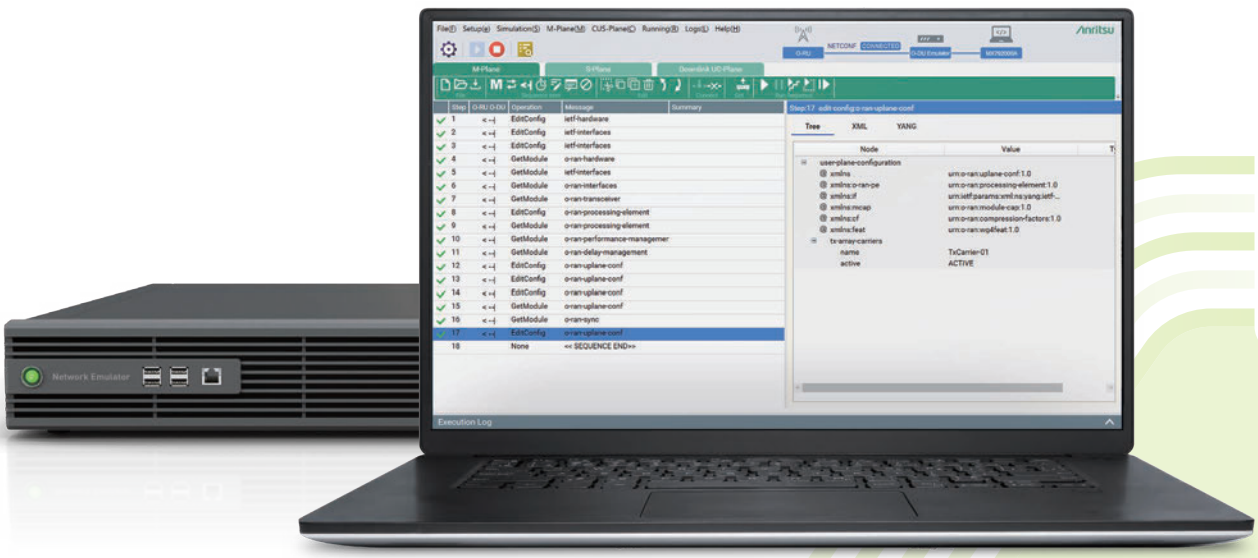
Anritsu Advancing beyond

O-RAN Radio Unit Test Solution

ORAN Test Platform	MX772000PC
O-DU Emulator Platform Software	MX773000PC



Anritsu Leads O-RAN Evolution

O-RU

O-DU

O-CU

• • •

Test Solution for O-RAN Radio Unit (O-RU)

This Flexible and Scalable Solution Supports Required Tests via Software Updates

Improves O-RU Tolerance

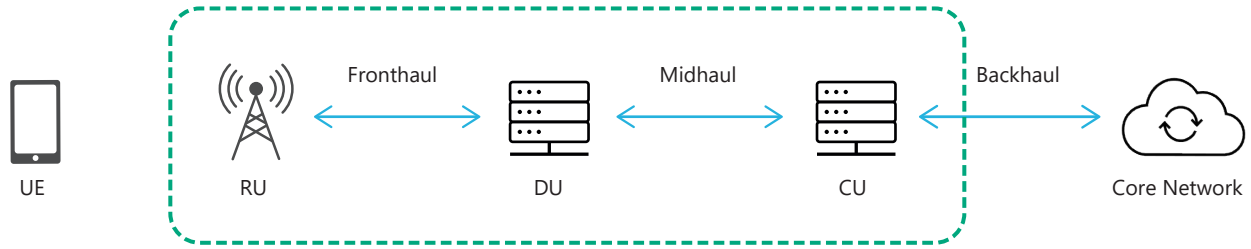
MX773000PC supports the S-Plane Time Error Injection test defined by the O-RAN Fronthaul Conformance Test

Scalable Platform

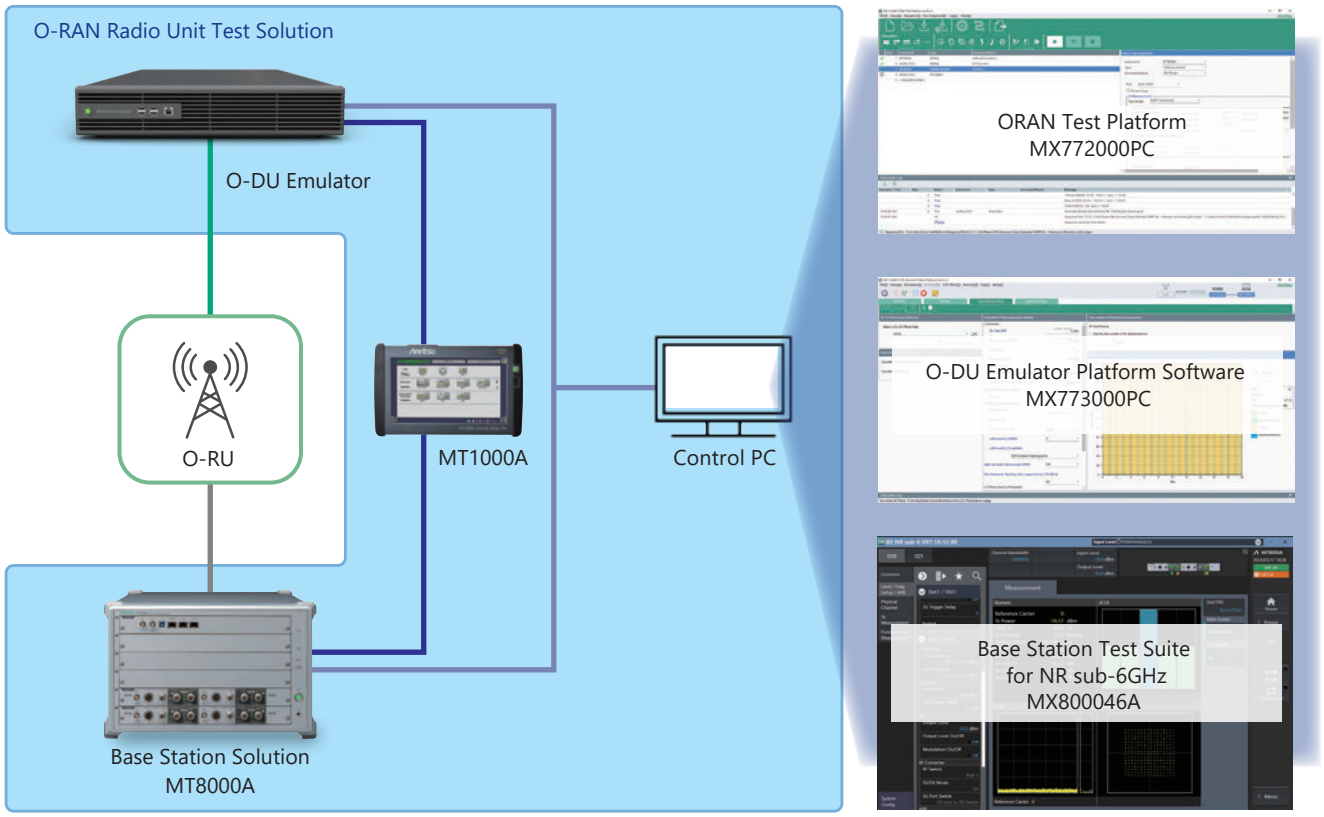
The flexible and scalable platform facilitates configuration of functions matching required test items

