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SERIES Q: SWITCHING AND SIGNALLING

**Signalling requirements to support the
International Emergency Preference Scheme
(IEPS)**

ITU-T Q-series Recommendations – Supplement 53



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Supplement 53 to ITU-T Q-series Recommendations

Signalling requirements to support the International Emergency Preference Scheme (IEPS)

Summary

This Supplement is an information document intended to identify the signalling requirements required to support the International Emergency Preference Scheme (IEPS). IEPS is described in ITU-T Rec. E.106 and allows authorized users to have access to the International Telephone Service while the service is restricted due to damage, congestion, and/or other faults. IEPS capabilities provide authorized users with preferential call and connection handling.

Source

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FOREWORD

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Supplement 53 to ITU-T Q-series Recommendations

Signalling requirements to support the International Emergency Preference Scheme (IEPS)

1 Scope

This Supplement identifies the signalling requirements to support preferential capabilities within networks that are used to support emergency response/recovery activities and disaster responders. IEPS is described in ITU-T Rec. E.106, *International Emergency Preference Scheme (IEPS) for disaster relief operations*.

2 References

- [1] ITU-T Recommendation E.106 (2003), *International Emergency Preference Scheme (IEPS) for disaster relief operations*.
- [2] ITU-T Recommendation E.370 (2001), *Service principles when public circuit-switched international telecommunication networks interwork with IP-based networks*.
- [3] ITU-T Q-series Recommendations – Supplement 47 (2003), *Emergency services for IMT-2000 networks – Requirements for harmonization and convergence*.
- [4] ITU-T Q-series Recommendations – Supplement 32 (2002), *Technical Report TRQ.2141.1: Signalling requirements for the support of narrowband services via broadband transport technologies – CS-2 signalling flows*.
- [5] ITU-T Q-series Recommendations – Supplement 22 (1999), *Technical Report TRQ.3000: Operation of the bearer independent call control (BICC) protocol with digital subscriber signalling system No. 2 (DSS2)*.
- [6] ITU-T Q-series Recommendations – Supplement 23 (1999), *Supplement to ITU-T Q.1901 Recommendation – Technical Report TRQ.3010: Operation of the bearer independent call control (BICC) protocol with AAL Type 2 Signalling Protocol (CS-1)*.
- [7] ITU-T Recommendation Q.1902.x series (2001), *Bearer Independent Call Control protocol (Capability Set 2)*.
- [8] ITU-T Recommendation Q.1950 (2002), *Bearer independent call bearer control protocol*.
- [9] ITU-T Recommendation Q.2931 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control*.
- [10] ITU-T Recommendation Q.2630.3 (2003), *AAL type 2 signalling protocol – Capability Set 3*.
- [11] ITU-T Recommendation Y.1271 (2004), *Framework(s) on network requirements and capabilities to support emergency telecommunications over evolving circuit-switched and packet-switched networks*.
- [12] ITU-T Recommendation M.3350 (2004), *TMN service management requirements for information interchange across the TMN X-interface to support provisioning of Emergency Telecommunication Service (ETS)*.

3 Definitions

This Supplement defines the following term:

3.1 authenticating entity: A recognized entity that validates that the user of the IEPS is entitled to such use under the charter of that entity. There would be a number of such entities, each tasked with authenticating attempts for IEPS by their members.

4 Abbreviations and Acronyms

This Supplement uses the following abbreviations:

AAL 2	ATM Adaptation Layer type 2
ACC	Automatic Congestion Control
ACG	Automatic Code Gap
BICC CS-2	Bearer Independent Call Control protocol, Capability Set 2
B-ISDN	Broadband ISDN
B-ISUP	B-ISDN User Part
CANF	CANcel From
CANT	CANcel To
CBC	Call Bearer Control Protocol
CPC	Calling Party's Category
DSS2	Digital Subscriber Signalling System No. 2
IAM	Initial Address Message
IEPS	International Emergency Preference Scheme
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
NMC	Network Management Control
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
QoS	Quality of Service

All other relevant abbreviations are contained in the above references.

5 Introduction

Disaster situations can occur any time, any place, unexpectedly. These events often significantly damage the community infrastructure and severely disrupt daily living. Recovery requires rapid response by local authorities, immediate reaction from utility service providers, and support from medical, construction, fire, and police resources. Effective communications are essential to facilitate the myriad activities for coordinating lifesaving activities concurrent with re-establishing control in the disaster area. Following a disaster, immediate response operations focus on saving lives, protecting property, and meeting basic human needs.

When a disaster strikes, the public telecommunications infrastructure generally sustains damage, experiences excessive traffic loads, and is subject to external interference that may severely limit the ability for response and recovery activities to communicate. Therefore, special provisions to facilitate effective communications for the emergency activities are necessary. This includes priority establishment and processing of communications through the telecommunication resources that remain available. IEPS traffic needs to receive preferential use of the surviving capacity of the impacted network.

