



ZERO TOUCH ACTIVATION & MONITORING FOR FTTx SERVICES

UMP Case study

INTRODUCTION

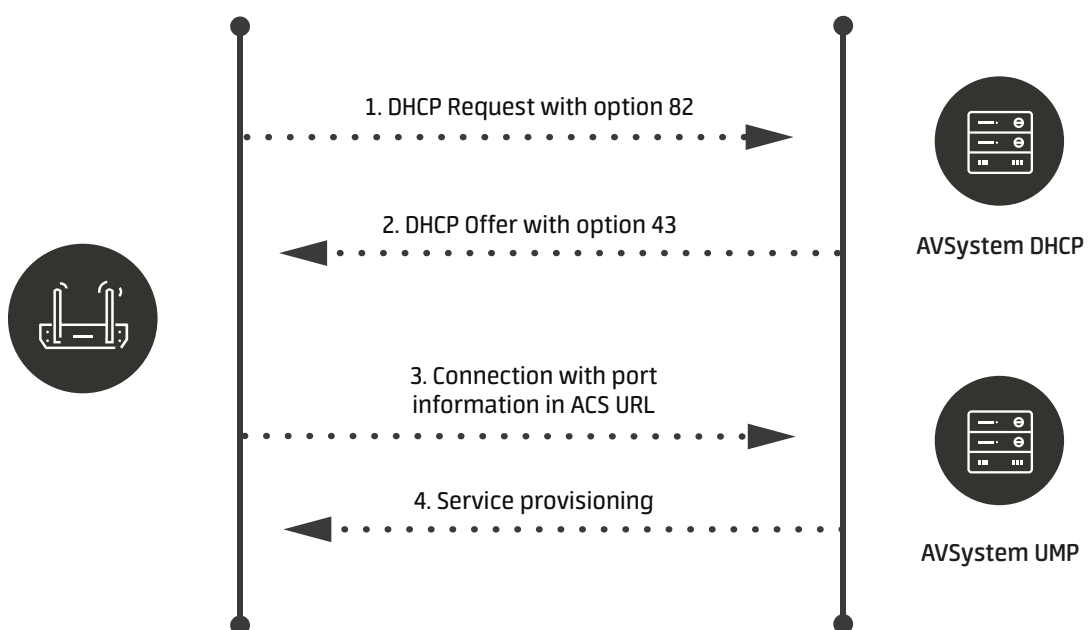
Zero touch scenarios became popular in xDSL networks, mainly including PPP credentials and VoIP service provisioning. Each service was assigned to MAC or serial number of a device, creating binding between a customer and service. Such approach works fine, however it has a few drawbacks, such as a necessity to reprovision data in case of hardware replacement at customer premises. To solve this issue TR-069 introduced possibility to use DHCP server to push out options responsible for ACS URL and provisioning code configuration (DHCP option 43). In conjunction with option 82, it allows to enable the port-based provisioning which results in service configuration being bound to DSLAM/OLT port instead of the device's serial/MAC. In this way provisioning has become easier from ISPs' point of view. This concept – originally started in a few DSL networks – is now much more widely utilized within modern fiber networks.



ZEROTOUCH EVOLUTION IN FTTX

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ZEROTOUCH PROVISIONING FLOW



SOLUTION'S COMPONENTS

The final solution of a European FTTx service provider's case study presented in this paper was based on the following components:

- AVSystem Unified Device Management Platform (UMP) – telco-grade TR-069 server enabling all provisioning, monitoring and reporting capabilities;
- AVSystem DHCP server – robust, multi-master DHCP server implementation;
- OLTs with DHCP option 82 supported – OLT needs to enrich DHCP request with the Option 82 data before sending it to the main DHCP server.

