Identifying bottlenecks in charging for next-generation networks

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Executive summary

Overall trends and challenges in the charging systems market

- The desire to launch new service types and grow revenue beyond that from traditional connectivity is the top driver for upgrading to new charging systems (cited by 80% of respondents to our survey). Mitigating high operating and maintenance costs (33%) and overcoming the performance issues of inefficient legacy systems (33%) are also important.

- 53% of communications service providers (CSPs) are considering using adjunct charging systems to make upgrades. These systems can then be run in parallel for different service types and brands.

- Running fewer charging systems reduces complexity and costs, but only 40% of respondents have implemented a full converged charging system (CCS). These are mainly large carriers and those with the narrowest service focus.

Factors affecting purchase decisions

- The top three reasons for issuing a new request for proposal (RFP) for charging systems are to upgrade charging functions (67%), support next-generation charging functions (40%) and reduce costs and complexity (27%).

- 60% of decisions to purchase a new charging system are made by the CTO. However, the demand for new digital services that rely on wider IT imperatives means that, increasingly, these decisions are being made by Chief Information Officers (CIOs) or joint Chief Technology and Information Officers (CTIOs).

- Key criteria when selecting a charging system vendor include functionality and integration with other CCS functions (60%), operational robustness (40%) and price (40%).

Our findings show that the previously desired consolidation of charging systems is taking longer than expected. As a result, there remains a significant need for adjunct or additional lighter-weight charging systems to support various lines of business and ensure strategic redundancy. This is particularly important among CSPs that are undergoing migrations to new charging systems in the next 1–2 years to improve overall efficiency. Upgrade considerations are diverse and ongoing for all CSPs except Tier-1 players.
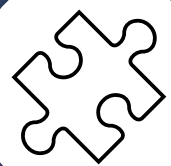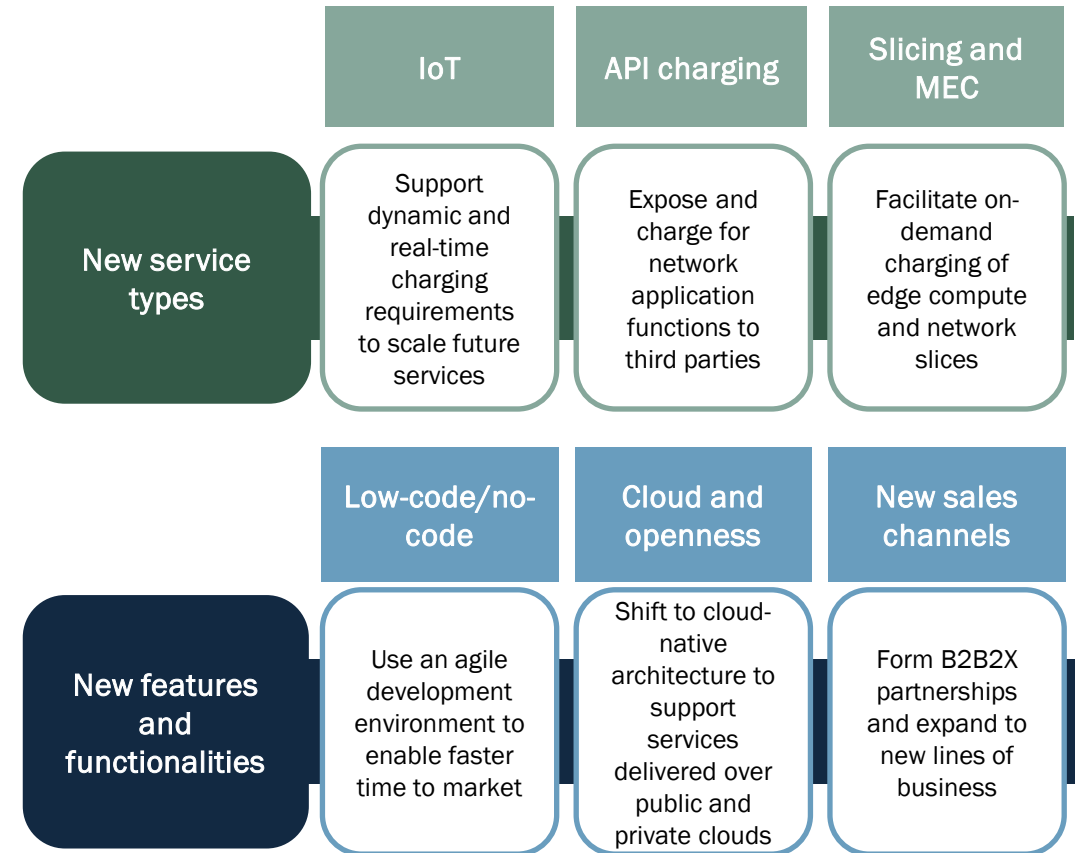
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CSPs are actively seeking to modernise their charging architecture to support of new services

Legacy charging systems are no longer adequate. They cannot address the evolving demands of next-generation networks, nor can they handle the large data traffic and complexity generated by emerging service types.

- The inability to process vast volumes of data and handle the intricate billing requirements of new services in real time leads to delays and inefficiencies.

- Legacy systems struggle to support personalised B2C services, innovative B2B models and AI-driven advanced service offerings that require flexible and scalable charging frameworks.

- The inability to integrate seamlessly with modern technologies and the dependence on manual processes further contribute to high operational costs.

Real-time dynamic charging capabilities are needed to support next-generation services. In addition, new charging systems must have the agility and flexibility to create additional new services to reduce the time to market from days to hours or minutes.

