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SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

Internet of things and smart cities and communities – Requirements and use cases

Internet of things requirements and technical capabilities for support of accounting and charging

Recommendation ITU-T Y.4118

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Recommendation ITU-T Y.4118

Internet of things requirements and technical capabilities for support of accounting and charging

Summary

Recommendation ITU-T Y.4118 provides accounting and charging requirements for Internet of things (IoT) as well as an IoT accounting and charging technical capability framework, in order to assist in the standardization of accounting and charging technical mechanisms for IoT and to facilitate the development of the IoT market. The Recommendation focuses on the network layer capabilities and service support and application support layer capabilities, as well as business use cases applied to IoT.

The use cases, requirements and technical capability framework provided in this Recommendation are from a technical point of view.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y.4118	2018-06-06	20	11.1002/1000/13496

Keywords

Accounting and charging, B2C, B2B2C, characteristics, Internet of things, requirements, technical capability framework.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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Internet of things requirements and technical capabilities for support of accounting and charging

1 Scope

This Recommendation provides accounting and charging requirements for Internet of things (IoT). Building on the requirements and framework for accounting and charging capabilities in the next generation network (NGN) [ITU-T Y.2233], this Recommendation provides specific requirements derived from the analysis of business use cases specific to the IoT.

Based on the identified requirements, an IoT accounting and charging technical capability framework is then specified.

The scope of this Recommendation includes:

– business use cases applied to the IoT;

– IoT accounting and charging requirements;

– IoT accounting and charging technical capability framework.

The use cases, requirements and technical capability framework provided in this Recommendation are from a technical point of view.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.2233] Recommendation ITU-T Y.2233 (2010), *Requirements and framework allowing accounting and charging capabilities in NGN*.

[ITU-T Y.4000] Recommendation ITU-T Y.4000/Y.2060 (2012), *Overview of Internet of things*.

[ITU-T Y.4100] Recommendation ITU-T Y.4100/Y.2066 (2014), *Common requirements of the Internet of things*.

[ITU-T Y.4113] Recommendation ITU-T Y.4113 (2016), *Requirements of the network for the Internet of things*.

[ITU-T Y.4455] Recommendation ITU-T Y.4455 (2017), *Reference architecture for Internet of things network service capability exposure*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 accounting [ITU-T Y.2233]: The process of collecting and analysing NGN service and NGN resource usage metrics for the purposes of capacity and trend analysis, cost allocation, auditing, billing, etc. Accounting management requires that resource consumption be measured, rated, assigned, and communicated between appropriate business entities.

3.1.2 billing [ITU-T Y.2233]: The process after rating in which the NGN transactions of NGN event usage are compiled and bills are produced.

3.1.3 charging [ITU-T Y.2233]: Function within the NGN network and the associated offline charging, online charging, and billing domain components whereby information related to a chargeable event is collected, formatted, transferred and evaluated in order to make it possible to determine usage for which the charged party may be billed (offline charging) or the subscriber's account balance may be debited (online charging).

3.1.4 Internet of things (IoT) [ITU-T Y.4000]: A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies.

NOTE 1 – Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of things to offer services to all kinds of applications, whilst ensuring that security and privacy requirements are fulfilled.

NOTE 2 – From a broader perspective, the IoT can be perceived as a vision with technological and societal implications.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 IoT service charging record (SCR): Formatted collection of information about usage of a chargeable IoT service for use in accounting and charging. Examples of chargeable IoT service include device management and data subscription.

NOTE – IoT SCR can be seen as the service related charging information record (CIR) for chargeable IoT services.

3.2.2 IoT network resource charging record (NRCR): Formatted collection of information about usage of a chargeable IoT network resource for use in accounting and charging. Examples of chargeable IoT network resources include network bandwidth, transferred data volume and exposed network capability.

NOTE – IoT NRCR can be seen as the network related charging information record (CIR) for chargeable IoT network resources. It is equivalent to the term CIR used in [ITU-T Y.2233].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

APN Access Point Name

B2B Business to Business

B2C Business to Customer

B2B2C Business to Business to Customer

CIR Charging Information Record

NGN Next Generation Network

NRCR Network Resource Charging Record

SCR Service Charging Record

SSAS Service Support and Application Support

UML Unified Modelling Language

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 Recommendation is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need 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 Business use cases applied to IoT

6.1 B2C use case

Figure 1 shows the model of the business to customer (B2C) use case of IoT, which is modelled via unified modelling language (UML) [b-UML].

NOTE – The following provides the applicable mappings between the IoT roles involved in this use case and the roles described in Appendix I of [ITU-T Y.4000]. This mapping applies also to the other use cases described in clause 6 of this Recommendation.

