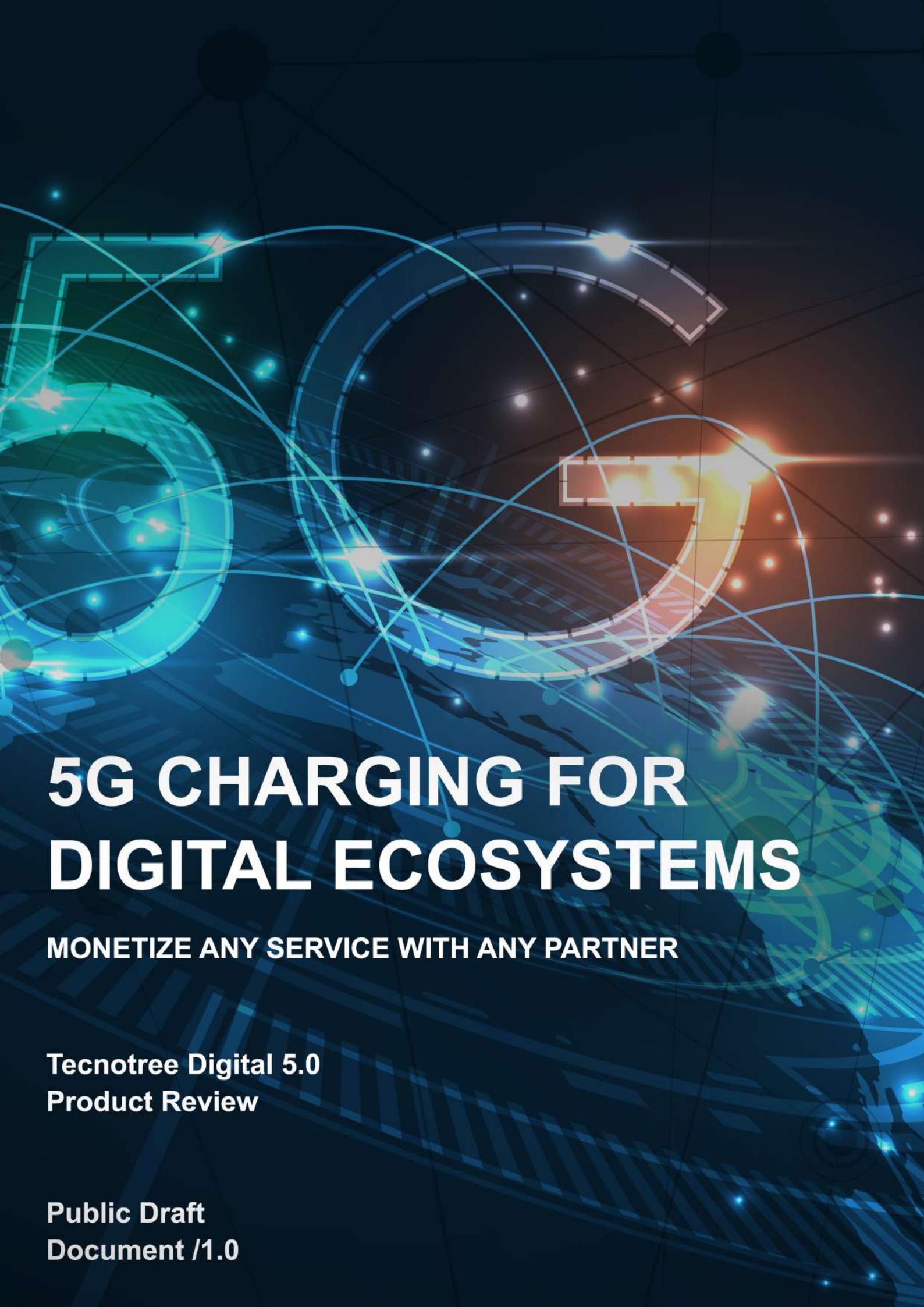


5G CHARGING FOR DIGITAL ECOSYSTEMS

MONETIZE ANY SERVICE WITH ANY PARTNER

Tecnotree Digital 5.0
Product Review

Public Draft
Document /1.0

TABLE OF CONTENTS

Omdia View

The time has come for 5G monetization !

In 2021, the availability of 5G networks rapidly expanded. As 2022 dawned, Omdia recorded over 170 commercial 5G network launches, with 15 telcos having launched 5G standalone (full 5G) commercial offerings. With more launches to come, the GSMA expects 5G subscribers to exceed one billion in 2022. Despite this progress, telcos need a fresh approach to monetization if they are to gain a return on investment.

The first step on this path to monetization is telco charging systems. In Omdia's OSS/BSS Evolution Survey – 2022, 48% of operators earmarked 5G charging and policy control as a top investment priority to improve monetization. These charging systems must do more than just support traditional telecoms services such as voice, messages, and data; they must be real-time, support any service, and charge for any value metric.

These feature-rich applications will be governed by configuration—not customization—enabling telcos and their suppliers to innovate faster and achieve better outcomes for end customers. To get there technologically, telcos must embrace the shift to cloud-native solutions, microservices and API-driven architectures, and the software mindset outlined by the 3GPP in the 5G standards.

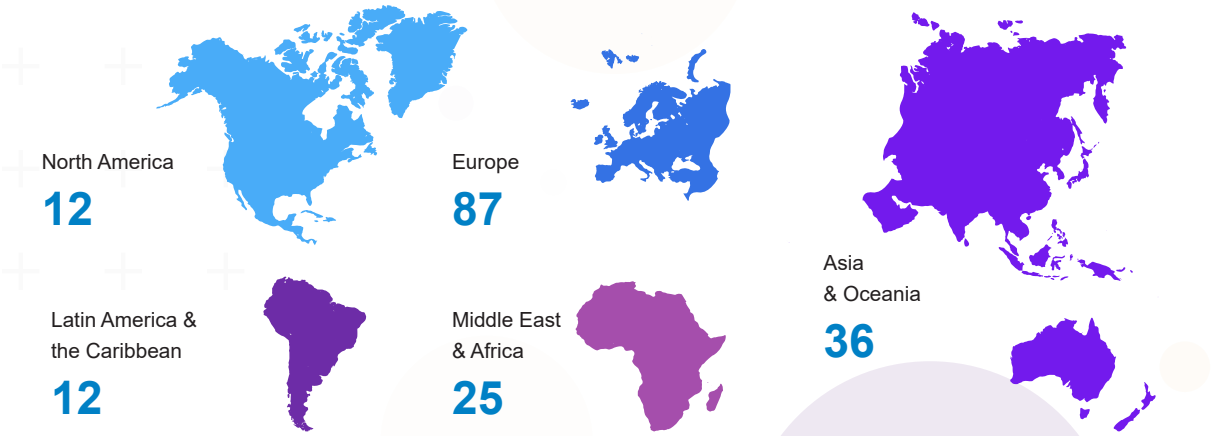
This technological evolution will enable telcos to grasp new commercial opportunities that 5G offers. Although the industry has identified 5G B2B services as the biggest of these commercial opportunities to pursue, it is still coming to terms with what exactly these services will comprise. The wide range of possible B2B(2X) services makes it imperative that 5G charging systems support a variety of value metrics—particularly non-telco value metrics—to reduce the cost to experiment and lower the time-to-market for new services. Telcos will not build these services alone but will need support from partners; this means their charging systems must also support their partners. There is much to do to monetize 5G and telcos' first steps will see the evolution of their charging systems.

