# OSA 5430

Advanced high-capacity synchronization solution

Reliable and accurate delivery of synchronization from the core to the network edge is essential to meet the stringent requirements of new mobile, fixed and cable networks. However, the challenges go beyond accuracy. As well as strict precision, network operators need a robust, scalable and cost-effective solution that can work over packet-based networks as well as legacy infrastructure.

With our OSA 5430, a carrier-grade IEEE 1588v2 grandmaster clock supporting 10Gbit/s as well as 1Gbit/s interfaces with hardware timestamping, cost-effective and accurate synchronization distribution for next-generation technologies such as LTE-A and 5G is no longer a challenge. What's more, its NTP server, multiple BITS outputs and GNSS receiver capabilities, make it also ideal for the smooth upgrade of legacy synchronization architectures. And with its ability to deliver precise timing to DOCSIS 3.1 remote PHY devices, the OSA 5430 is also a powerful tool to help cable operators tackle booming demand. With a modular, scalable and fully redundant design, our OSA 5430 offers the highest configuration flexibility and reliability. In addition, our integrated Syncjack™ technology enables in-service synchronization monitoring and assurance without the need for expensive test equipment.
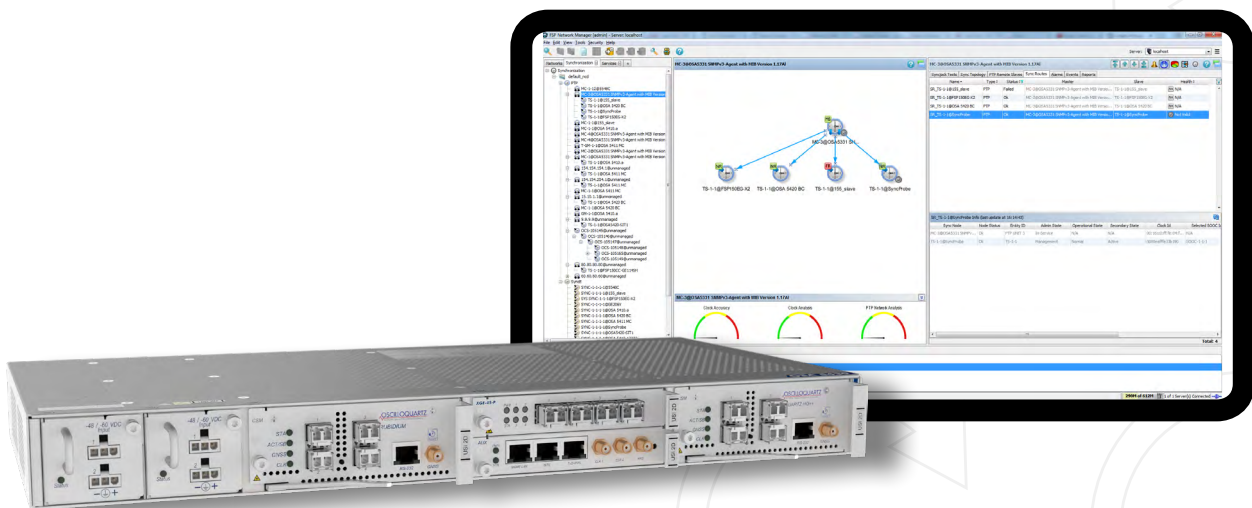
Your benefits

⊘ **Fully redundant hardware**
All key modules are protected ensuring no loss of performance and high service availability

⊘ **High-speed connectivity**
First telecom grandmaster supporting PTP, NTP and SyncE over 10Gbit/s as well as 1Gbit/s interfaces with hardware time stamping

⊘ **Syncjack™ techonology**
Built-in synchronization accuracy monitoring, testing and assurance functionality

⊘ **Extended holdover performance**
High-end quartz and rubidium oscillator options

⊘ **Unique flexibility**
Modular and scalable design, configurable to operate in ePRTC, PRTC, SSU, PTP grandmaster clock, APTS, boundary clock and slave clock mode as well as NTP server

