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Abstract: This document is the initial output of draft new Recommendation Q.IMS-INT-RS "IMS interconnection restoration architecture and procedures", resulting from discussion of Q3/11 meeting on 17-26 November 2025.

This document is the initial output of draft new Recommendation ITU-T Q.IMS-INT-RS "IMS interconnection restoration architecture and procedures", resulting from discussion of Q3/11 meeting on 17-26 November 2025.

This document is based on this meeting's discussion and results on the following contribution:

No.	Title	Source	Discussion
SG11-C196	Proposal to start a new work item - Q.IMS-INT-RS "IMS interconnection restoration architecture and procedures"	China Academy of Information and Communications Technology, China Telecommunications Corporation, China Mobile Communications Co. Ltd.	Accepted with modifications.

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Draft new Recommendation Q.IMS-INT-RS

IMS interconnection restoration architecture and procedures

1.Scope

This draft Recommendation provides IMS interconnection restoration architecture and procedures. The scope of this draft Recommendation consists of:

- Restoration architecture of IMS interconnection
- Service interruption conditions of IMS interconnection
- Restoration signaling procedures of IMS interconnection
- Interface descriptions of IMS interconnection restoration

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 Q.3630] Recommendation ITU-T Q.3630 v1 (03/2017), *Inter-IMS Network to Network Interface (NNI)*

[ETSI TS 124 229] ETSI TS 124 229 V16.5.0 (2020-03), *IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP)*

3.Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 Service Interruption: A condition during which one or more network elements become unresponsive to requests and cease to initiate any requests toward other elements in the system.

4. Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

BG	Border Gateway
DNS	Domain Name System
ENUM	E.164 Number Mapping
IBCF	Interconnection Border Control Function

I-CSCF	InterrogatingCall Session Control Function
IMS	IP Multimedia Subsystem
IP	Internet Protocol
NNI	Network to Network Interface
SBC	Session Border Controller
S-CSCF	Serving Call Session Control Function
SIP	Session Initiation Protocol
TrGW	Transition Gateway

5. Conventions

None.

6. Restoration architecture of IMS interconnection

6.1 Overview

[Editor's note: CSCF/SBC should be identified in the Figure 6-1. Contributions are invited.]

The IMS interconnection restoration architecture is based on a shared backup mechanism, which enables a set of primary interconnection points to utilize a common backup interconnection point located at a geographically separate site to recover service during failures.

The architecture requires each interconnected operator to maintain a dedicated backup interconnection point. The backup points of interconnected operators are interconnected to form a logical backup plane. Upon failure detection, service traffic is rerouted via this backup plane to ensure continuity.

The architectural reference model is shown in Figure 6-1.

