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Connectivity Management Platforms

IoT Transition Topic

Position Paper

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The Connectivity Management Platform (CMP) is one of the key underlying pieces of middleware used by Mobile Network Operators (MNOs), Mobile Virtual Network Operators (MVNOs), and even some enterprises wishing to act as their own operator, to manage connections, handling activation/ deactivation, billing, analytics, reporting and various other functions. This part of IoT is going through something of a period of transition.

CMPs are evolving. The scope of what functionality should be included has expanded dramatically in recent years, to the point where even the term CMP does not do justice to the breadth of offerings. There are many options for basic SIM management and billing, but differentiation is coming through the provision of core network functions, eSIM/remote SIM provisioning capability, cloud connectors, advanced analytics and even the provision of managed connectivity.

At the same time, Mobile Network Operators are being more proactive in reviewing their CMP strategy, looking to diversify into using alternative platforms. This approach is, in part, triggered by underlying requirements for CSPs to find low-touch on-boarding suitable for more cost-effectively addressing billions of devices. There is also a wider requirement for CSPs to implement a tiered approach to addressing the market.

This report looks at the key changes in the Connectivity Management Platform market in recent years, examines the functionality that is now required of CMPs, identifies the roles and capabilities of the different players in the CMP landscape (including specifying the functionality delivered by 'Thin' and 'Thick' CMPs) and offers some recommendations to MNOs and MVNOs about their strategy relating to CMPs.

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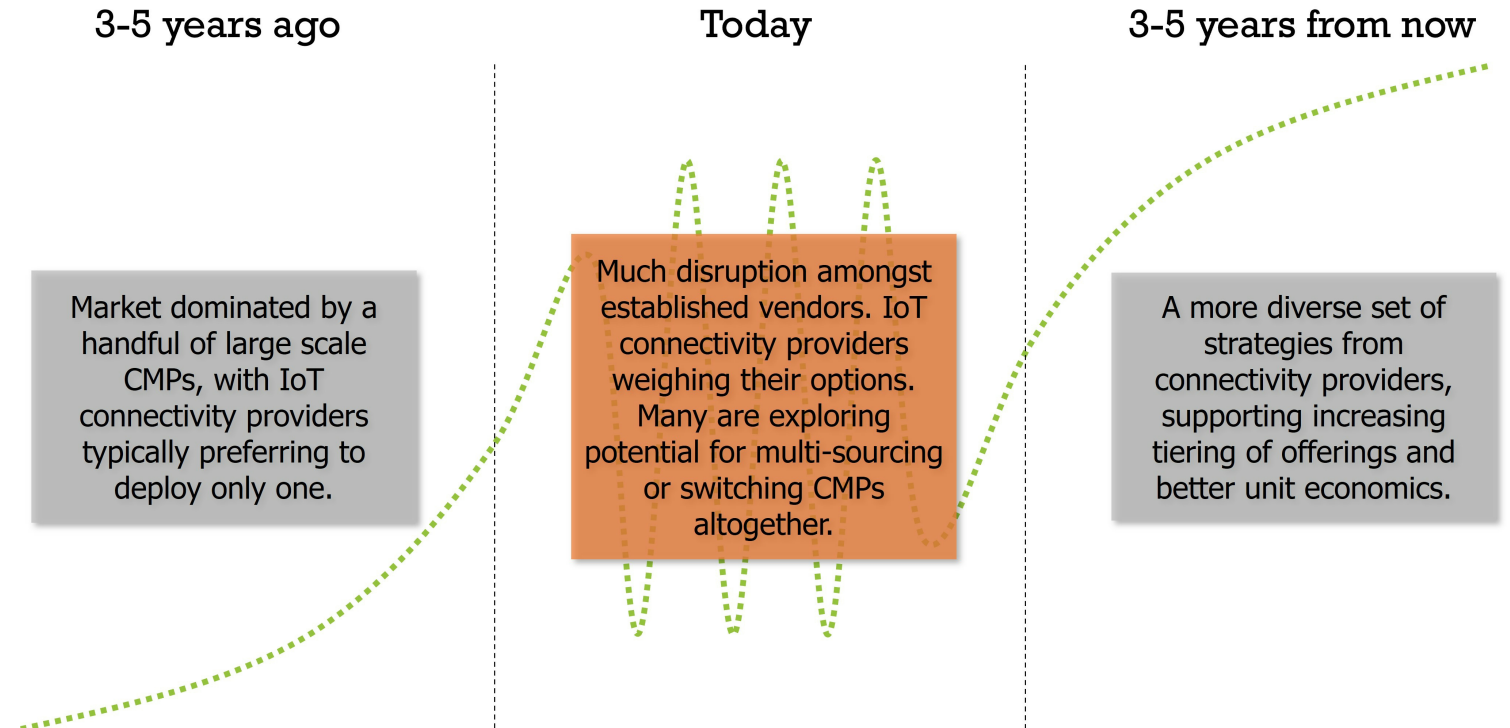
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About this report

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IoT 'Transition Topics'

Transforma Insights has identified a series of aspects of the Internet of Things that are going through a period of fundamental transformation. These IoT '**Transition Topics**' are the subject of Position Paper reports and Virtual Briefings identifying the key aspects of change and how organisations should position themselves to be best placed to realise the opportunities generated.

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Transition Topic: Connectivity Management Platforms

3-5 years ago

Today

3-5 years from now

Market dominated by a handful of large scale CMPs, with IoT connectivity providers typically preferring to deploy only one.

Much disruption amongst established vendors. IoT connectivity providers weighing their options. Many are exploring potential for multi-sourcing or switching CMPs altogether.

A more diverse set of strategies from connectivity providers, supporting increasing tiering of offerings and better unit economics.

