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SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN –
Resource control protocols

**Signalling protocols and procedures relating
to flow state aware QoS control in a bounded
subnetwork of a next generation network**

Recommendation ITU-T Q.3313



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Recommendation ITU-T Q.3313

Signalling protocols and procedures relating to flow state aware QoS control in a bounded subnetwork of a next generation network

Summary

Recommendation ITU-T Q.3313 specifies the signalling format and procedures for the flow state aware (FSA) transfer capability in a bounded subnetwork of a next generation network (NGN). The FSA transfer capability provides QoS controls that operate on a per-flow basis, allowing flows within a bounded subnetwork of an NGN to receive different treatments depending on signalled parameters. These parameters are requested using in-band signalling. The parameters contained in these signals are included in the "flow state" maintained on each flow (or each aggregate flow), at each FSA node.

Service options that may be selected include the requested support of the highest available end-to-end rate for data transfer, assuming some source-to-receiver forwarding paths are entirely within the bounded subnetwork of an NGN.

The focus of this Recommendation is on broadband (including mobile) service access scenarios typically involving restricted bandwidth shared by many flows. In such circumstances, customer satisfaction, when there is temporary congestion, may be best handled by applying flow preferences and QoS differently for each customer and not simply on the type of media. This leads to the notion of customised QoS supported partly by signalling and partly through web-based tools.

These concepts may also be applied to flow aggregates, with associated signalling support acting at the aggregate level between aggregation end-points, as defined in Recommendation ITU-T Y.2121. The customization of aggregates in this Recommendation is limited to the notions of preference priority and FSA transfer capability.

History

Edition	Recommendation	Approval	Study Group
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Keywords

Available rate, broadband service access, flow state, flow state aware (FSA), in-band signalling, NGN, QoS.

FOREWORD

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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.

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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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Recommendation ITU-T Q.3313

Signalling protocols and procedures relating to flow state aware QoS control in a bounded subnetwork of a next generation network

1 Scope

This Recommendation provides the signalling format and procedures for the flow state aware (FSA) transfer capability in a bounded subnetwork of a next generation network (NGN). The FSA transfer capability provides QoS controls that operate on a per-flow basis, allowing flows within a bounded subnetwork of an NGN to receive different treatments depending on signalled parameters. These parameters are requested using in-band signalling. The parameters contained in these signals are included in the "flow state" maintained on each flow (or each aggregate flow), at each FSA node.

Out of scope are any FSA edge functions at the network domain boundaries needed for interworking between two FSA networks, where one uses in-band signalling exclusively for all FSA service support and the other uses both out-of band signalling (for resource reservation and clear down) and in-band signalling (to establish the agreed flow state). FSA signalling must not be used in the core network as it impacts on the scalability.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T Y.1221] Recommendation ITU-T Y.1221 (2010), *Traffic control and congestion control in IP-based networks*.
- [ITU-T Y.2111] Recommendation ITU-T Y.2111 (2011), *Resource and admission control functions in next generation networks*.
- [ITU-T Y.2121] Recommendation ITU-T Y.2121 (2008), *Requirements for the support of flow-state-aware transport technology in NGN*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 available rate service (ARS) [ITU-T Y.2121]: The name of one of the flow state aware (FSA) transport services. ARS is primarily for applications that can flexibly adapt to the current available capacity and can quickly adjust their sending rate as the available capacity changes.

3.1.2 flow [ITU-T Y.2121]: A unidirectional sequence of packets with the property that, along any given network link, a flow identifier has the same value for every packet.

3.1.3 flow admission control [ITU-T Y.2121]: The determination, for authorised requests, of whether or not to accept a given flow.

3.1.4 flow aggregate [ITU-T Y.2121]: A hierarchical flow construct that is associated with a group of flows. The carried flows may extend beyond the flow aggregate. Except for the end nodes,



flow aggregate forwarders in general do not know that they are carrying flows within the flow aggregate. All packets belonging to a given flow aggregate are commonly routed between aggregation end-points.

