Key Steps
to Rolling Out Field Mobility Applications

KEY STEPS TO ROLLING OUT FIELD MOBILITY APPLICATIONS

Deploying mobile/handheld computers to users that are outside the walls of your facility requires a carefully calculated approach to ensure success.

There are 4 key aspects to consider:

1. The Software Requirements
2. The Hardware Requirements
3. Logistics for Rolling the Solution Out
4. Managing the Operation on a Daily Basis

Section 1- Software Requirements

Your first decision should be focused on choosing the right software. **Function (application software features) before form (hardware) is still the Mantra**.

While your present software may have all you need for a paper based field operation, it is rare that your existing software will have the ability to support handheld terminals or smart phones in the field simply because, even under ideal conditions, the handheld terminal will not always be connected to your host application. So that means you should consider software specifically designed to work with the terminals in that environment.

1. Some companies choose to run the applications in an offline mode (commonly referred to as batch), but this limits your ability to have access to real time information.
2. Ideally you want both on-line and batch, or what some have referred to as a "casual client." This means that the terminal operates in a batch or off-line mode when no connection is available and then automatically syncs up when a connection is found. Some application software intentionally operates in an offline mode when a work order or delivery has been started at a site, and then automatically looks for a connection when traveling to the next site, automatically syncing without the user having to do anything. There exists a wide variety of software solutions and you obviously need to choose the software that meets your business application need, but whatever you choose should have the ability for the

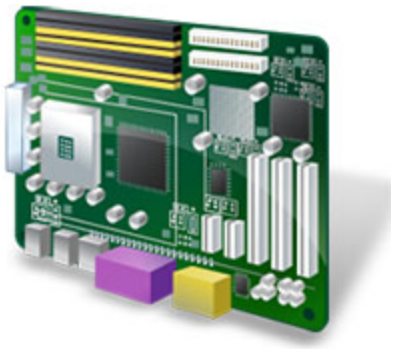
terminals to operate off-line as well as on-line and sync when appropriate. Also, it is important that the software support as many different types of terminals as possible (ideally Android, IOS (Apple), and Window Mobile/CE). This ensures you are not locked in to a particular device in the future.

3. Regardless of what you choose for software, the application that will be "hosting" the terminal application and interfacing back to your ERP or back-office system will need to reside on a server. There are options for this:

- You host it on your own server with an internet connection. This provides what some argue is a higher level of security, but it means you also need to address some form of redundancy so that if your primary server goes down, you have a backup server to take over.

- You may choose to use what is commonly referred to as Cloud hosting, which simply means that you contract with a company that specializes in hosting applications. It can still be dedicated to your company, but they are responsible for the hosting and ensure there is enough redundancy to ensure little or no down time. Typically these companies have servers at multiple locations so in the event of some catastrophe in one area, you are protected. While some may think this does not offer as high a level of security, that is proving to be less and less the case. Many businesses and government agencies choose a Cloud based agency to host their application. The security is very high, in fact high enough for even the NSA, IRS and financial institutions to choose. There are many organizations that offer cloud based hosting, including Amazon, IBM, Microsoft and Google to name a few. With that approach, the responsibility of hosting and security and redundancy has been outsourced, leaving your company to keep its focus on its business. Cloud hosting is very often included with your software providers solution.

- The software company providing your application software will very often offer SaaS (Software as a Service) which basically means you pay monthly for the use of the software and they are providing the hosting. Typically this is Cloud based in that the software company is contracting for the hosting from one of the larger hosting services. Your data and the data of many other customers using the same application is hosted on the same servers, but there is security in place to keep everyone's data secure. You should ask your software provider what company hosts their software and how many locations they have. It might be good to ask where those locations are so that you know they are geographically dispersed and resistant to regional outages.



Section 2- Hardware Requirements

Choosing hardware is generally constrained by what your software application provider supports, but unless your business requirements are very unique you should be able to find a solution that supports the primary OS's in use today (Android, IOS and Windows Mobile)

Beyond compatability with your software solution, there are a number of criteria to consider when deciding which hardware equipment best suits your needs in the field:

Barcode Scanning

If you need to scan barcodes, it is important to determine how frequently you will be doing that. If you are scanning only one or two barcodes per customer per stop, perhaps the camera on your device is adequate as there are barcode reading software applications available that can be used with a camera. Typically camera barcode scanning technology reads all the barcodes you might find, including 2D. The drawback to this is the depth of field (how close and far you can read the barcode) is very limited. Since it will read whatever barcode is displayed in the window, if more than one barcode is in view, it can be difficult to ensure you are reading the barcode you desire.

