MATRIXX Technical Datasheet

MATRIXX delivers a digital monetization solution that combines 3GPP-compliant converged charging with digital monetization capabilities not typically found in a charging system for customer engagement, subscriptions, promotions, payments, partners and data management. All customer and partner charges are generated in real-time, including usage, one-time, recurring and subscription across all lines of a CSP's business. This gives all customers a digital-first customer experience with always available and accurate service and balance information, including visibility of their complete unbilled spend position, be they B2C, B2B or B2B2X customers or partners.

MATRIXX is both a 5G Converged Charging System (CCS/CHF) and 4G Online Charging System (OCS) and includes 3G, 2.5G and 2G legacy cellular support. As an access-network agnostic platform, the same monetization solution supports services provided over cellular, fixed, wi-fi, cable and satellite networks. Offline control extends from typical cellular network charging to include post-event ingestion of service usage from any network or type of charge, including IoT, cloud services, partner offers and more. The flexibility and innovation of MATRIXX allows it to be used for new services and monetization use cases being defined, like NaaS, AI and network slicing, as well as those yet to be defined.

For network-based services, MATRIXX delivers high speed, ultra-low latency performance and simplified, automated operations. It is architected as a microservices-based, cloud native solution for deployment across public (hyperscalers), on premise data centers, hybrid and multi-cloud environments. MATRIXX supports integration into CI/CD and automation pipelines to fully realize the performance, reliability and elasticity benefits of a modern cloud native environment.

Designed for highly agile, omnichannel businesses, MATRIXX is a no-code solution with open, configurable APIs for extensibility and ecosystem enablement both northbound to the BSS domain and southbound to networks. It easily

integrates with mobile, fixed, edge and cloud networks as well as existing IT infrastructure to unlock revenues across channels, networks and data sources. TMF Open APIs are supported, with MATRIXX achieving silver certification, helping to reduce implementation time and effort.

MATRIXX is the bridge between northbound IT systems (such as for customer engagement and external catalogs) via open APIs and southbound 4G and 5G network core environments via Diameter or an HTTP/2 Service Based Interface; CAMEL, INAP and MAP SIGTRAN-based interfaces are natively supported by MATRIXX for direct support of legacy services and networks. This bridging role enables the platform to provide agile and adaptable monetization solutions that support prepaid, postpaid and pay now consumers as well as enterprise, IoT, Industry 4.0 and private network opportunities.

