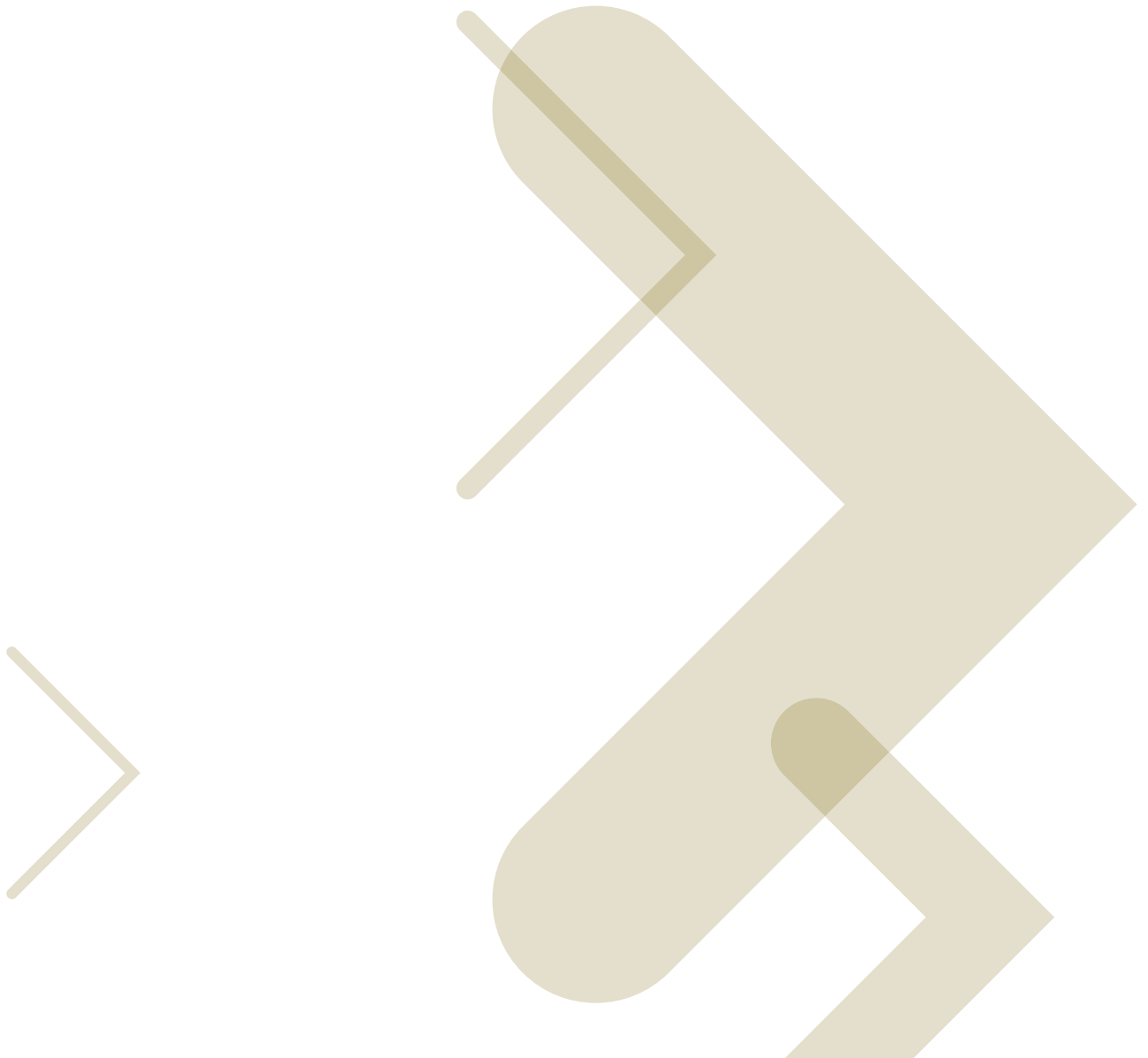


Choosing A Vehicle Computing Platform

Fixed-mount workstations may be a better solution



Mobile data communications are becoming increasingly important in empowering police officers, fire fighters and other first responders to perform their vital work more efficiently, productively and safely. For the past few years, the assumed solution for in-vehicle mobile computing and communications has been a removable, ruggedized laptop computer. Even as first responders continue to work with their laptops, however, municipalities and other government agencies are carefully examining the advantages of augmenting, or even replacing, laptops with advanced fixed-mount workstations, often in combination with ruggedized mobile handheld computers

It's no surprise that laptop computers have become the de facto mobile computing standard for public safety and other governmental professionals. At first glance, laptops seem like an ideal solution for most mobile computing needs. They are powerful computers that allow users to use the same computer and software for office and field work. They allow users to have all their crucial information with them at all times. Laptops can run on their own battery power. They are removable and portable, allowing firefighters or police officers to un-dock their computers and use them outside their vehicles.

