Utilisation of VoIP in Lift Emergency Communications – A Case Study

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Keywords: Lift, emergency, communications, VoIP, evacuation, multimedia, video, voice, messaging, IoT, internet, connected cabin.

Abstract. The use of VoIP is set to become the predominant industry standard for emergency voice communications with lifts in this decade. Already networks are VoIP driven, with radio network backhauling, SIP (Session Initiation Protocol) trunked connections, and applications like Skype, Microsoft Teams and many others using this now as the proven SIP-based form of digital communication. The advantage of VoIP over analogue or even mobile operator-specific VoIP derivatives like VoLTE (Voice-over-LTE) is that end-to-end QoS protocols can be applied to lift call quality and associated media like DTMF signalling when using VoIP. This paper will introduce the topic of VoIP for lift emergency communications, give lift industry examples of utilization current or planned, and present a case study using the Cairo Monorail project currently being implemented as an example of such technology deployment and the benefits offered. Finally, there will be a brief discussion of the impact of EN81:28 in respect of VoIP utilisation and advice on how this topic can be supported at a national and European level with the ultimate goal of assisting industry stakeholders, particularly lift consultants specifying communication solutions and independent lift installers and maintainers who might be unaware of technological advances that can benefit themselves and their customers.

1 INTRODUCTION

The Cairo Monorail will be the longest driverless monorail system in the world. The Monorail's two lines will create the first public transport links from Cairo's metropolitan area to the New Administrative Capital – which, when completed, will become the new administrative and financial capital of Egypt – and the 6th of October City in the Greater Cairo Region. It will have the capacity to transport nearly 45,000 passengers an hour in each direction. Schindler was selected to deliver, install, and maintain 136 lifts for the Cairo Monorail project (along with 272 escalators). Safety and reliability were the principal commitments, and Schindler chose the IP-based 2N LiftIP to support the lift communication, with a unit in each of the project's lifts. The 2N LiftIP uses VoIP technology for transmitting calls from the lift cabin, with full duplex audio transmission facilitating high-quality, uninterrupted communication. The IP connectivity also allows continuous online monitoring and remote management.

IP-based connectivity supporting VoIP is a natural fit for these kinds of projects because of the quality of the audio communication, the ease of installation, configuration and the ease of possibilities for remote monitoring and integration with CCTV networks and BMS (building management systems).

The telco industry as a whole has completely switched to VoIP (using SIP protocol) in the network core. But this VoIP evolution has already spread from the core through access networks to the network edge and customers' premises. More and more customers replace old desk phones with VoIP and take advantage of modern IP voice networks.

It makes sense for the lift industry to follow the same path and get rid of legacy technologies of the past century and consider utilizing and leveraging the connected environments.

2 CAIRO MONORAIL SOLUTION – CASE STUDY

The lift communication solution proposed by 2N is all IP and utilises VoIP with SIP to facilitate high-quality voice calling which is unaffected by ambient electrical interference, as can be common with analogue (line-powered) phones. The solution utilises IP-based phone communicators in each lift cabin connected through ethernet in the travelling cables through a PoE (power over ethernet) switch to the rail station(s) local area network (LAN) and central PBX.

The following plan shows the scale and number of stations and most, if not all, will have lifts for passengers including mandated disabled access provisions.