O-RAN Test Solution Outline

The mobile radio access network (RAN: Radio Access Network) is disaggregated into a Radio Unit (RU), Distributed Unit (DU), and Centralized Unit (CU) to build flexible and efficient networks using Open RAN (ORAN) for each interface.



The Fronthaul interface between the RU and DU is defined as an open interface by the O-RAN ALLIANCE.
The O-RAN Radio Unit Test Solution emulates the O-RAN Distributed Unit (O-DU) functions to evaluate the O-RAN Radio Unit (O-RU) Fronthaul Conformance Test specified by ORAN.WG4.CONF. O-DU Emulator synchronizes with O-RU via the Synchronization Plane (S-Plane) and sets O-RU via the Management Plane (M-Plane). In addition, downlink IQ data can be transferred via the User and Control Plane (UC-Plane).



ORAN Test Platform MX772000PC Features

ORAN Test Platform MX772000PC

The MX772000PC is test automation software installed in the Control PC and controls the MX773000PC and MT8000A. It can create, edit, and execute test cases for O-RU.

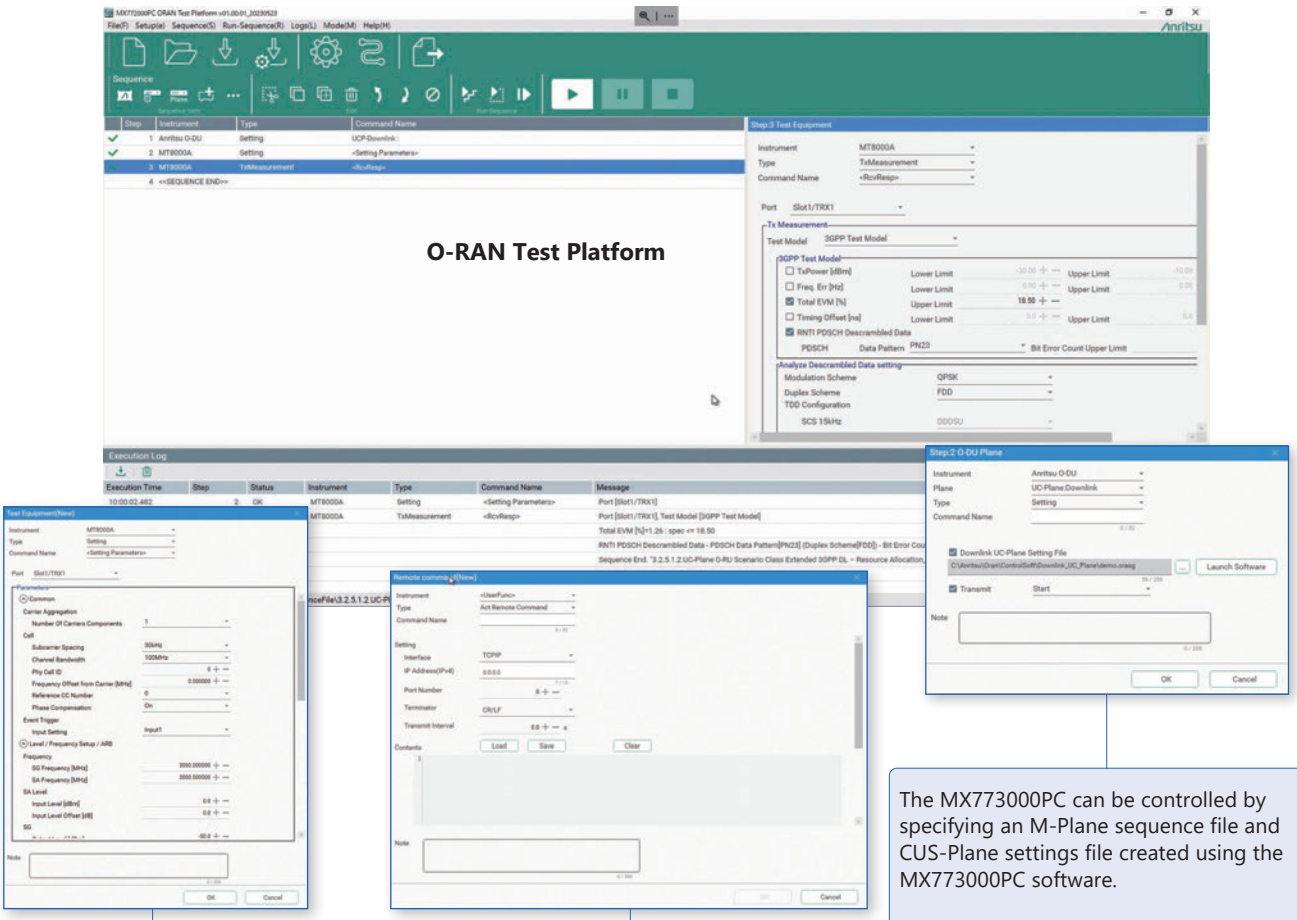
Controls MX773000PC and MT8000A required for evaluating O-RU

ORAN Test Platform MX772000PC Features

Test Automation Improves Test Efficiency

O-RU evaluation requires many test items and greatly increases the test engineer's workload. The MX772000PC improves O-RU test efficiency by controlling the MT8000A to automate measurement and Pass/Fail judgement of measurement results. Moreover, the MX772000PC GUI can set and control both O-DU Emulator and the MT8000A, helping test engineers create O-RU evaluation test cases without understanding code.

