Gridstream Solution

14.0

Landis+Gyr HES

Product Description

Date: 24.08.2020
D000043149 en 1.3

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1 Introduction to Landis+Gyr HES

Landis+Gyr is one of the world's leading suppliers of smart metering solutions. Since 1984, it has delivered several hundreds of system solutions in different sizes. There are millions of metering points connected to Gridstream solutions in Europe. Landis+Gyr's smart metering solution simplifies the way energy companies collect and manage their metering data. It's an end-to-end solution that gives utilities access to a complete range of advanced multi-energy products and systems, including smart meters, exhaustive communication options, advanced software and comprehensive services. Landis+Gyr HES is an essential part of the Gridstream solution for advanced metering management (AMM).

Gridstream solution is an end-to-end solution including smart meters and Landis+Gyr AIM system, which includes functionalities for both automated meter reading (AMR) and meter data management (MDM). However, many network utilities want to use Landis+Gyr's leading edge smart meter technology but prefer to use an existing third-party MDM system or an MDUS system to store and validate the smart metering data for Customer Information System (CIS). Landis+Gyr HES provides a lean and easy solution to connect the MDM/MDUS system or Distribution Management System (DMS) to Landis+Gyr's smart meters, including the best available support for advanced Landis+Gyr smart meter features and tools to manage the meter infrastructure and communication network. Further, Gridstream HES utilizes future-proof technologies and ensures a secure data transfer.

Landis+Gyr HES is the communication and data collection layer between the metering data management system and the metering network. Its main purpose is to collect metering data reliably from smart meters and provide it on-time to other systems. In addition, Landis+Gyr HES provides on-demand data, event and alarm information for other systems and has monitoring tools to ensure the best possible availability of the meters in the field.

Landis+Gyr HES includes highly versatile and flexible reading and control capabilities. The reading capabilities of Landis+Gyr HES include reading status and alarm data as well as event logs, power cut data and other power quality information (PQI) from the devices. Landis+Gyr HES enables remote data retrieval according to predefined schedules or on-demand, and offers a traceable data flow. Landis+Gyr HES can have one or more AMR engines, depending on the utility's needs and circumstances. In addition to the data collection features, the AMR engine of Landis+Gyr HES includes various options that enable controlling and configuring the metering devices remotely on the field. It is possible to remotely manage tariffs, loads, relays and power supply. Multiple communication servers can also be connected to each AMR engine to enable the best possible communication performance and to ensure cost-effectiveness.

An important part of the systems capabilities is secure and interoperable communication to the metering infrastructure based on IDIS standard. Moreover, the interface between Landis+Gyr HES and other systems is based on open standard IEC 61968-9 edition 2, which provides use-case-based and future-proof solution to interlink the two systems. All this makes the system very adaptable for different environments and requirements.

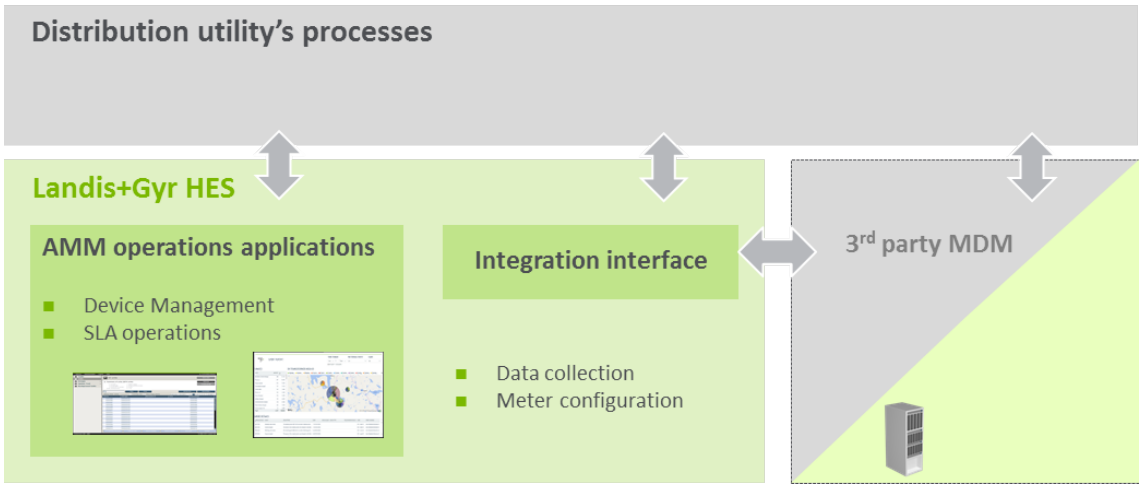

Figure 1: Overall structure of Landis+Gyr HES

2 Key benefits of Landis+Gyr HES

Landis+Gyr HES answers to several problems utilities might face. Landis+Gyr HES is a flexible and scalable system that ensures secure communications between metering devices and other systems. It offers tools for improved customer service and system monitoring. Furthermore, Landis+Gyr HES a future-proof solution based on open standards and protocols.

