

AGORA™: A FULL SCOPE IPAAS CLOUD-NATIVE PLATFORM AND API SUITE FOR DIGITAL CUSTOMER ENGAGEMENT

Contents

1. Principals of Incorporation into a Strategic Digital Architecture
2. Description of the Agora Headless Platform
3. Carrier Grade nonfunctional Capability
4. System Architecture
5. Technical Architecture
6. Platform Components
7. Conclusions

A DIGITAL SERVICE PROVIDER SOLUTION ACCELERATOR

Principals of incorporation into a Strategic Digital Architecture

Service providers are developing strategic digital architectures to enable the construction and deployment of world class digital customer experience and e-commerce capabilities.

These architectures often look for best in class software components from various suppliers to be configured, integrated, and deployed as quickly and efficiently as possible.

AwareX is offering as a component of digital architecture's its Agora™ Headless Platform to reduce risk, time to market, back end integration efforts and allow rapid production and integration of digital clients by the service provider and its partners for new client functionality.

The Agora Headless platform uses fully documented north and south bound API's, to enable **REAL TIME** enablement and reuse by service providers of the full set of over 100 out of the box existing Intent based API integrations as well as facilitating rapid new integrations to any back end enterprise systems.

Agora is based upon AwareX strong positive experience with the deployment of its microservices Integration Platform globally. A native cloud based highly available, strong SLA, secure, scalable platform which integrates the data from multiple back end systems (largely BSS) and enables its use by end customers via a wide range of digital channels. You can consider it as a mediation device which provides a single source of data via Intent based API's for multiple front ends from a diverse set of back end systems. Digital clients will be able to consume the published API's and data definitions for use in a Common Digital Experience Layer of a service providers architecture.

The Agora Headless Platforms as part of a strategic digital architecture enables the following key functions: -

- Creation of independent customer journeys on a per 'service type' basis

- Provides 1000's of customer 'Intents' based upon over 100 OOTB API's.
- Integration of multiple disparate sources of data
- Combination and logic processing of data to produce customer meaningful information
- Free choice of supplier for digital client creation
- A defined and documented API environment, facilitating clearly defined architectural separation
- An integrated test harness, to help developers be highly efficient
- Support for a suite of CSP developed Omni Client digital front ends from a single cloud data source with dependability and reliability
- Compliance to the TMF ODA architectural standards

In accordance with the TMF Open Digital Architecture (ODA) strategic Digital Architecture the Platform allows the separation as components via API's of the back-end system of record BSS, the integration and combination of data to meet end customer needs, the presentation of the data through an omni client approach.

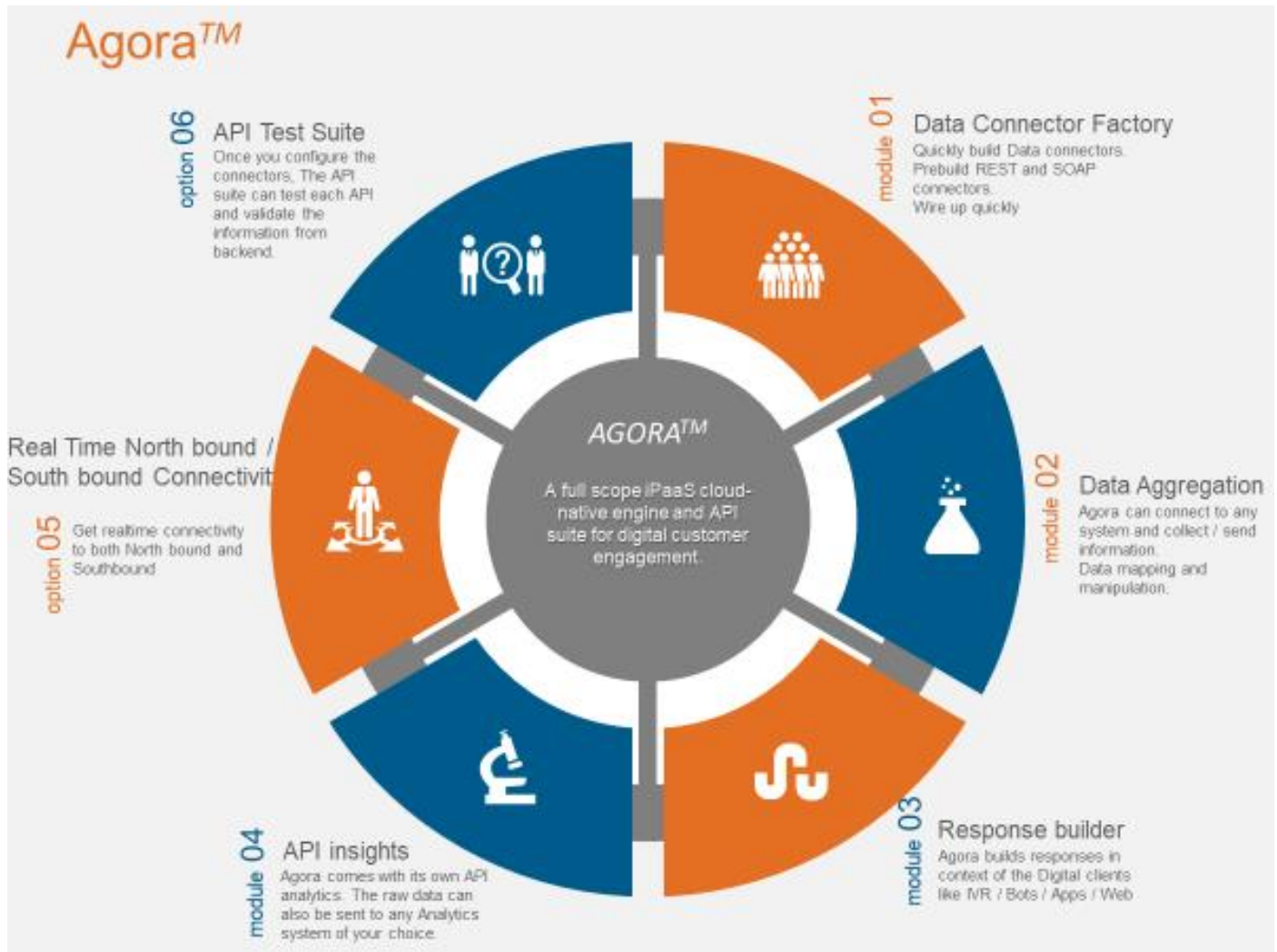
The autonomous, stateless, headless platform can scale horizontally without impacting the performance of legacy or new BSS, supports individual customer journeys which can be added to support a full range of service types in an agile and resilient manner.

