

The 3G Sunset and MVNOs

4.1 Introduction

NTT DOCOMO's 3G service will end on March 31, 2026.

Details can be found at the links below.

- Official NTT DOCOMO information
Notice of termination of FOMA and i-mode services
https://www.docomo.ne.jp/info/3g_closed/index.html (in Japanese)
- Official IIJ information
Regarding continued use of IIJ Mobile following the shutdown of NTT DOCOMO FOMA (3G)
https://www.iij.ad.jp/svcso1/mobile-support/news/3g_closed.html (in Japanese)

Regarding the NTT DOCOMO FOMA (3G) shutdown (IIJmio Mobile Type D)
<https://www.iijmio.jp/info/iiij/1712655772.html> (in Japanese)

Support for mobile data communication features related the end of NTT DOCOMO 3G service
<https://support.seil.jp/> (in Japanese)
→ Support → Technical information → Support for mobile data communication features related the end of NTT DOCOMO 3G service

NTT DOCOMO announced information back in 2019 about the termination of service, and the final date next March is now approaching. This will render 3G services from MVNO operators including IIJ unavailable, affecting voice calls, SMS, and data communication.

Devices that only support 3G will naturally become unusable, but what's not widely known is that even 4G (LTE)-capable devices may become unusable as a result.

This article provides a technical explanation of why this will happen. With there being little time left, we hope this will help many people navigate through the end of March 2026 by preparing for the 3G shutdown and avoiding the sudden loss of access to communication services.

4.2 Why is the 3G shutdown necessary?

Before discussing the problems that will arise from the 3G sunset, we first look at the evolution of cellular mobile wireless technology. Today's mobile wireless technology has evolved with new wireless standards being introduced

for commercial services roughly every 10 years since the introduction of 2G in 1991 (Figure 1).

Meanwhile, when new wireless standards are introduced:

- Investment in equipment for previous-generation wireless standards drops substantially, with the focus shifting to maintenance and upkeep of existing facilities only.
- As a result, equipment vendors stop manufacturing products and gradually discontinue support.
- Maintaining older equipment thus becomes increasingly difficult as the years pass.

This leads to the need to replace older wireless equipment with newer equipment. Further, compared with older wireless standards, newer standards define technologies that use the limited spectrum resources more efficiently, making migration to newer standards a natural progression.

At some point it thus becomes necessary to discontinue use of older wireless standards and migrate to newer ones. This is precisely why the 3G sunset is coming; it is a natural progression. As a supplement to Figure 1, we show the progression of 2G/3G shutdowns by carriers worldwide (Figure 2), as published by the GSA (Global mobile Suppliers Association), a global industry association of device vendors. These 2G/3G shutdowns are set to peak in 2025, with networks shifting en masse to 4G and later wireless generations (Figure 2).

In the early stages of a new wireless standard's introduction, however, the new wireless network starts off with limited coverage, so wireless networks are typically constructed so as to use the legacy standards to supplement coverage. To maintain continuity between wireless networks, the core

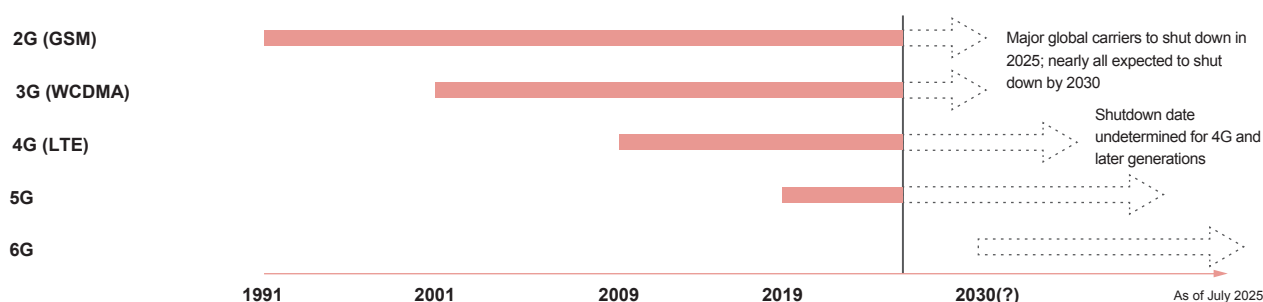


Figure 1: Global Service Launch Dates and Usage Periods for Cellular Mobile Wireless Technologies

networks work together to ensure users can move between the old and new wireless networks seamlessly without being disconnected.

With this in mind, devices are designed to support both old and new wireless standards, so that there are no problems when both old and new wireless networks exist alongside each other. But when old wireless networks are discontinued, as with the 3G sunset, this causes problems for devices designed on the premise that networks will be able to work together like this. The following explains this problem in detail.

4.3 Impact of the 3G Sunset

As mentioned in the previous section, device implementations mean that the 3G shutdown will have the following impacts.

