

ARGOS

CONNECTED. PROTECTED.

Argos System Status – October 2018, Yann BERNARD



**A NETWORK OF 25+ OFFICES WORLDWIDE AND 750+ STAFF,
FOR GLOBAL SOLUTIONS**



CLS created in 1986 is a subsidiary of



**27 international sites, Headquarters in
Toulouse, France**

- ✓ Unique operator of the Argos system
- ✓ Iridium value added services provider



ARGOS
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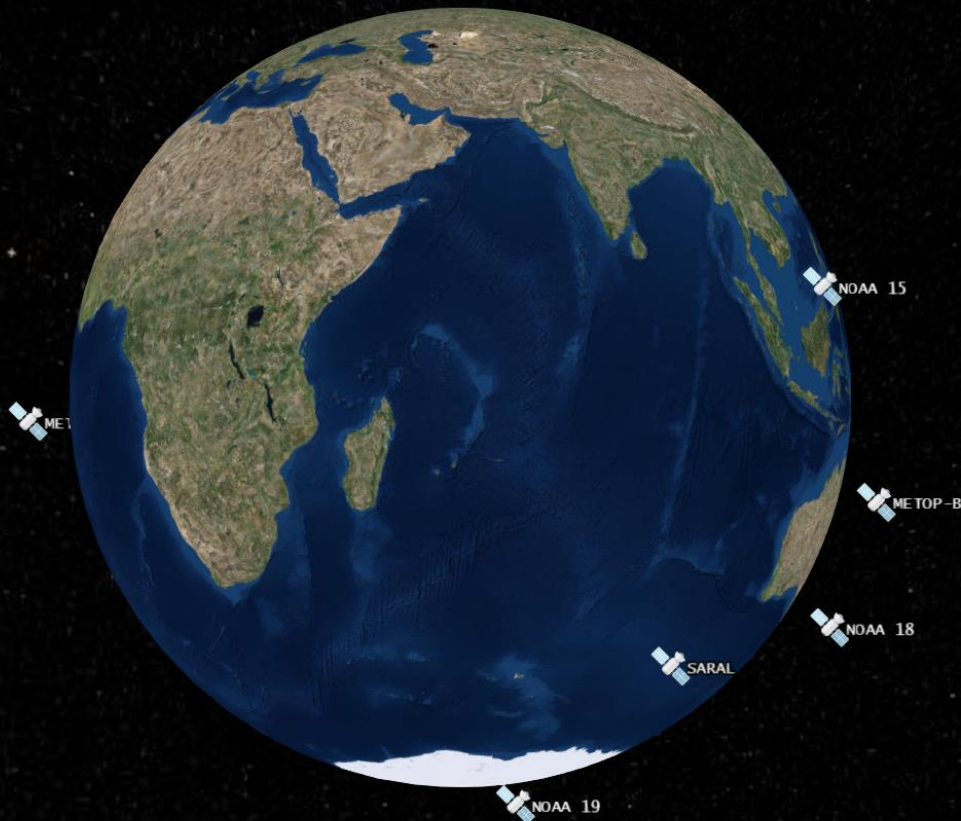
iridium[®]

With 2 global coverage LEO satellite systems and 3 processing centers operational 24/7, CLS is the privileged partner of JCOMM programs

