



MOBILE APPLICATIONS MANAGEMENT

# The Current Landscape

December 2013 | Prepared by Clarity Innovations | Contributors: Steve Burt, Marie Bjerrede



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## Introduction

As mobile devices are becoming increasingly prevalent in K-12 classrooms, the logistics of managing these devices and the apps associated with them is becoming an increasingly visible obstacle to scaling mobile implementations from small pilot projects to full district or even state initiatives.

New features and services to support Mobile Applications Management (MAM) in an educational environment have recently been released. Apple has addressed a long-standing issue with bulk application purchases through their Volume Purchasing Program (VPP) and now allows institutions to purchase applications for student devices, and then reclaim those apps as needed for other students to use. Google has created a simplified user experience for teachers with their Google Play for Education platform that allows teachers to readily find and select appropriate apps, pay for them via purchase orders, and distribute them to students.

These new capabilities highlight the importance of Mobile Applications Management in the K-12 education technology landscape, but there are still important gaps to fill before there are simple, seamless applications purchase, distribution, and ownership management platforms for education.

This paper explores the current capabilities of each of the major tablet ecosystems as well as gaps that remain in order to provide a strong systemic solution for K-12 districts with respect to mobile applications management for all platforms.

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## Executive Summary

The K-12 landscape is seeing a wide variety of implementation models for mobile learning with tablets. Some implementations provide one dedicated device for each student. Some assign devices to classrooms. Some allow students to bring devices from home. Some provide devices to students that are taken home and used for personal purposes in addition to academic purposes.

These multiple usage and ownership models create complex requirements for purchasing and managing apps. Schools want to be able to purchase apps and loan them to students for a time, then assign them to other students as needed. Teachers want to be able to select apps and deliver them to student devices. Parents and students want to be able to purchase apps and use them on school devices and personal devices. Teachers want to be able to purchase apps for personal use and access them via institutional devices, as well.

In order to fully support all these models, a Mobile Applications Management solution would need to provide the following functionality:

- Device and user enrollment in a MAM platform of both institutionally and personally owned devices;
- Institutional and personal applications purchase (including bulk purchases);
- Applications distribution to institutionally and personally owned devices;
- Applications license reclamation;
- Multiple user support for each device; and
- Monitoring and control of what applications are installed.

At the present time, no ecosystem fully supports these needs, though each of the three major tablet ecosystems: Windows, Android, and iOS have strengths in specific Mobile Applications Management components:

- Windows Pro 8.1 is particularly strong with respect to multiple user scenarios and applications control;
- iOS 7 is particularly strong with respect to applications license management and reclamation; and
- Android is particularly strong with respect to app discovery, purchase, and distribution at the teacher (rather than IT administrator) level.
- Additionally, Chromebook devices, while different from the tablet form factor, have the advantage of fairly seamless applications management, as the apps are browser based rather than native.

To fully address the market, however, a mobile applications management solution that only supports a single ecosystem is likely to be insufficient. This is beginning to be addressed not only by 3d party MDM/ MAM providers, but also by Microsoft's Windows Intune Platform.

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## Usage Models

The requirements of applications management in mobile learning implementations are complicated by the wide diversity in usage models between different institutions. This section describes some of that diversity.

In both pilot projects and full roll-outs, schools and districts are making different decisions with respect to device choice, whether tablets are owned by the institution or the family, whether devices stay in the classroom or go home with the student, and how many devices are made available per student. The implications of the varying usage models are discussed below.

### INSTITUTIONALLY PURCHASED DEVICES

In many schools and districts, the devices are owned by the institution. This simplifies device management issues, since the institution has the authority to lock down the devices, enroll them in MAM/MDM platforms, and fully control and monitor the applications installed on the devices.

## CLASS SET IMPLEMENTATION

The simplest implementation of a tablet program involves having one tablet per student where the device stays in the classroom. This is common in primary grades where students stay in the same classroom. The devices are stored in a specially designed “tablet cart” that provides storage and power for overnight charging. Each device is labeled with the name of the student using it, so there is a one-to-one correspondence between students and devices. Generally, the applications are chosen by the teacher who pushes the applications to the devices either independently or with the help of an IT administrator.

In middle and high school where students move among classrooms, some implementations will maintain a class set of devices for a single subject such as math or physics.