2.1 Improved customer service

By taking Landis+Gyr HES in use, the utilities can ensure that their customer service is able to provide customers with accurate, near real-time information on actual consumption values.

This removes the need for billing based on estimated consumption, reduces the number of billing errors and minimizes the need for clarification. Also, events, such as alarms triggered by smart meters, are available in short notice to improve the responsiveness of utility's processes.

2.2 Network planning and maintenance

Landis+Gyr HES includes automated features for various network operations.

To reduce the number of unnecessary site visits, Landis+Gyr HES offers dynamic and automated controls that enable connecting and disconnecting energy supply remotely when necessary. Controls can be targeted to a single metering point or to larger groups. It is also possible to remotely disconnect and reconnect power for those customers who fail to pay their bills.

In addition, power quality information (PQI) on voltage and supply, and time-stamped power outage information is readily available at all times. This way metering faults can be detected effortlessly. It makes the handling of complaints easier and forms the basis for network maintenance.

Access to accurate metering data offers utilities valuable knowledge on networks. This in turn helps to reduce network losses and perform better customer analyses based on load profile information. Planning any network investments becomes easier when actual metering data can be used in calculations.

2.3 Scalability

Landis+Gyr HES is an ideal metering data information system since it is possible to configure the system for a small or large utility or even to several utilities.

The system's substantial data delivery capacity with a decentralized architecture allows optimization of the system for the diverse needs. As a result, various strategies to optimize the system cost, reliability and performance are available. The system structure is not only reliable and cost-efficient but also ensures high system uptime. The system performance has been proven to match the data flow requirements of up to 3 million metering points, and, at the same time, the system is cost-efficient for very small environments of, for example, only 1,000 metering points.

2.4 Flexible communication

Landis+Gyr HES provides an optimal communication option for all customer segments and network areas. It includes fast and reliable solutions for both point-to-point (P2P) and point-to-multipoint (P2M) communication. The system supports multiple communication media to enable the best possible cost-effective solution for both rural and densely populated areas.

Bi-directional communication between the meters and Landis+Gyr HES enables remote meter reading, dynamic pricing and demand responses, as well as remote firmware updates. Development is based on open platforms to ensure interoperability and communication with third-party systems.

2.5 Interoperability

Interoperability is the key to system flexibility, and the use of industry standards is the key to Gridstream interoperability.

Landis+Gyr actively participates in standardization activities in Europe and utilises industry standards and protocols in research and development. The internal communication infrastructure of Landis+Gyr HES is based on global, non-proprietary standards and protocols. This ensures high level of openness and interoperability across multi-utility infrastructures and enables bi-directional communication with other manufacturers' hardware and software platforms.

2.6 Easy integration

Typically, integration processes between systems are implemented by tailoring the integration layers in each system involved. The challenge of this approach lies in the complexity of carefully defining the integration interfaces and responsibilities of each vendor and possible third-party integrators. It is likely that in the specification phase not all related details are taken into account and when problems occur it can be challenging to find the responsible party to finalize the integration. Landis+Gyr HES provides an easier solution to manage this challenge. Landis+Gyr has actively participated in the standardization work groups of the IEC 61968-9 standard, which is meant for smart data integration to DNO systems. This standard enables any system vendor to use the common language to engineer the integration based on this open industry standard, which enables system component extension or replacements and eliminates the utility's risk of being dependent on individual vendors.

The easy integration of Landis+Gyr HES doesn't only rest on the open integration process. Also, the fixed integration layer with ready-made setup, documentation and testing approach eases the integration. In this model other systems are integrated to Landis+Gyr HES by modifying the integration layer in their system according to the .xml schemas provided by Landis+Gyr. This integration layer, designed for smart metering data delivery according the IEC standard, is already specified and tested. Integrators save effort and time since they do not need to specify the layers or the roles of both systems, and receive a mature interface they can work with.

From a utility's perspective this approach is significantly easier to manage: Landis+Gyr HES system includes a standard interface and the integration service is retained from only one IT system vendor or integrator. These parties receive the integration documentation, technical support and access to Landis+Gyr HES integration testing system from Landis+Gyr thereby also making it easier for them to offer their integration solution to the utility.

