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(ITU-T LS13-36, to TSG-RAN) LS on Comments on ITU-T Study Group 11 liaison on "Proposed joint activity on generic control mechanism for end-to-end QoS service control and signalling protocol development based on IP transfer capabilities and IP QoS classes"

ITU - Telecommunication Standardization Sector

LS13-36

QUESTIONS: 6, 7/13

SOURCE: ITU-T Study Group 13, Geneva, 22 January – 1 February 2002

TITLE: Comments on ITU-T Study Group 11 liaison on "Proposed joint activity on generic control mechanism for end-to-end QoS service control and signalling protocol development based on IP transfer capabilities and IP QoS classes"

LIAISON STATEMENT / COMMUNICATION / INFORMATION

LIAISON TO: 3/4, 13/9, 8/11, 9/11, 12/12, 13/12, 14/12, 15/12, 2/16, 3/16, F/16 and 6/SSG

COMMUNICATION TO: ETSI (for 3GPP & TIPHON), TIA TR-45 (for 3GPP2) and TM Forum

INFORMATION TO: EURESCOM Project P1103

APPROVAL: Agreed to at ITU-T SG 13 meeting

FOR: Action

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Noting the desire of Study Group 11 to work in close collaboration with Study Group 13 on the issue of specifying end-to-end QoS service control, recognizing the importance of avoiding mis-matches of effort on QoS specifications that have plagued other technologies in the past, and desiring to clearly communicate the need for operational simplicity Study Group 13 has the following points to make with regard to negotiation and control of end-to-end QoS.

1. Application needs can certainly be specified in terms of User expectations or other appropriate measures. However, provision must also be made for the request of basic (homogeneous) transport supported by a specific QoS class, with a specific traffic descriptor.
2. Network Performance (or Bearer Service QoS) is specified in terms of those Bearer Service performance parameters that the network is able to substantially influence in the course of performing specific network functions (e.g., access, information transfer, or disengagement).

3. The use of a large number combinations of the performance parameters referred to in point 2 above is not feasible given current capabilities. Thus Study Group 13 and Study Group 17 (formerly Study Group 7) have used the approach of specifying QoS classes. For ATM in Recommendation I.356, for Frame Relay in Recommendation X.146, and for IP in Recommendation Y.1541 (consented at the February 2002 Plenary of Study Group 13).
4. In order for the above considerations to mesh in a successful delivery of Quality to the end-user – across a homogenous bearer network[1] - there should be broad categories of application QoS that are mapped into specific Bearer Service QoS classes[2].
5. Note that Question 6/13 has started work on generally specifying the IP performance needs of Video Applications. Quantification of multimedia conferencing has already been completed. These specifications will be used for mapping application QoS requirements into specific Bearer Service QoS classes (e.g. Y.1541 IP QoS classes).
6. In conducting negotiations between the network and the end user, the final decision on either accepting network proposed QoS or clearing the call must be left to the end-user.
7. The extent of 'coordination' with the IETF on IP QoS classes is minimal as the IETF will not produce any document that specifies levels of performance. The base set of parameters used in defining the IP QoS classes in Y.1541 are consistent with the work of the IPPM working group.

    Study Group 13 envisions a solution that goes beyond voice to address the full range of multimedia and data applications. Thus emphasis is placed on indicating the specific application in addition to a requested Application QoS class and Traffic Descriptor.

The BICC and Bearer layer functions need concentrate on communicating appropriate information at and between their respective levels, with each having its own domain of action. Thus a combination of an application and an application quality level at the BICC layer can be communicated between CSFs.

The Bearer layer using the BCF capabilities will communicate a translation of the Application QoS class to a Bearer Service QoS class, and use the native signalling to establish the requested connection.

In the draft of BICC CS3 below, it is most natural to have the translation of the Application QoS class to the Bearer Service QoS class occur in the CSF and be communicated via Q.CBC to the BCF.

Finally, there will need to be signaling mechanisms developed in Study Group 11 to account for the offering of alternate Application QoS classes based on achievable Bearer Service QoS classes. These would implement the desire of Study Group 13 to leave the final decision on whether to accept or reject a connection to the end-user (see point 6 above).