6 General requirements

The general requirements for IEPS are currently contained in ITU-T Rec. E.106 for Integrated Services Digital Networks (ISDN), Public Land Mobile Networks (PLMN), and Public Switched Telephone Networks (PSTN), irrespective of the bearer technology. Essential network features are identified as priority dial tone, priority call set up, including priority queuing schemes, and exemption from restrictive network management controls, such as call gapping.

The basic services E.106 addresses are voice and data. The growing emergence of integrated voice and data services of next generation telecommunication and mobile networks not only supports telephony but also provides a variety of enhanced modes of communication. These additional services can also be used for emergency communications and will enable emergency recovery operations to have a comprehensive menu of supporting communication capabilities.

In addition to the IEPS priority indication, the country/network of call origination and multiple levels of priority are required to be supported in the call control network based on bilateral agreement between administrations. Similarly, the IEPS priority indication is required to be supported in the bearer control network.

7 Detailed requirements

7.1 Identification of IEPS traffic and priority levels

Calls need to be marked to identify authorized IEPS users and the identification be maintained through to completion. Support for the IEPS call indicator is required for signalling, switching, and in bearer and traffic channels.

An IEPS priority indicator is generated in a network of the call originating country. The IEPS priority indicator is set independently from any other indicator or condition and is included in the very first signalling message of the call set up procedure, e.g., IAM. The Bearer Control Signalling Protocol shall, where possible, signal the IEPS priority indicator in the very first signalling message of the bearer setup procedure, e.g., SETUP, INVITE, etc. This will ensure that the Bearer Relay Nodes provide priority to Bearer setup with an IEPS indicator. The IEPS priority indication is retained in call and bearer control throughout the call duration.

Networks supporting IEPS use the Calling party's category and IEPS indicator values to trigger IEPS treatment. These values should be set prior to accessing the international network (for example, within the originating national network or at the outgoing international gateway).

Thirty-two levels of priority have been identified within ISUP and BICC. Priority levels are not used to provide preferential treatment for the call. The lowest numerical value signals the highest priority.

Incoming international gateway exchanges may be equipped to map priority level indications received in the context of incoming international IEPS calls to national priority levels required and applied in the terminating countries. In case that mapping is not implemented, priority level may be discarded, however the call shall continue to be treated as a priority call.

7.2 Security

Security protection is necessary to prevent unauthorized users from accessing scarce resources needed to support emergency operations. This includes such threats as spoofing, intrusion, and denial of service. IEPS calls should be protected against possible attempts to obstruct or otherwise impede the provision, operation and performance of the IEPS service.

Additional procedures concerning national issues should be considered, but are outside the scope of this Supplement.

7.3 Interworking

IEPS may be accessed or terminated via legacy national preference schemes or emergency services. International networks supporting IEPS should, at a minimum, transparently carry additional national information.

Gateways between domains using different preference mechanisms must be able to translate IEPS markings (i.e., IEPS CPC value) appropriately.

The following relationship exists between a national legacy and the IEPS priority scheme:

- i) Priority or preference within the international systems does not necessarily guarantee priority in national telecommunications networks.
- ii) Priority or preference within national systems does not necessarily guarantee priority in the international telecommunications networks.
- iii) IP-to-PSTN gateways should use the IEPS CPC value to maintain the identification for priority/preference for calls established as IEPS as consistent with clauses i and ii.
- iv) PSTN-to-IP gateways should have the capability to recognize the IEPS CPC value of an IEPS call, consistent with clauses i and ii, and mark packets in some way that maintains the identification for priority/preference treatment.

IEPS may be accessed or terminated via national preference schemes or emergency services. With regard to the priority rights, the following relationship between a national and the international emergency system (IEPS) is ensured:

- Priority in national systems does not include priority in IEPS. This is to avoid IEPS access by non-entitled users.
- IEPS priority always includes priority in national systems. This is necessary to ensure IEPS access via national preference systems.

7.4 IEPS treatment

When a node receives an IEPS call (i.e., the CPC value is "IEPS"), the call establishment proceeds with priority. The call is established with the CPC set as "IEPS" in the outgoing call set up message.

The IEPS priority indicator is conveyed across the international signalling network. The IEPS priority indication invokes preferential call handling in international transit exchanges, e.g., special routing capabilities.

The IEPS priority indication provides exemption from restrictive network management controls.

The network should try to reduce call set-up failures due to timer expirations caused by, for example, queuing delays for trunk allocation on congested routes.

The IEPS priority indication does not invoke pre-emption in the international network.

7.4.1 Queuing (ISUP) and polling (BICC)

For ISUP IEPS calls, if the above procedure fails to immediately find an outgoing circuit, the call is queued and shall take precedence over any other normal call attempts.

For BICC IEPS calls, if the above procedure fails to immediately find a bearer, the optional polling sequence described in Annex B applies.

7.4.2 Routing

The networks may use the IEPS marker for special routing to maintain an IEPS communication. Should the destination have "call forwarding" initiated, the network should then continue to reroute and process the communication session with the IEPS marker to the new destination. IEPS calls should be exempt from call restrictions to certain specific destinations (e.g., country codes or area codes), if activated.