The AwareX Agora platform has been built to align and comply with the TMF ODA standard architecture.

Description of the Agora Headless Platform

The Agora platform provides a fundamental part of a digital enablement and Integration Layer.

It will integrate and enable services to run in other components of the architecture and allow construction through use of 'Intents' of multiple front-end digital clients which will consume the Headless Platforms API's. The Agora platform will convert customers intents via API's into required data in a context aware fashion relevant to each customer journey and digital client type.



The headless platform technology is primarily Node JavaScript, Java and REST JSON for the connection between the platform and the client devices, facilitating enhanced architectural flexibility. The Platform uses Kabana, Elastic Search and Logstash for ease of system monitoring and control.

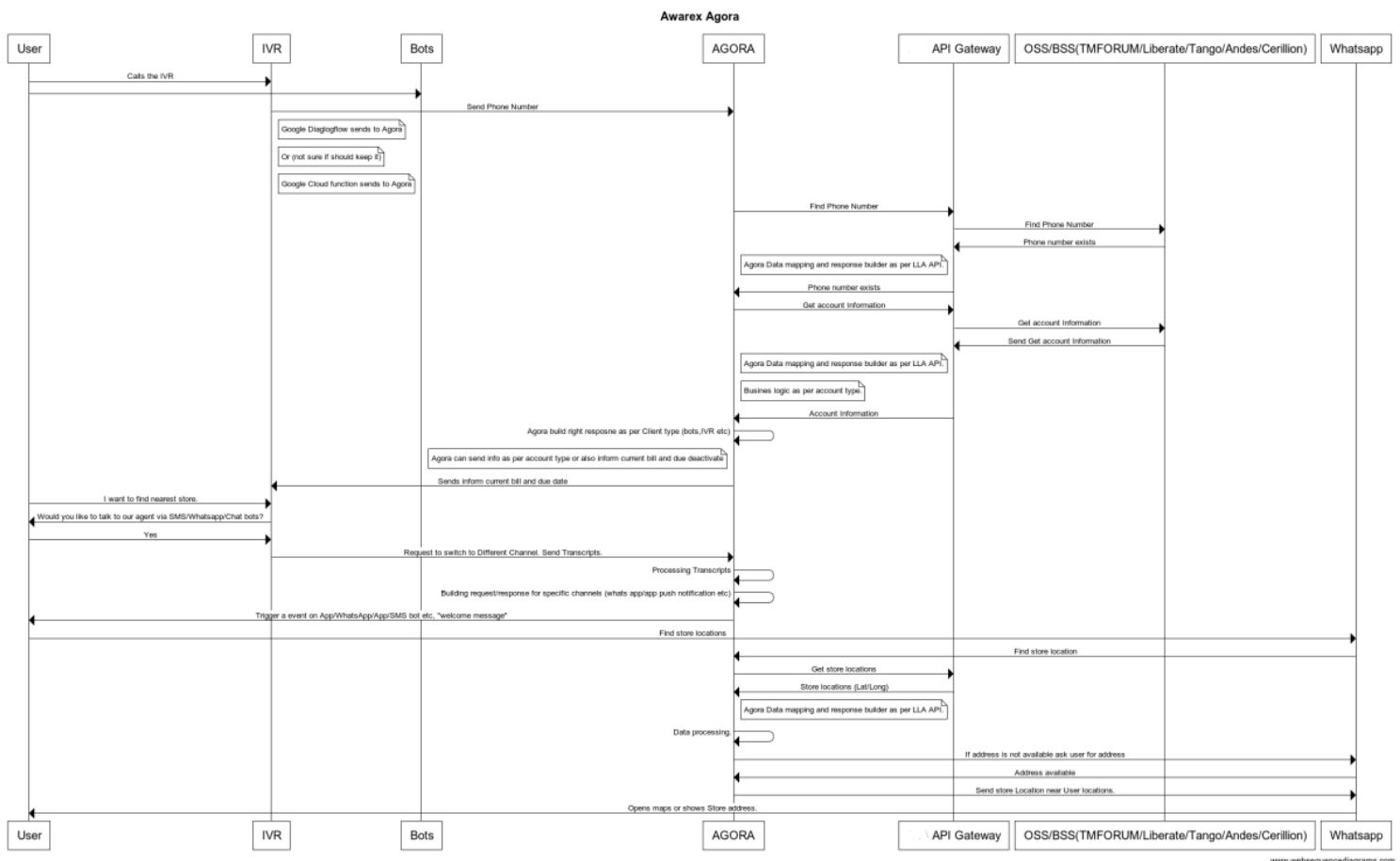
The platform in adhering to the TMF ODA standards is component based with 6 modules as shown above and in total is comprised of the following primary components: -