Chris W Silberberg
Senior Analyst
Service Provider Operations & IT

Commercial 5G Launches

Up to the end 2021

172	5G Launches
48	5G FWA Launches
15	5G SA Launches



- Omdia 5G Service Provider Tracker – 4Q21 (January 2022)
- GSMA The Mobile Economy 2022 (February 2022)
- Omdia OSS/BSS Evolution Survey – 2022 (August 2021)

5G: The any service, any partner generation

2.1. A new era of monetization

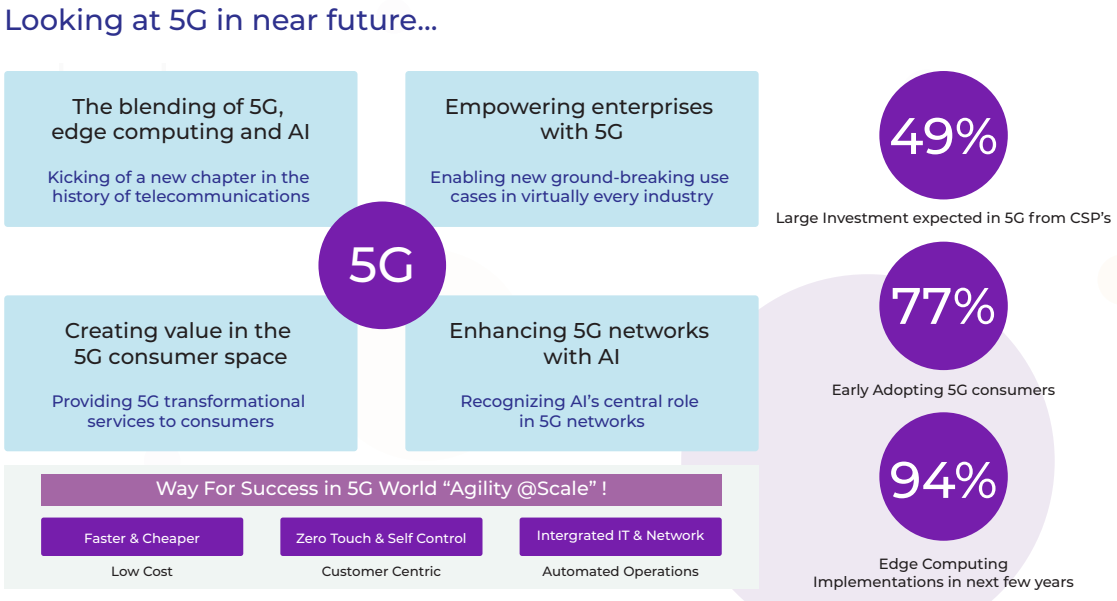
We are on the brink of an exciting leap in innovation that is changing the very fabric of our society. 5G is finally here and it's a game-changer! 5G introduces a whole new world of dynamic capabilities that can be introduced to applications, new services, and completely new business models. Its unique combination of high-speed connectivity, very low latency & ubiquitous coverage will support smart vehicles & transport infrastructure such as connected automobiles to start with.

- This is a huge opportunity for CSPs to shift from an Infrastructure to a platform mindset and become unique enablers in network embedded services. 5G value plane is instrumental to realise the full 5G potential in composing cloud-native charging and policy functions with hands-in network analytics and API exposure maximizing the revenue generation.

- 5G will enable us to control more devices remotely in applications where real-time network performance is critical, such as remote control of heavy machinery in hazardous environments, thereby improving worker safety, and even remote surgery.

- With the 5G value plane, CSPs can act quickly and rapidly launch new innovative services to the market dynamically leveraging their 5G network assets to build, deliver and monetize new experiences with innovative pricing and real-time exposure to partners and enterprises

5G is not just a boon to the Telecommunication Industry, but 5G will spur innovation across many industries and provide a platform enabling emergent technologies and IoT would become an integral part of our economy and lifestyle.



5G Key Capabilities

3 broad categories of 5G Use Cases

Enhanced mobile broadband (eMBB) for increased throughput and improved coverage and capacity.

Massive machine-type communications (mMTC) mass adoption of internet of things (IoT) with the ability to support a very high density of devices.

Ultra-reliable low-latency communications (URLLC) for mission-critical applications that require very low latency, and high reliability and security.

Network Orchestration	Mobile Edge Computing	Network Slicing
Program Network Automation for hardware & software elements	Decision making by end device & ultra-responsive experience	Multiple Virtual Networks over shared network infrastructure

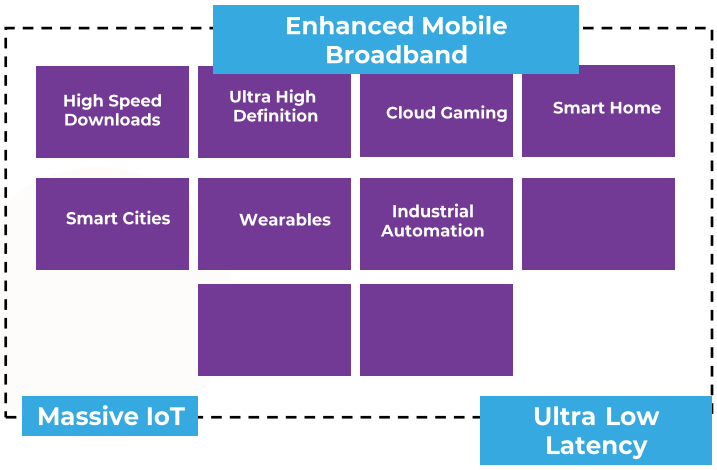
5G Value Additions

Flexibility	On-Demand network delivery to several users and connections
Speed	Improved distribution and speed upwards of 10 Gbps
Capacity	Supports billions of applications, users, devices and endpoints enabling Iot
Efficiency	Low power consumption and improvements in battery life
Analytics	High volume data can be used for analytics pattern identification, predictions
Edge Computing	Edge devices capability & intelligence for dedsion making
Latency	Ultra Low Latency support real-time control and collaboration applications

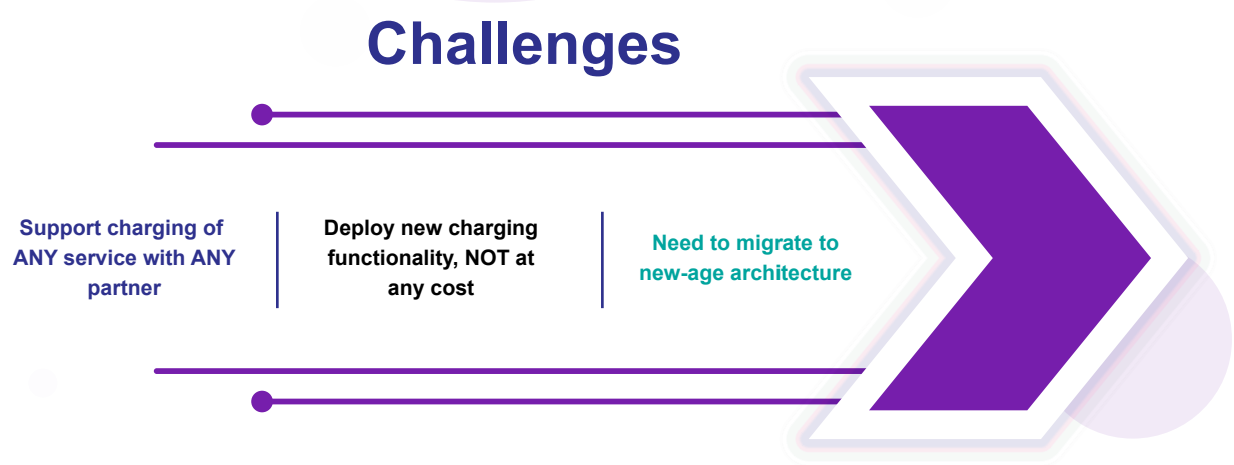
Unleash a sustainable Digital Ecosystem of Partners with 5G capabilities

New ground breaking use cases in virtually every industry blending of 5G, edge computing, and AI....