7.4.3 Quality of Service (QoS)

The QoS for different modes of service for IEPS would typically be designated as the best available to ensure clear clean communications and conveyance of important information. However, when the telecommunication resources are experiencing severe stress, an allowable degradation of QoS could be acceptable. This could occur only when resources have become unavailable to the point that the network cannot support non-emergency traffic and sufficient bandwidth and resources are not available to support the normally acceptable QoS level for emergency traffic.

Rather than lose the ability to communicate, emergency operations need to continue to convey critical information, even if with difficulty. Any possibility of getting information through is better than none at all. The IEPS needs to continue operation when only "best effort" service is available. Therefore, a special or supplemental class of QoS for IEPS may be necessary to define the conditions and terms for allowable degradation of service.

7.4.4 Exemption from restrictive Network Management Controls (NMCs)

Restrictive network management controls are not applied to this call. There are several types of restrictive NMCs that could negatively affect IEPS calls.

Code controls block traffic to destination codes that are difficult or impossible to reach. This conserves network resources to serve traffic that has a better chance of completing. Code controls are most effective for controlling focused overloads, a condition characterized by a surge of traffic from other parts of the network to a single office or customer identified by a destination code. Two code controls have been developed. Code blocking controls a percentage of calls forwarded to a destination code. Call gapping regulates the maximum rate at which calls are forwarded to a destination code.

Calls are subject to any pre-hunt control that may be in effect on that trunk group. Trunk group controls include CANcel From (CANF), CANcel To (CANT), Skip, Dynamic Overload Control, and Selective Incoming Load Control. The last two controls provide Automatic Congestion Control (ACC) by responding to machine congestion messages and "hard-to-reach" information sent by SS7. Automatic Code Gap (ACG) is another SS7 control imposed that could negatively affect IEPS calls.

7.4.5 DSS2 interaction with BICC call control

This clause describes the IEPS information mapping between the BICC signalling entity and the DSS2 signalling entity. IEPS information mapping between the BICC signalling entity and DSS2 signalling entity via the CBC (vertical) interface is shown in Table 1.

Table 1 – Mapping of IEPS information

BICC signalling entity (Parameter)	DSS2 signalling entity (Information Element)
Calling party's category (IEPS call marking for preferential call set up)	IEPS indicator (IEPS marking for preferential call/connection set up)

7.4.6 AAL2 interaction with BICC call control

This clause describes the IEPS information mapping between the BICC signalling entity and the AAL2 signalling entity. IEPS information mapping between the BICC signalling entity and AAL2 signalling entity via the CBC (vertical) interface is shown in Table 2.

Table 2 – Mapping of IEPS Information

BICC signalling entity (Parameter)	AAL type 2 signalling entity (Parameter)
Calling party's category (IEPS call marking for preferential call set up)	IEPS indicator

