

I n t e r n a t i o n a l T e l e c o m m u n i c a t i o n U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.2330

(09/2016)

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

Next Generation Networks – Enhancements to NGN

**Requirements of next generation network
evolution for supporting freedata service**

Recommendation ITU-T Y.2330

ITU-T



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Recommendation ITU-T Y.2330

Requirements of next generation network evolution for supporting freedata service

Summary

Recommendation ITU-T Y.2330 specifies requirements of next generation network (NGN) evolution for supporting freedata service, enabling NGN providers to offer NGN end users, in a flexible and secure way, the ability to enjoy content or services of third party providers without being charged.

Several scenarios of freedata service are described in the appendices.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y.2330	2016-09-29	13	11.1002/1000/13013

Keywords

Accounting and charging, data identification, freedata service, next generation network, policy management.

* 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/11.1002/1000/1830-en>.

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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Recommendation ITU-T Y.2330

Requirements of next generation network evolution for supporting freedata service

1 Scope

This Recommendation specifies requirements of next generation network (NGN) evolution for supporting freedata service, to enable NGN providers to offer NGN end users, in a flexible and secure way, the ability to enjoy content or services of third party providers without being charged.

In particular, this Recommendation introduces the motivation and basic scheme for freedata service support in NGN evolution. It then specifies the related requirements and capabilities of NGN evolution.

The appendices provide scenarios of freedata service, as well as details on freedata service data policy for data identification.

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.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of next generation networks*.
- [ITU-T Y.2201] Recommendation ITU-T Y.2201 (2009), *Requirements and capabilities for ITU-T NGN*.
- [ITU-T Y.2233] Recommendation ITU-T Y.2233 (2010), *Requirements and framework allowing accounting and charging capabilities in NGN*.
- [ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.
- [ITU-T Y.2702] Recommendation ITU-T Y.2702 (2008), *Authentication and authorization requirements for NGN release 1*.

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 application [b-ITU-T Y.2013]: A software entity residing on an application server that contributes to the delivery of an end user service.

3.1.3 application provider [ITU-T Y.2012]: A general reference to a provider that offers applications to the customers making use of the services capabilities provided by the NGN.

3.1.4 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).

3.1.5 content [b-ITU-T H.780]: A combination of audio, still image, graphic, video, or data.

3.1.6 next generation network (NGN) [b-ITU-T Y.2001]: A packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

3.1.7 NGN service stratum [b-ITU-T Y.2011]: That part of the NGN which provides the user functions that transfer service-related data and the functions that control and manage service resources and network services to enable user services and applications.

3.1.8 NGN transport stratum [b-ITU-T Y.2011]: That part of the NGN which provides the user functions that transfer data and the functions that control and manage transport resources to carry such data between terminating entities.

3.1.9 service [b-ITU-T Y.2091]: A set of functions and facilities offered to a user by a provider.

3.1.10 service provider [b-ITU-T X.1123]: A service provider is a business that provides service to customers over a network; it includes not only network service providers but also application service providers.

3.1.11 user [ITU-T Y.2201]: A user includes end user [b-ITU-T Y.2091], person, subscriber, system, equipment, terminal (e.g., FAX, PC), (functional) entity, process, application, provider or corporate network.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 freedata service: A service offered by a network provider which gives, in a flexible and secure way, a user the ability to enjoy content or services of third party providers without being charged for the transport traffic. The third party providers are charged by the network provider for the transport traffic concerning the content or services enjoyed by the user.

NOTE – In the context of this Recommendation, the NGN provider provides the freedata service to the NGN end user.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ANI	Application Network Interface
CAF	Charging and Accounting Function
DPI	Deep Packet Inspection
HTTP	Hypertext Transfer Protocol
ID	Identifier
IMEI	International Mobile Equipment Identity

IP	Internet Protocol
LAC	Location Area Code
NGN	Next Generation Network
OSI	Open System Interconnection
QoS	Quality of Service
SUP	Service User Profile
UNI	User Network Interface
URL	Uniform Resource Locator

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 prohibited from" 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 need not be present to claim conformance.

The keywords "is not recommended" indicate a requirement which is not recommended but which is not specifically prohibited. Thus, conformance with this specification can still be claimed even if this requirement is present.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is 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 NGN evolution for supporting freedata service

6.1 Motivation for freedata service

With the growing deployment of smart devices and Internet services, a lot of different business models and ecosystems, with a critical role of third party providers, have sprung up in recent years. There is a trend for users to limit or reduce the cost of accessing content or services. There is also a strong will for third party providers to attract more users in more convenient ways such as reducing the cost of the users' access to their applications.

