National Requirements for narrow-band PLC solutions published by DKE[1] AK 0.141 „PLC“ of K461

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- STMicroelectronics Design und Application GmbH
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DKE[1] (German national commission for electricity standardization – mirror to CENELEC/IEC)

National Requirements for narrow-band PLC solutions
Objectives I

- For **utility enterprises** especially those in Germany with its market model of extreme complexity **it is essential** to find a PLC solution in which **all devices of different manufacturers fully support interchangeability**. This requirement is also valid for the combination of meters with concentrators of different manufacturers.
- To achieve this aim the manufacturers of semiconductor devices must offer to the device manufacturers as much as possible components which are **compatible with each other in the PLC networks – like the Ethernet** components in Ethernet networks to lead in interchangeability at metering device level.
- The **PLC network must provide** a **transmission technology** being **completely transparent** for other communication protocols. In particular, it must be **possible to use the Internet Protocol** (the so-called IP layer, located in layer 3 of the OSI model) and **the transport protocols** located above this (**UDP and TCP**).

National Requirements for narrow-band PLC solutions
Objectives II

- The **available payload bandwidth and the response times must be** dimensioned **sufficiently to grant** covering of all currently discussed tasks in **Smart metering standard operation** processes **and all smart-grid applications which are not security-relevant**.
- The **necessary operational availability and robustness** have to be provided by the **PLC network inherently**, e.g. **without any controlling intervention by an operator**.
- The **interchangeability requirement** will have to be **proven by adequate conformity tests and certificates**.

National Requirements for narrow-band PLC solutions
Operational Requirements

- From the user's point of view in the future **up to 2000 PLC end points** are to be connected per PLC segment. In the current situation the population is between 200 and 300 PLC endpoints per PLC segment.
- **Behind a PLC end point** single nodes in **sub-networks need to be addressable** (e.g. via wireless network for submetering). Therefore the addressing required generally by IP must be transmitted beyond the PLC end point.
- For an efficient operation of a **PLC network it must provide monitoring information** which allows evaluating the **current availability and the analysis** of operational disturbances.
- To allow an efficient on-site installing of PLC components the **installation** must be possible **without parameterization with a minimum time** needed like „Plug and Play".
- **Bringing into service** of installed PLC components must be possible **time-decoupled of its installation**. The PLC component must allow bringing it into **communication service automatically without an employee on-site**.

National Requirements for narrow-band PLC solutions From Application Point of View

Application	Acceptable time latency	Volume[3] per day and PLC component	Initiator	Mainly used ...	Main direction of data volume	Con-nection
Data acquisition per measured quantity for billing	Max. 6 h	per end point: 100 values of 100 B each ⇔ 10 kB[4]	Site	Periodically	Site to Control centre	Unicast
Other data acquisition form the measuring device	< 10 s	per end point: 0,1 values of 1 kB each ⇔ 100 Byte	Control centre	Sponta-neous	Site to Control centre	Unicast
Transport of sales information (tariffs, ...) to the measuring device	Max. 6 h	per segment: 5 sales offices with 2 kB each ⇔ 10 kB	Control centre	Sponta-neous	Control centre to site	Unicast Multi Cast
Driving of actuators, including substitution of the ripple control technique	< 10 s	per segment: 50 values of 100 Bytes each ⇔ 5 kB	Control centre	Sponta-neous	Control centre to site	Unicast Multi Cast
Event signalling	< 10 s	per end point: 5 values of 100 Bytes each ⇔ 500 B	Site	Sponta-neous	Site to Control centre	Unicast
Operation of the communication network	variable: < 10 s to < 30 min	per Segment: 50 values of 100 Bytes each ⇔ 5 kB	Control centre	Sponta-neous	Control centre to site	Unicast Multi Cast
Monitoring of the communication network	variable: < 10 s to < 30 min	Per Segment: ~10% of the available time per day must be reserved	Site	Periodically	Site to Control centre	Unicast
Firmware upload (parallel to the day-to-day business)	Max. 5 * 24 h	per Segment: 1 transaction with 10 MB each ⇔ 2 MB	Control centre	Sponta-neous	Control centre to site	Unicast Multi Cast

National Requirements for narrow-band PLC solutions
Recommended Protocol Stack