MVSS Morrow Vehicular Server Systems

Written by Timothy Gray and Dave Asplund

With the release of the **CS9100 series** earlier this year, Morrow Military Industries (MMI) offers a unique rugged Xeon or Epyc server series in an extra rugged 19/2 form factor. With two processor options, from 64 to 128 cores performance cores and 32 to 64 efficiency cores. and up to 128 TB RAM, the military market interest has been strong. The increasing use of AI virtualization in military applications, combined with the constraints on unit size, makes CS9100 a perfect fit for many scenarios and deployments.

Several customers in NATO countries, both in Europe and North America, are already using the **CS9100 series** in vehicles, aircraft, weapon systems, pelican cases for mobile applications, and as a static but easily portable computer system in an electronics suite for base systems/command & control containers.

Like all Morrow products, the CS9100 series has a flexible design made for customized installs. Standard options come with military connectors (CS9101)

and sealed Industrial connectors (CS9121). All are designed for extremely rough environments and compliant with the relevant MIL-standard parameters. Storage options support up to three hardened SSD array modules each holding 24 16TB SSD drives in a cooling and vibration isolation gel block that conducts all the heat to the case for dissipation and extended lifetime. The three built-in arrays are expandable with a six-array dockable module, totaling nine arrays, or a twelve-array dockable module, totaling 15 arrays. All Morrow Industry SSD drives feature Space Grade 6D NAND drives each with 640Gb of ultra high-speed RAM caches on each module. Typical commercial drives are rated to 100,000 write cycles, however, MMI drives are guaranteed for over 1,000,000 write cycles due to the patented Morrow Temporal write technology and caching systems. Fully populated the system supports 1.152 petabytes of storage with propagation of all three array modules in a server allowing for Higher redundancy and RAID levels to increase speed and data integrity even in the most difficult of combat or operational environments. With the dockable arrays added to the **CS9100 series,** the storage is increased to 3.456 petabytes using a six-array dock unit or 5.760 petabytes using the 12-array dock.

Each server supports multiple extremely high-speed network connections including a dedicated fiber optic pair for connection to the vehicle systems when slotted in the mounting cage.

Systems have a wide range of power capabilities to operate from 12VDC to 96VDC and have manual and automatic controls to scale up or back capabilities based on the power available. Options for an air-cooled sealed case or a water-cooled/heated jacket that is bolted to the outside of the milled billet aluminum case to transfer heat away from the equipment in exceptionally wide operating temperature environments. With proper cooling, there is less than 6% thermal expansion due to utilizing MIC5 cast aluminum billet for all structural components. Extremely silent, a **CS9100** will generate less than 18 Db of noise or Vibration at full operation and 17 Db at heavy load.

Built-in virtualization hypervisor interface allows instant launching of additional systems as needed. The interface controls all interconnected units by the designated mainboard unit based on system load, under automation control using the Project Base Adaptive Cognitive Assistive Interface (BAS-AI) with no human oversite or under manual control by the operator when full performance

requiring human oversight is needed. Is capable of running at 100% for extended periods of time with adequate water cooling and a strong enough power supply. If temperatures exceed optimal ranges automatic operation throttling will occur.

The **CS9100 series** satisfies MIL-STD-196H requirements and exceeds specifications for US Navy High Energy Shock requirements for lightweight equipment. If seals are intact they can operate in 100% humidity and condensation environments.

Coupled with the Morrow Project **AN/PRC-297 SDR** radios the **CS9100 Series** can passively scan up to 18 different frequency bands at high speed for radio signal detection and logging when commanded to do so. Operation stops when personnel use the radio for communications to avoid operational interruption.

Game use:

The **CS9100 series** is not waterproof, when the unit is submerged due to the vehicle sinking or the emplacement flooding, a clock starts ticking to stages of equipment failure. Roll 3 D6+18 and the total is how many minutes the server will survive under a few feet of water. If any connector port was open, a closed panel is breached, or the seal is compromised the unit is instantly compromised. Even if the team had access to a functioning clean room they lack the tools and materials to re-seal the unit and repair/replace the cooling gel. Every time the system is opened another 10% degradation occurs.   After opening roll %dice as the computer will need to roll under it's current state to not suffer a failure and have to be restarted for any operation that is not routine vehicle or base operation due to internal cooling compromised and not transmitting all heat away from components.