The following provisioning flow was used in the studied case:

1. DHCP Request sent by a device after its initial power-up or factory reset is amended with Option 82 information by OLT and transmitted to the DHCP server.
2. Based on configuration provided by the ISP, the appropriate IP Address is assigned by DHCP Server. DHCP Response also contains an appropriate, individual ACS-URL for the device (as part of Option 43) including encoded locality information.
3. Connection is established with Unified Device Management Platform (UMP) by the CPE, and the port identification is sent encoded in the ACS URL.
4. Based on the locality information, appropriate service-related information is found by UMP and translated into the model-specific configuration workflow allowing for seamless service activation.

As soon as the procedure is finished, the device is fully configured both in terms of delivered services, security, as well as ready for desired monitoring to be active.

NOTE: Both ACS-URL as well as Provisioning Code are allowed to be sent to a device as a part of DHCP response by the TR-069 standard. In the described case, the client opted for the use of ACS-URL only based on interoperability issues with legacy devices without sub-options support. UMP unique flexibility allows for utilization of any combination of these parameters. Additional integration between AVSystem UMP and DHCP products allows for an even easier problem detection.



DEVICE GROUPING BASED ON OLT ASSOCIATION

In the most useful case, as soon as the service is configured, an end-user device is automatically assigned with the respective OLT ID and included in the OLT monitoring group. UMP automatically maintains groups of devices connected to the specific OLT using any dedicated parameter, which may reuse any existing operator's OLT identifiers convention.

Grouping of devices is dynamic, therefore the devices are moved to different OLT groups according to information contained in the DHCP Option 82. Monitoring automatically follows such changes and adds the device to the appropriate OLT group. Such method ensures that all devices physically attached to the particular OLT are always a member of the appropriate group related to this OLT. At the same time, the structure for enabling monitoring, data aggregation and batch KPI calculation is provided. At a predefined interval, UMP will retrieve and store all relevant parameters available on the ONTs. System can utilize any of the extracted data for calculation of KPIs or other single-device or group-related metrics.



INFRASTRUCTURE VISUALIZATION & MAPPING

AVSystemUMP includes a built-in geo-visualization engine allowing for geographical display of any group-related KPIs. A device typically belongs not only to an OLT group, but also to many other groups. Virtually an endless combination of presentation is possible:

- Showing devices belonging to a certain OLT (in the multitenancy scenario);
- Showing devices belonging to a certain OLT AND having high reboot count;
- Showing devices belonging to a certain OLT AND having high reboot count AND having specific firmware version

CUSTOMER CARE OPERATIONS

A Customer Care operator after receiving a call from an end customer can check all parameters reported by their device as well as review the historical data collected by the monitoring module, which include:

Fiber Monitoring

- ConnectionStatus
- RXPower
- TXPower
- SupplyVoltage
- TransceiverTemperature
- BiasCurrent
- ConnectionResetCount

Latency Monitoring

- Min RTT
- Max RTT
- AVG RTT
- Lost packets %

Bandwidth Usage

- BytesReceived
- BytesSent
- DownloadRate
- UploadRate
- DownstreamUtilization
- UpstreamUtilization
- NonIdleDownloadRate
- NonIdleUploadRate

Speedtests

- Upload Speed
- Download Speed

All these KPIs can be calculated per 1 device, per OLT as well as per desired groups of OLTs. At request, AVSystem can build additional custom report recalculating data in any desired way and generating any KPI using the above mentioned data or data indicated by Operator.

SUMMARY

AVSystem's FTTx solution consisting of UMP and DHCP platforms is an end-to-end solution for FTTx service activation in both regional as well as big ISP networks. Such an all-in-one solution provides low implementation costs and makes FTTx management fast and easy.

Introduction of remote management and monitoring for the purposes of support and automatic service provisioning actions decrease the customer support phone-call time by 30-80% (depending on the type of issues experienced by end users), as well as overall number of calls related to initial installation issues by 60-70%.

This allows for larger investments into the network itself, infrastructure and service portfolio development, while the unique design of UMP allows for seamless cooperation with a multitude of equipment used in present days and future networks.