SPACE TO MANAGE CHANGES IN WILDLIFE PATHWAYS FACED TO ENVIRONMENT & CLIMATE

STSC Conference, Vienna

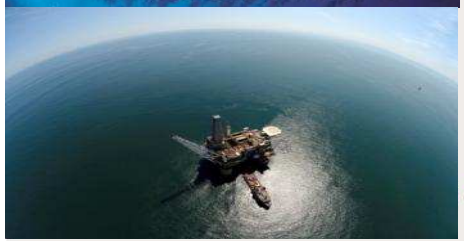
A Duplaa

03/02/2017

Agenda

1. **CLS**
2. Biodiversity protection : wildlife monitoring with ARGOS
3. Satellite Innovative systems to monitor animals

Key points



Created: 21 April 1986

Expertise:

- Operating satellite-based location, data-collection and ocean observation and monitoring systems
- Developing applications and value-added services from satellite-based data

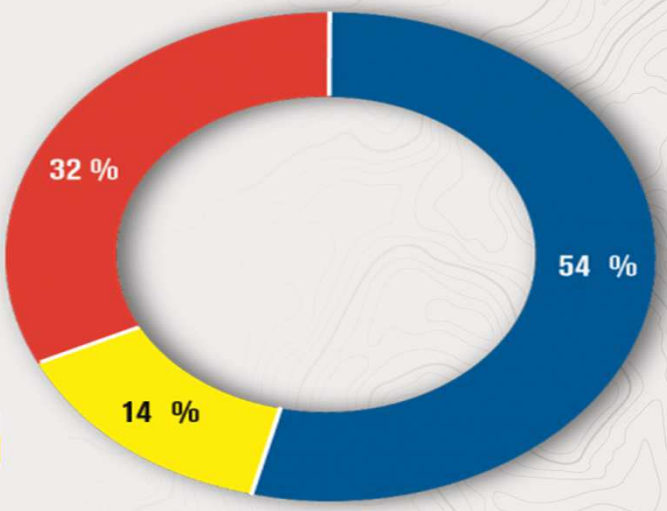
Activities:

- Satellite-base Positioning,
- Environmental data collection ,
- Satellite-based oceanography, radar applications,
- Geolocation of terrestrial vehicles.