⊘ **Operational simplicity**
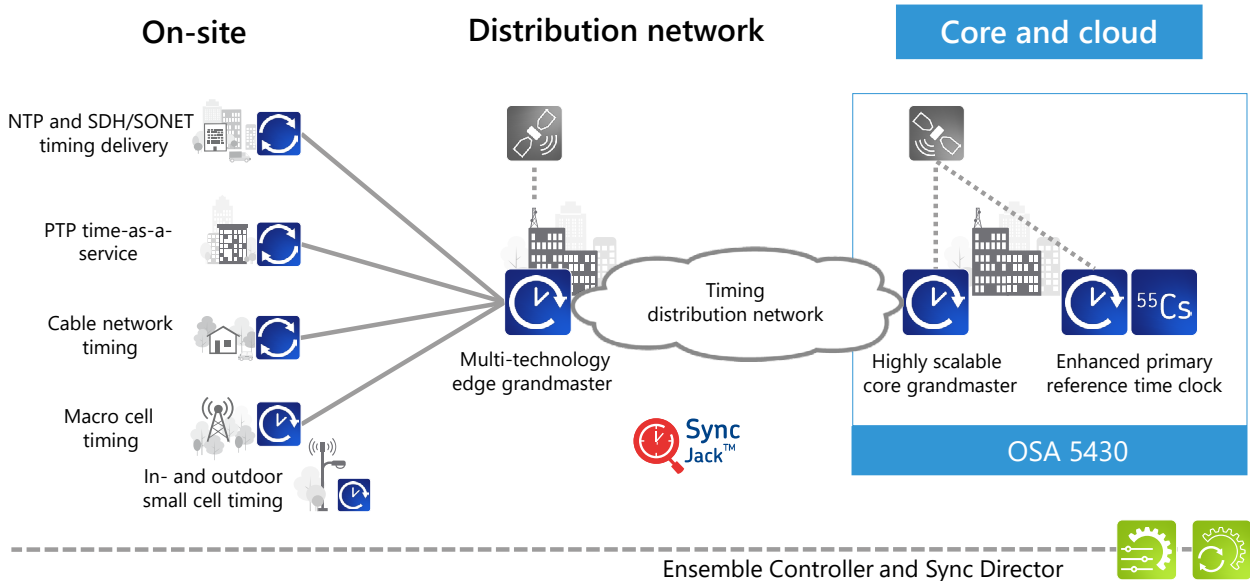Ensemble Controller, including Sync Director, for superior management and synchronization monitoring

High-level specifications

System overview

- High-quality OCXO, DOCXO and rubidium
- Up to 8 x 1/10GbE (base unit) plus 4 x 1/10GbE (line card)
- Up to 2048 unicast slaves
- Hot-swappable redundant clock, GNSS and PSU

Operation modes

- ePRTC, PRTC
- IEEE 1588 PTP grandmaster, boundary clock, slave and probe
- NTP server
- PRC/SSU (Sync-E and BITS)

Built-in GNSS receiver

- GPS / GLONASS / BEIDOU / GALILEO
- GPS+GLONASS
- GPS+BEIDOU
- GPS+GALILEO

PTP profiles

- Default profiles over Ethernet and IP multicast
- Telecom profiles G.8265.1, G.8275.1 and G.8275.2
- Enterprise hybrid profile
- HW-based packet processing

NTP server

- High-capacity Stratum 1 server
- HW timestamping
- NTP/PTP/Sync-E/SSU supported simultaneously
- NTP authentication
- PTP to NTP conversion

Expansion cards (optional)

- One hot-swappable expansion card per OSA 5430
- Line cards:
  - 16 x E1/T1/2.048MHz (120/100/75ohm)
  - 4 x 1/10GbE (PTP/Sync-E)

Applications in your network

Timing distribution from the network core

- Radio access network synchronization including 4G, 4.5G LTE/LTE-A, 5G NR, femtocells and small cells
- Precise synchronization of legacy network architectures based on NTP and PRC/SSU
- Cable networks (DOCSIS 3.1) and PON synchronization
- Data centers and enterprise networks synchronization

On-site   **Distribution network**   **Core and cloud**

NTP and SDH/SONET timing delivery

PTP time-as-a-service

Cable network timing

Macro cell timing

In- and outdoor small cell timing

Multi-technology edge grandmaster

Timing distribution network

Sync Jack™

Highly scalable core grandmaster

Enhanced primary reference time clock

55Cs

OSA 5430

Ensemble Controller and Sync Director

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Product variations

	OSA 5430
Size (WxHxD)	1RU 443m m x 44.1mm x 216mm / 17.44" x 1.73" x 8.50"
Clock	Quartz (OCXO) Quartz HQ+ (high-quality DOCXO) Quartz HQ++ (enhanced high-quality DOCXO) Rubidium
Expansion line Cards	Up to 1
PTP/NTP/Sync-E ports	Up to 12
BITS output ports	Up to 17
PSU	Hot-swappable redundant DC PSU (up to 2)

