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Source:	Rapporteur Q2/20
Title:	Updated baseline document of proposed new draft Recommendation ITU-T Y.SUM "Requirements and Capability Framework of Smart Utility Metering", output of Q2/20 meeting, Geneva, 25 November-6 December 2019
Purpose:	Discussion

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Abstract:	Updated baseline document of proposed new draft Recommendation ITU-T Y.SUM "Requirements and Capability Framework of Smart Utility Metering", output of Q2/20 meeting, Geneva, 25 November-6 December 2019

This document contains the updated baseline document of proposed new draft Recommendation Y.SUM "Requirements and Capability Framework of Smart Utility Metering", output of Q2/20 meeting, Geneva, 25 November-6 December 2019.

The updated baseline text is based on TD1346 [“Baseline document and A.1 justification of proposed new draft Recommendation Y.SUM "Requirements and Capability Framework of Smart Utility Metering" Q2/20 Rapporteur meeting, Geneva, 22-26 July 2019”], and amendments according to this Q2/20 meeting’s agreements.

NOTE from the Q2/20 Rapporteur: the table related to the contribution Doc02-Q2 (190722) submitted to the Q2/20 meeting, Geneva 22-26 July 2019, has been kept in this TD for tracking purposes.

No.	Source	Title	Proposals	Discussion and results
Doc02	China Mobile	Proposal on initiating a new work item on Requirements and Capability Framework of Smart Utility Metering Service	It is proposed to initiate a new work item on "Requirements and Capability Framework of Smart Utility Metering Service"	● To use "Smart Utility Metering service" in the new work item makes it incompatible with other existing work item, such as "Smart environmental monitoring". Result: "Smart Utility Metering" is used to replace "Smart Utility Metering service". ● More gap analysis within ITU-T should be added. Result: A thorough search within ITU-T on SUM is done and the gap analysis is updated accordingly. No overlap has been identified. ● Request to identify SUM as an application and include such statement in the new work item as appropriate Results: the scope is updated to identify SUM as an IoT application and a note is also added to clause 6 to reflect the request. ● To include possibly a sentence that the scope of this work item will focus on the common requirements and capability framework among all utility types Results: A sentence has been added in the scope to clarify the issue. ● To improve the summary of the values of the work item Result: The scope part has been edited to present a comprehensive summary of the discussion. ● In baseline document, the capability framework part should be orchestrated according to the requirements of SUM Result: The capability framework part has been modified to reflect the fact that requirements of SUM have not been discussed yet. A figure is kept to invite future contributions (as indicated a newly added Editor's note)

Draft new Recommendation Y.SUM

Requirements and Capability Framework of Smart Utility Metering (SUM)

Summary

Smart Utility Metering (SUM) may provide remote data collection for utility metering, device maintenance in real time and can support a variety of extended applications. Compared with other types of utility metering, SUM intends to improve utility management and meet the emerging requirements from extended applications, such as intelligent utility scheduling.

This Recommendation specifies the requirements and capabilities for the support of SUM.

Keywords

requirements; capabilities; IoT; smart utility metering

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Draft new Recommendation Y.SUM

Requirements and Capability Framework of Smart Utility Metering (SUM)

1. Scope

This Recommendation specifies requirements and capability framework of Smart Utility Metering (SUM).

As a smart application of Internet of Things (IoT) in the field of utility metering, SUM is an important means to improve utility metering management.

The scope of this Recommendation includes:

- Introduction of SUM
- Requirements of SUM
- Capability framework of SUM

Use cases of SUM are provided in Appendix.

NOTE 1- Though different utilities, such as electricity, water, gas and heat, are considered in this context, the scope of this Recommendation focuses on common requirements and capability framework for smart utility metering. The specific requirements and capability framework for each utility, including utility management and utility delivery, are out of the scope of this Recommendation.

NOTE 2 – Policy and regulation are out of the scope of this Recommendation.

2. References

[TBD]

3. Definitions

Editor's note: "metering" and "utility", but not limited to, are expected to be defined.