Network providers, like NGN providers, wish to have a rich ecosystem of third party providers, and benefit from the transport traffic of third party provider content or services. Consequently, there is a strong will for network providers to implement network evolution solutions for support of business models where the above expectations from users and third party providers can be satisfied.

In this perspective, this Recommendation addresses a relevant business deployment by studying and specifying the requirements and capabilities which need to be supported by NGN providers for the provision of the so-called "freedata service". This service allows the NGN end users the ability to enjoy content or services of third party providers without being charged for the transport traffic. The third party providers are charged by the NGN provider for the transport traffic concerning the content or services enjoyed by the NGN end users.

Clause 6.2 provides the basic scheme for the support of freedata service in NGN evolution.

6.2 Basic scheme of NGN evolution for freedata service support

Figure 1 provides the basic scheme for freedata service, which shows the related business roles, provisions and cash flows.

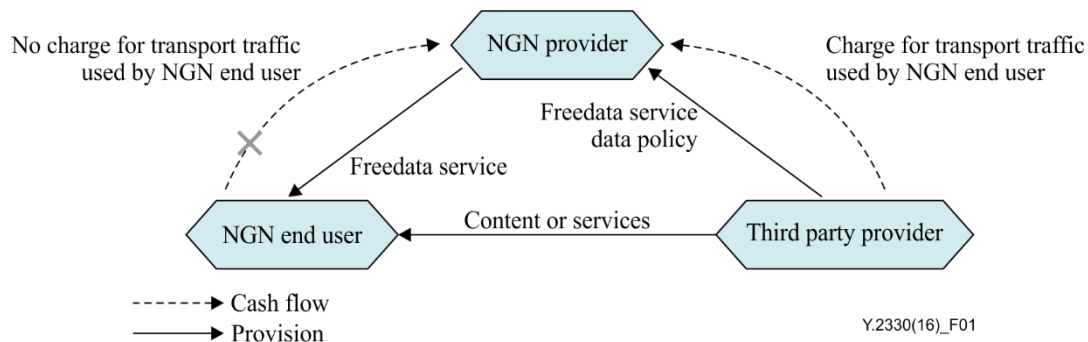


Figure 1 – Basic scheme for freedata service

In the basic scheme for freedata service, three business roles are identified:

- 1) NGN provider: the NGN provider provides freedata service to the NGN end user enjoying the third party provider's content or services. The NGN provider receives the freedata service data policy from the third party provider in order to identify the content or services' data of the third party provider.
- 2) Third party provider: the third party provider provides content or services to the NGN end user through NGN. The third party provider is charged for the transport traffic of the NGN end user. In order to identify its content or services' data, the third party provider provides the freedata service data policy to the NGN provider.
- 3) NGN end user: the NGN end user enjoys third party provider content or services through NGN, without being charged for the transport traffic used.

NOTE – This basic scheme representing business roles and their relationships for the freedata service support in the context of NGN evolution does not prevent its application in other network contexts.

Appendix I provides relevant scenarios of freedata service involving the various business roles.

7 Requirements of NGN evolution for freedata service support

7.1 Requirements of policy management

NGN is required to support management of freedata service data policy [ITU-T Y.2201] by creating and maintaining the policy related to freedata service data identification, and to freedata service accounting and charging.

NOTE 1 – In particular, the policy may take into account the third party provider identifier, third party provider content or service information, NGN end-user information (e.g., location, terminal). Appendix II provides details concerning options for the freedata service data policy related to data identification.

NOTE 2 – The management of the freedata service data policy ensures a privacy environment for each third party provider, so that all the data related to the third party provider's content or services are not leaked or modified.

NOTE 3 – The policy can be available either permanently or temporarily by manual configuration or automatic setup.

7.2 Requirements of data identification

NGN is required to support freedata service data identification features according to freedata service data policy.

7.3 Requirements of accounting and charging

NGN is required to support accounting and charging features [ITU-T Y.2233] with consideration of the following aspects:

- with respect to the identified freedata service data consumed by a given NGN end user, generation of accounting information and related charging information for the third party provider;
- with respect to the data consumed by that same NGN end user which are not part of the identified freedata service data, generation of accounting information and related charging information for the NGN end user.