Key points

Shareholders

ARDIAN



cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

Ifremer

CLS GROUP

CLS Group: worldwide presence

EUROPE

55
employees

FRANCE

335
employees
290 in Toulouse,
30 in Brest, 15 in Bidart

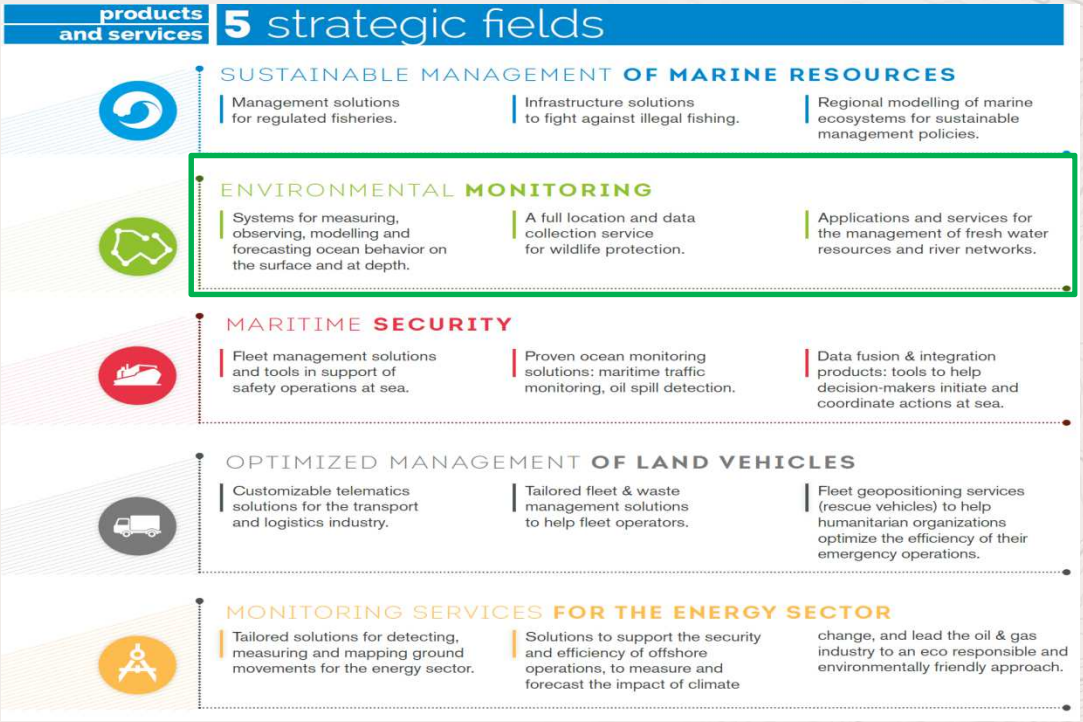
AMERICA

83
employees

ASIA-PACIFIC

27
employees

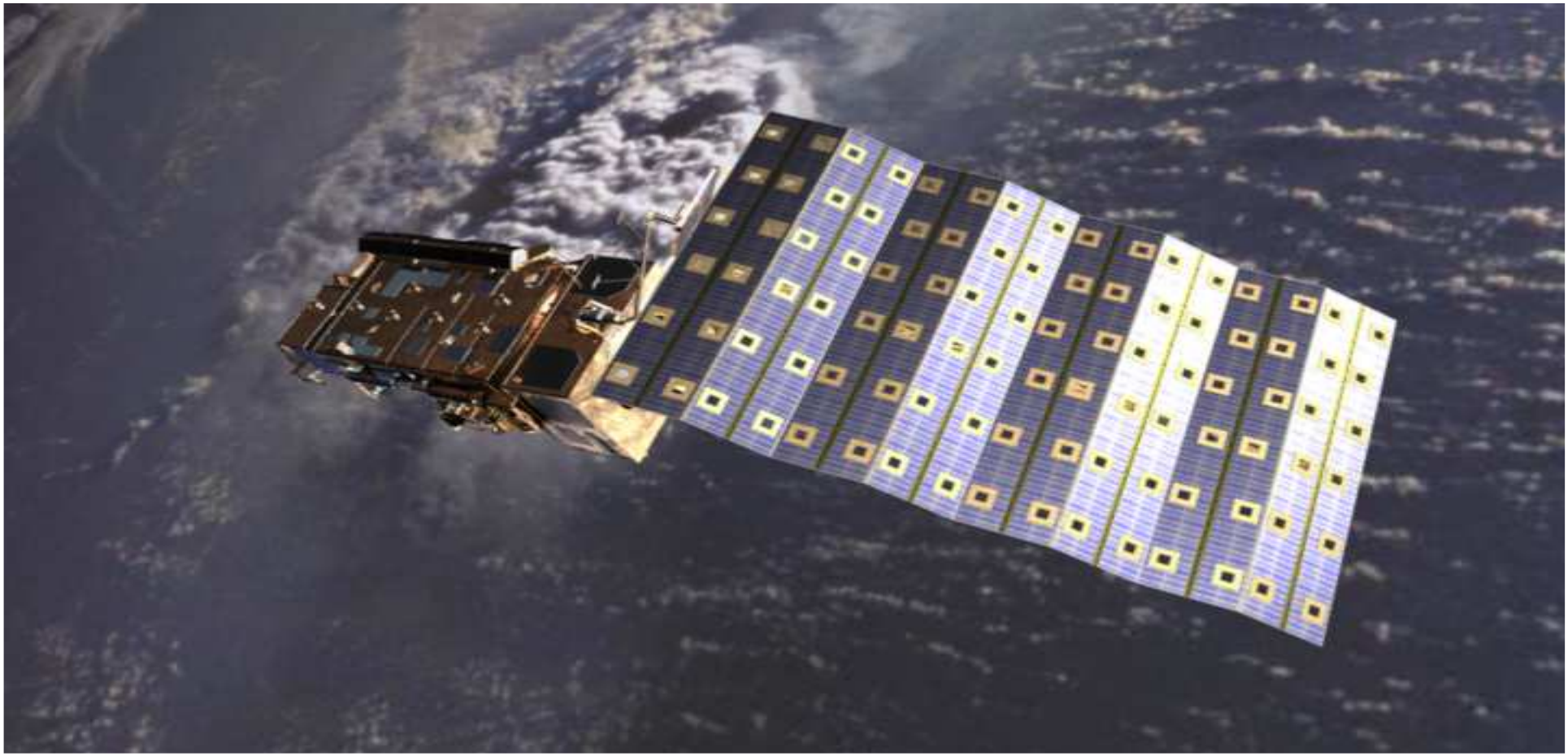
Activities


products and services
5 strategic fields
SUSTAINABLE MANAGEMENT OF MARINE RESOURCES
Management solutions for regulated fisheries.
Infrastructure solutions to fight against illegal fishing.
Regional modelling of marine ecosystems for sustainable management policies.
ENVIRONMENTAL MONITORING
Systems for measuring, observing, modelling and forecasting ocean behavior on the surface and at depth.
A full location and data collection service for wildlife protection.
Applications and services for the management of fresh water resources and river networks.
MARITIME SECURITY
Fleet management solutions and tools in support of safety operations at sea.
Proven ocean monitoring solutions: maritime traffic monitoring, oil spill detection.
Data fusion & integration products: tools to help decision-makers initiate and coordinate actions at sea.
OPTIMIZED MANAGEMENT OF LAND VEHICLES
Customizable telematics solutions for the transport and logistics industry.
Tailored fleet & waste management solutions to help fleet operators.
Fleet geopositioning services (rescue vehicles) to help humanitarian organizations optimize the efficiency of their emergency operations.
MONITORING SERVICES FOR THE ENERGY SECTOR
Tailored solutions for detecting, measuring and mapping ground movements for the energy sector.
Solutions to support the security and efficiency of offshore operations, to measure and forecast the impact of climate
change, and lead the oil & gas industry to an eco responsible and environmentally friendly approach.

Agenda

1. CLS
2. **Biodiversity protection : wildlife monitoring with ARGOS**
3. Satellite Innovative systems to monitor animals

THE ARGOS SYSTEM



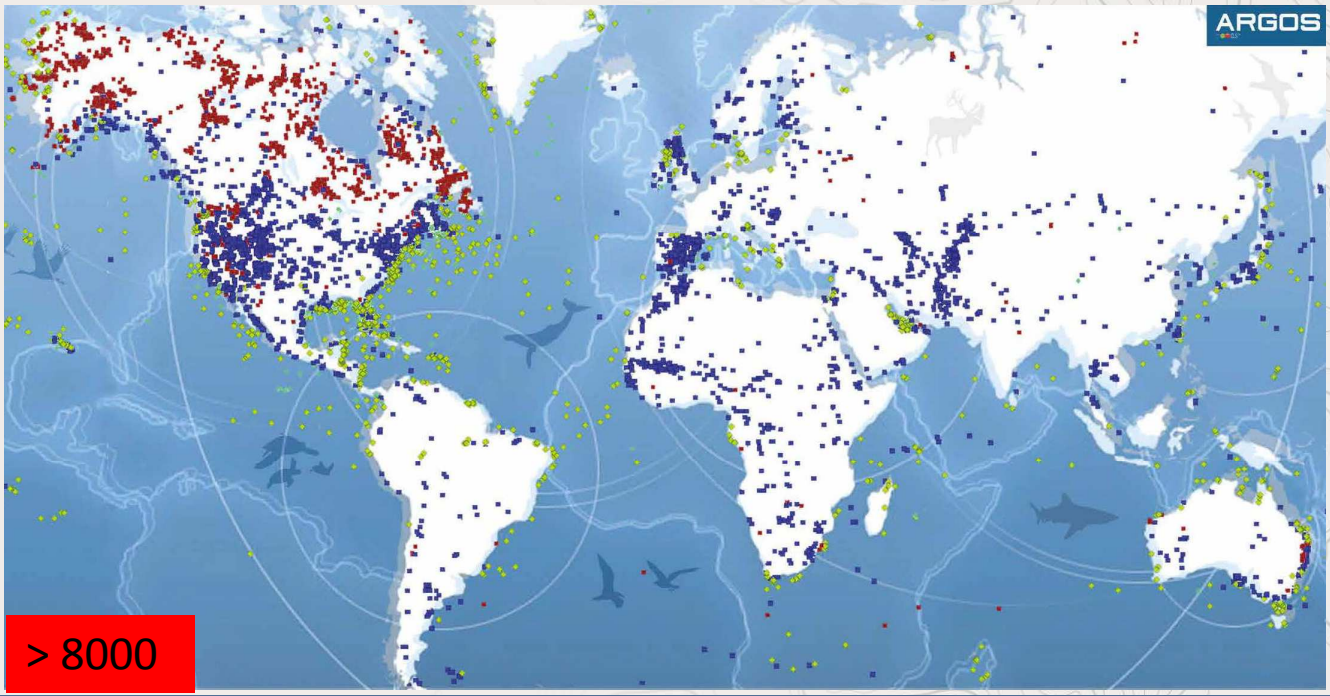
The Argos system

Argos is a global satellite-based location and data collection system dedicated to studying and protecting our planet's environment.

