

MENDIX FOR MOBILE APP DEVELOPMENT WHITE PAPER



TABLE OF CONTENTS

- Market Demand for Enterprise Mobile** **3**
- Mobile App Development Approaches** **4**
 - Native Apps **4**
 - Mobile Web Apps **4**
 - Hybrid Apps **5**
- Mendix Vision for Mobile App Development** **6**
 - JavaScript Pervasive as Base Technology **6**
 - Hybrid is the New Native **7**
- Mendix Hybrid App Development** **8**
 - Create Powerful Mobile Enterprise Apps Without Code **8**
 - Responsive UIs **9**
 - Native Device Functions **10**
 - Instant Testing **11**
 - Publish to App Stores **12**
 - End-to-End Mobile App Dev Flow **13**
- Open Platform For Any Mobile App Technology** **14**
- The Platform To Mobilize The Enterprise** **14**
- Conclusion** **16**

Market Demand for Enterprise Mobile

With the explosive increase in smartphone and tablet use, along with the massive consumer adoption of innovative apps and services, we are in the midst of a mobile revolution. And this revolution is fueling fundamental changes to application architecture. This is similar to, and probably even more impactful than, the earlier shift from monolithic systems to client/server architectures.

Modern applications require multi-channel clients and a scalable infrastructure. Moreover, they need to be easily deployed and rapidly changed based on user feedback.

For enterprise apps in B2B or B2C context, it's critical to realize that mobile apps are typically not stand-alone but part of larger applications targeted to engage customers and deliver a great experience in context. This means that it's not just about developing appealing apps running on a particular device.

Instead, it's about supporting end-to-end processes across various business functions tied into back-end systems and (cloud) services with bi-directional exchange of data and information. For

example, customer complaints issued through a mobile app may be part of a larger customer service application whereby the customer service staff view the complaints through desktop computers. In this instance, staff members benefit from greater context by leveraging multiple data sources that all converge and produce a 360-degree view of the customer.

A recent survey from DZone of more than 1,000 global IT professionals revealed that the biggest pain points for mobile app development are centered around multi-platform development and testing. Building native apps for multiple platforms (50%), testing efficiently (53%) and lack of skilled mobile developers (40%) were mentioned as main obstacles.

This white paper describes the capabilities in the Mendix App Platform for mobile app development and our vision on the technology developments in the mobile space. The paper targets Architects, Business Analysts and IT executives who would like to learn more about the Mendix offering for enterprise mobile solutions.

Mobile App Development Approaches

The three main approaches for mobile app development are: native, web, and hybrid. Each has inherent benefits and limitations. Mendix offers out-of-the box support for the web and hybrid approach and offers platform APIs to connect and integrate native apps into larger end-to-end applications built in Mendix that are connected with various back-ends.

From that perspective, Mendix does not prescribe just one way of working. Customer needs and demands will determine the right approach.

Native Apps

Native apps are built for a specific mobile Operating System using the platform's SDK and optimized for that system. The apps are published in the platform's app store and can be downloaded by users to run locally on the device.

The use of the platform's SDK means that these apps have no limits in terms of access to APIs and device features, performance optimization, and the use of the platform's GUI toolkit for user interface design.

Unfortunately, the native app code cannot be used across platforms. To deliver multi-channel apps, organizations

will have to invest in expertise for each target platform and repeat the app development effort for each platform. This obviously has significant cost implications.

Mobile Web Apps

Mobile web apps are essentially common web applications optimized for look and feel and to function well on mobile devices. Widely adopted web development languages, such as HTML5, CSS3, and JavaScript, as well as frameworks like AngularJS, provide the logic behind a web app.

The most prominent advantages of mobile web app development are multi-platform support, availability of expertise and the low cost of development.

Despite these advantages, there are limitations as well, mainly due to the fact that the native device functions and OS APIs cannot be leveraged fully, which causes the user experience to be quite different from native apps. In addition, these apps lack an efficient distribution mechanism, performance could be compromised due to lack of local storage and offline use is not supported. Depending on the requirements for the mobile app, these may be prohibiting factors for taking this approach.