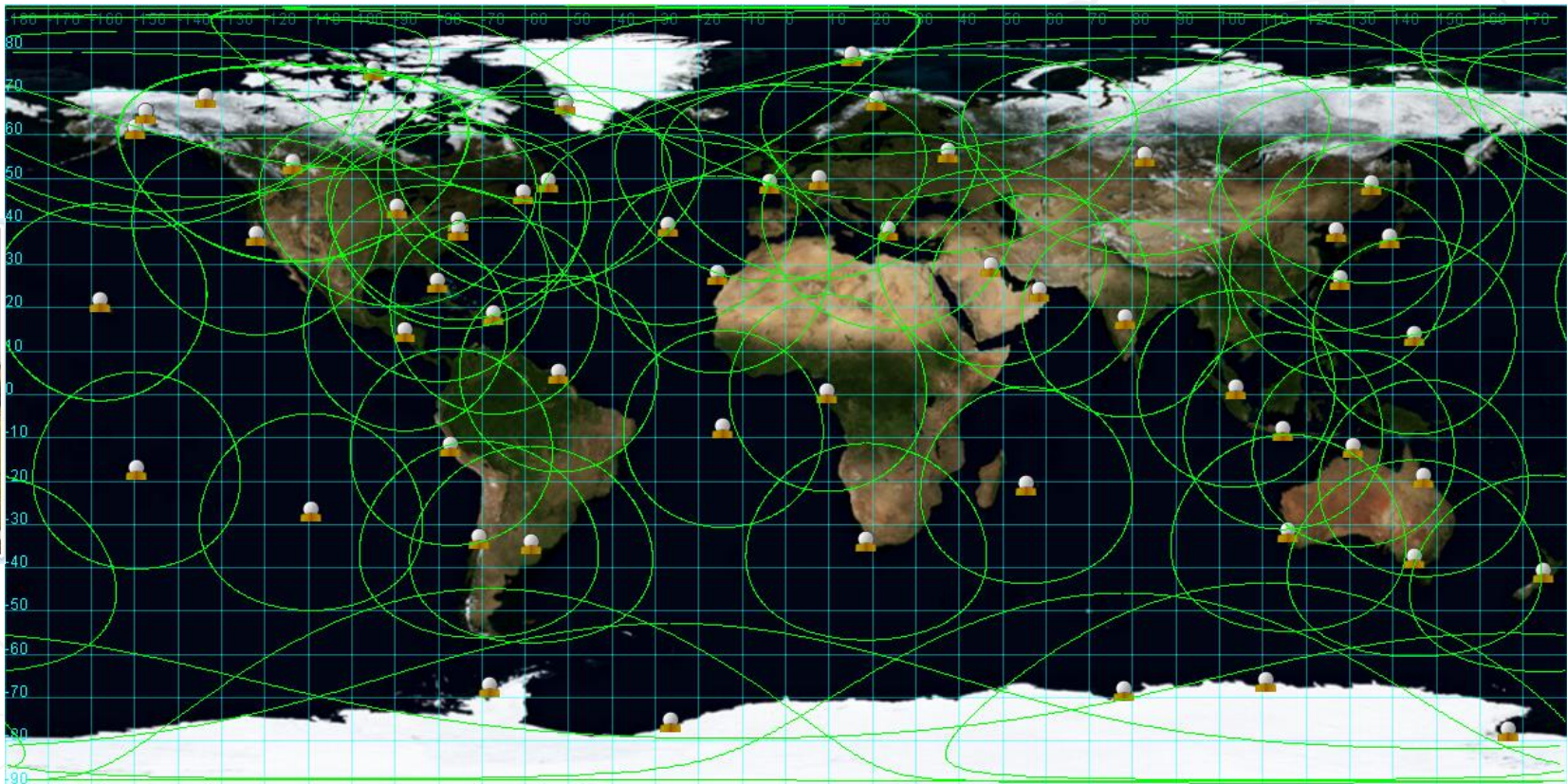




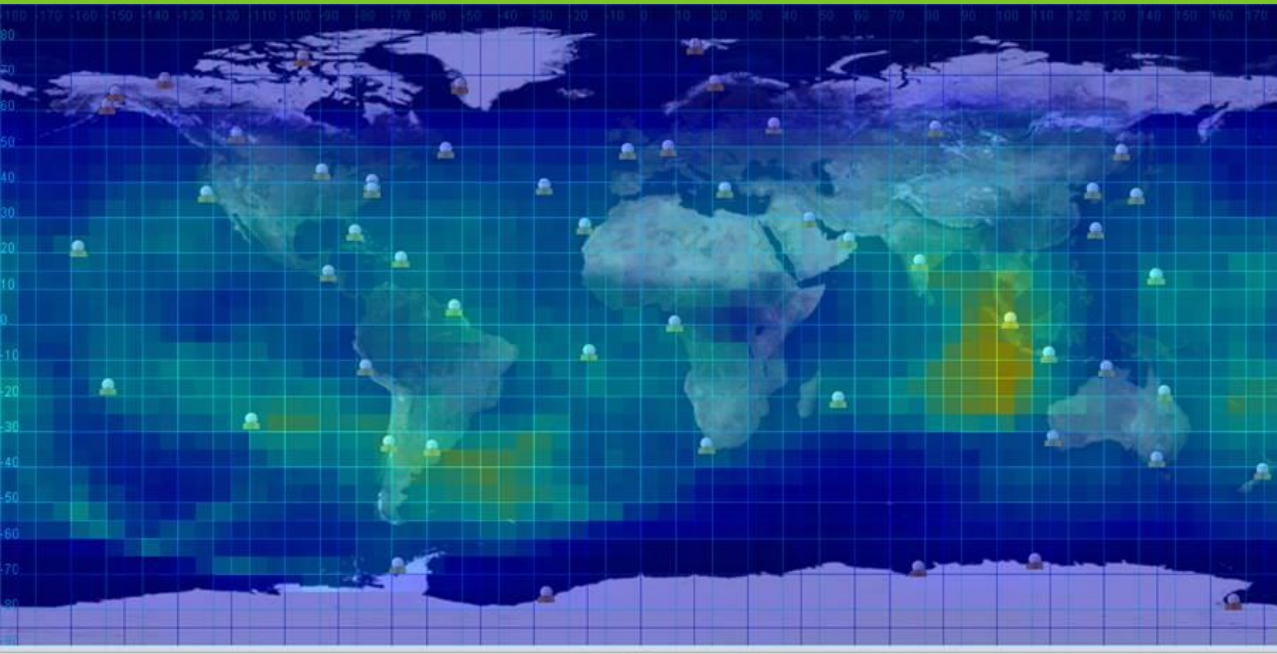
ARGOS : an International collaboration satellite system dedicated to environmental monitoring



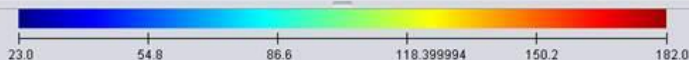
Ground network: 63 Argos antennae



Argos average delivery time



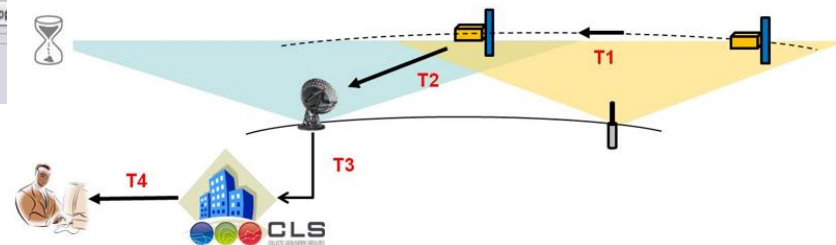
Visualiser les stations... Afficher les stations Afficher les cercles Min. 23 Max. 182 Visualiser les ap...



