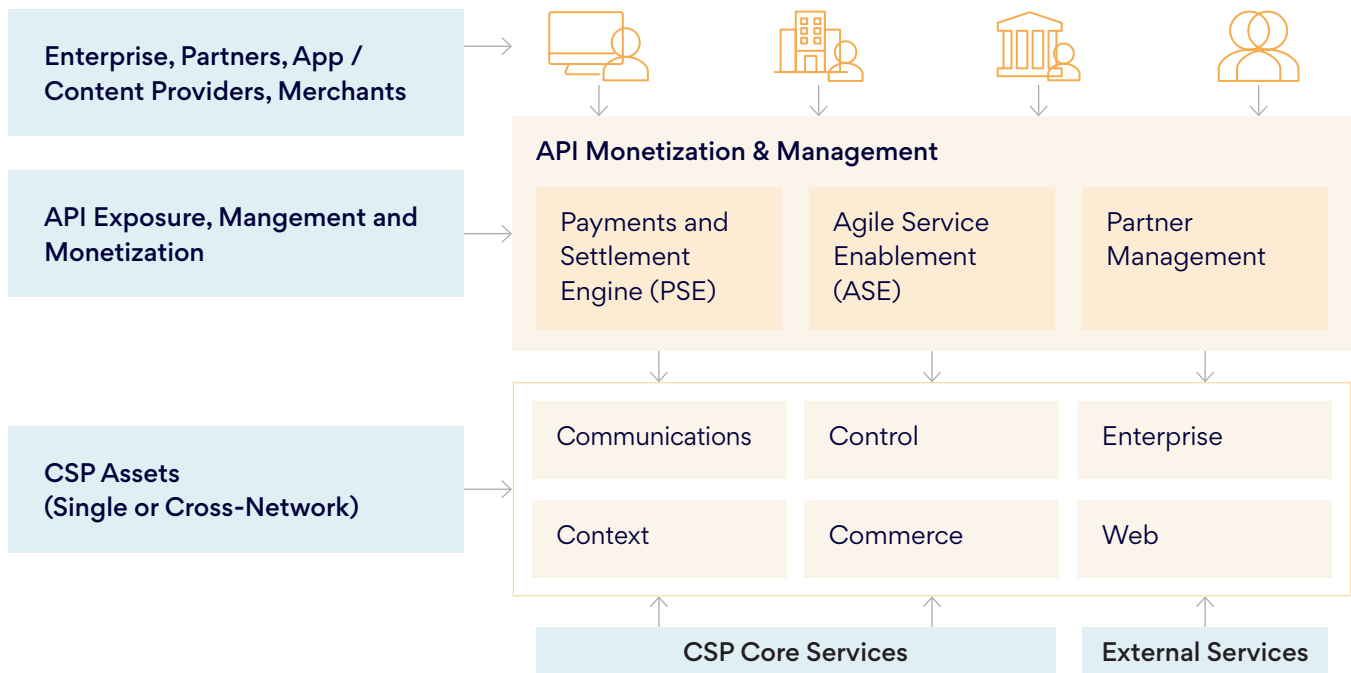**Persistent**

Datasheet

API Monetization & Management

The API Monetization & Management is a telco-grade software solution that allows communication service providers (CSPs) to expose, manage and monetize their core assets — communications, context, commerce and control — as easy-to-consume, web-based APIs. API services can be quickly created and launched, and the integral payments and settlement gateway allows API services to be monetized through a range of business models.

The solution can be deployed by network operators (mobile / fixed / cable / MSO) or cross-network cloud service providers (CSPs) enabling them to offer their Network-as-a-Service (NaaS) — to businesses, enterprise solution providers, Web / OTT players, app developers and content providers; thereby, opening up multiple new channels to market.

API Monetization & Management

Enterprise, Partners, App / Content Providers, Merchants	
API Exposure, Mangement and Monetization	Payments and Settlement Engine (PSE) · Agile Service Enablement (ASE) · Partner Management
CSP Assets (Single or Cross-Network)	Communications · Control · Enterprise · Context · Commerce · Web

CSP Core Services   External Services

The solution comprises **three** main closely-integrated software components

1\ **Agile Service Enablement** (ASE), where API services are created, exposed and controlled. APIs can be based on standards-based network services, such as GSMA OneAPI and Rich Communications Suite (RCS), the CSP's OSS/BSS "back-end" capabilities, external API services from partners or the web, or any combination of these "mashed-up" as a composite service.