If camera scanning is not adequate for your application, you might choose a device that has a built-in scanner (typically in addition to a camera). On these types of scanners you have choices you can make based on your needs. Laser or linear barcode scanners only read one dimensional barcodes, like you might typically see on a shipping container or a retail product. While the barcodes you can read are limited to 1D, the laser or linear barcode scanner is ideal in cases where there is more than one barcode near each other and you want to make sure you scan the one you intend the first time. In addition they tend to have a greater depth of field (how close and how far you can read the barcode) than a camera would.

The other popular option is image scanning. Image scanning can read both 1D and 2D barcodes from any orientation and has a better depth of field than a camera. With the exception of cases where you have multiple barcodes in close proximity, it is typically the choice for most scanning intensive applications.

On both the Laser and the Imager, there are scan engines that can read large barcodes at very long distances, such as a barcode on a dock door or truck label that might need to be read from 25 feet or more.

Laser and Image scanners are also designed to send the data to the terminal as if it were keyed in. This means that even if the software you chose did not support barcode scanning you can still use these types of scanners with it. As an example if you had a part number field that your software provider expected you to key data into, a laser or imager could scan the barcode and enter its data directly into the field automatically. The scanner could also be set up to add a postamble to cause it to exit the field and go to the next.

If you wish to use something beyond a camera and the device you have does not have a built in scanner, you still have options. For example Apple products don't have a built in scanner, but there are a number of companies that make "sleds" that not only add a true scanner, but also protects the terminal from breakage when dropped. Typically you can also get these "sleds" with mag swipe readers, if you want to read credit or debit cards or other security card. (note: additional application software and services are typically required to process credit and debit cards)

There are also Bluetooth scanners that can add barcode scanning functionality to a device. Most devices nowadays come with Bluetooth but there are different versions, so before going this route, test the bluetooth scanner you are considering with the terminal/smartphone or tablet you are considering.

How harsh is your environment?

If you have a harsh environment, you should lean toward industrial grade terminals, as consumer grade devices are not likely to provide you with the performance you need. If you decide on the need for a built-in scanner, the choice is already made for you, as most, if not all, devices with an integrated scanner are industrial grade.

Some of the key features that make up an industrial grade product include:

1. Drop specification of 4 feet or more.
2. Outdoor viewable screen
3. IP rating of 54 or higher (means it is sealed against various levels of moisture)
4. Able to operate in sub-freezing to temperatures over 100 degrees.
5. Generally offered with long term comprehensive service plans to safeguard your investment.

Other Features and Choices

Most devices designed for use in the field have a cellular radio, WIFI and Bluetooth. Regardless of what your application presently requires, it is wise to narrow your selection to devices that have all three types of wireless.

While cellular coverage is becoming more and more prevalent, you should still review the coverage maps for data and voice from the different carriers (such as AT&T, Sprint, T-Mobile, Verizon) you are considering to be sure you will have coverage where you need it. In rare cases you may find using one carrier in one area and another carrier in another may make sense. While most terminals are offered with different configurations for different networks, you do need to tell your hardware supplier which network the device will be used on. There are also devices on the market that allow you to switch from one carrier to another, but for the most part

those devices are data only, so you would not be able to make phone calls with them. For the most part it is unlikely that you would want to switch carrier networks on the fly on the same device, and while you may not think you ever want to use the device to make phone calls, it would be wiser to have a single carrier device where you have the phone call feature available, even if not turned on. T-Mobile and AT&T use SIM cards to register them on the network. That makes is easier to change between TMobile and AT&T networks if ever desired. Verizon and Sprint do not use SIM cards so you can't change from their networks for the most part.

More and more terminals are coming out without a keypad, just relying on the soft keys on the touch screen for operation. If you prefer a physical keypad, you will typically lean toward the industrial grade devices where that is common. There are typically choices as to the keypad layouts, from numeric only to full QWERTY, so ask about the keypad options for any product you may be interested in. ***Don't think that the keypad you see on a demo unit is the only one available for that terminal.***

More and more devices are coming out with a choice of OS. While all Apple products are only IOS, other devices on the market are available with a choice of Android or Windows Mobile. Which OS you choose is really irrelevant so long as your application will run on it.

