

# ZACube-2

pioneering South Africa's indigenous  
capability in maritime domain awareness  
solutions for Africa

56<sup>th</sup> Session of the Scientific and Technical Subcommittee

UNOOSA, 19 February 2019



science  
& technology

Department:  
Science and Technology  
REPUBLIC OF SOUTH AFRICA

# Agenda

- African maritime domain
- South African maritime domain
- South African “ZACube” nanosatellite missions
- Future constellations

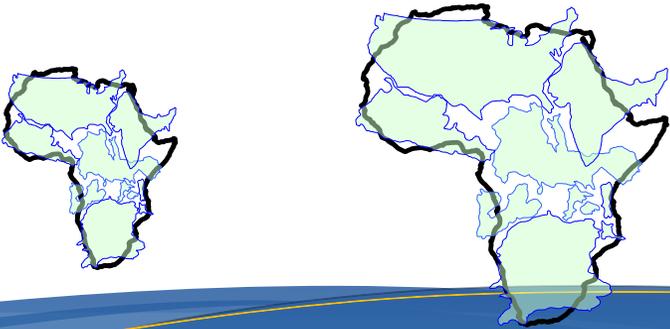
# African maritime domain

- Africa is a vast continent.



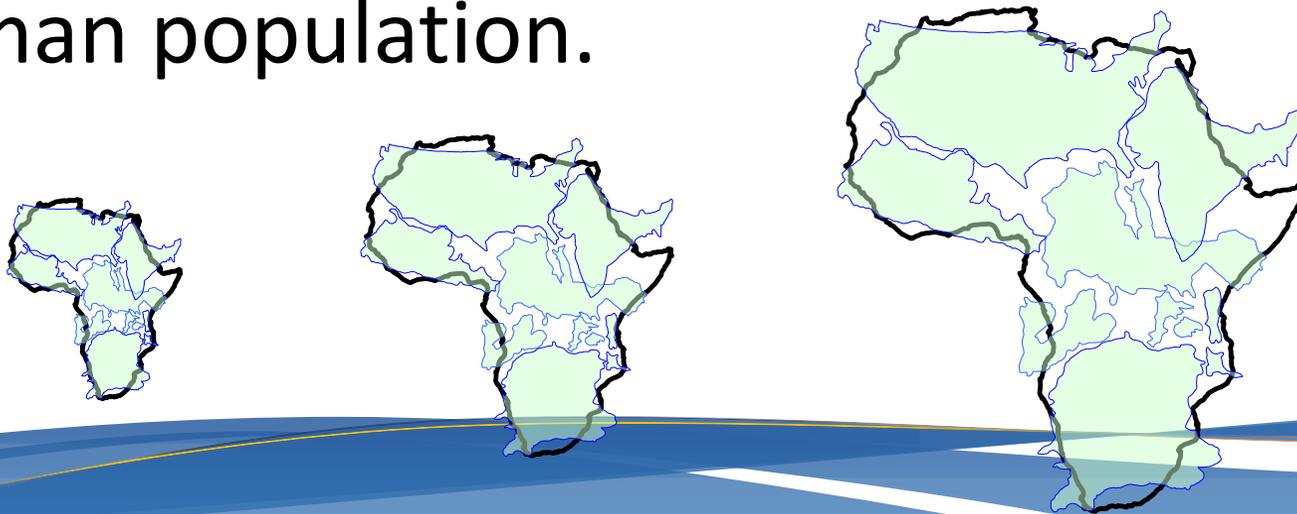
# African maritime domain

- Africa is a vast continent.
- Covers 22% of the Earth's land surface.



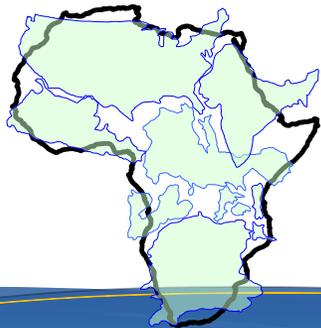
# African maritime domain

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- Covers 22% of the Earth's land surface.
- Accounts for 15% of the world's human population.



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# African maritime domain

- Its coastline spans  $\frac{3}{4}$  of the circumference of the Earth.
- 38 African countries are coastal or island states.
- Half of its over 100 port facilities handle containers and various forms of cargo.



# African maritime domain

## 2050 Africa Integrated Maritime Strategy

- *Africa's inland waters, oceans and seas are under pressure.*
- *International trade is very critical to many African economies, with over 90% of Africa's imports and exports conducted by sea.*



# African maritime domain

## 2050 Africa Integrated Maritime Strategy

*The overarching vision of the 2050 AIM Strategy is to*

- *foster increased wealth creation from Africa's oceans and seas by*
- *developing a sustainable thriving **blue economy** in a*
- *secure and environmentally sustainable manner.*



# African Space Programme

40

AUC objectives



35

serviced by  
space applications

# African Space Programme



# South African Maritime Domain

## Operation Phakisa

- *Presidential priority initiative*
- *Government, civil society, private sector, academia and other stakeholders plan together and collaborate in unlocking the economic potential of South Africa's Oceans*



**OCEANS ECONOMY**

# South African Maritime Domain

## Operation Phakisa **focus areas**

1



- Marine Transport and Manufacturing
- Small Harbour Development

2



- Offshore Oil and Gas exploration

3



- Aquaculture

4



- Marine Protection Services and ocean Governance

5



- Coastal Tourism

# South African Maritime Domain

## Operation Phakisa **focus areas**

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- Marine Transport and Manufacturing
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- Coastal Tourism