Mobile App Development Approaches

Hybrid Apps

The hybrid approach combines elements of native app development and mobile web app technologies. Hybrid apps are built in a cross-platform environment and brought to the device through a native wrapper that makes the app packageable and downloadable from app stores. A native bridge allows the app to use device-specific functions. A widely adopted technology for this is the use of

Apache Cordova / Adobe PhoneGap.

Hybrid apps combine the best of both worlds, offering a near-native user experience for apps built in a cross-platform toolset. Particularly for use cases where apps focus on transaction and interaction versus pure consumer apps like for gaming, this style of mobile app development is gaining popularity.

Figure: Pros and cons for styles of mobile app development

	PROS	CONS
NATIVE APPS	<ul style="list-style-type: none"> ▶ Optimal UX on each device ▶ High performance 	<ul style="list-style-type: none"> ▶ Complexity of management across the lifecycle ▶ High cost of development
HYBRID APPS	<ul style="list-style-type: none"> ▶ Cost effective ▶ Cross-platform ▶ Efficient distribution ▶ Leverage device functions ▶ Near-native UX for transactional apps 	<ul style="list-style-type: none"> ▶ Non-optimal UX for pure play consumer apps. (e.g. games) ▶ JavaScript development more complex than native languages
WEB APPS	<ul style="list-style-type: none"> ▶ Cost effective ▶ Cross-platform ▶ Ease of management across the lifecycle 	<ul style="list-style-type: none"> ▶ Non-optimal UX for all apps ▶ Inability to access device functions ▶ No distribution mechanism ▶ Low performance

Mendix Vision for Mobile App Development

Enterprises can greatly benefit from a single platform that supports the various styles of mobile app development for multiple devices and provides common mobile back-end services.

JavaScript Pervasive as Base Technology

The rapid evolution of standards like HTML and the wide adoption of frameworks to bridge the native device functions provide an ever-richer user experience for cross-platform apps. And from a logic perspective, JavaScript is a powerful platform-independent, back-end technology, even in native clients. There's a shift going on from native languages towards JavaScript, where JavaScript gets more and more embedded in native programming languages to raise the level of reusability of code across platforms.

From an architectural point, it is crucial to establish a decoupled architecture through use of clear APIs to build sophisticated cross-platform mobile apps

that are future proof. The mobile clients should communicate with the back-end server through REST services for typical mobile back-end services as well as the cross platform application logic and connection to other back-end systems.

A generic JavaScript library is required to be applied in both native and hybrid scenarios. It can be used as a core (back-end) library for data caching, security, user management, messaging, etc. On top of this library, specific JavaScript libraries for the UI and user experience can be embedded in HTML5 or native platform code.

The Model-Driven Development approach of Mendix eliminates the dependency on scarce resources for programming languages like Javascript. The core library is offered as a set of standard services in the platform. Specific libraries required for an optimal UI and user experience are built once and then offered as reusable widgets.

Mendix Vision for Mobile App Development

Hybrid is the New Native

Analyst firm Gartner predicts that by 2015 90% of mobile apps in the B2B space will be using hybrid (60%) or mobile web (30%) technologies. So from that perspective, hybrid is becoming the “new native.”

We observe blurring lines between the various mobile app development technologies with hybrid app development that includes offline usage, a native user experience and use of native device functions increasingly becoming the norm when building transactional mobile apps for B2B and B2C use cases.

As hybrid is becoming the new native, offline capabilities will become more and more part of the fabric of hybrid mobile enterprise apps. This includes the integration of native front ends with mobile back-end services as well as the expansion of application models to the mobile device along with local data storage, enabling developers to develop once and deploy to any mobile device at any location.

Figure: Mendix vision for mobile app support

	ONLINE	OFFLINE
WEB APPS		
HYBRID APPS		
NATIVE APPS		

Mendix Hybrid App Development

Create Powerful Mobile Enterprise Apps Without Code

The Mendix App Platform enables business users and developers to build and deploy sophisticated multi-channel apps with a model-driven development platform that is much more efficient and easier to learn than traditional technologies. With this approach, companies can deliver fully integrated multi-device enterprise apps often multiple times faster than with traditional approaches.

Model-Driven Development (MDD) has emerged as one of the leading approaches for enabling rapid, collaborative development. Because it uses visual models for defining application logic, process flows, or user interfaces, MDD empowers both developers and business users to rapidly build applications, without the need for labor-intensive, low-level coding. Consequently, it's significantly faster than using programming languages.

