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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

**Gateway control protocol: Priority traffic
treatment by ITU-T H.248 gateways**

ITU-T H-series Recommendations – Supplement 12



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Supplement 12 to ITU-T H-series Recommendations

Gateway control protocol: Priority traffic treatment by ITU-T H.248 gateways

Summary

Supplement 12 to ITU-T H-series Recommendations provides complementary information on the handling of priority traffic (e.g., international emergency preference scheme (IEPS)/emergency telecommunications service (ETS) traffic) by the ITU-T H.248 entities: Media Gateway Controller (MGC) and Media Gateway (MG).

This supplement illustrates the difficulty, even impossibility, of a generic specification i.e., a generic ITU-T H.248 profile, in justifying concrete, dedicated protocol solutions in the case of an available alternative for "emulation approaches".

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Supplement 12 to ITU-T H-series Recommendations

Gateway control protocol: Priority traffic treatment by ITU-T H.248 gateways

1 Scope

This supplement provides complementary information concerning the handling of priority traffic by the ITU-T H.248 entities: media gateway controller (MGC) and media gateway (MG).

The following aspects are covered within the scope:

- the notion of "priority traffic" from the perspective of the ITU-T H.248 gateway control interface (clause 6);
- a comprehensive traffic model for priority services (as introduced by [ITU-T H.248.81]) with focus on the MG (clause 6.1);
- the specification aspects of ITU-T H.248 profiles with respect to "generic" and "practical" profiles (clause 6.2);
- a status snapshot of some ITU-T H.248 profiles and Context attribute support for priority traffic handling (Appendix I);
- example use cases for different gateway types supporting priority traffic (such as with possible international emergency preference scheme (IEPS) call indicator support) (Appendix II).

This supplement illustrates the difficulty, even impossibility, of a generic specification, i.e., a generic ITU-T H.248 profile, in justifying concrete, dedicated protocol solutions in the case of an available alternative for "emulation approaches".

2 References

- [ITU-T E.106] Recommendation ITU-T E.106 (2003), *International Emergency Preference Scheme (IEPS) for disaster relief operations*.
- [ITU-T E.107] Recommendation ITU-T E.107 (2007), *Emergency Telecommunications Service (ETS) and interconnection framework for national implementations of ETS*.
- [ITU-T H.248.1] Recommendation ITU-T H.248.1 (2005), *Gateway control protocol: Version 3*.
- [ITU-T H.248.52] Recommendation ITU-T H.248.52 (2008), *Gateway control protocol: QoS support packages*.
- [ITU-T H.248.54] Recommendation ITU-T H.248.54 (2007), *Gateway control protocol: MPLS support package*.
- [ITU-T H.248.56] Recommendation ITU-T H.248.56 (2007), *Gateway control protocol: Packages for virtual private network support*.
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- [ITU-T H.248.81] Recommendation ITU-T H.248.81 (2011), *Gateway control protocol: Guidelines on the use of the international emergency preference scheme (IEPS) call indicator and priority indicator in ITU-T H.248 profiles*.

- [ITU-T H.Sup.9] ITU-T H-series Recommendations – Supplement 9 (2008), *Gateway control protocol: Operation of H.248 with H.225.0, SIP, and ISUP in support of emergency telecommunications service (ETS)/International emergency preference scheme (IEPS)*.
- [ITU-T I.130] Recommendation ITU-T I.130 (1988), *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN*.
- [ITU-T Q.1950] Recommendation ITU-T Q.1950 (2002), *Bearer independent call bearer control protocol*.
- [ITU-T Y.2111] Recommendation ITU-T Y.2111 (2011), *Resource and admission control functions in next generation networks*.
- [ETSI TS 122 153] ETSI TS 122 153 (2012), *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Multimedia priority service (3GPP TS 22.153 version 11.1.0 Release 11)*.
- [ETSI TS 129 238] ETSI TS 129 238, *Universal Mobile Telecommunications System (UMTS); LTE; Interconnection Border Control Functions (IBCF) – Transition Gateway (TrGW) interface; Ix interface; Stage 3*.
- [ETSI TS 129 334] ETSI TS 129 334, *Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; IMS Application Level Gateway (IMS-ALG) – IMS Access Gateway (IMS-AGW); Iq Interface; Stage 3*.
- [ETSI TS 183 018] ETSI TS 183 018, *Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control: H.248 Profile Version 3 for controlling Border Gateway Functions (BGF) in the Resource and Admission Control Subsystem (RACS); Protocol specification*.

3 Definitions

3.1 Terms defined elsewhere

This supplement uses the following terms defined elsewhere:

3.1.1 emergency telecommunications service (ETS) [ITU-T E.107]: A national service providing priority telecommunications to the ETS authorized users in times of disaster and emergencies.

3.1.2 international emergency preference scheme (IEPS) [ITU-T E.106].

3.2 Terms defined in this supplement

This supplement defines the following terms:

3.2.1 bearer-dependent decision point (BDDP): The media gateway controller (MGC) is the primary decision point with respect to the mapping of call control level information to gateway control signalling and the applicable ITU-T H.248 context, termination and/or stream entity as bearer level elements. The MGC provides all necessary information about bearer plane protocol stack, supported QoS technologies, etc.

NOTE 1 – This is the usual model in the master-slave relationship of ITU-T H.248 gateways.

NOTE 2 – The synonym of *technology-dependent ... / technology-independent ...* originates from the ITU-T resource and admission control function (RACF) architecture (see [ITU-T Y.2111]).

3.2.2 bearer-independent decision point (BIDP): In contrast to clause 3.2.1, definition of BDDP, the media gateway controller (MGC) is still the primary decision point with respect to the mapping of call control level information to gateway control signalling but lacks (partially or fully) bearer-related information. The MGC applies generic signalling and delegates the final mapping to the MG.

NOTE – The notion of *bearer-independent ...* originates from the bearer-independent call control (BICC) architecture (see ITU-T Q.19xx-series of Recommendation); applied, for example, in the ITU-T H.248 profile *bearer-independent call bearer control protocol* according to [ITU-T Q.1950].

3.2.3 mapping function (MF): A function, located in ITU-T H.248 entities (MGC and MG), for mapping protocol objects between two interfaces (MGC: between call control and gateway control signalling; MG: between gateway control signalling and user plane protocols). The mapping function relates to the following, hierarchical information:

MF type (a) – Protocol mapping: e.g., ITU-T H.248, ITU-T H.323, session initiation protocol (SIP), Internet Protocol (IP); protocol type mapping: MGC level mapping: SIP to ITU-T H.248, SIP session description protocol (SDP) to ITU-T H.248 (SDP); and MG level mapping: ITU-T H 248 to IP);

NOTE 1 – The MGC located mapping function (MF MGC) could affect the two protocol levels (a1) application control protocol (e.g., ITU-T H.323, SIP or BICC) and an optional embedded (a2) media description protocol (e.g., SDP).

MF type (b) – Type mapping: Mapping of information element types (e.g., signalling element type or IP header field);

NOTE 2 – At a syntactic level the mapping of information element types usually implies a mapping of the information element value.

MF type (c) – Value mapping: Mapping of information element value.

NOTE 3 – The combination of signalling element/type is also known as codepoint.

The mapping function may affect all three levels in any combination.

NOTE 4 – Appendix III illustrates some examples of different mapping functions.

4 Abbreviations and acronyms

This supplement uses the following abbreviations and acronyms:

BD	Bearer Dependent
BI	Bearer Independent
BDDP	Bearer-dependent Decision Point
BICC	Bearer-Independent Call Control
BIDP	Bearer-Independent Decision Point
DPI	Deep Packet Inspection
DS	Differentiated Services
ETS	Emergency Telecommunications Service
IEPS	International Emergency Preference Scheme
IP	Internet Protocol
IDS	Intrusion Detection System
LxVPN	Layer x Virtual Private Network
MF	Mapping Function

MF _{MG}	MG-located Mapping Function
MF _{MGC}	MGC-level Mapping Function
MG	Media Gateway
MGC	Media Gateway Controller
MPS	Multimedia Priority Service
MPLS	Multi-Path Label Switching
QoS	Quality of Service
RACF	Resource and Admission Control Function
RPH	Resource Priority Header
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SDO	Standards Development Organization
TC	Traffic Class
TDF	Traffic Detection Function
ToS	Type of Service

5 Conventions

[ITU-T I.130] defines a *stage and description level based specification methodology*. This supplement uses the conventions of Stage 2 and Stage 3 according to [ITU-T I.130], which relates to the following kind of information in cases of signalling interface specifications (such as ITU-T H.248 profiles):

- Stage 2: requirement for signalling interface, and
- Stage 3: protocol solution.