CLS is the unique operator of the Argos system on behalf of the 4 space agencies involved

Operational & global coverage system

The Argos system



- It allows any mobile object equipped with a compatible transmitter:
  - To be located anywhere in the world,
  - To send data from measurement sensors connected to this transmitter

CLS expertise in animal's monitoring

Argos is unique for birds thanks to:

A global coverage
Smallest transmitters (5gr and even smaller)
Ultra low power
Robust to harsh conditions
Water resistant
Solar panels
long lifetime from 1 to 6 years

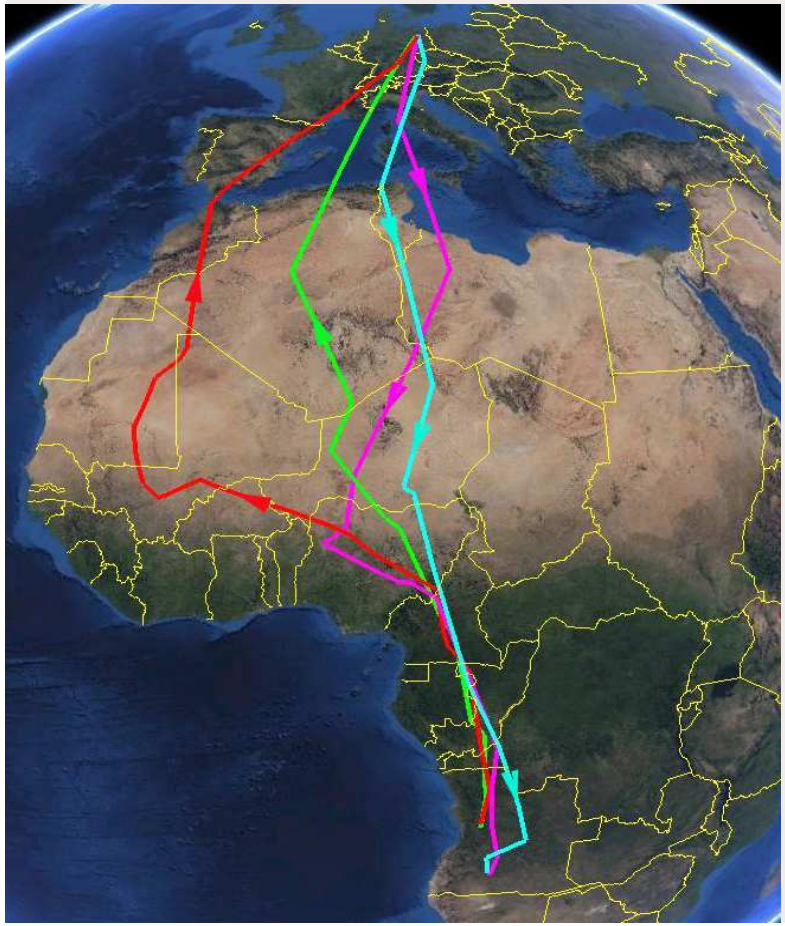
CLS GROUP

Types of birds tracked

From the bald-headed eagle to mangrove cuckoo

MANGROVE CUCKOO
SMALLEST ANIMAL
ever tracked

Case Study: Hobby tracking with 5g tag



Species: Falco subbuteo
Geographic area: Europe and Africa
Objective: Understand the migration patterns of this small bird.

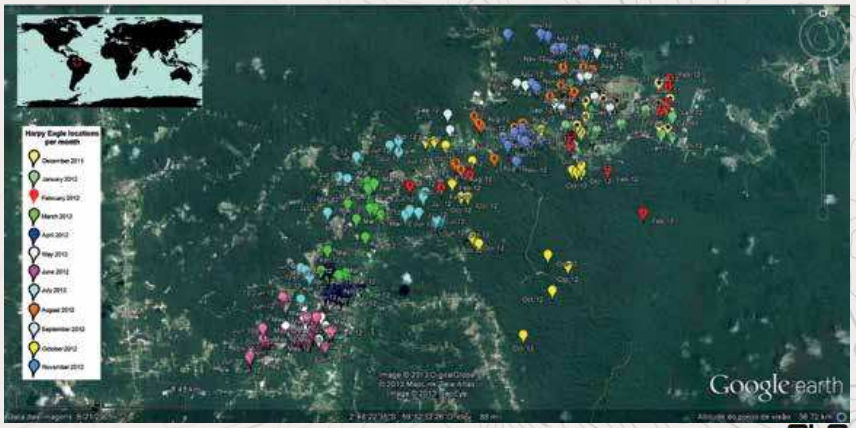
The first 5g satellite transmitter fitted to a Hobby delivered astoundingly high numbers of good Argos Doppler fixes. The complete dataset comprised over 2,000 positions.

Altogether, two spring and two autumn migrations, as well as two wintering periods were recorded.

Case study: Tracking Harpy eagles

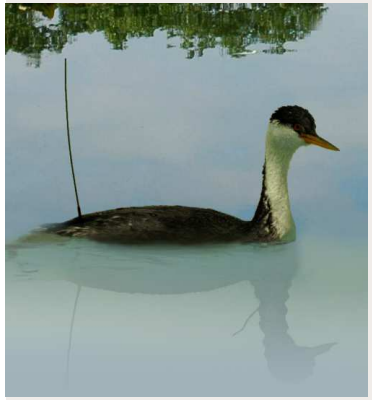
Species: Harpia Harpyja
Geographic area: Amazon rain forest, Brazil
Objective: Identify areas where Harpy eagles breed and hunt and determine which human factors contribute to modifications in their comportment in order to better preserve this species.

This individual Harpy eagle, tracked from December 2011 to November 2012 travelled on average 6.7 km/month, and uses an area of 111 km²/year and returns to certain areas in different months but without establishing a definite territory.



Project carried out by the Brazilian Harpy Eagle Conservation Program (PCGR), National Institute for Amazonian Research (INPA),

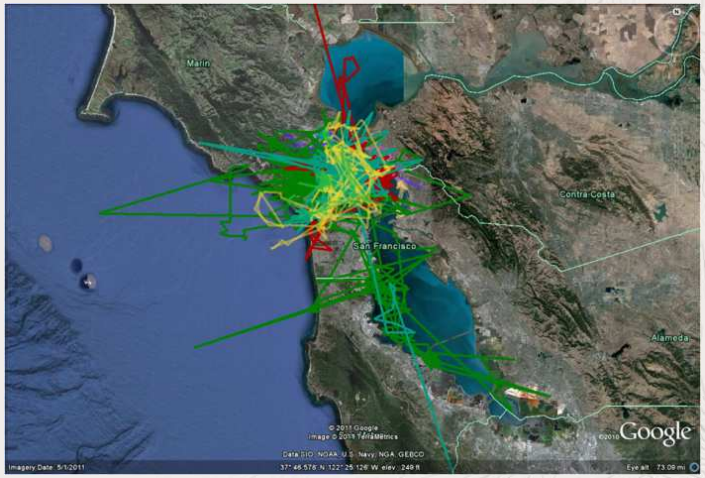
Case study: Tracking Western Grebes



Surgically implanting the Argos tags is the only technique that makes it possible to track this small (800-1800 g) bird that dives, swims and flies.

Species: Aechmophorus occidentalis
Geographic area: San Francisco Bay, California
Objective: Using surgically-implanted Argos satellite transmitters to track rehabilitated Western Grebes after an oil spill.

Figure 1: Tracks made by Western Grebes in San Francisco Bay, CA (December 2010-October 2011). Each line of color represents a different bird.