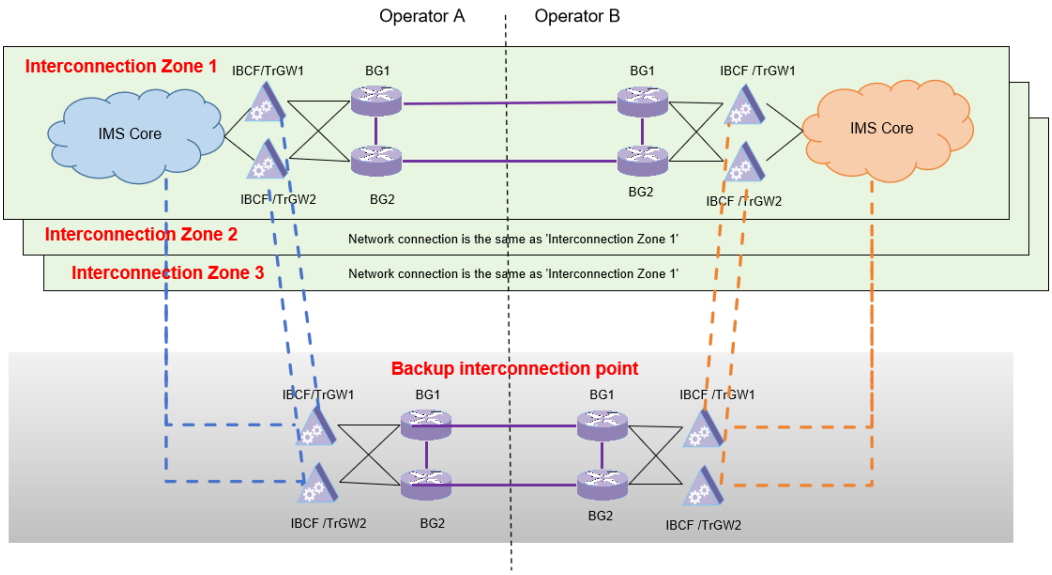

Figure 6-1 Restoration architecture of IMS interconnection

Note: The BG depicted in the architecture is a boundary entity responsible for security isolation, policy control, and Network Address Translation (NAT). As the BG resides on the critical interconnection path between operators and handles inter-network signaling and media traffic, its failure directly affects service interoperability

6.2 Requirements for restoration architecture

The implementation of the restoration architecture shall comply with the following requirements:

a）The backup interconnection point shall contain at least two sets of IBCF/TrGW node. The backup interconnection points of interconnected operators shall be interconnected in a full-mesh topology.

b）The backup interconnection point shall be located in a city different from any existing IMS interconnection point. Its implementation shall be fully independent of existing interconnection points, and no network equipment, service nodes, or transmission links shall be shared with the existing infrastructure.

c）Route reachability shall be established between the backup IBCF/TrGW and the S-CSCF/I-CSCF/SBC of each interconnected IMS core network to serve as backup transit links. Corresponding resolution data shall be provisioned in the ENUM/DNS systems of each respective IMS core network.

d）Route reachability shall be established between the backup IBCF/TrGW and each existing IMS interconnection IBCF/TrGW to serve as the backup routes. Corresponding routing data shall be provisioned in the existing IMS interconnection IBCF.

7. Service interruption conditions of IMS interconnection

IMS interconnection networks are typically based on an architecture incorporating redundant pairs of IBCF/TrGW nodes. The BG nodes are often interconnected in a ring topology at the transport layer. A typical architectural model is illustrated in Figure 7-1.

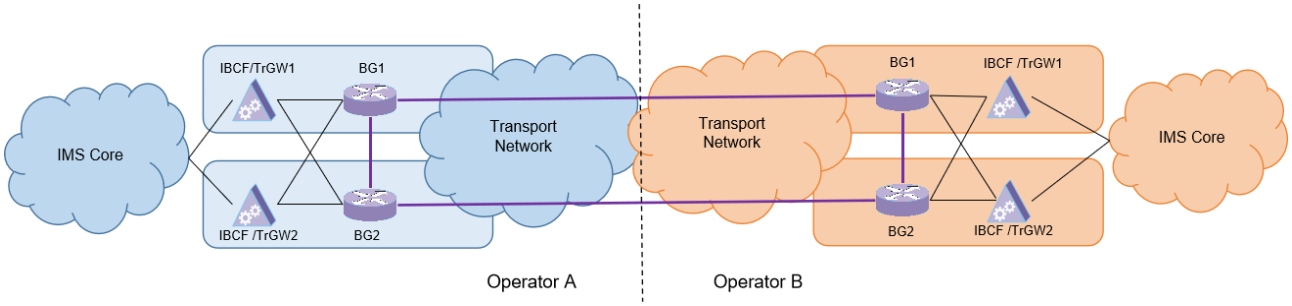

Figure 7-1 IMS Interconnection architecture

Service interruptions may occur due to specific failures. The restoration procedures specified in this Recommendation are activated under any of the following conditions:

a）Equipment-level failure: Complete failure of all IBCF/TrGW nodes within a single operator's network.

b）Gateway-level failure: Complete failure of all BG nodes within a single operator's network.

c）Transport-level failure: Complete outage of all interconnection links between two operators.