In addition, the Mendix App Platform provides core capabilities for non-functional application requirements, such as security, performance, scalability and manageability, out of the box. In Mendix, applications are built by defining

visual models for the various application components such, as the domain model, User Interface and process and application logic.

While the application's domain model and logic are typically the same across multiple channels, for the development of hybrid apps it is key to ensure an optimal user experience for the target device type: smartphone and tablet as opposed to desktop use. Also being able to leverage the mobile device functions, such as the camera, geo-location, contacts, etc., is critical to give more context to the application.

Mendix combines its highly efficient model-driven development, the support of native device functions with the integration of Adobe PhoneGap to generate appealing hybrid apps that immediately work on many devices and can be easily deployed to all the major app stores incl. Apple, Google and Microsoft.

The following sections describe the specific platform features that support hybrid app development.

Hybrid App Development - Features

Responsive UIs Made Simple

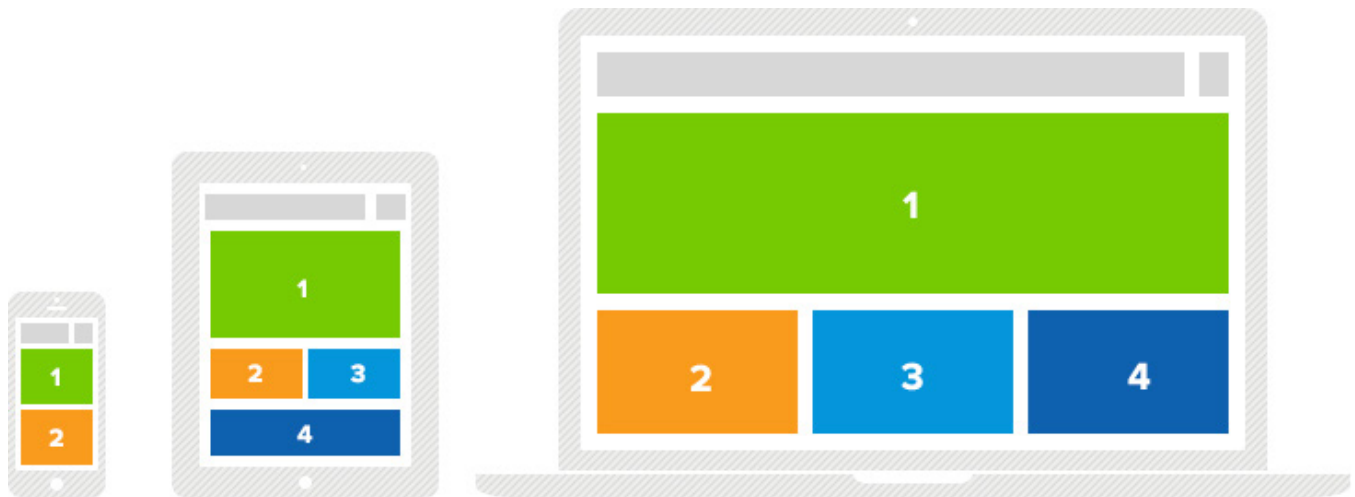
Mendix allows business engineers to create an optimal user experience through pre-defined Layouts for smartphone, tablets and desktop user interfaces.

Layouts are used to structure the user interface. They allow you to define a default page structure, which can be reused as a template. The advantage of using Layouts is that the common UI elements for the app that are independent from the device type can be associated with the relevant Layout. Hence the effort to optimize the user

experience per device type is minimal. Mendix supports responsive design through automatic scaling of the UI for the form factor of the respective device type. From a styling point of view, the Mendix App Store offers a variety of templates based on open source initiatives such as Bootstrap.

Here we serve the goal of enabling functionally oriented developers to build great and appealing multi-channel apps without risk of getting stuck in device-specific UI adoptions through coding.

