

Mass Migration of Lift Alarm Connections – A Case Study

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Abstract. The paper will take the form of a case study detailing the migration of 1100 lift alarms, owned by Premier Inn (a major hotel chain in the UK), from obsolete PSTN telephone lines to a managed service. The case study will cover four key areas:

- The scale of the problem faced by the lift owner/duty holder
- The selection criteria for alternative connectivity solutions
- Challenges with migrating a diverse lift portfolio covering the UK, the Republic of Ireland, the Isle of Man and the Channel Islands
- Additional insight gained into the lift alarm estate during and after the migration

The authors were closely involved with the migration from start to finish, so their records will form the basis for the material. In addition, direct testimony from the end client will be sought in order to present the perspective of the lift owner/duty holder.

1 INTRODUCTION

Across the globe, legacy analogue telephone line networks, based on copper cabling, are being retired and replaced with modern digital networks which utilise fibre optic cables. Our ever-increasing demand for internet access, and specifically the upload & download speeds available over those internet connections, has meant that the old analogue networks are no longer fit for purpose [1].

In the UK, the analogue switch-off began in 2018 and has rapidly gathered pace, with a final switch-off date of January 2027 confirmed as the hard stop for all analogue services. This poses a challenge for lift owners/duty holders as the vast majority of emergency alarms (autodiallers) installed on lifts in the UK are analogue devices. Digital telephone lines, therefore, present two key risks:

1. Support for Analogue Signalling: Analogue autodiallers rely on dual tone multi-frequency (DTMF or “touch tone”) signalling for their machine-to-machine communication needs. Support for legacy analogue signalling varies between digital telephone line providers and, even then, tends to be unreliable. This can affect the operation of an existing analogue autodialler and even prevent the units from dialling out in some cases.
2. Power Resilience: Copper telephone lines carried their own power (~48VDC) and operated separately from the mains power grid. Because fibre optic cable is unable to carry power, digital telephone lines rely on a separate mains power supply to operate. This means that during a mains power failure event, the telephone line will also fail unless backed up. Previously, failure of the telephone line itself was an extreme event and presented a low risk. With a digital telephone line, even a breaker tripping in the building could result in a loss of the line. A mains power failure event is also a key time for a lift entrapment to occur.

Premier Inn Limited (the client), a subsidiary of Whitbread, is a hotel chain headquartered in the UK, with operations in the UK, the Isle of Man, the Channel Islands, the Republic of Ireland, Germany, Austria, the United Arab Emirates, and Qatar. The UK's largest hotel chain, as of January 2025, the client was able to offer over 85,000 hotel rooms in the UK [2]. Across a diverse estate of buildings, the client has a portfolio of 1100 passenger carrying lifts in the UK, Republic of Ireland, and the UK Crown Dependencies of the Channel Islands and the Isle of Man. In addition, many of the client's sites have platform lifts and other lift appliances.

VerticA Consulting Limited (the consultant) have been working with Whitbread since 2007, beginning with new hotel site projects and later adopting modernisation and replacement projects within existing hotels. They also developed the model specification for all new lifts installed at the client's Inn sites and also provide full maintenance supervision and project management to the client for their entire lift estate.

Beginning in 2018, the consultant highlighted the risk posed by the analogue switch-off and engaged with the client to begin planning the transition for the lift alarms on all 1100 lifts.

2 FINDING THE RIGHT SOLUTION

The first port of call was to discuss with the incumbent communication provider (CP) potential solutions to replace the existing analogue lines. Keen to try and keep such a large number of lines with a key client, the CP looked at a number of solutions.

However, the CP was unable to find a workable solution to reliably support the required analogue signalling and did not want to provide the required number of uninterrupted power supply (UPS) units to ensure lines would continue to operate in a power failure. The CP's main concern was how they could maintain the UPS units once they were installed.

Finally, it was agreed that the CP would step away from provisioning the "lift lines" and the transition would be handled as a separate project.