2\ **Payments & Settlement Engine** (PS E), which allows the exposed API services to be monetized, as well as automating the settlement process between the CSP, its partners and external API providers.

3\ **Partner Management**, Which acts as the "front end' to the solution and manages all interactions with developers including on-boarding, provisioning and support.

The solution enables CSPs to:

\ Offer communications, context, commerce, and control features that enrich business applications using cloud-based APIs.

\ Monetize their assets in new ways.

\ Quickly and easily create, launch, and manage new API services composed from any combination of network, IT, and external assets.

\ Attract and collaborate with partners.

\ Manage end-user consent, authorization, and privacy.

\ Offer enhanced mobile cloud solutions to their customers.

1\ Agile Service Enablement

ASE can be regarded as the "core" of the solution. This is where API services are created and exposed, where access to those services is controlled, and where connectivity to — and abstraction of — the underlying CSP resources is handled.

ASE provides a set of "out-of-the box" network API services, such as SMS / MMS messaging, location, payment, voice call control, and data connection profile, which are compliant to OMA standards and for which both REST and SOAP-based versions are available. These API services are abstracted from the underlying network operator platforms via the connectivity and abstraction layer of ASE. Other network-centric API services such as those based on RCS (Rich Communications Suite) are also supported.

In addition to the supplied network API services, ASE provides the ability for CSPs to quickly and easily create custom API services and mash-ups using the GUI-based tools provided with the solution. With these tools, everything from "simple proxy" APIs through to more complex API services and mash-ups can be composed and deployed in a short space of time. CSPs can therefore expose, monetize, and manage any network, IT or asset that they own, allowing them to create a broad range of innovative, differentiated API services.

ASE can also be used to expose and manage existing CSP APIs that were previously created in another platform such as a legacy SDP, or indeed, external "public" APIs from web service providers or enterprises. In this case, ASE provides multiple routing options such that the existing API can be exposed in its original format, with ASE providing the policy enforcement and authorization functions,
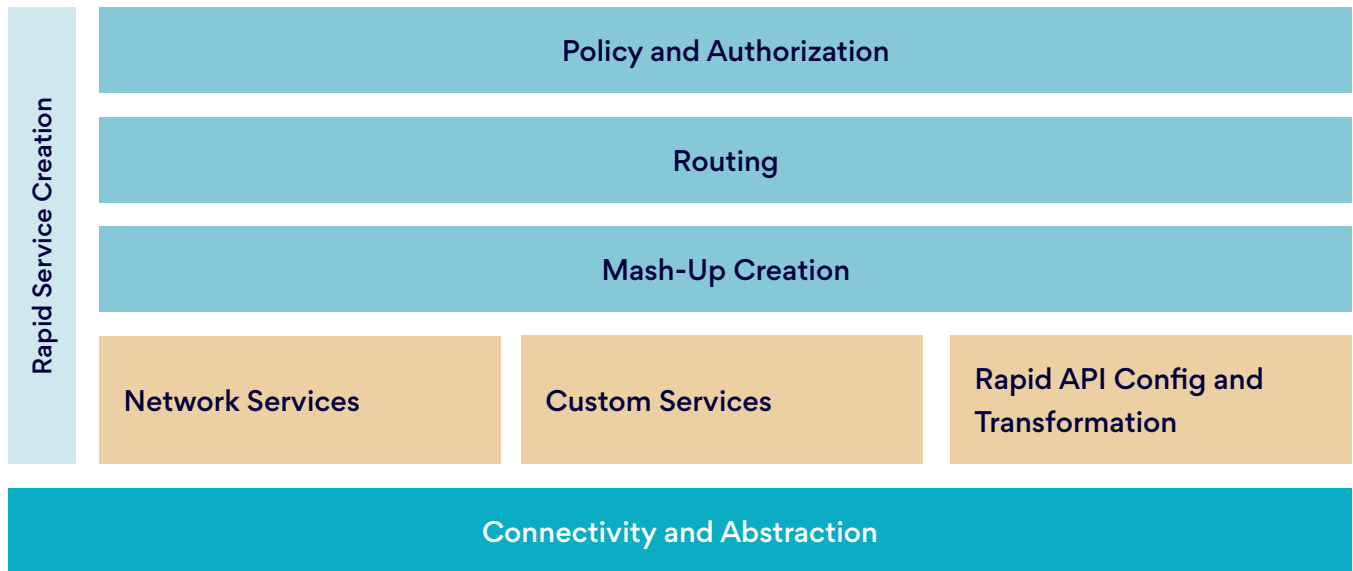
or transformed into another format as required by the CSP's partners (for example, transforming from SOAP to REST). Of course, the external API can also be mashed-up with one or more of the supplied or custom APIs to create a new, composite API.