3 Features of Landis+Gyr HES

Landis+Gyr HES supports various communication methods and protocols, thus ensuring secure and interoperable communications. Landis+Gyr HES also includes several value-adding applications such as Device Management and and HES SLA reports that provide the user with tools for monitoring and managing the system.

3.1 Communication

Landis+Gyr HES supports various communication options and protocols. It provides ideal communication options for all customer segments and network areas. It includes fast and reliable solutions for both point-to-point (P2P) and point-to-multipoint (P2M) communication. The support for multiple communication media enables a reliable and cost-effective solution for both rural and densely populated areas.

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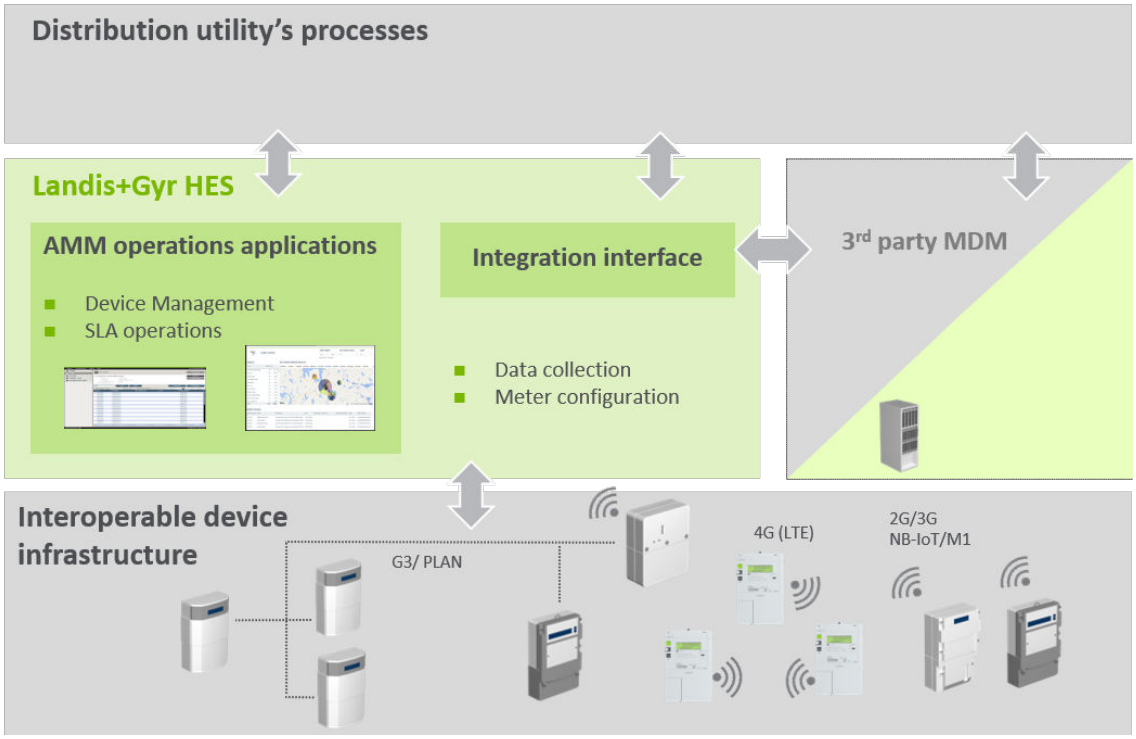

Figure 2: Landis+Gyr HES communication platform

In addition to the traditional request-reply communication between the system and devices, certain metering devices can actively push their data to the system. This makes communication in a metering system more efficient, flexible, and reliable.

3.1.1 Supported communication media

Landis+Gyr HES offers a wide range of communication options.

For example the following options can be used:

- Low voltage PLC network
- GPRS, 3G, NB-IoT/M1
- IP networks (LAN, WAN)

All combinations of the offered communication media are possible. The most commonly used options include PLC and GPRS/3G either separately or as a combination.

- PLC communication shows its strengths in large-scale transformer areas. It provides cost-efficiency due to lower investment and communication costs. When PLC is used with concentrators, it also offers operational efficiency because the concentrator can operate as a single communication interface for several metering devices.
- GPRS/3G communication is the optimal communication media in rural areas. It also enables additional functionality, such as SMS alarms, data push functionalities from the meter to Landis+Gyr HES, and a variety of wake-up functionalities.
- NB-IoT/M1 communication provides robust data transfer and reliable operations with higher range and better building penetration. It also offers additional functionalities like active notifications and alarms based on events as well as last gasp for power outages.

