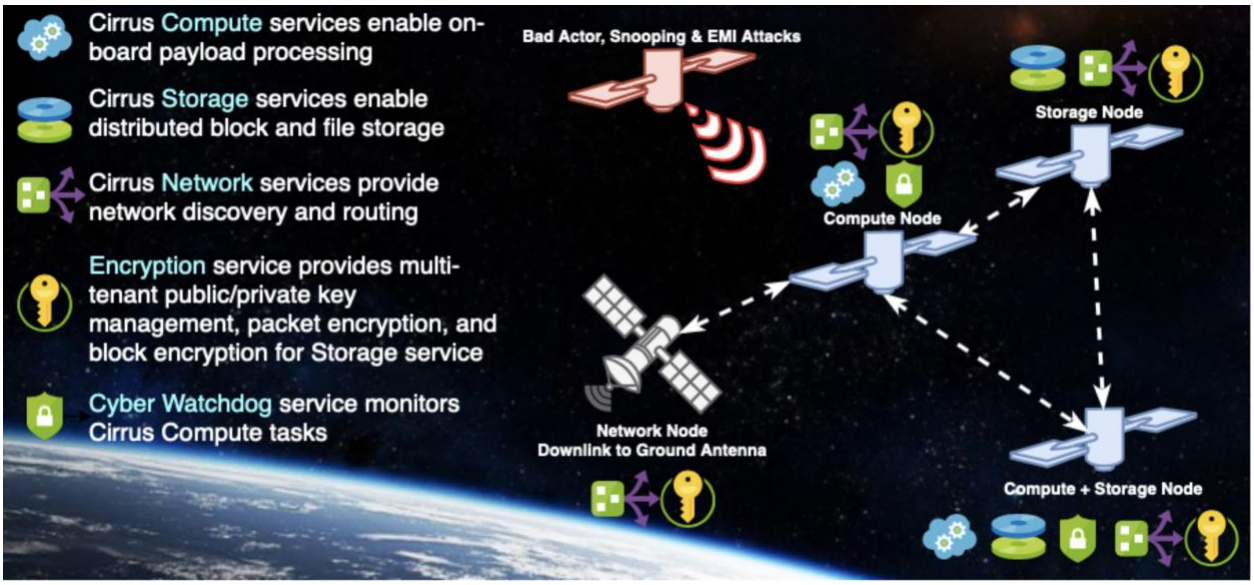
Cirrus

Space-Based Cloud Computing Platform

Cirrus is a suite of flight software services that enables distributed space missions to perform payload processing on a trusted platform. Its onboard networking, data storage, and compute services can support a wide spectrum of mission applications, including space situational awareness; intelligence, reconnaissance, and surveillance; cognitive and opportunistic sensing; and machine learning for space-based object detection, to name few. Cirrus addresses the desire to process data and execute artificially intelligent systems entirely on-orbit. The growing trend of satellite constellations poses a challenge for how to efficiently manage massively generated data. Likewise, satellite missions are not typically equipped to handle complex processing and storage of payload generated data onboard because they don't have the same availability of onboard resources. Cirrus provides the capability to network, store, and process data without requiring data to be downlinked. This capability allows missions to adapt and respond to information on the fly and enables complex autonomous systems to live fully on-orbit.



Modules/Components

Networking

The Cirrus Networking services provides dynamic spacecraft discovery, multi-hop routing calculations, and message encapsulation to support different spacecraft buses and radios. All Cirrus services leverage the Networking service to support integration with different embedded platforms and protocols. For instance, the network could be a fleet of drones or robots using different wireless protocols.

Compute

Hot loading autonomy or payload processing logic is possible with the Cirrus Compute service. This service provides commanding support to schedule, orchestrate, monitor, and deliver results for computational tasks in a sandboxed environment. The Compute service provides a fast transition for a non-FSW expert to develop and deploy capabilities to the flight platform without requiring any knowledge of flight hardware, space networking, or specific mission details.