Printers

The requirement for printers in the field is becoming less predominant than in the past. Terminals allow for signature capture so in many cases electronic documents is all that is needed. Many customers are fine with the electronically signed document being emailed to them if they need a copy. If a paper copy is required, there are many printer options available. In all cases it is best to use a Bluetooth printer. Other options include WIFI direct and cabled. In all cases it is recommended that you choose a battery operated printer, even though you will want to mount it in the vehicle and have it wired to a power source, either directly or via its mount. If you just need a small printer to print single copies, you would typically choose a portable printer that can be removed by the user so that he can take it to the back of the vehicle and not have to return to the truck to get the print out. If you need to print a full size invoice or if you need to print on multi-part forms, as some government regulations require, you most likely would keep the printer mounted in the vehicle as the size would make it awkward to carry.

Accessories

Here is a list of the typical accessories you should consider for your field mobility application. While the manufacturers typically offer a good selection designed specifically for use with their equipment, don't feel you have to settle for what they offer. If what they offer is not suitable, there are 3rd party accessory manufacturers you should look into.

1. Holsters: You should consider these for both the terminals and also for portable printers.
2. Mounts: You should consider mounts, especially in areas where there is a legal requirement to use hands free devices. Consumer grade devices typically offer only suction cup type mounts. Industrial business class products typically offer mounts that can be physically attached to the vehicle or dashboard and very often have sophisticated power harnesses so that they can be wired directly to the vehicle power. These tend to be better as

they are a more regulated power source than simply plugging into the powerpoint (cigarette lighter port) .
3. Charging options: If you are not using a mount, you can typically still charge the terminal and printer via the powerpoint (cigarette lighter port). Use the manufacturers recommended charger for this or an industrial grade one. The off the shelf lower cost ones do not tend to work effectively over a long period of time. If you don't want to charge them in the vehicle, you need to be certain that the batteries in the units are fully charged each day and that they will last a full shift. Even if you are "sure", I would recommend a spare battery as you don't want your drivers out in the field with a terminal that has a dead battery. If you are not charging the terminals in the vehicle, you would need to invest in chargers back at the depot so the terminals, printers and batteries can be charged at the end of the day. Business class industrial equipment is usually available with 4 slot chargers for the terminals and batteries, as well as single slot terminal chargers. Lower class products tend to only offer you a USB charger or perhaps a single slot cradle and few options for charging the batteries outside the device. NOTE: Apple products do not allow for removing the batteries while most other products on the market do. So if you choose Apple be sure you have a way to keep the device charged at all times.
4. Communications Options – Even though your devices have a cellular radio and a WIFI radio, there are cases where you may need to upgrade the firmware or application software or retrieve data from a device where the cellular or wifi feature is not operational, so it is wise to have a way of doing this via a cabled connection in the office. While in some cases this can be done with just a simple USB cable, typically you would have a single slot communications cradle. You do not need one for each terminal, but it is advisable to have one at each depot and at a minimum one in your main office or IT department.

Section 3 – Rolling the Solution Out

Initially you should have done some type of pilot and provided some type of training for your personnel that will be using the devices, but once that is done, you still have to roll out the hardware. If you have adequate staff and the number of units is minimal, you could choose to have your company do the staging and roll out. If you don't have the resources or time to do that, this can be a service provided by your hardware provider, your software provider, or a third party that specializes in offering these services. I recommend, even if you do intend to handle this in-

house, to explore your options for outsourcing and find out what the costs are. Here are the typical responsibilities related to a professional roll out:

1. Staging of the terminal – The terminals need to be configured so that when they arrive at the user's location they are ready to turn on and use. In order to accomplish this, consider the following:

   - Charging the device and any spare batteries – If you only have a few devices, this is not hard, but if you have more than a few devices, you will need to set up a staging area to remove the devices from their box, insert the battery, and charge the device for 2 hours or more depending on the manufacturers recommendation. If you are using spare batteries, you will want to charge those as well.
   - Update the device to the latest firmware or preferred version of firmware. Just like when you get a new PC, it is typical that updates need to be loaded on the devices. These updates are a mix of bug fixes and other performance enhancements. In some cases, even in the same lot of devices, there will be different versions of firmware, so it is key that you ensure all of your devices are up to date. These are free or included with your warranty or service contract.
   - Test the device to be sure that everything works from the touch screen to the scanner and camera to the WIFI, Bluetooth and Cellular radio. If the unit is for an AT&T or TMobile network, you need to insert the SIM card. For all carriers you need to check to see that you can reach the Internet via the cellular connection and if the device will be used to make calls, make a call. If any of the units prove to be bad, contact the manufacturer or supplier according to their procedure to either have the unit repaired or replaced. If a unit proves to be bad within 30 days of date of shipment, you can typically get it replaced rather than repaired.
   - Load your application software and test it.
   - Configure any other settings applicable to your operation such as WIFI, Email, etcetera.
   - Remove or block any applications or functionality on the device you do not want your user to have access to. These devices are quite powerful, and you don't want your user confused by getting into areas of the device that they don't need. ***Note: These last three steps are typically done using a staging system which has software that stores the profile or image you want on each device. Even then there are typically certain settings that need to be done for each site or possibly each user. There are some free utilities offered by the manufacturer but the more sophisticated methods have a cost and the stager would need to have been trained on how to use them.***
   - Package all items a user will get into kits that include all equipment and accessories (i.e. each kit has a terminal, holster, a spare battery and a car charger).