Main applications

- Enhanced primary time clock (ePRTC)
- Primary time clock (PRTC)
- 1588v2 PTP grandmaster clock (up to 2048 PTP clients at 128pps)
- 1588v2 PTP boundary clock (up to 2048 PTP clients at 128pps)
- 1588v2 PTP slave input (as backup to GNSS) - APTS
- GNSS receiver and PRC/PRTC including fan-out of multiple physical synchronization output interfaces
- Synchronization supply unit (SSU)
- NTP server
- Sync probe – Syncjack™ monitoring and assurance

NTP features

- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3 and v4 over IPv4 and IPv6
- MD5/SHA-1 NTP authentication
- Hardware timestamping accurate to 10nsec RMS
- NTP server accuracy within +/−100nsec from UTC when locked to GNSS
- Up to 16 NTP server IP addresses
- Support PTP and NTP on same Ethernet port
- PTP to NTP translation
- Up to three stacked VLANs per flow (Q-in-Q service provider tagged)
- Enhanced NTP statistics and client lists
- Up to 8000 transactions per second, per CSM
- PTP backup in case of GNSS outage

PTP networking features

- PTP profiles support:
  - ITU-T G.8265.1 frequency delivery profile (IP unicast over IPv4/IPv6)
  - ITU-T G.8275.1 time/phase delivery profile (full timing support - Ethernet multicast)
  - ITU-T G.8275.2 time/phase delivery profile (assisted partial timing support - IPv4/IPv6)
  - PTP enterprise profile (mixed multicast and unicast)
  - IEEE 1588 2008 PTP default profile over IP multicast
  - IEEE 1588 2008 PTP default profile over Ethernet multicast (Annex F)
- No performance degradation as slave capacity grows
- Up to 16 master/BC IP addresses (IPv4 and IPv6 supported simultaneously)
- Up to 16 EVCs (IEEE 802.1Q customer-tagged) and stacked VLANs per CSM
- Support for multiple profiles simultaneously
- Support PTP (TAI) and arbitrary (ARB) timescales
- Support master and slave on any port simultaneously
- Up to three stacked VLANs per flow (Q-in-Q service provider tagged)
- Enhanced PTP GM/BC/slave statistics, performance monitoring (15min and 24h), threshold crossing alarm (TCA) and SNMP traps
- In-house best-in-class clock recovery algorithms
- DoS protection using hardware access control list (ACL) and traffic rate limiting

Hardware modules

- Modules:
  - CSM: Clock synchronization module.
  - AUX: Auxiliary I/O module
  - PSU: Power supply unit
- Expansion line cards (optional):
  - XGE-4S-P: 4 x 1/10Gbit/s Ethernet card
  - BTOH-P-16: 16 x BITS outputs card
- Number of modules supported per product:

	OSA 5430
CSM	1-2
AUX	1
PSU	1-2
Line Cards	0-1

Product specifications are subject to change without notice or obligation.

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Clock synchronization module (CSM)

- Dual CSM design allows full protection of all critical components including GNSS , PTP/NTP ports , oscillator and management

CSM oscillator options

- Quartz (OCXO)
- Quartz HQ+ (high Quality DOCXO)
- Quartz HQ++ (enhanced high quality DOCXO)
- Rubidium

4 x Ethernet ports

- Hardware-based timestamping (PTP and NTP)
- 4x 1Gbit/s (SFP) or 10Gbit/s (SFP+), user configurable
- All ports support SM/MM colored/non-colored/dual/single fiber SFP / SFP+ and copper SFP
- Per-flow hardware-based policing and scheduling
- Configurable link asymmetry delay compensation

Synchronous Ethernet (SyncE)

- Compliant to the relevant sections of ITU-T G.8261/G.8262/G.8264
- Ethernet synchronization message channel (ESMC)
- Sync-E for time holdover during GNSS outage

GNSS Receiver

- Dual antenna inputs for embedded GNSS receivers (on each CSM)
- Multi-constellation GNSS (GPS / GLONASS / BEIDOU/ GALILEO) L1 32-channel receiver
- Hardware-ready for QZSS
- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay compensation
- Support fix positioning – single satellite mode
- Software configurable mode of operation
  - GPS (1575.42MHz)
  - GLONASS (1601.5MHz)
  - BEIDOU (1561MHz)
  - GALILEO (1575.42 MHz)
  - Combined GPS + GLONASS
  - Combined GPS + BEIDOU
  - Combined GPS + GALILEO
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50ohm)

Auxiliary card (AUX)

