INFORMATION NOTE

Phase out of legacy telecommunication technology (2G/3G/PSTN)

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Executive Summary

The building industry and its constituents including lifts and escalators are facing rapid technological changes. This change is in contrast with the very long lifetimes of the buildings themselves, built to last for more than 40 years and up to 100 years. Telecommunication technologies are changing at a pace which is significantly faster than the overall building technologies. Mobile technologies (often referred to generically as “GSM”) are replacing the traditional wired copper cables, and each individual technology generation lasts only a few decades. 4G is replacing 2G and 3G, and it is to be expected that even 4G will be replaced at some point in the future by 5G or other technologies still in development. For this reason, it is a core objective of the lift and escalator industry to adopt solutions which are as future proof as possible, based on open generic standards with wide adoption, ensuring long term availability and support.

Technological change requires adaptations. When in the past only voice communication was sufficient, today the requirements of lifts and escalators imply additional data communication for monitoring of emergency power supplies, and additional intermediaries such as gateways or routers. These new technical elements require an increased awareness amongst the various actors in end-to-end communication.

In this document, the main scenarios that will be addressed are the replacement of copper lines by 4G systems, the replacement of copper lines by fibre optics, and the replacement of legacy 2G/3G systems by 4G systems.

The phasing out of legacy systems may have numerous different causes. A major cause is the obsolescence of technologies leading to missing spare parts needed to maintain the telecom systems. The building industry does not and cannot control the phase-out decisions of telecom industry participants, and there are no long-term legal obligations to that effect. Another major cause is the decision by the telecom providers to discontinue the support for legacy technologies, for example when requesting from authorities a redistribution of frequency bands to make space for the newer generations of technologies. Such decisions typically anticipate the obsolescence of technology, especially when maintaining numerous technologies in parallel is not economically viable. This means that the building industry must follow this evolution without any possibility of influencing it.

These technological changes are unavoidable, but they can be anticipated. The situation will differ from country to country; continuous monitoring of the local situation will ensure that last-

minute surprises are avoided. Even if currently some geographic areas did not yet announce sunsetting of 2G, the phase-out will happen, so planning activities for setting up alternatives can already be started. Long-term planning of the replacement rollout is paramount to ensure the necessary resources are available, trained and operational.