IoT Transition Topic Position Paper

Executive Summary

If we look back 3-5 years the Connectivity Management Platform (CMP) space was relatively stable. The functionality included within CMPs was well-established with not too much evolution, and the market landscape was well defined, being dominated by two large players. The focus of the users of CMPs, predominantly Mobile Network Operators, was not generally very focused on the CMP space, and vendors of such solutions were mostly interested in incremental refinements to the service offering.

This has changed and will change further in the coming few years. We are currently in a period of transition with ownership, functionality, market structure and buying behaviour all in a period of flux. Ultimately, 3-5 years from now we expect there to be a 'new normal' in CMPs based on a more pluralistic market structure, with a wider range of, in many cases very feature-rich, platforms.

The CMP is one of the key underlying pieces of middleware that mobile network operators (MNOs) and Mobile Virtual Network Operators (MVNOs) use to manage connections, handling activation/deactivation, billing, analytics, reporting and various other functions.

The biggest piece of news in the IoT connectivity space for many years was announced in December: Aeris Communications would acquire the IoT capabilities of Ericsson, including its Connectivity Management Platform, IoT Accelerator (IoTA). Ericsson is one of the 'big two' in the Connectivity Management Platform (CMP) space, along with Cisco's Control Center. Cisco has also been through something of a transition in recent years with some price changes that weren't always welcomed by their mobile network operator customers.

These changes demonstrate a big challenge in the CMP space: how can vendors continue to support operator customers at declining revenue per connection, sometimes as low as USD0.20/year, at the same time as supporting their complex requirements, and all while trying to turn a profit.

As well as these changes by Cisco and Ericsson, the whole of the CMP space has been undergoing a set of changes in the last few years. New arrivals are stirring the pot, with alternative, agile cloud-native offerings with strong functionality delivered in a very cost-effective manner.

There is also a growing demand on the part of MNOs and MVNOs to find low-touch on-boarding suitable for addressing the whole of IoT in a more cost effective way, particularly the low-tier prepaid segment. Increasingly it is seen by MNOs that the way to achieve this is by way of a separate, often lower functionality, CMP.

In tandem, the range of functionality covered by the umbrella term 'Connectivity Management Platform' is also evolving, to include elements of analytics, eSIM/remote SIM provisioning, core network functionality, and global connectivity orchestration. The CMP term now covers too broad a set of vendors with too diverse a set of functionality. As a result, Transforma Insights thinks it is necessary to distinguish 'Thin' from 'Thick' CMPs based on the functionality that they deliver.

Stimulated by these changing dynamics on both the supply and demand side, there is a pronounced trend in the last few months for IoT connectivity providers, and particularly the Mobile Network Operators, to be more proactive in reviewing their CMP strategy, looking to diversify into using alternative platforms. In some cases they may want to find a replacement for existing main CMPs provided by Cisco or Ericsson. In others they will be looking for low-cost variants as a secondary platform. The good news for MNOs is that there has never been a better time to look at options for CMPs.

This report looks at the key changes that have happened in the market in recent years, examines the functionality that is now required of Connectivity Management Platforms, identifies the roles and capabilities of the different players in the CMP landscape (including specifying the functionality delivered by 'Thin' and 'Thick' CMPs) and offers some recommendations to MNOs and MVNOs about their strategy relating to CMPs.

*This report provides a summary of the more extensive Transforma Insights report '*IoT Connectivity Management Platform (CMP) market landscape*', published in April, 2023.*

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Key CMP market trends

Until recently the Connectivity Management Platform landscape was relatively static. Two vendors (Cisco and Ericsson) dominated, albeit with some operators picking alternative approaches, functionality evolved slowly, and there was relatively little to upset the status quo. However, in the last two years there have been a lot of emerging dynamics that have upset that situation and thrown the CMP space into a period of transition. In this section we examine some of the ways in which this has evolved.

Challenging economics

Transforma Insights has previously highlighted the challenges with the dilution in average revenue per connection, for instance in the report 'IoT connectivity providers need a hyperscale approach to counter the '$1 IoT' scenario' (October, 2021). The more widespread use of LPWA technologies, LTE-M and NB-IoT, will continue to drive the average spend on connectivity down. At the same time, there has been no decrease in the demands from operators for functionality from their CMPs. If anything they have become more demanding.

The question for CMPs is: how can we continue to support our operator customers at declining revenue per connection, sometimes as low as USD0.20/year, at the same time as supporting their complex requirements, and all against a background of being essentially loss-making.

Cisco has opted for a dual approach, raising prices to make its Control Center business profitable, and at the same time introducing additional value-added features and tiering. Ericsson has opted to exit the market altogether, transferring its IoT Accelerator business to Aeris Communications.

Falling barriers to entry result in new arrivals

It has become more financially viable to build a CMP and deliver a rich set of features based on being cloud-native. This has resulted in a greater level of competition in the space. There are now dozens of Connectivity Management Platforms in use. Many are simple skins of another vendor's platform, with varying degrees of differentiation. And many are only used by a single connectivity provider as their in-house CMP. However, the 'market' for CMPs, i.e. the options for licensing by connectivity providers, has grown in the last few years. In some cases this is a result of operators deciding that they have an in-house CMP that is sufficiently feature-rich that it can compete with the incumbent players (Cisco and Ericsson). In others it is a result of new entrants.

Frustration with established vendors

The CMP market has historically been dominated by two platforms: Cisco's Control Center (previously Jasper Control Center) and Ericsson's IoT Accelerator (formerly Device Connection Platform, DCP). Most major mobile network operator (MNO) groups used the platform from one or other of them. In some cases, this was alongside their own (e.g. Deutsche Telekom, Orange and Telefonica) and in a few cases it was both of them (e.g. Telenor Connexion). A small number of major MNO groups opted to rely entirely on their own infrastructure (e.g. Verizon ThingSpace and Vodafone GDSP). Beyond this, a small number of MNOs opted to use some alternative CMPs from Aeris Communications,

Comarch, ZTE and others. The bigger MVNOs tended to build their own, while smaller ones white label CMPs from MVNEs.