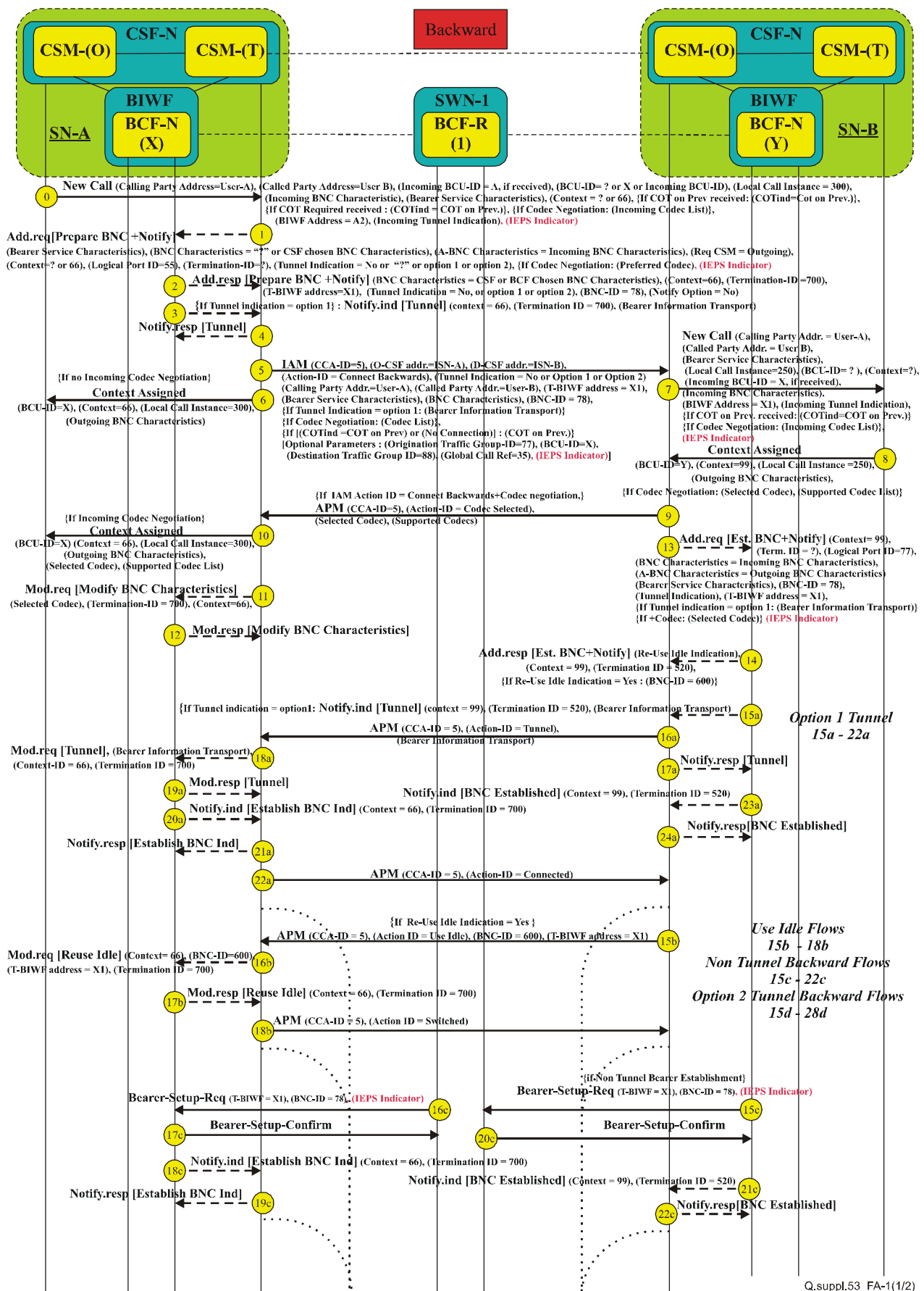
8 Conclusion

Support for IEPS needs to be developed and integrated into current and future networks, regardless of the technology.

Annex A

Support of IEPS bearer level priority indicator in E.106

A.1 Backward backbone network establishment composite flow



Q.suppl.53_FA-1(1/2)