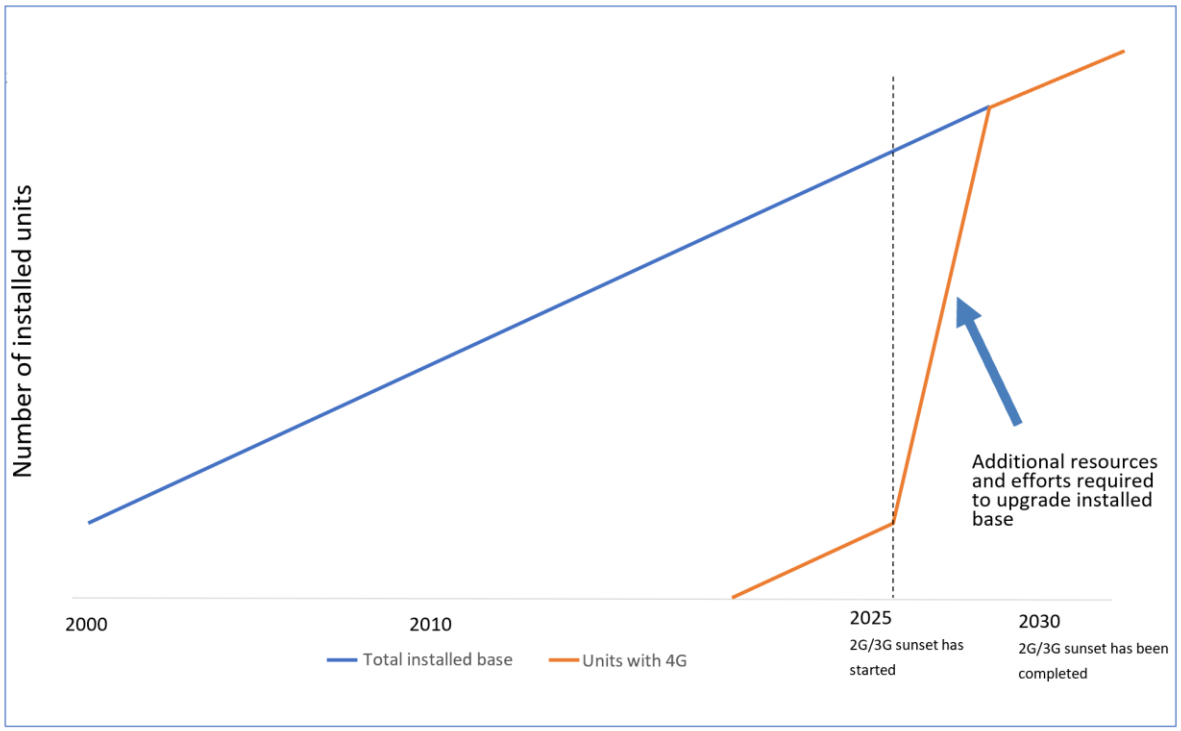

Figure 1: Additional upgrade effort required because of 2G/3G sunsetting

Purpose and Responsibilities

The European elevator market comprises approximately 6 million elevators[1] and is continuously expanding as urbanization increases.

Elevators are one of the safest and most used forms of transportation. Even in case of entrapment, elevators are safe.

In such a case, a typical scenario in a non-critical environment is as follows:

1. The passenger remains calm: the entrapment is not an emergency.
2. The passenger places an alert using the elevator's two-way voice communication system: trained professionals will respond promptly.
3. The passenger waits patiently while help is on the way: the intervention service will proceed to safely release the passenger.

[1] https://www.lift-journal.com/news/the-future-of-the-european-elevator-market

Thanks to this two-way voice communication system (requirement according EN81-28 and its revision[2]), the intervention time will be as short as possible, i.e. not more than one hour under normal conditions in a typical scenario.
In the future, technological advancements may even allow for real-time tracking of intervention service response and estimated arrival times to be displayed directly within the elevator car.

While building codes and regulations strive to reduce unwanted elevator shutdowns through reliable designs and proper maintenance, there is still a residual risk of entrapment. Example of entrapment causes are:

- **Power Failure**: entrapment can be avoided if the elevator system has emergency power or the building has a generator, which allows for the automatic release of passengers during power outages.
- **Doors**: improper closing or locking of doors can result in the elevator not re-opening.
- **Misuse**: repeated excessive loading or misuse will reduce reliability.
- **Environmental conditions:** extreme temperature, humidity, flooding or contamination will result in component failure.
- **Improper maintenance**: reduces reliability and delays problem detection and resolution.

The scope of technical responsibility in building management has broadened significantly in recent years. Whereas previously, responsibility for the operation of lifts and telecommunication service rested solely with respective operators, the integration of digital equipment into building infrastructure brings a shared responsibility of telecom operators with building owners. It is essential for lift and maintenance providers to extend their due diligence beyond their immediate scope to ensure that the building's entire network infrastructure (for both wired and wireless infrastructure) is suitable for the function of two-way voice communication. This includes to inform about the need of a thorough review and documentation of all relevant telecom systems. Particularly, it is crucial to verify the reliability of all equipment handling voice communications, such as routers and switches, which manage connectivity and are susceptible to disruptions caused by main power supply issues. This comprehensive approach ensures not only functionality but also the resilience of the building's systems.

[2] https://standards.cencenelec.eu/dyn/www/f?p=205:110:0::::FSP_PROJECT,FSP_LANG_ID:79043,25&cs=1353667E2E39D5F1E57C4B2D38B8CFFD2

The rapid obsolescence of technology, particularly in telecommunications, poses a significant challenge for operators managing connected units. The worldwide trend of decommissioning 2G and 3G networks as well as PSTN[3] networks is expected to accelerate, with plans to shut down most legacy networks by 2030 at the latest[4]. This situation necessitates an update of lifts reliant on these networks.

