# Market Guide for IoT Mobile Virtual Network Enablers

Published 31 October 2022 - ID G00729962 - 40 min read

By Analyst(s): Pablo Arriandiaga, Eric Goodness

Initiatives: CSP Digital Transformation and Innovation; Cloud and Edge Infrastructure

The MVNO-tization of the enterprise and IoT providers is driven by the need for control and security in their digital infrastructure and by expansion into new growth engines as connected products. CIOs at CSPs developing IoT MVNO capabilities should use this guide to select an IoT MVNE solution.

## Overview

### Key Findings

- The Internet of Things mobile virtual network enabler (MVNE) market is complex, with different vendor types covering diverse Internet of Things (IoT) MVNE capabilities. But this market is mainly focused on network infrastructure, IoT connectivity, BSS and OSS, and regulatory compliance.
- IoT enterprise MVNOs require composable IoT connectivity platform aggregation on top of their existing IoT connectivity vendors or regional LTE and 5G private mobile deployments to provide a single pane of glass to integrate with their IoT infrastructure.
- Tailored IoT BSS and OSS solutions are increasing demand by helping service vendors monetize niche segments that are underserved by traditional mobile network operators.
- Emerging technologies in identity management like eSIM or multi-IMSI enable mobile virtual network operators (MVNOs) focused on IoT to provide simplified connection management and global, or near global, connectivity. They also facilitate bring-your-own-connectivity scenarios and permanent roaming challenges.

### Recommendations

To enable digital transformation and innovation, CIOs at CSPs developing IoT MVNO initiatives:

- Refine your list of possible IoT MVNE vendors by, first, identifying the type of vendor that includes just the capabilities you need to work with, and then excluding vendors outside that type.
- Deploy flexible IoT MVNO capabilities internationally by selecting composable IoT connectivity platforms that preintegrate local mobile network operators or aggregate third-party IoT connectivity platforms.
- Design an MVNO strategy by segmenting the potential market. Then evaluate the market using different IoT MVNE capabilities depending on the segment, including tailored managed IoT connectivity platform, LTE and 5G private mobile network integration, and billing management capabilities.
- Ensure the IoT MVNE can support geographical expansion by assessing the eSIM and multi-IMSI capabilities and its level of integration with the carriers to guarantee regulatory compliance when international expansion is needed.

## Strategic Planning Assumptions

By 2025, Tier 1 CSPs extending their own IoT network capabilities with IoT mobile virtual network operators to globally compete in IoT will increase from six players in 2022 to 10 players.

By 2025, global manufacturers will implement MVNO capabilities of some scale in support of their IoT-enabled connected products, from less than 5% in 2022 to 20%.

By 2025, 10 Tier 1 CSPs, together with IoT MVNOs, will have standard solution portfolios with managed IoT connectivity platforms to integrate local LTE and 5G mobile private networks across different countries.

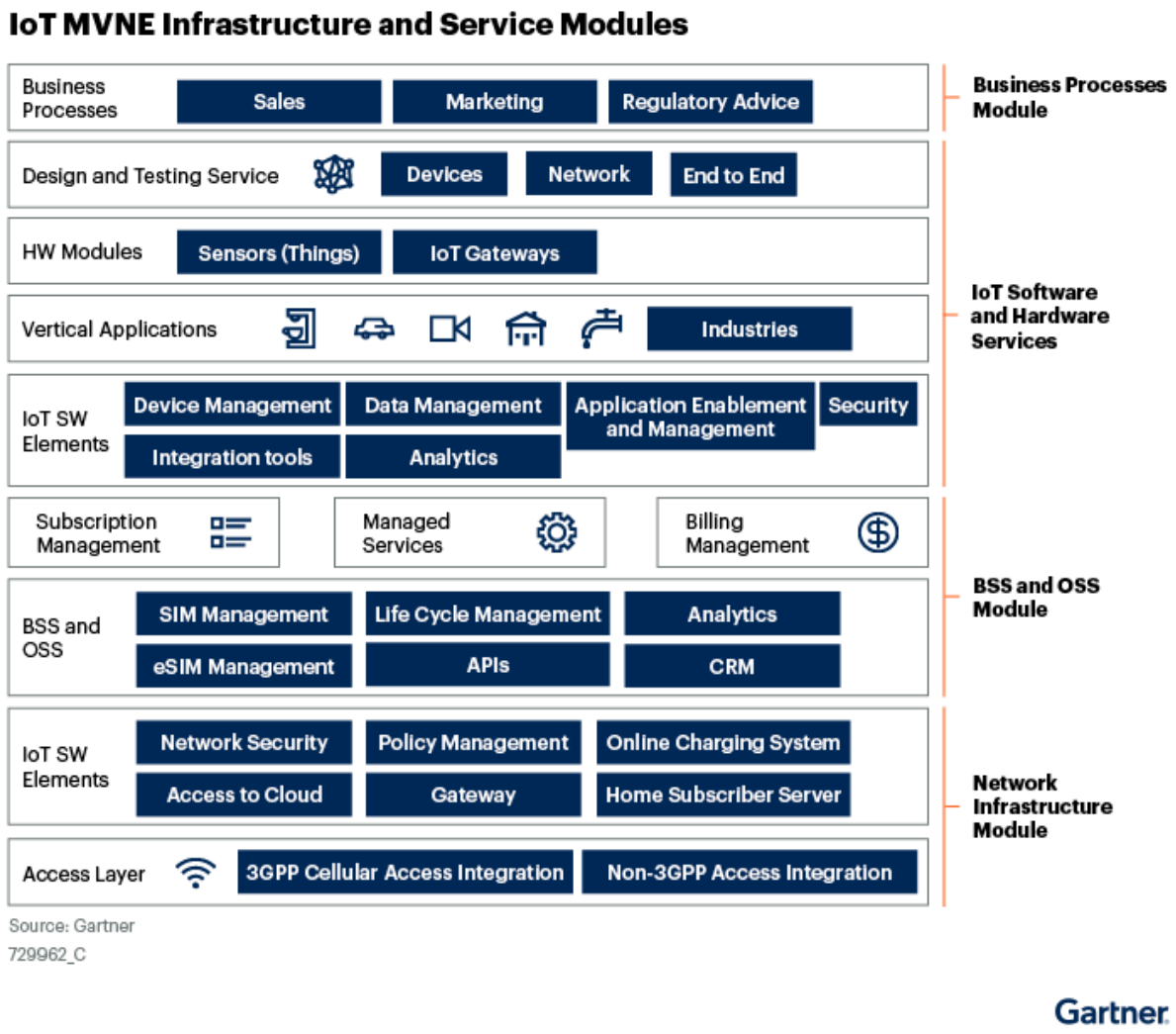
## Market Definition

The IoT mobile virtual network enabler market provides infrastructure and services that enable IoT MVNOs to deliver IoT connectivity to end users without having to develop their own infrastructure. Depending on the customers' requirements, MVNEs can provide core network infrastructure and all business support system (BSS) and operations support system (OSS) processes. MVNEs can also provide for CRM, IoT hardware and software services (such as security, analytics and device management), managed services, or vertical IoT applications. Other capabilities of MVNE include business support processes (such as collections, settlement, sales and marketing) and regulatory advice.