8 Capability framework of NGN evolution for freedata service support

8.1 Capability framework overview

The capabilities of NGN evolution for freedata service support are based on the NGN capabilities described in [ITU-T Y.2201].

Figure 2 shows an overview of the capability framework for freedata service support in the context of the NGN reference architecture [ITU-T Y.2012].

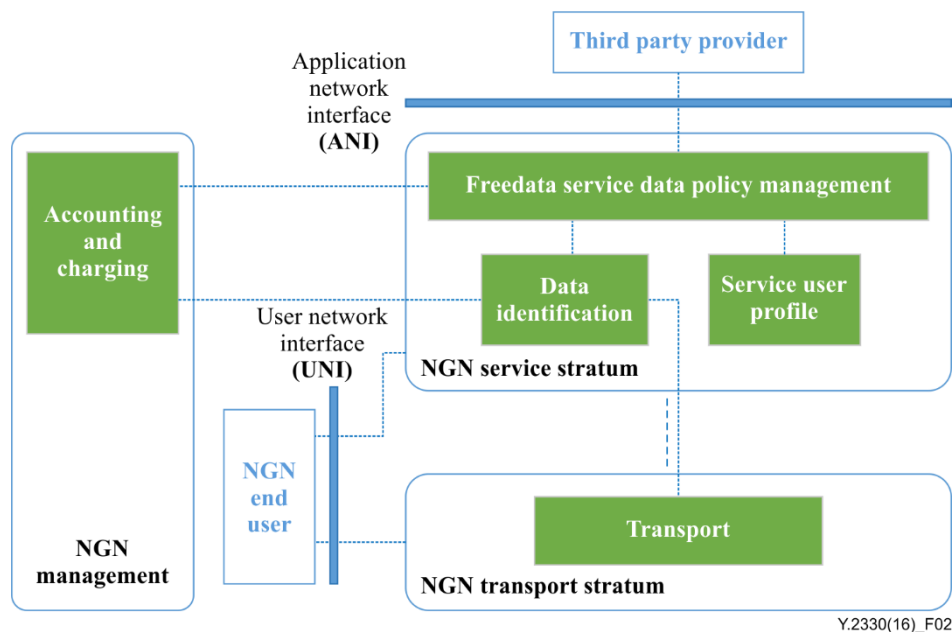


Figure 2 – Overview of the capability framework for freedata service support

The capabilities of NGN evolution for supporting freedata service support the requirements identified in clause 7 as follows:

- freedata service data policy management capabilities support the requirements of freedata service data policy management;
- data identification capabilities support the requirements of data identification;
- accounting and charging capabilities support the requirements of accounting and charging.

8.2 Service stratum capabilities

8.2.1 Freedata service data policy management

Freedata service data policy management requirements are aligned with the requirements of policy management identified in [ITU-T Y.2201], in particular with the following additional requirements:

- managing and storing the policy related to freedata service data identification, and freedata service accounting and charging;
- generating the mapping between NGN end-user information and data identification parameters to be used by the data identification capabilities (e.g., mapping of international mobile equipment identity (IMEI) to an NGN end-user's Internet protocol (IP) address);
- providing the policy related to freedata service data identification to data identification capabilities;
- providing the policy related to freedata service accounting and charging to accounting and charging capabilities.

8.2.2 Service user profile

Service user profile (SUP) is responsible for storing NGN end-user profiles, location related data and presence status data [ITU-T Y.2012].

SUP requirements of NGN evolution for freedata service support are aligned with the functional requirements of SUP in NGN [ITU-T Y.2012] with the following additional requirements:

- supporting NGN end-user terminal information (e.g., IMEI for mobile terminal);
- providing NGN end-user information according to the freedata service data policy to the freedata service data policy management capabilities.

8.2.3 Data identification

Data identification capabilities identify data according to the freedata service data policy's data identification requirements, in support of the following aspects:

- receiving and/or retrieving the policy related to freedata service identification from the freedata service data policy management capabilities;
- providing data identification's analysis results to the accounting and charging capabilities;
- receiving transport traffic from the transport capabilities;
- analysing the transport traffic and extracting transport traffic information according to the policy.

NOTE 1 – Deep packet inspection (DPI) [b-ITU-T Y.2770] is one of the possible technical methods for data analysis, while it is not the mandatory one.