– The "IoT user" corresponds to the application customer role;

– The "service provider" corresponds to application provider role and/or device provider role and/or platform provider role;

– The "network provider" corresponds to the network provider role.

As shown in Figure 1, in the B2C use case, the service provider provides the IoT service to the IoT user. Simultaneously, the network provider provides network resources to support the IoT service provision. In the B2C use case, the network resources related to the IoT service provision are subscribed by the IoT user. So, the IoT user independently subscribes the IoT service from the service provider and the network resources related to the IoT service provision from the network provider.

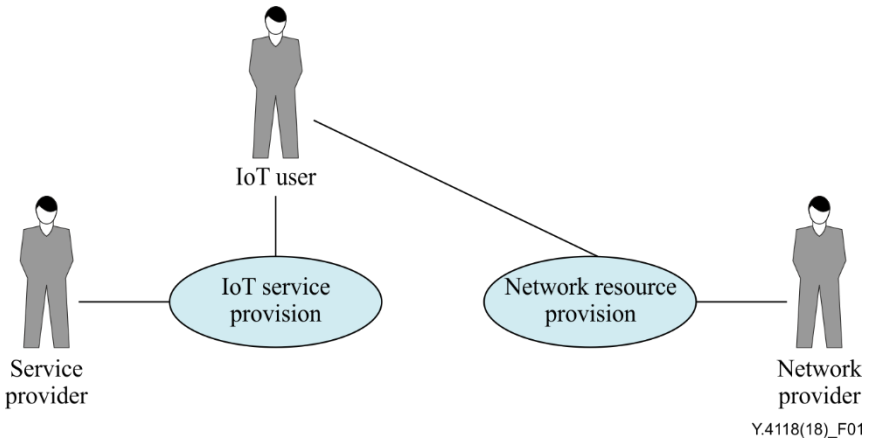

Figure 1 – Model for the B2C use case of IoT

The revenue flow of the B2C use case is shown in Figure 2. The IoT user will pay the service provider for the subscribed IoT service and will also pay the network provider for the network

resource usage. When the IoT user subscribes multiple IoT services from multiple service providers, there will be multiple independent revenue flows for these service providers.

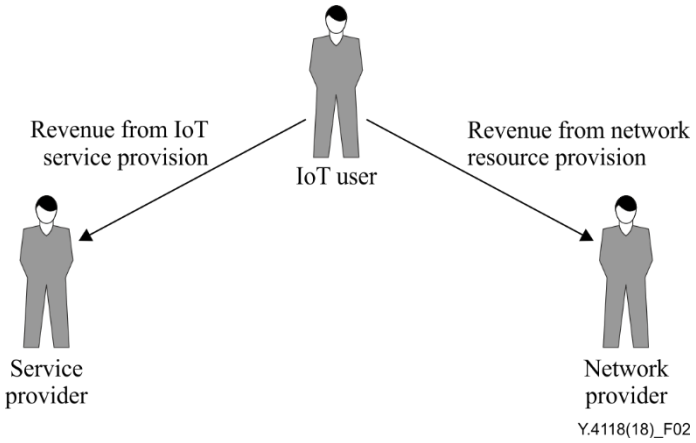

Figure 2 – Revenue flow for the B2C use case of IoT

An application example for the B2C use case is given in Appendix I.2.

6.2 B2B2C use case

Figure 3 shows the model for business to business to customer (B2B2C) use case of IoT, which is modelled via UML. As shown in Figure 3, in the B2B2C use case, the service provider provides the IoT service to the IoT user. Simultaneously, the network provider provides network resources to support the IoT service provision. Since, from the perspective of the IoT user, the IoT service provision also includes the network resource provision, the IoT user only subscribes the IoT service from the service provider and the provided network resources related to the IoT service provision are subscribed by the service provider rather than the IoT user.

