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“Low-Cost Computers Come at a High Price”

Why Police, Fire and EMS Agencies Need Rugged Computing Hardware

In a recent **Report on Mobile Computing**, the **International Association of Chiefs of Police** states,

*“ It is remarkable how much benefit a law enforcement agency and consequently the public can experience from a successful mobile computing system implementation ... The percentage of savings in time, personnel, money, consumables, accuracy, and safety can be truly monumental, often between 20-40 percent.”*¹

To realize these phenomenal benefits of mobile computing, equipment needs to be well-designed, user-friendly, and reliable—terms that, in the field of public safety has definitions very different from their equivalents in consumer and office markets. Just as the family minivan isn't suitable for patrol duty, consumer- and office-grade mobile computers are an extremely poor fit for the work environments faced by Police, Fire and EMS workers in the field.

The temptation to purchase consumer-grade hardware for mission-critical applications is always there, particularly in lean budget times. After all, the purchase price is significantly lower, the hardware lighter and prettier, the brands familiar—and isn't one computer more or less the same as another? But in the unforgiving environments and urgent, life-threatening work scenarios faced by public safety personnel, the truth is deploying “low-cost” consumer hardware in rugged work environments turns out to be very costly.

VDC Study

Tablet/Notebook Five-Year Total Cost of Ownership (TCO):

Fully Rugged: \$15,700

Consumer: \$27,100

An independent study by the VDC Research Group quantified the total cost of owning and supporting a mobile computing device for five years. In Police and Fire applications, the cost differences were stark: a fully rugged notebook computer costs \$15,700 to purchase, support, and operate—while a “low cost” consumer laptop costs over \$27,100 over the same time frame. Similarly, a “low-cost” consumer handheld PDA costs nearly \$25,300 over five years— over \$10,000 more than a fully rugged PDA. These costs mean that each “low-cost” device—laptop or PDA—carries an extra cost of over \$2,000a year. In a department with as few as 40-50 employees, the savings from deploying ruggedized hardware can exceed \$100,000 a year: enough to hire additional staff.

Annual Tablet/Notebook Failure Rates:

Rugged: 9%

Consumer-grade: 33%

Why so Expensive?

Even people familiar with the concept of TCO—Total Cost of Ownership, i.e. the amount of money spent on acquiring, maintaining, supporting, and use of a device—may be surprised at the magnitude of these numbers. It's one thing to understand that “computers cost money”; quite another to see how the purchase price of a computer is exceeded by the outlays required to support and keep it running. Then there is the cost of lost productivity, which is more difficult to measure, but no less real. After all, you bought the computer to realize “savings in time, personnel, money, consumables, accuracy, and safety.” If it's not working, those savings are lost.

Consider, for example, the cost of failure of a laptop's hard drive—a crucial and vulnerable component that is left unprotected in most consumer hardware. The drive itself must be replaced, of course, which costs money—but that's only the beginning. If the drive fails in the field, the user has to fall back to pen-and-paper and diminished operation, or in the worst case, stops work and return to headquarters so the problem can be dealt with. Data that resided on the hard drive—whether un-filed reports, unsent emails, evidentiary photographs, or just notes—will either be lost, or require very expensive and uncertain recovery efforts. The new hard drive must be installed, with the operating system, applications, and security software configured and tested—increasing IT costs. At this point, the total IT costs and loss of productivity are likely to exceed any costs savings from having bought a “low-cost” consumer device. There are steps to mitigate the risk —frequent backups and spare hardware—but those also carry costs, and are no help against the loss of productivity in the field.

These costs are likely to show up surprisingly fast in consumer-grade devices. VDC reports that non-rugged computers have an annual failure rate of 33%—that is, in any one year, one out of three computers owned by an organization will require some kind of repair. By contrast, fully rugged devices suffer an annual failure rate of only 9%, resulting not only in lower repair and IT costs, but substantially higher productivity amongst staff using them. VDC also reports that “the failure rate of non-rugged notebooks increases substantially with time,” with annual rates in the first year being 15-20%, rising to 35% after the second year. By contrast, failure rates of rugged equipment remain “fairly consistent” over their installed life. Looking at handheld computers, the contrast is equally stark. A consumer-grade device may be “cheaper” to purchase, but support and productivity costs quickly overwhelm any price advantage.

Why? The size, weight, appearance, and low price requirements of today’s consumers leave very little room for “over-engineering” or safety margins, resulting in enclosures that do little more than hold these parts together. They cannot protect the sensitive parts inside from shock, vibration, or temperature extremes. Liquids and dust have no problem getting inside, creating corrosion or gumming up mechanical parts. Such a design is an acceptable trade-off for products used in comfortable, air-conditioned homes or offices; in other more variable environments, they don’t last long.

VDC Survey - Primary causes of mobile computer failure in Police & Fire applications

Dropping Device	54.5%*
Excessive Heat/Cold Exposure	33.3%*
Excessive Shock/Vibration	33.3%*
Water/Liquid Exposure	30.3%*
End User or Intentional damage	12.1%*
Dust Particulates	12.1%*

*% of respondents surveyed who indicated this as primary cause.

Sensitivity Training

When it comes right down to it, high failure rates on “low-cost” computers are hardly surprising. After all, a mobile computer is a collection of very sensitive, precision-engineered parts: the screen is a paper-thin glass sandwich; the CPU performs billions of operations per second on a sub-atomic level; the hard drive consists of thin metal platters spinning at 5400 rpm, separated from other parts by distances many times smaller than a human hair.

Rugged Tablet/Laptop Value and Cost Justification

The value of ruggedized devices is that they are designed to protect the most sensitive parts from likely damage:

- Ruggedized Resistive Touch Screens eliminate the need for mice and keyboards, are made from tempered glass, so they will not break or shatter.
- Hard drives are solid state or mounted on shock absorbers, which protect the drive from impact when a computer is hit or dropped. The shock absorbers also dampen vibrations that can damage the drive or dislodge assembled parts.
- Exterior Cases are made from industrial strength, impact-resistant materials. Keyboards and joints are made waterproof by design or sealed with gaskets, preventing liquids and dust from getting inside. Ports and connectors are covered.
- Built-in features and components eliminate any moving parts and make fragile peripherals unnecessary.
- Stringent testing is done throughout the design, manufacture, and life of the product to make sure it meets specifications for shock, vibration, heat and cold. Well-known standards are followed—for example, the U.S. military’s MIL-STD-810F.

Conclusion

When it comes to mobile computers, government organizations should remember the old adage:

“We are too poor to afford cheap equipment that doesn’t last.”

Devices designed and built for consumers and office workers will not stand up to everyday use in the hostile outdoor environments in which government and public safety personnel work. The extra costs of support and lost productivity from failed devices exceed any up-front cost savings within a year of two of purchase. Government workers outside the four walls require ruggedized devices. Appropriate hardware will not only reduce TCO—it will raise productivity and increase job satisfaction.