ASSESSING EUROPEAN OPERATORS' READINESS FOR NEUTRAL-HOST INDOOR CELLULAR NETWORKS

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Contents

1. Executive summary

As operators in advanced 5G markets continue to expand their outdoor 5G roll-outs, attention is increasingly turning towards enhancing indoor coverage. The neutral host model, in particular, is beginning to gain interest as a way of offering shared access to a unified indoor network infrastructure. Even though many European operators are still focusing on outdoor 5G coverage expansion, the rising expectation for seamless indoor connectivity highlights the need for renewed consideration of the potential cost benefits of adopting a neutral host approach, such as capex and opex savings. It is important to investigate the readiness among European mobile network operators (MNOs) to adopt neutral-host solutions for indoor 5G networks.

Key concerns raised by MNOs for partnering with neutral hosts include: the potential loss of network differentiation, challenges in trusting new third-party providers, and issues around operational control. Conversely, there are also significant upsides from such partnerships, including external/co-investment opportunities, operational and cost efficiencies, increased relevance for MNOs using their own licensed spectrum, and the fulfilment of building owners' preferences for unified network infrastructures.

Operators have different reasons behind the varying emphasis they place on specific concerns and upsides. This is attributed to diverse experiences with network sharing – ranging from passive collaborations to active partnerships with tower companies – and budget availability for indoor deployment at scale. Moreover, the strategic importance of indoor coverage, as perceived by MNOs, plays an important role in determining their urgency for improving the connectivity to customers in buildings and their openness to partnering with neutral hosts.

The telecoms landscape is evolving. MNOs are beginning to recognise neutral hosts as value-creating partners to address indoor coverage challenges efficiently and cost-effectively. However, the success of these collaborations hinges on the MNOs' adaptability and willingness to embrace the changing dynamics of the telecoms industry.

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2. Introduction

Most MNOs have so far depended on outdoor macro sites to offer 'outside-in' coverage for indoor spaces.

This white paper begins by introducing the need and main technology options for dedicated indoor coverage solutions. It explores alternative approaches and best practices, drawing inspiration from example cases of indoor 5G coverage in the UK and the USA. The paper then presents a focused analysis of the dedicated cellular indoor solutions landscape for both commercial and public buildings in the following key European countries: France, Germany, Spain, and Italy. Furthermore, the paper assesses the readiness and willingness of mobile network operators (MNOs) to collaborate with neutral hosts for establishing shared indoor network infrastructures, based on extensive research and key takeaways from interviews with senior leaders and various stakeholders in these markets.

2.1 Indoor coverage in the 5G era

As the reach of 5G outdoor coverage expands and networks evolve into 5G standalone (SA) architectures for improved responsiveness and lower latency, users are becoming increasingly accustomed to the superior quality of service provided outdoors. This evolution, however, highlights a growing divide in the user experience between outdoor and indoor settings.

Most MNOs have so far depended on outdoor macro sites to offer 'outside-in' coverage for indoor spaces. This approach can only provide limited coverage with 5G frequencies due to the higher loss of 5G signals at the 3.5GHz frequency (the main 5G spectrum band), when penetrating through the enhanced insulation of modern buildings. Furthermore, upgrading legacy indoor systems like passive distributed antenna systems (DAS) to support 5G's new functionalities, including advanced multi-antenna technology and multiple input/multiple output (MIMO) capabilities to operate on the 3.5GHz band, proves challenging. Consequently, indoor mobile coverage often amounts to a compromised 5G signal from outside sources or reliance on existing 3G or 4G networks.

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While Wi-Fi provides an alternative with gigabit-speed capabilities indoors, it falls short in enabling mobile devices to seamlessly transition between indoor and outdoor enviornments. The fragmented nature of Wi-Fi, resulting from independent installations by various IT integrators for different tenants, often leads to network infrastructure duplication and a lack of consistency in user experience.

Considering that over 80% of mobile traffic is generated indoors,[1] where individuals spend more than 90% of their time,[2] the discrepancy between the demand and the availability of indoor networks is increasingly evident. This disparity not only represents a challenge for MNOs to overcome but also offers a chance to modernise indoor connectivity through the adoption of innovative technologies and the exploration of new business and operational models.

2.2 Technology options for dedicated indoor coverage

Building on the imperative to modernise indoor connectivity, as highlighted in the previous section, it is essential to explore the technological landscape that can support this transformation. This section offers an overview of the technology options available for dedicated 5G indoor coverage. From cellular-based solutions, including both low-capacity systems like passive DAS, repeaters, and femtocells, to high-capacity systems using active DAS or indoor small cells,[3] each technology plays a role in shaping the future of indoor wireless connectivity. Additionally, the evolving role of Wi-Fi, in tandem with these cellular technologies, underscores its continued relevance to complement 5G indoor coverage strategies.

Among these, active DAS and indoor small cells are particularly relevant for higher traffic scenarios in commercial or public buildings, the primary focus of this study. **Repeaters,** mainly used to extend the coverage of cellular signals, lack the capacity for high-traffic environments. **Femtocells,** similar to Wi-Fi hotspots, are typically suited for individual use in households or small buildings, due to their limited macro network co-ordination.