KEY PRODUCT FEATURES

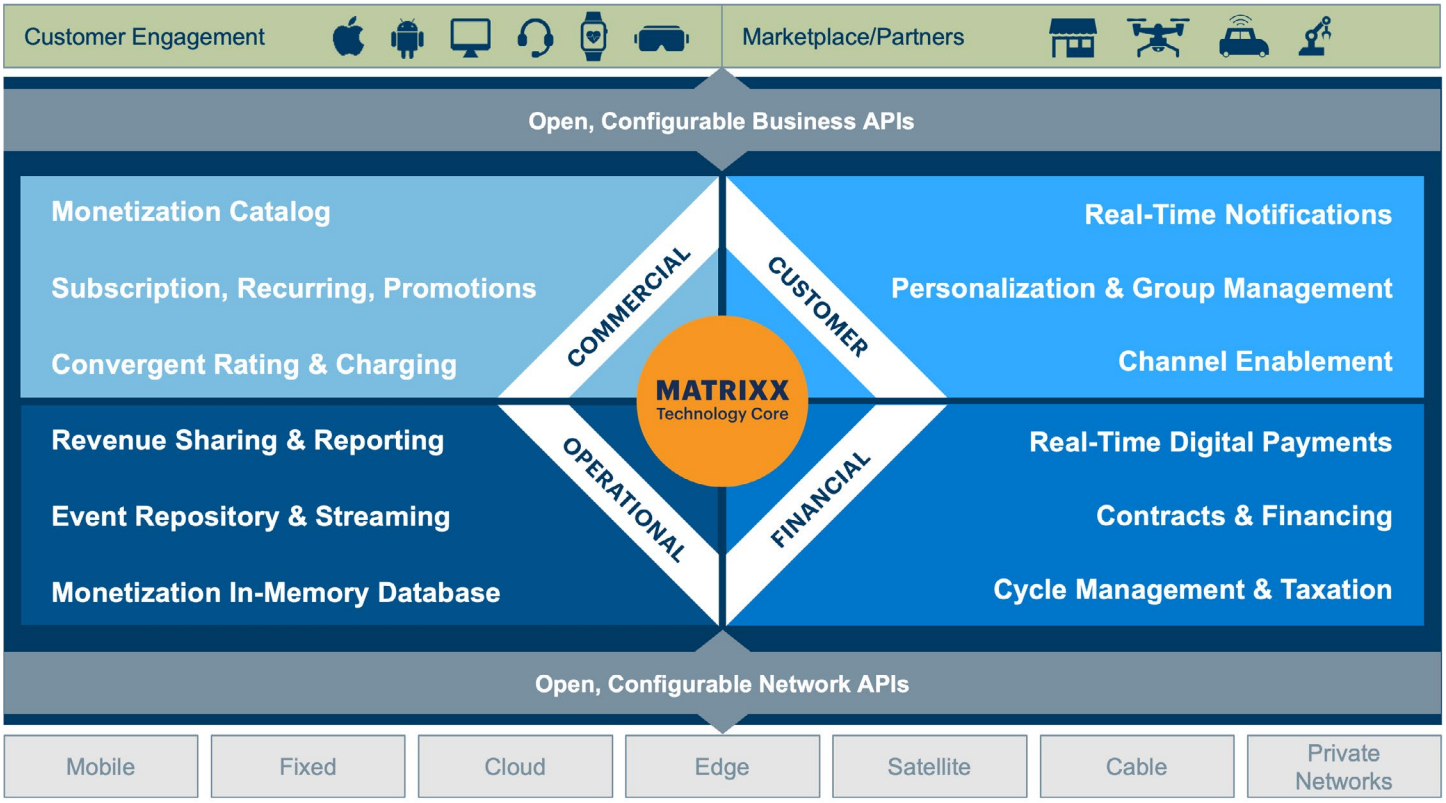


Figure 1: MATRIXX Digital Monetization Solution Key Product Features

The key features of the MATRIXX solution span the four agilities centered around the Technology Core.

MATRIXX was designed for the modern service provider, supporting the volume of transactions in today's world in real-time with guaranteed accuracy. The MATRIXX Technology Core is the high-speed decision engine and in-memory database that underpins the transformative capabilities of the MATRIXX solution. Its configurable decision-table architecture eliminates the need for custom development to support new business requirements. The high-speed decision engine eradicates performance bottlenecks so that every customer interaction is instant and precise. The Technology Core processes business rules in parallel, supporting concurrent balance updates that are guaranteed to be accurate and do not exceed credit limits for subscriber groups sharing a balance or allowance.

KEY PRODUCT FEATURES (continued)

COMMERCIAL AGILITY: New offers, faster and cheaper

Monetization Catalog

This is a configuration-based pricing and policy catalog providing rich monetization rules for charging, discounts, bonuses tax and proration for all products, bundles and offers be they services, goods or content. Reusable building blocks and parametrization are used, allowing commercial catalogs to interface via APIs. This gives the flexibility to provide individual customer offers in a way that requires few products to be configured in the MATRIXX catalog. Configurable rating rules can be loaded into the catalog and made instantly available.

The MyMATRIXX GUI is an easy-to-use tool for configuring and managing the MATRIXX monetization catalog and is an HTML5 application that runs on standard web browsers, providing administrative users access to all areas of pricing and price-related configuration. Once changes are approved, they are compiled for further testing or production release.

