



ships4sst

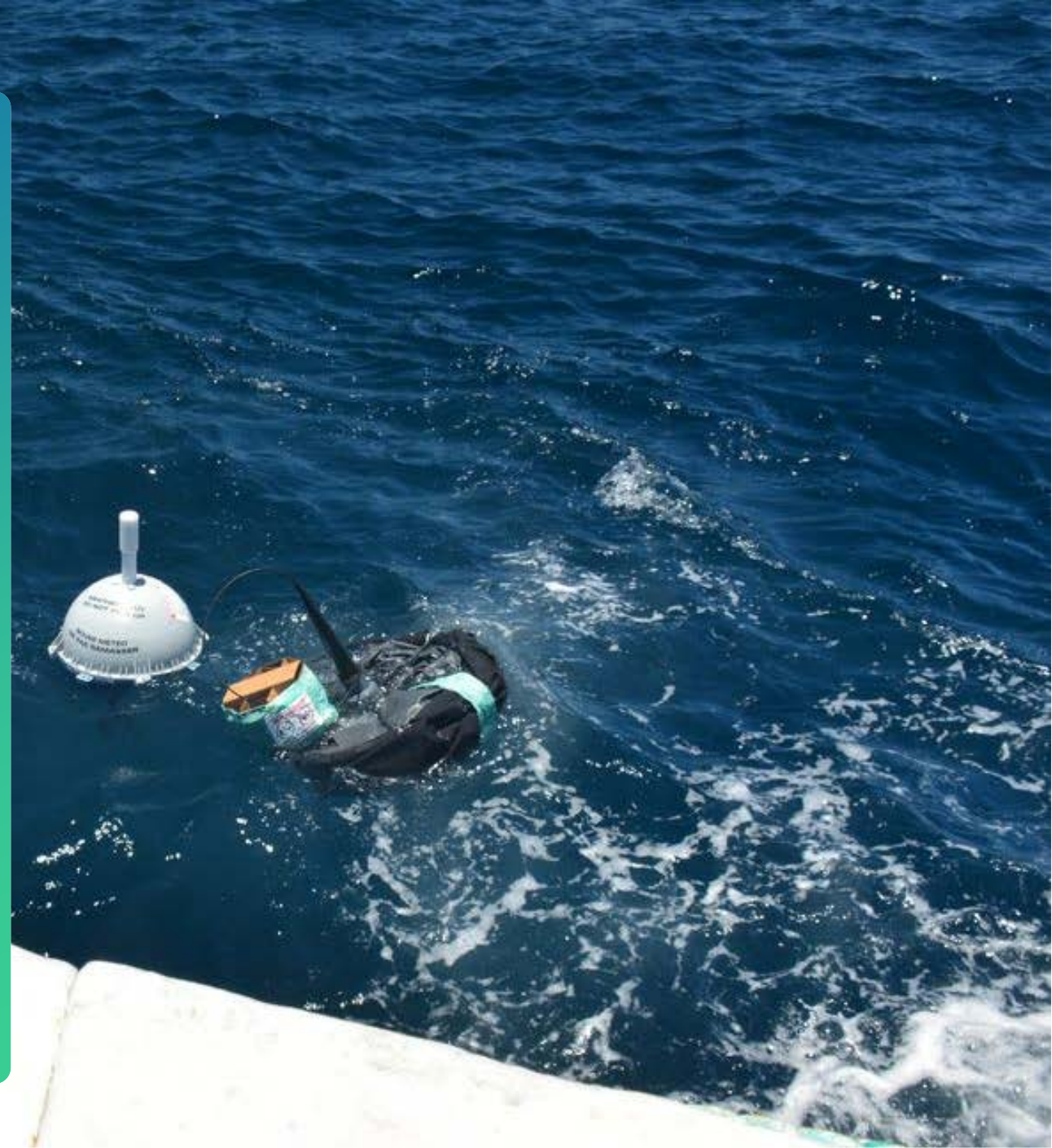
# Metrology in the TRUSTED Project

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08th September 2022



# Rationale: towards FRM

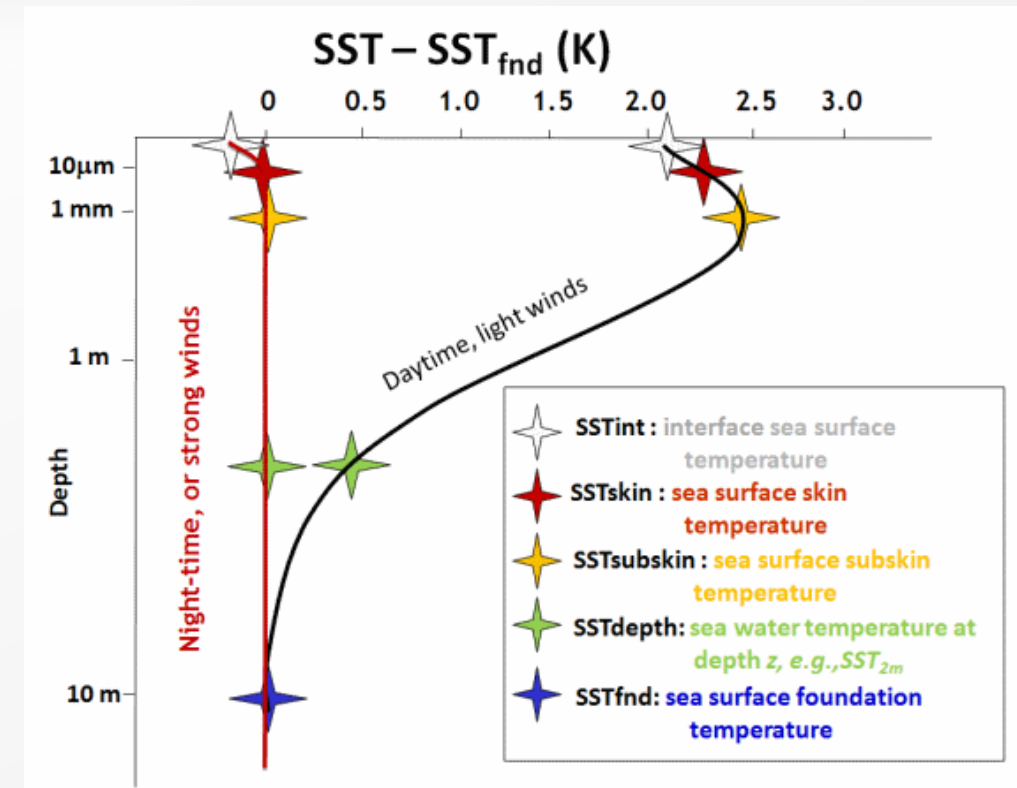
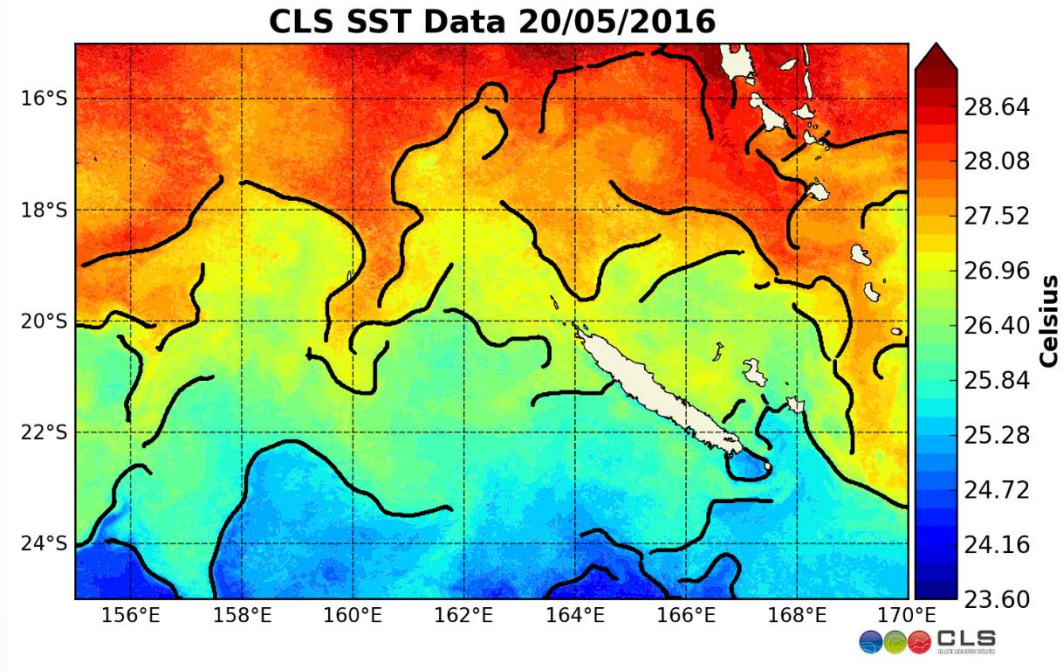
- Higher quality data needed to enable finer scientific investigations
- To improve satellite data quality:
  - Better instruments
  - Higher quality in situ data for calibration and validation purposes
- Copernicus: set up the TRUSTED project overseen by Eumetsat to get higher quality in situ data for the calibration/validation of the sentinel 3 radiometers



