Mobile Video Surveillance Meets Surveillance-Grade microSD Cards

Growing concern about public safety is prompting wider deployment of video surveillance by government agencies, private organizations, and consumers. A rising demand for mobile video surveillance systems in the transportation sector—including trains and trams, busses, transport vehicles and police automobiles—was valued at $1.4B in 2017, and it is expected to reach $2.7B by 2025 (CAGR of 9%)[1]

With wide implementation of mobile video surveillance systems in these vehicles, a huge volume of data will be generated that will require system optimization among data storage, processing and communication from an end-to-end topology perspective—driving the next innovation in mobile video surveillance solutions.

Mobile Video Surveillance System

Mobile video surveillance systems generally fall into two catagories: cameras mounted in a vehicle with onboard storage, and cameras connected to a mobile recorder mounted in the vehicle.

In both scenarios, cameras cover the view of driver, passengers and outside activities. In addition to video monitoring, these solutions may be integrated with GPS tracking and other vehicle-related monitoring (such as fuel, speed, temperature, etc.). With system connectivity improvements, it is possible to transmit the data to a centralized management system; however, for cost efficiency and connection reliability reasons , surveillance video archives are typically stored in a local storage device (for example,. mobile recorder) in the vehicle and then synchronized to a central management system upon return to the station. Therefore, a robust storage solution is critical for successful operation of mobile video surveillance systems. This brief discusses how to select a suitable storage solution for your mobile video surveillance system.

Storage Options for Mobile Video Surveillance Systems

Mobile video surveillance systems generally use one of three options for storing recorded video:

1. Hard disk drive (HDD): Typically used in mobile recorders, HDDs require additional designs for protection from external vibration and shock.

2. Solid state drive (SSD): Primarily used in mobile recorders given their capability of operating in harsh environments, SSDs offer protection from vibration and shock.
3. microSD card: Broadly used in dash cameras, mobile IP cameras and recorders , microSD cards offer flexibility and size advantages.

Storage Requirements for Mobile Video Surveillance Systems

To determine the most suitable storage option for a mobile video surveillance system, four key factors should be considered:

1. Operation in a harsh environment
Since the system is installed in a vehicle, the solution must be resistant to vibration and shock, while also supporting a wide temperature range.

2. Size of footprint
Mobile design aesthetics are trending to smaller, less obvious form factors; therefore, the size of the memory footprint is an important consideration. The figure below shows an example comparison among these three storage options.
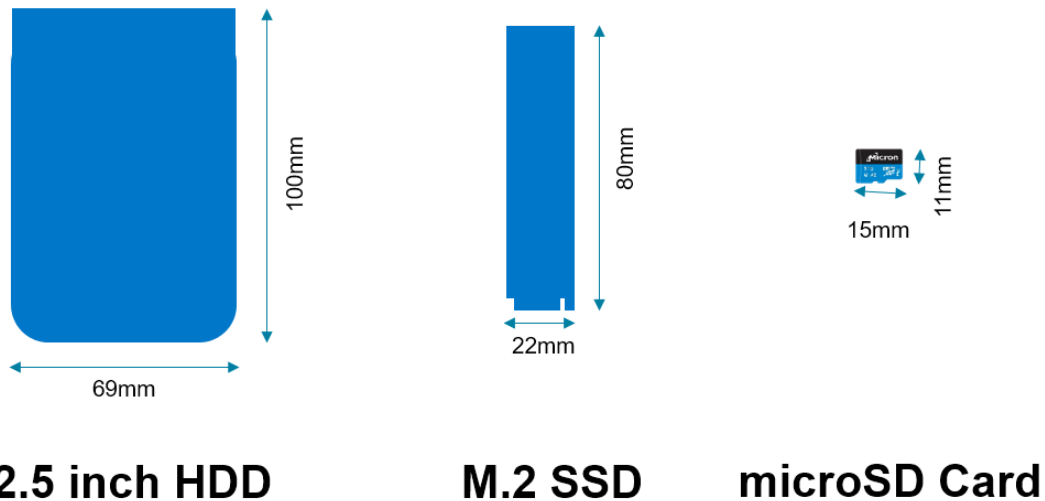