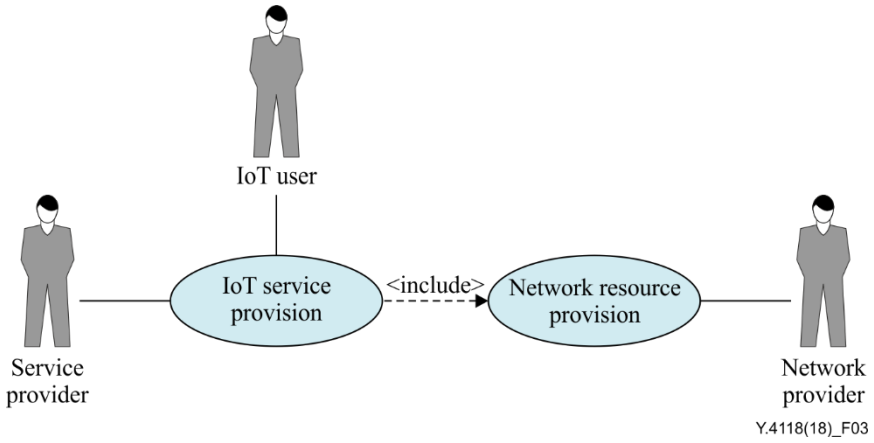

Figure 3 – Model for the B2B2C use case of IoT

The revenue flow of the B2B2C use case is shown in Figure 4. The IoT user will pay the service provider for the subscribed IoT service. The service provider will pay the network provider for the network resource usage related to the subscribed IoT service provision. When the IoT user subscribes multiple IoT services from multiple service providers, there will be multiple independent revenue flows for these service providers.

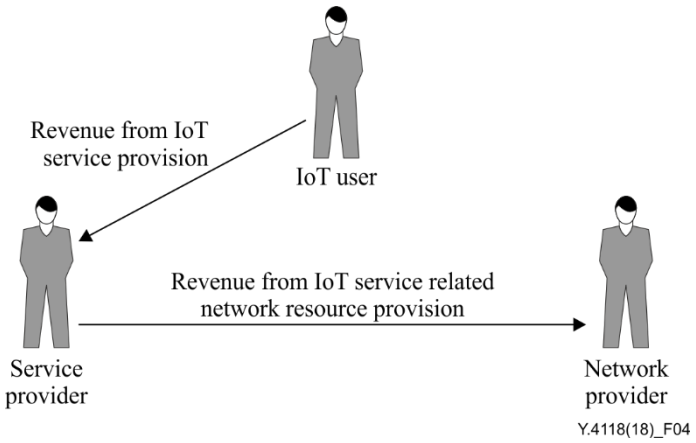

Figure 4 – Revenue flow for the B2B2C use case of IoT

An application example for the B2C2C use case is given in Appendix I.1.

6.3 The hybrid use case of B2C and B2B2C

Figure 5 shows the hybrid use case of B2C and B2B2C model of the IoT, modelled via UML [b-UML]. As shown in Figure 5, in the hybrid use case, the service provider provides the IoT service to the IoT user. The network provider provides network resources through the service provider to the IoT user to support the subscribed IoT service and also provides other network resources directly to the IoT user to support the network resource usage not related to the subscribed IoT service.

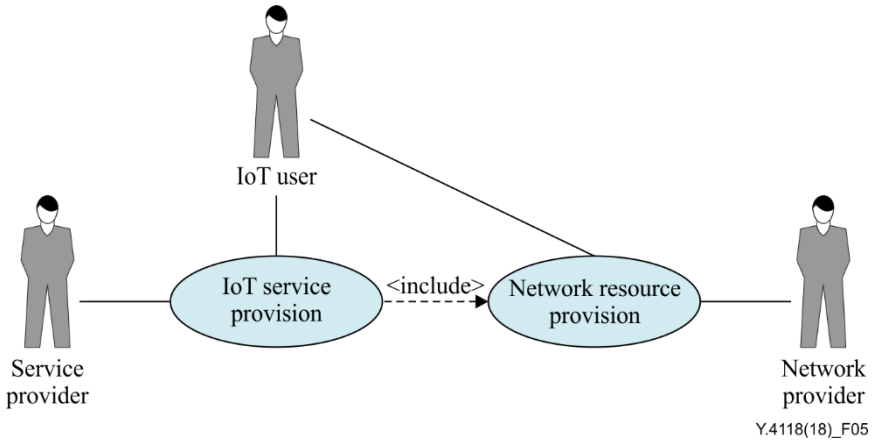

Figure 5 – The hybrid use case of B2C and B2B2C model of IoT

The revenue flow of the hybrid use case is shown in Figure 6. The IoT user will pay the service provider for the subscribed IoT service. The service provider will pay the network provider for the network resource usage related to the subscribed IoT service. The IoT user will also pay the network provider for the network resource usage not related to the subscribed IoT service.

