
Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >	
Title	QoS management Primitives for Service flow management	
Date Submitted	2005-07-21	
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Re:	Contribution on comments to IEEE 802.16g-04/03r3	
Abstract	In this contribution, we propose to define some primitives for QoS management.	
Purpose	Adoption	
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QoS management primitives for Service flow management

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1. Problem Statement

To provide end-to-end QoS, each network provider involved in the QoS connection should support QoS functions and service level agreements, and have available resources to satisfy a QoS requirement of service flow. In other words, a QoS service flow request from an end host can be delivered to the other end host and approved at each network provider. This QoS requirement in the QoS service flow request should be represented as an abstract form because each service provider may have different QoS policy. To provide QoS service flow from MS/SS, QoS information in the service flow should be exchanged between BS and access networks (including NCMS). The QoS information from the MS/SS may be transformed to IETF standard format such as RSVP or a proprietary format according to the QoS policy.

In this contribution, we would like to define some primitives which are included in service flow management SAPs in order to support QoS for each flow. In addition, we introduce some examples of service flow management.

2. Summary of the Proposed Remedy

In this contribution, we define 12 primitives to support service flow management between BS and access network (NCMS) which are described briefly in the following table.

Primitive	Direction	Primitive Contents
ASF.request	BS -> NCMS	Transaction ID, MS ID, Service flow descriptor, Service flow information , CS parameter information
ASF.confirm	NCMS -> BS	Transaction ID, Service flow descriptor, MS ID, Service flow ID, Service flow information , CS parameter information, service flow error parameter information
ASF.indication	NCMS -> BS	Transaction ID, MS ID, Service flow ID, Service flow descriptor, Service flow information, CS parameter information
ASF.response	BS -> NCMS	Transaction ID, Service flow ID, Service flow descriptor, Service flow information, CS parameter information, service flow error parameter information
CSF.request	BS -> NCMS	Transaction ID, MS ID, Service flow ID, Service flow information, CS parameter information
CSF.confirm	NCMS -> BS	Transaction ID, Service flow ID, Service flow information , CS parameter information, service flow error parameter information

CSF.indication	NCMS -> BS	Transaction ID, MS ID, Service flow ID, Service flow information, CS parameter information
CSF.response	BS -> NCMS	Transaction ID, Service flow ID, Service flow information, CS parameter information, service flow error parameter information
DSF.request	BS -> NCMS	Transaction ID, Service flow ID
DSF.confirm	NCMS -> BS	Transaction ID, Service flow ID, service flow error parameter information
DSF.indication	NCMS -> BS	Transaction ID, Service flow ID
DSF.response	BS -> NCMS	Transaction ID, Service flow ID, service flow error parameter information

Figure 1, 2 and 3 show an example of QoS mapping between a BS and a NCMS when the RSVP in network side is applicable. Flow service messages such as DSA, DSC and DSD will be transformed into “PATH” and “RESV” in RSVP messages [1] [2]. Service flow information such as delay, minimum traffic rate and so on are mapped to “flow spec” in RSVP. CS parameter information such as IP addresses, ports and so on are mapped to “filter spec” in RSVP.

