configuration from the manufacturer. This will include the following:

- Country code VoIP generic configuration
- NTD hardware specific configuration

This is also the case in the following scenarios:

- Manual factory reset (i.e. by the End User or remote reset by NBN Co).
- NTD replacement.

Figure 4 illustrates the DHCP and TR-069 traffic flow when a new NTD is installed.

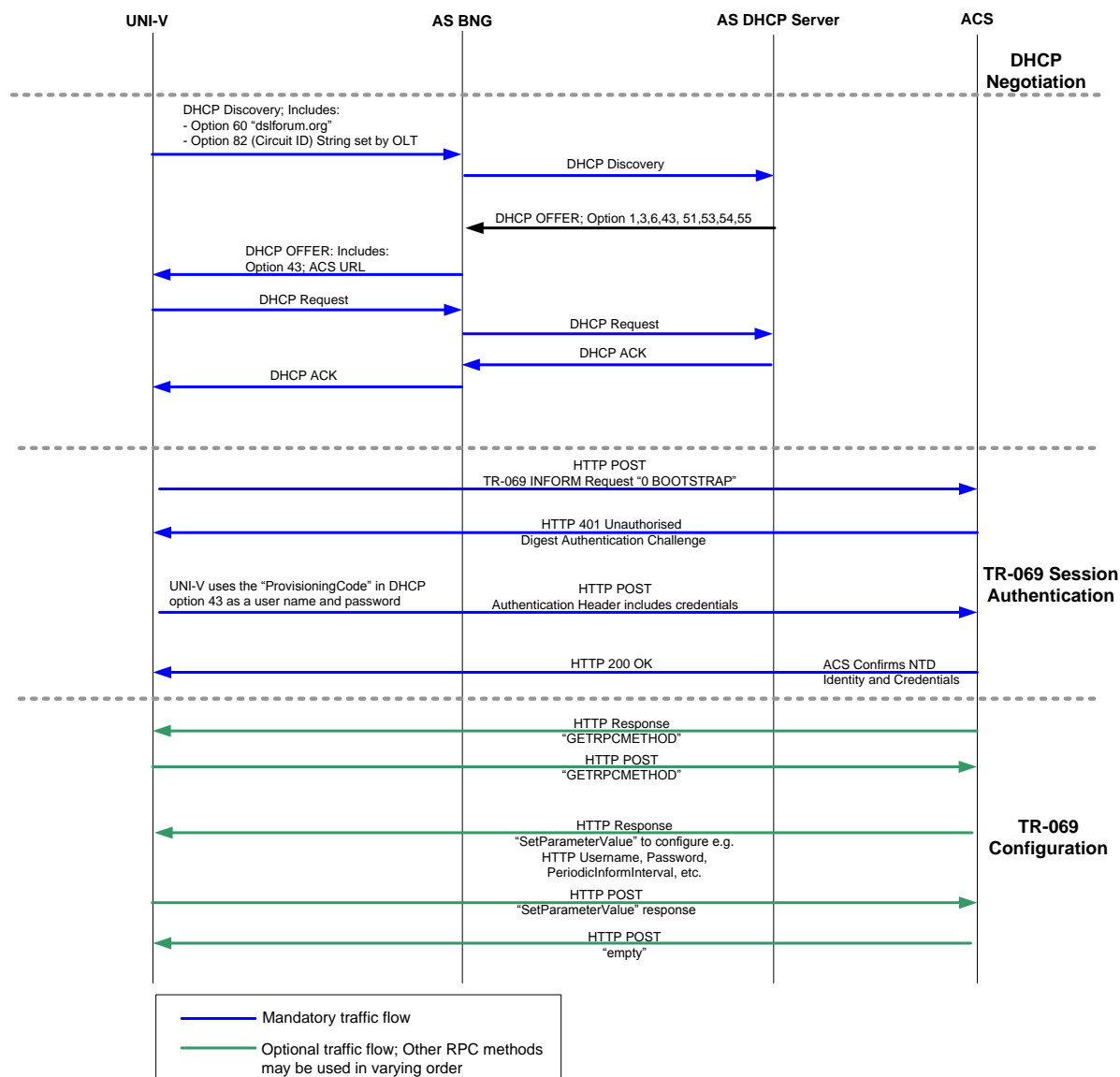


Figure 4 - DHCP & TR-069 Traffic Flows

Once the NTD has booted up, the following sequence of events will take place:

- 1) The UNI-V will send a DHCP discovery message to the access seeker DHCP server with option 82 (circuit ID) being set by the OLT.
- 2) Once the DHCP configuration phase is completed, the UNI-V will be configured with IP address and network mask, ACS URL (DHCP Option 43) and DNS Server address.
- 3) The UNI-V resolves the ACS URL using the DNS Server and initiates a "6 CONNECTION REQUEST" (HTTP POST) to the ACS. The UNI-V sends a "0 BOOTSTRAP" INFORM message. The INFORM message will contain the following CWMP information in the <cwmp: Inform> header:

DeviceId (Manufacturer, NTD Serial number, OUI and ProductClass). The values are set as follows:

- Manufacturer; set to “ALCL” (indicating Alcatel-Lucent).
- OUI; set to “0019c7”.
- SerialNumber; this is the serial number of the UNI-V configured by DHCP option 43 option code 254.
- ProductClass; this is the NTD variant, i.e. Indoor “I-240G-R” or Outdoor “O-240G-P”.

Event:

- “0 BOOTSTRAP”
- “4 VALUE CHANGE”

ParameterList:

- InternetGatewayDevice.DeviceInfo.SpecVersion
- InternetGatewayDevice.DeviceInfo.HardwareVersion
- InternetGatewayDevice.DeviceInfo.SoftwareVersion
- InternetGatewayDevice.DeviceInfo.ProvisioningCode
- InternetGatewayDevice.DeviceInfo.ParameterKey
- InternetGatewayDevice.DeviceInfo.ConnectionRequestURL
- InternetGatewayDevice.WANDevice.1.WANConnectionDevice.1.WANIPConnection.ExternalIPAddress
- InternetGatewayDevice.WANDevice.1.WANConnectionDevice.1.WANIPConnection.MACAddress

- 4) The ACS sends an authentication challenge to the UNI-V using “401 Unauthorized”.
- 5) The UNI-V then responds with an HTTP response including “Authorization” header. The header includes the HTTP credentials configured by DHCP option 43.
- 6) The ACS confirms the UNI-V identity by checking the HTTP credentials. Access seeker must ensure these HTTP credentials (i.e. set by the “ProvisioningCode”) have been pre-defined for each device type in the ACS.
- 7) The ACS then identifies the UNI-V by looking at the “DeviceId” and confirming the “Serial Number” (configured via DHCP option 43 option code 254) and “Manufacturer OUI” of the UNI-V (optionally the ACS may also use the ProductClass).

- 8) After the ACS confirms the NTD is a new device, the ACS may (and NBN Co ~~to delete the old XML filename and~~ recommends that it does) send a "SetParameterValue" action to configure the UNI-V with the following parameters:
- ACS URL (only if a change to the previously provided value is required):
"InternetGatewayDevice.ManagementServer.URL"
 - HTTP username: InternetGatewayDevice.ManagementServer.Username
 - HTTP password: InternetGatewayDevice.ManagementServer.Password
 - UNI-V INFORM periodic interval:
"InternetGatewayDevice.ManagementServer.PeriodicInformInterval".
 - Connection Request Password:
"InternetGatewayDevice.ManagementServer.ConnectionRequestPassword"
 - Connection Request Username:
"InternetGatewayDevice.ManagementServer.ConnectionRequestUsername"
- 9) The UNI-V replies with a "SetParameterValueResponse" message, for acknowledgement.
- 10) Every time the UNI-V receives a connection request from the ACS (HTTP GET) the UNI-V first challenges the ACS with "401 Unauthorized" to confirm the ACS identity. The ACS must then authenticate with the UNI-V using the HTTP credentials, i.e. "ConnectionRequestUsername" and "ConnectionRequestPassword" as configured in step 7 above.
- 11) When the UNI-V initiates a "6 CONNECTION REQUEST", the ACS must challenge the UNI-V with "401 Unauthorized". The UNI-V will respond by sending an Inform Message to the ACS with its HTTP credentials:
- "InternetGatewayDevice.ManagementServer.Username"
 - "InternetGatewayDevice.ManagementServer.Password". The HTTP password is hashed using the MD5 digest.
- 12) The ACS may query the UNI-V for its supported RPC method capabilities, using the "GetRPCMethod".
- 13) The UNI-V responds with "GetRPCMethodsResponse" including the RPC methods it supports.

Figure 5 illustrates TR-069 traffic flow to create a voice profile object.

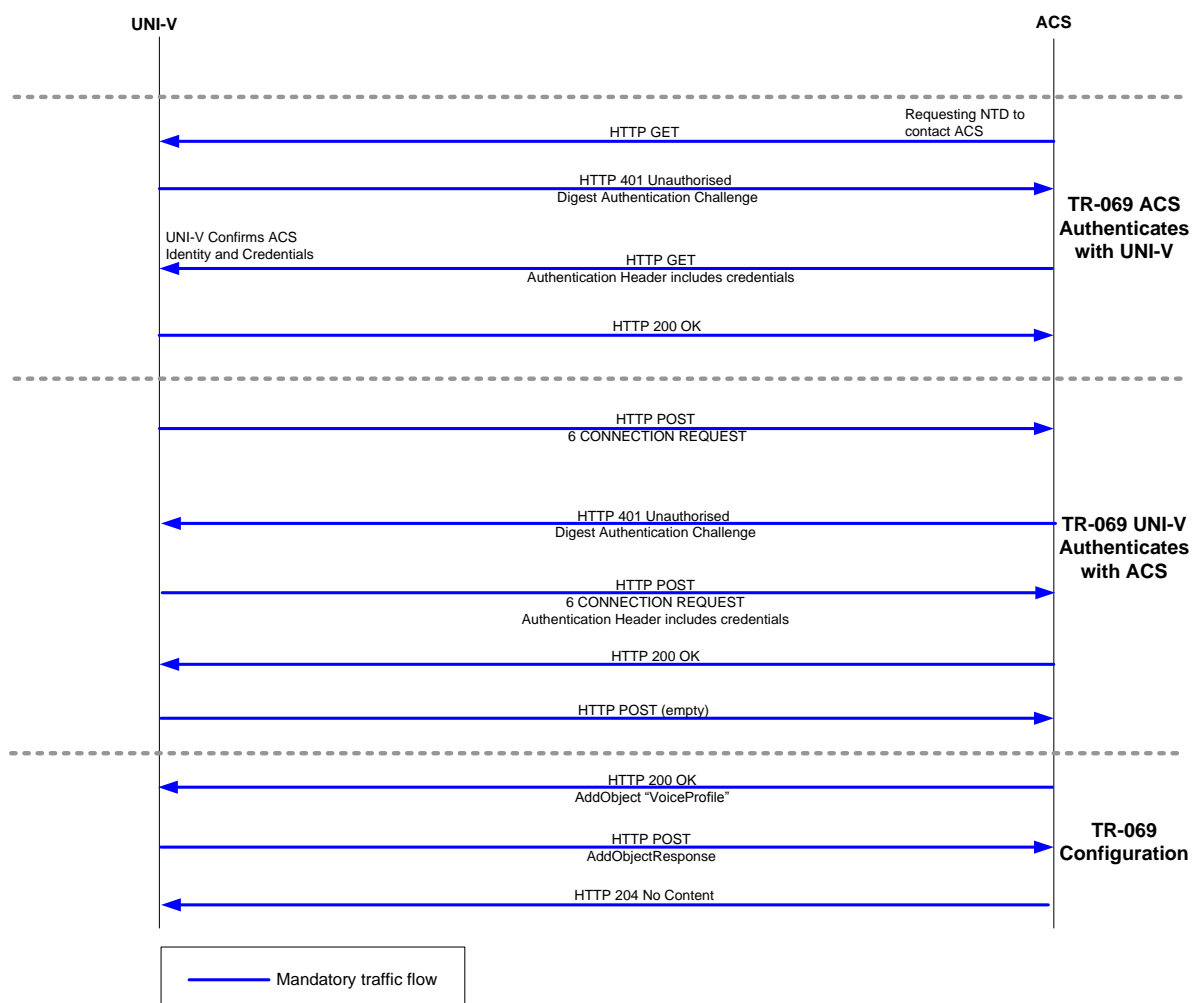


Figure 5 - Add VoiceProfile Object

- 14) To configure a new voice service, the ACS must first send the message "AddObject" to create InternetGatewayDevice.Services.VoiceService.{i}.VoiceProfile.{i}. The UNI-V will automatically also create a Line object.
- 15) The UNI-V, upon creating the object successfully, responds with "AddObjectResponse" with VoiceProfile object instance set "1".
- 16) The ACS uses the "SetParameterValue" method to configure the "InternetGateway Device.Services.VoiceService.{i}.VoiceProfile.{i}.Line.{i}" object parameters as shown in Figure 6.

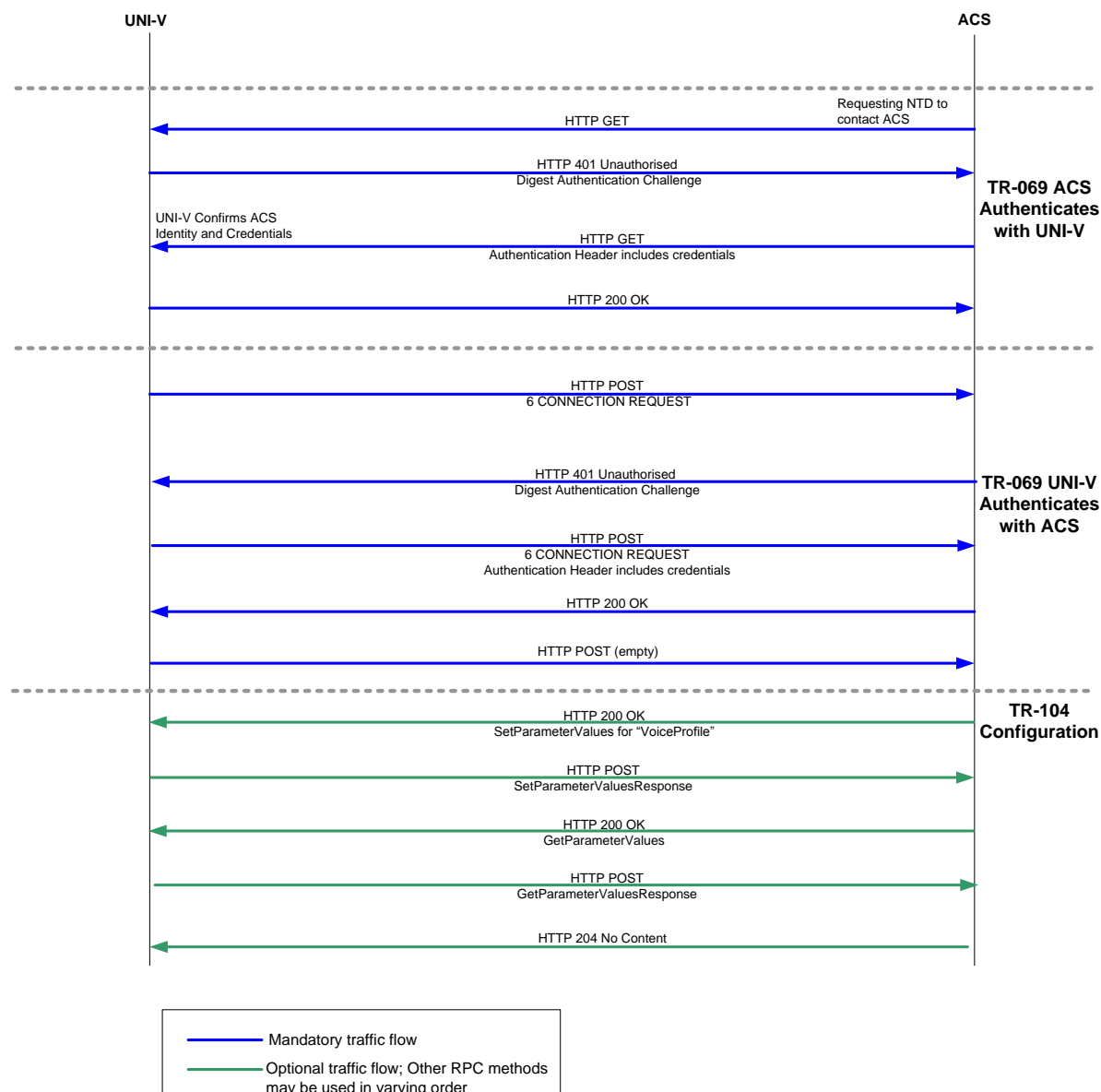


Figure 6 - Configure a new Voice Service

- 17) Every time the ACS sends a "SetParameterValue" to configure a parameter on the UNI-V, the UNI-V replies with a "SetParameterValueResponse" message, for acknowledgement (to confirm parameter value has been configured).
- 18) Once the ACS completes the provisioning, it will send an empty TR-069 message to indicate session closure (i.e. HTTP 204 No Content).

6.2. Use Case-2 NTD Manual Reboot

If the End User manually reboots the NTD, steps 1 to 5 in section 6.1 will be executed first with the exception that step 3 will not include “0 BOOTSTRAP” event code.

2) The following events then apply the new XML filename take place:

- 1) The UNI-V will send an INFORM message with a “1 BOOT” event code that informs the ACS a manual reboot has occurred.
- 2) The ACS confirms the UNI-V identity by checking the HTTP username/password.
- 3) Since the UNI-V sent an INFORM message with a “1 BOOT” event code, the ACS recognises this is a reboot event and that it does not need to configure the UNI-V (e.g. no TR-104 SIP configuration required). SIP configuration on the UNI-V will still be available after the reboot.

6.3. Use Case-3 Modification of End User Voice Service

This use case occurs when an access seeker wishes to modify a specific Customer Product being supplied to an End User, for example this includes the following changes:

- Adding/Removing a supplementary voice service for an End User
- Changing SIP username/password for an End User
- Changing a SIP configuration for an End User

The above service modifications do not require the voice service to be relinquished or removed. Adding or removing Customer Product voice features will not impact the voice service at the NBN Co Product level.

The sequences of events that are implemented to modify a voice service are as follows:

- 1) The ACS initiates a connection request (HTTP GET) to the UNI-V.
- 2) The UNI-V challenges the ACS with “401 Unauthorized”.
- 3) The ACS then authenticates using the HTTP credentials, i.e. “ConnectionRequestUsername” “ConnectionRequestPassword”.
- 4) The UNI-V verifies the ACS identity.
- 5) The UNI-V responds with HTTP message with “6 CONNECTION REQUEST” as an event code.
- 6) The ACS challenges the UNI-V with “401 Unauthorized”.
- 7) The UNI-V will responds by sending an Inform Message to the ACS with HTTP credentials:
 - a. “InternetGatewayDevice.ManagementServer.Username”
 - b. “InternetGatewayDevice.ManagementServer.Password”. The HTTP password is hashed using the MD5 digest.
- 8) The ACS verifies the UNI-V identity.
- 9) The ACS sends “SetParameterValue” to set the required parameter changes.
- 10) The UNI-V replies with a “SetParameterValueResponse” for acknowledgement.

6.4. Use Case-4 Cancellation of End User Voice Service

If the access seeker no longer desires to provide a voice service to the End User, it may disconnect the UNI-V in accordance with the processes set out in the NBN Co Operations Manual and the access seeker's access to the UNI-V and related NFAS Product Components will be removed.

6.5. Use Case-5 UNI-V Authentication failure with the ACS

If the UNI-V has an incorrect HTTP password, the connection will be rejected by the ACS and the UNI-V will keep retrying at random intervals from a range given by the post-reboot session retry count. See section 5.3.1.

6.6. Use Case-6 UNI-V Network Connectivity failure with the ACS

When an UNI-V is configured with a new ACS URL (via DHCP Option 43 or via ACS TR-069 configuration), the UNI-V will connect to the URL by sending "0 BOOTSTRAP".

If the UNI-V fails to connect to the ACS within 300 seconds, the UNI-V will fall back to the DHCP server, requesting a new DHCP offer and will continue to cycle until a successful connection to the ACS is achieved. This is described in more detail in section 5.2.1.

7. TR-104 Diagnostic Parameters Supported

Access seeker's ACS can query the UNI-V using TR-069 RPC methods to retrieve information about the connection or service status using the UNI-V voice line status in accordance with TR-104.

The UNI-V voice line object supports the following diagnostics parameters under the InternetGatewayDevice.Services.VoiceService.VoiceProfile.Line object:

- Status: Indicates the status of the UNI-V. For example if the status is "UP" this indicates the UNI-V is successfully registered with the access seeker's softswitch.
- CallState: Indicates the current status of the connection to the UNI-V, e.g. idle, InCall, Calling, etc.

6.5.8. **UNI-V SIP Overview**

The UNI-V SIP client will control the analogue states of the UNI-V, detect and process dialling, generate tones and Caller ID FSK transmissions, while signalling with the softswitch to control the phone call, and establish/tear down the RTP bearer channel associated with the voice path.

Signalling flows occur between the UNI-V and the softswitch. UNI-V traffic is carried in RTP packets which flow through the NBN Co ~~network~~Network in the same AVC as the signalling packet flow.

The UNI-V is an intelligent client (TISPAN Loosely Coupled), meaning it locally processes hook-flash events and the call-waiting service logic without reporting the hook-flash event to ~~the~~access seeker's softswitch. The UNI-V's call-waiting service logic may trigger the sending of SIP messages to ~~the~~access seeker's softswitch (e.g. placing an existing call on hold). Call feature service logic not utilising hook-flash events can also be implemented on ~~the~~access seekers' softswitch using basic SIP functions from RFC 3261 with a single signalling dialog for a voice call.

6.6.8.1. **UNI-V SIP Standard Support**

The UNI-V SIP stack on ~~both the indoor and outdoor~~the NTD is based on the following SIP standards in ~~the below table~~:Table 10:

SIP Standard Supported on indoor and outdoor NTDs	Definition
RFC 3261	Session Initiation Protocol (SIP)
RFC 2327	Session Description Protocol (SDP)
RFC 3264	An offer/answer model with Session Description Protocol (SDP)
RFC 3550	RTP: A transport protocol for real-time applications

Table 10 - UNI-V SIP Standard ~~Support~~support

Note: RTCP is available in the ~~first~~second release UNI-V, but will only become a supported feature in a future UNI-V release.