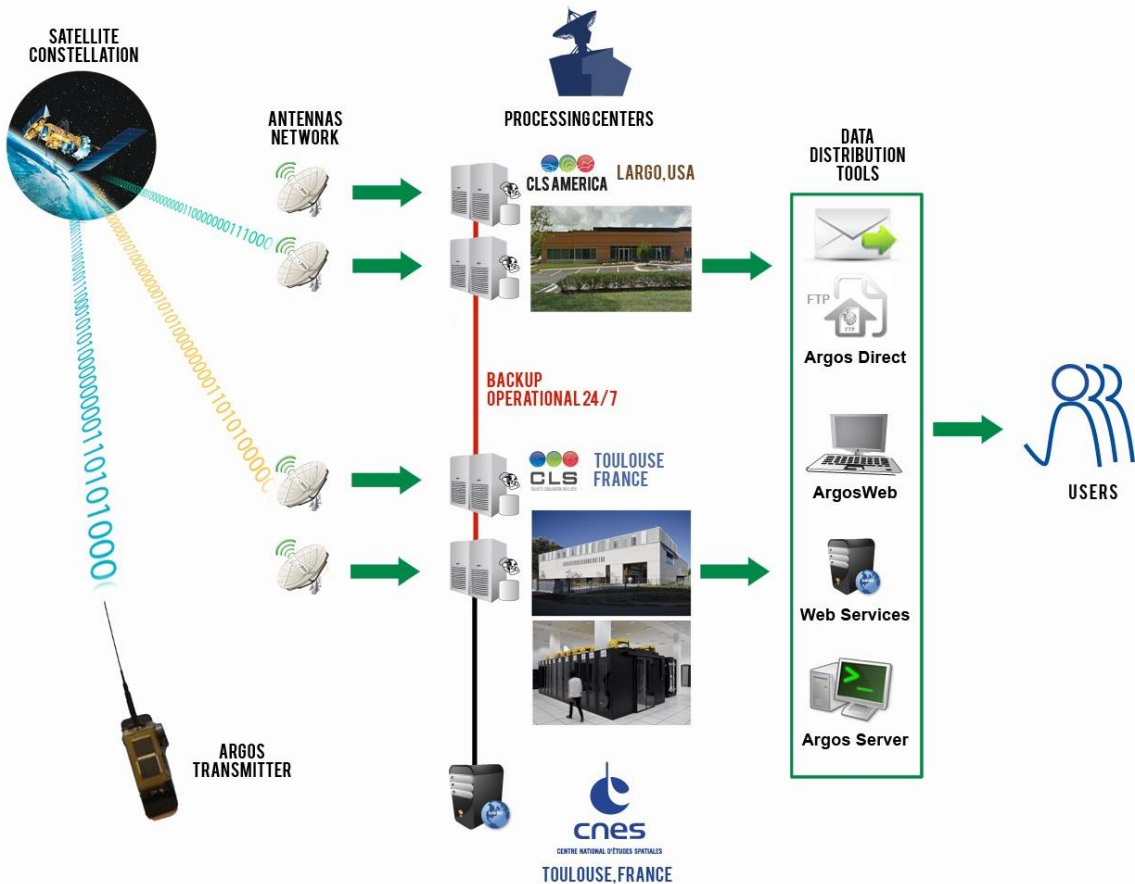
Still lower performances in the East of Indian Ocean areas due to :

Intermittent availability of the Bali antenna & the Perth antenna

→ Work in progress with Indonesia & BOM.



