

SERVICE AND TECHNICAL DESCRIPTION

Euronext Colocation Services

MARCH 2022

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1. INTRODUCTION

1.1. Document history

Version	Date	Description
1.0	June 2021	Version 1
2.0	August 2021	Version 2
3.0	March 2022	Version 3

1.2. Purpose

The purpose of this document is to provide Clients with a detailed definition of the Euronext Colocation Services provided by the Euronext Group, including all relevant technical configurations and hosting facility specifications.

It provides information associated with the first three layers of the standard OSI networking model (Physical, Data Link, and Network) and it does not include the application level requirements for each of the services provided by Euronext.

Additionally, during provisioning, Clients will receive specific network information regarding the service, such as IP peering information and IP addressing assignments (unicast and multicast addresses, TCP/UDP port assignments, etc.) for the relevant connections requested.

This document is published by Euronext ("Euronext"). Other relevant documentation relating other Euronext services is also available from our website at:

www.euronext.com/technology/euronext-data-centre

Capitalised terms used in this Policy, though not defined herein, shall either (i) have the same meaning as ascribed thereto in the legal documentation made available by Euronext in relation to its Colocation Services which governs the provision of the Colocation Services once executed by a Client and Euronext, or (ii) – in the case that they are not defined therein – in the Rules.

1.3. Readership and copyright information

This proprietary confidential Policy is the property of Euronext and constitutes Confidential Information of Euronext. Neither this Policy nor its contents may be disclosed to a third party, nor may it be copied, published, reproduced or used without Euronext's prior written consent.

Euronext uses reasonable efforts to arrange for that the data and other material in this Policy are correct and complete but does not accept liability for any error herein or omissions herefrom.

In addition, the information contained in this Policy does not constitute representations or warranties by Euronext and does not alter the terms of any agreements that currently exist with Euronext.

The development of Euronext products and services is continuous and published information may not be up to date or may change. It is important to check the current position with Euronext.

1.4. Amendment of this Documentation

This document may be amended at any time in accordance with article 2.5 of the GTCs.

2. OVERVIEW OF THE SERVICE

Euronext Colocation Services provide Clients with the fastest possible access to Euronext markets. Colocation Services – the ultimate option in terms of low-latency connectivity – allow Clients to host their trading hardware within Euronext’s Data Centre, putting them as close as possible to trading and market data systems.

The Euronext Colocation Services are not connected to the Disaster Recovery (DR) site. In the case that the DR procedures are activated, resulting in the Markets being operated from the DR Data Centre, Clients located in the Production Data Centre using Colocation Services or Wireless Services will be required to obtain Connectivity Services from Euronext to that effect.

The service is available to Euronext Members and Non-Members. Specific conditions and pricing may be applied.

For further information, please refer to the contacts listed in the “Contacts” section of this document.

2.1. Key features of the service

Hosting within Euronext’s Data Centre – as close as possible to Euronext’s core trading and information systems

Elimination of network latency attributable to network connections between the Client site and Euronext

Purpose-built Data Centre providing high standards of security, access, power and cooling, and entirely managed by Euronext

Access to all the available Euronext Markets

Wide choice of client connectivity options:

- Intra-Cabinet Cross-connects via structured cabling
- Proprietary lines connected to Data Centre’s Carrier Cabinets
- Wide range of different carrier connectivity options
- Wireless connectivity

Complementary added value services:

- Dedicated team of skilled engineers available for remote hands activities
- MiFID II compliant time synchronisation service

2.2. Performance Improvements

Clients utilising Euronext Colocation Services will be provided with the following key performance benefits produced by reduced latency between Euronext's markets and the Client's own trading applications:

- Reduced propagation delay: fewer components for packets to pass through
- Reduced transmission delay: physically close to the matching engines and market data infrastructure
- Reduced processing delay: significantly fewer components for packets to be processed

2.3. Service Offering

Access to all available Euronext Markets (Production and Test)	
Power usage (kilowatts per Cabinet)	4kW, 9 kW or 18kW
Cabinet security	
Key	Standard
Numerical code, card reader	Upon request
Biometric security	Upon request
Market Connectivity Services	
Trading/information cross-connections to the production/EUA environment	Minimum 2 for unicast services (TCP protocol) + minimum 2 for multicast services (UDP protocol)
Colocation Connectivity Services	
Cross-connections to MMR for Client connectivity purposes (wide range of different carrier connectivity options; resilient carrier provision available)	Minimum 1
Cross-connections Single User (to connect Cabinets of the same Client)	Upon Request