Figure: Responsive UIs displayed on mobile, tablet, and laptop



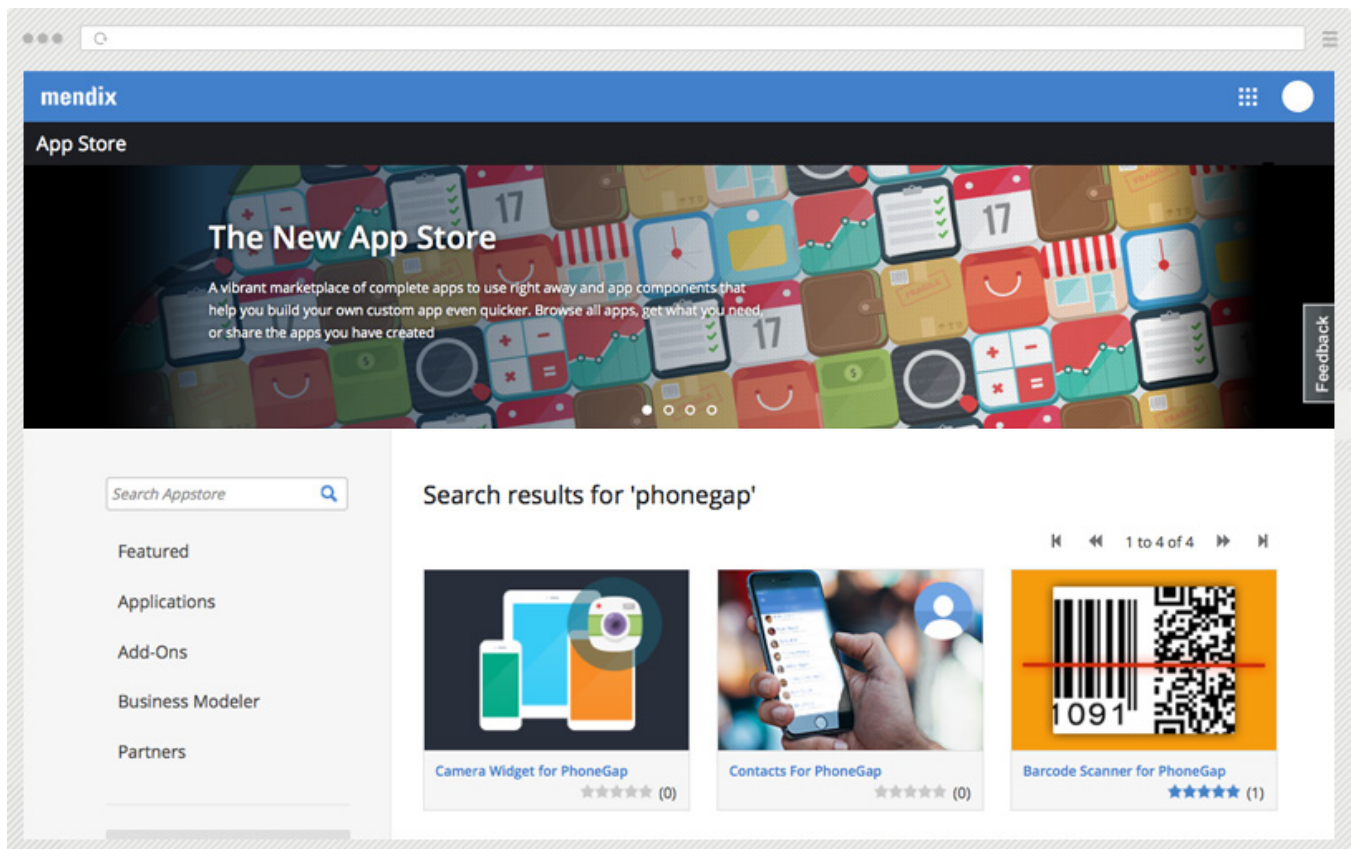
Hybrid App Development - Features

Native Device Functions

To leverage the mobile device APIs, Mendix offers out-of-the-box widgets for native device functions. Widgets are reusable UI components that allow you to quickly compose UI pages. The widgets are open source components downloadable from the Mendix App Store. They are built by Mendix and the Mendix developer community.

While the widgets themselves are written in JavaScript and the open source code is maintained in GitHub, a Mendix developer, building a hybrid app can easily drag and drop a widget as a building block into an app without any further coding.