ARGOS system overview



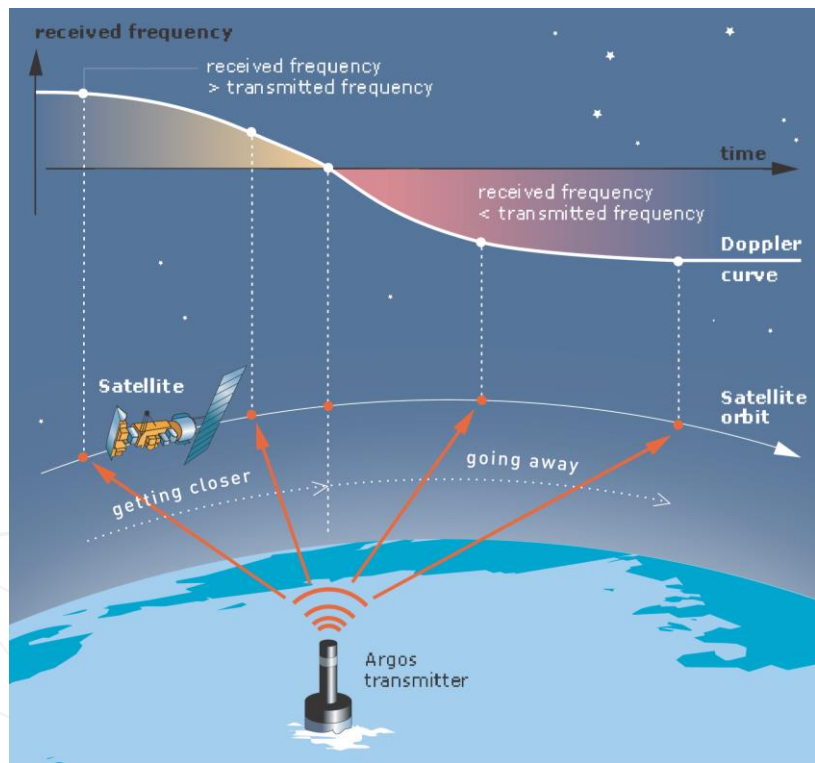
The Argos Data Collection System

- ⇒ **Global Coverage** thanks to polar orbits
- ⇒ **Robustness:** Communication protocol fitted for harsh conditions (no hand checking protocol)
- ⇒ Compatible with **low output power transmission** <1W (long lifetime autonomy)
- ⇒ **Satellite Pass Duration:** up to ~10-12 min
- ⇒ **# satellite passes / day / sat:**
 - ⇒ 3-4 (low lat.)
 - ⇒ 4-6 (mid lat.)
 - ⇒ 10-12 (high lat.)

	Argos-2	Argos-3	Argos-4
Processing Units	8 low data rate	9 low data rate 3 high data rate	32 low data rate 8 high data rate
Uplink Data Rate	400 bps	400 bps (low) 4800 bps (high)	124 bps (very low) 400 bps (low) 2400 (medium) 4800 bps (high)
Downlink (465.9875 MHz)	No	Yes	Yes
Downlink Data Rate	N/A	400 bps	1000 bps
Data Transmitted per Satellite Pass	0.4 Kbytes	Up to 4 Kbytes	Up to 4 Kbytes

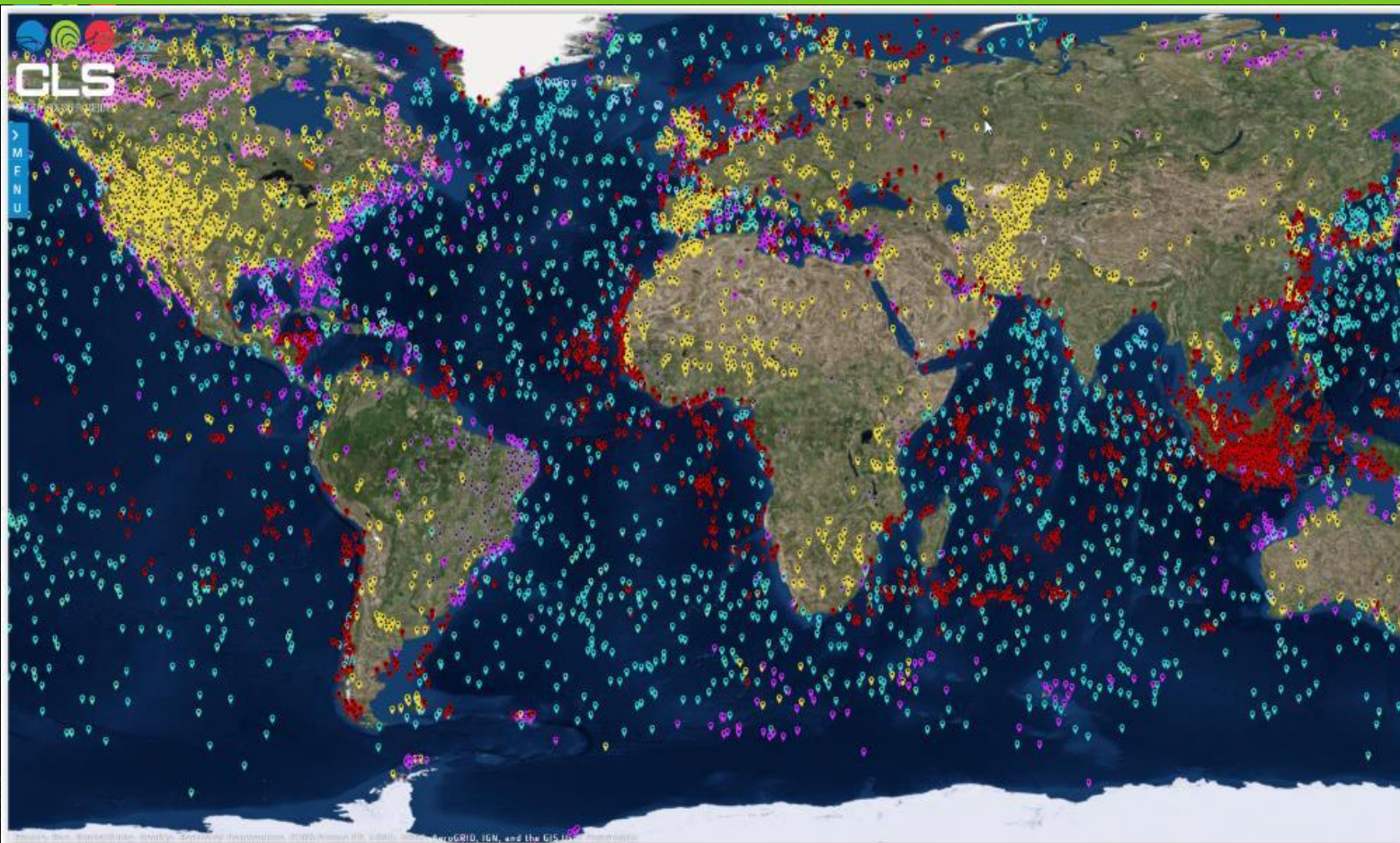
➤ With 6 operational satellites, from 7 Kbytes to **240 Kbytes** of data can be transmitted through Argos every day (24 hours)
