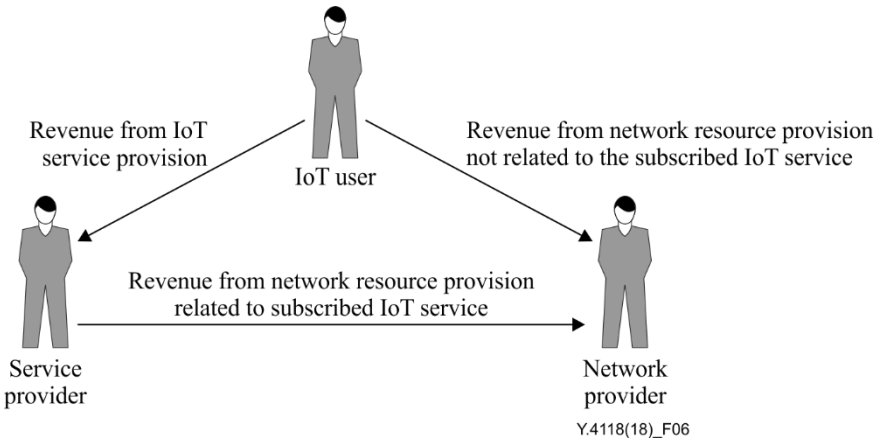

Figure 6 – Revenue flow for the hybrid use case of B2C and B2B2Cof IoT

NOTE – This use case also comprises the case of exceeding network resource usage for the subscribed IoT service since this usage can be seen as network resource usage not related to the subscribed IoT service (the exceeding usage not being specified in the subscription agreement).

An application example for the hybrid use case of B2C and B2B2C is given in Appendix I.3.

7 IoT accounting and charging characteristics

This clause describes key IoT accounting and charging characteristics identified on the basis of the business use cases described in clause 6. These characteristics are general across the different applications and deployments of IoT and constitute the basis for the IoT accounting and charging requirements identified in clause 8.

NOTE 1 – A given application or deployment of IoT does not have to support all or any of these characteristics.

NOTE 2 – In actual deployments, different IoT services may be provided by the same service provider or multiple service providers. Clauses 7 and 8 of this Recommendation assume the more general situation of multiple service providers.

7.1 Charging for both network resource usage and IoT services

In IoT scenarios, both the network provider and the service provider provide services to the IoT users. Therefore, the network resources provided by the network provider and the various IoT services provided by the service providers may need to be charged.

7.2 Split of charging for network resource usage

The network resources used by a given IoT device may be consumed for multiple IoT services provided by different service providers.

In some IoT scenarios, the network resource usage related to some of these IoT services will be charged to the corresponding service providers and the rest will be charged to the IoT user using the device. Therefore, the network resource usage by one IoT device may need to be split into multiple parts corresponding, respectively, to the IoT services charged to the IoT user using this device and the IoT services charged to the service providers responsible of that network resource usage.

For example, in the telematics scenario shown in Figure 7, the network resource usage of the car diagnostics services will be charged to the car vendor, while the network resource usage of the infotainment services will be charged to the driver.

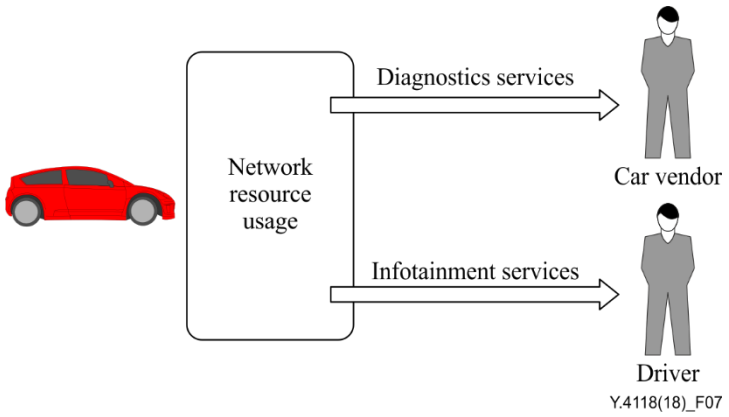

Figure 7 – Example scenario of charging split with respect to the network resource usage

7.3 Aggregation of charging data records for charging related to network resource usage and IoT services

In some IoT scenarios, the service provider or the IoT user may need to be charged for the network resource usage and/or the IoT service usage by a large set of IoT devices. Billing based on the aggregation of the charging data records related to each IoT device with distinct items associated to each occurrence of network resource usage and IoT service usage may be adopted as a charging approach in such scenarios.

7.4 Sharing of network resource pool

In some IoT scenarios, the service provider and/or the IoT user may need that the network provider provides a network resource pool. This allows the devices owned by the service provider and/or the IoT user to share the network resources of the pool.

7.5 Dynamically differentiated charging rates for network resource usage

In some IoT scenarios, IoT devices may need that network resource related adjustments be made according to the requirements of the different IoT services using those network resources, which may lead to differences in charging of the network resource usage.