DAS, especially the passive type, have been foundational for providing indoor coverage in large commercial and public buildings. Passive DAS uses coaxial cables to connect the passive antennas to signals combined at the headend unit from multiple operators. It has been a staple throughout the 3G and 4G era; however, their limitations include significant signal quality loss over the coaxial cable and limited MIMO support. Existing passive DAS is not a suitable technology for delivering high speed 5G services and upgrading the installed base of passive DAS to support MIMO and higher frequencies is not viable either as each MIMO branch would need more, and much larger, cables to support higher frequencies. Active DAS addresses these issues by using fibre or ethernet cables connected to active antennas to support higher frequency bands like 3.5GHz and advanced MIMO configurations, making it increasingly preferred over passive DAS for 5G indoor coverage.

Considering that over 80% of mobile traffic is generated indoors, where individuals spend more than 90% of their time, the discrepancy between the demand and the availability of indoor networks is increasingly evident.

[1] U.S. Environmental Protection Agency (1989), *Report to Congress on indoor air quality: Volume 2.*

[2] Ericsson (2021), *Mobility Report.*

[3] In the context of this paper, unless otherwise specified, we refer to indoor small cells only, in contrast to outdoor small cells.

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Indoor small cell solutions have a significantly smaller footprint in buildings than DAS.

Indoor small cells, with a similar architecture to active DAS, differ in their direct connection of active antennas to small cell radio units, bypassing the need for a headend unit and local base stations for the MNOs. Historically seen as expensive and limited in multi-operator bandwidth support, recent technological advancements have made small cells cost-competitive for high-traffic scenarios. Modern indoor small cells can effectively support very high-capacity multi-vendor environments when using multi-operator radio access network (MORAN) operator integration. However, small cells can also connect operators using radio frequency (RF) injection units. This enables operators to connect their own base stations independently to the small cell system, mimicking an active DAS solution. While this enhances their flexibility and attractiveness for various deployment scenarios, it will lower capacity and performance compared to what is possible when using a MORAN solution. Indoor small cell solutions have a significantly smaller footprint in buildings than a DAS, making them easier to deploy and more beneficial for the property owners.
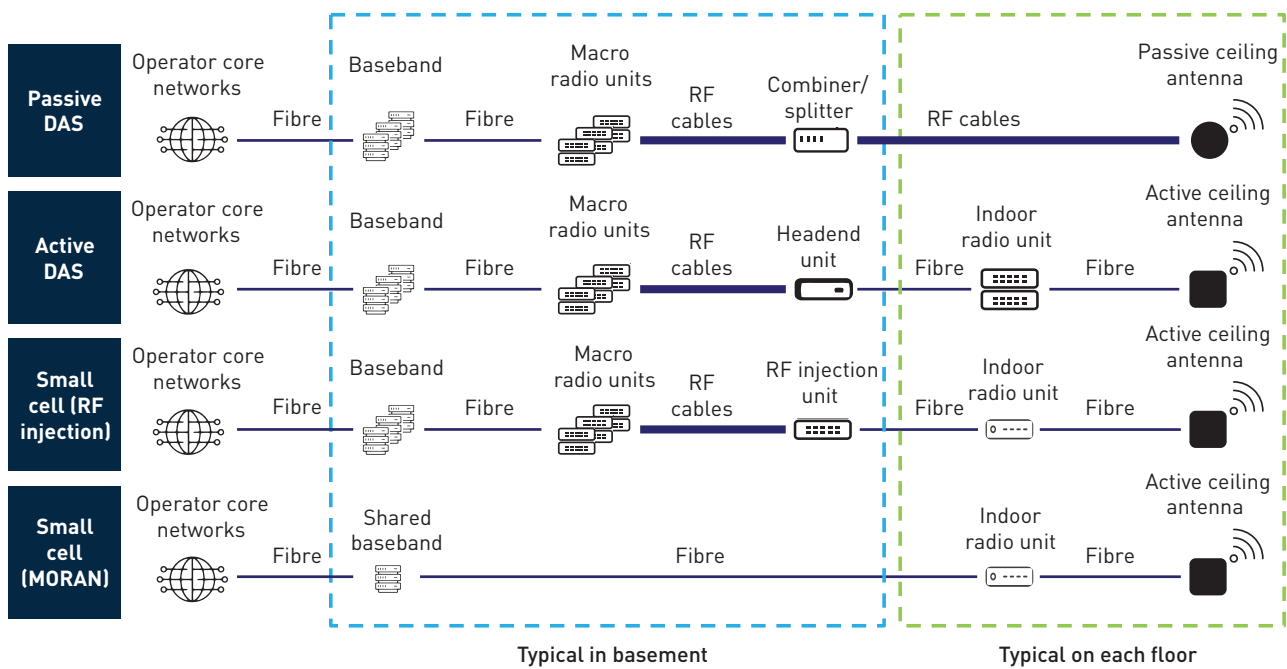
Figure 1: Illustration of the different architectures of DAS and small cell systems [Source: Analysys Mason, 2024]

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The evolution of **Wi-Fi**, particularly with Wi-Fi 6 and the anticipated advancements in future Wi-Fi standards, also plays a significant role in the indoor wireless ecosystem. Wi-Fi 6 brings improvements in capacity, efficiency, and throughput management over earlier versions of Wi-Fi. The development of seamless access technologies, such as Passpoint and the OpenRoaming framework, anticipates a future where users can seamlessly access and roam between public Wi-Fi hotspots, which could further enhance the user experience.