- (1) Devices only supporting 3G (no 4G support): Unusable as 3G signals are non-existent
- (2) Devices support both 3G and 4G: May become unusable due to absence of 3G signals even when 4G signals are present

The problems with 3G/4G dual-compatible devices in (2) above can be further classified as follows.

- (2-1) Problems caused by voice-capable devices (smart phones etc.)
- (2-2) Problems caused by devices always connecting to a 3G network first

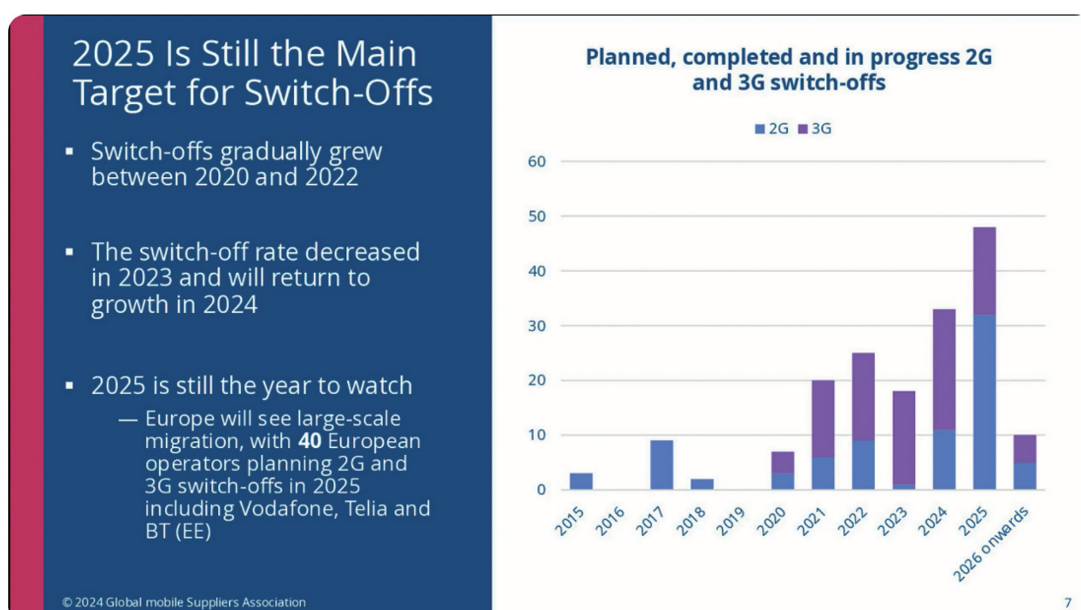
We explain each of these problems in the following section.

4.4 Problems Caused by Voice-Capable Devices (Smartphones etc.)

According to the 3GPP specifications defining mobile wireless standards, 4G devices can be broadly classified into two modes (UE usage settings). We explain each below.

(1) "Voice centric" mode

- A mode in which the device must connect to networks supporting voice functionality
 - The majority of smartphones use this implementation
 - Operates normally if either VoLTE (voice communication using 4G wireless) or CSFB (CS Fall Back), allowing voice communications by switching to 3G networks, is available
- However, when connecting to a 4G network, this mode causes the following problems when neither VoLTE nor CSFB is available.
 - Standard 3GPP behavior in this case is to disconnect



Source : <https://gsacom.com/webinar/2g-3g-sunset-and-implications-for-5g-broadcast/>

Figure 2: Courtesy of GSA, 2G/3G Sunset and Implications for 5G Broadcast

from the 4G network and switch to a mode that searches for another network (such as 3G) where voice is available

- If no available 3G network signals are found, the device remains out of service, so data cannot be sent or received
- After the 3G sunset, this problem may arise under certain combinations of device implementation and communication service constraints

- Cases that will be problematic after the 3G sunset include the following.
 - When using 4G (LTE) devices that don't support VoLTE
 - When using VoLTE-compatible 4G (LTE) devices on a service with no support for VoLTE

(2) "Data centric" mode

- The majority of data devices (routers, USB modems, communication modules) use this implementation
- Does not lose service like (1) even when voice functionality is unavailable
- Does not suffer from out-of-service issues after the 3G sunset

IJJ realizes that devices set to voice-centric mode (see (1)) may experience issues after the 3G shutdown, so for the Full MVNO-based IJJ Mobile Service/Type I, we plan to implement measures on the network side to prevent such issues.

4.5 Problems Caused by Devices Always Connecting to a 3G Network First

This problem may be common with 4G (LTE) devices not in voice-centric mode. The devices may be set up to

first connect to a 3G instead of a 4G network because of implementation details or settings. In such cases, the devices often then switch to a 4G network after a given delay such that users may not be aware that the issue is there.

When both 3G and 4G networks are available, this only amounts to initially connecting to 3G networks and then switching to 4G networks after a while. However, after the 3G shutdown, the absence of 3G networks prevents connection to 4G networks (Figure 3).