Laptops in the Real World

When you look at what actually goes on in practice, however, a different story sometimes emerges. The reality is, for all their vaunted portability, many organizations find that mounted laptops rarely leave the vehicle. There can be a number of explanations for this seeming anomaly. The most obvious is that in many cases, the laptop doesn't need to be removed from the vehicle—many police officers, for example, view their cruiser as their mobile office and prefer to write reports, etc. while in the vehicle. Un-docking the laptop and taking it out of the car only serves to reduce their readiness in an emergency—they have to remember to grab the laptop and mount it in the vehicle before taking off.

Tasks that require computing outside the vehicle aren't always well suited to laptops, either. Checking a driver's license, fingerprinting a suspect, conducting a fire inspection, monitoring a victim's vitals—many first responder tasks are hampered by the size, weight, setup time, and two-handed operation of a laptop. The laptop, therefore, remains in the vehicle.

Yet even in the vehicle, a laptop is hardly ideal. Mounted in front of the center console, it requires the operator's body to turn 30-45° in order to type, while the legs continue to point forward. This is an unnatural, uncomfortable position, which can lead to back pain and injury if maintained for long periods of time, as would be necessary to type out a report. Laptops also need to be mounted outside the car's airbag zones, which requires them to sit low and far forward. This means the operator can't keep the vehicle's window in his peripheral vision while looking at the screen—a significant safety issue during a traffic stop.

As the portability benefits of laptops begin to be examined more closely, some of laptops' other limitations are being exposed, such as the numerous design and functionality compromises that must be made for the sake of portability. These limitations are major reasons why a growing number of public safety and other government users are taking a new look at computers specifically designed for their environment, whether powerful fixed-mount workstations or handhelds.

*"In practice, we found that **officers who had laptops and tablets never took them out of the vehicle.** Added to that is the complexity of docking stations, docking ports, and resulting service problems, and we chose to go with a fixed-mount unit. . . . It was a unanimous vote of our governing body, made up of Police Chiefs and Representatives from [over 200] member agencies."*

—**Tim McRae, Technical Operations Supervisor**
Courts and Law Enforcement Management Information System (CLEMIS)
Oakland County, Michigan

The Fixed-Mount Alternative

Permanently mounted into public safety vehicles, usually in the passenger compartment or trunk, these computers are designed to outperform laptops in important functionalities. They usually have more expansion options and can operate in hotter and colder environments. They offer a greater array of connectivity options. And with removable keyboards and enhanced screen design, they're easier to use. But what about portability?

Although fixed-mount computers cannot be un-docked and carried around like laptops, many departments are beginning to look at portability a little differently. Many are looking at it as a system rather than as a "one computer does all" solution. Given some of the limitations of laptops, many municipalities and agencies are considering deploying a system that features a fixed-mount workstation that outperforms laptops in power and functionality, combined with today's powerful handheld devices and computers that can outperform laptops in functionality, portability and ease of use.

Laptops or Fixed-Mount Workstations?

When public safety and other government agencies or departments compare laptops with fixed-mount workstations, they consider a number of specific features that are important to first responders and other computer users who work in field. Some of the most important points of comparison include:

- **Design.** Anyone who has ever used a laptop understands the design compromises necessary to achieve portability. Keyboards are generally smaller and harder to use than the full size keyboards of fixed-mount workstations. Laptop keyboards are also not removable—unlike those of fixed-mount workstations, which can actually be put in the user's lap, reducing the need to sit awkwardly facing the computer.

Laptop manufacturers overcome these limitations by offering a design with an add-on display and keyboard, which allow the laptop itself to be mounted in the trunk. This works, but at the cost of having to buy two keyboards and two displays for every vehicle—a significant expense—and does nothing to address performance, heat, and other issues.