The decision to deploy 5G technologies, use Wi-Fi solutions, or integrate a combination of both depends on the specific needs of customers and the unique characteristics of each building. Within this context, Wi-Fi emerges not just as a tool for MNOs to enhance indoor coverage but also as a viable option for non-MNO entities aiming to provide indoor connectivity. This broadens the landscape of indoor coverage solutions, where both MNOs and other interested parties can leverage Wi-Fi to deliver seamless indoor coverage, ensuring that the quality of indoor connectivity aligns with the high expectations set by outdoor 5G networks.

The decision to deploy 5G technologies, use Wi-Fi solutions, or integrate a combination of both depends on the specific needs of customers and the unique characteristics of each building.

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3. Overview of indoor network deployment in developed markets

Most of the shared indoor networks in Europe are still based on DAS, with active DAS only becoming more common in recent years for new deployments, often labelled as '5G-ready DAS'.

Indoor small cell deployments have started generating traction in markets such as the UK and USA. Many European markets are still relying on traditional DAS solutions, and indoor small cell deployments are limited. This section outlines the current state of indoor network coverage in developed markets, with a primary focus on Europe. It incorporates information from both market research and interviews with market experts to establish different types of deployment processes and how regulation may play a role.

3.1 Current status of indoor coverage solutions

Shared indoor small cell deployments have increased in recent years, gaining traction in both the UK and USA. All of the four MNOs in the UK have agreed on the 'Joint Operator Technical Specification for Neutral Host In-Building' (JOTS NHIB) – a specification created to reduce complexity and enable shared networks. Freshwave, a neutral host active in the United Kingdom, recently partnered with MNO Three UK to deploy a 4G small cell network following the JOTS NHIB in a multinational company's headquarters. In the USA, independent small cell operators, such as Crown Castle and Extenet, have deployed tens of thousands of small cells for both indoor and outdoor use. These deployments include locations like the University of Mississippi (Ole Miss) and selected venues in Las Vegas.

In contrast, mainland Europe lags behind, with shared small cell solutions for indoor coverage remaining scarce. Most of the shared indoor networks in Europe are still based on DAS, with active DAS only becoming more common in recent years for new deployments, often labelled as '5G-ready DAS'. Interest from MNOs is mostly limited to locations with high footfall, such as stadiums and shopping centres, contributing to low overall indoor coverage in these markets. Furthermore, in attractive locations, parallel single-operator systems are still being deployed within the same buildings rather than shared network solutions.

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Shared deployments are, however, more common in public spaces. These deployments are often a result of a tender specifically asking for a dedicated solution. Tender processes appear most common in France and Italy, there are examples in metro stations in major cities, hospitals, and stadiums using DAS solutions. MNOs are driving most of the indoor coverage initiatives in Spain, benefitting from MNOs being willing to collaborate and deploy shared solutions. Existing solutions in Germany are also primarily MNO-driven, but many appear to be individual MNO deployments rather than shared ones.

Towercos are also actively leading the deployment of indoor networks in the studied markets. Affiliated towercos, such as Vantage Towers (previously owned by Vodafone) and TOTEM (previously owned by Orange), usually have a preferential relationship with their affiliated MNOs and are responsible for both outdoor and indoor network deployments. Independent towercos, such as Cellnex and TDF, have taken proactive approaches to secure exclusive access to buildings and invite MNOs on board at a price, essentially following the same model as neutral hosts.

The following table outlines a few indoor deployment examples identified in the studied markets.

Towercos are also actively leading the deployment of indoor networks in the studied markets.

Country	Deployment company	Technology used (generation)	Type of location	Current status
France	TDF	Multi-operator DAS (4G/5G)	Metro stations	Announced, to be active during 2024
Italy	INWIT	Multi-operator DAS (5G)	Hospitals	In operation
Germany	CommScope	DAS (5G)	Office	In operation
Spain	Cellnex	Multi-operator DAS (5G-ready)	Sport arena	In operation
United Kingdom	Freshwave	Small cells (4G)	Office	In operation

Figure 3: Examples of indoor deployments [Source: deployment companies' websites, 2024]

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Such coverage obligations typically focus on encouraging roll-out on outdoor networks. With fixed capex budgets, this may limit the resources available for indoor deployments.

3.2 Notable regulations and implications

When exploring opportunities within the indoor connectivity market, it is essential to distinguish between the different regulatory landscapes across geographical regions and the drivers for 5G deployment. One aspect is coverage obligations on licensed spectrum, which regulators typically include in spectrum auctions. Coverage obligations on mobile spectrum used for 5G deployment apply in many European markets, for example in Germany, where the 2.1GHz and 3.6GHz auctions in 2019 included obligations for the MNOs to provide 100Mbit/s speed to at least 98% of households in all states by 2022. Such coverage obligations typically focus on encouraging roll-out on outdoor networks. With fixed capex budgets, this may limit the resources available for indoor deployments.