Specific comments on the "Initial draft text of the BICC CS3 signalling requirements for end-to-end QoS service control" follow. General comments are in italics, and specific suggestions for clarifying text are in bold underline.

Framework for end-to-end QoS service control and network QoS control.

presents a framework for QoS control at different levels: call control (BICC, SIP/SDP, H.323), vertical control (H.248/MEGACO, CBC), bearer control (IP BCP) and bearer (DiffServ, IntServ/RSVP or MPLS/LDP).

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[1] Hetrogeneous networks consisting of multiple bearer capabilities are not discouraged, but at present the specific details of Bearer Service QoS inter-working would be left to the network. Study Group 13 intends to provide guidance on this issue in the future.

[2] Note that mappings between the various Bearer Service QoS classes are also required for seamless signalling of QoS requirements across multiple bearer networks. This would be particularly useful for planned extensions to the BICC protocol, and WP 4/13 intends to produce such mappings.

1) Call-control

a) End-to-end QoS service control is negotiated/communicated end-to-end at the call control level. ETSI TIPHON has defined a set of speech QoS classes, and signalling requirements and flows for this purpose. The idea is that call control protocols are enhanced with a generic end-to-end QoS service control mechanism to negotiate these speech QoS classes and associated parameters (Maximum delay, Maximum packet delay variation, Maximum packet loss, Peak bit rate and Maximum packet size). Such a generic end-to-end QoS service control mechanism should be defined independent of the underlying technology (ATM or IP) and operate across network domains and including terminal characteristics to negotiate/communicate the requested listener speech quality that will be perceived by the end-users (i.e. "mouth-to-ear"). **These speech QoS classes need to be mapped to specific IP, ATM, and FR QoS classes, and these mappings be made available to the appropriate QoS control elements.**

b) BICC (Q.190x) is one of the call control protocols that may be enhanced this way. Similar enhancements may be applicable to other call-control protocols like SIP/SDP and H.323. **The anticipated enhancement to BICC should be a table of translations between the various ATM, IP and Frame Relay QoS classes.**

2) Vertical control

a) QoS service control is also negotiated/communicated at the vertical control level. The ETSI TIPHON defined signalling requirements and flows include the vertical interface. The idea is that vertical control protocols are enhanced to negotiate/communicate the QoS settings (Maximum delay, Maximum packet delay variation, Maximum packet loss, Peak bit rate and Maximum packet size) in the bearer core network based on generic H.248/MEGACO extensions.These QoS settings should be defined independent of the underlying technology (ATM or IP) of the bearer core network. ***Vertical visibility is the point of the mappings of Application QoS classes into Bearer Service QoS classes. There must be visibility of these network QoS classes all the way up to the Application layer.***

b) CBC (Q.1950) is one of the vertical control protocols that may be enhanced this way.

3) Bearer control

a) Network QoS is negotiated/communicated at the bearer control level. ATM signalling does already intrinsically support network QoS SG13 has recently defined IP QoS classes and IP Transfer Capabilities. The idea is that bearer control protocols for IP are enhanced with a mechanism to negotiate the network QoS by using IP QoS classes and IP Transfer Capabilities.

b) IP BCP (Q.1970) is an IP bearer control protocol that may be enhanced this way.

4) Bearer

a) Network QoS is negotiated/communicated at the bearer level, i.e. as part of the protocols associated with the bearers in the core network. The idea is that IP QoS classes and IP Transfer Capabilties, as defined by SG13, are used to differentiate between different types of IP traffic.

b) IP QoS classes and IP Transfer Capabilities may be used to enhance existing IP mechanisms like DiffServ, IntServ/RSVP and MPLS/LDP. ***Is this the same as saying the the explicit support of the SG 13 defined IP QoS classes and IP transfer capabilities would be a useful enhancement to IP mechanisms like DiffServ, IntServ/RSVP, and MPLS/LDP? If so, Study Group 13 strongly agrees with this statement.***