# South African Maritime Domain

MPSG focus area

## National Oceans and Coastal Information Management

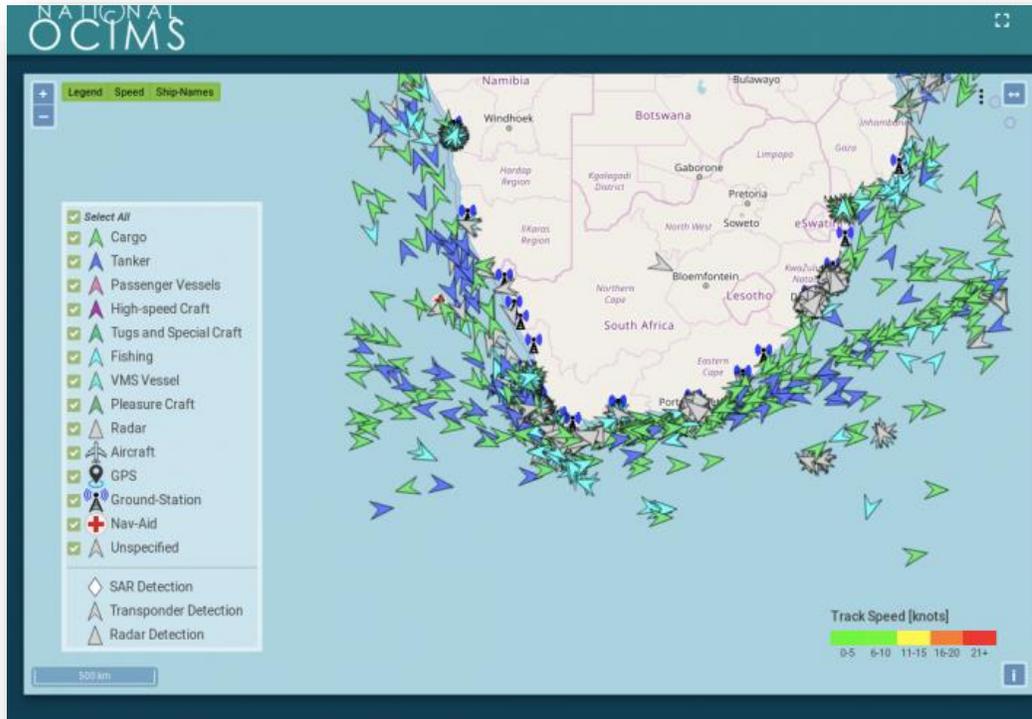


Decision support tools for:

- Marine spatial planning
- Coast flood hazard
- Harmful algae bloom
- Water quality
- Sea state
- **Marine domain awareness**

