

ACUMEN™ AI on the Edge

For Military Applications

Overview

Artificial Intelligence (AI), is intelligence demonstrated by machines. In computer science, AI research is defined as the study of “intelligent agents”. This is any device that perceives its environment and takes actions that maximize its chance of successfully achieving its mission. An example would be a surveillance or security drone which identifies a threat and then takes autonomous action to deter the threat.

There are several programs and initiatives within the DoD / Military which involve AI.

AI is used in the Defense Advanced Research Project Agency (DARPA) VMR system that increases the efficiency and responsiveness of analysts by quickly searching, filtering, and exploring large volumes of visual media to find only the images and data that are mission-relevant.

Another example of AI is the Low-Cost UAV (Unmanned Aerial Vehicle) Swarming Technology (LOCUST) which utilizes a large number of autonomous marine and aerial vehicles to perform defensive operations for the Navy and Marine Corp’s.

The US Army is also pursuing Robotic and Autonomous Systems (RAS) which enable faster and more accurate decision-making, making operations more efficient over a wider range of diverse situations.

With AI, the US DoD / Military, and other global military organizations can:

- Expand situational awareness
- Deploy assets more quickly
- React immediately to situations
- Optimize operational efficiency

Using AI for Remote and Mobile, DoD / Military Applications

In general, there are multiple challenges to deploying AI. Many involve the effectiveness and performance of the installed AI application.

- Is it properly capturing, filtering and parsing the data.
- Does the application react and behave as it has been taught.
- How can performance and latency be improved.
- Can it be easily managed and are parameters simple to adjust.

These challenges are common for all AI applications: military, government, and commercial.

But there are additional challenges when deploying AI for the military. Applications such as Air Force drones, Army robots, and Navy missile targeting systems do not operate in safe and controlled environments that are secured, cooled, and have ample power.

Remote and mobile military AI applications face additional challenges that need to be overcome.

- **Data storage and transmission security:** One of the largest challenges facing military organizations is cyber-security. The current budget for the US DoD to combat cyber-attacks is \$8.5 billion dollars. Cyber-attacks pose a serious threat to AI systems since these systems are often involved in mission-critical or mission-relevant information gathering and decision making. The data stored within remote and mobile AI systems and, more importantly, the information sent from these systems is often highly sensitive and requires the highest level of security.
- **Restricted bandwidth:** Mobile and remote AI systems don't have the luxury of high link speeds. The data captured, especially on a remote system with multiple inputs, is often many magnitudes higher than what the link can transmit.
- **Harsh environments:** Unlike commercial AI applications, military AI systems need to operate flawlessly regardless of the environment. Temperatures can range from as low as -40 °C to nearly 85 °C with humidity from 5% to 95%. Systems also need to survive physical shocks, drops, and never ending vibration which would normally damage or completely destroy commercial systems.
- **Restricted space, cooling, power, and low weight:** Remote and mobile military AI deployments do not have the benefits of operating in a commercial facility. Space is a restricted, cooling is limited or none-existent, and power is usually provided by a battery, small generator, or other limited power supply. Systems also need to be light weight since they may be hand-carried or air born on small aircraft.
- **Limited data storage capacity:** Remote and mobile AI systems have limited capacity to store data and perform operations. Yet the latest AI systems can be equipped with up to 16 high definition cameras. This requires a large amount of storage capacity which is difficult to achieve in a small mobile and remote system.

Why does BITMICRO® ACUMEN™ Ruggedized Supercompute AI Platform offer a superior platform for mobile and remote AI military applications?

ACUMEN Ruggedized Supercompute AI Platform offers a powerful, rugged, compact, high speed, power-efficient, and secure platform for AI including data and image acquisition, parsing, filtering, and transmission.