Cross-connections Multi User (to connect Cabinets of different Clients)	Upon Request
Wireless connections through Client's own antennae hosted on the roof of the Data Centre	Upon Request
Wireless connections through wireless carriers already present in the Data Centre	See Cross-connections to MMR for Client connectivity purposes
Time Synchronisation	
GNSS Time Synchronisation	Upon Request
PTP Time Synchronisation	Upon Request
Complementary Value-Added Services	
Cabinet set-up, goods receiving, storage and packaging	
Highly skilled Smart Hands Services	Upon Request

2.4. Client Benefits

With the increased speed of delivery of Market Data to Clients and the ability to execute orders with reduced network latency, Clients can benefit from:

- improved performance of algorithmic trading capability
- increased probability of accessing available liquidity
- ability to react more quickly to market changes
- removal of network capacity constraints.

3. COLOCATION SERVICES

3.1. Power configuration

Euronext provides Clients with up to 4kW, 9kW or 18kW of power, depending on the agreed contract. 18kW Cabinets are for Members only.

Each cabinet has two branch circuits coming from different STS connected to two independent UPS systems, which can provide the full redundancy in case of any power failure.

3.1.1. Power Specifications for 4 kW Cabinets

Each branch circuit is a three-phase feed which can support a maximum of 6kW of power. Both branch circuits are monitored to ensure that each carries half of the 4kW load, with an alarm in place in case total power exceeds 4kW.

3.1.2. Power Specifications for 9 kW Cabinets

Each branch circuit is a three-phase feed, which can support a maximum of 11kW of power. Both branch circuits are monitored to ensure that each carries half of the 9kW load, with an alarm in place in case total power exceeds 9kW.

3.1.3. Power Specifications for 18 kW Cabinets

Each branch circuit is a three-phase feed, which can support a maximum of 18kW of power. Both branch circuits are monitored to ensure that each carries half of the 18kW load, with an alarm in place in case total power exceeds 18kW.

Please note that Clients exceeding their agreed allocated power levels may be billed for the excess power according to the Policies. Clients may be served a request to reduce their Cabinets' power draw within an identified timeframe (which may be within the next two hours or sooner in case of a critical situation regarding the Markets or Colocation Room which can reasonably not allow for even a continuation of such excess power use of 2 hours).

Euronext in any case reserves the right to disconnect the power to the Cabinet if the issue is not resolved within the timeframe. This may result in Euronext terminating the agreement with the Client.

3.1.4. Power Configuration and PDUs

All Colocation Cabinets should be equipped with two power strips for a resilient supply. Each power strip is fed via a separate UPS supply. Clients are therefore recommended to use equipment which has dual power supplies to avoid potential single points of failure.

As standard, Euronext provides standard Rittal PDUs: reference 7979140 (16Amps) or 7979139 (32Amps) according to Cabinet power type. PDUs provided by Euronext are vertical and rack mounted.

However, Clients are permitted to provide their own Power Distribution Unit (PDU) for each requested Cabinet. Clients must arrange 16 or 32Amp three-phase PDUs according to cabinet power type. For 18 kW Cabinets, only 32Amp three-phase PDUs can be used. PDUs provided by Clients can be horizontal or vertical and rack mounted.

In any case, power connection, in raised floor, will be done by the Euronext Smart Hands Team.

IEC 309 socket AC Power receptacles are used to connect to the main power with C13 sockets for devices.

3.1.5. Power Not Used (PNU)

In the Colocation Room, Member and Non-Member can reserve empty Cabinets with no power (PNU), adjacent (or close if adjacent is not possible) to their current installation in the Colocation Room. Maximum power available for Cabinets reserved on a PNU basis is 9 kW

3.2. Cabinet Technical Specification

- Manufacturer: **Rittal VXIT**
- Size: **47 Rack Unit** (RU)
- Dimensions (Height x Width x Depth): **2200m x 800mm x 1200mm**

P/N	Description	Qty
-----	-------------	-----

5316116	Network/server rack VX IT with vented doors, with 482.6 mm (19") mounting angles, standard	1
5302015	Air baffle plate for VX IT 482.6 mm (19") mounting angles, standard	1
5302053	Cable duct for VX IT, TE	2
5302027	VX IT potential equalisation kit for VX IT	1
5502120	Cable route for TS	2
	Key door locks front + back	1

Each Cabinet has 1U patch panel on position 47U. Each patch panel has 48 ports for single mode LC links, which can be used for Euronext Colocation Connectivity, Euronext Time Synchronisation services or the connection to the Carriers or to the Approved Wireless Carriers.

Each Cabinet is locked with a key, which is managed by the Euronext Smart Hands Team and delivered to the Client at each access request

Additional security options (token/biometric scan) are available upon request.

