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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

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

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Table of Contents

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 (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

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.

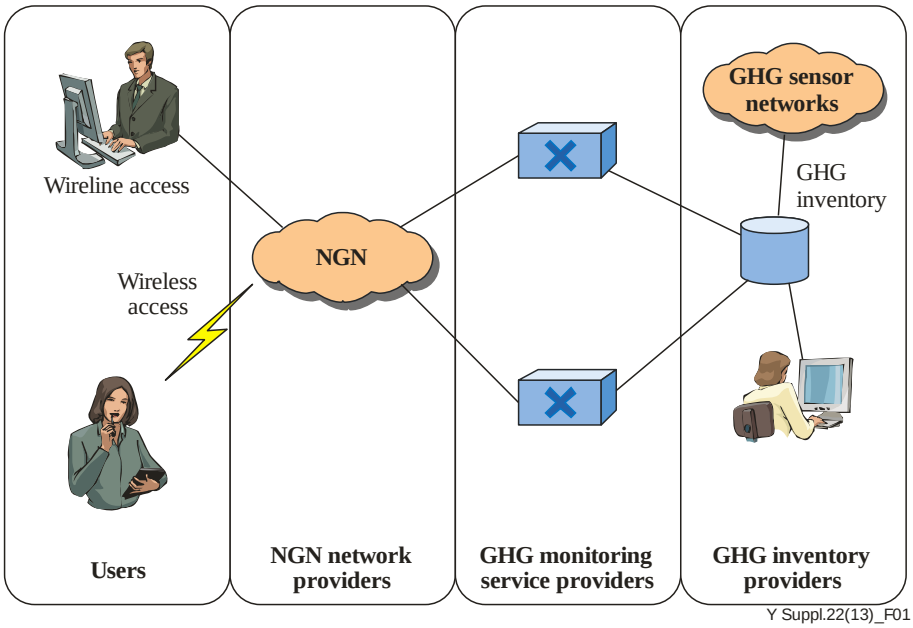

Figure 1 – Service model of GHG monitoring services provided over the NGN

The four roles in the service model relate to each other, as shown in Figure 2 and these roles are explained below:

- Users subscribe to services provided by NGN network providers for service provision and transport capabilities.
- Users subscribe to services provided by GHG service providers for GHG inventory-related information.
- NGN network providers and GHG monitoring service providers cooperate with each other according to the contract between them for the transport of data; the latter party pays the former party according to the contract that was made between them. For example, a GHG monitoring service provider uses an NGN network provider's network facilities both to pass data between itself and GHG inventory providers and between itself and NGN network providers. In this example, the GHG monitoring service provider pays the NGN network provider according to the contract that was made between them.
- GHG inventory providers provide GHG inventory-related information to GHG monitoring service providers according to the contract between them.
- Users do not have a direct business relationship with GHG inventory providers, as users obtain their GHG inventory data because of their business relationship with GHG monitoring service providers.

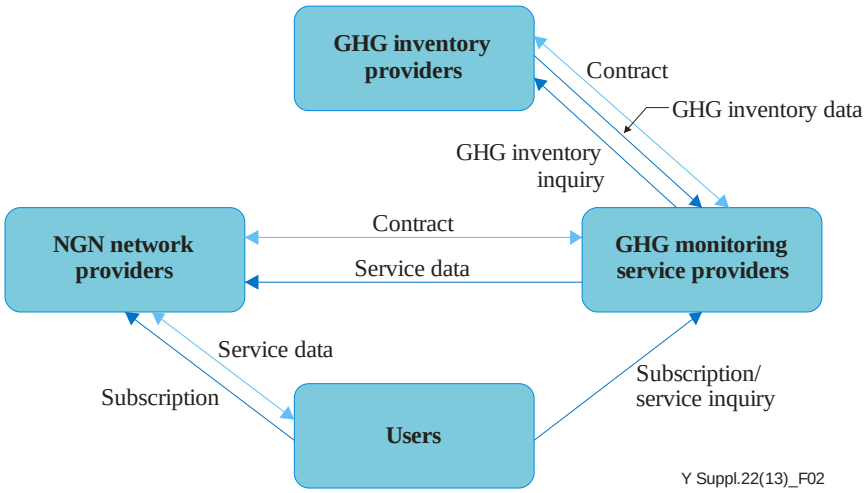

Figure 2 – Business relations for the GHG monitoring service

Before describing a service scenario for a GHG monitoring service, the requirements for a GHG monitoring service are presented. The requirements for a GHG monitoring service are provided in the following clause.

7 GHG monitoring service requirements

To provide a GHG monitoring service, considerations on both the general requirements regarding GHG accounting/reporting principles and the requirements based on NGN capabilities must be taken into account. Appendix I notes that GHG accounting and reporting shall be based on several principles, such as relevance, completeness, consistency, transparency and accuracy.