Subscription, Recurring, Promotions

All recurring and subscription charges, including for devices and contracts, are calculated in real-time on purchase and at the start of a cycle rather than at the end. One-time charges are also generated immediately upon purchase. The charge calculation includes any promotion, discount or bonus as well as proration of initial charges and tax where required with flexible revenue recognition (advanced, deferred, linear and consumption-based).

All charges are available in real-time to all channels, enriching the value of unbilled balance information available to customers. Personal and business plans are supported on a single device.

Convergent Rating and Charging

Highly configurable, real-time charging for all services, goods and content. 3GPP-compliant, fully convergent across all offerings, customer segments (enterprise, wholesale and consumer) and payment models (prepaid, postpaid, hybrid and pay now), supporting any connected devices, including cellular, fixed and wi-fi. Discounts and taxes can be calculated during rating with a breakdown included in the event. Group shared balances and allowances are managed in real-time with groups of tens of thousands supported.

Rerating is available in real-time with MATRIXX with the advantage of the same platform handling rating and rerating. Pricing configuration errors are the most common rerating use case with others, including tariff corrections, tax rate changes and provisioning issues. Events are reprocessed in a separate, parallel set of MATRIXX instances that do not interfere with the MATRIXX real-time engine. MATRIXX generates new events which contain the reference data required to either add to, remove or replace previously generated events in downstream systems.

CUSTOMER AGILITY: Complete transparency and control

Real-Time Notifications

System and subscriber-configured notifications are supported over push, SMS, USSD and email delivery with templates for enrichment and formatting of personalized messages. Triggers can be set for promotions, spend control and regulatory compliance, with actionable information delivered via URL/meta-data.

Personalization and Group Management

A subscriber group could be an individual with multiple devices, a family, an affinity group, a small business or a large enterprise hierarchy. MATRIXX offers subscribers and subscriber groups an up-to-date and accurate view of their balances and subscriptions, with user-configurable thresholds, spend limits and notifications. “Build-your-own-plan” and dynamic sharing are out-of-the-box features.

Channel Enablement

All channels, customer engagement mobile apps or web self-care, marketplaces and other systems like CRM, order management and provisioning use REST APIs to streamline integration with MATRIXX. Access can be direct or using orchestration tools. This ensures all channels are using the same data and micro-services so that customer experience is accurate and consistent regardless of channel.

KEY PRODUCT FEATURES (continued)

FINANCIAL AGILITY: Real-time generation and visibility

Real-Time Digital Payments

A major feature of digital monetization is the ability to offer customers a choice of how and when to pay. MATRIXX can process credit card and bank debit charges in real-time or by deferred settlement and caters for ad-hoc purchases, recurring autopay, threshold-based autopay and advanced recharge. Payment retries and grace periods can be configured.

Contracts and Financing

Use finance contracts to spread the cost of expensive devices or hardware and service contracts to support commitment-based pricing, including features such as termination and late payment fees. The contract parameters for duration, initial payments, installments, offer grants, discounts and terms and conditions are configurable through a GUI and exposed to the external commercial catalog and provisioning via an API. Contracts defined within the CRM system provide the source contract definition and terms, with MATRIXX ensuring charging level adherence to those terms.

Cycle Management and Taxation

Cycle management is flexible with auto-renewal at the start of a cycle for allowances and recurring charges. Grace periods can apply. Tax can be added at the end of the cycle where tax jurisdictions require this or in real-time by rating. The breakdown of taxes associated with each charge is included in the event.

OPERATIONAL AGILITY: Cloud native, multi-G network support and standards driven

Revenue Sharing and Reporting

Wholesale and retail can be supported on a single multi-tenanted MATRIXX platform using an event-driven architecture. Charging domains can be chained together in a configurable workflow, with the outputs of one used as input to another, e.g., the retail price is used as a basis for revenue share calculation.

