



Overview of Phunware Platform

Version 1.0

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Overview of Phunware

Abstract

Phunware transforms the digital human experience for brands. With the Phunware platform, solutions and data, you can quickly deliver exceptional customer satisfaction and revenue.

- Light up on-premise experiences and provide memorable engagement with your customers.
- Deliver relevant messaging to your customers that engage them before, during and after their visits.
- Understand your customers and others like them in an unprecedented way through any combination of your own data, proprietary Phunware data gathered from our global reach of 2.5 Billion devices, and third-party data with Phunware's Knowledge Graph technology.
- Reach highly-targeted audiences through Phunware's audience building and engagement technology.
- Reward your customers for sharing information and build loyalty through PhunCoin, the first security token backed by Phunware.
- Supercharge your existing mobile application with add-ons from Phunware.
- Create category-defining mobile experiences with Phunware's custom app development services.

Introduction

In early 2009, every large enterprise business was starting a digital transformation. Computing was transitioning to the cloud, application consumption was transitioning to mobile and software was transitioning to a Software as a Service (SaaS) model. At the time, only two percent of the world's internet traffic was mobile. Smartphones were just starting to replace feature phones and for the first time ever, and mobile users were empowered to make decisions about the applications they used and the content they consumed.

Phunware was founded to focus on one of the largest and most strategic opportunities in information technology: the opportunity to provide enterprises a comprehensive software platform that could help engage, manage and monetize customer experience journeys over mobile, directly impacting and improving brand interactions, business results and revenues for these organizations' users worldwide. Phunware defined a new market category for mobile, which it initially called the "mobile cloud" and which represented the world's only comprehensive mobile-first, native-first platform. This vision and approach ultimately evolved into Phunware's pioneering **Multiscreen as a Service (MaaS) platform**, the only fully integrated software platform that comprehensively equips brands to engage, manage and monetize their mobile app portfolios globally, at scale.

Phunware has expanded its addressable market reach into the largest and fastest-growing markets in the world. Positioning Phunware at the intersection of mobile, cloud, big data and SaaS has resulted in a current inventory of more than 2 billion Phunware IDs across more than 5,000 mobile application portfolios for more than 1 billion monthly active devices across more than 1 trillion database events.

Phunware intends to lead the "multiscreen cloud" industry the same way that Salesforce and Facebook are market leaders in the "sales and marketing cloud" and "social cloud" respectively. In doing this right, at scale, globally, Phunware envisions a computing future in which global technology will be composed of hardware, software, firmware and Phunware.

Phunware Cloud Platform

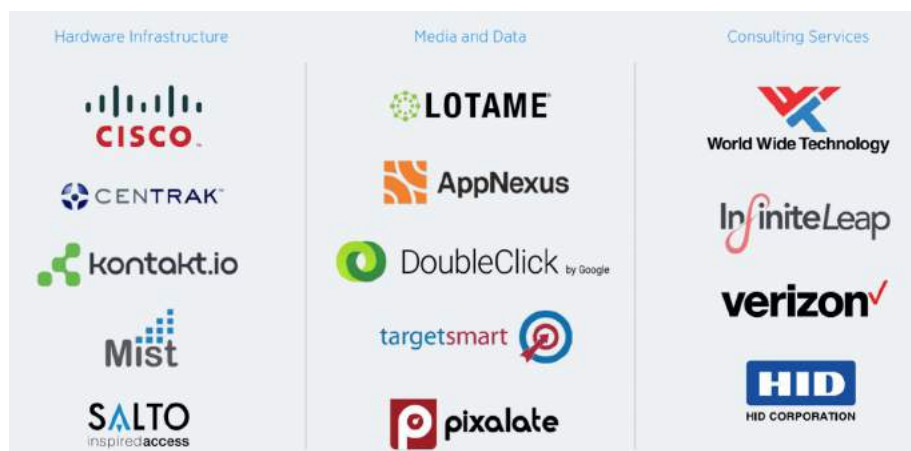
The Phunware cloud platform provides the only fully-integrated enterprise software platform for mobile that gives companies the products, solutions, data and services necessary to engage, manage and monetize their mobile application audiences globally at scale, including:

- Cloud-based mobile software development kits (SDKs) which include location-based services, mobile engagement, content management, advertising and analytics.
- A mobile application framework with pre-integrated iOS and Android software modules for building in-house or channel-based mobile application solutions.
- Cloud-based vertical solutions for Healthcare, Retail, Media, Real Estate and Hospitality, Sports, Entertainment and others.
- A Knowledge Graph platform, services and data allowing for real-time mobile audience targeting, reach, engagement and monetization for 1:1 insights and interactions globally at scale.
- PhunCoin, a cryptocurrency that aims to transform the relationship between brands and consumers by providing individuals the opportunity to earn PhunCoin in return for sharing their information, and companies the opportunity to build a more transparent, authentic and engaged relationship with their audiences.

The World's Leading Brands Choose Phunware



We build long-lasting and profitable relationships with our strong network of partners



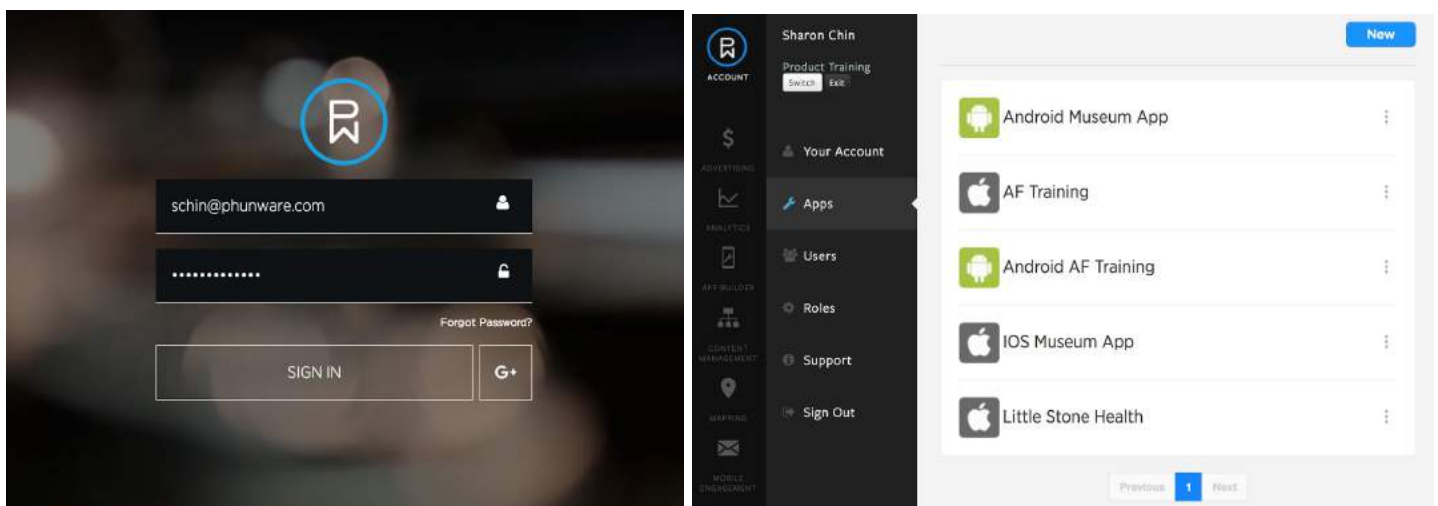
Multiscreen-as-a-Service (MaaS Portal)

Multiscreen-as-a-Service™ is a fully integrated services platform that enables brands to engage, manage and monetize users on mobile. This easy-to-use web portal allows even non-technical users to manage platform experiences and app configurations without extensive training, coding experience or dedicated support.

When you engage with Phunware, you get access to a dedicated organization (org) within the Phunware MaaS Portal. We will then assign an owner for your org, set up your Amazon S3 cloud credentials and enable modules you've purchased in the MaaS portal.

Phunware Modules include the following:

- [Location-based Services](#)
- [Mobile Engagement](#)
- [Content Management](#)
- [Analytics](#)
- [Audience Monetization](#)



View technical documentation on [MaaS configuration here](#).

Location-based Services

Phunware's location-based services module offers a comprehensive set of tools which enables brands to use their consumer's location to light up on-premise experiences and provide memorable engagement during their visit. Use the location-based services module for real-time indoor positioning that can enable various use cases such as navigation, location sharing and more within your facility.

The location-based services module includes:

- Mapping SDK, which handles the retrieval and display of all mapping information from the Phunware Multiscreen-as-a-Service (MaaS) Portal
 - Mapping SDK for [iOS](#) and [Android](#)
- Location SDK, which provides device location through various configurable location providers
 - Location SDK for [iOS](#) and [Android](#)

(Both SDK libraries share a dependency on Phunware's Core SDK, which handles authentication and brokering of network calls, analytics, and other internal functions.)
- Mapping API
- Mars API
- Core SDK for iOS and Android (Content Management and Analytics)
- Multiscreen-as-a-Service (MaaS) Portal Access
 - Mapping Portal
 - Content Management Portal
 - Analytics Portal

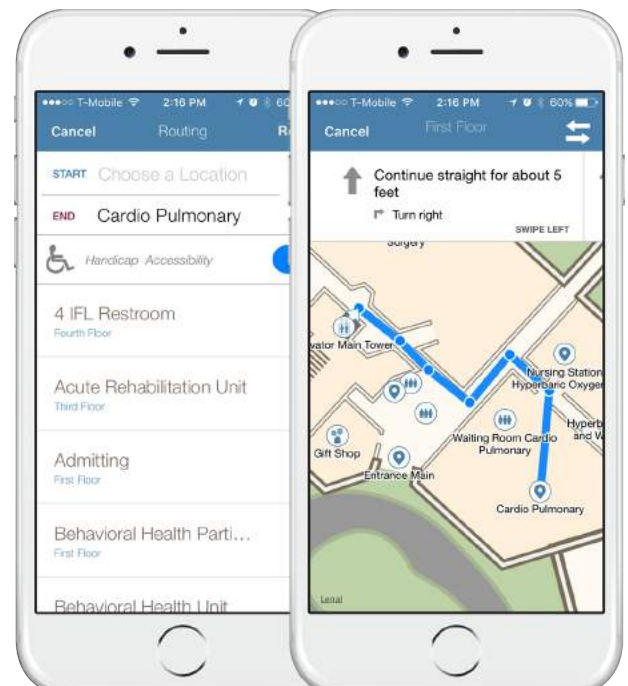
Indoor Routing and Navigation

The most common use case for our location-based services is leveraging a users' location in real time to enable navigation throughout your facility with static or dynamic wayfinding. Users receive a navigable route between two points of interest.

- **Static wayfinding:** Users see a highlighted map route and step-by-step directions to points of interest.
- **Dynamic wayfinding:** Users are able to see a blue dot on the map representing the device's current location. Users get interactive maps that route them to their locations in real-time by using their actual position and movements. **requires location hardware installation and configuration*

Landmark Routing

Navigation instructions can also be enhanced with contextual directions that make navigation user-friendly by including visual landmarks in routing directions. For example, "Walk 28 feet towards Lobby" or "Take a Right Turn after the Restroom."



ADA Compliance

Our Mapping SDK also supports a mobile wayfinding experience that meets the digital guidelines of the Americans with Disabilities Act (ADA) for access by visually impaired users. Visually impaired users can determine their current location, search and browse nearby landmarks, and navigate between points of interest using real-time directions read aloud via voiceover.

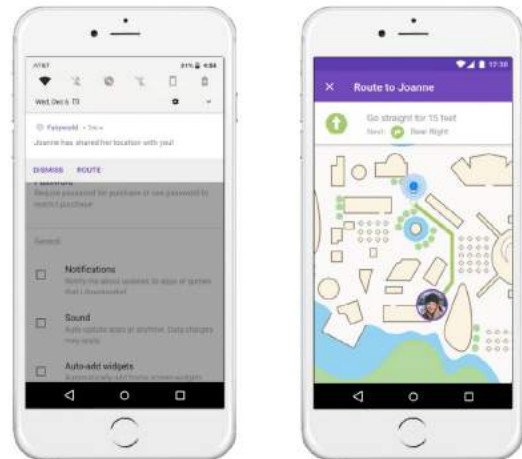
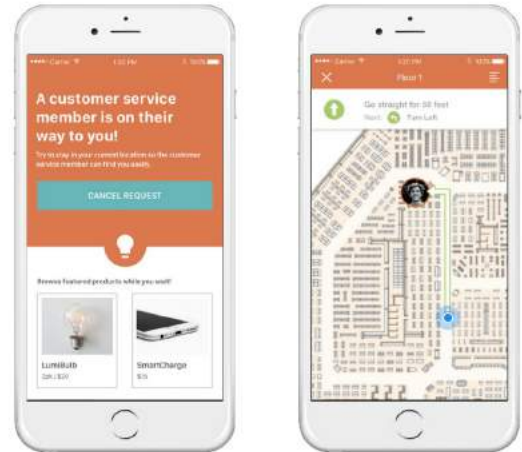
The SDK also takes full advantage of key iOS VoiceOver and Android Talkback visual accessibility capabilities, including gesture recognition and improved magnification and contrast, mirroring other impaired-friendly mobile platforms and ensuring a mobile experience that users are familiar and comfortable with.

Location Sharing

Location Sharing is part of our Mapping and Location SDKs that allows users to share, view and route to each other's locations from within your venue. This feature increases social engagement among users, help employees find customers in need of assistance and much more.

Use Cases

- Hospitality and Services: Receive guest's location and request details, send a confirmation to guests whose requests are being fulfilled, and navigate to a guest's location to complete the request.
- Retail: Enhance the shopper experience by making store associates easy to locate and help store associates navigate quickly to shoppers requesting assistance.
- Large Venues (Theme parks or stadiums): Make friends and family easy to find with location sharing groups and allow users to navigate directly to friends and family at the venue.



Multiscreen-as-a-Service (MaaS) Portal (Map Editor)

Customers will appoint an administrator, who will then have access to the portal and the ability to configure location-based services details and functions detailed below. This portal enables real-time map management and makes maps easy to edit, manage and update on the fly, directly within the cloud.

Setup of Venues, Campuses, Buildings and Floors:

- Venues: Broadest location identifier often representing a logical grouping or organization of areas to be mapped. For example, a particular university system.
- Campuses: A subset of a venue representing a grouping of buildings. For example, a specific university campus.
- Buildings: The various building of a campus.
- Floors: Specific, map-level representation in the navigation and wayfinding features.

- Native map hierarchy: Map hierarchy leveraged by the native application as it is defined in the MaaS Portal. Customer administrator can create and modify a venue, campus, building, and floor for their organization.

Setup of Points of interest (POIs), Routes, Publishing, Map Rendering



- Points of Interest (POIs): Specified locations on a map that contain detail information such as image, label, and description.
 - Administrator can create and modify a point of interest on a floor.
 - Administrator can position a point of interest on a floor.
 - Administrator can configure a point of interest as accessible.
- Routes: Navigable routes between locations on a map used in navigation.
 - Customer administrator can create and modify a route on a floor to connect points of interest for navigation.
 - User can provide two points of interest to the Mapping SDK and retrieve a navigable route between them based on routes configured on the MaaS Portal.
 - User can provide two points of interest to the Mapping SDK and retrieve an accessible route between them based on accessible routes configured on the MaaS Portal.
 - User can interact with each segment of a route returned by the Mapping SDK individually.
- Publishing: Ability to publish a draft venue for migrating changes to the live version of the venue.
 - User can view pending changes on a draft venue available for publishing.
 - User can publish pending changes on a draft venue and view results on a corresponding live venue.
- Render Map: The display of a map (floor) in a native application as it is configured in the MaaS Portal.

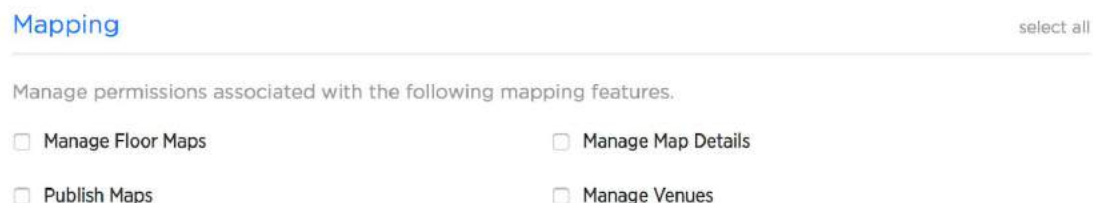
- User can view the map of a floor.
- User can zoom in or out on the map and adjust the viewable map area.
- User can rotate the map.
- User can view points of interest on the map.
- User can select a point of interest on the map.

Prior to getting access to the MaaS portal, you will need to provide standard map assets* so that Phunware is able to generate high fidelity maps that are specially designed (in addition to standard architectural elements) that either have customized branding or non-architectural elements included such as furniture. These maps are then used in the MaaS portal as well as in your app.

**Standard Map Assets are indoor maps representing hallways, rooms, and architectural elements indicating navigable areas of a specific floor. Areas of a full map may also include non-navigable areas ensuring the full floor is represented but will have fewer details (e.g., hallways and rooms may not be included and displayed as large, grayed-out areas). Maps are stored in MaaS in PDF or SVG format and positioned and sized on the external map and must be to-scale relative to the real world.*

Roles and Permission Controls

Access to the MaaS portal is role- and permission-based. We provide the ability to control user access to different actions and levels of information, so you have the option to build custom roles based on your specifications and security needs. For example, you might enable permissions so that only some roles can edit maps, while only admin users are able to publish maps. The current permission options for mapping are: Manage Floor Maps, Manage Map Details, Publish Maps and Manage Venues.



- SAML: (Note: We support SAML upon request and will require a custom integration.) When setting up logins for users in your org, you have the option to use your existing corporate password to authenticate into the Maas Portal. This provides an easier way to log into our portal and and credentials are securely authenticated with your user management system.

APIs

- **Mapping API:** REST API allows customers to manage resources associated with mapping, including venues, campuses, buildings, floors, points of interest, segments and routes remotely, including security and protocols via a RESTful interface. Use cases include:
 - Automatically marking a route as closed for construction.
 - Syncing phone number updates for Points of Interest.
- **Mars API:** REST API allows location hardware providers to publish updates to Phunware.

Analytics

Phunware's Analytics SDK empowers you to make smarter, data-driven decisions by giving you insight into how users interact with our mobile application. Analytics can be viewed in the MaaS Portal. Standard analytics

provided include engagement and retention metrics. You also have the ability to set custom analytics to track relevant actions to optimize user experience and conversions.

- Standard
 - Engagement metrics: Unique devices, sessions, new devices, average session length, OS version, device model and screen views.
 - Retention metrics: Automatic cohort retention calculations grouped by month.
 - Churn rates for 30, 60 and 90 day periods.
- Custom
 - Define specific event types you would like to track such as keywords users are entering when searching for points of interest on a map.
 - Organization administrators are able to configure events and send a configuration file to the application developer to make the integration of the events into the app as easy and error free as possible.

[Read more in the [Analytics section](#) of this whitepaper]

Web Wayfinding

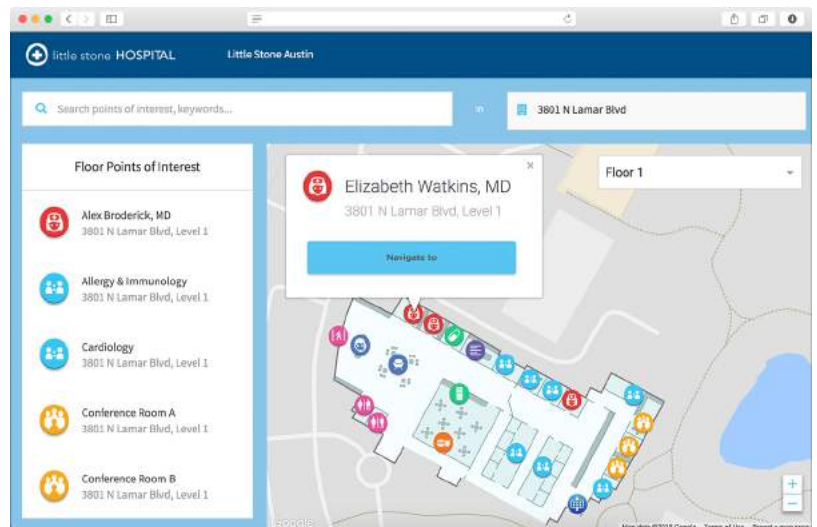
Phunware's web wayfinding solution is easily accessible via a desktop browser and uses the same map set up configured in the Maas portal. Users simply choose a start and end point, and the application generates turn-by-turn directions the user can then print at home to plan their journey.