NOTE 2 – The transport traffic information includes the following aspects (details are provided in Appendix II):

- traffic flow information;
- user information;
- combined information.

NOTE 3 – When the number of third party providers involved in freedata service is high, this can imply a large amount of identification tasks which may slow down overall performance. In such deployments, the data identification capabilities may be implemented in two separate steps: at first, the identification of the transport traffic which is not subject to charge for the NGN end user based on specific policy(s), and then, for that transport traffic, the identification of the third party provider which the transport traffic belongs to and is charged for.

8.3 Accounting and charging capabilities

Accounting and charging requirements of NGN evolution for freedata service support are aligned with the functional requirements of charging and accounting function (CAF) in NGN [ITU-T Y.2012] with the following additional requirements:

- with respect to the identified freedata service data consumed by a given NGN end user, generating accounting information and related charging information for the third party provider, according to the data identification' s analysis results;
- receiving the policy related to freedata service accounting and charging from the freedata service data policy management.

8.4 Transport stratum capabilities

The requirements of transport capabilities of NGN evolution for freedata service support are aligned with the functional requirements of access and core transport in NGN [ITU-T Y.2012], with the following additional requirements:

- mirroring the transport traffic to the data identification capabilities.

9 Security considerations of NGN evolution for supporting freedata service

The requirements of NGN evolution for freedata service support are aligned with the NGN security requirements according to [ITU-T Y.2201], [ITU-T Y.2701] and [ITU-T Y.2702].

Appendix I

Scenarios of freedata service

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

The following provides relevant scenarios of, but not limited to, freedata service:

- 1) Unlimited traffic of freedata service for all NGN end users
Any NGN end user would be allowed to use applications associated with freedata service without being charged.
Example use case: when a third party provider produces a new application and wishes to be charged for all its data on behalf of all the NGN end users, the NGN provider would charge the third party provider instead of the NGN end users for all application data.
- 2) Unlimited traffic of freedata service for specific NGN end users
Some NGN end users would be allowed to use applications associated with freedata service without being charged.
Example use case: when a third party provider produces a new office application for its employees (NGN end users) and wishes to be charged for all its data on behalf of its employees, the NGN provider would collect the employees' list and charge the third party provider instead of its employees for all application data.
- 3) Limited traffic of freedata service for specific NGN end users
Some NGN end users would be allowed to use applications associated with freedata service without being charged for limited traffic of the freedata service.
Example use case: when a third party provider produces a new online shopping application and wishes to be charged for 50 Mbyte of freedata service data for a selected set of its customers (NGN end users), the NGN provider would collect the customers' list and charge the third party provider instead of that selected set of customers for the cost corresponding to the 50 Mbyte of freedata service data.
- 4) Limited traffic of freedata service for particular terminals
Some NGN end users using particular terminals would be allowed to use applications associated with freedata service without being charged for limited traffic of the freedata service.
Example use case: when a terminal vendor (third party provider) promotes a new kind of terminal, the first 10000 terminal pieces are bound with a particular value-added service: anyone who uses these terminal pieces would enjoy 100 Mbyte without being charged, independently of any specific application or service. The NGN provider would charge the terminal vendor for the cost corresponding to the 100 Mbyte of freedata service data for all 10000 terminal pieces.
- 5) Unlimited traffic of freedata service for specific NGN end users at particular locations
At particular locations, NGN end users would be allowed to use applications associated with freedata service without being charged for unlimited traffic.
Example use case 1: an e-shopping application provider (third party provider) would be charged for unlimited traffic of its application users (NGN end users) who use its application in specific shopping centres.

Example use case 2: a shopping mall (acting as sponsor of all application providers offering content or services in the mall, then virtually representing a super third party provider) would be charged for unlimited traffic of the customers located in the mall (NGN end users), independently of the specific application they use.

