

ONT Easy Start

Using automation to support simple and cost-effective PON service activation

White paper

The process of installing and activating optical network terminals (ONTs) and Residential Gateways (RGWs) presents serious challenges to service providers seeking to roll out PON-based broadband services. Current processes typically involve sending field technicians on truck rolls to customer sites to provision ONTs manually and provision RGWs in an independent step. This approach is costly and time consuming.

Nokia ONT Easy Start addresses these issues by automating the ONT activation process. This automation optimizes field technician installations and enables end users to self-install their own ONTs. Additionally, ONT Easy Start supports a simple single step for activating both the ONT and RGW. It helps service providers reduce time to market and enhance the customer experience by rolling out high-quality PON services in a simple and cost-effective way.

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Introduction

Service providers are facing serious challenges as they seek to provision Passive Optical Network (PON)-based broadband services. The installation and activation of optical network terminals (ONTs) involves a complicated and costly set of activities. Service providers have been working to improve their provisioning processes. However, they still must send field technicians on truck rolls to end-user premises to install and activate all new or replacement ONTs. In locations with higher labor costs, a single truck roll can cost more than the ONT itself. In addition, ONT activation processes are typically not fully automated, so they cause quality issues that have a negative impact on the customer experience. On top of this Residential Gateways (RGWs) are activated through a separate second activation step, which is causing additional work and issues.

The real objective for service providers should be to make ONT plus RGW installation and activation as simple as (V)DSL modem activation. This means supporting a fully automated activation process that end-users can perform. To succeed with this objective, operators must address several challenges related to the PON technology, including the fact that a PON is a shared medium, while a (V)DSL is a point-to-point connection. Nokia is addressing this challenge with an innovative solution that makes ONT activation as simple and cost effective as (V)DSL modem activation.

This paper analyzes the challenges involved in the ONT provisioning process. It explains how the Nokia ONT Easy Start solution addresses these challenges and how service providers and end-users can benefit from this solution.

The challenges to activate PON services

Service providers want to use the latest innovations in PON fiber-to-the-home (FTTH) technologies to support gigabit services. The GPON broadband access services market is growing rapidly as a result. Vendors are now introducing XGS-PON and NG-PON2 solutions to address the market demand for even higher bit rates. To deliver more bandwidth and better services, service providers first need to connect their customers, which has proven to be more complicated than expected.

One of the main challenges in delivering PON broadband access services is to install and activate ONT and RGW devices on customer premises. To date, service providers have had to rely on field technicians to perform this work on site. The process often includes several manual steps, which can lead to errors and unhappy customers.

In contrast, end users of copper and coax broadband access services routinely self-install their DSL or cable modems. With truck rolls adding up to €100 of additional cost to connect or replace an ONT and RGW, the PON broadband access service is a less competitive and cost-effective option for rolling out broadband services.

Several factors make ONTs plus RGWs more difficult to install and activate than DSL or cable modems:

1. The user must be connected on a shared medium through the PON-defined Layer 2 protocols. The field technician that is installing the ONT typically performs this task in coordination with the service provider's back office. The task may include manual steps.
2. In the PON service activation process ONT and RGW serial numbers must be registered and assigned to end-users. One way of doing is to pre-assign ONT and RGW serial numbers to customers as part of the subscription process. But this adds more logistical work to the ONT and RGW shipment process and creates a greater potential for registration errors. Therefore, service providers typically perform this pairing of customer and serial during on-site installation by the field technician. This also adds complexity to the process and can also lead to human error.

3. The activation process must ensure end-user security on a shared medium. It is technically possible for anyone to connect an ONT to the GPON and request service. To avoid this possibility and the security issues it could create, service providers must establish user credentials during the subscription process and use these same credentials during the ONT activation process.
4. The installation and connection of ONTs present physical challenges and concerns. For example, GPON connectors and cables are more delicate to handle than copper connectors and cables. Service providers need to define additional instructions or practices to overcome these challenges.
5. The installation and activation of RGWs is typically a separate process from the installation and activation of the ONTs. The reason is that ONT activation is performed through the OLT using the OMCI protocol, while RGW activation is typically performed through the Automated Configuration System (ACS) using the TR069 protocol.