## Market Description

The IoT MVNE market is serving a variety of needs for IoT MVNOs that span from full IoT MVNO capabilities to light IoT MVNO capabilities (see Note 1 for more on representative vendor selection, and see Note 2 and Note 3 for IoT MVNO definitions). Figure 1 shows the infrastructure and services that the IoT MVNE market provides (see Note 4 for service module definitions).

### Figure 1: IoT MVNE Infrastructure and Service Modules




Source: Gartner
729962_C

Gartner

The IoT MVNE market has two main differences when compared with the well-established MVNE cellular market. One is the larger variety of IoT hardware (HW) and software (SW) services that IoT MVNEs can offer IoT MVNOs in addition to the connectivity and differences in the use of standards like embedded SIM (eSIM). The other difference is the integration of noncellular access into the IoT MVNE infrastructure. The latter spans from LPWA non-3GPP networks like LoRa and Wi-SUN to satellite.

## Market Direction

The IoT MVNE market is moving forward with a specific focus on six main areas to be aligned with IoT MVNO requirements:

- eSIM
- Global coverage
- Composable IoT connectivity platforms
- Security and LTE and 5G private mobile networks
- 3GPP LPWA networks
- Ease of management for small and midsize businesses and indirect channels
- Integration with hyperscalers

### eSIM

IoT MVNEs are adding eSIM subscription management capabilities to their BSS and OSS infrastructure. Mobile network operators (MNOs) are opening up their networks to provide eSIM interoperability. Adoption is starting to moderately take off. This is driven by some vendors like Eseye, Ericsson, MAVOCO, Nokia WING, Pelion or Wireless Logic that are actively pursuing initiatives that integrate local MNOs to offer local IoT connectivity or flexibility to offer bring-your-own connectivity. These initiatives are triggered by the need to comply with local regulation for permanent roaming like in Brazil, India, Gulf Cooperation Council (GCC) countries, Turkey, China or Australia and high-data-consumption scenarios where roaming is not cost-effective. This trend also benefits from increasing openness from Tier 1 MNOs to collaborate with IoT MVNOs like TELUS and Eseye [1] or to directly launch their own IoT MVNO initiatives as Telefonica in Spain did through its Telefonica Tech subsidiary. [2] Some IoT MVNEs still keep multiple international mobile subscriber identity (multi-IMSI) models as an alternative to eSIM and are evolving to iSIM.

## Global Coverage

CSP operational technology vendors, IoT MVNOs and some MNOs are deploying global infrastructures as a service to support regional and global presence for hybrid scenarios, including private and public networks. Most of these vendors show roadmaps to accelerate their international points of presence across different regions. This is to avoid data and signaling latency problems across regions and comply with local regulations where data needs to remain in the country as some permanent roaming regulations state. This global infrastructure enables existing IoT MVNOs — and even MNOs — to expand and compete in new geographical regions and extend their coverage to multinational clients. Alternative options such as satellite might also be considered, provided the services can meet data performance requirements, including throughput, latency, jitter, cost and availability.

## Composable IoT Connectivity Platforms

The composable IoT connectivity platform principle and implementation examples are defined in Industry Insight: Composable IoT Connectivity Will Revolutionize Managed IoT Connectivity Business. It has two main approaches that can work simultaneously:

- **The composable IoT connectivity hub (CICH)** enables enterprises and communications service providers (CSPs) to access local connectivity provided by local MNOs in each country. This opens up two potential markets — the first market is with multinational enterprises and global or regional CSPs as end users by using SIM cards issued by the CICH provider. The second market is ultimately giving maximum flexibility by integrating with local CSPs using their own or third-party physical SIM cards.
- **Composable managed IoT connectivity platform** adds a wrapping layer on top of the existing managed IoT connectivity platforms, which offers clients and ecosystem partners a stable interface independent of the underlying infrastructure. Clients use a limited set of features from their IoT connectivity platform that allows CSPs to integrate just the required set of capabilities that a client segment or a partner ecosystem requires in the composable managed IoT connectivity platform.

## Security and LTE and 5G Private Mobile Networks

Enterprises and full IoT MVNOs are demanding security services around connectivity and the SIM to connect their clients more securely to the cloud, or directly for developing specific LTE and 5G private mobile networks for their clients. Some IoT MVNEs are starting to support or plan LTE and 5G private mobile networks through virtualization, mainly oriented to enterprise clients in mission-critical verticals such as utilities. With increasing focus on industries like manufacturing, mining, oil and gas, logistics, or transportation, seamless transition from private to public mobile networks starts to be increasingly required. MNOs are looking for vendors to solve this challenge like Rogers with Expeto in Canada. [3] Another driver for this trend in industrial IoT environments is edge computing capabilities where some IoT processing, storage and analytics capabilities are moved to the edge. This environment needs to secure the access between the client premises, the edge infrastructure and the cloud.

## 3GPP LPWA Networks

IoT MVNEs are integrating LPWAN into their networks and BSS and OSS infrastructure. LPWAN adoption for 3GPP technologies (NB-IoT and LTE-M) is starting to take off outside of China, with LTE-M being the prevalent technology when roaming is needed and LTE-M and NB-IoT applying to nationwide projects. Assessing LPWAN roaming agreements with the IoT MVNE providers for the next three years will be important to guarantee LPWAN availability. LPWAN roaming agreements should work according to the LPWAN connectivity pricing that is between $1 and $2 per year per connection. Gartner has revisited the 3GPP LPWAN competitive trends and forecast in Composable Solutions Are Main Drivers for CSPs Selling IoT and 5G to Enterprises. In energy and utilities, government, and manufacturing and natural resources, including agriculture, 3GPP LPWAN will reach 1 billion connections worldwide by 2025, and the first three verticals will account for 73% of NB-IoT and LTE-M connections.

## Ease of Management for Small and Midsize Businesses and Indirect Channels

As more small and midsize enterprises adopt IoT capabilities to enable connected products and services, manageability is becoming a competitive issue to cost-effectively expand digital capabilities. Chief among the issues facing enterprises is the ability to acquire robust IoT device management software services to enable:

- Self-managed configuration and control
- Monitoring and diagnostics

- Provisioning and authentication
- Software and agent maintenance and updates
- Event processing, reporting and visualization
- Testing and certification

Other needs from this segment are:

- Developers' support through extensive and documented APIs
- Indirect channel enablement for IoT monetization
- IoT security

### Integration With Hyperscalers

Apart from providing their own IoT platform stacks to enterprises, hyperscalers are a crucial component in the IoT ecosystem. The majority of IoT platforms and connectivity platforms are running in or have been built with scalable cloud infrastructure provided by hyperscalers. This means that having a secure integration with the hyperscaler's infrastructure, or being integrated in the hyperscaler's IoT stack, provides differentiation for enterprises and IoT MVNOs developing IoT solutions using the hyperscaler's infrastructure as a service (IaaS) or PaaS. The role of hyperscalers grows in importance if CSPs cede the value-added services where 5G, edge computing and edge artificial intelligence (AI) converge.