Figure 1: Overview of the services and features that are driving CSPs' desire to deploy new charging systems

New service types	IoT	API charging	Slicing and MEC
	Support dynamic and real-time charging requirements to scale future services	Expose and charge for network application functions to third parties	Facilitate on-demand charging of edge compute and network slices

New features and functionalities	Low-code/no-code	Cloud and openness	New sales channels
	Use an agile development environment to enable faster time to market	Shift to cloud-native architecture to support services delivered over public and private clouds	Form B2B2X partnerships and expand to new lines of business

Source: Analysys Mason

The desire to generate revenue beyond that from connectivity is driving CSPs to introduce new charging systems

CSPs have so far been focused on the operational aspects of 5G RAN roll-outs, 5G standalone (SA) deployments and the level of network exposure, but **they are increasingly recognising the need to prioritise monetisation strategies**. As such, they are introducing new service types, expanding their sales channels and forming new partnerships to increase their revenue.

Competition for new service offerings is more likely to be from non-telecoms players. As such, the ability to rapidly on-board new partners, offer self-service approaches to administer and set up support for monetisation options and support charging capabilities for new business models for enterprise, B2C and B2B customers **are key priorities for operators.**

80% of the respondents to our survey reported that their existing systems have limitations when it comes to launching new types of services. This is a key motivation for implementing a new charging system.

The ability of CSPs' charging systems to support a wider variety of services and pricing and business models will enable revenue opportunities across new value chains.

Figure 2: Most significant reasons for implementing a new charging system
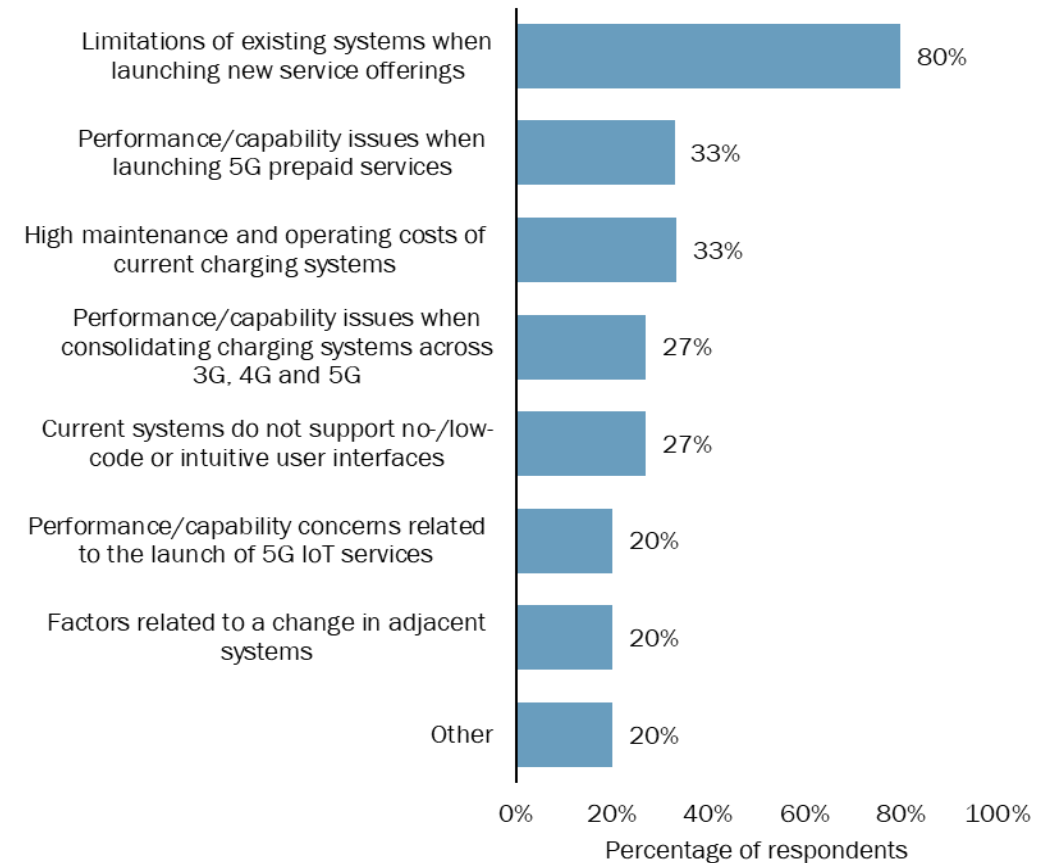
Source: Analysys Mason

Services that rely on API exposure, dynamic pricing and ecosystem partners are the most significant drivers for charging upgrades

80% of CSPs reported needing to upgrade their charging systems to monetise new service types.

IoT services and services exposed via the 5G core network exposure function (NEF) and other APIs are the main drivers of the need for an adjunct charging system (both cited by 40% of respondents).

Slice-based, cloud-based and mobile edge compute services are weaker drivers (each cited by 20% of respondents) because they have not yet reached operational maturity. Services that require dynamic pricing or trigger points were also cited by 20% of respondents as drivers of the need for an adjunct charging system. New services will be vital for effective monetisation of these emerging and complex services.

CSPs are also looking to diversify their offerings and expand their sales channels via API platforms and digital marketplaces to include third-party solution providers and downstream partners (cited by 13% of respondents as the reason for upgrading their charging system). Indeed, more advanced charging systems are essential to manage and reconcile sophisticated revenue-sharing arrangements and partnerships. This is currently a low priority for CSPs, but we believe that it will become increasingly important.