- Unified Control of Measurement Equipment
  Multiple pieces of test equipment, such the BTS and O-DU Emulator, can be controlled from one software application.



The MT8000A can be set from the dedicated GUI.

Base Station Test Suite

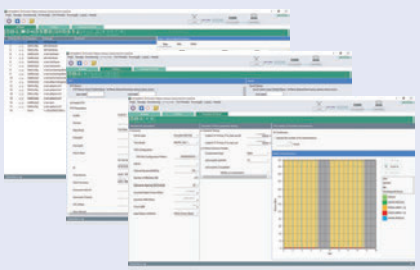
Each piece of measurement equipment can be controlled by SCI command scripts.*

MT1000A

SG

SA

The MX773000PC can be controlled by specifying an M-Plane sequence file and CUS-Plane settings file created using the MX773000PC software.

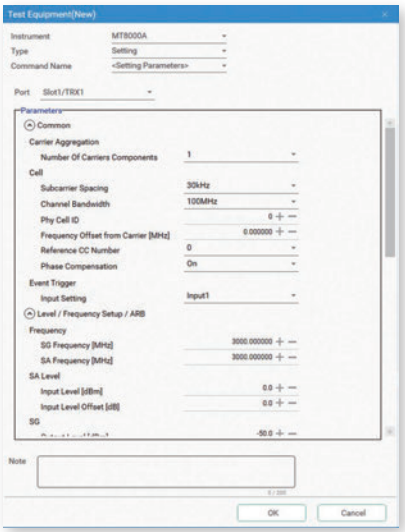


O-DU Emulator Platform Software

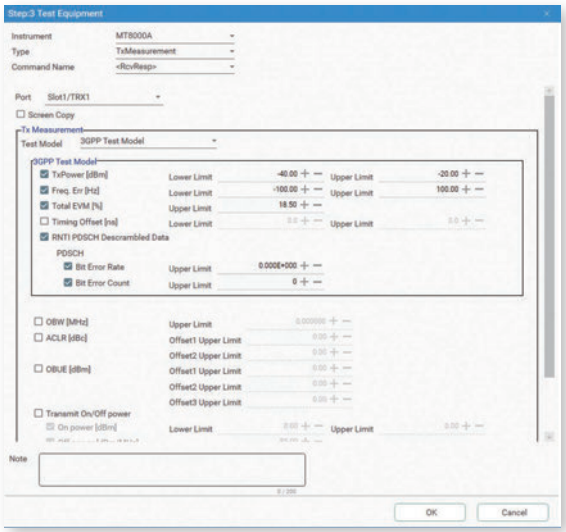
*: Required by TCP/IP controllable test equipment.

ORAN Test Platform MX772000PC Features

• GUI-based operation
The measurement equipment can be controlled by easy GUI operations.
Parameter settings and pass/fail evaluation conditions can be set at the MT8000A dedicated GUI.

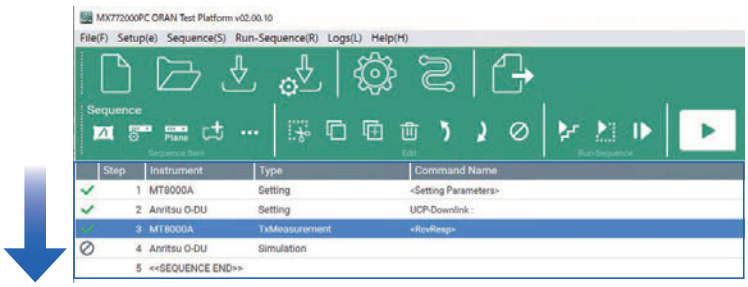


MT8000 Parameter Settings

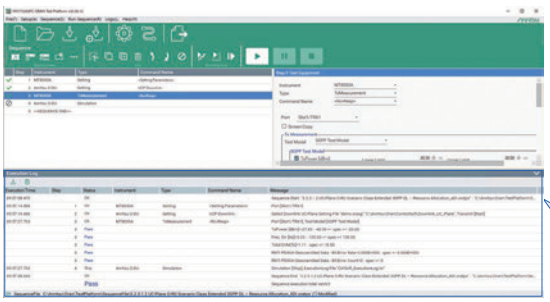


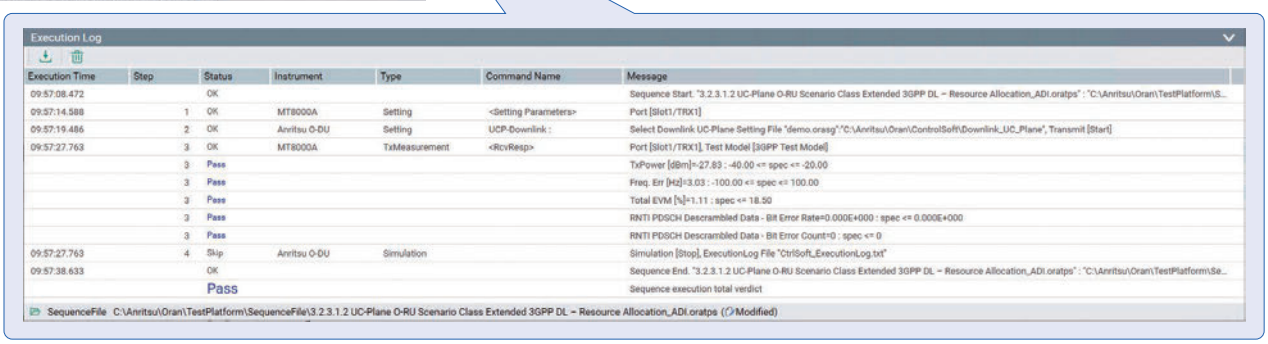
Pass/Fail Evaluation Settings

• Intuitive Sequence Creation and Editing
Multiple measurement equipment operations can be managed as a sequence tree. Sequences can be created and edited efficiently because sequence operations can be confirmed visually.