When evaluating solutions, the consultant set out a list of key evaluation criteria:

- Reliability – Whatever replaced the copper lines needed to have at least the same level of reliability and address the analogue signalling & power resilience concerns
- Management – The ongoing management of telephone lines with the existing CP had experienced some challenges, and this was an opportunity to also address those concerns. Key amongst these challenges/concerns were:
 - The lack of an asset list for telephone lines
 - Telephone lines serving lift alarms being cancelled
 - Telephone lines serving lift alarms being re-allocated
- Established Providers – Providers needed to show that they had experience working with lift autodiallers and were able to support work across the required territories
- Fixed Costs – Where possible, work should be on a fixed cost basis for the whole project
- Project Delivery – An end-to-end solution for the whole project across the full portfolio was required, with a minimum number of providers

The concerns about how a solution would be managed bear further discussion:

Whilst a true failure of a copper telephone line was an extreme event, typically involving physical damage to the copper cable itself, there were other ways a copper telephone line could be rendered inoperative.

Issues with telephone lines being cancelled in error, typically due to a perceived lack of usage or being re-allocated to serve other applications, had been a problem across the portfolio. Likewise, the telephone line serving the lift alarm being seized and re-allocated to other building services had been a recurrent problem. In both cases, this was done in error by telecoms engineers who were unclear how a line was being used.

Remedying these issues became a time-consuming process as the issues would often be misreported as a “failed autodialler”, only for the lift contractor to test the autodialler and find nothing wrong and report a “line failure”. This would typically lead to a drawn-out process of trying to coordinate the CP, the telephone line provider, and the lift contractor to confirm where the fault lay and provide a resolution.

After reviewing a number of potential providers for the transition, the field was narrowed to two options, and the consultant produced a paper outlining the various options explored and making a recommendation.

The consultant chose to recommend the Memco (the supplier) Sentinel Service (managed service) for the whole project, as it fulfilled all of the criteria previously set forth:

- Reliability – replaces the previous fixed telephone line with a 4G VoLTE¹ gateway and a non-steered roaming SIM card, so alarm calls are now placed over the mobile network. The SIM allows the gateway to connect to any of the UK mobile networks, to maximise the chances of getting a strong signal. The gateway has an onboard battery capable of operating the connection for four hours after a mains power failure. Last but not least, the gateway can support the required analogue signalling for autodiallers either directly through the voice channel or by converting to a digital signal & transmitting as data.
- Management – all connections are monitored, so if any faults occur, the client is alerted, whilst remote diagnostics and fault finding are undertaken by the monitoring team. If a fault cannot be resolved remotely, then a site visit is arranged in partnership with the relevant lift contractor. Key connection monitoring criteria: mains power status, battery status and mobile signal strength. Batteries are changed a minimum of every three years in line with the battery manufacturer's stated lifetime or as needed if recharge cycles or environmental conditions have shortened cell life. The management platform allows for a complete digital list of all assets and provides a digital audit trail for all connections.
- Established Providers – the supplier, having been in business since 1972, is a well-known name in the lift industry and was able to demonstrate how they could support both the deployment of services & coordinate with multiple lift contractors.
- Fixed Costs – supports a flat monthly fee to the end client and handles all costs with lift contractors, both for initial deployment of services and in life support (e.g. battery changes). This meant the client could accurately forecast costs for both the initial deployment and ongoing support of the connections.

¹VoLTE = Voice over Long-Term Evolution, the technology by which voice calls are made over 4G mobile networks.

- Project Delivery – By using the client's incumbent lift maintenance contractors, the supplier could coordinate deployment of services across all sites. The consultant also agreed on an installation specification for the equipment needing to be deployed to the site, to ensure consistency across the portfolio.

This managed service option was presented to the Whitbread board along with a commercial proposal from the supplier, and the project was approved in April 2024.

At the time of writing, the managed service also provides a 25% cost saving when compared to the cost of provisioning a digital telephone with voice (many commercial digital lines are internet only as standard) and a UPS. The authors are not aware of any digital telephone line options in the UK market with management or monitoring services. If these services were to be offered by a CP, it would almost certainly be an additional cost to the end client.