3.1.2 Supported communication protocols

To ensure a smooth communication between different meter types Landis+Gyr HES supports various protocols.

The following list shows the most commonly utilized protocols:

- DLMS (IEC 62056-61/62)
- PLAN (IEC 61334-5-1)
- M-BUS
- TCP/IP
- IDIS (61334-5-1)

3.1.2.1 DLMS protocol

Landis+Gyr HES is able to communicate through standard protocols (for example DLMS/ COSEM) with meters and data concentrators from several manufacturers. DLMS COSEM, the Companion Specification for Energy Metering, specifies the behaviour of the meter from the point of view of the utility's business processes. The formal specification of the behaviour is based on object modelling techniques (interface classes and objects).

To achieve interoperability, the large variety of elements offered by the DLMS COSEM standard are tailored and described in detail in the IDIS companion specification. In other words, the detailed object model and the communication protocols used are described in specific detail for a smart metering application.

The DLMS COSEM specifications provide the following interoperability benefits:

- Allows various data collection systems to have access to metering data.
- Allows the exchange of data with single metering equipment at a metering site.
- It is possible to exchange data with metering equipment either remotely or locally.
- Depending on the resources of the metering equipment, local and remote data exchange may be performed without interfering with each other.
- It is possible to use various communication media both on local area networks (LAN) and wide area networks (WAN).
- Provides authentication mechanisms to control access to data.
- Provides cryptographic protection of the messages.

Based on the open meter standard and within the DLMS Cosem specification the Landis+Gyr's E450 PLC meter family supports the following use cases with full interoperability with other meter manufacturers:

- Meter registration

- Remote tariff programming
- Meter reading on-demand
- Meter reading for billing
- Meter disconnection and reconnection
- Meter clock synchronisation
- Quality of supply
- Load management by relay
- Firmware update

3.1.2.2 IDIS (61334-5-1) support

To secure the interoperability required to ensure a seamless flow of data Landis+Gyr HES supports IDIS (61334-5-1). IDIS defines standardised communication between devices of different manufacturers. Among the first in the world Landis + Gyr provides utilities with both smart meters and a head-end system compatible with IDIS.

IDIS support in Landis+Gyr HES allows the use of Landis+Gyr meters and third-party meters in the same system. The system's IDIS support covers the typical smart metering use cases: billing energy data collection periodically or on-demand, relay and disconnector controls, load profile, data collection and event identifications.

3.2 High reading performance

Landis+Gyr HES system can include one or more reading engines according to customer requirements. The capacity of each reading engine can be enhanced by push and pull method.

Landis+Gyr HES supports automatic data push from the meters but can also request data from the meters (pull). The push method is typically used whenever high capacity is required by the utility.

When Landis+Gyr HES receives readings, it makes sure that the data is complete and stores it to the metering system database. The system monitors readings automatically and re-reading is performed, if any data is missing. Only if necessary, for example if a special reading is needed, Landis+Gyr HES system sends a request to the metering device. This means fewer and shorter connections and more efficient communication.

Installation and management of the metering system is easier with Landis+Gyr HES. Devices can be pre-configured in production to contact the metering system after they have been installed. Landis+Gyr HES then automatically recognises and registers them, and communication to the device is immediately available.

3.3 Alarm management

Landis+Gyr HES can receive alarms sent by devices, for example, in case of low power quality, e.g. power outages or voltage sags and swells, or fraud. It communicates the alarms further to DMS or MDM, thus providing accurate information about the network status and non-technical losses.

Additionally, alarm management reduces the probability of metering data loss in case of hardware errors.Landis+Gyr HES also allows remote configuration of metering points to automatically report any external or internal alarms detected in devices connected with the system.

3.4 Low voltage network monitoring

In Landis+Gyr HES it is possible to monitor low voltage network for possible failures that are typically caused by feeder line outages.

The low voltage network monitoring functionality has some differences depending on the used communication technology. In P2P solutions the functionality utilizes active alarming of P2P meters. In PLC solutions the functionality consists of a combination of PLC meter active alarms and DC diagnostics. When low voltage network monitoring is in use, the system delivers alarms further to the IEC interface based on the configured limits.

3.5 Security

For Landis+Gyr the confidentiality, integrity and availability of metering data are the top priorities when developing smart metering systems. Landis+Gyr HES ensures a secure and reliable data transfer at all system levels.