It may be noted that Stage 2 and Stage 3 information are fully decoupled (according to [ITU-T I.130]), e.g., a specific requirement may be principally satisfied by multiple signalling solutions.

NOTE – Other SDOs outside ITU may use a different convention for stage-based specification processes.

6 Priority traffic – Traffic model and profile specifications

This is follow-on information to [ITU-T H.248.81], which provides profile specification guidelines for ITU-T H.248 profiles *with support of priority traffic indication*. The notion of *priority traffic* covers the three context attributes *priority indicator*, *emergency indicator* and *IEPS call indicator* and shall be understood in this discussion as follows:

An ITU-T H.248 Context is associated with *priority traffic handling* when the following condition is true:

IF (*PriorityIndicator* > 0) OR (*EmergencyIndicator* = ON) OR (*IEPScallIndicator* = ON)

6.1 Traffic model

Figure 1 recalls again the overall traffic model from [ITU-T H.248.81]. Priority traffic handling as such affects multiple areas: "3", "4" and "5" with regard to the MG entity.

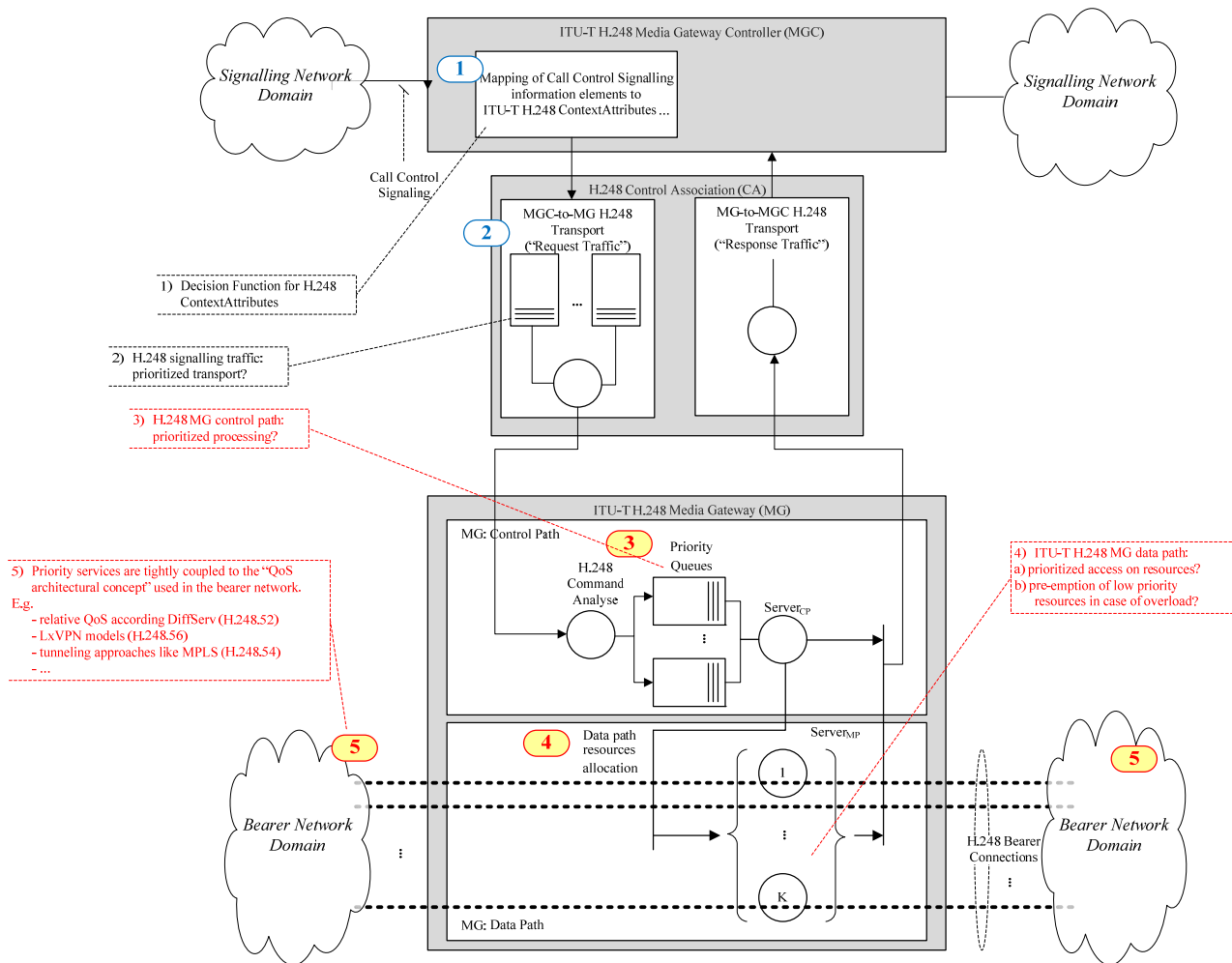


Figure 1 – Example overall traffic model for priority services with scope on the MG entity

The functional areas are (according to [ITU-T H.248.81]):

- Part III: MG control path – Priority command processing;
- Part IV: MG data path – Reservation, allocation and pre-emption of resources depending on national variation; and
- Part V: Bearer network – Support of dedicated "QoS and policy architectures".

Any kind of traffic priority indication sent from the MGC to the MG leads to corresponding actions in one or multiple functional areas. A generic MG processing rule concept for priority traffic handling may be introduced (see also Figure 2): the rule conditions are given by ITU-T H.248 signalling elements and the rule actions are related to the above-mentioned areas.

6.2 Conventions for abstracted ITU-T H.248 signalling specifications

The following clauses elaborate on specification aspects concerning priority traffic treatment. The generic method of "rule-based description of MG operations" (e.g., as outlined by [ITU-T H.248.79]) is used due to the general approach adopted by this supplement, the advantage of independence of specific ITU-T H.248 descriptors, and the compact format.

6.3 Specification plane: Type of ITU-T H.248 profile

This supplement introduces two ITU-T H.248 profile types:

- Generic ITU-T H.248 profile: characterized by a mix of mandatory, optional and conditional protocol capabilities, typically specified by SDOs (e.g., international profiles);

- Practical ITU-T H.248 profile: an instantiation of a generic profile, given by a concrete implementation and a given network operational environment. There are no optional capabilities: something is either useable or not.

MG rule actions may be linked to the MG rule conditions in the case of a practical profile (because there are no uncertainties either from the point of view of network engineering and MG capability support or the fact that the expected MG behaviour must be determined).

However, it is rather difficult (often impossible) to specify the association between concrete MG actions and their underlying conditions in generic profiles (due to their generic nature, vagueness of operational environment, etc.). Such a situation shall be called a *semantic issue of MG actions* in the context of priority traffic handling.

