



# CCS5 & TSC

## PROTOCOLS

### Packet & Frame Coding & Flow Control:

ECSS-E-ST-50-01C, 03C, 04C; ESA PSS-04-106,107,151; CCSDS 102.0-B-5, 201.0-B-3,202.0-B-3, 202.1-B-2, 301.0-B-3, 355.0-B-1, 355.1-B-1

**Packet Utilization (PUS):** ECSS-E-70-41A, C

**CubeSat (CSP):** versions 1 & 2

Flexible plugin & driver architecture; select protocol at installation.

Main protocols:

**Checkout & EGSE:** EDEN, C&C, CAN, ZMQ, Serial

**Ground Station:** Safran Cortex & compatible, ESA NIS, NDIU LITE SLE (RAF, RCF & F-CLTU) with UNIS option.

## TMTC DATABASE

**SCOS2000 MIB ICD 7.2** extended: (e.g.) unlimited field lengths, drop & load multiple databases, deduced parameters in TM & TC, variable parameters globally accessible & limit-checked, fine control of variable length parameters, big & little-endian parameters, VPD\_CHOICE, dynamic HK definition. MIB table browser with integrity checks available. All tables accessible from TOPE. Not supported: TC sequence tables (use TOPE or command stack files).

## AUTOMATION LANGUAGE

**TOPE** (includes Tcl/Tk 8.6).

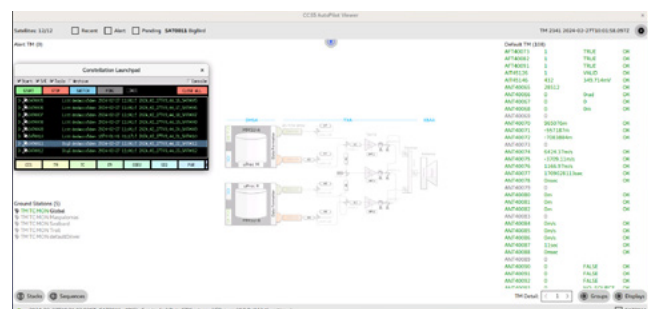
Numerous Tcl extension packages included, e.g. Tk, [incr Tcl], database access.

High level functions available in **Python**.

## SUPPORTED OS

Fully supported and tested on recent versions of **Windows and Linux**.

Installers provided as EXE, RPM & DEB. Online container repository.





## CLOUD PLATFORM SUPPORT

Available as Docker image with Kubernetes manifest, verified in AWS and MS Azure.

## ARCHIVE

Open format: raw binary segmented files, containing header & content, index stored in RDBMS: MySQL & compatible, PostgreSQL. TSC standalone defaults to SQLite.

TOPE supports retrieval of any archive object, from current or previous sessions, including TM and TC parameters in specific packets.

## GRAPHICAL DISPLAYS

Native user interface based on Qt. QML (Qt Meta-object Language) allows scripting of fluid touch-enabled displays. Mimic editor provides editor for simple schematic QML displays. Tk toolkit allows classic user-scripted graphical user interfaces to be written using TOPE.

## SPECIAL FEATURES

**SVF Mode:** operation with simulator running in simulated time.

**TM simulation:** inject raw data or generate TM according to its MIB definition.

**TC modelling:** model and verify commands sent by another entity.

Secure installation option, automated test & quality metrics.

**Zero Trust security:** OAuth2-based authentication support.

Support for agent-assisted sequence authoring.

## SOFTWARE PLATFORM

C++ based on commercial Qt 6.9. Tcl/Tk libraries included on BSD license terms.

IPR owned by Terma, no GPL.

## SUPPORT

Standard license price includes 1-year warranty & email support.

Standard training packages available on request.

Updates from <https://tgss.terma.com>

Export Control restrictions may apply.

**WIKI and access to the service desk available to licensed customers.**