Orange Belgium
Free Modem Choice
On Voo HFC Network
Network Termination Point Interface Spec's & Acceptance Tests Overview

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Acronyms

Abbreviation	Description
ACS	Auto-Configuration Server (TR-069)
ATDMA	Advanced Time Division Multiplexing Access= Docsis 3.0 Upstream Modulation
ATP	Acceptance Test Plan
BSOD	Business Service Over Docsis (CableLabs Standard)
BIPT	Belgisch Instituut voor postdiensten en telecommunicatie
BBWF	BroadBand World Forum
CCAP	Convergent Cable Access Platform (include Docsis DATA & Digital Video)
CM	Cable Modem
CMTS	Cable Modem Termination System
CPE	Customer Premise Equipment
CWMP	CPE Wan Management Protocol (from TR069 standard)
D-CCAP	Distributed CCAP (See above): Architecture based upon Remote (Mac)Phy Digital Fiber Node & Core (CMTS based)
DOCSIS	Data Over Cable System Interface Specifications
DS	Downstream
D3.0	Docsis 3.0 technology
D3.1	Docsis 3.1 technology
FOTA	Firmware Over The Air
HFC	Hybrid Fiber Coax (Network)
IoF	Internet Only Filter
IPR	Intellectual Property Right
L2vpn	Layer 2 VPN (Subset of BSOD standard)
MAC	Medium Access Layer
NDA	Non Disclosure Agreement
NetCo	Network Company (WholeSales Focus) or service provider
NTP	Network Termination Point
OBE	OBE Belgium
OFDMA	Orthogonal Frequency Division Multiplexing Access= Docsis 3.1 Upstream Modulation
OLO	Other Licensed Operator

Phy	Physical (Layer): include Ranging, Power Levelling, Modulation, …
ServCo	Service (Provider) Company (Retail Focus) or Service Provider
SH	Shell (Command Line Interface enabled Software)
SSD	Secure Software Download
SW	Software
TLN	Telenet (Cable Service Operator)
TLV	Text-Length-Value, command line inside the CM configuration file
ToF	Telenet Only Filter (Formely Telenet was an ISP: internet service provider) only
TR-069/369	Broadband World Forum standards to manage CPE (Control & Services) from WAN
UDC	Upstream Drop Classifier
UI	User Interface
US	Upstream
USP	User Service Platform (from TR-369 Standard)
UX	User eXperience
V-CCAP	Virtual CCAP (see above): Architecture based upon Remote (Mac)Phy Digital Fiber Node & Core Servers
WAN	Wide Area Network
WHS	WHoleSales

Introduction

Following the BIPT Decision of 26 September 2023 regarding the identification of the network termination point (NTP) for broadband services and TV services, OBE[1] defines in this NTP document the specifications that need to be fulfilled by a Private Modem for use on the footprint of the **Voo** cable network.

The BIPT Decision of 26 September 2023 is being appealed (Beroep van OBE Belgium tegen het besluit van de Raad van het BIPT van 26 September 2023 | BIPT). Should it appear that following the outcome of the appeal, the Decision of 26 September 2023 is annulled or needs to be amended, OBE preserve its rights to withdraw or amend the below specifications without prejudice.

OBE offers fixed retail broadband services throughout Belgium (Flanders, Brussels and Wallonia) using the cable networks of VOO and Wyre This document specifies the NTP for the footprint of the **Voo** HFC network only.

DISCLAIMER

The document is based on the current state of information and network specifications and is subject to change.

The specifications may change if deemed necessary and may break backward compatibility with previous versions. When a new version of the document is being published all previous documents become void, in line with any applicable delay period.

Major effort has been put into making this document as complete and accurate as possible, nonetheless OBE B cannot be held liable for any direct, indirect, incidental, consequential or special damages arising out of the use of the information.

The present specifications rely on the Wholesale NTP specifications of Voo; the general disclaimers of the underlying network operators must be considered by the terminal equipment providers. OBE cannot be held liable for any damages (direct, indirect, incidental, consequential or special) arising from that information.

The interface specifications do not apply under abnormal operating conditions such as:

- Operating conditions resulting from the use of services other than DOCSIS 3.0/3.1 over the dedicated data RF interface.
- Operating conditions arising from faults, maintenance, construction work, or efforts to minimize service interruptions.
- Operating conditions resulting from force majeure or third-party interference.
- Operating conditions during test signal injection governed by regulation.
- Instances of non-compliance with the relevant standards by an End User's installation, equipment, or technical requirements for connection, as established by this interface specification or public authorities, including the specified limits for electromagnetic compatibility.