• Automated Pass/Fail Evaluation
Pass/fail evaluation conditions for measurement results can be set within the measurement sequence.

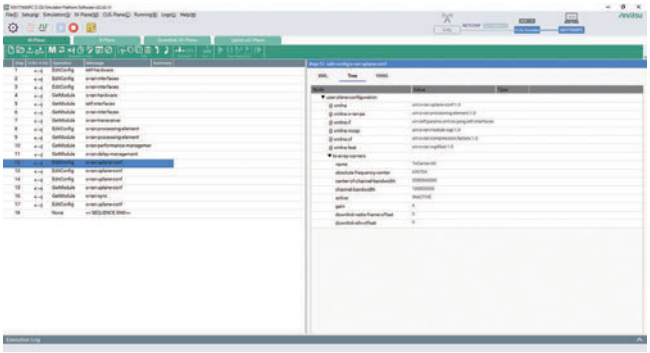




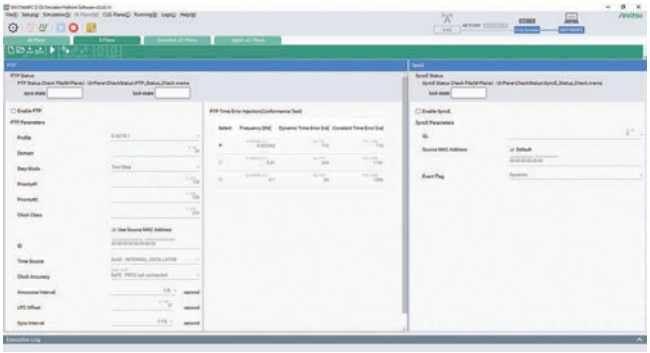
O-DU Emulator Platform Software MX773000PC Features

O-DU Emulator Platform Software MX773000PC

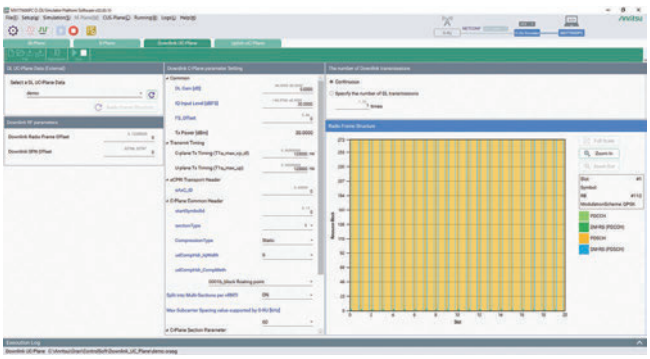
The MX773000PC is installed in the Control PC and server PC to emulate O-DU functions to set and control the O-RU via an O-RAN Fronthaul compliant CUSM-Plane.