In many of the countries analysed, both active and passive network sharing among MNOs is permitted and practiced. However, restrictions on spectrum pooling exist, such as in Germany where RAN sharing is permissible, but spectrum pooling is not. In France, active network sharing in densely populated areas is discouraged by the regulator due to concerns over potential negative impacts on competition and the heightened risk of collusion. Conversely, the French regulator encourages MNOs to collaborate with neutral host providers by setting clear criteria that, if followed properly by the neutral hosts, means MNOs must make fair offers to connect to the neutral host's network. This policy has successfully promoted the adoption of neutral host dedicated indoor solutions in metros in several cities.

Regulatory limits on electromagnetic fields (EMF), set according to the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines, may play a significant role in shaping indoor coverage strategies in certain markets. In places like Paris, France, and all of Italy, where EMF restrictions are particularly strict, the challenge is twofold. On one side, these limits hinder the ability of outdoor signals to penetrate buildings, and on the other, they drive up the cost of implementing dedicated indoor coverage solutions. This is because achieving effective coverage under strict EMF limits often requires installing numerous lower-power transmitters, increasing both complexity and cost.

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4. MNOs' perspectives on indoor network-neutral hosts

MNOs serve dual roles as both clients and, in most cases, spectrum suppliers for neutral hosts,[4] making their position in the indoor coverage value chain pivotal. Their stance towards neutral host collaboration is critical in determining the success or failure of such models. This section draws on interviews with various MNOs conducted as part of this project, revealing a range of views on the feasibility and desirability of working with indoor neutral host solution providers. Furthermore, we highlight and analyse common themes in MNOs' concerns and perceived upsides.

> Over half of the interviewees were concerned about losing differentiation when collaborating with indoor neutral host providers.

4.1 Concerns over partnering with indoor network-neutral hosts

Differentiation — Highlighted by 6 out 10 interviewees

Trust in new entrant and technology — Highlighted by 6 out 10 interviewees

Operational autonomy and control — Highlighted by 5 out 10 interviewees

Figure 4: Prevalence of key concerns identified by MNOs for indoor network-neutral hosts [Source: Expert interviews by Analysys Mason, 2024]

Loss of differentiation

Over half of the interviewees were concerned about losing differentiation when collaborating with indoor neutral host providers. Nationwide MNOs compete for market share based on coverage quality, amongst other factors, and hence use of shared infrastructure could weaken this advantage if the ability to differentiate coverage from that of competitors is lessened.

[4] Neutral hosts could acquire local spectrum or access to it, if available, to provide their service without need to access MNOs' spectrum. For example, CBRS band in the USA and the industry spectrum band in Germany are often mentioned in the discussions as the possible candidates for neutral hosts in these markets.

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> *"From an operator's perspective, a shared infrastructure…limits our ability to control the customer experience, which is crucial to our business."*
>
> **Head of PMO, MNO, Italy**

Conversely, challenger MNOs see partnering with a neutral host as an opportunity to compete more effectively, recognising the increased consumer emphasis on network quality.

Some MNOs no longer view wide-area coverage as a key differentiator and instead focus on configuring bespoke coverage solutions for key enterprise customers in specific locations. However, most acknowledge that while network coverage and quality differentiation remains important, coverage is less of a concern now than in the past, given that macro grids now reach the majority of populated locations in European markets, albeit not all with 5G frequencies deployed. The impact from the loss of coverage differentiation should be weighed against the potential benefits from sharing the network and working with neutral hosts, which will be elaborated in Section 4.2.

Trust in the new entrant and new technology

MNOs are concerned about working with third-party providers in the neutral host space. This apprehension stems from lack of confidence in the ability of these entrants to deploy networks to maintain the specific standards that established MNOs and their customers have come to expect. Many operators prefer working with established entities that have a proven reputation, especially in deploying networks in complex environments with new technologies.

> *"In some places, where a neutral host has an exclusive agreement, no one else can enter…. they can ask for unreasonable prices."*
>
> **Former commercial director, MNO, Spain**

There is also apprehension about established neutral hosts securing exclusive rights to deploy solutions in high-demand areas, forcing MNOs to pay premium access fees and potentially eroding their influence and bargaining power.

Concerns extend to small cell technology, where only a few MNOs have experience with single-operator deployments. The major questions are around the viability of shared small cell solutions in multi-vendor set-ups and their capacity to provide sufficient coverage for multiple MNOs in high-demand scenarios. Furthermore, MNOs also perceive small cell as more expensive than DAS, questioning its necessity and cost-effectiveness for typical mobile broadband use today.