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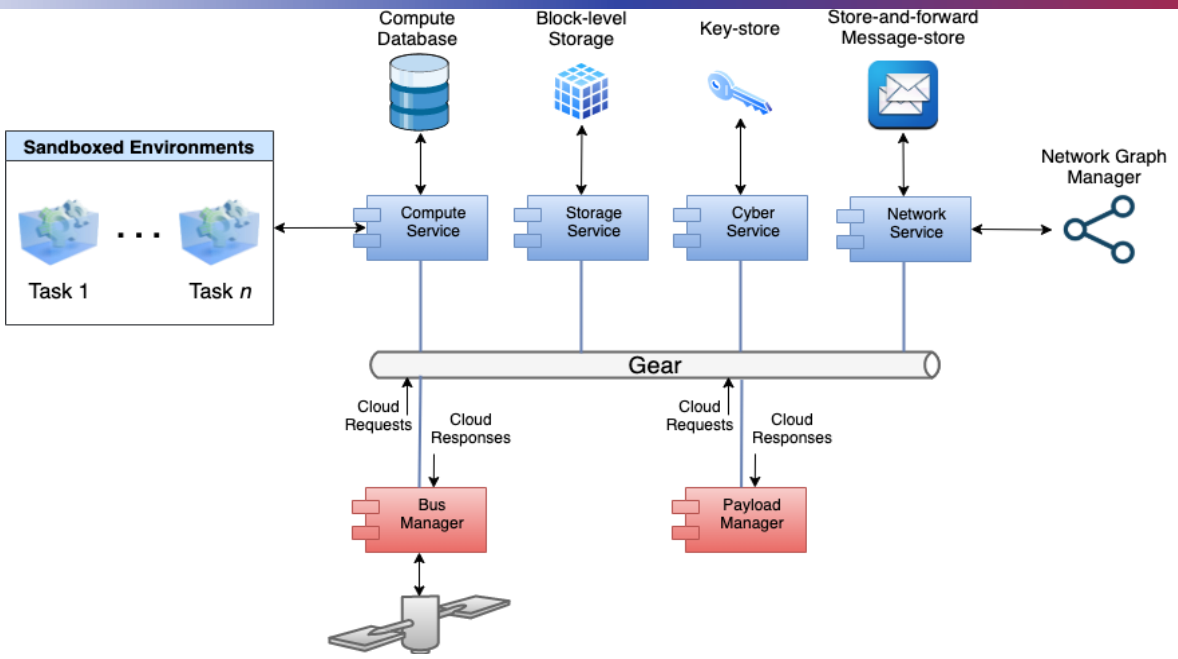

Storage

Solid state recorder management has already presented operations challenges. The next generation of distributed spacecraft storage features is brought to you by the Cirrus Storage service. It has a file transfer protocol that supports delay tolerant and bandwidth-limited networks where messages can be queued and large files are broken down into small messages. Compute tasks performing payload processing can query and retrieve sensor data stored on any neighborhood spacecraft.

Cyber

With Cirrus services potentially providing multi-tenant support, bad actors could potentially find exploits. Cirrus Cyber services provide a mix of encryption, watchdog, and other services to provide a defense-in-depth approach to protect the services and minimize the attack surfaces.

Specifications

- Runs on Linux-based OS
- Uses x86_64, ARM32, and ARM64 processors
- Written in C++
- Utilizes the Gear framework for messaging and middleware interoperability
- Development in Docker with Gear SDK running Ubuntu 20.04 LTS
- Provides secure compute, storage, and networking for on-orbit data processing and execution of complex software tasks

About Emergent

Emergent Space Technologies, Inc. researches, develops, integrates, and tests advanced systems and software solutions for civil, military and commercial space missions. We are industry leaders in the development of flight software for multi-spacecraft missions, including constellations, formations and clusters of small satellites. Our core competencies are systems engineering, integration and test; guidance, navigation and control; orbital mechanics; positioning, navigation and timing; advanced modeling and simulation; and SW architecture, design, development and test. Our domain expertise and experience, combined with our knowledge of current and emerging technology, make Emergent the team of choice in the aerospace industry.

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