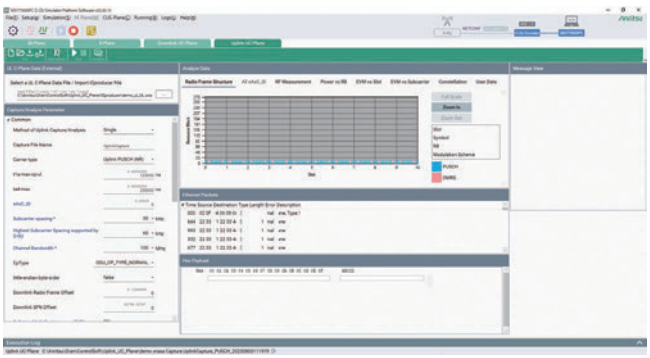
M-Plane



S-Plane



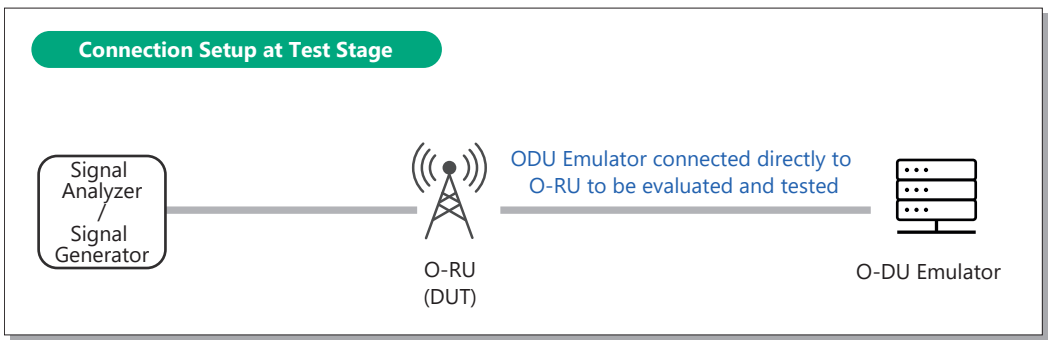
Downlink UC-Plane

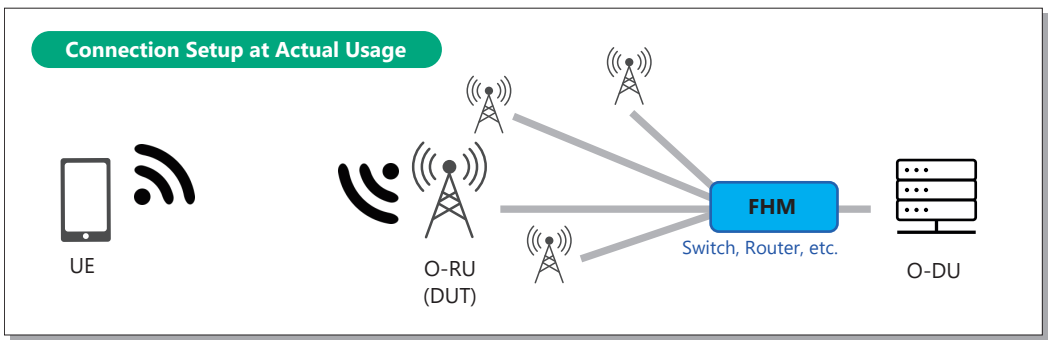


Uplink UC-Plane

Testing UC-Plane when Injecting Time Errors on S-Plane

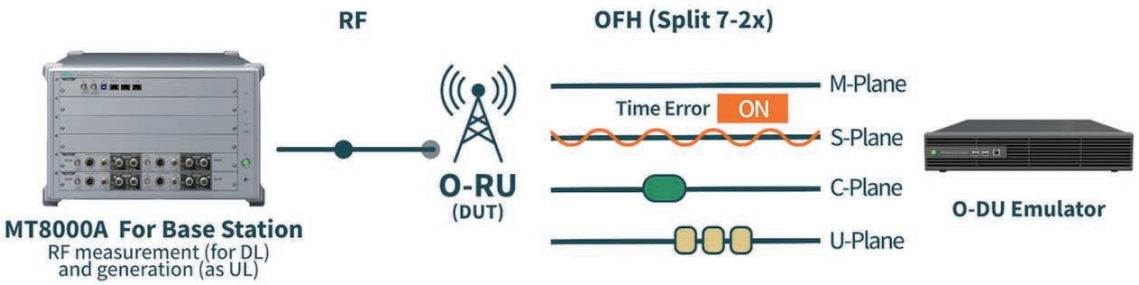
Precision time synchronization is required to build mobile network, but reduced throughput and unstable connections can be caused by degraded clock quality due to multi-vendor interoperability, multi-stage switch connections, transmission equipment, etc. The MX773000PC emulates insertion of time errors on the S-Plane to simulate reduced clock accuracy at O-RU evaluation.



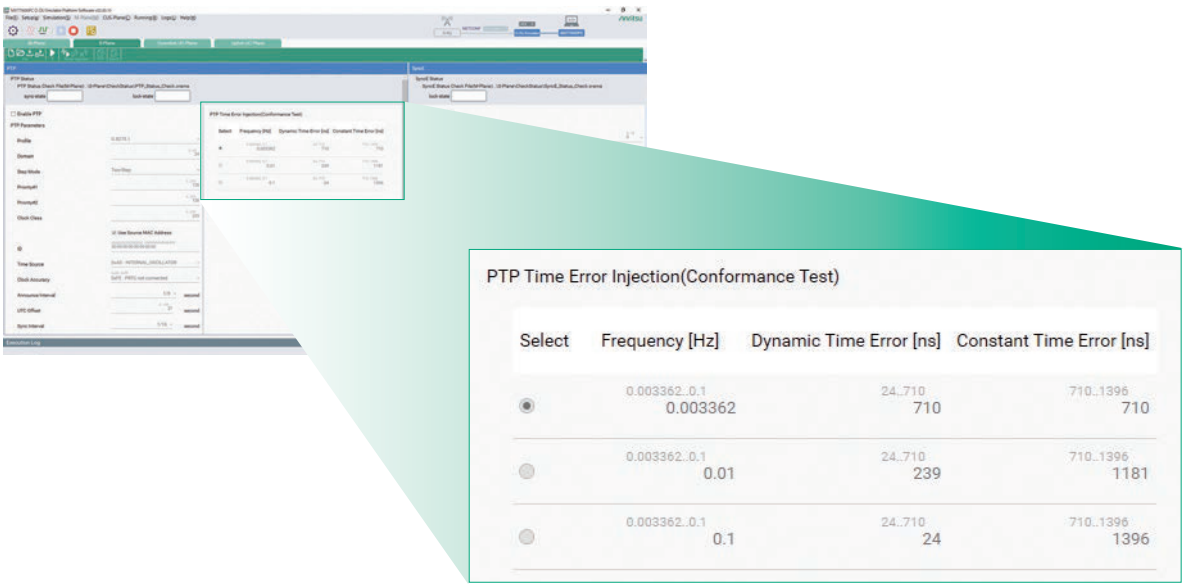


O-DU Emulator Platform Software MX773000PC Features

The MX773000PC S-Plane function can control the CU-Plane when adding a Time Error to the PTP clock, and the O-RU transmission characteristics can be evaluated in this condition.



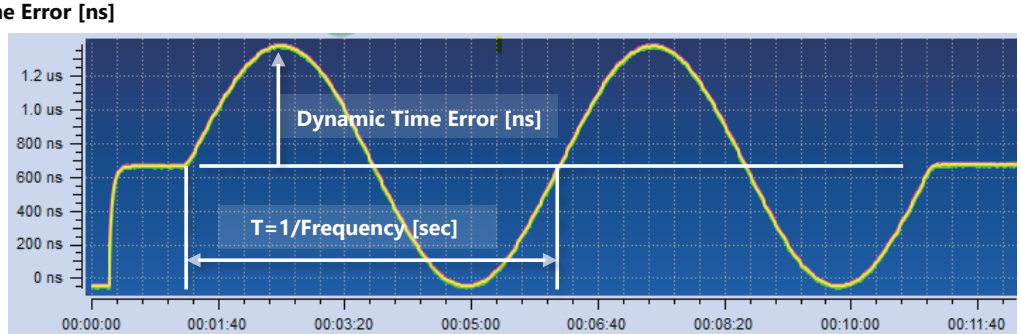
The Time Error is set at PTP Time Error Injection in the MX773000PC S-Plane screen.



The Time Error setting parameters are Frequency, Dynamic Time Error, and Constant Time Error. Any values can be set and freely changed for these parameters.
The following figure shows an example of a Time Error added to the PTP clock.