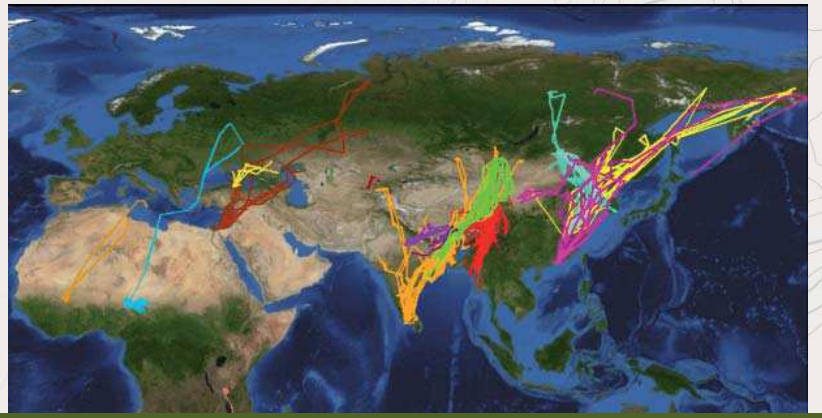
Case study: Tracking potential long-distance vectors of HPAI H5N1

Species: *Anas platyrhynchos (mallard), Anser indicus (bar-headed goose), Cygnus cygnus (whooper swan)*

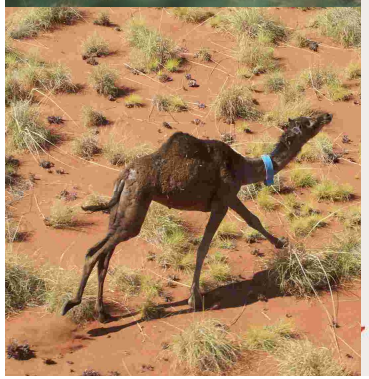
Geographic area: Asia and Africa

Objective: Evaluate the dispersive potential of HPAI H5N1 viruses by wildfowl through an analysis of the movement range and movement rate of birds monitored by satellite telemetry and the Argos satellite tracking system in relation to the apparent asymptomatic infection duration (AID) measured in experimental studies.

Project coordinated by the Food and Agriculture Organization (FAO) of the United Nations between 2006-2010. Full results published in **Journal of Applied Ecology.**



500 transmitters in 12 countries
24 species



Argos for land animals

Argos is unique for land animal tracking thanks to:

- A global coverage : especially Poles
- Robust to harsh conditions
- Transmitters of all sizes (smallest = 190 gr)
- Ultra low power
- Water resistant
- Solar panels
- Long lifetime from 1 to 6 years

GPS collars with Store-on-board datalogging and a compact, light-weight design (190 gr) that's ideal for use on smaller animals.

More than 35 years of wildlife tracking !

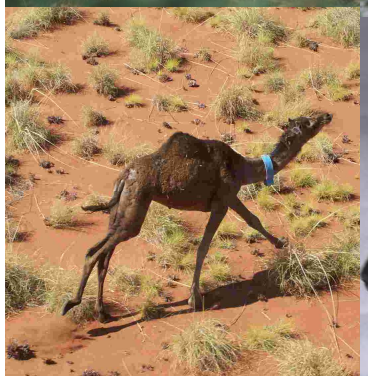
- ✓A global coverage
- ✓ Ultra low power consumption
- ✓ Robust to harsh conditions
- ✓ Water resistant
- ✓Solar panels or batteries
- ✓ Long lifetime from 1 to 6 years

Argos for land animals

From the African elephant to the prairie dog…

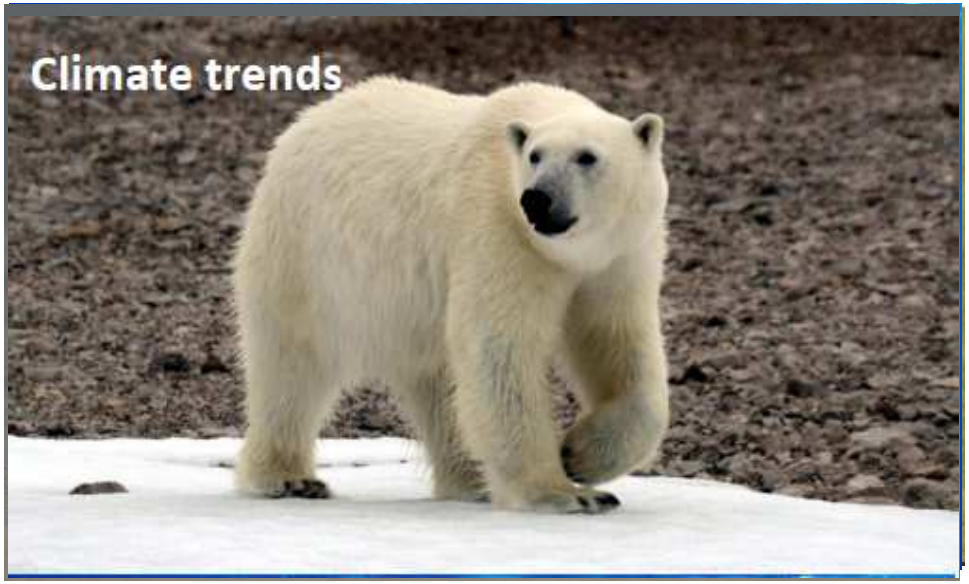
AFRICAN ELEPHANT

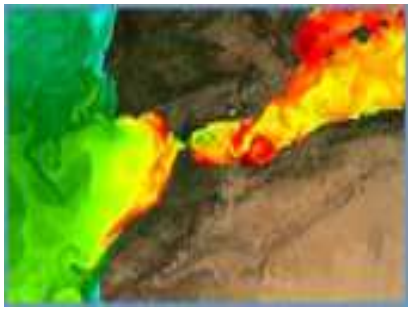
LARGEST LAND ANIMAL EVER TRACKED

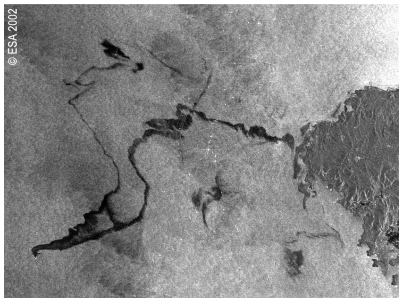


SCIENTIFIC NEEDS

Meteorological & Environmental Information as through the animal's eye (or feel)

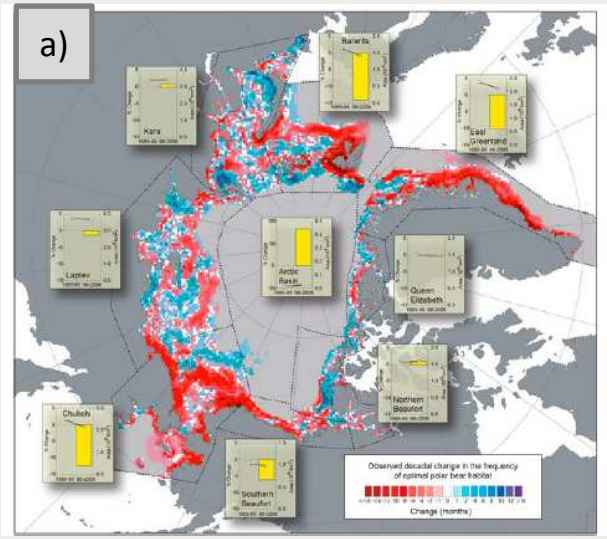


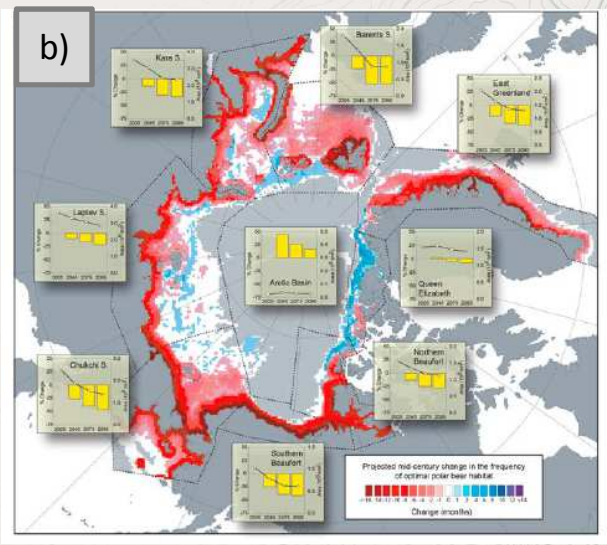




Case Study: Tracking polar bears

Species: Ursus Maritimus
Geographic area: Alaska
Objective: Understand polar bear adaptation to climate change by comparing polar bear behavior over 20 years with respect to changing sea ice extension.