The characteristics given in this interface specification are intended to be used to derive and specify requirements for equipment such as coaxial cables and cable modems to connect them to the dedicated data RF interface.

The values in this interface specification take precedence over requirements in equipment product standards and installation standards. The given characteristics are not intended to be used as electromagnetic compatibility levels or user emission limits in the HFC networks.

When an end-customer choses his own terminal equipment (modem) it is his responsibility to do the installation correctly, to do the most recent software updates (including security software) and to make sure that the modem complies with the specifications described in this document. It is therefore important that the modem supplier provides the right information, support and software updates to the end-customer.

OBE cannot be held liable for any problems arising out of the use of a modem which does not comply with the industry standards (e.g. for security). Moreover, OBE reserves the right (in line with the BIPT decision) to block any end-user device which has a negative impact on the network.

OBE/VOO provides services over cable networks that are subject to technological evolution. Parts of the cable networks used for the OBE/VOO services will or may be replaced by fiber-based networks in the near and/or medium-term future. This implies that modems built for services

over cable networks may no longer be usable at locations where a fiber network is deployed. As the speed and geographical scope of this evolution depends on a variety of parameters, OBE/VOO cannot provide guarantees regarding the duration during which a Private Modem based for services over cable networks can effectively be used at a given location. Suppliers of Private Modems based on these NTP specifications should warn customers of this uncertainty.

Should the end customer decide to move to other operators with his own private modem, OBE cannot guarantee that all the services will be supported (Packet Cable VoIP, ...). It' under the modem supplier's responsibility to be compliant with the different services on different locations.

Specifications update

OBE Belgium will update the present specifications whenever:

- There is a significant network change that requires an evolution of the present specifications (V-CCAP, Docsis 4.0, new overlay model, new frequency plan, others ...)
- The present specifications have been found to not be sufficiently accurate or exhaustive in order to meet the aim of the present specifications and with reasonable effort amendments to the present specifications can remedy these inaccuracies or lacks exhaustiveness.

Convention

Throughout this document, the words used to define the significance of requirements are capitalized. These words are:

"MUST, SHALL": This word means that the item is an absolute requirement of this specification.

"SHOULD": This word means that, except valid reasons in particular circumstances to ignore this item, this item is highly recommended.

"MAY": This word means that this item is optional.

And to consider the stakeholders in the specifications:

- **"Cable Operator"**: Voo HFC network Operator in this document.

- **"Private modem"**: Modem, other than the modem provided by OBE, chosen by the End-user to make use of the OBE services via the Cable Operator network. This will be synonym of CMP ("Cable Modem Propriétaire"), third-party modem & proprietary modem.

- **"CPE Supplier"**: supplier of a modem intended for use as Private Modem.

Scope

The present NTP document is the implementation OBE services provided over the Voo cable network of the BIPT Decision of 26 September 2023 defining the NTP for broadband services.

The BIPT Decision refers to NTP location A according to the schema below, which means the customer has the entire responsibility of the device compliance to connect the Public Access Network of OBE Service operator.