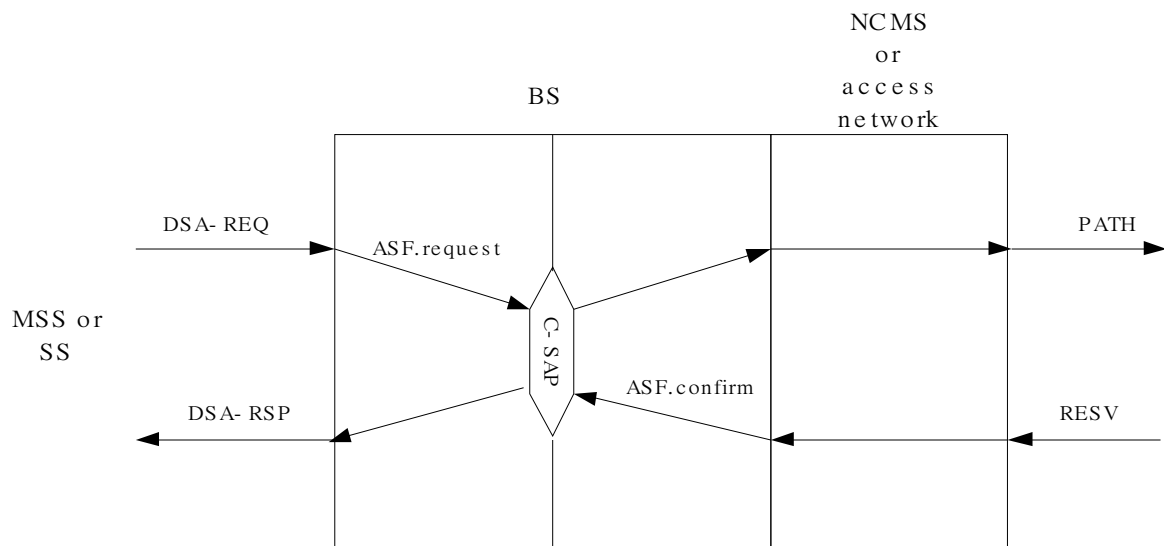


Figure 1. An example of QoS mapping between a BS and a NCMS in case of SS/MS-initiated service creation

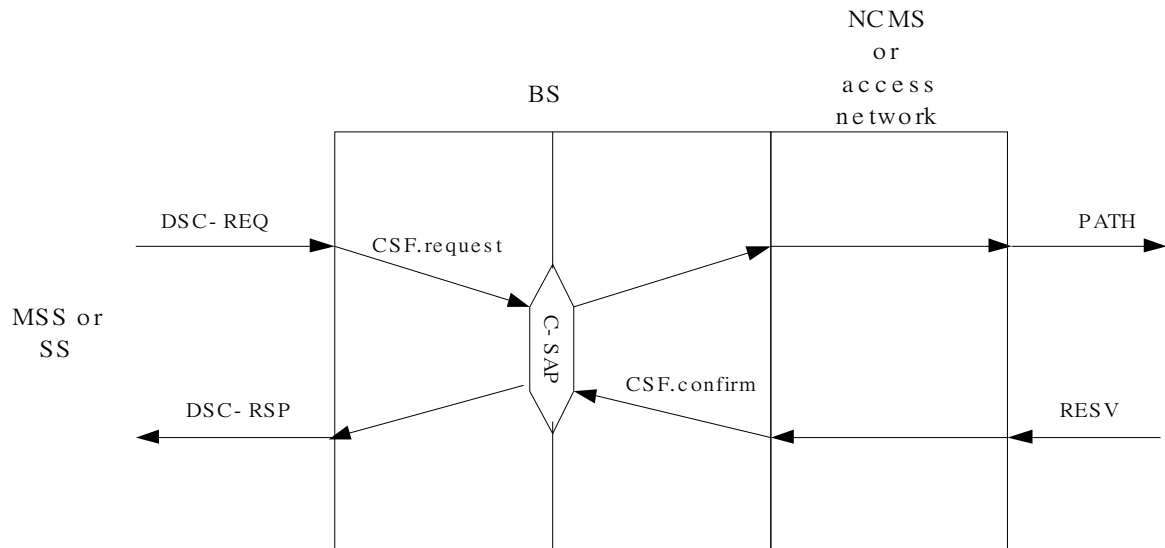


Figure 2. An example of QoS mapping between a BS and a NCMS in case of SS/MS-initiated service update

