

# GPS TIME SYNCHRONIZATION



## What is GPS ?

GPS stands for Global Positioning System, is a technology developed by the US Department of Defense for positioning and timing information and is used as an inexpensive, readily available utility for high precision positioning, navigation & time synchronization.

Currently there are 30+ satellites orbiting earth which provides accurate time & positioning information.

- 24 hours/day, 7 days/week
- Under any weather conditions
- Anywhere in the world



GPS Signal Provides longitude, latitude and altitude of coordinates in the space. It also provides information regarding the critical fourth dimension - time. Each GPS satellite contains multiple atomic clocks that contribute very precise time data to the GPS signals.

The positioning information is used for navigation purpose & timing information is used for time synchronization.

### Type of Navigation system other than GPS

(GNSS = Global navigation satellite system)

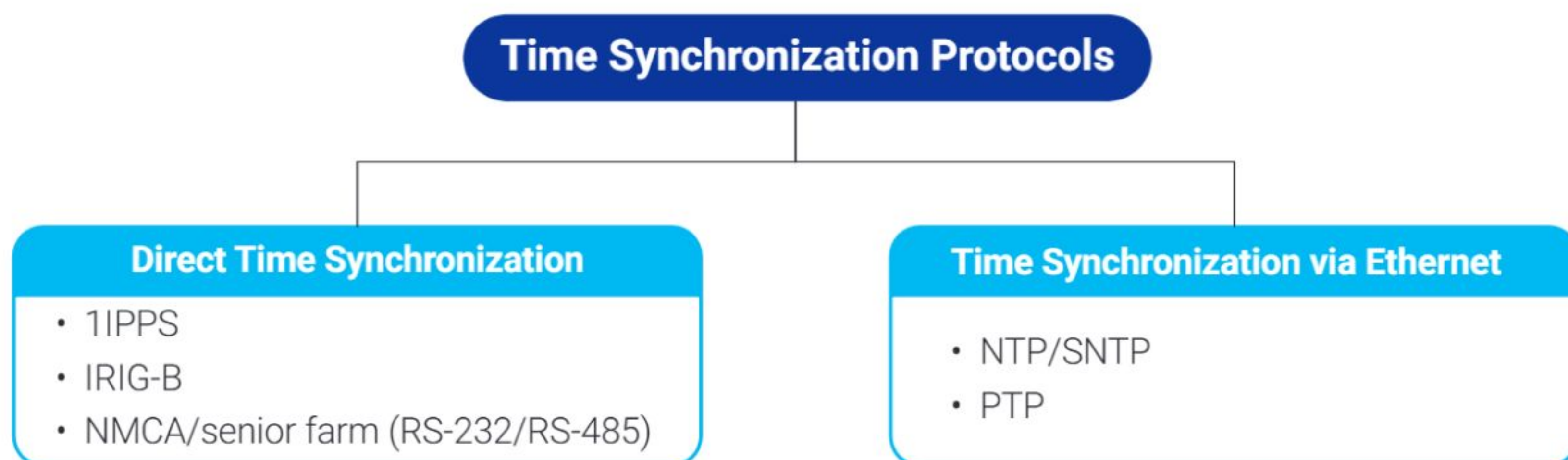
- 1** **IRNSS** is an autonomous system designed to cover the Indian region and 1500 km around the Indian mainland. This GNSS is owned and operated by the Government of India.
- 2** **GLONASS**: (Globalnaya Navigazionnaya Sputnikovaya Sistema, or Global Navigation Satellite System) is a global GNSS owned and operated by the Russian Federation.
- 3** **Galelio**: Galileo is a global GNSS owned and operated by the European Union.
- 4** **QZSS**: QZSS is a regional GNSS owned by the Government of Japan and operated by QZS System Service Inc. (QSS). QZSS complements GPS to improve coverage in East Asia & Oceania.
- 5** **BeiDou Navigation Satellite System (BDS)**: BeiDou, or BDS, is a global GNSS owned and operated by the People's Republic of China.

Our time synchronization product can capture time signal from GPS / GLONASS / NAVIC Satellites. Precise time is crucial to a variety of economic activities around the world. Communication systems, electrical power grids, and financial networks all rely on precision timing for synchronization and operational efficiency. Here we have mentioned why time syhchronication is necessary

## Why Time Synchronization is Required

- Time synchronisation required in most of the industry with time stamping of events with an accuracy of **1 millisecond (1 ms) to 1 microsecond (1 µs)** and this can not be provided via Global NTP Server. So to provide **higher accuracy Local time server** is required.
- To have common reference time throughout the organization. (e.g. Manufacturing Units, Airports, Railways, Share Market, Bank, etc).
- To correlate historical data points for post-event fault analysis to enabling real-time visibility for higher efficiency management of load and generation fluctuations, problem analysis and isolation, and reducing the impact of wide area outages.
- To Comply with Government Guideline (ex. Audit Trails in Pharma)

For time synchronization, the GNSS signal is received, processed by a local master clock / time server or primary reference, and passed on to downstream devices, systems or networks so that their local clocks are also synchronized to UTC. Typical accuracies range from better than 1 microsecond to a few milliseconds depending on the synchronization protocol.



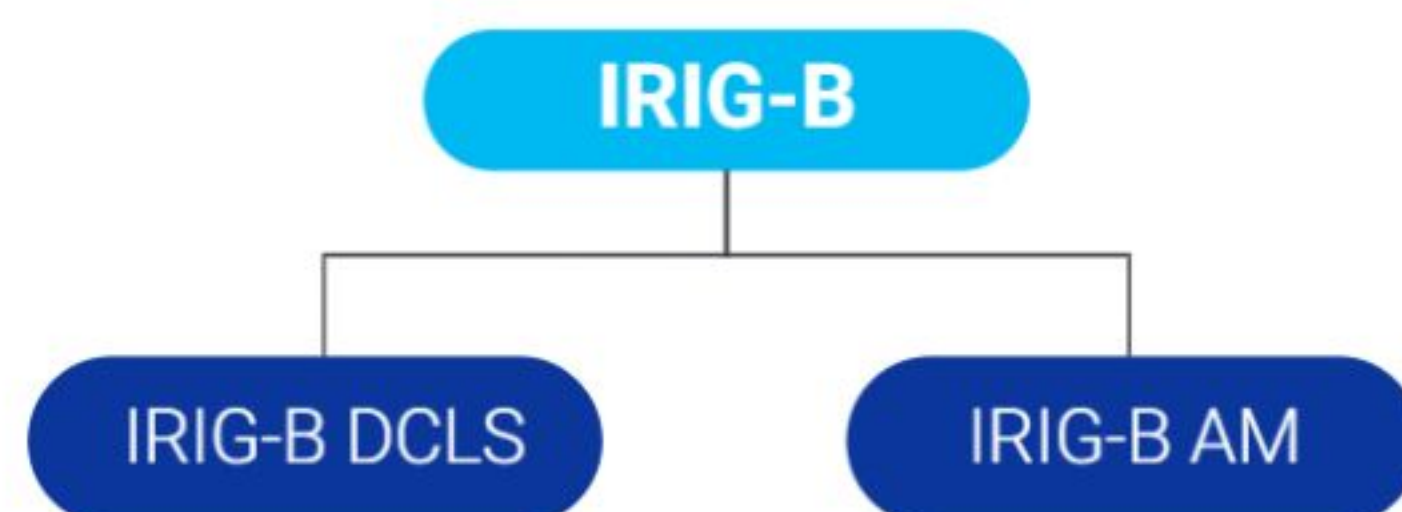
## Direct Time Synchronization

### 1PPS

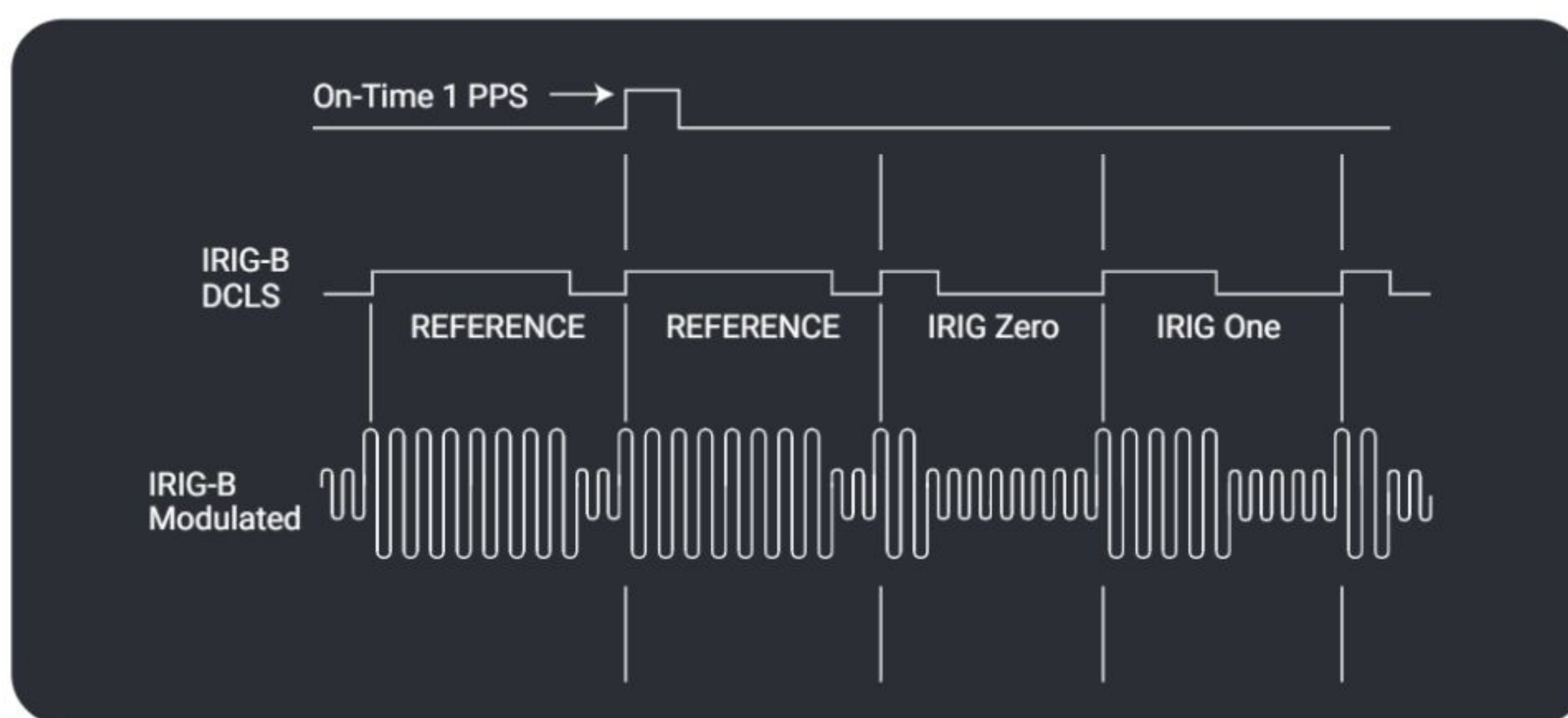
- 1PPS stands for one pulse per second. It is a high-precision time pulse from precision clocks like a GPS receiver that very precisely indicates the start of a second. Accuracy of time synchronization of 1 PPS can be in the Nanosecond range.
- The 1-PPS specification most commonly used for synchronising signals in substations comes from IEC 60044-8 and is referred to by the IEC 61850-9-2 process bus implementation.
- 1-PPS requires a dedicated distribution network, which can use coaxial or twisted pair or fibre-optic (multi-mode or single-mode) cables.
- The rise and fall time (tf) between the 10% and 90% levels must be less than 200 ns, and the high time (th) must be between 10 µs and 500 ms (measured at the 50% level).

## IRIG-B

- IRIG-B stands for Inter-range instrumentation group time codes B. IRIG-B can be applied in a substation for power quality and system stability monitoring, event recording and accurate time stamping for revenue billing (1  $\mu$ S).
- This time code can be transmitted as raw pulses over copper cables (coaxial or twisted pair) and fibre-optic cables, or as an amplitude modulated (AM) 1 kHz carrier over coaxial cable.