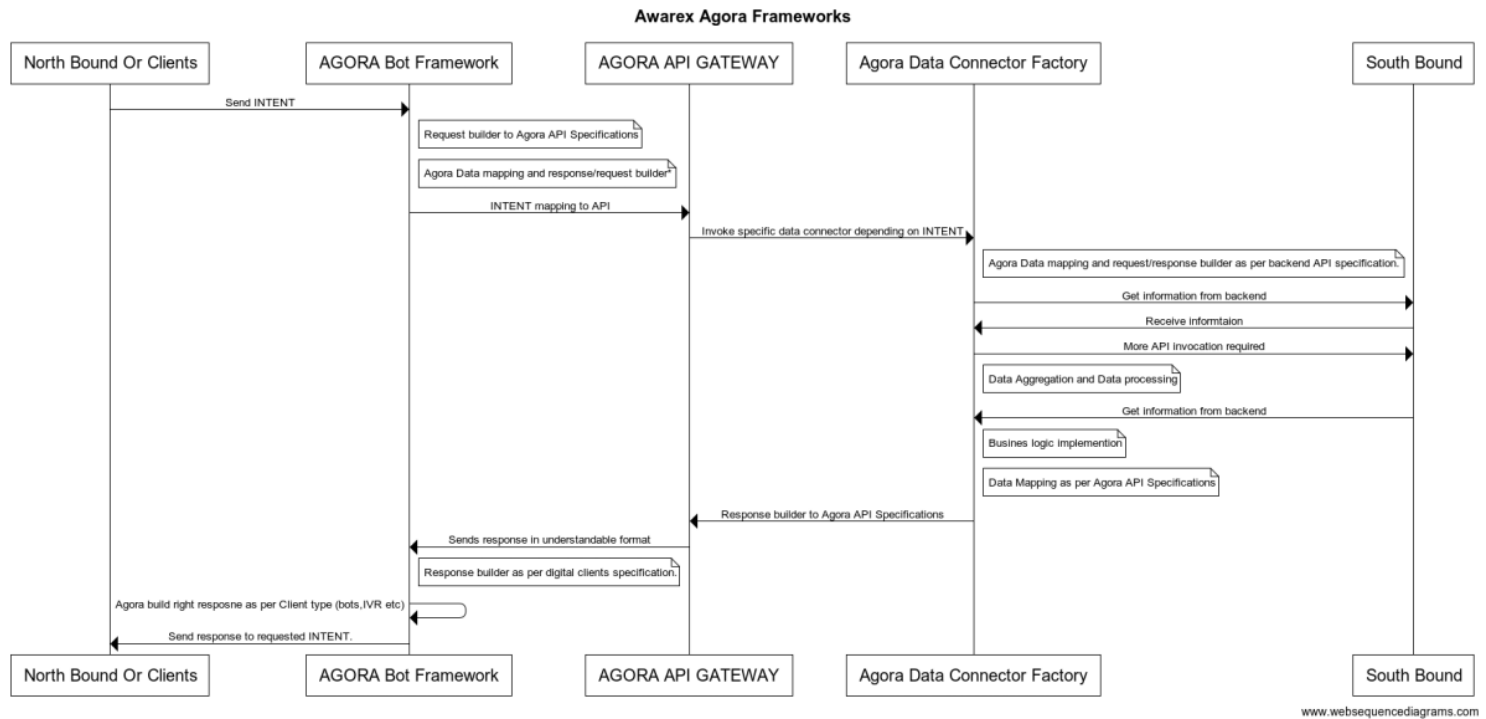
- **Microservices Integration**
 - API – Common RESTful, SOAP, RSA
 - Data Plug-ins including Logic Processing
 - Hypertext protocol secure HTTPS security manager
 - Parallel data loader
 - Support for Customer 'Intents'
 - API test manager Suite, for rapid development and test cycles