Appendix II

Details on freedata service data policy for data identification

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

In order to enable particular content or service with freedata service, and to support different scenarios such as those described in Appendix I, the following describes key information to be taken into account by the freedata service data policy for data identification:

1) Third party provider content or service information, including one or more of the following information options:

a) Traffic flow information:

According to the open system interconnection (OSI) seven layer model, all the traffic flows are provided with adequately defined information to distinguish themselves from one another. Based on the requirements of freedata service, usable information of a traffic flow includes the following:

- Network layer information:
 - Destination IP address: in a large number of freedata service, the destination IP address is used to identify the third party provider's server, which provides content or service for NGN end users, e.g., 203.0.113.108.
 - Source IP address: for particular NGN end users, the NGN provider is able to provide freedata service by identifying the NGN end user's source IP address, e.g., 198.51.100.32.
- Transport layer information:
 - Port: the port information alone cannot entirely meet the demand of distinguishing particular data. The port information is frequently used in conjunction with an IP address, e.g., 203.0.113.108:6789.
- Application layer information, including but not limited to:
 - Uniform resource locator (URL) (hypertext transfer protocol (HTTP) [b-IETF RFC 2616]) information: as for the data transferred in the HTTP protocol, they are always equipped with a URL, indicating the location of the uniform resource. For instance, for one third party provider with domain name 'abc.com', the third party provider is able to set 'abc.com' in order to identify all services, or set 'news.abc.com' in order to cover a particular news service.
 - User Agent (HTTP protocol [b-IETF RFC 2616]) information: the NGN end user using HTTP protocol to transfer data indicates the type of his/her terminal in the header of the 'User Agent'. A third party provider is able to use this type for data identification: e.g., any data carrying a particular 'User Agent' header is associated with the freedata service.

b) Content or service private information:

All the data flows sent by a particular content or service may be labelled by the third party provider with private information. For instance, one application using HTTP protocol may carry private headers. The NGN provider regards this private information for data identification and, if the data flows carry particular labels, they would be free of charge.

2) NGN end-user information, including one or more of the following information options:

a) Terminal information:

Terminal information is a key information to identify terminals between each other in NGN. For instance, IMEI is used for mobile terminals. In case of mobile terminal, when it is authenticated, the terminal provides the IMEI information to the NGN, and the NGN provider is able to regard this information for data identification.

b) Location information:

Network-based location information (e.g., cell tower identifier (cell ID) and location area code (LAC)) indicates the location of a terminal which can be regarded by the NGN for data identification. If the specific network-based location information matches given criteria, all related data flows sent by the related terminal would be free of charge.

3) Combined information:

The above-mentioned key information can be used separately to identify data according to specific criteria, but it may not always meet all the requirements for identification, especially in complex scenarios (e.g., the scenario number 5 described in Appendix I). So a combination of key information may also be taken into account for data identification.

Examples of combined information include but are not limited to:

- IP 5-tuple: for the third party provider, in order to filter particular data flows, any data matching a given IP 5-tuple, e.g., combination of destination IP address and transportation port, can be associated with freedata service. For instance, the identification filter could be '203.0.113.108:1234'.
- IP 5-tuple + URL: any data matching a given IP 5-tuple + URL, e.g., combination of destination IP address, transportation port and URL, can be associated with freedata service. For instance, the identification filter could be '203.0.113.108:1234 + *.xyz.com'.
- IP 5-tuple + application layer information: any data matching a given IP 5-tuple + Application layer information, e.g., in case of HTTP protocol, combination of a particular User Agent and destination IP address, can be associated with freedata service. For instance, if users use the third party provider's browser to visit a particular web site, these data would carry the User Agent (e.g., 'FastBrowser') of the browser and their destination IP address '203.0.113.108:1234' (which refers to the server of the web site). The identification filter could be 'User Agent (FastBrowser) + 203.0.113.108:1234'.
- Terminal information + location information: any data sent by terminals with particular terminal information at appointed locations can be associated with freedata service. For instance, in case a mobile vendor as third party provider launches a new mobile phone product (e.g., IMEI from 864587029000000 to 864587029999999) which could surf the internet for free at a particular shopping mall (e.g., where cell ID is 21102 and LAC is 0001H), the identification filter could be 'IMEI (864587029XXXXXX) + cell ID (21102) + LAC (0001H)'.

NOTE – As freedata service is based on data identification policy, the information sent by NGN end users is not to be modified in NGN.

The following is an example describing the consequences of such modifications. In order to accelerate data transmission, an NGN provider might deploy a non-transparent Internet cache in NGN, storing the data that NGN end users frequently require. The cache would redirect the NGN end-user requests to the cache storage. In this case, the original destination IP address of the NGN end-user requests would be changed by the redirection to the cache storage's IP address. If destination IP address is used as key information for data identification, the data redirected to the cache cannot be associated with freedata service. This mistakenly generates charging for those data.

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