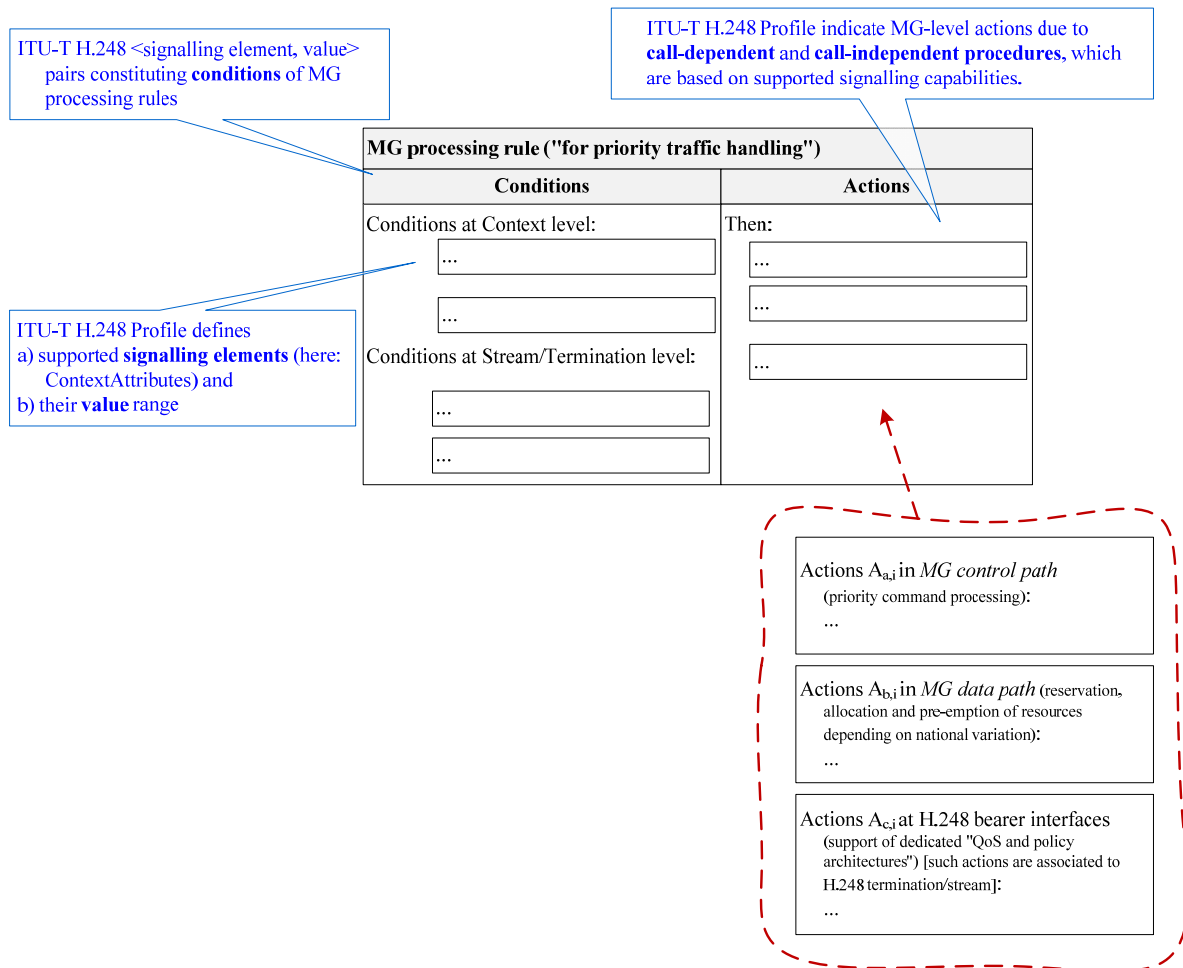


Figure 2 – Generic profile view – Processing rule concept (plus the three functional areas of possible MG actions)

Figure 3 indicates some principal issues related to generic profiles:

- #1: *generic* versus *practical* profile type (see above);
- #2: binding of actions to conditions (the exact specified binding determines the final service logic and hence MG behaviour);
- #3: *dependencies* on final operational environment of a deployed MG, concerning bearer protocol stacks, QoS architecture, overall traffic mix, etc.

Furthermore, each of the three Context attributes may lead to MG actions in the three areas, which could lead to some overlap (and possible interaction issues) when multiple Context attributes are used in parallel (see Figure 4):

#4: *isolated view* (e.g., by defining individual call-dependent procedures for each ContextAttribute element) is not appropriate due to possible *interaction problems* of MG-level actions);

The isolated view is often given in specification roadmaps when an initial profile version supports one (or two) Context attributes for priority traffic indication, and subsequent profile versions add further support in this area. In order to avoid interaction issues, a reconsideration and comprehensive view would then be necessary (see Figure 5):

#5: *comprehensive consideration* of all supported Context attributes and their binding to MG actions (in order to avoid possible interaction of individual MG actions and to define a deterministic MG behaviour).

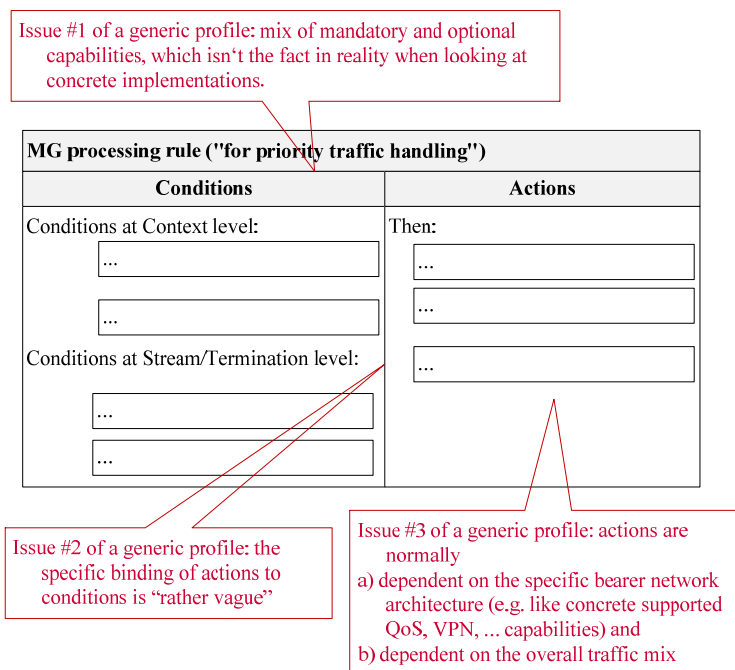
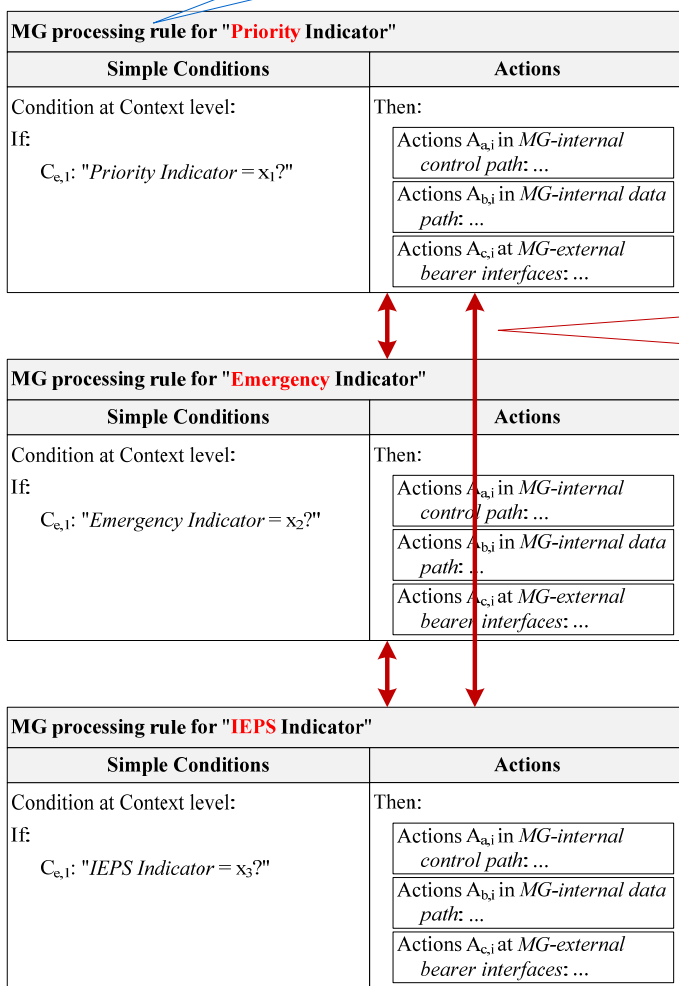


Figure 3 – Generic profile view – Some issues

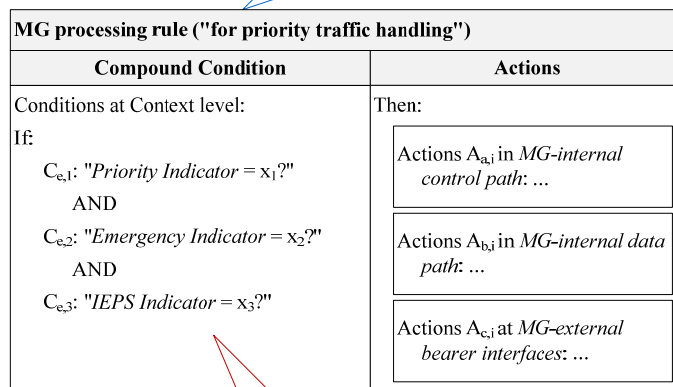
Assumption: all ContextAttributes related to traffic priorities would be supported.
Here: isolated view of correspondent processing rules.