- Below is the figure for IRIG – B AM and IRIG-B DCLS signal. IRIG-B AM is distinctive because of the 1 KHz sine wave carrier. It is similar to IRIG-B DCLS, since Pick-Pick values of the carrier signal follow the same form as IRIG-B DCLS, which contains the information



## Supported IRIG-B Protocol in Masibus GPS Master Clock

IRIG-B Protocol	Data
IRIG-B007	100 PPS, DCLS Signal, No carrier Frequency BCDTOY, BCDYR, SBS (Time of Day)
IRIG-B0127	100 PPS, DCLS Signal, 1KHz carrier Frequency BCDTOY, BCDYR, SBS (Time of Day)
IEEE 1344 (C37. 118-2005)	100 PPS, AM Signal, 1KHz carrier Frequency BCDTOY, BCDYR, SBS IEEE1344 assignment of CF bits
	100 PPS, DCLS Signal, No carrier Frequency BCDTOY, BCDYR, SBS IEEE1344 assignment of CF bits

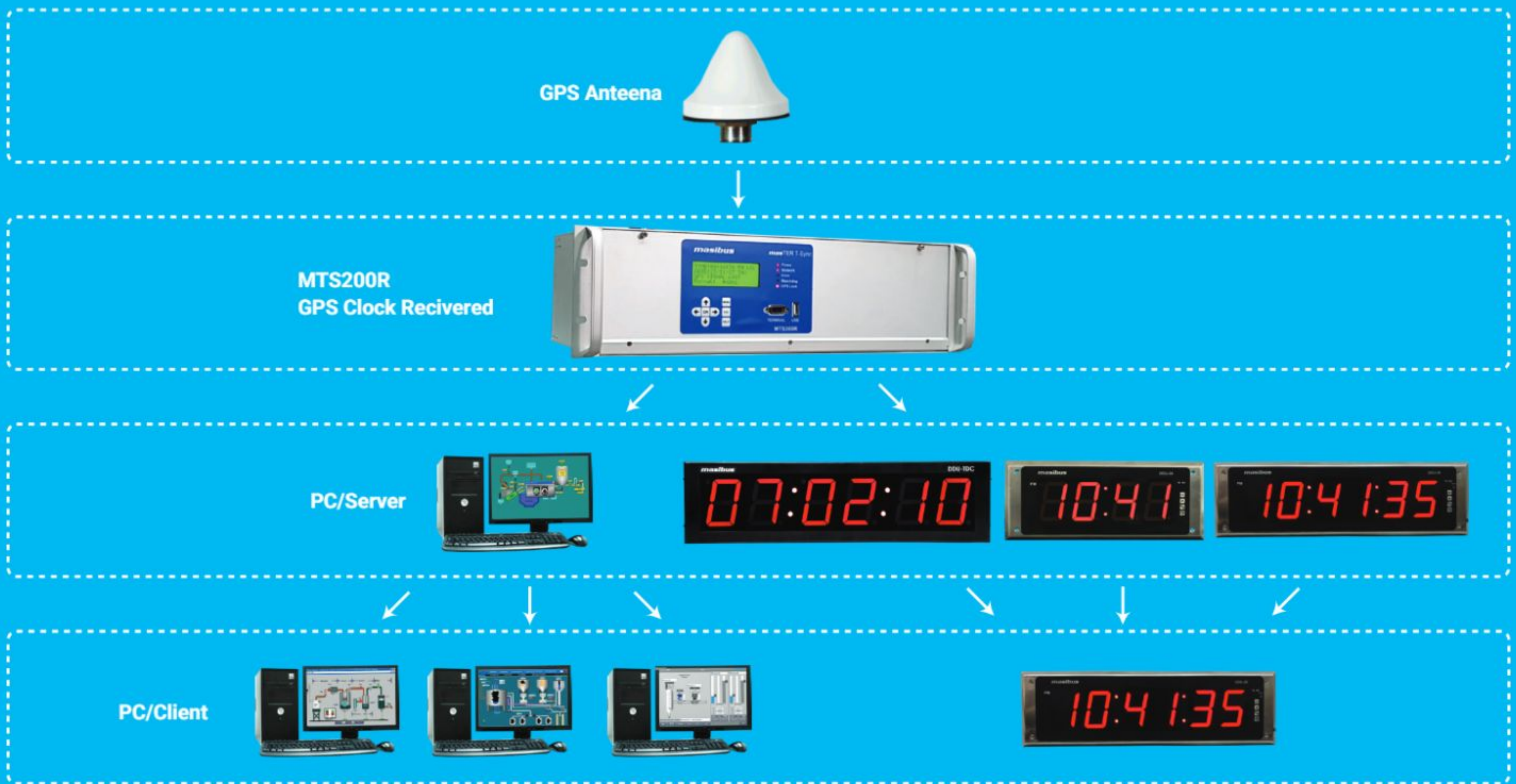
## Time Synchronization Via LAN/ Ethenert

### NTP/SNTP

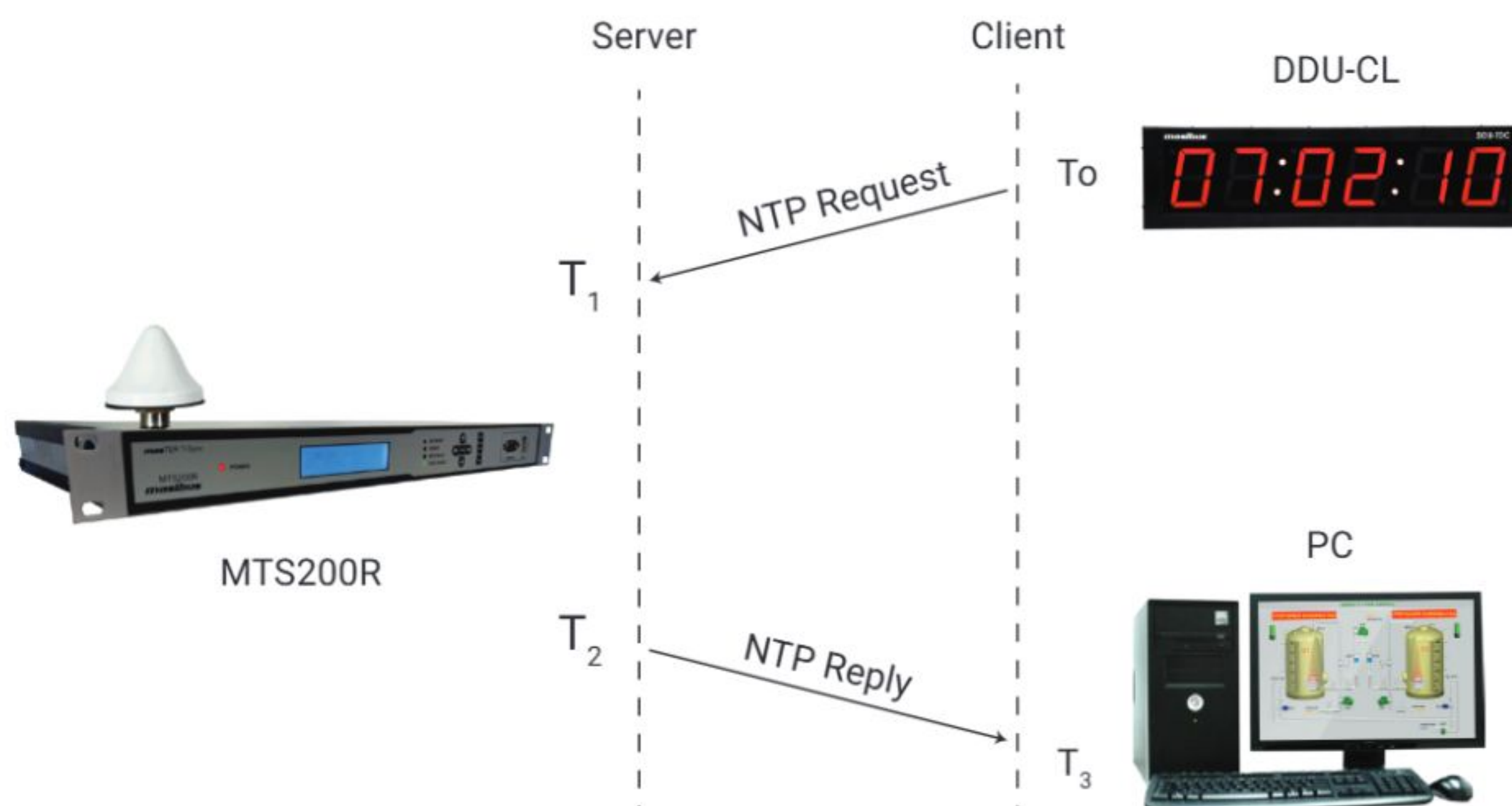
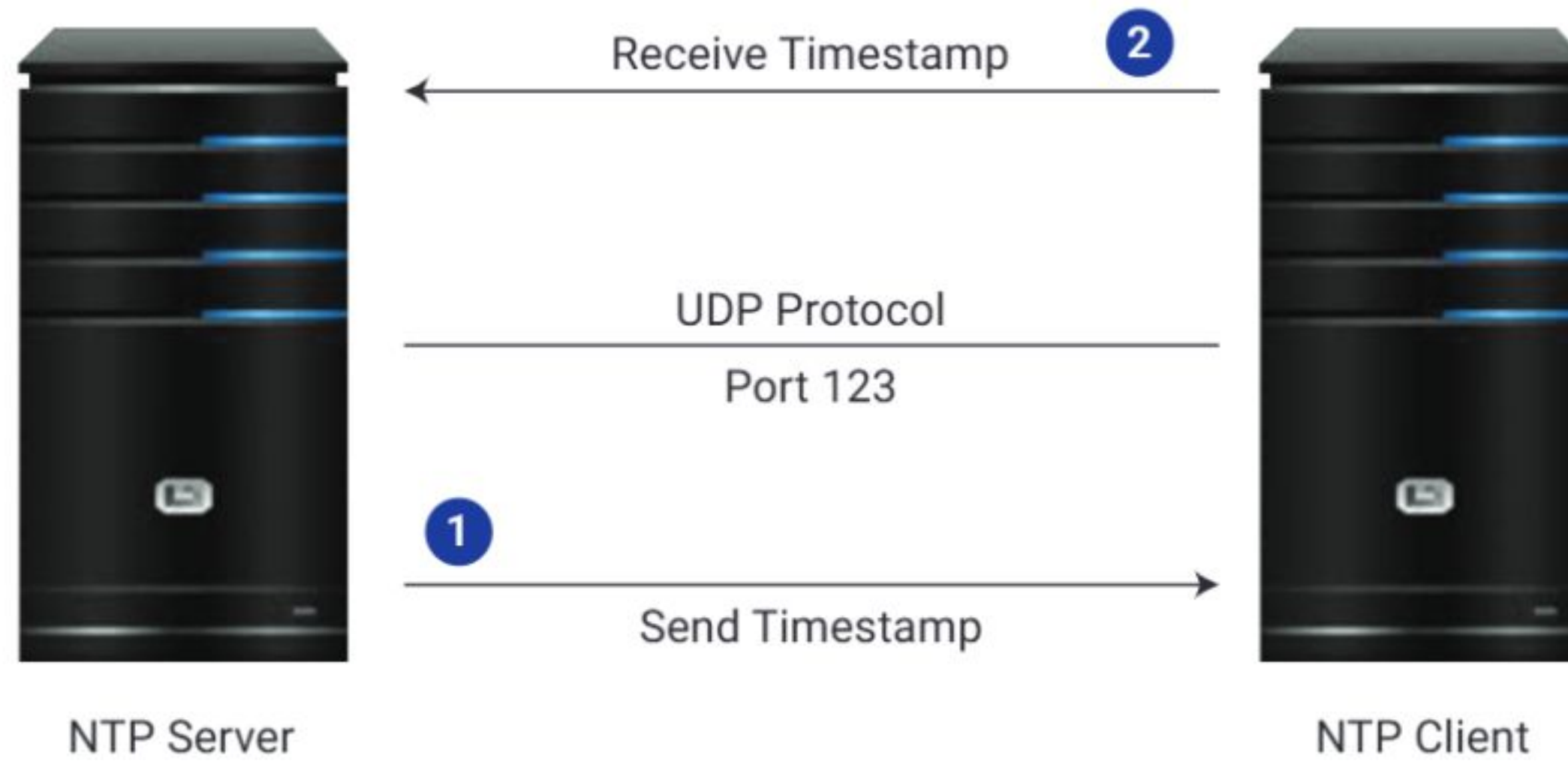
The NTP standard employs servers that supply clients, such as the computers in your network, with current Coordinated Universal Time, or UTC, information in response to individual requests. Although your hardware can ask for the present time from many different servers in the network, some devices provide more accurate data than others due to factors like system lag and latency.

The timekeeping servers in these networks are arranged in distinct strata, also known as layers. The most accurate devices exist in Stratum 0, and they include atomic, radio and other high-precision clocks, such as those found in NIST laboratories and GPS satellites. Stratum 1 servers, also known as primary time servers, are connected directly to Stratum 0 devices as well as their same-level peers.

Another variant of this protocol, known as SNTP or Simple Network Time Protocol, employs the same packet and message format. The major difference is that SNTP is significantly less accurate. Since clients cannot obtain timing data from multiple sources or use MD5 checksums, they're vulnerable to general network inaccuracies and malicious agents that intentionally provide incorrect time stamps.



## Time Synchronization with NTP Protocol



The Precision Time Protocol (PTP) is a protocol used to synchronize clocks throughout a computer network. On a local area network, it achieves clock accuracy in the sub-microsecond range, making it suitable for measurement and control systems.

## Features of PTP

- It has an alternate time-scale functionality.
- It uses a Grand Master clock to synchronize the communication.
- It works on master-slave architecture.
- It makes the path of communication traceable.

## Working of PTP

PTP is a protocol that works for seamless communication between different devices. It uses a master-slave system of time resources and provides synchronization. This system consists of one or more communication devices and a single network connection provided by a grandmaster device. This grandmaster is responsible for the root timing reference. The grandmaster transmits synchronized information to the devices residing in the communication medium.