Fully configurable chart of accounts and transaction template definitions that use decision tables to map each transaction to correct account codes. Accounts and amounts are calculated in real-time for fully auditable events. Includes daily posting file for ERP loading.

Event Repository and Streaming

MATRIXX produces valuable events from network messages, CSR and subscriber self-care actions that can be fed in real-time to analytics or other platforms to give context to campaigns or other activities as well as for invoicing.

An ultra-low latency, flexible event streaming framework offers guaranteed delivery and multiple filterable subscriber streams that can be archived and audited. Enables real-time analytics and campaigns, fraud analysis and enterprise notifications and includes support for Kafka, Google Pub/Sub and ActiveMQ adaptors.

Monetization In-Memory Database

Holds all the required data for rating and charging in memory with no need to go to another module or system. Provides a single source of truth for all customer and partner channels. Patented, non-blocking, ultra-high performance, highly available, transactional, geo-redundant and ACID-compliant in-memory database. MATRIXX is the only solution that includes the database resulting in less required compute resources and no third-party database costs.

SECURITY

Administrative user authentication and role-based access control are used for web applications (GUI-based tools or API access). User credentials and role-based definitions can be provisioned in a centralized Identity Management system (Keycloak) that uses OAuth2.

TLS encryption is used for data protection and privacy in web-based interfaces. TLS protection is supported in network interfaces — Diameter and 5G SBA. Encryption in-use and at-rest is provided as part of infrastructure with cloud-based offerings depending on the cloud provider chosen. Examples include AWS EFS encryption (encryption at-rest) and Google Confidential Compute (encryption in-use).

MATRIXX web clients, where applicable, are fully compliant with the OWASP Top 10.

DEPLOYMENT OPTIONS

MATRIXX can be implemented in network edge, telco cloud, private and public cloud environments. It is deployed as a cloud native, containerized application, orchestrated and managed by Kubernetes. It can be delivered on bare metal or virtualized infrastructure.

See cloud native infrastructure requirements section for more details.

With 5G, continuous evolution and the introduction of new services and capabilities drive the need for increasingly flexible performance and elastic scale, making cloud native deployments the primary choice for most organizations, providing:

- **Platform Abstraction** — The ability to take advantage of the practically-infinite scale of the cloud, or to deploy within a secure private data center, the cloud native architecture benefits from the portability and ubiquity of the Kubernetes ecosystem.
- **Container-Based Deployments** — Easily orchestrated, fast start-up times and lightweight implementation, allowing high utilization of the underlying hardware.
- **Loosely-Coupled Micro-Services** — Designed from the ground up as optimally sized autonomous business functions that independently scale, are easily upgraded, ephemeral and easily replaced.
- **DevOps** — Highly automated orchestration and processes allowing for continuous development, integration and delivery.

KEY INTEGRATION POINTS

This diagram depicts MATRIXX key integration points with engagement systems, BSS and networks.

The Business API Gateway is a secure, configurable and extensible REST API gateway for northbound apps and OSS/BSS integrations with REST/XML, REST/JSON and Java APIs. Features include API routing, call aggregation, transformation and enrichment with full security. MATRIXX has a rich set of OOTB APIs, including catalog, pricing and subscriber lifecycle with data and function exposed consistently to all channels, simplifying integration.

Network Gateways and APIs connect southbound to networks and are configurable to meet vendor-specific requirements.