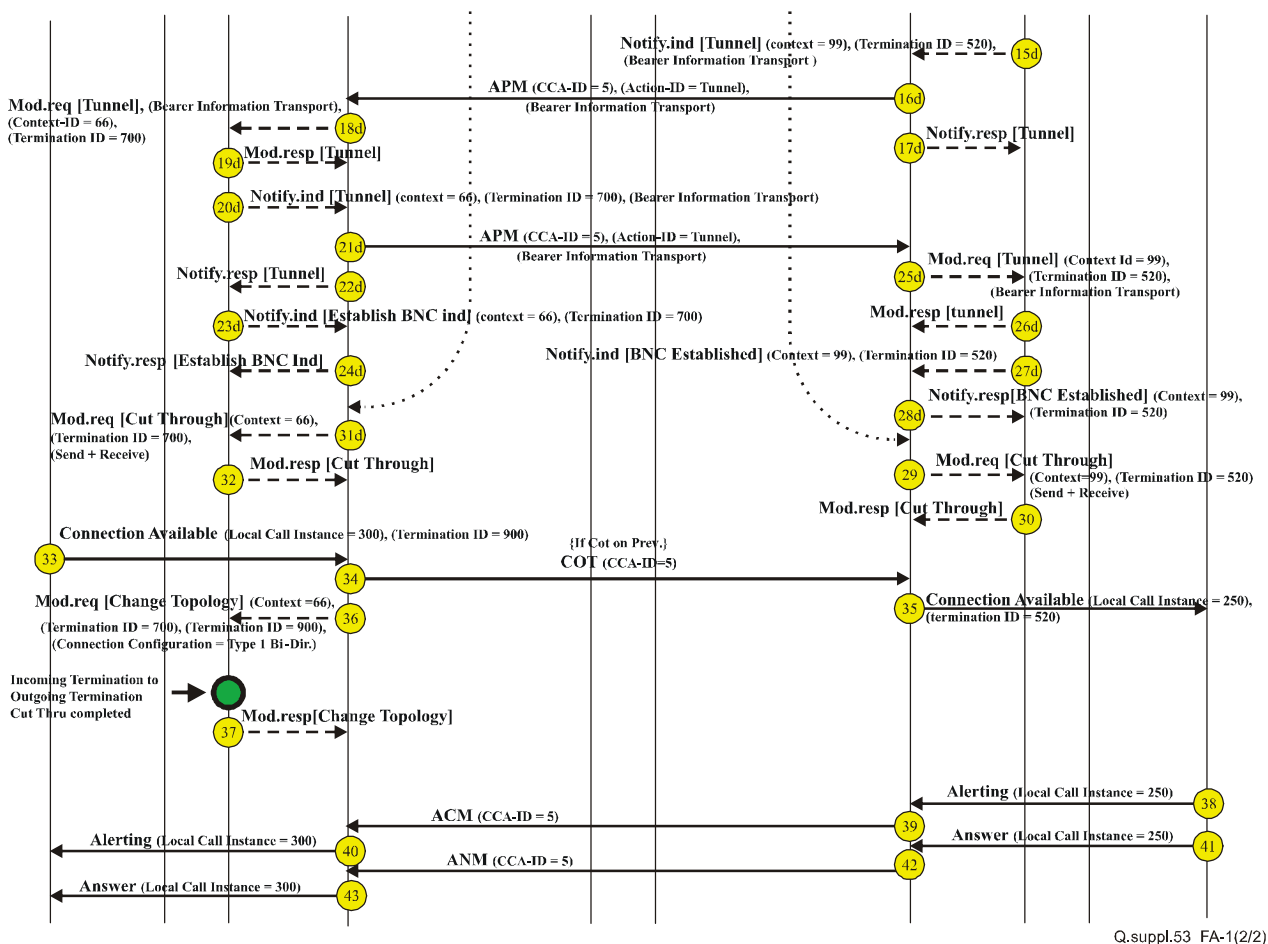


Figure A.1 – Composite backward connection establishment flow

The following numbered items describe the numbered flows shown above. Note that the following call flows are affected in support of IEPS: 0, 1, 5, 7, 13, 15c, and 16c.

0	New Call	SN-A:CSM-O to SN-A:CSM-T
<u>Address Information</u>	<u>Control information</u>	<u>Bearer information</u>
As TRQ.2141.1	As TRQ.2141.1 IEPS Indicator	As TRQ.2141.1

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS call (e.g. preferential treatment applied).

1	ADD.req (Prepare BNC with notification)	SN-A: CSM-T to BIWF-X
<u>Address Information</u>	<u>Control information</u>	<u>Bearer information</u>
As TRQ.2141.1	As TRQ.2141.1 IEPS Indicator	As TRQ.2141.1

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS connection (e.g. preferential treatment applied).

2	ADD.resp [BNC Prepared]	BIWF-X to SN-A: CSM-T
	As TRQ.2141.1.	
3	Notify.ind [Tunnel]	BIWF-X to SN-A: CSM-T
	As TRQ.2141.1.	
4	Notify.resp [Tunnel]	SN-A: CSM-T to BIWF-X
	As TRQ.2141.1.	
5	IAM	SN-A: CSM-T to SN-B: CSM-O
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator
		<u>Bearer information</u> As TRQ.2141.1

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS call (e.g. preferential treatment applied).

6	Context Assigned	SN-A: CSM-T to SN-A: CSM-O
	As TRQ.2141.1.	
7	New Call	SN-B: CSM-O to SN-B: CSM-T
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator
		<u>Bearer information</u> As TRQ.2141.1

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS call (e.g. preferential treatment applied).

Information Flows 8-12

As TRQ.2141.1

13	ADD.req (Est. BNC + Notify)	SN-B: CSM-T to BIWF-Y
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator
		<u>Bearer information</u> As TRQ.2141.1

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS connection (e.g. preferential treatment applied).

Information Flows 14-18b

As TRQ.2141.1

15c	Bearer-Setup.Req	BIWF(Y) to SWN(1)
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator
		<u>Bearer information</u> As TRQ.2141.1

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. **Resources are allocated for an IEPS connection (e.g. preferential treatment applied).**