Figure 3: Services that CSPs consider to be the most significant in necessitating an upgrade or augmentation to a charging system
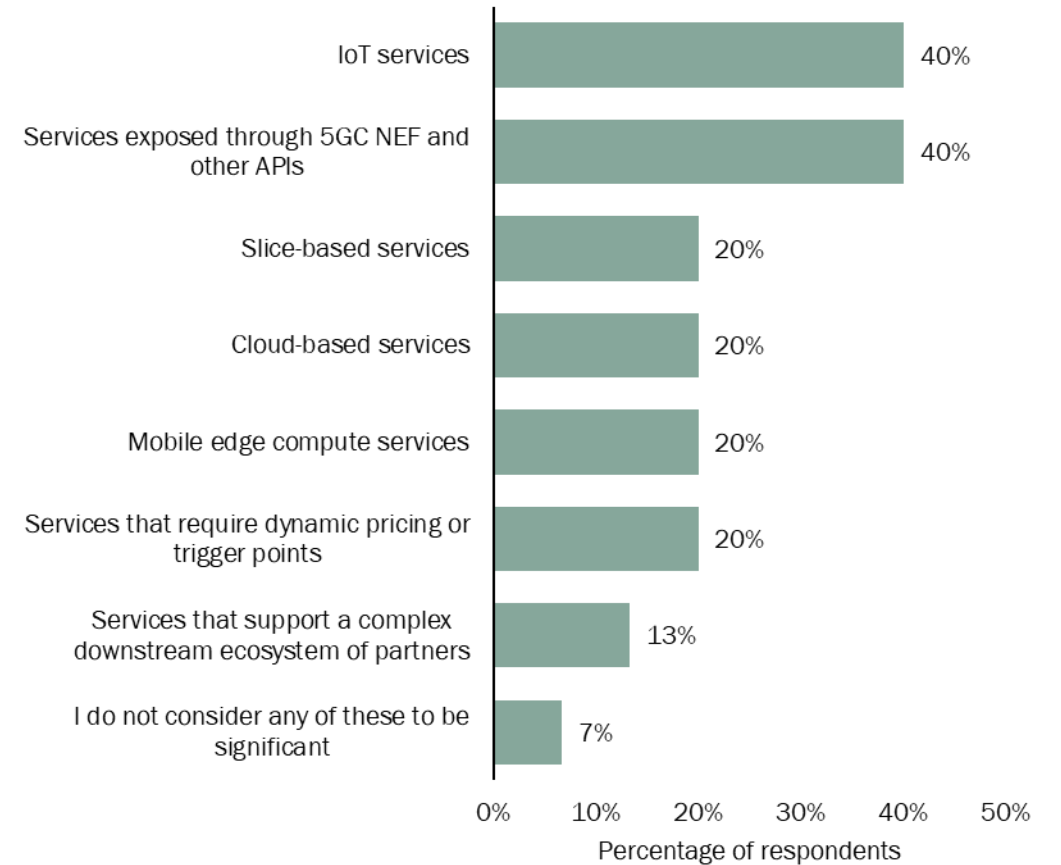
Source: Analysys Mason

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CSPs have been looking for ways to overcome the bottlenecks of legacy charging systems

Current charging systems struggle to support the monetisation of next-generation network services due to their slow processing speeds, inflexible pricing models, poor scalability and high maintenance costs. **The cadence of system upgrades further compounds these inefficiencies and results in challenges in the monetisation infrastructure and mechanisms.**

CSPs need new, real-time, dynamic pricing models, as well as advanced partner management, monetisation and settlement capabilities, to ensure the effective monetisation of next-generation services with complex service requirements (such as subscription-based models, usage-based pricing, digital wallets and IoT connectivity solutions) with greater flexibility and efficiency.

33% of respondents reported that the high costs of maintaining and operating inefficient legacy charging systems, as well as the resulting performance issues, are sufficient to warrant a charging system replacement.

> The main challenge with charging consolidation is integrating all the small technical catalogues and offers into one unified catalogue and then migrating everything from an offering standpoint. **The charging system is one of the most heavily integrated components in the network**. On the north, you have IT systems like BSS with billing and provisioning interfaces. On the south, you have charging network interfaces for online charging, real-time charging, CDRs and performance metrics. Migrating to a single entity takes time because all these interactions need to be moved to the new system. This complexity is why charging migrations tend to take a considerable amount of time.
>
> *– Senior Architect, Tier-1 CSP in North America*

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Very few CSPs have fully migrated to CCSs; the majority are still in the early stages of implementation or in the planning phase

93% of CSPs have started to implement CCSs, **but only the large Tier-1 CSPs and those with a narrow service focus have fully converged their charging systems.**

40% of respondents are still in the early-to-middle stages of implementation due to the complexity of migrating systems for multiple regions, lines of business (retail/wholesale) and service types (prepaid/postpaid and 4G/5G).

7% of CSPs are still in the planning phase and have yet to select a vendor that is best suited for integration and migration until 5G core integration is complete.

> I do not think any service providers, especially with the major global giants, have an immediate desire to consolidate everything under one system all at once. **It is more likely to be a gradual shift towards convergence over time.** Perhaps merging prepaid, postpaid and MVNOs could be the next step we see in the next 1–2, maybe 3 years. Looking further ahead, maybe in the next 4–5 years, we might see more comprehensive convergence, but not in the short term, not within the immediate future.
>
> *– Senior Design Specialist, Tier-1 CSP in North America*