In some classrooms, the teacher encourages students to find and use apps that support their learning. In this situation, the teacher may, for example, ask the students to choose an app that lets them take notes, but doesn't push the same app (such as Evernote) to all the students. Some may choose to use Word or Edmodo, or even e-mail for their note taking in this scenario. This means that each device will have a different set of apps, some of which will be institutionally managed and some that will be managed by the students themselves.

Even with students downloading apps in addition to institutionally chosen applications, this is still a relatively simple use case. At the scale of a single classroom, the differences among platforms and management systems are relatively small and any disadvantages can be overcome so long as there is sufficient real-time IT support available.

## PERSONAL DEVICE IMPLEMENTATION

In some implementations, the students keep the tablets with them at all times, including taking them home. In this scenario, the device management becomes somewhat more complex as students move to using the unfiltered WiFi networks outside of school, but the applications management remains similar to when students are working with a class set. The most significant change is that devices are no longer connected to a cart at night, which means that devices are no longer readily provisioned via that physical connection, but require a form of applications management that works over the air.

## MIXED CLASS SET IMPLEMENTATION

In some classrooms, rather than providing a tablet for each student, a pool of devices with varying form factors is made available. For instance, a classroom may have a half set of tablets and a half set of laptops or netbooks as well as a handful of desktop workstations.

In this scenario it is critical that the devices are readily sharable by multiple users. Ideally, all the devices and computers would support multiple user accounts. A student would then be able to pick up any device, log in, and see not only his/her applications, but also any user-specific documents and applications data. If the devices don't support that capability, students would need to store their work in the cloud, as a minimum, or use cloud-based services (such as Google Docs) for content creation, though these are still somewhat less polished than their native application counterparts.

## SHARED DEVICE IMPLEMENTATION

In cases where there are fewer than one device per student in a class, the students will need to share devices as with the mixed class set scenario described above and are subject to the same requirements and constraints.

## PERSONALLY PURCHASED DEVICES (BRING YOUR OWN DEVICE)

Many schools and districts are implementing a Bring Your Own Device (BYOD) policy. In this model, students bring the devices they already own, be it a laptop, a tablet, or a smartphone, to school. Under this usage model, the institution does not own the device and so is generally not able to apply strict mobile device management. The school is not able to control which applications are downloaded to the device by students and parents.

However, schools can still ask students to enroll their devices into the institution's Mobile Applications Management platform, making it possible for the school to distribute apps to the device. In this case, though, students will need to either explicitly download, or approve the download of each application as the device owner.

As students will bring devices from different ecosystems a BYOD implementation will require a mobile applications management platform that supports cross-platform deployment.

## INSTITUTIONALLY OWNED, PERSONALLY ENABLED DEVICES

In the corporate world, dissatisfaction with the security issues associated with BYOD implementations has led to a new model: Corporate Owned, Personally Enabled (COPE) devices. Whereas BYOD implementations try to create a secure space on a personally owned device, COPE implementations take institutionally owned devices and provide users with the most important freedoms of BYOD. In a classroom, this would mean that devices are managed largely as described in the section outlining Personal Device Implementation with the addition that students and parents are given the freedom to also download free or purchased applications to the device.

## MAM Requirements

In order to fully support all the usage models described in the previous section, a Mobile Applications Management solution will need to provide the following functionality:

- **Enrollment:** There needs to be a mechanism to identify devices with a classroom, a student, or a set of students. This way, when a teacher wants to send an app to a student, the system has a way of knowing which device that student is using.
- **Applications purchase:** Institutions need the ability to readily find great apps and purchase licenses in bulk. Teachers, and students (or their parents) need to be able to purchase apps for their own use. Additionally, It would be convenient to support additional purchasers for classrooms such as parents or PTA's that wish to buy the class an app in much the way they currently buy the class a book through the Scholastic Book Fair. This means a new level of application ownership – the classroom – and 3d party purchasers beyond the existing stakeholders.

- **Application distribution:** Teachers and/or administrators need a way to easily send the applications they choose to the students who need them. Students need to be able to see and download allowable or recommended applications to their own devices at will. This needs to work for both school-owned and student-owned devices. If a student is using more than one device for schoolwork, the necessary apps need to be downloaded to all the devices being used academically.
- **Application reclamation:** Institutions need to be able to reclaim apps that they have installed on a student's device and give it to another student as needed. This includes apps installed on devices that have been lost or broken and devices that belong to students. Students and teachers who have purchased and downloaded apps onto their school devices will need to be able to put those apps on personal devices when they turn their school devices in at the end of the year.
- **Multiple user support:** Devices may be shared by multiple students at the same time as students have multiple devices which means that there must be a mechanism for logging in to the device that allows each student to see and use the applications he has purchased or received from the school on that device.
- **Applications download control:** Institutions need to be able to restrict the applications that may be installed on devices used in an educational environment.