Fairly or unfairly, many MNOs have become increasingly frustrated with the two major CMP vendors. During the research for our 'Communications Service Provider IoT Peer Benchmarking Report' (February, 2023) we asked the biggest MNOs in the world about their experience with their CMP providers. The response was generally negative. Some were frustrated by price rises, which is perhaps no surprise, while others were critical about a perceived slow progress in product roadmap.

To provide some balance to this, we see some of the criticisms as unfair. The complaints about price increases were levelled mostly at Cisco, but it was crucial for it to turn Control Center into a sustainable business, which now seems to be the case. And complaints about roadmap must still be seen in the context of these two platforms continuing to be the market leaders. And it should be seen in the context of

very significant demands for customisation from many MNO customers, each of which will need to enter a queue in the relevant CMP's development pipeline.

Ericsson and Aeris: the big news

To further disrupt things, the biggest piece of news in the IoT connectivity space for many years was announced in December, and completed in late March: IoT MVNO Aeris Communications acquired the IoT capabilities of Ericsson, specifically its CMP IoT Accelerator (IoTA), and Connected Vehicle Cloud (CVC). Exactly what impact the acquisition will have is yet to be determined. However, based on our conversations, it seems that the focus of the new entity will be to operate as a CMP but with an MVNO-like role of directly addressing enterprises, particular automotive OEMs, on behalf of the carriers using IoT Accelerator.

How the operator customers respond to this shift of focus will depend on the extent to which they expect to be able to directly address multi-country deployments. Those operators most focused on multi-country

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Key CMP market trends

deployments, particularly for connected cars, such as Deutsche Telekom and Orange, are most likely to be disconcerted by the developments.

Combine the uncertainty over Aeris/Ericsson with some bubbling dissatisfaction with Cisco over perceived price increases, and a general (perhaps unfair) view that the product roadmap of both has been slow to evolve, and we see a significant wedge of MNOs considering their options for migrating away from the established players. This might take the form of literally shifting millions of connections between platforms (increasing numbers of alternative CMP vendors such as Eseye, floLIVE and Mavoco have experience of this) or the use of alternative CMPs for new connections.

New differentiation mechanisms

The basic functions of SIM management, such as activate/deactivate/suspend and billing are baseline functionality for a CMP, along with a dashboard user interface and APIs. Every CMP has that. Today CMPs are seeking to differentiate based on other capabilities. Cisco, for instance, talks now about 'IoT-as-a-Service' rather than CMP, reflecting that its portfolio is now wider.

Transforma Insights agrees. In the next section we outline the range of features and functionality that might now be included in a CMP offering. It goes way beyond just those baseline features mentioned above. As a result of the addition of these richer features we need to think about our market segmentation. There have always been differences between the levels of functionality offered by the various platforms, but this has become increasingly pronounced. In the next section we provide our view on how the CMP space ought to be segmented, broadly speaking between 'Thin' CMP vendors where the focus is on the core CMP

functionality, and 'Thick' CMP vendors which offer a range of additional services that are adjacent to the baseline capabilities.

The additional functionality provided by these 'Thick' CMP vendors is as follows:

- Core network - Many operate their own core network functions giving much greater control over connections, data flows and billing, and making the CMP function more transparent and real-time.

- eSIM subscription management - It is now almost impossible to talk about cellular-based IoT connectivity without considering remote SIM provisioning. The more sophisticated CMPs now also include access to SM-SR/DP and/or SM-DP+.

- Global connectivity orchestration - As an overlay on providing the eSIM/RSP infrastructure, CMPs can also act as an orchestrator of multi-country connectivity propositions from operators on their platform, not necessarily contracting with the enterprise, but providing the frameworks for this to happen.

- Analytics - There is a range of analytics functionality for churn prediction, root-cause analysis, anomaly detection and other operations that will be increasingly a differentiator.

- Integration services - This is not a standard add-on, but Comarch, for instance, also operates as an ICT consultancy, working on wider project development and charging for things like support and hosting.

Not all CMPs are equal. A 'Thin' CMP may be perfectly adequate for an operator's needs, particularly if it's

cheaper (it almost certainly will be). We think the 80/20 rule applies quite well with CMPs: 80% of customers will probably only demand the 20% of features that are included within the 'Thin' CMP. But those customers tend to represent the long-tail, whereas the more demanding will account for the bulk of connections and probably the bulk of value. Many operators will favour having a richer set of features and functionality particularly for addressing more demanding (and valuable) customers such as car manufacturers.

Market bifurcation

One of the current obsessions in the IoT connectivity space is how to more effectively address low-cost, low-data connections, particularly those enabled by constrained LPWA technologies. The key is to use platforms and processes that are appropriately scaled to be able to profitably address millions of connections generating relatively small amounts of revenue.

Effectively the IoT connectivity market is bifurcating, with one market focused on high-end, high-bandwidth, high revenue, connections (such as automotive), and the

other focused on low-end, low-data, low revenue. The former can continue to be addressed using existing processes and platforms, albeit that a bit of streamlining wouldn't go amiss. The latter, however, probably needs a rethink, to ensure that it can be addressed profitably. It needs its own channels, processes, and (relevant to this report) perhaps a separate lower-cost CMP.

One of the reasons why MNOs particularly are considering their options on CMPs is to be able to better address that low end of the market. In many cases they are looking at a CMP strategy that reflects a market segmentation that recognises this bifurcation. Deutsche Telekom, for instance, has its 1NCE subsidiary to address the low touch prepaid end of the market, while its main core DT IoT business addresses the more demanding customers.

The established vendors have also recognised this dynamic. Both now have tiered offerings, Cisco's comprises three levels: Advantage, Essentials and Lite. Similarly, other vendors such as Comarch and Mavoco have tiered offerings too.