ASE therefore provides investment protection for the CSP that has existing APIs that would be cost-prohibitive to change at source but require modification (for example, upgrading to a newer version) and additional access controls (i.e. policy and authorization).

Because of the close coupling of ASE, PSE, and Partner Management, all APIs exposed through the platform can be configured to generate real-time settlement events each time a partner application calls the API, according to that partner/application's service level agreement defined within Partner Management. This allows the CSP to monetize the use of its API in multiple ways, which can vary between partners / applications if desired. Therefore, providing the CSP with the ability to create API services, they can also create business models that can be tailored to different types of partner application.

ASE implements a comprehensive policy and security framework, allowing CSPs expose their key assets without compromising network defenses. Various policy controls are defined and enforced on a per partner/application basis ensuring granular control of different user types. The system offers features such as privacy management, subscriber identity management, etc., and also allows integration with external Policy Decision Points (PDPs) or Policy Enforcement Points (PEPs).

Agile Service Enablement

<div>

Rapid Service Creation

Policy and Authorization

Routing

Mash-Up Creation

Network Services	Custom Services	Rapid API Config and Transformation

Connectivity and Abstraction

</div>

Key Features and Benefits

\ Fast, flexible and easy creation of API services and mash-ups, by configuration rather than programming.

\ Broad policy and authorization framework for both internal and external APIs.

\ Investment protection for existing CSP APIs.

\ Real-time settlement event generation, allowing flexible monetization for API usage.

\ Comprehensive connectivity and abstraction layer, with pre-integrated adaptors towards multiple network operator platforms (Voice Switches, SMSCs, MMSCs, location platforms, billing systems) from all the major network equipment vendors.

Supplied Network API Services

Third-Party Call	Payment	Short Messaging
Multimedia Messaging	Terminal Status	Terminal Location
Address List Management	WAP Push	Announcements
Advice of Privacy	Data Connection / QoS	

2\ Payments and Settlement Engine

PSE enables CSPs to securely allow partners, such as application developers, content providers, and merchants, to bill the service provider's customers; thereby, allowing them to offer a Direct-to-Bill (D2B) service to partners, as well as the ability for partners to upsell additional features and content through in-application billing.

PSE also allows CSPs to charge partners for the use of network capabilities exposed via ASE. The settlement element manages the complex revenue sharing arrangements across the various parties involved in the end-to-end payment and network enabler transactions, providing detailed information required to settle payables and receivables with all parties.

