QFlex-400 WGS

ARSTRAT WGS Certified Satellite Modem

A High Performance Modem Based on the Popular QFlex-400 Series

CERTIFIED ★ WGS ★ CERTIFIED

TELEDYNE
PARADISE DATACOM
Everywhere**you**look™

Overview

The QFlex-400 WGS satellite Modem is our current rack mount ARSTRAT WGS certified satellite Modem, based on our comprehensive QFlex-400 series Modem. The unit is certified for use with the high-capacity wideband global SATCOM (WGS) system used by the United States and other allied militaries worldwide. The QFlex-400 WGS certified Modem is specifically focused for military and government applications providing broadcast services, data transfer, images and videos to troops in theater.

The QFlex-400 WGS ARSTRAT certified Modem supports DVB-S2 and DVB-S2X, the most powerful and robust modulation and coding available for the space segment, supporting modulations from QPSK to 16APSK. In addition, the Modem is IP centric, supporting Ethernet / IP data in the highly efficient Trunking mode, where maximum performance is achieved in terms of bit rate and packets per second, with zero jitter.

Our Flagship QFlex-400 WGS software defined Satellite Modem is our highest data rate Modem to date. The unit supports data rates to 249Mbps, has an extended L-band frequency range, better RF performance, higher processing capability allowing for future upgrades and yet, is smaller and lighter than it's predecessors and has the lowest power consumption to date.

It is ideal as a versatile point-to-point network modem or a remote modem in a point-to-multipoint network. It is fully compatible with our Q-NET™ satellite network solution and also with our standard QFlex-400 and Q-Lite series Modems.

Features

- Dual IF/L-band; data rates to 249Mbps
- Low power consumption, typically 30W
- DVB-S2/S2X
- Optimized 20% spectral roll-off
- LinkGuard™ signal-under-carrier interference detection
- Built-in spectrum & constellation monitors
- Q-NET™ Navigator network control app
- Interoperates fully with Q-Lite WGS product range, including Q-Lite Rugged WGS and Q-Lite Half Width WGS
- Software Defined Network support: vendor-independent network device control using standard commands (supports OpenFlow)

Markets and Applications

- Government secure networks
- Secure commercial networks operating on the WGS constellations
- Military secure networks
- Communications on the move
- IP Trunking
- Hub modem for Q-Lite WGS VSAT terminals

WGS Certification

- ARSTRAT WGS certification number 20-003

Why QFlex-400 WGS?

Our Flagship Software Defined Modem is Paradise Datacom's most innovative and flexible Satellite Modem to date

STATE OF THE ART

- DVB-S2X up to 16APSK provides the highest bandwidth efficiency
- Highly efficient Trunking mode, which provides the highest bit rate and packet per second performance with zero jitter

SECURE

- SCPC is both secure, and with Paradise Modems, easy to provision
- AAA Radius support and access control lists.

COMPATIBLE

- Compatible with Q-Lite WGS products
- Supports a simple, intuitive web browser in-common with all Paradise WGS Modem products
- Supports IF and L-band in one unit.

CONVENIENT

- Optional BUC power Supply reduces need for external equipment
- Built in Spectrum Analyser and Constellation monitor

PRACTICAL

- 1U rack mount chassis
- Simple front panel control with backlit LCD
- Intuitive web browser and Q-Net compatible
- Built in test tools, no need for expensive test equipment

EFFICIENT

- DVB-S2X is the most robust and efficient Modulation and coding for the space segment
- Support for Paradise Datacom's highly efficient IP Centric, Trunking mode.