3 DEPLOYMENT

The first step in deploying services across the portfolio was to establish a single asset list split both by site and by incumbent lift maintenance contractor. The main asset list held by the consultant included all lifts and lifting appliances, so it needed to be edited down to only include the passenger-carrying lifts. Platform lifts were then accessed on a case-by-case basis, as not all platform lifts in the UK require an alarm device to be fitted. Those platform lifts with alarms fitted were then incorporated into the asset list. This asset list was then used as the tracking document for the progression of the deployments over the course of the project.

Incumbent lift maintenance contractors were informed that the project was going ahead, and rate cards were agreed upon between contractors and the supplier for installing and configuring equipment on site. An agreement was also reached on how lift contractors would go about installing the equipment. Some chose to use dedicated teams for installations, and others opted to do this as part of their monthly service visits.

All installs had to comply with the installation specification agreed with the consultant:

- Gateway to be installed in the motor room or, in the case of MRL installs, at the top of the lift shaft or within the MRL panel if space allows
- Gateway to be powered by a dedicated 230VAC supply, isolated only by the main breaker switch

Where required, additional training was provided to lift engineers who were unfamiliar with the supplier's equipment or gateways in general.

Once a gateway had been installed, lift engineers were able to use an app on their smartphone to test the connection before leaving the site. Each lift contractor was issued additional high-gain antennas to be used with the gateways on sites where mobile signal was a challenge. As part of the planning process, the client was asked to flag any sites where they were aware mobile signal was a problem.

Each new connection was placed onto a '7-Day Check List' by the managed service's monitoring team. The connection was checked each day for seven days to ensure that both the mobile signal and power status remained stable. At the end of the seven-day check period, connections with no issues were moved to the main monitoring pool and the lift contractor was paid for the installation work. Any connections that did not pass the check were flagged, and it was arranged with the contractor that they revisit the site to remedy the faults identified.

4 CHALLENGES

The most common issue found during the seven-day check period was connections which exhibited problems with mains power to the gateway.

After investigation on different sites, this was found to be due to lift engineers connecting to a mains power supply, which they believed was only isolated by the main breaker switch, but was in fact switched with the lift shaft lighting.

This issue was a challenge to diagnose because, whilst working on the installation, the shaft lights would be switched on and only switched off once work was completed. When returning to the site to try and fault find, one of the first things a lift engineer would do was switch the shaft lights on (as is standard practice), which also restored the mains power to the gateway. This situation meant that the power issues at first looked like intermittent faults. Once this issue had been correctly diagnosed, further installation advice was issued to all contractors.

The client's hotel site at Heathrow Airport Terminal 4 proved to be a unique challenge as the site exhibited particularly low mobile signal levels. This had not been flagged at the start of the project, and it was later found that the client did not record mobile signal issues as part of their maintenance and repairs data, and it was instead recorded as part of their 'guest satisfaction' data.

A site survey using a mobile signal scanner showed that there were 4G mobile cells on towers nearby, but the recorded signal levels within the building and especially within the lift shafts were extremely low. It was noted that the site is located on the opposite side of the street to one of the airport surveillance radar (ASR) towers, and the working theory was that this ASR tower somehow interfered with or blocked the mobile phone signal.

The solution that was finally developed was to use directional antennas for the gateways, mounted in redundant pockets at the top of the lift shafts, installed facing in the opposite direction to the ASR. This allowed the gateways to receive a strong signal across all five lifts on the site (four front-of-house lifts and one back-of-house staff lift).

The client's site at Canary Wharf Westferry also proved a challenge as the mobile signal above the ground and first floors was extremely low. The building is a 26-storey block, and it was difficult to ascertain why the signal was so low in the upper storeys. Investigation of the local area did note a major Metropolitan Police station nearby and, right next to the site, an elevated section of the Docklands Light Railway (DLR). It was speculated that the police facility might have some form of signal blocker installed, which affected mobile signal in the area, or the DLR blocked signal from local towers to higher floors.