- **Performance.** Laptops have to balance performance with portability—goals that often conflict. Electronic components take up space, consume power, and give off heat, and in order to make laptops portable, they have to be crammed together very tightly. This requires manufacturers to choose CPUs and other components designed specifically for laptops—i.e. made smaller and designed to produce less heat. Such a compromise necessarily impacts performance. Having no need to keep portability in mind, fixed-mount workstations can use larger components and space them out better, for maximum performance.
- **Temperature range.** Because a laptop's components are packed close together, keeping them cool is difficult. Laptops cope with this problem by running their cooling fans faster and reducing processor performance in order to lower their heat output. (Some "rugged" laptops have been observed throttling their processor when ambient air is just above room temperature.) In a hot environment such as the inside of a vehicle on a summer day, the laptop's small fans may not be able to keep the electronics from overheating, causing significant performance problems or a safety shutdown. Even if a laptop is able to withstand the heat, its battery may not be. All batteries wear out, but heat accelerates this process, drastically reducing portability and requiring repeat purchases of expensive consumables.



The fixed-mount workstation's removable keyboard provides a more comfortable typing position.

MOTOROLA'S MW810 VEHICLE MOUNTED WORKSTATION

For public safety professionals in mission critical environments, safety and success depend on having the right information at the right time. As the leader in public safety wireless communications for over 80 years, Motorola understands this. Our MW810 Mobile Workstation is proof. Its three-piece, fixed-mount design provides reliable, mobile wireless connectivity and computing power for the latest mission-critical applications and is designed to withstand round-the-clock use in a public safety vehicle.

Batteries can also have a narrower operating and storage temperature range than the computer itself. When purchasing a mobile computing solution, it is important to check that all components meet your performance specifications—“surprises” in the field are nearly always expensive and unpleasant.

- **Expandability.** In the field, first responders and others need exceptional connectivity not only to networks but also to peripheral devices that help them do their jobs better. Yet the need for a laptop to be small means that it can only support a small number of ports for external devices and wireless connections.

Users will often compensate by adding external devices—such as USB hubs—to allow more peripherals to be connected to the laptop. This adds cost and creates support issues. A fixed-mount workstation can support far more connection options: it's not uncommon to have as many as fifteen built-in ports, supporting everything from analog video to digital license plate readers and vehicle telematics—as well as having room inside for specialized expansion hardware that further enhances its capabilities.

- **Connectivity.** In-vehicle connectivity allows you to simultaneously connect to a variety of systems—such as WiFi, GPS and public data networks—with better reception than typically delivered by laptops, whose small size limits the number of data connections they can support. You can adapt the workstation to utilize vehicle antennas to substantially improve reception, which helps to improve performance and productivity. Laptops can do this to some degree, but again, their physical size limits the number of available antenna ports. Mounting the laptop in the trunk renders the laptop's built-in antennas useless, requiring connections to external antennas—connections that use up the laptop's scarce ports.
- **Changes, Upgrades and Repairs.** Repairs and upgrades can also be issues. With laptops, relatively commonplace problems—like a broken screen or damaged keyboard—can be so expensive to repair that it's better to discard the computer and get a new one. Even when a

laptop is repairable, the time and cost involved are almost always substantial, leading to loss of efficiency and productivity. In addition, upgrading hardware (for example upgrading to a touch screen, adding GPS support, or switching cellular data cards) and performance (inserting expansion boards or antenna ports) is often difficult, expensive or in some cases, not possible with laptops. With fixed-mount workstations, making hardware and software upgrades is normally both simple and cost effective. CPUs, displays, and keyboards can be replaced separately as needed, resulting in thousands of dollars in savings per vehicle.

- **Theft or accidental loss.** In recent years, theft of laptops had become a growing and disturbing problem for almost every municipality and government agency. Laptops are relatively easy to steal and easy to sell. Adding to the problem, many government laptops contain sensitive information that should not be in the hands of criminals. Unlike laptops, fixed-mount workstations make a far less tempting target.



A fixed-mount workstation has a large number of ports for external devices.

Computing Beyond The Vehicle

With advantages in performance, flexibility, and connectivity, government agencies are well-advised to consider built-in workstations for their vehicles. But what about computing needs outside the vehicle? Does portability have to come with diminished flexibility and performance?

If “portability” is synonymous with “laptops,” then the answer is probably yes. Recently, however, public safety and other government departments have begun to look at portability as a system. Certainly laptop computers remain in productive use, and are the solution of choice for many users. But a new breed of powerful and feature-rich handheld computers and devices is opening up new possibilities for more efficient, less cumbersome portability. It's portability without the compromises inherent in laptops; an effective and efficient portability that can increase performance and help first responders work more safely and more successfully. It's portability that comes from using rugged handheld computers.