3.1.5 flow state [ITU-T Y.2121]: A set of values stored per flow identifier at each flow state aware node. This set of values will determine controls applied on a per-flow basis, dealing with forwarding rate, delay, and congestion recovery.

3.1.6 flow state aware node [ITU-T Y.2121]: A network node that is capable of maintaining flow state and applying per-flow QoS controls, based on recognising flow identifier and associated signals.

3.1.7 in-band signalling [ITU-T Y.2121]: A mode of signalling where the signalling messages are within the flow of the data packets, and follow a path that is tied to the data packets. Signalling messages are routed only through nodes that are in the data path.

3.1.8 maximum rate service (MRS) [ITU-T Y.2121]: The name of one of the flow state aware (FSA) transport services. MRS is for applications that want packet loss characteristics to be sufficient for streamed services as soon as possible but are unwilling to wait or be rejected by network admission control if network resource for this target QoS is not available immediately.

3.1.9 out-of-band signalling [ITU-T Y.2121]: A mode of signalling where the signalling messages are not in the same flow of the data packets, and may follow a different path to the data packets and are routed to one or more nodes that are not in the data path.

3.1.10 QoS structure [ITU-T Y.2121]: The block of QoS signalling information in a signalling packet.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 bounded subnet: In the context of Recommendation ITU-T Q.3313, a flow state aware (FSA) bounded subnet is a network section where all network nodes support that Recommendation.

3.2.2 ethertype: An Ethertype is a 16 bit identifier assigned by the IEEE to designate a layer 3 protocol being carried over Ethernet.

NOTE – The Ethertype for Recommendation ITU-T Q.3313 is 0x22EF.

3.2.3 flow identifier: A vector comprising the values of a number of elements taken from the header fields of the incoming packets which identify the flow. The flow identifier for a flow within a single FSA network is unique.

3.2.4 flow state aware proxy: A function that provides the origin and/or termination of the flow state aware end-to-end signalling path, and participates in requests and responses on behalf of a user application or management action.

NOTE – Flow state aware proxy may be located, for example, in a user end-system or at a network edge node where it serves as the signalling end-point of multiple users and associated applications.

3.2.5 preference priority: A parameter used to determine whether to admit a flow or scale its rate in case of network overload.

NOTE – In network overload state, an MRS flow with the lower preference priority may be rejected while the one with a higher preference priority level will still be admitted, or for ARS flows, preference priority should be used to scale the rate of the flow with respect to other ARS flows.

3.2.6 proxy: In the context of Recommendation ITU-T Q.3313, proxy is the name for a flow state aware signalling edge function, a process which encapsulates incoming traffic and inserts ITU-T Q.3313 signalling in one direction and in the other direction de-encapsulates and deletes ITU-T Q.3313 signalling.

NOTE – This process can be located inside a user's end-system or exist as a separate system in the data path.

3.2.7 RESPONSETIMEOUT: The maximum period that a signal packet of type request, renegotiate, or close has not been responded to.

NOTE – The signalling packet should be repeated a second and third time before the ITU-T Q.3313 state is dropped.

3.2.8 signal packet: Signal packets are used to carry signalling information across the bounded subnet where flow state aware (FSA) support is provided.

3.2.9 STATETIMEOUT: The maximum period between signalling packets before the network drops a flow.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AR	Available Rate
ARS	Available Rate Service
ATM	Asynchronous Transfer Mode
BT	Burst Tolerance
CD	Change Direction
CMTS	Cable Modem Termination System
DoS	Denial of Service
FSA	Flow State Aware
FSD	Flow Sender Depth
GBRA	Generic Byte Rate Algorithm
GR	Guaranteed Rate
ISP	Internet Service Provider
MRS	Maximum Rate Service
NGN	Next Generation Network
POP	Point of Presence
PP	Preference Priority
Ptype	Packet Type (in FSA header)
QoS	Quality of Service
SBW	Statistical Bandwidth
TP	Type (of FSA transmission mode)