- Super secure authentication manager
- Omni-Client Adapters, Model View Controller/Translator
 - Bot Server including support for intents
- AWS simple message system integration
- Audit log manager
- Monitoring and Operations
 - SLA Management
 - Dashboard, Operational data visualization
 - Ticket Management
 - Events log and Audit, Search and analytics engine
 - Server-side data processing pipeline for simultaneous multi source data ingestion

Process and Workflows

Agora is designed to be integrated into Customer Journeys or process workflows that facilitate delivering the right data at the right time to digital clients from back end legacy systems which act as the data systems of record.





Carrier Grade Non-Functional Capability

The Agora headless integration platform is delivered from the Cloud and is architected to provide required ‘Carrier Grade’ nonfunctional Capabilities: -

- High Availability
 - The platform is architected as an Active/Active multiple server configuration as standard with load balancing to ensure no single point of failure. Multiple AWS Cloud service zones are utilized by separate servers for added resilience.
- Graceful degradation
 - The platform architecture ensures that at worst the services exposed to the digital clients suffers graceful degradation rather than failure. The monitoring tools actively report user response times as well as system status.
- SLA
 - AwareX supports a 99.99% service availability SLA as standard, this can be increased to 99.999% through the use of multiple resilient Metro area Active/Active Clouds.
- Scalability
 - The system is designed as a native cloud platform and supports elastic horizontal scaling. Our current busy hour record is 22,000 TPM, 2,450 TPS, the CPU busy minute utilization peaked at only 53%, with a modal end customer round journey response time in the range 500 to 600 milliseconds.
- Security

- Taking advantage of the fundamental security of AWS plus our partnership with Verisign and NCC, secure by design, we use encrypted SSL over HTTPs for encrypted data transfers. We are currently certified as A+ rated security level by SSL labs. In addition, we also use code scanning and active monitoring.
- AwareX proprietary security includes enhanced authentication to stop any distributed denial of service attack. We internally authenticate to RS204, the highest available encryption standard using Tokens for any device requests only allowing genuine end users to access the platform service thus stopping completely any possible distributed denial of service attacks.
- **Manageability**
 - Suite of operational monitoring tools allow the operations team to deliver service availability 24*7*365. Service providers can make use of an operational dashboard showing the system and operational KPI's in real time, receive alerts via e-mail or integrated to their own Trouble Ticketing systems. In addition AwareX provides a support portal for all interaction needs.
- **Changeable**
 - The Platform can be updated with new features and functions in many cases without removing it from service for planned maintenance, on the fly upgrades of the digital clients are supported by the platform.
- **Digital clients**
 - The Platform provides a common API to enable the use of unlimited and variable device clients. There is no restriction on device type, Operating System, or OS version.
- **ESCROW**
 - Service assurance under all circumstances is facilitated by the awareX partnership with NCC for our innovative Cloud credential Escrow. This ensures whatever happens your service to the digital clients will always be available.

System Architecture

The digital systems architecture of how the Agora headless Integration Platform fits into a total digital Stack is shown below.

When integrating to the legacy environments there are two fundamental classes of back end integrations: -

- **BSS or Business Support Systems** – A class of high transaction processing and data base systems used by service providers to manage their business.
- **Enterprise Systems** – Commercial systems used for general purposes by a wide range of businesses, for example warehousing, ERP, inventory, and expense management. They can also include systems such as Next Best Offer, Micro-Loans and Loyalty systems.