Through a desktop browser, users get:

- Facility-wide routing and navigation between POIs.
- Dynamic search functionality.
- Multi-floor routing.
- Print functionality.
- Link sharing functionality with directions.

Whitelabel Support for Domain Names

The web wayfinding capability can be integrated into existing websites using the customer domain name to provide a seamless experience to end users. End users browsing the web wayfinding capability will not see Phunware branding or domain name present in their experience.



Using the MaaS portal, customer administrators can:

- Customize your web app with your company's logo, fonts and colors.
- Keep your maps and routes up-to-date with a map editor portal that allows you to make and publish updates quickly and easily for closures, construction, new location labels, etc.

Wayfinding Kiosk

The location-based services module can also be implemented onto dedicated device hardware for end users in the form of an interactive kiosk. Phunware software can be implemented onto this device (alongside a kiosk management solution) giving the developer full control of the user experience to meet customer business

needs. All location-based services capabilities are available to developers to implement including mapping user experiences, turn by turn directions, an interactive directory, and more.

Digital Signage Support

The location-based services module supports the ability to integrate with Digital Signage products. Customers can use a digital signage product like the Scala S player, trigger a user interface using native buttons, and display to end users a touch-friendly user interface for wayfinding. This capability can be nested side-by-side with other native video player capabilities like videos, animated text, and other features of the digital signage player software.

Hardware Agnostic

A location hardware provider is required to enable real-time indoor positioning. Phunware's location-based services module is hardware-agnostic. We work with multiple hardware providers and support location technologies including Wi-Fi, physical and virtual BLE beacons.

Compatible Hardware

Phunware aims to support a growing list of indoor location providers across a variety of technologies.

**(Note: that blue dot accuracy can vary between providers.)*

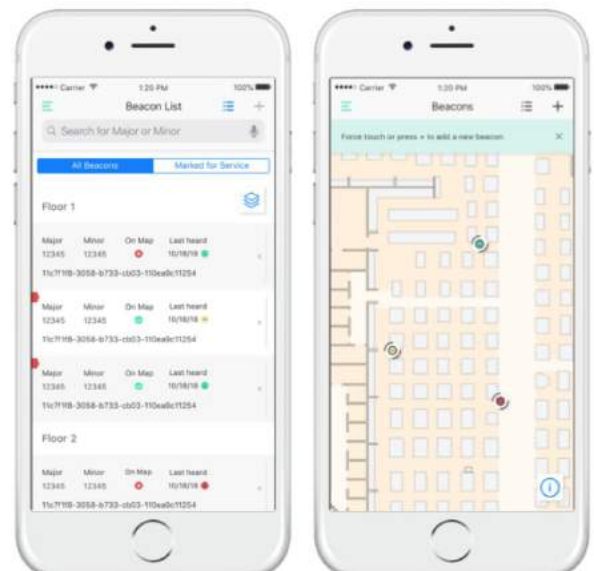
Beacons / Bluetooth Low Energy (BLE)	vBLE (virtual Bluetooth Low Energy)	Wi-Fi / combination hardware
<ul style="list-style-type: none"> Kontakt.io (Pro Beacon & Smart Beacon) Bluvision - Configuration Guide Aruba CenTrak / Awarepoint Cisco Meraki (MR-33, MR-42) 	<ul style="list-style-type: none"> Mist (AP 41, BT 11) 	<ul style="list-style-type: none"> Cisco Hyperlocation (AP 3600 / 3700) - Configuration Guide Cisco CMX (limited performance)

Locate App

For customers and partners who would like a self-serve approach to a blue dot deployment, the Locate app will guide you in setting up indoor blue dot. After the physical installment of your location hardware in your facility, use the Locate app to fingerprint your location to configure your blue dot routing in the app.

Beacon Maintenance

Our beacon maintenance solution helps customers manage the hardware (beacon) required for indoor positioning. Information on when the beacon was last heard by our software can help you identify beacons that require new batteries or a replacement.



MaaS Portal

Sort, view, search for beacon data within the MaaS portal. Beacons will be identified as red, yellow or green to indicate if it's not been heard within 3 weeks, heard within 1 to 3 weeks or heard within 1 week respectively. Users can then flag beacons that require servicing.

Locate App

Within the map of the Locate app, you're able to see beacons that need attention. Beacons for service are visible in the application, and able to be removed from flagged status for service.

Location Experience Kit

The Location Experience Kit is a simple and cost efficient way to trial the capabilities of our location-based services at your facility. The kit includes everything you need to set up a real-time blue dot experience in a trial area, including smartphones and beacons.

Upon successful setup completion, you will be able to:

- View your location (blue dot) on the map.
- Navigate between all points of interest configured.
- Access your map and static routing directions on the web.

The kit includes the following:

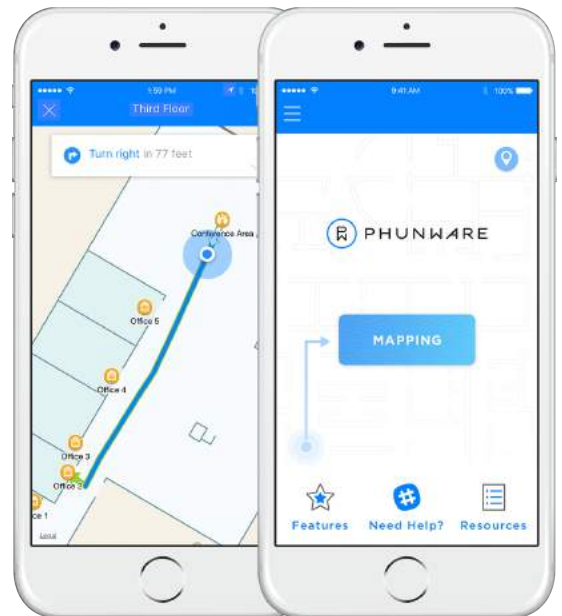
- Apple iPhone XR and Google Pixel 3.
 - Each smartphone comes installed with the apps you need for your trial, including the Locate app, PW Experience app with your custom map pre-configured, and Slack.
- 20 Beacons and a placement map showing where to install beacons.
- Instructional guide with simple, step-by-step instructions on how to install your beacons, fingerprint your location and test your blue dot will be provided.

Before you receive your Location Experience Kit, you will work with the Phunware team to plan a trial area and design a map based on your facility's blueprints. We will work with you to configure points of interest to test. You also get live support with a dedicated support team throughout your setup process.

Once you've received your kit, the setup requires three main steps:

1. Install beacons: Set up beacons in your trial area.
2. Fingerprint location: Configure beacons and routes in the Locate App.
3. Test the blue dot: Experience real-time navigation with the Locate App.

After your trial, the Phunware team will help you explore our full product capability.



View technical documentation about Location-based Services [here](#).

Mobile Engagement

Phunware's mobile engagement module helps brands deliver relevant and targeted messaging to their customers to engage them before, during and after their visits to the brand's physical places of business. Use the mobile engagement module to unleash the power of location and data to bring context and personalization to your mobile marketing strategy.

The mobile engagement module includes:

- Mobile Engagement (ME) SDK, which handles the retrieval of notifications and triggering of location-based events for proximity and geofence messaging.
 - Mobile Engagement SDK for [iOS](#) and [Android](#)
- Multiscreen-as-a-Service (MaaS) Portal access.
 - Campaign Management and Audience Segmentation
 - Analytics

Mobile Engagement Campaigns

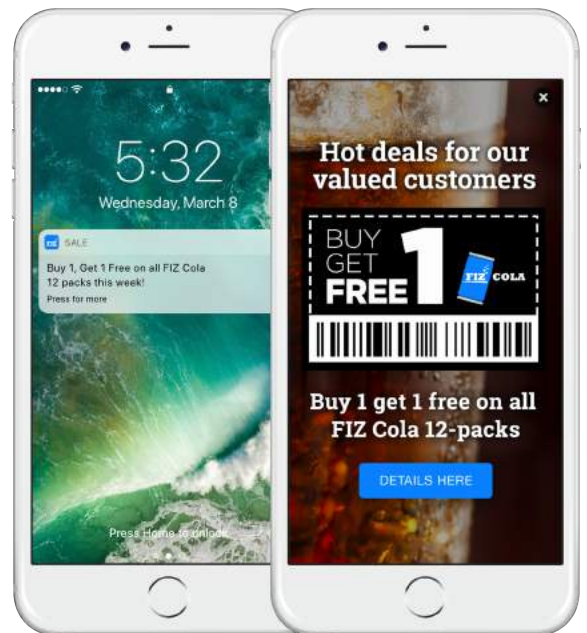
Connect with your app users when your message is most relevant and when users are most likely to engage. Mobile engagement campaigns are displayed as notifications on the mobile devices of app users, and can appear even when devices are locked. Phunware's flexible mobile engagement module works with a variety of location technologies such as GPS, Wi-Fi and physical and virtual Bluetooth beacons to ensure contextual targeting indoors and out.

There are three kinds of mobile engagement campaigns that can drive your business and keep your app audience engaged in different ways.

- Broadcast Campaigns: Reach targeted app audiences with messages distributed at specific times.
- Geofence Entry/Exit Campaigns: Target messaging to reach audiences when they are in close proximity to a location like a campus, neighborhood, or city.
- Beacon Entry/Exit Campaigns: Use beacons to target audiences at a more granular level when they are in your venue, such as specific departments, wings or near product displays.

Reach up to:

- 50 million active users per campaign.
- 1 million messages per second.
- 50,000 device registrations per minute.



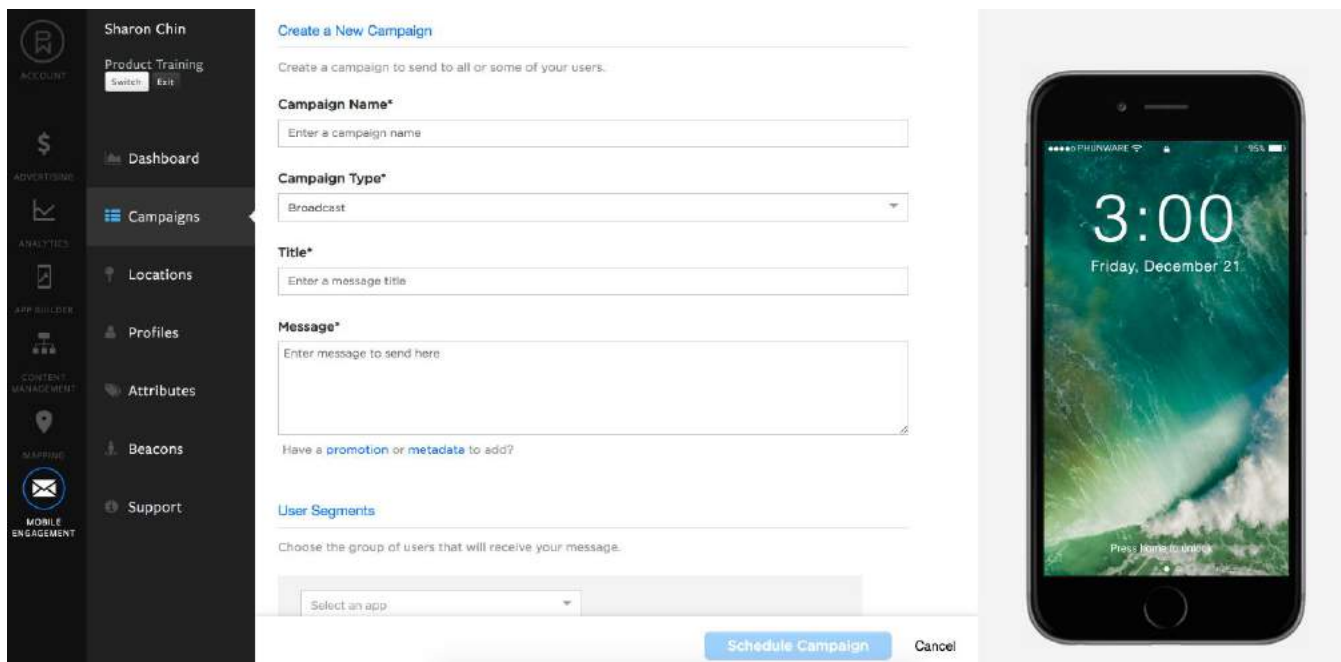
Multiscreen-as-a-Service (MaaS) Portal

Phunware's MaaS portal provides a single view to create and manage campaigns, identify specific audiences segments based on user profiles or locations, and access campaign analytics to view results.

Campaign Management

Your mobile marketing objectives determine the campaign type, trigger, target, and timing of your

campaign as well as the need to add optional promotions or custom metadata. The MaaS Portal provides easy-to-create campaign tools for building your message, segmenting the right audience based on specific criteria, and scheduling the campaign for instant delivery or pre-determined times you can set. Alongside the creation of your campaign, marketers can preview their message on-screen before sending.



Broadcast Campaigns

Broadcast campaigns send messages to all app users based on specific criteria set when identifying the audience. This criteria can be based on specific user attributes, profiles or locations. Additionally, delivery can be set to send immediately or based on a schedule to provide the right time to send your message. Rolling broadcasts are also supported which allow messages to be delivered at a specific time based on the user's timezone. Providing this granularity in messaging capabilities can allow specific use cases such as:

- A healthcare provider can send pollen alerts and allergy advice to allergy sufferers on 1/12/2019 at 10am as this coincides with their on-site pollen education seminar later that day.
- A retailer can send a promotion on cookware to all shoppers who are interested in housewares today at 5:30pm, as their target audience historically has the highest open rate between 5:15pm and 5:45pm.

Messages can include deep linking capabilities to guide users directly into specific areas of your app or to specific content (promotions, video links) that can be created within the campaign creation tool.

Attributes and Profiles

Attributes and Profiles allow you to deliver relevant, timely contextual communications to the right segments of your mobile audiences. Custom attributes can store information based on preferences, usage or other details that might be used to identify individuals or

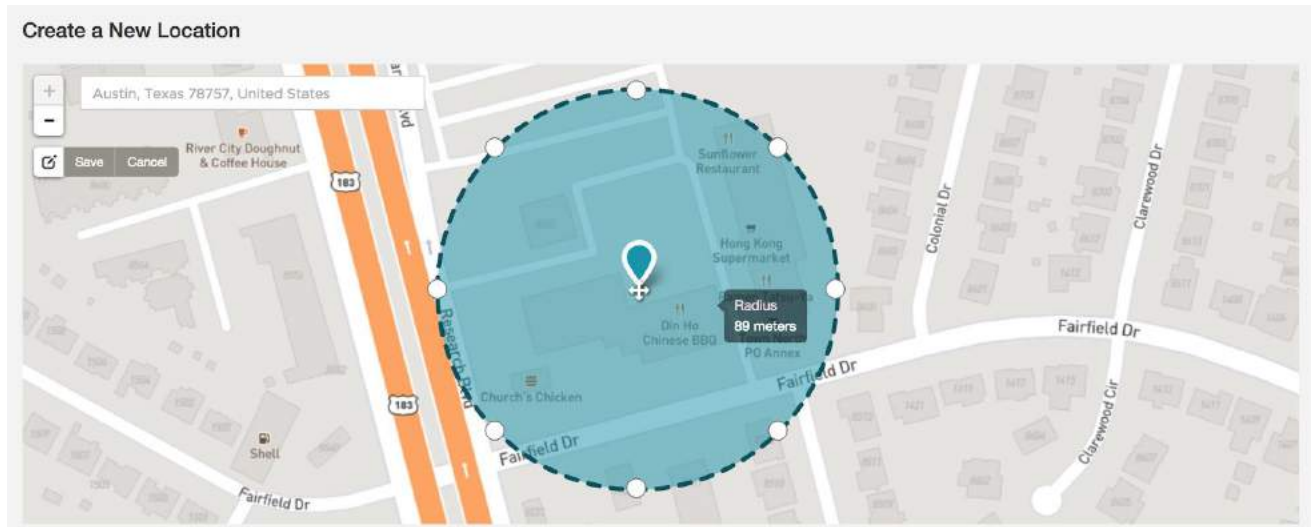
Filter profiles by attributes Hide Disabled Create New		
profiles		
NAME	LAST UPDATED	ATTRIBUTES
Automotive	12/13/2018 @ 13:37	automotive
Clothes - Boys	12/13/2018 @ 13:41	boys_clothes
Clothes - Girls	12/13/2018 @ 13:41	girls_clothes
Clothes - Men	12/13/2018 @ 13:43	men_clothes
Clothes - Women	12/13/2018 @ 13:43	womens_clothes
Cookware	12/13/2018 @ 13:44	cookware
Furniture	12/13/2018 @ 13:43	furniture
Housewares	12/13/2018 @ 13:37	housewares
Snacks	12/13/2018 @ 13:36	snacks
Toys	12/13/2018 @ 13:37	toys

groups. For example, pet owners or loyalty card holders could be segmented from your audience.

Setting attributes may come from in-app events (e.g., manually selecting subscription preferences) or through external system integration via APIs (e.g., an external CRM system).

Geofence Campaigns

Geofences consist of a central address with a virtual radius and perimeter that use GPS signals to target mobile devices as they enter, exit, or reside within that perimeter. A geofence might be as small as a house or as large as city. Messages in a geofence campaign are sent when a user device enters or exits a defined physical area defined in the MaaS portal within a specified amount of time. We recommend geofences to be drawn within 5-50,000 meters in diameter.



Use Case of leveraging geofences for your mobile marketing campaigns are varied:

- Geo-conquesting: Draw geofences at competitor stores and target messaging to reach users when they enter or exit a competitor store
- Geofence campaigns can be used at hospitals to automatically check a patient in to an appointment based on geofence triggers.
- Build a better “buy online, pickup in store” experience for retail. Know when your shoppers arrive and deliver an order to their car in the parking lot.

Beacon Campaigns

Target audiences at a more granular level by sending messages to users who pass into, out of, or stay within range of tagged beacons. Campaigns are created in MaaS and delivered directly to the user device that reaches a certain distance from that defined point.

Beacon campaigns can be powered by any bluetooth beacon hardware using the iBeacon protocol and require the purchase of beacons prior to creating campaigns. Once setup, messages can be sent to a user device based on proximity to a defined beacon.

Compatible Hardware Options (Beacons / Bluetooth Low Energy (BLE))

A beacon provider is required to enable beacon campaigns. Phunware’s solution is compatible with any beacon that follow the iBeacon protocol but have been tested with the following beacon providers:

Kontakt.io (Pro Beacon & Smart Beacon), Bluvision, Aruba, CenTrak / Awarepoint and Cisco Meraki (MR-33, MR-42).

Proximity Options

If you select Beacon Entry or Beacon Exit as the Campaign Type, you must also select the Beacon Proximity. The Beacon Proximity selection determines the general perimeter of beacon detection much like the radius setting for the geofence.

- Immediate: < 1 meter away.
- Near: 1-3 meters away.
- Far: 3-10 meters away.

Use cases

Beacon Campaigns provide the capabilities to target user devices in the moment when they are most likely to convert, such as:

- Sending a beacon entry message upon visiting a specific area of a store and combining with Point of Sale systems to attribute a conversion from visitor to paying customer.
- Providing an information message to a patient in a waiting area if they have resided (dwelled) for a specific time period without departing.
- Connecting with a scheduling system to validate attendees for an event and identify those who stay and/or leave early to target specific messages to them.
- Immediate range can also be tuned to be down to a few centimeters which allows for use cases like point of sale attribution for redemption of an offer.

Message Center

Mobile engagement campaigns with promotions configured through the MaaS portal can also appear in your app's Message Center (in addition to being received as a notification) where users can click to go to a message detail page.

From here, users can be presented with additional promotion content or links to video content or 3rd party sites via an in-app webview.