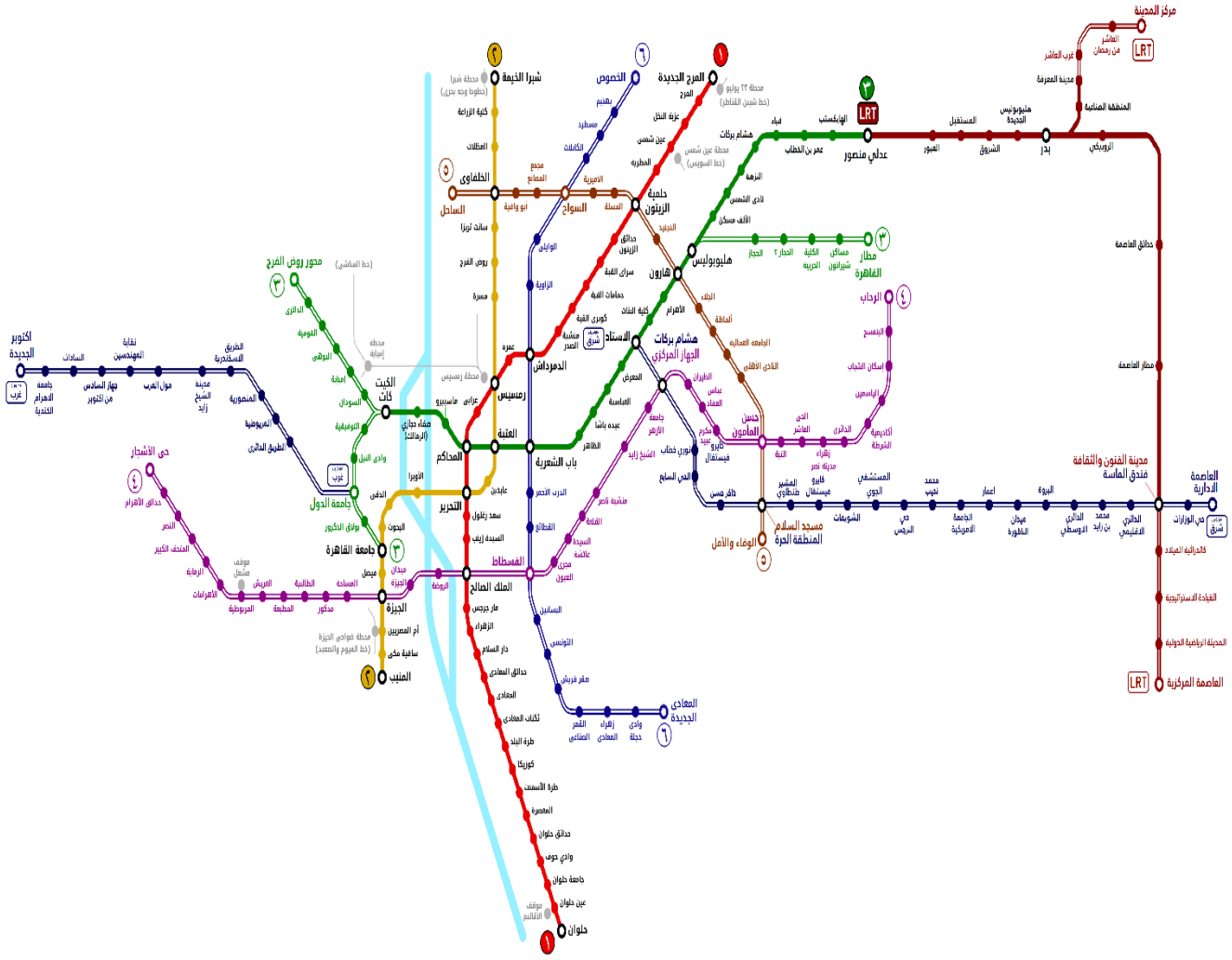

Figure 1 Cairo Monorail Layout (Source: Wikipedia)

Here is a typical schematic that will be replicated for each lift in every monorail station.