Figure: Mobile Widgets in the Mendix App Store



Hybrid App Development - Features

Instant Testing on Mobile Devices

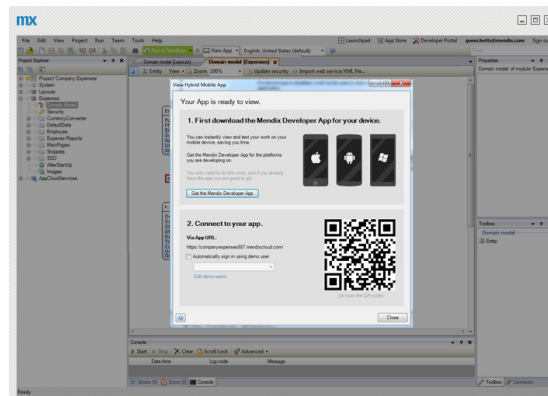
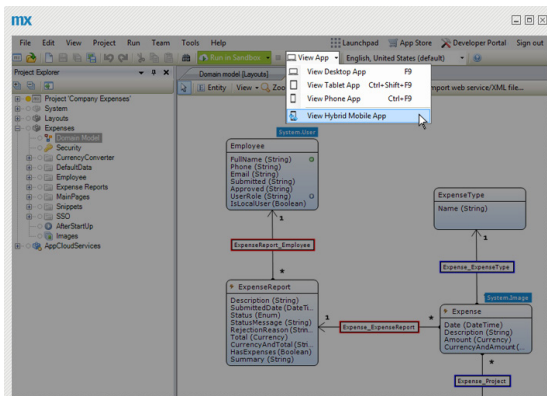
The Mendix Developer App allows you to quickly test hybrid mobile apps on any device, including native device APIs.

This app, available for iOS, Android and Windows Mobile, allows developers to develop locally and see changes instantly on a mobile device. This is done by pairing the device to the local development environment. Mendix generates a QR code that can be

scanned by the device using the Mendix Developer App. This App supports auto login as well.

The benefit of the Mendix Developer App is that the PhoneGap widgets will automatically work when you test the app. So you can test the widgets you included in the app using the native APIs of the device.

Figure: Mendix Developer App integration from Mendix Business Modeler



Hybrid App Development - Features

Publish to App Stores

Once testing has been completed, you can get the app ready to be published to public App Stores incl. Apple, Google and Microsoft by Mendix's 1-click publishing mechanism. Mendix offers two channels:

- Automatically create packages that can then be published to your devices Mendix currently supports iOS, Android and Windows Mobile. In Mendix you can simply connect to your Adobe PhoneGap Build account and use its cloud-based service to package mobile apps in the cloud and prepare packages for app store submission.
- Get a Mendix deployment package and build mobile packages yourself using PhoneGap / Cordova tools and your enterprise distribution solution.

In addition to general information about the app that will show up in the target platform app store, Mendix supports the management of all relevant icons for device types and platform OS combinations.

Figure: Publishing an app in Mendix

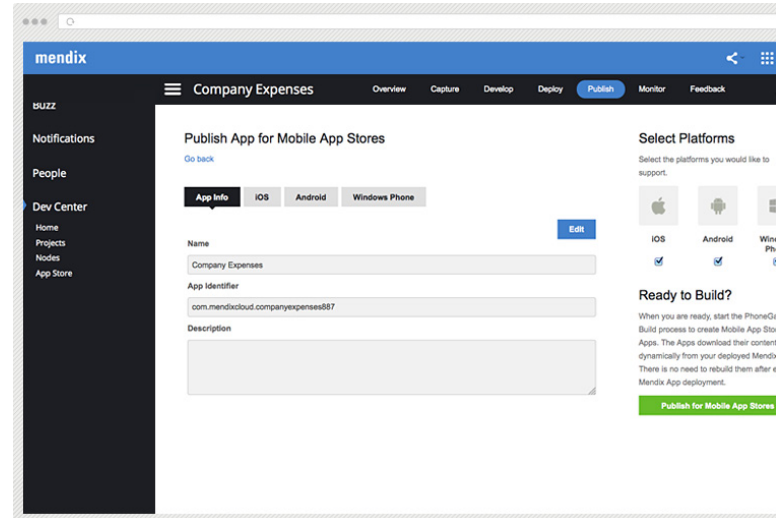
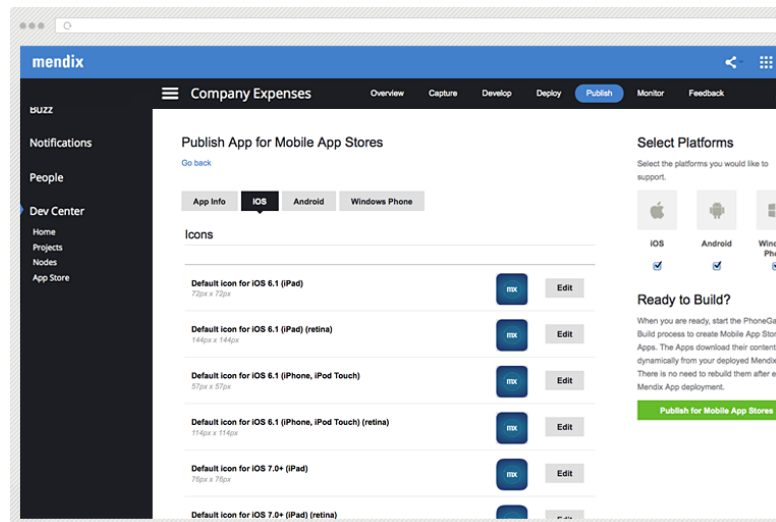