Payments and settlement are two interworking elements, both of which can be deployed independently.
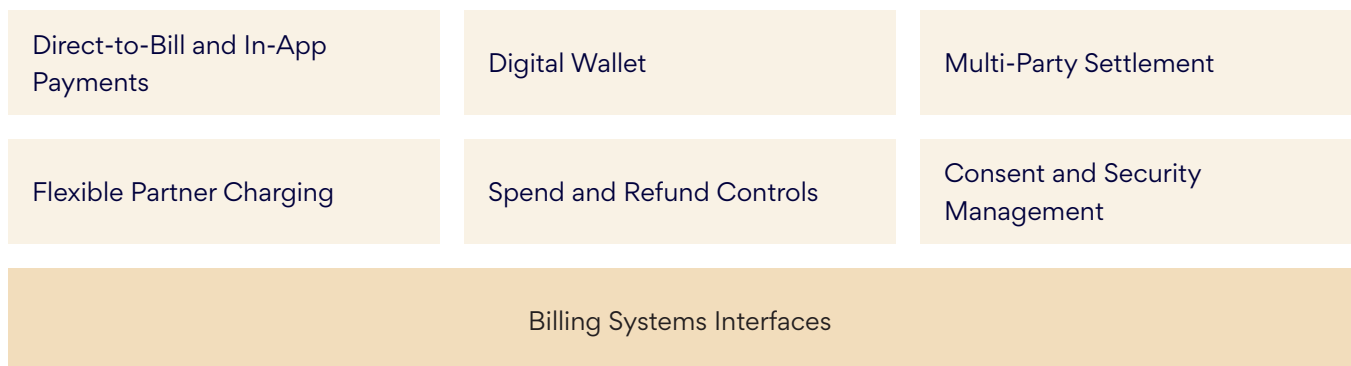
The payments API enables application developers and merchants to charge subscribers of the operator for their services and to receive appropriate settlement. For both components there are associated third-party care, customer care, and self care functions.

Subscribers are charged through their service provider's existing charging instruments, such as post-paid bills or pre-paid accounts. The settlement component provides the necessary data for the business systems to settle automatically with the partners, whether paying partners for BoBo transactions, or charging them for network API usage.

PSE also includes a built-in stored value account, which provides an alternative payment source to the operator bill and which can be reloaded from a wide variety of payment accounts including credit card, PayPal, and the operator's bill. This feature allows PSE to be used as a back-end transaction engine supporting, for example, a mobile wallet service being rolled out by a CSP.

PSE comes with easy to use administrative and management interfaces. The administrative interface offers the CSP various choices on configuring the platform whilst the management interface comes with a host of features to manage customers, review partner transactions, setup user roles, define email templates, and report formats. Depending on the CSP requirements, reports can be generated in, xml, csv, and pdf formats and the frequency of generation configured. All reports generated are made available via the Partner Management portal.

Payments and Settlement Engine

Direct-to-Bill and In-App Payments	Digital Wallet	Multi-Party Settlement
Flexible Partner Charging	Spend and Refund Controls	Consent and Security Management

Billing Systems Interfaces

Key Features and Benefits

\ Support for multiple payment models including one-off payments and subscriptions.

\ Support for in-application billing.

\ Consent Management / Advice of Charge (AoC) support, ensuring user consent to process a payment request has been received. AoC is available over SMS, WAP and web channels.

\ Dispute and refund handling, with full traceability on all transactions flowing through the system, including AoC history.

\ Full set of payment APIs; for example, authorize payment confirm payment, cancel payment, refund payment.

\ Flexible handling of issues such as taxation and multiple currencies.

\ Digital wallet / stored value element, supporting both real and virtual currencies. Digital wallet can be used as payment instrument for both content / application charging and network usage, and can form the basis of a network operator's mobile wallet offering.

\ Automated multi-party settlement, including modelling of contracts between commercial entities and real-time processing of settlement events.

\ Integration with various external payment instruments including pre- and post-paid billing systems.

3\ Partner Management

The Partner Management component within the solution provides portal capabilities for partner sign-up and management, associating settlement contracts, application provisioning and management, API management, reporting and analytics, defining application service contracts and a host of, partner self care features. Partner Management automates the process of partner onboarding, reducing the cost and time taken to interface with external partners.

For many CSPs the sign-up, creation, maintenance and configuration of new partners as well as their services are mainly manual and resource intensive processes. This causes problems with regard to timeliness, accuracy and coordination of the data required for the various service and back-end systems.

The goal of Partner Management is to reduce both management and integration effort for the CSP and partner alike. Partner Management provides the ability

to maintain all partner data in a single place, yet let it be shared with other systems to ensure smooth and correct functioning of the end-to-end delivery and charging of applications. This happens as part of a well defined business process and can include email based notification of relevant parties and system administrators or, in a more complex scenario, include direct API integration for automatic provisioning of external systems.

Partner Management provides advanced analytics and reporting, with restrictions applied on reports visibility based on user permissions. The Partner Portal also offers a range of developer material including standard specifications, code snippets and helpful guides to get them started quickly. Blogs and forums are an integral part of the platform and helps exchange ideas, ask questions and to build a developer community in the platform.