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# The Sea Surface Temperature profile

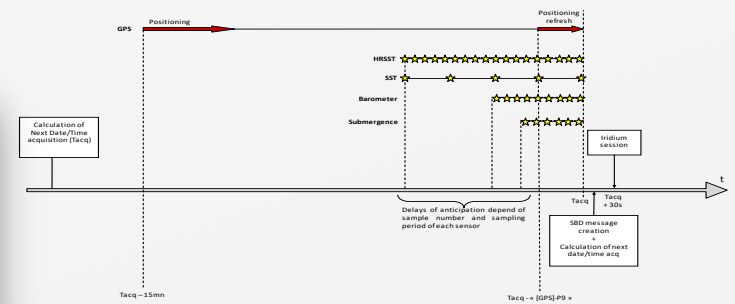


# SVP-BRST Design



## Design based on the SVP-B:

- DBCP compliant
- 4 sensors: P, SST, HRSST, HP
- GNSS positioning
- Iridium modem





# Metrology: calibration and quantification of uncertainties

- A calibration in two steps:
  - MoSens HRSST Sensors Calibration with an uncertainty budget.
  - Verification within the buoys with a final uncertainty budget.

$$U_C = 2 \sqrt{u_{tref}^2 + (S_{rep} + u_{bath})^2 + S^2}$$



Uncertainty budget of MoSens calibration	N° 4656 (mK)	N° 4658 (mK)
Reference temperature ( $u_{tref}$ )	0.9	0.9
Bath stability ( $u_{Bath}$ )	0.3	0.3
MoSens reproducibility ( $S$ )	1.7	0.9
MoSens repeatability ( $S_{rep}$ )	0.3	0.3
Expended uncertainty ( $U_C$ )	4.0	2.8

Uncertainty budget of HRSST measurements	N° Y17-07 (mK)	N° Y18-24 (mK)
Reference temperature ( $u_{tref}$ )	0.9	0.9
Bath stability ( $u_{Bath}$ )	0.3	0.3
Buoy HRSST reproducibility ( $S$ )	2.5	3.4
Buoy HRSST repeatability ( $S_{rep}$ )	0.5	0.5
Expended uncertainty ( $U_C$ )	5.5	7.2

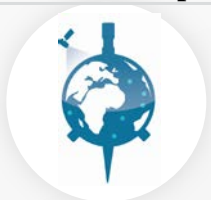


# Post Deployment Calibration

- **3 buoys recovered:**
  - 1 onshore Iceland (damaged)
  - 1 east of Iceland ( intact)
  - 1 moored in the North Sea
- **Quantification of the temperature sensor's drift:**  
 $\approx 4 \text{ mK/year}$