As an example, the network provider may need to adjust the charging rates of the provided network resources according to the network context (such as time, location, status of the network), e.g. in order to encourage the IoT services to reduce their network load.

In order to fulfil these requirements, the dynamic differentiated charging rates for network resource usage may be adopted as a charging approach in such scenarios.

8 IoT accounting and charging requirements

If the characteristics listed in clause 7 are supported by an IoT deployment, the following should be considered where applicable.

8.1 Accounting and charging requirements for IoT services

S-R-001: The IoT platform provided by the service provider is recommended to support event based charging so that the usage of IoT services can be charged based on the chargeable event records (e.g., the records of service requests).

NOTE 1 – The IoT platform provided by the service provider is a technical infrastructure that provides integration of generic and specific capabilities [ITU-T Y.4000], [ITU-T Y.4113]. The basic model of the network for the IoT described in [ITU-T Y.4113] provides more details about the IoT platform, including the relationship between IoT platform and network.

S-R-002: The IoT platform provided by the service provider is recommended to support session based charging so that the usage of session based IoT services can be charged based on the session records.

NOTE 2 – This requirement is suitable for IoT platforms that support session based IoT services. The remote video monitoring service is an example of session based IoT services.

S-R-003: The IoT platform provided by the service provider is recommended to support subscription based charging so that the usage of subscribed IoT services can be charged based on the subscription records.

S-R-004: The IoT platform provided by the service provider is recommended to support the aggregation of IoT service charging records related to a given IoT user so that one bill can be made to the IoT user.

S-R-005: The IoT platform provided by the service provider is recommended to support the transformation of IoT service charging records into a standard format.

S-R-006: The IoT platform provided by the service provider is recommended to support various charging policies (e.g. fixed-rate and dynamic rate).

S-R-007: The IoT platform provided by the service provider can optionally support the inclusion of the service usage related information (e.g. service usage time duration, service type) in the IoT service charging records.

S-R-008: The IoT platform provided by the service provider is recommended to support recording and tracking mechanisms for the IoT service charging records so that the IoT user can identify specific IoT service usage related information.

8.2 Accounting and charging requirements for IoT network resources

The requirements identified in this clause are derived from the IoT accounting and charging characteristics and can be seen as an extended set of the requirements in [ITU-T Y.2233] for IoT accounting and charging.

N-R-001: The network is recommended to support the aggregation of the network resource charging records related to a given set of IoT devices so that one bill can be made to the IoT user.

N-R-002: The network is recommended to support dynamic rate charging policies with respect to different network usage demands (e.g., different network access priority levels and different allowable network access time periods).

N-R-003: The network is recommended to support the charging of the network resource usage related to a given set of devices that share the network resource of a pool.

N-R-004: The network is recommended to support the transformation of the network resource charging records into a standard format.

N-R-005: The network is recommended to support the split of the network resource charging records related to one device with respect to different target network addresses or access point names (APNs) according to the information provided by the IoT service providers (e.g., static network address, platform APN).

NOTE – This requirement is for the purpose of distinguishing the network resources used for the IoT services provided by different service providers in order to support the B2C use case, the B2B2C use case and the hybrid B2B2C use case described in clause 6, i.e., the network resource usage related to an IoT service can be charged to the corresponding IoT service provider.

N-R-006: The network is recommended to support recording of the network capability exposure events and generation of the corresponding network resource charging records so that the usage of such network capability exposure service can be charged.

9 IoT accounting and charging technical capability framework

9.1 Technical capability framework overview

This clause identifies the technical capabilities for the support of accounting and charging in the IoT. These technical capabilities are derived from the IoT accounting and charging requirements provided in clause 8.

Figure 8 shows these technical capabilities and their positioning with respect to the two relevant layers of the IoT reference model [ITU-T Y.4000].

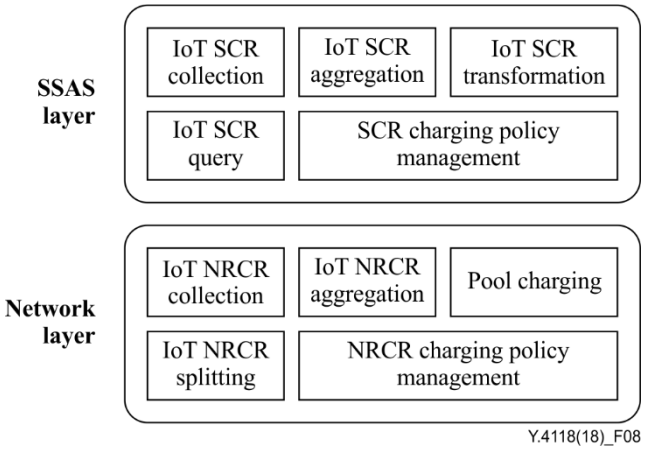

Figure 8 – IoT accounting and charging technical capability framework overview

The following technical capabilities are provided at the network layer: IoT network resource charging record (NRCR) collection capability, IoT NRCR aggregation capability, IoT NRCR splitting capability, pool charging capability and NRCR charging policy management capability.