Repairs:

If the unit experiences damage and needs to be repaired from a bullet hole, heavy impact, gnomes, etc… The damaged parts need replacement. To figure out the damage use the following table.

1-20%	Power supply damaged
21-40%	Management hardware Damaged
41-60%	Ram Damaged
61-80%	Storage Drives Damaged
81-100%	Motherboard Damaged

Replacement of the item will depend on if they have another unit to scavenge parts from. Replacement of parts for all items EXCEPT Storage Drives restores operation. Storage drive damage will create data loss. Roll %dice to determine how much data was lost. 100% data loss means the drive array must be formatted and they lose everything. The PD can have fun with this if there is any data loss as answers given can be wrong as the internal AI is also damaged and can make up for the missing information or it's own damage. Before players start claiming they made backups, point at the size of storage and ask who packed a military grade 6 petabyte usb stick in their personal effects to make those backups.

The cooling gel in normal repairs is cut out and removed, system repaired, then the gel replaced by pouring in new and letting it solidify. The teams do not have this polymer, they can not make the polymer, so repairs will be made by tearing and trying to put chunks back. This will significantly damage cooling abilities of the gel and is what creates the 10% degradation each time it's repaired. A light blue in color, it has the tactile feel of a stiff jello and feels cold as it pulls heat from the person's skin when in contact. Even in tropical temperatures it will feel cold, it does not get heat saturated until 200C. it will not burn, it can be eaten as it is

non toxic but it provides no nutritional value and will cause 3d6 hours of severe constipation. It has no flavor. It does conduct heat from the warm side to the cold side. If your players are hell bent on playing with the stuff, then yes they can burn their hand touching it if they put it next to a fire or in a fire. Consider it is 95% efficient at conducting heat away from the source to a cooler side.

Encryption Assistance:

Shutting down ALL virtual machines and using all available computing power to crack encryption gives a +20 to an encryption skill and reduces decryption time by 75% compared to anything else due to the array of FPGAs designed for the task. Communications recording, automated scanning, and adaptive monitoring will stop during this time. Field repair is not possible without parts or a second unit to scavenge parts. Disassembly will compromise all seals and it will no longer be waterproof or be able to run in tropical environments. Also, any form of compromised seal will require routine maintenance to remove particulates and chemicals that would impede operation by a percentage of the PD's choice or lockout continued operation.

The **CS9100 series** system library contains pretty much all the information the team needs upon unfreezing and is updated by the bolt hole from a small umbilical that is connected from the bolt hole's mainframe to the unit. It is kept operating by the bolt hole power system over this umbilical. When the unit is connected to a vehicle or building antenna system, updates can be delivered over encrypted radio frequency bursts or extreme low-frequency(ELF) signals. ELF is very slow data rates so only messages and critical information is sent over this mode. Critical location of resources on the teams map would be updated via this method.   Burst radio can be terrestrial or satellite based and can update larger chunks of information over time.   Normal project operation would have continual data stream updates as the constellation of project satellites and relay stations broadcast information from Prime Base.

Morrow OS is a hybrid of the MMI OS written for the Project and is unlike anything else yet similar. It has all the best aspects of every operating system known to humankind. Basic AI capabilities are included using the Project Base Adaptive Cognitive Assistive Interface (BAS-AI) but are limited due to an order

directly from Mr. Morrow himself.   The reasoning behind this was unclear. The AI code is for self-management of the systems, data analysis, and signals harvesting for the project. The BAS-AI is also tasked with data recovery, restructuring, extrapolation, and cataloging. The AI has a hard limit on its capabilities, however, there is very little data or hypothesis on what would happen if an adaptive system ran over longer than expected timeframes with no human oversight. (This leaves it in the PD's discretion as to how the AI adjacent program develops and if it becomes a fully functional AI. if it is a functional AI, the PD will further determine the imperatives or confines of the AI as well as the sanity level of the AI whether it is constant or fluctuates.)

These servers were available to the project starting in 2010 freeze dates, the technology in them exceeds anything available even in 2023. Morrow Trained Computer technicians will understand their operation and can repair them if they have the interactive manual, parts, materials, and tools to do so.   These same computers are found in Depots and Bases.   Science 1 has four units with 12 array docks in each half of the vehicle.   It is rumored that MARS1 has two units with six array docks with advanced unrestrained AI capabilities for automated combat response and battlefield projection planning. But these are only rumors.