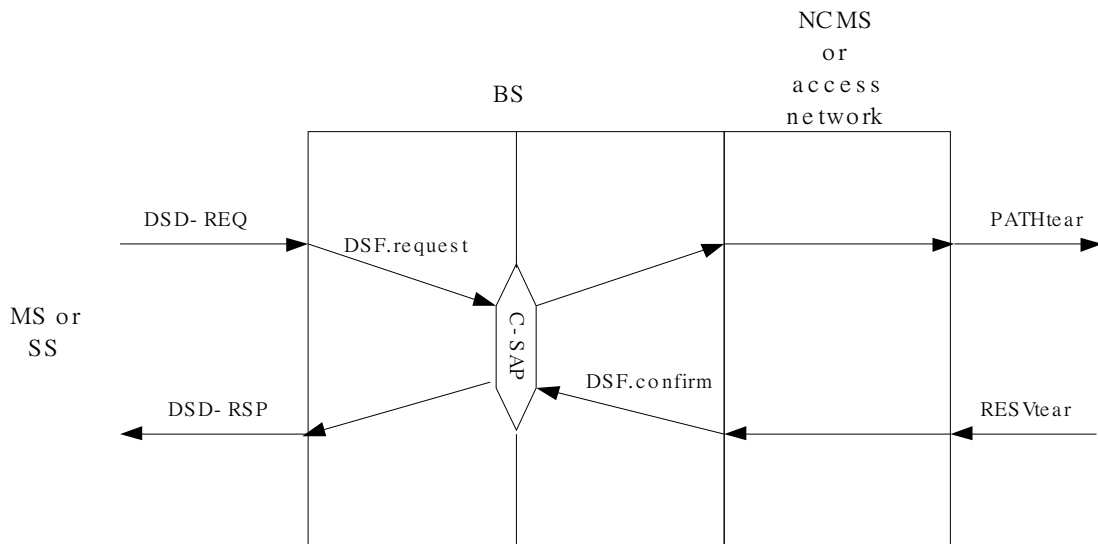


Figure 3. An example of QoS mapping between a BS and a NCMS in case of SS/MS-initiated service deletion

3. Proposed Text Changes

[Modify section 14.5.6.4 as follow]

14.5.6 Service Flow Management

14.5.6.4 QoS Management

The QoS Management Primitives are a set of primitives for supporting QoS management between BS and NCMS (access network). They are defined to support QoS service flows. A service flow ID is created and managed by the NCMS (or a network entity). A unique identifier of all SAPs is service flow ID because the service flow ID can only be identified in a network operator. The CID is only managed in MAC layer in a BS. MS ID in ASF request and CSF request is used to authorize the MS whether the QoS information is permitted.

Service flow application clients that interact with CS convergence layer should transform service flow information and CS parameter information to appropriate parameters of network protocol in network side and in reverse direction. How to convert specific QoS parameters between 802-16-Service-Flow and Network Flows is out of scope. Network side protocol modules such as RSVP, COPS (Common Open Policy Service) and SNMP (Simple Network Management Protocol) have better convert the specific QoS parameters between two sides. The service flow management primitives are designed as 2-way handshake style because resource reservation protocols in IETF and primitives at the 802.16 MAC SAP are designed as 2-way handshake style but service flow messages in IEEE 802.16d is designed as 3-way handshake style to negotiate QoS requirements in a service flow.