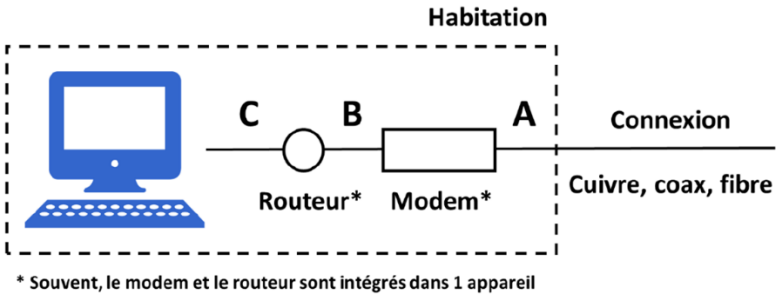
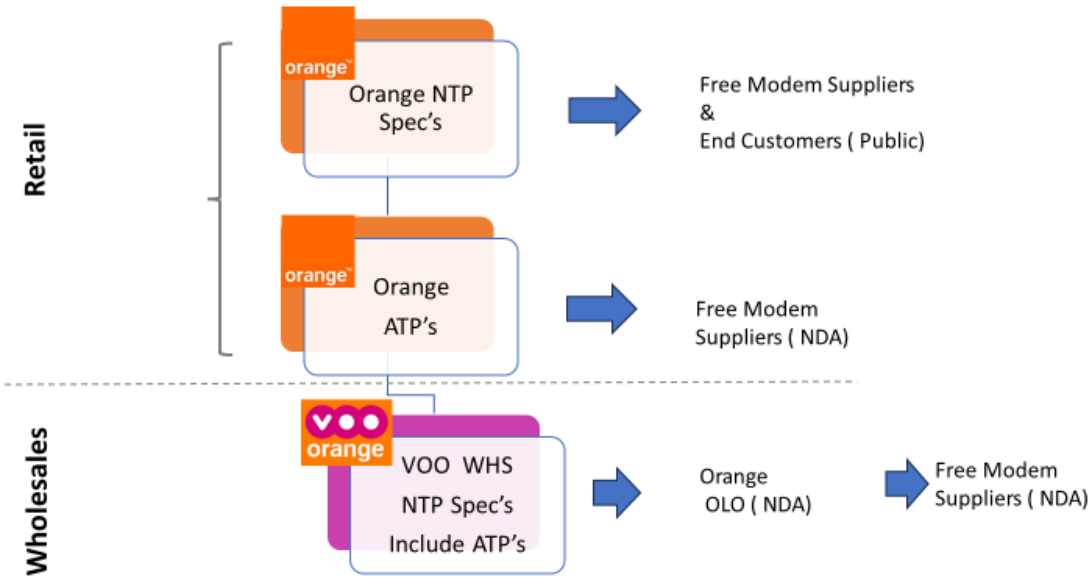


Figure 2 : Les différentes localisations possibles du NTP pour un service d'accès à l'internet.

As mentioned, the OBE service is provided on the Voo network. Consequently, the specifications of the Voo underlying network must be taken into account.

An overview of the set of documents that the private modem must comply with is shown under schematic below, described after.



This retail NTP OBE Interface Specifications document for the Voo network includes (from bottom to top level):

1/ the wholesales NTP specifications for the Voo network, February 1, 2024:

- **« Caractéristiques techniques des Modems et Routeurs Propriétaires relatives à la décision du 26 septembre 2023 de l'IBPT dans le cadre d'une utilisation sur le réseau VOO «**

2/ VOO has included in its document all the Interop Tests (ATP) to run by a recognized test lab

3/ The NTP VOO interface specifications document includes also acceptance tests below (from chp11 to chp 16):

4/ To ensure compatibility with the OBE services, a series of additional Acceptance Tests are required.

Modem Supplier Submission

To permit to deal with the new free modem choice context, the private modem supplier must support all the requirements of the Wholesales operators defined above and, in addition, must also support the OBE acceptance test plan defined below. Such OBE Specific acceptance test plan will permit a graceful & seamless integration with the OBE operations.

OBE has defined the characteristics that are mandatory (<MUST>), highly recommended (<SHOULD>) or optional (<MAY>). The acceptance tests are to ensure compatibility with the OBE services provided on the Voo network. Details of the acceptance test plan is on demand and following signature of non-disclosure confidential agreement (NDA)

To ensure the integrity of the network and the compliance of OBE with its regulatory requirements (towards wholesale network providers and end-users), The private modem supplier must provide OBE the report from an authorized test lab, executing the different test plans like Excentis in Ghent, Belgium.[3] .

Other Authority Test Lab can be proposed but must be, first, approved by OBE (Kyrio Lab[4], others (NL, GE…)).

Except DOCSIS Broadband Access, OBE cannot be responsible of the customer specific features like WIFI, Erouter, Security Firewall, TR069, VoIP, others …

New Modem Software Submission

In case of the private modem supplier submitting any new SW, supplier must, at minimum, notify OBE and certify the changes have no impact on the OBE operations and Voo HFC network.

If the private modem supplier has some doubts about some changes and their impacts, the supplier must show some test results on its own.

OBE reserves the right to require to re-pass some tests, should the modem show some strange behavior that could harm the HFC network or disturb OBE operations.