Capabilities of CMPs

The role of the Connectivity Management Platform is evolving, to the point where perhaps even the term CMP is past its sell-by date. It can be as simple as a SIM management and billing platform, or it can be highly sophisticated including core network functions, eSIM management and even extending some way into the provision of connectivity. We identify seven main types of functionality within the remit (or potential remit) of a CMP.

1. SIM management

The baseline functionality of a CMP, involving managing the SIM, specifically activation, deactivation, suspension, APIs and some billing functions.

2. Advanced analytics

This includes a range of analytics and automation based on that analytics, including related to security, anomaly detection, root-cause analysis, churn reduction, bill prediction and many more. This is likely to make increasing use of AI. To be fully optimised, this must be real-time.

3. Abstraction

Aggregate connectivity data from multiple CMPs to provide a 'single pane of glass' to enterprise customers to manage all their connections.

4. Core network functions

Some CMPs operate their own core network functions upon which client connections are hosted. This allows for greater control over connectivity functionality, greater transparency, more real-time capabilities and higher levels of security. Many CMPs, such as 1oT Terminal and Mavoco, don't have a core network.

5. eSIM subscription management

Management of the process, either via its own subscription management platform, or more typically from a specialist third party, to handle eSIM profile management and subscription management on the SIM. Includes SGP.02 and SGP.31/32 variants.

6. Global connectivity orchestration

A support role to operator partners whereby the CMP will provide enterprises with an opportunity to access connectivity packages from member operators. Contracting/commercial terms will usually continue to be with the individual operators.

7. Managed connectivity

Although typically the role of the MNO or MVNO, some CMPs provide actual connectivity, in the form of contracting for data plans and the associated management, with direct commercial relationship with the enterprise. However, we would categorise this as a capability derived from operating as a 'Connectivity Provider' rather than a CMP. The big question is whether CMPs can bridge that gap to being Connectivity Providers too.

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Capabilities of CMPs

Other functions

Beyond these seven, there are a few areas of functionality and characteristics of platform providers that might need to be considered:

- **Cloud connectors** - It is becoming increasingly standard to establish a proxy point on the network for protocol conversion and application of Transport Layer Security to deliver into cloud platforms .

- **5G Stand Alone (SA)** - Several platform providers, particularly the most sophisticated, are introducing features related to 5G, particularly around virtualised network functions and network slicing. In the context of the bifurcation topic discussed in the previous section, this would relate almost exclusively to the high-tier CMP market.

- **Differentiated UI and self-care** - This relates to the fact that CMPs need to provide differentiated views and functionality from their portals depending on the type of viewer, e.g. MNO, MVNO, reseller, enterprise, or subsets of those. The enterprise-facing UI should also include support for self-care by enterprise customers to help reduce the cost to serve for operators.

- **Mobile Private Network support** - Some CMP vendors are supporting cellular private wireless networks and the types of specific functionality required for them, whereas others are focused exclusively on public networks.

- **Multi-radio support** - This relates to the support for alternative network technologies such as 3GPP Non-Terrestrial Networks (NTN), LoRaWAN, Wi-Fi and others.
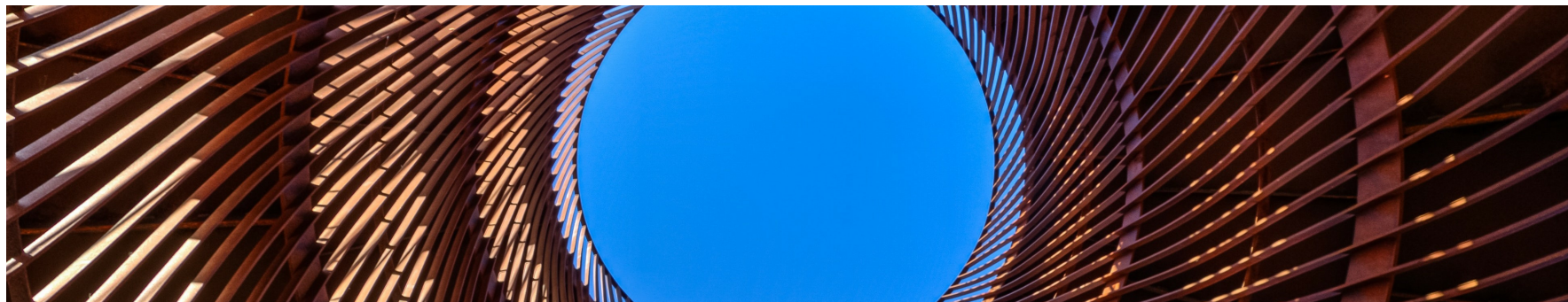
- **Security** - A CMP will include features associated with supporting security, including private APNs, network diagnostics and troubleshooting, device locking, device quarantining, and transport layer security. There is some overlap with the analytics functions mentioned in the previous section, but this is broader.

Commercial and operational considerations

In addition to all of the functional elements identified above, there are also a number of other considerations that might influence a connectivity provider when considering its choice of CMP:

- **Low total cost of ownership** - The issue of unit economics, both for the vendor and the operator, will be a huge consideration. It needs to make economic sense for both parties, i.e. the CMP vendor needs to be able to sustain the development roadmap, and the operator need a fee structure from the CMP that allows it to address devices generating less than USD1/year.

- **Fast time-to-market** - Operators will want a CMP that is deployable in a matter of weeks to avoid missing out on business. Being deployed in the cloud helps with this.

- **Agility** - CMPs also need to be sure that they can react to changing market dynamics, including regulation, requiring new features, reports or technologies, delivered in a timely way. As a result, an agile mindset is essential from the vendor.

- **Strict SLAs** - Increasingly IoT is being deployed for mission-critical use cases. Enterprises will demand strict SLAs and therefore operators will equally want similar SLAs with their CMP, particularly over up-time and fault resolution time. The ability to offer SLAs will depend largely on the CMP vendor's end-to-end control of the proposition. White labelling of third-party functionality makes for fewer guarantees.