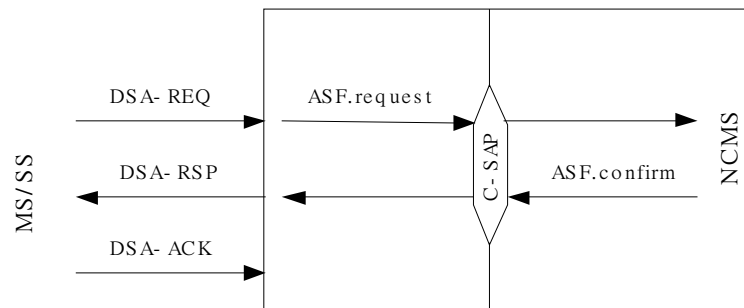


Figure 1. Example of primitive flow for SS/MS-initiated service flow

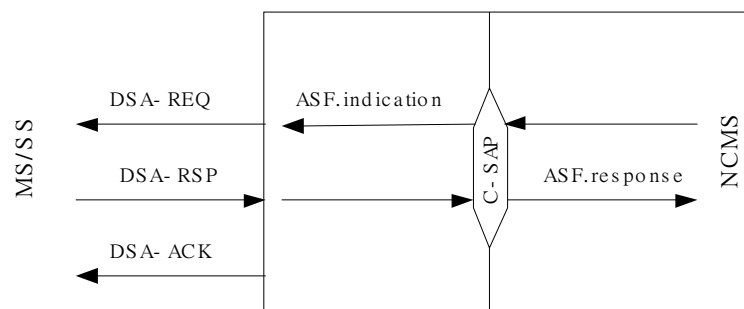


Figure 2. Example of primitive flow for BS-initiated service flow

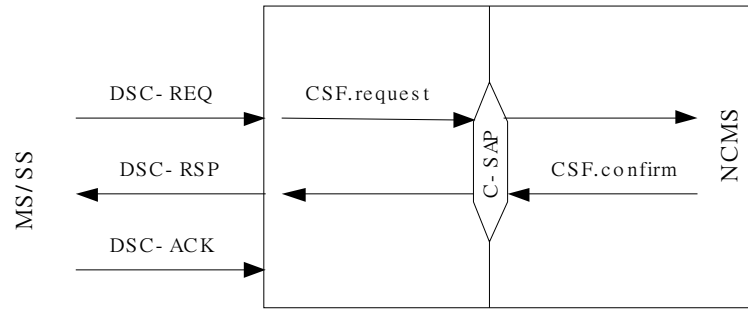


Figure 3. Example of primitive flow for SS/MS-initiated service flow

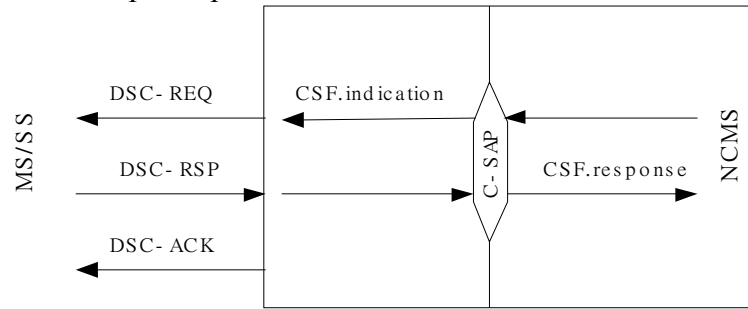


Figure 4. Example of primitive flow for BS-initiated service flow

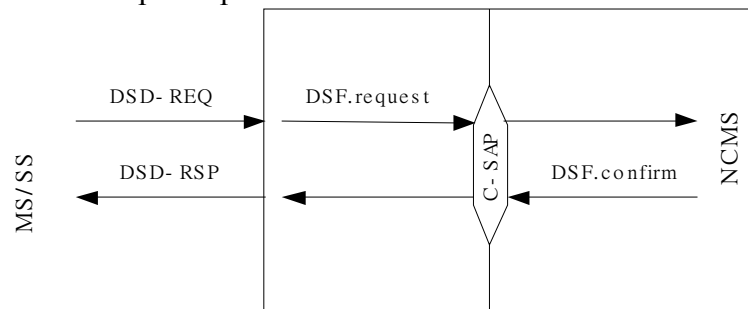


Figure 3. Example of primitive flow for SS/MS-initiated service flow

Figure 4. Example of primitive flow for BS-initiated service flow

14.5.6.4.1 Add_Service_Flow.request (ASF.request)

14.5.6.4.1.1 Function

This primitive is used by a BS to inform an QoS information from an MS of the QoS management entity in NCMS.