The following bulleted items show how the identified requirements in the first sentence align with the principles identified in the second sentence:

- GHG inventories need to be appropriately structured and managed to comply with the relevance principle. The GHG inventory framework must capture and be able to report information that meets the users' needs.
- GHG inventories need to be created from raw data using consistent methodologies to comply with the consistency principle. Unless consistent methodologies are used to create GHG inventory entries it would be impossible to make meaningful comparisons of emissions over time or between different GHG inventories.
- GHG inventories developed using consistent methodologies must disclose when calculations involving the use of assumptions are required, as well as the assumptions made. An audit trail must also be kept. If these requirements are met, then the transparency principle will also have been addressed.
- Calculated GHG reductions need to use consistent methodologies when dealing with direct emission data measurements and when dealing with the accounting and reporting of all indirect GHG reductions to comply with both the completeness and accuracy principles. Considering both direct and indirect GHG reductions within a chosen inventory boundary ensures that all the appropriate information is captured. Use of consistent methodologies which ensure that uncertainties are reduced as far as practical will automatically ensure accuracy.
- A kind of sensor network is required for collecting measured data of GHG emissions and this sensor network is comprised of sensor nodes consisting of sensor(s) and optional actuator(s) capable of sensed data processing and networking [ITU-T Y.2069].

- GHG inventory providers are required to:
  - maintain the inventory database (DB), which is the repository system or function for storing the GHG monitored data, including the direct/indirect GHG emission data and GHG reduction amounts;
  - interact with GHG sensor networks to obtain measured GHG emissions;
  - analyse the received GHG data and calculate the GHG reduction amount.
- GHG monitoring service providers are required to:
  - maintain a secure data transaction capability between the GHG monitoring service providers and the GHG inventory providers by adapting the data format;
  - filter the data from/to the user and apply authentication, authorization and accounting (AAA) [ITU-T Y.2703] procedures and others as appropriate;
  - maintain a secure data transaction capability through the NGN and between the GHG monitoring service provider and the user by appropriate means;
  - maintain the user service profile, which is the repository system or function which stores the user-related information used for user identification and user authentication.
- NGN network providers are required to:
  - support communications, using the NGN application/service support functions, between the GHG inventory providers and the GHG monitoring service providers and between the GHG monitoring service providers and the users.

The above listed requirements present an outline that helps to understand the features and relevant issues associated with the GHG monitoring service. The service scenarios for the GHG monitoring service could be used to explain the internal features of the service according to these requirements. Before describing the service scenarios, the functional architecture will be discussed. The functional architecture for GHG monitoring over NGN is described in the following clause.

8 Functional architecture for GHG monitoring services provided over the NGN

The requirements associated with each provider in clause 7 can be satisfied by newly defined functions which could be associated with each of those providers. Hence, the necessary functions which could be supported by each provider are identified below.

Figure 3 shows the functional architecture for GHG monitoring services provided over an NGN. Considering the need to satisfy the requirements of each of the service roles of the various service providers, as identified above, the functional architecture for the GHG monitoring service recognizes the need to support these requirements and thus identifies the following functions within the architecture:

- GHG inventory provider functions:
  - Data analysis function: The function used to analyse the received GHG data and to calculate the GHG reduction amount.
  - Inventory DB function: The repository system or function which is used to store the GHG monitored data including the direct/indirect GHG emission data and GHG reduction amounts.
  - Sensor-based measuring function: The function for measuring direct GHG emissions by interacting with GHG sensor networks.
- GHG monitoring service provider functions:
  - Data adaptation function: The function used to provide a secure data transaction capability between the GHG monitoring service provider and the GHG inventory provider by adapting the format of data.

  - User management function: The function used to process data from/to the user including the invocation of AAA procedures as well as others.
  - Network interface function: The function used to provide a secure data transaction capability for data transfer over the NGN and between the GHG monitoring service provider and the user by appropriate means.
  - Service user profile function: The function used to provide a repository system which stores the user-related information used for user identification and user authentication.
- NGN functions:
  - Application/Service support function: The function used to initiate data transfer capabilities between users and GHG monitoring service providers and GHG monitoring service providers and GHG inventory providers.
  - Transport stratum function: The function which provides the transport facilities for data transfers between users and GHG monitoring service providers and GHG monitoring service providers and GHG inventory providers.

The GHG sensor network architectural element refers to a set of GHG inventory provider function actions which include:

- The collection of GHG emission-related measurement data from GHG sensor networks.
- The analysis of the received GHG emission-related measurement data.
- The determination of the new information that should be added to the GHG inventory as a result of the data analysis and the entry of this data into the database.
- The adaptation of the GHG inventory data into an appropriate data format which allows it to be exchanged. This adaptation function will be applied in response to a data request which has been authorized by the user management function.

The service user profile architectural element refers to a set of GHG monitoring service provider actions which include:

- maintenance of a repository that contains relevant information about a user;
- interacting with the user management function to invoke AAA processes.