Reduced operational autonomy and control

With a shared small cell system, MNOs face a different set of challenges compared to traditional shared DAS. In a shared DAS solution, MNOs maintain control over their radios and baseband units, but not the indoor distribution network. Operators with DAS cannot access or control any data and network parameters beyond their own base station. This approach appears more secure as it follows how they have worked in the past, and passive DAS is typically very stable. For active DAS, there is a need to supervise the active parts, but, as operators work in a similar fashion for passive DAS, they cannot identify any causes for service interruptions beyond their own base station.
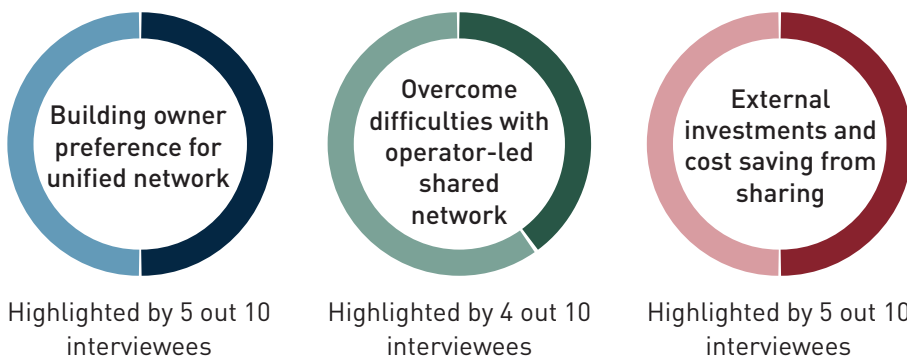
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In contrast, MNOs using a shared small cell solution typically need to trust a third party to also manage the unique operator baseband (as in classical RAN outsourcing structures) and also manage the indoor distribution network (in a MORAN fashion). This type of sharing maximises cost efficiency and service performance, but it can create an impression that an individual MNO cannot obtain full control and make changes to the network, as that might affect the service for the other operators. This limitation is similar in active DAS, but active DAS still operates in a way that is more familiar to the MNOs.

Ensuring high service level agreements (SLAs) with neutral hosts is critical for MNOs to maintain service quality. However, MNOs are concerned that reliance on neutral hosts for network modifications could limit their responsiveness to service issues. Concerns are particularly pronounced regarding service disruptions or quality degradation, where MNOs might be held accountable, despite limited direct control over rectifying the issues.

Collaboration between MNOs and neutral hosts in troubleshooting is also essential, but there is scepticism from MNOs about the neutral hosts' ability to efficiently handle these processes – despite their presence in any DAS solution. Additionally, the confidentiality of network information in a shared set-up, despite theoretical safeguards, remains a concern for operators.

Many of these concerns stem from operators' previous experiences with tower companies or operator-led shared networks. They highlight that the operational model and capabilities of neutral hosts still need to be demonstrated convincingly to gain MNOs' confidence, which is gradually growing as we see more and more neutral host networks being deployed.

4.2 Upsides of partnering with indoor network-neutral hosts

Building owner preference for unified network

Overcome difficulties with operator-led shared network

External investments and cost saving from sharing

Highlighted by 5 out 10 interviewees

Highlighted by 4 out 10 interviewees

Highlighted by 5 out 10 interviewees

Figure 5: Prevalence of key benefits identified by operators for indoor network-neutral hosts [Source: Expert interviews by Analysys Mason, 2024]

Ensuring high SLAs with neutral hosts is critical for MNOs to maintain service quality.

"There might be concerns about the confidentiality of network information. The neutral host might need to have their own lock to keep the information between the different operators separate."

Former Managing Director, TowerCo, Germany

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Meeting building owner's preference for unified network infrastructure

Most MNOs have historically preferred deploying and managing their infrastructure individually. However, there is a growing trend of building owners and enterprise customers favouring a unified network infrastructure — a single shared network accessible to all operators. This preference is driven by the desire to avoid operator lock-in and simplify property management, ensuring coverage for all tenants regardless of their chosen operator.

One notable initiative reflecting this trend is the Real Estate Digitalization Initiative (REDI) project in Sweden,[5] where leading building owners advocate for a unified indoor network as an integral part of building infrastructure, on par with utilities like water and electricity. While some MNOs have successfully convinced customers to maintain individual set-ups by promising upgraded services, other building owners are open to investing in part of the shared network infrastructure, where operators only need to provide base station equipment.

MNOs acknowledge that the neutral host model is well-positioned to meet the demand for unified infrastructure. Neutral hosts can streamline the set-up process, particularly in larger buildings or complex environments like metro stations, by leading discussions with building owners as impartial facilitators. Interviews also revealed that government-owned buildings are increasingly looking to improve indoor coverage through neutral hosts, suggesting that operators may face more pressure to connect to these networks.

Overcome difficulties with operator-led multiple operator deployment and operation

While some MNOs still consider an operator-led approach for setting up a shared network infrastructure, they acknowledge the inherent difficulties in such a process. Negotiating with building owners and identifying other interested operators can be a lengthy and unpredictable process. Even in markets with established frameworks for shared indoor deployment, the arrangements are often based on mutual understandings and goodwill rather than formal agreements.

The resource constraints faced by most MNOs add to these challenges. MNOs must often compete for resources from their design teams, who usually prioritise outdoor network roll-outs. Inability to assign dedicated resources as a single point of contact (SPOC) during implementation can be detrimental to a project's timeline, cost control, and meeting the requirements of all onboarded operators. This situation highlights the potential advantages of a neutral host, who could allocate dedicated resources, ensuring smoother project execution as scale and complexity increase.