At the same time, Microsoft and Amazon Web Services (AWS) are building mobile core network capabilities mainly focused on LTE and 5G private network capabilities and multiaccess edge computing (MEC). They are also starting to develop a BSS and OSS ecosystem with third parties, which may turn into relevant IoT MVNE providers in the future. The level of integration that existing IoT MVNEs have with this type of vendor is also relevant for CIOs and technology executives at CSPs when considering future roadmap evolution. See Tech Providers 2025: Edge Ecosystems Will Challenge CSPs' Dominance in Managed IoT Connectivity Services.

## Market Analysis

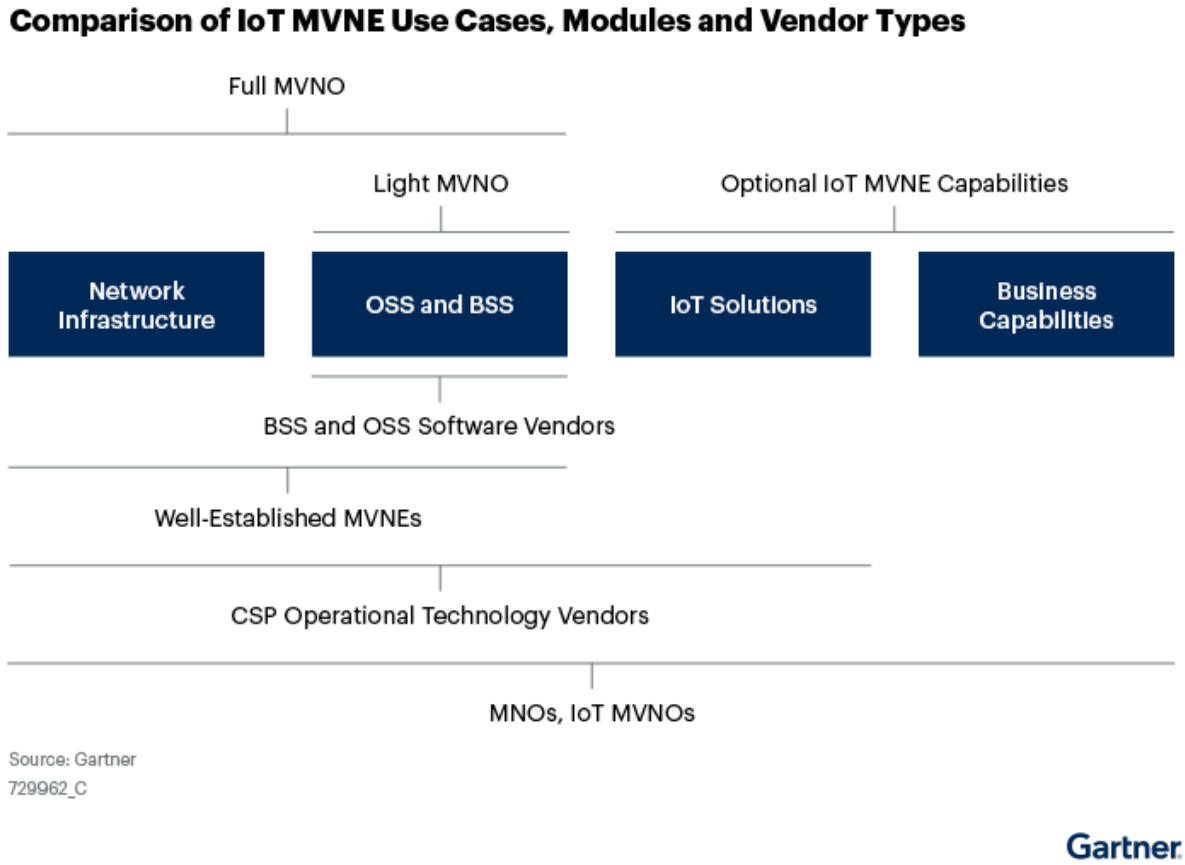
The IoT MVNE market is serving four main segments, each with different needs:

- IoT MVNOs directly competing with MNOs (see Magic Quadrant for Managed IoT Connectivity Services, Worldwide and 2022 Critical Capabilities for Managed IoT Connectivity Services, Worldwide). IoT MVNOs in this segment are evolving into competitive strategies that look for underserved segments by MNOs to maintain year-over-year revenue growth that is similar to MNOs' growth. MNOs have more resources and capital to scale and execute both horizontal and industry vertical strategies. This segment requires mainly network infrastructure and BSS and OSS capabilities. IoT HW and SW services here are not being adopted at scale.
- OEMs that require embedded connectivity in their hardware modules in verticals such as automotive, utilities or healthcare. This segment requires mainly network infrastructure, BSS and OSS capabilities, IoT HW services, and regulatory advice.
- Large organizations like the Dutch utility Enexis that are transforming themselves with IoT and require specific network personalization to comply with their security needs, requesting the best coverage and quality of service (QoS), and avoiding MNO lock-in. This segment is where IoT MVNEs are finding the most growth. This segment is the one that is requiring more IoT HW and SW services and composable IoT platform approaches for large multinationals.
- Resellers, value-added resellers (VARs), small IoT MVNOs like Choice IoT or Freeway, and IoT solution providers that want to embed connectivity and are normally focused on small and midsize businesses. This segment requires mainly BSS and OSS capabilities.

Cloud, software-defined networks (SDNs), network function virtualization (NFV) and virtual evolved packet core (vEPC) have reduced costs and time to market from using physical hardware networks to create IoT MVNOs, changing the business models that IoT MVNEs offer. Opex models with a single recurrent charge or revenue share, covering a number of capabilities and services, prevail. This means as-a-service models that are based on pay-as-you-grow models with minimum upfront fees. These models are consolidating and enabling more IoT MVNOs to enter the IoT connectivity space by reducing their time to market with more-predictable business cases. As a result of this, IoT MVNOs that were contemplating a light MVNO approach could have a stronger architecture with considerably less cost than well-established full MVNOs moving into a full IoT MVNO scenario.

Figure 2 shows which types of IoT MVNE vendors are covering the different IoT MVNE modules, and how these modules match with the two main IoT MVNO use cases (full and light MVNOs). Gartner has identified five main types of IoT MVNE providers in Figure 2. Not all these vendors are addressing the same capabilities, as this section reveals.