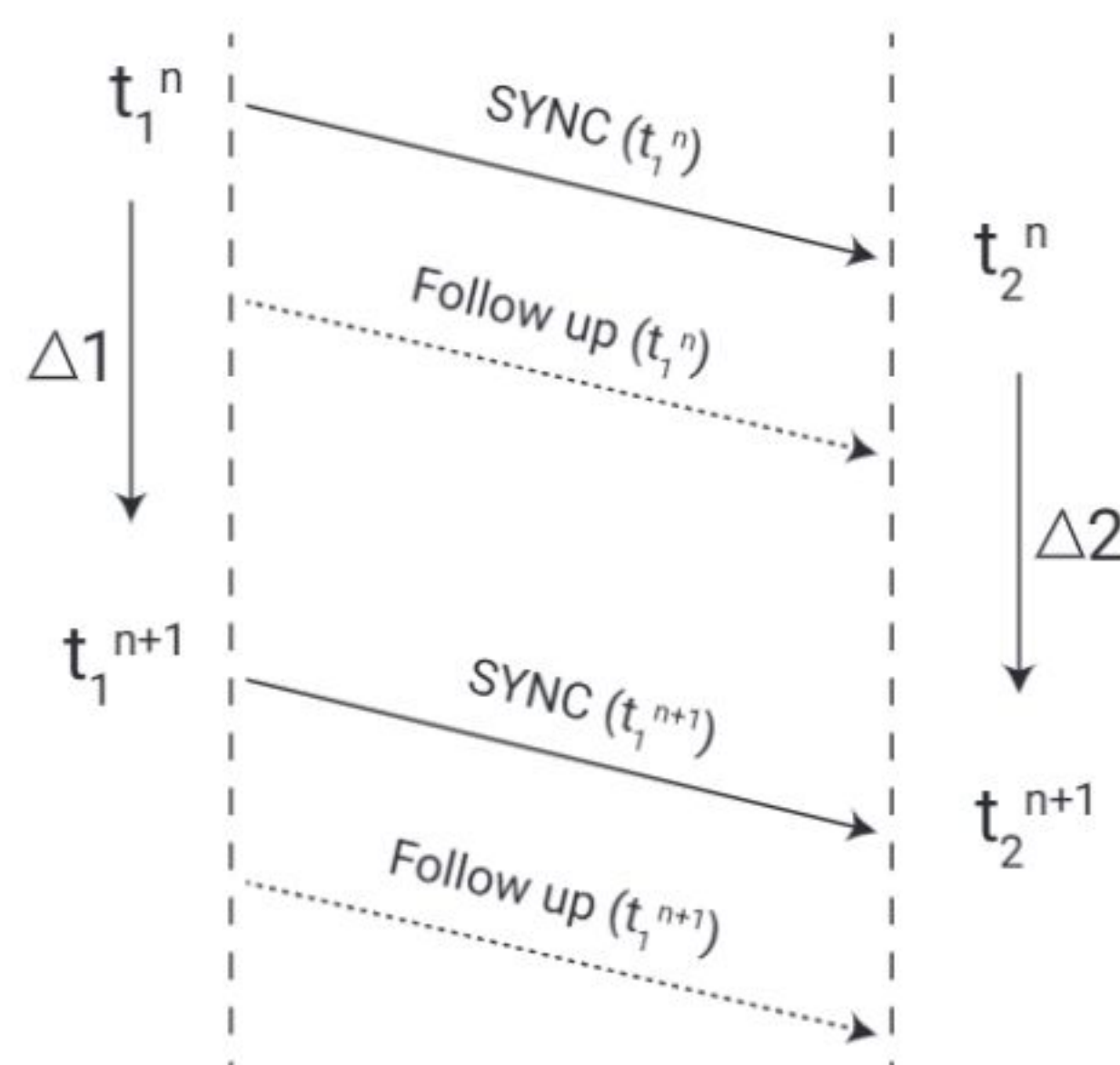
## This Protocol also

- Lets clients connect to multiple NTP servers for data backups, heightened accuracy and testing purposes
- Corrects for communication latency and individual clock drift
- Uses a standardized, 64-bit UDP packet that can theoretically achieve picosecond (trillionth of a second) timing and determine dates within a 136-year range
- Permits peer-to-peer communication, broadcasting, multicasting, calibration and secure MD5 hash algorithms

## Time Synchronization with PTP Protocol



MTS200R



$$\text{Send interval Master } \Delta_1 = t_1^{n+1} - t_1^n$$

$$\text{Receive interval Slave } \Delta_2 = t_2^{n+1} - t_2^n$$

$$\text{Drift of the slave} = \frac{\Delta_2 - \Delta_1}{\Delta_2}$$



Margin Unit

# Time Synchronization Master Clocks



**MTS300R**

## High Performance, Accurate, Modular

- 19" 3U Rack mount modular architecture
- Maximum 36 number of timing output can be provided
- Remote alarm notification using SNMP v1, v2, v3 and syslog, remote configuration using SSH, web, SNMP, telnet
- Supporting timing protocols are IEEE 1588 PTP (Power and power utility profile), NTP/SNTP, IRIG-B AM and IRIG-B TTL, FDM, 2.048 MHz. frequency O/P, fiber optic O/P, NMEA, proprietary serial O/P, NTP v2/v3/v4 with MD5 authentication with symmetric and auto key management
- Supporting networking protocols: IPv4, IPv6, UDP, TCP, SNMP, SSH, SCP, HTTP, HTTPS, SYSLOG, telnet
- Redundant and non-redundant GPS master time synchronization unit with internal comparator and switching module for redundancy



**MTS200R**

## High Performance, Accurate, Modular, Compact

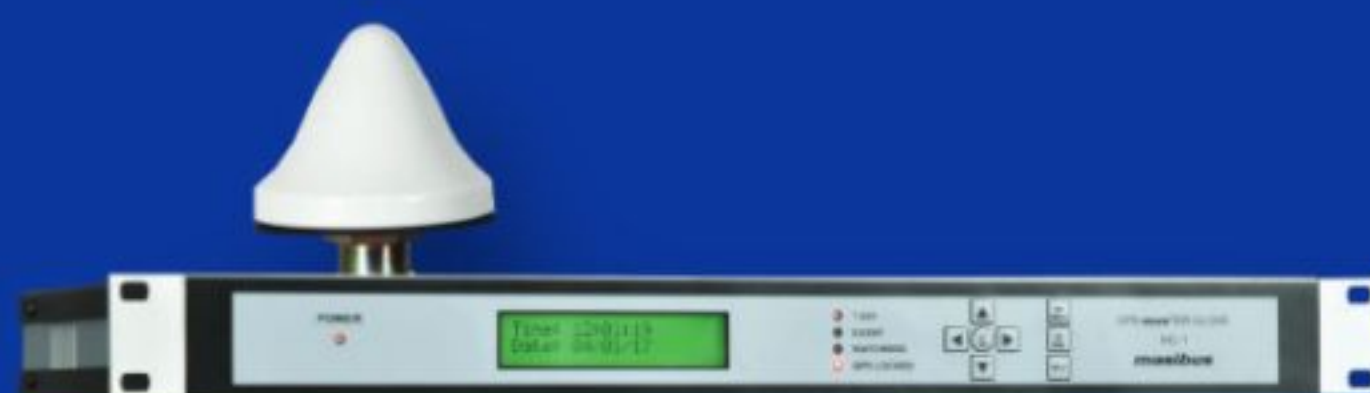
- 19" 1U Rack mount modular architecture
- Maximum 12 number of timing output can be provided based on the configuration selected

**MTS200L**



## Accurate, Reliable, Modular, Compact

- 19" 1U Rack mount modular architecture
- Maximum 16 number of timing output can be provided
- Power supply redundancy can be provided
- Supporting timing protocols are IEEE 1588 PTP (Power and power utility profile), SNTP/ NTP, IRIG-B AM and IRIG-B TTL, FDM, 2.048 MHz.
- frequency O/P, fiber optic O/P, NMEA, proprietary serial O/P
- Supporting networking protocols: IPv4, UDP, SNMP, telnet Remote alarm notification using SNMP, remote configuration using SNMP v1, v2, telnet



**MC-1-U**

## Accurate, Reliable, Compact

- 19" 1U Rack mount architecture
- Maximum 10 number of timing output can be provided
- Supporting timing protocols are SNTP/NTP, IRIG-B AM and IRIG-B TTL, NMEA, proprietary serial O/P
- Supporting networking protocols: IPv4, UDP, SNMP, telnet
- Remote alarm notification using SNMP, remote configuration using SNMP v1, v2, telnet



**MC-1-DE/DH**

## Accurate, Reliable, Compact

- Din-Rail mount/ rack mount /wall mount architecture
- Maximum 07 number of timing output can be provided



