



INSTALLING
RELIABILITY



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MONITOR & CONTROL SYSTEM

FLEXIBLE, RELIABLE AND
FIELD-PROVEN

The MONITOR & CONTROL SYSTEM (M&C) provides full control of all multi-vendor equipment, whether locally at one station or remotely via Internet, satellite or mobile networks. ND SATCOM's M&C system is the prime solution for comprehensive management of complex satellite ground stations and operates in more than 200 systems worldwide.

M&C7 is ND SATCOM's 7th generation of its scalable client & server system, ranging from a single local M&C7 server that controls a satellite ground station and associated baseband equipment to coupled M&C7 servers that manage your global network.

ND SATCOM's M&Cs are controlling hundreds of mobile and fixed satellite stations all over the world. Some M&C servers have been running for over 15 years; upgrades to the latest technology provide full backwards compatibility to legacy systems.

The M&C7 provides user-friendly, customised views and software drivers tailored to the actual system architecture of the controlled stations. Server coupling is the fault-tolerant concept implemented to:

- (1) manage devices locally in real-time and
- (2) allow expanded control footprint and add smart processing tasks with no single point of failure or extensive control overhead in a distributed M&C7.

KEY FEATURES

- Intuitive GUI, customised views and applications
- Command verification
- Extensive library of device drivers
- Virtual Machine support (no dongles)
- Interconnection of multiple M&Cs
- Logging database / multiple northbound interfaces
- Scripting with Python
- Auto-Pointing / Tracking
- EIRP / Uplink Power Control / Redundancy Control



SERVER ROOM



SNG AND FIXSTATION



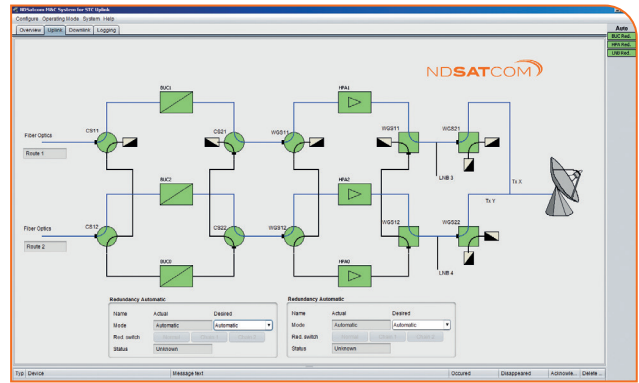
SCALABLE AND MODULAR SYSTEM ARCHITECTURE

The M&C7 server system is built for many specialised tasks. Tasks can be drivers for equipment or functions such as antenna tracking, spectrum views or redundancy controller. Each M&C7 supports multiple clients; one client is controlling the system at a time.

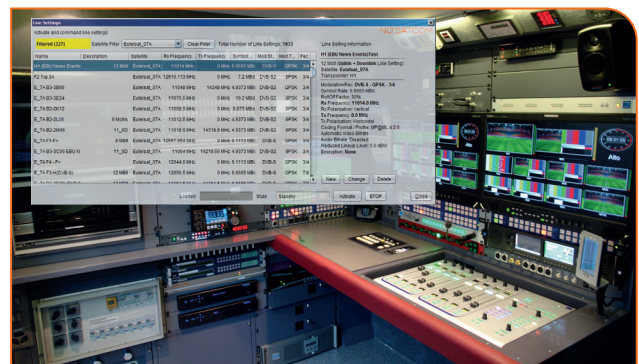
Each M&C7 server may connect other similar systems via TCP/IP to create an M&C server network. Varied topologies can be set up from star to meshed networks. For each server-to-server connection, the accessible tasks are configurable.

Devices from remote systems can be controlled as if they were in the local system. Imagine the hub operator accessing an SNG vehicle's M&C7 to set up transmission. No experienced personnel are needed in the remote stations. All operations are fully manageable remotely. M&C7 is capable of more than monitoring devices and allowing the operator to manage settings. Automatic processing modules – functions – can perform complex tasks. Functions can be combined to build more complex functions.

Two M&C7 functions simplify troubleshooting and operations significantly: Command verification with desired and actual parameter values show the user which desired parameter settings are already confirmed by the controlled device. Signal routing is not only visualised in block diagrams but also used for status propagation in any station design, allowing the user to identify affected path devices at a glance.