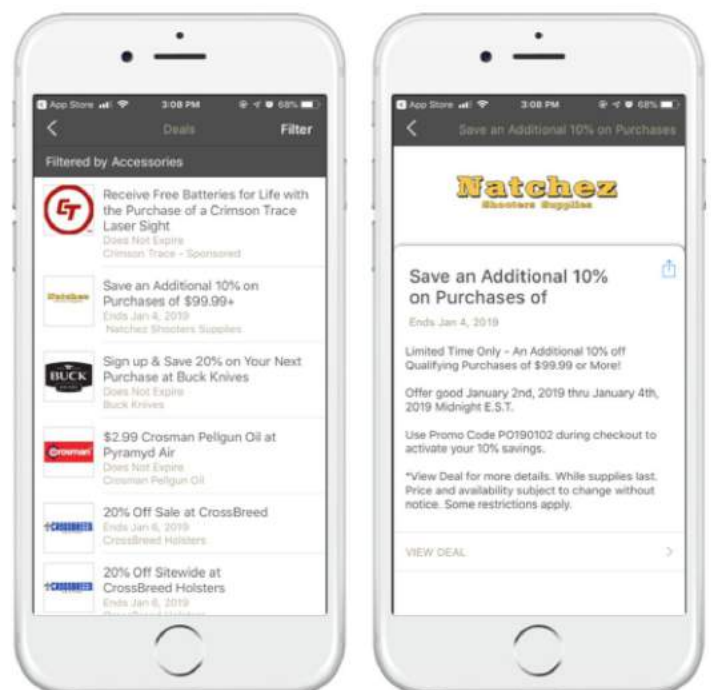
Promotions

In addition to the message notification, you can include a promotion in your campaigns. Promotions are HTML (text or images) encoded pages that open when the user taps on the message.

Metadata

If a specific promotion or metadata is configured, then selecting it will display the promotional content or the page specified by the metadata.

Metadata is an application specific key/value pair that is used to dictate custom behaviors like Message Center features and deep linking to Promotions or specific areas of the app. For example: By default when a user clicks on a notification, it opens your app to the home page, but when you add the key/value = showPromo/true to the metadata fields, the



notification links directly to the promotion.

Campaign Analytics

View campaign analytics within the MaaS portal. (Metrics may be expanded with custom tagging.)

Campaign Summary Analytics

- Number Sent: The number of notifications that are sent for the campaign.
- Open Rate: The percent of notification recipients who tap the notification to launch the app after receiving the campaign message.
- Message View Rate: The percent of messages that were tapped from the app Message Centers, to bring up message detail views. **Note: Only applicable if an in-app Message Center has been built.*
- Visit Rate: The percent of message recipients who visit target geofences, within the targeting window (# of hours/days), after receiving a notification.

Campaign Details Analytics

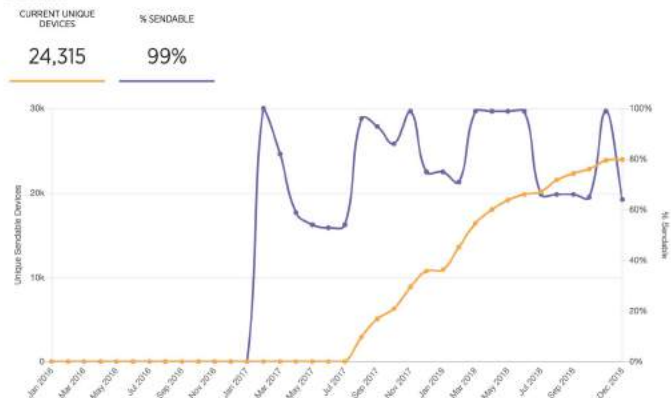
- Notifications: The number of notifications that are sent for the campaign.
- Opens: The number of notification recipients who tap the notification to launch the app after receiving the campaign message.
- Open Rate: The percent of notification recipients who tap the notification to launch the app after receiving the campaign message.
- Sendable Devices: The number of devices that are eligible to receive a campaign.
- Visits: The number of message recipients who visit target geofences, within the targeting window, after receiving a notification.
- Visit Rate: The percent of message recipients who visit target geofences, within the targeting window, after receiving a notification.

STATUS	APP NAME	NAME	TYPE	SCHEDULED TIME	# SENT	OPEN RATE	MSG VIEW RATE	VISIT RATE
<input type="checkbox"/>	GunDealio-Andr...	SIG's Suppressed Upp...	Broadcast	12/21/2018 @ 12:45 PM Device	-	-	-	-
<input checked="" type="checkbox"/>	GunDealio-iOS V...	Shop Gun Talk Holiday ...	Broadcast	12/20/2018 @ 05:55 PM Device	27465	0%	-	-
<input type="checkbox"/>	GunDealio-Andr...	Shop Gun Talk Holiday ...	Broadcast	12/20/2018 @ 05:55 PM Device	4845	4%	-	-
<input checked="" type="checkbox"/>	GunDealio-iOS V...	Sako A7 Rifle Sale Dea...	Broadcast	12/19/2018 @ 07:15 PM Device	22953	0%	-	-
<input type="checkbox"/>	GunDealio-Andr...	Sako A7 Rifle Sale Dea...	Broadcast	12/19/2018 @ 07:15 PM Device	5671	7%	-	-
<input checked="" type="checkbox"/>	GunDealio-iOS V...	(SP) Aguila 9mm- Pus...	Broadcast	12/18/2018 @ 05:40 PM Device	26239	0%	-	-
<input type="checkbox"/>	GunDealio-Andr...	(SP) Aguila 9mm- Pus...	Broadcast	12/18/2018 @ 05:40 PM Device	5795	10%	-	-
<input checked="" type="checkbox"/>	GunDealio-iOS V...	Walker's XCEL Electro...	Broadcast	12/16/2018 @ 02:30 PM Device	23146	0%	-	-
<input type="checkbox"/>	GunDealio-Andr...	Walker's XCEL Electro...	Broadcast	12/16/2018 @ 02:30 PM Device	4859	8%	-	-
<input checked="" type="checkbox"/>	GunDealio-iOS V...	Aero Precision Comple...	Broadcast	12/15/2018 @ 05:50 PM Device	29297	0%	-	-
<input type="checkbox"/>	GunDealio-Andr...	Aero Precision Comple...	Broadcast	12/15/2018 @ 05:50 PM Device	6336	6%	-	-
<input type="checkbox"/>	GunDealio-iOS V...	(SP) FN 509 Tactical E...	Geofence Entry	12/15/2018 @ 04:00 AM Device	5337	0%	-	-
<input type="checkbox"/>	GunDealio-Andr...	(SP) FN 509 Tactical E...	Geofence Entry	12/15/2018 @ 04:00 AM Device	1217	8%	-	-
<input type="checkbox"/>	GunDealio-iOS V...	Sightmark Reflex Sigh...	Broadcast	12/14/2018 @ 08:50 PM Device	24406	0%	-	-
<input type="checkbox"/>	GunDealio-Andr...	Sightmark Reflex Sigh...	Broadcast	12/14/2018 @ 08:50 PM Device	7083	5%	-	-

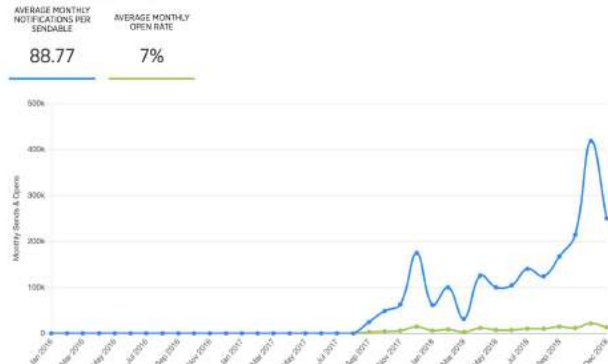
App-specific analytics

- Current Unique Devices: The number of devices that have downloaded the app.
- % Sendable: The percent of devices that are in a state to receive notifications. (opted in)
- Broadcast/ Geofence/ Beacon Campaigns: Provides an overview of the number of notifications being sent/received and opened by sendable devices for a selected app for a period of time
- Open rate: The percentage of notifications of the given type that have been opened, for a selected app, over a given time period
- Notifications per sendable: The average number of notifications for the given type that have been sent per sendable device for the select period by the selected app.

DEVICES



BROADCAST CAMPAIGNS



Campaign analytics help make your marketing more effective by:

- Measuring the percent of your users who opted in to push notifications to determine the effectiveness of that strategy.
- Measuring engagement with notifications by type (broadcast, geo-fence, beacon) to optimize campaigns and messaging.
- Measuring the number of HTML promotions viewed to inform marketing message creative.
- Measuring the number of visits to your location following the release of a campaign to understand the influence of mobile campaigns over foot traffic.
- Measuring new vs. repeat visitors to physical locations to spotlight trends around retention and long-term value.
- Measure click rates for a variety of campaign strategies to find the creative sweet spot that speaks to your audience best.

Mobile Engagement APIs

- On-demand API
 - The mobile engagement product includes the ability for customers to send messages to devices one at a time or in bulk by calling the on-demand APIs. This enables integration into existing systems such as loyalty programs, salesforce automation tools, and more.

[Learn more about [Mobile Engagement APIs here](#)]

View technical documentation about [Mobile Engagement here](#).

Analytics

Phunware's analytics module empowers you to make smarter, data-driven decisions by giving you insight into how users interact with your mobile application. Understand your audience at a deep level so you can engage and monetize more strategically.

The analytics module includes:

- Phunware Core SDK
- Multiscreen-as-a-Service (MaaS) Portal Access
 - Analytics Portal
- Phunware Analytics API

We provide engagement and retention analytics with the option to track your own custom analytics in our event manager. All analytics displayed in the MaaS portal are provided in real-time.

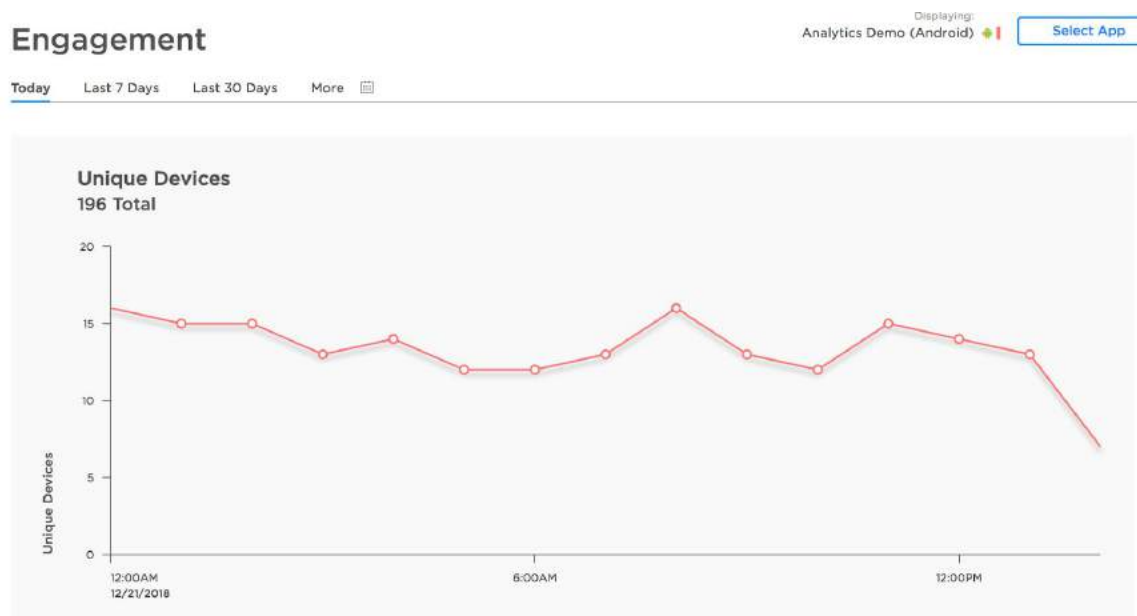
Engagement

Engagement analytics provide powerful insights by measuring how engaged your mobile audience is with your brand. Understand how users interact with your app and see how much time users spend in your app and when they use it most (or least).

- Audience analytics: Average session length, sessions per unique device, percentage of new devices.
- Device analytics: Device make, model, operating system version with breakdowns.
- Screen views: Most-visited app screens.

The following is a breakdown of the engagement metrics provided (Total or average by the hour):

- Unique devices: An app install on a distinct device for a distinct app user.

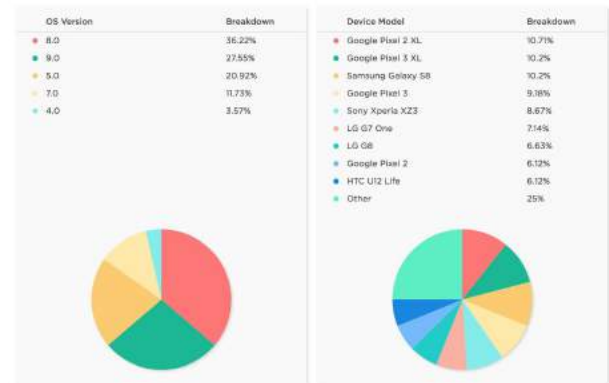
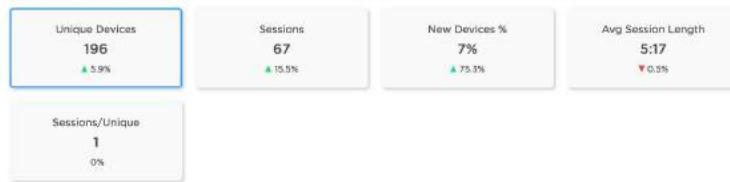


- Sessions: The count of sessions of users in the app.
- Average sessions per unique device: The average amount of sessions each user has over the given time period.
- Average session length: The average length of time a user spends in the application.

- **New devices:** The percentage of devices seen for the first time out of the unique devices seen over a time period. This metric allows publishers to understand what portion of your app engagement is driven by marketing (ie - new installs) vs returning users (demonstrating app stickiness/repeat value).

Summary

Today Average by Hour



- **OS Version:** Operating system being used by the app users and the percentage of that OS vs total devices.
- **Device Model:** Model of device being used by the app users and the percentage of that device model vs total devices.
- **Screen Views:** Count of unique screens in your app viewed by your audience

Screen Views

All Level Data

Search by Screen Name or App Section...

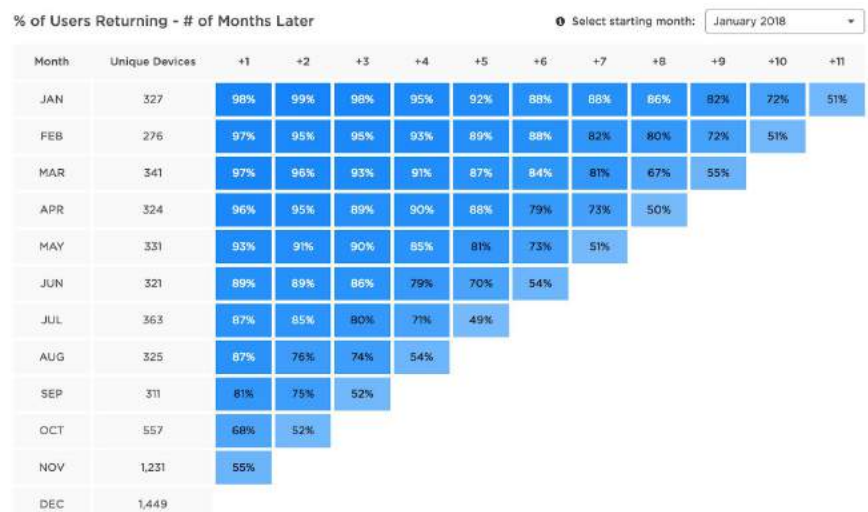
Screen Name	Screen Views	App Section	Unique Devices	Avg Time Spent (min:sec)
Ecommerce Page	17	Ecommerce	17	6:07
Search Page	17	Search	17	5:00
Payment Page	15	Payments	15	5:12
Add To Cart Page	14	Add To Cart	14	5:21
Wishlist Page	6	Wishlist	6	6:20

Retention

Cohort Retention gives you visibility into when devices (users) drop off and no longer return to your app, based on the month in which they were first seen (ie - likely initial download/install). This is key in understanding when is the best time to run campaigns, promotions, etc in order to retain users.

Analyzing retention metrics will help drive re-engagement activities (such as mobile engagement campaigns) to try to drive further user engagement as well as reactivate dormant users.

Example: If the numbers show that a high percentage of users tend to drop off after 4 months, then consider creating campaigns targeting users who have installed 3 months earlier in order to keep them engaged and get them past the 4 month drop off.



- The Retention visualization allow you to view cohort retention by month, for a 12 month time period starting at the month you select

- The Churn tiles provide are another look into the rate at which app users drop off, over 30, 60 and 90 days.



Event Manager (Custom Analytics)

The Event Manager is a powerful tool allowing both developers and non-developers the ability to create and manage custom events for tracking purposes. The event manager also offers buckets of predefined events you can import into your app and the ability to generate code files for your developers to use.

Events created from scratch must specify the following values:

- Display Name:** will be shown to Analytics portal users - this should be a user friendly string that clearly indicates what app user actions triggered the event.
- Event Name:** will be referenced by app developers to configure events within app code and not seen by Analytics portal users or app users.
- Trigger:** indicates what app user actions should trigger the event; used as reference by app developers and not seen by Analytics portal users or app users.
- Event Parameters** (optional): allows Analytics portal users to drill down into a particular event for more granularity into how a count breaks down. See dedicated **Parameter Configuration** section below.

Settings

Displaying: Analytics Demo (Android) [Select App](#)

Event Manager

Generate Code					Import	Create
Event Name ⓘ	Display Name ⓘ	Trigger ⓘ	Parameters ⓘ	Source ⓘ		
<input type="checkbox"/> add_payment_info	add_payment_info	when a user adds billing information		Created by User		
<input type="checkbox"/> add_to_cart	add_to_cart	when a user adds items to cart	quantity item_category (all)	Created by User		
<input type="checkbox"/> add_to_wishlist	add_to_wishlist	when a user adds an item to wishlist	quantity item_category (all)	Created by User		
<input type="checkbox"/> ecommerce_purchase	ecommerce_purchase	when a user completes a purchase	coupon currency (all)	Created by User		
<input type="checkbox"/> login	Login	When a user logs in	login_method	Standard		
<input type="checkbox"/> logout	Logout	When a user logs out		Standard		
<input type="checkbox"/> promotions_detail_action	Promotions Detail Action	When a user triggers an action from a Promotions item detail view	promotions_list_name promotion_name (all)	VS-Shopping		

Parameter Configuration

Each event can have up to five associated parameters that give more visibility into the breakdown of a particular metric. Events and their parameters should be carefully considered by app developers prior to configuration.

Event Import

To help speed up initial event configuration for a new app, Phunware provides sets of predefined

events, for key verticals/use cases, which are meant to simply be suggestions of common analytics events that an app publisher may want to wire up.

Settings / Event Manager /

Displaying: Analytics Demo (Android) [Select App](#)

Import

Standard VS-Generic VS-Shopping App

*The events listed in the table below will be imported into your app.

Cancel [Import](#)

Event Name ⓘ	Display Name ⓘ	Trigger ⓘ	Parameters ⓘ
login	Login	When a user logs in	login_method
logout	Logout	When a user logs out	
prompt_action	User Prompt Action	When a user takes an action on prompt or modal for permissions, preferences, access, etc.	prompt_type prompt_action
register	Register	When a user registers	register_method
screen_view	Screen View	When a screen view is loaded	screen_name custom_parameter1 (all)
search	Search Triggered	When a user performs a search for content	search_term
select_content	Content Viewed	When a user selects content	content_type item_id
settings_change	Settings Change	When a user updates an app setting	setting_type setting_action
share_content	Content Share	When a user shares content	content_type item_id (all)

Reports

The Reports section displays the custom events that were defined in the event manager and triggered by your app users.

Displaying: Analytics Demo (Android) [Select App](#)

Reports

Today Last 7 Days Last 30 Days More

All Level Data

Search event name...

Event Name	Count	Unique Devices
add_payment_info	5	5
> add_to_cart	11	11
> add_to_wishlist	11	11
> ecommerce_purchase	13	13
> Search Triggered	21	21

Analytics API

The Analytics API enables you to post input data to the service and retrieve data programmatically using RESTful methods. This provides developers flexibility to integrate Phunware Analytics with any custom application.