[5] REDI (2022), *5G inomhus fastighetsägares perspektiv.*

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Furthermore, the nature of operator-led set-ups often limits the level of sharing achievable. Most MNOs are hesitant to share radios or basebands in such set-ups to avoid exposing sensitive information to competitors. This limitation means that typical operator-led set-ups often only share the DAS network within buildings, with individual MNOs providing their own radios and basebands. This approach significantly restricts the potential cost savings of the shared network.

External investments and cost savings from sharing

MNOs universally express frustration over limited capex budgets. With indoor coverage often not ranked highly on the priority list for capital spending, there is typically no/minimal budget allocated for proactive deployments. This constraint is even more pronounced during capex freezes, when even projects with approved business cases and immediate return potential are put on hold.

The introduction of external capital investment from neutral hosts is seen as a welcome boost against these financial constraints, offering a new route to start indoor network deployments. The potential cost savings from the extensive network sharing in a neutral host set-up is also appealing. For instance, compared to a traditional operator-led shared DAS, where only 20–40% of the network cost is shared, a neutral host small-cell solution shares the full cost of the radio network, including both radios and basebands.

"They [MNO] might prefer... a neutral host, to invest the capex....especially when they lack the necessary capex for outdoors.."

**Head of product, neutral host service provider, France**

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5. Variance in MNO openness for neutral host solutions

While the main themes in concerns and benefits are shared by a majority of interviewees, the degree of emphasis they place on these aspects varies significantly.

Following the exploration of key concerns and benefits regarding neutral hosts in Section 4, this section sets out the variance in preferences among MNOs to engage with such solutions. While the main themes in concerns and benefits are shared by a majority of interviewees, the degree of emphasis they place on these aspects varies significantly. This variance reflects differing levels of readiness for adopting neutral host solutions across the markets and can be attributed to factors such as each MNO's experience with network sharing and towercos, financial pressures, and their perception of the strategic value of indoor coverage.
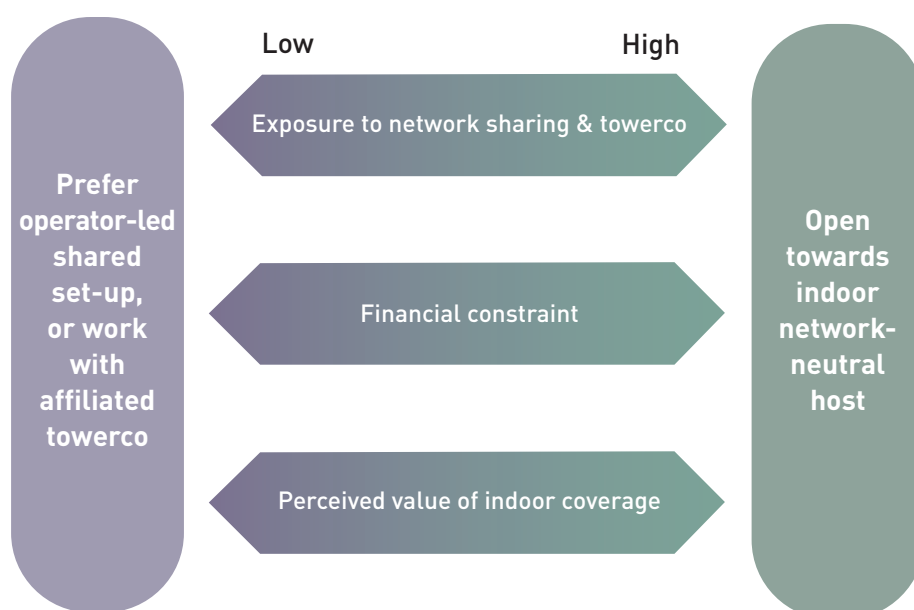
Figure 6: Three main factors affecting MNOs' preferences towards neutral hosts
[Source: Analysys Mason, 2024]

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5.1 Exposure to network sharing and towerco partnerships

MNOs' readiness to work with neutral hosts is significantly influenced by their experience with network sharing and towerco partnerships, which varies depending on the market. In Germany and France, network sharing (especially active) is limited to less populated areas, suggesting a cautious approach towards neutral hosts due to a preference for independent roll-out and network differentiation. In contrast, Spanish and Italian MNOs, having been more exposed to extensive network sharing, show greater openness to neutral host collaborations for indoor coverage.

The presence of towercos in the market influences MNOs' willingness to engage with neutral hosts for indoor deployments. Although towercos advocate for network sharing, MNOs with established relationships with a specific towerco often prefer it to lead shared indoor deployment initiatives instead of a third-party neutral host. This preference is based on existing partnerships and the operational synergy with towercos, potentially steering MNOs away from neutral host solutions, despite the general push for network sharing.

On the other hand, interviewees from Italian and German MNOs also acknowledge that towercos are typically cautious about handling active network equipment and may not be organisationally prepared to cater for more than 2–3 MNOs. These factors suggest that MNOs consider neutral hosts as a more flexible and suitable alternative for leading shared indoor network deployments.