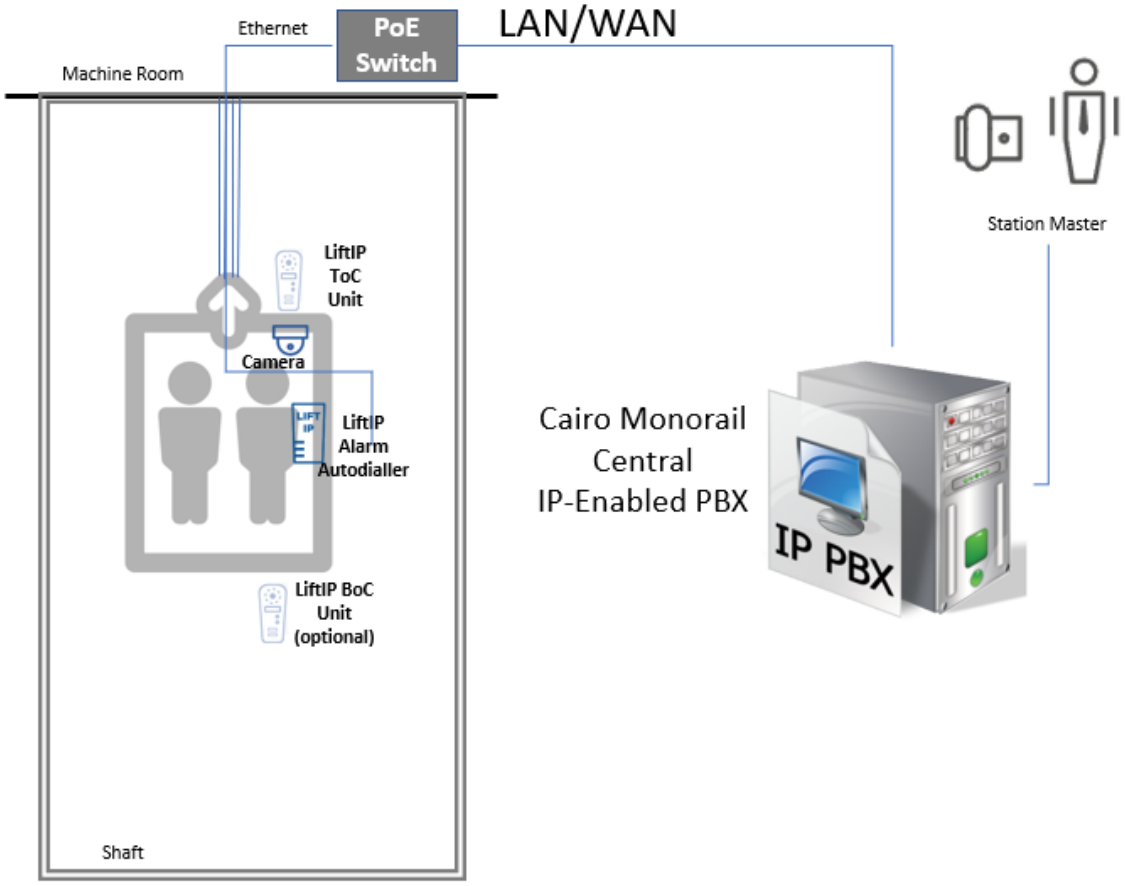

Figure 2 Lift Communication Solution Schematic (courtesy 2N)

3 IP TECHNOLOGY AS A FUTURE-PROOF SOLUTION

The whole telco industry has completely switched to VoIP (using SIP protocol) in the network core and this VoIP evolution has already spread from the core through access networks to the network edge and customers' premises. More and more customers replace old desk phones with VoIP and take advantage of modern IP voice networks. It makes sense for the lift industry to follow the same path and get rid of legacy technologies of the past century.

The concerns regarding VoIP infrastructure for use on lift emergency calls and the ability to guarantee connectivity are addressable in two ways. Firstly, mobile network gateways exist that have integrated analogue to VoIP converters which can work with any analogue autodialler and use the 4G data connection to connect the call through to the call centre, thereby providing direct connectivity without reliance on VoIP fixed networks. Those gateways are designed for EN 81-28 norm conformity, especially regarding the power backup. Secondly, a native IP emergency lift autodialler can be fitted with an I/O contact to deliver a notification if it is not possible for the IP autodialler to make a call regardless of network complexity from the lift to the call centre. The module monitors several key connection-related elements, including whether the IP phone is constantly registered to a SIP proxy server for call readiness, and can also ensure there are alarm number(s) programmed in the autodialler. This contact will also be triggered if the autodialler has no power.