2. Vehicle Installation – If you are using any type of mount beyond a suction cup with a car charger or no charger at all, you will need to install the mounts in the

vehicles. You can contract with your hardware supplier or a 3rd party if you don't want to tackle this yourself. Consider the following:

- If you have more than one model vehicle, the components needed to install the equipment may be different and in many cases require components beyond what the manufacturer supplies. ***Don't think that just because you paid for their best mounting product, that you won't need any other parts.***
- If you are wiring to the power source in the vehicle beyond the cigarette lighter, it is likely to require pulling the dashboard out.
- The party doing the installation should be very familiar with the equipment as well as proper installation in the vehicle.
- The installation can be done in parallel with the staging process but the installer should be equipped with a working terminal (and printer) so that the installation can be tested once installation appears to be complete. This should include verification by a project manager or other person assigned to the task to be sure that when the installer sends a test transaction, it is coming across as expected.
- The installer should take pictures of the installation and ideally email those to the same person who verified the transaction. The pictures should be analyzed to make sure everything has been installed in a professional manner and copies should be kept for future reference.

Section 4 – Managing the Operation on a Daily Basis

A **Help Desk** will be needed in order to ensure the operation runs smoothly. If your company has a Help Desk for other IT support matters, you might consider training them to also support this operation. You should weigh the costs of outsourcing against the impact on your current staff resources.

The Help Desk needs to be able to assess the root cause of any issues that may arise and categorize the issue into one or more of the following areas:

1. The device is broken
2. The device is giving errors due to a firmware issue

3. The application is giving an error due to a bug
4. The cellular carrier network is down or not operating correctly in that area
5. The user needs help understanding how to use the device
6. The user needs help understanding how to use the application

Device Management Tools

If you have chosen to have your company provide the Help Desk, it is advisable that you also invest in some type of device management software so that the people on the Help Desk can remotely access the device. In the rare case where there is no ability for the device to maintain a cellular or WIFI connection, device management software won't help, but that will be the exception rather than the rule. Device management software is typically available for purchase whether you host it or as a cloud based SaaS basis where you pay monthly per mobile device. The better device management software allows access to be shared on an as-needed basis with people having different levels of access according to their need. For example the Administrator would have full access while your IT department and software provider might also be given more limited access as well as the fleet manager whose access might be limited to just viewing.

Besides aiding the help desk, the better device management software would allow you to do such things as:

- Locate a lost device based on the last time it was turned on via GPS or a GPS function that is based on the cell towers it accesses.
- Lock out the ability to make calls, send text messages or other functions when the vehicle is in motion.
- Wipe a lost device so that your company information does not get used by an unauthorized person.
- Lock the device so it cannot be used for **any function** if it has been stolen. Commonly referred to as BRICKING.

Some device management software only supports a certain manufacturer's products, some only certain operating systems, but the better ones support a variety of different manufacturers products and various Operating Systems.

If you outsource your Help Desk, most likely they include software like this as part of their service, but you should ask to be sure. Even if the Help Desk is outsourced, your company should require certain access privileges.

The Device is Broken

If you determine a device is broken, you need to have a way to not only get it fixed but to allocate a spare to the user. In situations where the driver does not return to a depot at the end of each day, you will want a way to send him a replacement and get the broken unit sent in for service. In cases where there is depot the driver works out of, you can have spares at each depot and he can drop off the bad unit and pick up a spare. In that case you still have to send a spare to the depot and have the depot send in the broken one. In either case the easiest way to handle this

is to ship a properly configured spare to the location and in that shipping container have a shipping label for where the broken unit needs to go so that the receiver simply puts the broken unit in the container, slaps on the shipping label and leaves it for your shipper to pick up (typically UPS or FedEx). If it was certain that the unit was broken, the box would also contain the RMA paperwork required by the repair center. If it was not certain the unit was broken, it might be shipped to the Help Desk for further analysis.

