Universal Metering Interface UMI

Open interface standard focussing on battery-powered communication in the field of smart metering

Applications

Interfaces for metrology boards and communications modules to be used with electronic indexes of the themis series

Brief information

The roll-out of smart meters for the gas and electricity sectors is presented within the framework of EU Directives 2009/73/EC (gas) and 2009/72/EC (electricity). The Directives 2009/73/EC and 2009/72/EC have, in part, been interpreted very differently by the various EU countries. This has resulted in some countries having defined specific requirements which in certain circumstances differ considerably from the requirements of other countries. The open interface standard helps in the development of a single MID-compliant metrology board which can be extended thanks to modular, easily adaptable communications solutions and can be tailored to specific needs. Meters can thus be installed as "smart ready" meters and can then be integrated into the smart grid at a later date by adding a corresponding communications module.

Data security concept

Data security is a central issue when it comes to smart metering. The most important concepts, which can be implemented using scalable security methods (UMI schemes), will be defined in brief below. Symmetric and combined hybrid encryption processes can be used here.

Authentication: who's there?
Authentication means proving the authenticity of an identity. In smart metering, this is important when communicating with a meter, for example, but also when the components communicate with one another (e.g. the metrology board and the communications module). Authentication helps to ensure that the communications partner really is authorized to interact with the device.

Authorization: who is allowed to do what?
To ensure that the communications partner can only influence the data which is intended for them, role-based authorization is used. Access rights can be specifically granted, and unauthorized interventions or accidental erroneous interventions can be avoided. UMI identifies 16 different roles, e.g. manufacturer, service staff, administrator, which can be granted different access rights using a matrix.

Integrity: who guarantees authenticity?
To guarantee the authenticity of the data, the digital signature principle is used. This is a kind of seal. The signature can only be verified if the message is available completely unchanged. If only one bit is changed, the signature becomes invalid and the head-end system is alerted. The seal is therefore of maximum importance and is thus only issued by trustworthy bodies. As early as the production stage, the meter is issued a certificate containing information on the assigned trustworthy body.

Main features

- UMI is a freely available open interface standard which is clearly focussed on smart metering
- Supports modular concepts through defined, interoperable interfaces
- Developed for battery-operated low-power applications
  (15 µA at 3 V)
- Supports different safety levels and encryption processes as well as role-based authorization of users (e.g. manufacturer, service staff, administrator, etc.)
- UMI communications modules have an identical form factor and are interoperable.
- UMI communications modules can be designed for, and connected to, many different means of communication, e.g.
  - GSM, GPRS, SMS
  - ZigBee, Wireless M-Bus, Z-Wave, Wavenis, Bluetooth, WiFi
  - cable-based M-Bus, KNX, PLC
- UMI elements can be easily converted to other data formats

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UMI Scheme 1
Symmetric encryption

UMI Scheme 1 uses symmetric encryption. The same key is thus used for encryption and decryption. This key must be known to both communications partners.

Advantages

– A recognized, safe encryption standard is used (AES-128).
– Simple scaling is possible via the key length.
– The encoding process is quick.
– Integrity can be verified easily using hash values.

Disadvantages

– The keys are relevant for safety and must be protected.
– When transferring the key via an insecure channel, a problem arises when exchanging the keys.

UMI Scheme 2
Hybrid encryption

The asymmetric, certificate-based encryption uses different keys (private key and public key) for encryption and decryption. UMI Scheme 2 uses a hybrid encryption process. It generates a self-created, random symmetric session key using the Diffie-Hellman algorithm. All messages are then encrypted and decrypted with the rapid, resource-saving symmetric key.

Advantages

– Recognized, safe encryption standards are used (ECC-256, AES-128).
– No problems arise when exchanging the keys due to the asymmetrically encrypted transfer of the Diffie-Hellman components.
– By using the symmetric session key, quick and resource-saving encoding is made use of.
– Only the private key is relevant for safety. The public key can be freely distributed in the form of a certificate.
– Integrity can be verified easily using hash values.

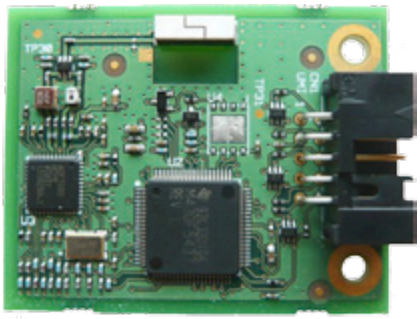
Disadvantages

– Both communications partners require a joint, trustworthy certificate authority (CA) which signs their certificates and thus confirms their trustworthiness.

Administration of role-based access rights

UMI has 16 different roles to control access to data. Individual writing and reading rights can be defined for all data fields via a matrix. Possible roles are service staff, manufacturer, administrator, etc.

UMI ZigBee communications module from Telegesis



Wireless M-Bus UMI communications module from Elster

UMI has been developed by Cambridge Consultants and can be purchased there.

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