International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.2122

Amendment 1

(11/2011)

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

Next Generation Networks – Quality of Service and performance

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Flow aggregate information exchange functions in NGN

Amendment 1: Information model

Recommendation ITU-T Y.2122 (2009) – Amendment 1

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Recommendation ITU-T Y.2122

Flow aggregate information exchange functions in NGN

Amendment 1

Information model

Summary

Recommendation ITU-T Y.2122 specifies the requirements for flow aggregate information exchange functions (FIXF) in NGNs. This Amendment extends ITU-T Y.2122 and defines the information model for the FIXF. The information model represents the data structure of the flow aggregate (FA) table entry defined in ITU-T Y.2122. It is essential for FA information to be exchanged in an unambiguous way.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y.2122	2009-06-29	13
1.1	ITU-T Y.2122 (2009) Amd. 1	2011-11-29	13

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

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation 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 Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. 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/.

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1) Clause 3, Definitions

Add the following new definitions to clause 3 and list them in alphabetical order:

3.3bis FIXF entity: One of the three functional entities, i.e., the FIE-FE, the FIG-FE, or the FIM-FE, defined in flow aggregate information exchange (FIXF).

3.5bis flow aggregate information element: A protocol and encoding-independent description of attributes about the characteristics (e.g., the total number of flows) and treatments (e.g., number of hops in the aggregation region) of a specific flow aggregate (FA), an arbitrary collection of multiple FAs, or an aggregation region.

3.5ter flow aggregate information model: An abstraction and representation of the entities regarding flow aggregates, their properties, attributes and operations, and the way that they relate to each other.

NOTE – Flow aggregate information model is independent of protocol, encoding, or implementation.

3.8bis information model: An abstraction and representation of the entities in a managed environment as well as their properties, attributes and operations, and way of relating to each other.

NOTE – Information model is independent of any specific repository, application, protocol or platform.

2) Clause 4, Abbreviations and acronyms

Add the following new abbreviations and acronyms to clause 4:

IE Information Element

T.E Table Entry

3) Clauses 9 and 10

Renumber existing clause 9, Security considerations, as clause 10, and add the following text as a new clause 9:

9 Information model

FIXF entities are required to support the information model defined in this clause.

9.1 The structure of FA information message and FA table

The FIXF information model has a hierarchical data structure with entities such as FA information message, FA table, FA table entry, sets, and FA information elements (IEs). Figure 9-1 describes the hierarchical structure of the FIXF information model. FA IE is the basic building block of the data structure. Sets are either composed of a set of IE identifiers or a set of IE values. The FA information message and FA table entry (T.E) are composed of the sets. The FA table is composed of the T.Es. Descriptions of each item are given in separate clauses.