# South African Maritime Domain

## OCIMS MDA decision support tool **Integrated Vessel Tracking**



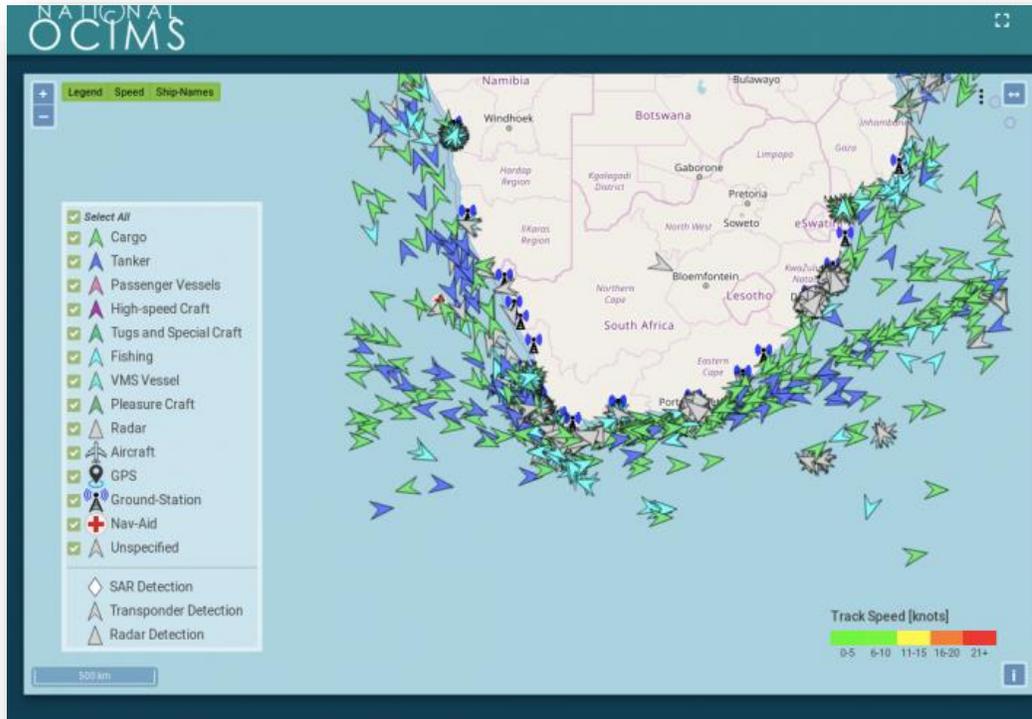
Synthetic aperture radar



Satellite based AIS

# South African Maritime Domain

## OCIMS MDA decision support tool **Integrated Vessel Tracking**



Synthetic aperture radar



Satellite based AIS

# South African Maritime Domain

## Satellite MDA applications **AIS** and **VDES**

### AIS

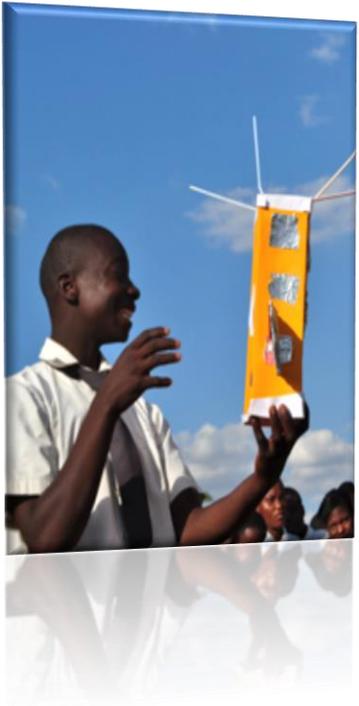
- Automatic tracking systems used for vessel traffic services
- Now also satellite based
- Provides
  - identification
  - position
  - course
  - speed
  - etc



### VDES

- AIS+
- Higher bandwidth
- Maritime machine to machine communications
  - Ship-ship
  - Ship-shore
  - Ship-satellite

# South African Maritime Domain



*It is up to us to ensure that Africans are not only treated as consumers of technology, but also as developers and managers of innovation.*

Honourable Mr Cyril Ramaphosa, President of the Republic of South Africa

# South African “ZACube” missions



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Department:  
Science and Technology  
REPUBLIC OF SOUTH AFRICA

Strategic Plan 2015 - 2020

- Strengthening and expanding existing **Human Capacity Development** programmes like the satellite engineering programme at the **Cape Peninsula University of Technology**
- Manufacturing, integrating, testing and launching EOSat1 and ZACUBE-2.
- Manufacturing and launching **South Africa’s first indigenous cube satellite constellation** to provide **automatic identification system** services to **Operation Phakisa** and the African continent.

# South African “ZACube” missions

ZACube-1, launched 21 November 2013, **Africa’s first!**



# South African “ZACube” missions

ZACube-2, launched 27 December 2018



DST Minister Mmamoloko Kubayi-Ngubane



# South African “ZACube” missions

ZACube-2, launched 27 December 2018



- Primary payload:

- AIS receiver



- Secondary payload:

- K-line camera for forest fire detection

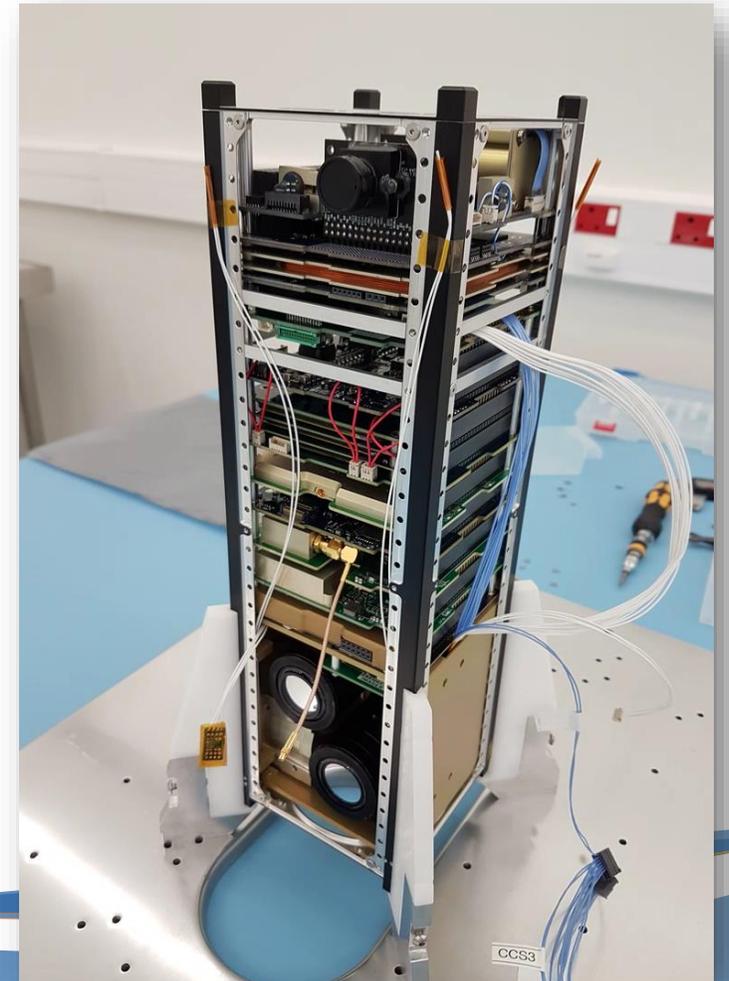


- Communications

- VHF, UHF, S- and X-bands

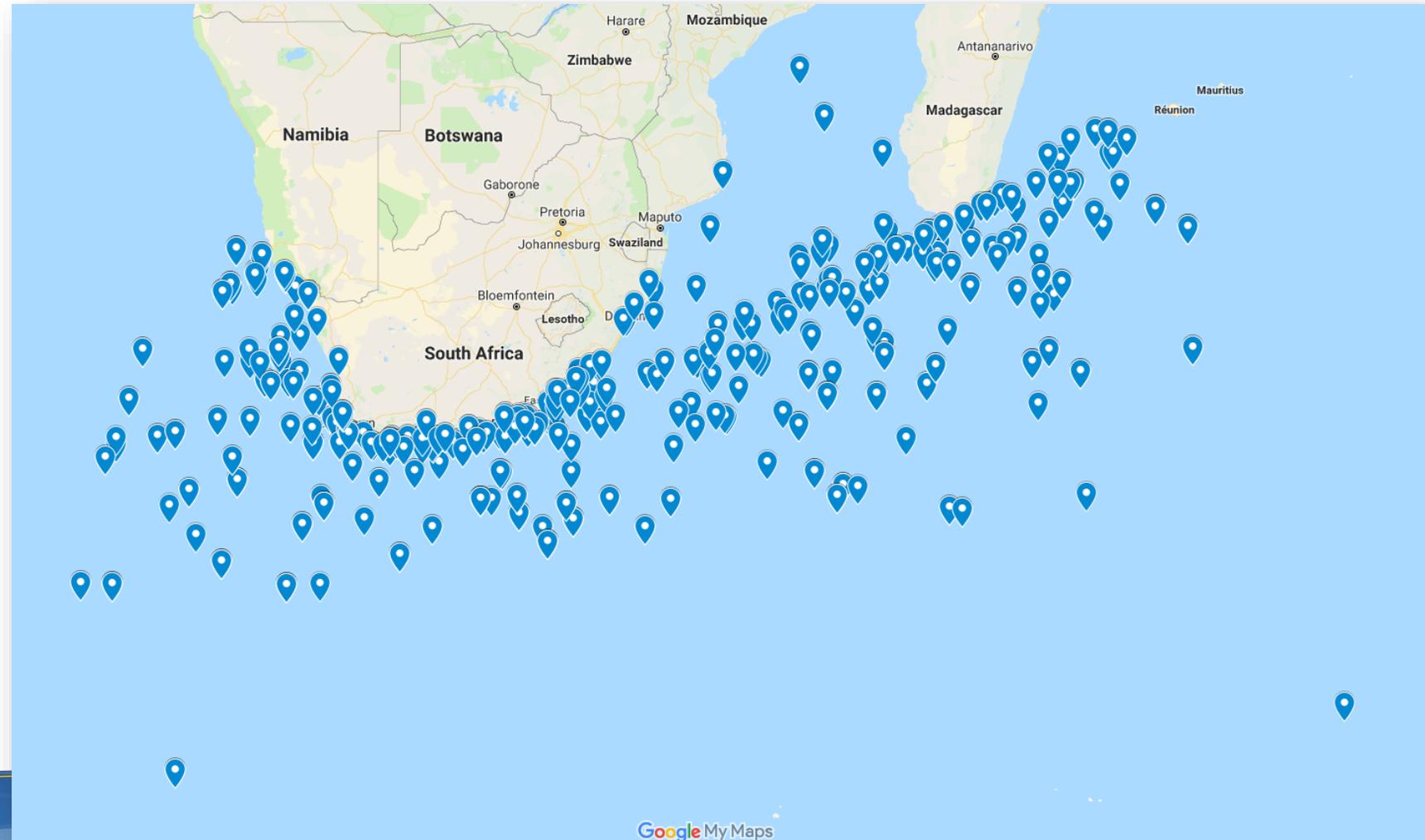


- 3-axes stabilisation



# South African “ZACube” missions

ZACube-2 AIS data



# South African “ZACube” missions

## ZACube-2 AIS data

**MarineTraffic** | Live Map | Explore | Community | Pricing | Vessels

**MARY LINA**  
Bulk Carrier

IMO: 9317157 | Gross Tonnage: 30046  
MMSI: 538007393 | Deadweight: 52454 t  
Call Sign: VPL88 | Length Overall x Breadth Extreme: 189.99m x 32.26m  
Flag: Marshall Is (MH) | Year Built: 2007  
AIS Vessel Type: Cargo | Status: Active

**Voyage info** | Companies at Destination

For full access: [Go voyage data](#)

IN MAL | ST HELENA BAY ANCH (24)  
ATD: 2019-01-07 11:28 LT (UTC +5) | ATA: 2019-02-18 05:31 LT (UTC +2)

[View Track](#) | [Route Forecast](#)