4 SIP PROTOCOL AND MULTIMEDIA COMMUNICATION

SIP is a signalling protocol used for initiating, maintaining, and terminating real-time sessions. These real-time sessions (RTP - Real-Time Transport Protocol) can carry various types of data, it can be a traditional voice call, a video stream from IP cameras, or instant messaging from software applications. In essence, SIP uses the Internet as the medium for voice communication between two endpoints.

4.1 Voice communication

SIP supports VoIP and offers excellent end-to-end call conversation and DTMF quality.

4.2 Video communication

Installation of IP cameras in lifts is becoming a new trend for several reasons:

- Visual information helps to better understand an emergency situation
- One of the big benefits of video is false alarm elimination
- Call centre can monitor the cabin floor and check if the passenger has fainted
- IP cameras in lifts integrated as a part of the Building Management System (BMS)
- Visual information can serve for analytics about resource utilization
- Awareness of monitoring reduces the rate of vandalism

SIP allows you to easily merge voice from a VoIP auto-dialler and video stream from IP camera(s) and deliver it in a single video call to the call centre.

4.2 Text communication

So far, the regulations have not fully covered the needs of hearing-impaired passengers. This has changed with the latest release of ASME A17.1 [1] in the United States, where new or modernized lifts must also offer options to communicate via text messages. Cars and even the main landing or machine room must be equipped with displays. SIP protocol is very flexible and offers several extensions. For example, the one defined in RFC 3428 speaks about how to implement instant messaging functionality. If your call centre is “VoIP”-ready, the implementation of text communication in SIP will be much easier.

5 CLOUD AND IOT

Lift companies need to have a robust, secure, and scalable system which can take care of thousands or millions of lifts in real-time. Even if your company is not big enough to build such a system on your own, there will be vendors who will provide the cloud infrastructure as a service.

The key goals are obvious:

- remote access to reduce interventions on-site
- automatic deployment
- management of device fleet from a single point
- overcoming the knowledge gap of your workforce
- prevention of configuration mistakes
- constant supervision of device status
- easy integration with external systems
- preventive and predictive analysis

VoIP will play a key role as a central data connectivity hub for all technologies in lifts of the future. Even today there are 4G gateways that can also support VoIP and automatically translate even analogue calls from old, existing lift cabin phones to VoIP.

6 VOIP EMERGENCY COMMUNICATION SYSTEM ARCHITECTURES

Let me briefly comment on the three most common IP technology use cases that you might encounter on the market. The first one presumes a lift company has their own "IP ready" PBX (Private Branch Exchange). The lift company manages IP PBX licensing on their own, and because they do not want to use a 3rd party cloud, they set up each device individually. They save some money on cloud services but must spend extra time on configuration. Each problem on-site or configuration change means technicians will have to travel there to check out what is going on. It is harder to calculate operational costs. Figure 3 shows this stand-alone topology.