OBE, CPE supplier and end user Roles and Responsibilities

Cable Operator & OBE Responsibilities

- Cable operator regularly adapts the HFC network by introducing new hardware and software and shall not be responsible of any service degradation following these network evolutions (Node split, CCAP chassis SW/HW upgrade, Amplifier replacement, Fiber cut repair...)
- Cable operator & OBE shall NOT be responsible to make any statements of compliance to the specifications contained in this document for CPE that OBE Belgium does not provide itself. OBE cannot assume any such responsibility in the most explicit sense possible.

CPE supplier Roles and Responsibilities

- The CPE supplier shall be the prime responsible for making statements of compliance to the specifications contained in this document on request of end users or on request of any legal entities that sell or intend to sell said CPE onto the Belgian CPE retail market. OBE cannot be held liable for any wrong information provided by the supplier.

End user Roles and Responsibilities

- According to BPIT decision §97:
  "... Il convient de souligner que si la localisation du NTP est définie au point A, la responsabilité du bon fonctionnement des équipements terminaux se situe d'abord chez l'utilisateur final qui le raccorde au réseau, sauf s'il s'agit d'équipements terminaux fournis par l'opérateur concerné lui-même..."
- The end user shall be the sole responsible for selecting its CPE hardware and software compliant to the present specifications.

- The end user shall be the sole person responsible for making sure that its selected CPE hardware and software is compliant with any evolution of the present specifications.
- The end user shall be the sole person responsible for upgrading the software of its CPE.
- The end user shall only use software approved by the CPE supplier and shall not modify it.
- The end user shall install CPE SW patches recommended for security reasons by the CPE supplier.

Modem Technology

The modem DOCSIS technology authorized is Euro-DOCSIS 3.0 or DOCSIS 3.1.

Contact

Company	Name	Title	Mail address
orange	OBE Cable Broadband	Free Modem Choice task force	Cable.engineering@orange.be

OBE positioning

OBE is a service provider and a Wholesales customer who is depending on the current obligations /possibilities/restrictions given by the Voo Wholesales Operator.

OBE will provide part of the generic config file. This config file may include some supplier specific info per private modem type.

OBE will not support Docsis Secure Software Download (SSD) of private modem on Voo HFC Network. Private modem suppliers must propose to the end customer a Firmware Over the Air (FoTA) infrastructure based upon TR-369 /069 CWMP (CPE WAN Management Protocol) -USP (User Service Platform) protocols.

Generic Configuration File

The generic configuration file will be common to all the private modems, OBE may accept, upon specific demand from the private modem supplier, to add some specific info as part of the generic configuration file for each new private modem type as soon as they are not disturbing the other private modems. This can be under the form of:

- TLV-11 (SNMP Proprietary OID based)
- Cable modem Supplier Specific Information TLV 43
- E-Router Supplier Specific Information TLV: TLV 202.43

Both the Supplier Specific information TLV (CM/eRouter) disposes of a Supplier ID selection that should permit to identify the private modem itself, and, as such, new private cable modem must take into account the relevant info and disregard all the rest.

TLV 202.2.2 <eRouter TR-069 Management Server URL> is not authorized.[5]Such info must be delivered using the other TLV format defined above.

Secure Software Download (SSD) – Firmware Over the Air (FOTA)

Any secure SW download must take place via the WAN IP Erouter interface and must be controlled by the private modem suppliers as a regular Firmware Over the Air (FOTA). A BBWF6 TR069/369 standards approach must be applied. This approach will not be applicable in bridge mode.

For instance, - cf BIPT decision item 85.5 - the user would select a profile from the modem user interface that will activate the right software check & update the software from the correct TR-069 ACS server, Or Such parameters can be hardcoded in the software itself, or any other solution. OBE will ask to explain the solution in ATPs to demonstrate that such a solution is fully secure.

Should the private modem supplier propose bridge mode, modem supplier must propose a solution e.g customer may download the SW itself and push it via the local web interface or fallback temporarily to e-Router mode to get a WAN IP and download the SW.