6.6.1.8.1.1. UNI-V SIP Extension Standards

The below table discusses Table 11 sets out the SIP extension standards supported or partially supported on the UNI-V and discussesdescribes how these standards are applicableapply in relation to the UNI-V.

SIP extension standard supported on indoor-and-outdoor NTDs	Description
RFC 3262: Reliability of provisional responses in SIP	<u>The UNI-V supports and inserts a 100Rel header field for new requests.</u>
RFC 3263: SIP: locating SIP servers	Defines the process used for resolving domain names when they are specified for register route or outbound proxy parameters
RFC 3265: SIP specific event notification	Used for Message Wait Indication
RFC 3311: SIP UPDATE method	May be used like a re-INVITE to modify SDP properties
RFC 3323: A privacy mechanism for SIP.	
RFC 3325: Private extensions to the SIP for asserted identity within trusted networks	This standard is utilised in some cases for caller ID information. This is not generated by <u>the</u> UNI-V
RFC 3350: Voice messaging client behaviour	
RFC 3842: A message summary and message waiting indication event package for SIP	Used with Message Waiting Indication
RFC 3515: SIP	This includes support for NOTIFY messages
RFC 3960: Early media and Ringing Tone generation in SIP	The UNI-V will accept early media using Gateway model for both modes
RFC 4028: Session timers in SIP	May be used during active calls for .keep-alive. messages. The UNI-V will periodically send re-INVITES when this function is enabled

Table 11_- UNI-V SIP Extension Standards Support

The following table Table 12 illustrates the SIP methods and requests supported on the ~~both~~ UNI-V SIP stack as per the SIP RFCs mentioned above.

SIP methods supported	Definitions
REGISTER	Registers a UNI-V with a softswitch
INVITE	Establishes a new call or updates properties of an active call
UPDATE	Used to modify the properties of a call
PRACK	Reliable acknowledge for intermediate answers during call setup
OPTIONS	Used by the softswitch to verify connectivity with the UNI-V and query its capabilities
ACK	Final response message to a request
BYE	Ends a call
CANCEL	Cancels a request transaction prior to 200 OK being received

Table 12_- SIP Method and Request Messages Supported on the UNI-V SIP Stack

Response codes are used as intermediate responses or final responses to SIP requests. The response codes supported specifically by the UNI-V are listed in ~~the table below.~~ Table 13.

All other ~~1xx,~~ 3xx, 4xx, 5xx, and 6xx SIP response codes received by the UNI-V indicate that the request failed. In most cases, this will result in a feature tone output from the UNI-V to connected CE (e.g. Ringing, Busy Tone, etc.) ~~to the UNI-V.~~

SIP response code	Action by UNI-V when receiving response code	Action when response code sent by UNI-V
100 Trying	No special action.	Sent in immediate response to an INVITE
180 Ringing	Send Ring-Back Tone to the UNI-V port	Sent in response to INVITE when a new call transaction is accepted by the UNI-V
183 Session Progress	If SDP included, establishes early media during call establishment. If no SDP, send Ring-Back Tone to the UNI-V port	Not sent by UNI-V
401 Unauthorized	UNI-V will re-try with authentication info -information	Not sent by UNI-V
403 Forbidden	Request/transaction failure-	Not sent by UNI-V
407 Proxy Authentication Required	UNI-V will re-try with authentication info -information	Not sent by UNI-V
415 Unsupported Media Type	Request/transaction failure-	An SDP offer did not contain any Codec configured for the SIP service
423 Interval Too Brief	Stops registration attempts	Not sent by UNI-V
480 Request Timeout	Request/transaction failure	Cancels a received INVITE when a new call is not answered after internal UNI-V timeout
488 Not Acceptable Here	Request/transaction failure	An SDP offer did not contain any Codec configured for the SIP service
486 Busy	End transaction; send Busy Tone to the UNI-V port	Sent in response to INVITE when a new call can't be accepted
491 Request Pending	Request/transaction failure	When Sent when a transaction in the same dialog is already in progress

Table 13_- Response Message Codes Supported on the UNI-V SIP Stack

6.6.2.8.1.2. Codec Negotiation

Codec negotiation is performed using the SDP offer / answer model (RFC 3264).

The SDP offer is contained in the INVITE and the SDP answer is contained in the ~~INVITES'~~INVITE "200 ~~ok~~OK" response:

- When the UNI-V ~~user~~ originates a call the INVITE sent to ~~the~~ access ~~seekers~~seeker's softswitch contains SDP with a priority list of all codecs supported by the UNI-V.
- If ~~at~~the UNI-V receives an INVITE with an SDP codec list that does ~~not~~ match any of the codecs supported by the UNI-V, ~~the~~ UNI-V will immediately after the "100 trying" send a "~~484~~488 Not Acceptable Here" response to the INVITE.
- When ~~the UNI-V user answers an incoming call to the UNI-V is answered by an End User,~~ the 200 ~~ok~~OK response contains SDP for the highest priority codec received in the INVITE that is also supported by the UNI-V.

Either end of the call can renegotiate the codec being used, in mid-call, by initiating a subsequent SDP offer / answer exchange using a REINVITE and “200 ~~OK~~” response.

~~6.6.3.8.1.3.~~ UNI-V SIP Timers supported

This section ~~discusses~~sets out the ~~various~~ timers supported on ~~both the~~ UNI-Vs ~~for~~ basic SIP signalling messages.

SIP timer parameter	Timer description	Value	access seeker configuration privilege level
Registration period	The registration expiration time that the client will propose by including it in an expires “Expires” header of a REGISTER request	0 to 65535 seconds (default 3600 seconds)	Configurable by access seeker at any time <u>Not configurable in TR-104</u>
Register retry timer	The duration to wait after a failed registration attempt (including the RFC 3261 defined retries) and the next registration attempt	0 to 65535 <u>30</u> seconds	Configurable by access seeker during on-boarding <u>Not configurable in TR-104</u>
<u>RegistrationPeriod</u>	<u>RegistrationPeriod is the interval at which UNI-V will send re-REGISTER messages. It is configurable and should be less than or equal RegisterExpires.</u>	<u>default 3240 seconds</u>	<u>Configurable in TR-104.</u>

Table 14 - UNI-V SIP Registration Timers

~~The following additional information on registration operation and timer values should also be noted:~~

- At NTD reboot, a random registration delay (0 to 5 minutes) is calculated and initiated. This delay is implemented to alleviate registration storms.
- If the UNI-V registration period value is lower than ~~the~~ access seeker’s softswitch’s minimum registration period ~~the~~ access seeker’s softswitch may send a “423 Interval Too Brief” response. On receipt of a 423 registration response the UNI-V ~~ceases~~will resend the Registration request with the registration ~~attempts until an updated XML file is downloaded or the NTD is reset.~~“Expires” header set to 3600 seconds.
- ~~The~~ By default, the UNI-V renews its registration ~~30~~360 seconds ~~(not configurable)~~ before the current registration expires. ~~(configurable in TR-104).~~
- When determining the ~~XML~~TR-104 “Registration Period” and “~~Register retry~~RegisterExpires” values ~~it is recommended, NBN Co recommends~~ that access ~~seekers balance~~seeker balances the

values which affect the ~~end-user's~~End User's service recovery time ~~and minimise~~with minimising registration traffic ~~and~~ which has the potential to generate registration storms.

- ~~NBN Co recommends that the~~The Register retry ~~value~~timer is ~~configured between the 5~~set to 30
seconds and ~~15 minute range~~is not a configurable parameter.

The following timers are built in the firmware ~~and of each NTD, are~~ defined ~~as per~~ in accordance with RFC 3261 and ~~will~~ ~~are~~ not ~~be~~ configurable by access ~~seekers~~ ~~seeker~~.

SIP timer parameter	Description
Invite message timer	The INVITE transaction timeout, designated as Timer B in RFC 3261
Non-INVITE message timer	The non-INVITE transaction timeout, designated as Timer F in RFC 3261
sip_timer_t2	The value of the SIP T1 <u>T2</u> timer (the maximum retry interval for a non-INVITE request)
sip_timer_t1	The value of the SIP T2 <u>T1</u> timer (the round-trip time estimate)

Table 15 - UNI-V SIP Timers

6.6.4.8.1.4. Digit collection timers

The digit collection timers are controlled by NBN Co and ~~have been~~ are set to:

- First digit timer - 12 seconds (+/- 0.5 seconds)
This is the maximum time allowed between a telephony device connection to the UNI-V going off-hook and the first digit being received. During this period Dial Tone is played. When the timer expires, ~~timer expiry~~ Busy Tone is played.
- Inter-digit timer - 6 seconds (+/- 0.5 seconds)
The maximum time allowed between digits. Applies to digit map patterns with and without the "T" symbol. Timer expiry indicates end of dialling. The # digit can also be used to indicate end of dialling.

6.6.5.8.1.5. Tones Support

The ~~indoor and outdoor NTDs support~~ UNI-V supports the generation of the tones described in ~~the table below:~~ Table 16:

Tones supported	Tones triggers
Busy Tone	Transaction failure errors 4xx (except 404), 5xx, and 6xx in response to INVITE
Disconnect Tone	BYE received
Number Unobtainable Tone	Error 404 in response to INVITE
Call Waiting Tones	Call Waiting service logic
Dial Tones	UNI-V off-hook is detected
Message Waiting Indication Tone; Stutter Tone	Message waiting is active and off-hook is detected
Recall Dial Tone	Output by UNI-V when flash-hook is used and after dialling some service codes
Ringing Tone	180 Ringing message in response to INVITE

Table 16 - UNI-V SIP Tones

6.6.6-8.1.6. Dial Plan configuration

Dial Plan support on the UNI-V is implemented using a digit-map generally following the MGCP standard format. The Dial Plan string length can be up to **2561024** characters- including parenthesis. Guidelines and examples of configurations are shown set out below:

- 1) The following characters are valid as per the MGCP standard:
 - a. Numeric number: 0,1,2,3,4,5,6,7,8,9.
 - b. Character: *,#,(,),[,], | and .
 - c. [] specifies the valid digit range. For example [1-5] indicates only the numbers 1 through 5 are acceptable.
 - d. Arbitrary number(s): "x" or "x."; Note that "x." represents a numeric string of any length, including a length of 0.
 - e. Timer: T; ~~Note: this~~ This is a critical dial timer, and there may be more than one T timer in the Dial Plan table. E.g. (123x.T|456x.T|**xxx.T). ~~Also Note:~~ If any other character is included in the Dial Plan, the UNI-V will treat the whole Dial Plan as invalid and reject it.
- 2) The Dial Plan begins with "(" and ends with ")". Each item in the Dial Plan is delimited by "|". E.g. (1234|**##|x.T).

- 3) ~~The Dial Plan is configured in the XML configuration file using the <DigitMap> tag and is a string of up to 2561024 characters- including parenthesis~~

E.g.÷

~~<DigitMap>(**.(**xxx|000E|106E|***xx|*xx*x.#|*xx*x.*xx#|*xx*x.*x#|*31*xxxxxxx|*xx#|*xx#|*xx#|#001|x.T)</DigitMap>)~~ The Dial Plan is applied to the End User service as per the details in to section 10.2.

4)3) Default Dial Plan

The UNI-V uses its default Dial Plan in the case where there is no other Dial Plan or an invalid Dial Plan is configured. E.g. default Dial Plan would be:

(***xx|*xx*x.#|*xx*x.*xx#|*xx*x.*x#|*31*xxxxxxx|*xx#|*xx#|*xx#|#001|x.T)

5)4) Matching rules

Consider the default Dial Plan example below:

(***xx|*xx*x.#|*xx*x.*xx#|*xx*x.*x#|*31*xxxxxxx|*xx#|*xx#|*xx#|#001|x.T)

- a. If one unique item is matched without ambiguity, the UNI-V will send the dialled numbers immediately. E.g. dial *43# matches the rule "|*xx#|".
- b. If the matched item contains timer T, UNI-V will delay initiating a call until the timer has expired. If a new digit is dialled before the timer expires, the UNI-V will re-check the dialled number containing new digits to see if the dialled number matches. E.g. dial 123456 matches the rule "|x.T|".
- c. If the dialled numbers do not match any items, the UNI-V will not send the numbers. E.g. dial ***#.
- d. If the numbers dialled match more than one item, the UNI-V will match on the item with the least number of wildcards to match. E.g. (**xx|123xxx.T|1234)
After dialing 1234, the UNI-V will initiate a call as the rule item1234 was matched instead of 123xxx.T.

Note: access ~~seekers can~~ seeker may specify service codes supporting call features based on the matching rules above.

Feature activation codes for the UNI-V's "Suspend Call Waiting" service (*70) and softswitch-based voice features such as Calling Number Display, call forwarding on busy, call forwarding on no answer and call forwarding unconditional, need to be included by the access seeker in the digit map.

6.7.8.2. UNI-V Voice Features Supported

This section ~~discusses~~sets out all the telephony features supported on both indoor and outdoor ~~NTDs~~the UNI-V.

SIP service features	Description of feature
Call Waiting	<ul style="list-style-type: none"> Accepting a second call whilst call is in progress Alternating between two calls
Suspend Call Waiting	<ul style="list-style-type: none"> Cancel Call Waiting
Call forwarding	<ul style="list-style-type: none"> Hosted by the access seeker softswitch Activation and Deactivation code configured in the Dial Plan
Call hold	<ul style="list-style-type: none"> Basic hold (flash hook supported)
Hotline service	<ul style="list-style-type: none"> Immediate connection to a preconfigured number
Distinctive Ringing	<ul style="list-style-type: none"> Alert-info header value indicates distinctive Ringing pattern for the different distinctive Ringing features.
DTMF support	<ul style="list-style-type: none"> DTMF for dialing<u>dialling</u> In band transmission only
Fax support	<ul style="list-style-type: none"> Fax passthrough
Calling Line Identification	<ul style="list-style-type: none"> Hosted by <u>the</u> access seeker softswitch Configured in the Dial Plan Send signal to CPE to display source number of incoming call
Calling Line Identification Restriction	<ul style="list-style-type: none"> Keep source number private in outbound calls Hosted by <u>the</u> access seeker softswitch Configured in the Dial Plan
Emergency Call	<ul style="list-style-type: none"> SIP Priority-headers to the <u>access seeker's</u> softswitch
Message Waiting Indicator	<ul style="list-style-type: none"> Visual Message Waiting Indicator Stutter Dial Tone
<u>Voice Band Data</u>	<ul style="list-style-type: none"> <u>Passthrough using G.711 with fixed jitter buffer size</u>

Table 17 - Voice Features Supported on the UNI-V

6.7.1-8.2.1. Call Feature Triggers

This sub-section describes how various call features are triggered.

6.7.1.1.8.2.1.1. Call Waiting

Call Waiting: If the UNI-V has Call Waiting enabled and ~~the~~ access seeker's softswitch allows more than one call to the UNI-V, then Call Waiting will be triggered when a second call is received by the UNI-V. The call hold feature is not required for the call waiting feature to be triggered.

If an ~~end-user~~End User has Call Waiting enabled on the UNI-V and call forwarding (both busy and no answer) is activated on ~~the~~ access seeker's softswitch, when the UNI-V receives a second call, the following features will be triggered depending on the softswitch call forwarding timers:

- If ~~the~~ access seeker's softswitch call forwarding no answer timer is less than the Call Waiting timeout of the UNI-V (UNI-V ~~call waiting~~Call Waiting timeout is 60 seconds), call forwarding no answer is triggered by the softswitch.
- If ~~the~~ access seeker's softswitch call forwarding no answer timer is greater than ~~60 seconds~~ (UNI-V call waiting the Call Waiting timeout of the UNI-V (UNI-V Call Waiting timeout is 60 seconds), the UNI-V will generate "486 Busy"~~hence~~, triggering the call forward busy logic on ~~the~~ access seekers' softswitch.

The Call Waiting feature is controlled by the UNI-V and is configured in the ~~XML configuration file~~ "<enable_cw>yes</enable_cw>".TR-104 "CallWaitingEnable" parameter under the VoiceProfile.{i}.Line.{i}. CallingFeatures object.

UNI-V Call Waiting is dependent on ~~the~~ access ~~seekers~~seeker's softswitch allowing two or more simultaneous calls to be made the same ~~end-user~~UNI-V.

The UNI-V supports the Call Waiting Tone specified in AS/CA S002:2010. The frequencies, amplitudes, and timing are specified in ~~section 4.4.2~~the UNI-V Electrical Specification documentation.

Call Waiting occurs when an INVITE for a new dialog is received during an active call. When Call Waiting is invoked, the UNI-V immediately sends "486 Busy" responses to subsequent INVITES (only one call can be waiting).

When an ~~end-user~~End User is in a conversation and receives a Call Waiting Tone, indicating an additional incoming call, the ~~user~~End User can:

- Ignore the 2nd call;
- Accept the 2nd call; or
- Toggle between the two calls (after accepting the 2nd call).

The UNI-V starts a 60 second Call Waiting timer when the Call Waiting ~~call~~signal is received, and ~~it~~the ~~timer~~ is cancelled when the Call Waiting call is answered or cancelled. If the timer expires (Call Waiting call ignored) the UNI-V sends a "486 Busy" response to access seeker's softswitch.

If ~~the~~ access seeker's softswitch applies its own no-answer or Call Waiting service in parallel with the UNI-~~Vs~~V's Call Waiting service ~~it,~~ access seeker's softswitch can abort the unanswered Call Waiting call by sending a "CANCEL" message as per normal RFC 3261 signalling.

The table below illustrates Table 18 describes the UNI-V Call Waiting service codes.

Service Code	Description
Recall	The active call is held and Call Waiting call answered
Recall + digit 1	The active call is released and the held call is resumed.
Recall + digit 2	The active call is held and the held call is resumed

Table 18 - Call Waiting service codes

A more detailed description of the Call Waiting service logic is ~~provided below~~ as follows:

Call Waiting is separated into two stages, before and after accepting the second incoming call as described ~~below in the following sub-sections~~. For illustrative purposes, it is assumed that A and B are on an established the call when C calls A, invoking Call Waiting.

6.7.1.1.1.8.2.1.1.1. Before accepting the second incoming call

When C calls A, A receives Call Waiting Tone and C hears the Ring Back Tone.

If A presses Recall ~~key~~, B is placed on hold by sending a re-INVITE, and A hears Dial Tone.
If:

- A presses digit '2', A accepts the call from C (B is on hold).
- A presses any other digit, it is ignored.
- A presses Recall again, A is reconnected with B. C will still be waiting (hearing the Ring Back Tone).
- A goes ~~on-hook~~ On-Hook, the call with B is released and A ~~is-rung~~ receives the Ringing Tone for the call from C. ~~Note if~~ If A is the called party of the A-B call, a 90 second release guard period is applied which is greater than the Call Waiting time out period.
- A does not press any valid digit key before Dial Tone timeout (~~12s~~ 12 seconds), A will hear Busy Tone. The call with B is released and the call from C is rejected.

6.7.1.1.2.8.2.1.1.2. After accepting the second incoming call

~~When Assuming the active call is A-C and the held call is A-B, when~~ A presses the Recall ~~key~~ the active call is placed on hold and A hears ~~Dial Tone~~ dial tone (both calls are now on hold).

If:

- A presses digit '1', the active call (A-C) is released and the held call (A-B) is resumed.
- A presses digit '2', the active call (A-C) remains on hold (held when recall key pressed) and the held call (A-B) is resumed (toggles between active and held calls).
- A presses any other digit it is ignored.
- A presses Recall ~~key~~ again, the active call (A-C) is resumed and the held call (A-B) remains held.
- A goes on-hook the active call ~~with B~~ (A-C) is released and A is re-rung by the held call ~~(A-B)~~.
Note if A is the called party of the active call a 90s release guard period is applied which is greater than the Call Waiting time out period.

- A does not press any valid digit key before ~~Dial Tone~~dial tone timeout (~~12-second~~12s), A will hear ~~Busy Tone~~busy tone and both calls are released.

Please refer to section

Section 9 ~~for~~sets out SIP call flows.

~~6.7.1.2.8.2.1.2.~~ Suspend Call Waiting

Call Waiting can be suspended for a single call by the End User dialling the UNI-~~Vs~~V's "Suspend Call Waiting" feature code *70 (fixed value). After dialling *70, the Dial Tone is played.

Call Waiting can be suspended for either:

- New calls – by dialling *70 before the called number, for example dial *70<dial-tone> 12345678.
- Existing call – by pressing Recall ~~key~~, dialling *70 then pressing Recall ~~key~~ again (resumes active call), ~~for example~~i.e., by following the sequence, Recall <dial-tone> dial *70 <dial-tone> Recall.

Call Waiting is re-activated at the end of the call.

To use "Suspend Call Waiting"", the digit map must contain a pattern that matches or partially matches *70, e.g. *X.T.

~~6.7.1.3.8.2.1.3.~~ Call Forwarding

Call forwarding on busy, ~~Call forwarding on no answer~~, and unconditional call forwarding are controlled by ~~the~~ access seeker's softswitch. To activate/deactivate call forwarding, the Dial Plan on the UNI-V must be configured with the same activation and deactivation dial codes implemented at ~~the~~ access seeker's softswitch.

Call forwarding (on busy, no answer or unconditional) is not a UNI-V feature, but rather a function of ~~the~~ access seeker's softswitch. Specifically, the UNI-V does not support:

- Splash ring / ping ring; or
- A special Dial Tone when call forwarding is active.

~~6.7.1.4.8.2.1.4.~~ Call Hold

The ~~end-user~~End User can initiate call hold during an existing call session, when:

- the ~~end-user~~End User receives a second call (using the call waiting feature); or
- the ~~end-user~~End User initiates a second call.

~~The table below illustrates~~Table 19 describes the service codes supported by the UNI-V.

Service Code	Description
Recall	The current call is held and a Dial Tone is generated
Recall + digit 1	The current call is released and the held call is resumed

Recall + digit 2	The current call is held and the held call is resumed

Table 19_- Voice Features ~~Supported~~ supported on the UNI-V

A more detailed description of the call hold service logic is ~~provided below~~as follows:

Call hold is separated into 2 stages, before and after the second call is established as described ~~below~~.in the following sub-sections. For illustrative purposes, it is assumed that A and B are on an established call when A invokes Call hold.

~~6.7.1.4.1.8.2.1.4.1.~~ Before second call is established

When A presses ~~recall key~~Recall, B is placed on hold ~~by~~through the UNI-V sending a re-INVITE, and A hears ~~the~~ Dial Tone.