3.1. Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

[TBD]

3.2. Terms defined in this Recommendation

This Recommendation defines the following terms:

[TBD]

4. Abbreviations and acronyms

This Draft Recommendation uses the following abbreviations and acronyms:

SUM Smart Utility Metering

5. Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement needs not be present to claim conformance.

The keywords "can optionally" and "may" indicate an optional requirement which is permissible, without implying any sense of being recommended. These terms are not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

6. Introduction of SUM

Editor's note: this clause will provide an overview of SUM. Uses of SUM will be provided (complemented by detailed information in Appendix), including, but not limited to, possible extended applications based on SUM.

7. Requirements of SUM

Editor's note: this clause will specify the requirements of SUM. It is expected it will specify requirements for at least SUM device and SUM platform.

7.1. SUM platform requirements

Editor's note: this clause will specify the requirements of SUM platform.

7.2. SUM device requirements

Editor's note: this clause will specify the requirement of SUM device.

8. Capability framework of SUM

Editor's note: this clause will provide a capability framework of SUM.

Editor's note: the following draft figure – which builds on the IoT Reference Model [ITU-T Y.4000] – is extracted from Doc02 submitted to the July 2019 Q2/20 meeting. It has not been discussed, but it has been agreed to provide it here with the purpose to stimulate contributions on SUM requirements and capabilities.

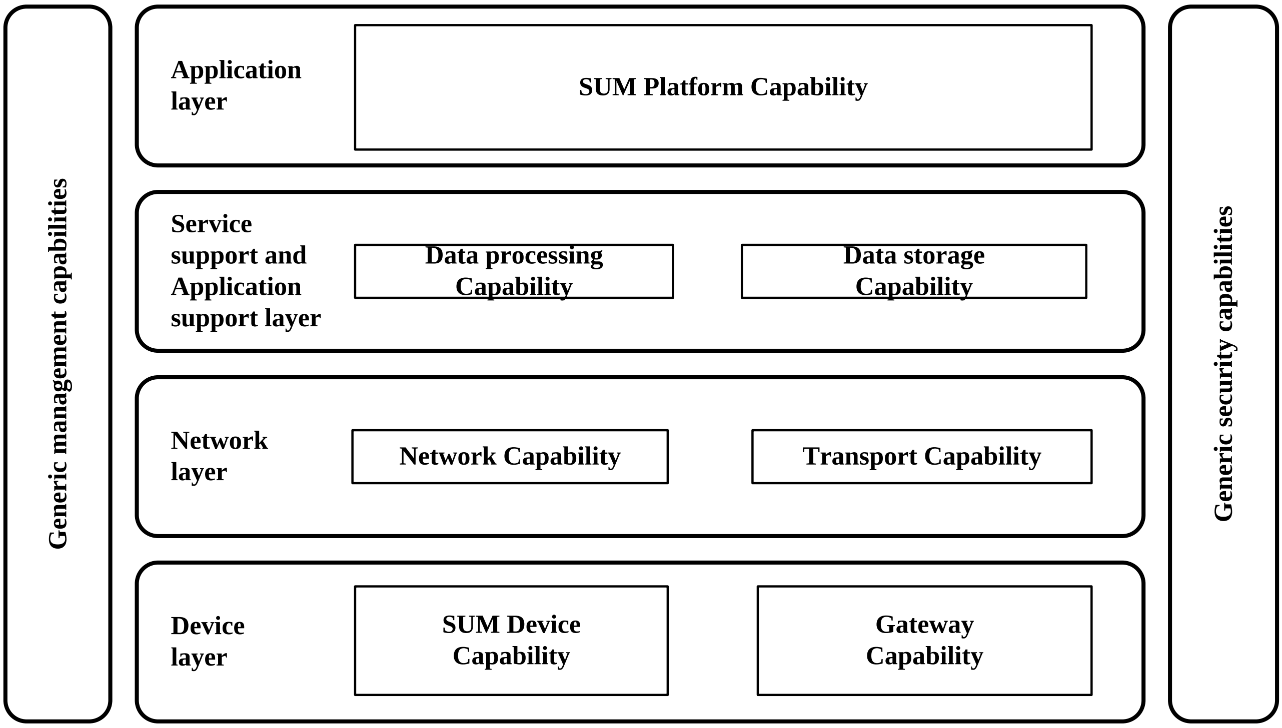

Figure 1 - Capability framework of SUM

Appendix I

Use cases of smart utility metering

(This appendix does not form an integral part of this Recommendation)

Editor's note: this Appendix will describe some relevant use cases, in terms of, e.g., extended services and/or specific utilities.