Partner and Service Management

The solution's Partner Portal (the Portal) is a comprehensive partner management system built on open standards, leveraging industry best practices. One of the main functions of the Portal is to simplify management and automate business processes between the CSP and a potentially large number of partners. Within the partner management framework, partners are organized into a hierarchical tree structure that enables easy management and delegation of rights for both the CSP and partners within their own organizations.

Partner applications can be registered within a few clicks. The partner can choose the required services via the service contracts at the point of application registration. Service contracts have a number of policies defined which when chosen will be attached to the application, and subsequently enforced by the ASE component of the solution.

Partner Management offers a fully automated environment for partner, developer and application onboarding, encouraging and increasing the success of applications being deployed on the platform.

Easy Integration with Existing CSP Portals

The Partner Management portal can be "skinned" with the CSP's branding, or easily integrated with an existing CSP portal using the supplied Portal APIs.
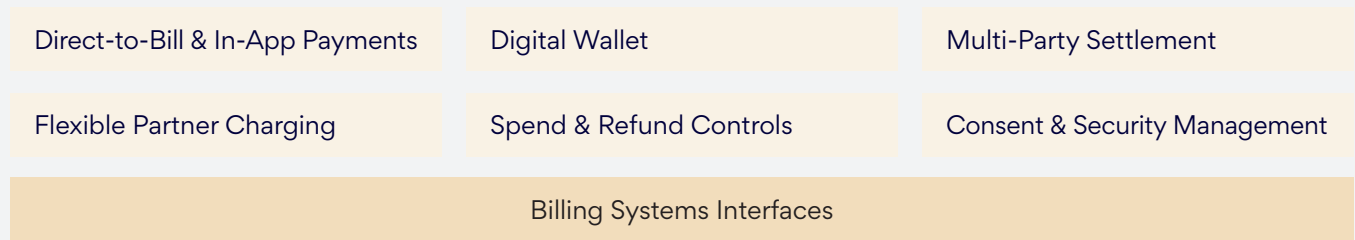
Partner Management

Partner Portal and Onboarding	Settlement and Service Contracts	Reporting and Analytics
API Management	Developer Tools and Resources	Platform Admin Portal

External Portal Interfaces

Key Features and Benefits
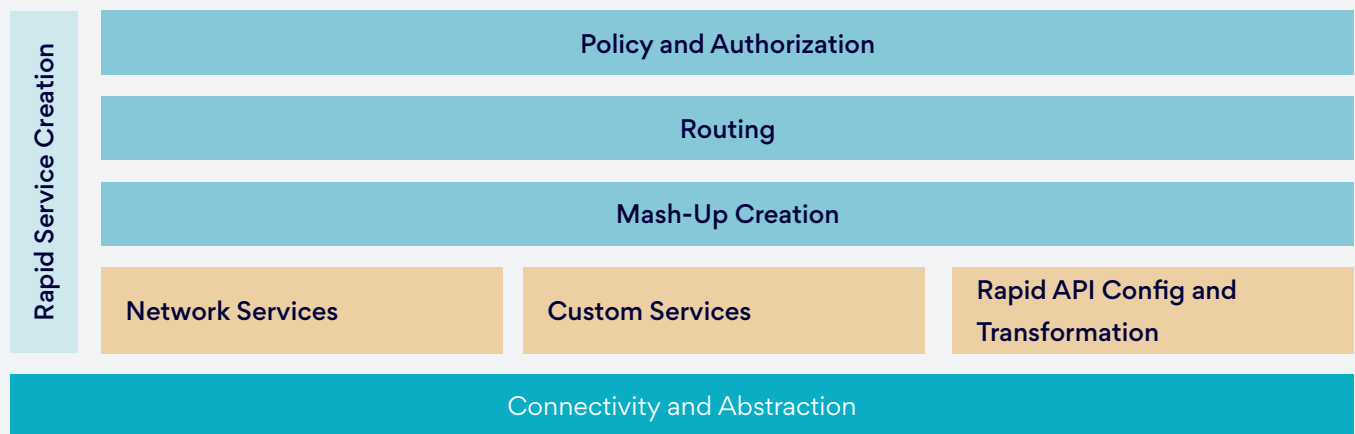
Portal functionality grouped under 5 main areas:

\ Management perspective

\ Partner perspective

\ Developer support

\ Reporting and Analytics

\ Dashboard

\ Partner self care, allowing "low touch" partner engagement.