Issue #4 of a generic profile: an isolated view (e.g. by defining individual call-dependent procedures for each ContextAttribute element) is not appropriate due to possible interaction problems of MG-level actions.
Hence, entire consideration required, see Figure 5.

Figure 4 – Generic profile view – Issue due to isolated consideration

That is required from an specification perspective: complete view of processing rule.



Issue #5 of a generic profile: overall picture must be considered, but difficulty at a generic level

Figure 5 – Generic profile view – Comprehensive consideration

6.4 Specification plane: Codepoint space

The comprehensive view (Figure 5) alludes to the usage of a single parameter (instead of three Context attributes) for the control of correspondent MG action(s). This clause discusses the thought behind such an approach. It does not revise existing ITU-T H.248 protocol syntax.

Figure 6 illustrates such an approach: the left-hand side provides legacy ITU-T H.248 protocol syntax, and the three Context attributes define a compound condition at Context level with regard to the required traffic handling. It is a hierarchical scheme due to the three explicit signalling elements for action control.

The right-hand side provides a flat scheme: the three Context attributes are mapped (and replaced) by a single variable, called *TrafficPriorityParameter*. The following aspects may be noted:

- The single parameter approach may already be applied today; internal implementation.
- There are 64 codepoints defined (required) by the three Context attributes ($2 \times 2 \times 16$).
- The three Context attributes could be thus unambiguously mapped on the *TrafficPriorityParameter* defined, for example, by a data type of integer and a value range of [0, 63] for this variable.
- The two signalling concepts ("three versus a single parameter") are functionally equal because the three ITU-T H.248 Context attributes are generic in the sense that they do not specify concrete MG actions.

A future gateway control (or other signalling or management) protocol design may consider defining just a single signalling element with a future safe codepoint space.¹

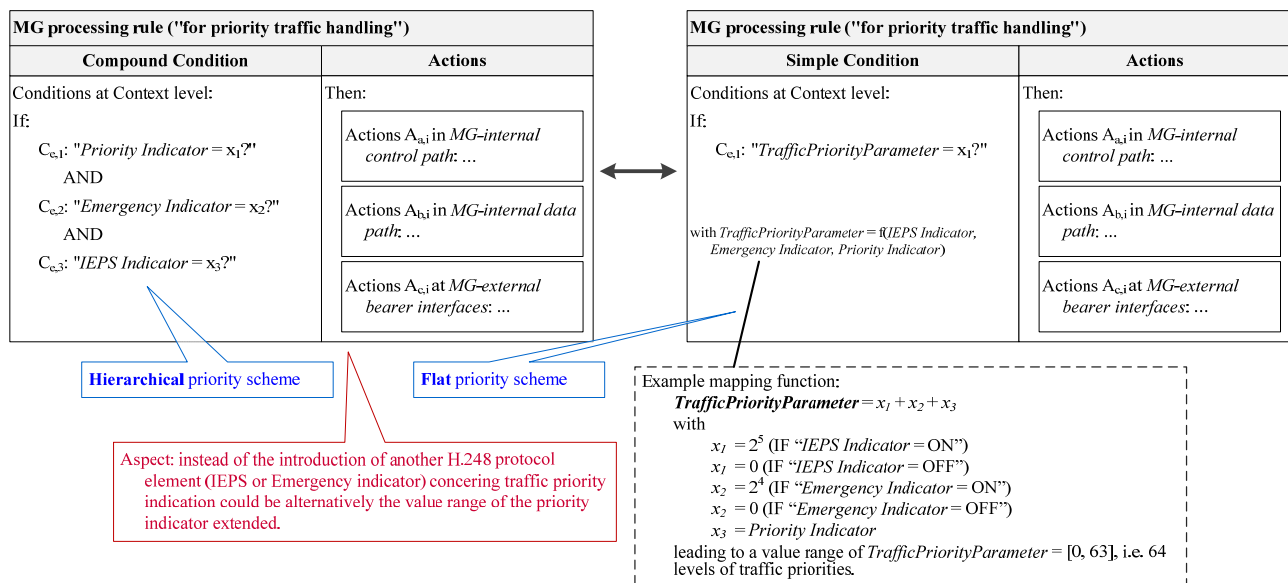


Figure 6 – Hierarchical versus flat priority scheme

6.5 Specification plane: Further comments

The requirement for MG behaviour should normally drive the requirement(s) for the ITU-T H.248 interface (but not vice versa). The subsequent MG behaviour would result from the definition of an overall network solution.

¹ Such a protocol engineering approach would avoid the side discussion here: Upgrade of ITU-T H.248 protocol version from 1 or 2 to 3 due to IEPS call indicator support.

The network element behaviour is first at the top level of a composed MGC/MG gateway entity, according to the overall traffic model of [ITU-T H.248.81]. Hence, there is a mapping of 'service requirements/capabilities' on the 'composed MGC/MG' and then 'functional distribution on decomposed gateway model'.

Appendix I

ITU-T H.248 profiles and Context attributes for priority traffic handling

This appendix contains an analysis of signalling support for priority traffic handling.

I.1 Status ITU-T H.248 profiles

ITU-T H.248 profile definitions include Context attribute support information (see the profile definition template in [ITU-T H.248.1]). There are many ITU-T H.248 profile specifications published by standard development organizations (SDOs). Of particular interest in this supplement are profiles for ITU-T H.248 IP-IP gateways; such as the 3GPP-defined profiles for their ITU-T H.248-based reference points I_x and I_q ([ETSI TS 129 238] and [ETSI TS 129 334], which are both based on the ETSI TISPAN I_a profile [ETSI TS 183 018]).

The following table summarizes the status for I_x and I_q interfaces:

Table I.1 – 3GPP profiles and typical support of Context attributes (status: Rel-11)

Context attribute	Supported	Values supported
...		
Priority Indicator	Optional (Note 1)	0-15 (Note 2)
Emergency Indicator	Yes	Yes/No
IEPS Call Indicator	No	NA
...		
NOTE 1 – This Context attribute parameter is allowed in ETSI TISPAN I_a Profile version 3. It is also used for the multimedia priority service (MPS) as specified in [ETSI TS 122 153].		
NOTE 2 – Priority values 11-15 of the priority indicator are reserved for the MPS.		

It may be noted that there is support of emergency calls only in pure 3GPP environments, and additional priority level support in ETSI TISPAN and 3GPP instantiations.

I.2 Discussion of the principal ITU-T H.248 signalling options

ITU-T H.248 supports the provisioning of protocol parameter values, which may sometimes be used as an alternative to the usual signalling of protocol values. There are further kinds of ITU-T H.248 decomposed gateway models, such as a bearer-independent or bearer-dependent style of operation (see clauses 3.2.2 and 3.2.1 respectively). The alternatives lead to various options which are outlined in this clause, using the concrete example of DiffServ-based QoS marking as the selected technology for priority traffic support. The different options are also related to a mapping function (MF) (see clause 3.2.3) involved at MGC and/or MG level.

I.2.1 Overview

The *principal ITU-T H.248 signalling options* are given by the combination of the following characteristics:

- i. The kind of mapping function (related to type and/or value mapping, $MF_{b,c}$)
 - a. At the **MGC** level: call control protocol related codepoints are mapped to ITU-T H.248 codepoints ('bearer dependent' or 'bearer independent') format (by the $MF_{MGC(b,c)}$); or/and
 - b. At the **MG** level: mapping of ITU-T H.248 codepoints to final IP bearer path format (by the $MF_{MG(b,c)}$);

- ii. ITU-T H.248 signalling format
 - a. **'bearer dependent'**, i.e., QoS marking codepoints signalled already in the format as used in IP bearer packets (hence, so-called *type mapping* (MF_b) not necessary);
 - b. **'bearer independent'**, i.e., (I.b) *type mapping* (MF_b) would be always required in the MG.

Four meaningful combinations are subsequently described. Appendix III, clause III.2, further illustrates the example variants.