Clients may install CCTV within their own Cabinets according to Euronext rules, as specified in the Specific Terms CCTV (made available upon reasonable request), and subject to the Client concluding a specific agreement with Euronext to this effect.

3.3. Cable equalisation

Euronext applies cable equalisation measures in respect of its Colocation Services when required under Applicable Law (i.e. MiFID II).

This means that the cables used to establish the Cross-Connects between the Cabinets of the Client on the one hand and the demarcation point in the Meet Me Room in the Production Data Centre on the other hand should be all of the same physical length (with an acceptable tolerance). The same applies for the cables used to establish the Cross-Connects between the Cabinets of the Clients on the one hand and the Euronext Equipment hosting the Markets on the other hand.

Furthermore, and in-line with regulatory requirements, Euronext engaged a reputable third party expert to validate the cable equalisation measures applied by Euronext as mentioned above. The outcome thereof demonstrates that these cable equalisation measures comply with the requirements thereof under applicable law. The maximum deviation between two equalised cables established as part of this third-party expert

validation was in line with expectations. As the report resulting from this validation contains highly confidential information on Euronext's infrastructure, this cannot be disclosed to Clients.

3.4. Market Connectivity Services

This section describes the connectivity between the Client Equipment and the relevant Euronext Colocation Services. In addition, this section identifies the connectivity for dedicated management of traffic from the Client Equipment to the Client's own location via the Client's own chosen Carriers.

Connectivity to the Market is provided via the following physical connections, each one also referred as Fibre to Exchange (FTE_x):

- 2 connections from Client Cabinet to unicast services for Production and EUA environment (all available services included)
- 2 connections from Client cabinet to multicast services for Production and EUA environment (all available services included)

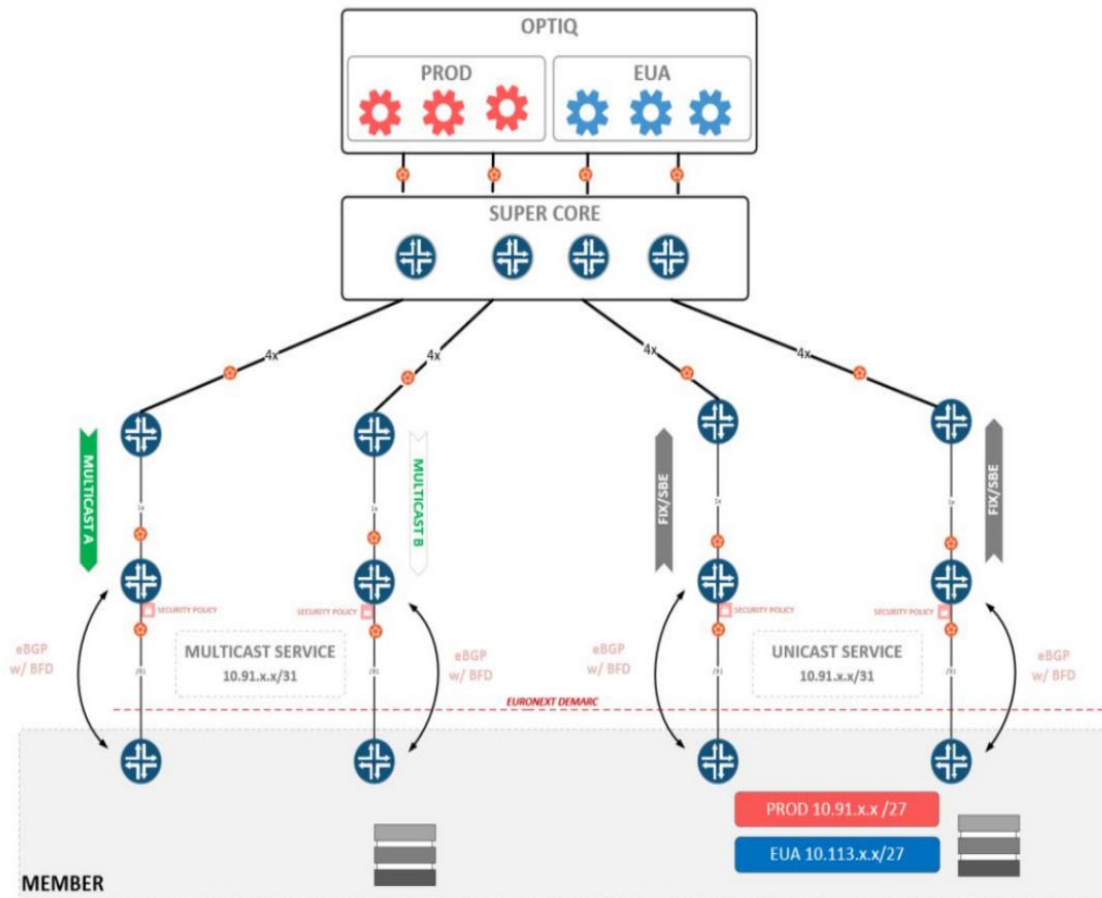
All connections to Euronext's services are provided in single mode fibre with LC connectors.

