

# CDMS

## Payloads Control and Data Management System



### Overview

CDMS combines state-of-the-art, commercially available internet protocol (IP) technology solutions to enable the on-board collection and processing, as well as the ground distribution of large amounts of data from payloads and facilities.

Payloads and facilities can use the CDMS as a router for their TM/TC, for direct point to point IP connections with their Principal Investigators. The payloads also use the CDMS software services for data processing, security keys management and data storage.

The CDMS includes state-of-the-art COTS, with limited proprietary software. It provides redundancy, scalability, flexible upgrades and low-cost maintenance and remote management.

### Flight Segment Architecture

The main components are:

- Modular main computer (“Gateway”) in high availability configuration
- Ethernet Switches
- Wireless Access Point (WAP)
- Processing and Virtualisation Nodes
- Network Attached Storage (CDMI-NAS)
- Power Conditioning and Distribution Unit (PCDU)

### Data & Software Services

The on-board CDMS provides reliable persistent on-board data storage services for the payloads and other components, with redundancy and replication. Data segregation and confidentiality is ensured. Supported protocols NFS, SFTP and SCP.

The on-board CDMS also offers virtualization infrastructure and the capability to execute standard and payload specific processing software.

- As Virtual Machines:
  - Kubernetes\* Cluster
  - XenOrchestra\*, for the management of local backups
  - CMAU\*, for CLSW MkII switch management
  - Broadcast Ancillary Data
- As Dockerised Software Services:
  - DataSync Service
  - DTN Node Service
  - Key Management Service (Cryptography)
  - Binary Data Sampling Service
  - Video Transcoding service
  - OoL (Out-of-Limit) Monitoring Service
  - Guacamole Service
  - DataSync services (CFDP, Rsync)

### Power

The CDMS PCDU provides power conversion for CDMS components as well as control and monitoring capability for power distribution to payloads. IT also provides filtering, isolation and over-current protection.

### Ground Segment Architecture

The CDMS ground software is designed as a Virtual Private Cloud environment, providing flexibility in terms of hardware requirements and infrastructure. The CDMS can be deployed in a data centre or in an on-premised infrastructure.

Note that the CDMS features, specifications and appearance as presented in this sheet are subject to change without prior notice.

#### APPLICATIONS

- In-orbit payloads interfaces
- Payload software virtualization
- Payload data storage and processing

#### FEATURES

- IP-based
- COTS-based
- Redundancy, scalability, upgradeability
- Security and data integrity
- Efficient payload/user integration

#### SERVICES AVAILABLE

- System operation
- Customization
- Virtualization
- Algorithm development
- Special data processing

For more information please visit:

<https://www.spaceapplications.com/>

or contact us:

[martin.ursik@spaceapplications.com](mailto:martin.ursik@spaceapplications.com)

#### ABOUT SPACE APPLICATIONS SERVICES

Space Applications Services NV/SA is an independent Belgian company founded in 1987, with a subsidiary in Houston, USA.

Our aim is to research and develop innovative systems, solutions and products and provide services to the aerospace and security markets and related industries. Our activities cover manned and unmanned spacecraft, launch/re-entry vehicles, control centres, robotics and a wide range of information systems.

## Space Applications Services NV/SA

Leuvensesteenweg 325,  
1932 Sint-Stevens-Woluwe  
(Brussels Area) – Belgium

+32 (0)2 721 54 84  
[info@spaceapplications.com](mailto:info@spaceapplications.com)  
[www.spaceapplications.com](http://www.spaceapplications.com)



[www.icecubesservice.com](http://www.icecubesservice.com)  
[www.aerospaceapplications-na.com](http://www.aerospaceapplications-na.com)

# CDMS

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The main components are:

- Operations and Administration workstations
- Network
- Virtual Private Cloud infrastructure
- Firewall Gateway

### User Interfaces

A user on ground (end-user, principle investigator) I can access the following user interfaces to manage his/her payload:

- Interfaces to the Yamcs server for TM/TC data:
  - Yamcs-Studio
  - Yamcs Web Interface
  - REST API + WebSocket
  - Python Client
- Access to data distribution server:
  - sftp, Filezilla
- Point to point connection to the payload:
  - SSH connection
  - custom ground software.

### Security

The security, data segregation and authentication are managed by an anti-malware / anti-virus software, firewall, intrusion detection system (IDS), VPN and 2-factor of authentication against an LDAP database. The system makes use of SmartCards and eToken.

### Specifications

ITAR/EAR free  
COTS-based  
Qualified for ISS

### Launch

Mass: < 150 kg  
Volume: < 0.6 m<sup>3</sup>  
Power consumption (on-board): <1.2 kW

### Architecture

CompactPCI architecture  
MultiCore CPU + GPU

### Data Processing and Storage

On-board Processing: >1 TFLOP  
70 TB of storage in RAIDZ NAS system

### Network and Data

Gigabit Ethernet interfaces  
Internal full-duplex peripheral transfer:  
up to 35Gb/s

### Interfaces for payloads

- Wireless (IEEE 802.11 b/g/n/ac/ad, Bluetooth) and Wired (IEEE 802.3)
- MIL-STD-1553, Ethernet, USB, RS232, RS422/485, SSDs,...

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[www.spaceapplications.com](http://www.spaceapplications.com)



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