- **Understanding of the technical challenges of optimising IoT** - Today there are a host of technologies optimised for IoT, including devices, LPWA network technologies, protocols, operating systems, and even mechanisms for supporting multi-country connectivity (e.g. eSIM or roaming) or data transport. This creates a challenge: each of the elements of the IoT solution needs to be optimised, and cross-optimised with each other, to ensure that, for instance, battery life is not compromised by a 'chatty' application, devices are able to block networks that don't have power-saving features, firmware updates can be handled appropriately, and different traffic types can be secured and routed in different ways. A CMP vendor should be able to help optimise this.

- **Compliance** - Transforma Insights believes that there is a future opportunity associated with Compliance-as-a-Service whereby a vendor provides some level of guarantee to the enterprise about the end-to-end compliance of its deployment. This could potentially be a role for a CMP.

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Capabilities of CMPs

The key question: can CMPs move into managed connectivity?

The inclusion of 'managed connectivity' as a category in the above segmentation might be seen as somewhat contentious. In the past, the two leading CMP vendors, Cisco and Ericsson, have at various points toyed with the idea of directly addressing the enterprise, but have been dissuaded of the wisdom of that approach by their operator clients (sometimes in very strong terms).

However, for many of the other connectivity providers considered in this report, the operation of a multi-tenanted CMP and the direct pursuit of enterprise customers is seen as being perfectly appropriate, particularly as many of the new competitors in the CMP market emanate from MVNOs/MVNEs. Those with MVNO operations, such as emnify, Eseye and floLIVE, for instance, combine both roles. The big question is this: has the market moved on to the point where Cisco and Ericsson can, with more or less the blessing of their operator customers, pursue enterprise customers as the lead vendor, aggregating the country connectivity of their partner operators. That is probably what Aeris is hoping with the new acquisition.

The global connectivity orchestration role is something of a half-way house in this. It allows the CMP to act in a support role, bringing together a typically multi-operator offering, often supported by its eSIM/RSP capability, but maintaining the commercial relationship as being between the operators and the enterprise customer. This is rather less contentious. But there is an obvious migration path from this functionality to being the provider of the managed connectivity itself.

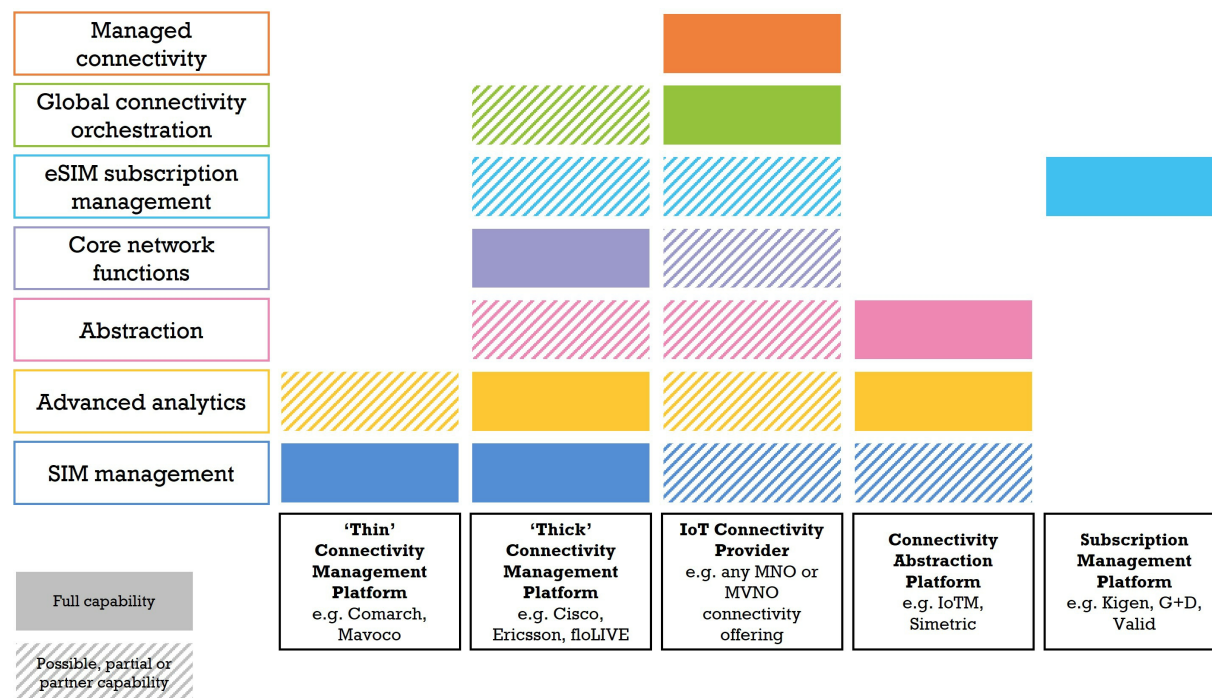One key thing to consider is the extent to which MNOs have been quite poor at addressing multi-country localisation. While MVNOs use multi-IMSI offerings and many have eSIM profile downloads available for multiple carriers per territory, MNOs tend to rely still on roaming for supporting out-of-footprint connectivity. Having a third-party, such as the new Aeris/Ericsson to handle the technical and commercial aspects of eSIM localisation, and therefore acting as the provider of managed connectivity has some appeal. Particularly if it can be combined by using a single core network and end-to-end transparency courtesy of being supported on the same platform.

Another consideration is that some MNOs are now to a greater or lesser extent reconsidering what their role is in the IoT ecosystem. In some cases this has involved a retrenching to a more wholesale-based role. In others it may manifest itself in an acceptance that complex multi-country deals (e.g. for car manufacturers) may not be appropriate for it to address directly. This is likely to be particularly the case for smaller and/or single-country operators, but would be applicable for larger groups who might equally be challenged addressing complex multi-country deals. In those instances, having a third party such as a CMP being able to address that aspect of the market and provide a guaranteed revenue stream in the form of incoming connections, may be seen as positive.