8. Restoration signaling procedures of IMS interconnection

8.1 Overview

Different restoration signaling procedures shall be applied depending on the Service interruption condition, primarily including IBCF triggered restoration and CSCF triggered restoration.

The IBCF triggered restoration signaling procedure shall be activated in the event of failures within the inter-operator IP bearer network, such as BG node or link failures.

The CSCF triggered restoration signaling procedure shall be initiated upon a complete failure of all IBCF/TrGW nodes at an interconnection point, resulting in a total loss of reachability between the IMS core network and the interconnection point.

8.2 IBCF triggered restoration signaling procedure

[Editor's note: interface should be identified in the Figure 8-1. Contributions are invited.]

The application condition for the IBCF triggered restoration is shown in Figure 8-1. When the primary interconnection route fails due to a transport network or BG device failure (indicated by the red line in Figure 8-1), the IBCF in the originating network shall use the IP address of the IBCF at the backup interconnection point as the next hop. This action redirects the service traffic to the backup route via the designated backup interconnection point (indicated by the green line in Figure 8-1) to complete the session establishment.

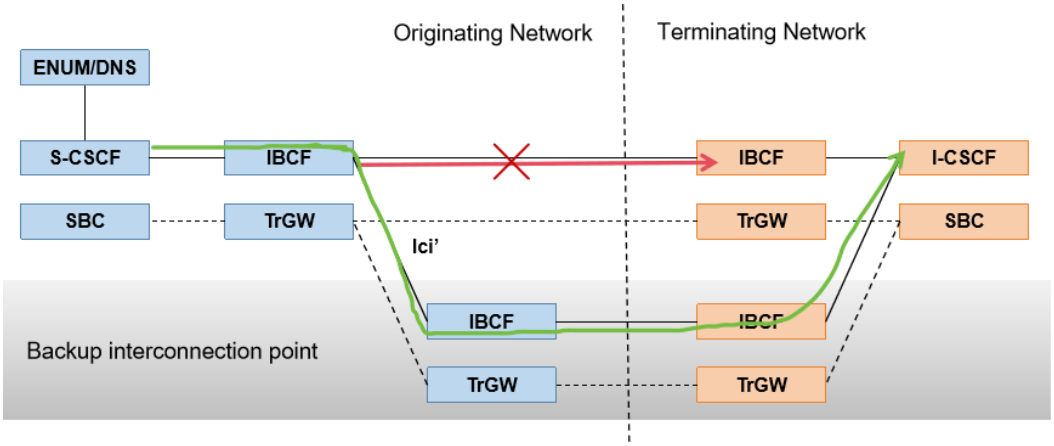

Figure 8-1 Architecture for IBCF restoration

Figure 8-2 illustrates the signaling procedure of CSCF restoration between IMS networks of different operators.