- Compelling new consumer and enterprise opportunities
- Advanced use cases with new network capabilities
- Micro segmentation served by network resources on demand
- 5G holds the potential to become the foundation for many new industrial applications and to support entirely new use

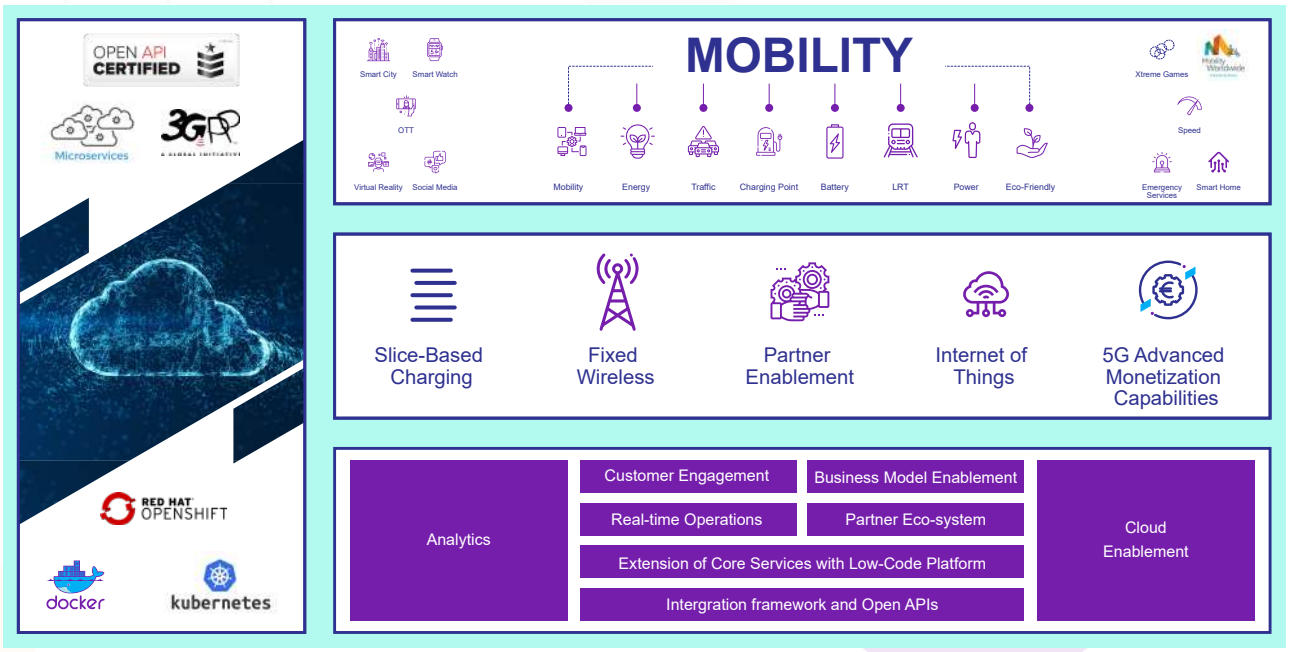


2.2. 5G adoption challenges and inspiration for any service and any partner monetization era



CSPs path to 5G monetization is not without challenges. They must migrate their charging systems to those built for the 5G age, new charging systems which have the functionality to support charging for ANY service with ANY partner. At the same time, CSPs cannot afford high upfront expenses for new systems, as they are themselves not yet fully clear on what 5G services they will monetize. They must also continue to monetize legacy networks and infrastructure. Below we summarise the shortcomings of current systems, and how new solutions can overcome them.

Tecnotree has adopted a mobility-first approach to transforming the digital charging landscape for CSPs with TMForum standardised open architecture compliant as per the 3GPP framework to enable new business models and monetize ecosystem partners



Current State

Cannot Support charging of ANY service with ANY Partner

- Legacy Systems: Charging solutions are designed to support traditional telco services such as minutes, messages, and data
- Don't Support New Business Models: They are not designed to support complex business models like B2B2X, or charge for complex value metrics like quality of service
- Cannot Support Ecosystem Partners: Charging solutions are difficult to expose to solution partners
- Not Agile: Supporting a new product line is a highly manual process, making new product launches an expensive and time- consuming process.
- Not Cloud-Native: Current charging systems do not have an integrated PCF and work Independently which incurs extra cost and processing time.
- Not Flexible: Current charging capabilities and offer recommendations are static and work based on the pre-configured rules

Tecnotree's DOCS

Advanced Pricing and Charging Models

- Going beyond Telco: In 5G CSPs need charging systems that can support a wide array of telco and non-telco value metrics, such as QoS, number of network connections, and various outcome-based models.
- Support Complex Commercial Models: They should also support various pricing models such as subscription-based, pay-per-use, flat-rate, or per-device pricing.
- Flexible and Configurable: Solutions must be feature rich and configurable to support more complex business models and faster innovation cycles, with the flexibility to easily create new offers for vertical solutions with specific require ments.
- Can support Digital Ecosystems: Charging systems need to be exposable to Telco partners through open APIs to support new business models and services
- Dynamic Policy Control: Need integrated policy control function which enables dynamic QoS control in real-time based on usage, time, device, quality of the network, which does not only allow FUP implementation but also allows more bandwidth for specific services.
- AI-Driven Models: Flexible micro charging capa bility which intelligently adapts to the suitable plan during subscription renewals - ex: in case the subscriber balance is lower than renewal charge (for existing plan) OCS to intelligently adapt to suitable fulfillment capability and vice versa suggests an option for upgrade. This enables a higher renewal and revenue realization rate.

Current State

The challenge is to realize new revenue streams through partners, NOT at any cost

- Slow Time to Market: Deploying a new solution to support 5G charging and func -tionalities is expensive and time consuming.
- Low Scalability: CSPs need a low risk but effective route to capture and secure revenue streams and take advantage of business opportunities from both traditional telecom services as well as digital services, 5G and IoT.
- Expensive: CSPs have already invested big for the current functionalities and the architecture

Tecnotree's DOCS

Advanced partnership and revenue models

- High Scalability: New age services could be from partners such as Video Conferencing, EV charging, or OTT services which require a combination of subscription, event, or usage-based charging needs.
- Fast Time to Market: Charging system will seamlessly enable such collaboration for bundled services or OTT services with revenue sharing capability.
- Configurable with Lower ToC: CSPs need to implement a scalable, flexible solution with a strong user-experience focus and future-proof product roadmap, enabling real-time convergent charging, policy control, decoupling, and fast service creation.

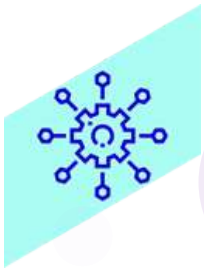
Current State

Need to migrate to new-age architecture

- Built for Legacy Systems: Current solutions are designed in a monolithic architecture framework, this reduces the solution flexibility, and increases the cost of resources, time, and money to scale.
- Low Time to Value: These solutions can become increasingly complex to manage as they are customized to fit a CSPs environment, leading to short-term benefits, but long-term impacts on scalability, performance, and agility.
- Non-Modular: Application development and deployment in the monolithic framework model is fraught with risk and uncertainty.