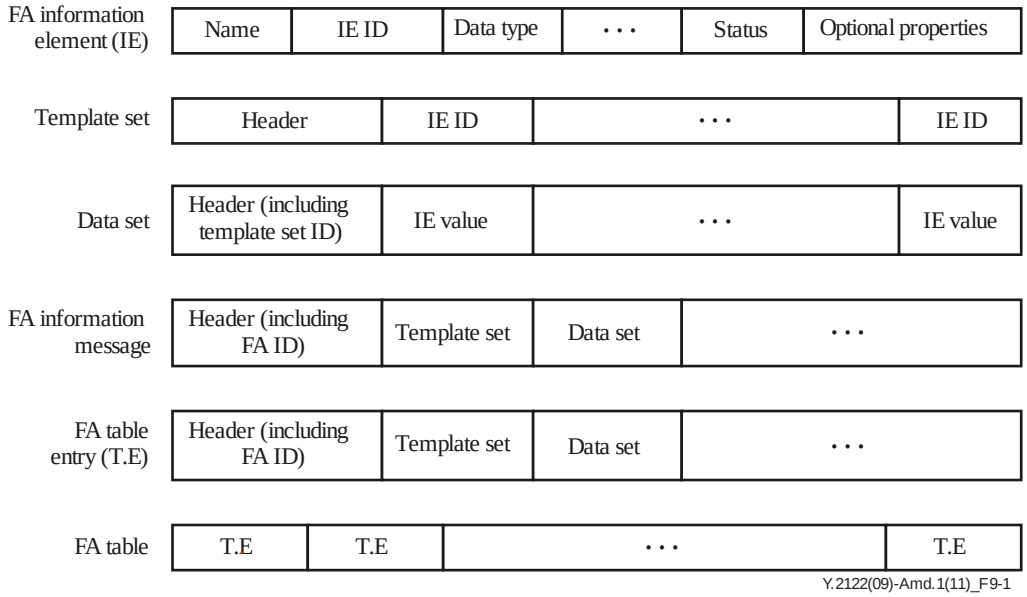

Figure 9-1 – The hierarchical structure of the FIXF information model

9.1.1 FA information elements and sets

FA IEs capture attributes of a specific flow aggregate, an arbitrary collection of multiple FAs, or an aggregation region (AR). An attribute may be either a characteristic (e.g., the total number of flows) or a treatment (e.g., number of hops in the aggregation region). FA IE is required to be the basic entity of the FA information model hierarchy. FA IE is required to have the mandatory and optional properties (see clause 9.2). FA IE is also required to have the identifier associated with it. The IEs may be distributed from a central entity or dynamically decided among the entities. The determination and distribution mechanisms are out of scope of this Recommendation. Examples of the IE can be seen in Appendix VIII. How an IE is encoded is also out of the scope of this Recommendation.

The sets (including data set, template set, or other sets to be defined in the future), are the building blocks of the FA information message and FA table entry. The template set specifies the IEs to be included in the data sets. The data set carries the values of the IEs specified in the template set. A data set is thus required to indicate the template set that determines the IE values that the data set has to carry. The FA information message and the FA table entry may consist of one or more sets.

9.1.2 FA table and FA table entry

It is required that the FIXF supports the addition, update, and deletion of FA information in the FA table. An FA table may be stored in a FIXF entity. An FA table may contain one or more entries. An FA table entry may contain one or more sets. How an FA table is implemented is out of the scope of this Recommendation.

9.1.3 FA information message

Information among FIFX entities is exchanged through FA information messages. An FA information message may contain one or more sets.

The FIXF information message may have a format similar to the FA table entry. The FA information message is required to have a message header and at least one data or template set. An FA information message may be constructed directly from an FA table with a new message header for transfer between FA entities.

Many forms of the FA information message are possible. Some examples of the structures of an FA information message are:

1) An FA information message consisting of an arbitrarily interleaved template and data sets, as depicted below:

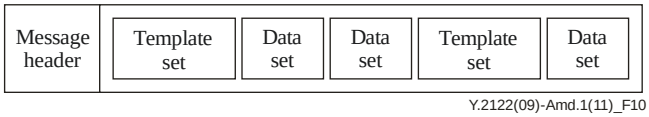

Figure 9-2 – An example of an FA information message

2) An FA information message consisting entirely of data sets:

   After the appropriate template records have been defined and transmitted to the collecting entity, the majority of the FA information message consists solely of data sets.

3) An FA information message consisting entirely of template sets.

For detailed FA information message examples, see Appendix IX.

9.2 Properties in the information element of FIXF

An IE specified for the FIXF is required to have the following properties:

- Name – the name of the IE.
- Element ID – the identifier of the IE.
- Description – the explanation of the IE and possibly how this IE is derived from the flow aggregate, or other information available to the observer.
- Data type – the data type of the IE. For example, the data type can be unsigned8 ranged from 0 to 255 or a string of 4 octets for the IPv4 address or 6 octets for the MAC address.
- Status – the status of the specification of this IE. For example, the status value can be 'current', 'deprecated', or 'obsolete'.