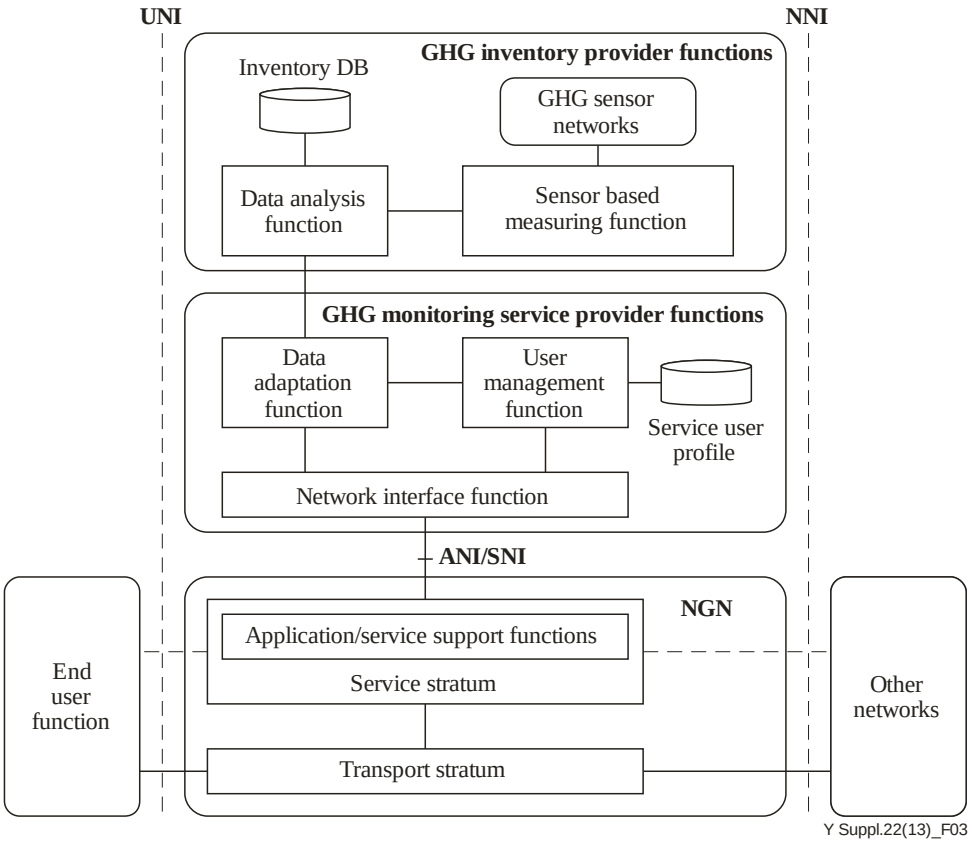

Figure 3 – Functional architecture for the GHG monitoring services provided over the NGN

9 Interactions between the NGN and GSNs for GHG monitoring

GHG sensor networks can interact with an NGN via a user network interface (UNI) or a network network interface (NNI). The GHG sensor network functions as a customer premises network when interacting via a UNI, whereas it functions as another network when interacting via an NNI. Functionally, GHG sensor networks are tightly coupled with the sensor-based measuring function of GHG inventory provider functions, as shown in Figure 3.

10 Service scenarios for the GHG monitoring over the NGN

Users of a GHG monitoring service can be classified as belonging to one of two types: those who use and manage GHG monitoring information and those that only use it. Scientists or GHG inventory experts could belong to the former while policy makers, regulatory agencies and corporations usually belong to the latter. In addition, users may want to have access to the service whenever and wherever they want. Therefore, the GHG monitoring service over NGN could include service features for managing the GHG inventory and allow for ubiquitous service features like GHG monitoring from remote sites. In this operating scenario, GHG accounting and reporting also need to be considered.

Considering these aspects and the requirements described in clause 7 it is appropriate to consider the following service scenarios:

– GHG inventory management
– provision of GHG monitoring information to users
– GHG accounting
– GHG reporting.

10.1 GHG inventory management

The GHG inventory framework which consists of the list for monitoring and the monitoring boundary information, needs to be updated to reflect the latest situation regarding GHG emissions. GHG inventory management includes incorporation of updates to the GHG inventory framework. Users such as scientists, policy makers, regulatory agencies and corporations who maintain their own inventories demand secure connections for managing GHG inventories to preserve confidential lists from external threats. The users can manage the GHG inventory from a remote site, via the NGN, through use of the GHG inventory management service.

10.1.1 Description

Users can manage the GHG inventory locally or globally using connections provided over the NGN. User terminals can be used to request or manage the service.

GHG inventory management involves:

– responding to requests for GHG inventory managing service from persons, organizations or companies;

– performing authentication, authorization and accounting processes in response to requests;

– preparing the required information base according to the requested inventory framework;

– updating the GHG inventory framework;

– adding missed or new items into the inventory;

– deleting unused items from the inventory;

The information flow for each case is described next.

10.1.2 Information flow related to inventory management

Assumptions:

1. The flow shown here is at a high level and not meant to show actual detailed protocol procedures.
2. Procedures for subscription are omitted from these flows. Users are assumed to have already subscribed to the NGN network providers and GHG monitoring service providers.
3. The details of the inventory are beyond the scope of this supplement.