“Doppler Effect” Location Principle



- ⇒ **GPS free** positioning system
- ⇒ Locations computed by the system itself
- ⇒ **Uncorruptible**
- ⇒ **Few seconds** with sky visibility is enough to get a position
- ⇒ Accuracy up to **250m**
- ⇒ For more accuracy **GPS** could be added

Argos usage – 18 000 active transmitters



-  AIRCRAFT
-  BIRDS
-  CONTAINERS
-  DRIFTER
-  FISH
-  FIXED STATION
-  ICE BUOY
-  LAND ANIMALS
-  MARINE ANIMALS
-  MOORED BUOY
-  SHIP
-  SUBSURFACE FLOAT
-  UNDERWATER STATION
-  UNDERWATER VEHICLE
-  UNKNOWN PLATFORM TYPE

A single secured web site to:

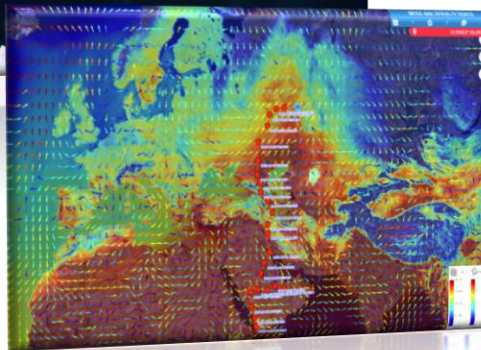
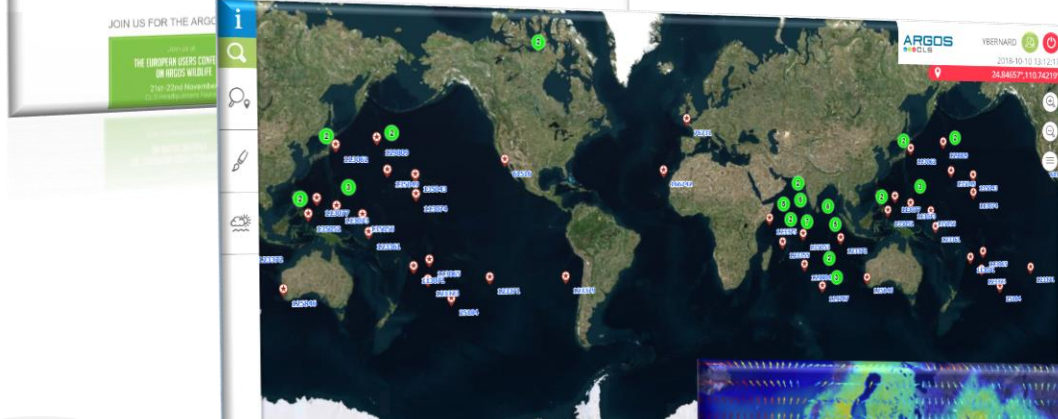
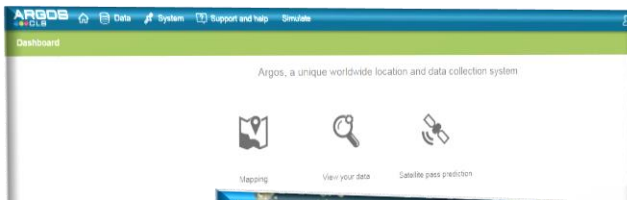
- ✓ View all positions on a map
- ✓ Download all available data
- ✓ Export Google Earth files
- ✓ Manage users settings

⇒ *Free access to one year of data online*

⇒ *Meteorology & Oceanographic data from Global Models (EUCMWF, Copernicus) together*

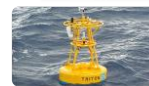
⇒ *Mapping and along-track sampling*

⇒ *Mobile friendly responsive design*

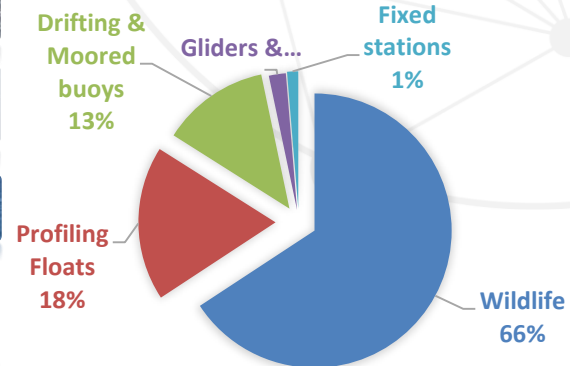


Argos JTA pricing

- **Argos Join Tarif Agreement (JTA)** part of the Satcom Forum under the umbrella of IOC and WMO through JCOMM.
- **Cost recovery basis**, operation costs = revenue
- A pricing structure **simple, attractive and budget predictable**
 - 15€/month per active platform
 - 4€/day of transmission capped to 12 days per month
 - **UNLIMITED monthly subscription @ 63 € / platform**
(*"all you can transmit" offer*)
- **Argos service costs has been divided by 3** for oceanography & meteorology applications in 2018