Figure: Managing icons and splash screens



Hybrid App Development - Features

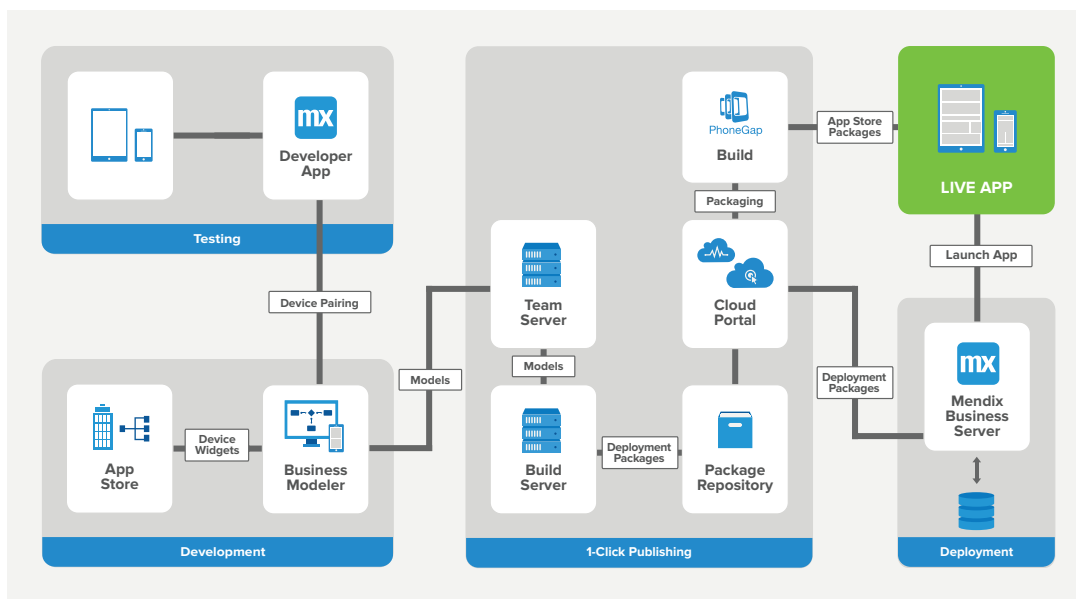
End-to-End Mobile App Dev Flow

Mendix supports the end-to-end mobile app development flow, making it simple and intuitive for any developer to build sophisticated and appealing mobile apps that can be part of larger multi-channel applications integrated with back-end apps and services:

- The mobile app development takes place in the Mendix Business Modeler, connected to the Team Server that stores all the development artifacts.
- To use native device functions in the UI, widgets can be downloaded from the App Store.
- Instant testing is supported through the Mendix Developer App.

- Once testing has been completed, a deployment package is created with a single click, which triggers the Build Server to create the package and place it in the Package Repository.
- From the Cloud Portal, the app is published for the target mobile platforms. The back-end part of the app is automatically deployed in an App Environment.
- Once the app is in the respective mobile platform app store, and provisioned to or downloaded by the end user, the mobile app can be used.