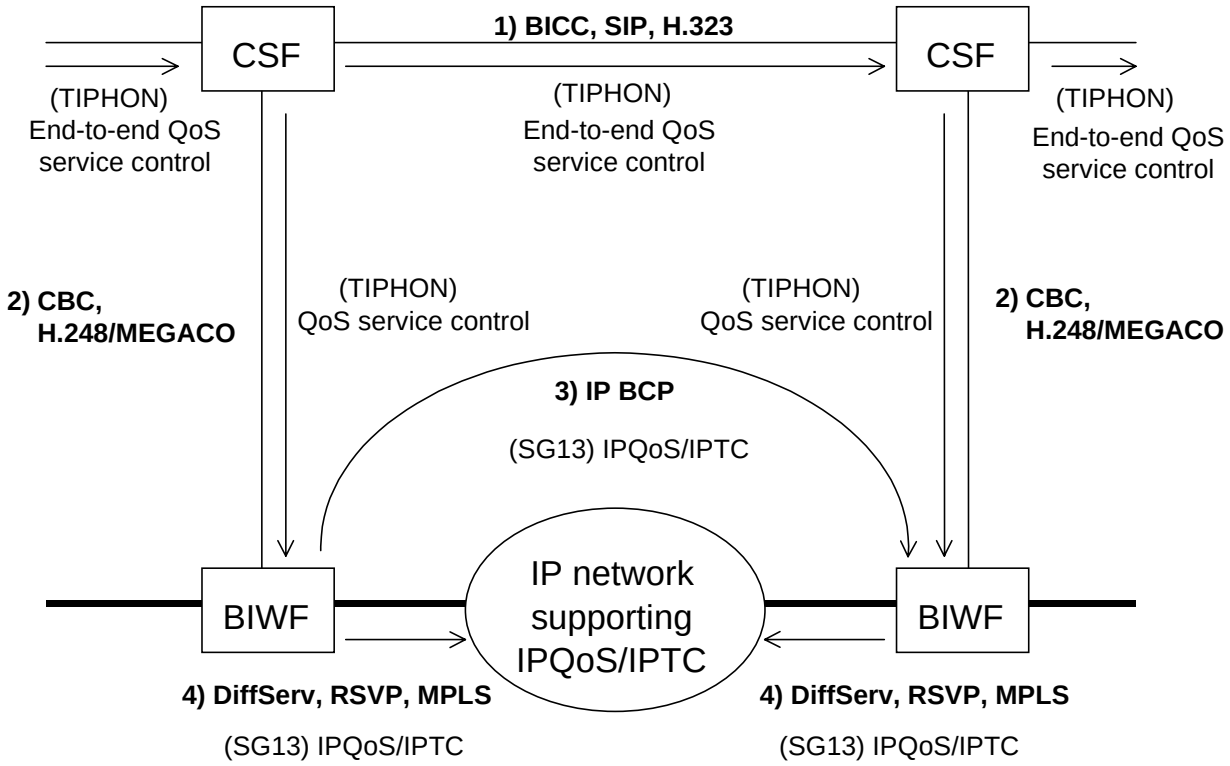

Figure 1: Framework for end-to-end QoS service control and network QoS control

QoS information flows applicable to BICC

Figure 2 shows the general model for QoS information flows with BICC when making a translation of the relevant parts in Figure 8 in ETSI TS 301 329 part 3.