WELL EQUIPPED

Transmitter
Fast:
- Up to 249Mbps and 69.9Msps
- Output power: IF 0 to -25dBm; Standard L-Band +5 to -40dBm

Interface Ports
Convenient:
- 4 port GB Ethernet switch for IP Traffic and M&C
- Support for VLAN M&C
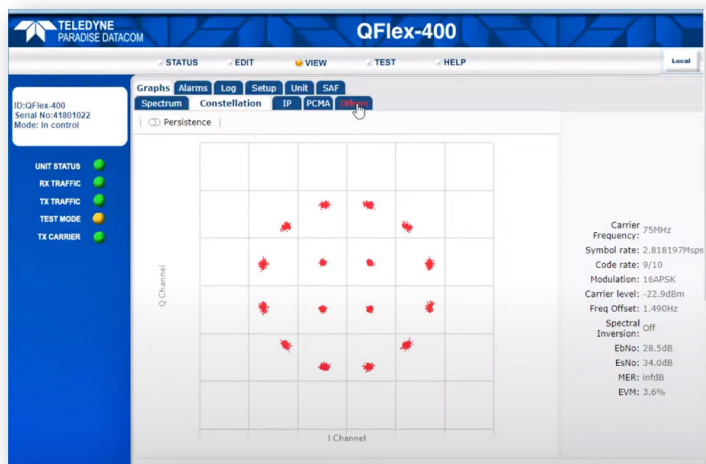
RF Stages
Future Proof:
- Transmit and Receive speeds field upgradeable, only pay for the capacity you need now
- Extended L-Band coverage from 950 to 2,450 MHz
- Wideband IF 50 - 180MHz

Receiver
Fast:
- Up to 249Mbps and 69.9Msps

Powerful On-Board Test Equipment

Constellation view: The Rx Constellation Monitor can be used to check for correct modem operation including checking for signal distortion and phase noise. The persistence mode is useful for showing any long-term effects due to phase noise and interference.

Spectral view: The Rx Spectrum Monitor is a powerful real-time spectrum analyser within the modem that is used to view the received signal spectrum. The monitor can not only display the wanted carrier but a Super Wide view allows checking for adjacent interfering carriers.

LinkGuard™ Interference Detection

Built-in Spectrum Analyser showing LinkGuard™ Signal-Under-Carrier interference detection without/with interferer present.
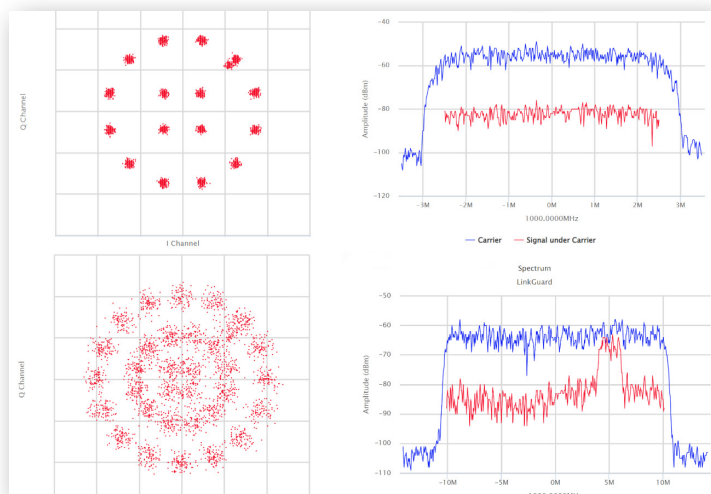
Advanced Bandwidth-Efficient Features

The QFlex-400 WGS modem supports the most powerful bandwidth-saving technology available.

DVB-S2X, is between 20% and 60% more bandwidth efficient than its predecessor, DVB-S2.

Supports the highly efficient transparent Ethernet Trunking mode.

Included Network Management

Q-NET Navigator supports monitor and control of all Paradise modems from a single application.

Includes easy-to-use navigation, support for multiple operator roles / access levels, continuous status / alarm polling and full access to all modem features. The web based Q-NET Navigator is included as standard, free of charge.

The Paradise Family of Secure SCPC Modems

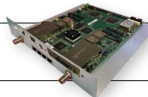| Paradise SCPC Modems			Point-to-Point	Mesh	Point-to-MultiPoint, Star, Hybrid		Features of Note
					Hub	Remote Site	
Standard	1U 19" Rack	QFlex-400	✔			✔	PCMA+ enhanced carrier overlay available
		QMultiFlex-400	✔	✔	✔	✔	Optional Embedded Hub Canceller
		QFlex-400 P2MP	✔			✔	Configured remote
		QubeFlex	✔				Small Sat/LEO - support for CCSDS
		AXIOM-N	✔			✔	IP-centric modem
Small Form Factor	Rack Mount Half Width	Q-Lite Half Width	✔			✔	Mountable side-by-side in 1U rack space
		AXIOM-C	✔			✔	Compact IP-centric modem
	Rugged	Q-Lite Rugged	✔			✔	IP65 weatherproof outdoor modem
		AXIOM-R	✔			✔	IP67 IP-centric modem
	OEM Card	Q-Lite Card	✔			✔	For OEM integration
		AXIOM-X	✔			✔	Our smallest modem