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Types of Connectivity Management Platform

Categories of Connectivity Management Platform

[Source: Transforma Insights, 2023]

	'Thin' Connectivity Management Platform e.g. Comarch, Mavoco	'Thick' Connectivity Management Platform e.g. Cisco, Ericsson, floLIVE	IoT Connectivity Provider e.g. any MNO or MVNO connectivity offering	Connectivity Abstraction Platform e.g. IoTM, Simetric	Subscription Management Platform e.g. Kigen, G+D, Valid
Managed connectivity			Full		
Global connectivity orchestration		Partial	Full		
eSIM subscription management		Partial	Partial		Full
Core network functions		Full	Partial		
Abstraction		Partial	Partial	Full	
Advanced analytics	Partial	Full	Partial	Full	
SIM management	Full	Full	Partial	Partial	

Full capability

Possible, partial or partner capability

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CMP market segmentation

We have identified two main categories of IoT CMP: the 'Thin' CMP and the 'Thick' CMP, which are discussed in the following sub-sections. We also think it is worth considering a set of other associated vendor types, specifically the 'IoT Connectivity Provider', the 'Connectivity Abstraction Platform' and the 'Subscription Management Platform'.

Based on the functional elements outlined in the previous section Transforma Insights has identified two types of IoT Connectivity Management Platforms: the 'Thin' and 'Thick' variants. The most important thing to stress with regard to the market segmentation categorisation is that there is a lot of potential overlap and movement between the categories. A single company could exist in multiple of these categories. This is most common for MNOs and MVNOs that may also operate CMPs. Furthermore, there will be evolution between them. When first deployed, today's Thick CMPs had functionality more akin to the Thin category, but capabilities evolved.

The functionality of the Thin versus the Thick CMP may vary somewhat. Some may include limited capabilities that overlap with what is provided by the Thick CMP. The borders between each of these groups is blurry.

The Thin Connectivity Management Platform

The Thin CMP performs the fundamental functions required of a CMP and little more. It handles SIM management with probably some aspects of advanced analytics. There are dozens of companies that have this level of capability, including 1oT Terminal, Mavoco and the CMPs of many MVNOs/MVNEs.

The Thick Connectivity Management Platform

Thick Connectivity Management Platform refers to a richer set of functionality that covers SIM management as well as the adjacent areas of providing core network infrastructure, analytics, eSIM/RSP and some aspects of global connectivity orchestration, i.e. aggregating multiple connectivity provider offerings in order to present to enterprises.

The incumbent players in this category are Cisco Control Center and Ericsson IoT Accelerator. The general consensus is that Cisco is the market leader, but with some complaints from MNO clients that its roadmap could have been more progressive in the last few years, and some gripes about its recent price changes. Ericsson has been catching up somewhat, particularly through its eSIM offering. Its position in the market has been thrown into some uncertainty by the handing over of ownership of IoT Accelerator from Ericsson to Aeris. Both Cisco and Ericsson are increasingly being challenged by some of the alternative CMPs, such as floLIVE, in part over considerations of cost.

The key question for this segment is the extent to which it will be able to truly orchestrate the connectivity offerings of its operator customers, even potentially to the extent of providing a managed connectivity offering. Both Cisco and Ericsson have dabbled in this area in the past but have generally been dissuaded by their operator customers from pursuing it. However, the market may have moved on. There are, after all, other CMP providers, such as those operating also as MVNOs, which straddle the provision of connectivity to enterprise customers as well as the licensing of CMPs to MNOs.

IoT Connectivity Provider (and overlap with CMP)

Many companies straddle both the role of CMP and the role of the Connectivity Provider. Amongst MNOs, Verizon and Vodafone, perform both functions, with their own in-house CMP and the provision of managed connectivity. A few other MNOs have opted to develop their own capability in parallel with using one or more of Cisco or Ericsson, including Deutsche Telekom, Orange and Telefonica.

A large part of the CMP landscape involves companies that are also IoT MVNOs and Mobile Virtual Network Enablers (MVNEs). In some cases, MVNOs have developed a CMP capability that they want to externalise, e.g. Eseye providing it to MNOs as part of a broader managed connectivity offering. In other cases, MVNOs have migrated wholly (or almost wholly) to focusing on licensing their in-house developed CMP; Jasper Wireless is the quintessential example here, migrating from being an MVNO to licensing its CMP, prior to its acquisition by Cisco. 1oT also fits into this category. A slight variant is companies that have been predominantly MVNEs, licensing their CMP, that have increasingly moved into being an MVNO, such as BICS and emnify. There are also several companies operating predominantly as CMPs that have complemented it with an MVNO offering, such as floLIVE.

Connectivity Abstraction Platform

This category of CMP abstracts data from multiple CMPs to provide a 'single pane of glass' to enterprise customers to manage all connections, although subject to what data is made available by the CMPs). Includes IoTM and Simetric. Abstraction capability is also provided by some Thick CMPs and Connectivity Providers.

Subscription Management Platform

Included for completeness because it overlaps with roles of the other players. Involves the management of the infrastructure for handling eSIM profile switching and other aspects of remote SIM provisioning. This includes Kigen, G+D and Valid.

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Conclusions & Recommendations

Transforma Insights makes the following conclusions and recommendations to Mobile Network Operators, MVNOs or enterprises considering their options with regard to Connectivity Management Platforms.

1. **There has never been a better time to look at options for CMPs.** Buyers have a wide variety of options open to them.

2. **Focus on customer needs.** Considerations of choice of CMP should always include the enterprise perspective, i.e. what functionality do they need and how will they want to use it. This includes ease of API integration, performance, latency and the full device-to-cloud capability. Consider integration points and the end customer to whom the CMP is ultimately targeted.