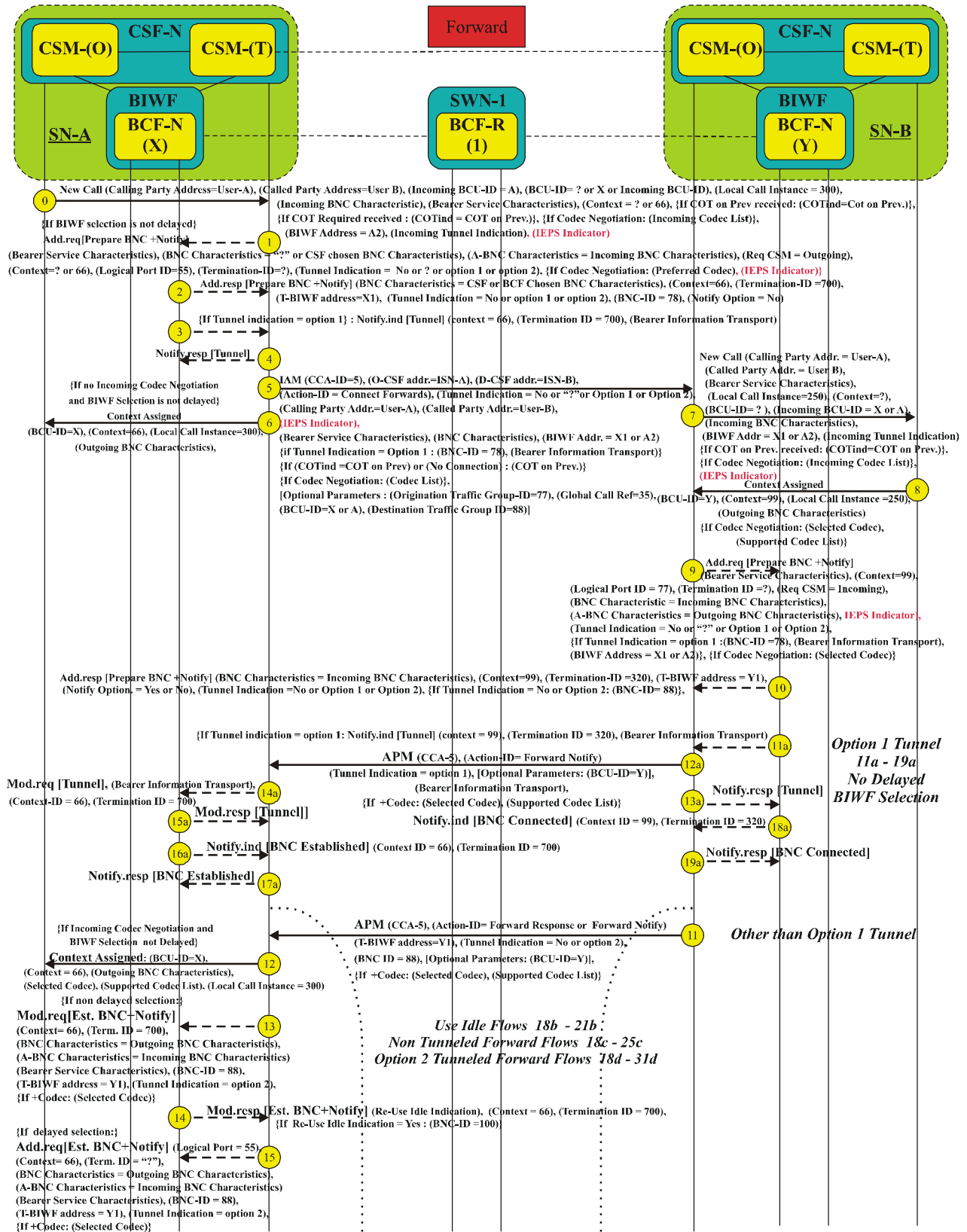
16c	Bearer-Setup.Req	SWN(1) to BIWF(x)	
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator	<u>Bearer information</u> As TRQ.2141.1

Initiation of information flow: As TRQ.2141.1.

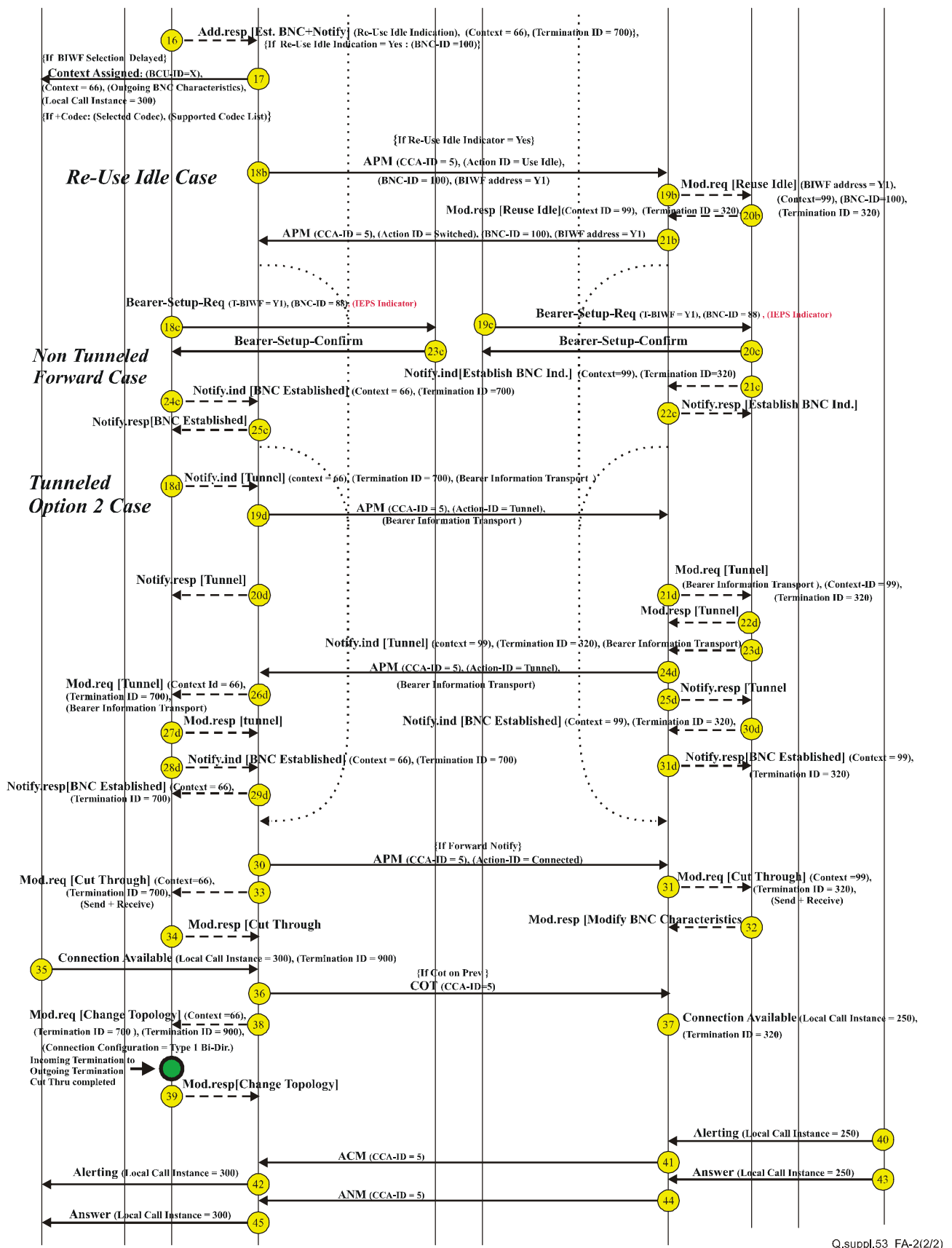
Processing upon receipt: As TRQ.2141.1 **Resources are allocated for an IEPS connection (e.g. preferential treatment applied).**