Tecnotree's DOCS

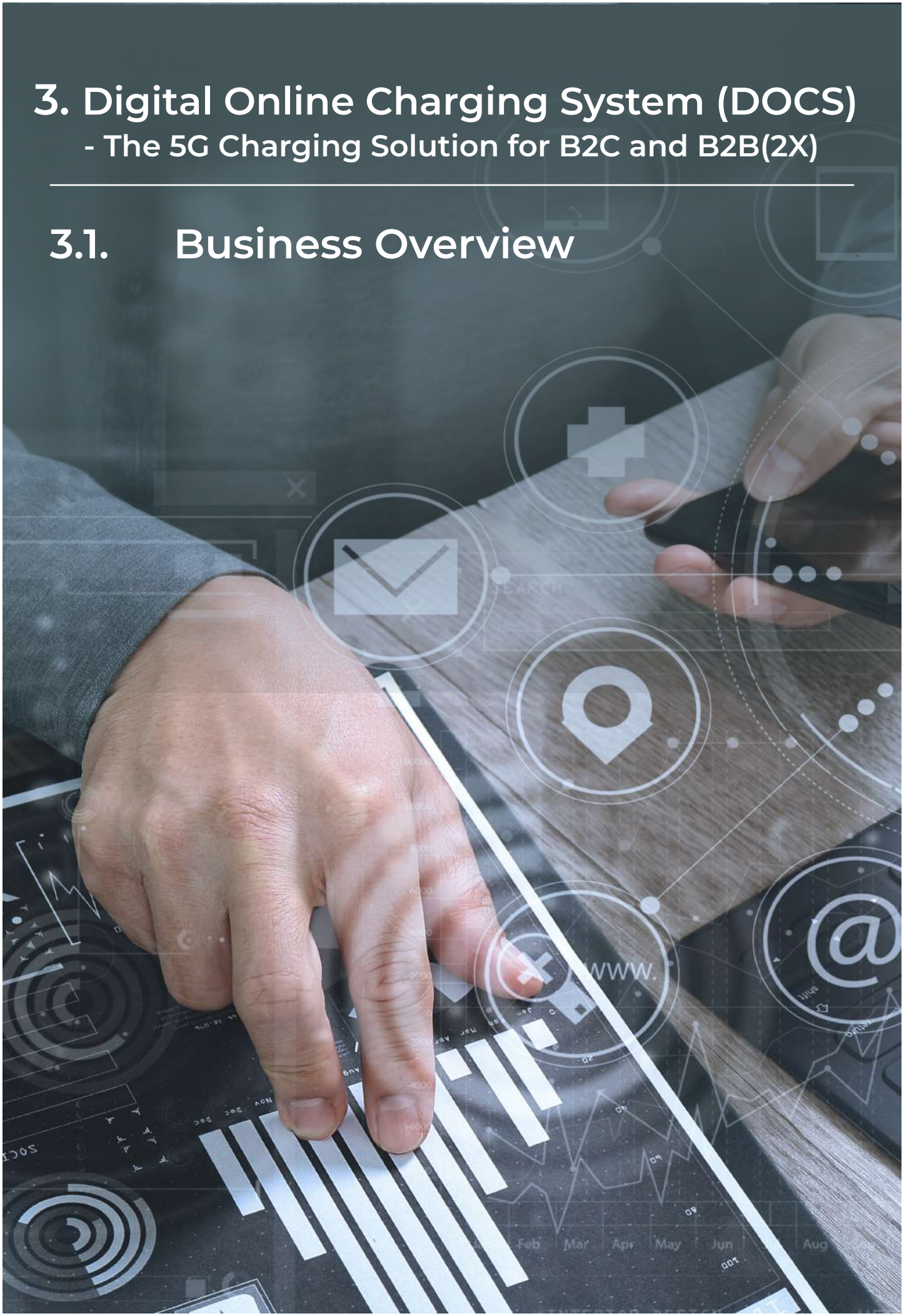
Implement microservice-based architecture with parallel / co-existing deployment models



- Dual Speed Transformation: Implement to cater specific services with co-existing deployment models along with your current online charging systems, allowing CSPs to sweat their equity in existing legacy investments
- Agile & Cloud-Native: Applications built to a cloud-native architecture are developed as microservices that are mostly stateless and loosely coupled.
- Modularity: A microservices architecture consists of a collection of small, autonomous services. Each service is self-contained and should implement a single business capability within a bounded context.
- Fast Time to value: These smaller software elements enable horizontal scaling as the demand grows with just-in-time provisioning of infra and services.

3. Digital Online Charging System (DOCS)
- The 5G Charging Solution for B2C and B2B(2X)

3.1. Business Overview



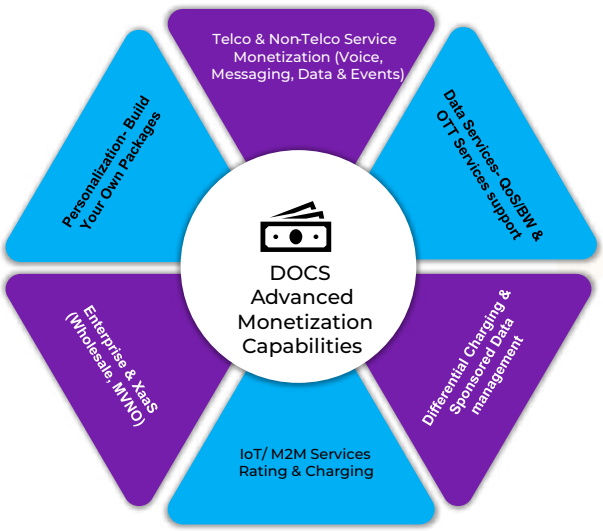
- In Tecnotree, we have designed and built our Digital Online Charging System (DOCS) from the ground up to support the future needs of 5G Telco Service providers. We have not limited ourselves to only Telco Services like Hybrid/Prepaid/Post-paid but have thought and built beyond for providing over the edge charging solutions for new complex business models of B2B, B2C, and B2B2X for 5G based non-telco IoT Service.

- DOCS is no more JUST a Charging solution for the CSPs but would function as the core for the network of networks where each slice could be a sub network. CSPs get ample opportunities for maximising the revenue by providing new out of the box Services like augmented and virtual reality, in-car entertainment, and connectivity, music, and gaming (mobile and cloud), consumer IoT Services, electric automobile industry to name a few.

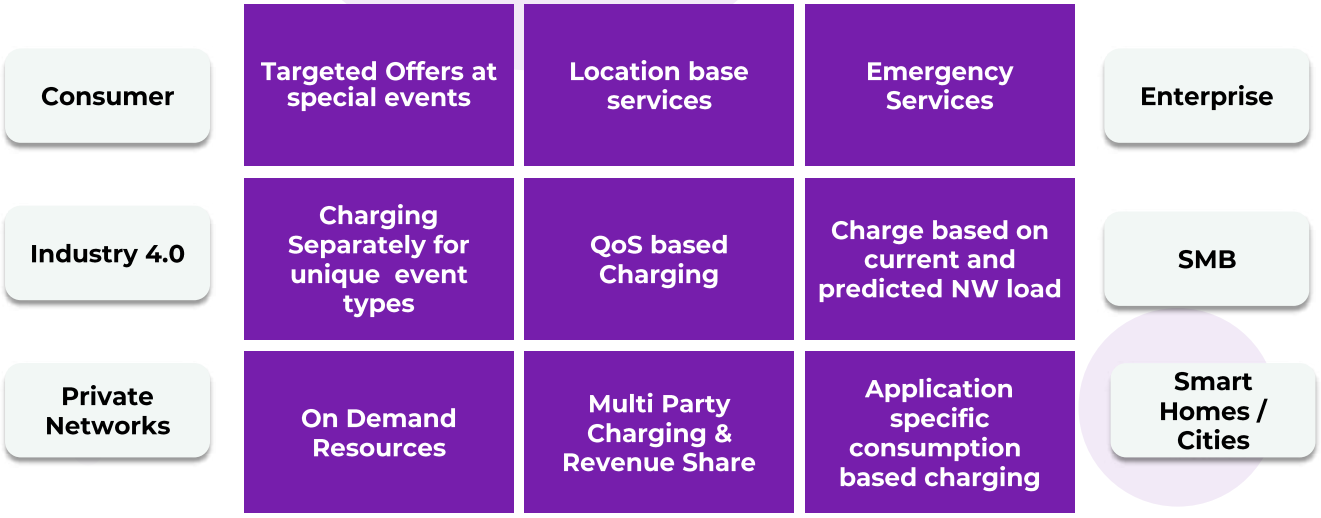
- DOCS is built with functionally rich, high-performance rating and balance management unhindered by the complexity of the pricing and discount model or account structure. Our Shared Plans and wallets for retail and enterprise services in single charging system is a key in this age of unlimited services helps sharing services among the group members.