If:

- A presses ~~recall~~Recall, A is reconnected with B.
- A does not dial any digit before Dial Tone timeout (12s), A hears ~~the~~ Busy Tone:
 - If A presses ~~recall key~~Recall, A is reconnected with B.
 - If Busy Tone times out (60s), the call with B is released and A hears ~~the~~ Howler Tone.
 - If A goes on-hook, the call with B is released.
- A dials C, which can be a service activation code or another phone number.
 - If the call to C is rejected, A hears ~~the~~ Busy Tone.
 - If A presses ~~recall key~~Recall, A is reconnected with B
 - If A goes on-hook, A is alerted by ~~the~~ Ringing ~~(re-rung)~~ to indicateTone, which indicates that B is still held. A can either pick up the phone to be reconnected with B or wait for Ringing timeout to release the call with B.
 - If the call to C is successful, A can communicate with C (see operation after second call is established.)
 - If A presses ~~recall key~~Recall before the call to C is accepted or rejected, the call to C is released and A is reconnected with B.

~~6.7.1.4.2.8.2.1.4.2.~~ After second call is established

Following the scenario in previous section, after the call to C is accepted, if A presses ~~recall key~~Recall, A hears ~~Dial Tone~~dial tone.

If:

- A presses digit '1', the active call (A-C) is released and the held call (A-B) is resumed.
- A presses digit '2', the active call (A-C) remains on hold (held when recall key pressed) and the held call (A-B) is resumed (toggles between active and held calls).
- A presses any other digit, it is ignored.
- A presses ~~recall key~~Recall, the active call (A-C) is resumed and the held call (A-B) remains held.

- A goes on-hook the active call (A-C) is released and A is alerted by Ringringring (re-rung) to indicate a call is still held. (i.e. A-B). A can either pick up the phone to resume the held call or wait for Ringringring timeout to release the call.
- A does not press any valid digit key before Dial Tone dial tone timeout (12s), A will hear Busy Tone busy tone
 - If A presses ~~recall~~ Recall key the active call (A-C) is resumed and the held call (A-B) remains held.
 - If Busy Tone busy tone times out (60s) the calls with B and C are released and A hears Howler Tone tone.

If A goes on-hook the active call is released and A is alerted by Ringringring (re-rung) to indicate a call is still held. A can either pick up the phone to resume the held call or wait for Ringringring timeout to release the call.

6.7.1.5.8.2.1.5. Hotline Service

The UNI-V's hotline (immediate) service is self-contained and does not rely on any softswitch hotline capability.

The hotline destination is pre-provisioned in the XML configuration files direct-connect-uri using the TR-104 "X_ALCALTE-LUCENT-COM_DirectConnectURI" parameter under the VoiceProfile.{i}.Line.{i}.CallingFeatures object.

At off-hook detection, the UNI-V does not play the Dial tone and immediately sends an INVITE request with the FROM header populated with the value of the X_ALCALTE-LUCENT-COM_DirectConnectURI field.

At off-hook detection the UNI-V does not play Dial Tone and immediately sends an INVITE request with the FROM header populated with the value of the direct-connect-uri field.

Once the INVITE has been sent, normal call processing is applied by between the UNI-V and softswitch.

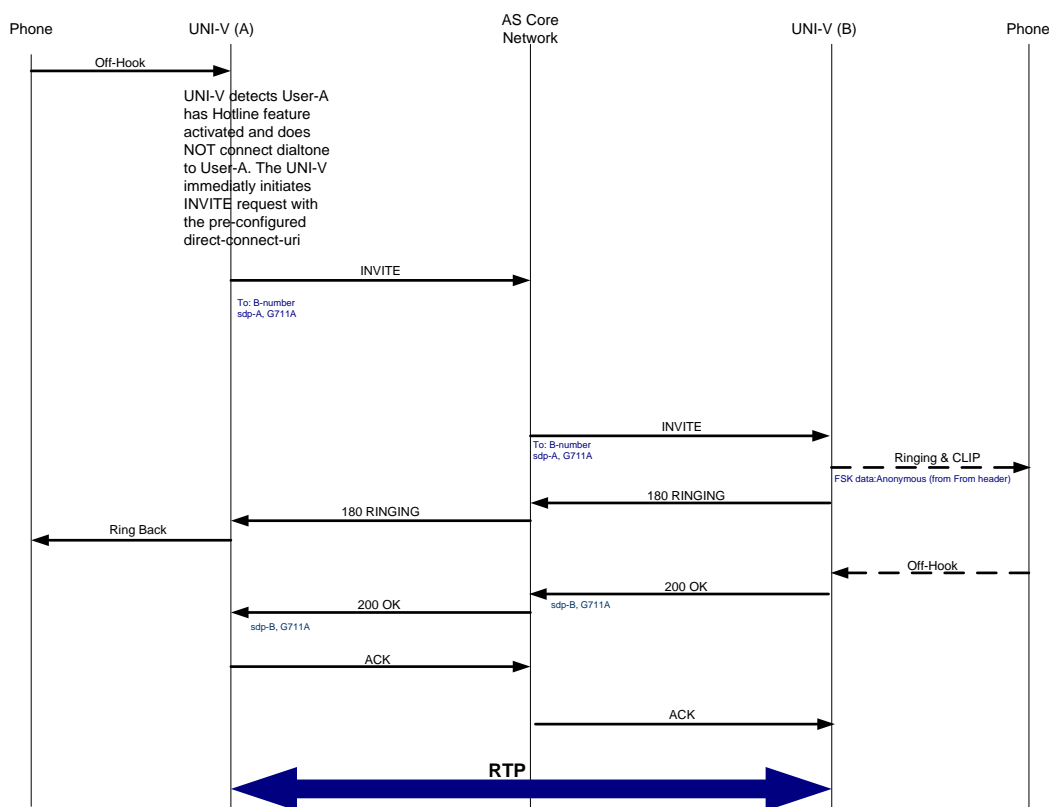


Figure 7 _Hotline SIP flow

~~6.7.1.6.8.2.1.6.~~ **Distinctive Ringing Support**

The UNI-V supports 5 different Ring cadences (DR0, DR1, DR3, DR6 and DR7) with timings defined in AS/CA S002:2010. When an INVITE is received by the UNI-V for a new call, the UNI-V will act as follows depending on the value in the INVITE “alert-info” header:

- If the “alert-info” value is in one of the UNI-V supported formats:

`<http://127.0.0.1/[anytext]/dst_ring_[ring-cadence-index]>`

`<http://127.0.0.1/[anytext]dr[ring-cadence-index]>`

Note the underscore character between “dst” and “ring” and between “ring” and the ring cadence number.

Then the [ring-cadence-index] value determines the distinctive Ringing pattern ~~as per the following table:~~ in accordance with Table 20:

Ring-cadence-index value	Distinctive Ringing pattern
1	DR0
2	DR1
3	DR3
4	DR6
5	DR7

~~Table 20 - Distinctive Ring Cadences~~

- If the “alert-info” header is not presented, the default cadence (DR0) will be applied.
- If the “alert-info” header contains an invalid value, the default cadence (DR0) will be applied.

The UNI-V does not include an “alert-info” header in outgoing SIP INVITE requests.

~~6.7.1.7.8.2.1.7.~~ DTMF Support

DTMF Tones will be encoded as normal voice data (in-band). In-band DTMF is transmitted within the audio of the phone conversation, ~~(i.e. it is audible to the conversation partners).~~ Only a uncompressed codec (G.711 A-law) can carry in-band DTMF reliably.

~~6.7.1.8.8.2.1.8.~~ Decadic support

Decadic or pulse dialers are not supported by the UNI-V.

~~6.7.1.9.8.2.1.9.~~ FAX Support

~~Indoor and outdoor NTDs~~ The UNI-V can support the transmission of fax across the NBN Co ~~network~~ Network:

1) -Fax pass-through is only supported with the G.711 A-law codec. This is the default setting. Fax is encoded in G.711 A-law similar to voice traffic. Once a SIP call is setup, the UNI-V will automatically switch the codec to clear channel (G.711 A-law codec with jitter buffer fixed and echo cancellation disabled). Data will be sent using the same packetisation delay as other UNI-V telephony traffic (i.e. 20ms).

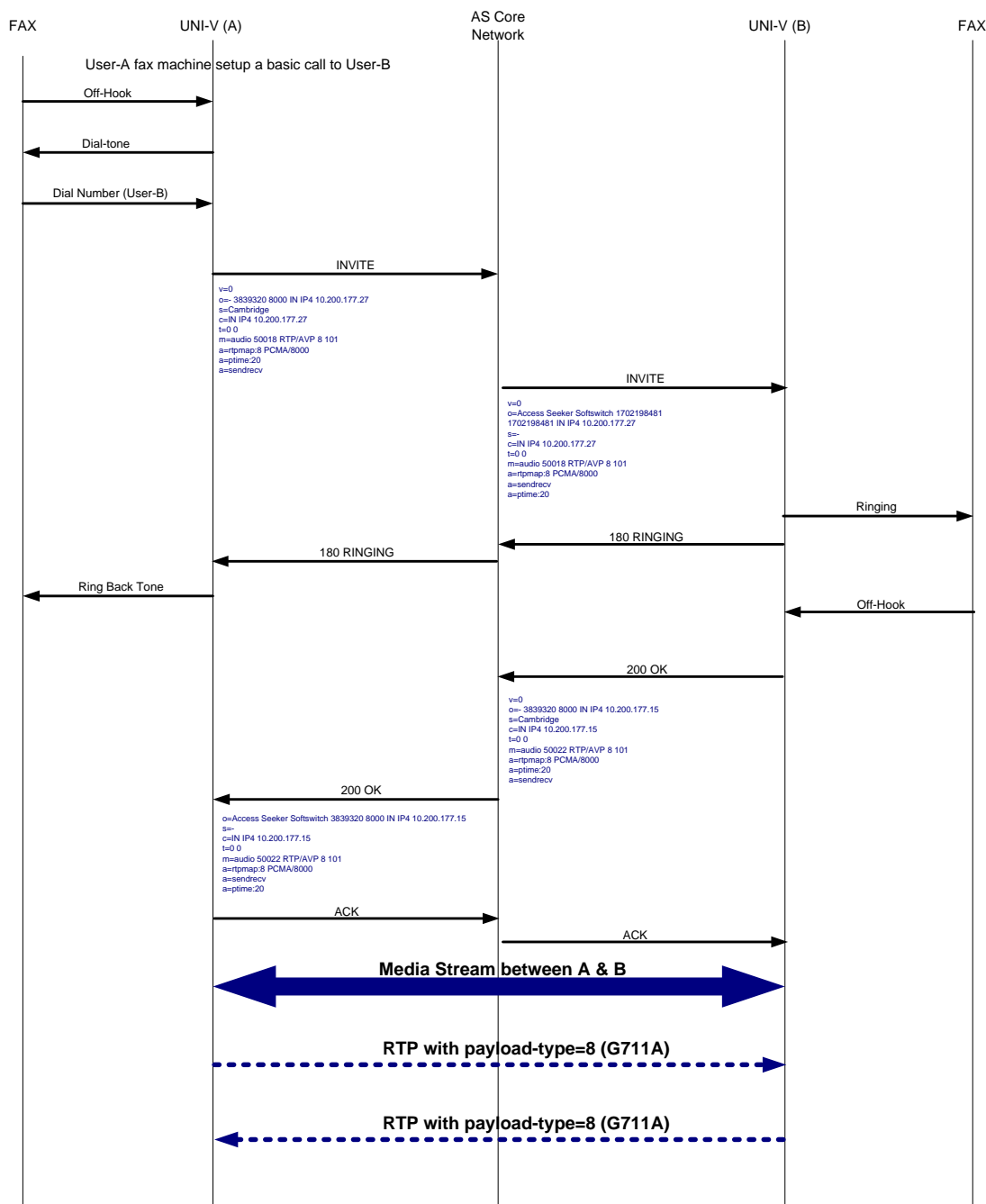


Figure 8 - Fax Pass-Through

~~6.7.1.10~~ 8.2.1.10. **Calling Line Identification**

Calling Number Display (**CND**) is implemented in the following states:

- During ~~on-hook~~ **On-Hook**
- Phone ~~off-hook~~ **Off-Hook** (when a second call is received using Call Waiting feature).

When a SIP INVITE message is received at the UNI-V, the UNI-V utilises the “P-Asserted-Id” header or if it is not present the “From” header. ~~FSK is then used to output caller id to the telephone handset. Therefore it is recommended that the access seeker softswitch does not include P-Asserted-Id in the SIP INVITE messages when CLIR is applied and the “From” header should be set to anonymous. The CND feature is controlled by the UNI-V and is configured in the TR-104 “CallerIDEnable” parameter under the VoiceProfile.{i}.Line.{i}. CallingFeatures object.~~

~~When CallerIDEnable is set to “true”, FSK is then used to output the caller ID to the CPE connected to the UNI-V. If however CallerIDEnable is set to “false”, no caller ID will be sent to the CPE.~~

~~Access seeker can still control CND through its softswitch when enabled on the UNI-V by setting the softswitch to not include P-Asserted-Id in the SIP INVITE messages when CLIR is applied and setting the “From” Header to anonymous.~~

~~6.7.1.11~~ 8.2.1.11. **Calling Line Identification Restriction**

Calling Line ID Restriction (**CLIR**) is not a UNI-V feature, but rather a function of ~~the~~ access seeker’s softswitch.

CLIR is normally implemented by ~~the~~ access seeker’s softswitch using a prefix sequence before the ~~dialled~~ **dialled** number (~~E.g.~~ *67 followed by the required number to dial). The CLIR prefix must be considered when configuring the Dial Plan (digit map).

~~6.7.1.12~~ 8.2.1.12. **Message Waiting Indication**

~~M~~The Message ~~waiting indication~~ **Waiting Indication** feature allows the UNI-V ~~user~~ **End User** to be notified (RFC 3842) when they have a message waiting in their message service. The UNI-V supports implicit message waiting subscription (~~it~~ does not send a message waiting subscribe message).

~~The access~~ **Access** seeker’s network ~~is expected to~~ **must** send a SIP NOTIFY message with “Messages-Waiting” header set to “yes” and “Voice-Message” set to the “n” number of messages whenever the message count changes and when the UNI-V completes registration ~~if~~ **unless** the message count is ~~not~~ zero.

When the SIP NOTIFY “Messages-Waiting” header is set to “yes”, Visual Message Waiting and Audible Message Waiting are activated as follows:

- 1) Visual Message Waiting: the UNI-V will send FSK signals that causes a blinking led on the CPE ~~connected to the UNI-V where supported.~~
- 2) Audible Message Waiting: the UNI-V plays Message Wait Tone (Stutter Dial Tone) instead of standard Dial Tone when the UNI-V user goes off-hook.

~~Similarly when~~When the SIP NOTIFY “Messages-Waiting” header is set to “no~~,”~~ Visual Message Waiting and Audible Message Waiting are de-activated.

The MWI feature is controlled by the UNI-V and is configured in the TR-104 “MWIEnable” parameter under the VoiceProfile.{i}.Line.{i}. CallingFeatures object.

~~6.7.1.13.8.2.1.13.~~ **Emergency Call**

~~Where an~~If access seeker suffixes emergency numbers with “E” ~~in their~~within its Dial Plan (Eg. “000E” and “106E”), the UNI-V will support special call handling when an emergency call is originated by the ~~end user~~End User (subject to, among other things, mains or battery power being supplied to the NTD).

The initial INVITE message will contain two priority headers:

- Priority: emergency
- Resource-Priority: emrg

The UNI-V provides an emergency call treatment only for outgoing calls. When an emergency call is initiated, the emergency attributes comes into effect only after an emergency call gets answered.

During an emergency call, the UNI-V will ignore flash-hook (e.g. call hold etc) and any new incoming call is denied with “486 Busy Here”.

7.9. SIP Flows/Call Scenarios

7.1.9.1. Authentication

A 401 or 407 response to a request from the UNI-V may contain information that the UNI-V can use to authenticate the UNI-V according to the rules in RFC 3261. The UNI-V will re-send the request with updated information based on configured username, and password parameters described in the SIP configuration section. Authentication is supported for REGISTER and INVITE messages.

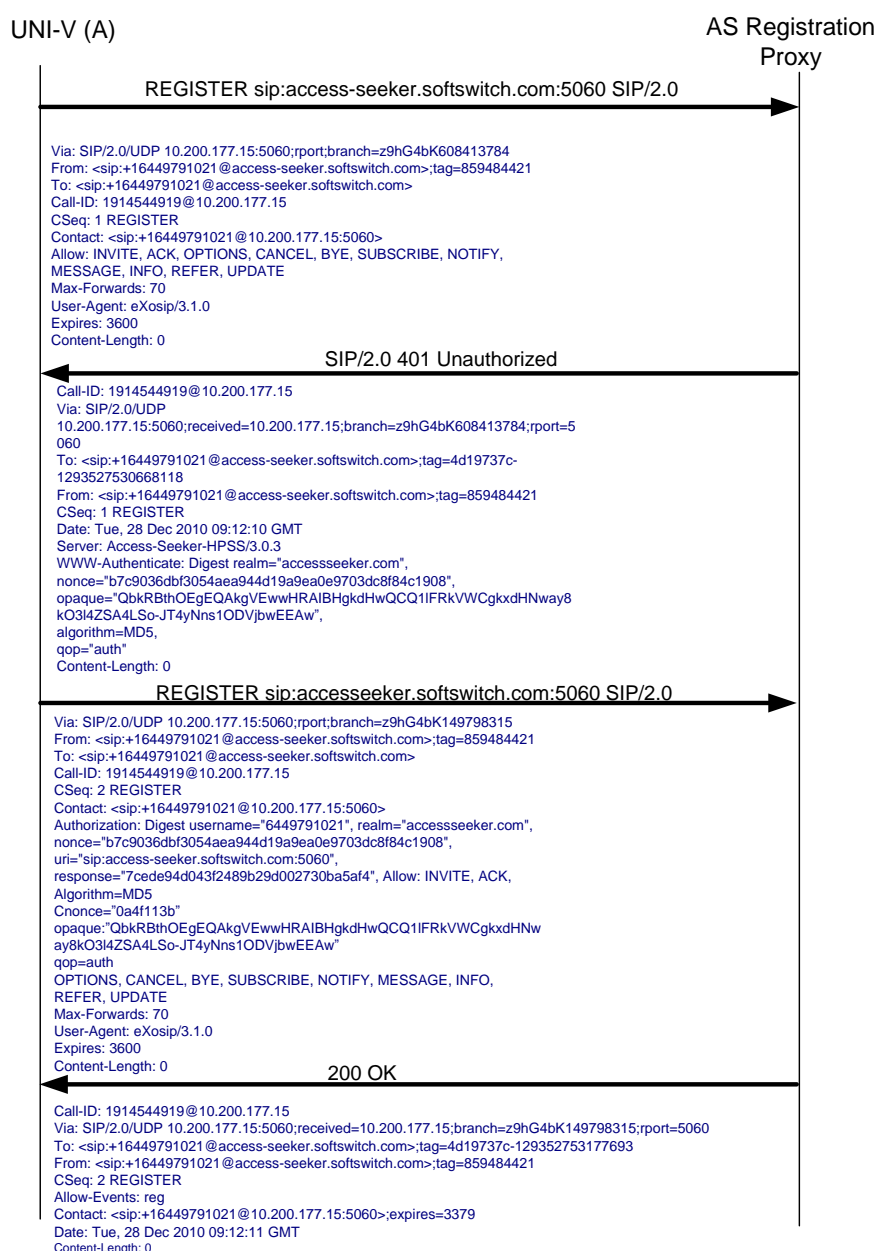


Figure 9 - SIP Registration and Authentication

7.2.9.2. Registration Failure- Incorrect Password

UNI-V (A)