14.5.6.4.1.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Add_Service_Flow.request

```
(
    Transaction ID
    MS ID
    Service flow descriptor
    Service flow information
    CS parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

MS ID

48-bit unique identifier used by MS. MS ID is used for user authorization

Service flow descriptor

Information regarding the attribute an uplink or downlink service flow

Service flow information

Required QoS information of a service flow include traffic characteristics and a scheduling type such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, service flow scheduling type, tolerate jitter and maximum latency

CS parameter information

Required IP filter rules of a service flow such as packet classification rule and IPv6 flow label

14.5.6.4.1.3 When generated

This primitive is generated when a BS receives a DSA-REQ message.

14.5.6.4.1.4 Effect of receipt

The QoS management entity in NCMS shall respond to this primitive by sending Add_Service_Flow.confirm. The management entity for service flows checks the validity of the request from the point of view of its own resources. If the request is accepted, the QoS management entity in NCMS creates unique service flow ID for the request.

14.5.6.4.2 Add_Service_Flow.confirm (ASF.confirm)

14.5.6.4.2.1 Function

This primitive is used by the QoS management entity in NCMS to response the ASF.request from a BS. Service flow information in ASF response has approved QoS information if the ASF.request is accepted.

14.5.6.4.2.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Add_Service_Flow.confirm

```
(
    Transaction ID
    MS ID
    Service flow ID
    Service flow descriptor
    Service flow information
    CS parameter information
    Service flow error parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

MS ID

48-bit unique identifier used by MS. MS ID is used for user identification

Service flow ID

Unique identifier to identify a service flow

Service flow descriptor

Information regarding the attribute an uplink or downlink service flow

Service flow information

Approved complete QoS information of a service flow such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, service flow scheduling type, tolerate jitter and maximum latency

CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

Service flow error parameter information

Failed reason and every specific failed QoS parameter if a ASF request is rejected

14.5.6.4.2.3 When generated

This primitive is generated when the QoS management entity in NCMS responds to Add_Service_Flow.request primitive.

14.5.6.4.2.4 Effect of receipt

This primitive informs the result of the service flow creation of a BS. A BS receiving the primitive shall transmit DSA-RSP message following the information provided by this message.

14.5.6.4.3 Add_Service_Flow.indication (ASF.indication)**14.5.6.4.3.1 Function**

This primitive is used by the QoS management entity in NCMS to inform QoS information. Service flow information and service flow ID are included in ASF.indication of a BS.

14.5.6.4.3.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Add_Service_Flow.confirm

```
(
    Transaction ID
    MS ID,
    Service flow descriptor
    Service flow ID
    Service flow information
    CS parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

MS ID

48-bit unique identifier used by MS.

Service flow descriptor

Information regarding the attribute an uplink or downlink service flow

Service flow ID

Unique identifier to identify a service flow such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, service flow scheduling type, tolerate jitter and maximum latency

Service flow information

Approved complete QoS information of a service flow

CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

14.5.6.4.3.3 When generated

This primitive is generated when the QoS management entity in NCMS informs QoS information of a BS.

14.5.6.4.3.4 Effect of receipt

A BS receiving the primitive shall transmit DSA-REQ message following the information provided by this message.

14.5.6.4.4 Add_Service_Flow.response (ASF.response)

14.5.6.4.4.1 Function

This primitive is used by a BS to respond the ASF.indication to the QoS management entity in NCMS.

14.5.6.4.4.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Add_Service_Flow.request

```
(
    Transaction ID
    Service flow ID
    Service flow descriptor
    Service flow information
    CS parameter information
    Service flow error parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

Service flow ID

Unique identifier to identify a service flow

Service flow descriptor

Information regarding the attribute an uplink or downlink service flow

Service flow information

Approved complete QoS information of a service flow such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, service flow scheduling type, tolerate jitter and maximum latency

CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

Service flow error parameter information

Failed reason and every specific failed QoS parameter if a ASF request is rejected

14.5.6.4.4.3 When generated

This primitive is generated when a BS receives a DSA-RSP message.