When a unit is sent to the repair center, it would typically come back to the Help Desk to be reconfigured as in most cases the repair center does not provide reconfiguration services and in any case, the Help Desk should verify that the unit has indeed been repaired. Reconfiguration is similar to the original STAGING as described in SECTION 3.

If you outsource the Help Desk, that company would typically have a process very similar to this. You might choose to have your own Help Desk to determine whether a terminal is broken or not, and then contract out the process of managing the spares and RMA and the restaging processes.

The Device Is Giving Errors Due To A Firmware Issue

If the Help Desk determined the issue with the device is due to a firmware issue, and they have a firmware update and they use some type of Device Management Software, they can typically push the firmware update out to the device and reboot it. Typically Device Management software also monitors the version of firmware and automatically updates devices before the issue occurs, so in many cases this type of issue would not occur. If you are not using device management software or there is no known firmware update, the Help Desk would have the user reboot the device so they can continue to work. The Help Desk would have documented the error and opened a case with the manufacturer. When a firmware update becomes available, you would want all of the units updated. If you have Device Management Software, in most cases that can be done automatically. If you don't have Device Management software each device will need to be updated individually, typically at each of the depots or sent into the Help Desk. This would require a great deal of effort and possibly cycling of spares. In some cases, even with the Device Management software, there could be a firmware issue which makes a device lock up completely or not able to communicate via cellular, so that unit would need to go through the manual process, but more than likely the Help Desk could push out the firmware update to all of the other devices that have not locked up yet, greatly simplifying the problem resolution process.

The Application Has a Bug

Generally speaking the Help Desk documents the Application Error and has the user reboot the terminal so they can keep on working until the application issue is resolved. Once a resolution is found, if you have Device Management Software, updates can be pushed out automatically. If not, the issue will be addressed similar to the way a firmware issue is addressed when there is no device management software.

Typically software companies provide updates to their application software which may not be bug fixes but enhancements to the application. With Device Management software these enhancements can be automatically pushed out, while without DM, the units would need to be manually updated, typically at a central location.

Is the Cellular or WIFI Network is Down?

In the event that one or more devices cannot seem to connect, it could be a carrier issue in that area. The Help Desk should have a way to verify that through an arrangement with the carrier.

The User Needs Help Understanding How To Use the Device

The Help Desk should be able to walk the user through the basics of operating the terminal, from simple items, such as how to change the battery and how to charge the device, to actual use of the terminal. Typically the User will have been trained, but if they are new, they may have questions while in the field for the first few days. With Device Management software, the Help Desk would have remote access to the device and could take control of the device and actualy show the user how to operate it. For the most part this should be fairly simple for the Help Desk to walk the user through. In some cases you may want to consider self-help videos which would have been pre-loaded on the terminal.

The User Needs Help Understanding How to Use the Application

Generally speaking, the Help Desk should have enough information to be able to walk the user through any of the application processes and if Device Management software is present, could remotely take over the device and walk the user through the process. In some cases, the software supplier might have an Application Support Desk but typically that is not the Help Desk the user would be directed to.

General Maintenance

Just as a company would have their vehicles inspected on a regular basis, the devices and the mounting equipment in the vehicles should be inspected periodically. It is wise to have contracted with the manufacturer for a comprehensive repair plan so you manage your repair costs and don't have to issue a PO each time a unit is sent in for repair. Generally speaking batteries and other accessories are not what a client has covered by a service plan, so they just buy replacements when needed. For single shift operations you should plan on replacing the batteries once every three years. Typically you may the manufacturer might say the batteries are good for so many charge cycles, like 500, but planning a battery refresh every three years is a good rule of thumb. It is suggested that batteries be replaced as a lot and old batteries properly disposed of so that all batteries are in close to the same condition. Accessories should be replaced as they start to fail or show a lot of wear.

Conclusion

Hopefully you have found this document helpful. It is written based on what I have learned from the more than 25 years that I have been involved in mobile computing. It certainly does not address every situation but at a minimum it should give you an idea of what to consider to better ensure your field mobility solution is a success.

If you would like some help with your project or just want to ask a question, feel free to reach out to me at email address nick.duva@compsee.com or phone at (404)935-3341.

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