A solution that addresses these challenges should have a minimal impact on the existing operational processes and operations and business support (OSS/BSS) systems, including the ACS system already deployed. The solution must be able to address single- and multi-vendor OLT/ONT/RGW networks. The solution must also work in a wholesale business model.

The ONT and RGW installation and activation challenges do not apply solely to new subscriptions related to network growth. As GPON networks mature, most ONT and RGW installations and activations will be related to maintenance replacements, swap programs for next-generation ONTs, and customer churn. Churn rates will vary significantly, from the typically low rates for residential customers in rural areas to much higher rates for renters in cities, who on average stay less than two years in the same apartment. Market studies show that more than 50 percent of end-users prefer to self-install their devices so that they do not have to wait at home for a field technician. This number will grow as more people become comfortable with broadband technologies.

Solution to the PON service activation challenges

The Nokia ONT Easy Start solution addresses the challenges involved in installing and activating ONTs and RGWs with a set of blueprint activation processes, functions, and interfaces. It is pre-integrated within the Nokia PON product portfolio and provides a simple interface to the service provider OSS/BSS.

This section illustrates how ONT Easy Start can streamline the ONT and RGW provisioning process. It describes the simple procedure that end users or field technicians follow to install and activate an ONT and RGW in the home and the few remaining activities that service provider can address from the back office. It also explains how service providers can easily integrate the ONT Easy Start solution into their existing OSS/BSS environments.

End-user perspective

ONT Easy Start enables end users or field technicians to set up their PON broadband service in three simple steps.

From a CPE perspective there are the following possibilities. The first possibility is that customer services are directly offered from the ONT. However, in most circumstances the customer needs to have both an ONT and RGW, which can reside in one hardware device or two separate hardware devices. ONT Easy Start supports both cases. The remainder of this section describes the procedure for ONT and RGW together.

However, the same procedures can be used of the ONT only case.

1. **Install connect and activate the ONT and RGW**

Subscribers receive their ONTs and RGWs by mail or pick them up at one of the service provider's retail outlets. The service provider sends login credentials to users by traditional mail or email. The ONT and RGW can either be a two-box solution or a one-box solution. To install the ONT and RGW, a user simply connects the ONT to the PON connector and in case of a separate RGW box, the RGW to the ONT, and powers it on.

For the activation of the ONT and RGW a local connection is used. The user connects a laptop, tablet, or mobile device to the RGW (or ONT if no RGW exists) through a cable or Wifi connection and launches any web browser. ONT Easy Start then launches the activation web portal through a captive session and automatically captures the ONT and RGW serial number.

Alternatively, it is also possible to activate the ONT and RGW by a smartphone or tablet using a wireless connection. In this case the user scans a QR code or barcode on the ONT and RGW devices, containing the serial numbers with the smartphone or tablet. The scan launches the ONT Easy Start activation web portal.

2. **Log in to the ONT Easy Start web portal**

The user enters the login credentials sent by the service provider. The ONT Easy Start solution retrieves all other required information in relation to the ONT and RGW automatically, including the serial number(s) of the ONT and RGW.

3. **Test the optical line and activate the services**

A user or field technician can test the optical line, activate the ONT and the RGW with a single click. The solution automatically performs basic optical line testing, Layer 2 ONT configuration (including ONT software), and ONT activation and interfaces with OSS-BSS to ensure the Zero touch activation of the RGW through the existing customer ACS system.

Service provider perspective

ONT Easy Start makes ONT and RGW activation much simpler and less expensive for service providers. By automating the activation process, it enables service providers to support customer self-installation and avoid costly truck rolls for new subscriptions, maintenance replacements, and upgrades to next-generation technologies such as XGS-PON and NG-PON2. ONT Easy Start also simplifies new FTTH rollouts and reduces the training requirements for field technicians. The same field technician can install the fiber drop in a given home and use ONT Easy Start to provision the customer's ONT and RGW.