Figure 1: HDD vs. SSD vs. microSD Card Footprint

3. Storage retention
In general, a seven-day storage retention period covers most mobile video surveillance application usage models in the transportation sector. (See below for the range of storage size requirements depending on camera resolution and number of channels needed in the mobile video surveillance system.)
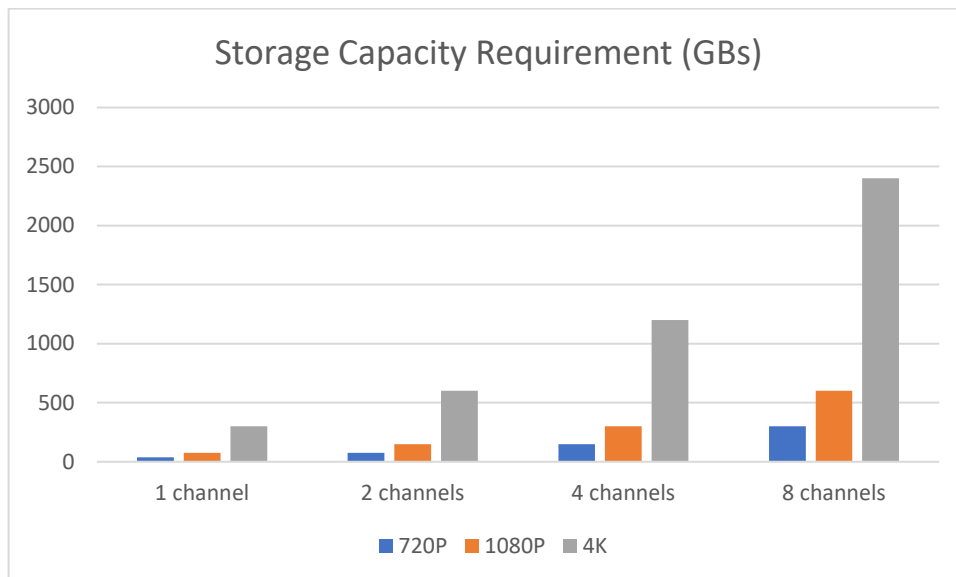
Figure 2: Storage Capacity Requirement for Mobile Video Surveillance System

The analysis is based on above configurations:
- Camera bit rate: 1 Mb/s (720P) / 2 Mb/s (1080P) / 8 Mb/s (4K)
- Recording hours per day: 12 hours
- Connected camera channel per system: 1 - 8 channels
- Storage retention: 7 days

4. Upgradability
A microSD card's removability makes it perfect for storage upgrade requirements in the field. Increasing days of retention, upgrading camera resolution requirements, or adding additional cameras in a vehicle are all scenarios that are easily serviced by simply opening the camera/recorder slot and replacing the card with the appropriate density.

Design Considerations Using microSD Cards as Primary Storage

Given the requirements discussed above, solid state storage with industrial, ruggedized design and up to 1TB capacity can address most use cases. Industry advancements in NAND technology have enabled high-density solutions in the microSD card form factor, enabling smaller footprint and removability features that provide additional system design benefits. As the microSD card becomes the mainstream primary storage in mobile surveillance, system designers, installers and end users must be aware that not all microSD products are the same. Key considerations with using microSD cards in mobile surveillance include:

- Endurance and quality: Is the microSD card designed to handle three years of continuous recording? A typical mobile video surveillance system needs to be ruggedized toward all-weather

resistance. To reduce maintenance and decommission costs during service years and lower TCO, a high-endurance, surveillance-optimized microSD card is essential.

How long can a microSD card last in surveillance?