Figure 4: CSPs' plans for migrating online and offline charging systems (OCS/OFCS) into CCSs
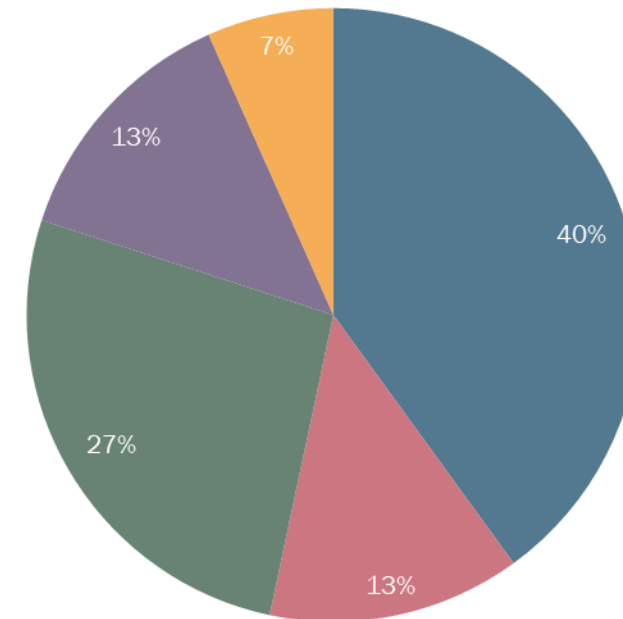
- Fully migrated to CCS
- We are near completion
- We are in the middle stages of migration
- We are in the early stages of implementation
- We are still undecided

Source: Analysys Mason

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CSPs are considering adjunct charging systems for specific lines of business and service types
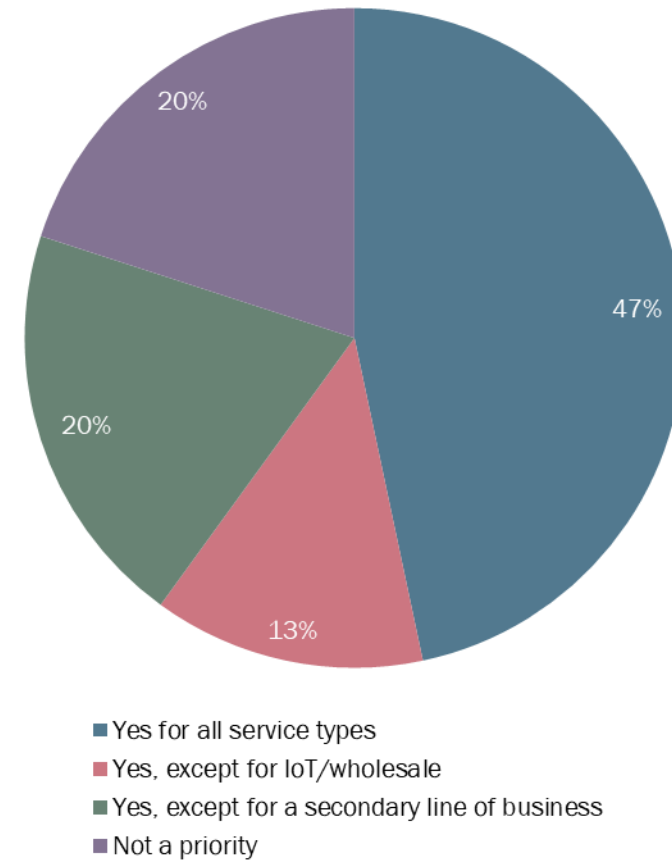
The shift to new 5G SA architecture has necessitated a new CCS architecture. CSPs have been consolidating their existing OCS/OFCSs for both prepaid and postpaid customers.

CSPs believe that reducing the number of charging systems will reduce operational complexity, but **more than half of respondents (53%) reported that running a single CCS (or fewer CCSs) was not a priority in all cases. These CSPs expressed a preference in deploying a separate charging system for specific lines of business and/or service types** that have unique operational requirements. These include high-volume, low-margin services such as IoT, an MVNO, retail or wholesale line of business and back-up charging systems.

> Running fewer charging systems is seen as desirable, but it is not necessarily a high priority. It is more of a nice-to-have than a critical imperative. **Operating different systems for different services is still acceptable based on the specific needs and requirements of each service.** It is not a strict mandate but rather a desirable goal with a lower priority overall.
>
> *– Senior Design Specialist, Tier-1 CSP in developed Asia–Pacific*

Figure 5: CSPs' responses when asked if reducing the number of charging systems is a priority

- 47%
- 20%
- 20%
- 13%

- ■ Yes for all service types
- ■ Yes, except for IoT/wholesale
- ■ Yes, except for a secondary line of business
- ■ Not a priority

Source: Analysys Mason

CSPs' current charging systems do not adhere to the most recent industry standards; pent-up demand for advanced charging functionalities is becoming increasingly prevalent