The network layer capabilities which are necessary to support the IoT network resource charging and accounting requirements listed in clause 8.2, can be seen as an extended set of the accounting and charging capabilities identified in [ITU-T Y.2233].

NOTE – For convenience, Figure 8 does not show the network layer capabilities already defined in [ITU-T Y.2233]. On the other hand, some shown capabilities represent extensions of network layer capabilities already defined in [ITU-T Y.2233] for the support of accounting and charging in the IoT. Details on the relationships between the network layer capabilities identified in this Recommendation and the accounting and charging functions in [ITU-T Y.2233] are given in Appendix II.

The following technical capabilities are provided at the service support and application support (SSAS) layer: IoT service charging record (SCR) collection capability, IoT SCR aggregation capability, IoT SCR transformation capability, IoT SCR query capability and SCR charging policy management capability.

The SSAS layer capabilities, which are necessary to support the IoT service accounting and charging requirements listed in clause 8.1, are new technical capabilities not identified in [ITU-T Y.2233].

9.2 Network layer capabilities

9.2.1 IoT NRCR collection capability

According to the requirement N-R-006 in clause 8.2, the requirements of IoT NRCR collection capability are given as follows:

– IoT NRCR collection capability is recommended to support the collection of the NRCR related to the network service in charge of exposing the network capabilities [ITU-T Y.4455].

NOTE – The requirements for the collection of the NRCR related to other network services (e.g., data communication and audio call) are aligned with [ITU-T Y.2233].

9.2.2 IoT NRCR aggregation capability

According to the requirement N-R-001 in clause 8.2, the requirements of IoT NRCR aggregation capability are given as follows:

– IoT NRCR aggregation capability is required to support the aggregation of the NRCR related to a given set of IoT devices.

NOTE – This includes the case of NRCR split by the IoT NRCR splitting capability.

9.2.3 IoT NRCR splitting capability

According to the requirement N-R-005 in clause 8.2, the requirements of IoT NRCR splitting capability are given as follows:

– IoT NRCR splitting capability is recommended to support the split of the NRCR related to one device based on the network address or access point name used for the device access.

NOTE – The type of information used by IoT NRCR splitting capability for the NRCR splitting depends on the concrete deployment options of the IoT platform provided by the service provider: e.g., for an IoT platform with dedicated APN, the APN information can be used for splitting with low complexity; for an IoT platform with static network address, the static network address information can be used for splitting with medium complexity; and for an IoT platform with dynamic network address, the IoT SCRs information can be used for splitting with high complexity.

9.2.4 Pool charging capability

According to the requirement N-R-003 in clause 8.2, the requirements of pool charging capability are given as follows:

– The pool charging capability is recommended to support the charging of the network resource usage related to a set of devices (associated with one subscriber account) which are sharing the network resources of a given network resource pool.

NOTE – As an example, the pool charging capability can be used to support online charging for a set of devices sharing one account associated to a given network resource pool.

9.2.5 NRCR charging policy management capability

According to the requirement N-R-002 in clause 8.2, the requirements of NRCR charging policy management capability are given as follows:

– The NRCR charging policy management capability is recommended to support dynamic rate charging policies with respect to different network usage demands of IoT services.

NOTE – Network usage demands of IoT services include, but are not limited to, different network access priority levels and different allowable network access time periods.

9.3 SSAS layer capabilities

9.3.1 IoT SCR collection capability

According to the requirements S-R-001, S-R-002, S-R-003 and S-R-007 in clause 8.1, the requirements of IoT SCR collection capability are given as follows:

– IoT SCR collection capability is recommended to support the collection of event records (e.g., the records related to service requests) so that the usage of IoT services can be charged using event based charging.

– IoT SCR collection capability is recommended to support the collection of session records so that the usage of IoT session based services can be charged using session based charging.
– IoT SCR collection capability is recommended to support the collection of subscription records so that the usage of subscribed IoT services can be charged using subscription based charging.
– IoT SCR collection capability can optionally support the inclusion of the service usage related information in the IoT SCRs.