Figure 2: Comparison of IoT MVNE Use Cases, Modules and Vendor Types




## Light MVNOs

Light IoT MVNOs do not provide much value in a pure connectivity scenario, addressing only small and midsize business (SMB) markets using self-service portals for engaging with end users. They are more suitable for enterprises embedding connectivity in their value proposition (such as OEMs) or adding connectivity to their IoT infrastructures. Additionally, as MNOs start to promote their IoT MVNO channels and develop standard MVNE modules connecting their network infrastructure with their OSS and BSS, this approach will become more relevant, providing light IoT MVNOs with more off-the-shelf capabilities.

Existing IoT MVNOs are becoming more agile in shifting from direct sales to promoting other IoT MVNOs reusing their infrastructures and defining prepackaged IoT modules that are more suitable for a light IoT MVNO. CSP operational technology vendors are also well-positioned to offer IoT MVNE capabilities addressing light IoT MVNOs. They own the main IoT OSS and BSS platforms and are deploying an underlying network infrastructure that is plugged into many MNOs globally.

Well-established MVNEs and BSS and OSS software vendors can also provide OSS and BSS for light IoT MVNOs. However, they will require MNOs to open up their IoT MVNO channels to plug and integrate their systems and services. It should be noted that light IoT MVNOs can be useful for use cases where enterprises are looking for IoT monetization services on top of their current IoT infrastructures. Professional service vendors are more focused on the managed service part of the network and integration of the OSS and BSS. They are also more suitable for a CSP rather than they are for a light IoT MVNO, although they have these capabilities. We see an increasing trend of BSS and OSS vendors positioning their offerings for this type of light MVNOs.

IoT MVNE capabilities for light IoT MVNOs are marketed without any upfront fees, directly in a pay-as-you-grow model per SIM, per month, starting with a small number of SIMs. Alternatively, IoT MVNE capabilities for light IoT MVNOs are marketed with an upfront fee between $20,000 and $30,000, as well as a pay-as-you-grow model per SIM, per month. The market approach depends on the complexity of the project and the level of non-pre-integrated capabilities required.

## Full MVNOs

Full IoT MVNO is the usual approach that existing midsize to large IoT MVNOs are taking. Well-established MVNEs, IoT MVNOs offering IoT MVNE capabilities and CSP operational technology providers are better-positioned to offer IoT MVNE connectivity capabilities requiring specific network customization due to network expertise and network infrastructure capabilities. MNOs are also starting to develop modular MVNE services for their IoT network infrastructures. However, they are less agile than the other vendors on building up prepackaged MVNE modules, and providing subscription management and billing management capabilities for an indirect channel due to their legacy infrastructures and platforms. The subscription management module aims to avoid manual interactions. In addition, most CSPs need further investments in orchestration execution capabilities on a virtual machine (VM), virtual network function (VNF) network, OSS service layer and customer layer, which are required for CSPs to fully monetize those technologies.

Large organizations requiring greater levels of control of the network and general-purpose IoT MVNOs are the ones deploying full IoT MVNOs. Enterprises of this type require strong security and MNO lock-in avoidance to guarantee the best coverage, price and QoS. Full IoT MVNO requirements can cover a full network deployment or specific elements. For example, it could be a home subscriber server (HSS) gateway for private MVNOs with their own SIMs and numbering plans that are built on top of a MNO network infrastructure.

IoT MVNE capabilities for full IoT MVNOs are still marketed with an upfront fee between $80,000 and $100,000, as well as a pay-as-you-grow model per SIM, per month.

### Optional IoT Capabilities

CIOs and technology executives at CSPs must consider these IoT capabilities that IoT MVNEs can provide as part of the IoT strategy. Mainly when these capabilities are off-the-shelf, they can be managed through the same BSS and OSS environment that the IoT MVNE is providing. For IoT HW and SW services and industry-vertical IoT applications, existing IoT MVNOs and MNOs are better-positioned than other players. MNOs and existing IoT MVNOs have their focus in one or two verticals, normally around verticals that have a big component of cellular connectivity, such as automotive, asset tracking, utilities, healthcare or smart cities. All these types of vendors are also better-qualified for offering HW modules from their catalogs, as well as design and testing services. These types of solutions are in less demand by IoT MVNOs, as some of them are directly partnering with other types of vendors for developing them. It can also be an opportunity for CIOs and technology executives at CSPs to accelerate the time to help their business units provide out-of-the-box vertical applications. This depends on the IoT MVNO strategy directly from the IoT MVNE, thus reducing complexity. CSP operational technology providers are developing prepackaged industry vertical capabilities.

Finally, well-established MVNEs, existing IoT MVNOs and MNOs are best-positioned to offer regulatory advisory services due to their experience in complying with local regulations across multiple countries. IoT connectivity requires strong regulatory capabilities due to total or partial permanent roaming restrictions, or for enterprise MVNOs that want to operate as private IoT MVNOs. These capabilities are mainly required by IoT MVNOs that plan regional or global expansion and need to understand local regulations in their targeted countries.

## Representative Vendors

*The vendors listed in this Market Guide do not imply an exhaustive list. This section is intended to provide more understanding of the market and its offerings.*

## Market Introduction

The following table of representative vendors illustrates the five types of vendors that Gartner identifies in this research that provide IoT MVNE capabilities. The categories are not mutually exclusive and are intended to provide users with general guidance on the diversity of vendor types (see Note 1).

### Table 1: Representative Vendors in IoT Mobile Virtual Network Enablers

(Enlarged table in Appendix)

| *Vendor* | *Product, Service or Solution Name* | *Vendor Type* |
|---|---|---|
| Amdocs | Amdocs Digital Brands Suite, Amdocs eSIM Cloud | BSS and OSS |
| Beyond Now | Infonova Digital Business Platform, Infonova SaaS BSS | BSS and OSS |
| BICS | SIM for Things | MNO |
| Enea | Enea Aptilo IoT Connectivity Control Service (IoT CCS) | CSP operational technology vendor |
| Ericsson | Ericsson IoT Accelerator, Ericsson Digital BSS, Ericsson Billing | CSP operational technology vendor |
| Eseye | Infinity IoT Platform, Integra | IoT MVNO |
| Expeto | NeXtworking Platform (Expeto xControl, Expeto xCore, Expeto xRouter, xView) | CSP operational technology vendor |
| floLIVE | floCONTROL | IoT MVNO |
| iBASIS | Global Access for Things, Simfony IoT Connectivity Management Platform | MNO |
| MAVOCO | MAVOCO Connectivity Management Platform | BSS and OSS |
| Nokia | WING Core aaS, WING Digital Hub, IMPACT | CSP operational technology vendor |
| NTT | Transatel MVNO-in-a-Box, Service Provider Connect | MNO |
| Pareteum MVNE | ARTA | Well-established MVNE |
| RevX Systems | RevX IoT Operations Platform | BSS and OSS |
| Tata Communications | MOVE | MNO |

Source: Gartner

# Vendor Profiles

## Amdocs

Amdocs, based in the U.S., is a global technology and services provider for the communications

and media industry. Amdocs is focused on SaaS BSS with the cloud-based Amdocs Digital Brands Suite running on AWS that includes BSS IoT life cycle management, including subscription management and billing. It offers a 5G online charging system (OCS) as an optional add-on and the option to integrate a third-party OCS. Amdocs eSIM Cloud offers eSIM life cycle management through its partnerships with eSIM leading vendors like Thales or Giesecke+Devrient. Amdocs exposes open APIs to support third-party applications.