All modem models except QubeFlex are also available as **encrypted models**, capable of TCP/IP packet payload encryption using symmetric AES with 256-bit keys. Note that these models are export controlled.
The QFlex-400, Q-Lite, Q-Lite Half Width and Q-Lite Rugged models are also available as WGS-certified models.

The Q-Net Family

Q-Net is a fabric that allows each of the Q-Series modems to seamlessly interoperate giving you the ability to upgrade your network and re-use assets at will.

The different models have been thoughtfully designed to cover a wide variety of network situations flexibly and securely.

From models with WGS certification and encryption, to built-in features like 1:1 redundancy and test tools, we give you the lowest risk, highest return secure network available.

QFlex-400 Encryption
- Remote Site
- 1:1 Redundancy
- AES-256 Encryption
- WGS Models

Q-Lite
- Comms on the Move on UAV

Q-Lite Rugged
- Manpack terminal

Q-Lite
- Half-Width Shipboard Terminal

QMultiFlex-400
- Point-to-Point, Star Hub, Mesh Terminal
- Encryption Models
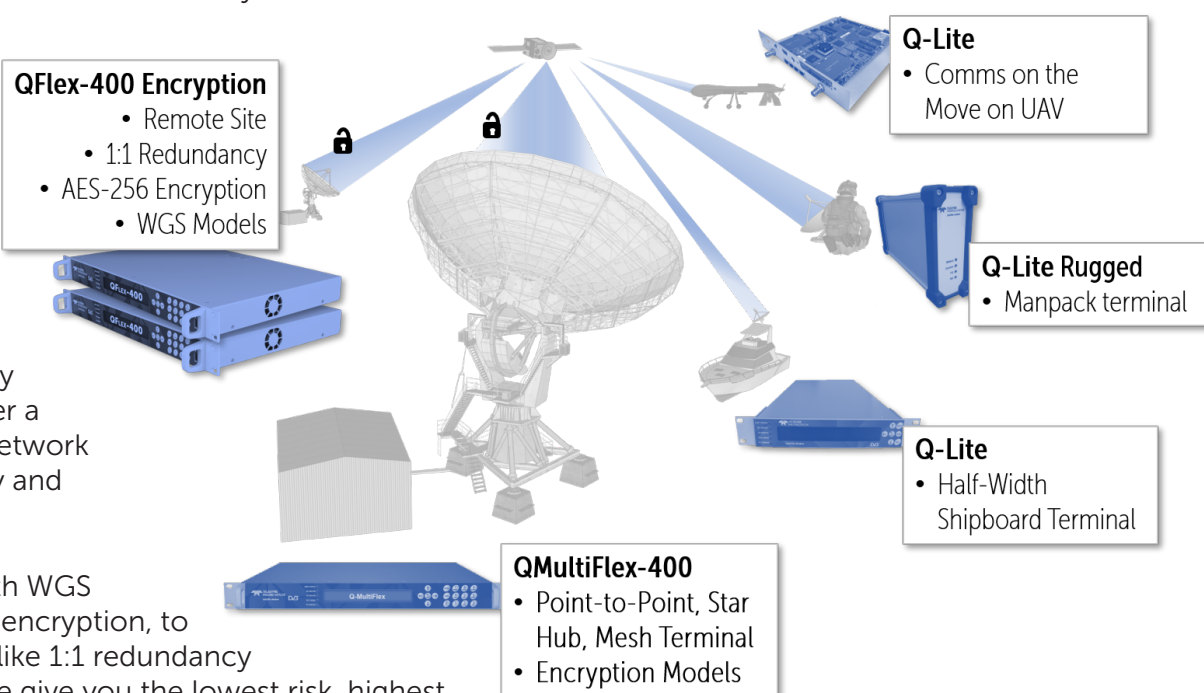
Main Specifications