■ **Error Insertion Image (Frequency 0.003362 Hz Case)**

Time Error [ns]



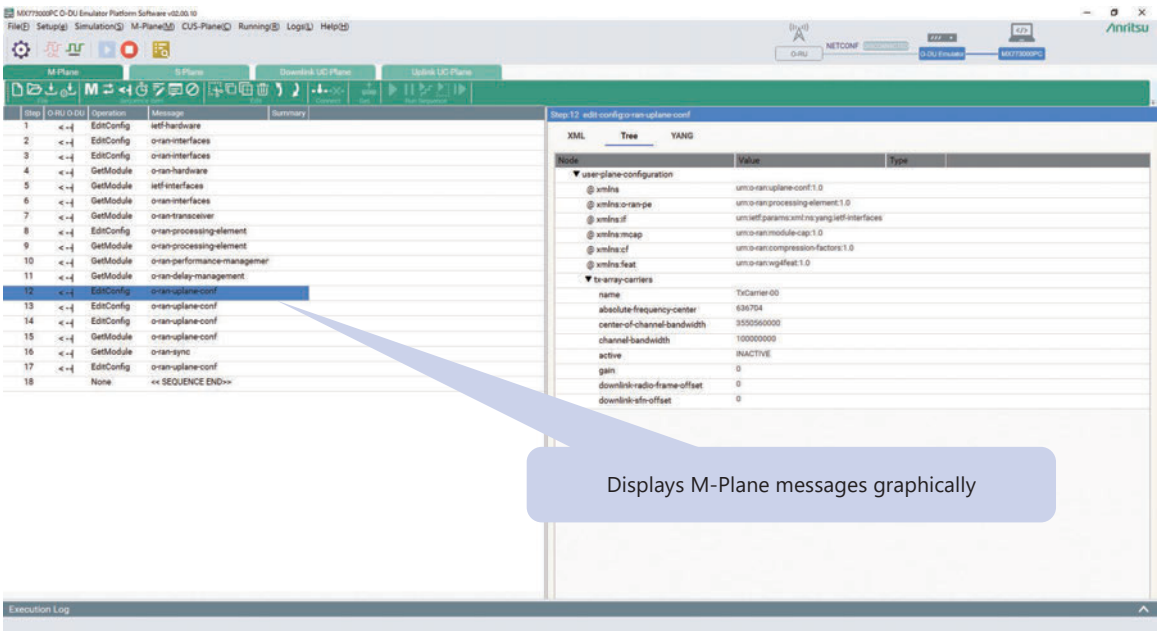
Constant Time Error [ns]

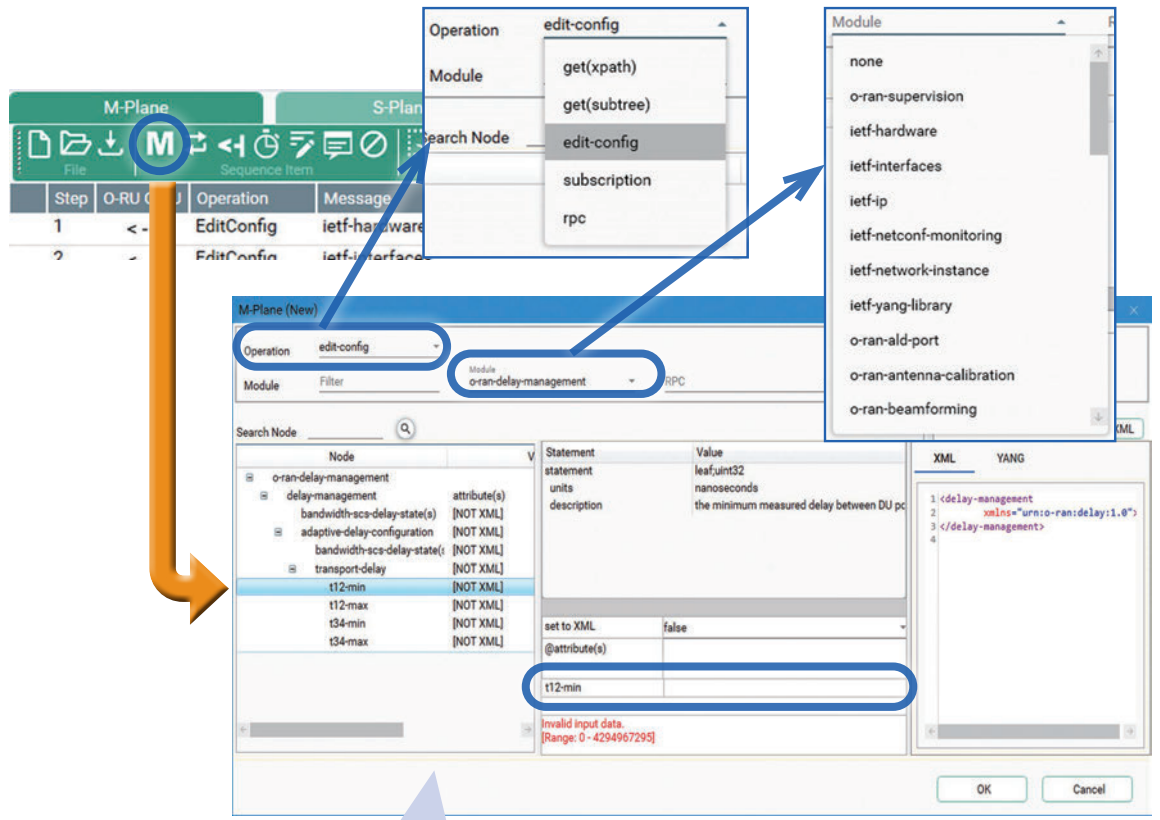
Time [sec]

O-DU Emulator Platform Software MX773000PC Features

Easy-to-use GUI for M-Plane Settings

Test engineers modify and change many configuration parameters when changing M-Plane settings, which increases workloads and causes mistakes. The MX773000PC graphically displays M-Plane messages and has a GUI to help simplify message creation and editing and reduce editing mistakes, improving the O-DU Emulator and O-RU connection efficiency.