The solution in the end was a simple but time-consuming one – run a mains power cable and communication cable from the MRL panel on the 26th floor, inside the lift shaft, and down to the gateway located on the wall of the lift shaft at the ground floor. This solution was used for all four lifts on site.

5 PROJECT PROGRESSION, ADDITIONAL INSIGHTS AND WAYS OF WORKING

The project scope was for 1100 connections across 570 sites, being deployed by six different lift contractors.

Deployments began in July 2024 on the mainland UK, then Northern Ireland, the Republic of Ireland and finally the Isle of Man and the Channel Islands.

By November 2024, 80% of the connections had been deployed; this rose to 90% by March 2025, and project completion is (at the time of writing) projected for the end of July 2025.

As mentioned in Section 2, the client had been unable to obtain an asset list for telephone lines from their CP. So as part of the deployment process, it was agreed with the client that lift engineers would record the current telephone line numbers which served the lifts (this data could also be captured in the app which was used to test each connection). This would then allow the client to cancel the old telephone lines as the managed service was deployed.

An additional benefit which the client was able to realise from the managed service was a log of activity recorded by the gateway and transferred to the monitoring platform. This included logs of when alarm calls had been placed from the autodialler and autodiallers which had become faulty over time and were dialling out unnecessarily. Previously, the latter would not have been detected and would have incurred unnecessary call costs. The fact that this call activity could now be identified allowed the consultant to highlight to lift contractors where autodiallers needed to be investigated for faults and potentially replaced.

Whilst the move away from landlines eliminated the need for coordination with a CP, it became apparent that new ways of working needed to be established with lift contractors. Several call-outs for lift autodialler faults were reported back as being “issues with the line”, despite the fact that the connections showed no faults on the managed service’s platform. A new ‘ways of working’ document was produced on how to fault find when the client sites reported autodialler issues and, once approved by the consultant, was discussed and agreed with the lift contractors. The document covered four key areas:

1. Perimeters of responsibility: the supplier being responsible for the gateway, and the lift contractor being responsible for the autodialler on the lift car
2. Fault Finding Process:
 - 1) Gateway – remote and on-site
 - 2) Autodialler – on-site
3. Escalation process for faults which could not be rectified and authorisation process for site visits
4. Invoicing for work carried out

6 CONCLUSION

The project has been an example of how clients, lift consultants, lift contractors, and suppliers can work together to deliver a major transition in a short timescale.

The client now has fully managed connections for their autodiallers and is proactively alerted of any issues. The backup batteries for all connections are fully monitored and tracked for when they need changing, eliminating a key risk posed by digital phone lines and a common fault seen on autodialler systems [3].

Fault resolutions are co-coordinated with lift contractors to ensure only qualified persons are working on site. The consultant is now using the managed service's monitoring data as part of their maintenance surveillance for the client, and in particular when assessing defects related to autodiallers on insurance reports.

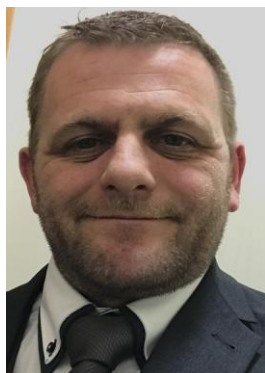
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BIOGRAPHICAL DETAILS



Matt Davies is the Business Development Manager for digital products and services at Memco (a brand of Avire). In addition to his responsibilities at Memco, Matt is a member of the BSI committee 'MHE/4 Lifts hoist and escalators', CEN TC10 WG1 Working Team 4 responsible for revising EN81-28, the European Lift Association 'Telco Working Group' and the American Society of Mechanical Engineers 'A17 Ad Hoc Committee on Door Protection'.



Chris Holmes is the Technical Director at VerticA Consulting Limited, having started in the lift industry as an apprentice engineer, Chris has worked in the field on Installations, Modernizations, Servicing and Project Management before becoming UK Bases Site Technical Support for a Global Supply Chain, which led to a Sales Manager role before his journey at VerticA began when he joined as Technical Consultant in 2016.

