

# Cloud Removal & Compression Solution

## The CogniSAT-CRC solution maximises the utilisation of Earth Observation Satellite Assets

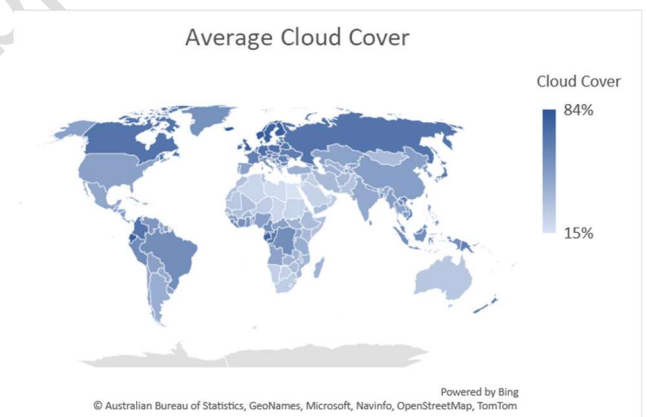
Part of the CogniSAT<sup>TM</sup> family, CogniSAT-CRC is a self-contained solution combining the power of the CogniSAT-XE family of On-Board AI Payload Processors with state of the art lossless image compression and a flight-proven AI-based Cloud Detection and Removal algorithm. This solution guarantees that images are analysed on satellite so that only useful images are transmitted to the ground station and that this transmission is as efficient as possible. The use of this solution can result in a six-fold increase in the number of useful images which can be transmitted to the ground station each day thereby increasing the revenue-generating potential of the Earth Observation asset.

## AI Engine combines image analysis and compression

### Maximising Space Asset Utilisation

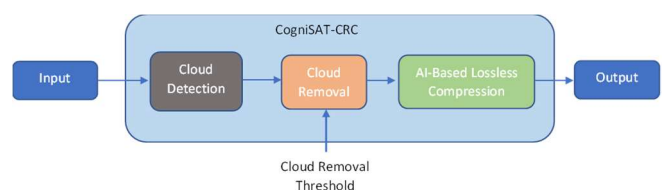
All optical Earth Observation sensors are subject to their images being obscured by atmospheric conditions, most notably cloud cover. It is estimated that, at any time, over 50% of the earth's surface is obscured by clouds. This means that at least half of the information captured by a satellite-based imager is of no use for most applications. Transmitting this data, even if compressed, results in communications bandwidth being wasted. The CogniSAT-CRC solves this challenge by removing these cloudy images before compression. This typically results in a six-fold increase in the usable data received by the ground station when compared with the transmission of uncompressed images and a three-fold increase when compared with the use of standard compression approaches.

Additionally, as only useful images are gathered for transmission, the imaging system can capture a greater surface area on each orbit thereby maximising the utilisation of the EO asset and the potential financial return. Studies carried out by Ubotica have shown that the use of the CogniSAT-CRC in conjunction with state of the art imaging systems can result in a 50% reduction in downlink costs while, at the same time, providing a three-fold increase in the surface area of the earth which is successfully imaged.



### Modular Implementation

The CogniSAT-CRC solution combines state-of-the-art Neural Network-based cloud detection and compression to efficiently deliver only those images which contain useful information for transmission to the ground station. This approach guarantees the optimum utilisation of the communication network.



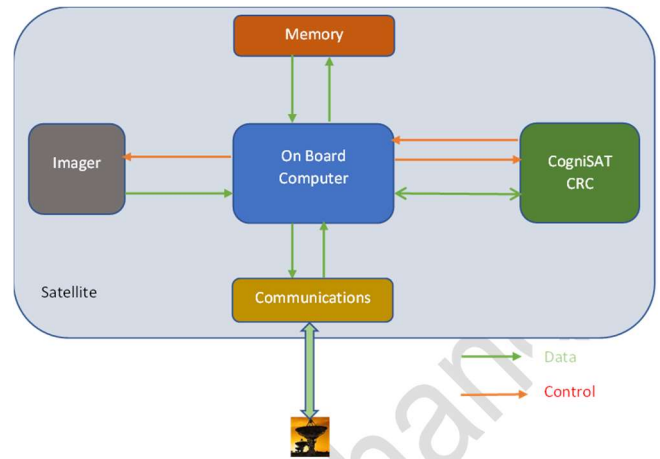
# System Architectural Overview

## System Connectivity

The CogniSAT-CRC (CRC) is a self-contained system solution which acts as an AI coprocessor to the satellite On-Board Computer (OBC). The solution includes an application which runs on the OBC and controls the operation of the CRC hardware module. Documentation provided with the CRC solution details the operation of this application and its command structure. The system is designed to minimise the overhead requirements on the OBC.

## System Architecture

As shown in the block diagram, the CogniSAT-CRC accesses all satellite resources through the OBC. The OBC controls the Imager and stores its images, in a format compatible with the CRC, in its memory. The OBC calls the CRC, using CogniSAT-CRC application to specify the cloud density threshold and the location of



the images to be analysed and the application returns the compressed image ready for transmission to the ground station.

## Hardware Module Specifications

	Min	Typ	Max	Units	Notes
<b>Physical Characteristics</b>					
Length		94.0	98.0	mm	PC/104 form factor (Max includes Connectors)
Width		90.0	99.0	mm	PC/104 form factor (Max includes Connectors)
Height		15.0	18.5	mm	(Max includes Connectors)
Mass		80.0		g	
<b>Electrical Characteristics</b>					
Supply Voltage		5		V	
Power		2	5	W	Dependant on application
<b>Environmental</b>					
Operating Temperature	-40		+85	°C	
Storage Temperature	-55		+85	°C	
Shock			1,269	g	3-axes, SRS, 5g @ 30Hz / 1,269g @ 1kHz to 10kHz
Vibration (Sine)			15.0	g	3-axes, 3g @ 5Hz - 125Hz, max g @ 20Hz - 40Hz, 2 Oct/min
Vibration (Random)			14.2	grms	3-axes, 20Hz - 2,000Hz, max g 50Hz - 800Hz 2min/axis
Thermal-Vacuum	Operation from -40°C to +65°C at 1x10 <sup>-5</sup> mbar				

Operational Parameters	
Supported Sensors	Pan/Mono
	RGB
	Multispectral
	Hyperspectral
Compression Factor	5,75 (Typical)
Connection Interfaces	10/100/1000BaseT Enet
	USB 2.0/3.0

## Ordering Information

Part Number	Description
<b>CogniSAT-CRC-EM</b>	CRC Solution integrated in CogniSAT-XE2 Engineering Model
<b>CogniSAT-CRC-FM</b>	CRC Solution integrated in CogniSAT-XE2 Flight Model
<b>CogniSAT-CRC-Opt</b>	Post-launch optimisation service to maximise operational efficiency
<b>CogniSAT-CRC-Sen</b>	Custom sensor integration service