I.2.2 Bearer-dependent ITU-T H.248 signalling

ITU-T H.248 signalling (i.e., ADD and MODIFY request commands) carries the bearer-dependent DiffServ codepoint (as e.g., assigned for priority traffic). The MG directly uses that DiffServ codepoint for QoS marking in outgoing bearer packets. There are two variants from the MGC perspective, see Figure I.1.

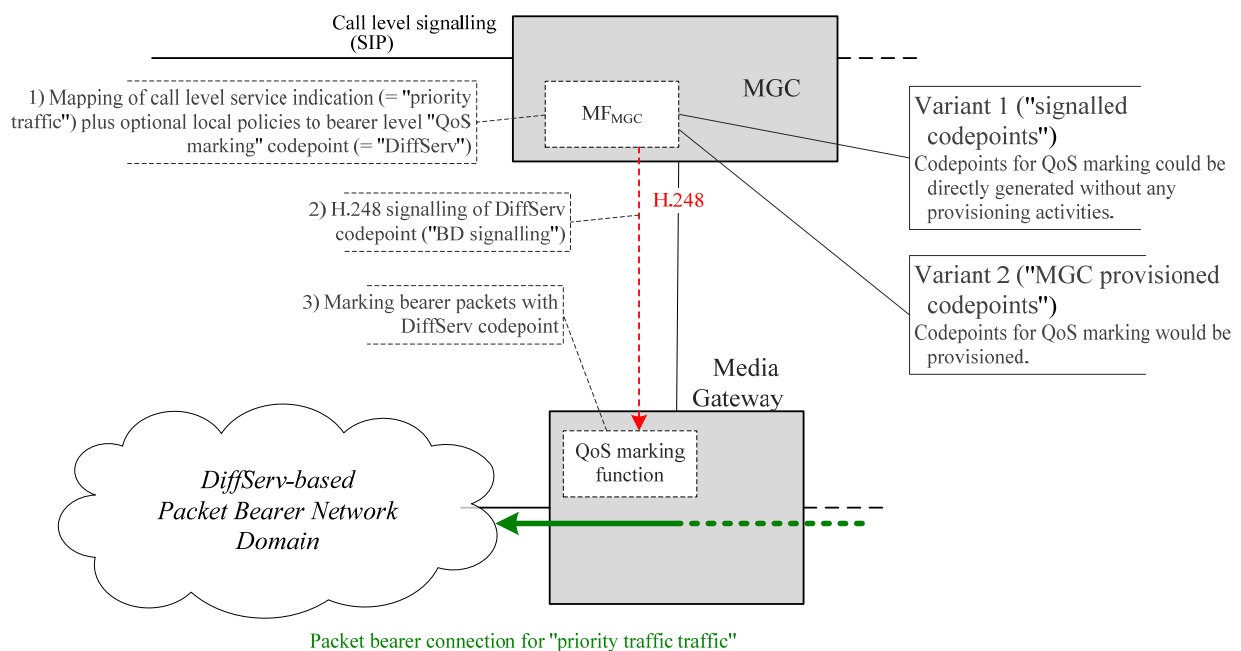


Figure I.1 – Control of an MG-level QoS marking function – Variants 1 and 2

Details:

- Variant 1: the call control signalling (SIP) includes the QoS marking codepoints applicable for this media in the format used in the IP packets. The same codepoints are sent in the ITU-T H.248 signalling to the MG. Thus, type mapping and value mapping are avoided in this variant, both at MGC and MG level.
- Variant 2: either call control signalling does not support signalling of DiffServ values or a local DiffServ translation is applied at the MGC. In this case, the QoS marking is provisioned at the MGC; the MGC provides the DiffServ mapping and includes the DiffServ codepoints in the ITU-T H.248 signalling. Thus, there is type/value mapping at the MGC level, but no such mapping is additionally necessary by the MG.

I.2.3 Bearer-independent ITU-T H.248 signalling

The DiffServ codepoint for a particular packet bearer traffic class might also be provisioned at the MG level. This implies the necessity of a correspondent mapping function at the MG level (MF_{MG}, see Figure I.2) besides the MGC level MF.

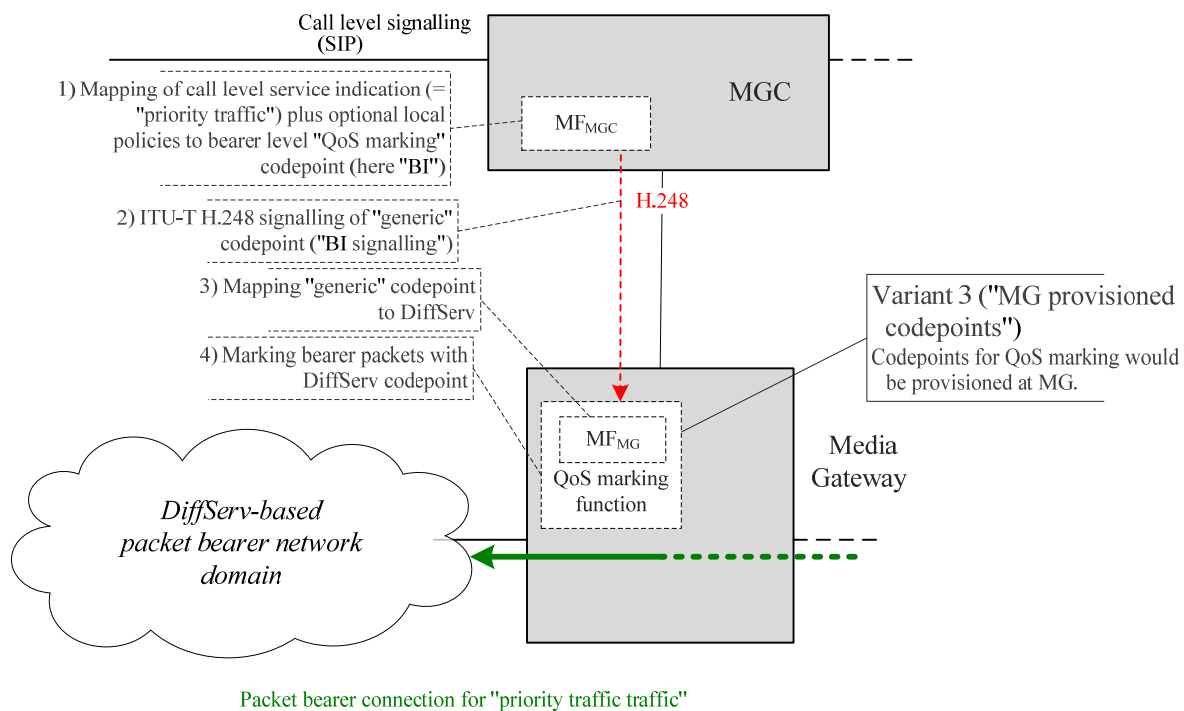


Figure I.2 – Controlling of the MG-level QoS marking function – Variant 3

Details:

- Variant 3: there is no explicit signalling of DiffServ codepoints at the ITU-T H.248 interface. Instead another ITU-T H.248 protocol element could be signalled to trigger marking bearer packets with appropriate DiffServ codepoints.
- Variant 4: in addition to other ITU-T H.248 protocol elements as in variant 3, ITU-T H.248 signalling may contain direct DiffServ codepoints, which leads to a mix of both ITU-T H.248 signalling options (i.e., bearer-dependent and bearer-independent formats used in parallel), and hence requires the careful consideration of possible interaction issues.

I.3 IEPS/ETS traffic support: Signalling (Stage 3) solutions

There are different signalling (Stage 3) alternatives as outlined by the previous clause, in order to satisfy requirements (Stage 2) for IEPS/ETS traffic support:

- (A) **Native approach:** direct signalling (Stage 3) method based on the explicit ITU-T H.248 signalling element for that purpose, e.g., the ContextAttribute IEPS call indicator. "Native" means that a Stage 3 protocol element is used for the underlying Stage 2 requirement. This approach is bearer independent.
- (B) **Emulation approach:** indirect signalling variant by reuse of existing signalling (Stage 3) capabilities for IEPS/ETS, like the ContextAttribute *Priority indicator* for IEPS/ETS (bearer independent) or diffserv codepoints (bearer dependent). "Emulation" means the use of Stage 3 for other Stage 2 requirements (if Stage 3 is applicable).

Thus, the "native" approach may require a mapping function (but not necessarily), whereas the "emulation" approach requires a mapping function.