<u>Information Flows 17c-43</u> As TRQ.2141.1

A.1.2 Forward backbone network establishment composite flow



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Q.suppl.53_FA-2(2/2)

Figure A.2 – Composite forward establishment flow

The following numbered items describe the numbered flows shown above. Note the following call flows are affected in support of IEPS: 0, 1, 5, 7, 9, 18c, and 19c.

0	New Call	SN-A: CSM-O to SN-A: CSM-T		
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator	<u>Bearer information</u> As TRQ.2141.1	
Initiation of information flow: As TRQ.2141.1.				
Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS call (e.g. preferential treatment applied).				
1	ADD.req (Prepare BNC with notification)	SN-A: CSM-T to BIWF-X		
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator	<u>Bearer information</u> As TRQ.2141.1	
Initiation of information flow: As TRQ.2141.1.				
Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS connection (e.g. preferential treatment applied).				
2	ADD.resp [BNC Prepared]	BIWF-X to SN-A: CSM-T		
As TRQ.2141.1.				
3	Notify.ind [Tunnel]	BIWF-X to SN-A: CSM-T		
As TRQ.2141.1.				
4	Notify.resp [Tunnel]	SN-A: CSM-T to BIWF-X		
As TRQ.2141.1.				
5	IAM	SN-A: CSM-T to SN-B: CSM-O		
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator	<u>Bearer information</u> As TRQ.2141.1	
Initiation of information flow: As TRQ.2141.1.				
Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS call (e.g. preferential treatment applied).				
6	Context Assigned	SN-A: CSM-T to SN-A: CSM-O		
As TRQ.2141.1.				
7	New Call	SN-B: CSM-O to SN-B: CSM-T		
	<u>Address Information</u> As TRQ.2141.1	<u>Control information</u> As TRQ.2141.1 IEPS Indicator	<u>Bearer information</u> As TRQ.2141.1	

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS call (e.g. preferential treatment applied).

8	Context Assigned	SN-B: CSM-T to SN-B: CSM-O		
As TRQ.2141.1.				
9	ADD.req (Prepare BNC with notification)	SN-B: CSM-O to BIWF-Y		
	<u>Address Information</u>	<u>Control information</u>	<u>Bearer information</u>	
	As TRQ.2141.1	As TRQ.2141.1 IEPS Indicator	As TRQ.2141.1	

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS connection (e.g. preferential treatment applied).

<u>Information Flows 10-21b</u>				
As TRQ.2141.1				

18c	Bearer-Setup Req	BIWF(X) to SWN(1)		
	<u>Address Information</u>	<u>Control information</u>	<u>Bearer information</u>	
	As TRQ.2141.1	As TRQ.2141.1 IEPS Indicator	As TRQ.2141.1	

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS connection (e.g. preferential treatment applied).

19c	Bearer-Setup Req	SWN(1) to BIWF(Y)		
	<u>Address Information</u>	<u>Control information</u>	<u>Bearer information</u>	
	As TRQ.2141.1	As TRQ.2141.1 IEPS Indicator	As TRQ.2141.1	

Initiation of information flow: As TRQ.2141.1.

Processing upon receipt: As TRQ.2141.1. Resources are allocated for an IEPS connection (e.g. preferential treatment applied).