## Time Display Units / Slave Clocks



DDU-HZ



DDU-TDC



DDU-DT



DDU-46



DDU-DY



DDU-44

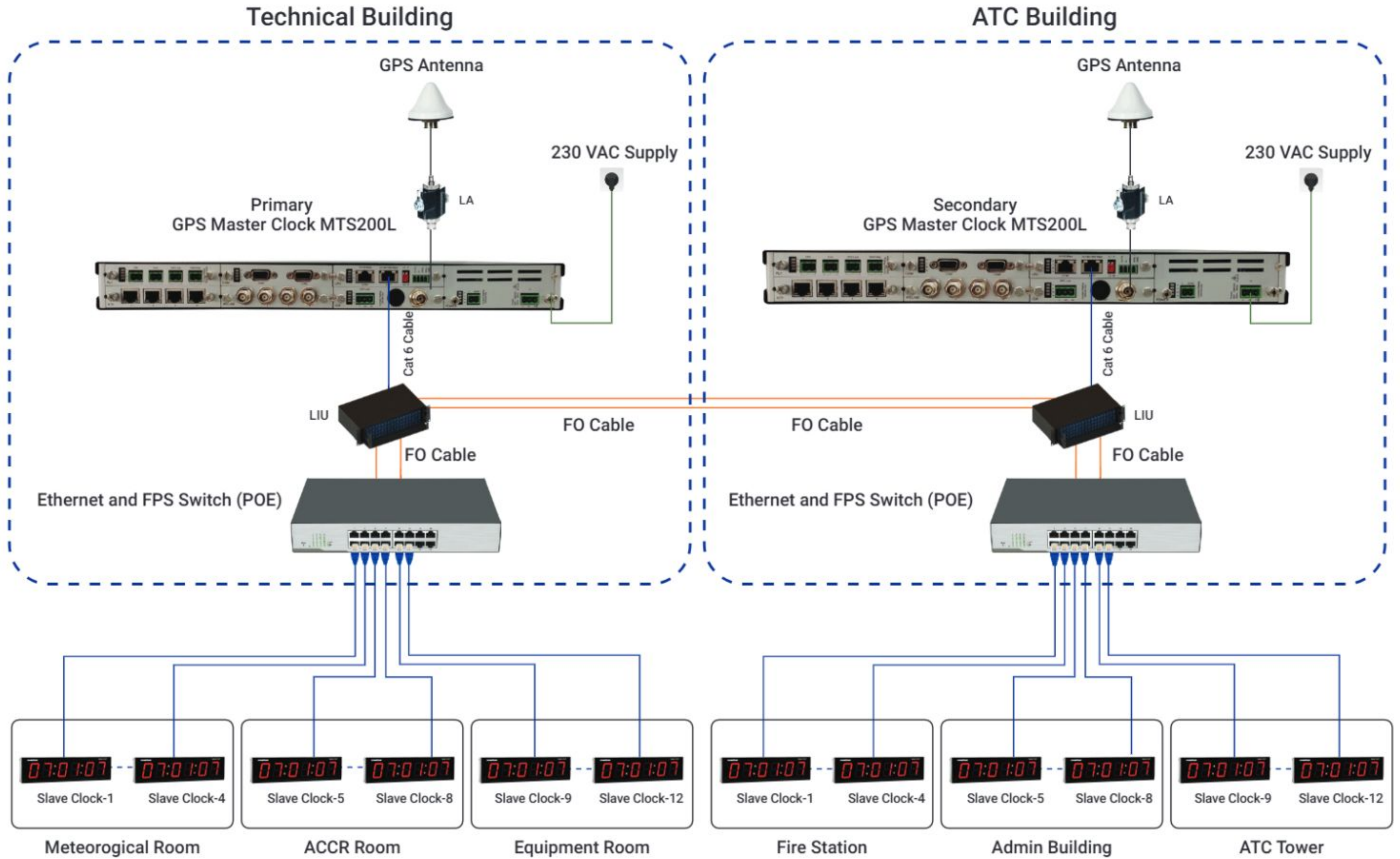


DDU-CL

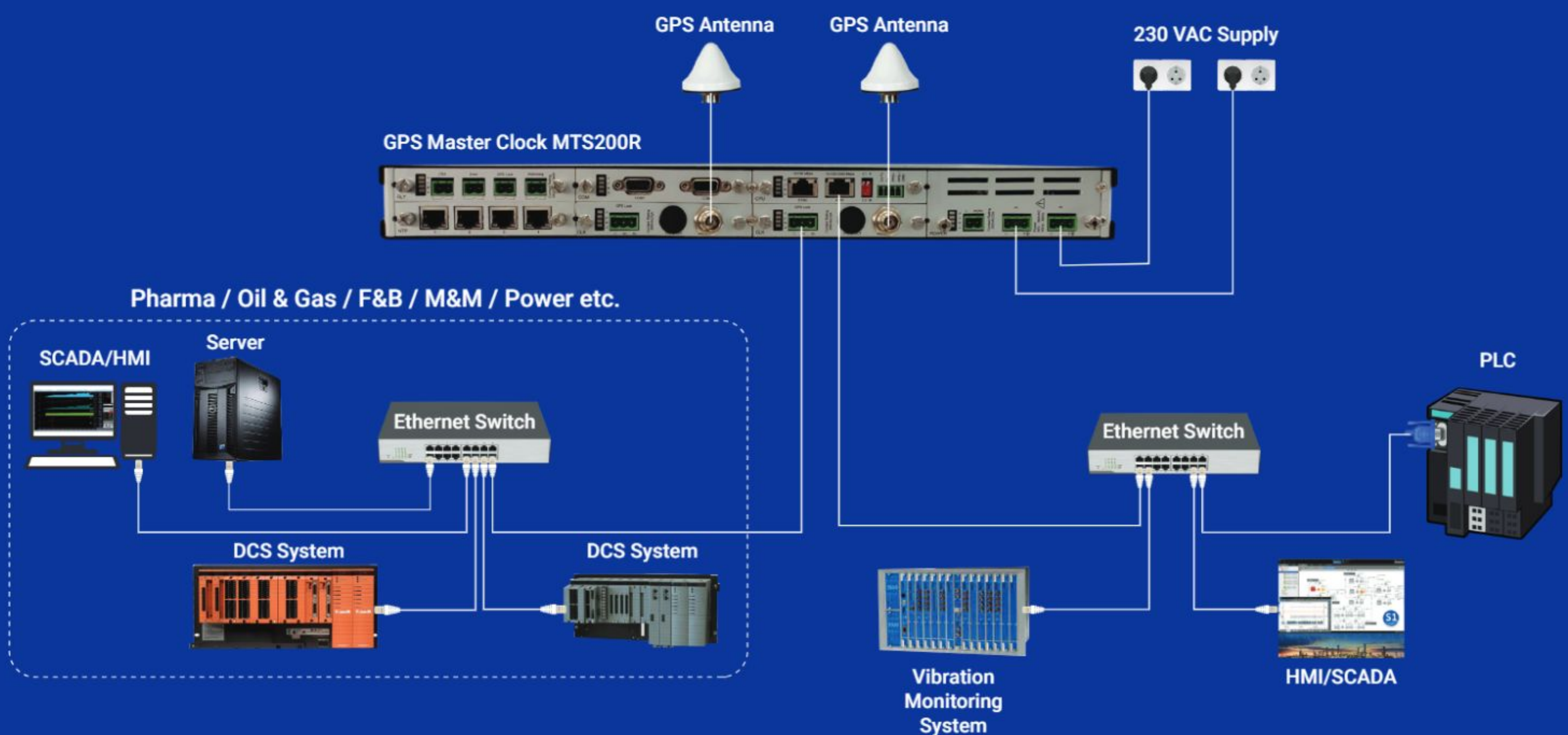


DDU-TM

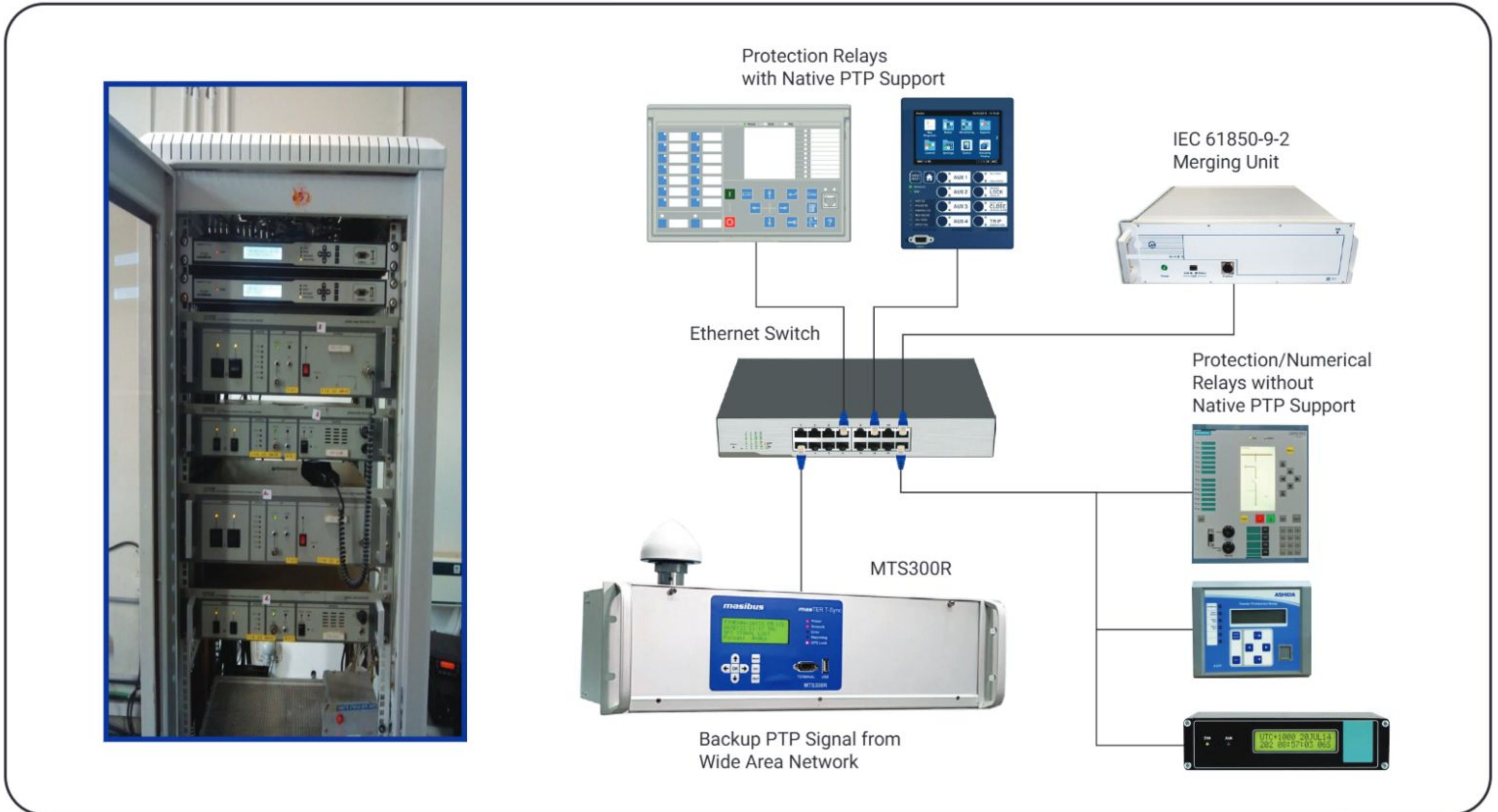
## Time Synchronization in Airports



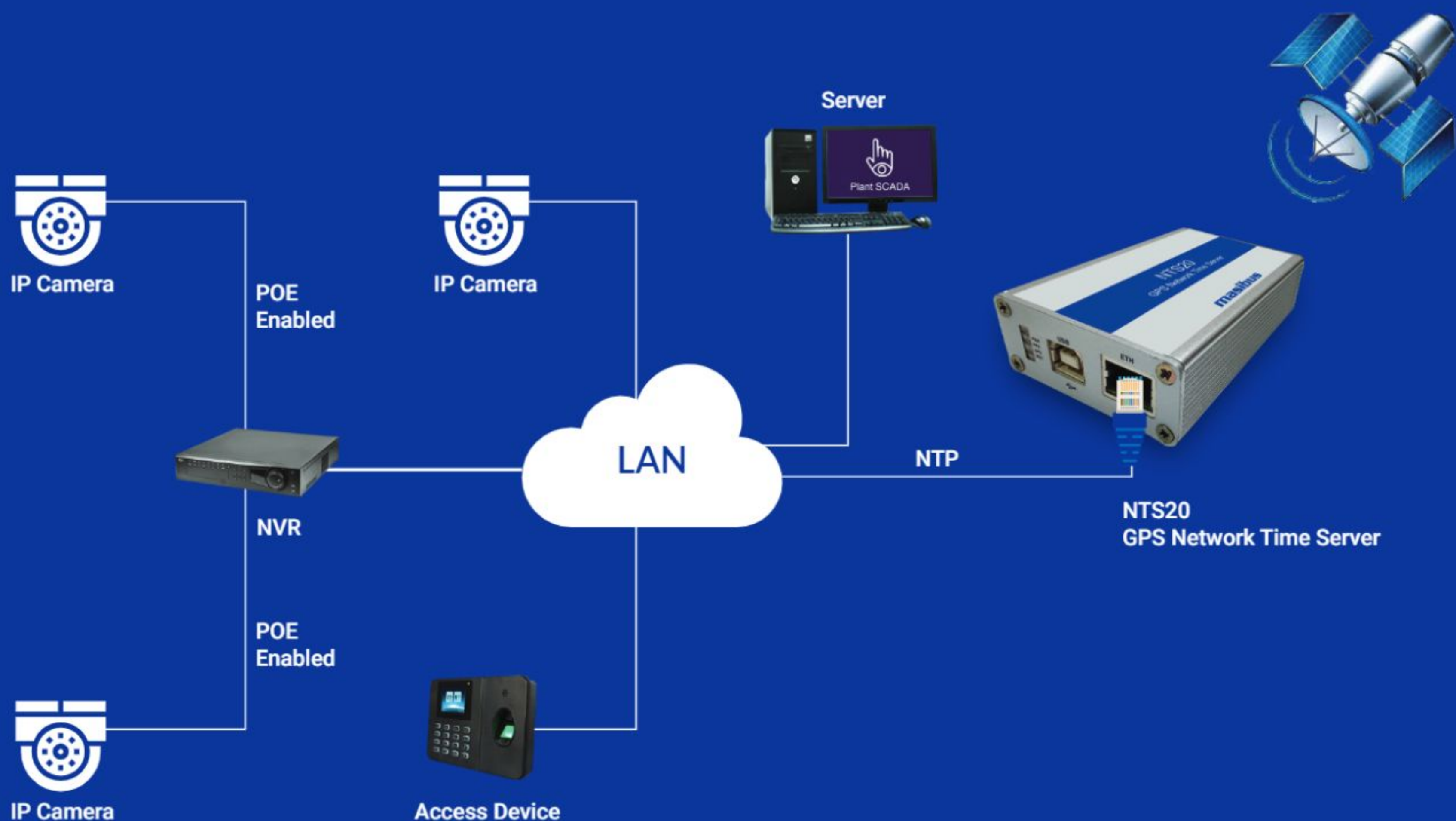
## Configuration Example in Process Industries



## Time Synchronization in Substation Automation



## Time Synchronization in Security & Surveillance Application



Video surveillance is an essential part of today's security system. Without accurate time stamps, surveillance video cannot be reliably used for event checking or other legal purposes. Therefore, it is necessary to use a system that provides accurate and reliable time stamping for legally traceable time.

Many systems rely on their internal clocks that have the tendency to drift—to gradually fall away from the actual current time. Such systems provide a false sense of security in that their time stamps can not be considered as valid proof.

NTP or Network time protocol is a time synchronization protocol is standard protocol is currently available in most of the IP cameras, Access control systems and computers. NTS20 will work as NTP server and all other devices like IP cameras, Access Control system will work as a NTP Client.

# Master Clock with Wireless Connectivity



MC-2

## GPS Wireless Master Clock - MC-2

- Receives automatic time from network of GPS satellites
- Transmits the time to clock through RF or serial
- Synchronization of server time system through RS-232/RS-485



DDU-24



DDU-26

## Wireless Slave Clock - DDU-24/26

- Each clock can act as repeater to extent network range
- Works in stand-alone mode if network fails
- DDU-24 / DDU-26 is also available in Ex-proof enclosure for gas group IIA and IIB (IP65)



DDU-44



DDU-46

## Wireless Slave Clock - DDU-44/46

- Use of unlimited slave clocks with in transmitter's range
- Optional TP (LAN Interface) with IEEE 802.3af compliant PoE
- Retains time during loss of power/time code