Option (A) requires ITU-T H.248.1 version 3.

Appendix II

Potential use cases with IEPS call indicator support

II.1 Overview

The following use cases may be identified concerning ITU-T H.248 IP-IP gateway types (not an exhaustive list):

Table II.1 – Overview of use cases

Potential use cases with IEPS call indicator support
Use case #A: Support of multiple, different IP QoS architectures
Use case #B: IP bearer connection traversing different IP QoS architectures
Use case #C: Priority treatment with more than 16 priority levels
Use case #D: Network monitoring of signalling traffic (here: ITU-T H.248)
Use case #E: National regulations which mandate the use of both IEPS call and priority indicators
Use case #F: Heterogeneous vendor landscape

A crucial location of such an ITU-T H.248 gateway is the edge of an administrative domain, such as the peering point between different network operators. Such an interconnection scenario needs to consider a wide spectrum of possible network architectures and technology support due to different preferences and/or network status of individual operators.

Figure 1 (in clause 6) summarizes priority traffic handling by ITU-T H.248 entities. Any kind of traffic priority indication sent from the MGC to the MG leads to correspondent actions in one or multiple functional areas.

II.2 Use case #A: support of multiple, different IP QoS architectures

This use case focuses on bearer network characteristics (called 'area 5' in Figure 1) by considering support of multiple, different IP QoS architectures (see Figure II.1).

The assumption is that the Stage 2 requirement could be satisfied by dedicated QoS support for IEPS/ETS traffic as a Stage 3 solution. This implies a mapping of IEPS/ETS information at call control signalling level to appropriate "ITU-T H.248 means" (see also Figure. II.1).

There are two basic solutions, according to different mapping strategies, outlined in Figure. II.1:

- Solution A.1:
 - the MGC is responsible for all kinds of QoS mappings, thus a so-called *bearer-dependent decision point* (see clause 3.2.1);
 - the Stage 2 requirement could already be supported by ITU-T H.248 signalling elements for *QoS technologies*;
 - the ContextAttribute *IEPS call indicator* may not be needed at all;

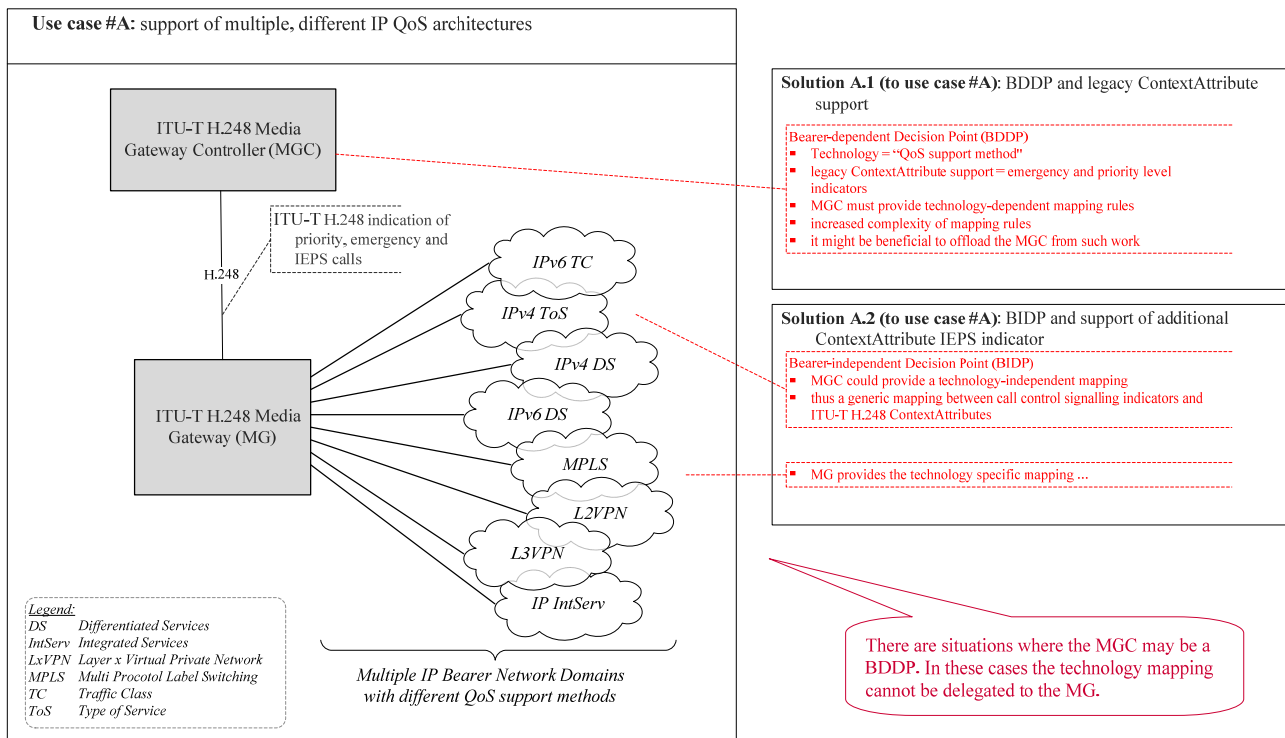


Figure II.1 – Use case #A: support of multiple, different IP QoS architectures

– Solution A.2:

- the *bearer-dependent decision point* (BDDP) responsibility is delegated to the slave MG entities;
- the MGC would thus be acting as a *bearer-independent decision point* (BIDP) (see clause 3.2.2);
- a generic mapping between call control signalling indicators and ITU-T H.248 ContextAttributes would be possible.

Conclusions:

- Option A.2 looks attractive from the MGC perspective; however, existing profile specifications assign the BDDP to the MGC (due to the *master* attribute of a MGC, see also clause 3.2.1)
- thus, the starting point for Stage 3 would be the assumption of a "QoS technology aware" MGC (i.e., option A.1)
- any IEPS call indicator support is not straightforward to justify.

II.3 Use case #B: IP bearer connection traversing different IP QoS architectures

The next use case is similar as scenario #A, but focuses on the interworking aspect: the end-to-end IP bearer connection for IEPS/ETS traffic traversing different IP QoS architectures (Figure II.2). Thus, the two ITU-T H.248 IP stream endpoints would then have different protocol stacks and/or different policy enforcements for IEPS/ETS support, leading to additional mapping complexity as in comparison to #A.

Conclusion:

- the discussion (for the indicated solutions B.1 and B.2 in Figure II.2) is fairly similar to that for use case #A.