Topology	Point to Point or Star Modem within a Point to Multipoint Network
Frequency	**L-band:** 950 to 2,450MHz (resolution 1Hz) **IF:** 50 to 180MHz (resolution 100Hz) N-type connectors for Tx & Rx
Data Rates	**Standard:** 2,048kbps **Options:** 5, 10, 25, 60, 100, 200 & 249Mbps
Data Rate Limits	**DVB-S2/S2X:** 68kbps to 249Mbps
Symbol Rate Limits	**DVB-S2/S2X:** 150ksps to 69.9Msps
Operating Modes	**DVB-S2/S2X** (EN 302 307-1 & EN 302 307-2)
Impedance	50Ω
Return Loss	Typically >18dB for **IF** and >16dB for **L-band** to 2GHz
Redundancy	1:1 through 1:16 redundancy

Modulator

Output Power	**IF:** 0 to −25dBm (0.1dB steps) **L-band:** +5 to −40dBm (950 to 1950MHz) 0 to −40dBm (1950 to 2150MHz) 0 to −30dBm (2150 to 2450MHz) (0.1dB steps)
Output Power Stability/ Accuracy	Stability: $\pm$1.0dB, 0°C to 50°C Accuracy: $\pm$0.375dBm
Transmit Filter Roll-off	20% (other spectral roll off's are available including 5% roll off, which is 15% more bandwidth efficient than 20% roll off. (*Not WGS certified*))
Phase Accuracy	$\pm$2° maximum
Amplitude Accuracy	$\pm$0.2dB maximum
Carrier Suppression	-30dBc minimum
Output Phase Noise	As EN 302 307, EN 300 421
Harmonics & Spurious	Better than −60dBc/ 4kHz in-band
Transmit On/ Off Ratio	-65dB minimum
BUC PSU Option	24V or 48V DC via IFL cable, 200W
BUC 10MHz Reference	Via IFL cable; 10MHz $\pm$ 0.01 ppm; 2dBm $\pm$ 2dBm
FSK Control	Allows monitor & control of a compatible L-band BUC from the modem via the Tx IFL cable

Demodulator

Input Range (dBm)	IF minimum: -130 + 10 log (symbol rate) L-band minimum: -140 + 10 log (symbol rate) IF/L-band maximum: -68 + 10 log (symbol rate)
Maximum Input Power	**L-band:** +10dBm **IF:** 0dBm
Wanted-to-Composite	-102 + 10 log (symbol rate)
Frequency Sweep Width	$\pm$1kHz to $\pm$255kHz (1kHz steps)
Acquisition Time	Dependent on FEC, data rate and sweep width
Receive Spectral Roll-off	20% (other spectral roll off's are available including 5% roll off, which is 15% more bandwidth efficient than 20% roll off. (*Not WGS certified*))
LNB 10MHz Reference	Via IFL cable; 10MHz $\pm$ 0.01ppm; 2dBm $\pm$ 2dBm
LNB Voltage	Programmable 13V, 15V, 18V, 20V or 24V DC to LNB via IFL cable; maximum 0.5A

Test Facilities & Alarm Outputs

Built-in Test Tools	As part of built-in web server: Rx constellation monitor; Rx spectrum analyser; **LinkGuard™** Signal-Under-Carrier interference detection; beacon receiver function that provides automatic detection of satellite beacon transmissions time graphs for key performance indicators (IP throughput, Eb/No, etc.)
Other Test Modes	Transmit CW Transmit alternate 1-0 pattern
Alarm Relays	4 independent Form C relays for unit, Tx, Rx and deferred alarms

Mechanical/Environmental

Size	1U chassis, 285mm deep excluding front panel handles and rear panel connectors and fans
Weight	3kg
Power Supply	90 to 264VAC, 1A @100V, 0.5A @240V, 47 to 63Hz Fused IEC connector (live and neutral fused); 48V DC option
Compliance	FCC, CE and RoHS compliant
Safety Standards	EN62368-1:2014,Edition 2
Emissions & Immunity	Emissions: EN55032:2015 Class A Immunity: EN55032:2017
Temperature	Standard: 0 to 55°C; Storage: -20°C to 70°C
Humidity	95% relative humidity, non-condensing