3. **The definition of CMP must include a wider range of connectivity-related capabilities.** The lines between CMP and other aspects of supporting IoT connectivity have blurred, including with eSIM/remote SIM provisioning, the operation of core network functions and even the provision of managed connectivity itself.

4. **If all you want is basic connectivity management platform functionality there are many options.** Lots of CMPs offer simple variations of baseline functionality around SIM management and billing. But there is quite a wide variation when it comes to additional value-added services.

5. **Selection of CMPs should include considerations of a plethora of technical and operational issues.** These include cost (and therefore the ability to profitably address the market, including tiering), time-to-market, SLAs, security, compliance, agility, support for real-time data, and the ability to deliver the appropriate UI. These will vary by operator. For instance, some will be actively keen to have CMPs provide global connectivity orchestration for them, to provide coverage elsewhere in the world, whereas others will see that as their core business.

6. **Cisco and Ericsson will continue to dominate at the high end.** They generally have superior features and functionality, but may not be the optimum choice for addressing the low end.

7. **Consider your different customer segments and whether they need different approaches.** It is now widely accepted that there is a bifurcation in the IoT connectivity space between low cost LPWA connectivity and high-end 4G/5G connectivity. Each needs addressing differently and this might be based on using different CMPs.

8. **Decisions by MNOs and MVNOs about CMP strategy will be highly specific to their circumstances.** If you are in the position of reconsidering your approach to platforms we recommend speaking with Transforma Insights analysts who can help with identifying the best approach and the most appropriate vendors.

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floLIVE: Offering Access and Control Over Every Element of Connectivity

Every aspect of our lives has been impacted by Digital Transformation, and connectivity is no exception.

As use cases have evolved, remaining competitive has become increasingly complex from both a technical and a commercial perspective. Poor experiences with connectivity showed enterprises and OEMs what doesn't work, forcing them to become more knowledgeable about their wants and needs, and become more demanding about the connectivity solutions that will check all of their many boxes.

Many OEMs and enterprises have suffered as a result of:

- **Poor SLA:** Slow and ineffective support, as a result of a connectivity service that is offline or is made up of multiple platforms and vendors.

- **Inflexibility:** Being boxed into a post-paid model only, with no options for new business models.

- **High costs:** Incurring fees that don't align with their operational model, for example paying before devices become active.

- **Consumer-focused MNOs:** MNOs who would not adapt their organizations to the needs of IoT in terms of business models, service and support, visibility and control.

- **Performance challenges:** When connections are based on roaming agreements, high latency and poor bandwidth follow.

- **Privacy issues:** Data privacy regulations were not met, leaving the business open to penalties and risk.

- **Permanent roaming:** As many regions have restrictions where devices can only connect for 3-6 months at a time.

Enterprises and OEMs are no longer satisfied by vague information on coverage and cost. Today, they are informed, educated organizations that want specific details on the level of service they should expect, and how their vendor is going to make that happen. Many have specific performance requirements ("We need <90 ms latency across the U.S."), while others know exactly where they will operate, and want a guarantee that permanent roaming restrictions won't impact their availability.
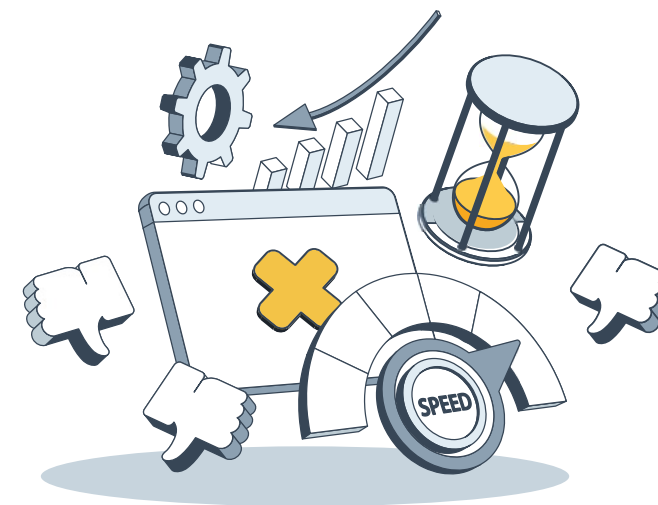
At floLIVE, we've identified a trend, where **companies want to become their own mobile operator**. This means they don't want to rely on another layer of service and support to get the control that they need. Instead, they want to take the reins, and be able to handle all aspects of the solution.

This could be anything from managing low-level network settings and initial configuration of devices, to customer network steering based on their own operational needs, rather than one chosen for them by an MNO. We've seen customers discussing their niche security requirements, and how they want to be able to monitor devices in real-time to identify the first signs of fraud, information leakage, or a data breach.

These demands are not just preventative, they are also part of a new approach to creating innovative business models. Enterprises and OEMs want to be able to choose flexible billing cycles, utilize cross-country or cross-carrier data pooling, create one-time models for niche customers, and much more.

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Key Challenges Facing Mobile Operators Today

For Mobile Operators Looking to Serve this Customer-base… Legacy CMPs Won't Cut it

For Mobile Network Operators (MNOs), the status quo has changed pretty quickly. Serving this new, empowered customer persona is not easy, especially when most MNOs are leaning on legacy technology to make it happen.

Traditional CMPs are based on an old software architecture, making it very different to adapt to change. Cue long change request cycles, and seriously long time to market for customers. As they were designed for on-premises deployments, they required heavy CapEx to get them off the ground, and yet OpEx was also high, all the better to maintain these heavy and expensive platforms.

All charging, rating and billing processes were completed offline, which means zero visibility for the customer on their connectivity expenses until the invoice rolled around at the end of the month. If there were faulty devices, data breaches, or devices that had been stolen, this could only be identified after the horse had bolted – by spikes in usage that had already incurred added costs.