Attachment 1 – Useful information reviewed at the July 2019 Q2/20 meeting based on input contribution Doc02-Q2 (190722) and related meeting drafting activities

Background

Utility metering is widely used in people's life and industrial production, providing measurements of electricity, gas, water or heat consumption and data management. With the development of society and economy, the utility consumption of living and industrial has increased greatly, and at the same time, higher requirements for resource conservation are needed. Traditional mechanical metering has been unable to meet these needs, and the following defects exist:

1.1 Unable to implement remote data collection

Traditional mechanical meters must rely on relevant personnel to manually read the measurements, such as the water consumption of the water meter, which is time-consuming and laborious, and is prone to errors.

1.2 Real-time remote maintenance cannot be realized

The traditional mechanical meters are usually checked and repaired by relevant personnel on a regular basis, or the user can report the problem for repair. This traditional type of maintenance is difficult to maintain the meter in real time.

1.3 poor to support extended applications

The traditional mechanical meter can only measure the utility consumption, and the utility consumption data is only used for billing, and the function is single, and it is difficult to implement data analysis and other extended applications.

Therefore, North America, Europe, Asia Pacific, Latin America, the Middle East and other regions have carried out research on Smart Utility Metering (SUM) in recent years. Through automation and intelligent control technology, Smart Utility Metering can greatly reduce operating costs; provide more intelligent applications and a better user experience.

Discussion

Smart Utility Metering (SUM) realize remote data collection, real-time remote maintenance, and can deploy more extensive applications, which can provide a better user experience and create more market opportunities than traditional mechanical metering.

2.1 remote data collection

SUM can automatically report data periodically through the network, so that the meter data can be automatically obtained through the platform, saving manpower and improving efficiency.

2.2 remote maintenance in real time

SUM sends the real-time running status to the platform. If the meter runs abnormally, for example due to meter damage or abnormality, the application will send an alarm message to the platform to notify the relevant personnel to fix it in time. At the same time, the relevant personnel can remotely control the meter switch through the platform, so that the utility supply in a certain area can be turned off in the event of an emergency.

2.3 enable a wealth of extended applications

SUM can obtain various information, such as water quality and water pressure for water metering, and gas quality and pressure for gas metering, by integrating multiple sensors. The platform can analyze these pieces of information to provide more extended applications, such as monitoring utility quality compliance, monitoring excess utility supply or shortage, analyzing user consumption trends, and intelligent supply scheduling. These extended applications can greatly improve the user experience.

SUM has been implemented and tested on small scales, but due to the lack of standards in the industry, vendors are unable to meet the high-speed growth demand for SUM. Therefore, it is necessary to specify requirements and capability framework standards of SUM.

The goal of this work item is to provide technical descriptions of a general framework, including requirements and capabilities for Smart Utility Metering. Regulation is out of the work item's scope.

Regarding to the proposed new work item, gap analysis is done fully based on investigation of ITU-T and other SDOs. The result of gap analysis is: ***the proposed new work item has no duplication with ITU-T and other SDOs*** (such as 3GPP, oneM2M and ISO etc, including published and some under study work).

The following two tables briefly show the gap analysis trail.