There are six supported service types: -

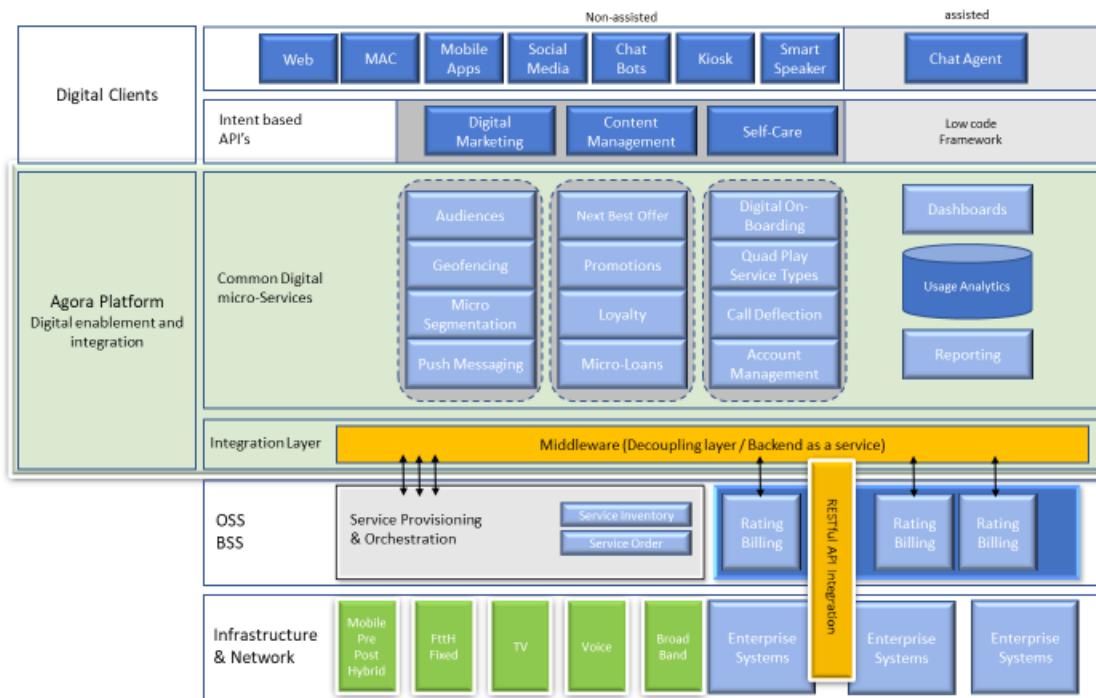
- **Mobile Pre-Paid**
- **Mobile Post-Paid**
- **Mobile Hybrid**
- **Fixed Line**
- **Internet**
- **Cable TV / VOD**

The Agora headless platform will support unlimited digital clients as they are developed and added to the overall system. A single Intent based API developed for one type of digital client will support all other types of digital client allowing for much faster roll out and support of multiple client types.

- Progressive Web Apps
- Native Smartphone Apps (iOS, Android, Harmony)
- KaiOS OS Web and/or native Apps
- Web Portal (Responsive)
- Mac native app
- Bots (Google)
- Smart Voice Clients (Amazon Alexa)
- Kiosks
- IVR
- Social Media integrations, (Facebook Messenger, What's App)
- Agent screen support
- Partner Integrations

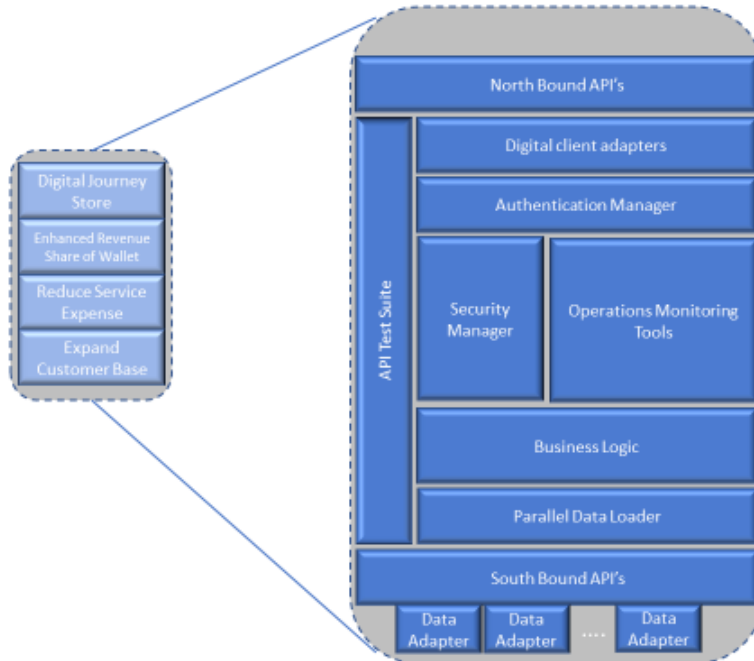
The diagram below shows the Agora headless platform components (in the green shaded area) and how it can be deployed as part of an overall digital architecture.

The awareX Agora platform is a source of Common Digital Services and resides in the Common digital enablement and integration layer of strategic digital architectures. It facilitates the delivery of services to the Common digital experience layer and each of its digital client components.



Technical Architecture

The diagram below shows the platform technical architecture.



Selected Agora Platform Components: -

API Documentation for Agora headless services

The platform provides a full set of API documentation via an online service. There are currently 98 API's available and 332 Data Definitions in the documentation. Service Providers and their partners can access the API's online and develop data connectors to consume the API's in just 3 lines of code. Examples of the online service screens are shown below.