10 000 ACTIVE JTA PLATFORMS





ARGOS TEAM CLS

ARGOS FOR NEXT GENERATIONS



ALEXANDRE TISSERANT JEAN MULLER SEBASTIEN VINCENT STEPHAN LAURIOL OUAN ZAN ZANIFE

CHIPSET TEAM INTEGRATION & SUPPORT



CLÉMENT TRICOT STÉPHAN LAURIOL PATRICK GROUSSIN

CONTRACTS & SA



CÉCILE CONVERT NADINE LUCAS CATHERINE BRINSTER SEEMA OWEN (WOODS HOLE GROUP)

USER OFFICE



ANNE-MARIE BRÉONCE ANNA SALSAC JIMENEZ CHARLES ORIEU LA ROCHELLE DEBBIE STAKEM (WOODS HOLE GROUP) JENNIFER SPARKS (WOODS HOLE GROUP) HOWARD WALLER (WOODS HOLE GROUP) JI HUYN CHO (KL TRADING - KOREA) MASAYUKI NAGASAKA (CUBIC-1 - JAPAN) HOLLY LOURIE (SIT AUSTRALIA)

SALES TEAM



YANN BERNARD ALINE DUPLAA SOPHIE BAUDEL BRICE ROBERT KENSON JOSEPH THOMAS GRAY (WOODS HOLE GROUP) LEO AMBROSI (WOODS HOLE GROUP) CHRISTIAN BULL (CUNLOGAN - CHILE) MARIA JOSE BOLHARTE (CLS PERU) JULIO PELLEGRINI (PROOCERANO - BRAZIL)

ALEXANDRE SALMAN (ES-PAS - RUSSIA) ANDY WU (CLS CHINA) YUTOMI HIDEFUMI (CUBIC-1 - JAPAN) SANG CHUL KIM (KL TRADING - KOREA) ANTON WIJAYA (PT CLS INDONESIA) GUAN OON (SIT AUSTRALIA)

TECHNICAL TEAM 24/7 OPERATIONS



PHILIPPE ROQUES CHRISTOPHE GRUTHIER MARC LEFEBVRE JULIEN ANDRAL PASCAL ANTONA LUC BRUCHET MARC DELVOLVE PATRICK GARCIA AMÉLIE GIL RAPHAËL GIRARD CANN LY FRÉDÉRIC MAYART PHILIPPE PARIS JEAN-YVES VALENTIN GILLES YIEU

PROCESSING CENTER



ALINE CHAVILLON MICHEL TURIOT ALAIN FONTANAUD THOMAS PANGAUD PHILIPPE YAYA HUGUES CAPOEVILLE PHILIPPE DE SAINT LEGER

60 people dedicated to Argos worldwide !

A new satellite with an Argos payload will be launched next month (07/11/18): METOP-C

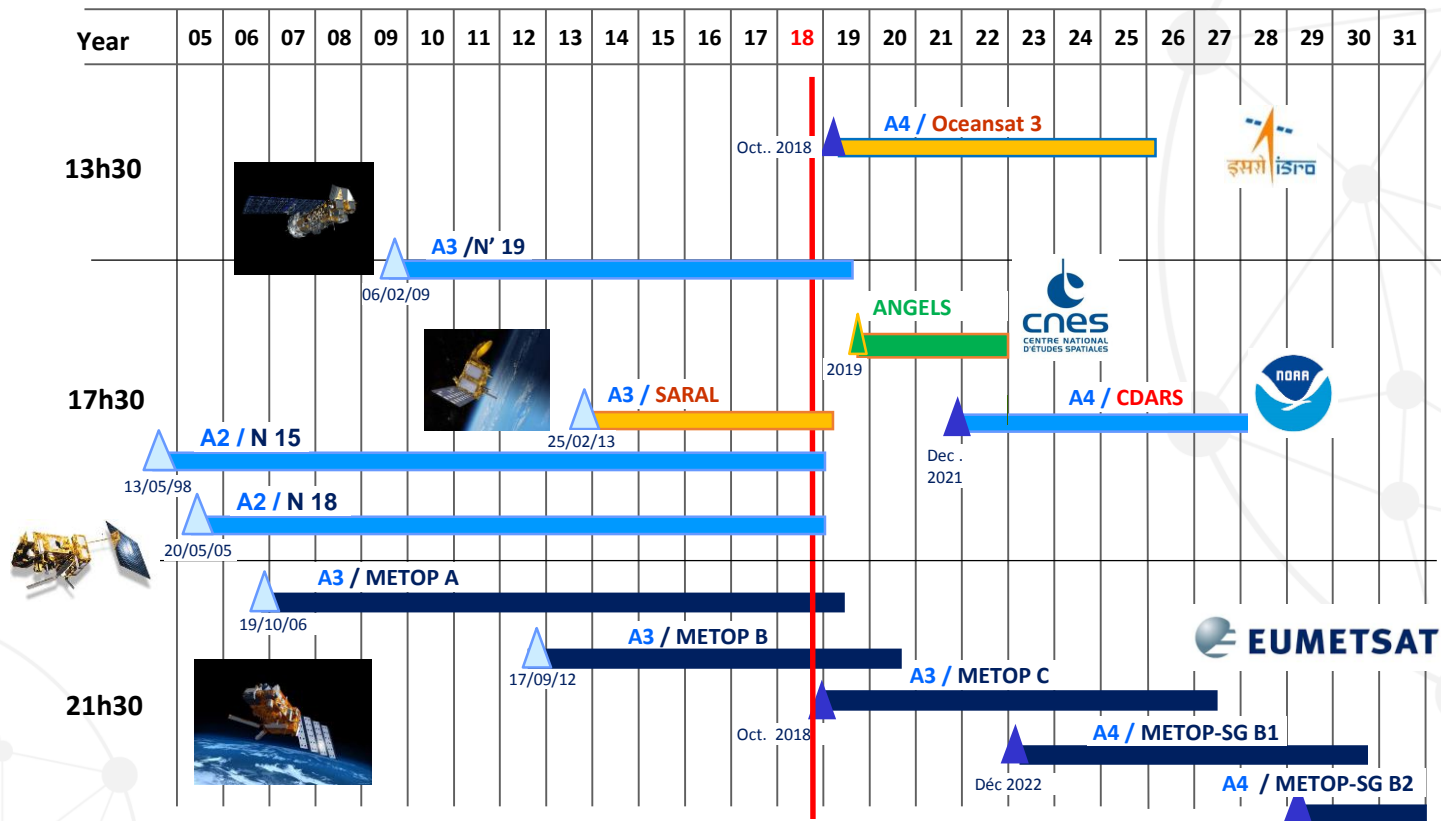
New generation of satellite instrument Argos-4 will be launched end 2019 by ISRO on OceanSat-3