Amdocs eSIM Cloud and Digital Brands Suite are SaaS solutions supporting digital enterprises that want to have more control of their IoT infrastructure, telco B brands, IoT MVNOs and other IoT MVNEs that want to complete their offerings. The business model that Amdocs offers for the eSIM Cloud platform includes the SaaS subscription, a one-time integration fee that depends on the complexity of the project, and pay per profile downloaded. Amdocs Digital Brands Suite SaaS business model is flexible and is usually based on the number of end devices under management.

## Beyond Now

Beyond Now, based in Ireland, goes to market as an ecosystem orchestration and digital platform provider. The company's software enables enterprises to launch and monetize new services by using its digital platform, digital marketplace and BSS SaaS.

Beyond Now offers traditional MVNE capabilities for BSS, subscription and billing management, and sales and marketing. Beyond Now's software enables MVNOs to integrate and monetize 5G and LTE, IoT, private mobile networks, and edge technology opportunities by allowing them to monetize integrated bundles as integrated, easy-to-consume multiparty solutions.

Beyond Now focuses heavily on the broader advantages of its digital solutions that can accelerate from connected solution concepts to revenue generation. Additionally, its connected digital solutions provide integrated observability and communication across the solutions' ecosystem to foster improved customer experience and services.

The company serves customers across Asia/Pacific, Europe, the Middle East, Africa and the Americas in industries such as communications, media, entertainment, technology, financial services and automotive.

Beyond Now's business model is based on a SaaS contract minimum of $200,000 that is structured as a pay-as-you-grow subscription.

## BICS

BICS, headquartered in Belgium, is a wireless and wireline operator and service provider offering global IoT cellular-based solutions. BICS offers its own managed IoT connectivity platform, SIM for Things, that includes multi-IMSI and eSIM capabilities with its own eSIM subscription manager as an option (SM-SR/DP and SM-DP+) from Thales that includes LTE-M. BICS offers local breakout capabilities in Europe, the U.S. and Asia/Pacific. Roaming agreements are one of BICS's strengths as an extension of its traditional wholesale business. BICS offers its own core network and OSS and BSS capabilities, exposing a full set of APIs for security, monitoring and cloud application providers. Regarding the security layer, BICS offers Private IPX, Cloud Connect and IoT SAFE. BICS also offers a proprietary Subscriber Monitoring and Advanced Reporting Tool (SMART) that provides customers with business intelligence and analytics for global connectivity.

BICS also integrates SIM for Things in private mobile network environments with seamless handover from private to public networks and integrates 5G, NB-IoT and LTE-M. BICS offers flexible business models depending on the modules and IoT MVNO needs.

## Enea

Enea, based in Sweden, provides large-scale Wi-Fi service management solutions and IoT connectivity control services. Enea's Aptilo software and services are used by over 100 service providers.

The company targets MNOs and MVNOs that seek to provide customers self-managed services, with higher-value IoT connectivity services to regional and multinational enterprises. Enea Aptilo IoT Connectivity Control Service (IoT CCS) is a network layer solution to enable IoT connectivity management and security to augment standard 3GPP network functions to automate and accelerate the activation and provisioning of IoT connections. Enea partners with hyperscalers for infrastructure and with security providers such as Fortinet.

The company offers its software hosted in the public cloud as SaaS. The pricing is the pay-as-you-grow model, which is based on the number of active devices, and transported data volume. The average deal size is approximately $800,000 with an average contract duration between 12 and 36 months.

## Ericsson

Ericsson, based in Sweden, is a global, publicly traded network equipment, software and service provider. Ericsson's IoT proposition is focused on the network infrastructure module with a cloud-native 5G core that includes support for NB-IoT and LTE-M, and the BSS and OSS module. It also includes vertical IoT applications for automotive through Connected Vehicle Cloud. IoT Accelerator is the platform that Ericsson offers as a managed IoT connectivity platform, and it's currently deployed by more than 35 CSPs with more than 90 million IoT devices under management by the end of 2Q22. The platform is completed with other MVNE modules like Ericsson Billing, Ericsson Digital BSS, and Ericsson Device and Application Verification. Ericsson also offers composable IoT connectivity services through IoT Accelerator Connect and supports private 4G and 5G networks.

Ericsson's main focus for IoT MVNEs is global full IoT MVNOs, although its main client base is traditional telcos or telcos expanding IoT MVNO capabilities. Ericsson's IoT MVNE deployments are global but mainly concentrated in EMEA and Asia/Pacific, with a minor presence in other regions. Ericsson delivers a SaaS business model with the format of platform as a service (PaaS) with revenue share that includes a minimum monthly fee and five-year contracts on average.

## Eseye

Eseye is an IoT MVNO based in the U.K. The company provides cellular connectivity under its multi-IMSI AnyNet+ eSIM multioperator proposition. In 2022, Eseye launched its Infinity IoT Platform managed IoT connectivity platform that is white-labeled as Integra and offered as a SaaS or PaaS model. Integra provides device enablement capabilities through APIs and AnyNet Connectivity to orchestrate, automate and optimize connectivity. This includes commercial and technical integration for local connectivity with more than 15 MNOs, roaming access to over 700 MNOs and support for bring-your-own-connectivity (BYOC) scenarios. Integra also provides a single point of support, single billing, and single SDK and API. Integra also supports eSIM and iSIM through its own subscription manager secure routing (SM-SR). Eseye also offers the Hera router series, connectivity plug-in modules, device certification and testing services, and regulatory advisory services. Eseye runs its global software-defined network (SDN), including international points of presence for local breakouts in the U.S., Europe, Asia/Pacific, Africa and Latin America that ensure data sovereignty and General Data Protection Regulation (GDPR) compliance.

Eseye presence is well-balanced globally with more than 3 million subscriptions under management, including LTE-M. Eseye supports midsize and large enterprise IoT MVNOs and MNOs. It offers a flexible pay-as-you-grow business model and the option to zero-rate carrier data charges (BYOC), plus platform SaaS and PaaS fees, professional services, and support.

## Expeto

Expeto is a small, privately owned company headquartered in Canada, founded in 2015 with about 40 employees. Expeto's target segment is midsize and large multinational enterprises. Partners usually solicit these customers for sales and delivery. Expeto's partners are SIs or CSPs that offer Level 1 support, where Expeto acts as Level 3 support.