Easily create and edit M-Plane sequence by selecting operation and module and editing settings

MX772000PC, MX773000PC Software Summary (Options)

Name	Model	Remarks
ORAN Test Platform	MX772000PC	Software for controlling MX773000PC, MT8000A, and other measurement equipment, editing and executing other operation sequences to automate series of test procedures included in O-RAN conformance test with functions for controlling measurement equipment using Ethernet, evaluating pass/fail for each procedure and outputting logs. Used by installing in control PC. *: Select at least one of the following options: MX772000PC-TL001 MX772000PC-TL002
MX773000PC Control Plugin (1 year)	MX772000PC-TL001	Option for controlling MX773000PC to create, edit, and execute MX773000PC test cases. *: Requires MX772000PC
MT8000A Control Plugin (1 year)	MX772000PC-TL002	Option for controlling MT8000A to create, edit, and execute MT8000A test sequences. *: Requires MX772000PC
O-DU Emulator Platform Software	MX773000PC	Software for controlling O-RU and evaluating wireless TRx signal instructions and wired data. *: Requires MX773000PC-TL001 and at least one of the following options: • MX773000PC-TL011 • MX773000PC-TL020 • MX773000PC-TL030 • MX773000PC-TL040
ORU Test Suite (1 year)	MX773000PC-TL001	Option to enable function to control O-RU via O-RAN Fronthaul from O-DU Emulator.
M-Plane Sequence Builder (1 year)	MX773000PC-TL010	Option to enable function to create and edit M-Plane sequences. *: The MX773000PC-TL011 option must be enabled to use this option. *: Requires MX773000PC
M-Plane Sequence Player (1 year)	MX773000PC-TL011	Option for enabling function to execute M-Plane sequence. *: Requires MX773000PC
S-Plane Player (1 year)	MX773000PC-TL020	Option to enable S-Plane function. *: Requires MX773000PC
DL UC-Plane Player (1 year)	MX773000PC-TL030	Option for sending UC-Plane packets and outputting Downlink signal from O-RU (includes Downlink signal setting function). *: Requires MX773000PC
UL U-Plane Analyzer (1 year)	MX773000PC-TL040	Option for receiving U-Plane packets and performing RF/payload analysis of Uplink signal from O-RU (includes Uplink setting function). *: Requires MX773000PC

TL License

The MX772000PC-TLxxx and MX773000PC-TLxxx are term licenses with a validity period of 1 year. These licenses include support.

Notes on TL Validity Expiry

The licensed MX772000PC and MX773000PC software functions cannot be used after the TL license validity period expires.

MX772000PC and MX773000PC Specifications

M-Plane	
O-RAN Reference Standard	O-RAN.WG4.MP.0-v07.00
M-Plane Interface	RJ45 (1000BASE-T) SFP28 (25 Gbps, FEC), connected via same interface as CU-Plane
TCP/IP	IPv4/IPv6
DHCP	DHCP v4, DHCP v6, Static IP
SSH/TLS	SSHv2
C-, U- and S-Plane	
O-RAN Reference Standard	O-RAN.WG4.CUS.0-v07.00
S-Plane Protocol	PTP v2, SyncE (ESMC)
O-RAN Fronthaul Ethernet Link	SFP28 (25 Gbps, FEC), SFP+ (10 Gbps)
L2 Protocol	Ethernet, VLAN Does not support IP/UDP and multiple VLAN Tags
eCPRI	O-RAN Split Option 7-2x
Sub-carrier Spacing	15 kHz, 30 kHz 15 kHz enabled only at 20 MHz channel bandwidth
Channel Bandwidth	20, 40, 60, 80, 100 MHz
Duplex Mode	TDD and FDD
Downlink Signal	NR-FR1-TM1.1 NR-FR1-TM1.2 NR-FR1-TM2 / 2a NR-FR1-TM3.1 / 3.1a NR-FR1-TM3.2 NR-FR1-TM3.3
Uplink Signal	G-FR1-A1-1 G-FR1-A1-2 G-FR1-A1-4 G-FR1-A1-5 G-FR1-A1-7 G-FR1-A1-8 G-FR1-A2-4 G-FR1-A2-5

Operating Environment

DU Emulator Hardware

The MX773000A runs on the following Server PC with accelerator card.
Read the MX773000PC Operation Manual for how to install the accelerator card in the Server PC and the setup procedure.

Server PC	Dell PowerEdge R750 OS: None CPU: Intel Xeon Gold 5315Y 3.2G or better Main Memory: 32 GB or better PCIe riser configuration; 4, Half Length, 6x16 slot, Option ID: GNY63SK SKU: 330-BBSC Storage: 960 GB SSD SATA LAN: 25 Gigabit Ethernet 1 port 1 Gigabit Ethernet 1 port
Accelerator Card	Xilinx T1 Telecom Accelerator Card

Recommended Control PC Specifications

OS	Windows 10 (64 bit)
CPU	Intel® Core™ i7-8700 or better
Main Memory	≥16 GB
LCD Size	≥12.1-inch
Resolution	1920 × 1080 or better
Interface	Gigabit Ethernet (1000Base–T) network adapter

Configuration Guide

MX772000PC and MX773000PC configuration examples are shown below.