## Platform Performance

None of the ecosystems has a compelling user experience for all use cases and all stakeholders, even if assuming a homogenous (single device type) mobile learning implementation, and the logistics and experience for most stakeholders only becomes more complex in usage models involving multiple types of devices. Table 1 compares the performance of each Operation System tablet and its ecosystem against Mobile Applications Management requirements in a homogeneous implementation.

	iOS7	Win 8.1	Android	Chrome
Device Enrollment	●	●	●	●
Student Enrollment	●	●	●	●
App institutional purchase	●	○	●	●
App distribution and update	●	◐	●	●
Personal apps purchase	◐	◐	◐	◐
License reclamation	●	○	○	○
Multiple users support for device	○	●	○	●
Application control	◐	●	◐	●

Table 1

Fully Supported	Nearly Fully Supported	Partially Supported	Minimally Supported	Not Supported
●	◐	◑	◒	○

## DEVICE AND USER ENROLLMENT

Device and user enrollment works similarly across the ecosystem. All platforms require an administrator to enter devices (UUID) and users (account credentials) into a management platform that can then be used to distribute apps to the device associated with a particular user. All platforms allow institutionally purchased apps to be put on the device while the user can add any personally purchased apps by simply logging in to the relevant on-line applications store with their personal credentials.

## APPLICATION PURCHASE AND DISTRIBUTION

Bulk purchasing has been a challenge for educational institutions on all platforms until recently. With the release of iOS 7, institutions can now purchase managed licenses through Apple's Volume Purchasing plan via iTunes and distribute and reclaim them using a 3d party MAM system. With the release of Google Play for Education, institutions can set up purchase orders that allow teachers to select apps in bulk and distribute them to students with a simple Google Groups list. On Windows Pro 8.1, however, institutions need to make a separate agreement with each app developer, obtain an installable version of the app, upload that file to a MDM/MAM system, and then sideload it to devices through centralized distribution or student self-serve access to an institutional version of the Windows store.

All platforms also support the capability of downloading free apps from public or private online applications stores if the devices and users are granted that access.

## LICENSE RECLAMATION

Apple alone has the capacity to reclaim app licenses – to take the app off a device as needed and make it available to a different student. On all other platforms the licenses are forever tied to the device on which they were installed or to the user account under which they were installed. Personally purchased apps also cannot be reclaimed, but since users are allowed to download them to a very large number of devices (infinite for Apple, Android and Chrome, and 81 devices for Windows Pro 8.1) that limitation is effectively moot in practice. Note that for Chrome devices all apps are web-based and therefore not installed on the device as such – access management allows the user to access their apps from any device by logging in with their Google credentials.

## MULTIPLE USER SUPPORT

Windows Pro 8.1 devices are part of a highly sophisticated management ecosystem that makes it easy to manage multiple users on a single device and multiple devices per user simultaneously. iOS 7 devices are notoriously poor for multiple users, needing to be wiped and restored between users. Android devices typically support more than one user, but when used in conjunction with Google Play for Education, enrolled devices only fully support one user account. Chrome, with its purely web-based approach also provides complete support for multiple users.

## APPLICATION DOWNLOAD CONTROL

Windows Pro 8.1 and iOS devices can be managed in a mode that strictly controls the applications that are downloaded to the device. Chrome devices support black and white lists for applications access. Student Android devices used with Google Play for Education are cumbersome for restricting applications access – they are not provisioned with a Google Play app and are expected to be configured to not allow a wallet to be associated with the student account in order to prevent students from casually downloading unapproved apps, but this is circumventable by logging in to Google Play via the browser (though that can also be restricted via Proxy to prevent such logins.)

## Mobile Applications Management Industry Gaps

There are several areas where key MAM functionality is not available for one or more ecosystems. For institutionally purchased devices, any ecosystem that fully addressed all the needs of schools for applications management would drastically simplify the logistics and management of mobile learning implementations. For BYOD and some COPE usage models, solutions that provide full cross-platform support for all devices will be needed.

Some of the key gaps are reiterated below:

### VOLUME LICENSING AND RECLAMATION

With the exception of Apple, none of the major players allow schools to purchase apps in bulk, deploy them for student use, then reclaim them for use by another student as needed.