DDU-24-XP

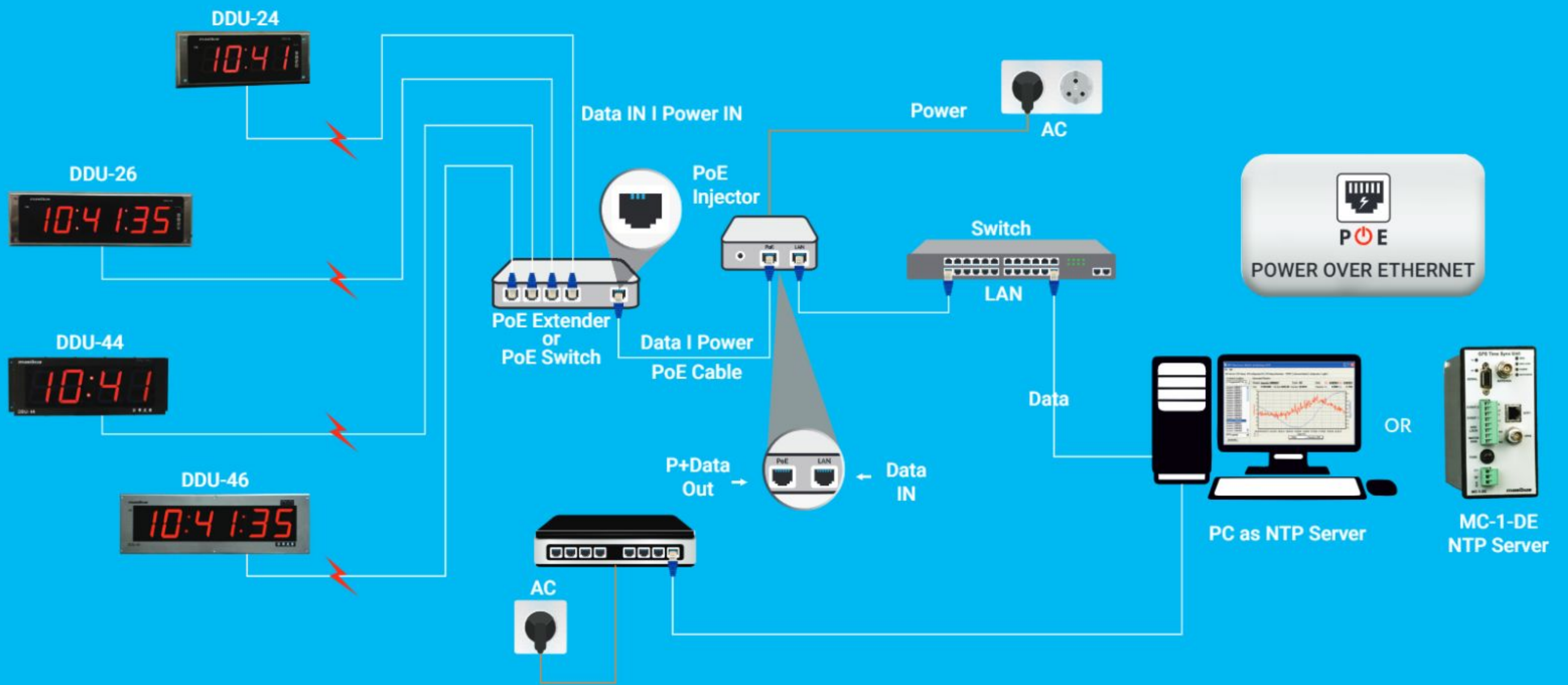


DDU-26-XP

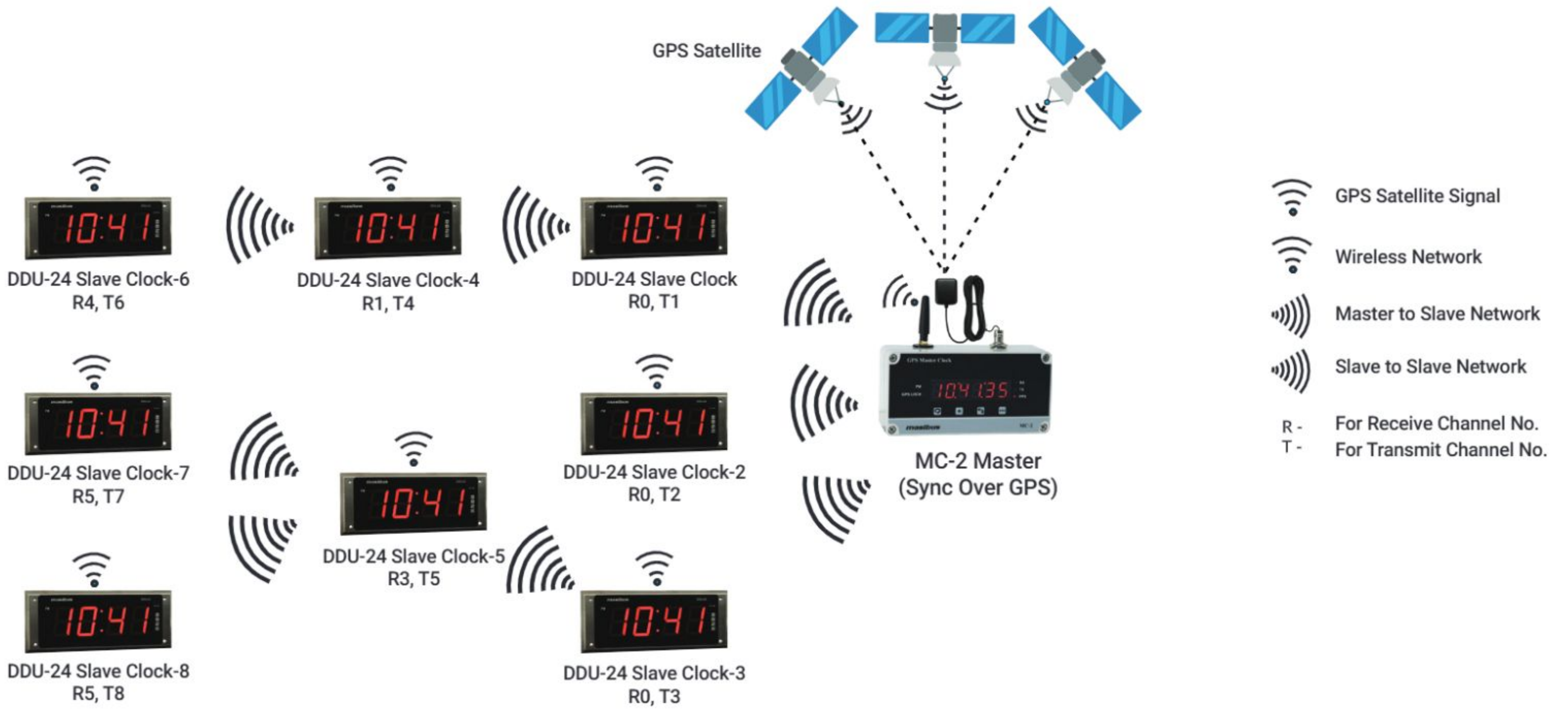
## Frequency Hopping

- Frequency-hopping is a method of transmitting radio signals by rapidly changing the carrier frequency among many frequencies occupying a large spectral band.
- The Frequency changes are controlled by a code known to both transmitter and receiver DDU Clocks
- It is inevitable that the wireless module will encounter frequency interference during communication. At this time, the wireless module will continuously switch frequencies of 868MHz band until the module avoids the interfered frequency and resumes communication at both the ends of the transceiver, which further extends the RF range and enhances the error free performance between the wireless clocks within the network
- RSSI (Received Signal Strength Indicator) function is inbuilt inside our clock model MC-2 & DDU
- Frequency hopping technique needs constantly switch the frequency, but it does not know whether the Particular RF channel can be used or not. So the RSSI can help the frequency hopping function to quickly find the available channels for communication
- Our Transceivers MC-2 / DDU Clocks determines the available channels and assign it to each clock for further internal RF continuous communication in the same network

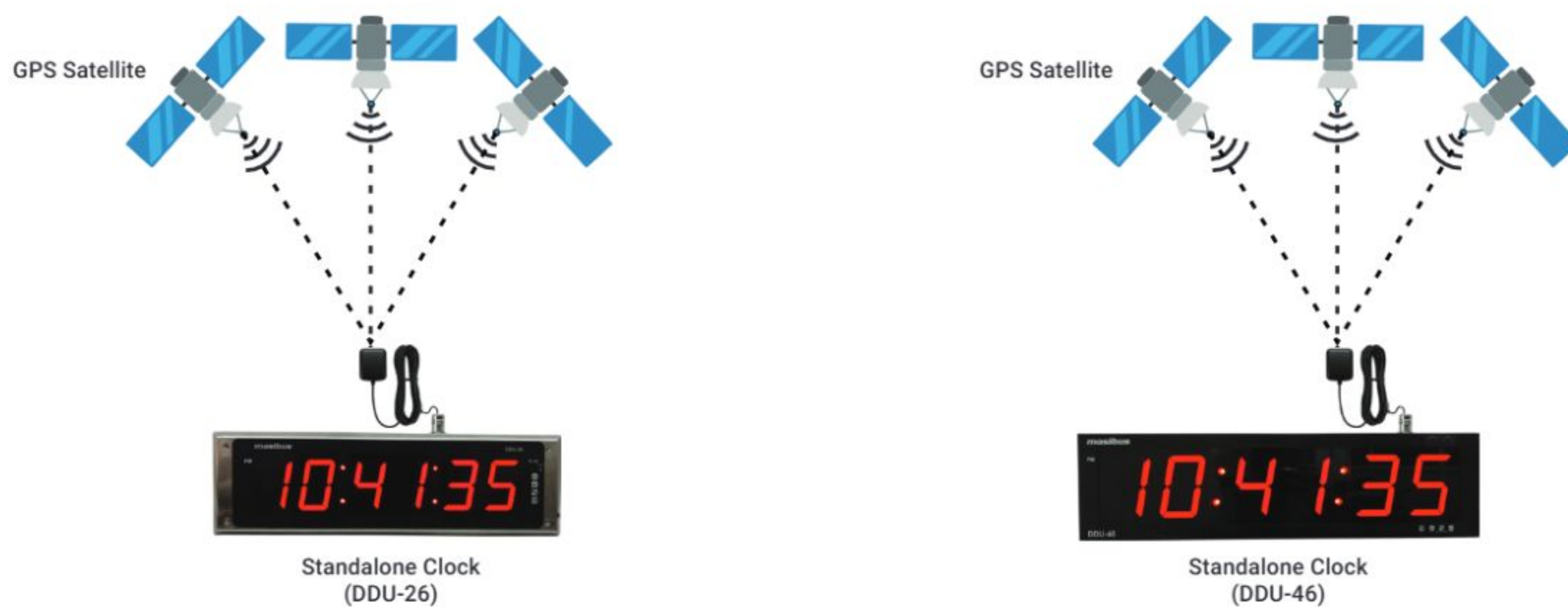
## Local Clock Display in any Process Industries



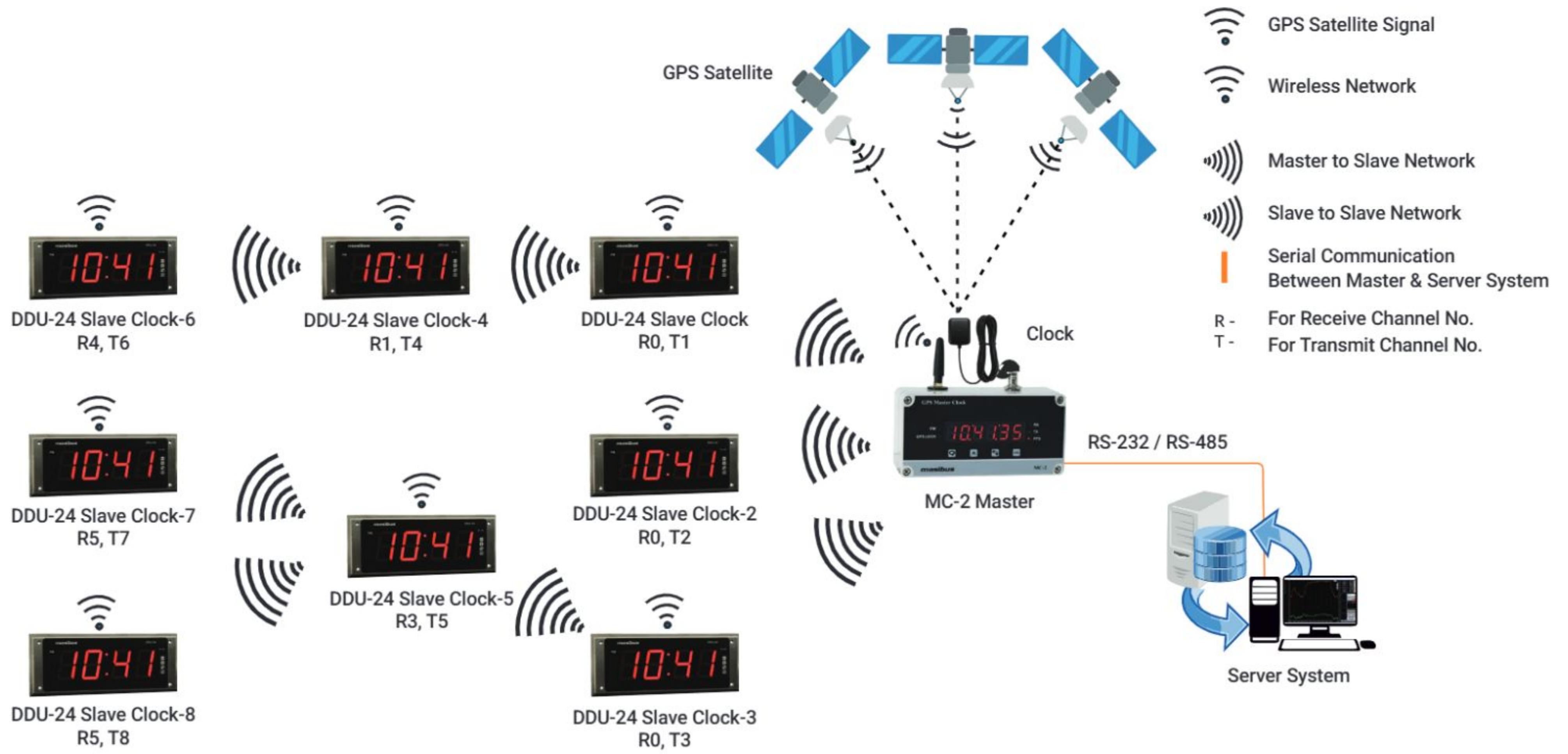
## Wireless Master Sync Over GPS Application Diagram