AS Registration
Proxy

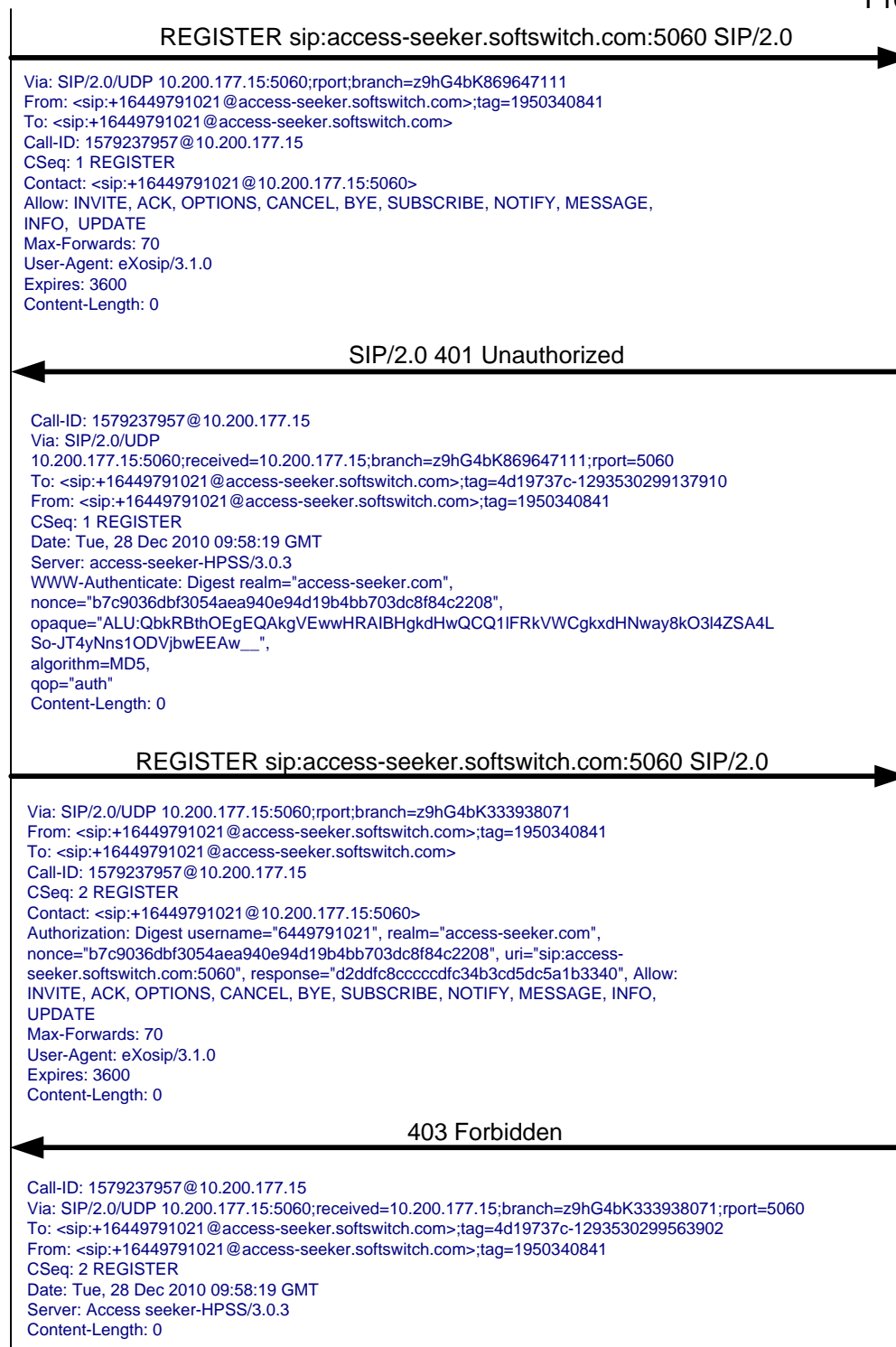


Figure 10 – Registration Failure - Incorrect Password

7.3.9.3. Registration Failure- Invalid Number

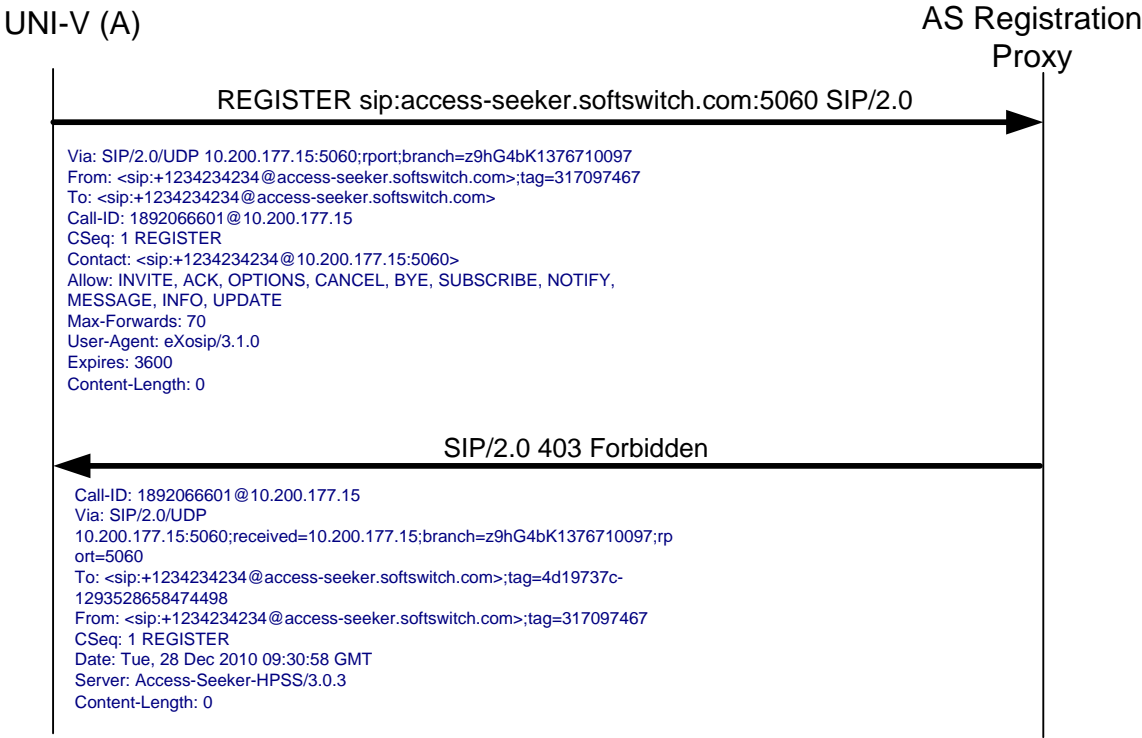
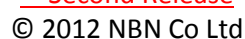
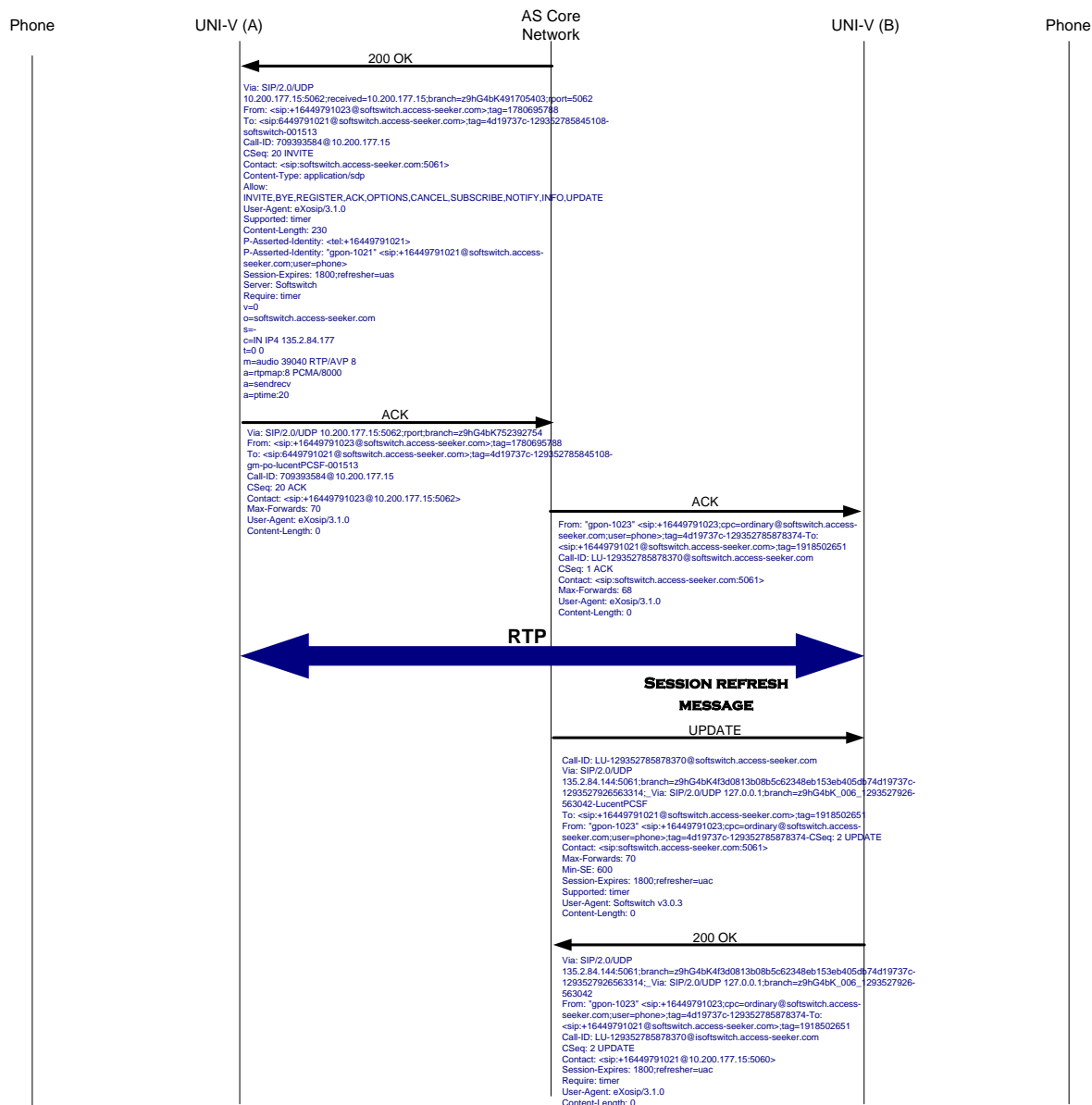


Figure 11_ Registration Failure - Invalid Number





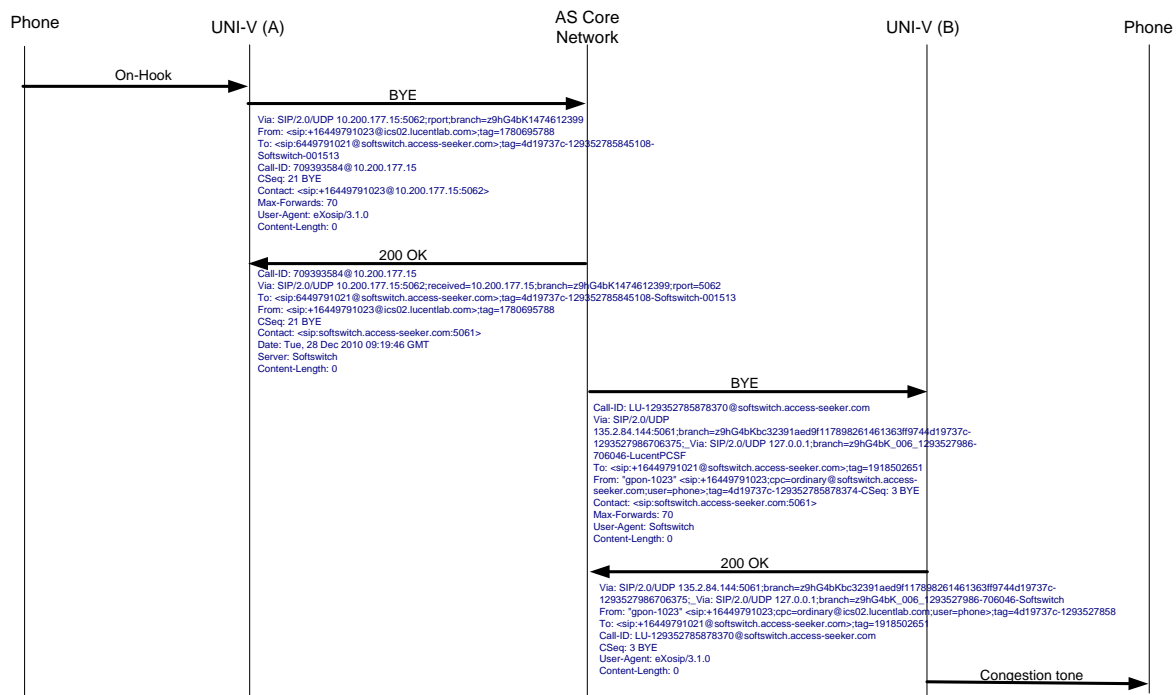


Figure 12 – SIP Signalling Basic Call Flow

7.4.1.9.4.1. Basic Call (No Answer)

In a basic call scenario, when **NTD-UNI-V (A)** calls **NTD-UNI-V (B, NTD)**, **UNI-V (B)** will terminate the call (if no answer) after 60 seconds by sending a “480 Request timeout” as shown in the below diagram:

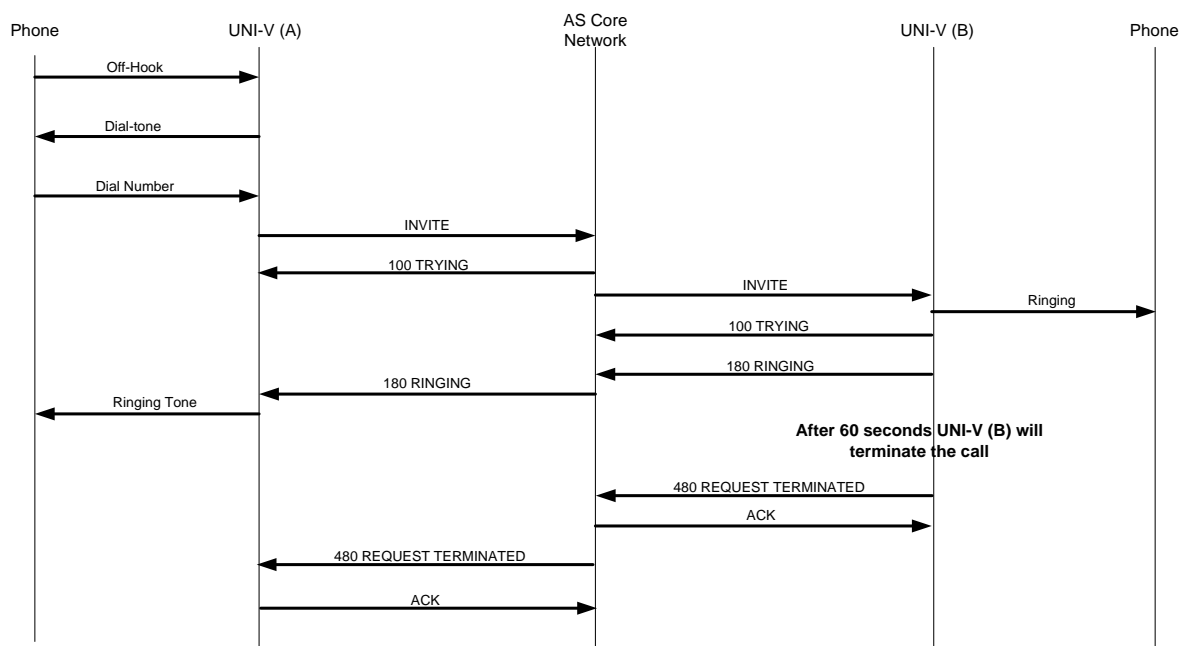


Figure 13 - Basic Call (No Answer)