- The future of successful subscription models starts now. In the subscription-based pricing model, customers pay on a regular basis for a service or product. Subscription pricing is different than pricing for traditional products, as pricing is often based on the length of the subscription, making longer subscriptions the cheapest options.

Transforming Online Charging with Digital OCS (DOCS)



DOCS Enabling Charging Levers for 5G



3.2. Highlights

The following table describes the salient features of Tecnotree Digital Online Charging System

HIGHLIGHTS

Converged Charging (Support Flexible Charging Models)

Convergence of Prepaid, Post-paid, Networks and Services

Online + Offline Charging for Telco + Non-Telco Use Cases

Subscription charging models

Can be Standalone or Adjunct Module

Integrated PCF

Extensive support given for 5G QoS policy, related 5G signalling interfaces and charging control functions

Managed and streamlined 5G policy rules mainly for all the 5G control plane functions, including the 5G network slicing, mobility management and roaming

Collect and analyse subscriber data from various metrics to optimize resources

Managing subscribers, applications, and network resources in real-time

Cloud-native implementation and Increased speed, low latency

Supports rapid policy use case deployment

Parallel / Co-existing Deployment Models with Current Charging Systems

Providing one or more microservices (and a co-development approach)

Several microservices addressing an adjunct charging capability (strategic extension, right sized for service provider needs)

A fully converged system comprised of microservices, capable of fully integrated Policy and Charging (PCC)

Distributed models for deployment closer to the edge as they emerge

Slice Charging

Capability to charge any Telco & Non-Telco service

Configurable unit of measurement via framework

B2B2X Model; Charging over REST

Monetizing the Charging System itself

Innovative Monetization

Cross Promotions, Upselling

Slice Charging

Charging as a Service (ChaaS)

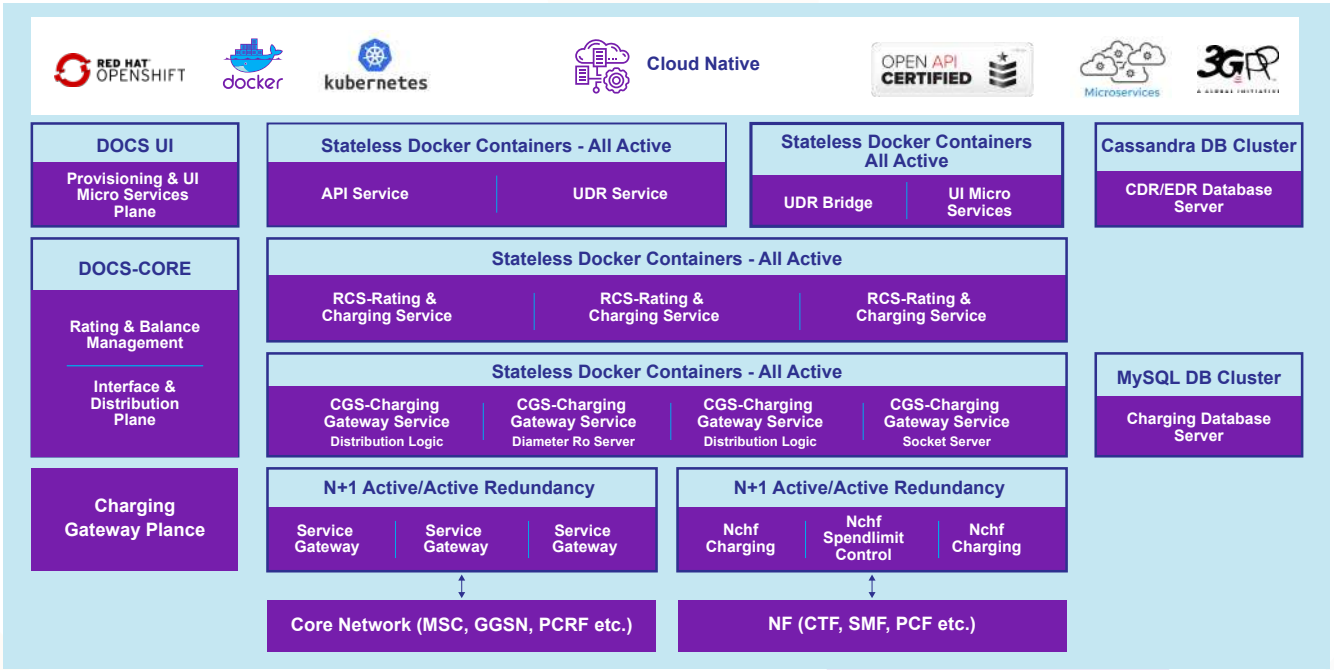
Intelligence-based Products

3.3. DOCS - Technical discussion

In Tecnotree, we have designed Tecnotree Agility™ real-time convergent charging with the unique user-payer paradigm allowing the user of the service to be separated from the payer. The same functionality can also be applied in a corporate context, to limit the company's exposure to runaway usage of services by employees

3GPP	OPEN API CERTIFIED	Microservices	Cloud Native	RED HAT OPENSHIFT docker kubernetes
Compliance to latest 3GPP Release 3GPP TS 23.501 System Architecture for the 5G System; Stage 2. 3GPP TS 23.502 Procedures for the 5G System; Stage 2. 3GPP TS 23.503 Policy and Charging Control Framework for the 5G System; Stage 2. And More.....	TMF654 Prepay Balance Management API (Customer) TMF635 Usage Management API (Common) TMF632 Party Management API (Engaged Party) TMF681 Communication API (Common) TMF620 Product Catalog Management API (Product) TMF679 Product Offering Qualification.....	Microservices - Charging Gateway Service (CGS), Rating Function (RF), Account and Balance Management Function (ABMF), Charging Function (CHF), Policy Charging Function (PCF) Services Based Architecture (SBA) Control & User Plane Separation (CUPS) Supports services deployment in Control User Plane according to the user scenarios	B2B2X offerings & monetization Network Slicing (eMBB, uRLLC, Massive IoT) Based products and offerings Catalog Driven Order fulfillment Digital Partner ecosystem through Open APIs - Partner Onboarding, Partner's Product Onboarding	Digital Operations Auto Scaling Zero Down time Self healing Continuous deployments: "Release early, release often and listen to your customer...." Multi-Tenancy VNF Readiness* Built-in 99.999% Availability