Bandwidth options available, both for Members and Non-Members, are:

- 1 Gbps
- 10 Gbps
- 25 Gbps (available in the future)

Additional market handoffs can be ordered by Clients (subject to applicable terms).

The following high-level diagram identifies the connectivity between Client Equipment and Euronext's trading and data feed services:



The network has been designed to provide a low-latency solution while ensuring sufficient security and operational standards are maintained.

For access to the Markets, Clients must connect their primary and secondary switches to Euronext primary and secondary switches. Specifically, two connections must be implemented for unicast services and two for multicast services.

Care should be taken when deciding on the model of switches to use in order to ensure compatibility with available power and rack chassis mounting.

Euronext services may operate either in unicast or multicast.

Optiq operates with:

- Unicast protocol connections for the trading interface
- Multicast protocol connections for the market data feed interface

The Client subnets that will directly interface with Euronext services will be provided by Euronext. The Client's servers must present themselves to the Production and EUA environments with addresses that belong to the given subnets.

3.4.1. Unicast connections

As standard, the following subnets are offered to the Client for each market handoff:

- 1x subnet /27, included in the range 10.91.0.0/16, to access Production environment
- 1x subnet /27, included in the range 10.113.0.0/16, to access EUA environment

In the case of Clients hosting End Users in their Cabinets (such as Service Providers), Euronext will assign, where technically applicable, /27 subnets (for Production and EUA) for each End User.

The unicast colocation zones will use the BGP Routing Protocol in EBGp mode.

To interconnect Client devices with Euronext switches, 2 x /31 subnets within the range 10.91.0.0/16 are assigned by Euronext. Clients shall use a BGP private ASN provided by Euronext.

3.4.2. Multicast connections

To interconnect Client devices with Euronext switches, 2 x /31 subnets within the range 10.91.0.0/16 are assigned by Euronext

The multicast colocation zone will use the PIM-SM Multicast Protocols.

The multicast RPT/ SPT will be configured to ensure separate paths for Multicast A and B Feeds

Once Clients have their switches connected to Euronext switches, a simple "ping" test to the IP(s) of Euronext switches (BGP peers) can be completed.

3.5. Colocation Connectivity Services

Two types of connection are available for Clients to develop their own businesses:

- Internal cross-connections
- Remote connections

3.5.1. Internal Cross-Connections

3.5.1.1. Single User Cross-Connects

Euronext provides Cross-Connects to connect Clients' Cabinets via dedicated structured cabling terminated into dedicated patch panels.

Patch panels and trunk cables will be billed according to the Price List and the capacity required.

Cross-Connects are provided in single mode fibre with LC connectors, but can be provided also in multi mode fibre, copper and coaxial cabling.

In case of adjacent Cabinets belonging to the same Client, Clients can realise connections between the Cabinets by removing the side panels.

Clients who wish to remove the side panels of their Cabinets must inform Euronext before the delivery of the Services by Euronext.

3.5.1.2. Multi User Cross-Connects

Euronext provides Cross-Connects to connect the Cabinets of different Clients.

Such Cross-Connects can only be established by Euronext.

Cross-Connects are provided in single mode fibre with LC connectors.

3.5.1.3. Internal patching / Structured cabling

Internal patching (within a rack) is expected to be completed by the Client, but can upon request also be performed by Euronext when cables and complete rack layout are provided by Clients. The first eight (8) hours of installation will be provided free of charge.

Extra hours will be invoiced in accordance with Smart Hands prices provided for in the colocation price list. Clients should note that such invoices will be issued post Go-Live.

Standard inter-cabinet cabling when specified in the order form, i.e. single user Cross-Connect. can be performed by Euronext Smart Hands Services.

More complex structured cabling (single user inter-racks) may also be performed by the Euronext Smart Hands team under the agreement in effect between the Clients and Euronext upon request. The related costs will be charged to the Client on the basis of a specific quote to be agreed.

3.5.2. Remote Connections

Client proprietary connections can be used by Clients to reach their hosted Client Equipment from their own locations.