WGS Certification

Number	ARSTRAT WGS certification number 20-003

QFlex-400 WGS - Satellite Modem

Features

DVB-S2/S2X Rx Adaptive Equaliser	Corrects for slope on the carrier and group delay (typically found at transponder edges, causing inter-symbol interference). The 9-tap Rx equaliser is provided as standard; automatically switched on above 10Msps
Traffic Interfaces	**Standard:** **4-port Gigabit Ethernet switch** (RJ45 connectors; used for IP traffic and M&C)
Utility Interfaces	**9-way D type** for 1:1 and 1:N redundancy (compatible with Q-NET PDQS Redundancy Switch); **15-way D type** for alarms (4 independent Form C relays for unit, Tx, Rx and deferred alarms), Tx Inhibit signal and scalable DC voltage output for antenna pointing; **USB connector** for software upgrades, etc.; **Second fan; FSK signalling**

Network Control

Description	Web browser user interface support is provided as standard. SNMP and command line interfaces support the development of third-party user interfaces. In addition, the following network control application options are available
Q-NET™ Navigator	A simple interface to allow all Q-series modems in a network to be monitored and controlled from a single desktop application. Provided as standard, free of charge.

Ethernet: Standard Features

Trunking Mode	Hardware Layer 2 switch supporting 249Mbps bi-directional traffic at up to 200,000 packets per second; zero jitter
IPv4/IPv6	Dual IPv4/IPv6 TCP/IP support
VLAN Support	Passes VLAN tagged traffic transparently in Trunking mode
DHCP	DHCP client for automatic allocation of M&C IP address
SNMP	SNMP v1, v2c & v3
Access Control Lists	Separate IP and MAC address black/white user access control lists (for M&C port only)
Network Time Protocol (NTP)	NTP client synchronises modem time & date to NTP server; provides millisecond accuracy
Web Server	Modem web server M&C interface (including built-in tools listed under Test Facilities)
AAA RADIUS Secure User Login	Authentication, Authorisation & Accounting. Greater access control & accountability. Replaces standard modem login with user's personal network login credentials
IP Metrics	Tx, Rx throughput (bps, pps) graphs; dropped, errored packet counts
OpenAMIP Protocol Support	Controls modem interaction with compliant antenna control units to support antenna deployment/ pointing/tracking
Ethernet MTU Size	Standard: 10k bytes