Harm to network

By definition a coax line is said to cause harm to the network when it:

- Disturbs any of its neighboring behind the same fiber node such that the service of other neighboring end users is impaired or seriously risks being impaired
- Leads to disproportional operational burden compared to other users. A not exhaustive set of examples of disproportional operational burden is the following:
    - creating excessive support calls
    - flooding the HFC network and / or operational systems (including the OBE & Cable operators monitoring systems) with e.g.:
        - Modem flapping
        - Too many errors on the modem
        - Modem sending interferences upstream (wrong timeslot/frequency)
- Causes security issues or serious security risks

OBE has / claims the right to take measures, reactively as well as proactively, regarding any modem connected to a service with an own private modem connected:

- For which it has been established that it causes harm to the network
- For which it is strongly suspected that it causes harm to the network
- For which there is a high risk that it will cause harm to the network
- That is not compliant to the present specification

These measures include, but are not limited to:

- Reducing the spectrum configured for the modem (attribute mask) to which said modem is connected. Often this sufficiently mitigates harm to the network and this way the end user can still enjoy a basic connectivity service.
- Remotely locking the network WAN port of the modem (Network Access=off) after modem reboot
- Physically disconnecting the drop line:
  - Either at the network side
  - Or at the customer (end user) premises side (NIU)
  - Maintaining a blacklist of CPE.

By definition any of the above 3 measures (reduce the spectrum, remotely lock the port, physically disconnect the line) shall apply whenever a blacklisted CPE is connected to the OBE network. The blacklist entry and exit criteria will be defined at a later stage.

Note: the fact that OBE has / claims this right does not mean that OBE will exercise this right in an overly conservative dogmatic manner. It will be exercised in a reasonable way, balancing the benefits of all the end users that use the OBE service, whether they use a freely chosen modem or a modem provided by OBE.[7]

OBE Acceptance Test Plan Overview

The test plan includes 20 tests to run & report results. Most of them are quite straightforward.

Details are part of the associated OBE ATP document (under NDA).

Nbr	ID	Category	Description	Status	Comments
1	OBE-ATP-1-1	RF	Gold Channel List (D3.x)	SHOULD	Faster CM Initial Attachment, can be selectable via profile on UI
2	OBE-ATP-1-2	RF	SNR–RX dowsntream levels (D3.0/D3.1)	MUST	Both the RX & SNR levels reported by SNMP from 3 units of different production batch must reflect the correct values within the following range both for D3.0 & D3.1 signals: • D3.0: RX levels: - 20 dBmV to -6 dBmV SNR levels: 25 dB (MDD loss) to 35 dB (256QAM clean) • D3.1 (PLC or 6 MHz): RX levels: - 15 dBmV to -6 dBmV SNR levels: 27 dB to 41.5 dB

					Must be compared with calibrated RF field testers like Veex CX310 or VIAVI ONX220 or other reference testers; Standard deviation must be less than 1 dB.
3	OBE-ATP-2-1	SW	TR069-369	MUST	Firmware Over the Air (FOTA) as Secure Software Download (USP). The private modem supplier must present the solution & confirm it's secure. Such a solution will permit easy remote diagnostics for troubleshooting (CWMP).
4	OBE-ATP-3-1	CFG	Smart Parser	MUST	CM must connect even if: unrecognized TLV 11(OID), or duplicate TLV 11 (OID) present. Unrecognized TLV must be ignored. Duplicate TLV may not be skipped. Supplier Specific TLV with Irrelevant Supplier ID must be ignored. Such an event or parsing error must be logged (local, syslog).
5	OBE-ATP-3-2	CFG	CFG file will include System Name OID .1.3.6.1.2.1.1.5.0 as Config Version	MUST	There must be no conflict to use System Name to define the config file version. Such a field must be programmable by Config file TLV. OBE will track the changes of the generic config file after new private modem info inclusion.
6	OBE-ATP-4-1	DOCSIS	DOCSIS IP Filter	MUST	Still in use even if D3.1, incompatible with UDC [9]
7	OBE-ATP-4-2	DOCSIS	DOCSIS UDC + CMIM Mask	SHOULD	To be future proof, filtering combining both source CPE index port based upstream & Bogon