5.2 Financial constraints

In the markets analysed, all MNOs are facing challenges of stagnating average revenue per user (ARPU) coupled with the significant expenses associated with extensive 5G roll-out. The financial pressures vary across operators, and is one factor that influences their willingness to partner with neutral hosts. Fixed capex budget, alongside uncertainties about the return on investment for indoor coverage, emerge as primary reasons why MNOs hesitate to invest in indoor deployments. Adopting a shared infrastructure model through neutral host partnerships could offer a way to mitigate financial pressures, making the investment in indoor networks potentially more appealing and financially viable.

Our interviews suggested MNOs under more intense financial stress, particularly in highly competitive markets, are most receptive to the prospect of external help provided by neutral hosts. The prospect of investment by neutral hosts into indoor solutions that can meet the needs of multiple operators in a given market may be welcomed by MNOs. These MNOs, already accustomed to outsourcing network operations to optimise operational expenses, also tend to find collaborating with a neutral host less of a barrier.

The presence of towercos in the market influences MNOs' willingness to engage with neutral hosts for indoor deployments.

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Conversely, leading MNOs in less competitive markets show a greater reluctance to engage with neutral hosts. Despite recognising the potential benefits such partnerships could offer, they prioritise retaining full control over their network infrastructure. Their focus on maintaining market dominance and delivering superior coverage quality makes them less inclined to share network infrastructure with competitors or to rely on external parties for network operations.

5.3 Perceived value of indoor coverage

The value MNOs place on dedicated indoor coverage plays a crucial role in their readiness for neutral host solutions. Although all MNOs recognise the importance of having a presence in high-traffic locations like stadiums or subway stations, their perceived value for indoor coverage beyond these locations varies significantly.

Many MNOs we interviewed agree that enhanced indoor coverage in commercial buildings does not directly translate into increased subscriber numbers, resulting in limited short-term return on investment. With competing demands for capex, especially from expanding 5G outdoor coverage, indoor networks often receive minimal budget allocation. Typically, indoor deployments are reactive, addressing the specific needs of unsatisfied enterprise customers or for private network solutions. In these scenarios, the neutral host model is generally deemed less relevant, as the focus is more on bespoke solutions rather than shared infrastructure. Currently in Europe, roll-out of 5G coverage via the 3.5GHz band is still low relative to overall mobile coverage levels, shown by the chart below. If MNOs prioritise investment in further 3.5GHz roll-out, this will focus capex budgets towards these (outdoor) solutions.

However, some MNO interviewees stated that they do appreciate the long-term strategic value of indoor coverage for consumer use, particularly as younger generations prioritise consistent, high-quality data services. They fear losing relevance to customers if they delay for too long in delivering high-quality service in places where customers spend most of their time. For MNOs in these markets concerned about maintaining customer value, partnering with neutral hosts appears to be a preferable alternative to leaving the market to non-cellular solutions, like advanced Wi-Fi with OpenRoaming.

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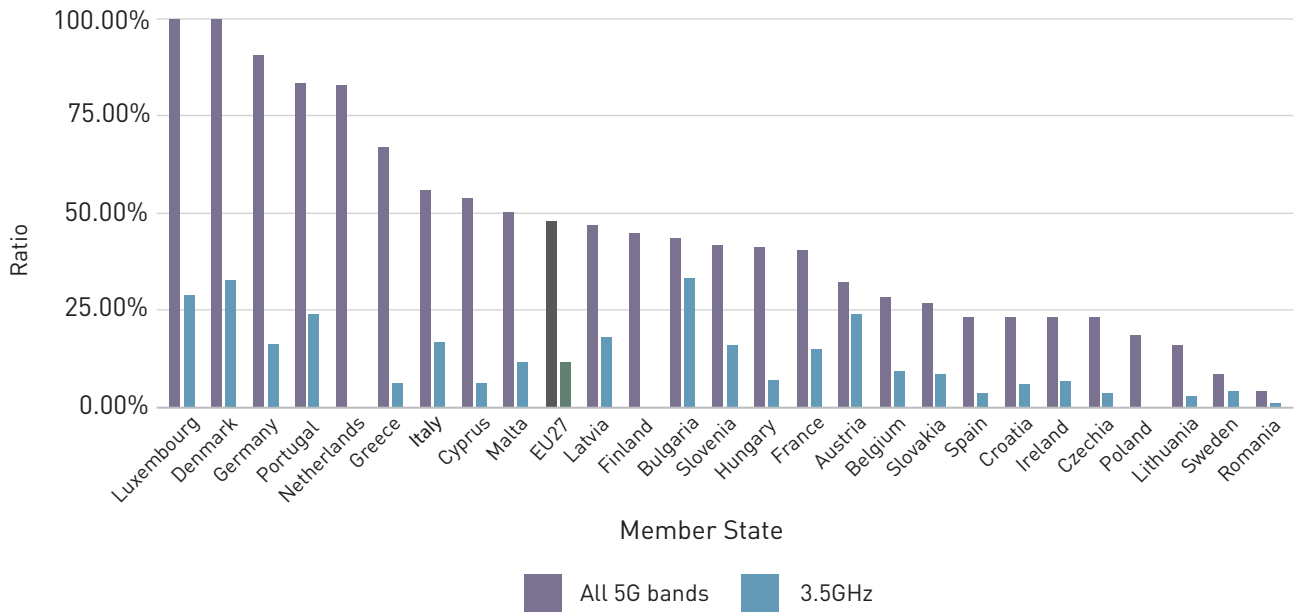
Figure 7: 5G base station as a percentage of existing 4G base stations in EU member states

[Source: European 5G Observatory, 2024]

6. Conclusion

The neutral host model presents a flexible and effective alternative to tradional operator-led deployments.

