SMART METER DATA EXCHANGE – FUNCTIONALITY, EFFICIENCY, SECURITY, CONNECTIVITY WITH DLMS/COSEM

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SUMMARY

The paper provides information on the latest developments concerning the DLMS/COSEM specification for smart meter data exchange, internationally standardized as IEC 62056 and EN 13757-1.

ÖZETÇE

Özellikle gizliliğe ve güvenliğe odaklanarak temel noktaları vurgulayan bildiri, akıllı ölçüm veri değişimine yönelik DLSM/COSEM standartlarına genel bir bakış sunuyor ve en heyecan verici yeni gelişmeleri tanıtıyor.

ABSTRACT

The paper provides an overview of the DLMS/COSEM standard for smart metering data exchange, highlighting the main points with a special focus on privacy and security and presents the most exciting recent developments.

1. SMART METERING AND STANDARDIZATION

Consensus based International Standards are essential tools in rolling out large scale interoperable smart metering systems.

The DLMS/COSEM specification has been published first as IEC 62056 in the year 2002, and since then it has constantly evolved to meet the needs of smart metering.

DLMS/COSEM standard gained wide global acceptance, and it has been confirmed as a key standard in smart metering.

2. THE COSEM OBJECT MODEL: FUNCTIONALITY AND SEMANTIC INTEROPERABILITY

The COSEM interface objects model the functionality of smart meters using the object-oriented approach. The objects model a large range of metering and control business functions, including billing, load profiling, power quality, revenue protection, customer informa-tion, load and supply control, accounting and payment.

The objects also model management functions including configuration, parametrization, access rights, security, firmware update, as well as meter and communication channel supervision.

The interface classes constitute a library, from which the required functionality of the smart meter can be built.

Using a common object model – COSEM – for all energy types and over all communication channels ensures semantic interoperability.

3. DLMS APPLICATION LAYER: SYNTACTIC INTEROPERABILITY

The DLMS application layer protocol provides services to access the data, represented by COSEM object attributes and methods. Data exchange takes place within logical connections, called application associations between the meters – acting as servers – and central systems, acting as clients.

The specification has been recently extended to cover data exchange between meters and third parties outside the smart metering system like energy providers, meter operators and other market participants to ensure end-to-end security. These third parties shall be DLMS/COSEM aware and use DLMS/COSEM clients (e.g. Head End Systems) acting as brokers for them.

New services and mechanisms have been recently added to further improve functionality and efficiency. These include the unified ACCESS service, a Data Notification service supporting push operation and the general block transfer mechanism handling long messages in an efficient way. The DLMS services and their encoding ensure high efficiency. Messages can be also represented now in XML.

Using a common application layer over all communica-tion channels ensures syntactic interoperability.

4. SECURITY AND PRIVACY

Security and privacy are two key aspects of smart metering. DLMS/COSEM provides a highly flexible and scalable security toolbox. This includes identification and authentication of the communicating partners, security policies, access rights to COSEM object attribute and methods and cryptographic protection of DLMS messages and the COSEM data carried by them.

Protection may be applied by multiple parties in a multi-layer fashion as requested by the business needs to ensure full security and privacy. It may be authentication, encryption (AES-GCM 128/256) and ECDSA digital signature. For managing the keys, key transport, key wrapping and Diffie-Hellman key agreement mechanisms are specified.

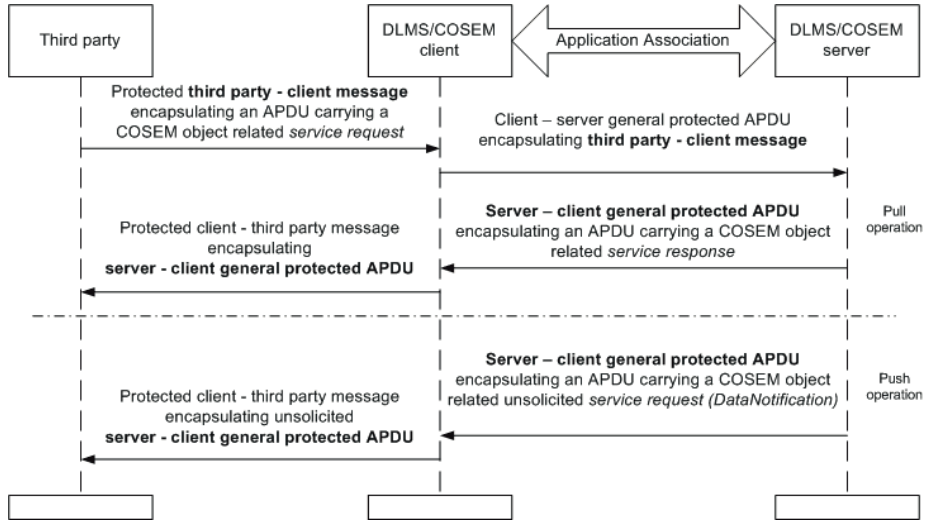The DLMS/COSEM end-to-end security concept is shown in Figure 1.

Figure 1 – DLMS//COSEDM end-to-end security concept

5. CONNECTIVITY: COMMUNICATION PROFILES

To ensure connectivity over various communication media, DLMS/COSEM also specifies a number of communication profiles, many of them IP based. These profiles specify how the COSEM object model and the DLMS/COSEM Application layer can be used most efficiently over the communication media specific lower protocol layers.

Communication profiles are available for the wide Area Network, for the Neighborhood Network and the Local network. Popular media supported include S-FSK PLC, B-PSK PLC, PRIME OFDM PLC, G3 OFDM PLC, Euridis, and soon wired and wireless M-Bus (EN 13757).

6. CLOSING THE INTEROPERABILITY GAP: COMPANION SPECIFICATIONS

DLMS/COSEM is a toolbox that specifies the necessary elements to build meters of any complexity, that measure and control any energy type, that support a large range of uses cases, and that communicate over various media.

Project specific companion specifications, generally developed by large utilities or by consortia, take choices that provide in the standard. These choices should be then followed by all suppliers to achieve full interoperability.

7. THE DLMS USER ASSOCIATION

The DLMS/COSEM standard is supported by the DLMS UA, with a membership of more than 275 companies, including utilities, system providers, meter manufacturers, telecom providers and chip manufacturers from all over the world. To date, some 400 meter types manufactured by 80+ manufacturers have been certified to be DLMS/COSEM compliant.

Membership in the DLMS UA is open to any entity active in the field of smart metering. Members gain access to the latest specification, can contribute to its development and can get meters certified.

8. BIBLIOGRAPHY

[1] IEC 62056, Electricity metering data exchange – The DLMS/COSEM suite –
[2] EN 13757, Communication system for and remote reading of meters