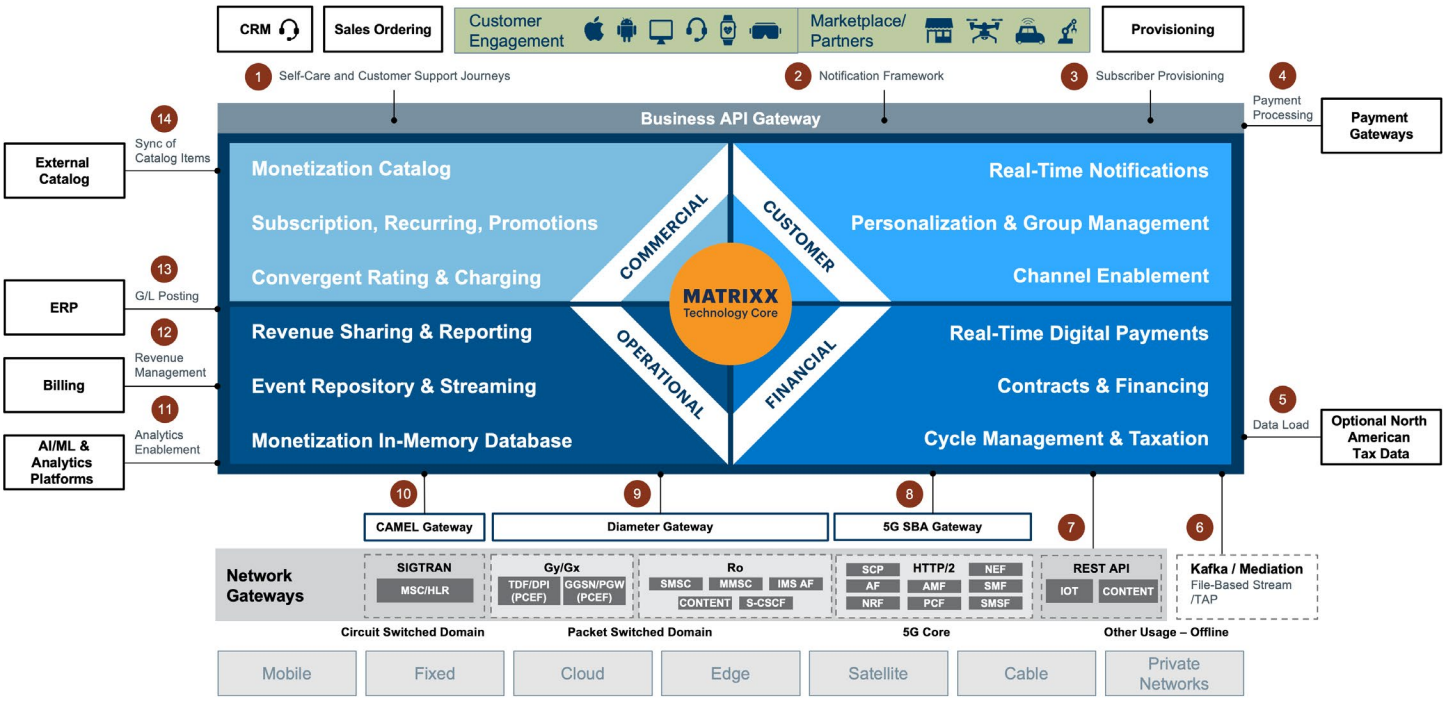