Table-1 Gap analysis inside ITU-T related to Smart Utility Metering

No.	SGs	Title and numbering	Analysis results
1	SG5	ITU-T L.1400 ITU-T L.1420 ITU-T L.1430 ITU-T L.1440	ITU SG5 focuses on the environmental and climatic impact of information and communication technologies. Electricity consumption, including the full supply chain of electricity generation as well as the distribution losses, is considered in quantifying GHG and energy effects of ICT projects. Besides, it mentioned the effects of ICT include an efficiency-improved utility management. However, it did not touch SUM
2	SG13	ITU-T Y.2072 (ex Y.energy-platform) Y.energy-brokerage (on-going) Y.dv-ess (on-going)	ITU-T Y.2072 (ex Y.energy-platform), "Framework of Energy Sharing and Trading Platform", provides a framework of energy sharing and trading platform for integrated control and management considering energy production, storage and consumption. Y.energy- brokerage, "Framework of trusted electricity brokerage for distributed energy resources", provides a framework of trusted electricity brokerage for distributed

			energy resources taking into account the blockchain technology for trust provisioning in electricity markets. Y.dv-ess, "Framework of Distributed and Virtualized Energy Storage Systems", provides the framework of distributed and virtualized energy storage systems. However, they did not touch SUM
3	SG15	ITU-T G.9958 (ex G.shp6)	ITU-T G.9958 (ex G.shp6), "Generic architecture of home networks for energy management", This recommendation specifies functional definitions of components and networks to provide energy management services in home. It also specifies home network configurations and requirements for these services. However, it did not touch SUM
4	SG17	ITU-T X.1331 (ex X.sgsec-2)	ITU-T X.1331 (ex X.sgsec-2), "Security guidelines for home area network (HAN) devices in smart grid systems", provide threat analysis of the HAN in the smart grids, security requirements, and security functions. Since the role and functions of each HAN device are different, the security requirements and security functions by devices are provided. However, it did not touch SUM
5	SG20	Y.energy-mMG (on-going)	Y.energy-mMG, "Application model for energy services on multiple microgrids", provides application model including overview architecture of multiple microgrids energy system, classification of the energy services, requirements and operating procedures for the energy services. Additionally, use cases of the energy services with an appendix. However, it did not touch SUM

Table-2 Gap analysis with work of other identified SDOs

No.	SDOs	Work related to water metering	Analysis results
1	ISO	Electricity: ISO 50001:2018 ISO 50002:2014 ISO 50003:2014	ISO 50001:2018 ISO 50001 is based on the management system model of continual improvement also used for other well-known standards such as ISO 9001 or ISO 14001. it provides a framework of requirements for organizations to: develop a policy for more efficient use of energy, fix targets and objectives to meet the policy, use data to better understand and make decisions about energy use, measure the results, review how well the policy works, and continually improve energy management. ISO 50002:2014 specifies the process requirements for carrying out an energy audit in relation to energy performance. ISO 50003:2014 specifies requirements for competence, consistency and impartiality in the auditing and certification of energy management systems (EnMS) for bodies providing these services. However, it did not touch SUM
		Water: ISO 4064-1	It defines the metrological and technical requirements for specifying cold drinking water and hot water flow meters. However, it did not touch SUM
		Gas ISO/IEC 17025:2005 ISO 2531:2009 ISO 17484-1:2014 ISO 17484-2:2009 ISO/TR 19480:2005 ISO 17089-1:2010	ISO/IEC 17025:2005 certified gas detector calibration services including gas flow meter calibration ISO 2531:2009 provides standards for ductile iron pipes, fittings, accessories and their joints for water applications ISO 17484 series provides standards for Plastics piping systems ISO/TR 19480:2005 provides standards for Polyethylene pipes and fittings for the supply of gaseous fuels or water -- Training and assessment of fusion operators ISO 17089-1:2010 specifies requirements and recommendations for ultrasonic gas flowmeters (USMs),. However, it did not touch SUM
		Heat: ISO 9869-1:2014 ISO 8301:1991	ISO 9869-1:2014 describes the apparatus to be used, the calibration procedure for the apparatus, the installation and the measurement procedures, the analysis of the data, including the correction of systematic errors and the reporting format. ISO 8301:1991 Defines the use of the heat flow meter method to measure the steady-state heat transfer through flat slab specimens and the calculation of its heat transfer properties. Annex A forms an integral part of this standard. Annexes B, C, D and E are for information only. However, it did not touch SUM
2	IEC	Electricity IEC 6205x series	IEC 62052, 62053, 62054, 60514, 61358, 62058 establishes standards for type test and acceptance test for all kind of metering equipment.