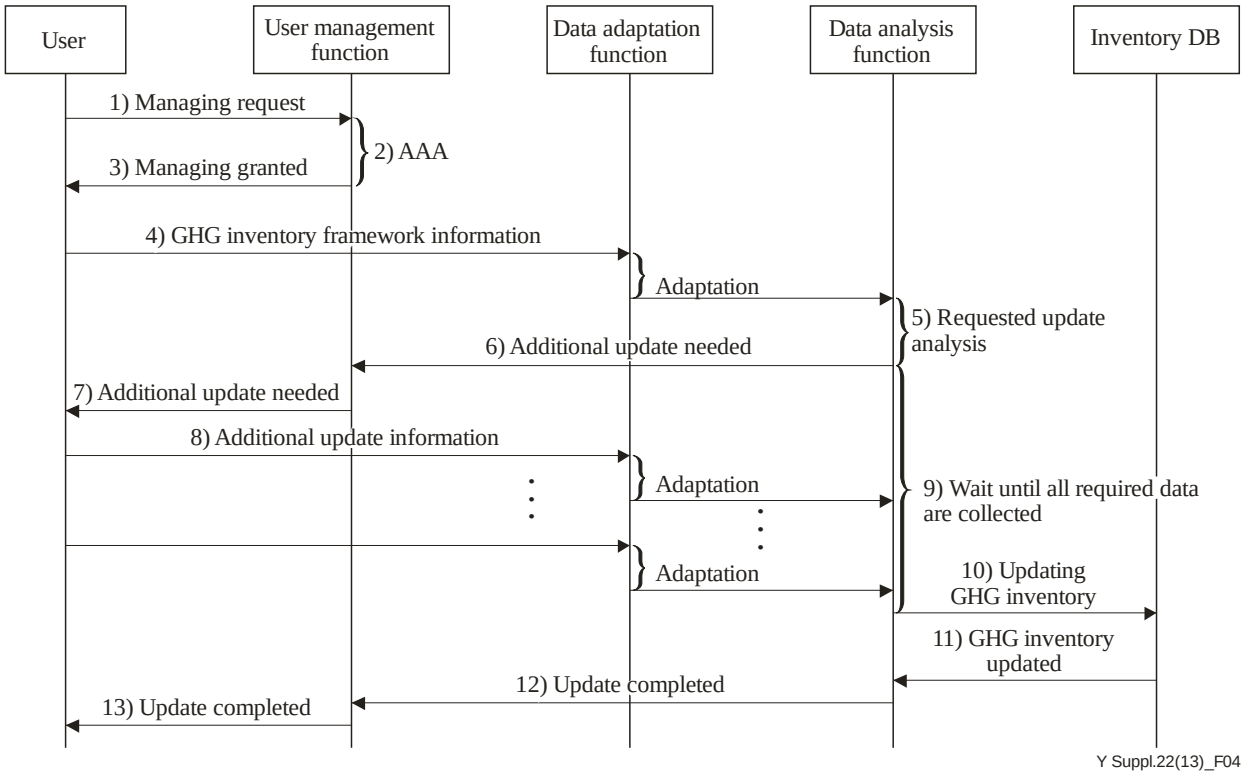

Figure 4 – Information flow for GHG inventory management

Flow descriptions:

1. The user initiates a managing request to the user management function, (via a UNI and an application network interface (ANI)).
2. The user management function carries out the AAA procedure in response to the user request using the related information in the service user profile.
3. If the AAA result is valid then the user management function notifies the user that it will accept and respond to the managing request by sending a grant signal to the user which includes the data adaptation function. Otherwise, it notifies the user that the request has been denied.
4. The user sends the requested GHG inventory framework information to the data analysis function via the data adaptation function.
5. The data analysis function analyses the received GHG inventory framework information and determines whether additional updates are necessary in the inventory DB. If additional updates are not needed, skip to step 10.
6. The data analysis function notifies the user management function that an additional update is needed.
7. The user management function notifies the user that an additional update is needed.
8. The user sends the additional update information to the data analysis function via the data adaptation function.
9. The data analysis function collects the additional update information from the user. If additional updates are not needed it skips to step 10, otherwise it returns to step 6 until all the required data is collected.
10. The data analysis function updates the GHG inventory DB by applying the received framework (and update information, as appropriate).
11. The data analysis function detects that the GHG inventory updates are completed.

12. The data analysis function responds to the user management function with an indication that the update has been completed.
13. The user management function responds to the user with an indication that the update has been completed.

10.2 Provision of the GHG monitoring information to users

The GHG inventory is only allowed to be monitored or accessed by authorized users or terminals. Users such as scientists, policy makers, regulatory agencies and corporations demand secure connections for monitoring GHG inventories and to keep confidential all information that is exchanged, especially when they want to monitor the GHG inventories on a real-time basis from anywhere and everywhere. The users can monitor the GHG inventory at remote sites through NGNs by using this service feature.

10.2.1 Description

Users can monitor the GHG inventory at any local or remote site if they can connect to the NGN. User terminals can be used to request or manage the service features.

Provision of the GHG monitoring information to users involves:

– initiation of requests for GHG monitoring data by persons, organizations or companies from remote sites;
– performing authentication, authorization and accounting processes in response to requests;
– preparing the required information according to the requested monitoring items;
– transferring the prepared information to the users or terminals at the remote site.

Users can monitor GHG data from a GHG inventory DB from a remote site. The information flow is described next.

10.2.2 Information flow for the provision of GHG monitoring information to users

Assumptions:

1. The flow shown here is at a high level and not meant to show the actual detailed protocol procedures.
2. Procedures for subscription are omitted in these flows. Users are assumed to have already subscribed to the NGN network providers and GHG monitoring service providers.
3. The details of the inventory and GHG monitoring information are beyond the scope of this supplement.