Information Flows 20c-45
As TRQ.2141.1

Annex B

Use of polling in the CSF for IEPS BICC calls

For BICC IEPS calls, the optional polling sequence for handling the seizure of a BIWF is:

- 1) The CSF shall attempt to seize a BIWF.
- 2) If there is no reply, or the BIWF indicates failure due to temporary resource unavailability, an ACM (no indication) is returned to the incoming side (unless COT is expected, in which case the ACM is sent once the COT has been received). A polling guard timer is started to prevent the CSF to be polling for an IEPS call for an excessive time.
- 3) The CSF may immediately select and attempt to seize a different BIWF. Upon failure due to temporary resource unavailability, or no reply, this step may be repeated to select other appropriate BIWFs.
- 4) If failure, due to temporary resource unavailability (or no reply), is indicated on all selected BIWFs, the CSF shall start a polling timer (Tpoll).
- 5) On expiry of Tpoll, the CSF shall attempt to seize the first BIWF. If there is no reply, or the BIWF indicates failure due to temporary resource unavailability, steps 3 and 4 are repeated until a BIWF indicates that resources are available. The time between the sets of BIWF seizure attempts (Tpoll) should increase for each successive set of seizure attempts.

A typical example sequence is illustrated in Figure B.1:

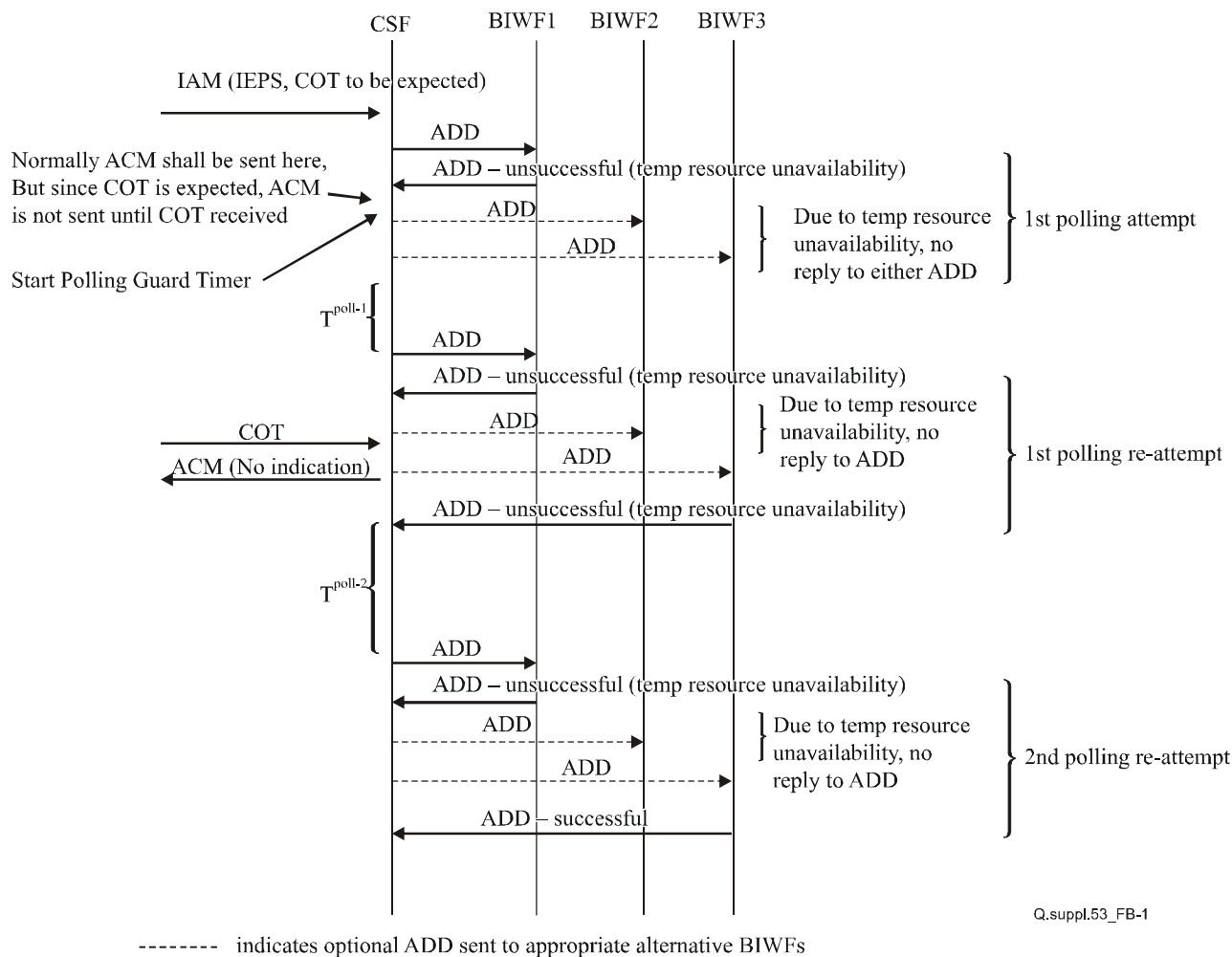


Figure B.1 – Example polling sequence in the CSF

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