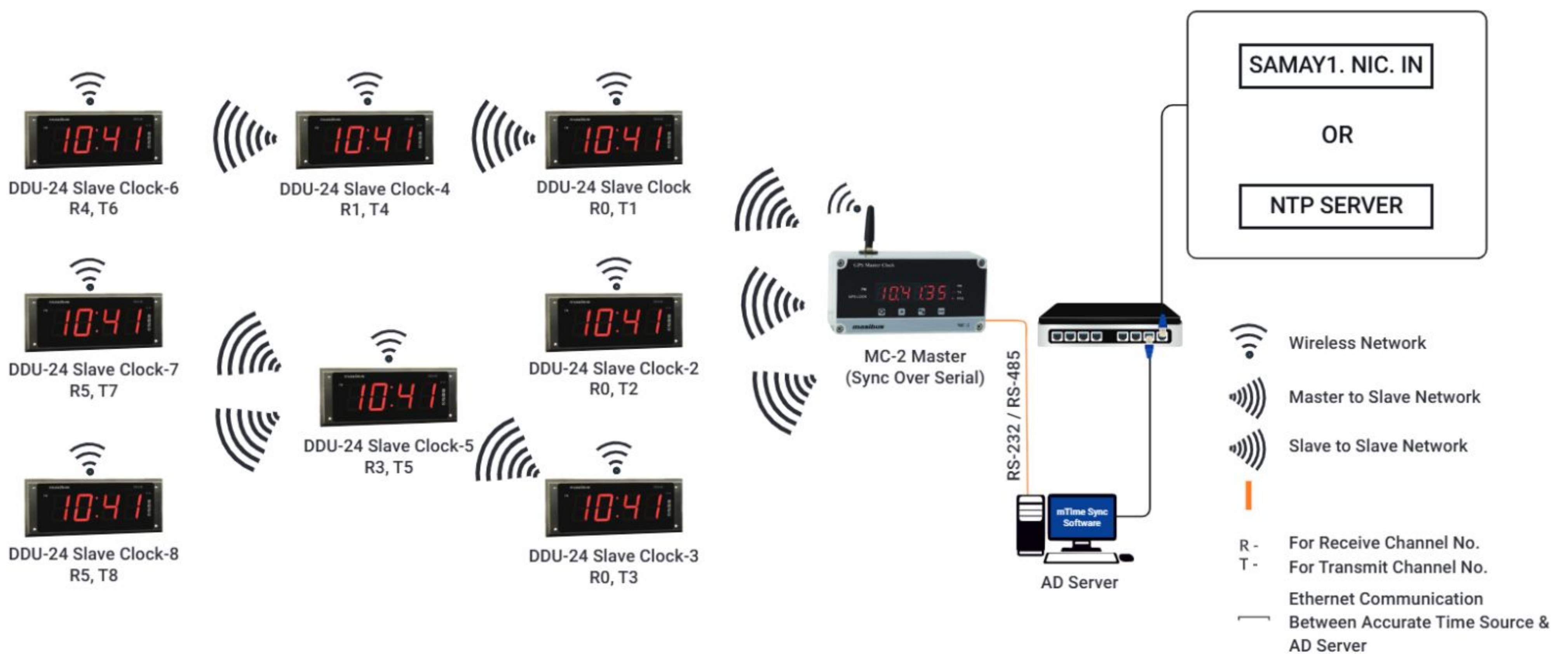
## Standalone Clock Sync Over GPS Application Diagram



## Wireless Master Sync Over Serial Application Diagram



## Wireless Master Sync Over NTP Application Diagram





# Technical Specifications- GPS Products

Technical Specifications	Product Models	MTS300R	MTS200R	MTS200L	MC-1-U	MC-1-DE	MC-1-DH
Parameters	Sub Parameters						
Timing Accuracy	Timing Accuracy	<15 ns with GPS Receiver (Receiver is locked on fixed position)					
	Positioning Accuracy	< 10 m					
	Input Frequency	1575.42 MHz L1 C/A code					
	Tracking	12 parallel channels					
	Acquisition Time	Hot Start < 5 sec. Warm Start < 38 sec. Cold Start < 45 sec.					
GPS Antenna	Redundancy	✓	✓	X	X	X	X
	Type	Active L1. GPS, 40 dB gain					
	Antenna Cable	RG6					
	Operating Temperature	-40 to +85 °C					
	Coverage	360 °C					
	Ingress Protection	IP67					
	Weight	150 g					
Display	LCD	20 X 4 Backlight LCD	20 X 2 Backlight LCD	20 X 2 Backlight LCD	20 X 2 Backlight LCD	X	6 digits, 0.56"(14mm) Seven Segment LED Display(Red)
	Data	Local/UTC Time, Date, Day of Week, Day of Year, GPS Parameters, LOCK/UNLOCK, Total GPS Satellites available, Timezone set, Ethernet LIVE/NOT-LIVE status,	Local/UTC Time, Date, Day of Week, Day of Year, GPS Parameters, LOCK/UNLOCK, Total GPS Satellites available, Timezone set, Ethernet LIVE/NOT-LIVE status,	Local/UTC Time, Date, Day of Week, Day of Year, GPS Parameters, LOCK/UNLOCK, Total GPS Satellites available,	Local/UTC time and date Day of the week Position latitude, longitude Status of the GPS receiver Current Data format of COM2	X	Local/UTC Time and Date, Lock/Unlock Indication
LEDs / Status Indication	Status Indication	Front Panel- Power, GPS Locked, Error, Network, Watchdog Rear Panel - Each card having Power and Status LED indicators as per card functionality	Front Panel- Power, GPS Locked, Error, Network, Watchdog Rear Panel - Each card having Power and Status LED indicators as per card functionality	Front Panel- Power, GPS Locked, Error, PPS, Watchdog Rear Panel - Each card having Power and Status LED indicators as per card functionality	Power, 1PPS, Watchdog, RTC ON/Event, GPS Locked	Power, 1PPS, Watchdog,GPS Locked	
Keys	Switch	Menu, 4 Navigation keys, Enter. Esc, Help	Menu, 4 Navigation keys, Enter. Esc, Help	Menu, 4 Navigation keys, Enter. Esc, Help	Menu, 4 Navigation keys, Enter, ESC, Help	X	
User Interface	Configuration Programming	Front keypad, Front console DB-9 Port (Serial RS-232) Web server (HTTP/HTTPS), SSH, SNMP, TELNET (Ethernet RJ45 Port)	Front keypad, Front console DB-9 Port (Serial RS232) Web server (HTTP/HTTPS), SSH, SNMP, TELNET (Ethernet RJ45 Port)	Front keypad, Front console DB-9 Port (Serial RS232) SNMP, TELNET (Ethernet RJ45 Port), HTTP	Keypad Hyper Terminal (Serial COM Port) Ethernet Parameters using TELNET (Ethernet RJ45 Port)	Serial,Telnet*	Telnet
Special Function	Antenna Cable Delay Compensation	✓	✓	✓	✓	✓	✓
	Manual Time Setting	✓	✓	✓	✓	✓	✓
	Universal Time Zone Setting	✓	✓	✓	✓	✓	✓
	Daylight Saving Time	✓	✓	X	X	X	X
Output	Event Outputs [configurable Event outputs (1 to 86400 seconds), PMOS relay,Rating: 350VDC/120mA ]	✓	✓	✓	1	2	X
	PPS output (BNC Female connector) (TTL into 250 ohms)	✓	✓	✓	1	1	1
	IRIG-B TTL [IRIG-B (007) or IEEE 1344/ C37.118-2005, 50 ohm]	✓	✓	✓	1	2 x IRIG-B TTL or 2 x IRIG-B AM or 1 x IRIG-B TTL + 1x IRIG-B AM	1
	IRIG-B AM [IRIG-B (127) or IEEE 1344/ C37.118-2005, 1 KHz AM Signal]	✓	✓	✓	1		
	PTP (IEEE 1588)	✓	✓	X		X	X
Frequency Output [2.048 Mhz ITU-T G.703 (E1), Unbalanced, BNC into 75 ohms]	Maximum 4	Maximum 4	Maximum 4	X	X	X	





# Technical Specifications- GPS Products

Technical Specifications	Product Models		DDU-TDC	DDU-TM / DDU-DT Time/Date Display	DDU-TD Time & Date Display	DDU-DY Day Display	DDU-HZ Frequency Display	DDU-CL Calendar Display (Date, Time, Day)
Parameters	Sub Parameters							
Display	No of Digit	Yes	Six	Six / Eight*(Date Only)	Time / Date: Six Digit	Three Digits	Five Digits	Time: Six Digit Date: Six Digit Day: Three Digit
	Digit Height	Yes	4" (100 mm)					Time: 4"(100 mm) Date: 2.3"(57 mm) Day: 2"(50 mm)
	Type of display	Yes	7-Segment	7-Segment	7-Segment	7-Segment	7-Segment	Time: 7-Segment Date: 7-Segment Day: 5x7 dot matrix Type
	Display Colors#	Yes	Red/Amber/Green/Blue	Red/Amber/Green/Blue	Time:Red Date: Red/ Amber	7-SRed/Amber/Green/ Blue	Red/Amber/Green/Blue	Time:Red Date:Red/ GreenDay: Red/Amber
	Display Format	Yes	Time: HH:MM:SS Date: DD.MM.YY / MM.DD.YY / YY.MM.DD	Time: HH:MM:SS Date: DD.MM.YY / MM DD.YY / YY.MM.DD	Time: HH:MM:SS Date: DD.MM.YY / MM.DD.YY / YY.MM.DD	DDD	XX.XXX	Time: HH:MM:SS Day: DDD Date: DD.MM.YY / MM.DD.YY / YY.MM.DD
Special Function	Lock/Unlock Indicator	Yes	✓	✓	✓	✓	NA	✓
	12/24 Hour Mode	Yes	✓	✓	✓	NA	NA	✓
	AM/PM Indication	Yes	✓	✓	✓	NA	NA	✓
	International Time Zone	Yes	✓	✓	✓	✓	NA	✓
User interface	Serial Configuration [Hyper Terminal]	Yes	✓	✓	✓	✓	NA	✓
	Telnet CLIENT [with LAN Interface only]	Yes	✓	✓	✓	✓	NA	✓
	Password Protected	No	✓	✓	✓	✓	NA	✓
	DIP Switch	No	NA	NA	NA	NA	✓	NA
Input	RS-232/RS-485	Yes	✓	✓	✓	✓	✓	✓
	IRIG-B TTL [PWM]	Yes	X	✓	✓	✓	NA	✓
	IRIG-B Modulated	Yes	X	✓	✓	✓	NA	✓
	NTP (LAN Interface)	Yes	✓	✓	✓	✓	✓	✓
	NTP (LAN Interface) Ethernet Frequency Input		X	✓	X	X	X	X
	Line Frequency Input	Yes	NA	NA	NA	NA	✓	NA
Connectors	RS-232[DB9]/ RS-485 [Standard 3-pin Plug-in Type]	Yes	✓	✓	✓	✓	✓	✓
	Ethernet, 100 BaseT, RJ-45	Yes	✓	✓	✓	✓	✓	✓
	Power, Standard 3-pin Plug-in Type	Yes	✓	✓	✓	✓	✓	✓
Physical Dimension	IP	Yes	IP20 (Rack/Panel, Wall Mount and Table Top)	IP20 (Table Top, Rack/ Panel, Wall) IP65 (Wall, Hanging Type)	IP20 (Table Top, Rack/ Panel, Wall) IP65 (Wall, Hanging Type)	IP20 (Table Top, Rack/ Panel, Wall) IP65 (Wall, Hanging Type)	IP20 (Table Top, Rack/ Panel, Wall) IP65 (Wall, Hanging Type)	IP20 (Table Top, Rack/ Panel, Wall) IP65 (Wall, Hanging Type)
	Size[W x H x D] [in mm] [Without Mounting Bracket]	Yes	665 X 175 X 60 (IP20)	646 x 177 x 68 ( IP 20) 200 x 800 x 120 (IP65)	646 x 355 x 68 (IP 20) 400 x 800 x 120 (IP65)	326 x 177 x 68 (IP 20) 200 x 400 x 120 (IP 65)	646 x 177 x 68 (IP 20) 200 x 800 x 120 (IP 65)	646 x 266 x 68 (IP 20)
	Weight (Approx.)	Yes	3.8 Kg (IP20)	4.5Kg (IP 20) 9Kg (IP65)	7.32 Kg.(IP 20) 16kg (IP65)	2.5Kg (IP20) 3.3 KG (IP65)	4.5Kg(IP20) 9Kg(IP65)	5.5 Kg. (IP20)
		Yes	M.S With Powder coating both in & out side	Aluminum with powder coat paint inside & out (IP20) 1.2mm mild steel with powder coat paint inside & out (IP65)				
	Front Acrylic	No	Smoke Grey Acrylic					
		Yes	Table Top, Rack/Panel/ Wall Mounting	Table Top/ Rack/Panel/ Wall/Hanging				
Power Supply	Power (NON POE)	Yes	AC: 90-264 V, 47-63 Hz, 1Ph & DC: 120-300 V	AC: 90-264 V, 47-63 Hz, 1Ph & DC: 120-300 V	AC: 90-264 V, 47-63 Hz, 1Ph & DC: 120-300 V	AC: 90-264 V, 47-63 Hz, 1Ph & DC: 120-300 V	AC: 90-264 V, 47-63 Hz, 1Ph & DC: 120-300 V	AC: 90-264 V, 47-63 Hz, 1Ph & DC: 120-300 V
	Power Consumption	Yes	<10W	<10W	<20W	<10W	<10W	<20W
	POE (NTP) Option	No	48V DC [36V DC min - 57V DC] Max. Standard: IEEE 802.3af]	48V DC [36V DC min - 57V DC] Max. Standard: IEEE 802.3af]	X	48V DC [36V DC min - 57V DC] Max. Standard: IEEE 802.3af]	X	X
	Power Consumption	No	<6W	<6W	X	<6W	X	X
Environmental	Operating Temperature	Yes	0 °C to +55 °C					
	Storage Temperature	Yes	-20 °C to +80 °C					
	Humidity	Yes	20-90 % RH (Non-condensing)					
Isolation	Isolation: Supply to Input	Yes	1500VAC RMS					

Note :- \* For 8 Digit Date display contact factory  
# For Display Color Other than RED, please specify at the time of Order