Communication is secured by using various security methods, including data encryption according to IDIS standard, to prevent unauthorized contacts. Access to metering data is secured by utilising centralised user access management.

Landis+Gyr also holds the Information security ISO/IEC 27001:2013 certificate which covers among other things system software development, solution integration testing and support processes.

The corner stones of the Gridstream solution security are:

- Authentication
- Authorizations
- Encryption
- Logging

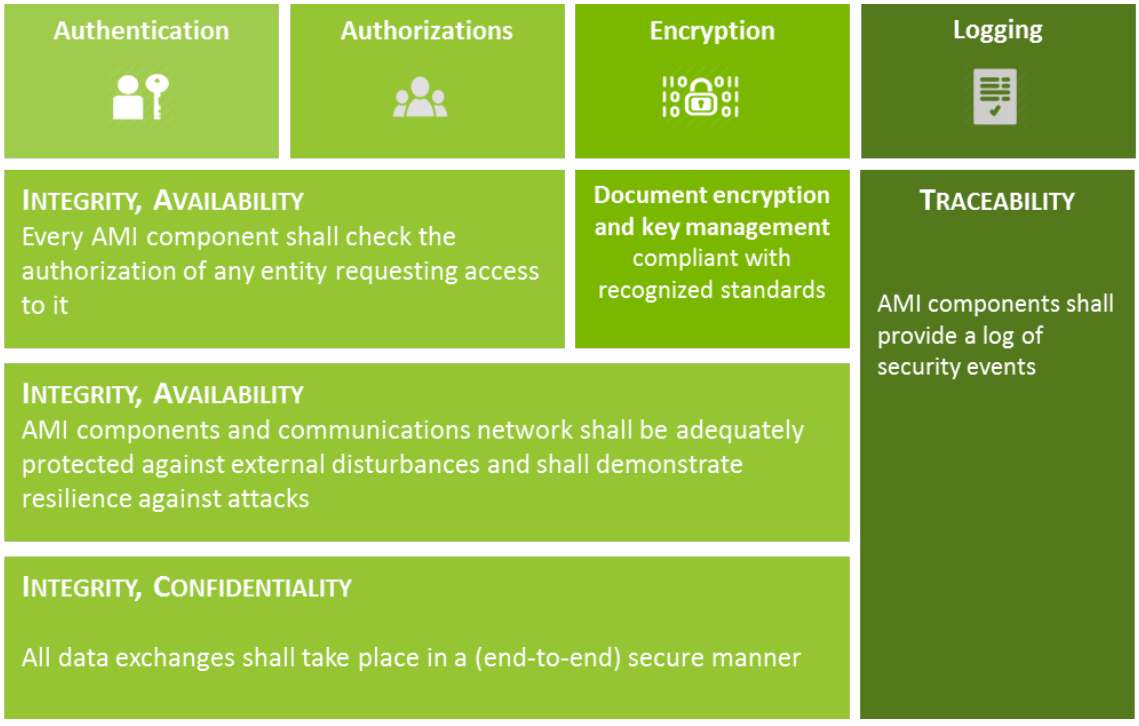

Figure 3: Corner stones of the Gridstream solution security

3.5.1 System security

Landis+Gyr HES includes a User Access Management component that provides centralised user access management as well as single sign-on between all system applications.

System functions are only available for authorized users to protect the system from unauthorized access. Also, user rights are defined in detail to ensure that each user only has access to features essential for him. You can easily assign user rights to different types of users,

such as admin users, customer service personnel and users responsible for metering. User rights are managed outside of the integrated applications.

In addition to centralised user management, auditing is a key security feature. The User Access Management component includes an audit trail functionality to answer to your auditing needs. User authentication and authorization – both successful and failed ones – are written to the audit trail with details. Also, the User Access Management administrative operations are audited. Passing an action context between applications is also supported to enable end-to-end auditing of cross-application business processes. When used, it enables binding the different audit messages to the originating user action.

The User Access Management component can also be integrated with different authentication providers such as Active Directory (AD) or Lightweight Directory Access Protocol (LDAP).

Further, the system includes possibilities to limit the number of operation within a defined time period. This is available for selected control operations.

To further improve the system security, Landis+Gyr recommends network segmentation.

3.5.2 Communication security

Landis+Gyr HES offers security for all data communications.