More and more departments are turning to handheld computers for portability and ruggedness

The New Handhelds

Today's handheld computers can be fully ruggedized to withstand the rigors of the front lines and field use. Tested to global standards, today's handheld devices are dust-tight, drop resistant and water resistant, even to the point of full immersion. But a majority of handhelds, even those with high-level functionality and maximum ruggedness, weigh in at about one or two pounds, just ten to twenty percent of the weight of many ruggedized laptops.

Today's rapidly evolving new handheld devices and computers can combine with robust fixed-mount workstations to create a more efficient, more effective portability system for first responders and other government field workers—whether social workers, building inspectors, highway maintenance, or fleet management staff. These handhelds provide plenty of computing power for their applications, but they are smaller than laptops and easier to use under difficult circumstances.

Expanded Functionality. The new handhelds are extremely versatile and feature-rich. Functionality can be customized to your exact needs, providing an exceptional degree of flexibility. There are a variety of hardware options, such as different sizes and types of keyboards and displays. In addition, handhelds can have powerful capabilities—such as GPS, barcode scanners, RFID capabilities, cameras and more—built into the device. This allows sophisticated output options, such as combined data and photo capture that provide images displaying time and GPS coordinates. Many units are also able to display real-time video from surveillance cameras, providing first responders with invaluable foreknowledge of a scene or situation.

Field applications like fingerprinting, electronic citation, or Records Management can be accessed instantly, keeping one hand free. Built-in bar code scanners and ruggedized attachments eliminate the need for vulnerable peripheral devices.

Enhanced Connectivity. Handheld units offer ubiquitous wireless connectivity. Most offer data and phone calls on a single device, often with Bluetooth capabilities. You can have high-speed connectivity to a variety of networks, such as Mesh or cellular data, and you can even create WiFi-based “network bubbles” of up to several hundred feet around a vehicle connected to a private network. This enables the handheld to transmit to the fixed-mount workstation which can relay data to control centers over a private network. It also lets the handheld access applications running on the vehicle workstation, putting the workstation's full power into the hands of users.

Ease of Use. Unlike some laptop computers, today's sophisticated handheld devices do not have to be force fit into field situations. They are designed specifically for the situation in which they will be used. All are compact and lightweight. Some provide hands-free portability with the ability to fit into a pocket or holster, and are less cumbersome to use. Others are designed with comfortable “gun grips” ideal for scanning-intensive and other types of applications.

A BROAD PORTFOLIO OF HANDHELD DEVICES

As a pioneer and respected global leader in mobile computing, Motorola offers one of the industry's broadest portfolios of powerful handheld computers and devices. We offer a wide range of dependable, rugged handheld mobile computers specifically designed to provide the most efficient, most effective solutions for protecting and empowering users from first responders to field workers in virtually every municipality, department and agency.

The Future Of Portability

In many cases, laptops will continue to be used in much the same way as they are used today. For one thing, there are a lot of laptops out there that are functioning well and providing excellent portable utility. They are not going to be replaced en masse. For another, under certain circumstances, laptops remain the preferred technology choice. This is especially true of laptops that are tied to a specific individual, like a police or fire official or supervisor. Although he or she may use the laptop primarily in the office, there are times when it's important to be able to take that particular computer, with all its applications and data, into the field. Laptops are well-suited for this kind of use case.

Portability Systems

But as the limitations of laptops as truly portable devices become more apparent, and as their use outside of vehicles continues to decline, fixed-mount workstations are beginning to become a valued option in many instances. When true portability is not crucial, the fixed-mount workstation is an alternative that provides a great many advantages over laptops, especially in terms of power, performance and connectivity. For organizations that need more efficient and more effective portability, a system of handheld computers and devices supported by a powerful fixed-mount workstation is a solution certain to grow in years ahead.

What are the cost implications? In most cases, laptop computers and fixed-mount workstations are similar in cost. The major cost differential occurs when handheld devices are added to the mix; adding these units will normally cause the combined fixed-mount workstation and handheld portability system to cost approximately 15-25 percent more than the price of a single laptop. It's worth keeping in mind that such a system is far more practical in the field, and that it eliminates the need to purchase expensive, fragile standalone accessories like cameras and bar-code scanners.

And of course, there is more to cost of ownership than purchase price: heightened personnel effectiveness, better productivity, and savings on support and replacement costs can easily justify a higher up-front outlay. (This is, after all, why so many agencies buy rugged equipment in the first place.) Safety and effectiveness remain key considerations. Municipalities and other government agencies will ultimately decide on their best vehicle and field communications and computing options—whether laptops, fixed-mount workstations or handheld computers—based on their own organization's resources, goals, and strategies.



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