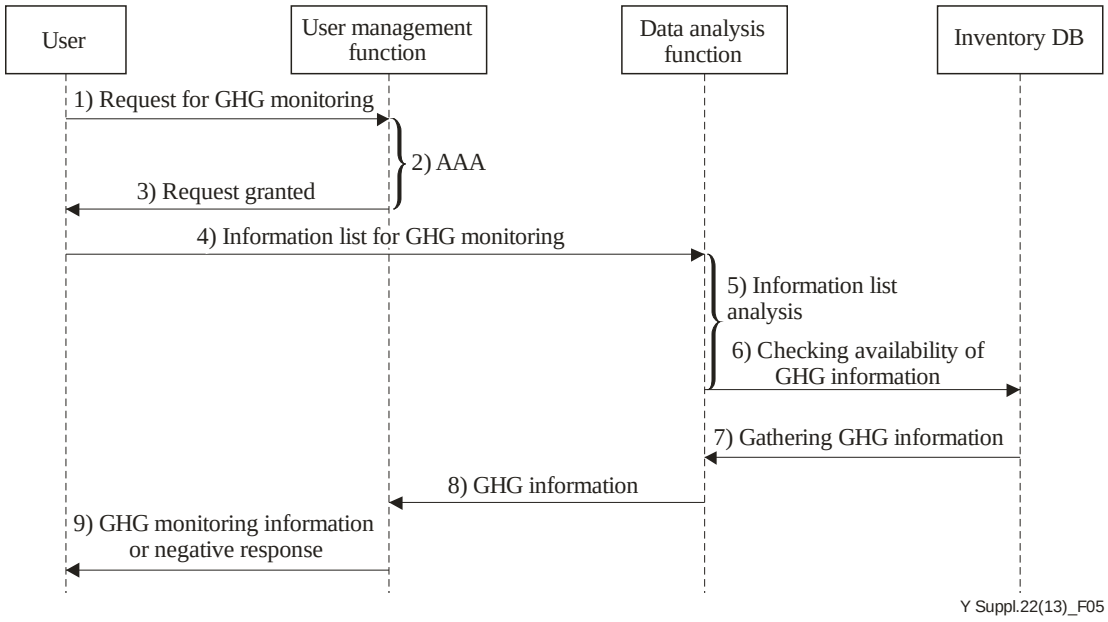

Figure 5 – Information flow for the provision of GHG monitoring information to users

Flow descriptions:

1. The user initiates a request for GHG monitoring data to the user management function.
2. The user management function carries out the AAA procedures in response to the request, using the related information in the service user profile.
3. If the AAA result is valid then the user management function notifies the user that it will accept and respond to the GHG monitoring data information request. Otherwise, it notifies the user of the denial of the service request.
4. The user sends the requested information list related to GHG monitoring, which includes monitoring boundaries and monitored duration, to the data analysis function.
5. The data analysis function analyses the received request for information lists.
6. The data analysis function checks the availability of the requested information from the GHG inventory DB. If the requested information is not available, it skips to step 9.
7. The data analysis function gathers the appropriate GHG monitoring information data from the GHG Inventory DB according to the requested information list.
8. The data analysis function delivers the GHG monitoring information data to the user management function.
9. The user management function sends the prepared information (or negative response after step 6) to the user that placed the request for information.

10.3 GHG accounting

Accounting associated with GHG monitoring is regarded as one of the main GHG roles as it is this process that can identify reductions in GHG. The GHG inventory could be continuously updated to reflect not only the measured or direct GHG emission amount from GSN information but it also could be updated to reflect indirect GHG reduction. The environmental and GHG emission impact of ICT could be included in this category (see [ITU-T L.1410] and [ITU-T L.1420]). The resulting GHG reduction amounts could fulfil an important role in the trading of certified emission reduction (CER) credits when operating within the clean development mechanism (CDM) process. Using the NGN to support GHG accounting may assist in vitalization of this business.

10.3.1 Description

GHG reduction is accomplished not only by the reduction of the direct emissions of GHG but also by the reduction of the indirect emissions of GHG from changes in many factors such as a change of facilities to new ones and a reduction in electricity consumption. The amount of direct GHG emission reduction is mainly determined by measuring GHG emissions using GSNs. However, the amount of indirect GHG reduction is determined through calculations that take into consideration many factors.

GHG accounting involves:

– collecting the direct GHG emission amount from GSNs and/or collecting or computing indirect GHG reduction data obtained from persons, organizations or companies at local and remote sites;

– performing calculation processes to obtain the GHG reduction amounts;

– updating the GHG inventory to reflect the calculated GHG reduction amounts.

User terminals can affect the GHG reduction amount data by reporting changes that may cause the GHG reduction. The GHG reduction amounts will be affected by the GSN data reporting of direct GHG emission measurements at the sensor nodes. The information flow for each case of direct and indirect GHG reduction is described next.

10.3.2 Information flow for the GHG accounting for indirect GHG reduction

Assumptions:

1. The flow shown here is at a high level and not meant to show the actual detailed protocol procedures.
2. Procedures for subscription are omitted from these flows. Users are assumed to have already subscribed to the NGN network providers and GHG monitoring service providers.
3. The details of the GHG inventory and calculations associated with GHG accounting are beyond the scope of this supplement.