In the case of wired connectivity, devices cannot rely anymore on analogue copper networks providing power (e.g. POTS[5]) but must now be updated or extended to include a power supply and backup batteries. This backup must be provided for the devices of the lift as well as the other devices in the building which are necessary to ensure the voice communication.

Because of the increased complexity and reliability issues, the previous approach of using analogue telephone adapters is being replaced with the use of devices with built-in digital VoIP[6] capabilities which can provide continued functionality and compatibility with modern technologies.

Technical Overview

PSTN is the traditional circuit-switched telephone network that has been in use for over a century. It enables voice communication through a dedicated physical circuit established for the duration of a call. PSTN typically relies on copper wires and analogue signal transmission. 2G and 3G mobile networks work on similar circuit-switching principles using radio communications instead. These networks have gradually added data transmission capabilities.

4G LTE (Long Term Evolution) offers significantly higher data speeds and improved performance compared to previous generations and includes data transmission as a core capability. It supports IP-based voice communication through VoIP which uses protocols such as SIP[7] or dedicated VoIP subsets such as VoLTE[8].

VoIP refers to the technology that enables voice communication over data networks in a way which is independent of transmission technology, such as the Internet. Instead of using traditional circuit-switched phone lines, VoIP transmits voice data in packets over IP networks

[3] PSTN: Public switched telephone network
[4] https://www.emnify.com/blog/global-2g-3g-phase-out
[5] POTS: Plain old telephone service
[6] VoIP: Voice over IP
[7] SIP: Session Initiation Protocol
[8] VoLTE: Voice over LTE

and uses protocols such as SIP and different codecs (used to encode voice signals into digital data) such as G.711, G.729...

4G offers more advanced solutions to maintain voice communications than 2G and 3G solutions being phased out by mobile operators. Over-the-top VoIP has the primary advantage of using dedicated SIP interfaces towards dedicated SIP servers through the 4G data channel and therefore being independent of the telecom operator technology. Examples of this principle include Zoom, Microsoft Teams, and WhatsApp. VoLTE capabilities on the other hand are dependent on the individual operators' implementation of the technology.

Using over-the-top VoIP also helps to avoid the following challenges:

- Analogue signalling support: previously, information was transferred as audio tones (DTMF[9]), but this is not guaranteed anymore for end-to-end communication. VoIP gives an immediate control over all parameters previously using DTMF, from sender to receiver.
- Compatibility issues: existing PSTN equipment connected in a way that used to be compatible with 2G/3G might no longer work with VoLTE.
- Configuration issues of VoLTE depending on the operator: VoLTE profiles can vary from one operator to the other. Over-the-top VoIP bypasses that problem by relying on a common specification compatible with the Internet.

Although VoIP is the most promising solution for the future, other legacy solutions such as VoLTE or analogue in band DTMF can coexist during the transition period until the VoIP is fully adopted and deployed by all market stakeholders.

Most European countries are discontinuing their PSTN network. This process raises several challenges:

- Lack of awareness that this is happening: most users have not yet started preparing for this replacement operation.
- Most PSTN networks provided some power backups from the network itself, allowing for continued phone line operations even during a power outage. 4G, and optical fibre networks, might not provide this power backup and it needs to be addressed separately.

[9] DTMF: Dual-tone multi-frequency signaling

New communication technologies like 4G and fibre optics come with different power backup requirements compared to PSTN:

- **Wireless antennas and repeaters:** Missing power backups for wireless antennas, including repeaters, can lead to service interruptions.
- **Fiber installations:** Depending on the type of fibre installation, power backup may be needed to ensure continuous service during power outages.

The availability of the required emergency power provided by the respective service providers or building owners cannot be guaranteed by the lift service providers.