WGS Supported Modulation and Code Rates

Waveform	Minimum Data Rate (kbps)	Maximum Data Rate (kbps)	Minimum Symbol Rate (ksps)	Maximum Symbol Rate (ksps)
QPSK DVB-S2 1/4 NF	73.536	34,268.00	150	69,900
QPSK DVB-S2 1/3 NF	98.467	45,885.73	150	69,900
QPSK DVB-S2 2/3 NF	198.338	92,425.49	150	69,900
QPSK DVB-S2 5/6 NF	248.199	115,660.94	150	69,900
QPSK DVB-S2 8/9 NF	264.968	123,474.94	150	69,900
QPSK DVB-S2 9/10 NF	268.292	125,023.97	150	69,900
QPSK DVB-S2X 13/45 NF	85.171	39,689.60	150	69,900
QPSK DVB-S2X 11/20 NF	163.287	76,091.82	150	69,900
QPSK DVB-S2 2/5 SF	114.139	53,188.86	150	69,900
QPSK DVB-S2 1/2 SF	127.326	59,333.92	150	69,900
QPSK DVB-S2 3/4 SF	213.040	99,276.78	150	69,900
QPSK DVB-S2X 11/45 SF	67.985	31,681.17	150	69,900
QPSK DVB-S2X 14/45 SF	87.766	40,898.76	150	69,900
QPSK DVB-S2X 7/15 SF	133.919	62,406.45	150	69,900
QPSK DVB-S2X 32/45 SF	206.447	96,204.25	150	69,900
8PSK DVB-S2 2/3 NF	297.095	138,446.47	150	69,900
8PSK DVB-S2 3/4 NF	334.219	155,745.84	150	69,900
8PSK DVB-S2 9/10 NF	401.881	187,276.57	150	69,900
8PSK DVB-S2X 23/36 NF	284.426	132,542.52	150	69,900
8PSK DVB-S2X 13/18 NF	321.770	149,945.01	150	69,900
8PSK DVB-S2 3/5 SF	258.798	120,599.78	150	69,900
8PSK DVB-S2 8/9 SF	386.667	180,186.67	150	69,900
8PSK DVB-S2X 7/15 SF	199.781	93,098.14	150	69,900
8PSK DVB-S2X 26/45 SF	248.962	116,016.18	150	69,900
8PSK DVB-S2X 32/45 SF	307.978	143,517.81	150	69,900
16APSK DVB-S2 2/3 NF	395.580	184,340.33	150	69,900
16APSK DVB-S2 5/6 NF	495.028	230,682.87	150	69,900
16APSK DVB-S2 8/9 NF	528.471	246,267.70	150	69,900
16APSK DVB-S2 9/10 NF	535.101	249,357.20	150	69,900
16APSK DVB-S2X 26/45 NF	342.247	159,487.00	150	69,900
16APSK DVB-S2X 3/5 NF	355.506	165,666.00	150	69,900
16APSK DVB-S2X 23/36 NF	378.711	176,479.26	150	69,900
16APSK DVB-S2X 25/36 NF	411.860	191,926.78	150	69,900
16APSK DVB-S2X 7/9 NF	461.584	215,098.05	150	69,900
16APSK DVB-S2X 77/90 NF	507.993	236,724.57	150	69,900
16APSK DVB-S2 3/4 SF	421.449	196,395.36	150	69,900
16APSK DVB-S2X 7/15 SF	264.928	123,456.23	150	69,900
16APSK DVB-S2X 8/15 SF	304.058	141,691.01	150	69,900
16APSK DVB-S2X 3/5 SF	343.188	159,925.80	150	69,900
16APSK DVB-S2X 32/45 SF	408.406	190,317.10	150	69,900

Ordering: QFlex-400 WGS

| Standard Features		Description
Base Modem	✓	74kbps to 2.048Mbps Tx/Rx DVB modem with 4-port Gigabit Ethernet switch for M&C and traffic. Front-panel keypad and display IF operation 50 to 180MHz. L-band operation 950 to 2450MHz; high-stability 10MHz reference All features described under Ethernet Standard Features. All features described under Test Facilities AUPC: Automatic Uplink Power Control AC mains input
DVB-S2X To 249Mbps subject to prevailing modem data rate limits	✓	**DVB-S2/S2X CCM Tx:** DVB-S2 QPSK, 8PSK & 16APSK Tx operation per EN 302 307-1. DVB-S2X QPSK, 8PSK, 8APSK, 16APSK, Tx operation per EN 302 307-2. Includes 20% spectral roll-off.
		DVB-S2/S2X CCM Rx: Add-on card supporting DVB-S2 QPSK, 8PSK & 16APSK Rx operation per EN 302 307-1. DVB-S2X QPSK, 8PSK, 8APSK, 16APSK Rx operation per EN 302 307-2. Includes 20% spectral roll-off

Optional Features

Tx Only	○	Transmit functions only
Rx Only	○	Receive functions only
Extend Tx Data Rate	○	**5Mbps data rate:** Extends base operation to 5Mbps
	○	**10Mbps data rate:** Extends 5Mbps operation to 10Mbps
	○	**25Mbps data rate:** Extends 10Mbps operation to 25Mbps
	○	**60Mbps data rate:** Extends 25Mbps operation to 60Mbps
	○	**100Mbps data rate:** Extends 60Mbps operation to 100Mbps
	○	**200Mbps data rate:** Extends 100Mbps operation to 200Mbps
	○	**249Mbps data rate:** Extends 200Mbps operation to 249Mbps
DC Input	○	**48V DC:** K3025 48V DC primary power input (in place of 100 to 240V AC input)
BUC PSU	○	**AC In & 24V Out:** P3553 AC input, 24V 200W DC to Tx BUC
	○	**AC In & 48V Out:** P3554 AC input, 48V 200W DC to Tx BUC
	○	**48V In & 24V Out:** P3555 48V DC input; +24V 200W DC to Tx BUC
	○	**48V In & 48V Out:** P3556 48V DC input; +48V 200W DC to Tx BUC