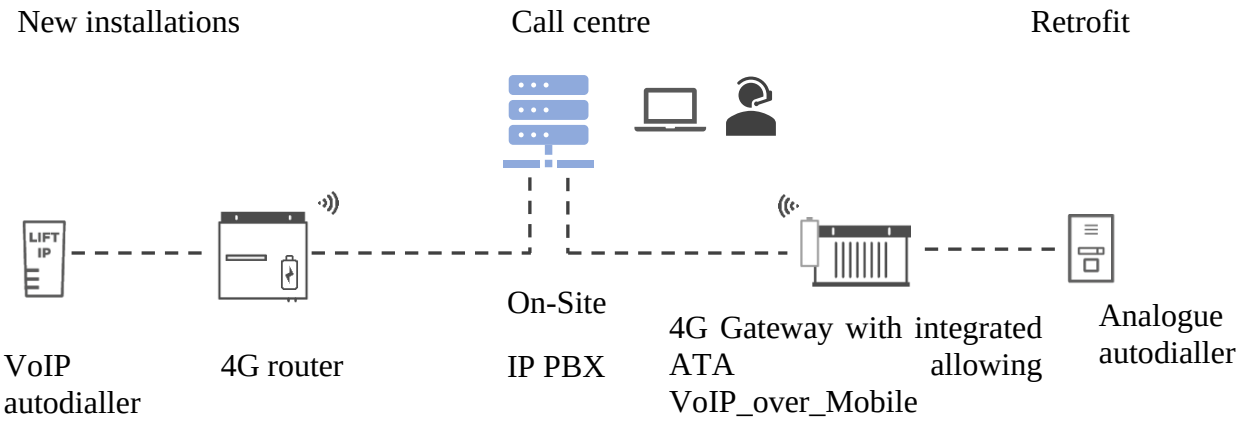

Figure 3 Stand-alone topology

The second use case is the opposite. The lift company has no experience with VoIP, and their PBX system does not support it. A complete emergency communication system will be delivered by a VoIP service provider in that market who offers both communication devices and cloud services. The lift company will pay a subscription fee, without any or with minimal investments into their own infrastructure. TCO (Total Cost of Ownership) and ROI (Return on Investment) are simple to evaluate. It is possible to perform remote troubleshooting to some extent. Upgrades, configuration changes and new features can be deployed centrally by clicking a "single button". Figure 4 shows the Cloud topology.

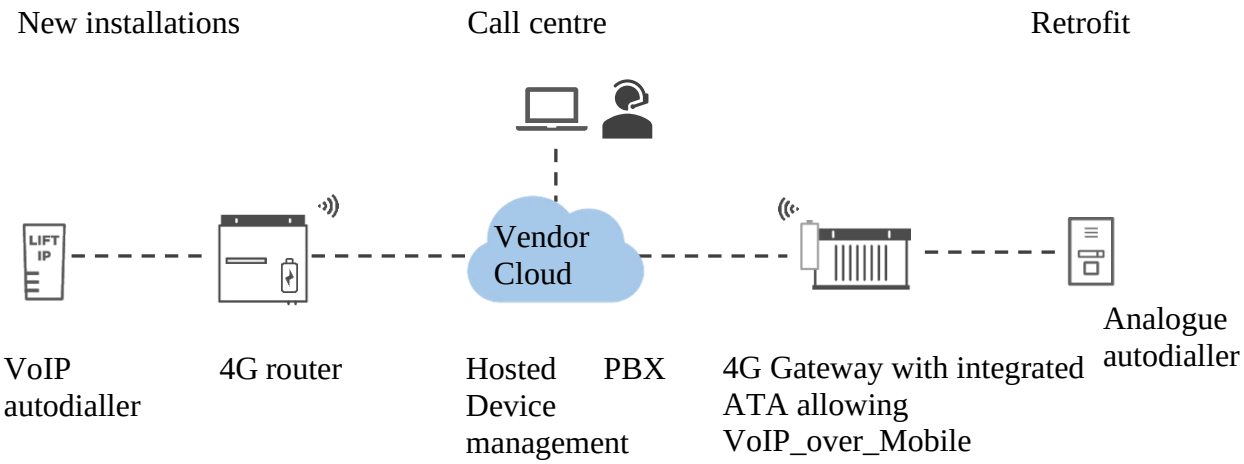

Figure 4 Cloud topology

The third scenario is a mix of the two previous. The lift company wants to keep their IP PBX for Call centre agents, but potentially tens of thousands of devices need to be registered at a national VoIP provider's hosted PBX due to cheaper prices. Both systems will be interconnected via SIP trunk. The lift company clearly sees the advantages of mass management and real-time monitoring and pays a small fee to get these value-added cloud services. Their emergency communication system is robust, secure, well-managed and without hidden costs. Figure 5 shows the Hybrid topology. Each architecture has its pros and cons and gives lift companies the option to choose the optimal solution.