ONT Easy Start also eliminates the need to register ONT and RGW serial numbers. During the activation process, it automatically maps the ONT and RGW serial numbers to the end user's identity and reports the mapping to the relevant OSS/BSS. This automation prevents data entry errors and helps the field technician avoid unnecessary manual work.

If ONT Easy Start discovers problems during the ONT activation process, it will report them to the applicable service provider OSS/BSS. The service provider should set up an environment that can deal with these issues in a proactive way to provide the best end-user experience. However, the cost for doing this will be significantly lower than the cost of sending field technicians to the customer premises for every new subscription and ONT plus RGW replacement.

Service providers should evaluate the current practices related to ONT and RGW installations and adapt them as required to support customer self-installation.

For example, there may be concerns about the safety of the lasers in indoor ONTs. However, these are [class 1 lasers](#) that do not pose any safety risks. Some service providers have additional ruling, e.g. the requirement that a self-install of an ONT can only be performed when a shuttered fiber jack is available in the home. In this case a service provider should preferably install the fiber jack in the customer home in the same truck roll that the fiber drop is installed in the home, this to avoid unnecessary expensive truck rolls.

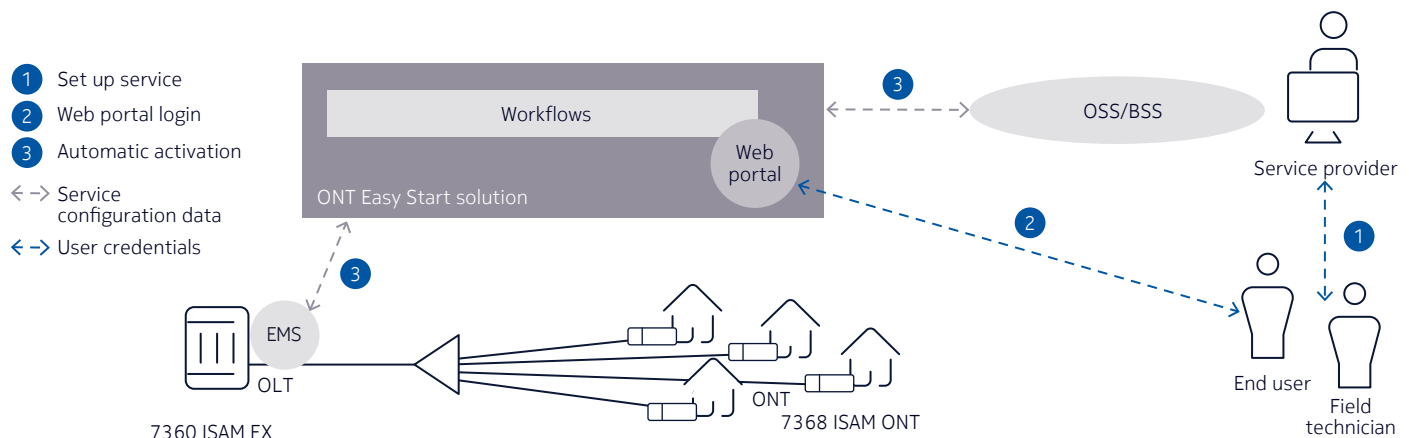
Some service providers put outdoor ONTs or ONTs in closed containers in basements. These ONTs cannot be installed by end users. In this case service providers should re-evaluate those practices.

In general, fiber cables are a bit more tedious to handle than copper cable. Service providers can overcome this challenge with clear fiber cable handling instructions. Dirty fiber connectors are also a known problem for GPON technology. Service providers must address this problem to maximize the opportunity for customer self-installation. Some service providers are planning to address this issue plus their safety issue with shuttered fiber jacks.

Introducing the ONT Easy Start solution in the service provider network

As shown in Figure 1, ONT Easy Start is a self-contained solution. It uses a minimum set of interfaces to facilitate easy introduction into service providers' operational and OSS/BSS environments.

Figure 1. ONT Easy Start supports a simple three-step ONT plus RGW activation process



The numbers in Figure 1 indicate the order in which the three activation steps take place and the interfaces used to perform them. The key interface to ONT Easy Start is the interface to the customer OSS/BSS and ACS. In step 3, the ONT Easy Start solution must receive the relevant subscriber configuration information before activating the ONT. This information includes the subscriber's user credentials and the characteristics of the subscriber's PON service. The service provider's OSS/BSS supplies these characteristics.