NOTE – The types of the SCRs supported by the IoT SCR collection capability highly depend on the services provided by the IoT platform provided by the service provider and the business strategies: e.g., for an IoT platform providing remote video monitoring services, the session records can be collected to support session based charging of the video monitoring services; for an IoT platform providing IoT data subscription services, the subscription records can be collected to support subscription based charging of those services; and for an IoT platform providing data retrieval APIs and device control APIs, event records are required to be collected to support event based charging according to the API requests.

9.3.2 IoT SCR aggregation capability

According to the requirements S-R-001 in clause 8.1, the requirements of IoT SCR aggregation capability are given as follows:

– IoT SCR aggregation capability is required to support the aggregation of the SCR related to a given user of the service.

9.3.3 IoT SCR transformation capability

According to the requirements S-R-005 in clause 8.1, the requirements of IoT SCR transformation capability are given as follows:

– IoT SCR transformation capability is recommended to support the transformation of the SCRs.
– If the transformation of the SCRs is supported, it is required that it is performed using a standard data format of SCRs.

9.3.4 IoT SCR query capability

According to the requirements S-R-008 in clause 8.1, the requirements of IoT SCR query capability are given as follows:

– IoT SCR query capability is recommended to support the query of IoT service usage information related to the IoT user.

9.3.5 SCR charging policy management capability

According to the requirements S-R-006 in clause 8.2.1, the requirements of SCR charging policy management capability in SSAS layer are given as follows:

– The SCR charging policy management capability is recommended to support various charging policies for the IoT service charging.

NOTE – IoT service charging policies include, but are not limited to, service fixed-rate charging and service dynamic rate charging.

Appendix I

Application examples for business use cases applied to IoT

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

I.1 Smart bracelet application example for B2B2C use case

Smart bracelets, one type of wearable device, have been widely used recently, e.g., to record the user's heartbeat, blood pressure, walk steps and so on.

Generally, users buy smart bracelets from service providers and pay for customized service (such as health status, statistics data). Bracelets upload user data to the service provider's platform through the network provided by the network provider. Service providers analyse the uploaded data and push the analysed results to the users.

In the B2B2C use case, users who use smart bracelets subscribe an integrated service from the service provider and do not need to pay the communication fee of network resource usage (e.g., bandwidth and the amount of the data transmission) to the network provider directly. Users only need to pay the service fee directly to the service provider and the communication fee will be paid by the service provider to the network provider.

Figure I.1 depicts a smart bracelet application example forB2B2C use case.

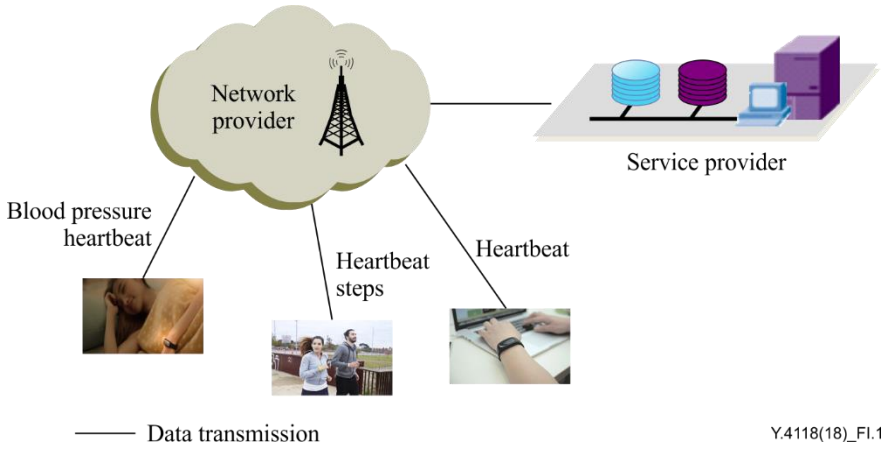

Figure I.1 – Smart bracelet application example

I.2 Telematics application example for B2C use case

Telematics is a typical application of the IoT, Figure I.2 depicts a telematics application example for B2C use case.

A car driver subscribes to a real-time traffic information service from the service provider. The car uploads its position information (e.g., GPS) to the service provider through the network provided by the network provider. The service provider communicates the real-time traffic information to the car driver, and the driver may choose the road which has no traffic jam to the destination. The car driver just subscribes the road information service (not including the communication) from the service provider. In addition, the car driver has also to subscribe to the network provider for the communication service. The car driver has to pay the service fee to the service provider and also needs to pay the communication fee (the cost generated by the data transmission) to the network provider.