[Learn more about the [Analytics API here](#)]

Content Management

Phunware's content management module allows you to spend time building your brand instead of unnecessary mobile infrastructure. Create, manage and publish content and configuration for your Phunware application easily through our user-friendly portal. In this module you will configure schemas, create structures around the schemas and enter content into those structures.

The content management module includes:

- Content Management SDK
- Multiscreen-as-a-Service (MaaS) Portal Access

Phunware's content management module populates your application with the content that your users need. These general rules will help you understand how the content management module in MaaS organizes your content data and help you plan the structures and containers for your content.

Containers: A collection of structures that are used to organize the content and data displayed in your application. Containers can only contain structures. **Note: Structures hold the schemas; these schema structures then collect the content.*

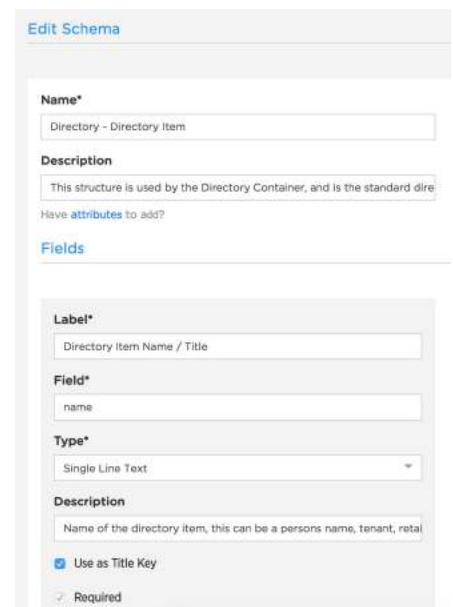


Schema Management - Data types: A data or content group that identifies the content to be displayed in your application and how it must be stored in the database. Each schema must be added to a structure if it is to be used to collect content.

For example: for a schema named "Author Info", fields might include: "Last Name", "First Name", "Picture" and "Quote about writing". This schema could be used by a bookstore app on the title catalog page, the book details page and an author page.

The following are examples of schema fields:

- Single Line Text, Multiline Text, Image, Object, Boolean, Single Select, Date, Time, Date & Time, Number, Integer, Decimal, GUID.
- MaaS Mapping POI Object.



The screenshot shows the 'Edit Schema' form. It has a light blue header with the title 'Edit Schema'. The form contains the following fields:

- Name***: A text input field containing 'Directory - Directory Item'.
- Description**: A text area containing 'This structure is used by the Directory Container, and is the standard dire'. Below it is a link 'Have attributes to add?'.
- Fields**: A section header for the schema fields.
- Label***: A text input field containing 'Directory Item Name / Title'.
- Field***: A text input field containing 'name'.
- Type***: A dropdown menu with 'Single Line Text' selected.
- Description**: A text area containing 'Name of the directory item, this can be a persons name, tenant, retail'.
- Use as Title Key**: A checkbox that is checked.
- Required**: A checkbox that is checked.

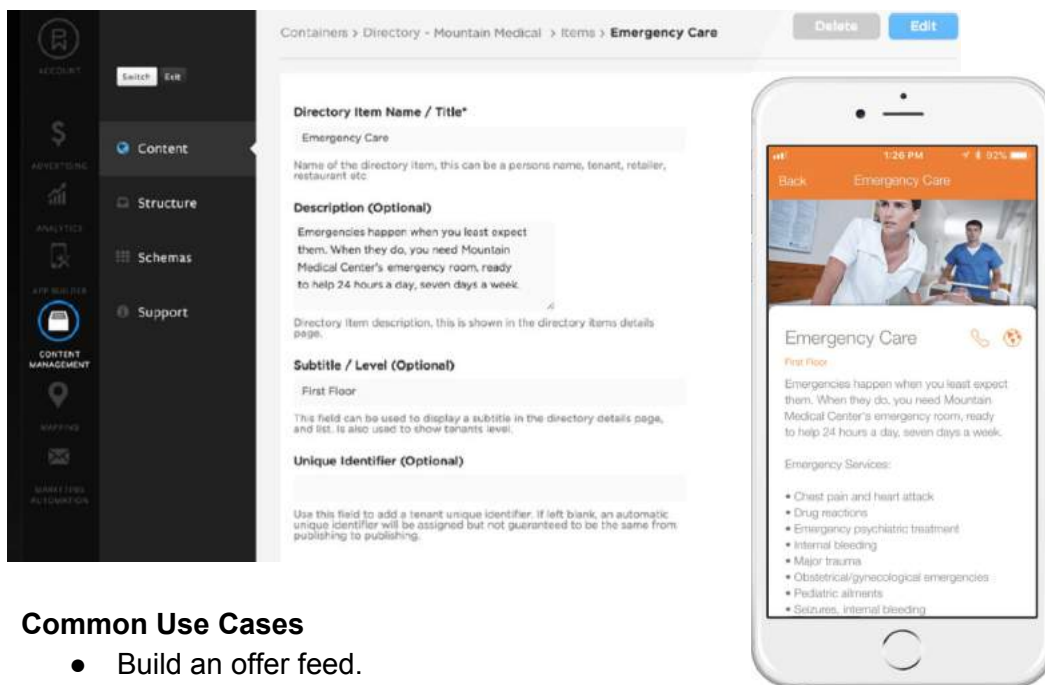
- MaaS Mapping Building Object.

Structures - Nesting of data types: A data set that consists of a name, field name, one or more schema structures and a type of either object or array. Structures can be added, nested and combined in a container.

- Create nested layers of structures, to build even more complex object models.
 - Nested Content: Content that falls under another type of content or is logically on a lower level in a hierarchy. In the “Great Escapes Home” example below, the “Locations” structure is nested under the “About Great Escapes” structure and the “Hours” structure is nested under “Locations”.

Content - Entering content into the system: The data that populates your application pages. This data/content is added to your containers in the content management module.

- Choose lists, text fields, etc.
- Import/export certain structures as a .CSV for easy updating.



Common Use Cases

- Build an offer feed.
- Build a simple events feed.
- Build a simple ticketing system.
- Build a simple social network profile.
- Build a movie catalog.
- Post articles to your app / news content.
- Embed HTML to re-use your existing website content in a native app experience.
- App settings to update app behavior in the background for users, feature flags, etc.

Over-the-Air Content Updates

Deploy updates and new content through the cloud—no client updates or app store re-submissions required. You also have the option to configure a force update when you have a crucial release to ensure that all users are only on the latest version of your app.

Roles and Permission

Access to the MaaS portal is role- and permission-based. We provide the ability to control user access to different actions and levels of information, so you have the option to build custom roles based on your specifications and security needs.

Current permissions for content management include: Delete Content, Save Content, Read S3, Delete Schemas, Save Schemas, Read Structure, Read Content, Delete S3, Save S3, Read Schemas, Delete Structure, Save Structure.

Content Management Engine

Enable access to the following Content Management Engine activities.

- | | |
|---|---|
| <input type="checkbox"/> Delete Content | <input type="checkbox"/> Read Content |
| <input type="checkbox"/> Save Content | <input type="checkbox"/> Delete S3 |
| <input type="checkbox"/> Read S3 | <input type="checkbox"/> Save S3 |
| <input type="checkbox"/> Delete Schemas | <input type="checkbox"/> Read Schemas |
| <input type="checkbox"/> Save Schemas | <input type="checkbox"/> Delete Structure |
| <input type="checkbox"/> Read Structure | <input type="checkbox"/> Save Structure |

Native Focused

Our mobile solutions are native focused. This makes it easy for developers to access the content they need without sacrificing what typical web focused content management systems do.

Integration with location-based services module

Our content management module is integrated into the location-based services module to allow selection of POIs and browsing buildings - to build complex structures around POIs in the LBS module. You can also use it to build complex structures around building objects, and have access to that information while using the Mapping SDK.

If you are creating a POI Directory, you must have:

- Mapping SDK uploaded to development environment
- Location SDK uploaded to development environment
- Mapping configured for venues, campuses, buildings, floors (with maps), POIs and Routes

[Read more in the [Location-based services section](#) of this whitepaper]

Integration with Phunware Analytics Module

Easily track consumption of content through the analytics module.

[Read more in the [Analytics section](#) of this whitepaper]

Amazon AWS CDN

The content management module is integrated into the Amazon AWS CDN for content delivery so images and other assets have great end user performance for loading images.

Other Use Cases

- How to build a message board with favoriting and voting. Includes a script for CME schema creation!
- How to drive game balance configuration options using CME.
- How to build a simple product catalog using CME, with favoriting and voting.
- How to build a store finder using CME, including a script for creating the schema!
- How to build a video sharing application using CME.
- How to build a news feed app using public RSS feeds - including favoriting and comments and push alerts when new comments are posted.



- How to build a simple quoting app. Users can register and ask for quotes - only see their quotes, and Staff app can see all quotes and send responses. Push messages are sent when messages are sent from Staff app using on demand push mechanism.

View technical documentation about [Content Management here](#).

Audience Monetization

The Phunware audience monetization gives publishers the ability to maximize revenue through mobile in-app advertising and innovative mobile experiences.

SSP and Yield Optimization

Phunware's audience monetization provides a full Supply Side Platform (SSP) that allows publishers to auction their inventory to multiple demand sources- including unique direct sold demand from [Phunware's Audience Engagement solution](#).

Additionally, the platform features yield optimization and automatic floor pricing to ensure each impression gets the highest value possible.

Features include:

- Self Service Signup.
- Domain level campaign blocking.
- IAB category filters.
- Ad quality controls.
- Custom Floor Pricing.
- Built-in Consent and Privacy management for GDPR Compliance.
- Performance Reporting by placement, inventory, and geographic region.



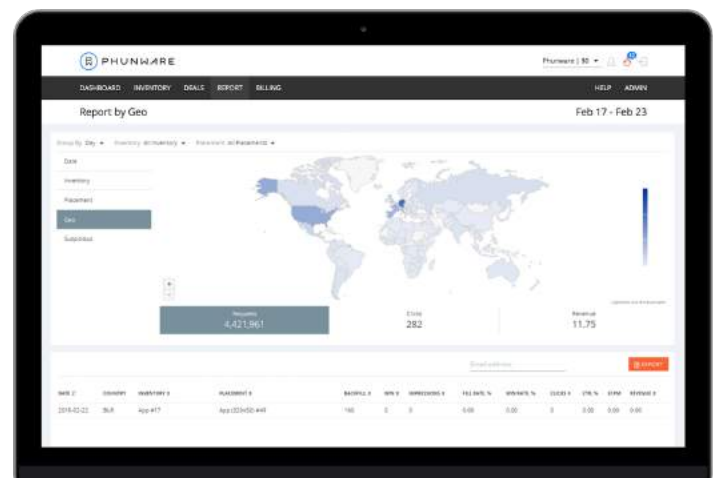
Private Marketplaces

In addition to the SSP features listed above, Phunware also provides support for private marketplaces so publishers can expose their higher quality inventory to direct demand sources. Publishers can create deal IDs, manage floor pricing, and bring their own demand to be included in a private auction.

Performance Demand

Phunware also provides the capability to further monetize traffic with performance video and rich media campaigns. By exposing unsold inventory, publishers can realize additional revenue from CPA and CPI priced direct campaigns.

Revenue from performance campaigns is aggregated and reported in effective CPM. You also get real-time, customizable reporting and analytics for each of your inventory items



Integration Options

- Support for Android, iOS, Desktop, and Mobile Web publishers:
 - Android and iOS native SDK.
 - Mediation Tag Macro Support: Mopub, LKQD, Aerserv, Ironsource, Google Ad Manager (DFP).
 - Server-to-server connections available for use with existing ad server.

- Support for all major ad formats for immersive user experiences
 - Banner
 - Native
 - Video
 - Rewarded Video with Rich Media Endcard
 - Rewarded Survey
 - MRAID
 - VPAID



Use Cases

- Offer a freemium app model and still monetize your users outside of in-app purchases.
- Use mobile-optimized bite-sized surveys to keep monetizing your user data even after they leave your app.

Feature List

- Create and manage ad units.
- Create video, interstitial, rewarded video, native, banner placements in dashboard.
- Display banner, interstitial, native method, video or rewarded video with callbacks.
- Generate tags for use in most major mediation platforms.
- Set up automatic payments or request payment.
- View near real-time reporting on requests, impressions, earnings, and calculated fields (CTR, eCPM, fill rate) by date range.
- Set blocked or whitelisted ad categories by placement.
- Set price floors.
- Block ads from specific brands and domains per placement.
- Create rewarded video placements.
- Set up s2s Postback URLs and passthrough macros for ad completes.
- Activate or deactivate placements and inventory.
- Set custom ad sizes.
- Option to toggle dynamic yield optimization.
- Create PMPs and organize direct deals with advertisers.
- Preload Ad method. (precaching)
- Includes companion Ad support for video. (MRAID and Static)
- Includes close button for skippable or completed video.
- Includes close button on Interstitial.
- Single Line Install - cocoapods. (iOS) and Gradle/Maven/JCenter (Android)
- Send GDPR parameters to notify advertisers of user consent.
- Send additional optional parameters for better targeting and revenue.

Additional Features

- Automatic payouts for revenue above \$50. (Wire transfer and PayPal available)
- Developer support team.

View technical documentation about [Audience Monetization here.](#)

Knowledge Graph

Phunware Knowledge Graph is a powerful, modern data platform that provides intelligence to engage, manage and monetize users on mobile. Phunware Knowledge Graph connects, organizes and normalizes consumer data that are superior for high performance information retrieval. Knowledge graphs represent knowledge in a form that is also usable by machines and provide a foundation for Artificial Intelligence (AI). Leverage Phunware Knowledge Graph to better understand your customers and provide real-time engaging experiences.

Accelerate your data maturity by unifying your existing customer-centric data

Derive incremental value from your existing data investment by unifying data in a high-performance customer profile. Powered by our proprietary Phunware Data Model, valuable consumer interactions on mobile, web, and other related systems can be integrated together into a unified data capability.

Expand knowledge of your customers through a Phunware Data Licensing

Our data enrichment service expands the connections and properties of a customer profile for a deeper view of customer interactions, location history, mobile app usage and marketing segments. Phunware also has relationships with a number of data partners which extend and add value to our core mobile data set.

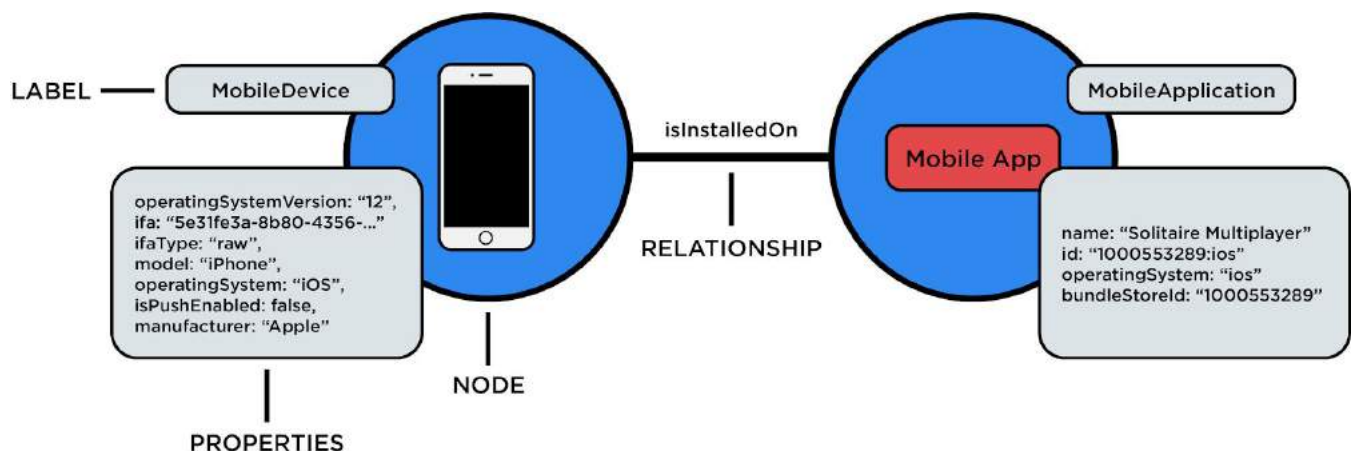
Influence future business outcomes through Artificial Intelligence (AI)

Use Knowledge Graph as a high quality data foundation for machine learning to predict customer churn, optimize engagement and increase revenue through product recommendations.

Phunware ID

The core construct of Knowledge Graph is the **Phunware ID** profile - the integrated set of demonstrated actions, preferences, characteristics and predicted behavior for each user. End-users interact with a variety of business processes where underlying transactional applications store data in traditional databases. The fragmentation of data across an IT infrastructure makes it very challenging to understand and serve customers. Knowledge Graph solves this problem by unifying diverse data into a Phunware ID profile.

A wide range of user and audience scenarios is now become possible when large volumes of customer-centric knowledge can be actioned upon to make timely operational decisions, increase revenue and customer satisfaction.



Graphs store real world entities (e.g. a mobile device) as nodes with labels that describe the formal data type (e.g., MobileDevice). Properties store the data values for each node such as the operating system of a device. Relationships connect nodes together and they can include properties as well. For example, the relationship “isInstalledOn”, represents that a particular mobile application is installed on a specific mobile device. The connections and properties of a native graph database make it very powerful and intuitive to understand given its visual representation.

The Knowledge Graph software system includes:

- **Phunware Data Model:** A customer-centric, open and extensible data model built using industry standard technology and vocabularies.
- **Phunware Graph Query Library:** a collection of pre-configured graph queries for answering common questions and deriving insight.
- **Phunware Graph API:** A RESTful programmatic interface that simplifies knowledge extraction.
- **Graph Database:** An enterprise, native graph database platform (Neo4j Enterprise - requires a separate license)
- **Graph Browser:** A visualization tool that enables business and technical users to explore connections and data available in the graph database.
- **Data Integration Tools:** data ingestion utilities to load data using streaming and batch updates.

Key Features and Value for Brands and App Publishers

Data Model: The open and extensible data model integrates demonstrated consumer interactions on mobile, web and other related systems that can be unified by the Phunware ID profile. Retaining high value customers, keeping them engaged and driving conversion as they interact in the physical and online world now becomes possible with a unified view.

Knowledge Graph API: The API enables mobile developers to deliver a rich, personalized mobile experience by tailoring content on the fly using the Phunware ID properties for a particular consumer.

Graph Browser: The graphical browser and embedded graph database algorithms enable data engineers and data scientists to derive information that can be otherwise difficult to discover. This new insight can be used to optimize engagement, drive conversion and anticipate the needs of consumers.

Quality Data: It's common for data scientists to spend 70% of their time preparing data for model development. The clean and quality data corpus of Knowledge Graph saves valuable time for data scientists to develop artificial intelligence solutions that continuously learn how to optimize outcomes for your business.

Machine Learning Algorithms: The embedded algorithms can also accelerate machine learning model development by identifying the most influential features for extraction. These techniques can be used to preserve revenue by predicting customer churn and taking targeted actions proactively. Predictive recommendations can optimize engagement and upsell, cross-sell products and services.

Streaming Microservice: Kafka services enriched Phunware ID profiles in real-time thereby enabling marketing strategies that are highly dependent on time, location and demonstrated user actions.



Phunware Data Licensing: Data Licensing enriches Phunware ID profiles with data that Phunware sees across its entire data ecosystem. This enables marketers to gain a deeper insight into mobile users and the audience.

[\[Learn more about Data Licensing here\]](#)

Key Features and Value for Media Buyers

Knowledge Graph API: The RESTful API simplifies knowledge extraction including the creation of location-based mobile audiences using custom defined radial and polygon boundaries.

Graph Query Engine: The command-line interface and graph browser in Knowledge Graph make it easy for data professionals to create custom, scaleable and hyper-targeted mobile audiences that can be activated on Demand Side Platforms.

Campaign Execution Feedback: Knowledge Graph becomes smarter as media campaign execution data is ingested as a feedback loop to evaluate performance and inform future marketing strategies.

Marketing Dimensions: Six, hierarchical [marketing dimensions](#) enable data analysts and media buyers to easily segment user profiles.