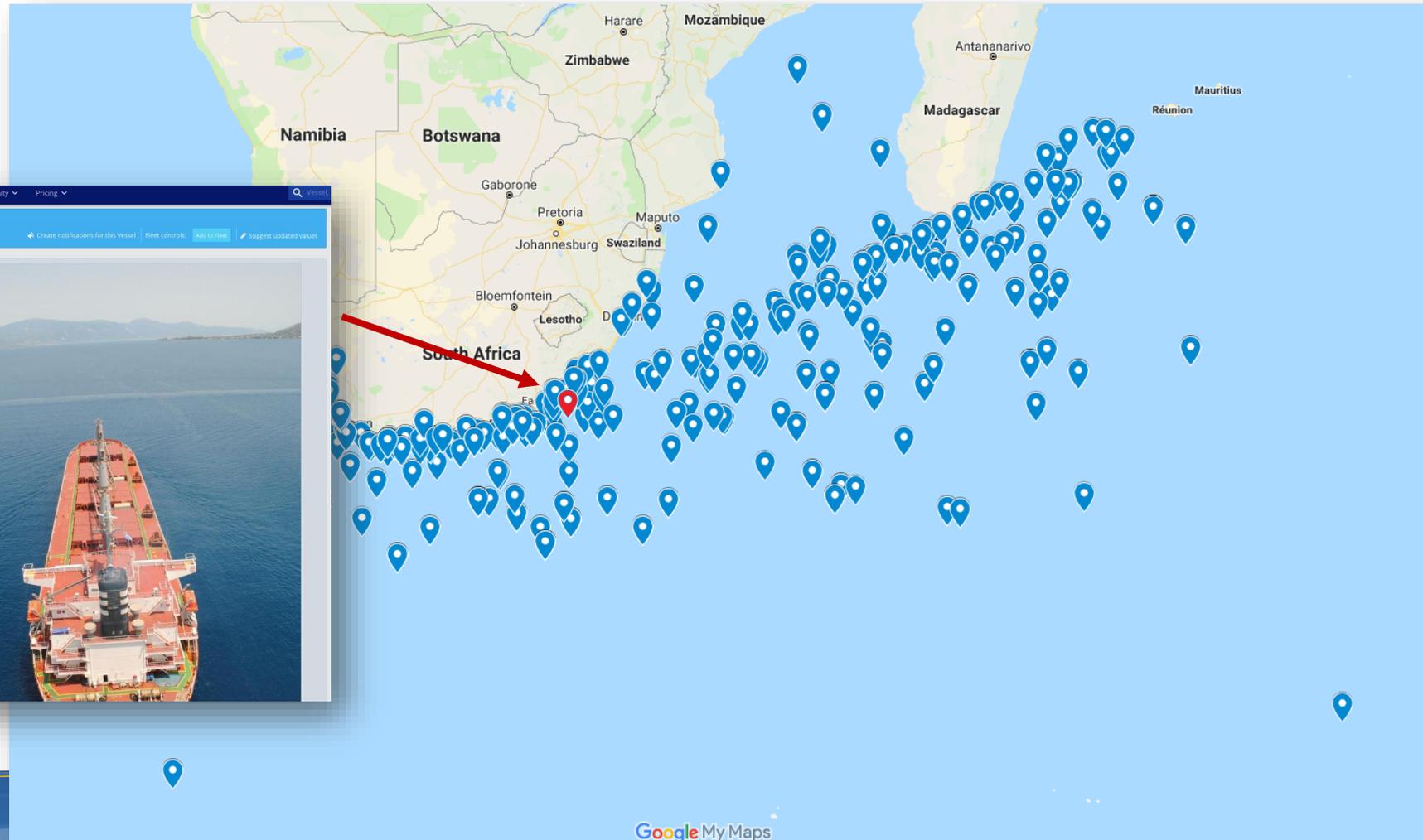
Distance Travelled: \*\*\*\*\*  
Draught: 6.5m  
Load Condition: \*\*\*\*\*  
Speed recorded (Max / Average): 11.8 / 8.7 knots

[Itineraries History](#) | [Latest Positions](#)

Reported ETA Received: 2019-02-19 09:34 LT (UTC +2)