7.5.9.5. Call Forwarding on Busy

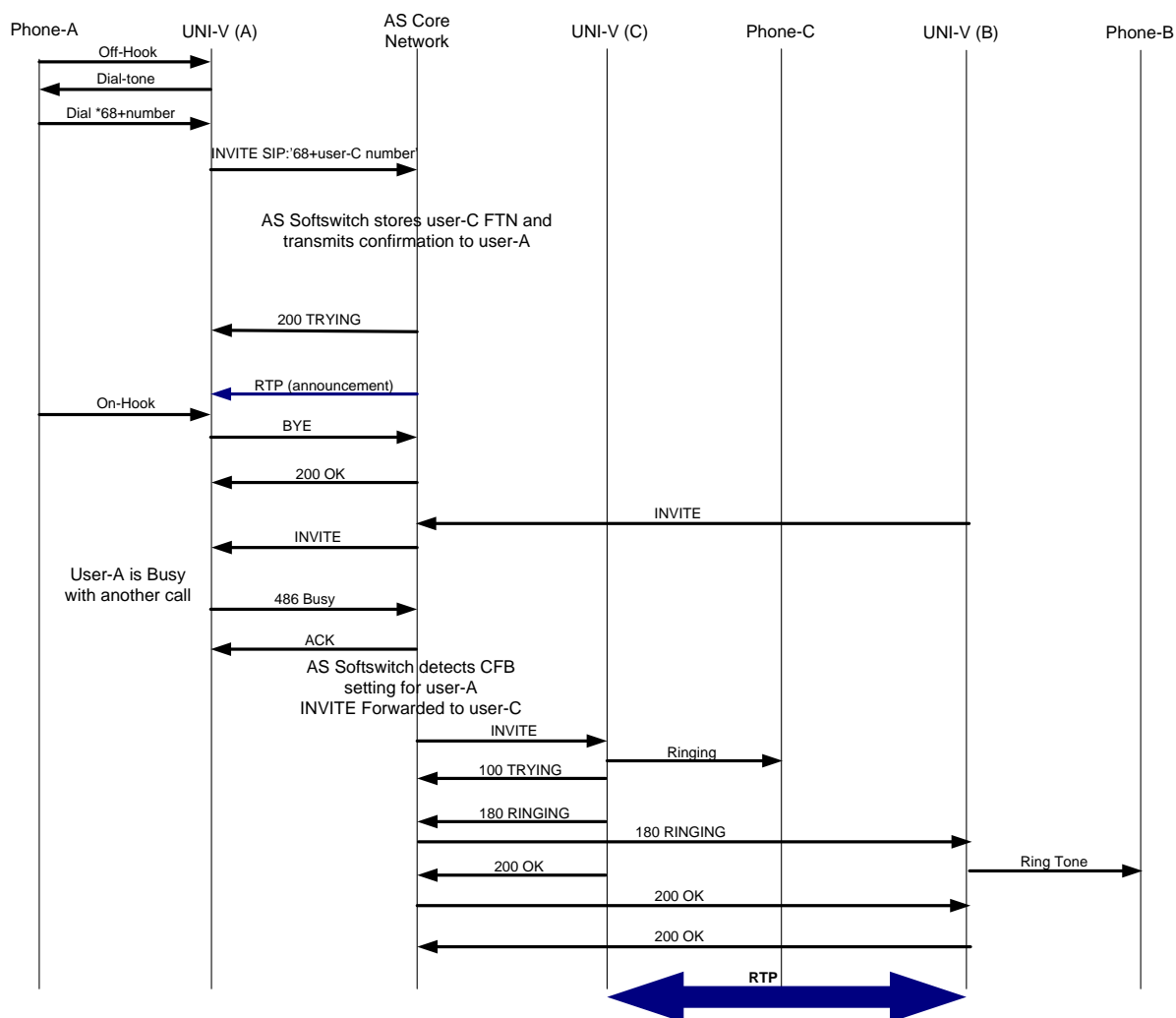


Figure 14 - Call Forwarding on Busy SIP Flow

7.6.9.6. Call Forwarding on No Answer

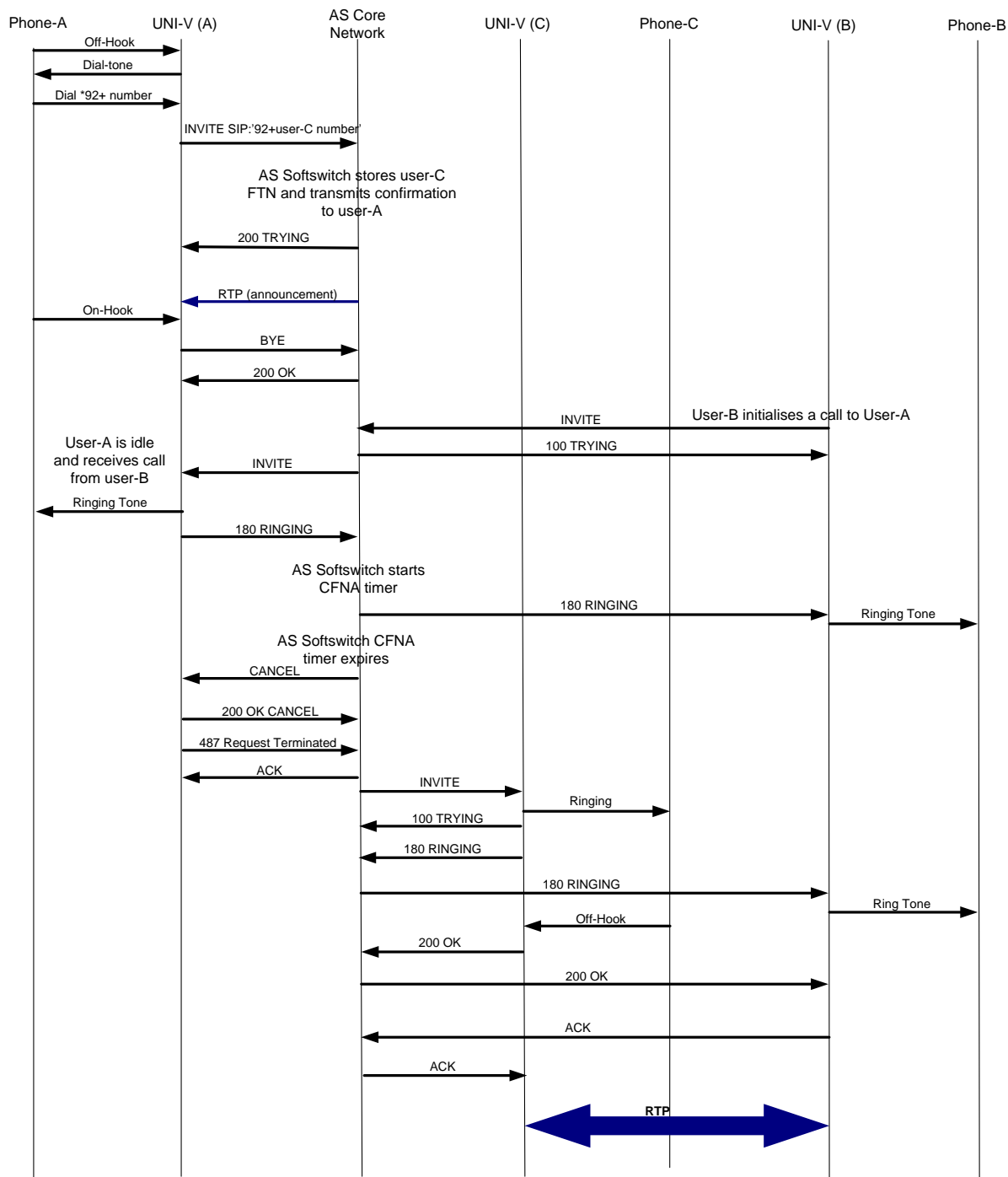


Figure 15 - Call Forwarding SIP flow - No Answer

7.7.9.7. **Call Forwarding (Unconditional)**

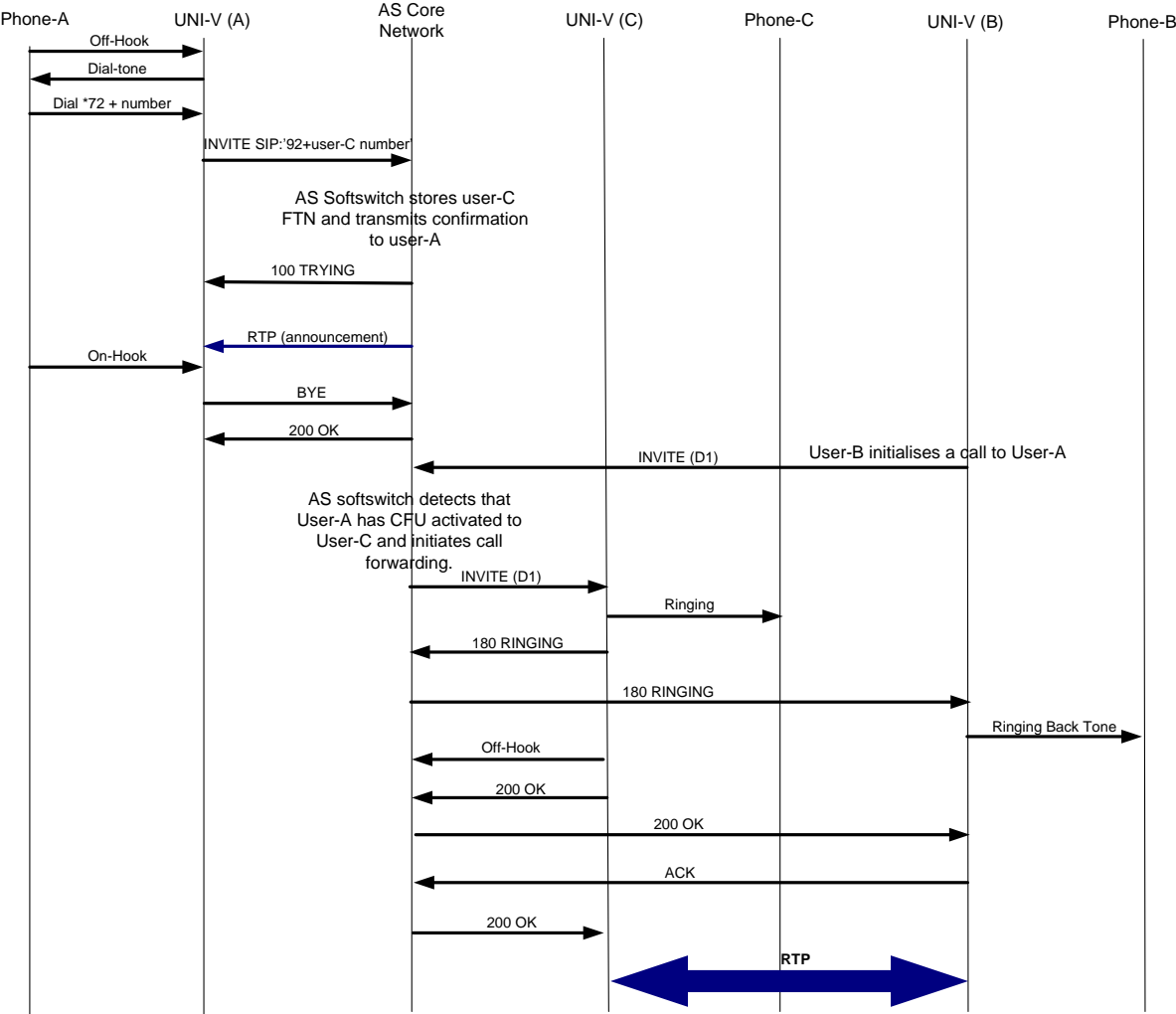


Figure 16 - Call Forwarding SIP Flow - Unconditional

7.8.9.8. Call Hold

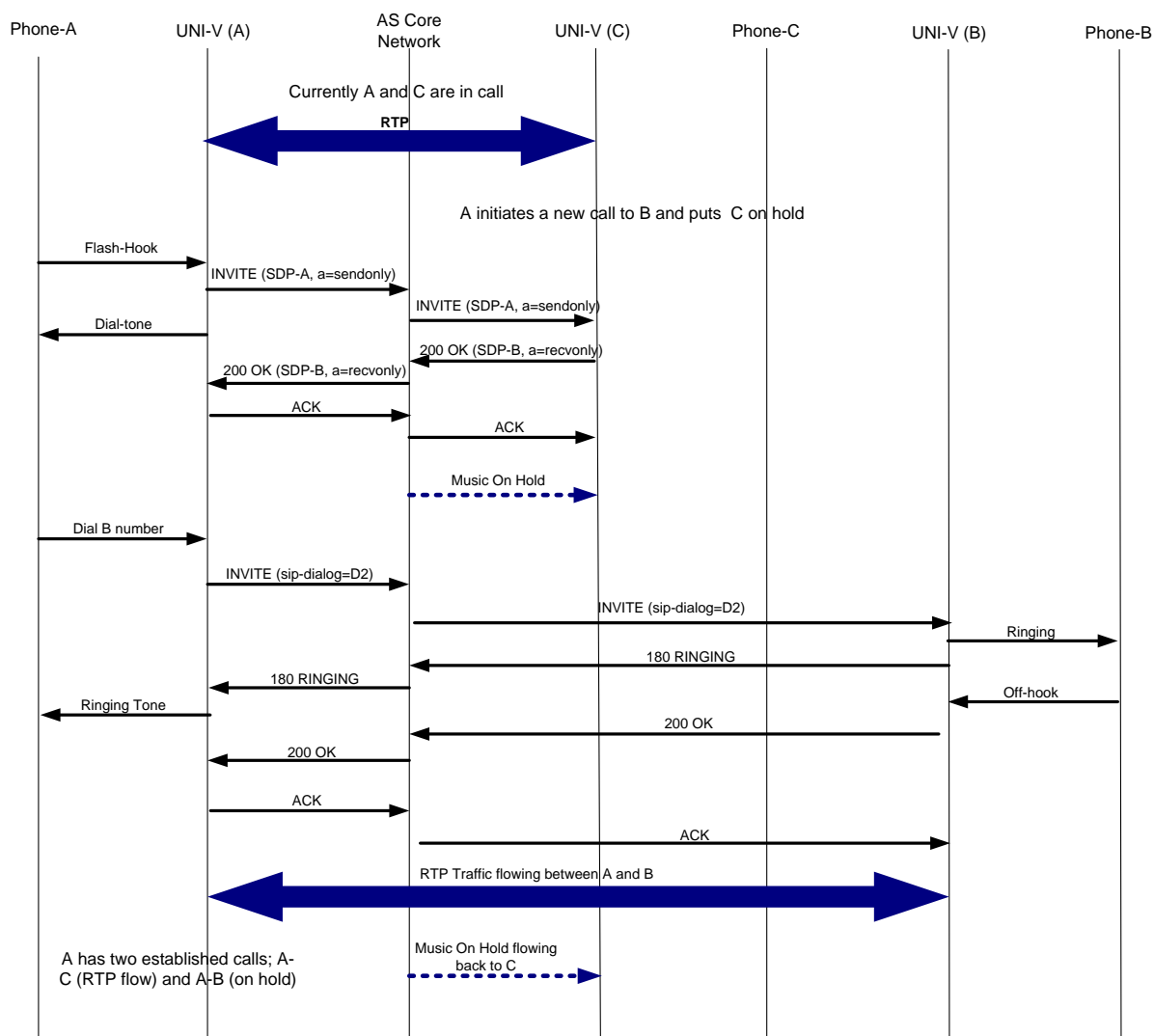


Figure 17 - Call Hold SIP Flow

7.8.1.9.8.1. Caller Resumes the Held Call

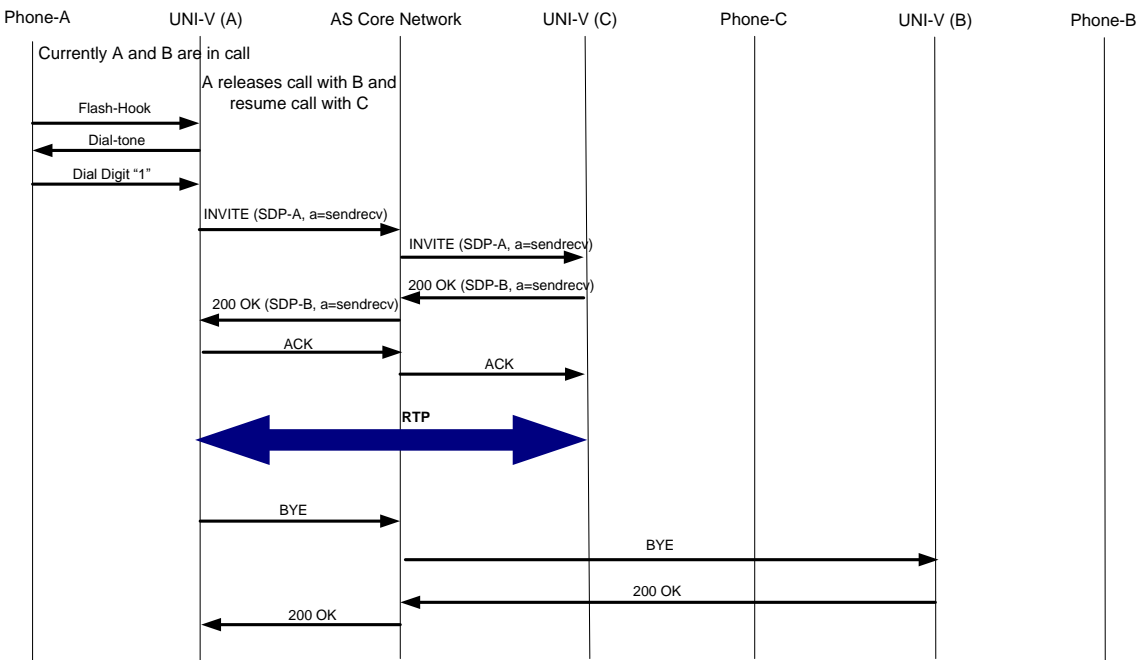


Figure 18 – Caller Resumes the Held Call

7.9.9.9. Call Waiting

7.9.1.9.9.1. Call Waiting received- Ignore 2nd Call (softswitch Call Waiting timer triggered)

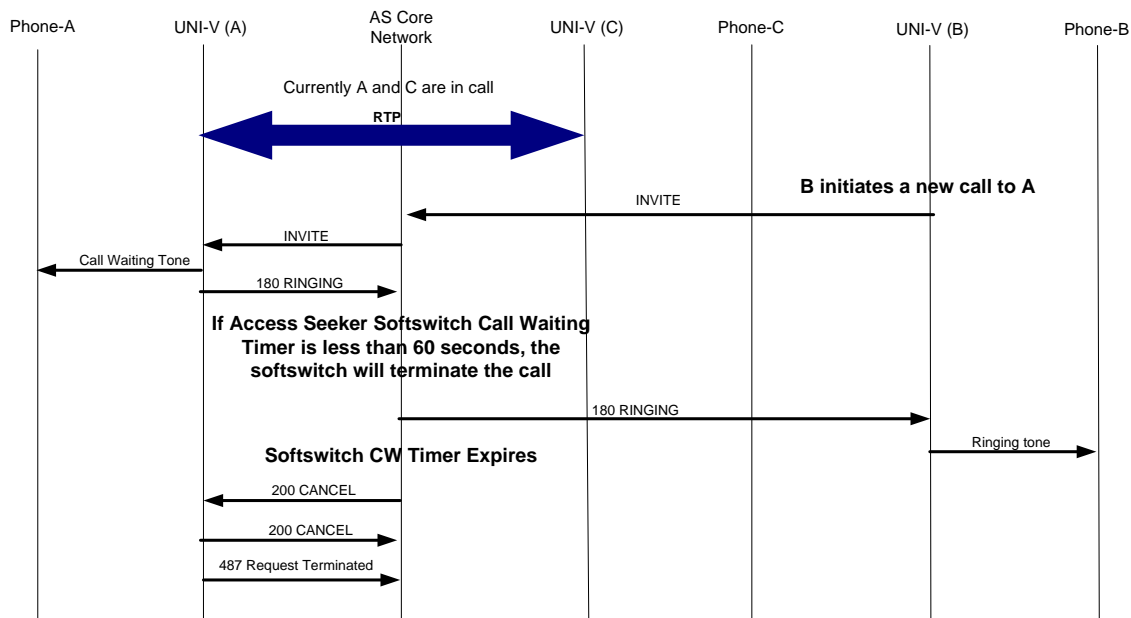


Figure 19 - Call Waiting - Ignored Second Call: softswitch Call Waiting timer Triggered

7.9.2.9.9.2. Call Waiting received- Ignore 2nd Call (UNI-V Call Waiting timer triggered)

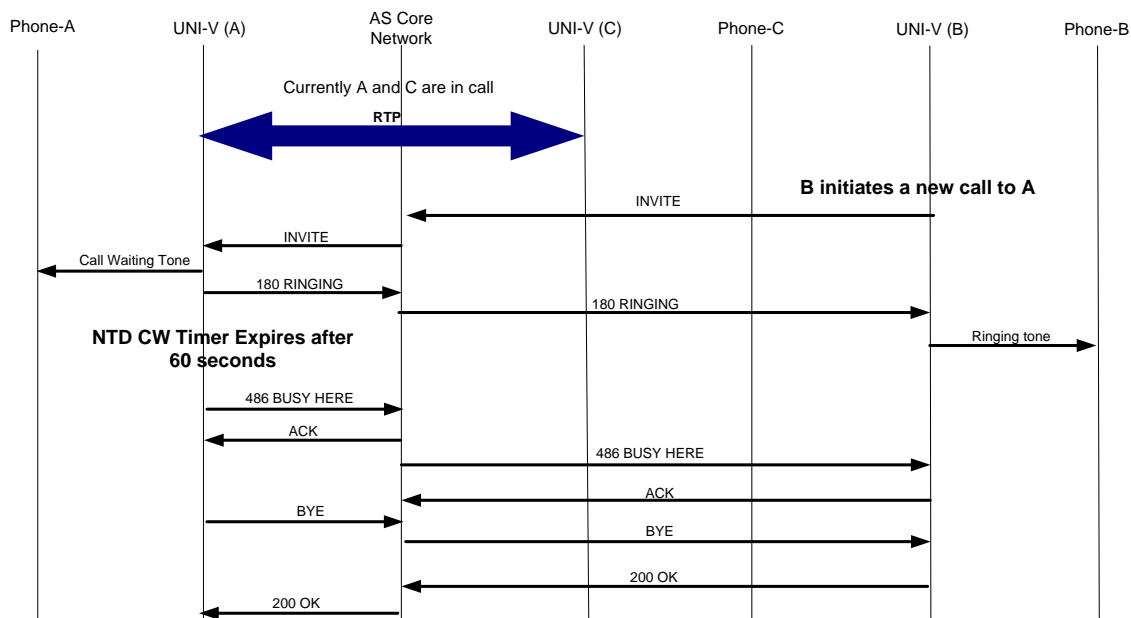


Figure 20 - Call Waiting - Ignored Second Call: UNI-V Call Waiting timer Triggered