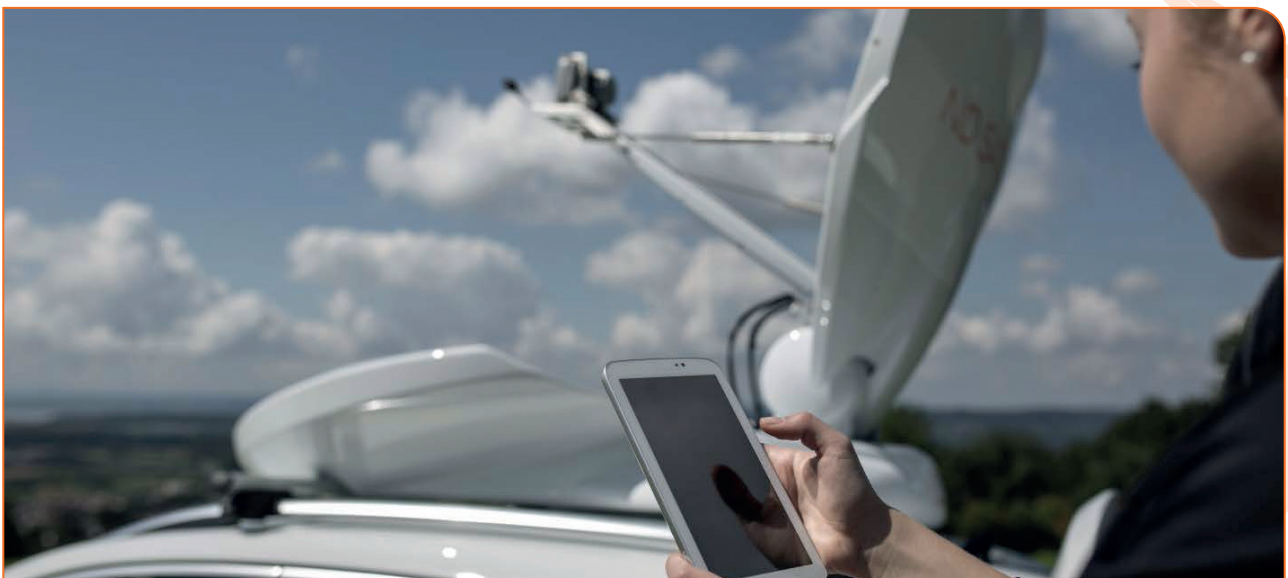
UPLINK WITH REDUNDANCY FUNCTION



CUSTOMISED SNG STUDIO

CLIENT GUI

A client connects via IP to one M&C7 server to use the GUI. Elements in the GUI are menu bars, a graphical representation of the ground system or systems and the notification window for logs and alarms. Dedicated symbols reflect the status of components. Additional icons link to components connected to other servers. M&C7 offers multi-language support: each M&C7 client may use its own language.



EASE OF USE



USER ROLES

M&C7 protects and secures data via different security levels. The system can be accessed with no login at all if wished. Widely used is the 2 or 3 Layer Role access for control rooms without user management but limited access for operators. Most stringent access configuration applies full user/mode management including a GUI-based configuration where access of each variable can be defined.

EVENT HANDLING

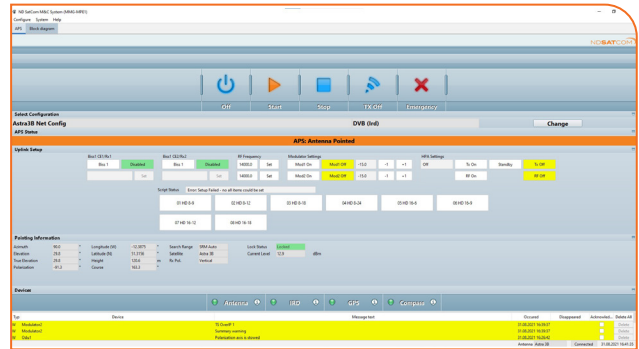
The client GUI uses the notification window for logs and alarms and uses visual effects to highlight details. M&C7 generates SMS messages or emails for notification. In addition, the northbound interface offers SNMP and JSON based Web-Services and even a programmable interface to interact with other NMS systems.

ADVANCED FUNCTIONS

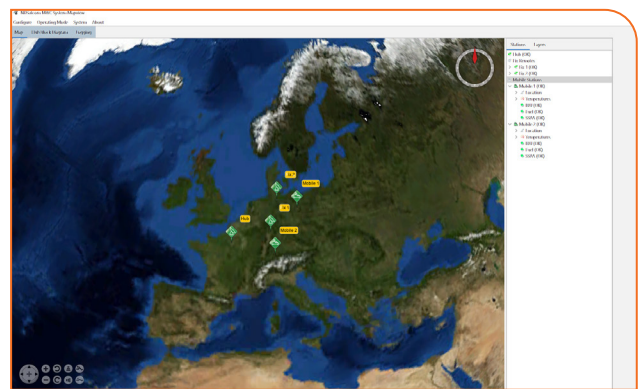
Line Settings (presets) to setup complete Uplink and / or Downlink chains automatically; another function acts as interface to the Media Fleet Manager that controls capacity settings in SNG fleets. In this case, multiple stations, each controlled by a local M&C7, are integrated in an end-to-end network management & scheduling platform. This provides operators with a fully automated, efficient, end-to-end communication network. Complex processing by external spectrum analysers can be integrated as tasks in the M&C7's operator GUI, even from a remote station.