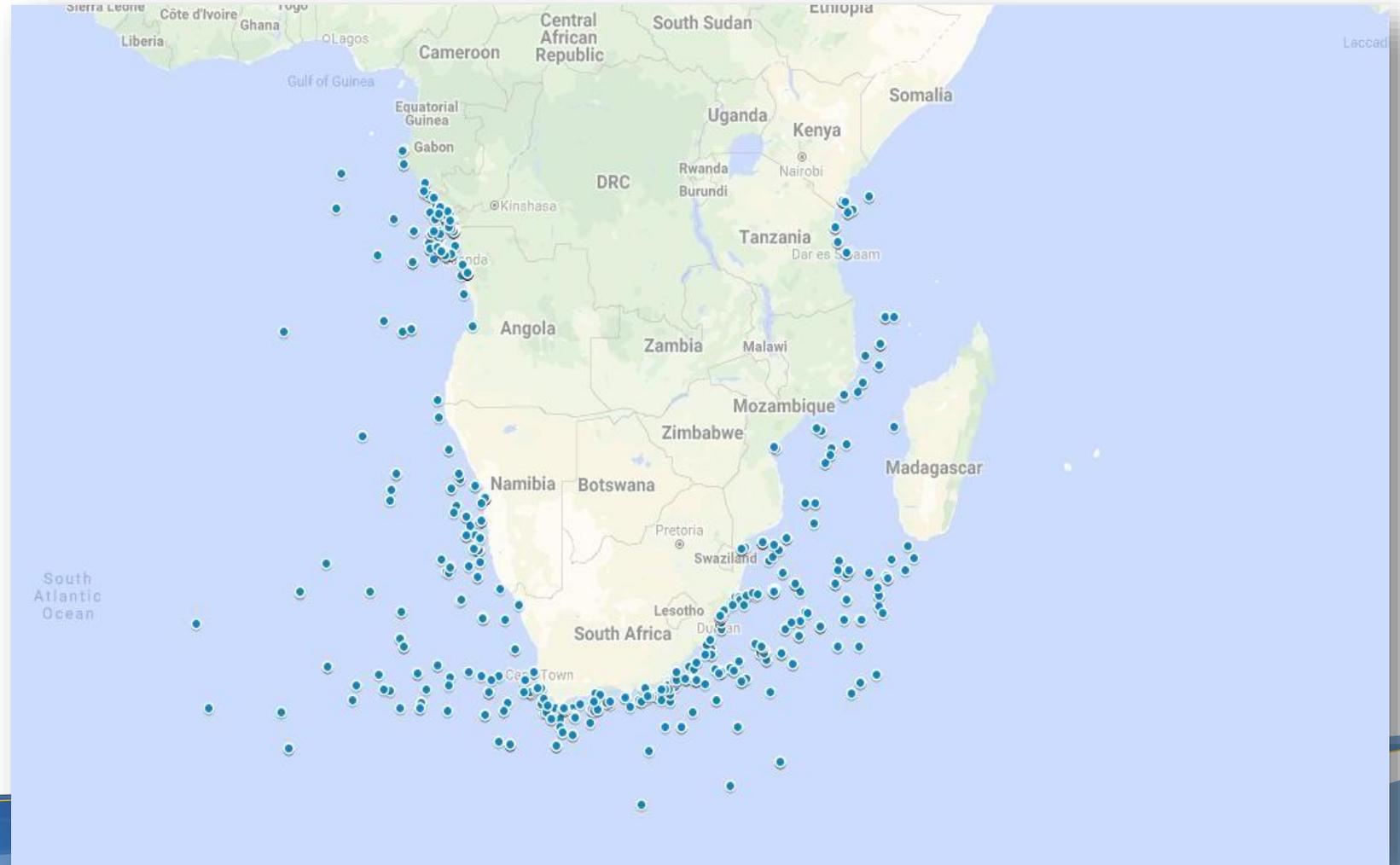
**Latest Position**

Position Received: 2 minutes ago (2019-02-19 07:33 (UTC))  
Vessel's Local Time: 2019-02-19 09:33 (UTC +2)  
Area: SAFR - South Africa  
Latitude / Longitude: -32.71249° / 18.04059°  
Status: Stopped  
Speed/Course: 0.2kn / -  
AIS Source: 1469



# South African “ZACube” missions

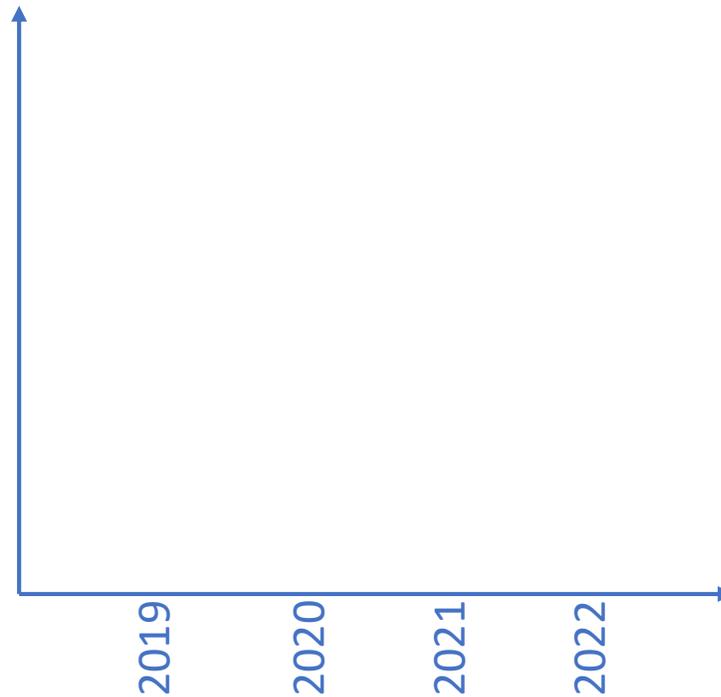
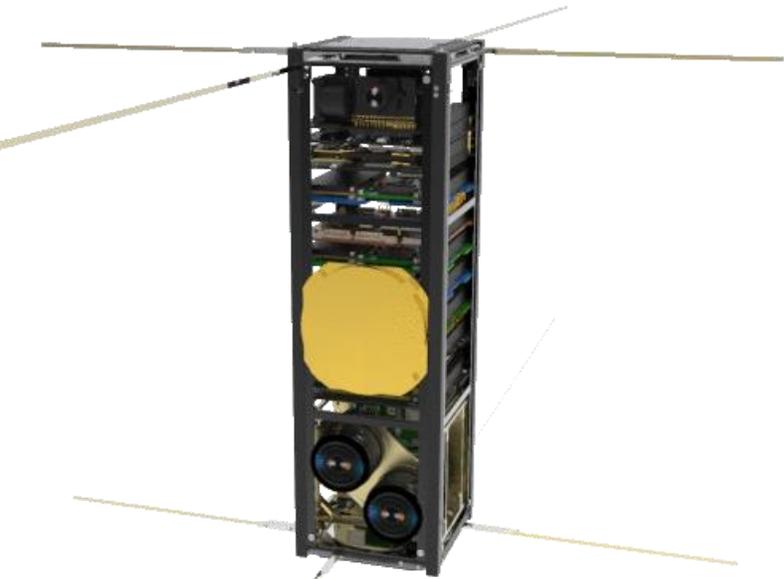
ZACube-2 AIS data