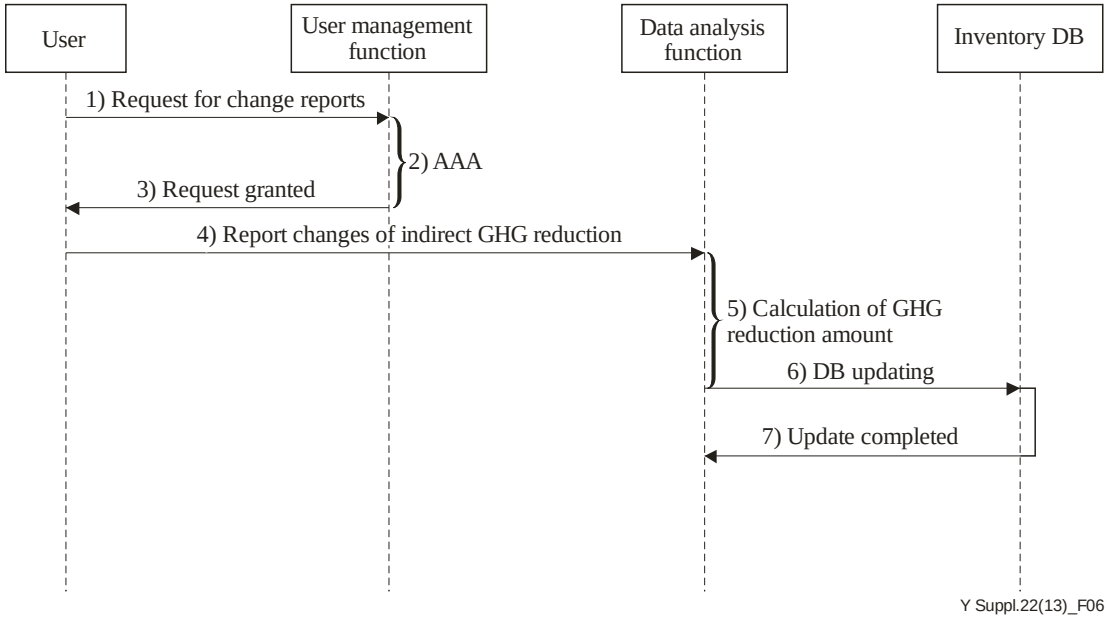

Figure 6 – Information flow for the GHG accounting for indirect GHG reduction

Flow descriptions:

1. The user requests permission to report changes, associated with indirect GHG emission reduction calculations, to the user management function (via a UNI and an ANI).
2. The user management function carries out the AAA procedure in response to the request, using the related information in the service user profile.
3. If the AAA result is valid then the user management function notifies the user that it will accept and respond to reported changes. Otherwise, it notifies the user of the denial of the service request (via a UNI and an ANI).
4. The user reports the changes causing the GHG emission reduction such as a change of facilities to new ones and a reduction in electricity consumption to the data analysis function (via a UNI and an ANI).
5. The data analysis function calculates the GHG reduction amount from the received information relating to the indirect GHG reduction and determines what information should be added to the inventory DB.
6. The data analysis function updates the inventory DB with the data associated with the update.
7. The data analysis function perceives that the inventory DB update has been completed.

10.3.3 Information flow for the GHG accounting for direct GHG emission

Assumptions:

1. The flow shown here is at a high level and not meant to show the actual detailed protocol procedures.
2. Procedures for subscription are omitted from these flows. Users are assumed to have already subscribed to the NGN network providers and GHG monitoring service providers.
3. The details of the GHG inventory and calculations associated with GHG accounting are beyond the scope of this supplement.

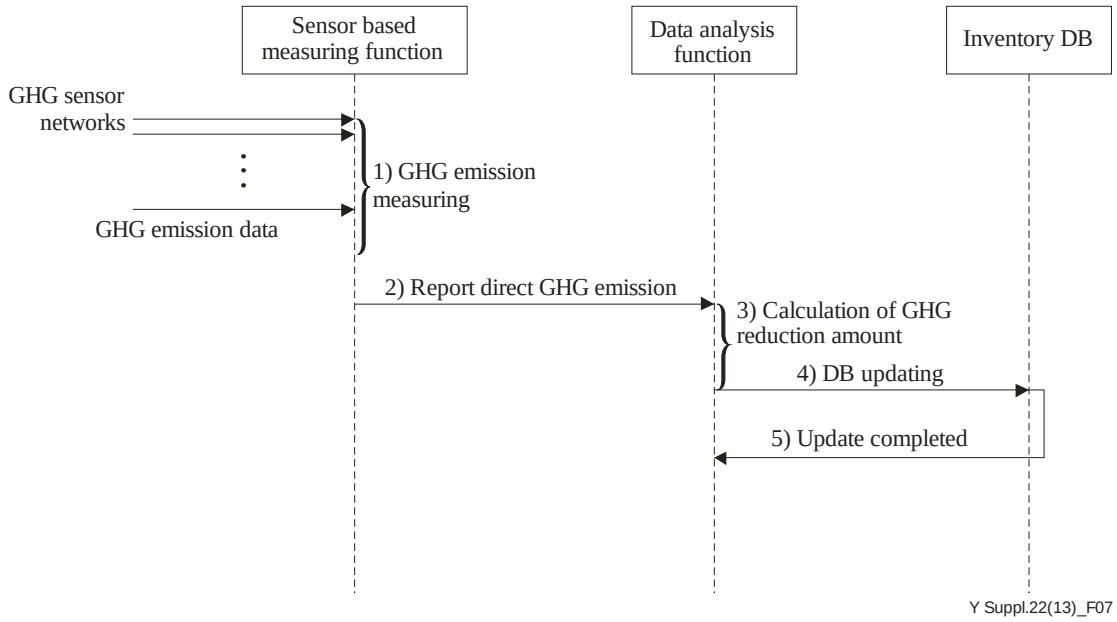

Figure 7 – Information flow for the GHG accounting for direct GHG reduction

Flow descriptions:

1. The sensor-based measuring function, which is part of a GHG sensor network, measures direct GHG emissions.
2. The sensor-based measuring function reports the measured GHG emission amount to the data analysis function.
3. The data analysis function calculates the GHG reduction amount from the received direct GHG emission data.
4. The data analysis function updates the inventory DB with the data associated with the update.
5. The data analysis function detects that the inventory DB update has been completed.