The Expeto platform enables enterprise mobile networking over any combination of private or public radio networks to deliver the capacity, compute, bandwidth and latency needed to meet application requirements. The Expeto platform also provides observability at a device and user level. The Expeto platform supports network visibility and control capabilities related to the access and network layers, BSS, OSS, and subscription and billing management. Expeto owns its IMSI range and provides single SIM roaming between public and private LTE networks. For international roaming, the company has agreements with several carriers. Expeto uses multi-IMSI solutions for high-data-volume use cases. In this use case, the client signs agreements with local carriers and integrates the local network services into the Expeto platform.

Expeto's business model offers software as a managed service as recurring quarterly fees based on the relevant number of customer sites.

## floLIVE

floLIVE is a global connectivity and networking service provider and MVNE, and a privately owned company headquartered in the U.K., founded in 2015. floLIVE offers a proprietary and modular cloud-based connectivity management PaaS named floCONTROL that encompasses globally distributed core networks supporting all cellular and 3GPP LPWA technologies. floLIVE also offers a cloud-based orchestration suite and a remote SIM provisioning (RSP) and SIM management platform, including multi-IMSI and eSIM with third-party eSIM platform integration. floCONTROL also includes a telco-grade cloud-native BSS after the acquisition of BD Innovations in April 2020. floLIVE offers BYOC flexibility and has more than 2.5 million connections under management. floLIVE also has public and private radio access network (RAN) partners for private LTE and 5G networks and offers its clients global IoT connectivity services.

floLIVE serves all types of IoT MVNOs and MNOs with a balanced global presence and offers a business model based on a fixed monthly fee per active SIM and a connectivity fee depending on the usage. The company offers specific pricing plans for 3GPP LPWAN.

## iBASIS

iBASIS is a global communications service provider, based in the U.S., and part of Tofane Global. iBASIS is composed of four main acquisitions branded as:

- iBASIS
- iBASIS, the former wholesale unit of Royal KPN and NOS International Carrier Services
- Altice Europe, international voice carrier business in France, Portugal and the Dominican Republic
- Simfony, an IoT PaaS provider and MVNE

iBASIS Global Access for Things offers IoT core network and subscription management capabilities, combined with Simfony IoT Connectivity Management Platform that offers OSS and BSS capabilities and exposes APIs acquired in 2022. Simfony can be installed in the cloud or on-premises. iBASIS, due to its wholesale heritage, is particularly strong with its roaming agreements covering 190 countries and over 700 MNOs. iBASIS offers eSIM and iSIM capabilities for enabling local IoT connectivity apart from roaming. iBASIS supports SIM roaming between private LTE and 5G and public networks. iBASIS IoT installed base is predominantly LTE-M and 4G.

iBASIS IoT MVNE presence is mainly focused on EMEA, followed by North America, serving global and local IoT MVNOs and enterprise MVNOs. IoT solution providers, OEMs and IoT resellers are also IBASIS's primary segments. iBASIS's minimum size deal is in the low thousands, and the average contract duration is 36 months.

## MAVOCO

MAVOCO is an IoT connectivity management platform provider headquartered in Austria with more than 90 employees. MAVOCO delivers a fully integrated BSS and OSS stack for IoT through its IoT Connectivity Management Platform (CMP) that is cloud-native (although it can also be deployed on-premises). It supports direct network integration through standard network protocols or API integration, including aggregating third-party IoT connectivity platforms. MAVOCO offers different configurations for the CMP, spanning from a dedicated CMP to a multitenant CMP, and includes migration from legacy CMP platforms. It supports LTE and 5G mobile private networks and how they can scale into large global connected environments. MAVOCO supports eSIM. MAVOCO also offers professional services for integration and deployment, onboarding, go-to-market training, and migrations.

MAVOCO's has sales presence and IoT subscriptions deployed across all regions, with 14 network operator customers worldwide, mainly MNOs and a few IoT MVNOs. MAVOCO has a strong focus on IoT enterprise MVNOs and also services light and full IoT MVNOs, resellers and MNOs. MAVOCO's business model is flexible and can start with a small monthly fee and a pay-as-you-grow model.

## Nokia

Nokia is a global provider of network equipment, software and services, headquartered in Finland. Nokia's MVNE proposition is delivered through Nokia Worldwide IoT Network Grid (WING). Nokia WING offers global IoT core infrastructure as a service with distributed mobile core in public data centers to provide worldwide coverage with control and user nodes in the U.S., Europe, the Middle East, South America and Asia/Pacific. Nokia WING Digital Hub is the managed IoT connectivity services platform that includes subscription management capabilities and supports eSIM and multi-IMSI, including BYOC scenarios, and exposes APIs. Nokia WING also offers device and data management capabilities through Nokia IMPACT and a collection of industry vertical IoT applications for asset tracking, transportation and smart agriculture offered jointly with third-party partners. Nokia WING has a 24/7 service operations center (SOC) in Romania. Nokia WING has a strong practice in LTE and 5G mobile private networks.

Nokia WING provides services to IoT MVNOs such as Marubeni or HMD Global. Nokia WING is mainly focused on MNOs and has an increasing focus on IoT enterprise MVNOs. Nokia has more than 20 CSP customers in all regions and offers flexible business models, including revenue share and monthly subscription fees, with an average contract duration of three years.

## NTT

NTT, headquartered in Japan, provides IT solutions and international communications services. NTT acquired Transatel in 2019. NTT is an MNO and MVNO in Japan, as well as a global MVNO across 190 countries and locations, relying on access agreements with other MNOs. NTT's Transatel brand provides the IoT MVNE capabilities.

Transatel offers a complete IoT MVNO stack from full core network to subscription management and OSS and BSS capabilities and API exposure, and supports flexible eSIM integration architectures, including BYOC scenarios. Transatel offers "MVNO-in-a-Box" for quick IoT MVNO deployments through a cloud-based service that aggregates MNO connectivity. Service Provider Connect service is more focused on adding Transatel's data agreements for creating the IoT MVNO offering, using two pricing schemes — a consumption-based or a bundle-based model. Transatel offers five service models that include reselling, where the company charges the end user, or more-traditional IoT MVNO models where the IoT MVNO charges the end user. Transatel's IoT Connectivity management platform can be white-labeled for customers who can also use Transatel's Ubigi brand for their consumer services.

Transatel's MVNE business has global sales presence and close to 2 million connections across all regions, although the main portion is focused on Europe and Asia/Pacific. Its business model is flexible and depends on the modules contracted by the customer. For larger projects, the average contract is five years, and for smaller customers, the average contract is three years.

## Pareteum MVNE

Pareteum MVNE, based in the Netherlands, is a global telecommunications technology company focused on providing "digital telco as a service" solutions to CSPs, MVNOs and enterprises. Pareteum MVNE's target customer segments for IoT MVNE services are:

- CSPs offering IoT connectivity services
- Midsize and large multinational enterprises supporting their digital strategies
- IoT developers, independent software vendors and device OEM vendors creating integrated IoT connectivity solution bundles

The company offers a comprehensive technology stack supporting MVNO capabilities spanning access and network layers, OSS, BSS, subscription and billing management, sales and marketing functions, and an IoT connectivity management platform. Pareteum MVNE offers its customers a catalog of professional services, including managed services and some business consulting in the form of regulatory advisory services.