Euronext Colocation Services have an open connectivity policy allowing Clients to evaluate and select their Carrier from a list of suppliers that have an existing presence at the Data Centre, or any other Carrier, provided that the Client is responsible for ensuring that such new Carrier establishes its presence in the Data Centre and carrying any costs in relation thereto.

Connections via wireless devices (to be placed in the designated area of the Data Centre, subject to additional Charges) to Clients' own locations are also available.

3.5.2.1. Leased lines connections

Several Carriers are present in the Euronext Data Centre.

Euronext connects the Carriers' Cabinets in the Meet Me Rooms of the Data Centre to Euronext Cabinets in the Meet Me Room, and then to Euronext Cabinets in the Colocation Room, via Cross-Connects.

Euronext can then provide the Client with the final delivery of the circuit into the patch panel of the Client's Cabinet.

These connections provided by Euronext are delivered in single mode fibre with LC connectors.

3.5.2.2. Wireless connections

Two options are available for Clients to connect wirelessly:

- Clients can rent space on the roof of the Data Centre to install their own antenna;
- Clients can use the antenna of a wireless carrier already present at the Data Centre.

4. SYNCHRONISATION SERVICES

For all Clients, Euronext's NTP service is available at no additional Charge. NTP protocol can be received through the unicast connections to Euronext.

Euronext can also provide a range of resilient, highly-precise time synchronisation services for Clients located in the Data Centre.

The Time Synchronisation Service consists of two delivery formats:

- Precision Time Protocol (PTP)
- GNSS

The service is duplicated for resilient delivery of the time signal. Clients are not permitted to install their own GNSS antenna in the Euronext Data Centre.

4.1. Precision Time Protocol (PTP) Time Feed

The Precision Time Protocol (PTP) time feed provides resilient and diverse feeds that achieve MiFID II compliant accuracy.

To maintain accuracy and resiliency, the PTP Feed is serviced by 2 pairs of separate GNSS antennae located in diverse positions on Euronext Data Centre roof coupled with a PTP-over-fibre service provider. Resiliency is built in across the solution to ensure an alternative source is available in case of issues with the primary source.

The following schematic diagram identifies equipment set-up for PTP time source and PTP feed distribution:

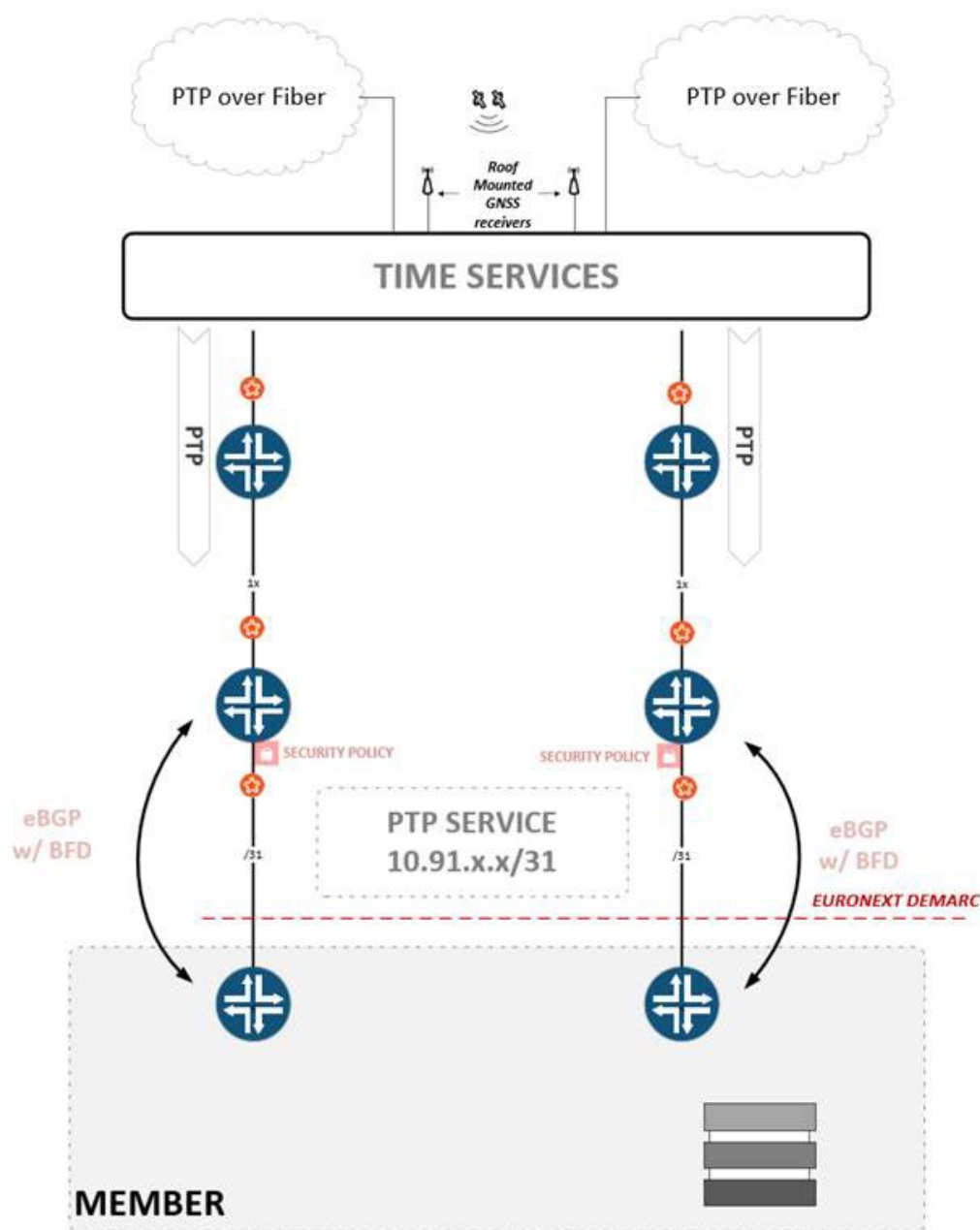


Figure 1 - Schematic of equipment set-up for PTP time source and PTP Feed Distribution

The PTP infrastructure is composed of:

- four GNSS antennae, installed on two different areas of the Data Centre's roof and allowing Euronext to subscribe to two independent UTC traceable time service providers, compliant with MiFID II regulations
- PTP Grandmaster over-fibre service provider
- four Oscilloquartz Grandmaster Time servers, with Rubidium oscillator
- Euronext switches to run on Boundary Clock
- Euronext switches to distribute PTP to Clients.

The PTP infrastructure has been designed considering:

- Different levels of redundancy, in order to manage:
 - Data hall failure
 - Cabinet failure
 - Time source failure (service provider)
 - Natural events such as solar flare, sky visibility
 - Hardware failure
- Monitoring requirements, in order to monitor:
 - UTC traceability as well as offset monitoring on boundary clocks running PTP
 - Accuracy between Grandmasters (to monitor time accuracy between service providers)
 - Grandmaster status (in the event the Grandmaster goes into hold-over mode)
 - Monitoring of the timing infrastructure to guarantee UTC traceability.

Handoff / presentation:

Clients will be presented with two single mode fibre (LC termination) connections, each of which interfaces with its own Grandmaster for resiliency. Connections can be 1Gbps or 10Gbps.

Euronext provides PTP multicast using UDP over multicast address 224.0.1.129.

Routing protocol is eBGP with BFD.

To interconnect Client devices with Exchange switches, 2 x /31 subnets within the range 10.91.0.0/16 are provided

Version of PTP provided is PTP 2.0 (1588-2008), Domain 0

Key Benefits of the PTP Service:

- Resilient and accurate time provision based on diverse GNSS feeds.
- High-spec infrastructure to maintain time signal accuracy.
- The PTP time feed is derived from the same time source signal as used by Euronext for the Euronext Trading Platform timestamping.
- No hardware infrastructure required from Euronext, reducing need for cabinet space and power provision.

4.2. GNSS Time Feed

For the GNSS Time Service, Clients are provided with two resilient and diverse connections for the provision of GNSS signal.

To maintain accuracy and resiliency, the GNSS Feed is serviced by two separate pairs of GNSS antennae located in diverse positions on the Euronext Data Centre roof. Resiliency is built in across the solution to ensure an alternative source is available in case of issues with the primary. Each GNSS antenna is connected to separate GNSS splitter boxes and FO converter in Euronext Colocation Room.

Clients are provided with two coaxial cables with BNC connectors.

Offset for clock synchronisation is 2239 Nanoseconds (ns).

5. COMPLEMENTARY SERVICES

Euronext Colocation Services also include added-value services for Clients, such as the Smart Hands Services.

5.1. Smart Hands Service

Euronext can provide on-site support for a range of installation, planned and reactive activities as requested.

The Smart Hands Service will be provided by a dedicated Smart Hands Team that will be able to arrange the presence of a field engineer at any time, covering all days of the year, including weekends and bank holidays, expected after the Go-Live of the Colocation Services in 2022 (until that date the Smart Hands Services are in principle only available during normal business hours as specified below).

The following distinction is made regarding the related Charges for requesting Smart Hands Services during or outside business hours:

- Smart Hands Support Hours are Mon-Fri, 09.00-18.00 CET, excl. Italian public holidays.
- Smart Hands Non-Support Hours are Mon-Fri 18.00-09.00 CET, Italian public holidays and week-ends.