7.9.3.9.3. Call Waiting Received- Accept 2nd Call

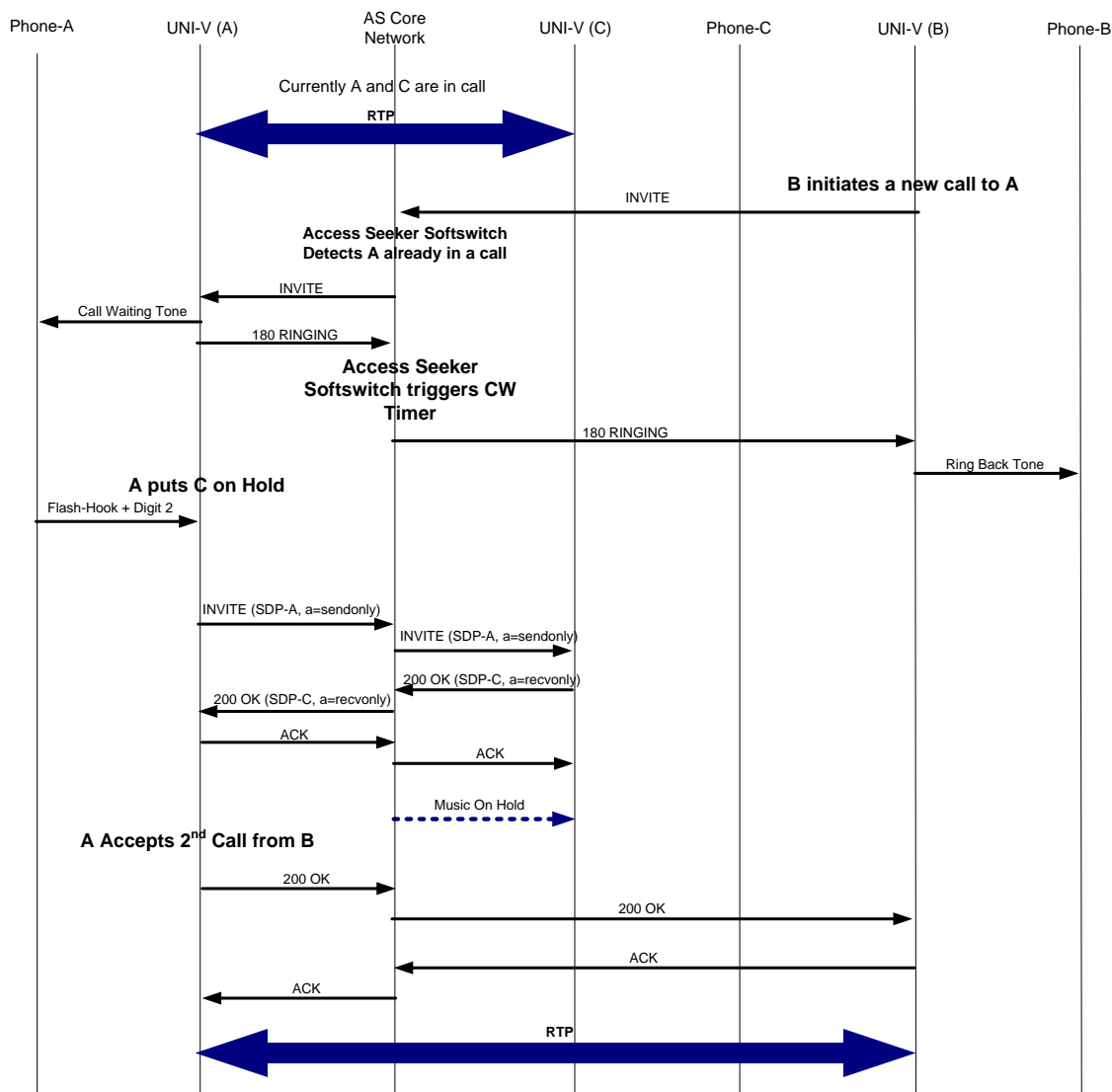


Figure 21 - Call Waiting Received - Accept Second Call

7.9.4.9.9.4. **Call Waiting Received- Resumes Held Call**

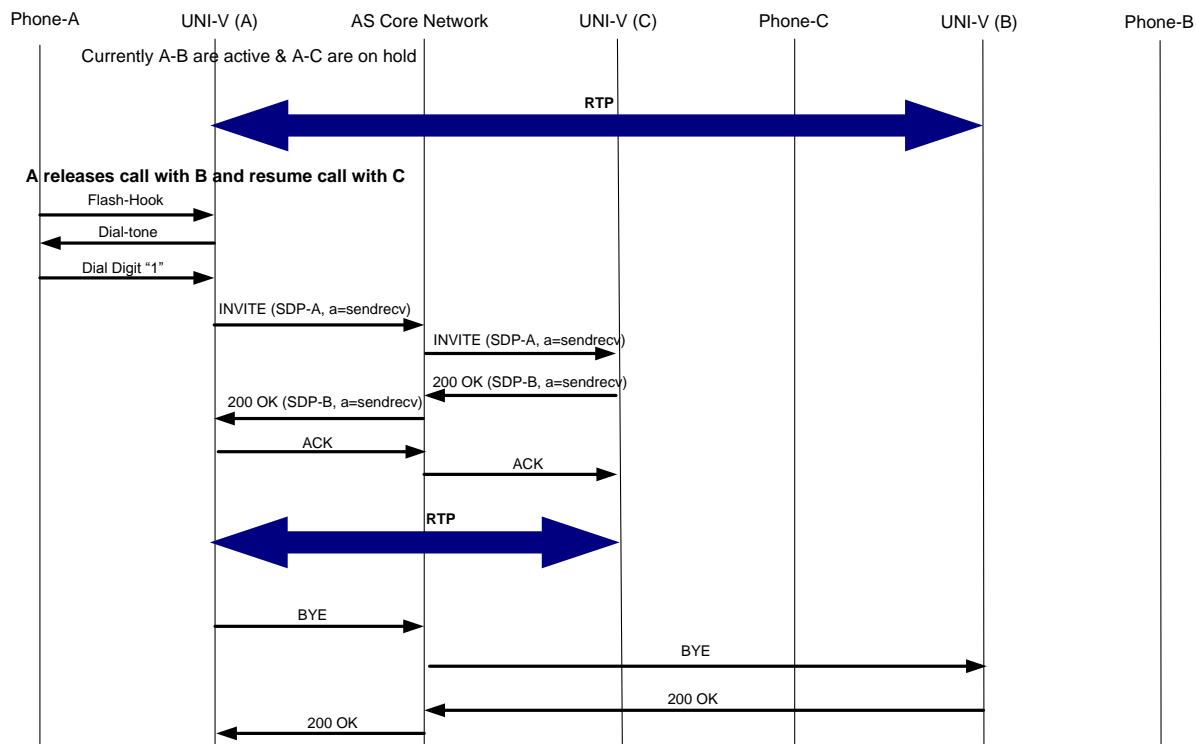


Figure 22 - Call Waiting Received - Releases 2nd Call

7.10.9.10. Distinctive Ringing

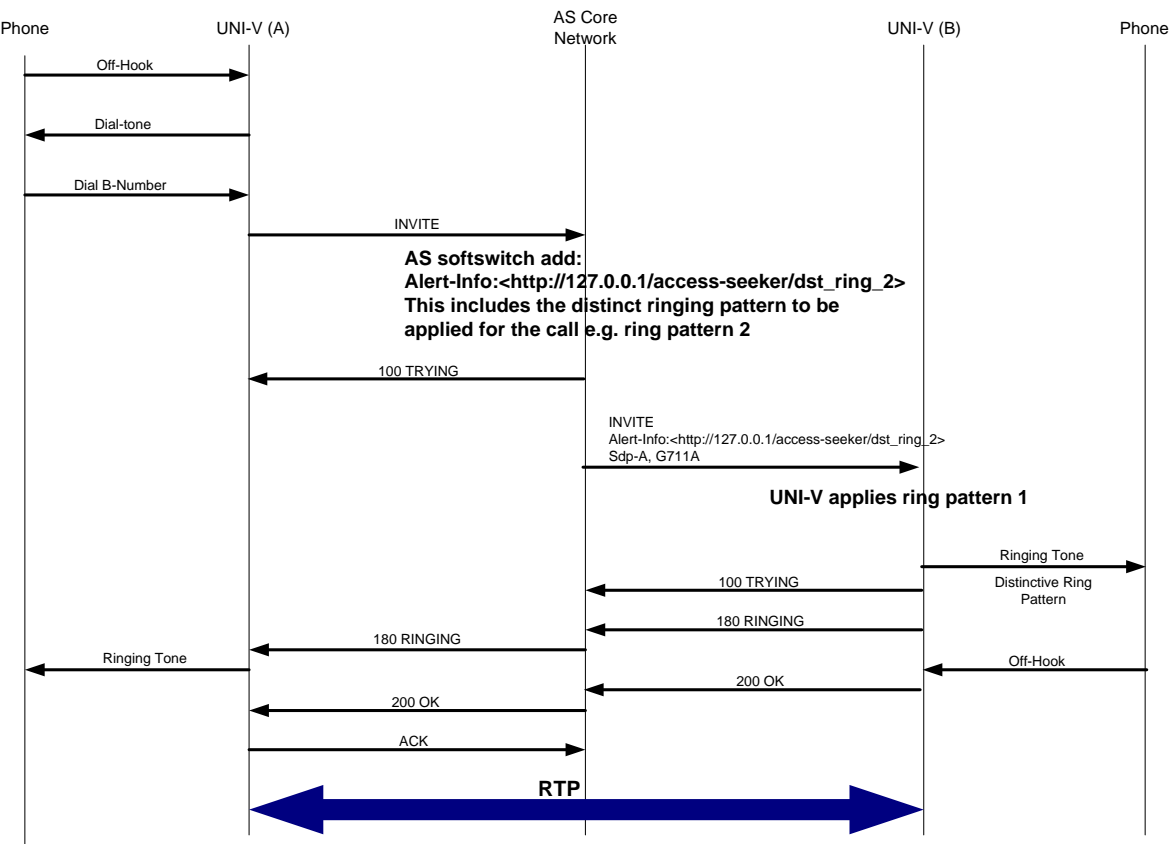


Figure 23 -Distinctive Ringing

7.11.9.11. Calling Number Display

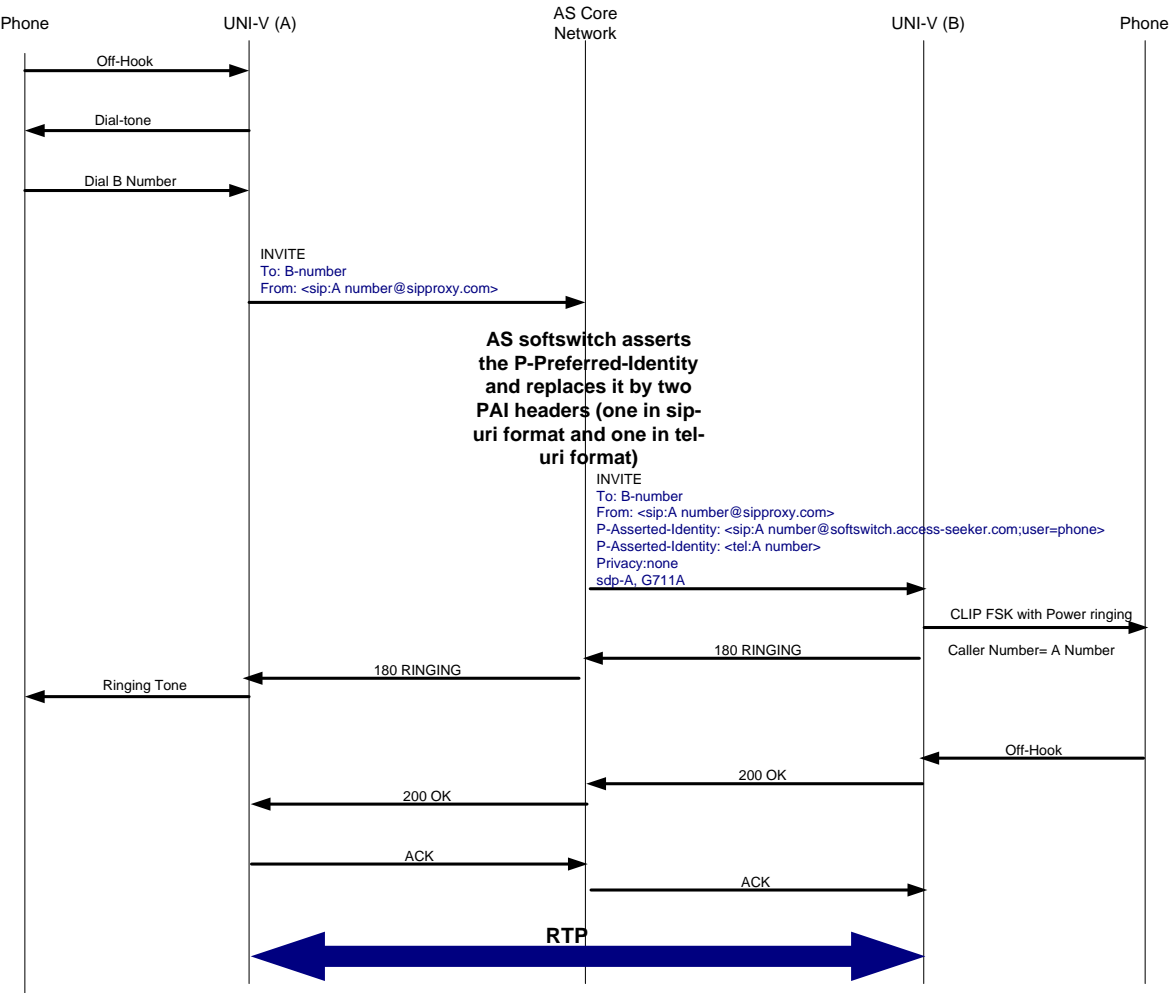


Figure 24 - CLIP SIP Flow

7.12.9.12. Calling Line ID Restriction (CLIR)

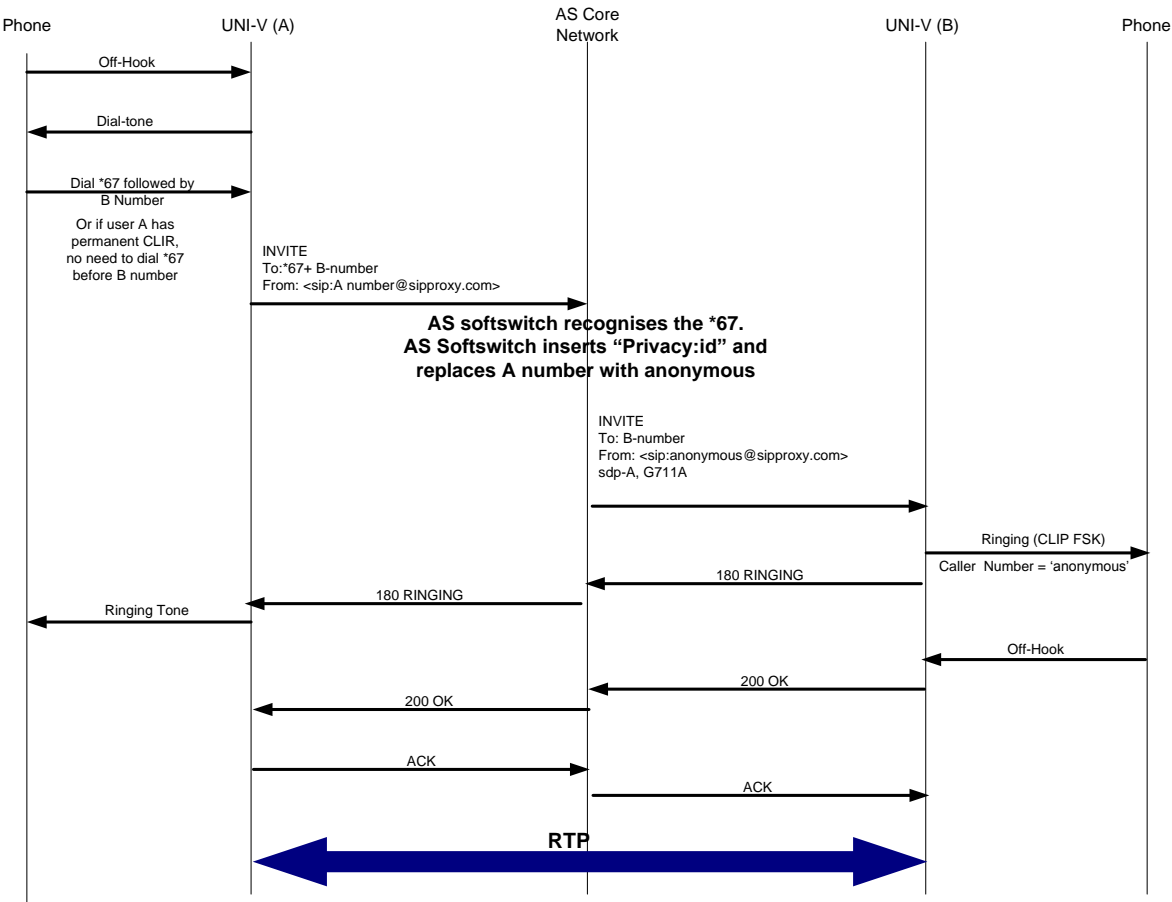


Figure 25 - CLIR SIP Flow

7.13.9.13. Emergency Calling

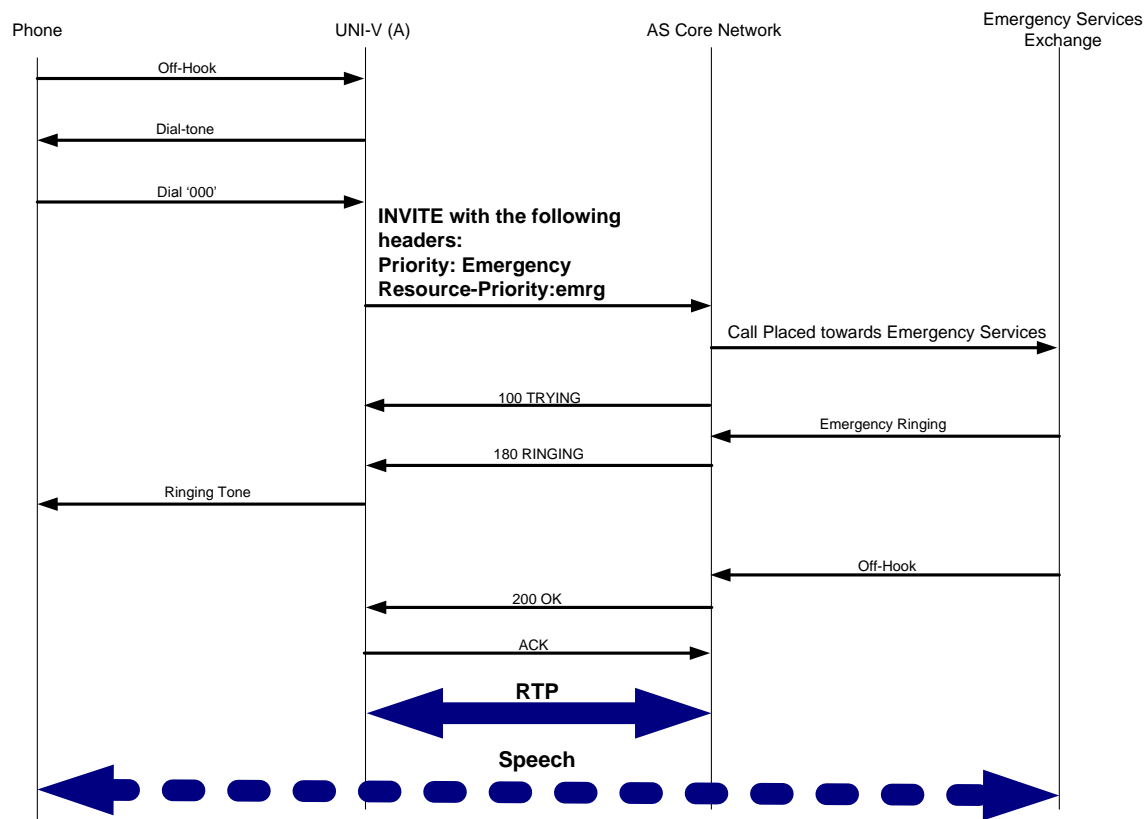


Figure 26 - Emergency Call SIP Flow

7.14.9.14. Message Waiting Indication

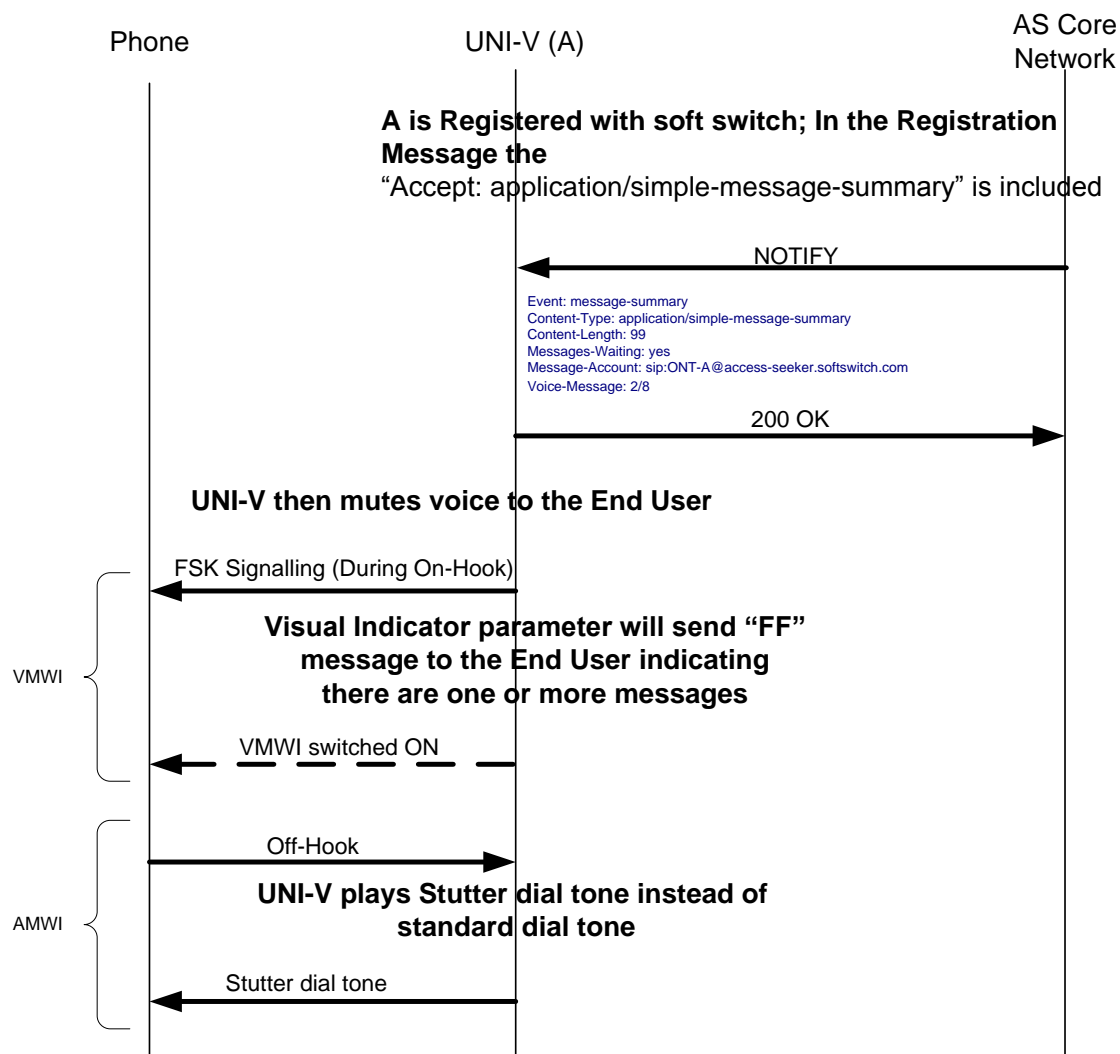


Figure 27 - Message Waiting Indication SIP flow

7.15.9.15. Abandoned Call

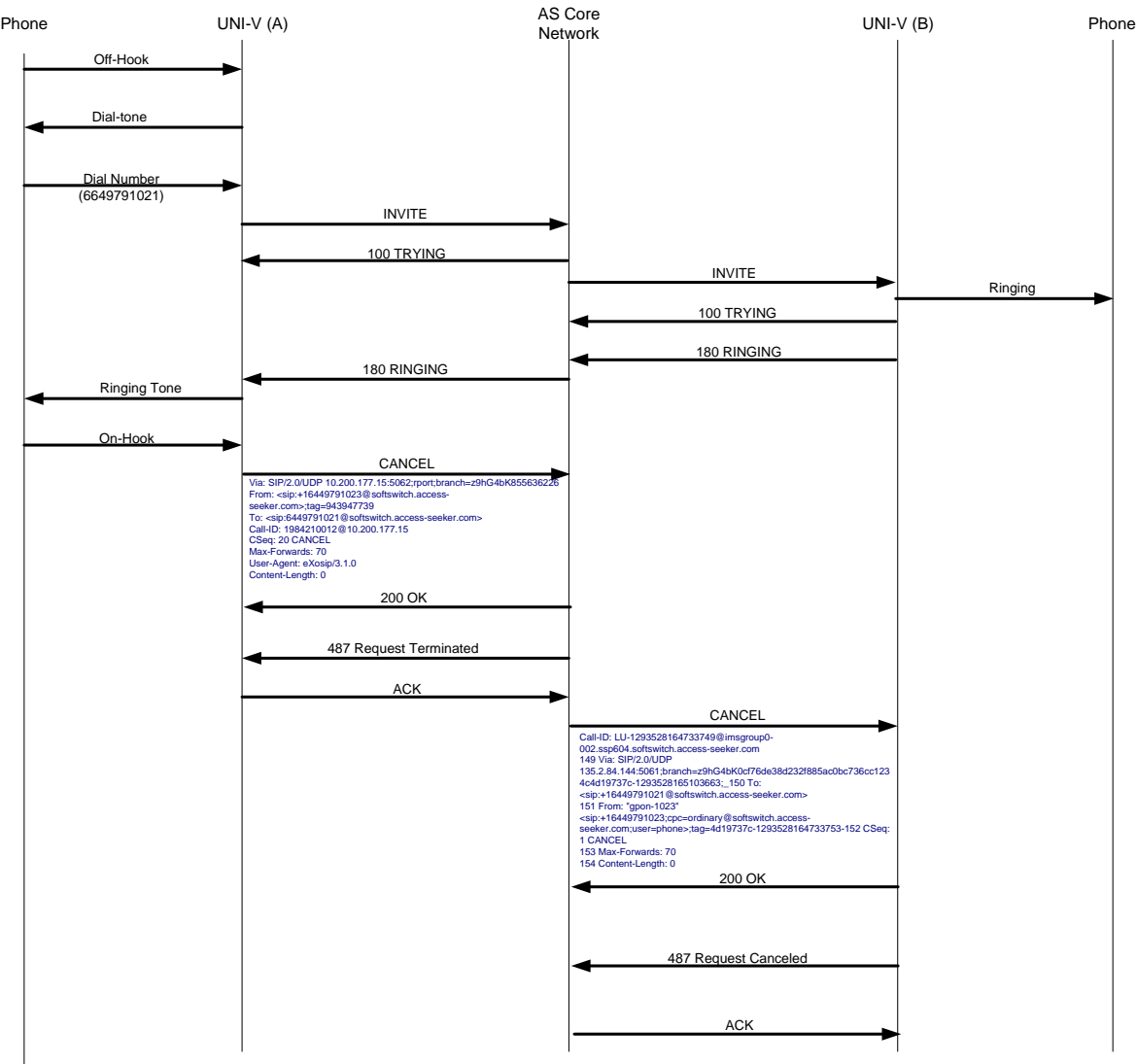
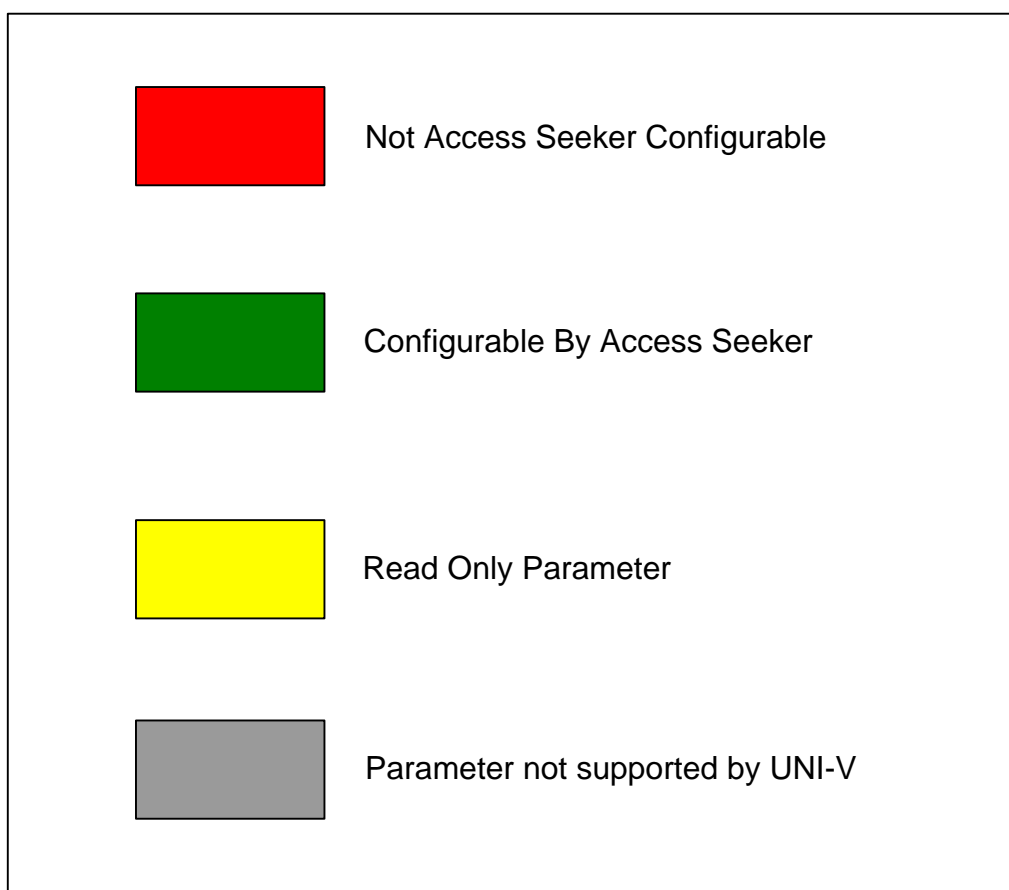


Figure 28 _Abandoned Call Flow

8.10. ~~XML~~ TR-069 Parameters Configuration File ~~Overview~~

The UNI-V telephony service is configured by an XML configuration file downloaded from the access seeker's ftp server.

~~The XML~~ This section lists all objects and their parameters that are currently supported by the UNI-V. It describes each parameter, its default value and whether it may be writable or not as illustrated in the diagram below. Some parameters are displayed by the UNI-V as writable, however those parameters are not supported by NBN Co and hence cannot be configured by access seeker.