# Technical Specifications- GPS Products



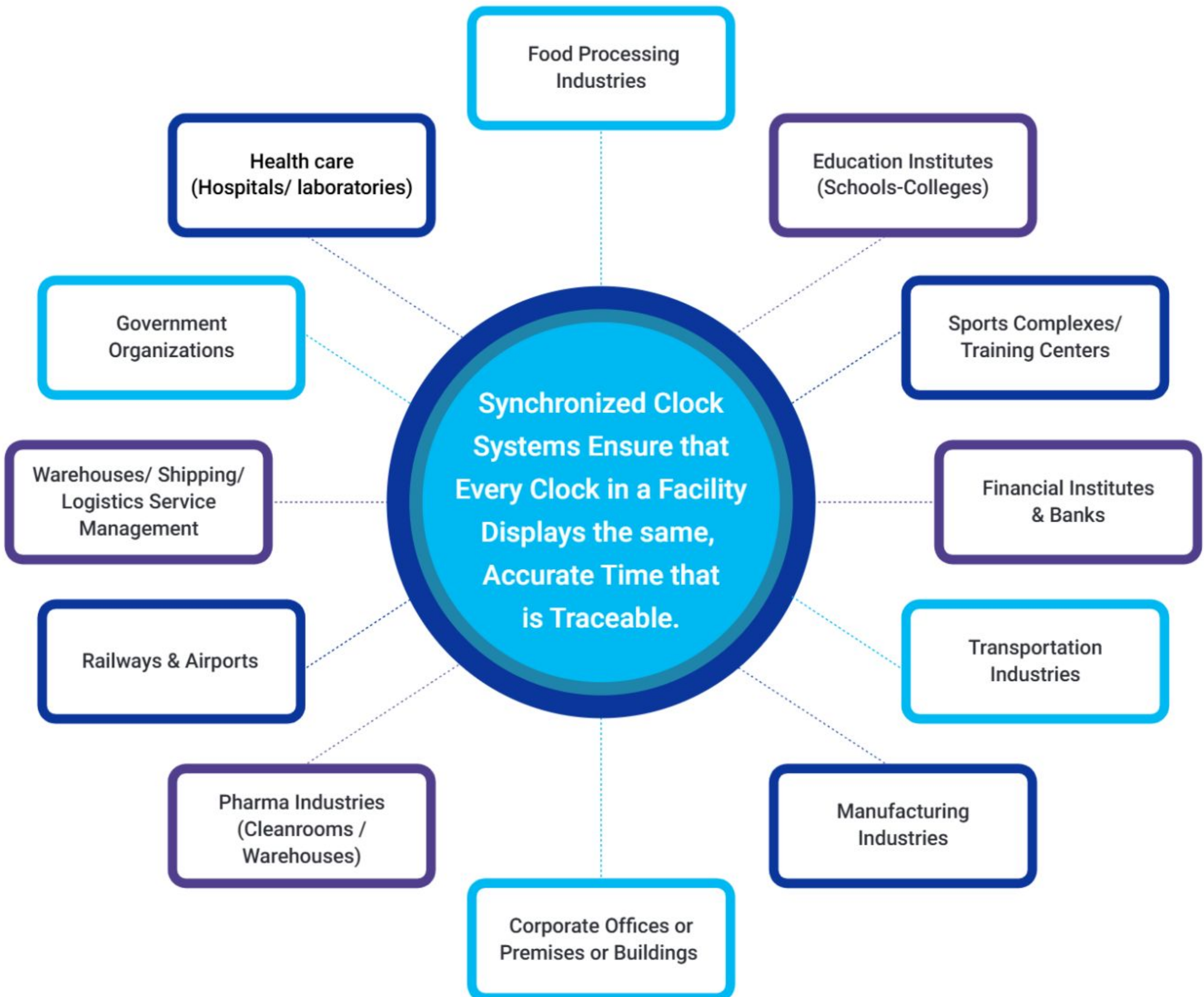
Specifications	MC-2 (Master Clock)	DDU-24/44 (Slave Clock)	DDU-26/46 (Slave Clock)
<b>Display</b>			
No. of Digit	Six	Four	Six
Digit Height	0.56" (14mm)	2.3" (57mm) for DDU-24/26 4"(100mm) for DDU-44/46	
Type of Display	LED		
Display Color	RED		
Display Format	Time: HH:MM:SS Date: DD.MM.YY/MM.DD.YY.MM.DD	Time: HH:MM Date: DD.MM/MM.DD	Time: HH:MM:SS Date: DD.MM.YY/MM.DD.YY.MM.DD
12/24 Hour Mode	✓		
AM/PM Indication	✓		
International Time Zone	✓		
<b>User Interface</b>			
Push Button Switch (For Configuration)	✓		
Password Protected	✓		
<b>RF wireless Communication</b>			
Wireless Frequency	886 MHz		
AM/PM Antenna	3 db Rubber duct External Antenna	Integrated antenna	
Receiver Sensitivity	-120 dBm	-120 dBm	
Transmitter Power	+30 dBm	+20 dBm	
Distance Range (Approx.)	600m Line of site,100meters with obstacles, 50 meters with obstacles for slave to staveldepends on site conditions)		
<b>Serial Communication (RS-232/RS-485)</b>			
Protocols	NMEA 0183/RMCI/NGTS/T-Format		
Baud Rate	4800/9600/19200/38400	9600/19200	
Terminal	4 pin, Plug-in type Connector: Wire: 2.5mm <sup>2</sup>		
<b>Power Supply</b>			
Power	AC:85-265V, 50/60 Hz, 1Ph & DC: 100-300 V		
Power Consumption	<2W	5W	
Terminal	3 pin, Plug-in type Connector		
Cable/Conductor Size	2.5mm <sup>2</sup>		
<b>Environmental</b>			
Operating Temperature	0°C to +55 °C		
Storage Temperature	-20 °C to +80 °C		
Humidity	20-95%RH (Non Condensing)		
<b>Physical</b>			
Enclosure Protection	IP20		
Size (HxWxD) in mm	80x160x55	118 x 298 x 54 for DDU-24 175 x 460 x 70 for DDU-44 (MS Enclosure) 215 x 500 x 79 for DDU-44 SS Front	118 x 404 x 54 for DDU-26 175 x 665 x 70 for DDU-46 (MS Enclosure) 215 x 705 x 79 for DDU-46 SS Front
Weigh (Approx.)	0.4Kg	1.5 Kg for DDU-24 2.8 Kg for DDU-44 (MS Enclosure) 3.0 Kg for DOU-44 (SS From)	1.9 Kg for DDU-26 4.0 Kg for DDU-46 (MS Enclosure) 4.1 Kg for DDU-46 (SS From)
Material	ABS	Front plate (SS) and Enclosure Mild Steel for DDU 24/26 DDU-44/46 Mild Steel for DDU-44/46	
Mounting	Wall Mount / Table Top	Wall Mount/ Panel Flush Mount	
<b>GPS Receiver for MC-2</b>		<b>Optional NTP [LAN Interface] for Slave Clock</b>	
Timing Accuracy	<15 rs with GPS Receiver (Receiver is locked on fixed position)	Time Sync Protocol	NTP V3, UDP, Telnet
Positioning Accuracy	< 10m	Internet Protocol	IP V4
Input Frequency	1575.42 MHz L1 C/A code	Mode	Client
Tracking	12 Parallel channers	Protocol Time Format	UTC
Acquisition Time	Hot Start <5 Sec. Warm Start <38 Sec. Cold Start <45 Sec.	Physical	RJ45, 10/100 Mbps
<b>GPS Antenna for MC-2</b>		<b>PoE (Power Over Ethernet) for NTP Slave Clocks</b>	
Type	Active L1, GPS, 28 dB gain	Standard	IEEE 802.3af
Antenna	RG174 (5 Meters supplied with unit)	Input Supply Voltage	48VDC [36VDC min.-57VDC Max.]
Operating Temperature	-40 to + 85 °C	Power Consumption	<6W
Coverage	360 °C Omni-directional	Terminal	100 BaseT, RJ45
Ingress Protection	IP67	Cable	CAT 5
Weight (Approx.)	60 gm		
Isolation (Withstanding Volatge) Between primary terminals* and secondary terminals**: At least 1500 V DC for 1 minute Between primary terminals* and gronding terminal: At least 1500 V DC for 1 minute Between gronding terminals and secondary terminals**: At least 1500 V DC for 1 minute		*Primary terminals indicate power terminals ** Secondary terminals indicate RS-232/RS-485 Insulation resistance: 20MQ or more @ 500 V DC between power terminals and gronding terminal #For any different type of antenna cable and length contact HO	
<b>DDU-24-XP / DDU-26-XP</b>			
<b>Physical</b>		<b>Mounting</b>	
Size [H x W x D] in mm	180 x 350 x 85 for DDU-24 180 x 455 x 85 for DDU-26	Mounting	Wall mounting with the help of 4 Nos. bolts of size M8
Enclosure	Flame proof (Explosion proof) Ex-d	Cable Entry Size/No.	3/4" ET-2 Nos.
Area Classification	Zone 1&2	Plug Details	1 Blind Plug & 1 DC Cable gland 3/4" ET
Gas Group	IIA, IIB		
Enclosure Protection	IP65		
Weight (Approx.)	5.4Kg for DDU-24/ 6.7Kg for DDU-26		

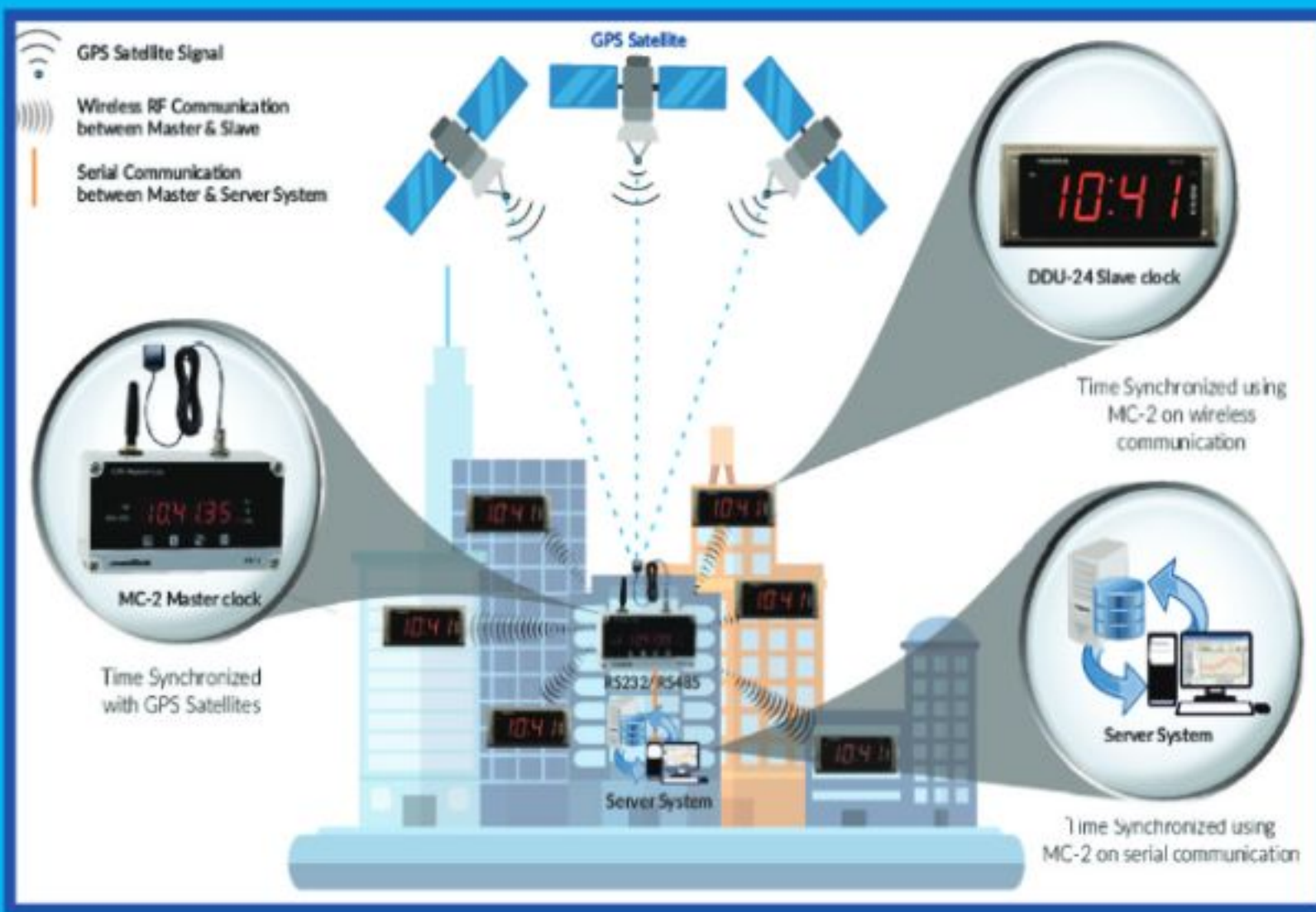
## DDU-24-XP / DDU-26-XP

Physical		Mounting	
Size [H x W x D] in mm	180 x 350 x 85 for DDU-24 180 x 455 x 85 for DDU-26	Mounting	Wall mounting with the help of 4 Nos. bolts of size M8
Enclosure	Flame proof (Explosion proof) Ex-d	Cable Entry Size/No.	3/4" ET-2 Nos.
Area Classification	Zone 1&2	Plug Details	1 Blind Plug & 1 DC Cable gland 3/4" ET
Gas Group	IIA, IIB		
Enclosure Protection	IP65		
Weight (Approx.)	5.4Kg for DDU-24/ 6.7Kg for DDU-26		