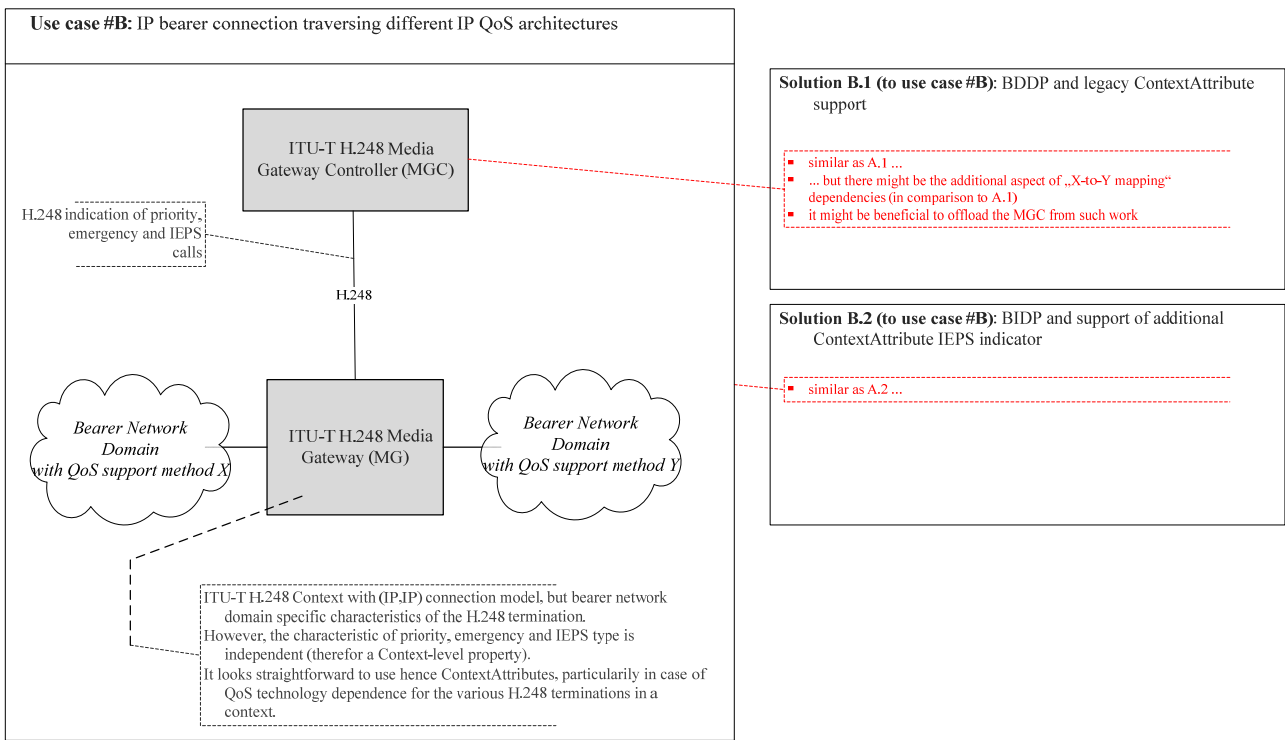


Figure II.2 – Use case #B: IP bearer connection traversing different IP QoS architectures

II.4 Use case #C: Priority treatment with more than 16 priority levels

The codepoint space would be exhausted in network environments which request more than 16 priority levels (due to existing protocol design of [ITU-T H.248.1]). The IEPS/ETS service could not be *emulated* (option B in clause I.3) by reserving a particular ITU-T H.248 priority indicator codepoint exclusively for IEPS/ETS calls.

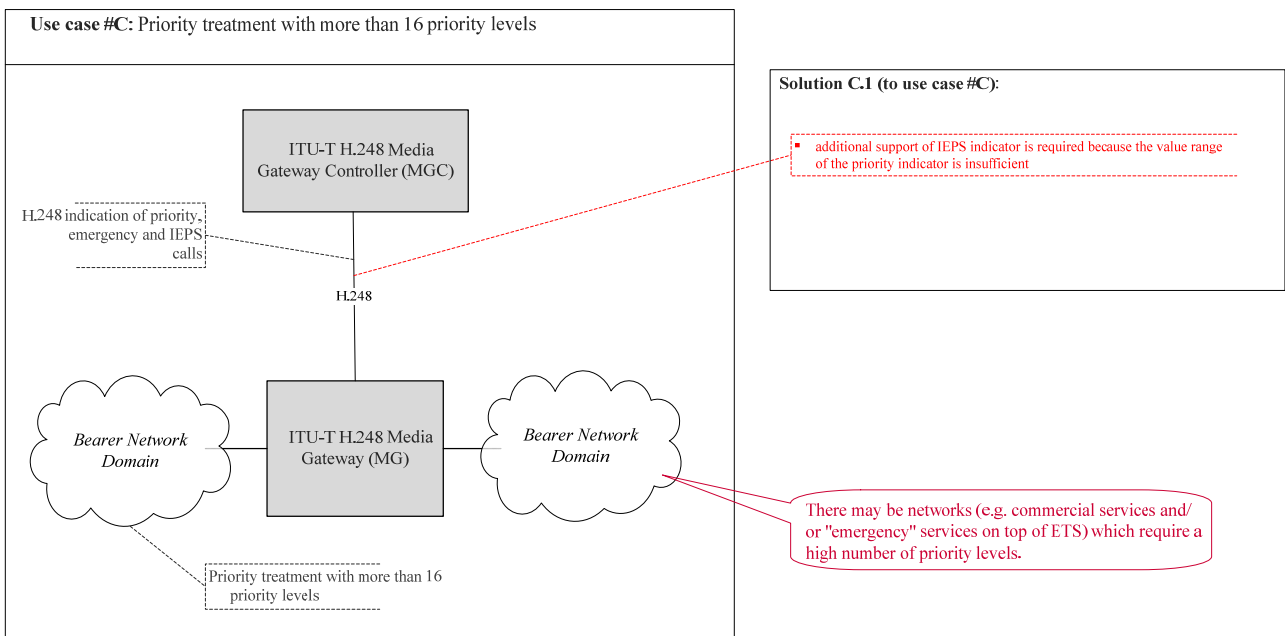


Figure II.3 – Use case #C: Priority treatment with more than 16 priority levels

Conclusions:

- there would be just one feasible solution (C.1) by support of the IEPS call indicator
- there is not yet any Stage 2 requirement announced requesting more than 16 priority levels.

II.5 Use case #D: Network monitoring of signalling traffic (here: ITU-T H.248)

Figure II.4 illustrates a theoretical network monitoring scenario, based on policy rules, – such as used by deep packet inspection (DPI), traffic detection functions (TDF) or intrusion detection systems (IDS), for detection of application "IEPS/ETS service" in network control plane traffic.

Conclusions:

- No further consideration is required since such a hypothetical monitoring service should not place any explicit requirements on the signalling.

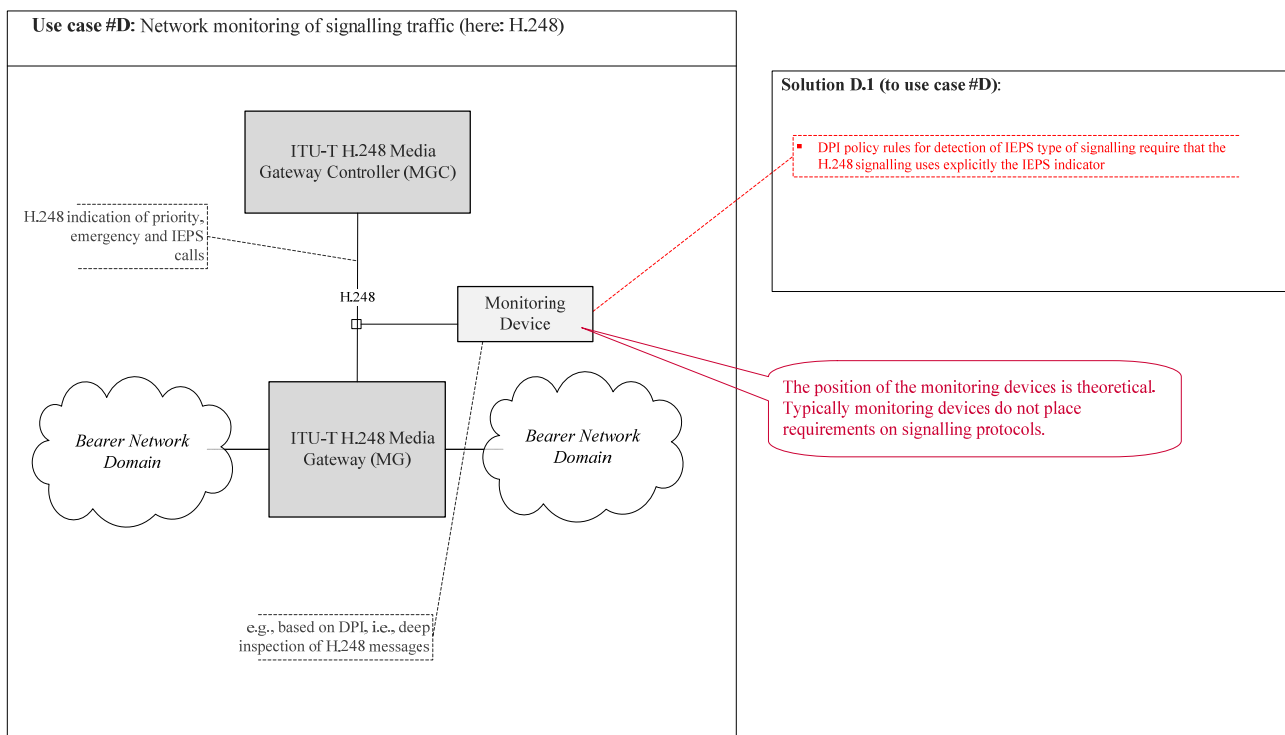


Figure II.4 – Use case #D: Network monitoring of signalling traffic (here: ITU-T H.248)

II.6 Use case #E: National regulations which mandate the use of both IEPS call and priority indicators

Regulation authorities could explicitly mandate support of all ContextAttributes for national solutions.