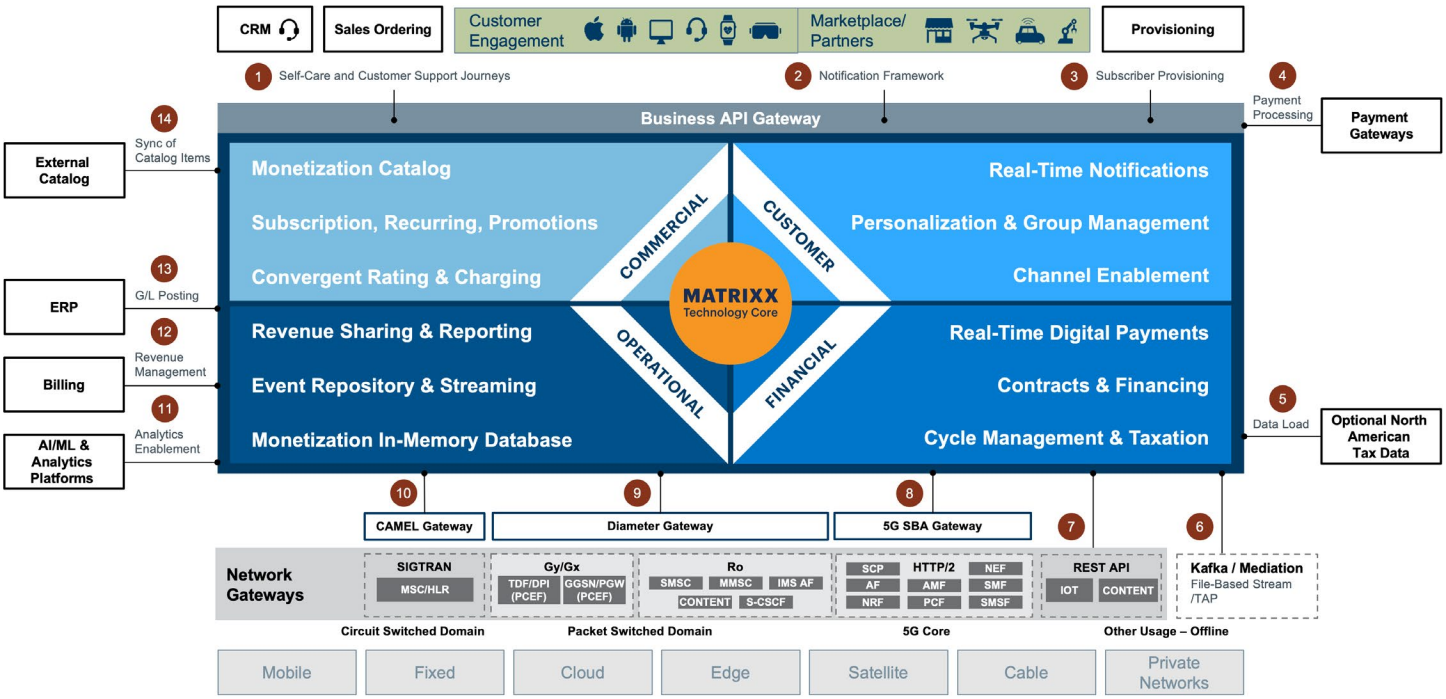


