

International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Series Y

Supplement 22

(06/2013)

SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

ITU-T Y.2200 series – Supplement on greenhouse gas monitoring services provided over NGN

ITU-T Y-series Recommendations – Supplement 22



International
Telecommunication
Union

Documents
Document Sharing Hub

ITU-T Y-SERIES RECOMMENDATIONS

**GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-
GENERATION NETWORKS**

GLOBAL INFORMATION INFRASTRUCTURE

General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899

INTERNET PROTOCOL ASPECTS

General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	Y.1500–Y.1599
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899
IPTV over NGN	Y.1900–Y.1999

NEXT GENERATION NETWORKS

Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Enhancements to NGN	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Packet-based Networks	Y.2600–Y.2699
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899
Carrier grade open environment	Y.2900–Y.2999

FUTURE NETWORKS

Y.3000–Y.3499

CLOUD COMPUTING

Y.3500–Y.3999

For further details, please refer to the list of ITU-T Recommendations.

Supplement 22 to ITU-T Y-series Recommendations

ITU-T Y.2200 series – Supplement on greenhouse gas monitoring services provided over NGN

Summary

Information communication technologies (ICTs) play an important role with regard to greenhouse gas (GHG) monitoring. GHG monitoring is an integral part of the global initiative to reduce greenhouse gases in an attempt to resolve climate change issues. The next generation network (NGN) is considered to be a communications platform suited to support the GHG monitoring task. This supplement describes general aspects of the GHG monitoring issue, and it provides requirements and required functions. In addition, a service model and functional architecture for a GHG monitoring service are presented. NGN-based GHG monitoring service scenarios are also presented.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y Suppl. 22	2013-06-28	13	11.1002/1000/11975

Keywords

Climate change, GHG monitoring.

* 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>.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this publication, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this publication is voluntary. However, the publication may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the publication is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the publication is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this publication may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the publication development process.

As of the date of approval of this publication, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this publication. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2014

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

		Page
1	Scope	1
2	References.....	1
3	Definitions	1
	3.1 Terms defined elsewhere	1
	3.2 Terms defined in this supplement.....	1
4	Abbreviations and acronyms	2
5	Conventions	3
6	General description of GHG monitoring services provided over the NGN	3
7	GHG monitoring service requirements.....	5
8	Functional architecture for GHG monitoring services provided over the NGN	6
9	Interactions between the NGN and GSNs for GHG monitoring	8
10	Service scenarios for the GHG monitoring over the NGN.....	8
	10.1 GHG inventory management.....	9
	10.2 Provision of the GHG monitoring information to users.....	11
	10.3 GHG accounting.....	12
	10.4 GHG reporting.....	15
11	Security considerations	18
	Appendix I – Principles for GHG accounting and reporting	19
	Bibliography.....	20

Introduction

Climate change has been a major concern for many years. Concerns relate to changes in the weather from what has been the average weather based on empirical data, as well as changes in the distribution of weather events with respect to an average, greater, or smaller number of extreme weather events.

It is man-made climate change which results from the release of GHG (primarily carbon-based emissions), that is of major concern because it appears to be leading to a progressive and accelerated warming of the planet.

One of the main ways in which ICTs can contribute to reducing GHG emissions is through their use in programmes which are implemented to monitor climate change and measure GHG emissions.

GHG emissions can be measured by sensors on the ground, in the air, in vehicles, on tall towers and in aircraft. Sensors for measuring GHG emissions can be used to form a sensor network. Sensor networks created to monitor and measure GHG emissions, known as GHG sensor networks (GSN), could provide measured data which can be captured and placed into an inventory and may then be provided to service providers. The processed and captured GHG-related data could be appropriately formatted and then provided to users located anywhere in the world using the NGN, which is a global infrastructure.

This supplement describes the service model and scenarios for a GHG monitoring service over an NGN that has an interactive real-time reporting capability and which can cover a wide geographical area such as a mountain, a farmer's field, a large forest, a sea, an industrial area or a rural area using GHG sensor networks.

Supplement 22 to ITU-T Y-series Recommendations

ITU-T Y.2200 series – Supplement on greenhouse gas monitoring services provided over NGN

1 Scope

This supplement describes greenhouse gas (GHG) monitoring systems and how they can be used in conjunction with next generation networks (NGNs) to provide a GHG monitoring service. Specifically, this supplement defines:

- service requirements for GHG monitoring systems which use the NGN
- a service model for GHG monitoring systems which use the NGN
- service scenarios for GHG monitoring systems which use the NGN.

2 References

- [ITU-T L.1410] Recommendation ITU-T L.1410 (2012), *Methodology for the assessment of the environmental impact of information and communication technology goods, networks and services*.
- [ITU-T L.1420] Recommendation ITU-T L.1420 (2012), *Methodology for energy consumption and greenhouse gas emissions impact assessment of information and communication technologies in organizations*.
- [ITU-T Y.2069] Recommendation ITU-T Y.2069 (2012), *Terms and definitions for the Internet of things*.
- [ITU-T Y.2703] Recommendation ITU-T Y.2703 (2009), *The application of AAA service in NGN*.

3 Definitions

3.1 Terms defined elsewhere

This supplement uses the following terms defined elsewhere:

None.

3.2 Terms defined in this supplement

This supplement defines the following terms:

3.2.1 certified emission reduction (CER): A type of emissions unit (or carbon credit) issued in support of the clean development mechanism (CDM).