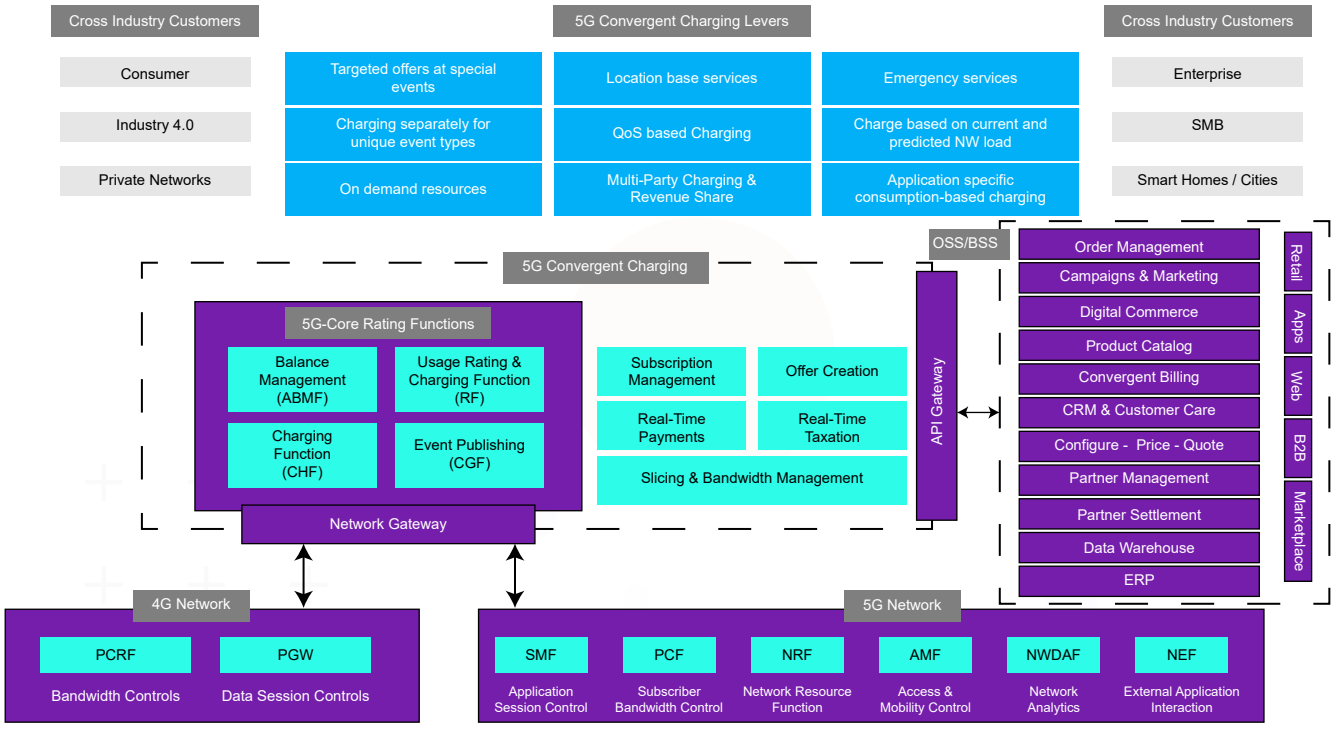
- The following diagram describes the functional architecture view of Tecnotree's DOCS



- We have developed a charging system with cloud-native efficiency and DevOps agility to take maximum advantage of the efficiencies of modern cloud computing networking and storage technology and align with the standalone 5G service-based core network. It supports a comprehensive core network including 3GPP HTTP/2 Nchf, Diameter, and SS7 IN protocols with the supporting business logic flexibility to charge based on the large variety of transport, session and application-level parameters and metrics.

- It has been Integrated with the core network and business policy management functions (4G PCRF and 5G PCF) to deliver dynamic bandwidth or quota-based offerings. DOCS provides integrated policy control function that enables dynamic QoS control on real-time based on usage, time, device, and quality of the network, which not only allows FUP implementation but also allows more bandwidth for specific services such as video call or streaming services which maximizes customer satisfaction.

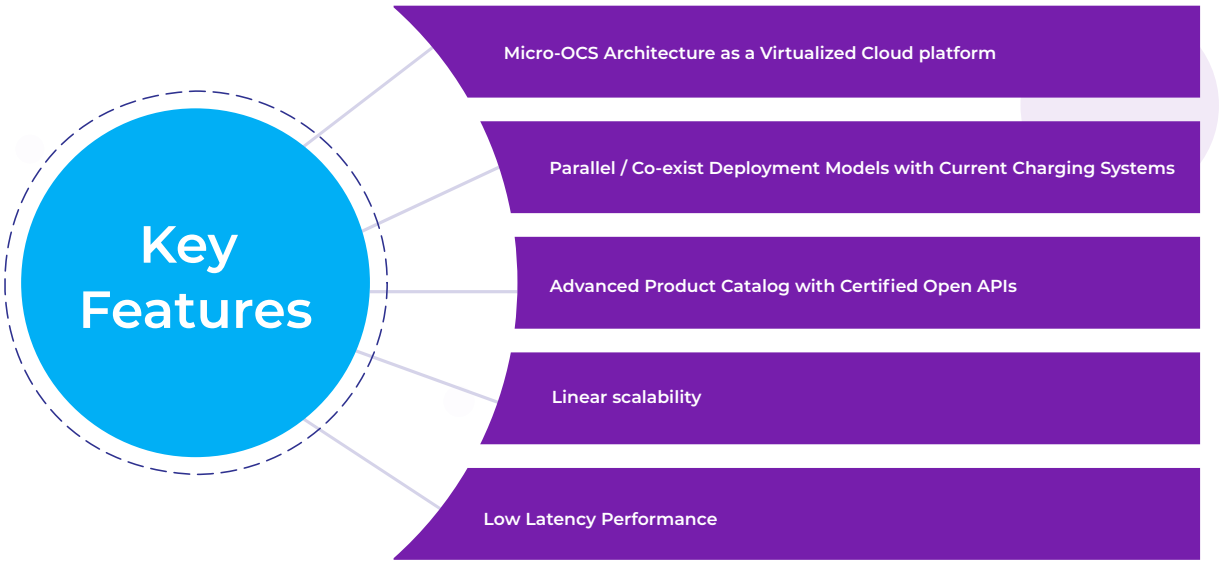
Expanded Charging Levers for 5G-mapping to Convergent Charging & BSS



- Tecnotree micro-DOCS solution architecture is designed to focus on speed to deliver services, efficiency, and scale by emphasizing declarative configuration, stateless, “shared-nothing” processes that horizontally scale, and an overall loose coupling to the deployment environment.

3.4. Key Features

In Tecnotree, we have designed Tecnotree Agility™ real-time convergent charging with the unique user-payer paradigm allowing the user of the service to be separated from the payer. The same functionality can also be applied in a corporate context, to limit the company's exposure to runaway usage of services by employees



DOCS Business Enablers

Converged Online/Offline Rating & Charging	5G SA and NSA support	Catalog & offerings (Slices, resources, connectivity & Mobility etc.)	Wallets & Balance Mgmt. (Static & Dynamic)	Friends & Family/CUG/Enterprise Group
Mobile VPN	Sponsored Data	Payer Paradigm	IOT/OTT Services Charging	Balance Transfer, P2P Transfer
time Discounts and Bonus	Slice Based Charging	Personalized Notifications	Recharge Management & Topup	Taxation & GL Mapping
Multi currency	Recommendations	Home Zone/location based charging	QoS Based Charging (Slice, EDGE, Radio Access Technology)	Multi Network Interoperability

3.4.1. Micro-DOCS architecture as a virtualized cloud platform

Micro-DOCS solution architecture as a CNF (Cloud-native Network Function) is designed on the following:

- Focus on speed to deliver services
- Efficiency
- Scale by emphasizing declarative configuration, stateless, “Shared-nothing” processes that horizontally scale, and an overall loose coupling to the deployment environment.

We have explored a shared systems architecture to enable cost efficient, scalable, and future-proof delivery models for the Tecnotree Micro-DOCS. This solution can be deployed in a private and shared data centre, as well as public cloud infrastructure. Complete virtual DOCS solution components can be deployed on low-cost commodity hardware.

3.4.2. Parallel/Co-exist Deployment Models with Current Charging Systems

Parallel Deployment

Typically, charging system transformations are large initiatives. We can reduce the transformation challenges significantly as DOCS can be deployed alongside existing OCS so that DOCS supports specific services, segment of customers with very minimum change to existing integration touch points. This reduces the risk profile of large transformations and supports faster revenue realization.