Euronext change windows for the Smart Hands Services are the following:

- Monday–Friday from 18:00 to 01:00 CET the following morning
- Saturday and Sundays from 09:00 to 17:00 CET

In the case that maintenance/changes are not completed within the change windows for the Smart Hands Services, then on a non-discriminatory basis Euronext may (upon request of the Client and to the extent reasonably acceptable to Euronext) allow Clients to overrun the original timeframe to complete their set-up.

Note that before the Go-Live of the Colocation Services, changes will be permitted during Support Hours.

After the Go-Live, outside of the change windows for the Smart Hands Service, the on-call emergency service is available for limited support activities on request, such as re-booting of Client Equipment and visual “lights-on” inspection.

Smart Hands Services are able to perform many activities, including:

- Inventory of Client Equipment (including digital pictures of equipment)
- Labelling equipment and cable connections
- Changing pre-labelled, pre-ejected removable media (e.g. tapes, CDs) when applicable
- Logistics assistance, including reception, assisting with moving equipment and unpacking boxes
- Reading off serial numbers on Client Equipment
- Providing visual verification to assist with troubleshooting
- RMA (returned materials/merchandise authorisation) and shipping of replaced equipment
- Installing pre-configured equipment
- Installing, replacing or removing equipment
- Power-cycling a router, server, switch
- Plugging in a console port for remote management by Client
- Replacing or verifying cable integrity of an installed cross-connect
- Moving or securing a cable
- Putting up or taking down a loop on a carrier circuit to assist in remote testing
- Cabling signal testing a circuit with diagnostic equipment
- Loop-back testing for telco circuits
- Supporting and accompanying a Client to the correct rooms and racks for installation and maintenance activities
- Structured cabling (upon request and subject to specific Charges)

The Smart Hands Service is NOT able to perform any configuration tasks beyond initial set-up of out of band (OOB) management or tasks that require access to a device's OS directly.

Relevant charges payable to Euronext for the provision of the Smart Hands Service are priced upon Client's request, and mutually agreed by the Parties in writing prior to the commencement of the provision of such services by Euronext.

5.2. Other on-site services

Euronext can manage other on-site services, such as shipment handling or packaging.

5.2.1. Shipment receiving

Euronext can handle shipments at the Data Centre, either receiving goods or allowing courier pick-up.

5.2.2. Goods storage

Euronext can store Client goods in its own warehouse facility at the Production Data Centre before the installation in the Client's Cabinet.

5.2.3. Packaging

Euronext is able to dispose of the packaging from Clients' material.

6. DATA CENTRE TECHNICAL SPECIFICATIONS

The Euronext Production Data Centre is located at:

Aruba S.p.A.
Via S. Clemente, 53
24036 Ponte San Pietro (BG)
Italy

6.1. General Data Centre Characteristics

The Aruba Global Cloud Data Centre (IT3), where the Euronext Colocation Services are provided, is fully owned by Aruba S.p.A, the leading data centre company in Italy with a significant European footprint. The Aruba campus is located in Via San Clemente 53, 24036 Ponte San Pietro, Bergamo, in the north of Italy, not far from Milan. It has a surface area of approximately 200,000 m², and can host up to five data centres with a total of 90,000 m² of dedicated computer rooms.

6.1.1. The building

Exchange Colocation Services are provided from one of the Data Centre buildings on the Aruba campus, with a capacity of 10,000 m² divided into ten 1,000 m² floor rooms, and with expansion to another building planned during 2022. DC-IT3 is fully Rating 4 certified (ANSI/TIA 942-B-2017 regulation). The scope of certification includes site location, architecture, security, safety, fire suppression, electrical, mechanical and telecommunication.

Three different buildings make up the complex:

- the **Data Centre** which holds the computer rooms, the entrance hall for visitors and employees, the NOC and the labs;
- the **Power Centre** where the power supply units for the data rooms are located (UPS, batteries, general low voltage and medium voltage panels);
- the **Delivery Building** which holds the loading docks, some storage space and the area for water/water heat exchangers for the cooling system.

All three buildings are built with a reinforced concrete structure, compliant with current earthquake regulations.

6.1.2. Access

The Aruba Global Cloud Data Centre Campus (DC-IT3) has 4 entry points (carrier entrance) for fibre optics: North, South, East and West.

Internal connectivity and distribution are designed according to ANSI/TIA 942B Rating 4, meaning that full resiliency within the building is guaranteed.