Figure 2: MATRIXX Key System Integration Points

1. **Self-Care and Customer Support Journeys** — Customers, marketplaces and partners, self-care apps, engagement systems, CRM and other customer-facing channels interact with MATRIXX using REST or Java APIs through the Business API Gateway.
2. **Notification Framework** — Notifications generated based on threshold breaches, low balance, offer purchases and lifecycle changes which may be sent via SMPP, USSD (MAP-SIGTRAN), SMTP, or published using a native JMS/XML framework.
3. **Subscriber Provisioning** — A provisioning API simplifies the integration of CRM, sales ordering, provisioning and BSS systems by performing data model translation, interface abstraction, error checking and catering for multiple integration protocols.
4. **Payment Processing** — An extendable payment framework is pre-integrated into the Barclaycard, Braintree, CyberSource, Datatrans, Foo Masterpass, mPay and RomCard payment gateway and can be adapted for other payment gateways.

KEY INTEGRATION POINTS (continued)



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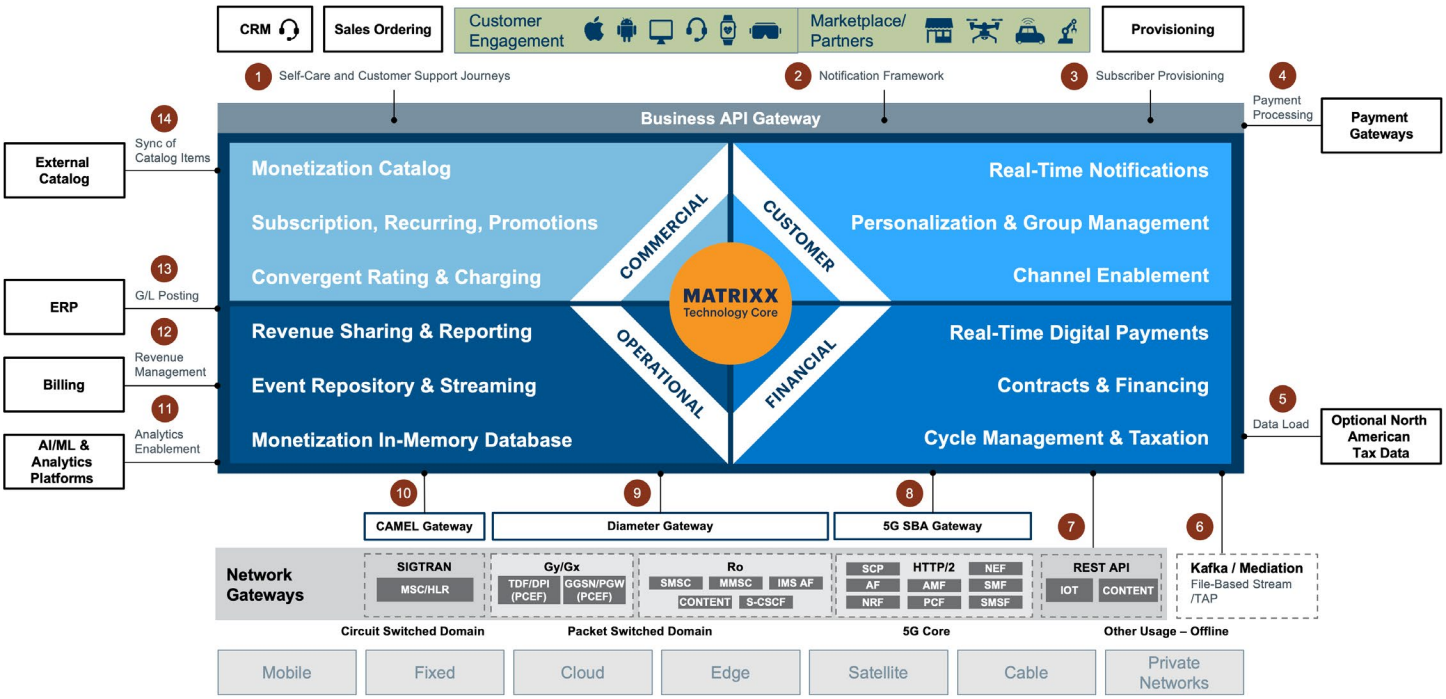
5. **Optional North American Tax Data** — Customers have the option to license and upload periodic taxation data from CCH (a MATRIXX partner) and configure it in MATRIXX to meet project needs for US jurisdictional taxation. CCH also licenses tax data for other markets (e.g., Canada and US territories) in a form that enables future MATRIXX taxation support for those markets.
6. **File-Based Stream/TAP** — Offline rating is supported by streaming offline charging events/records via Kafka integration or by converting CDRs and TAP records into Diameter Ro requests using third-party mediation. For Kafka-based integration, offline charging events/records are consumed by MATRIXX Kafka consumer micro-service which sends these events into the MATRIXX Engine for charging/rating.
7. **Non-Network Usage** — MATRIXX supports event-based charging for non-network usage via a REST API for content, IoT and other services.
8. **Configurable 5G SBA Gateway** — MATRIXX is compliant with 3GPP Release 16 specifications for Service Based Architecture (SBA), Charging Function (CHF) and Network Repository Function (NRF) interworking. MATRIXX provides Converged Charging System (CCS) functionality within a 5G core environment through the CHF, providing charging services to network functions (e.g., SMF, PCF, SMSF, AMF, NEF) with support for converged charging (over N4x reference points) and spend control (over N28 reference point). The SBA Gateway provides a flexible parameter mapping mechanism, allowing specification changes and vendor-specific parameters to be configured locally without product coding.
9. **Configurable Diameter Gateway** — MATRIXX is compliant with 3GPP Online Charging System (OCS) standards and supports real-time charging for all services, using Ro or Gy interfaces. A subset of 3GPP-compliant Policy and Charging Rules Function (PCRF) functionality is supported natively via Gx. All Diameter integration can be locally configured without coding.