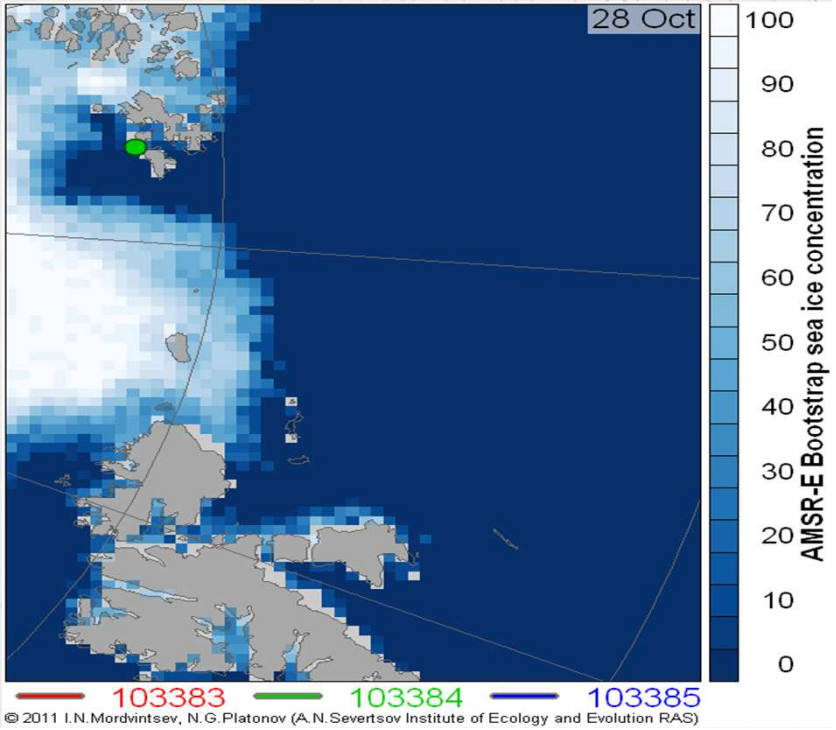




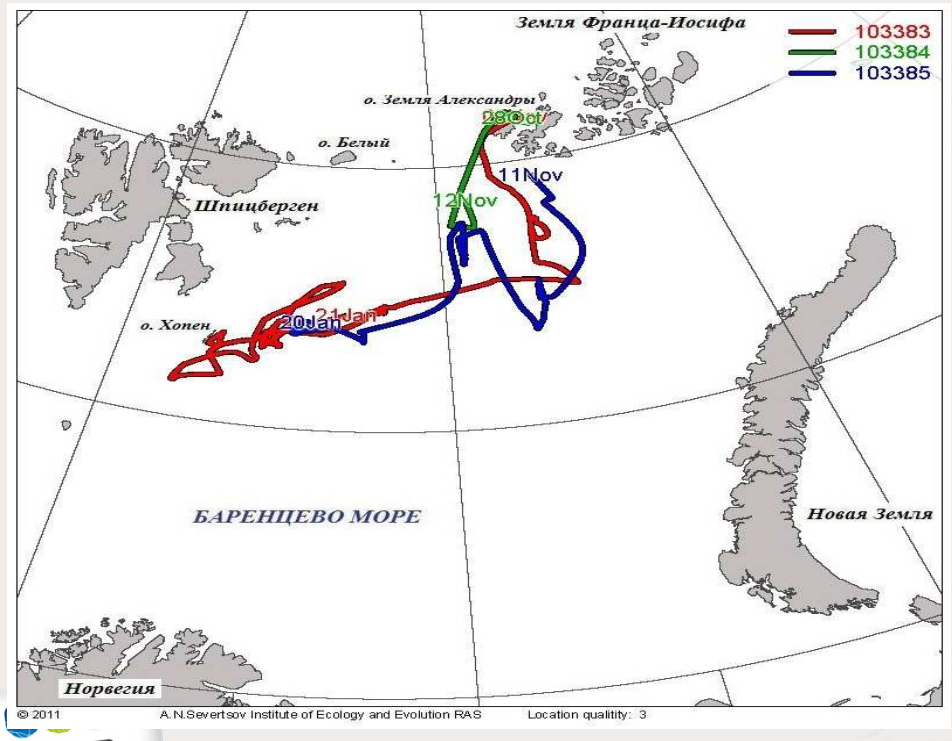
Change in the cumulative number of months of polar bear optimal sea ice habitat:
a) observations comparing 1985-1995 to 1996-2006;
b) projections comparing 2001-2010 to 2041-2050. Data George Durner, USGS

Polar bear monitoring in northern Russia

3 polar bears have been tagged satellite collars in Russia



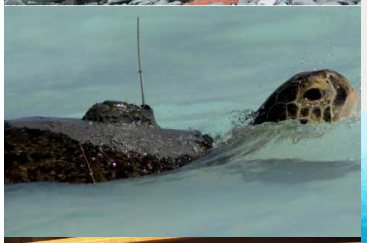
Polar bear monitoring in northern Russia

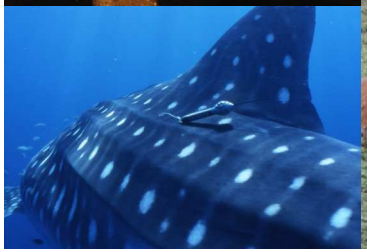


- Study habitat evolution
- Assess in real time the climate impact
  - **Step 1** : Monitor animal mobility
  - **Step 2** : Monitor the ice: localisation, thickness, movements
- **Objective:** animal conservation

Argos for marine animals

From pelagic fishes to marine mammals…





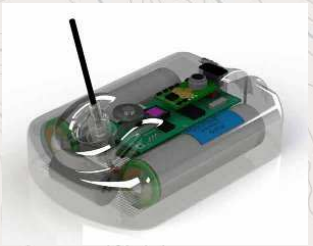
1800
MARINE ANIMALS
tracked as they migrate
across the oceans

Argos for marine animals

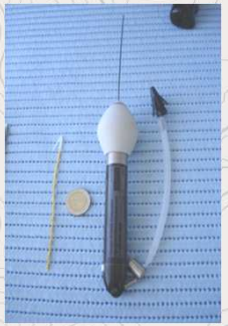
Argos is unique for marine animal tracking thanks to:

- Global coverage
- Ultra low power
- Water-proof
- Long lifetime from 1 to 6 years
- Robust to harsh conditions
- Argos, Argos + GPS, and light-based locations available

For surface marine animals (turtles, crocodiles, whales, surface sharks, seals, walrus) PTTs are glued on the skin, or can be harnessed

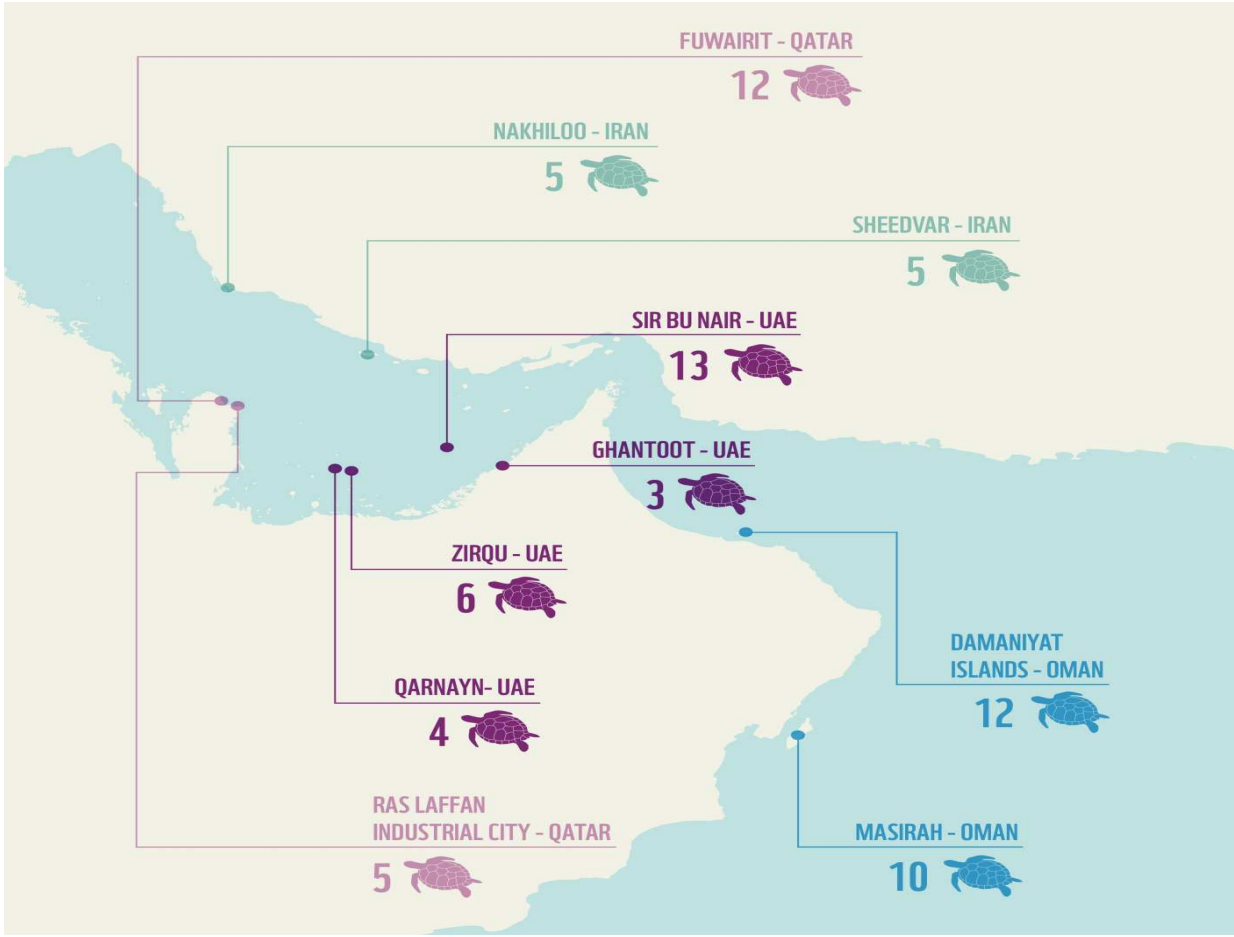


For pelagic fishes: tags are harpooned and pre programmed to detach automatically. Geolocation is based on light level records. Records temperature profiles, pressure, salinity and light level.



Marine Turtle Conservation

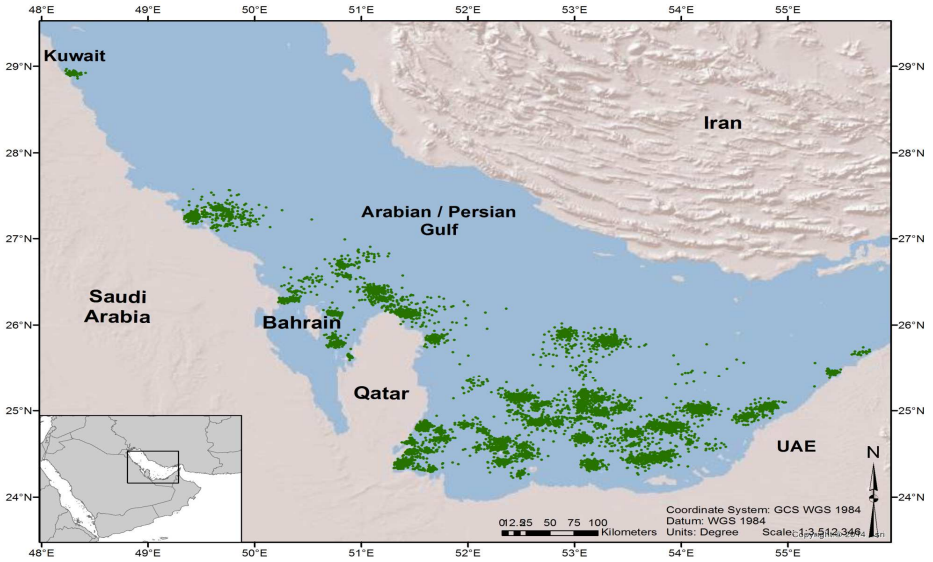
- Study spatial dynamics of animal populations
  - **Step 1** : Monitor 75 hawksbill turtles in 4 countries in the region: Iran, Oman, Qatar and the UAE
  - **Step 2** : Assess the selected habitats and human pressure
- **Objective:** Implementation of marine protected areas



Foraging grounds

The Hawksbill sea turtle *Eretmochelys imbricata* was listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), to protect it from the international trade that had contributed significantly to its decline in the preceding decades.