A number of national and international carriers already have a presence in Aruba IT3-DC-A. The Data Centre is carrier-neutral by design. The list of national and international carriers connected to Aruba, and the list of network providers that own fibre into Aruba, will be made available upon request.

Aruba IT3-DC-A is already connected via dark fibre to Milan MIX (Milan Internet eXchange) using DWDM Technology. Carriers can use this resource to connect from the MIX to Aruba.

6.1.3. Room power supply and cabling

The Data Centre is designed according to the highest ANSI/TIA 942-B standards, with optimal flexibility, resilience and functionality. In particular, all components serving the power supply and cooling system have 2N redundancy.

All the systems have been designed and built to meet the highest levels of resiliency:

- Multi-modular power centre featuring 2N redundancy. Each redundant module can supply 1MW of UPS-protected IT load (with 2N +1 configuration on each power module).
- Redundant emergency generators with 48-hours full-load autonomy without refuelling
- Data hall made entirely of REI firewalls and ceiling with double insulation
- Maximum logical and physical security, with guards 24/7 and up to 7 different security perimeters.

Since 2011, Aruba Data Centres have been powered exclusively by 100% renewable energy from European Guarantee of Origin scheme (GO) certified sources.

Aruba is also a producer of renewable energy thanks to its hydroelectric plants and photovoltaic systems installed on the building of at its Global Cloud Data Centre DC-IT3 campus in Ponte San Pietro.

Power and network structured cabling run on a 4-tier tray structure located below the raised floor. The entire area is 2 metres high and allows technicians to work in this space, minimising the human presence inside the Data Hall.

Cable trays are positioned at different levels, each level dedicated alternately to either power cables or network cables to guarantee segregation and physical protection to

cables, and reach each cabinet located in the Data Hall, in order to provide power and network connection to the IT equipment.

6.1.4. Cooling systems

The cooling system uses ground water extracted from redundant wells and sent to redundant heat exchangers.

The piping system serving each data room is made with 4 lines with a quarter of the total Computer Room Air Handler (CRAH) connected to each line. Oversizing of CRAH and other components makes it possible to lose up to 2 lines and/or half of CRAH without problems on IT cooling.

There are two completely independent primary cooling circuits:

- **Main primary circuit:** normally used in production mode, this uses ground water (offering further redundancy, because water is extracted from two different groups of wells) and water/water heat exchangers (each data hall can use chilled water from at least 4 different heat exchangers).
- **Emergency primary circuit:** this uses conventional air/water chillers (each data hall can use chilled water from at least 4 different chillers). Issues with impact on main primary circuit cannot affect the backup primary circuit, so full 2N redundancy is obtained.

Redundant Primary cooling circuits (which include pumps to extract water from the wells) are powered by dedicated MV/LV transformers and backed up by dedicated Diesel Generators. The switch from the main primary circuit and the backup primary circuit is fully automated using motorised valves.

The Main and Emergency primary circuits can also work in mixed and load-balanced conditions in order to run any maintenance procedure with no cooling power reduction or redundancy loss.

To maximise the performance and efficiency of the air conditioning, it is required that all equipment and devices located inside the racks are installed to follow the direction of the cold air flow.

6.1.5. Fire prevention

DC-IT3 buildings are equipped with highly sensitive smoke detection systems:

- Optical sensors connected to each other on a loop with fireproof cables.
- Additional sensors inside the ventilation duct.

- All sensors are connected to a central unit that activate optical and acoustic alarms and trigger the fire extinguishing system.
- Sensitive areas (data rooms, power centres, medium voltage transformer rooms and MV panel rooms) are equipped with an inert gas fire suppression system (nitrogen).
- Fire detection and extinguishing system in every single module.
- Liquid loss detection system.

6.1.6. Security

Aruba S.p.A is ISO 27001 certified and provides all features required to guarantee security everywhere in the campus and in the halls:

- All external and internal accesses are controlled by sophisticated authentication mechanisms that can be adapted to the usage of specific data rooms. All Cabinets are equipped with locked metal openings. Upon request, biometric access may be provided with dedicated access control systems, ensuring that access is monitored and controlled.
- The building is equipped with an anti-intrusion system that uses dual-technology volumetric sensors combined with contact sensors at multiple places.
- Guards are onsite 24/7, stationed at different security checkpoints
- There are up to 7 different security perimeters from the outside to reach the Data Halls inside each Data Centre building. Video surveillance is guaranteed 24/7, 365/365 by an adequate number of video cameras, both inside (along all the walkways and in sensitive areas) and outside.
- The Data Centre is built on land 25 metres higher than the nearby river and is located to avoid any risk of flooding (the river bank opposite the campus is 6 metres lower).

7. CONTACTS

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