3.4.3. Advanced Product Catalog with Certified Open APIs

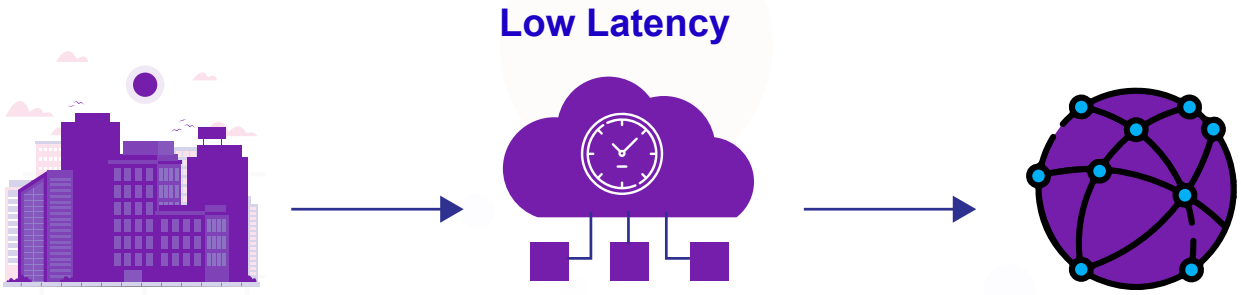
DOCS is built with Open APIs and using our Open APIs, clients and partners can connect DOCS directly to third-party systems which helps eliminate manual errors, saves time through automation, and eases the process of integration.

Below is a list of TMF REST APIs related to charging certified by Tecnotree.

- Product Catalog Management API (TMF 620)
- Prepay Balance Management API (TMF 654)
- Usage Consumption API (TMF 677)
- Usage Management API (TMF 635)

With the added advantage of over the edge product Catalog, partners can provide their B2B2X services through the DOCS microservice architecture. DOCS includes GUI based technical product Catalog through which business user can create technical products in tandem with telco's and/or partner's commercial product Catalog and integrate seamlessly.

3.4.4. Low Latency Performance



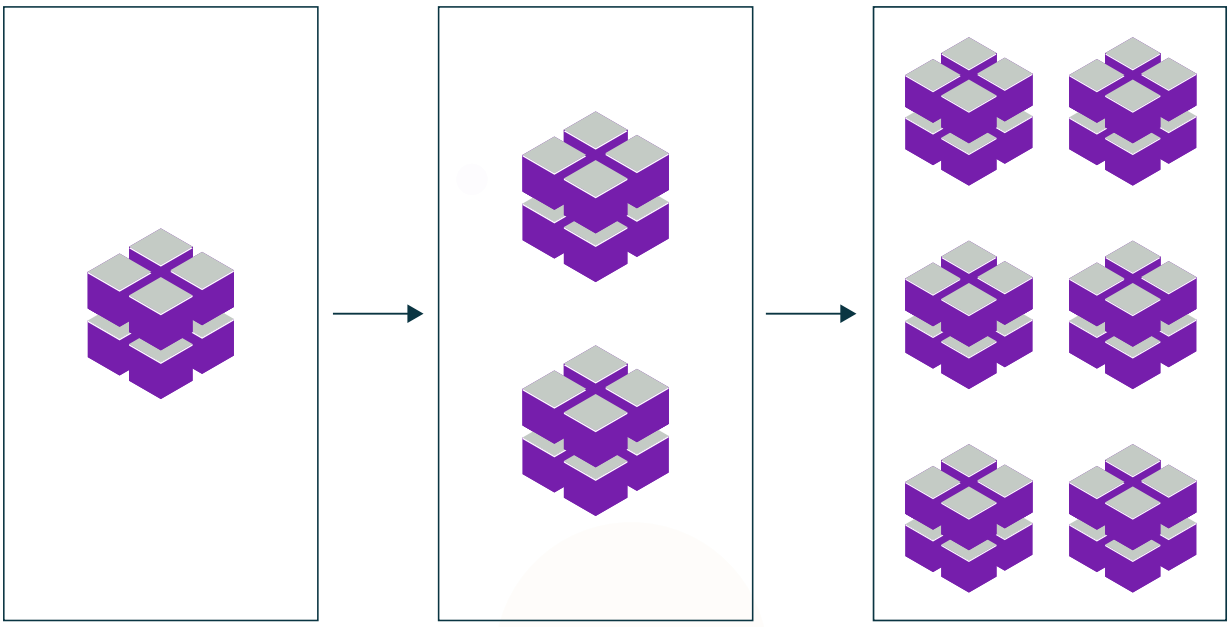
Many monetization strategies are focused on enterprises with B2B2X use cases—these increasingly require very large and complex hierarchies. Performance is a measure of transaction processing efficiency.

To preserve the low latency use cases that 5G enables, real-time charging transactions must be processed with single-digit millisecond latency alongside always accurate rating, balance, and threshold management. Digital Online Charging Systems support complex charging structures while maintaining extreme performance with high throughput and parallel transaction processing.

3.4.5. Linear scalability

A scalable, performant microservice is driven by efficiency, one that can not only handle many tasks or requests at the same time but can handle them efficiently and is prepared for tasks or requests to increase in the future.

Digital Online Charging Systems is enabled to monetize existing 2G-4G offerings as well as 5G with linear scalability and efficient resource utilization. As an elastic microservice-based architecture, it can be instantaneously scaled-up or scaled-down based on real-time traffic needs through interactive GUI as per the demand and is highly available and resilient to failures.



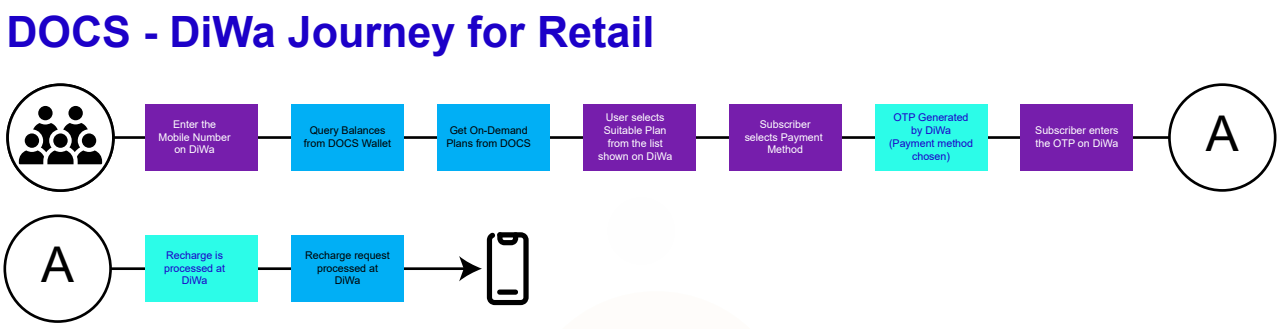
4. Case Studies

4.1. Tier - 1 Middle East CSP trial of Mobile Wallet for IoT Service Charging

A Tier-1 mobile operator in the Middle East with over 200+ million subscribers successfully implemented their 5G network. To monetize on their 5G services, CSP introduced new IoT services for their subscriber. This resulted in the onboarding of multiple IoT partners with their individual wallets. Subscribers had to recharge each wallet while subscribing to the IoT services. This was frustrating for subscribers and the CSP saw a decline in their 5G IoT business.