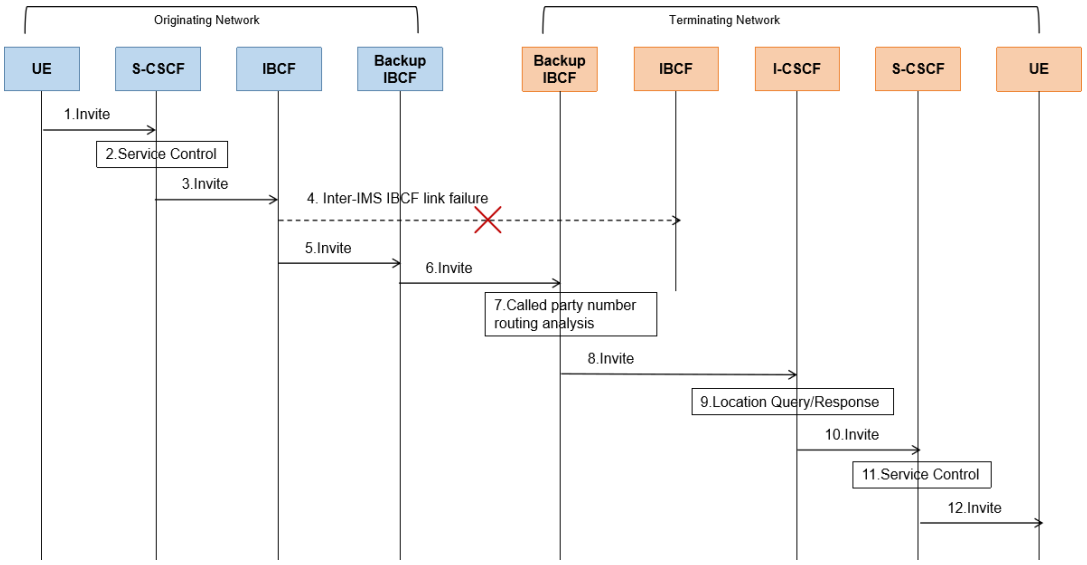

Figure 8-2 Signaling procedure of IBCF restoration

The procedure depited in figure 8-2 includes the following steps:

Step 1-3: The originating IBCF receives an Invite request.

Step 4: All IP links between IBCFs of two interconnected operators fail. Alternatively, all IP links between TrGWs of two interconnected operators fail, while the links between IBCFs remain operational.

Step 5: The restoration mechanism operates in either automatic or manual mode:

a) Automatic restoration: This mode is triggered when the originating IBCF detects IP unreachability to the peer operator's IBCF. It shall automatically redirect traffic to the backup interconnection point based on pre-provisioned route priorities.

b) Manual restoration: This mode is initiated by maintenance personnel via the network management system upon detecting relevant alarms (e.g., TrGW blockage). Personnel shall manually reconfigure the local IBCF routing data to set the highest priority for the route towards the backup interconnection point, thereby initiating the restoration.

Step 6: The Invite request is transmitted from the originating backup IBCF to the terminating backup IBCF.

Step 7: Upon receiving the Invite request at the backup interconnection point, the terminating network shall route the call to the I-CSCF serving the called user based on pre-provisioned routing data analysis, and proceed with subsequent call establishment procedures.

Step 8-12: The Invite request is forwarded to terminating UE.

8.3 CSCF triggered restoration signaling procedure

[Editor's note: interface should be identified in the Figure 8-3. Contributions are invited.]

The application condition for the CSCF triggered restoration is shown in Figure 8-3. Upon the link failure between the IMS core network and the local interconnection point IBCF (indicated by the red line in Figure 8-3)), the S-CSCF in the originating network shall redirect the inter-operator service to the backup interconnection point.This action switches the service traffic to the backup route via the designated backup interconnection point (indicated by the green line in Figure 8-3) to complete the session establishment.

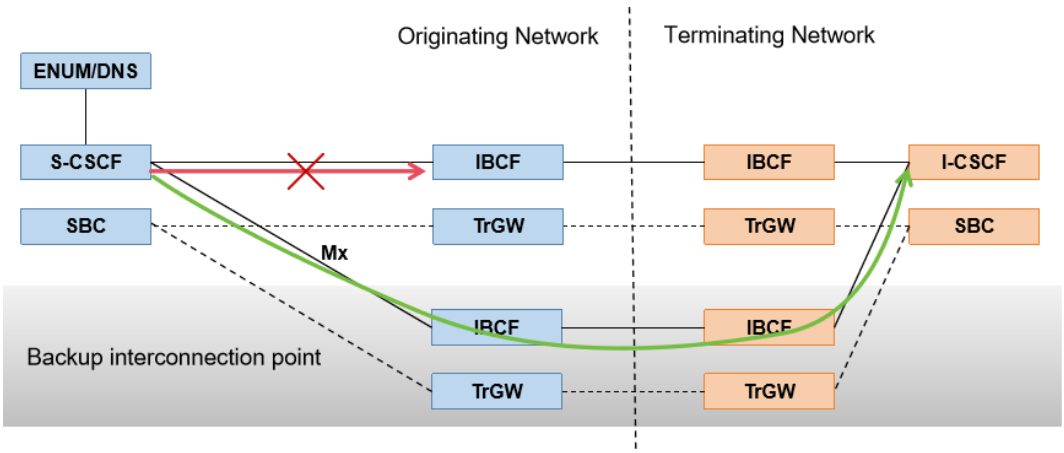

Figure 8-3 Architecture for CSCF restoration

Figure 8-4 illustrates the signaling procedure of CSCF restoration between IMS networks of different operators.