3.2.2 clean development mechanism (CDM): A Kyoto Protocol mechanism which is discussed in Article 12 of the Kyoto Protocol, and which is intended to assist developing countries in meeting their greenhouse gas emission obligations.

3.2.3 data adaptation function: The data adaptation function enables and facilitates interaction between the GHG inventory provider functions and the GHG monitoring service provider functions, by adapting the format of the data from GHG inventory provider functions to that of the GHG monitoring service provider functions.

3.2.4 data analysis function: A function which is required to analyse the raw data from a sensor-based measuring function to determine, based on the analysed results, the updates that should be made to an inventory database and to perform an update to the inventory database.

- 3.2.5 direct GHG emissions:** The amount of GHG emissions directly measured by a GSN.
- 3.2.6 greenhouse gas (GHG):** Any one or more of the six gases identified as the major greenhouse gases in the Kyoto Protocol; carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).
- 3.2.7 GHG inventory:** A type of emission inventory that performs an accounting of the amount of pollutants discharged into the atmosphere, containing the total emissions for one or more specific greenhouse gases or air pollutants, originating from all source categories in a certain geographical area and within a specified time span.
- 3.2.8 GHG inventory provider:** A GHG inventory provider owns and maintains a GHG inventory and provides inventory information in response to user requests.
- 3.2.9 GHG inventory provider functions:** The functions required to support a GHG inventory provider.
- 3.2.10 GHG monitoring:** All activities directly related to the accounting and reporting of direct GHG emissions and indirect GHG reductions.
- 3.2.11 GHG monitoring service provider:** A GHG monitoring service provider offers a service that collects data from GHG inventory providers and transports it via an NGN.
- 3.2.12 GHG monitoring service provider functions:** The functions required to support a GHG monitoring service provider.
- 3.2.13 GHG sensor network (GSN):** The sensor network consisting of systems, elements and nodes that measure the amount of GHG emissions and collect the associated relevant data.
- 3.2.14 indirect GHG reductions:** The amount of GHG reductions determined by calculation of factors that indirectly affect GHG emissions.
- 3.2.15 inventory database:** The inventory database is the database that stores GHG emission data which has been produced by a data analysis function.
- 3.2.16 NGN network provider:** An NGN network provider owns the NGN infrastructure and offers a service which is used to transport the service information, e.g., via an NGN to the users.
- 3.2.17 network interface function:** The network interface function enables the delivery of the service data from GHG monitoring service provider functions over NGN by providing interfaces to the NGN via an application network interface (ANI) or a service network interface (SNI).
- 3.2.18 sensor-based measuring function:** The function required to collect data related to GHG emission measurements from GHG sensor networks and to deliver the collected data to a data analysis function.
- 3.2.19 service user profile:** The service user profile is a database that stores the user data including the user subscription status, billing and logging dates.
- 3.2.20 user management function:** The user management function uses information stored in the service user profile to identify users who are authorized users and to grant them access rights to services.

4 Abbreviations and acronyms

This supplement uses the following abbreviations and acronyms:

AAA	Authentication, Authorization and Accounting
ANI	Application Network Interface
CDM	Clean Development Mechanism

CER	Certified Emission Reduction
DB	Database
GHG	Greenhouse Gas
GSN	GHG Sensor Network
NGN	Next Generation Network
NNI	Network Network Interface
QoS	Quality of Service
SNI	Service Network Interface
UNI	User Network Interface

5 Conventions

None.

6 General description of GHG monitoring services provided over the NGN

In order to resolve the issue of GHG emissions causing climate changes, it is essential to consider GHG monitoring services, as the processed and captured GHG-related data could be appropriately formatted and then be provided to users located anywhere in the world using an NGN as the global infrastructure, and in the form of a GHG inventory.

GHG inventories are a type of emission inventory that is an account of the amount of pollutants discharged into the atmosphere. They usually contain the total emissions for one or more specific greenhouse gases or air pollutants, originating from all sources within a certain geographical area and within a specified time span, usually a specific year. A GHG inventory is generally characterized by the following aspects: the types of activities that cause emissions; the chemical or physical identity of the pollutants included; the geographical area covered; the time period over which emissions are monitored and the methodology used. GHG inventories can be used for both scientific applications and policy processes.

Scientists use inventories of natural and anthropogenic emissions (which are emissions relating to or resulting from the influence of human beings on nature), as tools when developing atmospheric models. Policy makers use inventories to develop strategies and policies for emission reduction and to track the progress of those policies. Regulatory agencies and corporations rely on inventories to establish compliance records with allowable emission rates. Businesses, the public and other interest groups use inventories to better understand the sources and trends related to emissions. The proliferation of the use of GHG inventories could demand a more convenient and more user-friendly means for accessing data. Moreover, the infrastructure with security and assured quality of service (QoS) can be provided via an NGN that would be a good candidate for supporting inventory-related services required by users. In this supplement, a GHG inventory-related service provided over an NGN is called the GHG monitoring service provided over an NGN.

Users may request a GHG monitoring service from a GHG monitoring service provider via an NGN managed by an NGN network provider. Users may also request GHG inventory data from a GHG monitoring service provider. When the information request is received, the GHG monitoring service provider will check the availability of the requested information in the GHG inventory with the help of GHG inventory providers. If it is possible, the GHG inventory providers will deliver the requested GHG inventory data to the GHG service provider who will then forward the data via the NGN to the user who requested the data. Figure 1 shows the service model for this procedure.