It is possible to secure the communication

- between the data concentrator and the system (WAN security)
- between the data concentrator and IDIS meters under it (PLC security)
- between point to point devices and the system

Symmetric key cryptography, based on DLMS data transport security and data access security, is used for the PLC meter to data concentrator interface and for the point to point device to system interface. TLS is used for the data concentrator to system interface. A public key infrastructure is used to facilitate key generation and distribution for the secure solution. Security settings can be easily configured in Device Management application.

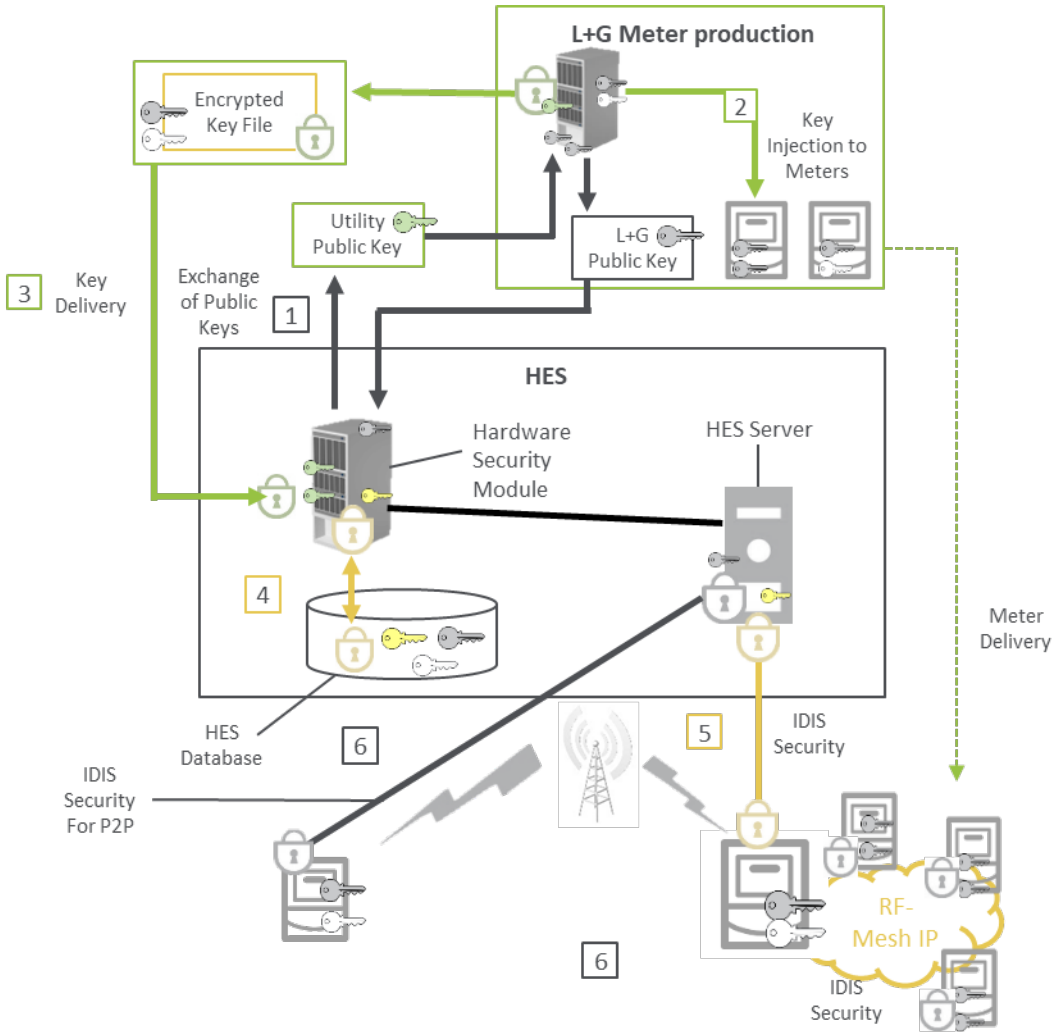

Figure 4: Communication security

3.6 Integration: services via IEC interface

Landis+Gyr HES includes a fixed integration layer: an open standard IEC 61968-9 edition 2.0 interface to connect with other systems. The integration provides several use cases for other systems to access and control smart metering devices as well as many features to help integrating third-party systems.