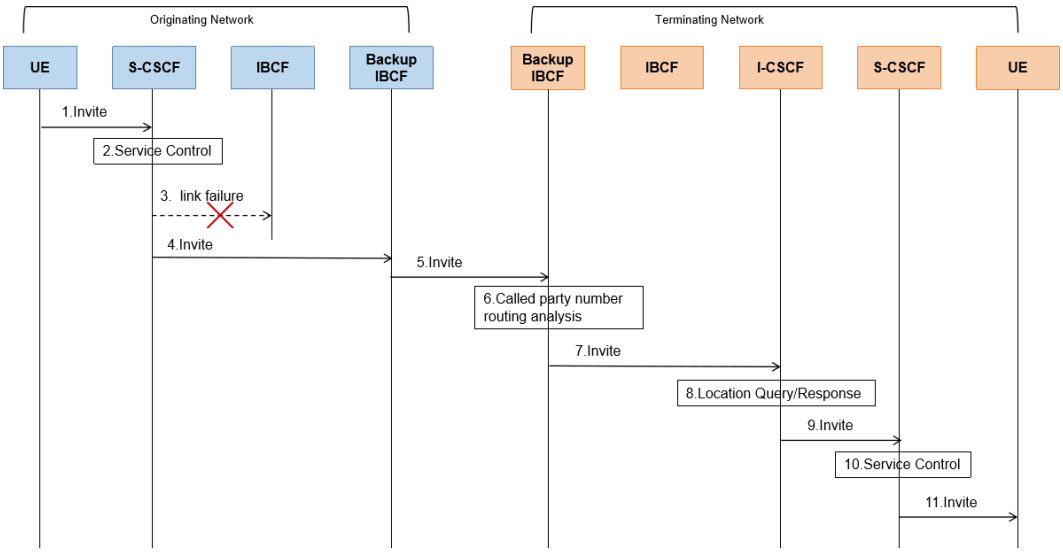

Figure 8-4 Signaling procedure of CSCF restoration

The procedure depited in figure 8-4 includes the following steps:

Step 1-2: The originating CSCF receives an Invite request.

Step 3: A complete communication failure occurs between the originating S-CSCF and the local IBCF; or the originating operator detects a complete communication failure between the SBC and the local TrGW.

Step 4: The restoration mechanism operates in either automatic or manual mode:

a) Automatic restoration: This mode is triggered when the originating S-CSCF detects a communication failure with the local IBCF. It shall automatically redirect inter-operator service traffic to the IBCF at the backup interconnection point based on pre-provisioned route priorities.

b) Manual restoration: This mode is initiated by maintenance personnel via the network management system upon detecting a complete communication failure between the SBC and the local TrGW. Personnel shall manually reconfigure the S-CSCF's next-hop route to point to the IBCF at the backup interconnection point, thereby initiating the restoration.

Step 5: The Invite request is transmitted from the originating backup IBCF to the terminating backup IBCF.

Step 6: Upon receiving the Invite request at the backup interconnection point, the terminating network shall route the call to the I-CSCF serving the called user based on pre-provisioned routing data, and proceed with subsequent call establishment procedures.

Step 7-11: The Invite request is forwarded to terminating UE.

9. Interface descriptions of IMS interconnection restoration

9.1 Interface Ici'

Interface Ici' is defined as the reference point between IBCFs within the same operator's network.

The protocols used for this interface shall be based on the NNI specifications as defined in ITU-T Q.3630 v.1, ensuring consistent signaling exchange during restoration procedures.

9.2 Interface Mx

Interface Mx is defined as the reference point between the S-CSCF and IBCF within the same operator's network.

The protocols used for interface Mx shall comply with the 3GPP TS 24.229 specification for SIP-based session control.

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