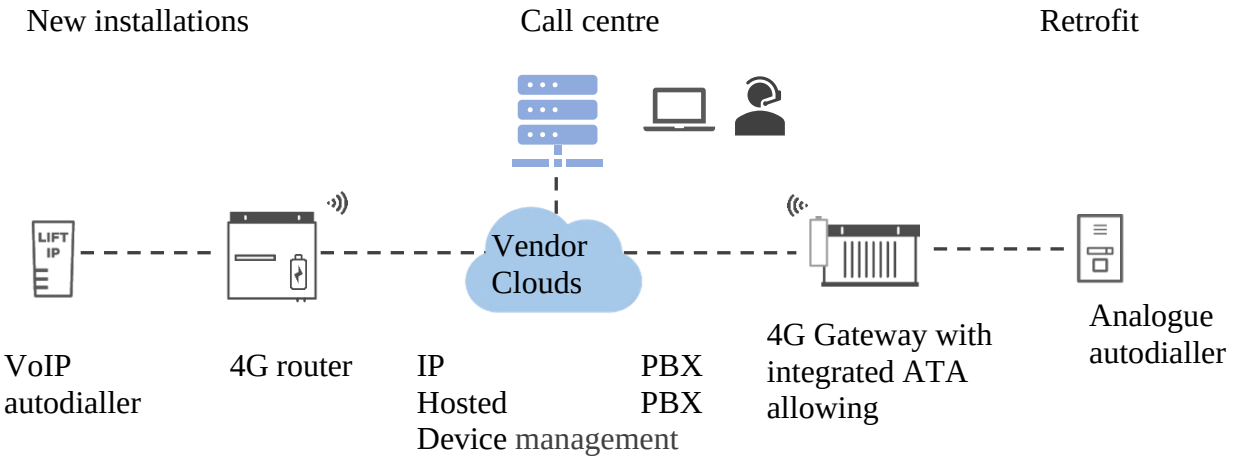

Figure 5 Hybrid topology

The following table shows a comparison of various architectures.

Table 1 Comparison of various architectures

	Stand-alone	Cloud	Hybrid
Lift VoIP auto-dialler registration	Customer's PBX	Hosted PBX	Both customer's and hosted PBX
Advanced cloud features	No	Yes	Yes
Simplicity of administration	Difficult	Easy	Medium difficult
Ease of integration with 3rd party systems	None	Easy	Medium
Cost	Low	Low	Medium

7 HOW TO GET READY FOR THE IP FUTURE?

Considering all mentioned factors forming today's and tomorrow's telco and IT world, the only way to the future goes hand in hand with transformation to full IP. Partnering with companies with strong competency in VoIP will save you time, money, and will help you to increase your reputation on the market. I believe there is a role for national lift associations LEIA and lift standards groups like CIBSE to assist with information, advice and guidance supporting and aligning with standards whilst encouraging the adoption of more modern, more robust technologies for lift communication.

8 CONCLUSIONS

We are standing at the beginning of changes that will define emergency communication for the next decade. The inevitable changes in communication network technologies will have a huge impact on all lift companies, and it is necessary to get ready for the VoIP shift as soon as possible.

Technologies allow video calls and easy management of a large number of communication devices, automatic configuration, and remote access without the need to educate and train your field technicians.

With IP technologies, you will save money, your workforce's time and number of on-site visits. Having an overview of devices in the field 24/7/365 puts your emergency communication under your control.

REFERENCES

[1] ASME, https://www.asme.org/

BIOGRAPHICAL DETAILS

Jason Godwin is a Regional Sales Manager at 2N with responsibility for lift communication products across the UK, Australian and North American markets. He started work in the UK lift industry under his father, Mike Godwin before moving to Australia where he worked for Kone and Boral Lifts (OTIS) rising to senior management level on new lift sales and also modernisations. He then returned to Europe settling in Prague and, in the absence of lift industry opportunities there, decided to focus on telecommunications while also assisting his brother Adrian Godwin at Lerch Bates Europe from time to time. Jason holds an MBA from RMIT University in Melbourne, Australia.