Table of Contents

- 1. Overview
 - 1.1. Version information
 - 1.2. Contact information
 - 1.3. License information
- 2. Purpose
 - 2.1. Goal
 - 2.2. Challenges
- 3. Resources
 - 3.1. Account-hierarchy-controller
 - 3.2. Activates-push-notifications-for-user
 - 3.3. Add-new-shared-usage-member
 - 3.4. Addondetails
 - 3.5. Addons
 - 3.6. App-launch
 - 3.7. Authentication
 - 3.8. Authentication-via-sms
 - 3.9. Available-packages-for-loyalty-points-redemption
 - 3.10. Balance-transfer
 - 3.11. Balances
 - 3.12. Balances-and-topup-history
 - 3.13. Bill-delivery-method
 - 3.14. Bill-download
 - 3.15. Bill-history
 - 3.16. Bill-itemized-summary
 - 3.17. Bill-payment
 - 3.18. Bill-summary
 - 3.19. Billing-address
 - 3.20. Call-center-config
 - 3.21. Call-me
 - 3.22. Cancel-subscriptions
 - 3.23. Captcha
 - 3.24. Change-password
 - 3.25. Channel-lineup
 - 3.26. Cms-data
 - 3.27. Complaints-and-suggestions
 - 3.28. Credit-me
 - 3.29. Device-lookup

Awarex Integration Platform API Documentation

1. Overview

This documentation describes the client-integration platform API provided by Awarex's Integration Platform. This API is stateless and is implemented over HTTPS.

1.1. Version information

Version: 7.1.0.RELEASE

1.2. Contact information

Contact: integrationplatform@awarex.com

1.3. License information

License: This API is private and confidential property of AwareX. No other use is authorized. This API and its documentation are subject to change without notice. License URL: <https://www.awarex.com>

2. Purpose

2.1. Goal

Mobile operators do not follow any standards in the APIs they provide, when they even provide an API. The goal of MobileAware's Unified product suite as a whole is to have a single-source mobile app per mobile platform/OS that can communicate with these diverse backend systems. Integration Platform is responsible for mediating between the native apps and the various backends. UMW provides a common API that insulates the native apps from the details of individual backend implementations.

2.2. Challenges

Because of variability and unpredictability of backend APIs, data can arrive at any time. The UMW API and Unified client apps need to cater for this.

- 3.30. Externalpaymentconfig
- 3.31. Fags
- 3.32. Favourite-numbers
- 3.33. Generic-web-views-service
- 3.34. Get-internet-config
- 3.35. Get-location
- 3.36. Get-loyalty-points-configuration-and-redemption-history
- 3.37. Get-loyalty-points-package-details
- 3.38. Get-tv-plans-config--special-channel-groups
- 3.39. Gift-payment
- 3.40. Help-and-faq--deprecated-.(note-this-service-is-deprecated.-please-use-cms(posttype)-endpoint.)
- 3.41. Home
- 3.42. Informexternalpayment
- 3.43. Link-account
- 3.44. Lite-home
- 3.45. Loan-configuration
- 3.46. Manage-accounts
- 3.47. Manage-shared-usage-plan
- 3.48. Miscellaneous-charges
- 3.49. Notification-settings-config
- 3.50. Paperless-billing
- 3.51. Payment-fac
- 3.52. Payment-history
- 3.53. Payment-locations
- 3.54. Payment-method
- 3.55. Personal-details
- 3.56. Plan-retention
- 3.57. Plans
- 3.58. Promotions
- 3.59. Recharge-credit
- 3.60. Recover-password
- 3.61. Redeem-packages-for-loyalty-points
- 3.62. Register-for-loyalty-club
- 3.63. Register-user
- 3.64. Remove-shared-usage-

3.30. Externalpaymentconfig

3.30.1. Get The External Payment Config

POST /getExternalPaymentConfig

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	request	request	true	GetExternalPaymentConfigRequest	