Tecnotree' s Solution:

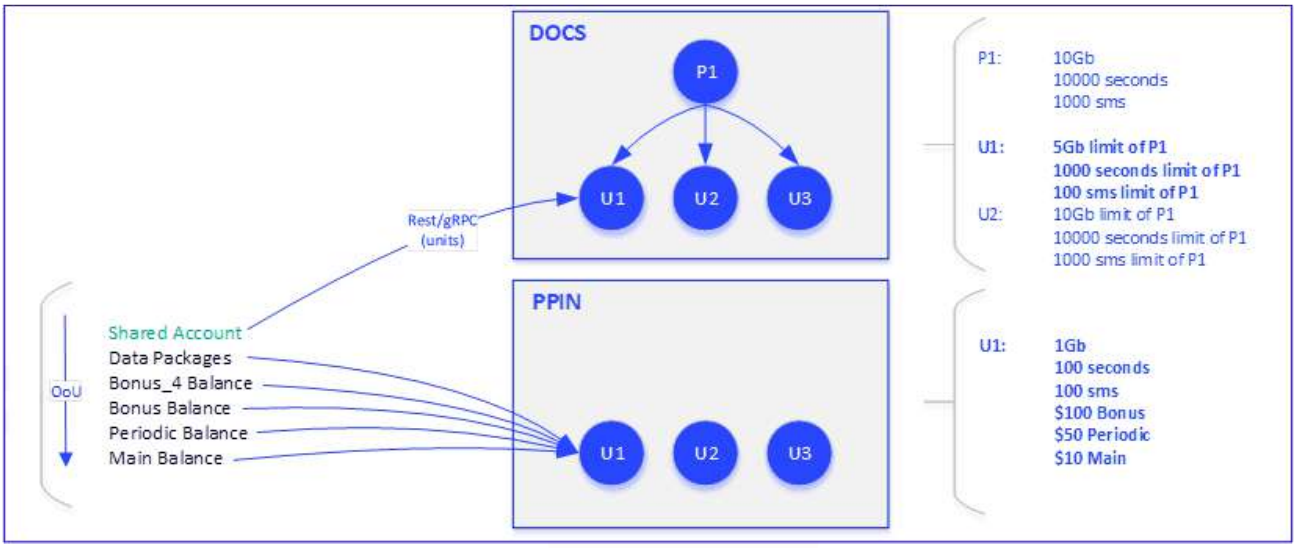
Tecnotree has proposed an in-house Digital Wallet "DiWa" integrated with DOCS(Digital Online Charging System) microservice architecture. This wallet would be a unified wallet for all IoT services. DOCS will provide recurring/on-demand recharge plans for the subscribers. The users can subscribe to any of these plans through their digital wallets. All the IoT services can then be monitored and charged in real-time. If the wallet balance goes below the threshold, the wallet can communicate to DOCS in real-time to increase the balance seamlessly using the recurring/on-demand plans chosen by the subscribers.



This approach also supports CSPs with parallel/co-existing deployment models, as they only deploy the most relevant elements of the DOCS solution. This is possible as DOCS leverages TM Forum Open APIs to run alongside a CSPs existing OCS.

4.2. Tier - 1 Central America CSP Deploys Co-exist Deployment Models with their Legacy Charging Systems to implement Shared Plan Services

A Tier-1 mobile operator in Central America with over 100+ million subscribers wanted to streamline its operations. They wanted to launch new shared plan services by determining which subscribers (individual and corporate) can share package units with other subscribers and deploy standalone use cases without disrupting its existing systems. However, the mobile operator's outdated, manual processes were limiting its ability to efficiently deploy and test 'containerised' 5G applications. The below diagram helps you understand to realize the concept behind the implementation.



The operator deployed the Microservices from DOCS to implement the user-payer paradigm and provide the functionality of shared plan services. Currently, their legacy charging system deployed in the network does not support this feature, whereas the DOCS designed to support 5G monetization supports the shared plan feature. As a charging feature, the system also enables dynamic quota reservation which allows adaptive reservation of units based on usage. So Tecnotree provided this feature to the CSP by deploying DOCS also along with their legacy charging system.

4.3. Conclusion

'5G challenges Telcos to charge differently. They must implement converged charging solutions that can flex to rate for any conceivable metric; react to charge in real-time; dynamically scale to support millions of human and machine subscribers, and they must support charging for an increasing range of partner services.

The adoption of 5G convergent charging systems will see Telcos not only embrace cloud-native architectures but also give them the tools to streamline their charging estates, which should result in faster service innovation and better customer outcomes.'

Chris W Silberberg
Senior Analyst, Service Provider Operations & IT, OMDIA

As the roll-out of 5G network infrastructure gathers speed, monetization of 5G-enabled use cases has become a matter of urgency - especially as CSPs are caught between the pressures of a squeeze on margins and the high cost of 5G deployment. CSPs should accelerate the adoption of 5G Charging system to monetize the opportunities of 5G. With Tecnotree' s DOCS, state-of-the-art next gen charging solution, csps can innovate, build, deliver and monetize new experiences with advanced pricing and real-time exposure to partners and marketplaces by providing rapid ability to integrate securely to digital wallets for charging of third-party services including auto top-up, recharges, bill payments and buying new telco/non-telco services

It also provides significant benefits for adjacent systems such as billing and mediation, besides aiding the monetization of new applications, such as those based on network edge or network slicing. In assessing new vendor solutions, CSPs should prioritize architectural agility, mature microservices and the ability to interface with the network as important considerations.

If you still need a reason to adopt DOCS, visit
www.tecnotree.com/products/online-charging or write at
marketing@tecnotree.com for more information.

4.4. About the Contributors

Ramakrishnan Subramanian

(Senior Director, Charging and Billing Portfolio)

Heads our digital transformation and research for charging and billing portfolio along with research programs such as monetization platforms and digital experience for 5G. With over 25+ years of experience in the telecom industry, his focus includes impact of 5G on digital BSS systems, telecom charging opportunities for B2B2X, ecosystem and value chain, and microservices-based architecture models.

Himanshu Bhusan Malla

(Product Head, Charging and Wholesale Billing)

He leads the product development and research for charging and B2B2X wholesale billing. With over 20+ years of experience, he focuses on customer journey and experience for 5G, digital Realtime analytics for charging and customer engagements. He manages the product development cycle including prototyping designs balancing firm objectives against customer targets

Thejus Kuruvadi Suresh

(Senior Product Manager, Charging and Wholesale Billing)

Thejus has over 10+ years of ICT Industry success and manages the product roadmap development for 5G and IOT services for B2B2X, market research and data analysis. He has worked on various telecom projects for BSS/OSS across Europe, Central America, The Middle East, and Africa with a proven history of superior market penetration and product launch prowess with developing a deep understanding of business needs and the current market landscape.

Chris Silberberg

(Senior Analyst, Service Provider Operations & IT, Omdia)

Chris is a senior analyst in Omdia's service provider transformation team, where he aids clients in making strategic decisions through high-quality reports and trackers. Chris covers a range of service provider operations & IT topics, including BSS, converged charging, future billing, partner ecosystem management, operator cloud strategies, and edge monetization systems.

About Tecnotree

We are a global provider of IT solutions for the management of services, products, customers, and revenue for Communications Service Providers. We help customers to monetize and transform their business into a marketplace of digital services. Together with our customers, we empower people to self-serve, engage and take control of their own digital life.

We deliver customer experience with signature Finnish design and quality excellence.

Our customers use our products to establish a dynamic ecosystem that offers highly relevant solutions to people.

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We create business advantage for our customers by providing actionable insight to support business planning, product development, and go-to-market initiatives.
Our unique combination of authoritative data, market analysis, and vertical industry expertise is designed to empower decision-making, helping our clients profit from new technologies and capitalize on evolving business models.

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We hope that this analysis will help you make informed and imaginative business decisions. If you have further requirements, Omdia's consulting team may be able to help your company identify future trends and opportunities.

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