The configuration parameters described in this section are broken into two groups:

- 1) ~~TR-098 configuration file format is common to both internal and external NTD variants.~~ parameters
- 2) ~~The data contained in the XML~~ TR-104 configuration file is categorised into one of the following categories: parameters

The TR-069 based object model that is supported by the UNI-V is shown below:

InternetGatewayDevice

DeviceInfo (general device info)
ManagementServer (parameters for TR-069 management)
WANDevice.{i} (a WANDevice is a physical Interface on the network side)
 WANConnectionDevice.{i} (Virtual Ethernet interface on the GPON link)
 WANIPConnection (+ etc.) (IP connection on the network side)
Services (any additional services supported by the SIP Client)
 VoiceService.{i} (Voice over IP service configuration)
 Capabilities (NTD capabilities supported)
 Codecs (List of codecs supported by NTD)
 SIP (SIP specific capabilities supported by NTD)
 PhyInterface (Unique identifier for physical port)
 VoiceProfile (Object associated with NTD voice characteristics)
 FaxT38 (For enabling/disabling T38 Fax)
 RTP (For RTP Ports used and DSCP marking)
 SIP (SIP Registrar Server and Outbound proxy server configuration)
 Line (Object for configuring a specific voice line on the NTD)
 CallingFeatures (Activating/deactivating Calling features supported)
 Codec (Enabling/disabling and priority configuration for each codec)
 SIP (SIP Client credentials)

10.1. UNI-V TR-098 Configuration Parameters

InternetGatewayDevice

Category/Parameter	Access-seeker configurable/Description	Write/Read	Default Value
Elements not supported by particular NTD model/LANDeviceNumberOfEntries	No/Number of LAN instances	Read	0
Model specific adaption	No		
Country specific (tones, levels, etc.)	No		
UNI-V port 2 specific	No		
Service (NBN co and access-seeker) specific	Limited during on-boarding process		
User specific (NTD common and UNI-V port 1 specific)WANDeviceNumberOfEntries	Yes at any time/Number of WAN instances	Read	1

Table 26 Categorization of XML element types

For clarification, all entries before and, some after the </HW_Specific> XML tag are not access seeker configurable. Refer to section 8.2 for further details.

In simplistic terms data in the XML configuration file is either an XML element consisting of a key name tag and key value for example:

InternetGatewayDevice.DeviceInfo

<Password>123456</Password>Parameter	Description	Write/Read	Default Value
AdditionalHardwareVersion	There is no additional hardware version supported	Read	NULL

<u>AdditionalSoftwareVersion</u>	<u>There is no additional software version supported</u>	<u>Read</u>	<u>NULL</u>
<u>HardwareVersion</u>	<u>Hardware version supported</u>	<u>Read</u>	<u>0062-1D-01</u>
<u>SoftwareVersion</u>	<u>Software version supported</u>	<u>Read</u>	
<u>Description</u>		<u>Read</u>	
<u>Manufacturer</u>	<u>NTD manufacturer</u>	<u>Read</u>	<u>ALCL</u>
<u>ManufacturerOUI</u>	<u>NTD manufacturer identifier</u>	<u>Read</u>	<u>0019c7</u>
<u>ModelName</u>	<u>The model name of the NTD</u>	<u>Read</u>	<u>GPON RGW ONT</u>
<u>ProductClass</u>	<u>NTD variant</u>	<u>Read</u>	<u>I-240-GR; Indoor NTD O-240-GR; Outdoor NTD</u>
<u>ProvisioningCode</u>	<u>Access seeker identifier and other provisioning information. On a new NTD install DHCP Option 43 will configure the UNI-V with its initial provisioning code to authenticate with the ACS. Max is 63 characters.</u>	<u>Read/Write</u>	<u>NULL</u>
<u>SerialNumber</u>	<u>Serial number of the UNI-V. Each UNI-V will be represented with a unique serial number</u>	<u>Read</u>	<u>String</u>
<u>SpecVersion</u>	<u>This parameter is deprecated by TR-098</u>	<u>Read</u>	<u>1.0</u>

Or an element group tag for example:

InternetGatewayDevice.ManagementServer

<u><group> "group-start"</u> <u>——<keyname1>keyvalue1</keyname1></u> <u>——<keyname2>keyvalue2</keyname2></u> <u></group> "group-end"Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>ConnectionRequestURL</u>	<u>The HTTP URL the ACS uses to connect to the UNI-V. This is configured in the form: http://host:port/path. Max is 255 characters.</u>	<u>Read/Write</u>	<u>NULL</u>

<u>ConnectionRequestUsername</u>	<u>The Username the ACS uses to connect to an UNI-V using Connection Request.</u> <u>Max is 63 characters.</u>	<u>Read/Write</u>	<u>NULL</u>
<u>ConnectionRequestPassword</u>	<u>The password the ACS uses to authenticate with the UNI-V using Connection Request.</u> <u>Max is 63 characters.</u>	<u>Read/Write</u> <u>Note Read will return an empty string.</u>	<u>NULL</u>
<u>Username</u>	<u>Username used by the UNI-V to authenticate with the ACS when initiating a connection.</u> <u>Max is 63 characters.</u>	<u>Read/Write</u>	<u>NULL</u>
<u>Password</u>	<u>The Password used by the UNI-V when connecting to the ACS.</u> <u>Max is 63 characters.</u>	<u>Read/Write</u> <u>Note Read will return an empty string.</u>	<u>NULL</u>
<u>PeriodicInformEnable</u>	<u>Enable or disable the UNI-V from periodically sending information to the ACS using the Inform method.</u> <u>"1"= enabled</u> <u>"0"= disabled</u>	<u>Read/Write</u>	<u>1</u>
<u>PeriodicInformInterval</u>	<u>The duration in seconds before the UNI-V connects to the ACS. This will call the Inform method if the PeriodicInformEnable is enabled.</u> <u>Unsigned Integer max value is 0Xffffff (Hex).</u>	<u>Read/Write</u>	<u>86400</u>
<u>URL</u>	<u>The URL used by the UNI-V to connect to the ACS. This is initially configured using DHCP Option 43 option code 1.</u> <u>Max is 255 characters.</u>	<u>Read/Write</u>	<u>Set by DHCP Option 43</u>
<u>ParameterKey</u>	<u>Specific for Motive ACS</u>	<u>Read</u>	

(Purple text is informative only and would not be included)

8.1. XML configuration file schema

The XML schema diagram below illustrates the access seeker configurable elements and their location within the XML tree:

NBNco Voice XML schema for ONT firmware release

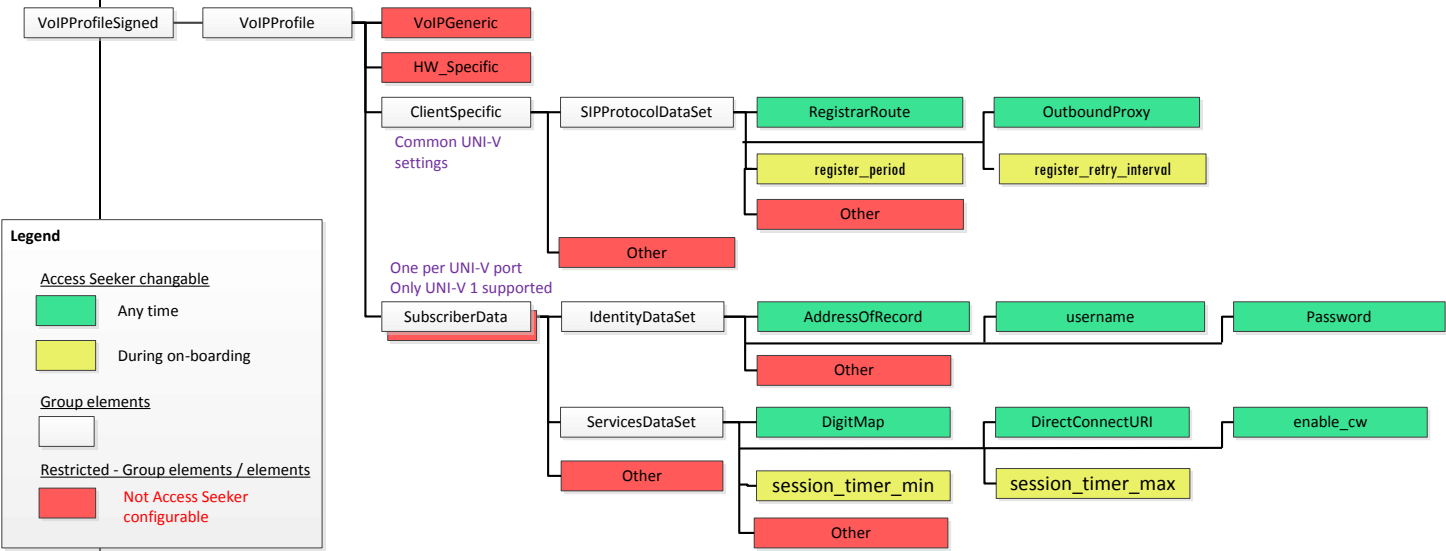


Figure 29 XML schema

8.2.—Details of access seeker configurable elements

All elements and values are ASCII

InternetGatewayDevice.WANDevice.{i}.

Element nameParameter	Description	Value constraintsWrite/Read	Default valueValue
OutboundProxy	Server or proxy that all SIP messages and responses are sent	Must be a non-null value Max-99 characters A numeric IP address and port number (xxx.xxx.xxx.xxx:port) or A fully-qualified domain name and port number (fqdn:port)	null
RegistrarRoute		Must be set to same value as OutboundProxy	null
register_periodWANConnectionNumberOfEntries	UNI-V proposed registration expiration time Sets Expires-value of REGISTER requestsNumber of WAN instances	Integer in the range 0 to 65535 Unit is seconds <u>Read</u>	36001
register_retry_interval	Interval between successive registration retries after a failed registration retry	0 to 65535 Unit is seconds 0 (zero) disables registration	60
AddressOfRecord	SIP address of record (AOR)	Must be a non-null value Max-99 characters Typically: username@ipaddress or username@fqdn May include "SIP:" prefix Note SIP: is automatically added to SIP fields if not included in this value	null
username	SIP authentication user name	Optional (can be null) Max-99 characters Only populate if SIP authentication applied	null
Password	SIP Authentication password	Optional (can be null) Max-99 characters Only populate if SIP authentication applied	null

DigitMap	A collection of numbering plan patterns that determine when dialling is complete	Must be a non-null value Max 254 characters enclosed within {} See section below for supported values	{x.T}
DirectConnectURI	If set (not null) a UNI-V off-hook event triggers sending an immediate INVITE with this value as the To address	Optional (can be null) Max 99 characters Value must be the same as SIP To header value if user had dialled the number. For example sip:1234@domain	null
enable_cw	Enable / disable Call Waiting service	yes / no Only enable if user has Call Waiting service and Softswitch supports more than one simultaneous terminating call per UNI-V	no
session_timer_min	RFC 4028 session timer minimum session-interval	A non-negative integer Unit is seconds	90
session_timer_max	RFC 4028 session timer maximum session-interval	A non-negative integer Unit is seconds	1800

Table 27 XML element details

8.3.—Digit map

Refer to the UNI-V interface specification—Dial Plan configuration section 6.5.6 for more detail.

The digit map value must begin with “(“ and end with “)”. Modifiers are case sensitive.

InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.

Pattern elements, symbol, or modifier Parameter	RepresentationDescription	Write/Read	Default Value
0-9, *, #	Dialled digits		
*	Represents any 0~9 digit (but not * or #)		
x{n} <i>Lower case</i> *WANIPConnectionNumberOfEntries	x followed by digits with a length of n; for example, 123x{5} equals 123xxxxxNumber of WAN IP instances	Read	1
{s-e}WANPPPConnectionNumberOfEntries	Any one of the enclosed digits, a contiguous digit range can be represented by s-e where s is the lowest and e the highest digit 12{0-48*} matches the following numbers 120, 121, 122, 123, 124, 128 and 12*	Read	0
.(dot)	Zero or more occurrences of the previous element. Dot is typically used with T (x.T) to represent an unspecified number length 2xx.T matches the following numbers 2x, 2xx, 2xxx, 2xxxx etc		
T <i>Upper case</i>	Pattern matches only if the inter-digit timer expires at point T Used with x. to specify a dial pattern with an unspecified number of digits e.g. 013x.T will match 013, 013x, 013xx, 013xxx, etc		
+	Pattern separator.		
E <i>Upper case</i>	Emergency call indicator e.g. 000E and 016E		

Table 28 Digit map elements, symbols and modifiers

8.4. XML configuration file creation script

8.4.1. Overview

NBN Co's supplier of NTDs has supplied a perl script (provided at on-boarding) for creating a well formed XML configuration file from plain text input files and a hardware XML file as illustrated in Figure 30. The script is provided for convenience only and its use is not mandatory.

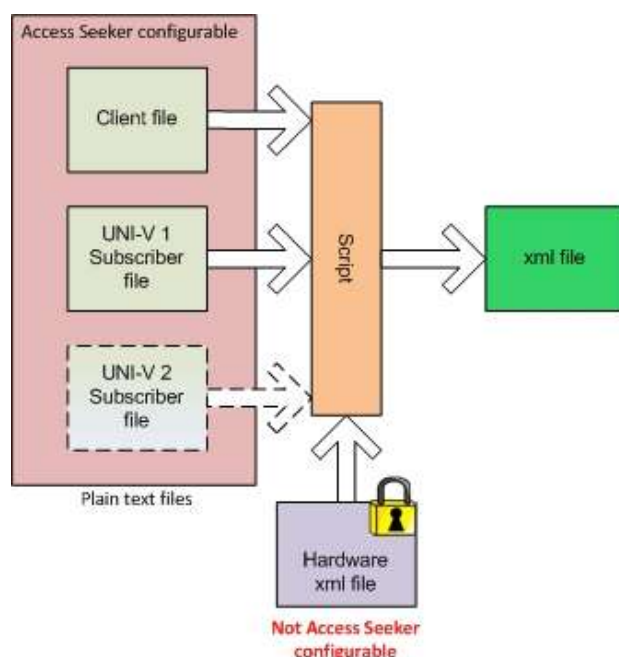


Figure 30 Script Flow

The access-seeker configurable data is contained in either a client (NTD common) or subscriber (UNI-V) file. The data split between the client and subscriber files matches the XML schema split shown in Figure 29 XML schema.

The script contains a control table making it easy to alter which elements are configurable by an access-seeker. Please refer to section 8.4.7 for guidelines.

Finalising the access-seeker variable / fixed elements and a corresponding script is an expected output from the voice on-boarding process. Please refer to the Wholesale Broadband Agreement and the NBN Co Operations Manual for further information regarding the on-boarding process.

Note that the script does not perform any validation of the input values.

8.4.2. Input files

The access-seeker configurable input files consist of element name and value pairs. The element value, for all data type (string, integer, Boolean, etc), is contained within quote marks. For illustrative purposes, the configurable data is shown in italics with a grey font e.g. *some value* in the following sections.

8.4.3. Client

A sample client file using fictional values is shown below. The first line must be as shown below and there must be no blank lines.

```
VoIPClientID="1"  
RegistrarRoute="accessseeker.com.au:5060"  
OutboundProxy="accessseeker.com.au:5060"  
register_period="3600"  
register_retry_interval="60"
```

8.4.4. Subscriber

A sample subscriber file using fictional values is shown below. The first line must be as shown below and there must be no blank lines.

```
UNIID="513"  
AddressOfRecord="aor@accessseeker.com.au"  
username="aor"  
Password="password"  
DigitMap="(x.T)"  
DirectConnectURI=""  
enable_cw="no"
```

8.4.5. Script Use

The script has the four input parameters as listed Table 29:

1	Client file name	Mandatory
2	Subscriber file name (for UNI-V 1)	Mandatory
3	Subscriber file name (for UNI-V 2)	N/A
4	Hardware XML file name	Mandatory

Table 29 Script input parameters

By default the script output is sent to the stdout device or it can be piped to a file e.g. ">output.XML".

Example:

```
makeXMLnbnV07-1.pl clientv7-1.txt subscriberv7-1.txt hw4nbnv7-1.xml > samplev7-1.xml
```

8.4.6. Cautions

- An NTD version change may result in NBN Co supplying a different script version. Therefore, it is recommended that the access seeker not modify the script but instead provide a wrapper layer as required to create the plain text files and to call this script.
- The script does not perform any validation of the input values.
- Copying of files between Unix and non-Unix operating systems can alter line termination characters (e.g. "Carriage Return Line Feed" in DOS and "Line Feed" in Unix). This can be corrected by Unix utilities such as "fromdos".
- The client and subscriber input files must not contain blank lines including after the last data line.
- The hardware XML file is not access seeker editable.
- Alteration in gain levels are performed via the NBN Co management systems and the level setting in the XML configuration file are not to be altered.

8.4.7. Script modification guidelines

The script consists of two parts definition data and code logic. The definition data is further broken down as follows:

AttributeNames	Defines the non hardware elements that the script can be process An entry must exist for every element in the ClientOutputOrder and SubOutputOrder sections No entry is required for grouping tags Order is not significant
ClientOutputOrder	Defines the order that the Client elements and group tags are created
SubOutputOrder	Defines the order that the subscriber elements and group tags are created
OutputValues	Defines constants for the element group tags and the non access seeker configurable elements

Entries in the OutputValues section can represent:

1. Group tags or element entries as shown below

```
"ClientFM"=>"<ClientSpecific>"
```

2. Elements

```
"session_timer_min"=>"<session_timer_min>90</session_timer_min>"
```

3. A multi line group and its elements

```
"dynamic_codec_payload_map_entry"=>"<dynamic_codec_payload_map_entry>" . "\n" .  
"<mimetype>audio/telephone-event</mimetype>" . "\n" .  
"<payload_number>97</payload_number>" . "\n" .  
"</dynamic_codec_payload_map_entry>"
```

Items appearing in OutputValues section override values in the client and subscriber input files, thereby removing constant values or non access seeker configurable items from the input files.

The syntax of the OutputValues section differs from the input files. Using examples 2 and 3 above the corresponding input file syntax is illustrated below:

- Element

```
session_timer_min="90"
```

- A multi line group and its elements

```
dynamic_codec_payload_map_entry="audio/telephone-event:97"
```

Special care is required when including a multi-line element in an input file as some parts may not be configurable. Using the example above and with reference to Table 27 only the value after the ":" (the telephone event payload number) is configurable.

8.4.8. Product release 1 files

During on-boarding, access seekers will be provided two files (template_pr1_v7-1.zip and script_pr1_v7-1.zip). These may be edited by access seekers.

The contents of those files are:

- Script (makeXMLnbv7-1.pl)
- Client template (clientv7-1.txt)
- Subscriber template (subscriberv7-1.txt)
- Hardware file (hw4nbv7-1.XML)
- Sample XML file (samplev7-1.XML)

InternetGatewayDevice.WANDevice.{i}.WANConnectionDevice.{i}.WANIPConnection.{i}.

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>ConnectionTrigger</u>	<u>Trigger used to establish IP connection.</u>	<u>Write/Read</u>	<u>AlwaysOn</u>
<u>ConnectionType</u>	<u>Specifies the connection type of the connection Instance.</u>	<u>Write/Read</u>	<u>Unconfigured</u>
<u>DNSOverrideAllowed</u>	<u>Whether or not a manually set, non-empty DNS address can be overridden by a DNS entry received from the WAN. Default value is disabled.</u>	<u>Write/Read</u>	<u>0</u>
<u>LastConnectionError</u>	<u>This parameter indicates the reason for the last failed connection. Only "ERROR_NONE" is displayed.</u>	<u>Read</u>	<u>ERROR_NONE</u>

<u>PortMappingNumberOfEntries</u>	<u>The total number of port mapping entries</u>	<u>Read</u>	<u>0</u>
<u>PossibleConnectionTypes</u>	<u>The type of connections supported by the UNI-V for this connection instance. This parameter supports only "Unconfigured".</u>	<u>Read</u>	<u>Unconfigured</u>
<u>RSIPAvailable</u>	<u>This indicates if Realm IP is available for the UNI-V. This parameter is set to be disabled.</u>	<u>Read/Write</u>	<u>0</u>
<u>RouteProtocolRx</u>	<u>Routing protocol supported by the UNI-V. The NTD only supports the "OFF" value setting.</u>	<u>Read/Write</u>	<u>Off</u>

10.2. UNI-V TR-104 Configuration Parameters

InternetGatewayDevice.Services.VoiceService.{i}.

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>VoiceProfileNumberOfEntries</u>	<u>Number of VoiceProfile instances.</u>	<u>Read</u>	<u>1</u>

InternetGatewayDevice.Services.VoiceService.{i}.Capabilities

The overall capabilities that are supported by the UNI-V are summarised in the below table. All parameters are "READ", hence are not configurable.