Extremely Secure: ACUMEN AI Platform is fully integrated with BITMICRO RAMPART™ Distributed End-to-End Embedded Cyber Security. RAMPART Distributed Cyber Security delivers end-to-end AES-256 encryption. RAMPART Distributed Cyber Security creates the most advanced, distributed, and seamless, secure data storage and data transmission environment for remote ACUMEN military AI platforms. Regardless of how or where the ACUMEN AI platform is deployed, sensitive data created, stored, processed, enriched or sent by ACUMEN AI platform will be safeguarded by RAMPART Distributed Cyber Security AES-256 encryption, while it is stored and while it is being transmitted to another location.

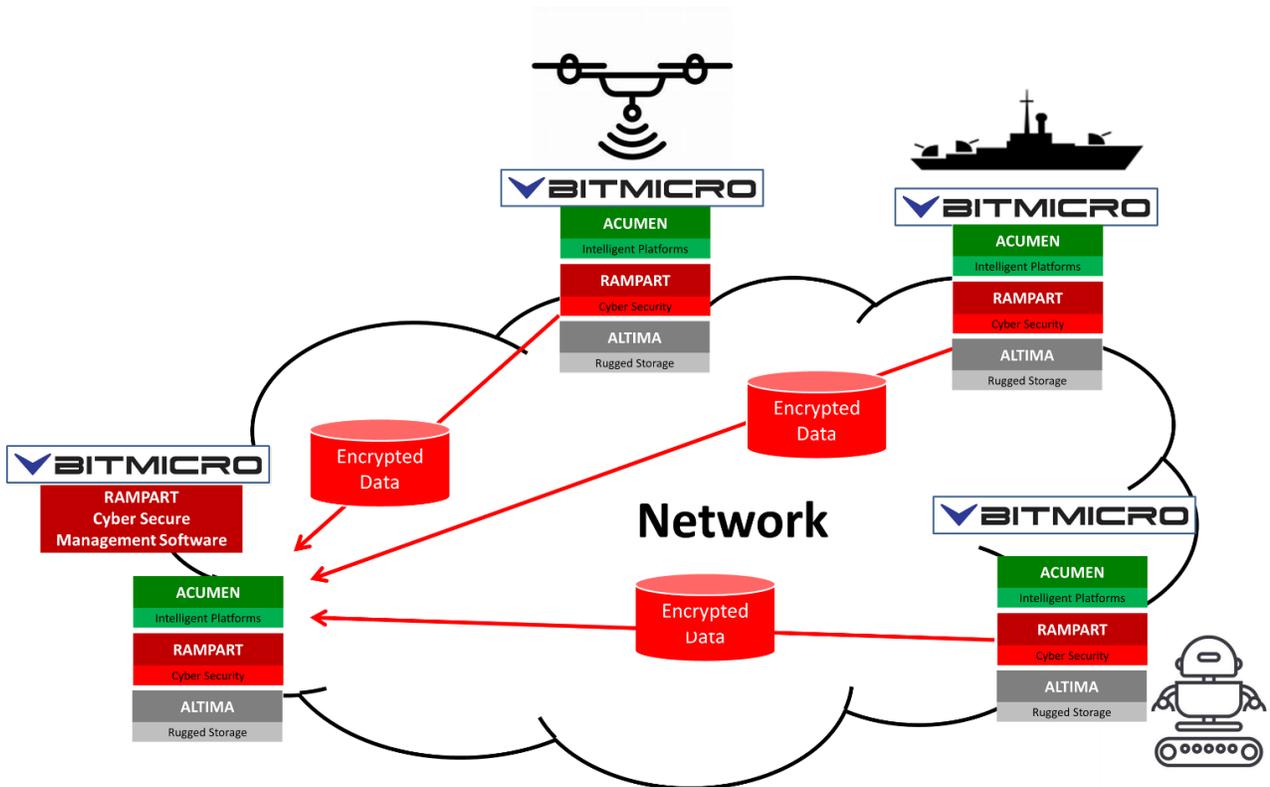
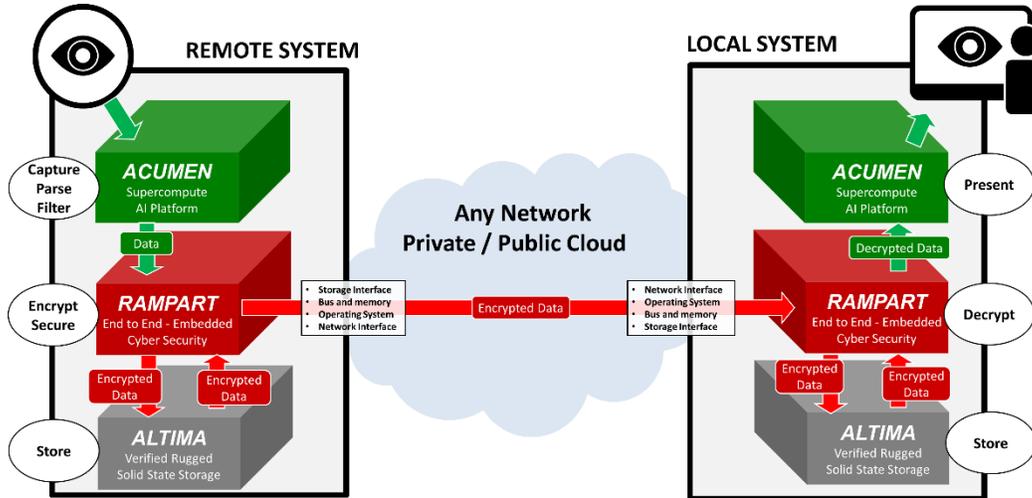
Efficient Bandwidth Use: BITMICRO ACUMEN AI platform supports up to 16 inputs which can encode and decode 4K resolution videos with a 60Hz refresh rate. A combination of powerful CPUs, GPUs, and accelerators allows ACUMEN AI platform to acquire high-quality images and, thru deep learning applications, allows images to be quickly analyzed, filtered, parsed, and encoded. By only sending data that is mission-relevant, transmission bandwidth requirements are greatly reduced.