Proprietary IEs are required to have the additional property as defined below:

- Proprietary tag –the proprietary tag indicating whether this IE is used for enterprise use only. Enterprises and institutions may wish to define IEs for enterprise-internal purposes.

An IE specified for the FIXF reference points or by any future extension may have the following properties defined:

- Data type semantic –additional detail describing the data type.
- Unit – the unit of measure for the IE, for example, second or microsecond.
- Range – the range of values that can be assigned to the IE, for example, 0 through 511 inclusive.
- Reference – the additional references that further define the IE or provide additional context for its use, for example, a document such as an ITU-T Recommendation or a uniform resource locator (URL).

The FIXF is required to allow further limiting of the IE scope. By default, most IEs have a scope of "a specific flow aggregate". Further definitions for the scope of the IE are required to be possible, for example, for the aggregation region or a subset of the flow aggregate.

IEs to be exchanged are conveyed by an FA table entry. Table 2 in clause 8.3 in this Recommendation specifies the IE that may be gathered, stored, updated, and exchanged over networks at the reference points.

4) New Appendix VIII

Add the following new Appendix VIII:

Appendix VIII

Information element examples for flow aggregate information exchange functions (FIXF)

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

Examples of IEs for attributes of flow aggregates in flow aggregate information exchange functions (FIXF) are given below.

The description in these examples is in between a general high-level description and the actual protocol-dependent format. These examples are not intended to specify detail of the stage 3 level.

1) *FA ID*
   - Name: FA ID (identifier)
   - Description: a value assigned for recognition of a flow aggregate. This value is locally unique; i.e., it is meaningful only between the exchanging entities.
   - Data type: variable length string
   - Data type semantics: identifier

2) *Number of flows within the FA*
   - Name: number of flows within the FA
   - Description: the number of flows within the FA.
   - Data type: integer
   - Data type semantics: number

3) *Maximum sum of Rs divided by link capacity*
   - Name: maximum sum of Rs divided by link capacity
   - Description: the maximum value of the sum of sustainable transfer rates (Rs) of flows within the FA divided by the link capacity, among all the links the FA traverses in the aggregation region.
   - Data type: real number
   - Data type semantics: number

5) New Appendix IX

Add the following new Appendix IX:

Appendix IX

Typical message examples for flow aggregate information exchange functions (FIXF)

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

Consider the case where FIE-FE resides in domain *A* as shown in Figure IX.1. Assume that the FIE-FE has three FA table entries, each of which corresponds to different flow aggregate, to FIE-FE in domain *B*.