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>ButtonMap</u>	UNI-V does not support button map. Default value of "0" indicates that this field is unsupported.	<u>Read</u>	<u>0</u>
<u>DCSPCoupled</u>	UNI-V marks the RTCP traffic differently from the RTP traffic. Default value of "0" indicates that this field is unsupported.	<u>Read</u>	<u>0</u>
<u>DigitMap</u>	UNI-V supports digit map. Default value of "1" indicates that this field is supported. Max 1024 characters enclosed within ()	<u>Read</u>	<u>1</u>
<u>EthernetTaggingCoupled</u>	RTCP traffic uses the same S-VLAN ID as the RTP traffic. Default value of "1" indicates that this field is supported.	<u>Read</u>	<u>1</u>
<u>FaxPassThrough</u>	The UNI-V does not support the the parameter VoiceService.-{i}.VoiceProfile.{i}.FaxPassThrough. Default value of "0" indicates that this field is unsupported.	<u>Read</u>	<u>0</u>
<u>FaxT38</u>	The UNI-V supports the parameter VoiceService.{i}.VoiceProfile.{i}.FaxT38. Default value of "1" indicates that this field is supported.	<u>Read</u>	<u>1</u>
<u>MaxLineCount</u>	Maximum total number of lines supported across all profiles supported by the UNI-V	<u>Read</u>	<u>2</u>
<u>MaxProfileCount</u>	Maximum number of distinct Voice Profiles supported by the UNI-V	<u>Read</u>	<u>2</u>
<u>MaxSessionCount</u>	Maximum number of voice sessions supported across all voice profiles and lines.	<u>Read</u>	<u>4</u>
<u>MaxSessionPerLine</u>	Maximum number of voice sessions supported for any given line across all profiles.	<u>Read</u>	<u>2</u>
<u>ModemPassThrough</u>	The UNI-V does not support VoiceService.-{i}.VoiceProfile.{i}.ModemPassThrough	<u>Read</u>	<u>0</u>
<u>NumberingPlan</u>	The UNI-V does not support VoiceService.{i}.VoiceProfile.{i}.NumberingPlan object.	<u>Read</u>	<u>0</u>
<u>PSTNSoftswitchOver</u>	The UNI-V does not support the PSO Activate Facility Action for calls to be switched to PSTN line.	<u>Read</u>	<u>0</u>
<u>RTCP</u>	The UNI-V does support VoiceService.{i}.VoiceProfile.{i}.RTP.RTCP object. RTCP is supported by the UNI-V and is permanently enabled and non-configurable.	<u>Read</u>	<u>0</u>
<u>RTPRedundancy</u>	The UNI-V does not support VoiceService.{i}.VoiceProfile.{i}.RTP.Redundancy object.	<u>Read</u>	<u>0</u>
<u>Regions</u>	The geographic region associated with this profile is "AU" representing Australia region.	<u>Read</u>	<u>AU</u>
<u>RingGeneration</u>	The UNI-V does not support	<u>Read</u>	<u>0</u>

	<u>VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Ringer object.</u>		
<u>SRTP</u>	<u>Secure RTP is not supported by the UNI-V, hence the UNI-V does not support VoiceService.{i}.VoiceProfile.{i}..RTP.SRTP.</u>	<u>Read</u>	<u>0</u>
<u>SignalingProtocols</u>	<u>Signalling protocol supported by the UNI-V is SIP.</u>	<u>Read</u>	<u>SIP</u>
<u>ToneGeneration</u>	<u>The UNI-V does not support VoiceService.{i}.VoiceProfile.{i}.Tone.</u>	<u>Read</u>	<u>0</u>
<u>VoicePortTests</u>	<u>The UNI-V does not support VoiceService.{i}.PhyInterface.{i}.Tests object.</u>	<u>Read</u>	<u>0</u>

InternetGatewayDevice.Services .VoiceService .{i}.Capabilities.Codecs.{i}.

In the capabilities object, the codec list includes all supported codecs by the UNI-V. This includes the bit rate supported for each codec, packetisation periods supported for each codec and whether or not silence suppression is supported for each codec.

G.711ALaw (This is the standard PSTN codec recommended for use in Australia)

<u>Parameter</u>	<u>Values Supported</u>
<u>Bitrate</u>	<u>64000 (bits/seconds)</u>
<u>Codec</u>	<u>G.711ALaw</u>
<u>EntryID</u>	<u>1</u>
<u>PacketizationPeriod</u>	<u>10,20,30 (ms)</u>
<u>SilenceSuppression</u>	<u>1 (Supported)</u>

InternetGatewayDevice.Services .VoiceService.{i}.Capabilities.SIP

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>EventSubscription</u>	<u>The UNI-V does not support VoiceService.{i}.VoiceProfile.{i}.SIP.EventSubscribe and VoiceService.{i}.VoiceProfile.{i}.Line.{i}.SIP.EventSubscribe.{i} objects. Set to "0" Disabled</u>	<u>Read</u>	<u>0</u>
<u>Extensions</u>	<u>SIP method extension supported by UNI-V.</u>	<u>Read</u>	<u>REFER,UPDATE,INFO</u>
<u>ResponseMap</u>	<u>The UNI-V does not support VoiceService.{i}.VoiceProfile.{i}.SIP.ResponseMap. Set to "0" Disabled</u>	<u>Read</u>	<u>0</u>
<u>Role</u>	<u>The role of the NTS is a "UserAgent"</u>	<u>Read</u>	<u>UserAgent</u>
<u>Transports</u>	<u>The UNI-V support UDP as a SIP transport protocol.</u>	<u>Read</u>	<u>UDP</u>
<u>URISchemes</u>	<u>The UNI-V does not support any URI schemes beyond the URI schemes required by the SIP specifications.</u>	<u>Read</u>	<u>NULL</u>

InternetGatewayDevice.Services. VoiceService.{i}.PhyInterface.{i}.

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>Description</u>	<u>A description of the physical port.</u>	<u>Read</u>	<u>0x0201 (UNI-V-1) Or 0x0202 (UNI-V-2)</u>
<u>InterfaceID</u>	<u>A unique identifier of the physical port.</u>	<u>Read</u>	<u>1</u>

<u>PhyPort</u>	<u>The UNI-V physical port number</u>	<u>Read</u>	<u>1</u>
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InternetGatewayDevice.Services .VoiceService.{i}.VoiceProfile.{i}.

Note: There are no VoiceProfile and Line objects existing by default. VoiceProfile needs to be created by access seeker's ACS. Once a VoiceProfile is created, a single Line object will be created automatically.

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>DTMFMethod</u>	<u>Method used by UNI-V to pass DTMF digits. UNI-V only supports InBand.</u>	<u>Read/Write</u>	<u>InBand</u> <u>(Note that InBand is case sensitive)</u>
<u>DigitMap</u>	<u>A collection of numbering plan patterns that determine when dialling is complete.</u> <u>Max 1024 characters enclosed within {}</u>	<u>Read/Write</u>	<u>{**xx *xx*x# *xx*x*xx# *xx*x*x# *31*xxxxxxxx{ *xx# #xx# *#xx# #001 *x.T x.T)}</u>
<u>DigitMapEnable</u>	<u>Enable/disable digit map parameter above.</u> <u>"0"= Disable</u> <u>"1"=Enable</u>	<u>Read</u>	<u>1</u>
<u>Enable</u>	<u>Enable/Disable all lines in the VoiceProfile object.</u> <u>- Disabled</u> <u>- Enabled</u>	<u>Read/Write</u>	<u>Disabled</u>
<u>Reset</u>	<u>This will reset and re-initialize the line to perform start-up actions e.g. SIP Registration.</u> <u>"0"= Disable</u> <u>"1"=Enable</u>	<u>Read/Write</u>	<u>0</u>
<u>Name</u>		<u>Read/Write</u>	
<u>SignallingProtocol</u>		<u>Read</u>	<u>SIP</u>
<u>MaximumSessions</u>	<u>The maximum number of simultaneous call sessions for all lines in the VoiceProfile object.</u>	<u>Read</u>	<u>2</u>
<u>NumberOfLines</u>	<u>The number of lines supported in this VoiceProfile object.</u>	<u>Read</u>	<u>1</u>
<u>Region</u>	<u>The geographic region associated with this profile is "AU" representing Australia region.</u>	<u>Read</u>	<u>AU</u>

InternetGatewayDevice.Services .VoiceService.{i}.VoiceProfile.{i}.FaxT38

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>

InternetGatewayDevice.Services .VoiceService.{i}.VoiceProfile.{i}.RTP

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>DSCPMark</u>	The DSCP marking of the outgoing RTP traffic	<u>Read/Write</u>	<u>0</u>
<u>LocalPortMax</u>	Highest port number from the port number range for incoming RTP traffic. <u>0 to 65535.</u>	<u>Read</u>	<u>50100</u>
<u>LocalPortMin</u>	Lowest port number from the port number range for incoming RTP traffic. <u>0 to 65535.</u>	<u>Read</u>	<u>50000</u>
<u>TelephoneEventPayloadtype</u>	This is only used in an SDP offer by the UNI-V for DTMF events if RFC 2833 transmission of DTMF information is enabled. <u>0 to 128.</u>	<u>Read/Write</u>	<u>97</u>

InternetGatewayDevice.Services .VoiceService.{i}.VoiceProfile.{i}.SIP

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>DSCPMark</u>	The DSCP marking of the outgoing SIP traffic	<u>Read/Write</u>	<u>0</u>
<u>OutboundProxy</u>	Server or proxy that all SIP messages and responses are sent. A numeric IP address (xxx.xxx.xxx.xxx) or A fully qualified domain name and port number, (fqdn). if this parameter is empty, all SIP signalling traffic will use the ProxyServer parameter (below). <u>Max is 256 characters.</u>	<u>Read/Write</u>	<u>NULL</u>
<u>OutboundProxyPort</u>	Destination port used when connecting to the OutboundProxy. <u>0 to 65535.</u>	<u>Read</u>	<u>5060</u>
<u>ProxyServer</u>	The address of the SIP Proxy server where all SIP requests are sent to unless the OutboundProxy (parameter above) is configured. A numeric IP address (xxx.xxx.xxx.xxx) or A fully qualified domain name and port number.	<u>Read/Write</u>	<u>NULL</u>

	<u>(fqn).</u> Must not be empty. Max is 256 characters.		
<u>ProxyServerPort</u>	<u>Destination port used when connecting to the ProxyServer.</u> 0 to 65535.	<u>Read/Write</u>	<u>5060</u>
<u>ProxyServerTransport</u>		<u>Read</u>	<u>UDP</u>
<u>RegistrarServer</u>	<u>If the OutboundProxy parameter is empty, all SIP traffic uses the RegistrarServer address.</u> <u>If this parameter is empty, the ProxyServer parameter will be used.</u> <u>The RegistrarServer parameter must be configured with a value identical to the value set in the ProxyServer.</u> Must not be empty. Max is 256 characters.	<u>Read/Write</u>	<u>NULL</u>
<u>RegistrarServerPort</u>	<u>Destination port used when connecting to the RegistrarServer.</u> <u>This parameter must be identical with ProxyServerPort.</u> 0 to 65535.	<u>Read/Write</u>	<u>5060</u>
<u>RegistrarServerTransport</u>		<u>Read</u>	<u>UDP</u>
<u>RegisterExpires</u>	<u>UNI-V proposed registration expiration time.</u> <u>Sets Expires value of REGISTER requests.</u> <u>Unsigned Integer max value is 0xFFFFFFFFUnit is seconds</u>	<u>Read/Write</u>	<u>3600</u>
<u>RegistrationPeriod</u>	<u>RegistrationPeriod is the interval at which NTD should send re-REGISTER messages. It is configurable and should be less than or equal RegisterExpires.</u> <u>Unsigned Integer max value is 0xFFFFFFFFUnit is seconds.</u>	<u>Read/Write</u>	<u>3240</u>
<u>UserAgentDomain</u>	<u>The UNI-V domain.</u> Max is 256 characters.	<u>Read/Write</u>	<u>NULL</u>
<u>UserAgentPort</u>	<u>SIP signalling port number used by UNI-V.</u> 0 to 65535.	<u>Read</u>	<u>5060</u>
<u>UserAgentTransport</u>	<u>Transport protocol to be used for incoming call control signalling. Only</u>	<u>Read</u>	<u>UDP</u>

	supports UDP.		
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InternetGatewayDevice.Services .VoiceService.{i}.VoiceProfile.{i}.Line.{i}

<u>Parameter</u>	<u>Description</u>	<u>Write/Read</u>	<u>Default Value</u>
<u>CallState</u>	Indicates the call state of the UNI-V. The following are the call states supported: <ul style="list-style-type: none"> • <u>Idle</u> • <u>Calling</u> • <u>Ringing</u> • <u>Connecting</u> • <u>InCall</u> • <u>Disconnecting</u> 	<u>Read</u>	<u>NULL</u>
<u>Enable</u>	Enable/disable the Line object.	<u>Read/Write</u>	<u>Disabled</u>
<u>PhyReferenceList</u>	The UNI-V this Line object is associated with.	<u>Read/Write</u>	<u>NULL</u>
<u>Status</u>	Indicates the status of the UNI-V line. The UNI-V supports: <u>Initializing</u> , <u>Registering</u> , <u>Unregistering</u> , <u>Error</u> , <u>Disabled</u> and <u>UP</u> .	<u>Read</u>	<u>NULL</u>

InternetGatewayDevice.Services .VoiceService.{i}.VoiceProfile.{i}.Line.{i}.CallingFeatures

<u>Parameter</u>	<u>Description</u>	<u>Read/Write</u>	<u>Default Value</u>
<u>CallTransferEnable</u>	Enable/Disable both <u>Attended</u> and <u>Unattended</u> Call transfer. This Parameter must be disabled by Access Seekers.	<u>Read/Write</u>	<u>1</u>
<u>CallWaitingEnable</u>	Enable/Disable call waiting feature.	<u>Read/Write</u>	<u>1</u>
<u>CallerIDEnable</u>	Enable/Disable Calling number display	<u>Read/Write</u>	<u>1</u>
<u>MWIEnable</u>	Enable/Disable message waiting visual and audio indicator.	<u>Read/Write</u>	<u>1</u>
<u>MaxSessions</u>	Specifies that 2 sessions are allowed by the interface.	<u>Read</u>	<u>4</u>
<u>X-ALCALTE-LUCENT-COM-DirectConnectURI</u>	If set (not null) a UNI-V off-hook event triggers sending an immediate INVITE with this value as the To address. Value must be the same as SIP To header value if user had dialled the number. Typically:	<u>Read/Write</u>	<u>NULL</u>

	sip:hotline@fgdn or sip:hotline@ipaddress Max 256 characters		
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InternetGatewayDevice.Services . VoiceService.{i}.VoiceProfile.{i}.Line.{i}.Codec.List.{i}.

the parameters in this section are populated from the VoiceService.{i}.Capabilities.Codecs table.

G.711ALaw (This is the codec recommended for PSTN interconnect in Australia)

<u>Parameter</u>	<u>Read/Write</u>	<u>Default Values</u>
<u>Bitrate</u>	<u>Read</u>	<u>64000 (bits/seconds)</u>
<u>Codec</u>	<u>Read</u>	<u>G.711ALaw</u>
<u>Enable</u>	<u>Read/Write</u>	<u>1 (enabled)</u>
<u>EntryID</u>	<u>Read</u>	<u>1</u>
<u>PacketizationPeriod</u>	<u>Read/Write</u>	<u>20 (ms)</u>
<u>Priority</u>	<u>Read/Write</u>	<u>1</u>
<u>SilenceSuppression</u>	<u>Read/Write</u>	<u>1 (Enabled)</u>
		<u>This parameter must be disabled by access seeker</u>

G.711MuLaw

<u>Parameter</u>	<u>Read/Write</u>	<u>Default Values</u>
<u>Bitrate</u>	<u>Read</u>	<u>64000 (bits/seconds)</u>
<u>Codec</u>	<u>Read</u>	<u>G.711MuLaw</u>
<u>Enable</u>	<u>Read/Write</u>	<u>1 (enabled)</u>
		<u>This parameter must be disabled by access seeker</u>
<u>EntryID</u>	<u>Read</u>	<u>2</u>
<u>PacketizationPeriod</u>	<u>Read/Write</u>	<u>20 (ms)</u>
<u>Priority</u>	<u>Read/Write</u>	<u>2</u>

G.729

<u>Parameter</u>	<u>Read/Write</u>	<u>Default Values</u>
<u>Bitrate</u>	<u>Read</u>	<u>8000 (bits/seconds)</u>
<u>Codec</u>	<u>Read</u>	<u>G.729</u>
<u>Enable</u>	<u>Read/Write</u>	<u>1 (enabled)</u>
		<u>This parameter must be disabled by access seeker</u>
<u>EntryID</u>	<u>Read</u>	<u>3</u>

InternetGatewayDevice.Services . VoiceService.{i}.VoiceProfile.{i}.Line.{i}.SIP

<u>Parameter</u>	<u>Description</u>	<u>Read/Write</u>	<u>Default Value</u>
<u>AuthPassword</u>	<u>SIP Authentication password.</u> <u>Max is 48 characters.</u>	<u>Read/Write</u>	<u>NULL</u>
<u>AuthUserName</u>	<u>SIP authentication user name.</u> <u>Max is 48 characters.</u>	<u>Read/Write</u>	<u>NULL</u>
<u>URI</u>	<u>SIP address of record (AOR).</u> <u>Typically:</u> <u>sip:username@fqdn</u> <u>or</u> <u>sip:username@ipaddress</u> <u>If the URI is configured with username but without</u> <u>"@ipaddress" or "@fqdn", the UNI-V will</u> <u>automatically add an @ and will use the domain</u> <u>configured in</u> <u>VoiceService {i}.VoiceProfile {i}.SIP.UserAgentDomain.</u> <u>Max is 256 characters.</u>	<u>Read/Write</u>	<u>NULL</u>

9.11. Definitions

The following words, acronyms and abbreviations are referred to in this document.

Term	Definition
AAA	Authentication, Authorization, Accounting
ACS	Auto-Configuration Server
ALU	Alcatel-Lucent
AMWI	Audible Message Waiting
AOR	Address of Record
API	Application Program/Programming Interface
AR	Automatic Recall
AS	access seeker
ASCII	American Standard Code for Information Interchange
ATA	Analogue Telephony Adaptor
AVC	Access Virtual Circuit
BBPSU	Battery Backup Power Supply Unit
BH	Busy Hour
CAC	Call Admission Control
CAS	CPE Alerting Signal
CE	Customer Equipment
CIR	Committed Information Rate
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Indication Restriction
CND	Calling Number Display
Connectivity Serving Area	A geographical region that is addressable using a single CVC
CPE	Customer Premises Equipment
CVC	Connectivity Virtual Circuit
CWT	Call Waiting
CWMP	CPE WAN Management Protocol
DHCP	Dynamic Host Configuration Protocol
DN	Directory Number
DNS	Domain Name Service
DTMF	Dial Tone Multi Frequency
FQDN	Fully Qualified Domain Name
FSK	Frequency Shift Keying
FTP	File Transfer Protocol
ICMP	Internet Control Message Protocol
IP	Internet Protocol
LAN	Local Area Network
MAC	Media Access Control
MTU	Maximum Transmission Unit
MWI	Message Waiting Indicator
NFAS	NBN Co Fibre Access Service
NNI	Network to Network Interface
NTD	Network Termination Device
NTP	Network Time Protocol
OSI	Open System Interconnection
OSS	Operating Support System
PCMA	Pulse Code Modulation using G.711 A-law codec
POI	Point of Interconnect
POTS	Plain Old Telephone Service
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RADIUS	Remote Access Dial-In User Service
REN	Ringer Equivalence Number
RTP	Real-time Transport Protocol
R-Value	The value for quantitatively expressing speech quality

Term	Definition
SDP	Session Description Protocol
SIP	Session Initiated Protocol
S-TAG	Service Tag
TC	Traffic Class (Quality of Service Traffic Class)
TISPAN	Telecommunication and Internet converged Services and Protocols for Advanced Networking
UA	User Agent
UDP	User Datagram Protocol
UE	User Equipment
UNI-V	User Network Interface - Voice
URI	Universal Resource Identifier
URL	Uniform Resource Locator
V-Series	ITU-T Recommendation (Data communication over the telephone network)
VBD	Voice Band Data
VID	Virtual Local Area Network Identifier
VLAN	Virtual Local Area Network
VMWI	Visual Message Waiting
VoIP	Voice over Internet Protocol
<u>WAN</u>	<u>Wide Area Network</u>
Wholesale Broadband Agreement	An agreement entered into between NBN Co and an access seeker for the purpose of the access seeker acquiring services by NBN Co, including the NFAS.
XML	Extended Markup Language

10.12. Known issues

A number of issues pertaining to the first release UNI-V functionality have been observed. NBN Co intends to rectify these known issues in future UNI-V releases.

Please note that suggested workarounds proposed by NBN Co should be assessed by ~~the~~ access seeker to determine the workaround's suitability to ~~their~~its environment. It is up to ~~each~~ access seeker to make its own decisions about the suitability of workarounds proposed by NBN Co.

1) Call rejection

Overview

The UNI-V rejects incoming calls under specific conditions.

Issue

In the INVITE SDP offer, when ~~an~~the access seeker network offers 10 or more codecs for negotiation with the UNI-V and G711AG.711A is not offered for negotiation within the first 10 codecs, the UNI-V rejects the offer and hence the call is rejected. The UNI-V only supports the G.711A codec.

Potential solution / work-around

Access ~~seekers~~seeker could operate ~~their network~~sits network in a manner that will either present the G.711A within the first 10 supported codecs, or restrict the number of codecs allowed to be negotiated with the UNI-V.

Assessment

NBN Co intends to expand the number of codecs allowed in the SDP in a future release of the UNI-V.

2) Register "302 Moved Temporarily" response not supported - UNI-V registration response 302 not being actioned)

Issue

On reception of a 302 Register response, the UNI-V does not resend REGISTER message to new destination.

Assessment

Redirect servers can be used to provide scalability and redirect message to the correct destination by sending a 302 response. For example Broadsoft uses network servers to redirect SIP messages to the correct application server by sending a 302 response.

Potential solution / work-around

UNI-V receipt of 302 responses can be avoided by:

- a) Having a Session Border Controller (which performs the 302 redirect) between the UNI-V and the Redirect servers (typical deployment configuration)
- b) Configuring the UNI-V to register with final destination rather than Redirect server.

3) Call Waiting suspend service code

Issue

The UNI-V has a hard coded Call Waiting suspend activation code *70 that may clash with an access seeker's softswitch feature activation code(s).

Potential solution / work-around

Avoid the use of, or reassign, softswitch *70 feature codes.

4) Session Retry Wait Interval

10.1.1. Overview

The UNI-V will retry failed sessions to attempt to redeliver events that it has previously failed to deliver and to allow the ACS to make additional requests in a timely fashion.

Issue

The UNI-V does not fully comply with the retry wait interval table specified in TR-069 Amendment 1 standard (table 3 in section 3.2.1.1).

The UNI-V implements only the first 3 waiting retry intervals in a circular loop. This generates more traffic towards access seeker's network when the UNI-V does not receive a response to any requests.

Potential solution / work-around

There is no direct workaround at present. One way to reduce traffic is by setting the PeriodicInformInterval value on the UNI-V to a fairly long interval which will lower TR-069 periodic traffic across access seekers' network.

Assessment

NBN Co intends to fix this defect in future releases to fully comply with the retry waiting interval.

5) Option code 254 (DHCP Option 43) state from invalid to valid

Overview

UNI-V rejects authentication with ACS when DHCP OPTION 43 Option Code 254 is changed from invalid value to a valid value (using UNI-V default ALCL TR069 serial number) during the DHCP lease renewal.

Issue

If access seeker happens to send an invalid sub Option 254 value, followed by a valid sub option 254 which exactly matches the default TR-069 serial number (the NTD's serial number), the UNI-V will reject authentication with access seeker's ACS.

Potential solution / work-around

This scenario is very unlikely as access seeker is unlikely to be using option code 254 at all if using the NTD hardware serial number for TR-069 identification.

Assessment

NBN Co intends to fix this issue in a future release of the UNI-V so that if option code 254 is used and the status changed from an invalid value to a valid value, the UNI-V will still be able to authenticate the ACS.