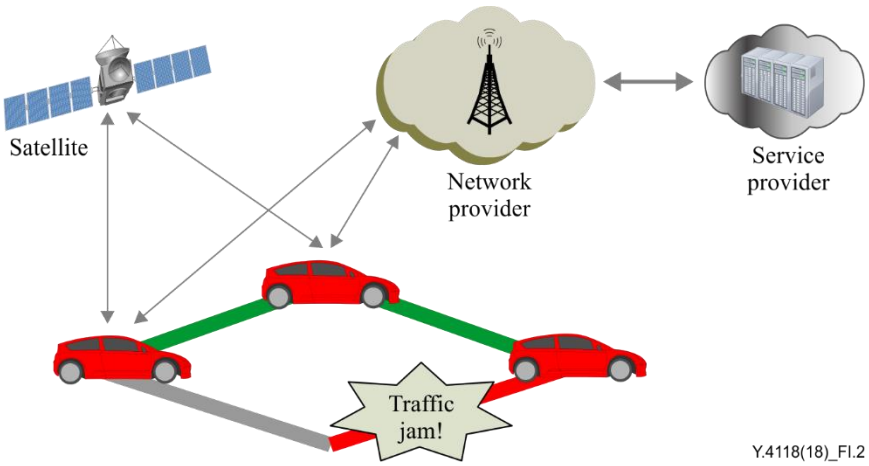

Figure I.2 – Telematics application example

I.3 Smart watch application example for hybrid use case of B2C and B2B2C

Users buy smart watches from service providers and subscribe related services, e.g., body health monitoring. The service provider may include the communication fee related to the body health information reporting and the body health monitoring service fee into the smart watch price so that the users do not need to pay additional fees when using the body health monitoring service. The communication fees included in the smart watch price will be finally paid to the network provider by the service provider. In some cases, the users may use the communication functions of smart watch for other purposes, e.g., voice call, SMS or web browsing: in such cases, the users will also need to pay the communication fee for these usages to the network provider.

Figure I.3 depicts the smart watch scenario of hybrid of B2C and B2B2C use case.

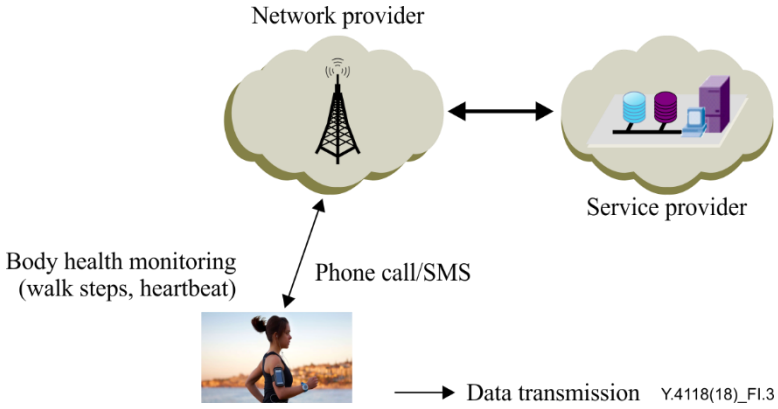

Figure I.3 – Smart watch application example

Appendix II

Relationship between the network layer capabilities for IoT accounting and charging identified in this Recommendation and the accounting and charging capabilities identified in [ITU-T Y.2233]

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

The network layer capabilities identified in clause 9 of this Recommendation are introduced to support the IoT network resource charging requirements. These capabilities can be mapped into the accounting and charging functions defined in [ITU-T Y.2233]. Table II.1 shows the specific relationships including the required capability extensions to [ITU-T Y.2233] according to the technical capability requirements identified in clause 9.2 of this Recommendation.

Table II.1 – Relationships between the network layer capabilities in this Recommendation and the accounting and charging functions in [ITU-T Y.2233]

Network layer capabilities in this Recommendation	Corresponding functions in [ITU-T Y.2233]	Required capability extensions
IoT NRCR collection capability	Charging collection function	Support of the collection of the NRCR related to the network service in charge of exposing the network capabilities (clause 9.2.1)
IoT NRCR aggregation capability	Charging gateway function	The aggregation of the NRCR (CIR) related to a given set of IoT devices, including the aggregation of splitted NRCR (clause 9.2.2)
IoT NRCR splitting capability	Charging gateway function	The split of the NRCR (CIR) related to one device based on the network address or access point name used for the device access (clause 9.2.3)
Pool charging capability	Account balance management function	Online charging of the network resource usage related to a set of devices (associated with one subscriber account) which are sharing the network resources of a given network resource pool (clause 9.2.4)
NRCR charging policy management capability	Rating function	Dynamic rate charging policies with respect to different network usage demands of IoT applications (clause 9.2.5)

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