Military Grade Ruggedness: ACUMEN AI platform is designed to military standards. It can withstand extreme temperature ranges of -40°C to 85°C and humidity nearing 95%. Shock has been tested to exceed 140 G and vibration is rated for 5 Grms at 10-500 Hz. BITMICRO manufacturing process ensures that every device is verified rugged.

SWaP: ACUMEN AI platform is a low SWaP (Size, Weight, and Power), portable and rugged platform for remote and mobile military AI, supercomputing, or data recording applications. Power requirements range from as low as 35w depending on the configuration, application, and amount of RAMPART Distributed Cyber Security solid state storage capacity required. The compact 105mm x 105mm footprint is ideal for smaller systems. System height depends on storage requirements. Weight, including industrial casing, varies from 60oz and up depending on configuration.

Large Storage Capacity: ACUMEN AI platform, through RAMPART Distributed Cyber Security, utilized BITMICRO ALTIMA solid state storage. Up to 16TBs of storage capacity is available to address the requirements of even the most data intensive military AI applications. ACUMEN AI platform supports a wide range of NAND types including SLC, SLC Mode over 3D TLC NAND, MLC Mode over 3D TLC NAND, 3D TLC NAND. ALTIMA solid state storage is time-tested and verified rugged to reliably store and protect sensitive data.

Figure 1: Flow chart showing how the remote and mobile ACUMEN AI Platform functions and is supported by RAMPART cyber security and ALTIMA solid state storage for secure and reliable data storage and transmission



Conclusion

Artificial Intelligence provides the US DoD / Military, and other global military organizations with clear advantages.

In addition to the traditional challenges of deploying AI for any commercial and government application, the military has additional challenges including security, bandwidth, ruggedness, low SWaP, and capacity.

ACUMEN AI platform offers a powerful, rugged, compact, high speed, power-efficient, and secure solution for military organizations deploying remote and/or mobile AI applications.

ACUMEN “AI on the Edge” AI platform is designed to meet and overcome the unique challenges facing the US DoD / military. ACUMEN AI platform delivers the security, performance, ruggedness, efficiency, and capacity demanded to successfully and reliably use AI on remote and/or mobile systems.