Responses

HTTP Code	Description	Schema
200	OK	GetExternalPaymentConfigResponse

Consumes

- application/json

Produces

- application/json

3.31. Fags

3.31.1. Get FAQs.(Note: This service is Deprecated. Please use /getHelp endpoint.)

POST /getFags

Responses

HTTP Code	Description	Schema
200	OK	Response

Consumes

- application/json

Produces

- application/json

memoer
3.65. Restart-device
3.66. Send-image-controller
3.67. Service-address
3.68. Service-contract
3.69. Service-contract---services-available
3.70. Service-contract---submit-selected-available-services-and-account-details
3.71. Shared-data
3.72. Shared-usage-summary
3.73. Special-consumptions
3.74. Store-locations
3.75. Store-locator
3.76. Subscription-address
3.77. Support-tickets
3.78. Suspend-account
3.79. Teasers-deprecated-(note:-this-service-is-deprecated.-please-use-cms(posttype)-endpoint.)
3.80. Terms-and-conditions
3.81. Terms-and-conditions.-deprecated-(note:-this-service-is-deprecated.-please-use-cms(posttype)-endpoint.)
3.82. Third-party-bill-payment
3.83. Topup-against-bill
3.84. Topup-config
3.85. Topup-voucher
3.86. Topup-webview
3.87. Tv-available-plans---activate
3.88. Tv-available-plans---general-tv-groups
3.89. Tv-available-plans---individual-channels
3.90. Unlink-account
3.91. Unregister-from-loyalty-club
3.92. Update-user-profile
3.93. Usage-details
3.94. Usage-details-download
3.95. Usage-summary
3.96. User-profile

3.75. Store-locator

3.75.1. withGeoLocation

POST /getStoreLocations/withGeoLocation

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	request	request	true	StoreLocationsWithGeoLocationRequest	

Responses

HTTP Code	Description	Schema
200	OK	Response

Consumes

- application/json

Produces

- application/json

3.76. Subscription-address

3.76.1. Get Subscription Address

POST /getSubscriptionAddress

Parameters

Type	Name	Description	Required	Schema	Default
BodyParameter	getSubscriptionAddressRequest	getSubscriptionAddressRequest	true	GetSubscriptionAddressRequest	

Responses

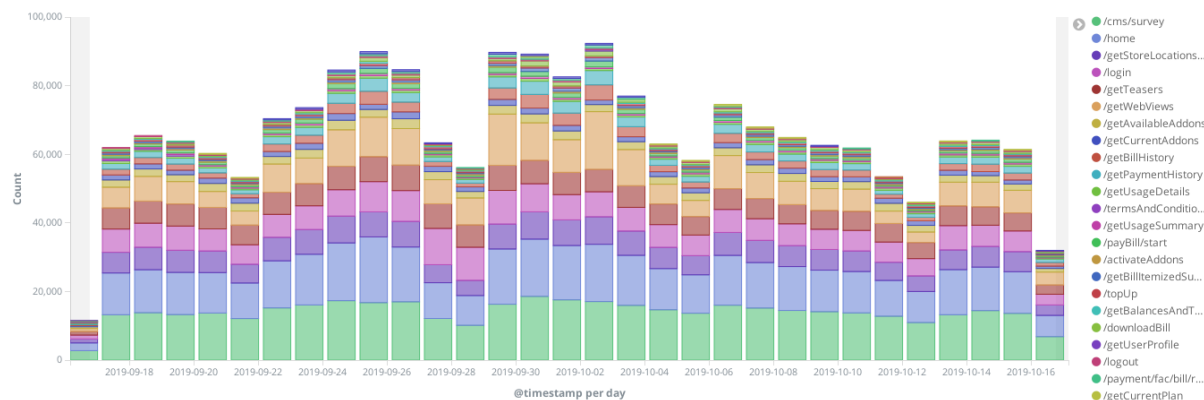
HTTP Code	Description	Schema
200	OK	GetSubscriptionAddressResponse

Agora API Test Suite

The AwareX Agora platform is provided with a test suite which enables all API's to be tested against the expected performance and data field configuration. This significantly reduces the time to test and verify each API consumed by each digital client and ensure productivity of development resources. This is a critical productivity tool of the Agora headless platform.

Operations Dashboard

An operations and systems management dashboard is available which provides full visibility of all technical monitoring and control aspects of the system and digital channels as well as API usage and performance as shown below.



Reporting

Export of data to any data repository or reporting system of the service providers choice is supported.

Hybrid Deployment Option.

The Agora microservice integration platform is a native cloud design. We recommend it is delivered from the public cloud, however if you require a hybrid implementation the system also support this in one of three ways.

- AWS Outposts, this allows the system to operate as if it is in the AWS cloud but physically resides in a local data center of your choice, such as your own inhouse data center.
- A private cloud, if you operate a private cloud awareX integration platform can run on it, however we will need to understand details equivalent to AWS such as security, operations, and configuration.
- On-prem, we can even run on local hardware in your data center, although this will extend the project implementation time and we will need to understand details equivalent to AWS such as security, operations, and configuration

Support

AwareX systems are currently running in support of service providers around the world, we have extensive experience of supporting Opco's as well as their IT processes, we provide a full SLA support model and provide a documented support process and portal to facilitate all types of support requirements.

Upgradable

The software right to use (RTU) license for the Agora headless Integration Platform includes the RTU all future releases and upgrades without the need to pay for any additional or new features or functions which are provided in future Generally Available (GA) software releases. This means you can enjoy enhanced functionality based upon our product roadmap at no additional cost except the fees for the upgrade implementation services.