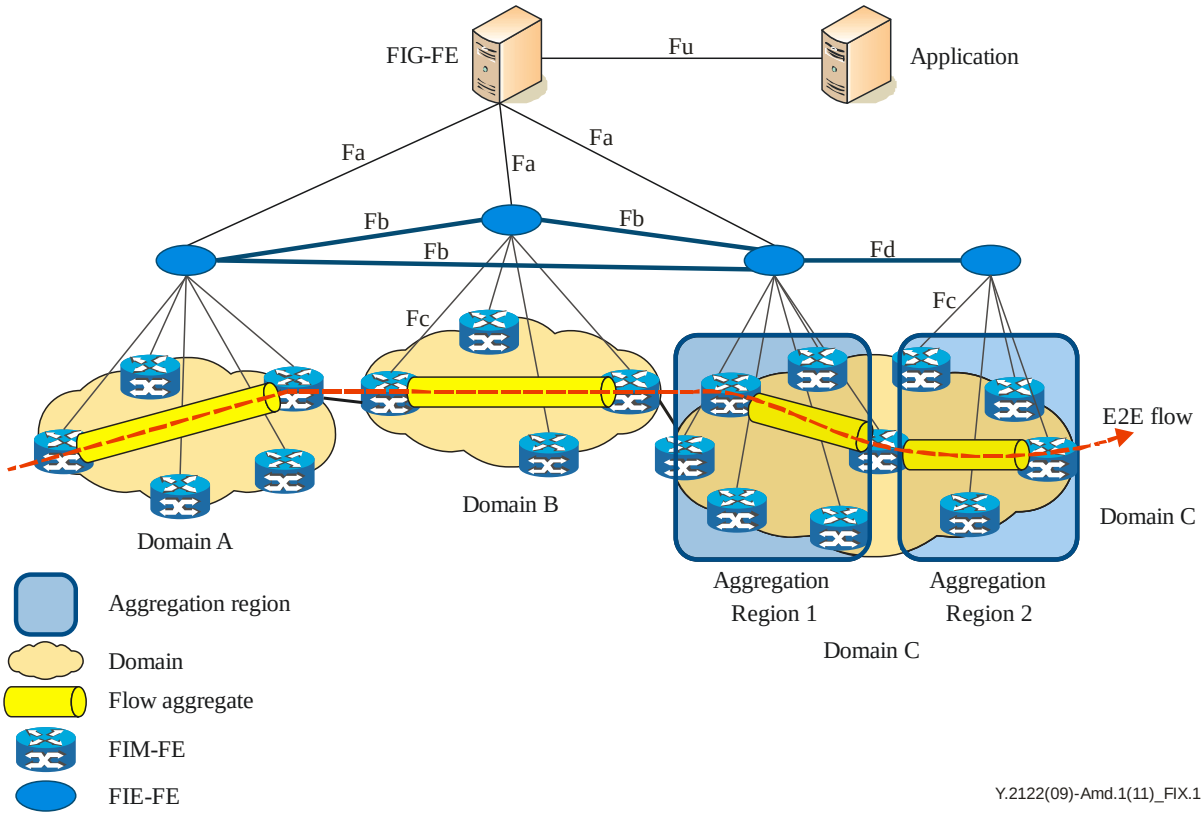

Figure IX.1 – An example of implementation topology for FA information exchange

Further assume that the FA information messages have different IEs:

- FA information messages 1 and 2 for FAs 1 and 2 have the following same IEs.
- FA identifier.
- Number of flows within the FA.
- Maximum sum of Rs divided by link capacity.
- Maximum sum of Bs divided by link capacity.

FA information message 3 for FA 3 has the following IEs. (As can be noticed, FA table entry 3 is rather network-specific control information):

- Maximum number of flows within the FA among all the FAs in the network.
- Maximum number of hops within the domain, over a path of any flow.
- Maximum number of ARs in the network.

In this case, the FIXF message may look like this:

Y.2122(09)-Amd.1(11)_FIX.2a

The template set for the FA information messages1 and 2 indicates the IEs to exchange as follows:

Template ID 1	
0	FA identifier
0	Number of flows within the FA
0	Maximum sum of Rs divided by link capacity
0	Maximum sum of Bs divided by link capacity

The 0s in front of the IEs indicate that their scopes have the default value "flow aggregate".

The template set for the FA information messages 3 indicates the IEs to exchange as follows:

Template ID 2	Field count 3
0	Maximum number of flows within the FA among all the FAs in the network
0	Maximum number of hops within the domain, over a path of any flow
0	Maximum number of ARs in the network

The 0 at the front of each entry in the template set indicates that this IE is not proprietary-specific. Enterprises and institutions may define their IEs with proper registrations.

The two data sets following the first template set may look like this:

Set ID 1	Field count 8
31 (FA identifier, e.g., MPLS label for FA 1)	
127 (Number of flows within the FA 1)	
0.1 (Maximum sum of Rs within FA 1 divided by link capacity)	
2.4 (Maximum sum of Bs divided by link capacity)	
17 (FA identifier, e.g., MPLS label for FA 1)	
242 (Number of flows within the FA 1)	
0.25 (Maximum sum of Rs within FA 1 divided by link capacity)	
4.6 (Maximum sum of Bs divided by link capacity)	

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Printed in Switzerland
Geneva, 2012