# Future constellations



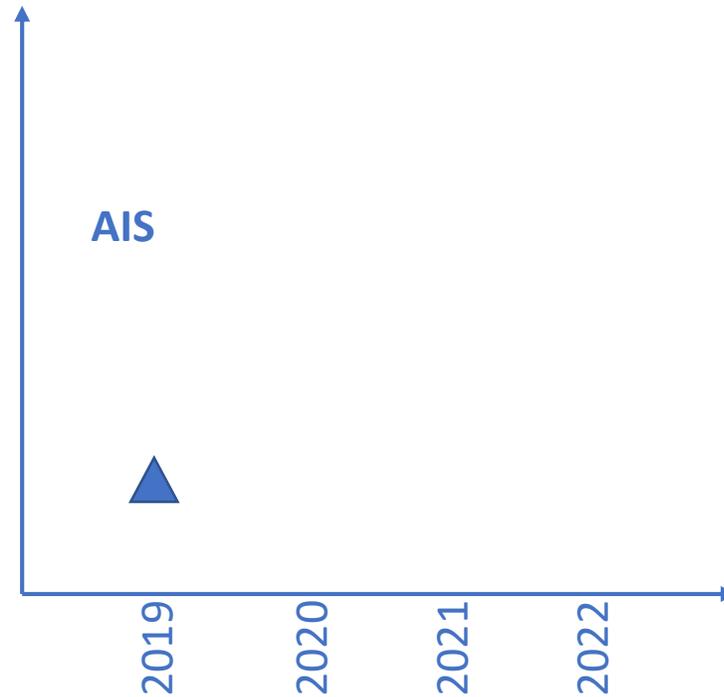
MDASat, 2019 - 2022



# Future constellations



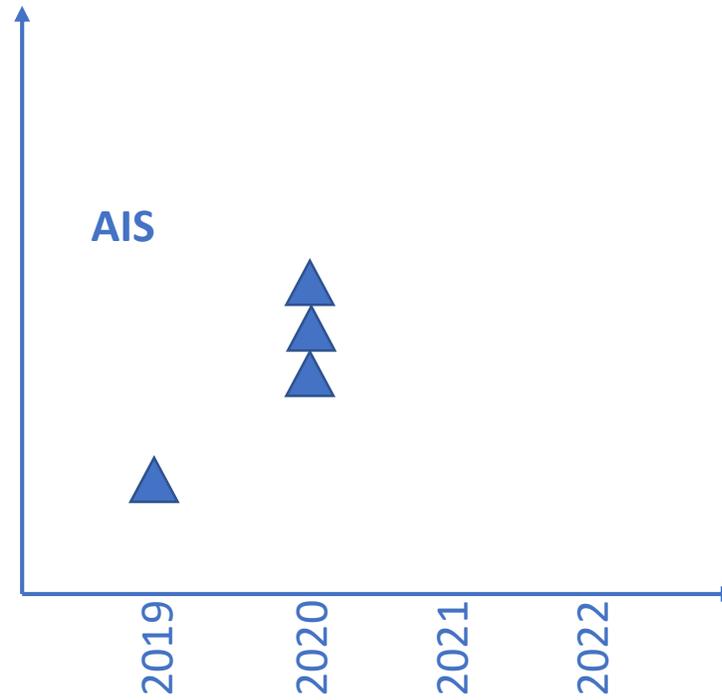
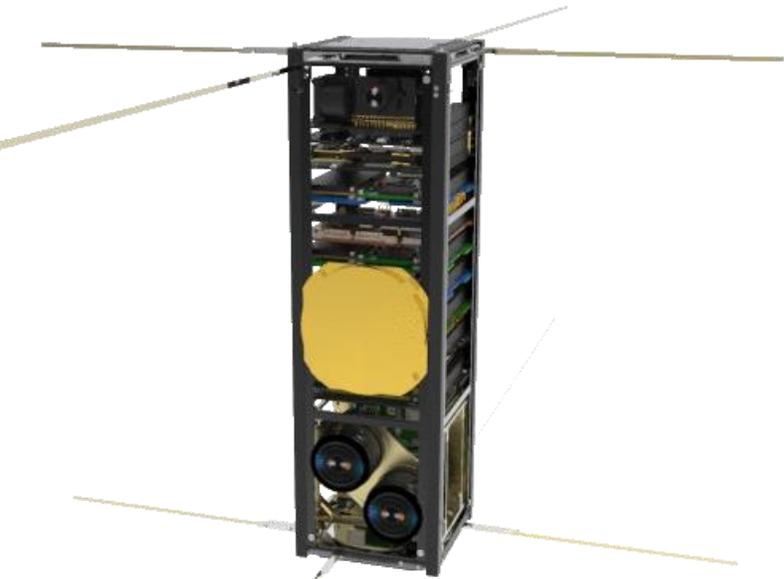
## MDASat, 2019 - 2022