Nesting grounds



Agenda

1. CLS
2. Biodiversity protection : wildlife monitoring with ARGOS
3. **Satellite Innovative systems for livestock (herds)**

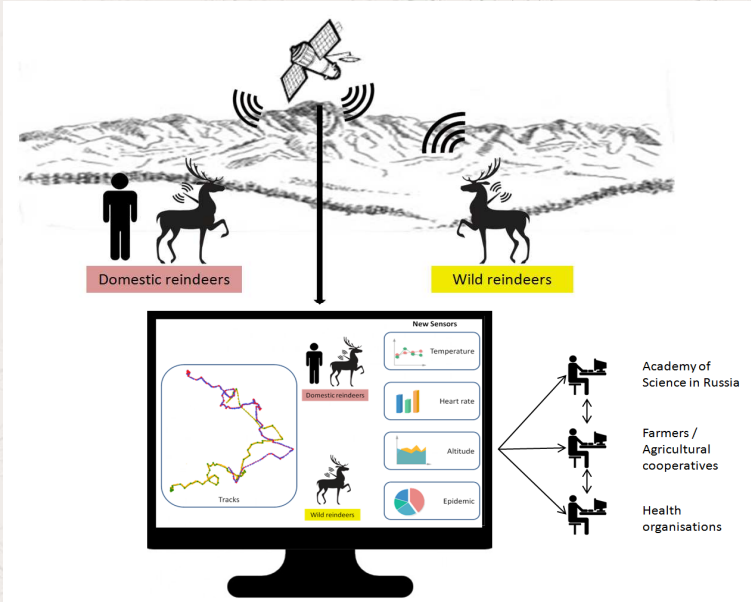
Space Innovative System to Monitor Animals

-SISMA is a project to study new market developments in the field of livestock monitoring, the feasibility of establishing new services for **Health and Disease**, **Farm animal tracking**, and **Ecosystem services including animal conservation**.

-**CLS is conducting a Proof of Concept for Reindeers management in Russia.**

The strategy approach is to be able to link the geo-monitoring of animal " health and environmental conditions" taking into account the short term needs of herders, as well as identifying the markers of change.

➔**Objective: integrated knowledge management system of reindeer population**



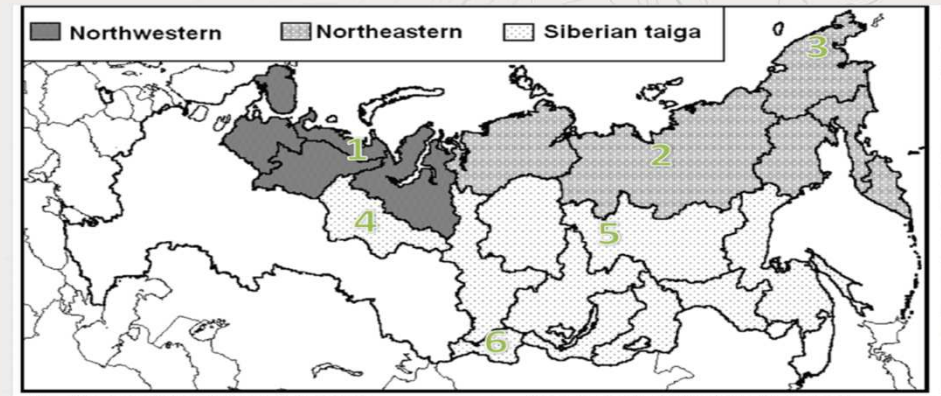
Reindeers scene

Differenciated production systems

- Type of enterprises
  - RE = Public or state reindeer herding interprises
  - RH = Private independant reindeer husbandry households
- Type of regions / Size of herds
  - Tundra type / large herds
  - Taiga type / small herds

There are different types of husbandry which requires different approaches in management.

Species in danger



Needs to be addressed to manage reindeers population

The overall need is related risk management and the sustainability of reindeer husbandry, that is the needs to monitor, control and survey 4 strategic observation domains or risks:

Risks 1: Health & infectious diseases (early detection of health status vulnerability)

Risks 2: Commercial Hunting (spatial monitoring and counting of reindeers population)

Risks 3: Pasture availability & degradation. Land occupation/land status

Risks 4: Population "safety in numbers" & conservation

SOLUTION DEVELOPED: INNOVATION

- Functional innovation:

  Establish a durable link between:

  Animal's health and monitoring conditions,

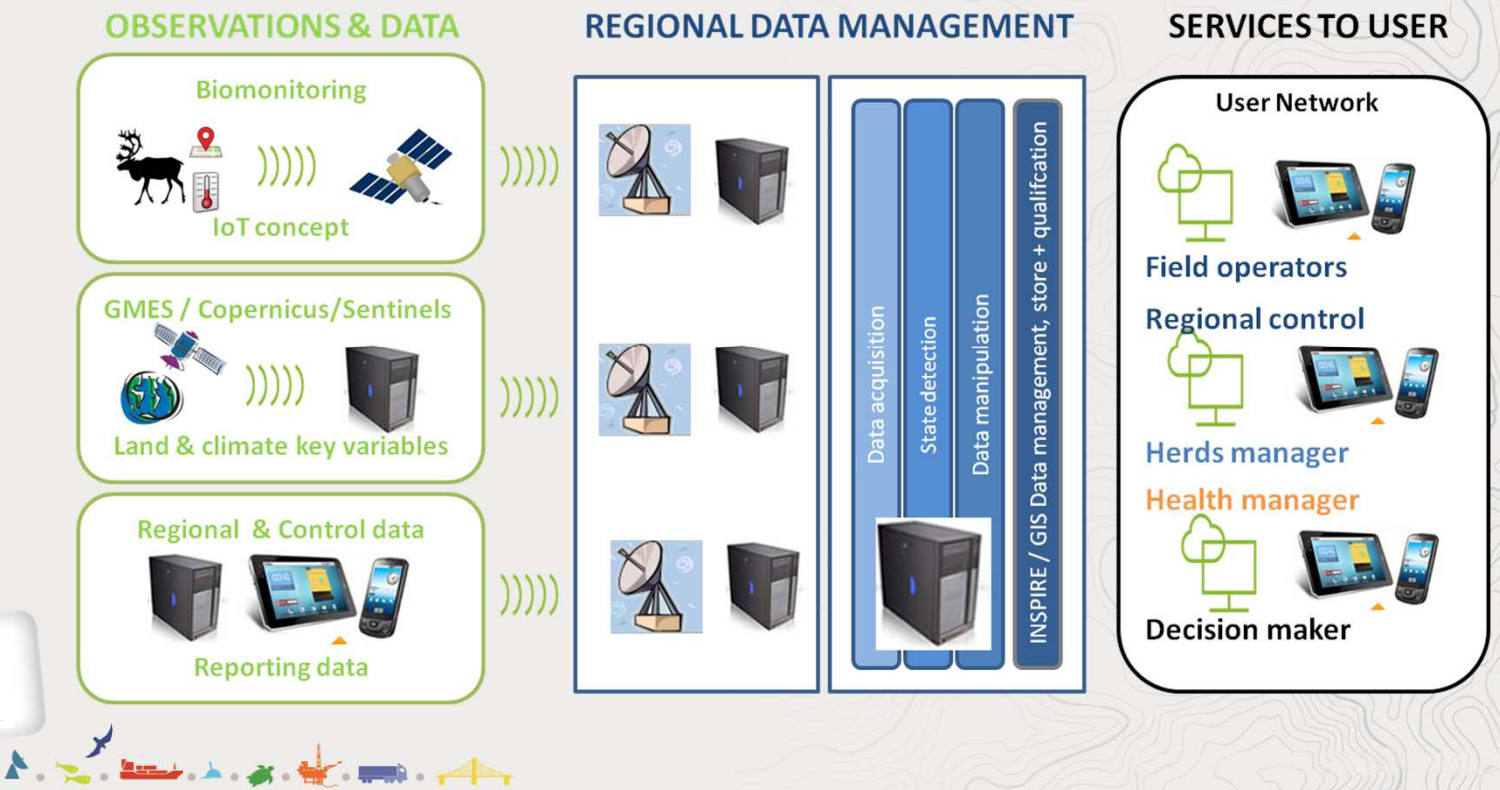
  Integrated system & data to provide the services