KEY INTEGRATION POINTS (continued)



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10. **Configurable CAMEL Gateway** — Real-time, circuit-switched charging is supported using CAP 1, 2, 3, 4 for voice and CAP 3, 4 for SMS with MAP supported for network queries (MNP and USSD query services support).
11. **Revenue Management** — Events or aggregated events are generated for every session and interaction, and these are streamed in near real-time to external billing and revenue management systems. MATRIXX provides an event streaming micro-service with Apache Kafka or Google Pub/Sub connectors to manage and deliver event streams to external target systems.
12. **Analytics Enablement** — Events are generated for every session and interaction with subscription objects in the MATRIXX platform. This data contains a valuable source of information for further analysis and evaluation in BI, analytics platforms or with AI/ML services. MATRIXX provides a streaming micro-service with Apache Kafka or Google Pub/Sub connectors to manage and deliver event streams to external target systems.
13. **General Ledger Posting** — Event Detail Records (EDRs) are generated for all General Ledger (G/L) balance changes and all charging transactions. Each record contains detailed charge record and balance impact information, including taxation and discount breakdown and all G/L assignments. The associated G/L information for all EDRs is processed daily to provide aggregate G/L posting information that can be integrated with an ERP financial system.
14. **External Product Catalog** — The commercial catalog items can sync to the monetization catalog in MATRIXX via REST.

CLOUD NATIVE INFRASTRUCTURE REQUIREMENTS

The following minimum environment configurations are required to run MATRIXX:

- **Kubernetes Distribution** — A production-grade, fully supported Kubernetes distribution for public or private cloud such as Amazon EKS, Google GKE and Google Confidential GKE Nodes, Microsoft Azure AKS, Red Hat OpenShift Container Platform (OCP) or VMware TKG.

  MATRIXX also offers an Embedded Kubernetes option, including services and support based on Red Hat OCP, giving telcos the option of both platform and application services from a single vendor.

- **Worker Nodes** — Linux x86-based public or private cloud or bare metal worker nodes.

- **Persistent Volumes** — For local storage solutions (EBS, local SSD, etc.), a small space for host OS and container images is required. For shared storage solutions (file storage, EFS, NAS, NFS/SAN, etc.) MATRIXX is ReadWriteMany (RWX) and requires fast shared storage for transaction log files. Standard shared storage is used for archiving transaction log files, checkpoints and events.

- **Load Balancers/Ingress Controllers** — Production grade cloud platform network load balancer for non-HTTP ingress traffic (such as Diameter) along with an appropriate application load balancer or separate ingress controller and network load balancer for HTTP traffic (5G SBI — Service Based Interface and Business API transactions from IT/BSS systems).

- **Networking** — Standard Kubernetes Container Network Interface for networking. Optionally, single root I/O virtualization (SR-IOV) networking for the processing pods for improved network performance.

About MATRIXX Software

MATRIXX Software delivers a modern converged charging and digital monetization solution proven at scale. Global operators like Telefónica and Telstra, IoT providers like Tata Communications and network-as-a-service (NaaS) providers like DISH rely on the platform to overcome the limitations of traditional Business Support Systems (BSS). With MATRIXX, service providers can rapidly configure, deploy and monetize personalized, innovative offerings. Its cloud native platform delivers accurate, real-time information that improves customer engagement. MATRIXX enables commercial innovation and real-time customer experiences that drive revenue and growth opportunities across multiple markets.

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