The following use cases are supported:

- Publishing data
  - Meter readings
  - Maximum demand
  - Device events and alarms
  - Power outages
  - Power quality
  - Demand and current supervision
  - Tampering
  - Meter diagnostic events
  - Multi-energy
- On-demand meter reading
  - Disconnector status

    - Latest consumption figures
    - Instantaneous voltage and current values
- Controls
    - Connect and disconnect
    - Load control
    - Sending messages to CII (Consumer Information Interface)
    - IP address update
    - Power supervision
- Device installation
    - Device discovery
    - Automated communication acceptance
    - Metering point and installation status
    - Device groups
- Device parameterization and meter reading scheduling
    - Scheduling meter readings and controls
    - Tariffs (TOU)
    - Demand and current supervision
    - Load control schedules

3.7 Scalability – optimizing the system

The system architecture of Landis+Gyr HES enables decentralized system processes which are divided to meter communication, database and integration. The system performance can be scaled horizontally by adding servers to each of these layers according the performance demands. Landis+Gyr HES integration servers use queue based communication to enable connectivity to only single endpoint for integrated systems which means that the adding servers to Landis+Gyr HES does not affect other integrated systems. The high data delivery capacity with a decentralized architecture allows optimization of the system cost, reliability and performance.

Focus on performance: a decentralized architecture with efficient system processes enables horizontal scaling, so that Landis+Gyr HES can scale up to meet the extreme performance requirements in different smart metering environments. This is achieved by adding hardware capacity to the most loaded component, for example the communication server. This enables system optimization for different smart metering setups, from point-to-point only to point-to-multipoint systems, which pose different challenges to the communication layer.

Focus on cost: the decentralized architecture allows to set up the system in a way that ensures an optimal cost structure, taking into account direct hardware costs, indirect hardware costs (server room costs such as space and energy consumption expenses) and direct software costs (database and operation system licenses). System performance and architecture allows selecting servers with appropriate number of CPUs allowing the use of affordable Oracle Standard Edition

Focus on reliability and maintainability: utilities can optimize system reliability by ensuring quick recovery in case of a system hardware component failure. System maintainability and related costs can be optimized by designing system configuration based hardware components which are readily available and have low stand-by costs. To give an example: for large systems, a communication server layer can be built by using several low cost servers (instead of a single high performance unit) commonly used elsewhere in the utility's IT system, which enables keeping pre-configured spare unit on the shelf for quick recovery.

3.8 Device Gateway

Reducing the TCO, utilize installed meters investment and ensure vendor's independence are the motivations to seek for a system that is able to support the wider possible range of different metering devices, moreover having a single system increases the operational efficiency. Landis+Gyr HES includes a platform called Device Gateway that ensures a fast and reliable development of new device support.

Device Gateway communicates with devices using device type specific drivers. The gateway determines which driver is the most suitable for handling the request based on the configuration and unit type information it receives in the request. New device support can easily be added to the system by developing a driver for the device type.

3.9 Support for STS prepayment

Landis+Gyr HES is also an ideal system for market areas where prepayment is the preferred payment method for energy consumption.

The offered solution is based on worldwide STS standard (IEC 62055-41/51) and offers the STS prepayment metering solution to protect your revenue. The prepayment support includes the possibility to control the sending of STS tokens (consumption and currency) as well as IEC message support for integrating to an STS prepayment solution. Additionally, the system supports the use of engineering tokens.

3.10 Consumer Information Interface (CII) configuration

Consumer Information Interface (CII) enables easy and secure transfer of the meter data to end consumer devices or applications. You can configure the Consumer Information Interface (CII) in Device Management.

Currently, Device Management supports configuring the CII of devices connected to the electricity meter through an optical port. You can enable and disable the Consumer Information Interface, define the registers and schedules for sending data, secure the data transfer to the interface and further to the consumer device as well as change the encryption key. Also, sending of a text messages is possible. In addition, you can read the status of the current CII configuration.

3.11 Applications

Landis+Gyr HES includes versatile and effective tools for data collection and device management.

In addition to the applications that are part of the Landis+Gyr HES package by default, there are several advanced, value-adding applications that can be purchased as optional extensions to the utility's overall system. The basic package completed with optional applications makes Landis+Gyr HES a solution that can offer the best possible service for utilities of all types and sizes. The list of additional applications expands continually.

3.11.1 Device Management for advanced meter management

The web-based AMR application Device Management offers an intuitive user interface for taking care of most of the daily tasks related to handling metering devices and their environments, and scheduling meter readings.Device Management can be used to load devices and their configurations to the system database, to monitor the process of loading tasks, connect devices to metering points, create groups and read consumption values from individual devices or device groups–either directly or as scheduled tasks.

Device Management contains tools for reading metering data from the energy meters to the AMR database based on specific events or on demand requests, or according to predefined schedules. The results are saved in the database from which they can be viewed, reported or

transferred to other systems. Automatic readings can be scheduled to take place at a defined time, either once or repeatedly during a defined period of time. On-demand readings can be requested whenever the user needs up-to-date metering data.