The Pareteum MVNE's go-to-market strategy includes direct sales by internal resources and indirect partners such as CSPs and SIs. The Pareteum business models offer its software as a perpetual license or a SaaS license model. Pareteum MVNE also offers targeted managed and full outsourcing services to create build-operate-manage solutions where Pareteum operationalizes and manages all elements of the technology stack.

## RevX Systems

RevX Systems, based in the U.S., targets enterprises as an extension to carrier-provided SIM management to streamline and automate the IoT back office. RevX Systems offers its IoT billing and operations platform to companies seeking to monetize 5G- and LTE-enabled services and aggregate multiple carrier and service delivery relationships into a unified platform. Companies of any size that market connectivity, software and hardware as a service to hundreds or tens of thousands of customers are a prime target for RevX Systems. Target companies include remote video surveillance, health and senior care, access control and monitoring, telematics, child and pet trackers, and smart city solutions. The RevX Systems software catalog offers MVNO enablement capabilities relating to the access layer, BSS and OSS, subscription and billing management, and SIM management capabilities for cellular IoT.

The RevX setup fee ranges from $2,500 to $15,000 (based on requirements), and a monthly subscription begins at $995. Data plans are options, and contract terms are negotiable. RevX Systems has a sales presence in the U.S. and services companies mainly in North America, with a nominal installed base in Europe and Asia/Pacific.

## Tata Communications

Part of the Tata group and based in India, Tata Communications is a digital ecosystem enabler. Tata Communications offers IoT MVNE services through Tata Communications MOVE global IoT platform. Tata Communications MOVE is a cloud-based platform encompassing a range of capabilities, including connectivity management platform, eSIM hub, subscription management and AI-enabled dynamic network switching. Tata Communications provides a global SIM capability, including eSIM and multi-IMSI services, for regional breakout and personalized service provider name (SPN) and exposes a rich set of APIs.

Tata Communications has eight packet gateway points of presence across the Americas, Europe, Africa and Asia/Pacific. Tata Communications maintains an IoT partner ecosystem that includes IoT platform providers such as PTC, Infineon and Micron Technology, as well as cloud service providers like Microsoft Azure and AWS. Until the end of 2023, Tata Communications will augment its market offering with IoT-enabled applications for fleet management, content management and private 5G services. The company views the automotive ecosystem across gas-powered and electric vehicles as its largest opportunity for market impact.

The company's business model pursues direct sales to large multinational organizations and sells with and through partners, particularly in the microelectronics and embedded connectivity segments where it maintains a sizable business. The current pricing model is usage-based per connection, with fixed duration contracts.

## Market Recommendations

CIOs and technology executives at CSPs developing IoT MVNO initiatives should consider short-term or midterm strategies when assessing potential IoT MVNE vendors. Switching from one provider to another across different time scales may impact costs, depending on the level of customization and integration that the CSP has with the existing IoT MVNE.

### Short-Term Strategies (12 to 18 Months)

In short-term strategies, evaluate your required capabilities around connectivity. This means:

- Select IoT MVNEs that have eSIM or multi-IMSI subscription management capabilities available to avoid vendor lock-in and simplify IoT connectivity management. A better option may be IoT MVNEs that are shifting into a composable IoT platform (including local MNO integration), or managed IoT connectivity platform aggregation and flexibility for BYOC IoT connectivity scenarios in selected geographies.
- Ensure the IoT MVNE can support geographical expansion by requesting the IoT MVNE to provide local regulatory compliance and its funded roadmap and capabilities for global coverage and regional breakout.
- If creating a portfolio of external connected products and services, negotiate a business model with the IoT MVNE that allows revenue share, pay-as-you-grow strategies or as-a-service models with the selected MVNE modules. As-a-service models can apply to infrastructure, platforms, products or applications — assuming a minimum upfront fee in the case of deep network customization requirements for full IoT MVNOs.
- Deploy IoT MVNO capabilities progressively, avoiding big upfront investments by selecting flexible IoT MVNE as-a-service business model or revenue share based on the pay-as-you-grow model.

### Midterm Strategies (18 Months to Three Years)

- Prioritize IoT MVNE vendors that are more active on LTE and 5G private mobile networks if you are taking a private MVNO approach. Prioritize IoT MVNE vendors also if you are planning to provide LTE and 5G private mobile network infrastructure to your clients in the future or aggregate private mobile network locations distributed across different geographies. Due to the expected uptake of LTE and 5G private mobile networks in the future, even if you are not considering it right now, include those requirements in your MVNE selection process.
- Evaluate 3GPP LPWA roadmaps for roaming agreements and the ability to bring your own local 3GPP LPWA agreements, mainly for LTE-M.
- Assess the 5G and edge computing strategy from the IoT MVNE vendor, including 5G network roadmap and transitions from LTE and 5G private mobile networks to 5G network slicing capabilities and integration with hyperscale public cloud providers.
- Check the IoT MVNE's capabilities and roadmap relevant to the vertical and segments you are prioritizing in your IoT MVNO strategy.

## Evidence

[1] TELUS Makes Global IoT Connectivity Seamless With TELUS Global Connect, GLOBE NEWSWIRE.

[2] Telefonica Finalizes the Launch of a New Virtual Operator for IoT Networks, Gearrice.

[3] Expeto to Collaborate With Rogers for Business on Enterprise First Wireless Private Network Managed Solution, Expeto.

## Note 1: Representative Vendor Selection

The 15 vendors named in this Market Guide were selected to represent the five types of vendors as discussed in the Market Analysis section, as they are more proactively looking after IoT MVNE initiatives:

- IoT MVNOs
- MNOs
- CSP operational technology vendors
- Software vendors (BSS and OSS)

- Well-established MVNE organizations

## Note 2: Gartner's Initial Market Coverage

This Market Guide provides Gartner's initial coverage of the market and focuses on the market's definition, rationale and dynamics.

## Note 3: IoT MVNO Definitions

### IoT MVNOs

Gartner defines an IoT MVNO as a spectrum of arrangements with a mobile network operator specifically for the IoT business. At the lower end of the continuum is what is called a "light IoT MVNO." This is a company offering machine-to-machine (M2M) services through an agreement with a MNO spectrum owner — with the new entrant controlling the branding, marketing and tariff structure, OSS and BSS, and some network elements.

At the higher end is what is called a "full IoT MVNO." This is a company with its own network code, issuing its own SIM cards and controlling elements of network infrastructure (EPC or vEPC). For example, they are the HSS, Gateway GPRS Support Node (GGSN), Packet Data Network Gateway (PGW), Policy and Charging Rules Function (PCRF — or their equivalent virtualized nodes), OSS and BSS on their own, or using a MVNE infrastructure. Full IoT MVNOs can also be non-cellular-based connectivity MVNOs.