\ Business process automation, supporting on-boarding process design, execution and monitoring.

\ Policy management: service contract definition and management, creation of templates for pre-defined partner and application profiles, control of access to network resources.

\ Web 2.0-style developer community support including blogs, forums and content.

\ Advanced reporting and analytics, providing a large variety of online and offline reports.

\ Application management

\ APIs for integration into existing CSP portal.

API Monetization & Management

Payments and Settlement Engine

Direct-to-Bill & In-App Payments	Digital Wallet	Multi-Party Settlement
Flexible Partner Charging	Spend & Refund Controls	Consent & Security Management

Billing Systems Interfaces

Agile Service Enablement

Rapid Service Creation

Policy and Authorization

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Network Services	Custom Services	Rapid API Config and Transformation

Connectivity and Abstraction

Partner Management

Partner Portal and Onboarding	Settlement and Service Contracts	Reporting and Analytics
API Management	Developer Tools and Resources	Platform Admin Portal

External Portal Interfaces

CSP

Communications	**Commerce**	**Context**	**Control**
Voice	Payments	Location	QOS
Messaging	Refunds	Presence	Policy
Multimedia	Identity	Profile	Data Communication
Conference	Settlement	Device Type	Security & Trust

Close coupling of functions such as API exposure, policy enforcement, event charging, and revenue management provides for a high-performance Network-as-a-Service (NaaS) solution that can be rapidly integrated and launched, dramatically reducing time-to-market compared with custom-built, IT-led solutions assembled from disparate software modules.

The solution offers extensive, field-proven connectivity to a wide variety of underlying network platforms from all of the major network equipment providers, spanning both circuit-based (SS7) and IP-based (SIP) technologies, and to different backend post and pre-paid billing systems.

In addition to supporting standard network services such as call control, payment, messaging, and location out-of-the-box, the solution allows new services to be created quickly and easily, by configuration rather than programming. This allows CSPs to create new, differentiated services, composed either from their own resources and assests (such as specific network or IT capabilities that they wish to expose), or by combining / mashing-up their own APIs together with those from other CSPs.

As a complete commercial solution for NaaS, the solution provides solutions in both single network operator and cross-operator (cloud provider) environments. The solution includes essential functionality for a commercial NaaS service, such as:

Full Direct-to-Bill (D2B) solution for apps and content; cross-operator billing integration	Advanced reporting and repudiation management; refund support
In-application billing support	Subscriber self-care
Subscriber authorization and anonymization	Advanced policy management
Support for multiple partner charging models	APIs into existing CSP portals
Automated multi-party settlement	Agile services creation and enablement for flexibility
Centralized consent management (privacy management, advice of charge, etc)	Automated on-boarding and lifecycle management
Automated API routing across network operators (for cloud deployment models), allowing "any user, any network" access to customers	Developer portal with full web 2.0 environment; developer self-care

Key Business Benefits

For Network Operators

With the solution, network operators can re-establish themselves in the application value chain by partnering, rather than competing, with "Over the Top" providers of applications and services, through implementing Network-as-a-Service.

With the solution, operators can quickly and easily create and monetize differentiated APIs and mashups, attract many types of partner with innovative services and business models, and onboard partners rapidly and at low cost.

Multi-service operators that offer mobile, broadband / cable, and IPTV services can use the solution to enable converged services that exploit the synergies offered by their broad portfolio of network assets and resources.

For Cross Network Providers

The solution enables cross-network service providers to develop value-added, industry-targeted B2B solutions that combine network / mobile capabilities and intelligence with their existing portfolio of on-demand cloud-based services.

The solution brings cross-network intelligence, communications and monetization to the cloud, allowing service providers to significantly enhance their customer value proposition and provide "any user, any network" access to its customers.