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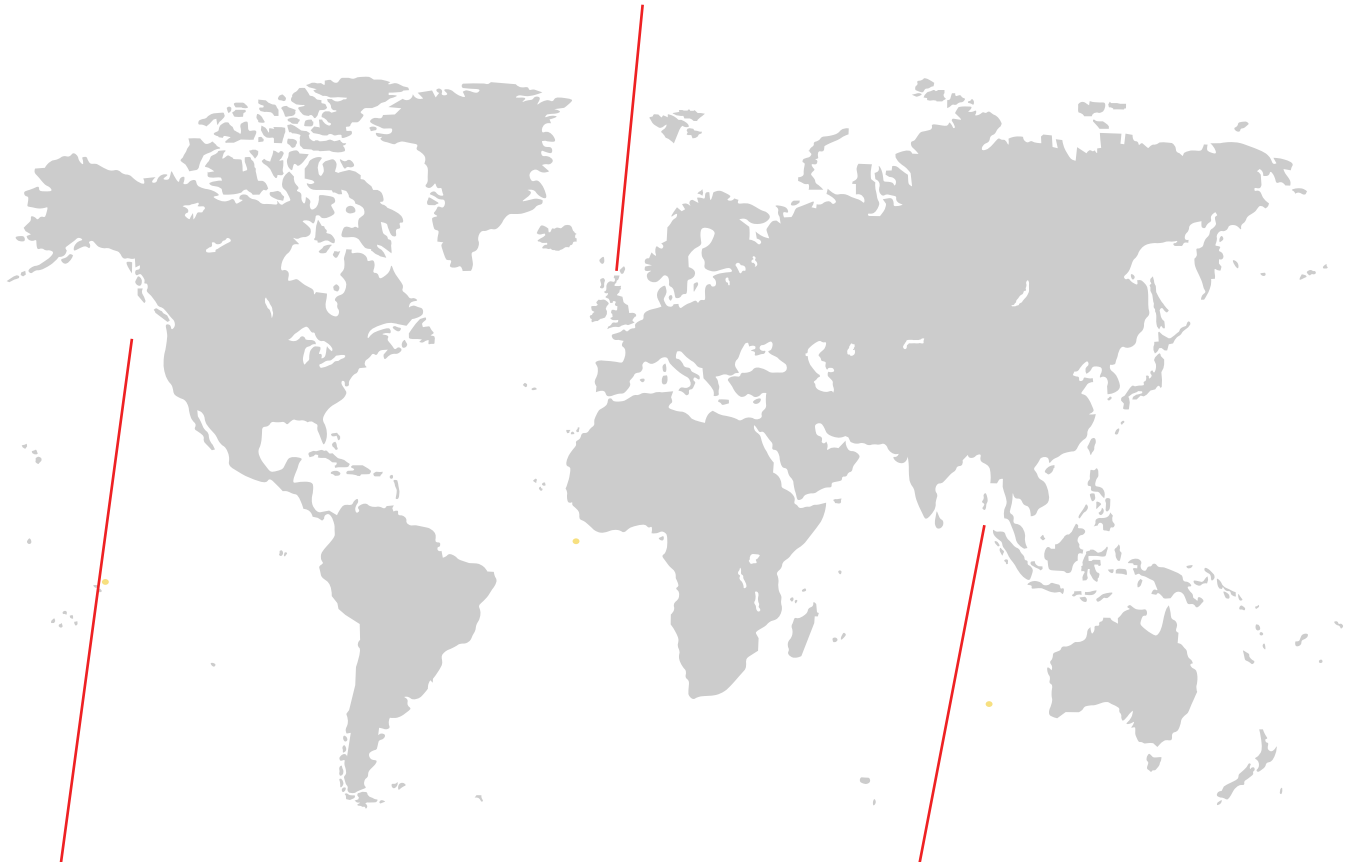
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