3GPP standards have evolved to include significant changes in charging, rating and policy management architecture for 5G SA networks in anticipation of future services.
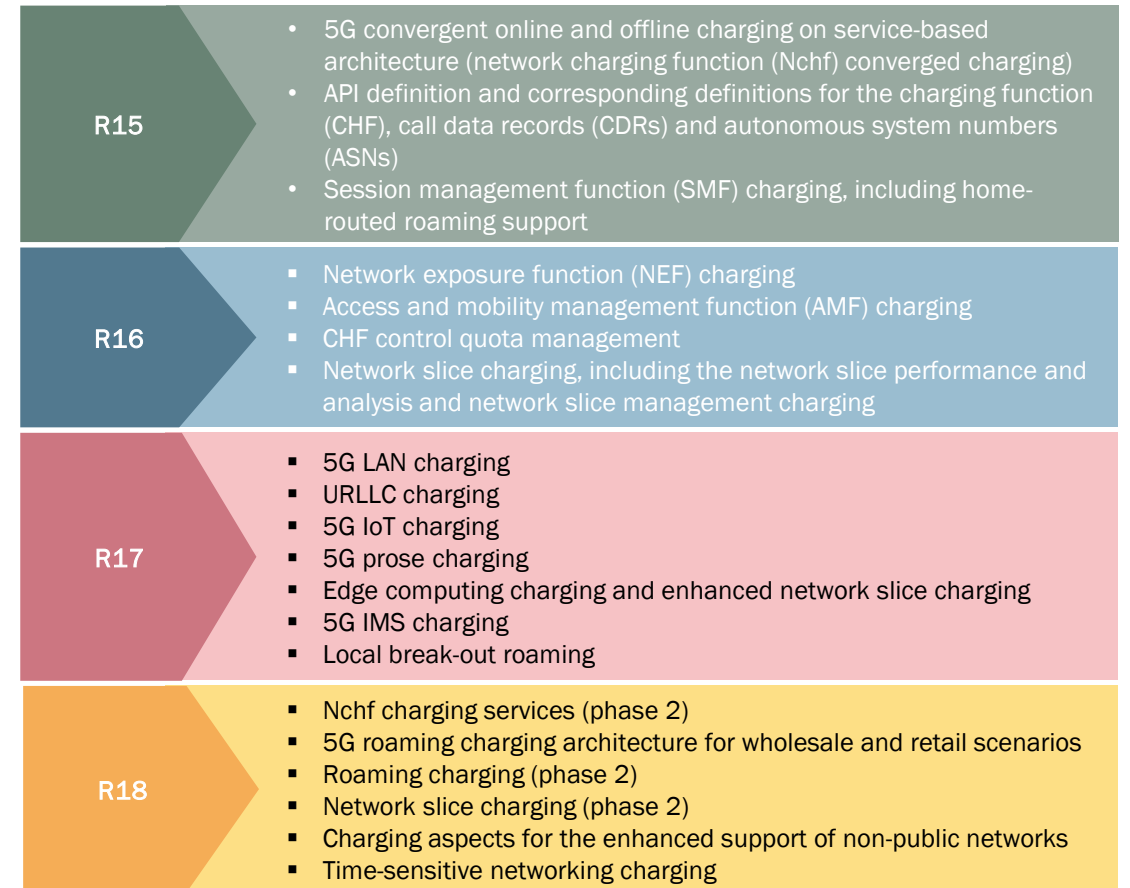
New functional areas are being added in each new 3GPP release to support charging for network slices, edge computing and both wholesale and retail roaming scenarios.

However, **the most recent standards for charging have not yet been adopted by CSPs** because most vendors' charging systems are built on their own architectural frameworks, which adds complexity for CSPs.

This has led to a large disparity between industry standards and market realities with respect to current charging implementations.

CSPs recognise that their charging systems must comply with industry standards and we expect this to happen in due course.
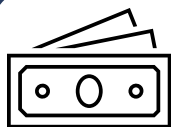
Figure 6: Overview of recent 3GPP releases

R15
- 5G convergent online and offline charging on service-based architecture (network charging function (Nchf) converged charging)
- API definition and corresponding definitions for the charging function (CHF), call data records (CDRs) and autonomous system numbers (ASNs)
- Session management function (SMF) charging, including home-routed roaming support

R16
- Network exposure function (NEF) charging
- Access and mobility management function (AMF) charging
- CHF control quota management
- Network slice charging, including the network slice performance and analysis and network slice management charging

R17
- 5G LAN charging
- URLLC charging
- 5G IoT charging
- 5G prose charging
- Edge computing charging and enhanced network slice charging
- 5G IMS charging
- Local break-out roaming

R18
- Nchf charging services (phase 2)
- 5G roaming charging architecture for wholesale and retail scenarios
- Roaming charging (phase 2)
- Network slice charging (phase 2)
- Charging aspects for the enhanced support of non-public networks
- Time-sensitive networking charging

Source: Analysys Mason

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Overall drivers and challenges in the charging systems market

Factors affecting purchase decisions

Recommendations and methodology

Purchase decisions are increasingly being made by both the CTO and the CIO

60% of CSPs acknowledge that the CTO is the ultimate decision maker when investing in new charging systems. This is largely because the CTO is responsible for ensuring the technological feasibility and integration of these systems within the existing network infrastructure.

However, the CIO is increasingly gaining influence, particularly as the remit to deliver more complex services on top of the network grows. This shift reflects the expanding role of IT in driving service innovation and operational efficiency. Some CSPs have adopted a collaborative approach to decision-making, in which other key stakeholders in marketing and BSS teams are involved in order to align the technological capabilities with broader business objectives.

87% of CSPs agree that the move away from CTO decision-making is being driven by the demand for new digital services. Digital services such as API exposure, edge compute and cloud-native architecture require sophisticated IT infrastructure. These IT imperatives require seamless integration with advanced charging systems, which makes decision-making more complex and nuanced.

Figure 7: Decision-makers within CSPs

- CTO
- CIO
- Joint decision between CTO and CIO/CTIO
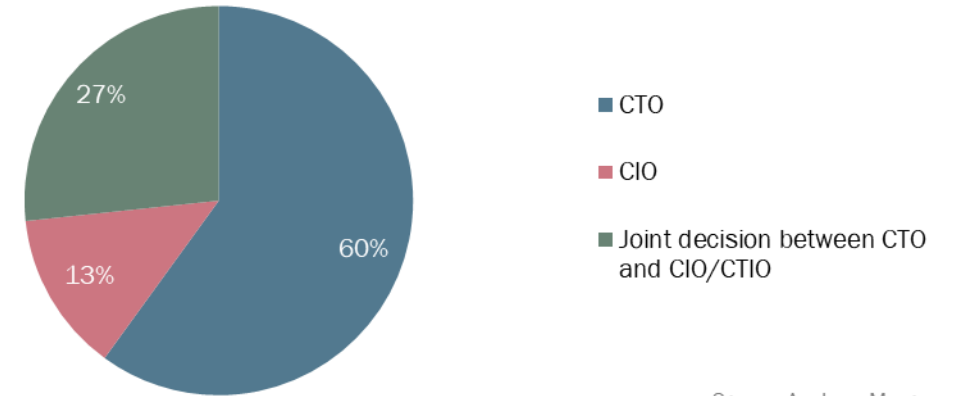
Source: Analysys Mason