For the most part, these CMPs leaned on the MNO's main core network, and by that we mean the consumer infrastructure. This meant higher operational costs for the MNO who had to pay separate license fees for an expensive consumer core, the billing element of the solution, and the CMP. These costs were simply rolled over to the enterprise. As the MNO is reliant on 3 different vendors for 3 different systems, (and all the integration complexity of bringing those systems together), SLA can't help but suffer.

Coverage was handled through global roaming agreements, with a focus on local connectivity within the MNOs footprint. Today's landscape means that roaming doesn't fit the needs of connected devices, forcing MNOs to accept a new way forward to obtain global coverage for IoT.

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floLIVE's HyperLocal Global Network

floLIVE has designed, built and deployed the world's first and largest hyperlocal global network. With the connected era in mind, it was designed to minimize the use of roaming, and to maximize the use of local connectivity - especially in regions like Turkey, Brazil and China, where permanent roaming is a significant challenge.

The network is based on local identical POPs, hosting profiles from the local MNOs in-region. Based on a cloud-native software architecture, this bleeding-edge design provides flexibility for introducing new capabilities with less risk, and promises IT and hosting costs that are significantly lower than other software-based solutions.
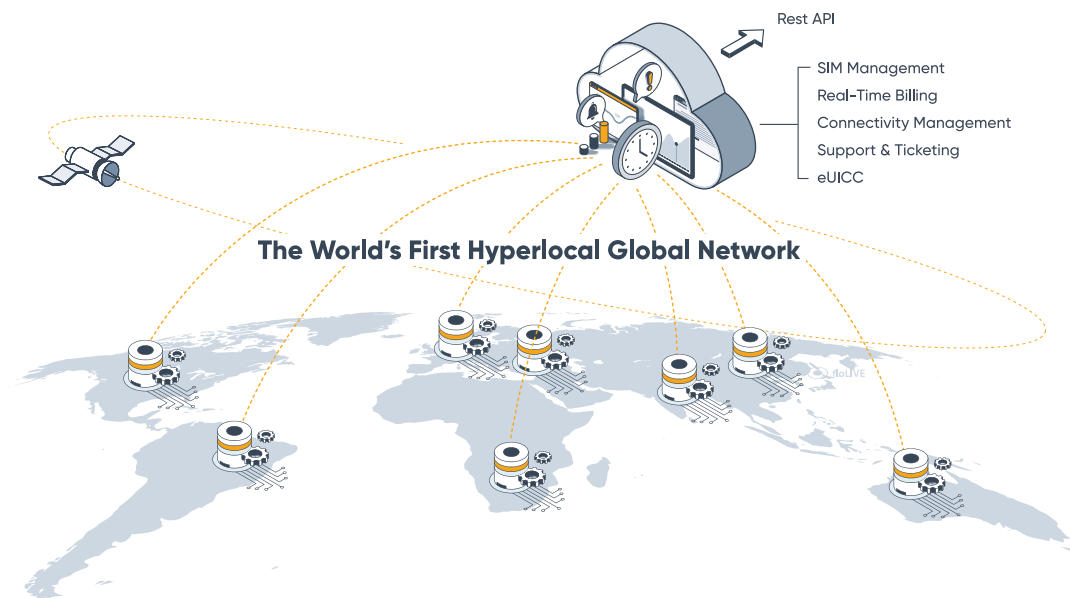
This carrier-grade platform serves not only MNOs but also IoT MVNOs and other global enterprises - and all can benefit from:

- **A true single pane of glass:** All POPs are identical to one another, which means a SIM in Brazil looks and behaves the same way as one in China, or South Africa.
- **Real-time by design:** Every element of the platform exposes its internal events in real-time. End users can visualize and resolve issues, including root cause, at a glance.
- **Multi, Multi, Multi and Multi:**
  - Multi-tenant, with no need for separate instances.
  - Multi-tier, supporting the value chain for resellers, distributors, module makers and manufacturers
  - Multi-network, complements MNOs' existing roaming-based coverage with localized coverage where needed, to overcome roaming and data privacy restrictions.
  - Multi-technology, supporting - 2G, 3G, LTE, CAT-M, NB-IoT and 5G.
- **eUICC support:** Our patented multi-IMSI over eUICC SIM technology allows for the best of both worlds, including autonomous switching and highly efficient IMSI swapping at no additional cost.
- **High performance:** Local core networks means low latency for best-in-class performance, and local breakouts can further reduce latency for specific business needs.
- **Limitless customization:** As floLIVE owns the whole technology stack, new and emerging market requirements can be met with ease, no matter if its changes

The World's First Hyperlocal Global Network

Rest API

SIM Management
Real-Time Billing
Connectivity Management
Support & Ticketing
eUICC

to the core network, the billing engine, business models, SIM management, or more.

- **Low Marginal Unit Cost:** The more your business grows, the more profitable you will be, as the marginal unit cost constantly drops as you scale.
- **Performance Consistency:** Benefit from a globally consistent performance of your IMSI in your regions of interest.

As cost and coverage become table stakes, MNOs and their enterprise customers need to consider how they are going to offer these alongside the new competitive edge - visibility and control.

floLIVE empowers its customers and partners to gain access and autonomy over every parameter they can think of, with floLIVE keeping the wheels turning behind the scenes. Take the driver's seat for connectivity, and trust that we will maintain and manage your global platform, continually expanding it to offer you better coverage and functionality to meet the needs of tomorrow.

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About Transforma Insights

Transforma Insights is a technology industry analyst firm focused on the impact of emerging technologies and the associated technical and commercial best practice.

We help technology adopters understand the opportunities associated with new technologies, particularly the Internet of Things, but also in Artificial Intelligence, Distributed Ledger, Edge Computing and others under the umbrella of 'Digital Transformation'.

We help technology vendors understand the changing market dynamics and the associated market opportunity.

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IoT Transition Topic Position Paper