			IEC 62059 provides dependability specifications and field performance monitoring for metering equipment. IEC 62051 and 62056 cover data exchange for meter reading, tariff and load control, in which DLMS/COSUM specification defines an interface object model and communication protocols to carry the data. IEC/PAS 62055, provides a framework for specifying standards for prepayment systems, and based on this framework, specifying an application and a physical layer protocol for transporting prepayment tokens. In sum, IEC provides a sound basis for specifications, type approvals and acceptance testing, however, IEC did not standardise functional requirements. However, it did not touch SUM
		Water: IEC 60034，60045,60092,60947,,62734	The IEC defines a range of water-related standards, including equipment requirements for pumps, motors, switches, water delivery services, water purification and wastewater treatment standards, wireless networks and configuration requirements for water-related data, etc. Specifically, IEC 62734 provides standards for Industrial networks - Wireless communication network and communication profiles. It defines a protocol suite, including system management, gateway considerations, and security specifications, for low-data-rate wireless connectivity with fixed, portable, and slowly-moving devices, often operating under severe energy and power constraints. However, it did not touch SUM
		Gas: ISO/IEC 17025:2005	ISO/IEC 17025:2005 certified gas detector calibration services including gas flow meter calibration However, it did not touch SUM
3	ANSI	Electricity : ANSI C12 series	ANSI C12 series established acceptable performance criteria for new types of ac watthour meters, demand meters, demand registers, pulse devices, and auxiliary devices. ANSI C12.1-2014 provides Code for Electricity Metering; ANSI C12.18-2006 (R2016) provides Protocol specification for ansi type 2 optical port; ANSI C12.19-2012 contains American National Standard for Utility Industry End Device Data Tables; ANSI C12.20-2015 provides Electricity Meters - 0.1, 0.2, and 0.5 Accuracy Classes; ANSI C12.21-2006 (R2016) provides protocol Specification for Telephone Modem Communication; ANSI C12.22-2012 provides Protocol Specification For Interfacing to Data Communication Networks However, it did not touch SUM
		Water: NSF/ANSI 61	Define some requirements for water meter devices However, it did not touch SUM

		Gas: ANSI B109 series	Both B109.1 and B109.2 define diaphragm type gas meter capacity as that volume of 0.60 specific gravity gas at an absolute pressure of 14.73 PSIA ; ANSI B109.2 is the standard for diaphragm meters handling more than 500 Cubic Feet Per Hour; ANSI B109.3 covers the "Rotary Type Gas Displacement Meter. However, it did not touch SUM
4	oneM2M	Application Developer Guide	These are the guides including use case, architecture and procedure etc. for the contributors to write the suitable contributions for oneM2M These guides are based on home lighting controlling application involving lights in a home that can be remotely controlled by a user’s smart phone leveraging the capabilities of oneM2M However, it did not touch SUM
5	3GPP		Not touch SUM
6	GSMA	Smart meters: Compliance with radio frequency exposure standards https://www.gsma.com/publicpolicy/wp-content/uploads/2015/06/gsma_smart-meters_2015.pdf	It summarized previous research on radio frequency exposure for smart meters. It did not work on standardization on this issue. However, it did not touch SUM
7	CEN	Water : EN 13757	It provides various layers of protocols and transport security requirements for water meter and platform interaction. However, it did not touch SUM
		Heat: EN 1434-1 CR 13582	EN 1434-1 specifies the general requirements for thermal energy meters. Thermal energy meters are instruments intended for measuring the energy which in a heat exchange circuit is absorbed (cooling) or given up (heating) by a liquid called the heat-conveying liquid. The thermal energy meter indicates the quantity of heat in legal units. CR 13582 provides standards for Heat meter installation - Some guidelines for selecting, installation and operation of heat meters, However, it did not touch SUM
8	OMA	OMA LightweightM2M (LwM2M)	OMA Lightweight M2M is a protocol from the Open Mobile Alliance for M2M or IoT device management. OMA contains a unified definition of various sensor devices, and an Australian company, South East Water Corporation, provides data format definitions for some water meter acquisition parameters. However, it did not touch SUM