DMP Pre-processor: For customers that use a Data Management Platform (DMP) for activating marketing campaigns, Knowledge Graph can improve your first party data quality and device addressability by pre-processing, validating and cleansing data before it's sent to a DMP. This empowers media professionals to create unique, targeted campaigns with custom segments that leverage unique graph connections that are not found with traditional DMP's.

Key Features and Value for Chief Technology Officers

Structured Data Feeds: Knowledge Graph can publish data in structured data formats including RDF, JSON and CSV. Realize incremental revenue by monetizing structured knowledge as by-products of your business operations in data marketplaces or as published feeds.

Data Modeling Agility: Flexible data storage of Knowledge Graph enables agility and reduced cost over re-architecting traditional databases as the business changes.

Programming languages: Drivers for popular programming languages (.Net, Java, JavaScript, Python) enable application developers to build intelligent, customer-centric business processes by seamlessly integrating Knowledge Graph into your IT infrastructure.

Information Retrieval: Phunware's data model and underlying graph technology optimize query performance for customer-facing business processes that are highly dependent on low latency.

Third-Party Visualization: Data in Knowledge Graph can be explored in other visualization tools (e.g. Tableau) using published connectors to display data with other customer-centric dashboards.

Data Maturity: Today's leading businesses across all types of industries use graph technology as a critical capability for delivering customer-centric value. Phunware accelerates an organization's data

maturity by providing all of the documentation, technology, and technical architecture required to implement graph infrastructure in a fraction of the time of building in-house.

Detailed Features

Phunware Data Model

The Phunware Knowledge Graph is powered by a connected data model with a documented ontology at <https://ontology.phunware.com>. The open and extensible model can unify data from Phunware, customer's, published open data on the Internet and from exclusive data partners.

PHUNWARE ONTOLOGY

The Phunware Ontology comprises the formal naming and definitions of the entities and the relations between the entities within the Phunware Knowledge Graph. The entities (such as mobile devices, mobile applications, and locations) are the nodes, and the relations (such as `isInstalledOn` and `isSeenIn`) are the edges within the graph. Our ontology leverages industry standard and open, shared vocabularies such as schema.org to enable data exchange interoperability.

ENTITIES

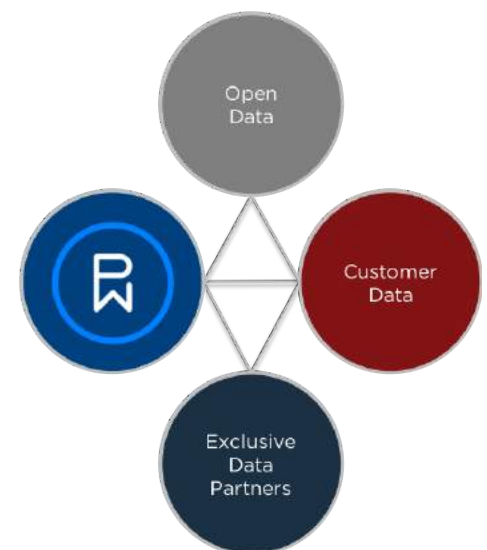
The Phunware Knowledge Graph contains the following kinds of *Entities*:

- Person** - a Person (who owns a `MobileDevice`)
- Household** - a Person belongs to a Household
- Residence** - a Household resides at a Residence
- MobileDevice** - a device such as a smartphone or a tablet
- MobileApplication** - a software application such as 'The Weather App' that runs on a `MobileDevice`
- Locations**
 - GeoCoordinates** - A representation of a rectangular patch of land on Earth (approximately 38m x 19m).
 - name (`Geohash` string ; precision 8)
 - latitude (latitude of centroid of geohash)
 - longitude (longitude of centroid of geohash)

- **Phunware Ontology:** Comprises the formal naming and definitions of the entities and the relations between the entities within the Phunware Knowledge Graph. Our ontology leverages industry standard and open, shared vocabularies such as schema.org to easily integrate data and enable data exchange interoperability.

Knowledge Graph is powered by a broad set of entity types to optimize the mobile experience including devices, apps, places, location, WiFi, people, households, residences and media.

- **Extensible:** Easily extend the data model with custom, unique or open entities and relationships to adapt the graph to your business domain.
- **Proven Scale and Performance:** Based on the same data model used by Phunware internally to power a 1+ billion device graph from 5 billion transactions per day. The model has been scaled and proven to deliver millisecond results with over 17 billion nodes.



- **Marketing Dimensions:** Six hierarchical marketing dimensions enrich data with additional meaning and enable segmentation across the following perspectives.
 - **Consumption:** Goods, services and apps consumers buy and use.
 - **Geography:** Country, state, city, zip code and location data point (geohash).
 - **Lifestyle:** Declared and inferred characteristics, behaviors, and patterns that define key life events and situations.
 - **Intent:** Actions users are likely to take based on demonstrated mobile behavior.
 - **Interest:** Declared or derived interests.
 - **Personal:** Declared and inferred characteristics such as demographics, psychographics and socioeconomics.
- **Phunware SDK Integration:** Mobile app events from user actions and Mobile Engagement campaigns flow seamlessly into the graph's unified Phunware ID profile.

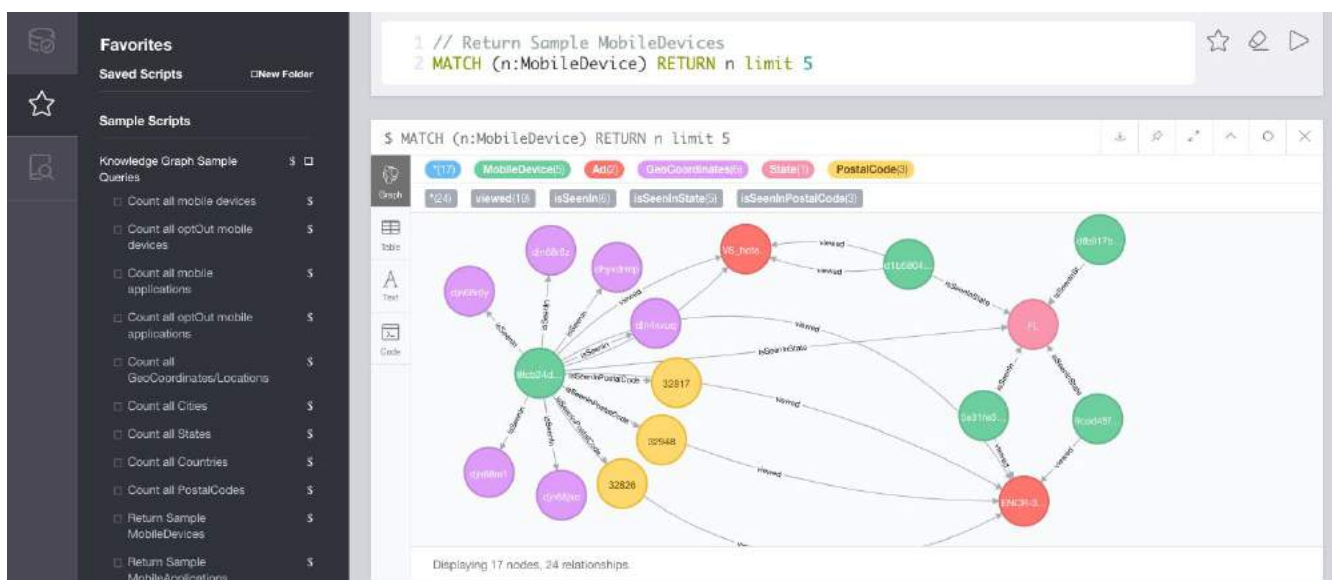
Programming Interfaces

Access the graph programmatically with the Phunware Knowledge Graph API, custom queries and popular programming languages to derive insights, generate mobile audiences and enable intelligent experiences.

- **Phunware Knowledge Graph API:** simplifies knowledge extraction using RESTful programmatic methods including polygon and radial location queries, asynchronous file exports.
- **Query interface:** easily code custom queries in a web browser or command line interface to extract knowledge with superior performance.
- **Programming Languages:** integrate Phunware Knowledge Graph with custom applications using drivers for .Net, Java, JavaScript and Python.

Graph Browser and Query Library

Visually explore and query connected data to derive insights from patterns, clusters and connections using native graph browser and third-party visualization tools (e.g. Tableau). Our library of pre-built Knowledge Graph queries enable data engineers and data-savvy business stakeholders to quickly derive insights and answers using the query editor in the graph browser.



Data Integration Tools

Populate the graph with real-time data updates via a streaming microservice as well as periodic updates using bulk loader utilities.

Graph and Machine Learning Algorithms

Build intelligent applications by deriving deep insights using clustering, classification, centrality, pathfinding or custom algorithms. Algorithms can execute within the graph database or externally on cloud machine learning platforms.

- **Centrality** - determine the importance of distinct nodes in a connected network. This algorithm can help identify highly engaged, the most influential or unique users in a network. These algorithms can also identify the most influential features for machine learning.
- **Pathfinding and Search** - finds the short path between nodes.
- **Community Detection** - evaluates how a group is clustered or partitioned. This can be used to segment customers.

Integration with Phunware MaaS Modules

The Knowledge Graph seamlessly integrates into other Phunware products including MaaS Mobile Engagement, Analytics, Content Management and other modules. Use the Phunware Knowledge Graph to power platform capabilities such as marketing engagement with connected data. From optimized media spend to intelligent content delivery to timely, personalized push notifications, this integration can supercharge any aspect of digital transformation.

Flexible Deployment

Phunware Knowledge Graph provides customers with flexibility to deploy the graph on-premises or on leading cloud platforms. Knowledge Graph has two deployment modes that enable flexibility to support using Knowledge Graph in different use cases.

Mobile App Portfolio Optimization: Knowledge Graph can be tightly coupled with the MaaS platform for brands and app publishers to optimize app portfolios. It seamlessly integrates Phunware SDK data into the Phunware ID profile to understand user behavior, provide intelligence to optimize Mobile Engagement campaigns and personalize app content. Data-savvy professionals can easily launch the graph browser from the Knowledge Graph icon in the MaaS portal. This private instance of Knowledge Graph contains Phunware ID profiles for data collected by Phunware on behalf of a customer with a valid support agreement. Together with [Data Licensing](#), the private graph instance can include enriched profiles for a customer's mobile audience and Phunware ID profiles that not members of the current audience.

Media Optimization: Knowledge Graph is used by media buyers independent of the MaaS platform to drive more effective campaign performance using targeted audiences. Campaign data and optional Data Licensing are used by Knowledge Graph to generate high value audiences and lookalike audiences powered by machine learning technology.

Phunware Data Licensing

The Phunware Knowledge Graph is fully compatible with Phunware Data Licensing products so as data is delivered to customers with all relationships and data quality validations are preserved.

[Read more about [Phunware Data Licensing here](#)]

Application Framework

Phunware Application (App) Framework allows developers to quickly and easily deploy native apps instead of building from scratch. By leveraging pre-built, fully tested SDKs and modules, the Phunware Application Framework provides a single integrated solution to manage the entire mobile application lifecycle. This results in faster time to market (4-6 weeks vs 4-6 months), fewer resource investments and less technical expertise needed thanks to an intuitive backend and a dedicated Phunware support team.

More than “write once, run anywhere” technology, the Phunware Application Framework creates native, fully brandable, industry-specific applications that leverage device-specific capabilities such as location technologies, sensors and OS-specific design patterns and guidelines. The Application Framework is built as a scalable cloud solution that eliminates the need for multiple third-party integrations and uses configurable, reusable modules to enable dynamic over-the-air app updates for continuous learning and testing without app store approvals.

Framework Components

Phunware’s Application Framework leverages platform-specific (Android, iOS, etc.) modular design patterns for ease of use. Because it separates application interface from core functionality, you have the flexibility to supplement built-in tools with customizations as needed. And because the Framework does not utilize a proprietary integrated development environment (IDE), you can use familiar tools such as xCode and Android Studio to build your application.

The Framework also includes support for core application functions such as app updating, content caching and deep linking so you don’t have to spend time or resources building these capabilities from scratch.

MaaS (MultiScreen-as-a-Service) Portal Access

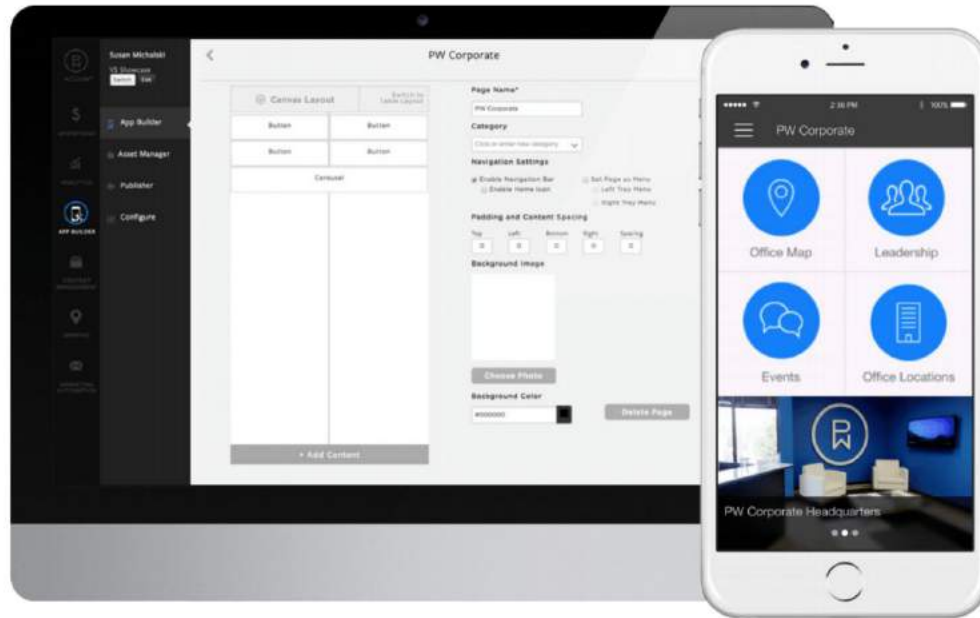
This easy-to-use web portal allows even non-technical users to manage MaaS platform experiences without extensive training, coding experience or dedicated support.

[Read more in the [MaaS Portal section](#) of this whitepaper]

App Builder

This web interface within the Maas Portal allows you to manage and deploy native app content layouts, user interfaces and high-level configurations such as page layout, UI and app behaviors. App Builder also allows you to manage and publish dynamic content without requiring end-user updates or an app store resubmission, thereby reducing developer and QA overhead support. App builder allows you to configure the following features within the app:

- Home Page: Configurable links/images, featured content carousel, brand/sponsor imagery
- Side Menu: image-based links for primary navigation
- Informational Directories: Searchable/filterable list view with thumbnail/text, detail view with hero image and text description, and dynamic feed integration
- Webviews: In-app webviews
- About Us Page: Custom image header, text description, link to in-app webviews, click to call/email and configurable forms



Platform Modules

The Application Framework comes with ready-to-use, modules consisting of SDKs and APIs (for developers) and web portals (which are easier for less technical personnel to manage). The following modules are pre-integrated into the Framework for seamless implementation into your application:

- **Location-Based Services**: Enable real-time indoor positioning that can enable various use cases such as indoor navigation, location sharing and more within your facility.
 - Home to Venue: Auto-launch driving directions using Google/Apple Maps if user is not in your facility. Get seamless transition to indoor directions
- **Mobile Engagement**: Target, engage and re-engage app users via notifications based on their attributes and/or location
- **Analytics**: View engagement and retention data such as app session and usage analytics, timed event analytics, aggregated user analytics and more
- **Content Management**: Manage, curate, load and store media, metadata and content
- **Parking Reminders**: Provide reminders for users of their parking location via a GPS-based pin drop, photo capture, voice memo record, and text memo capture.
- **Events**: Promote special events
- **Settings**: Allow users to personalize their communications and notification preferences

Multi Language Support

- App experience in multiple languages including English, Spanish, Portuguese, Chinese (simplified), Japanese, and Arabic

Industry-Specific Mobile Solutions

Our Application Framework includes vertical-specific, fully brandable and configurable solutions for various industries including healthcare, retail and residential.

Healthcare Solution

Phunware's feature-rich mobile app solution enables healthcare providers to elevate the patient journey while optimizing operational and staff efficiency, lowering costs and even boosting revenue. Using cutting-edge mobile and location technology, this innovative, brandable solution provides real benefits that take your facility to future of healthcare.

Phunware has created mobile experiences for some of the world's most respected brands, including some of the largest healthcare facilities in the United States. If you don't have an app for your facility, Phunware offers customizable and brandable app templates that can be deployed rapidly and include a powerful feature set out of the box. If your facility already has an app, Phunware's features can also be integrated a-la-carte. Our award-winning creative and engineering teams can even create custom mobile solutions, extensions and integrations.



Benefits of the Phunware Healthcare Solution

- Cloud-based patient engagement and staff management platform provides enterprise-class reliability and scalability worldwide
- Updates are made in the cloud and automatically pushed to patients and visitors without requiring the application to be republished in the app marketplace
- Multiscreen capabilities allow consistent content and updates across mobile, web and tablet-based kiosks
- Hardware-agnostic software works with multiple hardware providers and supports location technologies including Wi-Fi, physical and virtual BLE beacons and even VLC (visual light communications)

Brandable Template

- Splash Screen: Optional intro video and integrated imagery with hospital branding integration
- Home Page: Configurable links/images, featured content carousel and hospital imagery
 - Add quick links to key content pages or spotlight hospital special content
- Side Menu: Primary navigation with image based links
- About Us: Include Custom image header, text description, link to in-app webviews, click to call/email and configurable forms

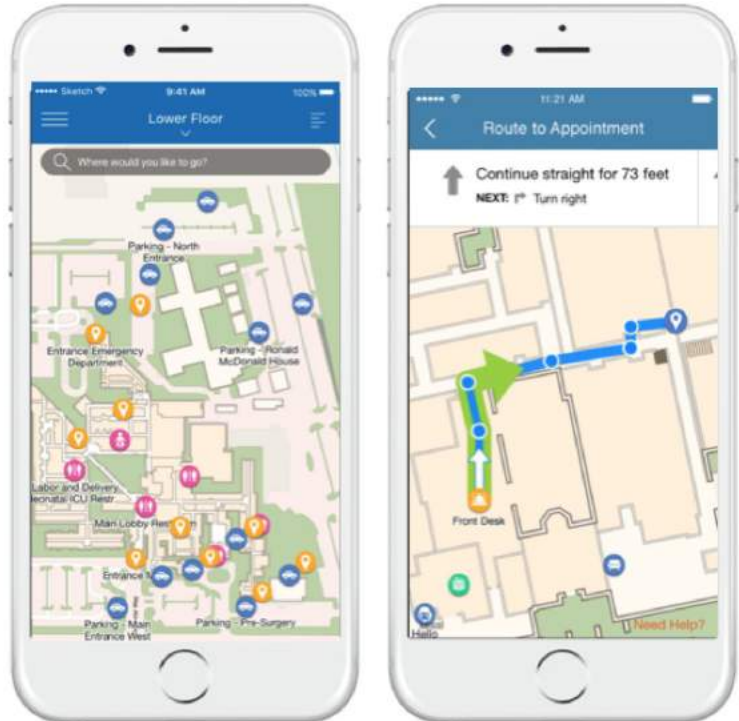
Features

Confusing navigation, revenue lost due to missed appointments, Medicaid reimbursements tied to patient satisfaction: all of these are significant challenges for hospitals. Phunware offers a dynamic new way to engage with patients before, during and after hospital visits. Using the latest smartphone capabilities and location-based technology like beacons and indoor Wi-Fi, Phunware's mobile solutions empower you to engage with patients on their phones in real time.

Mapping and Navigation (Static)

Provide turn-by-turn directions around the facility within the app or on desktop. Allow patients and visitors to quickly scan hospital maps, pull up information for specific departments or physicians and navigate between points of interest.