Configuration Example

Configuration*1 including accessories supporting all O-RU SFP28 and SFP+ fronthaul interfaces.
This configuration can evaluate the TRx characteristics of the RF signal output from the O-RU Fronthaul CUSM-Plane.
Use of the following main functions is supported:

- M-Plane sequence creation and editing
- M-Plane sequence execution
- S-Plane function
- UC-Plane Downlink setting and output
- UC-Plane Uplink setting and analysis
- Automated control (MT8000A and MX773000PC) used by compliance test
- MT8000A (Ports: 2 TRx, Frequencies: FR1)

Model/Order No.	Qty.	Name
MX772000PC	1	ORAN Test Platform
MX772000PC-TL001	1	MX773000PC Control Plugin (1 year)
MX772000PC-TL002	1	MT8000A Control Plugin (1 year)
MX773000PC	1	O-DU Emulator Platform Software
MX773000PC-TL001	1	ORU Test Suite (1 year)
MX773000PC-TL010	1	M-Plane Sequence Builder (1 year)
MX773000PC-TL011	1	M-Plane Sequence Player (1 year)
MX773000PC-TL020	1	S-Plane Player (1 year)
MX773000PC-TL030	1	DL UC-Plane Player (1 year)
MX773000PC-TL040	1	UL U-Plane Analyzer (1 year)
MT8000A	1	Radio Communication Test Station
MT8000A-001	1	Control Module
MT8000A-020	1	RF Base Module
MT8000A-021	1	0.4 GHz-6 GHz RF Sub Module
MX800046A	1	Base Station Test Suite for NR sub-6 GHz
MX800046A-011	1	Transmit On/Off Power Measurement
MX800046A-051	1	PDSCH Descramble Function
MX800046A-SS101	1	Base Station Test for 5G NR sub-6 GHz Support Service (Per Year)
MT1000A	1	Network Master Pro
MT1000A-005	1	AUX I/O
MU100010A1	1	10G Multirate Module
MU100010A-001	1	Up to 2.7G Dual Channel
MU100090B	1	High Performance GNSS Disciplined Oscillator
G0437A	1	Server for O-DU Emulator
G0438A	1	Accelerator card for O-RAN Fronthaul
G0329A	2	10G LR 1310 nm SFP+*2
G0356A	2	8G FC/10G SR 850 nm SFP+*2
G0388A	2	25G SR 850 nm SFP28*2
G0389A	2	25G LR 1310 nm SFP28*2
J1579A	1	Optical cable SM LC/PC to LC/PC 3 m*3
J1581A	1	Optical cable MM LC/PC to LC/PC 3 meter*3
J0127B	2	COAXIAL CORD, 2.0M (BNC-P • RG58A/U • BNC-P)
J1440A	3	LAN Cable (straight cable, 3 m)
J1557A	1	BNC T-Adapter
J1891A	1	Coaxial Adaptor (BNC-J, SMA-P)

*1: The control PC, USB-LAN adapter (recommend ELECOM EDC-GUA3-B), and RF cables must be provided separately by the customer.
*2: M-Plane loopback requires two G0388A units; connecting the O-RU and O-DU Emulator requires any two G0329A, G0356A, G0388A, or G0389A units. Select according to the supported O-RU interface.
*3: M-Plane loopback requires one J1581A; connecting the O-RU and O-DU Emulator requires either one J1579A, or one J1581A. Select according to the transceiver.

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
	Software
MX772000PC	ORAN Test Platform*1
MX772000PC-TL001	MX773000PC Control Plugin (1 year)*3
MX772000PC-TL002	MT8000A Control Plugin (1 year)*3
MX773000PC	O-DU Emulator Platform Software*2
MX773000PC-TL001	ORU Test Suite (1 year)*3
MX773000PC-TL010	M-Plane Sequence Builder (1 year)*3, 4
MX773000PC-TL011	M-Plane Sequence Player (1 year)*3
MX773000PC-TL020	S-Plane Player (1 year)*3
MX773000PC-TL030	DL UC-Plane Player (1 year)*3
MX773000PC-TL040	UL U-Plane Analyzer (1 year)*3
	Operation Manual
	The following Operation Manual is provided as a booklet.
W4099AE	MX772000PC ORAN Test Platform Operation Manual
W4100AE	MX773000PC Operation Manual
	Application Parts
G0437A	Server for O-DU Emulator*5
G0438A	Accelerator card for O-RAN Fronthaul*5
G0329A	10G LR 1310 nm SFP+
G0356A	8G FC/10G SR 850 nm SFP+
G0388A	25G SR 850 nm SFP28
G0389A	25G LR 1310 nm SFP28
J1579A	Optical cable SM LC/PC to LC/PC 3 m
J1581A	Optical cable MM LC/PC to LC/PC 3 meter
J0127B	COAXIAL CORD, 2.0M (BNC-P • RG58A/U • BNC-P)
J1440A	LAN Cable (straight cable, 3 m)
J1557A	BNC T-Adapter
J1891A	Coaxial Adaptor (BNC-J, SMA-P)

*1: Requires either MX772000PC-TL001 or MX772000PC-TL002.
*2: Requires MX773000PC-TL001 and at least one of the following options:
- MX773000PC-TL011
- MX773000PC-TL020
- MX773000PC-TL030
- MX773000PC-TL040

*3: The MX772000PC-TLxxx and MX773000PC-TLxxx are term licenses with a validity period of 1 year and include support.
*4: Requires MX773000PC-TL011 to enable this option.
*5: Becomes Anritsu O-DU Emulator by combining G0437A and G0438A and installing firmware.

The MT8000A and MT1000A are required to make best use of the O-RAN O-RU Test Solution. The MT8000A measures the Rx characteristics of the RF signal output from the O-RU and is also required to generate the Tx signal for input to the O-RU.
The MT1000A is required to synchronize the O-DU Emulator and MT8000A. Synchronization is performed by inputting the MT1000A 1PPS signal and the 10 MHz reference signal to the O-RU Emulator and MT8000A.

The configuration for each product is listed below.
Refer to each product catalog for more details.

Model/Order No.	Name
	MT8000A Configuration
MT8000A	Radio Communication Test Station
MT8000A-001	Control Module
MT8000A-020	RF Base Module
MT8000A-021	0.4 GHz-6 GHz RF Sub Module
MX800046A	Base Station Test Suite for NR sub-6 GHz
MX800046A-011	Transmit On/Off Power Measurement
MX800046A-051	PDSCH Descramble Function
MX800046A-SS101	Base Station Test for 5G NR sub-6 GHz Support Service (Per Year)
	MT1000A Configuration
MT1000A	Network Master Pro
MT1000A-005	AUX I/O
MU100010A1	10G Multirate Module
MU100010A-001	Up to 2.7G Dual Channel
MU100090B	High Performance GNSS Disciplined Oscillator

Note:

Anritsu Advancing beyond

Specifications are subject to change without notice.

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