9	IEEE	Electricity: IEEE 1547 Series-2014 IEEE C37 series IEEE 1686-2013 IEEE 1815-2012 IEEE 1901-2010 IEEE Std 1588-2008 IEEE Std 1701-2011 IEEE Std 1702-2011 IEEE Std C37.239-2010	IEEE 1547 Series-2014 provides interconnection standards with electric power systems (EPS), which covers the technical specifications for, and testing of, the interconnection and provides requirements relevant to the performance, operation, testing, safety considerations, and maintenance of the interconnection. It includes general requirements, response to abnormal conditions, power quality, islanding, and test specifications and requirements for design, production, installation evaluation, commissioning, and periodic tests. IEEE C37 series provides standards of measurements, performance requirements and precision time protocol for power system. IEEE 1686-2013 provides Standard for Intelligent Electronic Devices Cyber Security Capabilities; IEEE 1815-2012 provides Standard for Electric Power Systems Communications-Distributed Network Protocol (DNP3); IEEE 1901-2010 provides Standard for Broadband over Power Line Networks: Medium Access Control and Physical Layer Specifications; IEEE Std 1588-2008 provides Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems; IEEE Std 1701-2011 provides Standard for Optical Port Communication Protocol to Complement the Utility Industry End Device Data Tables; IEEE Std 1702-2011 provides Standard for Telephone Modem Communication Protocol to Complement the Utility Industry End Device Data Tables; IEEE Std C37.239-2010 provides Standard for Common Format for Event Data Exchange (COMFEDE) for Power Systems However, it did not touch SUM
10	CEA	Electricity: CEA 709.1-D-2014 (ANSI) CEA 709.2-A-2000 (R2012) (ANSI) CEA 709.3-1999 (R2004) (ANSI) CEA 709.4-2013 (ANSI) CEA 852.1-A-2014 (ANSI) CEA CEDIA CEB29-2012	CEA 709.1-D-2014 (ANSI) provides Standard for Control Network Protocol Specification; CEA 709.2-A-2000 (R2012) (ANSI) provides Standard for Control Network Power Line (PL) Channel Specification; CEA 709.3-1999 (R2004) (ANSI) provides Standard for Free-Topology Twisted-Pair Channel Specification; CEA 709.4-2013 (ANSI) provides Standard for Fiber-Optic Channel Specification; CEA 852.1-A-2014 (ANSI) provides Standard for Enhanced Protocol for Tunneling Component Network Protocols over Internet Protocol Channels; CEA CEDIA CEB29-2012 provides Standard for Recommended Practice for the Installation of Smart Grid Devices. However, it did not touch SUM
11	SAE	Electricity: SAE J 1772-2017 SAE J 2836-1-2010 SAE J 2847-1-2013	SAE J 1772-2017 provides standards for SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler; SAE J 2836-1-2010 (SAE J2836-1-2010) provides Use Cases for Communication Between Plug-in Vehicles and the Utility Grid; SAE J 2847-1-2013 (SAE J2847-1-2013) provides Communication for Smart Charging of Plug-in

			Electric Vehicles using Smart Energy Profile 2.0 However, it did not touch SUM
12	NEMA	Electricity: NEMA SG-AMI 1-2009 (R2015)	NEMA SG-AMI 1-2009 (R2015) provides requirements for Smart Meter Upgradeability. However, it did not touch SUM
13	ASTM	Heat: ASTM E3137 / E3137M - 18	Standard Specification for Heat Meter Instrumentation, This specification defines general specifications for heat meters. Heat meters are instruments that measure heat in heat exchange circuits in which energy is absorbed (cooling) or given up (heating) by a flowing liquid. However, it did not touch SUM