- Interactive, searchable maps
- Point of interest (POI) detail cards
- Step-by-step directions
- Accessible routing
- Support for multiple locations/buildings/floors
- Customizable POI markers



Real-time Navigation

Enable blue-dot, GPS-like indoor navigation (Location hardware required)

[Read more in the [Location-based Services section](#) of this whitepaper]

Map editor portal

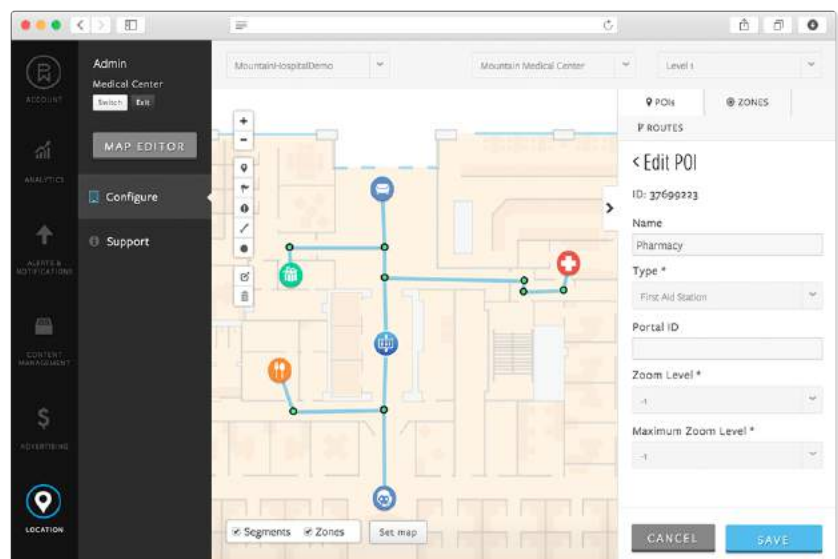
Edit, manage and update facility maps to reflect constructions or wing closures without developer resources.

Home-to-Venue

Auto-launch driving directions using Google/Apple Maps when patients or visitors are not at your hospital.

Provide seamless transition to indoor directions when they arrive.

- Determine driving directions from home to hospital
- Spotlight preferred parking lot based on final destination
- Receive step-by-step indoor directions



Mobile Engagement

Send personalized alerts and promotions to patients and visitors based on their location or attributes

- Encourage app engagement via announcements or wellness tips
- Welcome hospital visitors via proximity based (geofence) messaging
- Enable 1-1 patient communications

[Read more in the [Mobile Engagement section](#) of this whitepaper]

Informational Directories

Allow patients and visitors to browse Departments, Physicians, Services, etc and locate items on map, receive step-by-step directions

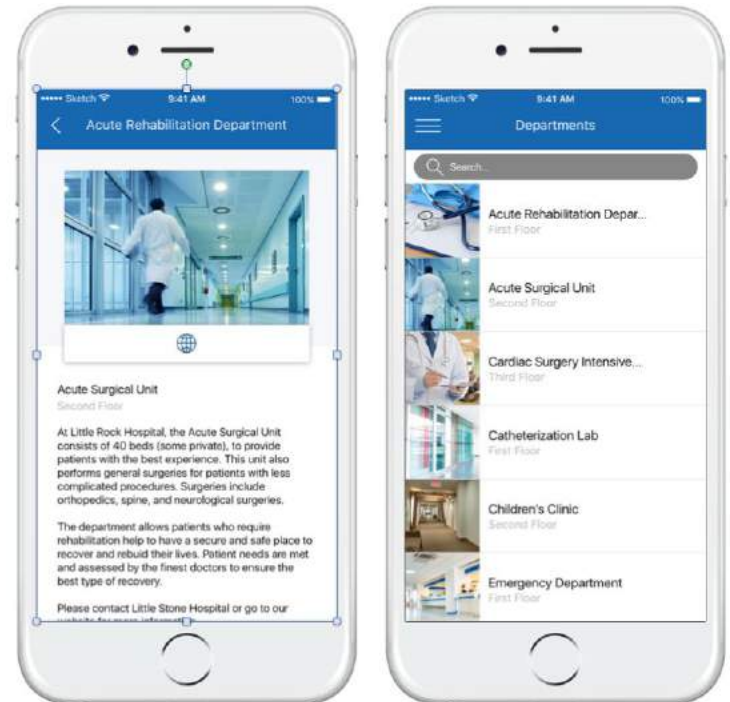
- Searchable or filterable list view with thumbnail and text
- Detail view with hero image + text description
- Dynamic feed integration
- Content sharing

Parking Reminders

Allow patients and visitors to drop a GPS pin, take photos and notes or record a voice memo of their parking location

Content Management

Easily make changes to app content such as information in directories or open hours



[Read more in the [Content Management section](#) of this whitepaper]

Analytics

Optimize and improve patient and visitor experiences using insights from app usage and location analytics. Gain insight around basic traffic and usage, retention and churn and content engagement.

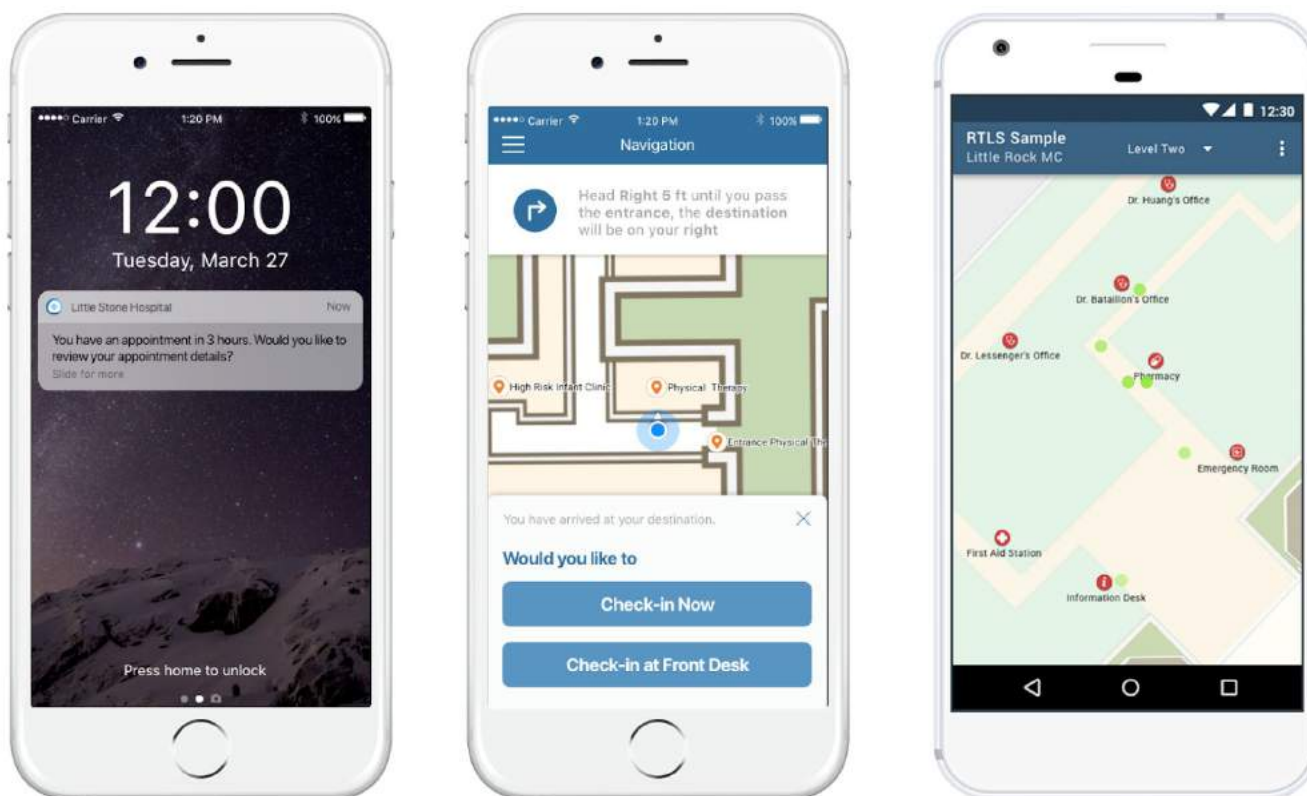
- Event/action-based tagging
- Time-based metrics
- Segment by time frame
- Custom events
- Campaign management and analytics

[Read more in the [Mobile Engagement section](#) of this whitepaper]

Premium Features *(Requires customization and various integrations)*

- Alerts and reminders: Notify patients about upcoming appointments and prompt navigation right to the facility.
- Express check-in: Trigger staff workflow as patients enter the facility
 - Set a proximity alert via geo-fence when patient is in the parking lot and when they have arrived in the office

- **Asset tracking:** Track equipment and assets in real time and navigate to them
 - Navigate to the location of the asset
 - Identify the nearest staff member to page for emergencies
- **Patient and staff tracking (location sharing):** Allow patients and staff to share their location and navigate to one another
 - Help staff identify a patient's location in waiting areas
 - Staff can share their location when paged for emergencies
- **Dwell-time monitoring:** Interact with patients and trigger different messages based on dwell time
 - Optimize work and traffic flow in areas with long waiting times
 - Compile accurate dwell times and set alarms for compliance and audit
- **Integrations:** Integrate SDKs within the app to support end-to-end patient experience
 - MyChart integration: Allow patients to schedule and review appointments, access test results, pay bills and communicate with the doctor's office
 - Amwell integration: Provide patients with access to a suite of virtual services including video visits



[Left to right: Appointment reminders, Express Check-in, and Asset Tracking]

Retail

Phunware's retail module empowers brands with the improve efficiency and elevate the shopper experience. Phunware's enterprise mobile software solutions help retailers transform the shopper experience with contextually-triggered messages, real-time indoor navigation, the ability to request assistance and share their location and more. The same indoor navigation technology can help store associates to speed restocking and order completion time.

- **Impact the shopper journey:** Send highly targeted messages to shoppers to drive store traffic, engagement and revenue and increase shopper satisfaction by providing a world-class in-store experience.
- **Improve store operations:** Take advantage of location technology and analytics to impact store operations. Increase staff efficiency and reduce restocking time and overhead.
- **Know your shoppers:** Use big data to build robust shopper profiles that cover interests, demographics and more. Serve relevant offers to high-value customers or use insights to target and acquire more shoppers.

Shopper App

Engage your audience along their shopper journey - before, during and after a visit to your store.

Mobile Engagement

Leverage shopper location and profile data to personalize campaigns and maximize revenue opportunities.

- Target Campaigns: Build sophisticated campaigns that target shoppers in real time based on contextual triggers and/or precise location.
 - Broadcast campaigns: Send promotions or info to all shoppers in your database
 - Geofence campaigns: Attract shoppers in certain regions such as zip code or store location
 - Geo-conquesting: Influence shopper behavior and keep customers coming back with targeted messages delivered right at your competitors' doors.
 - Beacon (in-store) campaigns: Using beacons to engage shoppers allows for much more accurate and granular targeting. Target shoppers when they are:
 - standing in front of a particular aisle or product bay (Attribute sales to an individual item)
 - entering your store front (Welcome guests with personalized message)
 - exiting doorway with a thank you message (Feedback or survey forms)
 - Send push notification promotions and navigation to the specific item on sale
[Read more in the [Mobile Engagement section](#) of this whitepaper]



Navigation

Help shoppers find products with in-store real time navigation.

[Read more in the [Location-based Services section](#) of this whitepaper]

Analytics

Use analytics to reveal more insights about:

- Shopper behavior and store operations
- Engagement and conversion metrics, such as app sessions per hour and number of unique devices
- Detailed location analytics, such as heat mapping and in-store traffic flow (when paired with a hardware partner)

[Read more in the [Analytics section](#) of this whitepaper]

App User Acquisition and Engagement

Build your shopper base with Phunware's Audience Building and Engagement solutions and engage them with relevant brand messages.

[Read more in the [Audience Building](#) and [Engagement](#) section of this whitepaper]

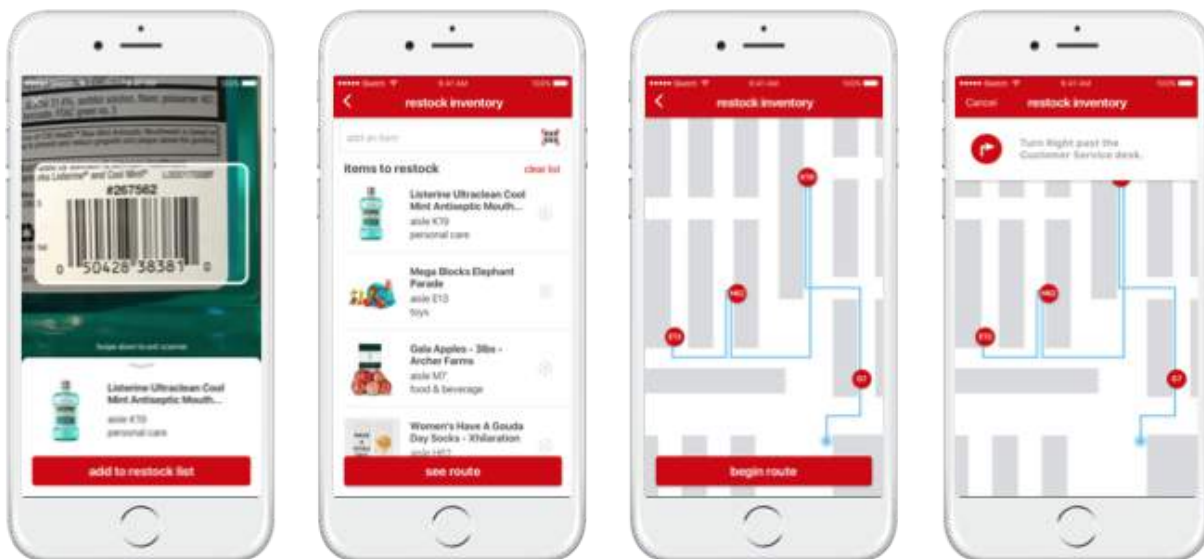
Associate App

Phunware can impact operational efficiency and associate productivity when wayfinding is enabled in associates' handheld devices.

Real-time navigation

Guide employees on the most efficient route to the proper location for stocking in-store or in warehouses.

- Inventory stocking: Place items on appropriate shelves when shipments arrive and restock items from returns and fitting rooms.
- Finding products: Easily locate items for customers using “Buy Online, Pick Up in Store” (BOPUS) or “Buy Online, Ship from Store (BOSFS) to fulfill orders quickly.
- Also beneficial for training seasonal or new workers and fast changing store/ warehouse layouts



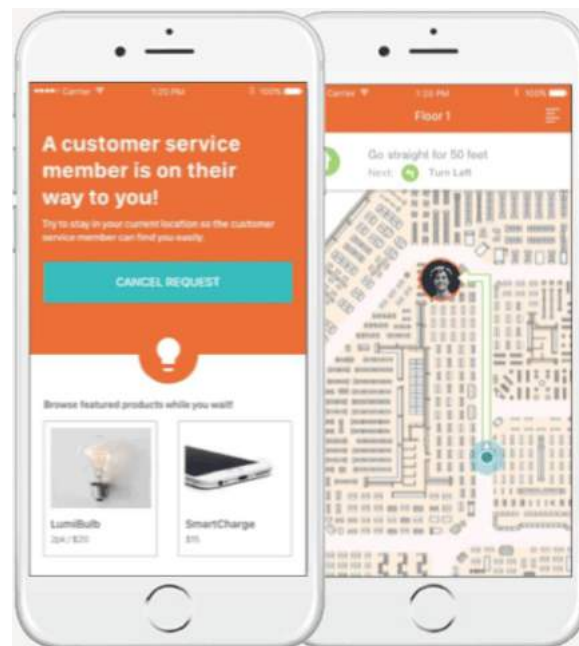
Premium Features *(Requires customization and various integrations)*

- **Buy Online, Pickup in Store:** Know when your customers arrive when they breach a geofence around the parking lot and deliver an order to their car.
- **Point of Sale Redemption:** Use Mobile Engagement and beacon technology to ensure single use redemption of offers at retail point of sale. Customers can use their mobile phone to receive, and redeem personalized offers.

- **Request Assistance (Location Sharing):** Large open areas can leave shoppers hunting for a sales associate to assist them in their product selection while in store.

Using a combination of Mobile Engagement and Location-based Services, brands can create real-time location sharing capability to give shoppers a better in-store experience. Shoppers can request help, and associates will be notified of their request, and once paired, shoppers and associates will see each other's location on a map to know exactly how long it will take for help to arrive.

- **Real Time Location Services (RTLS):** Large retail facilities can have many items that a staff member needs to locate to function efficiently. Create efficiency for staff by leveraging Location-based Services and a third party RTLS system to help staff visualize where items are on a retail location, and assist in routing them to the location of the item.



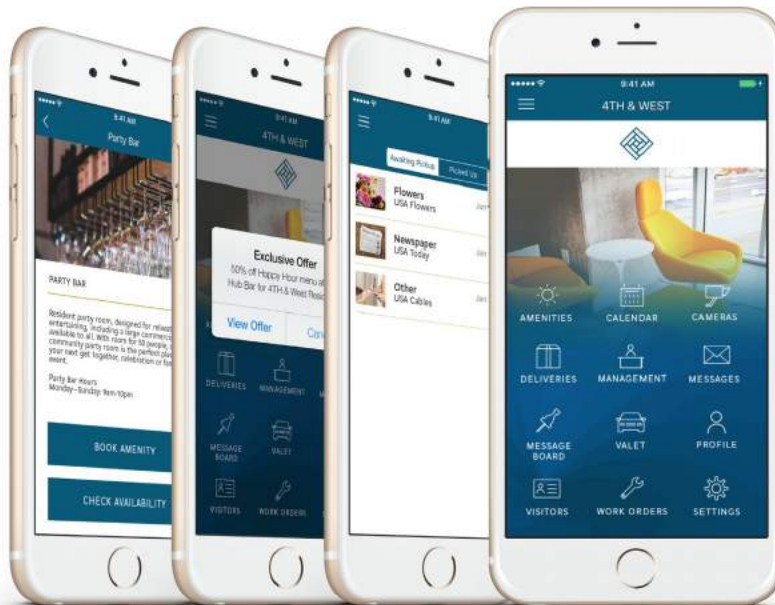
Residential Solution

Phunware's residential solution creates a premium resident experience and improves staff efficiency. Whether you're managing residential properties, mixed-use developments or student housing, every service your property offers is immediately accessible through your branded mobile app and website. Satisfaction happens in real time, day or night, no matter where your resident is.

Phunware's technology is used by some of the most prestigious properties and real estate groups in the US and abroad. We've worked with customers ranging from resort-style high-rise rental properties to luxury residential buildings and beyond. Residential customers experience increased property values, better quality resident communications, richer community engagement, increased retention of residents, and a digital lifestyle that sets their property apart from competitors

Residential Mobile App

For residents of multi-unit properties, a mobile app that makes property services and amenities accessible day or night can be a decision-making differentiator, impacting where they choose to lease or buy. Phunware's configurable resident mobile solution includes the following.



- **Package Notifications:** Receive mobile alerts and emails with detailed information about packages received at the front desk.
- **Work Orders:** Take a picture and submit a work order directly through the app.
- **Alerts and Messages:** Receive real-time communications about property events through text, email or push notifications.
 - Inbox: Receive in-app notifications and messages stored in a persistent inbox.
 - Preferences: Set contact preferences for email and broadcast notifications.
- **Directory:** View a directory of points of interest within the property
- **Events:** promote property events to residents with tap to RSVP or save to calendar options
- **Amenity Booking:** Browse and request amenities with a few taps and swipes.
- **Calendar:** Stay up-to-date on property events and amenity availability.
- **Digital Concierge:** Click to call or click to email requests to property departments.

- **Visitor Lists:** Manage a secure list of authorized visitors and service providers, informing the front desk of changes in real time.
- **Live Camera Views:** View cameras around the property to check how crowded the gym or pool is before venturing down the elevator.
 - The Staff Dashboard supports Axis Camera and ExacQ Camera integration
- **Message Boards (Forum):** Easily communicate with other residents to find a dog sitter, start a club and more.
- **Valet Parking:** Request a vehicle with a few taps and watch it arrive on the live camera.
- **Meet the Staff:** Browse staff members including pictures and individual contact information. Residents can contact staff members quickly via email or phone from within the app.
- **Library:** Access to view documents and files posted by the Property such as Newsletters, Financial documents, Renter's book, Board Minutes, etc.