Conclusion:

- No further consideration is needed here because a national (or local) ITU-T H.248 profile would/could be derived from international (or global) ITU-T H.248 profile specifications.

II.7 Use case #F: Heterogeneous vendor landscape

No further elaboration of this use case is needed, because this is rather a network operator topic and beyond the scope of SDOs.

II.8 Summary and conclusions

The Stage 2 requirement for IEPS/ETS support may be basically satisfied by two Stage 3 solutions: *with* and *without IEPS call indicator* capability, called a native (A) and emulation (B) approach in clause I.3.

A number of practical and more theoretical use cases are discussed in this appendix. It might be concluded that the *native* approach could be beneficial in two scenarios:

- A.2: MGC as the bearer-independent decision point (BIDP) when IEPS/ETS support implies a dedicated QoS technology; and
- C.1: Exhausted codepoint space due to unavailable priority level codepoints for additional IEPS/ETS indication.

However, the majority of use cases could already be solved by an *emulation* approach.

Appendix III

Mapping function – Examples

The mapping function (MF) is defined in clause 3.2.3. This appendix illustrates the concept through some examples.

III.1 Examples of MGC- and MG-located mapping functions

Examples:

- MGC-located mapping function (MF_{MGC}):
 1. the SDP "b=" line is mapped from the session initiation protocol (SIP)/session description protocol (SDP) to ITU-T H.248/SDP with a modified "b=" line value: MF types (a1, c) (because the information element type (SDP "b=" line) is unchanged (Figure III.1).

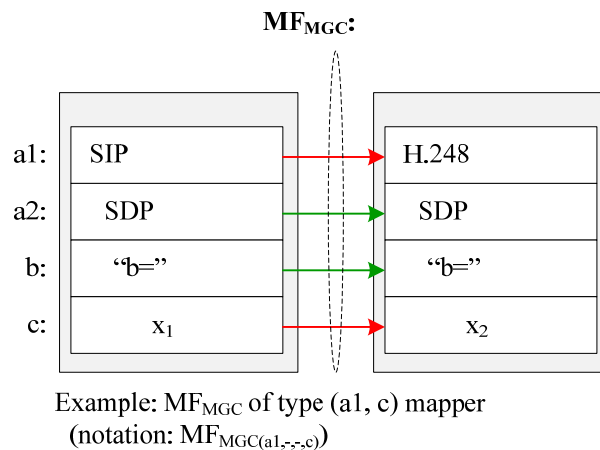


Figure III.1 – Example of an MGC-level mapping function (MF_{MGC})

2. the SIP resource priority header (RPH) value x_1 is mapped to
 - 2.1 ITU-T H.248 priority indicator with value x_2 (see also Table 2 of [ITU-T H.Sup9]): i.e., MF types (a, b, c);
 - 2.2 ITU-T H.248 *ds/dscp* property with value x_3 : i.e., MF types (a, b, c);
 - 2.3 ITU-T H.248 *vlan/pri* property with value x_1 : i.e., MF types (a, b) (because the Ethernet priority here is identical to the SIP RPH value);
 3. the SDP "a=qos" attribute is mapped from SIP/SDP to ITU-T H.248/SDP
- MG-located mapping function (MF_{MG}):
 4. the ITU-T H.248 priority indicator with value x_1 is mapped to
 - 4.1 IPv6 traffic class with value x_2 : i.e., MF types (a, b, c);
 - 4.2 IPv6 traffic class with value x_1 : i.e., MF types (a, b);
 - 4.3 Ethernet priority header with value x_1 : i.e., MF types (a, b);
 - 4.4 IPv4 DiffServ field with value x_2 : i.e., MF types (a,b,c);
 - 4.5 IPv6 DiffServ field with value x_2 : i.e., MF types (a, c);

5. the ITU-T H.248 *ds/dscp* property with value x_1 is mapped to
 - 5.1 IPv6 DiffServ field with value x_1 : i.e., MF type (a);
 - 5.2 IPv6 DiffServ field with value x_2 : i.e., MF types (a, c);
 - 5.3 Ethernet priority header with value x_1 : i.e., MF types (a, b);

III.2 Complete view on the two mapping functions in series

The examples in this clause refer to the evaluation of signalling options in clause I.2, which selects three variants for their discussion. Figure III.2 illustrates the three variants:

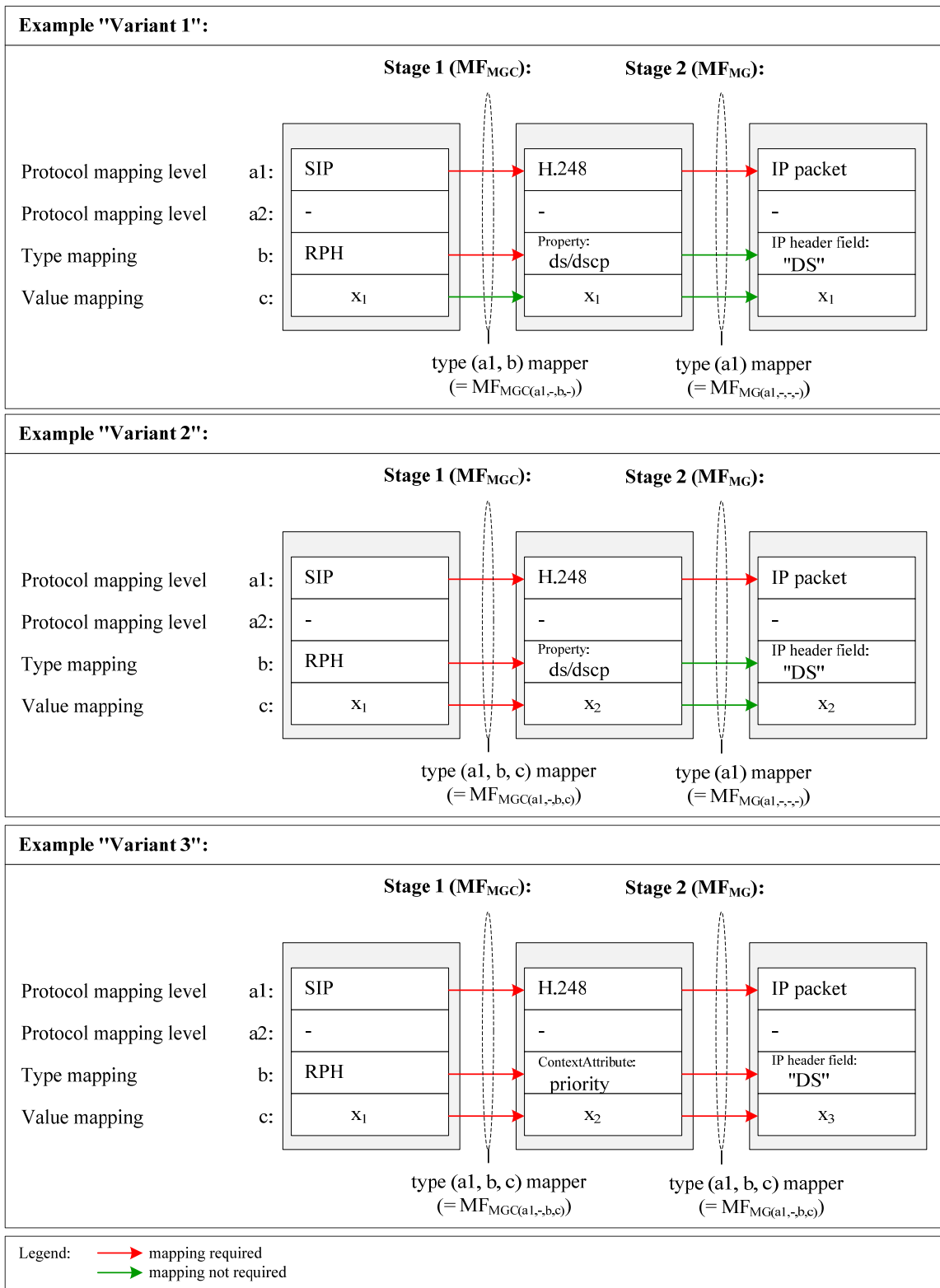


Figure III.2 – Three of the variants as discussed in clause I.2

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