### MANY-TO-MANY MANAGEMENT

Windows Pro 8.1 and Android 4.2 and above provide full support of multiple user accounts on each device and multiple devices for each user. Students can log in to the device with their own account and see only their own environment, email, and other data. Data from multiple devices are synced. iOS devices, on the other hand, are notoriously cumbersome to share with a device wipe and restore required between users.

### APPLICATIONS ACCESS

Sharing personally purchased and institutionally purchased applications on a single device is currently cumbersome, involving logging out of institutional accounts and into personal accounts to download previously purchased applications. Apps need to seamlessly follow the user and allow optional download of apps that are accessible via any of a user's registered accounts, regardless of which credentials are used for log-in.

### CROSS-PLATFORM SUPPORT

Windows Intune and 3d party MDM/MAM suppliers are working to develop the platforms that will work seamlessly across these ecosystems, but are hampered by limitations placed by the assorted applications store licensing policies and capabilities as well as by differences in API support across operating systems and devices.

## Conclusions

Mobile Applications Management is a relatively new and relatively immature area, though one that is evolving rapidly. Generally speaking, the tools for managing apps are still either fairly cumbersome or incomplete and developments in both the tablet ecosystems for each operating system and in management tools are needed to simplify the use of tablets in educational environments.

Currently, Windows management tools are the most powerful, especially when considered in conjunction with the mobile device management capabilities of a platform that was developed for the detailed administration of tens or hundreds of thousands of computers. However, these tools were developed for an architecture and software distribution model that preceded the sandboxed, downloadable apps model, though they are evolving towards a more seamless experience.

iOS management tools are rudimentary and not well tuned to educational institutions, as though they were originally developed for special purpose configurations and repurposed for the classroom rather than redesigned for enterprise-level management. The iOS tools have significant limitations with respect to scalability.

Android management tools are simple and scalable, being designed from the ground up for cloud-based environments, but are not yet as full-featured much in the way that the cloud-based apps and software are still less polished than their native counterparts. In particular, there is no support designed for multiple users or BYOD programs – devices using Google Play for Education are expected to be enrolled in the full device management solution and used in a 1:1 full classroom setting only.

MDM/MAM tools such as Windows Intune and 3d party provider platforms are moving towards addressing many of the user experience issues with the ecosystem-specific tools as well as providing cross-platform support. However, until each ecosystem provides solutions and API access to specific features such as multiple user support and bulk purchasing and distribution, these management platforms will remain limited in their capacity to deliver a seamless, simple mobile applications management solution for education.

## References

Apple's Volume Purchasing Program for Education ([http://images.apple.com/education/docs/vpp\\_education\\_guide\\_en\\_Oct2013.pdf](http://images.apple.com/education/docs/vpp_education_guide_en_Oct2013.pdf))

Apple Configurator Help (<http://help.apple.com/configurator/mac/1.0/>)

Apple's Volume Purchasing Program: Migrating from redemption codes to managed distribution (<http://support.apple.com/kb/HT6015>)

Apple's Profile Manager Help (<http://help.apple.com/profilemanager/mac/3.0/#apd0E2214C6-50F0-48C9-A482-74CEA1D77A9F>)

Google's About Chrome Devices (<https://support.google.com/chrome/a/answer/1289189>)

Microsoft's Academic Volume Licensing (<http://www.microsoft.com/education/ww/buy/Pages/volume-licensing.aspx>)

Microsoft Windows InTune Support (<http://support.microsoft.com/ph/15994>)

Microsoft System Center Configuration Manager 2012 Support (<http://technet.microsoft.com/en-us/library/gg682129.aspx>)

Microsoft BYOD Devices - A Deployment Guide for Education (<http://www.microsoft.com/en-us/download/details.aspx?id=39681>)

Windows Store Apps – Deployment Guide for Education (<http://download.microsoft.com/download/6/B/2/6B26EABE-7014-4B17-9E94-C7160220A85C/Window%20Store%20Apps%20-%20Deployment%20Guide%20for%20Education.pdf>)

Windows AppLocker Support (<http://technet.microsoft.com/library/hh831440.aspx>)

Tablets With Google Play For Education Help (<https://support.google.com/android/a/#topic=3309012>)

Google Admin Console Help (<https://support.google.com/a/answer/55955?hl=en>)

Google Apps Documentation and Support (<https://support.google.com/a/?hl=en#topic=24642>)