Figure: Hybrid App Development flow in Mendix



Open Platform for Any Mobile App Technology

In addition to hybrid app development, Mendix supports the development of mobile web applications out of the box. In that case, the PhoneGap / Cordova widgets, test and build services are simply left out of the equation.

If there are specific needs that would require the development of native apps, the Mendix App Platform can be leveraged as Mobile Backend-as-a-Service (MBaaS) and for integration with various back-end systems for the development of pure native apps on the platform of your choice.

The Platform to Mobilize the Enterprise

The demand for mobile apps has increased significantly and there is a clear need for modern application architectures. Many organizations are faced with challenges due to the costs associated with building and testing multi-platform applications (not to mention the challenge of finding qualified resources to bring your roadmap to fruition).

As a result, businesses now demand tools that support multi-channel clients, provide a scalable infrastructure, ease deployment and enable rapid change based on user feedback.

Mendix offers a game-changing solution by offering out-of-the-box support for mobile app development in the Mendix App Platform. This unique approach helps our customers realize the following key benefits:

- ✓ **High-productivity through low-code Model-Driven Development**
- ✓ **Increase project success rate through Business & IT collaboration**
- ✓ **Frictionless experience throughout the App Delivery Cycle**
- ✓ **One platform that does it all**

The Platform to Mobilize the Enterprise

High-Productivity Through Low-Code Model-Driven Development

Model-driven development allows for building apps through visual modeling of domain objects, UI and process and application logic. It reduces the need for coding to the minimum. Mendix has driven this approach to perfection by offering a rich repository of reusable building blocks and services to further increase productivity.

This approach delivers two key benefits: it significantly speeds application development and it unlocks a pool of resources without a technology background. These additional resources may lack traditional coding experience, but they have a deep understanding of the business to develop innovative and differentiating apps.

In the context of mobile app development, MDD allows business engineers to build sophisticated hybrid apps without the coding obstacles that typically impede mobile app projects. Mendix puts mobile app development in the hands of every developer, eliminating the resource bottleneck for native platform language and JavaScript development.

Increase Success Rate Through Business & IT Collaboration

Too often application development projects are challenged in terms of cost override, scope creep, long timelines and misaligned end user expectations.

Mendix aligns business and IT and fosters collaboration throughout the lifecycle of the application, from requirements gathering to development, to deployment and management of the apps. Collaboration also calls for a highly iterative approach and instant feedback mechanisms in every stage of the lifecycle.

In the context of mobile app development, the integration with PhoneGap / Cordova and the Mendix Developer App allows for immediate testing of hybrid apps modeled in Mendix by developers, business analysts and business stakeholders.

The Platform to Mobilize the Enterprise

Frictionless Experience Throughout the App Life Cycle

Mendix supports the full cycle of building mobile apps. The integration of PhoneGap / Cordova with the Mendix App Platform for testing and publishing hybrid apps, as well as the native device function widgets that are available in the Mendix App Store, provides business engineers a frictionless experience to build sophisticated mobile apps.

One Platform That Does It All

With Mendix, you'll have the complete cloud platform that does it all. Business and IT can easily work together to design, build and test your app, integrate it with other systems, deploy it instantly and run it securely and efficiently 24/7.

Conclusion

A critical success factor for the roll-out of enterprise mobility solutions is to move beyond expensive, disconnected and hard to maintain standalone mobile tools but rather leverage a fully integrated platform for multi-channel app development.

Mendix's vision for mobile app development is clear: leverage the power of the Mendix App Platform for app development and delivery, the mobile back-end services as well as the openness of the platform to support the main approaches of mobile app development. Combined, the Mendix App Platform provides a future proof choice for enterprise mobility solutions.

Get first hand insight into our mobile app development platform.

Start building with Mendix today ▶



mendix.com

Mendix is the app platform company for the enterprise. We enable companies to build, integrate and deploy web and mobile applications faster and with better results, effectively driving ROI in days not months. Learn more, join our user community and get started for free at **now.mendix.com**.

© Mendix Inc. 2014. All Rights Reserved. Mendix, the Mendix logo, and the Mendix App Platform are trademarks or registered trademarks of Mendix, Inc. Other product and company names are property of their respective owners.