For Enterprises

NaaS enables enterprises and other organizations to improve customer service, increase employee collaboration, enhance business processes and drive productivity gains. By providing streamlined, on-demand access to network intelligence and communications, NaaS adds network value to a wide variety of business solutions such as field force automation, mobile-enabled business processes, customer relationship management and employee collaboration.

For Web & Mobile Application Developers

NaaS empowers web and mobile application developers to differentiate their apps with network features and allows them to reach and bill their maximum potential customer base.

NaaS makes it easy for developers to enrich their apps with valuable network capabilities and intelligence and provides a new direct-to-bill monetization channel for their applications. NaaS helps developers increase sales conversion rates, reduce time to revenue, and realize a low-friction, up-sell path through in-application billing.

Technical Data

The relationship between the three main components of the solution can be summarized as follows: application and services developed by partners access CSP network and billing capabilities via APIs provided by agile service enablement, are managed by the partner management engine, and are monetized by the payments and settlement gateway.

Web Services APIs

SOAP Web Services	ETSI / 3GPP Parlay X; v2.2 SMS, MMS, Third Party Call, Call Notification Call Direction, Terminal Status, Terminal Location Address List Management
	GSMA, OneAPI (1.0), OMA PXProf (1.0) (Profile based on Parlay X v 3.0) SMS, MMS, Terminal Location, Payment
	API Monetization & Management Proprietary WAP Push, Subscriber Profile, Advanced Payment
REST Web Services	GSMA, OneAPI (1.0), OMA ParlayREST (1.0) (Profile based on GSMA OneAPI v 1.0) SMS, MMS, Location, Payment
	GSMA, OneAPI (2.0), OMA RESTNetAPI (2.0) (Profile based on GSMA OneAPI v 2.0) SMS, MMS, Location, Payment, VoiceCall Control, Data Connection Device Capability OneAPI 2.0 support inconjunction with OAuth 2.0
	API Monetization & Management Proprietary WAP Push, Subscriber Profile, Advice of Privacy Click-2-Call, Sandbox (text config)

Network Integration

ETSI INAP CS1, CAP Phase 4, Ericsson INAP CS1+, SIP 3GPP ISC
ETSI MAP Phase 2+, 3GPP MAP
SMPP, UCP, WAP Push Access Protocol, WAP Service Indication, WAP Service Load,
MM7, OMA Mobile Location Protocol, XMPP
HTTP interfaces (SOAP, XML, REST, etc).

OSS / BSS Integration

SNMP, JMX
LDAP, Diameter, Radius

Business Process Automation

Dynamic business process management (BPM) and service orchestration.

Carrier Grade Architecture Very High Availability

The solution employs a number of techniques to offer hardware resilience to the customer for each component. Typically, high availability is catered for by providing a combination of active-active and active-standby components that ensure there is no single point of failure within the solution's framework.

Each functional component is deployed on a minimum of two servers to ensure continuous service availability. Component redundancy within each server protects against both power problems and component failure. Network capability resilience is ensured using multipathing technology, dual ethernet cards and switches, etc. Data integrity it maintained with disk mirroring for internal storage and dual arrays or a SAN for external storage. Software clustering technology complements the hardware strategy to protect data.

For all components, the minimum setup for each would be a two server active-active logical cluster with load balancing. Each logical cluster should be sized to have the capacity to ensure that a single server can handle the projected traffic for that component.

Scalability

The solution is designed to provide the capability for both horizontal and vertical scalability from just a few to many thousands of transactions per second.

N+1 deployments allow simple linear scaling of capacity and allow flexible resource sharing.

The solution services can be replicated across as many machines as needed to accommodate heavy load and scaled across multiple hardware platforms.

About Persistent

We are a trusted Digital Engineering and Enterprise Modernization partner, combining deep technical expertise and industry experience to help our clients anticipate what's next. Our offerings and proven solutions create a unique competitive advantage for our clients by giving them the power to see beyond and rise above. We work with many industry-leading organizations world-wide including 14 of the 30 most innovative US companies, 80% of the largest banks in the US and India, and numerous innovators across the healthcare ecosystem. Our company fosters a values-driven and people-centric work environment. Our strength of over 22,500+ employees is spread over 18 different countries across the globe.

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