# Masibus Wireless Master / Slave Clocks for Accurate Time Synchronization

Model	MC-2	DDU-24	DDU-44
Unit	Master Clock	Slave Clock	Slave Clock
Display Size	6 digit, 0.56"(14mm)	4 digit, 2.3" (57mm)	4 digit, 4" (100 mm)
Display Type	LED	LED	LED
Mounting	Table-top/ Wall	Wall/ Panel/ Flush	Wall/ Panel/ Flush
Repeater	✗	✓	✓
Communication	RF or Serial or both	RF or Serial or both	RF or Serial or both
Time frame Inputs	NMEA-0183[RMC]/ NGTS/ T-Format	NMEA-0183[RMC]/ NGTS/ T-Format	NMEA-0183[RMC]/ NGTS/ T-Format
Timing Accuracy	< 15 ns with GPS Locked	< 15 ns with GPS Locked	< 15 ns with GPS Locked
Flameproof	Available	Available	Available





## Government Departments/Corporate Buildings-Offices

To maintain workflow, IT server rooms, interdepartmental activities, meetings, deadlines, employee schedules to optimize and increase productivity and efficiency. Same accurate time across workstations, offices, departments, meeting rooms, activity areas in the entire facility



## Manufacturing Industries

- Local time display of Manufacturing processes
- Shift changes
- Packaging & shipping schedules
- Maintain accurate timing
- Better processes management for entire premises or plant

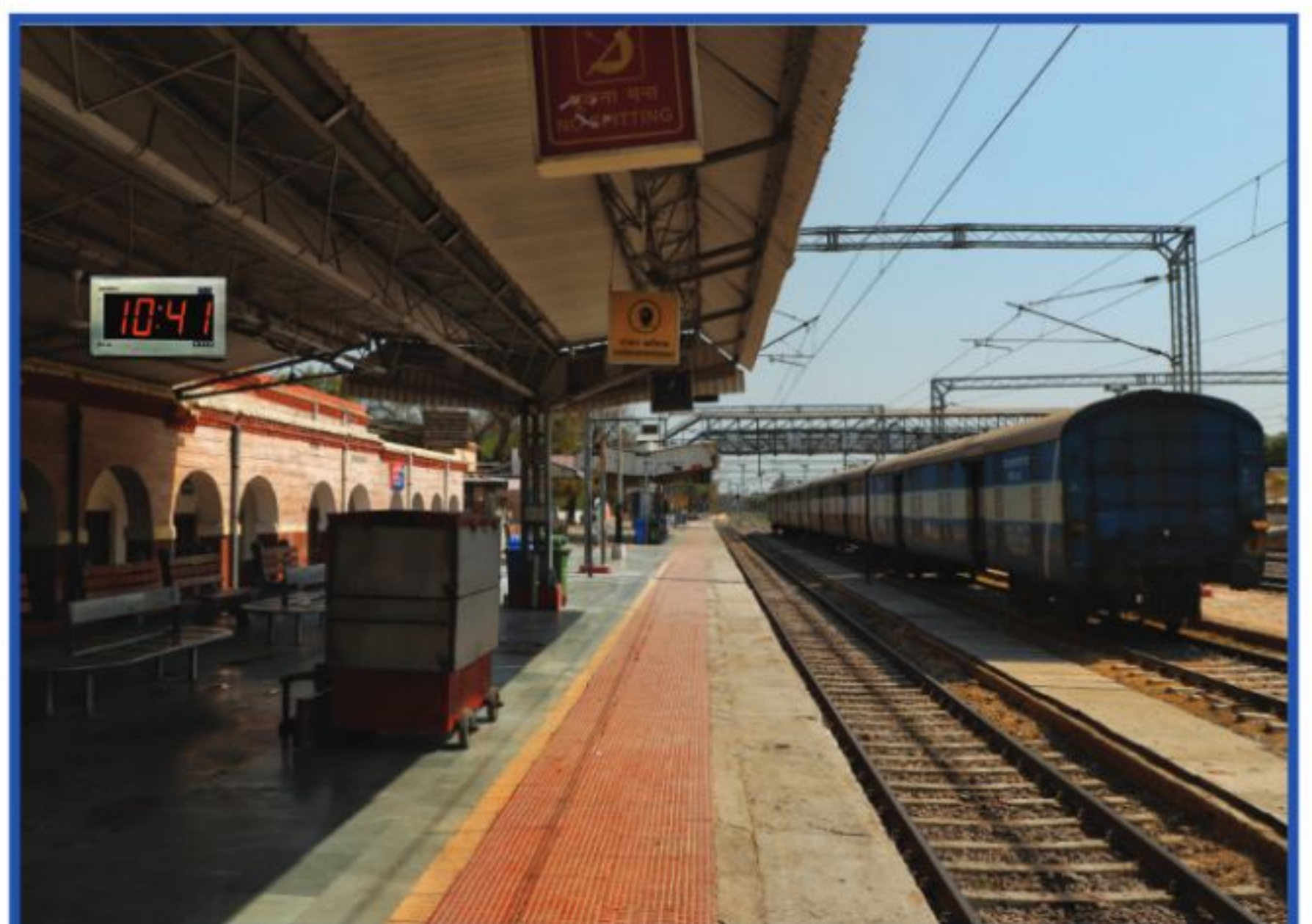
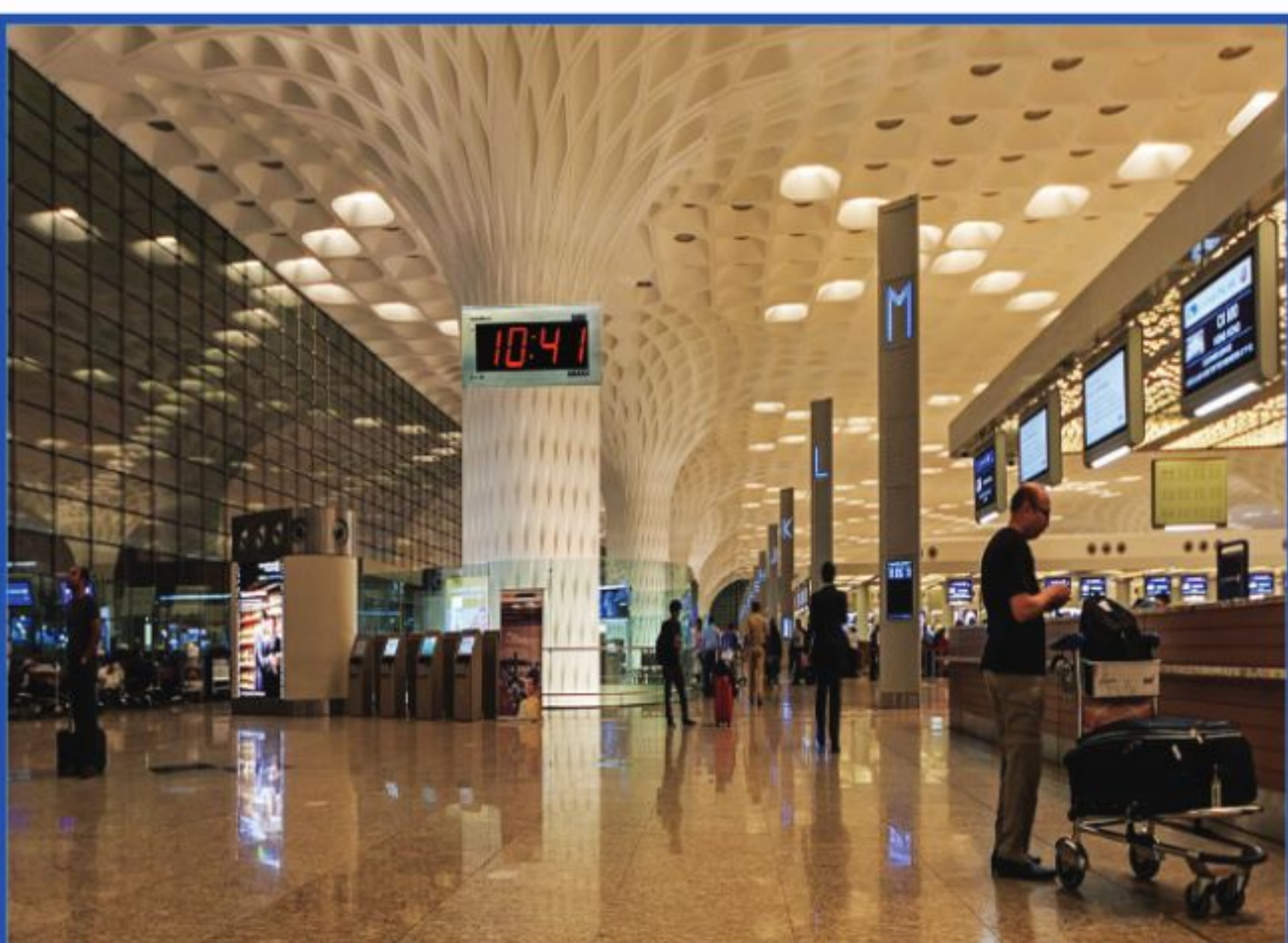


## Pharmaceutical Industries

- Local time display at various section
- All pharmaceutical company (Manufacturing / warehouses / cleanrooms)
- Time punctuality in clinical research, Operation/ production/ reports
- USFDA compliance (21 CFR) - legally traceable timestamps, audit trails, file logs & process reports etc.

## Public Transports - Railways & Airports

Provide accurate time information to waiting rooms / IT networks / maintenance areas / terminals / station-displays/ service area / canteens and workforce management in different areas at railways and airports





# Where all GPS Clock is Used



**Airport**



**Surveillance / Traffic Signal**



**Banking Sector**



**Power Generation**  
(Fossil, Renewable, Hydraulic, Nuclear etc.)



**Metro Railways**



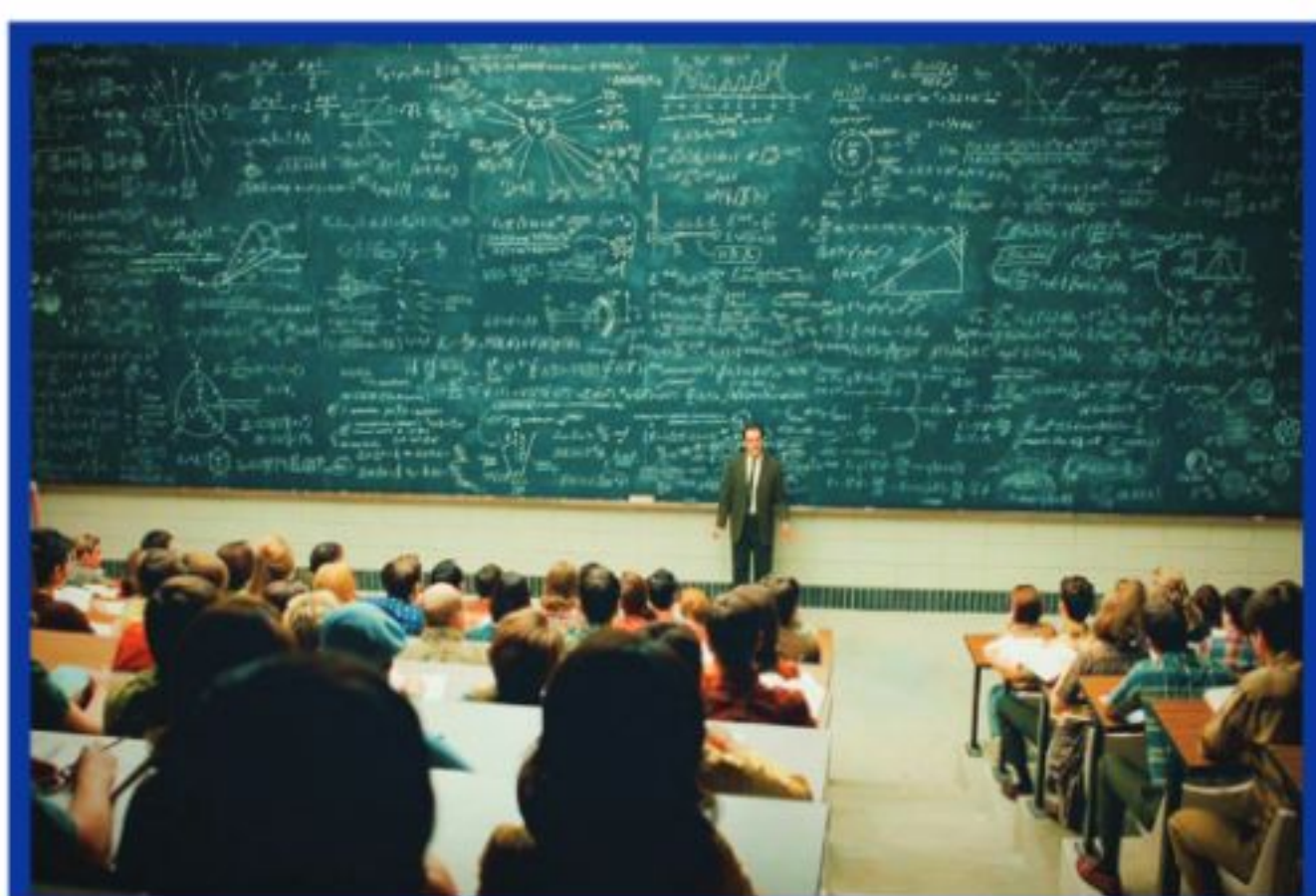
**Process Industries for time stamp & SOE**



**Power Distribution**



**Hospital**



**Educational Institute**



**Shopping Mall**

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