### IoT MVNO Pure Players

IoT MVNO pure players are MVNOs whose initial constituency is to become an IoT connectivity player (examples are Aeris and Soracom). An IoT MVNO player can be cellular or noncellular.

### IoT Enterprise MVNOs

IoT enterprise MVNOs are IoT MVNOs founded by enterprises derived from the CSP business. These organizations can be non-technology-oriented organizations (such as utilities or insurance companies), technology and service providers (TSPs — such as SIs, IoT software vendors or IT integrators), or OEMs. An IoT enterprise MVNO player can be cellular or noncellular.

### Cellular IoT MVNOs

Cellular IoT MVNOs are MVNOs that operate under a licensed spectrum using access technologies standardized by 3GPP.

### Noncellular IoT MVNOs

Noncellular IoT MVNOs are MVNOs that operate under nonlicensed spectrum, using access technologies such as LoRa or Sigfox. These access technologies are not standardized by the 3GPP.

### Private IoT MVNOs

Private IoT MVNOs use cellular connectivity services only for internal usage, avoiding stronger regulation requests (specifically, to lawfully intercept). This type of MVNO requires specific regulation changes. An example is Enexis, which became a private MVNO, thanks to changed regulations in the Netherlands.

### Generic MVNOs

Generic MVNOs are MVNOs that are not IoT-focused. These types of MVNOs have been traditionally addressing consumer and business cellular connectivity solutions.

## Note 4: IoT MVNE Infrastructure and Service Module Definitions

- **Access layer:** This service module allows the integration of different types of access methods to the IoT MVNE infrastructure for 3GPP and non-3GPP access, typically LPWA unlicensed networks, wireless LAN (WLAN) networks or satellite. 3GPP defines two mechanisms for integrating trusted and nontrusted non-3GPP networks into the EPC network infrastructure that IoT MVNEs can provide.

- **Network layer:** IoT network infrastructure's main requirement is the ability to scale the millions of potential devices with the data and signaling increase implications. IoT MVNEs can provide full network capabilities with EPC or its virtualized version (vEPC), or modular network services required by the IoT MVNO, such as HSS or policy management. They can also provide security services around connectivity, secure access to cloud environments such as AWS or Microsoft Azure, or real-time data control through an OCS with specific rating models for IoT connectivity.

- **BSS and OSS:** This module includes a variety of BSS and OSS capabilities that are provided to the IoT MVNOs mainly focused on connectivity management. These capabilities span IMSI, global SIM and eSIM management, ordering management, provisioning management, change management, incident management, life cycle management, reporting, and analytics. IoT MVNEs can also provide customer relationship management (CRM) systems.

- **Subscription management:** This provides mechanisms to manage subscription models of the different MVNE selected modules that IoT MVNOs can develop or sell. These modules are normally sold in a prepackaged way and can be tracked with consistent data for settlements between the IoT MVNE, the IoT MVNO and even with the IoT MVNO's clients.

- **Billing management:** Billing services span from preinvoice mechanisms that simplify the billing process for IoT MVNOs with their clients to full billing, invoicing, payment, collection and debt collection services.

- **Managed services:** Managed services sit on top of the different service modules — for instance, IoT MVNO clients' BSS definition and configuration (client and billing structure), CRM operations, or network API support services.

- **Regulatory advisory services:** Regulatory support is increasingly becoming an additional service that IoT MVNEs can offer to IoT MVNOs that are not used to dealing with telecom regulation complexity, such as permanent roaming restrictions or specific IoT private MVNO regulation.

- **Sales and marketing:** IoT MVNOs can select these services when the IoT MVNE can also be a channel partner. Specifically, MNOs acting as IoT MVNEs enable their sales channels to become IoT MVNOs that are using their infrastructure in specific verticals to complement their current offerings.
- **IoT SW elements:** These sit on top of the network and BSS and OSS infrastructure. These solutions use IoT platforms' infrastructure and include device management for IoT endpoints (things), gateway provisioning and management, security, data management, IoT analytics, or application development via APIs.
- **Vertical IoT applications:** This is a catalog of off-the-shelf vertical IoT applications — for example, fleet management, citizen engagement and home automation.
- **Hardware modules:** This is a catalog of hardware modules, including IoT endpoints (things) and gateways that IoT MVNOs can use off the shelf for clients, normally managed by an IoT platform that is part of the IoT HW and SW module. The IoT MVNE guarantees compatibility of the hardware modules across the network that it uses.
- **Design and testing services:** These help IoT MVNOs to quickly validate their end-to-end solutions.

## Recommended by the Authors

Some documents may not be available as part of your current Gartner subscription.

Magic Quadrant for Managed IoT Connectivity Services, Worldwide

2022 Critical Capabilities for Managed IoT Connectivity Services, Worldwide

Composable Solutions Are Main Drivers for CSPs Selling IoT and 5G to Enterprises

Industry Insight: Composable IoT Connectivity Will Revolutionize Managed IoT Connectivity Business

Market Guide for 4G and 5G Private Mobile Networks

Quick Answer: What Mistakes Must CSPs Avoid in the Edge Computing Business?

Hype Cycle for CSP Networks Infrastructure, 2022

Four Key Revenue Growth Opportunities for CSPs with 5G in Enterprise

## Table 1: Representative Vendors in IoT Mobile Virtual Network Enablers

| *Vendor* | *Product, Service or Solution Name* | *Vendor Type* |
|---|---|---|
| Amdocs | Amdocs Digital Brands Suite, Amdocs eSIM Cloud | BSS and OSS |
| Beyond Now | Infonova Digital Business Platform, Infonova SaaS BSS | BSS and OSS |
| BICS | SIM for Things | MNO |
| Enea | Enea Aptilo IoT Connectivity Control Service (IoT CCS) | CSP operational technology vendor |
| Ericsson | Ericsson IoT Accelerator, Ericsson Digital BSS, Ericsson Billing | CSP operational technology vendor |
| Eseye | Infinity IoT Platform, Integra | IoT MVNO |
| Expeto | NeXtworking Platform (Expeto xControl, Expeto xCore, Expeto xRouter, xView) | CSP operational technology vendor |
| floLIVE | floCONTROL | IoT MVNO |
| iBASIS | Global Access for Things, Simfony IoT Connectivity Management Platform | MNO |
| MAVOCO | MAVOCO Connectivity Management Platform | BSS and OSS |
| Nokia | WING Core aaS, WING Digital Hub, IMPACT | CSP operational technology vendor |

| *Vendor* | *Product, Service or Solution Name* | *Vendor Type* |
|---|---|---|
| NTT | Transatel MVNO-in-a-Box, Service Provider Connect | MNO |
| Pareteum MVNE | ARTA | Well-established MVNE |
| RevX Systems | RevX IoT Operations Platform | BSS and OSS |
| Tata Communications | MOVE | MNO |

Source: Gartner