Figure 8: CSPs' responses when asked if the drive to support new IT imperatives is driving transformation for charging systems

- Yes, we see it now
- In the next few years
- Never
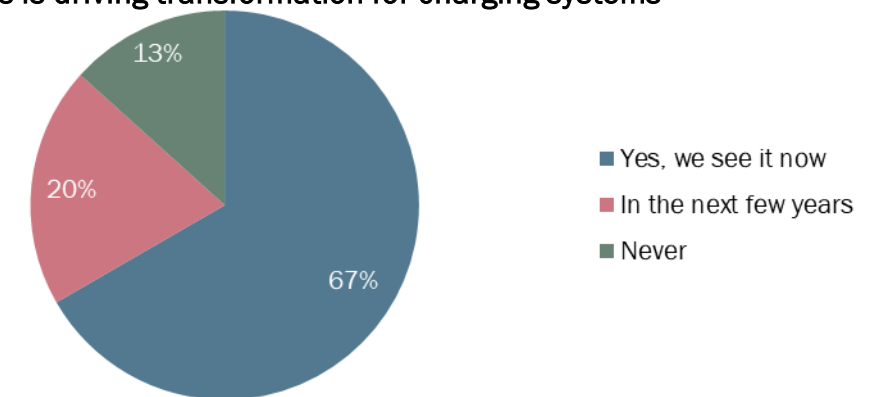
Source: Analysys Mason

CSPs need to be certain that new charging systems will bring about cost savings and deliver new technological capabilities before issuing an RFP

Figure 9: CSPs' responses when asked when they last issued an RFP for charging systems

- ■ Within the last 1–2 years
- ■ 3–4 years ago
- ■ More than 4 years ago

15%
46%
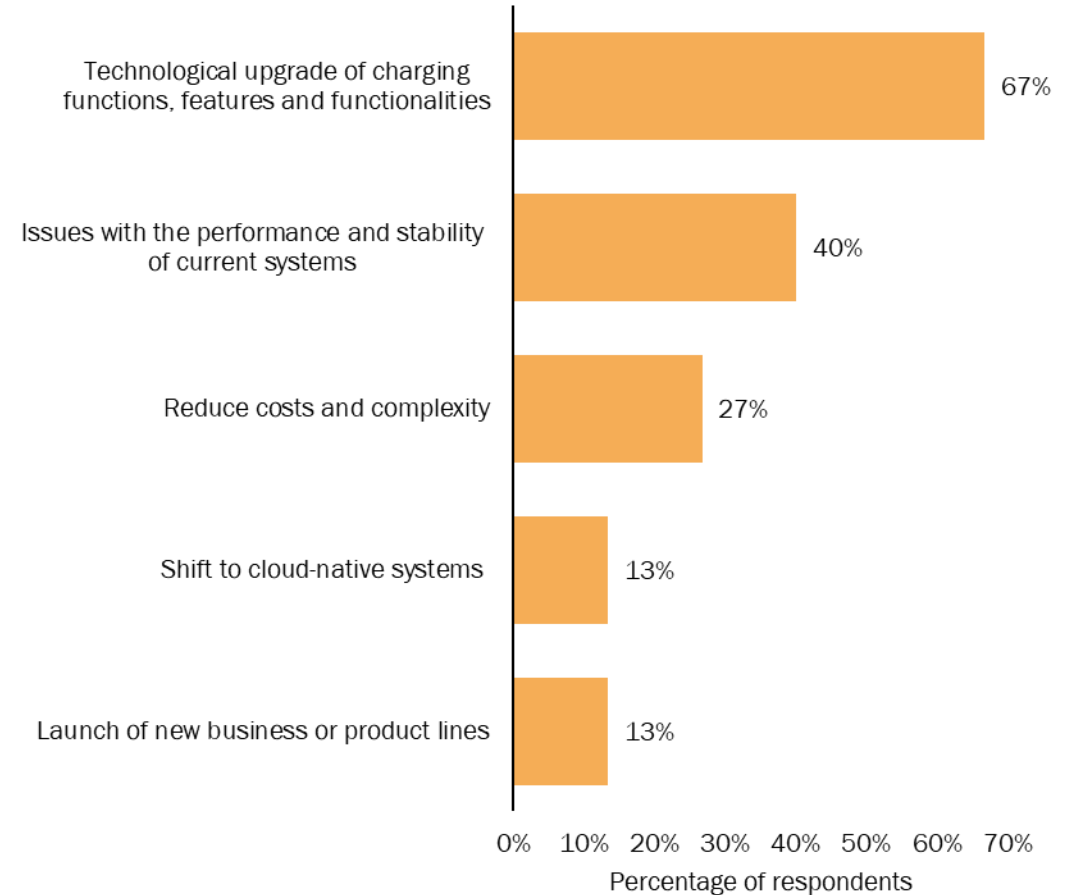38%
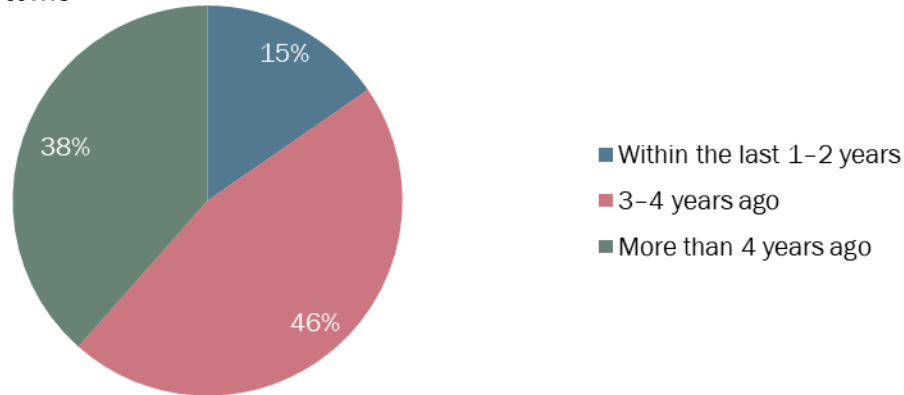
Source: Analysys Mason

Evaluation of RFP responses is a lengthy and deeply involved process whereby technical aspects, commercial factors, cloud-nativity, governance, operational issues and strategic factors are evaluated.