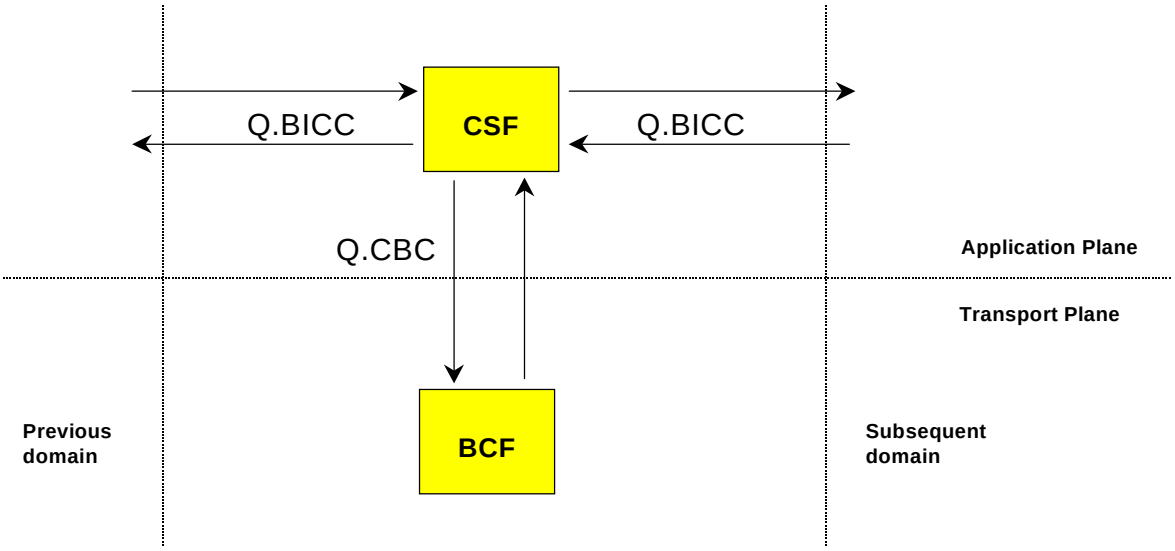

Figure 2: General model for QoS information flows in a BICC context

Following section "Q.BICC related QoS primitives and parameters" details the Q.BICC related QoS primitives and parameters based on the QoS primitives and parameters in the ETSI deliverable. Similarly, section "Q.BICC related QoS parameters" provides the Q.CBC related QoS primitives and parameters.

Q.BICC related QoS primitives and parameters

The Q.BICC related QoS primitives and parameters are extracted from clause 8.1 and clause 8.2 of ETSI TS 101 329 part 3. ***Note: throughout the following, it should be recognized that the ETSI TIPHON Class of Service need to be replaced by a generalized Application QoS class that includes the ETSI TIPHON Class of Service as a special case. Additionally some indication of the specific application needs to be accommodated.***

Q.BICC related QoS primitives

This information flow (QC2 in ETSI TS 101 329 part 3) communicates the QoS related bearer information between the domains of different service providers.

Q.BICC QoS request (Qbicc.QoSreq) requests the establishment of a bearer conforming to a particular ETSI TIPHON Class of Service or with defined QoS characteristics. **The initial version of this message from the end-user must contain the Application QoS class identifier. It would be best if the corresponding Bearer QoS class were also identified. If the corresponding Bearer QoS class is not initially identified, the first implementation of CSF must identify it and populate any further Q.CBC and Q.BICC messages originating from that CSF with it.**

NOTE Identical to QoSM request (QC2.QoSMreq) in ETSI TS 101 329 part 3 clause 8.1.1.

Q.BICC QoS confirm (Qbicc.QoSconf) acknowledges the creation of a bearer conforming to a requested ETSI TIPHON QoS Class or with specified QoS characteristics. **Here the offered Application and Bearer Service QoS classes must be included. Unless the congestion prevents networks from admitting the request this confirmation message should be used even if the Application QoS Class is different from that requested. A different Application QoS class could be offered if the corresponding CBC confirm message indicates a different offered Bearer QoS class. The user would then be free to either accept or reject the offered connection.**

NOTE Identical to QoSM confirm (QC2.QoSMconf) in ETSI TS 101 329 part 3 clause 8.1.1.

Q.BICC QoS reject (Qbicc.QoSrej) rejects the creation of a bearer conforming to a requested ETSI TIPHON QoS Class or with specified QoS characteristics. **This is an instance of a rejection message that should typically originate only from the end-user. The network should originate such a message only if they cannot support the request due to admission control policies. BICC and ETSI flows should reflect this if they do not already do so.**

NOTE Identical to QoSM reject (QC2.QoSMrej) in ETSI TS 101 329 part 3 clause 8.1.1.

Q.BICC release request (Qbicc.QoSrelreq) requests the release of a bearer.

NOTE Identical to QoSM release request (QC2.QoSMrelreq) in ETSI TS 101 329 part 3 clause 8.1.1 and the release of a transport flow is already covered by existing Q.BICC procedures in Q.1902 series.

QoSM release confirm (Qbicc.QoSrelconf) confirms the release of a bearer.

NOTE Identical to QoSM release confirm (QC2.QoSMrelconf) in ETSI TS 101 329 part 3 clause 8.1.1 and the release of a transport flow is already covered by existing Q.BICC procedures in Q.1902 series.