Software Philosophy

Every piece of software delivered by AwareX has the concept of 'Product' behind it, repeatable, stable, upgradable, secure, scalable, and supportable. Because this is a product every aspect of the overall system has evolved and been thought through to be a true solution.

Pre-Integrated Interfaces

We support a large number of interfaces to existing back end BSS systems. In addition, should in the future BSS changes take place many external BSS are also supported as shown below. This enables fast and assured integration to your BSS systems. We also integrate with the API's exposed by Enterprise Service Busses for example MuleSoft, API servers as well as RPA and direct connect.



Security Testing

As a standard product both AwareX and its customers conduct regular PEN testing of the system allowing us to review results regularly and ensure we are current with the evolving threat. Since this is not a one-off event for us the product approach enables better security through more testing than a custom platform would ever endure. AwareX has a partnership with Verisign and NCC to ensure we are secure by design; we use static code scanning and active monitoring.

AwareX proprietary security includes enhanced authentication to stop any distributed denial of service attack. We internally authenticate to RS204, the highest available encryption standard using Tokens for any device requests only allowing genuine end users to access the platform service thus stopping completely any possible distributed denial of service attacks.

Support

Software support and maintenance is provided for the product. We provide a support portal for customer use which enables all the usual product reporting and queries to be handled as tickets with an SLA. New GA software release versions are regression tested and we expect a zero defects release. However, should a bug be identified a full support process with escalation is provided.

Operations

We use a standardized industry set of operational tools 'ELK' configured to provide a full operational management and monitoring capability. Since they are monitoring a product, we have standard dashboards and alarms which enable a 24*7*365 support model with a choice of 4 nines or 5 nines availability SLA.

High Availability

The Product has been architected to be active/active Highly Available (HA) in every implementation. It is delivered as standard with 99.99% service availability SLA. This can be extended to 99.999% availability SLA if required. (see separate white paper on AwareX high availability and DR).

Data Security

The AwareX suite is GDPR compliant, this is the strict EU personal data privacy and data security specification. We use encryption, tokens and hashing to ensure no personal data is every attributable to an individual and we hold no personal or private data on our systems. Our long-term storage provides logs for operational audit trail use only and it is not possible to identify any personal data from them.

We internally authenticate to RS204, the highest available encryption standard using Tokens for any device requests only allowing genuine end users to access the platform service thus stopping completely any possible distributed denial of service attacks.

Scalability

AwareX products are deployed in customers with millions of end subscribers and supporting multi-million plus monthly active devices. The Agora headless Integration Platform is stateless and allows for easy horizontal scaling through simple server addition without limitation. It also employs mechanisms such as making data request calls in parallel to the backend systems wherever applicable, to reduce overall response times. On the infrastructure side, AwareX solutions run on AWS, the industry leading cloud services platform, which provides unparalleled scalability and reliability.

Standardized Architecture for all Channels

The awareX Agora headless Platform has been architected to support a comprehensive set of digital engagement Omni-Client systems not just an APP or Web. This means that the product infrastructure supports of course Native Smartphone Apps but the same API's, integrations, data processing and reformatting, security, analytics are all not just re-used but instantly available to all other digital channels. A huge range of digital clients are all supported for example Facebook Messenger Bots, Google Bots, SMS bots, Web portals, IVR and Voice channels for Alexa and Google, Kiosks, Agents screens. In future as, new digital channels evolve they will be able to be rapidly implemented leveraging the existing product infrastructure and the same API's.

New Digital Channels

Because of the extensible product architecture AwareX is highly responsive to the introduction of new digital channels all of which fully utilize the existing infrastructure, API's, integrations, security and scalability. This means a new digital channel can be added very quickly and supported for a minimal cost. The original digital channel was the Smartphone App but since its introduction AwareX has also introduced support for Feature phone bots, Smartphone bots, Facebook bots, Web portal and Voice systems Alexa and Google and the KaiOS phone OS.

Conclusions

The AwareX Agora headless Integration Platform delivers critical digital architecture component allowing the intent based build out of digital channels quickly at low cost. It is a fully Headless Platform with documented API's that has its own test suite for rapid digital client development and testing. The system provides the ability to consolidate multiple existing back end Telecom and Enterprise data sources into a consistent, secure, and scalable format that can be delivered consistently to any new digital front-end device.

The existing common services like show bill, show bill history, show top up history, usage of assets like Voice, Data, SMS and many many more standard data required by multiple digital clients in the common digital experience layer are immediately available in REAL TIME.

New back end data sources and new digital clients can be added quickly and securely leveraging the Platforms inherent capabilities.

If you want to deliver an enhanced digital customer experience and e-commerce capability with reduced risk and rapid implementation then a swift effective implementation of the awareX Agora digital headless engagement Platform enables you to show real change to your customers, staff and shareholders in a short space of time without the need for changing any back-end legacy systems. This is the single most effective way of enabling a digital customer engagement in the shortest possible time as a component of a strategic digital architecture.