					destination (10./8,172.16./12,192.168./16) & official IPv4 multicast (224.1.1.1-32) by default (generic filter)
8	OBE-ATP-4-3	DOCSIS	ToF/IoF[10] Filters	MUST	After digital switchover, analog spectrum is reused for Docsis. But some obsolete internet filters can still be present and filter some new DOCSIS channels (D3.0 or D3.1). Modem during registration must be up & operational even running downstream partial service. Must be tested against CISCO CCAP.
9	OBE-ATP-4-4	DOCSIS	Intensive US partial Service OFDMA	MUST	Create an intermittent strong ingress with a clock rate of 1 per minute over a 30 min period, 50% duty cycle, validate no data interrupt upstream & no modem reboot/re-init. Must be tested against CISCO CCAP.
10	OBE-ATP-4-5	DOCSIS	Intensive US partial Service OFDMA	MUST	Create an intermittent strong ingress with a clock rate of 1 per minute over a 30 min period, 50% duty cycle, validate no data interrupt upstream & no modem reboot/re-init. Must be tested against CISCO CCAP.
11	OBE-ATP-4-6-V	DOCSIS	DOCSIS US CM attribute Mask	MUST	Permit to not run D3.1 OFDMA if in-Home network is not D3.1 ready (VOO, need new NIU & validation)
12	OBE-ATP-4-7-V	DOCSIS	DOCSIS Cable DS resiliency	MUST	CM must be running gracefully "Downstream Resiliency Bonding Group"[1] defined by CISCO Cable.

[1] CM must be running gracefully "Downstream Resiliency Bonding Group" [1] defined by CISCO Cable.

13	OBE-ATP-4-8-V	DOCSIS	D3.1 OFDM Profile Management (Pro/Demotion)	MUST	See Details in ATP, on CISCO CCCAP.
14	OBE-ATP-5-1	IpV6	IPv6 Prefix Delegation /56	MUST	Policy defined by Orange Group.(not /64) to be future proof. Must be tested against CISCO CCAP.
15	OBE-ATP-5-2	IpV6	IPv6, no incoming session to the HOME LAN	MUST	By default, no incoming IPv6 session. Policy defined by Orange Group. Possibility via Web User interface defining specific ipV6 forwarding rules. OBE declines all responsibility in case of attack.
16	OBE-ATP-6-1	CGN	CGNAT optout	SHOULD	Permit to get public IP based upon DHCP option 12 (Hostname=OPT-IN by default=CGNAT) modification by the User modem interface to OPT-OUT to get public IP & define port-based forwarding. WAN Remote Access, DMZ are not available by default (CGNAT).
17	OBE-ATP-7-1	Log	Second Syslog	MAY	Permit the OBE to detect a mal function. Should include DOCSIS (embedded) event and important Erouter Event like no ipV4 or IPv6 provisioning.
18	OBE-ATP-8-1	Bridge	Bridge Mode (legal obligation)	MUST	In bridge mode, only one ethernet port (index 1) must be enabled to allow OBE to collect data consumption (legal obligation). WIFI must be disabled. User will receive public IP.

[1]Downstream Resiliency Bonding Group:

https://www.cisco.com/c/en/us/td/docs/cable/cbr/configuration/guide/b_docsis_cbr_full_book_xe16_9/b_docsis_cbr_full_book_xe16_9_chapter_010001.html

19	OBE-ATP-9-1	SNMP	DOCSIS Monitoring	MUST	The following MIBS must be supported and operational, even under stress conditions: 1. IF-MIB/ifXTable (64 Bit counters) 2. Docs-Cable-Device-Mib 3. Docs-IfMib 4. Docs-If3Mib 5. Docs-If31Mib 6. Docs-PnmMib 7. CableLabs/esafeErouter SoftReset Stress conditions means loop every 5 minutes combining snmpget & snmpwalk over about 20 Mibs with 3 retries. Python Script is defined in ATP document.
20	OBE-ATP-10-1	SPEED	Built-In Iperf3 TCP client on WAN interface	SHOULD	SpeedTest iperf3 Client must be: -programmable via TLV11 or Erouter/Supplier Specific TLV in config file - must include: enable/Server IP adress/ Service Port/test period/DS +US/Nbr of // sessions, TCP mode,) - must be HW accelerated on TCP-IP socket to get Downstream Speed > 2 Gbps and Upstream Speed > 1 Gbps - must be interoperable with OBE Iperf3 servers (details in ATP) -Customer interface or Back office (SNMP) must be able to trigger a speed test to troubleshoot DOCSIS issue and decouple from home Lan issue.

Test package upon NDA signature

Upon NDA signature, the modem supplier will receive from OBE a complete test package that will include 4 items:

- 1/ Test Check List
- 2/ Test set-up:
  - CCAP CMTS staging Configuration, CISCO CCAP (Voo)
  - Generic Config file to run on VOO HFC network.
- 3/ OBE Retail ATP's (including Gold Channel list)
- 4/ Voo WHS NTP's(+ATP's)