67% of CSPs stated that the main reason for issuing an RFP for new charging systems is to obtain advanced charging functions, features and functionalities to support new service requirements.

40% of CSPs reported that the obsolescence of aging hardware and IT infrastructure (database and architecture) has led to capacity issues that have affected the performance and stability of current systems.

Only 27% of CSPs cited the need to reduce the cost of licensing and maintenance as a primary motivation for issuing an RFP.

Figure 10: Primary purpose of CSPs' most recent RFP for charging systems

Category	Percentage
Technological upgrade of charging functions, features and functionalities	67%
Issues with the performance and stability of current systems	40%
Reduce costs and complexity	27%
Shift to cloud-native systems	13%
Launch of new business or product lines	13%

Percentage of respondents

Source: Analysys Mason

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Integration capabilities and operational efficiency continue to be key criteria when selecting a vendor for new charging systems

The criteria for evaluating RFP responses vary depending on each CSP's business goals. **60% of respondents to our survey reported that the ability of a solution to integrate with existing systems and other vendors' products is a key criterium for vendor selection.**
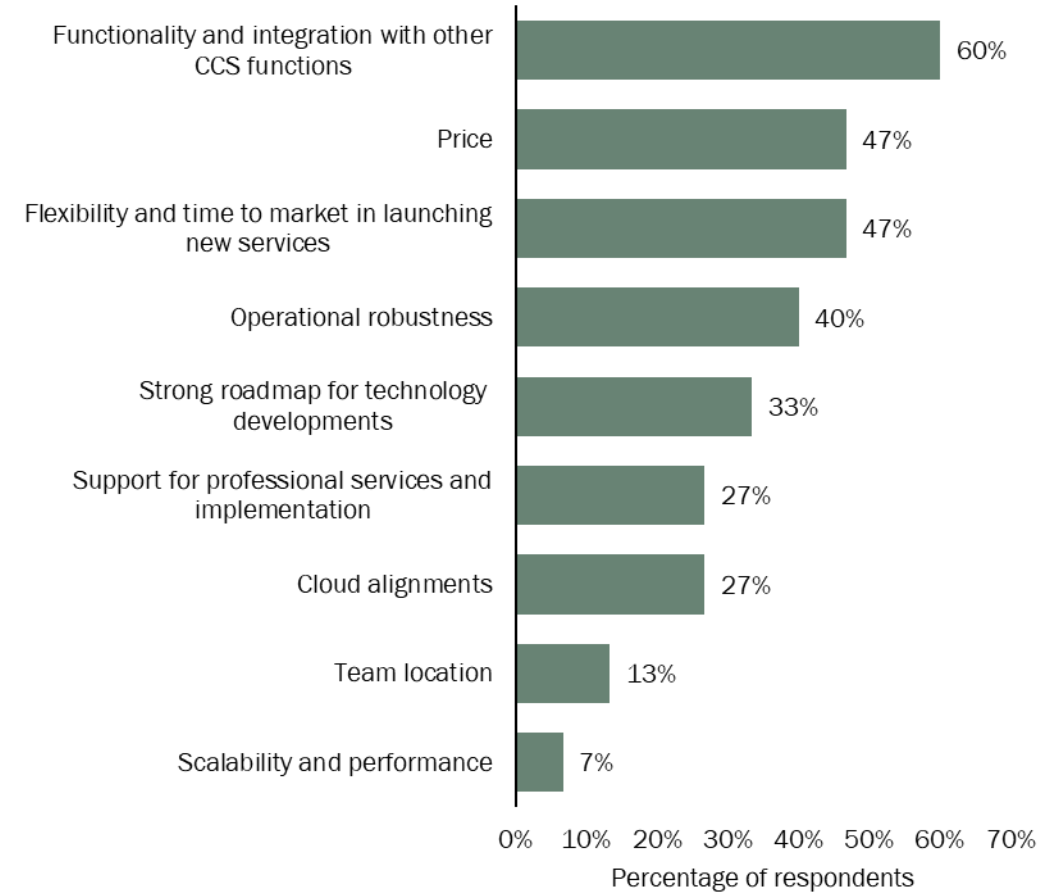
Price, flexibility and time to market are also important to CSPs when deploying a new charging system. Regular technological upgrades and low-code/no-code automation capabilities are also important to ensure operational robustness.

> " The technical and commercial criteria generally supersede the rest but the amalgamation of 5G and digital architectures is also considered an important aspect for the vendor to be compliant with. Support for low-code solutions, quickly creating new bundles and promotion are also key criteria.
>
> – *IS Solution Specialist, Tier-2 CSP in developed Asia–Pacific*

Figure 11: Headline criteria used to evaluate RFP responses for charging systems

| Criterion	Percentage
Functionality and integration with other CCS functions	60%
Price	47%
Flexibility and time to market in launching new services	47%
Operational robustness	40%
Strong roadmap for technology developments	33%
Support for professional services and implementation	27%
Cloud alignments	27%
Team location	13%
Scalability and performance	7%

Percentage of respondents

Source: Analysys Mason

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Overall drivers and challenges in the charging systems market

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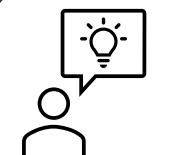
Recommendations

CSPs need to consider factors beyond the architectural simplicity of a single charging system for all service types.