Since the problem is on the device side, it cannot be addressed on the network end, so it's up to device users to do something about it. If users encounter symptoms like this, they need to act quickly. IJJ's knowledge of the problem indicates that the causes can be classified as follows.

- Devices designed to always connect to a 3G network first and for which it is not possible to apply a fix or change
 - Such devices will be unusable after the 3G sunset and will thus need to be replaced

Examples:

The 510FU and 520BU (USB modems) previously sold for IJJ's enterprise mobile services fall into this category.

- Devices designed to always connect to a 3G network first but which can be modified via a firmware update
 - While unusable post 3G sunset on older firmware,

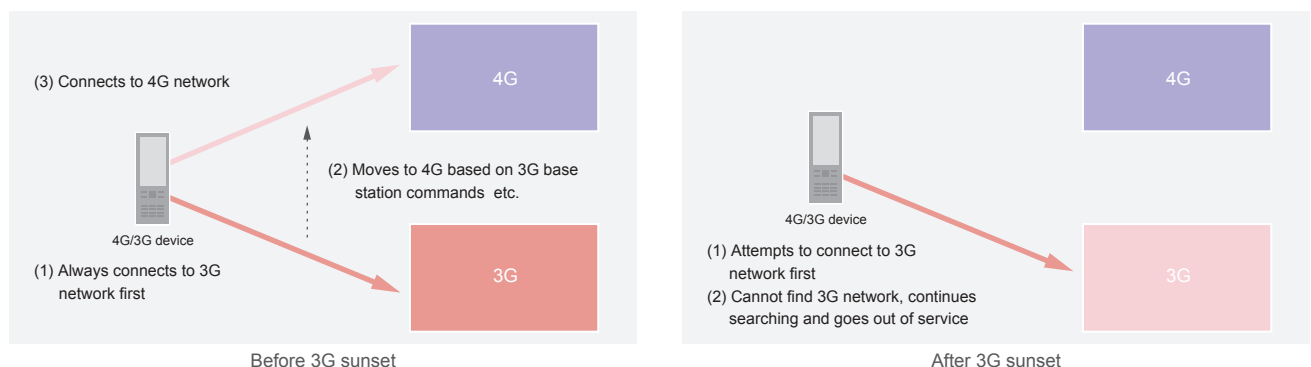


Figure 3: The Problem with Devices Connecting to a 3G Network First

such devices can be used after the 3G sunset if updating to the device manufacturer's latest firmware alters the device settings to first connect to a 4G network

- Whether a given model can be used after the 3G sunset must be confirmed with the manufacturer

Examples:

1. Fujisoft FS040U (secure connection mode)
2. NCXX UX302NC, UX302NC-R
3. Atmark Techno Armadillo-IoT G4/G3M1

- (c) Devices that connect to a 3G network first by default but which can be configured to connect to a 4G network first
- Such devices will be unusable post 3G sunset if no action is taken but can continue to be used if the settings are changed
 - Whether a device has such functionality and how to configure it must be confirmed with the manufacturer
 - Key devices, and the settings required to force them to first connect to a 4G network, as follows.

Examples:

Google Pixel series (APN type needs to be set to "ia" in the APN settings)

Microsoft Surface series (Internet and attach settings APN setting need to be configured)

- (d) Smartphones or communication modules for which the APN settings result in the device connecting to a 3G network first
- This problem is frequently reported by enterprise IIJ mobile service customers
 - IIJ mobile service specifications require username, password, and authentication method to be entered in the APN settings and do not allow connections to be made without this information
 - But for various reasons, values for username,

password, and authentication method are not provided for 4G connections in certain cases, causing IIJ's equipment to reject such connections, thus precluding the devices from connecting to a 4G network

- After a 4G network connection is rejected in this manner, such devices fall back to 3G networks, and since the username, password, and authentication method are set properly for 3G network connections, such devices are then able to connect normally
- We omit the details here due to space constraints, but the reason this occurs has to do with differences between the initial connection method used on 4G and 3G networks
- Key devices and the associated fixes are as follows.

Examples:

Smartphones (all Apple devices)

The problem can be avoided by using iOS APN configuration profiles

Communication modules in general (Quectel EC25-J etc.)

The problem can be avoided by setting username, password, and authentication method in the communication module in advance via implementation-dependent AT commands (AT+QICSGP for Quectel)

4.6 Conclusion

This article has discussed how NTT Docomo's termination of 3G services on March 31, 2026 will also prevent certain 4G (LTE)-capable devices from connecting to 4G wireless networks. With less than a year until the 3G sunset, time is limited. The issues described in the latter half of this article often occur without users realizing it, so we are hopeful that readers will take this opportunity to double check the adequacy of their 3G shutdown preparations to ensure they can navigate smoothly through the 3G sunset.

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