NOAA, in coordination with the U.S. Air Force, is undertaking the next step to support flight of an Argos-4 instrument in 2021: CDARS program

CNES will launch ANGELS (Argos NEO Generic Economic Light Satellites) the 1st Argos CubeSat end of 2019

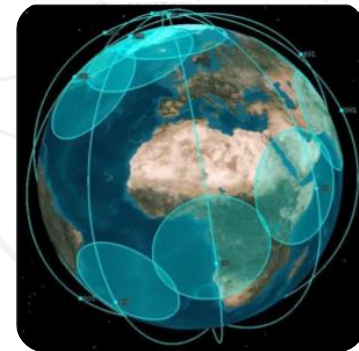


Argos constellation in 2018

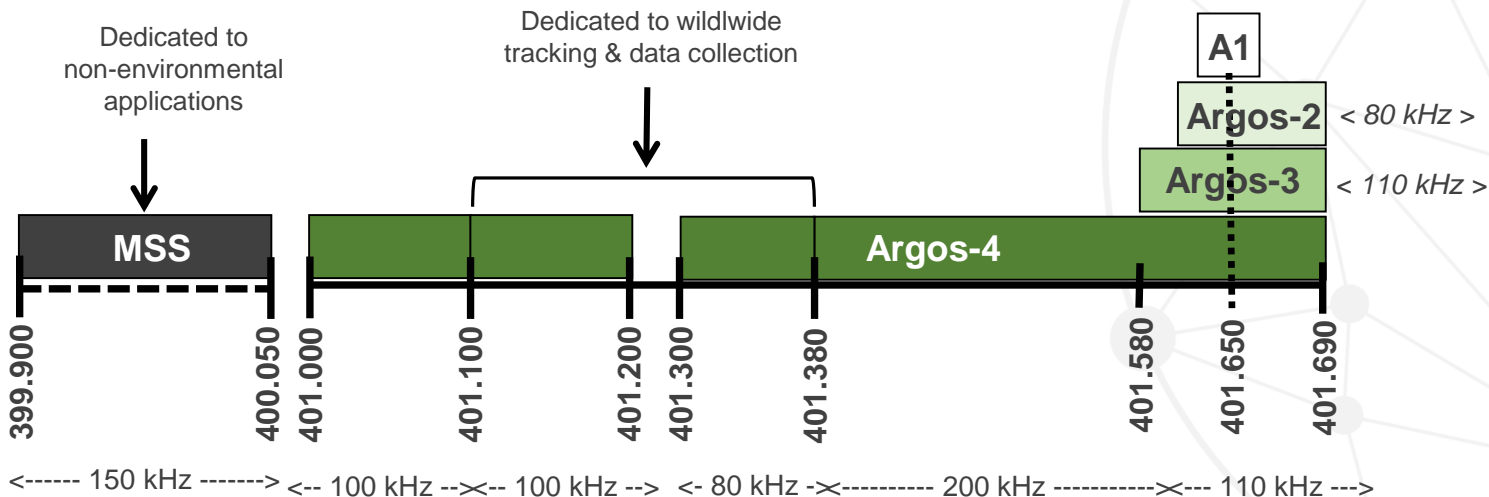


Argos-4 improvements

- **To reinforce performance for very low power transmitters**
 - ✓ Objective : to decrease the transmitter output power : **down to 100 mWatt**
- **To reinforce high data rate performance (2400- 4800 bps)**
 - ✓ **4 dB improvement**, automatic switch between medium and high data rates
 - ✓ New downlink, compatible with US frequency regulation
- **To increase the system capacity**
 - ✓ More than **50 000 beacons** will be processed (5 000 today) on a footprint (5 000 km diameter) thanks to a better performance regarding detection
 - ✓ 40 processing unit (instead of 12 with Argos-3)
 - ✓ High increase of frequency bandwidth (600 kHz instead of 110 kHz on Argos-3)



ARGOS-4 FREQUENCY BANDS



⇒ 590 kHz Argos-4 environmental band (ESS)
+ 150 kHz Argos-4 in MSS band



A PROMISING FUTURE



A revolution is coming...