- NAND flash cell architecture (SLC/MLC/TLC) has a big impact on the reliability of storage solutions based of said memory components.
- **Card lifetime can vary depending on:**
  - Different NAND memory offers different levels of endurance
  - Combination of random and sequential access
  - Firmware optimization with respect to background operation

Assumption: Card Capacity 128GB and data rate of 8Mbits/s
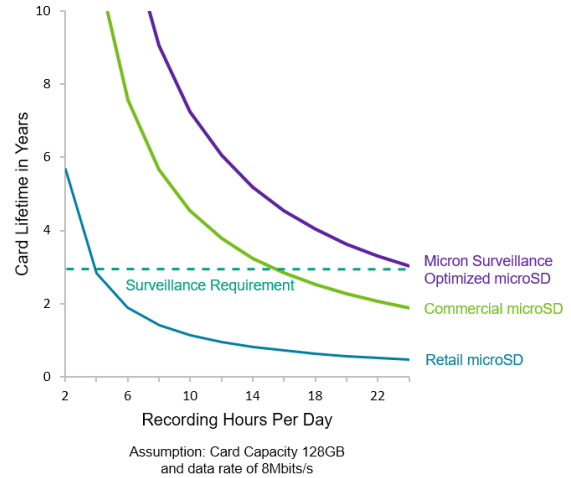
Figure 3: microSD card endurance

- Recording performance: Does the solution give confidence that the card is capturing all essential and critical footage at all times? Continuous video recording into a microSD card can cause frame drop issues. The microSD card must optimize its recording performance for surveillance usage to reduce the risk of data loss.

What is the expected recording performance?

- Sustained recording with minimum/no lost frames is a key focus for surveillance (Frame Capture, Test conditions 30FPS @ 8Mbps).

Frame Capture
Retail SD Card

Frame Capture
Micron's OEM uSD Card
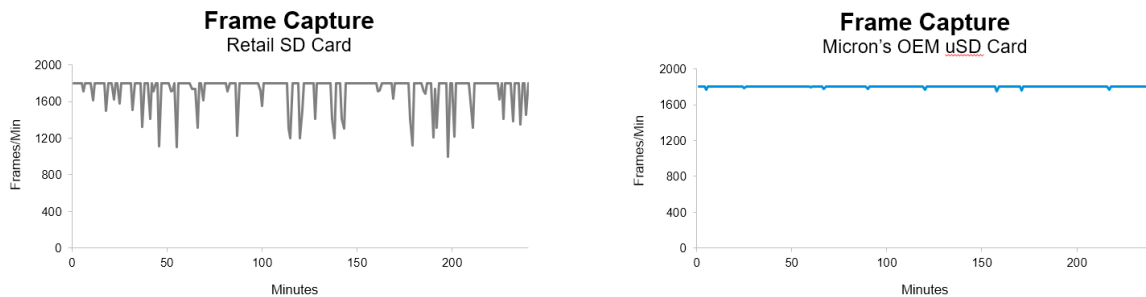
- Figure 4: microSD card recording performance

Introducing Micron's Industrial microSD Card for Mobile Video Surveillance Systems

Micron's industrial microSD cards are specifically designed for edge video surveillance workloads and features:

- Storage densities of 32GB, 64GB, 128GB, 256GB, 512GB and 1TB enable more video to be stored at the edge and increase design flexibility
- Three years of high-quality, continuous, 24x7 video recording in a wide range of temperatures and environments
- A two million hours mean-time-to-failure (MTTF) or 0.44 percent annualized failure rate (AFR), which is equal or better than most surveillance HDDs[2]
- Special firmware designed for continuous video recording that minimizes frame drops
- Technology for the cards to self-monitor and provide information on usage and expected useful life remaining
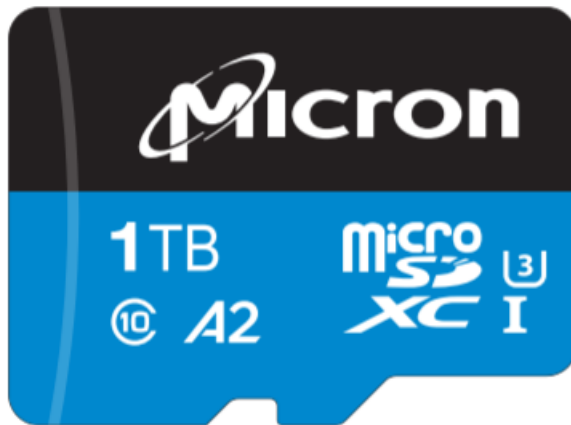
References

[1] MarketsandMarkets – Mobile Video Surveillance Market 2025 Forecast
[2] Reference WD Purple drive & Seagate Skyhawk HDD specs

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