14.5.6.4.4.4 Effect of receipt

This primitive informs the result of the service flow creation of the QoS management entity in NCMS.

14.5.6.4.5 Change_Service_Flow.request (CSF.request)**14.5.6.4.5.1 Function**

This primitive is used by a BS to inform an QoS information from an MS of the QoS management entity in NCMS.

14.5.6.4.5.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Change_Service_Flow.request

```
(
    Transaction ID
```

MS ID
 Service flow ID
 Service flow information
 CS parameter information

)

Transaction ID

A unique sequential identifier of the transaction set by the BS

MS ID

48-bit unique identifier used by MS. MS ID is used for user authorization

Service flow ID

Unique identifier to identify a service flow

Service flow information

Required QoS information of a service flow include traffic characteristics and a scheduling type such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, tolerate jitter and maximum latency

CS parameter information

Required IP filter rules of a service flow such as packet classification rule and IPv6 flow label

14.5.6.4.5.3 When generated

This primitive is generated when a BS receives a DSC-REQ message.

14.5.6.4.5.4 Effect of receipt

The QoS management entity in NCMS shall respond to this primitive by sending Change_Service_Flow.confirm. The management entity for service flows checks the validity of the request from the point of view of its own resources.

14.5.6.4.6 Change_Service_Flow.confirm (CSF.confirm)

14.5.6.4.6.1 Function

This primitive is used by the QoS management entity in NCMS to response the CSF.request from a MS. Service flow information in CSF response have approved QoS information if the CSF request is accepted.

14.5.6.4.6.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Change_Service_Flow.confirm

(

Transaction ID
 Service flow ID
 Service flow information
 CS parameter information
 Service flow error parameter information

)

Transaction ID

A unique sequential identifier of the transaction set by the BS

Service flow ID

Unique identifier to identify a service flow

Service flow information

Approved complete QoS information of a service flow such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, tolerate jitter and maximum latency

CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

Service flow error parameter information

Failed reason and every specific failed QoS parameter if the request is rejected

14.5.6.4.6.3 When generated

This primitive is generated when the QoS management entity in NCMS responds to Change_Service_Flow.request primitive.

14.5.6.4.6.4 Effect of receipt

This primitive informs the result of the service flow modification of a BS. A BS receiving the primitive shall transmit DSC-RSP message following the information provided by this message.

14.5.6.4.7 Change_Service_Flow.indication (ASF.indication)**14.5.6.4.7.1 Function**

This primitive is used by the QoS management entity in NCMS to inform QoS information. Service flow information is included in CSF.indication of a BS.

14.5.6.4.7.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Add_Service_Flow.confirm

```
(
    Transaction ID
    MS ID,
    Service flow ID
    Service flow information
    CS parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

MS ID

48-bit unique identifier used by MS.

Service flow ID

Unique identifier to identify a service flow

Service flow information

Approved complete QoS information of a service flow such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, tolerate jitter and maximum latency

CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

14.5.6.4.7.3 When generated

This primitive is generated when the QoS management entity in NCMS informs QoS information of a BS.

14.5.6.4.7.4 Effect of receipt

A BS receiving the primitive shall transmit DSC-REQ message following the information provided by this message.

14.5.6.4.8 Change_Service_Flow.response (CSF.response)**14.5.6.4.8.1 Function**

This primitive is used by a BS to respond the CSF.indication to the QoS management entity in NCMS.

14.5.6.4.8.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Change_Service_Flow.request

```
(
    Transaction ID
    Service flow ID
    Service flow information
    CS parameter information
    Service flow error parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

Service flow ID

Unique identifier to identify a service flow

Service flow information

Approved complete QoS information of a service flow such as service class name, QoS parameter set type, maximum sustained traffic rate, maximum traffic burst, minimum reserved traffic rate, minimum tolerable traffic rate, tolerate jitter and maximum latency

CS parameter information

Approved IP filter rules of a service flow such as packet classification rule and IPv6 flow label

Service flow error parameter information

Failed reason and every specific failed QoS parameter if a CSF request is rejected

14.5.6.4.8.3 When generated

This primitive is generated when a BS receives a DSC-RSP message.