SPACE IOT

A NEW ARGOS SYSTEM IS BORN



GIVES BIRTH TO A COMPANY DEDICATED TO THE NEXT ARGOS SYSTEM



With Kinéis, ARGOS becomes IoT Everywhere



20

NANOSATELLITES
INTEGRATED PROPULSION



25

GROUND STATIONS



3

STRATEGIC
PARTNERS



2021

PUT INTO ORBIT

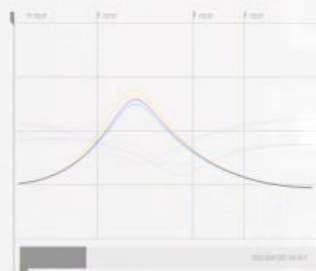


2022

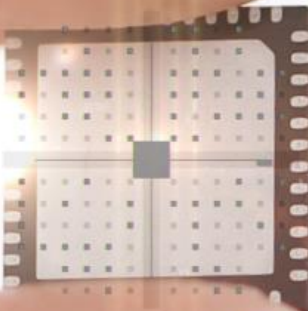
OPERATIONAL SYSTEM



A single chipset for Connectivity



RF TRANSCEIVER
7mm X 7mm



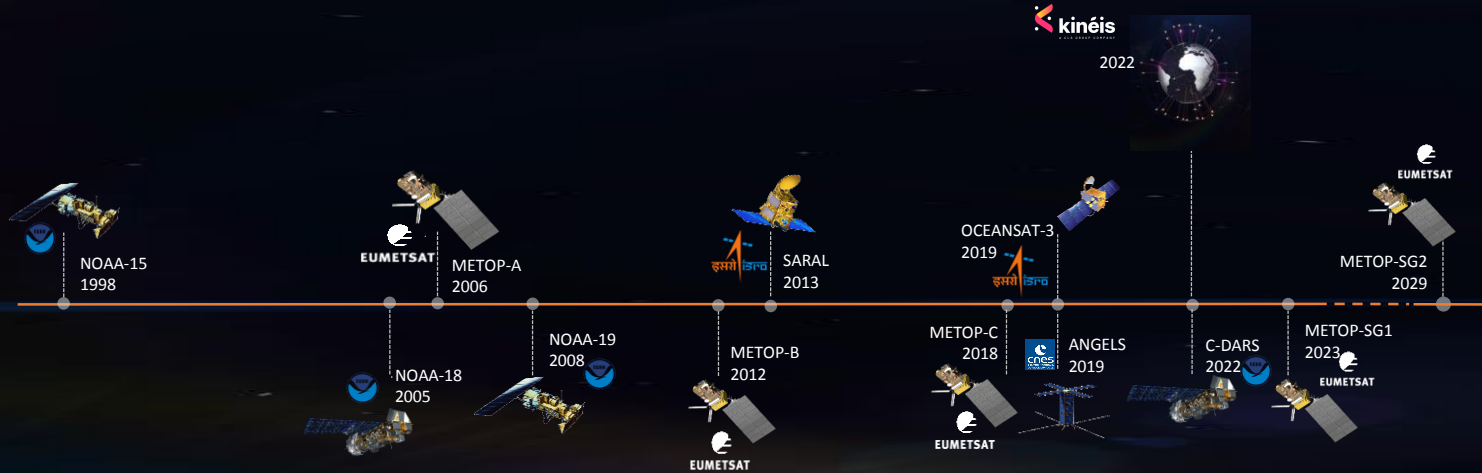
PHASE REACT US-3 CHIPSET

MODE OFF	0mW
MODE VEILLE	0,1mW
MODE RECEPTION	50mW
MODE TRANSMISSION	60mW

T-RD-043

ARTIC chipset : Argos Receiver Transmitter with Integrated Control

- RF 7mm x 7mm single chip compatible with Argos 2/3/4
- “Easy to use” component: Functionalities addressed by a few SPI commands





ARGOS OPERATOR

AIMS TO

1



REINFORCE THE SYSTEM

2



ENSURE ITS CONTINUITY

3



REMAIN A KEY PARTNER FOR THE INTERNATIONAL
SCIENTIFIC COMMUNICATION



TOTAL CONTINUITY OF SERVICE WITH THE ARGOS SYSTEM

- Total compatibility between Argos generations



INCREASING REVISIT TIME

- 10 to 15 minutes in average
- Less than 20 minutes everywhere



CAPACITY TO TRANSMIT MORE DATA

- More satellite passes
- More possibilities to send data in high data rate

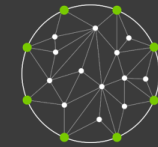


TWO WAYS GUARANTEED

- A constellation fully equipped to communicate with transmitters



Thanks for your attention !



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www.argos-system.org