Q.BICC related QoS parameters

Table 1 lists the parameters used in the Q.BICC related QoS primitives not yet covered by the Q.BICC protocol. The deleted items refer to the information elements already covered by the BICC CS2 protocol in the Q.1902 series. ***Some indication of the specific application (voice, video, etc.) needs to be incorporated in the following primitives. A traffic descriptor (e.g. peak rate) could also be useful if the application indication does not specifically correspond with such a descriptor.***

NOTE The contents of Table 1 is an interpretation of the table in ETSI TS 101 329 part 3 clause 8.2.3.

Table 1: Identification of Q.BICC related parameters for end-to-end QoS service control

Primitive	**Parameter**	**Status**
Qbicc.QoSreq	**QoS Service Class** **This should be clearly identified as the application QoS class. While voice may be the initial application, others should be allowed.**	Optional
	Codec Type and Packetisation	Mandatory
	NOTE Already covered by the codec related BAT ASE information elements	
	Transport QoS Parameters **This should be the Bearer Service QoS class corresponding to the Application QoS Class above.**	Mandatory
	Traffic Descriptor	Optional
	Transport Addresses	Mandatory
	NOTE Already covered by the BAT ASE information element Interworking Function Address	
	Application Data Transport Protocol ***might be used to identify application or populate traffic descriptor.***	Optional [Default RTP]
	NOTE Already covered by the BAT ASE information element Bearer Network Connection Characteristics	
	Packet Transport Protocol	Optional [Default UDP]
	NOTE Already covered by the BAT ASE information element Bearer Network Connection Characteristics	
	QoS Mechanism ***This may be best left to the Transport network to choose in support of the requested Application, Bearer QoS, and traffic descriptor(s).***	Optional
	NOTE Not indicated via BICC. Requires further discussion as not intended to be signalled in BICC. For IP this refers to RSVP or DiffServ and in ATM to equivalents like DSS2/SVCs and PVCs	

Qbicc.QoSconf	**QoS Service Class** **This should be clearly identified as the application QoS class. While voice may be the initial application, others should be allowed.**	Optional
	Codec Type and Packetisation *NOTE Already covered by the codec related BAT ASE information elements*	Mandatory
	Transport QoS Parameters **This should be the Bearer Service QoS class corresponding to the Application QoS Class above.**	Mandatory
	Transport Addresses *NOTE Already covered by the BAT ASE information element Interworking Function Address*	Mandatory
	Application Data Transport Protocol *NOTE Already covered by the BAT ASE information element Bearer Network Connection Characteristics*	Optional [Default RTP]
	Packet Transport Protocol *NOTE Already covered by the BAT ASE information element Bearer Network Connection Characteristics*	Optional [Default UDP]
Qbicc.QoSrej	**Reason [TBD]**	Mandatory

Q.CBC related QoS primitives and parameters

The Q.CBC related QoS primitives and parameters are extracted from clause 8.1 and clause 8.2 of ETSI TS 101 329 part 3.

Q.CBC related QoS primitives

This information flow (QT2 in ETSI TS 101 329 part 3) communicates the QoS related transport flow information between a service domain and an associated transport domain. This information contains the QoS related characteristics required of the transport flows that will carry the media flow and the properties of the media flow.

Q.CBC QoS request (Qcbc.QoSreq) requests the establishment of a transport flow with defined QoS characteristics across a Transport Domain or the reservation of Transport Domain resource. **This should carry both the application QoS class and the corresponding Bearer Service QoS class. Identification of a traffic descriptor might be useful.**

NOTE Identical to TRM QoS request (QT2.TRMQreq) in ETSI TS 101 329 part 3 clause 8.1.3.

Q.CBC QoS confirm (Qcbc.QoSconf) acknowledges the creation of a requested transport flow or the reservation of Transport Domain resource. **This also carries the Application QoS class and the corresponding Bearer Service QoS class. If the requested Bearer Service QoS class or traffic descriptor is unsupportable, but if an alternative is available these alternatives should populate this message and be indicated by a blank Application QoS class field. The CSF can will then translate the offered Bearer Service QoS class and/or traffic descriptor to populate a new Application QoS class to be confirmed with the corresponding BICC message to the end-user.**

NOTE Identical to TRM QoS confirm (QT2.TRMQconf) in ETSI TS 101 329 part 3 clause 8.1.3.