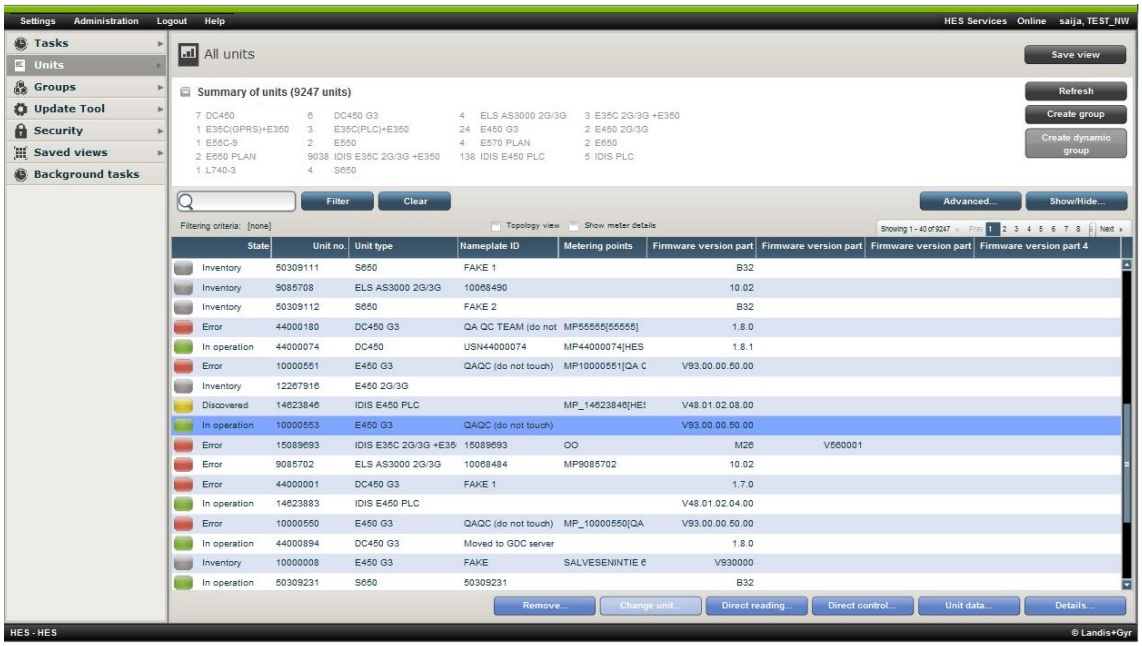

Figure 5: One of the main windows

In Device Management, it is also possible to configure data concentrators and set reading profiles, push schedules as well as push registers for the connected devices. Further, Device Management includes tools for updating device parameters remotely and for performing firmware upgrades remotely to certain meters.

Similarly, it is possible to control metering devices remotely through Device Management. Depending on the selected module and voltage system, a control job can be targeted to a single device, device group or all devices in a certain area. The users can activate controls whenever necessary. Automatic controls can be scheduled to take place at a defined time, either once or repeatedly during a defined period of time. For example, a control job can be used for disconnecting or reconnecting the electricity supply of a customer. It is also possible to control the network load, tariffs and other services. Note that remote device configuration options vary depending on the device type.

Landis+Gyr HES also offers the possibility to remotely change the device's time, when necessary. The master-time setting tasks of Device Management are used for sending a time setting command to one or more terminal units. The master-time-setting command forcibly sets the device's time to conform to the system.

3.11.2 HES SLA reports

HES SLA reports provide users with easy access to view the data and data deliveries in Gridstream HES. The reports are based on Oracle BI Publisher, so a licence is needed to access the reports.

The reports enable monitoring of the data delivery (performed through the IEC integration interface) and the SLA levels of selected unit groups either on a given day (daily report) or within a selected time period (monthly report). Further, the reports provide statistics of the number of reading and control requests sent from an external system via the IEC interface, as well as detailed information on the requests and the system's ability to meet the required SLA. The SLA levels can be adjusted with the report parameters according to customer needs, so the report displays data based on the agreed SLA levels. For improved SLA statistics reliability, it is

also possible to exclude, for example, broken meters from the reports in Device Management application.

3.11.3 User Access Management

The User Access Management component provides an own UI for managing users, their permissions and possible LDAP/Active Directory integration.

You can easily configure user details and permissions as well as run reports of user permissions. It is also possible to configure various settings, for example, the password policy.

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