CUSTOMISATION

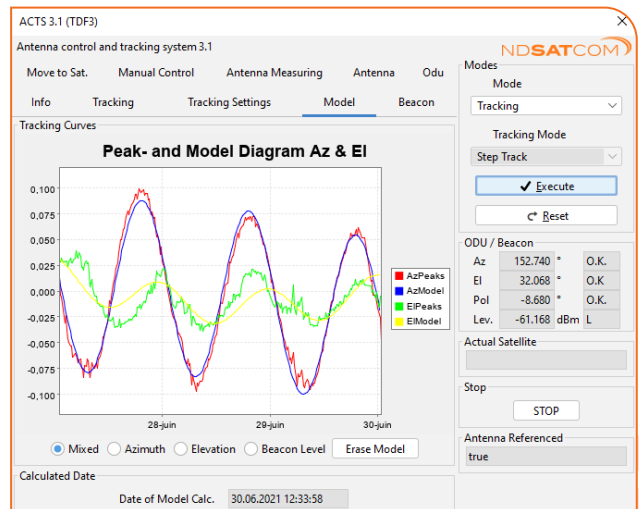
Ground stations and requirements are never the same. The modular M&C7 architecture helps to adopt to new equipment and new driver installations, new GUIs or client updates. There are many ways to do that, from coded software to scripts to using our GUI Designer Tool. Everything is possible.



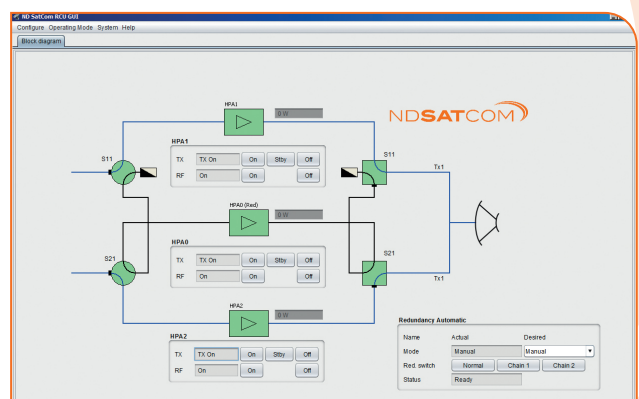
AUTO POINTING AND 1-CLICK UHD UPLINK SETUP



SNG FLEET IN A MAP OVERVIEW



TRACKING GRAPH



RCU GUI



EVOLUTION

During the long life cycle of a ground station, equipment will change over time. M&C7's Station Configurator enables dynamic selection of alternate devices, including adding new drivers to avoid downtime of the M&C7 servers.

Customers may extend the M&C7 via the logging database. Captured data can be filtered, shown in charts and exported for further processing. The parameters archived in the database are configurable by the Logging Configurator Set-up Tool. Advanced customers may even design their own GUI using the GUI Designer Tool based on block diagrams and routing paths. Sometimes the system requirements change and the customer needs to add a function or complex workflow: a Python scripting interface allows the addition of new tasks at runtime. Examples are Main/Backup switching of a station or activating a transmit chain.

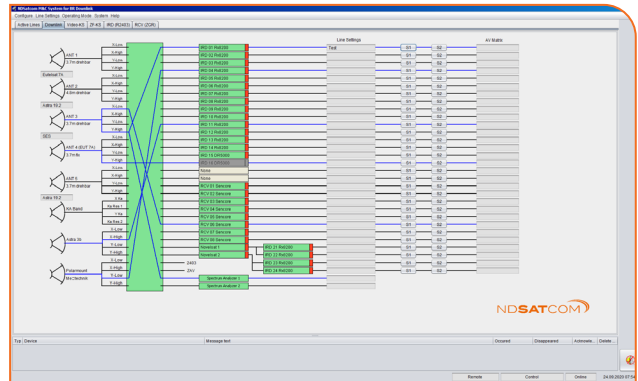
HARDWARE PLATFORMS

The M&C7 software runs on standard Windows computer with Java installed. The system can be easily integrated into existing environments by not having any specific requirements. No dongles are used to install M&C7 in a Virtual Machine. To connect to serial devices M&C7 supports a stand-alone serial-to-IP converter.