Once the user has connected the ONT and provided valid credentials, the solution activates the PON layer 2 service automatically. If the activation succeeds, the solution provides a success indication that includes the serial number of the connected ONT and the connected RGW. This will allow the ACS in the customer OSS/BSS to apply the zero-touch provisioning process to configure and activate the RGW. If the activation fails and ONT Easy Start detects the failure, it generates a trouble ticket.

ONT Easy Start can interface with the service provider OSS/BSS in real time. Service providers can also choose a more loosely coupled integration approach. For example, the OSS/BSS could apply a script to send subscriber information to the ONT Easy Start solution every few hours or once a day.

The ONT Easy Start workflows are internal to the solution. They are not exposed to the service provider OSS/BSS. Result of the ONT activation and the ONT plus RGW serial numbers will be exposed real-time to the OSS/BSS, including the ACS.

In addition, the ONT Easy Start solution can also be easily integrated with the existing customer end-user portal environment and existing field technician applications. From an implementation perspective the solution can either be rolled out on physical server or as a virtualized solution based on Docker, Kubernetes that can be easily integrate into the customer cloud.

ONT Easy Start benefits

ONT Easy Start automates the complex, multi-step ONT and RGW activation process. It simplifies and transforms FTTH provisioning into a virtually error-free process and enables customer self-installation. These capabilities create significant business benefits for service providers.

Reduce operating cost

By supporting customer self-installation, ONT Easy Start helps service providers avoid costly truck rolls. In cases where the service provider sends a technician to perform an installation, ONT Easy Start provides cost savings by reducing on-site time, handling communication with the back office for successful activations, and preventing configuration errors.

Improve the customer experience

The high level of process automation provided by ONT Easy Start reduces errors and increases first-time-right ONT and RGW installations and activations. It also enables end users to self-install their services at their own convenience rather than having to wait at home for a field technician. These capabilities enhance the customer experience.

Speed time to market for PON-based services

Customer self-installation reduces the need for field technicians. This helps service providers accelerate the introduction of broadband services or speed up ONT and RGW swap programs that support broadband service evolution.

Simplify activation processes

ONT Easy Start is a vendor-agnostic solution that can be introduced across multivendor networks. Service providers can use it to establish one process for the entire PON broadband access installed base. ONT Easy Start solution is also a self-contained solution that handles all the complexities associated with PON Layer 2 activations and integrates this with the layer 3 (RGW) activation process in such a way the user or field technician can activate the PON service in one simple step. It provides a simple OSS/BSS interface that allows service providers to integrate the solution into existing environments in a fast, easy, and cost-effective way.

ONT Easy Start Functional Role

ONT Easy Start is a vendor-agnostic solution that can be introduced across multivendor networks. Combined with Altiplano intent based programming, ONT Easy provides activation automation simplifying service portfolio management.

Conclusion

The activation of ONTs and RGWs is one of the biggest challenges that service providers face in providing PON-based broadband services. The Nokia ONT Easy Start solution addresses these challenges by fully automating the ONT and RGW activation process for new subscriptions, maintenance replacements, and upgrades to next-generation ONTs and RGWs. This automation reduces the time and effort required to activate ONTs and RGWs, enables end users to self-install their own ONTs and RGWs, and improves quality by eliminating manual provisioning errors. With ONT Easy Start, service providers can reduce the cost of ONT and RGW activation while providing a better customer experience.

Abbreviations

BSS	business support system
DSL	digital subscriber line
GPON	gigabit passive optical network
NG-PON2	Next-Generation Passive Optical Network 2
OLT	optical line terminal
ONT	optical network terminal
OSS	operations support system
PON	passive optical network
RGW	residential gateway
VDSL	very-high-bitrate digital subscriber line
XGS-PON	10-gigabit-capable symmetric passive optical network

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Nokia OYJ
Karakaari 7
02610 Espoo
Finland
Tel. +358 (0) 10 44 88 000

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