10.4 GHG reporting

The GHG reduction amount is reported to the users periodically (e.g., annually, monthly or weekly), or in response to user demands. The users can check the GHG reduction amount from the reports periodically or whenever they decide to do so.

10.4.1 Description

Users can check the GHG reduction amounts by accessing GHG inventories located locally or globally if they can connect to the NGN.

GHG reporting involves:

– initiation of requests for information in GHG inventories to the GHG monitoring service providers; requests may be made for periodic reporting or for one-time requests;
– performing authentication, authorization and accounting processes in response to requests;
– gathering the required GHG emission information;
– determining the GHG reduction amounts from the gathered information;
– transferring the GHG reduction amount information reports to the users.

Users may subscribe to a service that provides GHG reduction amounts periodically or to a service in which this information is available on-demand. The information flow for each case is described next.

10.4.2 Information flow for periodic GHG reporting

Assumptions:

1. The flow shown here is at a high level and not meant to show the actual detailed protocol procedures.
2. Procedures for subscription are omitted from these flows. Users are assumed to have already subscribed to the NGN network providers and GHG monitoring service providers.
3. The details of the inventory and GHG reporting information are beyond of the scope of this supplement.

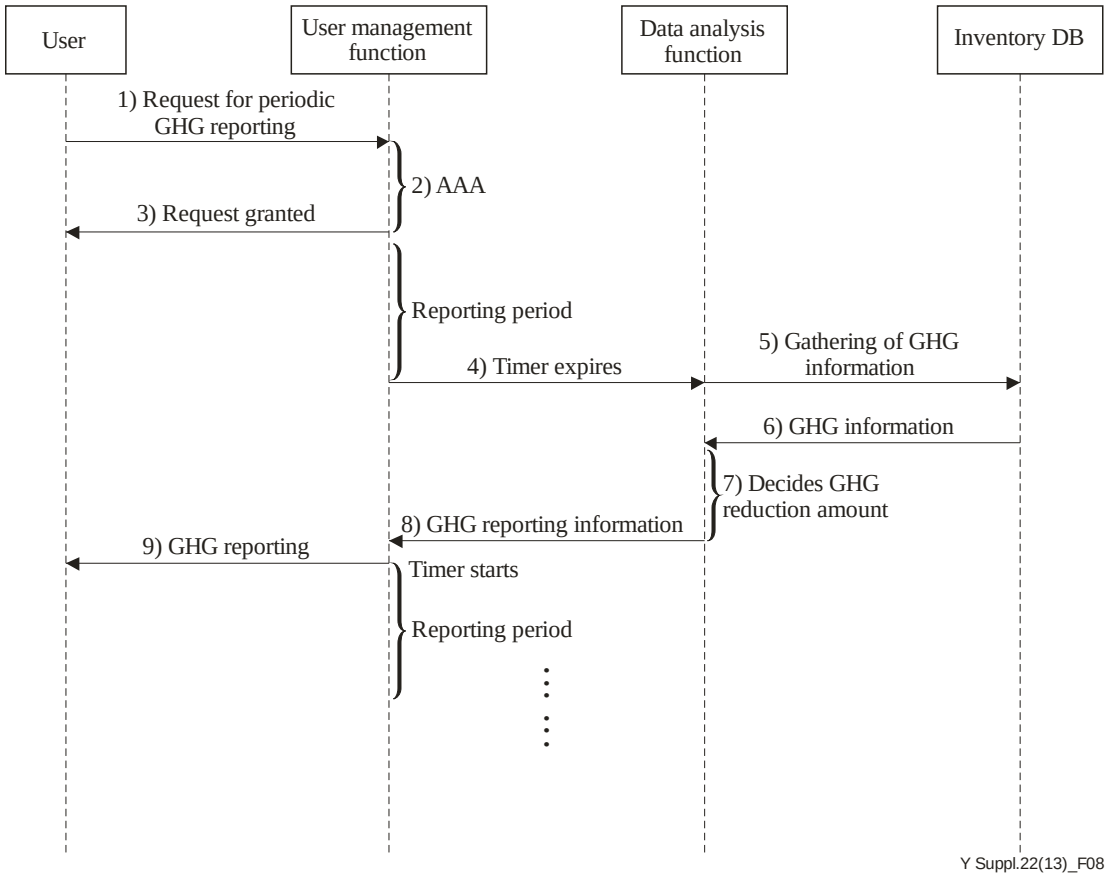

Figure 8 – Information flow for periodic GHG reporting

Flow descriptions:

1. The user terminal initiates a request for periodic GHG reporting to the user management function (via a UNI and an ANI). The request includes the duration between each reporting event (e.g., year, month, day).
2. The user management function carries out the AAA procedure in response to the user request, using the related information in the service user profile.
3. If the AAA result is valid then the user management function notifies the user that it has accepted the request for periodic reporting and starts the timer for tracking the report period. Otherwise, it notifies the user terminal of the denial of the service request (via a UNI and an ANI).

