Data in Motion and Space Operations
Space Proliferation Requires Data Modernization

As the Space Force and SPACECOM respond to growing international threats with a new generation of communications, positioning, navigation, and timing (PNT) meteorological and space-based sensors, there is a commitment to leave to history the stove-piped and proprietary data systems built to support a single constellation or even a single space-based platform. Military leaders are no longer willing to have command and control (C2) systems, telemetry tracking and control (TTC), sensor data availability, reusability, and interoperability limited by a single program's objectives. Instead, they are working to aggregate data in real-time and provide secure data sharing and dissemination to support space operations, assured launch, space sensing, and satellite and missile defense.

Confluent Platform can play a key role in this data modernization effort with:

Real-time data streaming: Confluent Platform is an ideal foundation for streaming satellite and spacecraft sensor data to support C2 and analytics operations because its streaming microservices can read the data as it arrives, and it can perform critical processes like health monitoring and threat detection and immediately share those results for enhanced situational awareness and response.

Scalability, high availability, and resilience: Confluent Platform scales horizontally. Whether deploying on bare metal commodity hardware or virtualized environments such as Kubernetes, or cloud environments, Confluent accommodates large data volumes for ingestion and downstream access. With real-time replication, data can be shared across clusters in different data centers and geographies and delayed, denied intermittent, and latent (DDIL) edge environments.

Security: Confluent Platform can be used to encrypt data in transit and at rest and can also be used to authenticate users and control access to data. Confluent supports role-based access control (RBAC) or can be configured to handle policy or attribute-based access controls (PBAC) where more granular data-sharing rules are required. Lastly, Confluent has connectors for data diodes and can accommodate use on either side of cross-domain systems.

Multicloud/hybrid cloud/DDIL edge architectures: The government has good reasons to avoid vendor lock-in across all space operations to ensure maximum mission flexibility, economy, and innovation. Depending on a single cloud service provider (CSP) introduces program risks and sustainment costs. By being cloud-agnostic, Confluent preserves the government's ability to switch between CSPs and significantly reduces engineering change costs when rehosting. Even during peacetime, users at the edge don't always have dependable comms. As a foundational component of survivable data infrastructure, Confluent Platform's inter-cluster replication can be configured to store data for mission playback when an edge location is unavailable and then pick up the stream exactly where it failed when comms returns.

Every aspect of satellite operations— telemetry and health-of-system data, object and debris trajectories, collisions, associated changes, and threats— need to be made available to space operators in real-time.

Space operations and data mesh

A data mesh is a data architecture that distributes data ownership and governance to the teams that create and use the data. This approach can be useful for military space operations for several reasons:

- It can improve data access and sharing while helping to ensure the most stringent security and access controls. In a traditional data architecture, data is often siloed in different departments or systems. This can make it difficult for other teams to access the data they need to make decisions. A data mesh can help break down these silos by giving teams ownership of their data. This makes it easier for teams to share data with each other, which can lead to better decision-making.

- It can improve data quality. In a traditional data architecture, data quality is often a problem. Ambiguity in data terms, context, and meaning is often the source of these issues. A data mesh can improve data quality by giving teams ownership of their data products. This means that teams are responsible for ensuring that the data they collect and store is accurate and fresh.

- It can improve security. By enabling the separation of concerns in the data, a data mesh also makes data more resilient to cyberattacks. In a traditional data architecture, all data is stored in a central location. This makes it a prime target for cyberattacks. A data mesh can make data more resilient to cyberattacks by distributing data across different systems, making it more difficult for attackers to gain access to all the data.

Real-time Insights from Spacecraft Data
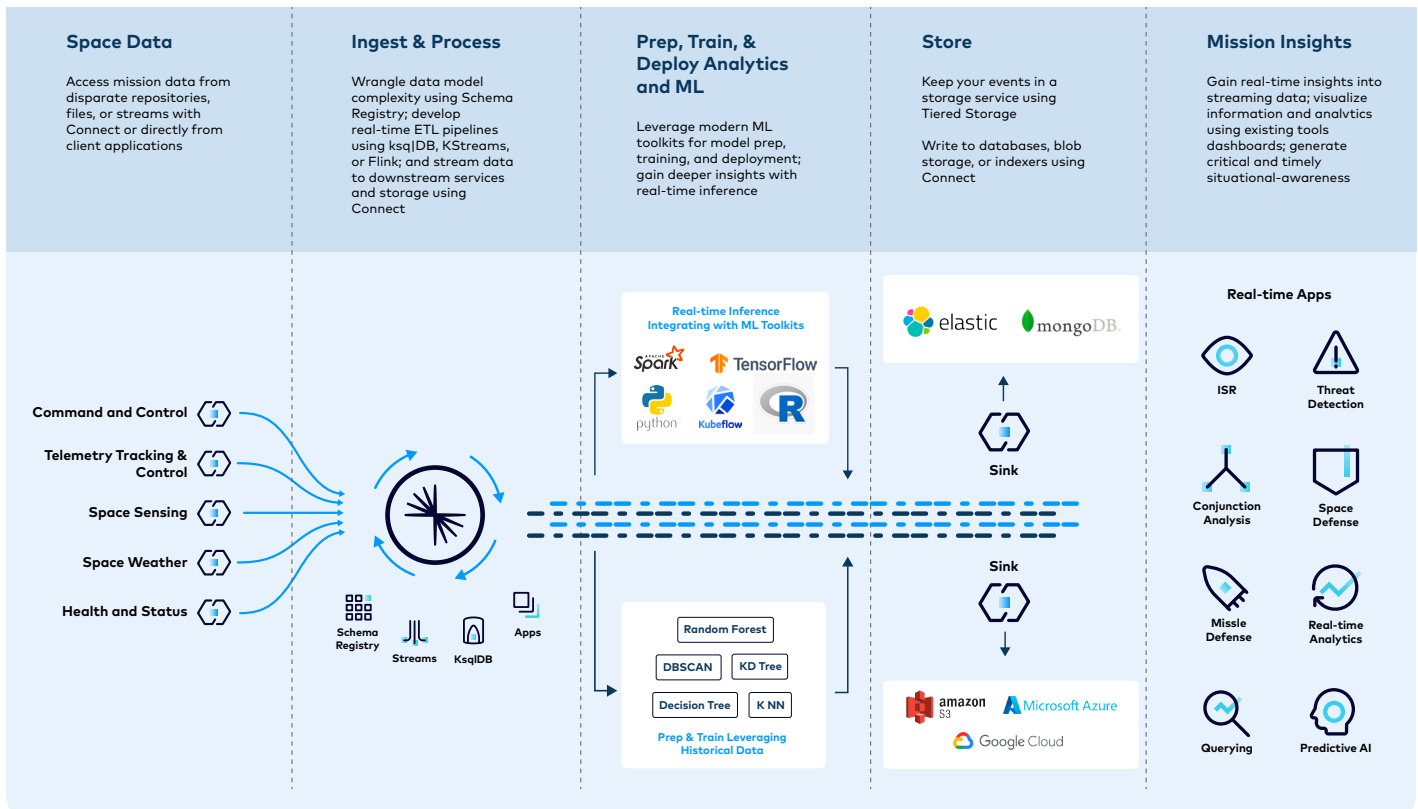
The value of data streaming platforms to space systems modernization is that it helps the government move away from expensive, brittle, and difficult-to-maintain proprietary architectures and meet critical real-time and high availability data requirements. To learn more about how Confluent Platform can support your data modernization efforts contact a Confluent expert today at publicsector@confluent.io