SUPPORT SERVICES

M&C7 is designed to operate SNGs or fixed stations for decades. Long-term support is easy by replacing drivers for new devices or adding functions over time.

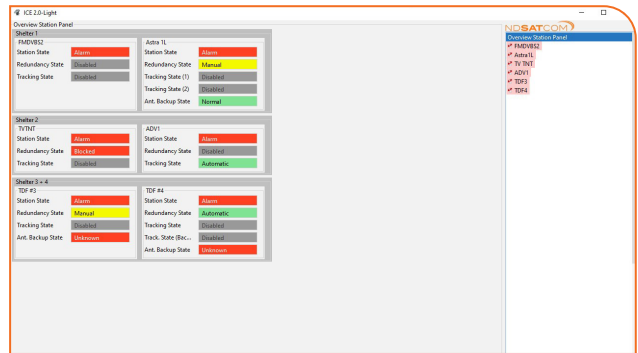
ND SATCOM offers support bundles over the full life cycle, including spare parts handling, repair services and software maintenance.



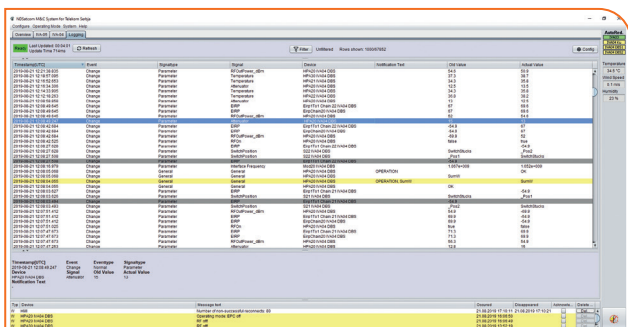
DOWNLINK PATH USAGE VISUALISATION



TRACKING ANTENNAS CONTROLLED BY M&C



STATUS OVERVIEW



EVENT DATABASE



DATABASE VISUALISATION

TECHNICAL SPECIFICATIONS

FEATURES

Client/Server architecture	access of client from any remote location via IP, client GUI shows a server system with its local information, client GUI shows all network information when using multiple coupled servers
Hardware Requirements	run server and/or client on any tablet, netbook, laptop or desktop PC, minimum Windows 7 operating system or newer
Virtual Machine Support	no dedicated hardware, no dongles, M&C7 software can be installed within any virtual machine running any Windows
3 Layer Command Verification	1st layer: client checks parameter range limits, letter and numbers violations, 2nd layer: server checks parameters before activation (e.g. block switching off an HPA before cooling down), 3rd layer: server verifies device acknowledgments of applied settings
Coupling of multiple M&C7 servers	integrate stations by coupling independent M&C7 servers managed by one M&C7 system, integrated system visualised on a single client GUI overview
GUI	block diagram views with routes based on M&C7 server parameters and status, access to logging and alarm database
Status Monitoring	actual status of the controlled system, status can be requested remotely via the SNMP interface
Alarm and Event Notifications	highlighted alarms or any changing events in GUI, can be sent via SMS, Email or SNMP traps
Bandwidth Requirement	client/server connection: approx. 20 kbit/s
Secure Login	full User/Mode Management including logging to track who did what. All passwords are hashed and stored securely
Backup and Restore	simple configuration files in text format, backup/restore by copy/paste commands

OPTIONS

Redundancy Switching Option	M&C7 server monitors local devices and executes redundancy switching in real-time
Automation/Scripting	Python scripting at M&C7 server, scripts updateable in live system
Spectrum Viewer	spectrum analyser screen integrated at client GUI
Remote Control	northbound interface offers SNMP and JSON based Web-Services
Equipment Configurator	dynamic selection of equipment in live operation
Antenna Pointing	automatic pointing system controls SNG antenna systems (receive signal, GPS and Compass), Eutelsat characterisation
Antenna Tracking	based on satellite beacon signal, may use a previously M&C7-recorded model
Line Settings for Automatic Up-/Downlink Chain Configuration	multiple presets stored at local M&C7 server, parameters for any devices in a transmit and/or receive chain will be set automatically at Line Setting activation time, Line Setting works independently from any device manufacturer
Logging Database	Logging Configurator Setup tool, collect alarms, Log configuration changes by user, used by graphical or textual analysis tasks
Notification	automatic notification generation configurable, sent via SYSLOG, Email, SMS or SNMP traps
Multi Language Support	each operator can choose his local language individually in client

CUSTOMISATION

GUI Designer	Tool box to draw block diagrams and routing paths, Add link status information maintained by M&C7 server tasks or scripts
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