   NOTE – If a user wishes to obtain a report prior to the timer expiring the first time, the user must use the GHG reporting on-demand service.
4. When the timer expires, the user management function starts the actions necessary to prepare the periodical report by notifying the data analysis function that a report is required.
5. The data analysis function gathers information from the GHG inventory DB.
6. The GHG data from the GHG inventory DB are transferred to the data analysis function.
7. The data analysis function determines the GHG reduction amounts.
8. The data analysis function sends the produced report to the user management function and starts the timer again.
9. The user management function provides the produced report to the user.

10.4.3 Information flow for on-demand GHG reporting

Assumptions:

1. The flow shown here is at a high level and not meant to show the actual detailed protocol procedures.
2. Procedures for subscription are omitted from these flows. Users are assumed to have already subscribed to the NGN network providers and GHG monitoring service providers.
3. The details of the inventory and GHG reporting information are beyond of the scope of this supplement.

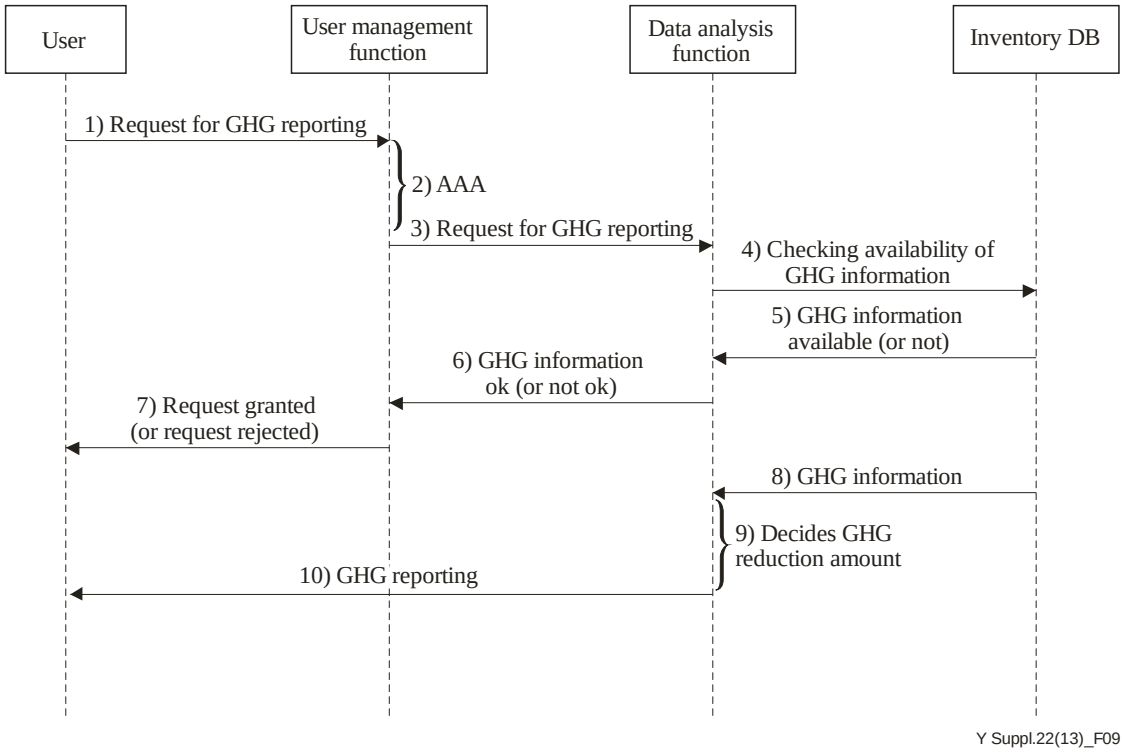

Figure 9 – Information flow for on-demand GHG reporting

Flow descriptions:

1. The user initiates a request for a GHG inventory emission data report to the user management function.
2. The user management function carries out the AAA procedure in response to the user request, using the related information in the service user profile.
3. If the AAA result is valid then the user management function requests the data analysis function to check the availability of the requested GHG information in the inventory DB.
4. The data analysis function checks the availability of the requested GHG information in the inventory DB.
5. The data analysis function detects whether or not the requested GHG information is available in the inventory DB.
6. The data analysis function notifies the user management function as to whether or not the required GHG information is available.
7. The user management function provides a response to the user indicting that the request for information has been accepted and a report will be issued, or that the request has been rejected because the requested information is unavailable.

8. The inventory DB sends the gathered GHG monitoring information data to the data analysis function.
9. The data analysis function determines the GHG reduction amounts.
10. The data analysis function sends the produced report to the user.

11 Security considerations

As various services are provided in the NGN, new concerns and threats unknown in the legacy networks, may be encountered. Therefore, additional measures may be required to guarantee at least the current level of security.

While no specific guidance is provided in this supplement in regards to security, implementers should be aware of the security information that is published in [b-ITU-T X.805], [b-ITU-T Y.2701] and [b-ITU-T Y.2702].

Appendix I

Principles for GHG accounting and reporting

According to the GHG protocol published by the World Resources Institute (WRI), GHG accounting and reporting shall be based on the following principles:

– Relevance: Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users, both internal and external to the company.

– Completeness: Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.

– Consistency: Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods or any other relevant factors in the time series.

– Transparency: Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

– Accuracy: Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

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