# Future constellations



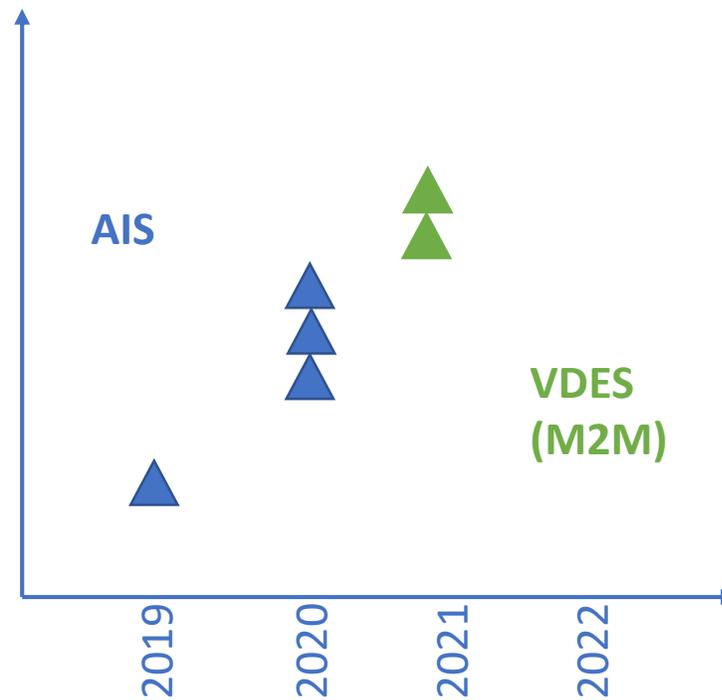
## MDASat, 2019 - 2022



# Future constellations

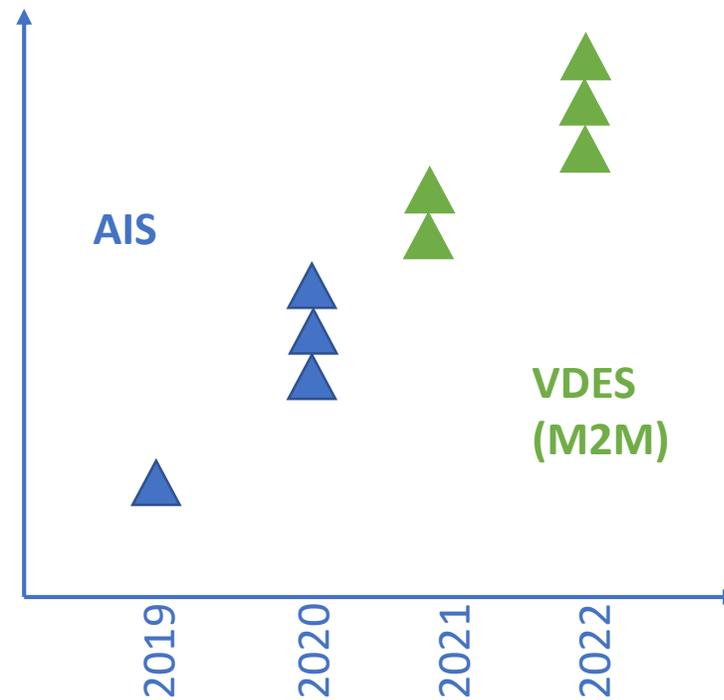


## MDASat, 2019 - 2022



# Future constellations

## MDASat, 2019 - 2022



Thank You

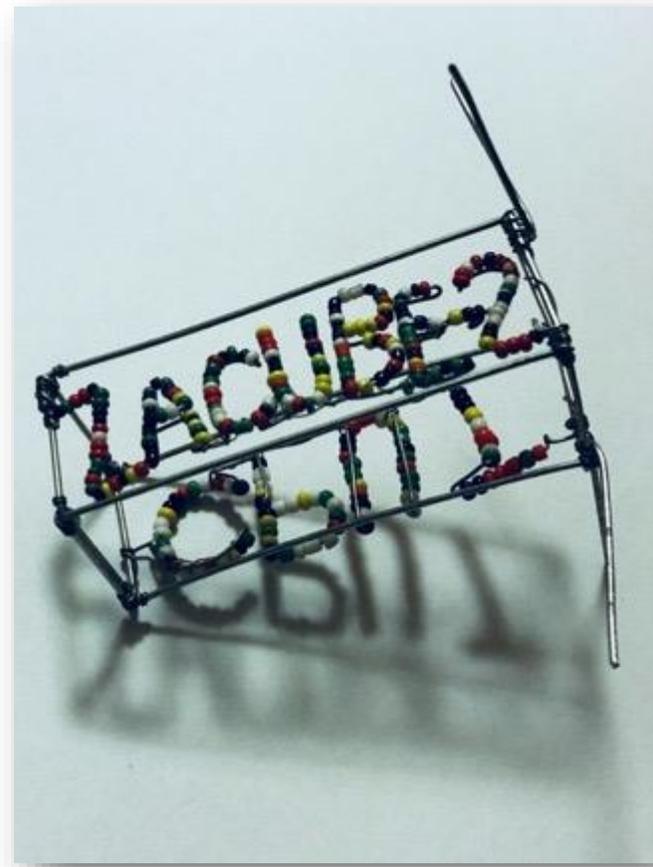
Dankie

Ngiyathokoza

Enkosi

Ngiyabonga

Ke A Leboga



Ke A Leboha

Ke A Leboga

Ngiyabonga

Ndi A Livhuha

Ndza Khensa

French South African Institute of Technology

<http://www.cput.ac.za/fsati>

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