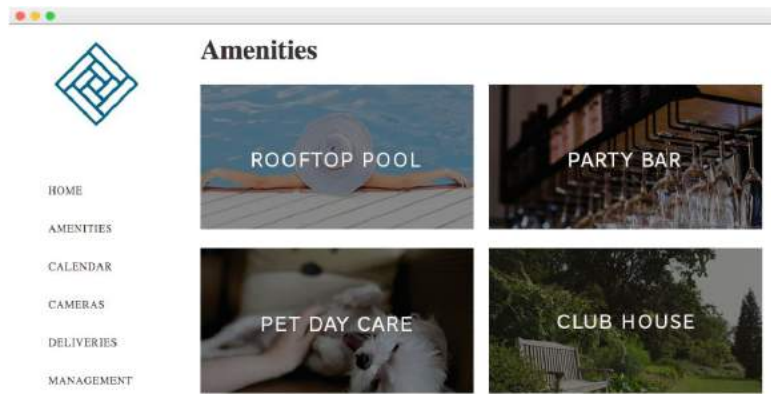
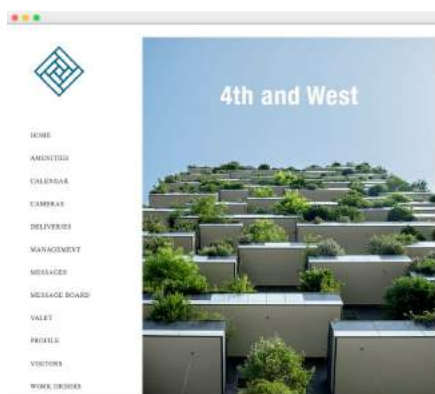
Premium Features

- **Smart Locks:** Manage door access through the app.
 - Conveniently and securely unlock doors
 - Share door access with their guests (and restrict it)
 - Remote access: Unlock any online door remotely and allow access to guests even when they are away from home
 - SMS access: Invite visitors via SMS and give multiple visitors access. Visitors receive an SMS and can join the app in "visitor mode".
 - Elevator Control ensures guests can only get to the floors and units they are supposed to in the actual elevator.
 - Residents are notified via a push notification when one of their unit's visitors accesses a unit door.
- **Mobile Engagement:** Partner with nearby retailers to create resident offer campaigns to boost foot traffic, revenue and customer loyalty
- **Navigation (Location-based Services):** Explore the neighborhood and get navigation directions surrounding points of interest



Residential Community Website

The community website is an extension of the Resident app. Residents can enjoy the same functionality in a full browser view. Residents can check their deliveries, calendar, inbox, or request a service the same way they would from the Residential app.



Staff Dashboard

Phunware's solution for multi-unit residences empowers staff to do their jobs more efficiently by automating tasks and providing enhanced visibility into property operations.

Resident CRM

Manage important details about your residents, vehicles, visitors, pets and more. Generate and export reports on property information and resident activity.

Resident Communication Tool

Easily keep your residents informed with messages based on who they are and their preferred method of communication.

Send targeted communication to pet owners or a memo in another language to international residents. The Phunware platform provides email, SMS and push notifications with segmentation capabilities.

Mass Notifications

Multi-Language support included. Target groups of residents based on language, resident type, or by a custom group for a mass email or broadcast push. (SMS messages are available at extra cost.)

Email/Push/SMS Templates

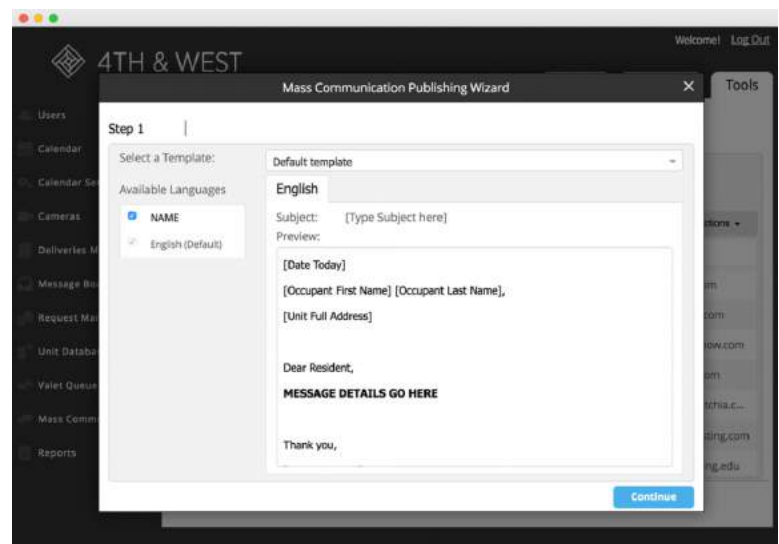
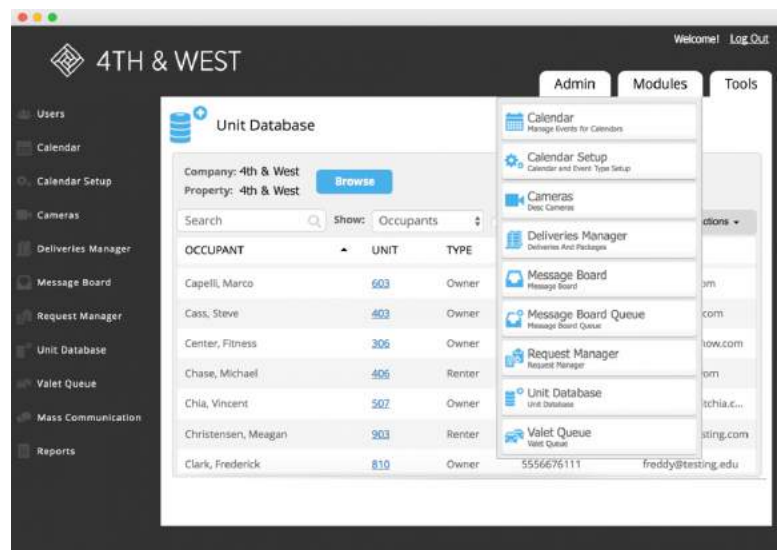
Create branded system messages easily within Staff Dashboard with an easy to use drag-and-drop editor. Add and delete templates used with Mass Communication and brand them to the property.

Staff can also easily edit system emails such Resident On-boarding, Visitor SMS On-boarding, Delivery Notifications, resident password recovery emails, etc.

Request Tracking

All resident requests (work orders, repairs, valet, etc.) come to a centralized location for staff to handle. This ensures nothing falls through the cracks and provides management with accountability on request status and response times.

Valet Queue: View Valet requests, filtered by start and end date. See when the service has been fulfilled and close the request.



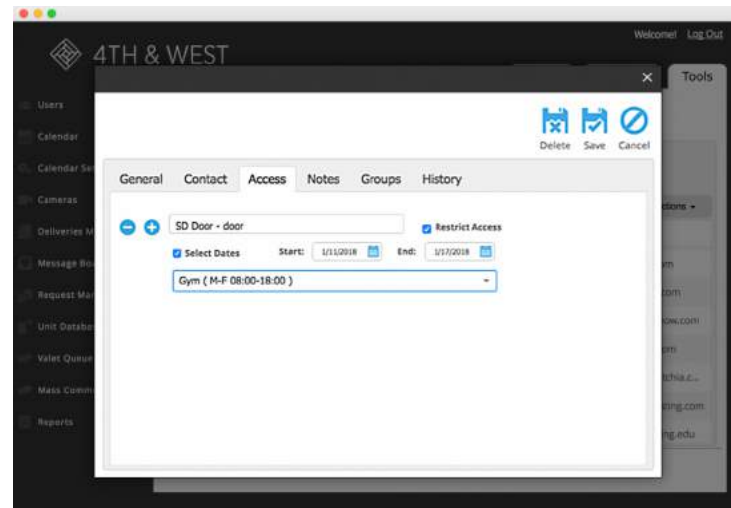
Delivery Tracking and Management

Quickly scan packages in bulk into the database when they're delivered, triggering automatic push and email notifications to residents. Residents can sign for packages digitally, eliminating the need to manage paper and ensuring accountability.

Smart Lock Integration

Create, manage and restrict door access for residents and visitors from a central location. Provides ability to approve visitor door access before being granted to a visitor.

Includes door access reporting to show full view into visitors who are granted access to a door, when it's opened, and by whom, and at what time. Integration requires Salto ProAccess Space engagement.



Calendar Setup

Add, edit, and delete single calendar events and recurring ones. Create and update calendars, define calendar visibility, and display order shown in the resident mobile app.

Camera Manager

Add, edit, delete and organize camera feeds. Camera and feed must be IP-based. Hardware installation and configuration guidelines must be followed property.

Message Board Manager

Add and update message boards. Associate a board with a property. Set moderation level. Posts on moderate boards will be sent to the Message Board Queue section for approval.

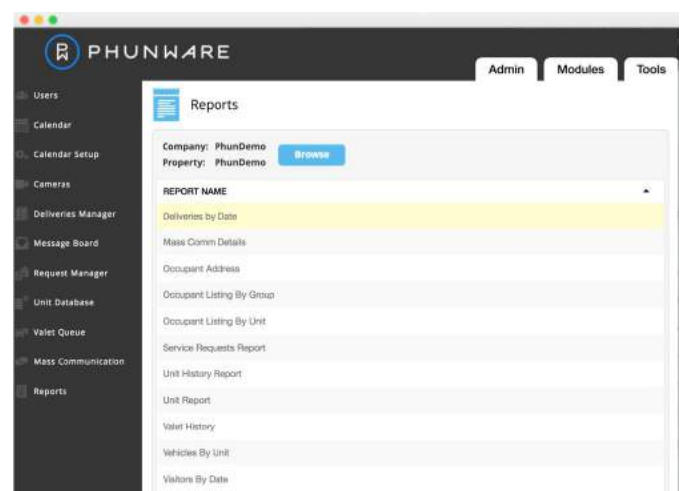
Reports

Pull reports on actions performed within the staff dashboard including work orders fulfilled, deliveries tracked, communications sent and more for operational insights that can inform better decisions and increase workflow efficiency.

Analytics

Get insights on app usage, engagement and retention in the Maas Portal.

[Learn more about [MaaS Analytics here.](#)]



Staff User Management Roles

Add, update and delete staff users and define their permissions via roles.

Package Kiosk

Displays information about units with packages awaiting pickup and weather forecasts. Integrates with the Staff Dashboard to display, in a standard Web browser provided by the property. (Note: Hardware not included or sold by Phunware)

Sales Center Application

While potential buyers are on-site, use your branded app to showcase your property's lifestyle. Then, keep your property top of mind with a mobile application buyers can take with them. Allow sales staff and potential residents to interact with your branded app loaded with interactive sales brochure information.

- View available residences, floorplans, property imagery and pricing.
- Update app content in real time to ensure sales staff are working with the most up-to-date information and marketing material.



Mobile Takeaway App

Keep potential residents engaged with property information and updates.

- Browse the image and video gallery of amenities, views and residences.
- Review available floorplans, key plans and unit specs.
- Take a neighborhood tour with integrated Google Maps.
- Receive push notifications on property sales and development.
- View live camera feeds during construction.

Premium Features *(Requires customization and various integrations)*

Property Management Integration: Integrate your property management software with Phunware's solution to avoid double data entry every time you make a change in your desktop property management software database. Integration options include import/export tool support as well as custom options as required. Common integrations include Yardi, MRI and RealPage.

- **Knowledge Graph:** Unify data from various sources (such as the residential app and your property management software) to get unique insights into resident data to help increase resident rentals and retention.

[Learn more about the [Phunware Knowledge Graph here.](#)]

Data Licensing

Phunware Data Licensing is a data enrichment service that expands the connections and attributes of a [Phunware ID profile](#). Rich Phunware ID profile provided by Phunware Data Licensing enables a broad set of use cases to engage, manage and monetize mobile audiences at scale including:

- Gaining deeper insight into user behavior
- Increasing the engagement with your audience and retaining high value customers
- Acquiring new users to scale audiences
- Optimizing media campaign performance
- Personalizing app experiences to retain customers and increase customer satisfaction

We process 6 billion events per day across over 1 billion global unique devices every month. The data collected ranges from mobile application usage activity, geo-location events, WiFi network events, geofence entry and exit events, proximity triggers using bluetooth, and more. These data are cleansed, curated and organized into a unified profile with marketing dimensions that enable segmentation. This extensive data set is made available to customer as a data license.

Phunware has relationships with a number of data partners, which extend and add value to the core at scale mobile data set. Partners extend the Phunware data with rich, domain specific data such as high quality political data from TargetSmart and L2. This expands our data corpus with household attributes, voting history and demographics for U.S. voters. Probabilistic household and device matching based on location signals enable the delivery of targeted mobile media to influence political campaign outcomes. Political domain attributes include:

- Household demographics: presence/number of children, number of males, number of females, number of adults, age ranges, household size, income range, net worth range
- Household voting history: number of Democrats and Republicans,
- Voting districts and precincts for each address

Profile Enrichment

Data Licensing extends the known data about customers giving brands and marketers unique insight into devices and demonstrated user behavior. Information such as locations visited, application usage, media consumption, and other interactions provides the ability to create unique and valuable interactions.

- Brands can target offers and increase conversion using the extended profile.
- Machine learning can use enriched Phunware ID profiles to recommend products to purchase, personalize experiences to extend user sessions and reduce churn.
- Location-aware insight in the physical world can be used to deliver the right message at the right time.
- Gain insight into location patterns and density, mobile apps used by users and audiences to optimize media campaigns.

The enrichment service can extend Phunware ID profiles using two methods depending on how mobile device data is collected.

- **Phunware collected:** For mobile applications that use Phunware SDK's, Phunware automatically collects this data and processes it in real-time. The Phunware ID profile is updated when new data is

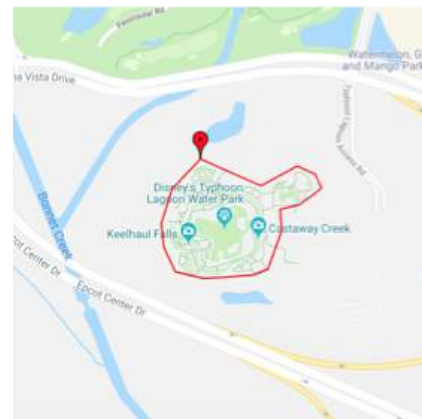
collected. The Phunware ID profile of a mobile device is also updated when any other data is seen across Phunware's data platform. Since Phunware is collecting the device data, the Phunware ID profile is being updated and it can easily be provisioned through data licensing without any customer actions.

- **Customer collected:** Our customers may have existing mobile applications that do not use Phunware SDK's or collect information on mobile devices through various methods. In this scenario, customers can post a list of mobile devices over a secure FTP channel for Phunware to process. Phunware will ingest these devices and perform a match against our internal knowledge graph using the device advertising ID or MAC Address. Phunware ID profiles will then be provisioned in data licensing for any matched devices. This provides a broader view of the applications used, locations visited and derived marketing segments such as interests and intents.

Mobile Audiences

Brands can leverage Phunware's extensive data set to create custom audiences for use in mobile media campaigns. Using the Phunware Knowledge Graph API, location-based audiences defined by custom polygons and radial boundaries can be easily created in seconds. Our footprint of over 600K location data points (geohashes) enable brands to assemble high value location-based audiences for use in mobile media campaigns, thereby increasing campaign performance metrics and generating more clicks and conversions.

- **Device Harvesting:** Build and activate large scale audiences based on location activity within custom-defined polygons or radial boundaries over specific date ranges.
- **Geo-conquesting:** Identify mobile users visiting competitor locations in seconds using polygon and radial geofence device matching powered by the Phunware Knowledge Graph API.
- **Custom Audiences:** Campaign specific audiences can be created using any property or marketing dimension as defined by the [Phunware Ontology](#).



These custom, optimized audiences can be delivered to DSP's for activation.

- **DMP 1st Party Data Enrichment:** Extend and enrich mobile device data in your DMP account to reach new mobile users and tailor audiences with segments (behaviors) derived from Phunware's [marketing dimensions](#).

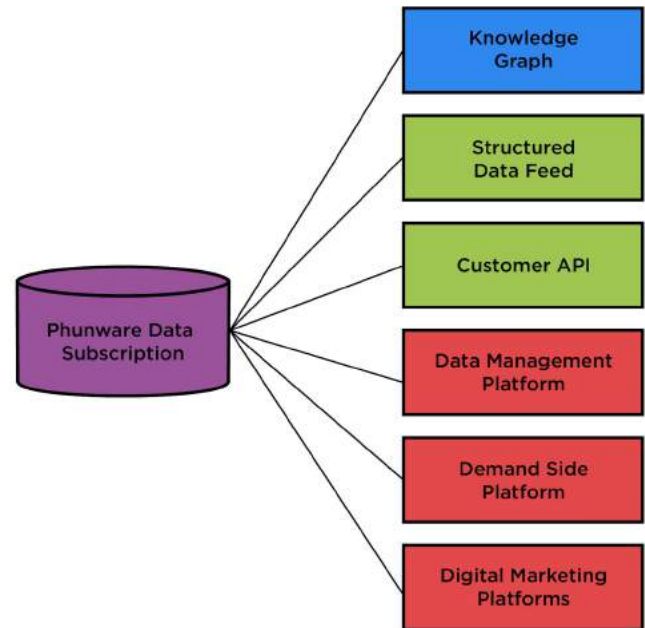
Content Personalization

Using data collected from a mobile app, developers can personalize content as the corpus of demonstrated actions increases over time. Data Licensing can supercharge that corpus by extending the Phunware ID profile with all of the other demonstrated user behavior and data that is seen outside a mobile app. The Knowledge Graph API enables programmatic access to the user profile and its properties can be used to personalize content to drive conversion, engagement and customer satisfaction.

Data Licensing Consumption Patterns

Phunware offers flexibility for how Data Licensing can be provisioned for use.

- **Phunware Knowledge Graph:** Data Licensing can be configured to automatically inject enriched Phunware ID profiles directly into a [Knowledge Graph](#) as a real-time event stream or in batch-mode.
- **Structured Data Feed** - Phunware can deliver a data license as a structured data feed as RDF, JSON or CSV. This enables customers to consume Phunware ID profiles directly into their data infrastructure.
- **Customer API** - Phunware can deliver a data license by posting Phunware ID profiles to a customer-supplied data collection API endpoint.
- **Data Management Platform (DMP)** - Phunware can deliver a data license as mobile device segments to the DMP of your choice. This deployment model expands your 1st party mobile data footprint for activating audiences at scale.
- **Demand Side Platform (DSP)** - Phunware can deliver a data license as a custom audience to the DSP of your choice.
- **Digital Marketing Platform:** Phunware can deliver a data license to digital marketing platforms where identify resolution solutions can enrich profiles with Phunware's data.



Audience Building

Phunware Audience Building is a managed service capability to grow mobile audience scale.

User lifetime value (LTV), a top priority for brands, is at the core of Phunware's audience building platform. Our platform delivers non-incentivized and high lifetime value (LTV) users to your app on a cost-per-install (CPI) basis..

Performance-based Marketing

- CPI (cost per install) and CPA (cost per action) campaign pricing are available to support a variety of different user actions
- Bring the attribution partner of your choice to track your conversions
- Active fraud protection to detect and block suspicious devices and remove false conversions
- Meaningful scale across more than 30,000 publisher integrations
- Optimized to encourage post-install actions and retention in your newfound audience

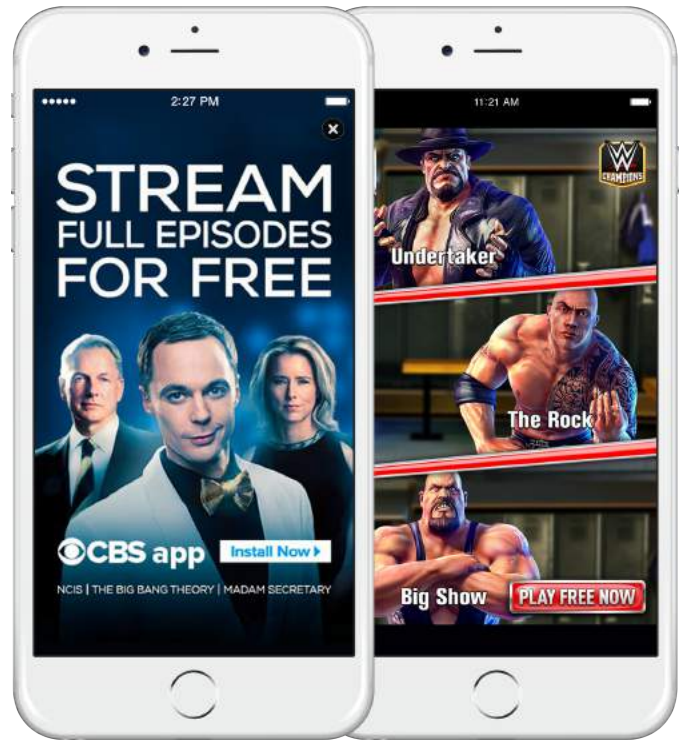
Audiences

Leverage Phunware Knowledge Graph Audiences to target and optimize your campaign for custom mobile audiences. You can even add meaningful scale to your app by building lookalike audiences based on your highest-value users.