CSPs are still using multiple charging systems where practical considerations require, despite the current trend of rationalising to fewer charging systems. Deploying additional or adjunct charging systems can reduce the time to market, lower the cost of operations and improve the integration with billing systems, which may be more important in terms of supporting business objectives than consolidating to a single charging system.

CSPs must continue to upgrade their systems and adopt new charging capabilities to support and monetise new service types beyond traditional connectivity.

The business-centricity of being able to rapidly launch new services types beyond connectivity-based services alongside the technical capability to support 5G SA are critical factors for effective monetisation. CSPs should ensure that their charging systems are able to support the complexity of changing environments in cloud, partner ecosystems and new networks standards, and have the right balance between adaptability and dependability.

CSPs should adopt the right vendor solutions to expand their charging capabilities and enable them to balance near-term opportunities with longer-term strategic needs.
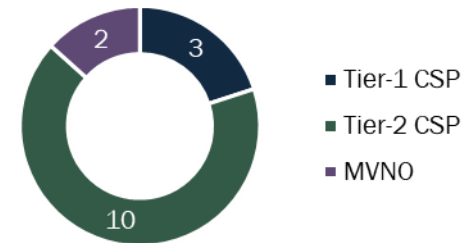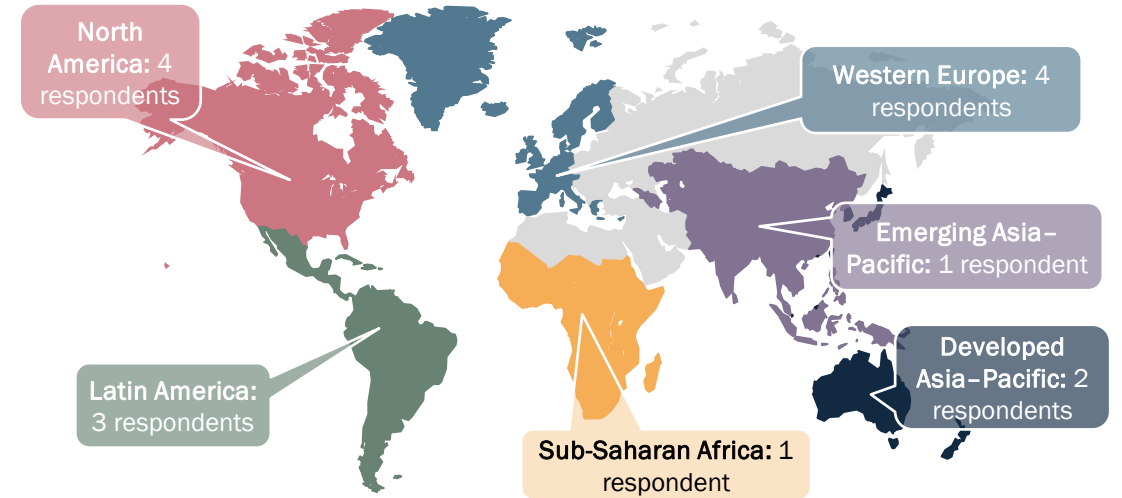
Most CSPs are trying to support new services by using small, innovative vendors for their current charging solutions, some of which may have out-grown their initial capabilities. However, as new charging capabilities are needed, CSPs should consider using vendors which can support their longer-term strategic needs, to avoid overwhelming their current systems and to allow for more reliable scaling as needed.

Methodology

Amdocs commissioned Analysys Mason to identify and understand where bottlenecks exist in current charging systems, as well as CSPs' strategies for implementing new charging systems for next-generation networks.

We conducted interviews with 15 Tier-1 and Tier-2 CSPs and mobile virtual network operators (MVNOs) worldwide. We also used in-house materials derived from our ongoing research on charging systems.

This report showcases key findings from our research examining CSPs' strategies for migrating from legacy charging systems to new charging architecture and builds on previous research on the state of charging systems.

North America: 4 respondents

Western Europe: 4 respondents

Emerging Asia–Pacific: 1 respondent

Developed Asia–Pacific: 2 respondents

Latin America: 3 respondents

Sub-Saharan Africa: 1 respondent

- Tier-1 CSP
- Tier-2 CSP
- MVNO

Job titles

- CIO
- Data Network Analyst
- Director of Billing
- Head of Operations
- IS Solution Specialist
- Senior Design Specialist
- Senior Director of Technology
- Senior Network Solutions Architect
- Senior Product/General/Project Manager
- Technology Product Owner

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- Fixed–Mobile Convergence
- Future Comms
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- Smart Devices
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Business Services

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- IoT Services
- Private Networks
- SME Services

Operational Applications

- Automated Assurance
- Customer Engagement
- Digital Experience
- Monetisation Platforms
- Network Automation and Orchestration
- Service Design and Orchestration
- Applications Data and Strategies

Networks and Cloud

- Cloud and AI Infrastructure
- AI and Data Platforms
- Fibre Infrastructure
- NaaS Platforms and Infrastructure
- Wireless Technologies
- Operator Spending
- Sustainable Networks
- Wireless Infrastructure

Space

- Earth Observation
- Government and Military Space
- Satellite Capacity
- Satellite Infrastructure
- Satellite Mobility
- Satellite Strategies for Telcos

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- Asia–Pacific Metrics and Forecasts
- European Core Forecasts
- European Country Reports
- European Quarterly Metrics
- Global Telecoms Data and Financial KPIs
- Middle East and Africa Metrics and Forecasts

SMB Technology Forecaster

- Business Applications
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- Devices and Peripherals
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