  - M2M & IOT
  - Integrated GIS

  Community management

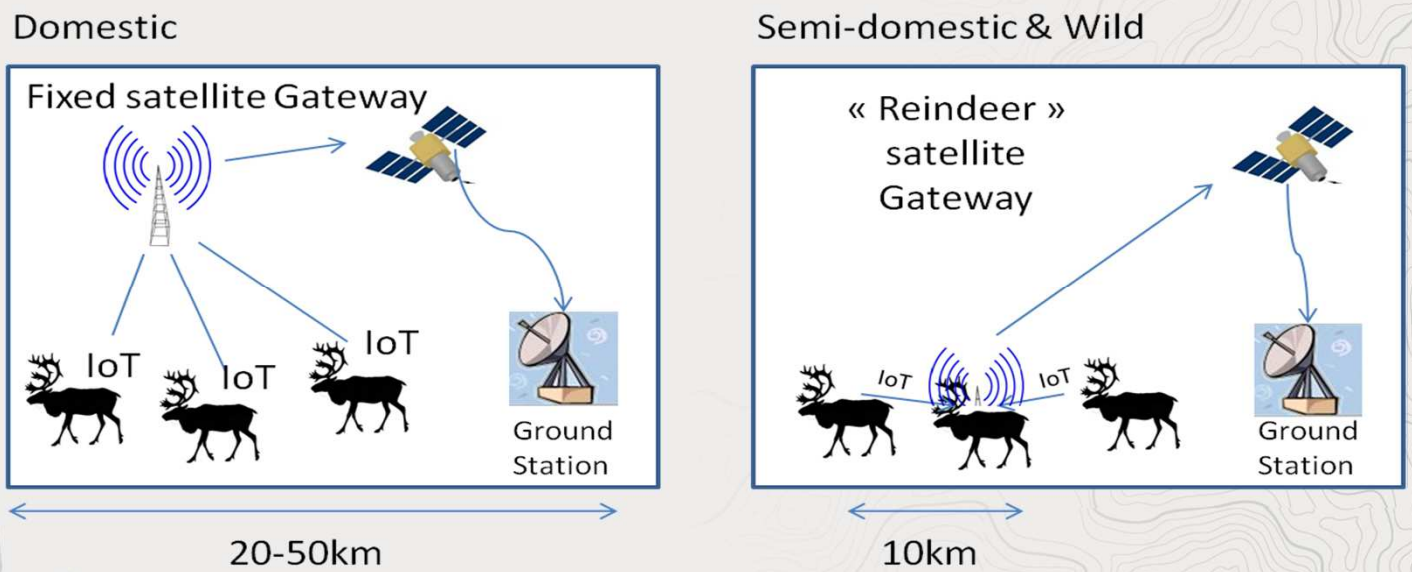
  - Share data and diagnostics

Description of System Architecture

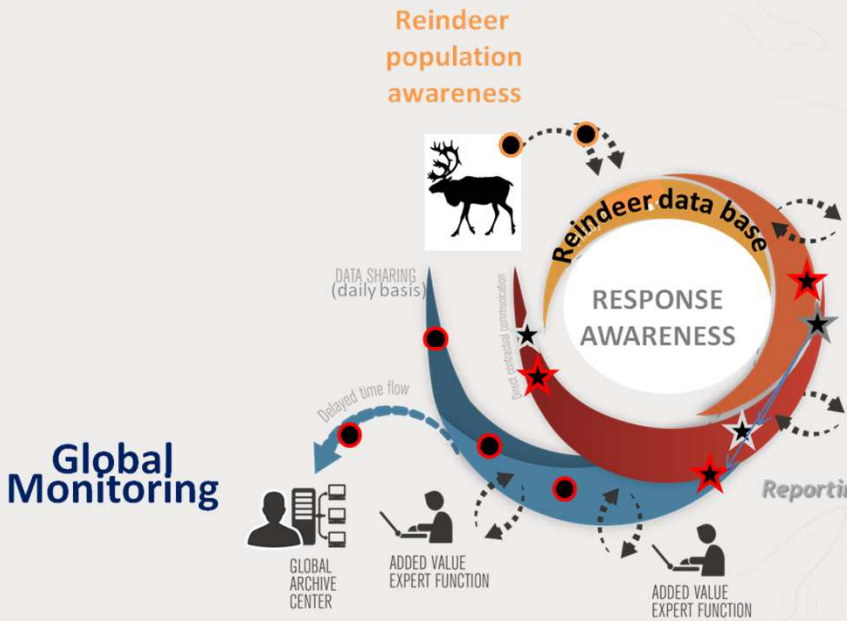


Description of System Architecture

- **Animal conditions monitoring**



Innovative System



Raw data

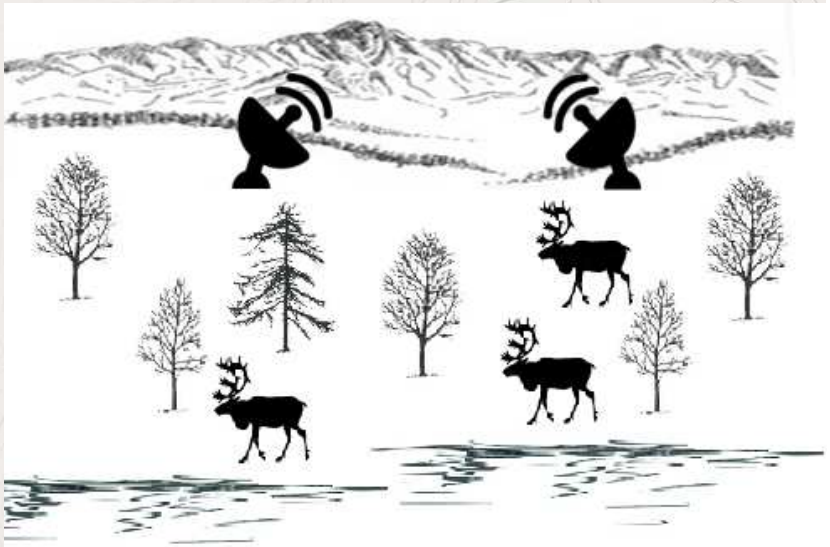
information

Risk

reporting

Frédérique Blanc

Regional management

Conclusion

- A **key strategic approach** is to be able to link the geo-monitoring of animal to health and environmental conditions with the different needs of headers.
- **The User community** is organized in various profiles,/level of access. They contribute at different level to diagnostic of animals.
- Each **level of user community** add value in the system based on Public Private Partnership.
- The **long term management** of accurate satellite data, the merging of diagnostics intelligence and information sharing is expected to:
  - facilitate long term decisions
  - Establish priorities on short to medium term,
  - Help decision makers to give priority to their actions and reduce risks.