Five years into the 5G era, customer expectations, reshaped by the expanding availability of higher-quality outdoor 5G coverage, are compelling MNOs to increasingly focus on enhancing indoor connectivity as well. The emergence of Wi-Fi innovations, such as OpenRoaming, offering seamless connectivity experiences, also challenges MNOs to reconsider their approach to maintaining customer value in scenarios where uninterrupted connectivity between outdoor and indoor environments is essential.

Neutral host solutions stand out as a strategic adaptation for MNOs facing resource constraints, enabling them to maintain market presence and a direct connection to their customers through deploying their own licensed spectrum assets in a shared deployment. This model, while not universally applicable, presents a flexible and effective alternative to traditional operator-led deployments. It may offer MNOs the opportunity to respond adeptly to the pressures exerted by alternative connectivity solutions and evolving consumer expectations.

The telecoms industry is navigating a period of significant transition. The decisions made by operators today regarding partnerships with neutral hosts, engagement with alternative technologies, and approaches to indoor coverage will be pivotal in shaping their future role and success in a rapidly evolving market.

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7. Glossary

ARPU	Average revenue per user. Represents revenue generated by one user, such as a subscriber.
Baseband	Baseband refers to a range of unprocessed frequencies of a signal that is yet to be modulated.
Base station	Base station refers to the central hub of a network covering a specific area. For outdoor networks, a cell tower is a base station providing coverage.
DAS	A distributed antenna system is a type of solution where multiple smaller antennas are distributed to transmit radio signals and thereby strengthen a user's connectivity to the mobile network.
MORAN	A multi-operator radio access network is a type of infrastructure arrangement where MNOs can share components in the radio access network while they are also able to control their own frequencies.
Neutral host	Provider of active and passive telecoms infrastructure for operators. A neutral host owns the infrastructure and allows operators to connect for a fee.
Radio unit	A radio unit is a type of transceiver located on base stations which acts as a bridge between wireless devices and wireless networks, enabling the two to connect.
Towerco	A company that constructs, manages, and maintains telecoms infrastructure for one operator or multiple operators. A towerco can be a fully independent entity or affiliated to an existing operator.

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8. About the authors

Lei Shi (Principal)

Lei has extensive experience in leading mobile network procurement, spectrum valuation, market analysis and technology strategy projects. Recent engagements include directing 5G network procurement processes for mobile operators and neutral hosts, leading technical due diligence on mobile operators and on telecoms service and equipment vendors and developing 5G and Internet of Things (IoT) strategies for industrial and service companies.

Jacob Renning (Consultant)

Jacob contributes to a broad range of projects at Analysys Mason, including technical and commercial due diligence, transaction advisory, and business strategy projects. Jacob holds an MSc in Business and Economics and a MSc in Information Systems from Linköping University in Sweden.

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9. About Analysys Mason

Analysys Mason is the world's leading management consultancy focused on telecoms, media and technology (TMT). We give clarity and confidence in answering our clients' biggest commercial questions: What strategy will best enhance value? What implementation plan will be most successful? What is the optimal positioning for five years' time?

We bring together commercial and technical expertise across four interconnected consultancy practices strengthened by globally respected research.

Strategy. We cover all aspects of strategy development and review based on a highly analytical and data-driven approach. Our propositions include corporate growth strategy (organic and inorganic), business unit strategy (including consumer and enterprise products), and infrastructure strategy (including capex optimisation through data analytics).

Transaction support. We provide robust commercial and technical due diligence support for TMT debt and equity financing, M&A and IPO processes. We support the full M&A cycle from opportunity scouting through to post-merger integration.

Transformation. We help structure and operate major IT, digital and business transformation programmes. We also have deep expertise around what it takes to avoid the pitfalls of and maximise the success of complex change programmes.

Regulation and policy. We play a leading role in helping to formulate and examine policy and regulation related to TMT. We support governments, regulators and the whole telecoms sector in a rapidly changing world increasingly shaped by digitalisation.

Subscription research. We evaluate the key topics driving the TMT industry and quantify the impact on operators and vendors worldwide. Clients rely on our research as an essential resource for strategic planning, investment and benchmarking.

Global reach, local insight

Our advice is rooted in deep domain knowledge that combines global reach and local insight into markets to help our clients achieve their goals. Our service offerings are fully integrated across all five key strengths. This allows us to make sense of a complex TMT landscape and create valuable insights in ways that cannot be matched by narrower domain specialists or generalist consultants that lack our depth of experience.

Working with private- and public-sector clients in 140+ countries, we are committed to advancing TMT's role as a critical enabler of global economic, environmental and social transformation – and to contributing to a world where technology delivers for all.

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