Q.CBC QoS reject (Qcbc.QoSrej) rejects the creation of a requested transport flow or the reservation of Transport Domain resource. ***Should presumably only be used in conjunction with connection admission policies to deny a request.***

NOTE Identical to TRM QoS reject (QT2.TRMQrej) in ETSI TS 101 329 part 3 clause 8.1.3.

Q.CBC QoS release request (Qcbc.QoSrelreq) requests the release of a transport flow.

NOTE Identical to TRM QoS release request (QT2.TRM QoS relreq) in ETSI TS 101 329 part 3 clause 8.1.3. The release of a transport flow is already covered by the existing Q.CBC procedures in Q.1950.

Q.CBC QoS release confirm (Qcbc.QoSrelconf) confirms the release of a transport flow.

NOTE Identical to TRM QoS release confirm (QT2.TRM QoS relconf) in ETSI TS 101 329 part 3 clause 8.1.3. The release of a transport flow is already covered by the existing Q.CBC procedures in Q.1950.

Q.CBC QoS performance notification (Qcbc.QoSperfnotif) notifies the Service Domain of the performance of the Transport Domain in meeting the requested QoS levels. This may be a periodic event or an urgent alarm. Note: this primitive is a management primitive and its use is for further study.

NOTE Identical to TRM QoS performance notification (QT2.TRM QoS perfnotif) in ETSI TS 101 329 part 3 clause 8.1.3. For further study.

Q.CBC related QoS parameters

Table 2 lists the parameters used in the Q.CBC related QoS primitives not yet covered by the Q.CBC protocol. The deleted items refer to the information elements already covered by the BICC CS2 protocol in Q.1950.

NOTE The contents of Table 2 is an interpretation of the table in ETSI TS 101 329 part 3 clause 8.2.5.

Table 2: Identification of Q.CBC related parameters for end-to-end QoS service control

Primitive	Parameter	Status
QT2.TRMQreq	**Transport QoS Parameters <u>This should be the Bearer Service QoS class corresponding to the Application QoS Class in the Qbicc.QoSreq.</u>**	Mandatory
	Traffic Descriptor	Mandatory
	Transport Addresses	Mandatory
	NOTE Already covered by the BIWF address in Q.1950	
	Packet Transport Protocol	Optional [Default UDP]
	NOTE Already covered by the Bearer Network Connection Characteristics in Q.1950	
QT2.TRMQconf	**Transport QoS Parameters <u>This should be the Bearer Service QoS class corresponding to the Application QoS Class in the Qbicc.QoSreq.</u>**	Mandatory
	Transport Addresses	Mandatory
	NOTE Already covered by the BIWF address in Q.1950	
	Packet Transport Protocol	Optional [Default UDP]
	NOTE Already covered by the Bearer Network Connection Characteristics in Q.1950	
	QoS Mechanism	Optional
	NOTE Not indicated via CBC. Requires further discussion as not intended to be signalled in CBC. For IP this refers to RSVP or DiffServ and in ATM to equivalents like DSS2/SVCs and PVC	
QT2.TRMQrej	**Reason [TBD] <u>This should presumably only be used in conjunction with connection admission policies.</u>**	Mandatory

Parameter contents

Table 3 specifies the information to be covered by the parameters listed in above sections “Q.BICC related QoS parameters” and “Q.CBC related QoS parameters” based on the QoS parameter groups in ETSI TS 101 329 part 3 clause 8.2.1.

Table 3: Identification of parameter contents for end-to-end QoS service control

Parameter Group	Description	Parameters	Description
QoS Service Class – **Should be re-named as the Application QoS Class**	**Describes the end-to-end ~~ETSI TIPHON~~ Application QoS class ~~of~~ ~~a~~ corresponding to the Bearer Service QoS class.**	**Application dependent, e.g., for voice ETSI TIPHON's** Best, High, Medium or Best Effort	**Application dependent, e.g., for voice, ETSI TIPHON's** Parameters specifying the ETSI TIPHON QoS Class as defined in ETSI TS 101 329 Part 2
Transport QoS Parameters	Specifies the **Bearer Service** QoS class corresponding to the application QoS class.	**Determined by respective Bearer Service QoS classes in Y.1541, I.356, or X.146.**	**See Y.1541, I.356, or X.146.**
Traffic Descriptor	Characterises the resource requirements of an application data flow (excludes transport flow resource requirements). **This will presumably be independent of the specific Bearer Service so that it may be interpreted in terms of Bearer Service specific descriptor (e.g., Peak Cell Rate for ATM, Committed Information Rate for Frame Relay).**	Peak Bit	Maximum bit rate (bit/s) of the media flow.
		Maximum Packet Size	Maximum size of the media packets