- Target based on behaviors, interests, location and technographics that are more likely to convert.
- Leverage pre-built audience segments or build your own
- Tailor customized messaging to separate audiences to test and improve conversion rate.

Analytics

Get full visibility into—and control over—the supply sources of your user acquisitions. Track campaign performance using your partner of choice— we can integrate with top mobile tracking partners like TUNE, Kochava, AppsFlyer and more. Measure and track progress towards your most important KPIs (installs, post-install actions, LTV, etc.)



View technical documentation on [Audience Building here.](#)

Audience Engagement

Phunware Audience Engagement is a managed service capability that delivers targeted media to optimize engagement with your audience. Build and target mobile audiences with Phunware. We're constantly processing proprietary data from thousands of apps and real-world actions, tied to a Phunware ID. The result? Exclusive insights into users' interests, behaviors and locations.

Audience Targeting

Combining mobile advertising with Knowledge Graph data from over a billion devices, Phunware makes it easy to deliver customized messaging and improve efficiency with targeted campaigns. Work with a dedicated team to design, build and target Phunware ID groups that are made up of your ideal consumers tailored to your campaign needs- using interest, location, demographic, and technographic characteristics and outperform cookie-cutter segments.

Advanced Mobile Ad Formats

Our in-house studio brings your brand to life by creating captivating mobile-first creative. From rich media to video, our ad units feature cohesive branding and animation that entice users to take action.

Interactive Rich Media

Work with our creative studio to make information gathering through the use of tappable galleries, swipeable cards and other interactive features.

Video Rich Media

Our rich media units can house additional videos to allow users to watch more.

360 Video

Our 360 video rich media connects to the magnetometer, accelerometer, and gyroscope of the user's mobile device allowing users to engage with 360 videos with one of a kind accuracy.

Vertical Video

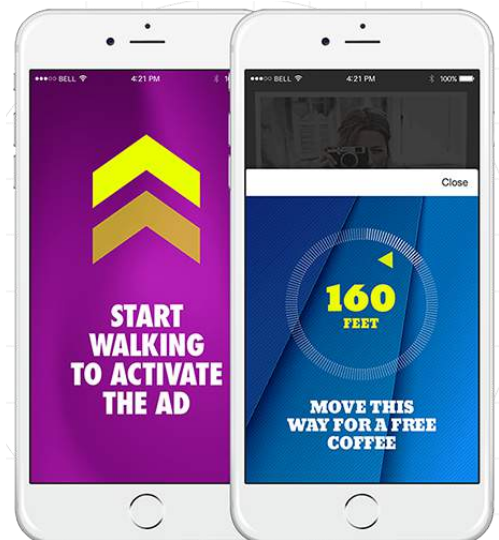
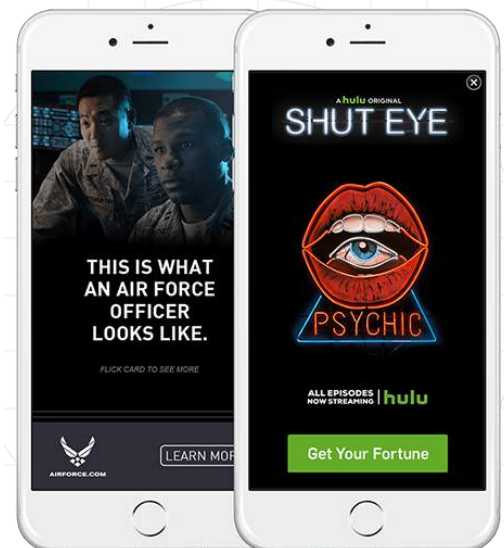
Distribute your own vertical video ads (VerVid™) or enlist the services of our creative studio to help.

Motion Ads

Prompt users to use certain motions and actions - like steer, dip, bend, draw, push, pull, shake, walk - to engage with your ad and trigger real-world interactions.

Playable Ads

Playable ads are fully designed and enhances for the mobile experience and make users feel like they are playing an actual mobile game but in a rich media unit



Campaign Analytics

Our account management and optimizations team carefully monitors and makes daily optimizations to ensure your overall campaign KPIs are met and exceeded. Customized reporting is available, and we will always provide a wrap-up report with insights future recommendations.

Standard reporting includes:

- Impressions served
- Clicks and click-through-rates
- Rich media engagement rate
- Video completion rate
- Daily breakout per creative
- Sum of spend and added value

Advocacy

Phunware enables campaign organizations, government affairs and advocacy groups to build and engage voter and constituent audiences. Our solution brings together first-party mobile data and voter files to deliver highly targeted messaging to granular audiences.

For the first time ever, campaign teams, crisis PR managers, government affairs and advocacy groups can use this data to engage voter and constituent audiences on mobile devices by messaging directly to them on thousands of apps.

Advocacy Marketing Campaigns

Phunware combines the power of the Knowledge Graph with data from the leading national voter databases to enable accurate audience targeting for specific advocacy uses. With a registered voter address, Phunware generates a list of mobile device IDs associated with a household boundary based on device location activity that can then be targeted with your messaging.

Audience Targeting

Phunware's audience targeting capabilities and Knowledge Graph technology allow for more efficient campaigns and tailored messaging for both large and narrow scale campaigns. Targeting can be performed using location, interest, technographic, and demographic segments to further isolate audiences for improved results.

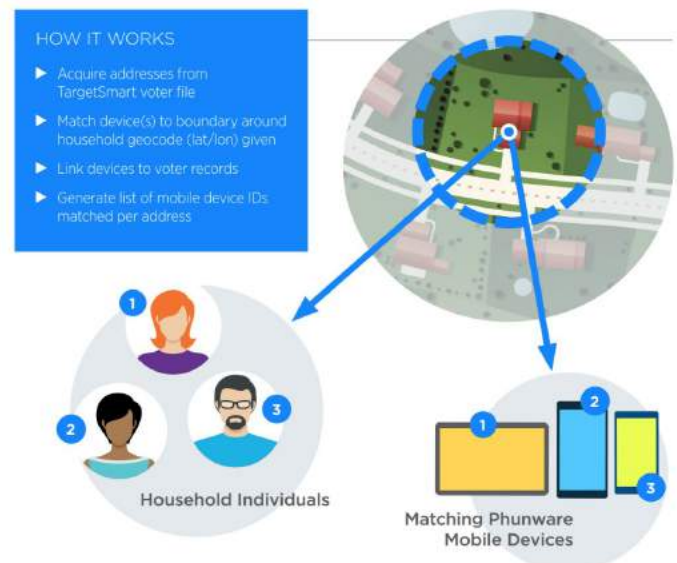
- Designated Market Audience Targeting: Reach voter and constituent audiences in specific markets to increase awareness of upcoming elections and encourage voter turnout, calls to elected officials or other desirable outcomes.
- Target campaigns based on 2,000+ demonstrated behaviors and characteristics

Device Matching

Using Knowledge Graph location segments, Phunware offers the ability to match mobile presence to voter lists, making targeted advertising possible.

From a provided list of voters, Phunware can perform accurate targeting and selectively deliver your advocacy messaging to drive actionable results.

- 75%-85% mobile audience match rate from known voter lists
- Match against historical event or rally locations to create hyper-targeted
 - Geo-fence Location Targeting: Set up a geo-fence to precisely target voters at





specific locations including campaign events, polling centers, and other points of interest.

- Partnered with the leading voter-data organizations

Managed Service

Phunware offers managed service media campaigns in addition to data

- Easy CPM pricing models and a managed service to help optimize against your goals
- Access campaign insights and attribution statistics

Custom Solutions

From strategy to fulfillment, Phunware creates category-defining mobile experiences for the world's leading brands. We deliver at every stage of the mobile lifecycle.

Phunware provides fully integrated and comprehensive solutions across application experience definition, portfolio creation, discovery, user acquisition, user engagement, user monetization and the underlying data for making smarter business.

Phunware has experience with the development of applications across a plethora of device types on both iOS and Android. The Phunware team provides total mobile application lifecycle management from strategy to creation to launch, support, and monetization.



Strategize: A successful strategy results from clearly understanding business and user goals, implementing intelligent architecture and ensuring platform extensibility and expandability. Creating utility and value as a first priority and focusing on experiences rather than feature sets ensures we deliver solutions that drive value.

We drive ongoing results through the combination of performance with business intelligence, evolving roadmaps underlying experiences and treating those experiences like core products and services.

Create: Our design team is focused on creating the most incredibly visual and interactive experiences possible. Phunware design is never random and always based on careful study of your goals and your audience. Our goal is to build applications that encourage users to interact with design elements and enjoy searching for the subtleties that bring the experience to life.

Launch: Delivery is not the destination but the beginning of an ongoing journey that strives to continuously innovate and inspire. Our solutions include a support infrastructure to enable the constant evolution of the brand experience across mobile and how users engage with it.

Monetize: Increase ROI by building larger audiences for your app and monetizing users. We'll help you leverage data analytics and market insights to make even smarter decisions around acquiring future users, creating monetization campaigns and your overall app strategy going forward.

Creative Fulfillment Process

Phunware will work with you to create your custom app through our creative fulfillment process.

- **Discover:** We engage in collaborative conversations about your goals for your mobile solution and its features. After we help you define the possibilities for those features, we hone in on what we want to focus on for release 1.0.

- **Architect:** Once we've agreed on features and expectations, design begins with an application and data map
- **Design:** Our creative team then goes deeper with high-fidelity wireframes that detail all of your application's expected user flows. We make sure the app's look and feel embodies your brand and personality.
- **Develop:** As your visual designs are approved, we work collaboratively with you to develop your app. This step involves a prioritized feature backlog and detailed sprints.
- **Evaluate:** As your application is built, our QA team tests your app for quality.
- **Launch:** Phunware Program Managers work closely with you to help coordinate the successful launch of your app across multiple app marketplaces and review times.
- **Support:** We transition you project to Support to ensure continued success. We continue our discussion, exploring future phases and roadmap planning, often rolling out new features and releases.

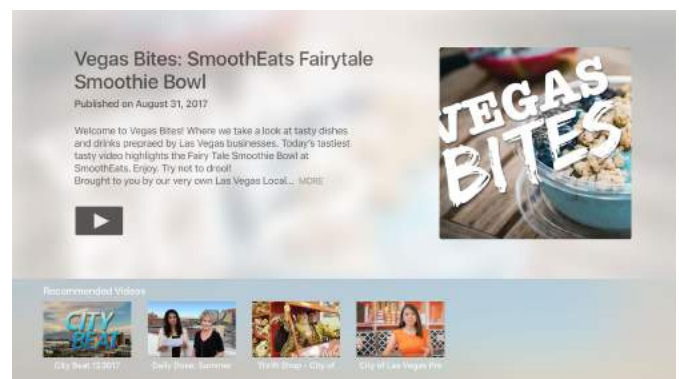
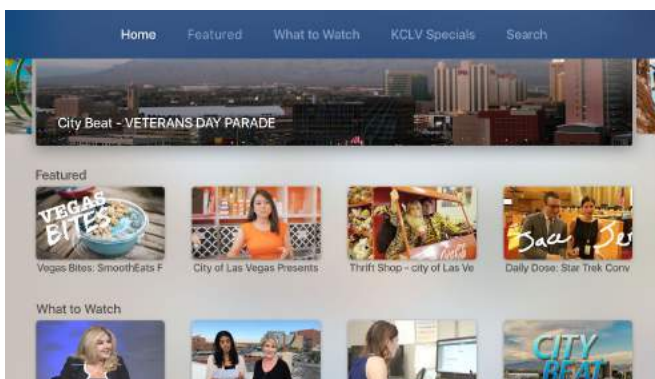
Media and Entertainment

We have introduced category-defining experiences which challenge the outer limits of the most advanced connected devices for the world's most respected entertainment brands including La Musica, Fox, The CW and WWE Network.

- **Strategy:** Identify mobile KPIs and a plan for reaching them at scale. Build and execute against a long-term, future-proof mobile vision.
- **Custom App Development:** Manage, test and develop native iOS, tvOS and Android applications as a unified portfolio or individual apps. Drive viewer engagement with stability, scalability and 99.9% uptime.
- **App user acquisition:** Drive installs and high-value user acquisition on a low-risk, performance cost-per-action basis. Target and optimize campaigns with data from thousands of Phunware apps.
- **Branding and Engagement:** Use mobile marketing automation and paid media campaigns to show attributable lift in tune-in, video starts, seasonal engagement, brand awareness and more
- **Lifecycle Management:** Let Phunware manage execution and analysis, using campaign, user and location analytics to inform marketing and mobile strategy.

TV OS

tvOS, Apple's TV-based operating system, is changing the way brands develop apps and eliminating the gap between iOS and TV. Phunware can help your brand expand past video streaming to creating unique experiences with custom tvOS apps that work seamlessly between users' iPhones and their TVs.



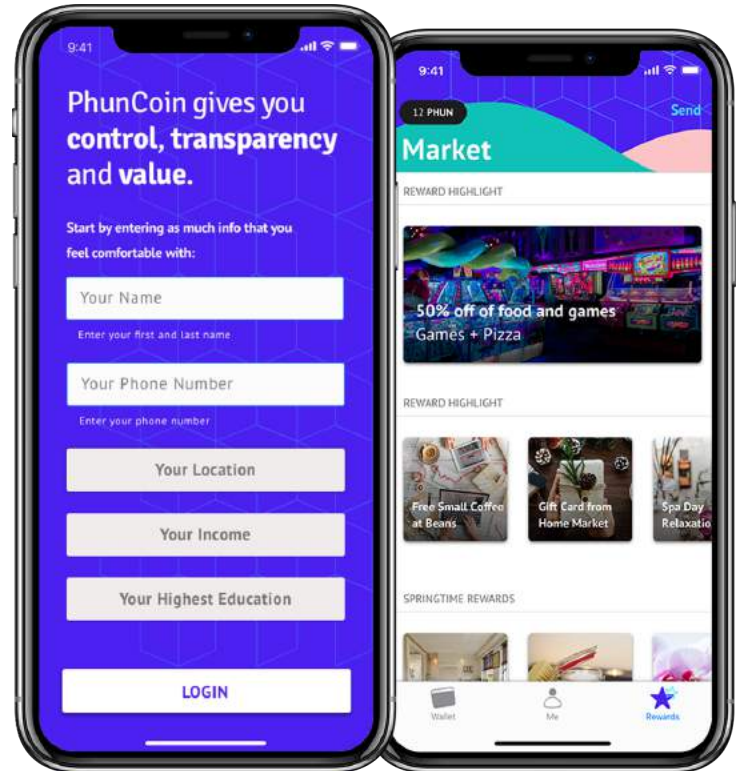
PhunCoin

PhunCoin is a mobile-first blockchain ecosystem that connects brands and consumers. It incentivizes consumers to share accurate data and allows brands to provide a unique loyalty and rewards program for their consumers without the liability of typical loyalty programs.

PhunCoin allows consumers to take back control of their data by gaining better insight and management over its usage while offering brands unprecedented audience insights through a value-based exchange.

PhunCoin is uniquely positioned for mainstream adoption thanks to the global reach and distribution provided by Phunware's mobile economies of scale.

- **Consumers** receive PhunCoin for sharing unique data attributes and actively participating in engaging marketing campaigns
- **Developers and publishers** receive PhunCoin for utilizing Phunware's SDKs and APIs to better engage, manage and monetize their consumers
- **Brands** gain access to more relevant data and use PhunCoin for their own incentive programs and marketing campaigns



Key System Components

- Flagship Application is a native mobile suite of features
 - This mobile-first, native application suite is the primary way end users interact with PhunCoin.
 - The PhunCoin app includes a digital cryptocurrency wallet and transaction history, a simple and intuitive interface that allows users to enter and control the submission of their data and a marketplace of offers and rewards where users can redeem PhunCoin they have earned
- Marketplace
 - A marketplace of digital goods and services is available to Consumers giving them the ability to get real world value from the PhunCoin they have earned
- Software Development Kit (SDK)
 - The PhunCoin SDK enables App Developers to onboard new users and send data generated by those users into the Data Exchange, as well as providing an entrypoint into the ecosystem
- Data Exchange
 - The Data Exchange serves as a connection hub for participants in the ecosystem, enabling the capture and organization of user data for use in advertiser Data Enrichment requests
- Smart Contracts Platform
 - PhunCoin will leverage existing blockchains to achieve our design goal of low cost value transfer

PhunCoin for Brands

The PhunCoin ecosystem provides a suite of innovative tools and verified customer data that helps brands and agencies scale their digital marketing easily and affordably. With PhunCoin, brands get real-time access to invaluable data about their target consumers and can incentivize them for their actions directly through cryptocurrency based rewards.

- Access to deterministic and intent-based data about target consumers
- Privacy and GDPR compliant data exchange with KYC* verified profiles
- Power audience targeting and media buys and receive bonus impressions for more efficient ad spend and scale
- Reward consumers for visiting locations and/or taking specific actions

**Know Your Customer (KYC) regulations require PhunCoin to identify and verify the identity of our users*

Phunware Audience Engagement and PhunCoin

Phunware Audience Engagement and PhunCoin together deliver customized messaging and improved efficiency with customer-data targeted advertising campaigns. Build and target groups with your ideal consumer traits and tailor specific messaging with improved effectiveness and scale on your digital campaigns.

By combining your campaign with the PhunCoin ecosystem, any earned or purchased PhunCoin can be exchanged for media in lieu of traditional pricing. In addition to the benefits of targeting with PhunCoin data, qualified brands paying for Audience Engagement services in PhunCoin will receive *bonus impressions* on their campaigns.

PhunCoin Marketplace

PhunCoin will support a marketplace of digital offers for goods and services integrated into the ecosystem. Consumers can spend PhunCoin on brand specific rewards, or earn more PhunCoin through branded incentives. By participating in the marketplace, brands can directly engage with PhunCoin user segments.

- Boost engagement by creating branded incentives that pay in PhunCoin
- Earn more PhunCoin by creating and selling branded offers or discounts in the marketplace

Loyalty Programs with PhunCoin

Brands can use PhunCoin to directly incentivize consumers in their own apps or loyalty programs. PhunCoin provides a way for brands to maintain control over their brand marketing and rewards, without having to manage their own points or currency.

- Provides an opportunity for brands to draw in PhunCoin members to their own programs
- Avoid carrying loyalty liability
- Prevent loyalty offer and redemption fraud by ensuring that only KYC verified members can hold or transact in PhunCoin. In addition, the PhunCoin marketplace will





maintain a team of fraud specialists and automation to immediately freeze any abusive accounts.

Use Cases

- Consumers
 - Consumers are rewarded in PhunCoin when they join the ecosystem and opt-in to provide validated data.
 - Consumers are rewarded in PhunCoin as their data is used for targeting from Partner Brands
 - Consumers can use PhunCoin to unlock special offers from select Partner Brands
 - Consumers can receive PhunCoin in exchange for visiting a targeted location
 - Consumers can engage with the Flagship Application where users can receive PhunCoin in exchange for updating and enriching their data
- Developers and Publishers
 - An App Developer can use the PhunCoin SDK to send PhunCoin to users as they engage with app content
 - The PhunCoin SDK makes it simple and easy for a developer to enable incentivization of user behavior, including viewing videos, trying new features, interacting with virtual reality characters in an augmented reality mobile experience or any other engagements designated by your team