Stabilizing Voice Call Continuity during Failed 5G to 4G Handover

Voice call continuity during failed 5G to 4G handover

A voice call continuity feature is a network feature that

- detects service requests during 5G-4G handover events
- maintains voice call continuity and quick user plane restoration, and
- activates automatically

Table 1: Feature History Table

Feature Name	Release Information	Feature Description
Stabilizing voice call continuity during failed 5G to 4G handover	2026.03.0	You maintain voice call continuity and minimize call drops when a 5G to 4G handover fails. Your device can quickly resume 5G voice service with near-instant recovery and improved call stability.

Feature attributes and applicability for voice call continuity

The following list describes key attributes of this feature:

- Detects service requests during handover events
- Maintains voice call continuity and quick user plane restoration
- Activates automatically
- Applies only to UE-initiated (idle mode exit) triggers

The following table compares pre-feature to post-feature behavior:

Table 2: 5G-to-4G handover service request handling comparison

Attribute	Pre-feature behavior	Post-feature behavior
Service request during handover	Rejected (HTTP 400), user plane recovery blocked	Accepted, triggers handover termination and rapid user plane restoration
Voice call impact	SIP 481 call drop, RTP loss window up to 10 seconds	IMS continuity preserved, RTP loss reduced to < 1 second
Operator action required	Possible manual intervention	None; automatic operation
Compatibility	Manual configuration required	Backward compatible, no config changes needed

Note Ensure that the service request trigger is UE-initiated (Idle Mode Exit) for this feature to apply. Other triggers do not activate this enhancement.

This feature addresses scenarios in which the UE returns to 5G following a failed LTE handover and issues a service request while the access network has not sent a corresponding handover cancel. The SMF enhancement ensures any pending handover is canceled, user plane is re-established quickly, and IMS (IP Multimedia Subsystem) service stability is maintained.

Example of feature usage during failed 5G-to-4G handover

After a failed LTE handover, a UE reselects 5G and sends a service request. The SMF detects that a handover is pending, cancels the incomplete procedure, and resumes user plane services for the call in 5G. The voice call continues without interruption, without a SIP call drop.

How stabilizing voice call continuity works

This process concerns SMF actions when UE returns to 5G following a failed 5G-to-4G handover and submits a service request, typically during IMS voice calls. Without this process, voice calls may abruptly drop due to overlapping handover procedures and network state inconsistencies.

- Applicable to mobile networks implementing voice call continuity and with frequent mobility events between 5G and 4G technologies.

Summary

The key components involved in the process are:

- UE: Initiates service request after returning to 5G, seeking to resume voice service.
- SMF: Detects overlapping service request and handover state, resolves conflicts, and restores user plane.

- AMF: Relays service request and associated signaling to SMF.
- PCF: Receives network status updates as cleanup actions complete, enabling further policy or application steps.

Workflow

When a 5G-to-4G handover fails and the UE returns to 5G, the SMF retains the original handover context. A collision occurs when the UE initiates a Service Request (Idle Mode Exit, upCnxState=ACTIVATING). Instead of rejecting this request with an HTTP 400 error, the SMF associates it with the existing context. It then aborts the handover, clears transient N4 tunnels and timers, and resumes the 5G user plane in a single transaction. This procedure ensures the voice call continues with minimal RTP loss and prevents an IMS drop.

Stabilizing voice call continuity platform support and restrictions

The following items outline platform support and operational restrictions for the stabilizing voice call continuity feature:

- Automatic activation: The feature is enabled by default on supported SMF platforms and does not require manual operator intervention.
- Platform scope: Applies to Homer SMF implementations using the `pdn5g4gHo` procedure enhancement.
- Compatibility: Works with V-SMF and H-SMF entities without upgrades or configuration changes.
- Restriction: Limited to UE-initiated (Idle Mode Exit) events; other triggers are not supported by this feature.
- Operational isolation: No effect on memory, latency, or non-related mobility procedures.

Table 3: Platform support and restriction lookup table

Item	Supported platforms	Activation state	Restrictions
SMF (Homer)	Homer SMF, Cisco SMF v22.14 or newer	Auto-enabled; operator action not required	Supports only UE-triggered (Idle Mode Exit)
V-SMF, H-SMF interoperability	All Cisco V-SMF and H-SMF platforms	No activation required	No changes to V-SMF or H-SMF procedures
5G-to-4G handover procedure	`pdn5g4gHo` enhancement	Supported automatically	Only for handovers in progress, not after completion
Configuration options	All supported platforms	No operator tunables, not configurable	Cannot be disabled or adjusted

Item	Supported platforms	Activation state	Restrictions
Metrics and monitoring	{procedure="pdn5g4gHo"} New Label Value: failure_reason="serviceReqHandBack	Provided automatically	Metrics limited to UE-initiated events

The following items highlight functional integration and scope limitations of the feature:

- No disruption to regular handover flows, IMS calls, or user-plane connectivity outside supported trigger events.
- Maintains backward compatibility; integrates service request handling into existing SMF logic transparently.
- Monitored via metrics for service request-triggered handover aborts.
- No impact on V-SMF or H-SMF process states or timers.
- Always enabled; no readiness checks or manual deployment procedures required.

Table 4: Functional integration and scope limitation lookup table

Item	Impact area	Integration state	Limitation
IMS call stability	Minimized RTP loss window	Integrated with SMF service request logic	Only during handover aborts triggered by AN Idle Mode Exit
Handover guard timers	EPS-FB and IDFT timers automatically cleared	No effect for unrelated triggers	Not triggered by MBR, only via Service Request
User-plane continuity	User-plane resumes with no downtime	Platform operation seamless	Feature active only during failed handovers, not routine flows
Monitoring	Abort metrics available	Prometheus, internal counters	Metrics available only for AN Idle Mode Exit aborts
Secondary function isolation	V-SMF/H-SMF functions unaffected	Full isolation from V-SMF/H-SMF logic	No cross-effect in multi-SMF architectures

Table 5: Feature compatibility and operational comparison

Attribute	Homer SMF	VSMF/HSMF
Activation	Automatic, always enabled	N/A (transparent integration)
Operator control	No manual controls	No configuration changes needed
Metrics	UE-initiated events only	Not applicable
Supported handover	5G-to-4G failed, UE-initiated (Idle Mode Exit)	Compatibile with enhanced SMF logic

Note This feature does not support manual override or disabling. Only UE-originated Idle Mode Exit events in failed handovers activate the voice call continuity processing.

```
smf_procedure_failures_total{procedure="pdn5g4gHo", failure_reason="serviceReqHandBack"}
```

Best practice for stabilizing voice call continuity

Collision handling best practices

When a service request (idle mode exit) is received during an ongoing 5G-to-4G handover, the handover is aborted gracefully, and the service request is handled to move the session to the connected state.

Operational and integration best practices

Rely on the automatic function of this feature. Do not require operator action or configuration changes. Monitor extended metrics for service request-related handover aborts to evaluate network stability and feature behavior. Maintain backward compatibility and verify no impact to secondary SMF functions (VSMF, HSMF).

- Review metrics such as smf_procedure_failures_total with failure_reason="serviceReqHandBack" to track aborts and enhance operational awareness.
- Confirm the feature activates only for relevant triggers, specifically UE-initiated (idle mode exit) events, to maintain isolation from unrelated procedures.

Applies to SMF handling of UE-initiated service request events during ongoing 5G-to-4G handover procedure, covering Homer SMF pdn5g4gHo enhancements.

Relevant to networks using Homer SMF pdn5g4gHo, auto-enabled with no impact to VSMF or HSMF, and limited to UE-initiated (idle mode exit).