Example information flow

Figure 3 shows an example information flow for end-to-end QoS service control for call set-up for the translation to the BICC case by using the signalling primitives described in sections "Q.BICC related QoS primitives" and "Q.CBC related QoS primitives" **for the case of a successful connection attempt with no negotiation**.

EDITORS' NOTE The procedures for end-to-end QoS service control may be considered to follow the same principles as the already existing procedures for end-to-end codec negotiation in BICC CS1 and BICC CS2. Similarly mid-call procedures for end-to-end QoS modification and mid-call QoS modification may be considered because the perceived QoS is highly related to the codec type employed end-to-end as part of the connection. The exact scope and properties of these procedures and protocol message flows needs further discussion.

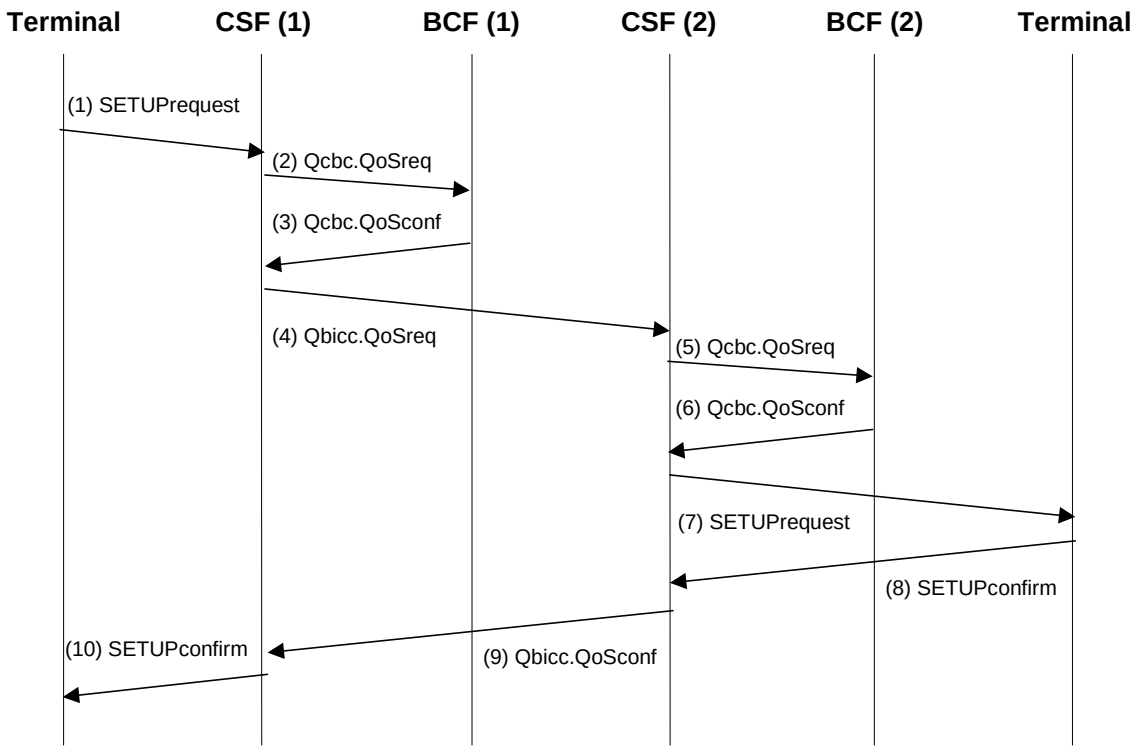

Figure 3: Example information flow for end-to-end QoS service control with BICC
(For the case of a successful connection attempt with no negotiation)