14.5.6.4.8.4 Effect of receipt

This primitive informs the result of the service flow creation of the QoS management entity in NCMS.

14.5.6.4.9 Delete_Service_Flow.request (DSF.request)

14.5.6.4.9.1 Function

This primitive is used by a BS to inform QoS information from an MS of the QoS management entity in NCMS.

14.5.6.4.9.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Change_Service_Flow.request

```
(
    Transaction ID
    Service flow ID
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

Service flow ID

Unique identifier to identify a service flow

14.5.6.4.9.3 When generated

This primitive is generated when a BS receives a DSD-REQ message.

14.5.6.4.9.4 Effect of receipt

The QoS management entity in NCMS shall respond to this primitive by sending Delete_Service_Flow.confirm. The management entity for service flows delete assigned resources for service flow ID.

14.5.6.4.10 Delete_Service_Flow.confirm (DSF.confirm)

14.5.6.4.10.1 Function

This primitive is used by the QoS management entity in NCMS to response the DSF.request from a MS.

14.5.6.4.10.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Delete_Service_Flow.confirm

```
(
    Transaction ID
    Service flow ID
    Service flow error parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

Service flow ID

Unique identifier to identify a service flow

Service flow error parameter information

Failed reason and every specific failed QoS parameter if a DSF request is rejected

14.5.6.4.10.3 When generated

This primitive is generated when the QoS management entity in NCMS responds to Delete_Service_Flow.request primitive.

14.5.6.4.10.4 Effect of receipt

This primitive informs the result of the service flow deletion to a BS. A BS receiving the primitive shall transmit DSD-RSP message following the information provided by this message.

14.5.6.4.11 Delete_Service_Flow.indication (DSF.indication)

14.5.6.4.11.1 Function

This primitive is used by the QoS management entity in NCMS to inform QoS information. Service flow ID is included in DSF.indication of a BS.

14.5.6.4.11.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Add_Service_Flow.confirm

```
(
    Transaction ID
    Service flow ID
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

Service flow ID

Unique identifier to identify a service flow

14.5.6.4.11.3 When generated

This primitive is generated when the QoS management entity in NCMS informs QoS information of a BS.

14.5.6.4.11.4 Effect of receipt

A BS receiving the primitive shall transmit DSD-REQ message following the information provided by this message.

14.5.6.4.12 Delete_Service_Flow.response (DSF.response)

14.5.6.4.12.1 Function

This primitive is used by a BS to respond the DSF.indication to the QoS management entity in NCMS.

14.5.6.4.12.2 Semantics of the service primitive

The parameters of the primitives are as follows:

Delete_Service_Flow.request

```
(
    Transaction ID
    Service flow ID
    Service flow error parameter information
)
```

Transaction ID

A unique sequential identifier of the transaction set by the BS

Service flow ID

Unique identifier to identify a service flow

Service flow error parameter information

Failed reason and every specific failed QoS parameter if a DSF request is rejected

14.5.6.4.8.3 When generated

This primitive is generated when a BS receives a DSD-RSP message.

14.5.6.4.8.4 Effect of receipt

This primitive informs the result of the service flow deletion of the QoS management entity in NCMS. The QoS management entity in NCMS deletes assigned resources for service flow ID.

Reference

- [1] Braden, R., Ed., et. al., "Resource Reservation Protocol (RSVP) - Version 1 Functional Specification," RFC 2205, September 1997.
- [2] Wroclawski, J., "The Use of RSVP with IETF Integrated Services," RFC 2210, September 1997.
- [3] IEEE-Std 802.16-2004
- [4] IEEE P802.16e/D9