Synchronization interfaces

- 1 x BITS in/out
- 1 x PPS in/out
- 1 x Time-of-day (ToD) + PPS in/out
- 2 x CLK 10MHz in/out

BITS

- 1 x BITS input and output over shielded RJ-48
- User-configurable: E1, T1 (DS1), 2.048MHz
- G.823 / G.824 sync interface compliant
- Synchronization status message (SSM)
- BITS input for time holdover during GNSS outage
- Output squelch option
- SSU filtering option

PPS in /out

- 1 x PPS input/output (user configurable)
- User configurable input and output delay compensation
- SMA-F connector (50ohm)
- Output squelch option

ToD + PPS In/Out

- G.8271 compliant
- ToD format – NMEA 0183 ($GPZDA sentence) and CCSA
- RS422 over shielded RJ-45
- Output squelch option

CLK in / out

- 2 x CLK 10MHz input / output (user configurable)
- SMA-F connector (50ohm)
- Output squelch option

Output expansion line cards

- Line cards:
  - XGE-4S-P: 4 x 1/10Gbit/s Ethernet card
  - BTOH-P-16: 16 x BITS card
- One line card per OSA 5430
- Field upgradable
- Hot insertion / extraction support
- Overvoltage / current protection
- Two line cards share a single mountable patch panel with 16 x RJ-48 / RJ-45 and/or 16 x BNC connectors

BTOH-P-16 (16 x BITS)	XGE-4S-P (4 x 1/10Gbit/s)
Capabilities — 16 x BITS outputs over high density connector (VHDCI) – supporting 2.048MHz, E1 or T1 (DS1), SW configurable of output signals type and line impedance (E1, 2.048MHz)	4 x 1/10Gbit/s fiber Ethernet ports (PTP / Sync-E) Syncjack™ Sync-E and PTP monitoring and assurance

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Holdover performance

	Clock	Aging / Day (after 30 days)	Temperature Stability
Quartz CSM	High-quality OCXO Stratum 3 / G.812 Type III	$\pm 5 \times 10^{-10}$	$\pm 50 \times 10^{-10}$
Quartz HQ+ CSM	DOCXO Type I	$\pm 2 \times 10^{-10} / \pm 1 \times 10^{-10}$ *	$\pm 2 \times 10^{-10}$
Quartz HQ++ CSM	DOCXO Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-11} / \pm 1 \times 10^{-1}$ *	$\pm 1 \times 10^{-11}$
Rubidium CSM	Rubidium Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-12}$	$\pm 2 \times 10^{-10}$

Note: Effective daily aging after device has been powered for one month and locked to GPS for three days, for the following three days.

	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz CSM	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
Quartz HQ+ CSM	8 hours	13 hours	15 hours	1.2 days	1.7 days	0.5 years
Quartz HQ++ CSM	15 hours	1.3 days	2 days	4 days	6 days	>1.5 years
Rubidium CSM	15 hours	1.3 days	2 days	4 days	6 days	>5 years

Note: The above are approximated values assuming constant temperature, no initial phase and frequency error, after device has been powered for one month and locked to GPS for 72 hours.

Sync signal conversion

From / To	SyncE Tx	BITS OUT	CLK OUT (10MHz)	PTP	NTP	PPS OUT	ToD
GNSS	✓	✓	✓	✓	✓	✓	✓
SyncE Rx	✓	✓	✓	✓	n/a	freq	n/a
BITS IN	✓	✓	✓	✓	n/a	freq	n/a
CLK IN (10MHz)	✓	✓	✓	✓	n/a	freq	n/a
PPS IN	✓	✓	✓	✓	✓	✓	✓
PTP	✓	✓	✓	✓	✓	✓	✓

GM / PRTC frequency and time accuracy
- While locked to GNSS:
- Phase and time – PRTC / G.8272 phase accuracy (±100nsec from UTC)
- Frequency – PRC / G.811 frequency accuracy

GM / ePRTC frequency and time accuracy
- While locked to GNSS and connected to ePRC:
- Phase and time – ePRTC / G.8272.1 phase accuracy (±30nsec from UTC)
- Holdover within +/-100nsec for 14 days

Syncjack™ monitoring and assurance tools
- Clock accuracy for up to two clock probes – computing TE, TIE and MTIE of physical clocks
  - Calculation of maximum, constant and dynamic TE, TIE and MTIE between physical source and reference signals
  - Programmable source and reference signals including SyncE, BITS, PPS, GNSS and 10MHz
  - MTIE mask and time error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports

- Clock analysis for up to four PTP clock probes – packet TE, TIE and MTIE
  - Calculation of packet maximum, constant and dynamic TE, TIE and MTIE between physical reference signal and timestamps within the PTP packets
  - Support for active and passive probe mode
  - Programmable reference signals including SyncE, BITS, PPS, GNSS and 10MHz
  - MTIE mask and Time Error threshold alarms based on SNMP traps
  - TE/TIE raw data collection and export to server
  - Daily MTIE and TE performance monitoring reports
- PTP network analysis including PTP network probe
  - Packet delay and packet delay variation performance statistics
  - Delay asymmetry
  - Network usability statistics (FPP based on G.8261.1)
  - Packet loss statistics
  - Programmable reference signals including SyncE, BITS, PPS, GNSS and 10MHz
  - Enhanced sync assurance statistics, performance monitoring (15min & 24h), including data export, threshold crossing alarm (TCA) and SNMP traps

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Low-touch provisioning
- Text-based configuration files
- FTP/SFTP/SCP for configuration file copy
- Remote software upgrade

Management and security

Local management
- Serial port (RS232 over RJ45) for CLI (on CSM)

Remote management
- Local LAN port (100/1000BaseT over RJ45) using CLI, SNMP and Web GUI interfaces (on AUX)
- Support for IPv4 and IPv6 (dual stack)
- Maintains in-band VLAN-based management tunnels
- Static routes & configuration of default getaways
- Fully interoperable with ADVA FSP 150 and ADVA FSP 3000 products
- Supported by ADVA Ensemble Controller, including Ensemble Sync Director

Management protocols
- Telnet, SSH (v1 / v2)
- HTTP / HTTPS
- SNMP (v1 / v2c / v3)

Secure administration
- Configuration database backup and restore
- System software download via FTP, HTTPS, SFTP or SCP (dual flash banks)
- Remote authentication via RADIUS/TACACS+
- SNMPv3 with authentication and encryption
- Access control list (ACL)
- ICMP filtering and rate limiting

IP routing
- ICMP
- DHCP v4/v6
- ARP cache access control
- IPv4 RIPv2 and static routes
- IPv6 NDP address resolution and static routes
- RIPng for IPv6

System logging
- Syslog, alarm log, audit log and security log
- Configurable system timing source – local/NTP/PTP/PRTC (GNSS)
- User configurable time zone and daylight saving time (DST)

Standards compliance
- ITU-T G.8261, G.8262, G.8264, G.703, G.781, G.812, G.811
- ITU-T G.8272.1, G.8272, G.8273.2
- ITU-T G.8265.1, G.8275.1, G.8275.2
- IEEE 1588v2 (PTP), 802.1Q (VLAN), 802.1ad, 802.1p (priority), 802.3ae (10G)
- RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON), RFC 2460 (IPv6)
- RFC 1059 (NTPv1), RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (SNTPv4)

Regulatory compliance
- CE compliance
- RoSH compliance
- Power: ETSI 300 132-2, BTNR2511, ETS 300-019, ETS 300-019-2-[1,2,3], ANSI C84.1-1989
- Safety: EN 60950-1, 21CFR1040.10, EN 60825
- EMI: EN 55022 2010 Class A, EN 61000-3-2-2006, EN 61000-3-3 2008, EN 300 386 v1.6.1 2012, FCC 47FR Part 15 2014 Class A, ICES-002 2012 Class A

Power supply
- Hot-swappable, modular DC-PSU: -48 / -60VDC (tolerate -36 to -72VDC) with over-voltage and over-current protection

Environmental
- Dimensions (W x H x D): 443mm x 44mm x 216mm / 17.44" x 1.73" x 8.50"
- Weight (depending on the configuration): 3.6Kg to 5.5Kg
- Operating temperature (ambient): -5 to +45°C
- Storage temperature: -40 to +70°C (GR-63-CORE)
- Humidity: 5 to 95% (non-condensing)
- Operational altitude: -450m to 5000m

Optional accessories
- GNSS (GPS / GLONASS/BEIDOU/GALILEO) antenna kits 10 / 20 / 60 / 120 / 150m (32.8ft / 65.6ft / 196.85ft / 393.7ft / 492.1ft), including indoor and outdoor cables, roof antenna, lighting protector and mounting kit
- 1:2/1:4/1:8 GNSS (GPS / GLONASS/BEIDOU/GALILEO) splitters
- GNSS window antenna
- Cables and adapters accessory kit
- Patch panels for BITS line cards

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