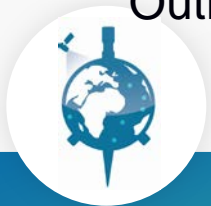
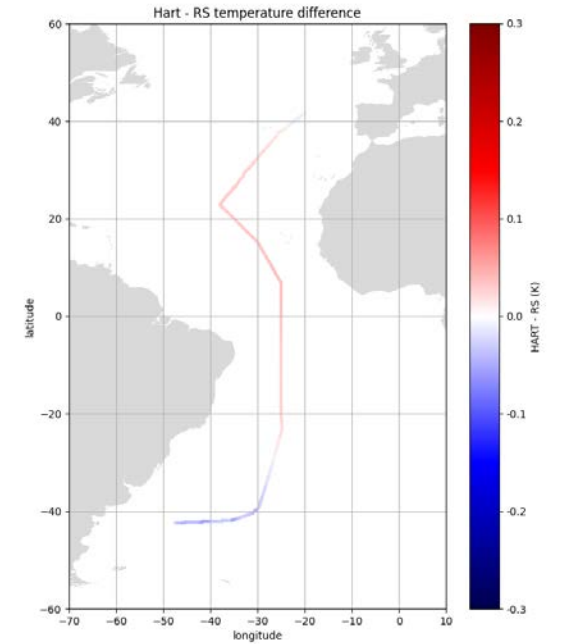
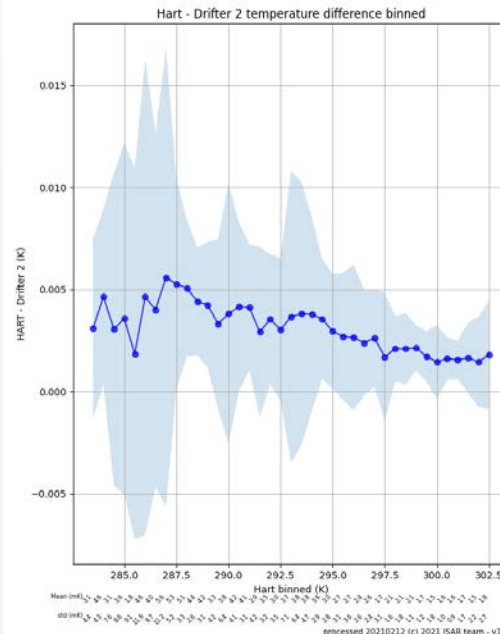
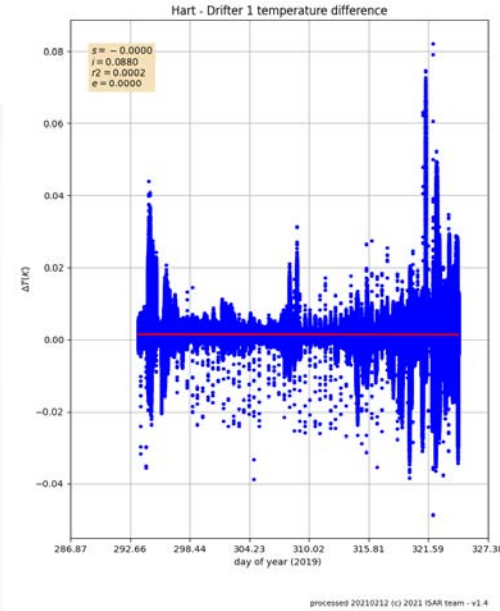
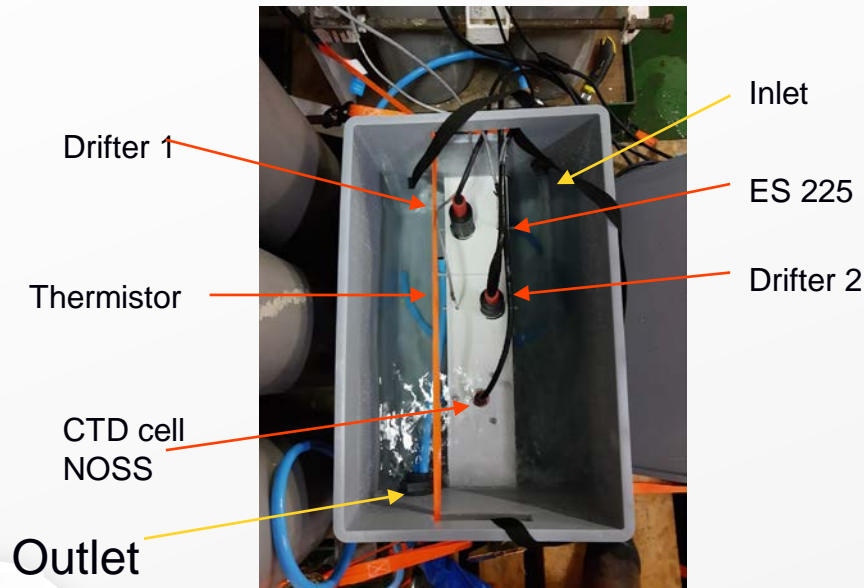
Tref standard uncertainty :	0.001	°C
Bath stability standard uncertainty :	0.000	°C
Reproducibility buoy n° 025 :	0.006	°C
Repeatability buoy n° 025 :	0.001	°C
<b>Verification expanded uncertainty:</b>	<b>0.012</b>	<b>°C</b>

Tref standard uncertainty :	0.001	°C
Bath stability standard uncertainty :	0.000	°C
Reproducibility buoy n° 017 :	0.005	°C
Repeatability buoy n° 017 :	0.001	°C
<b>Verification expanded uncertainty:</b>	<b>0.011</b>	<b>°C</b>

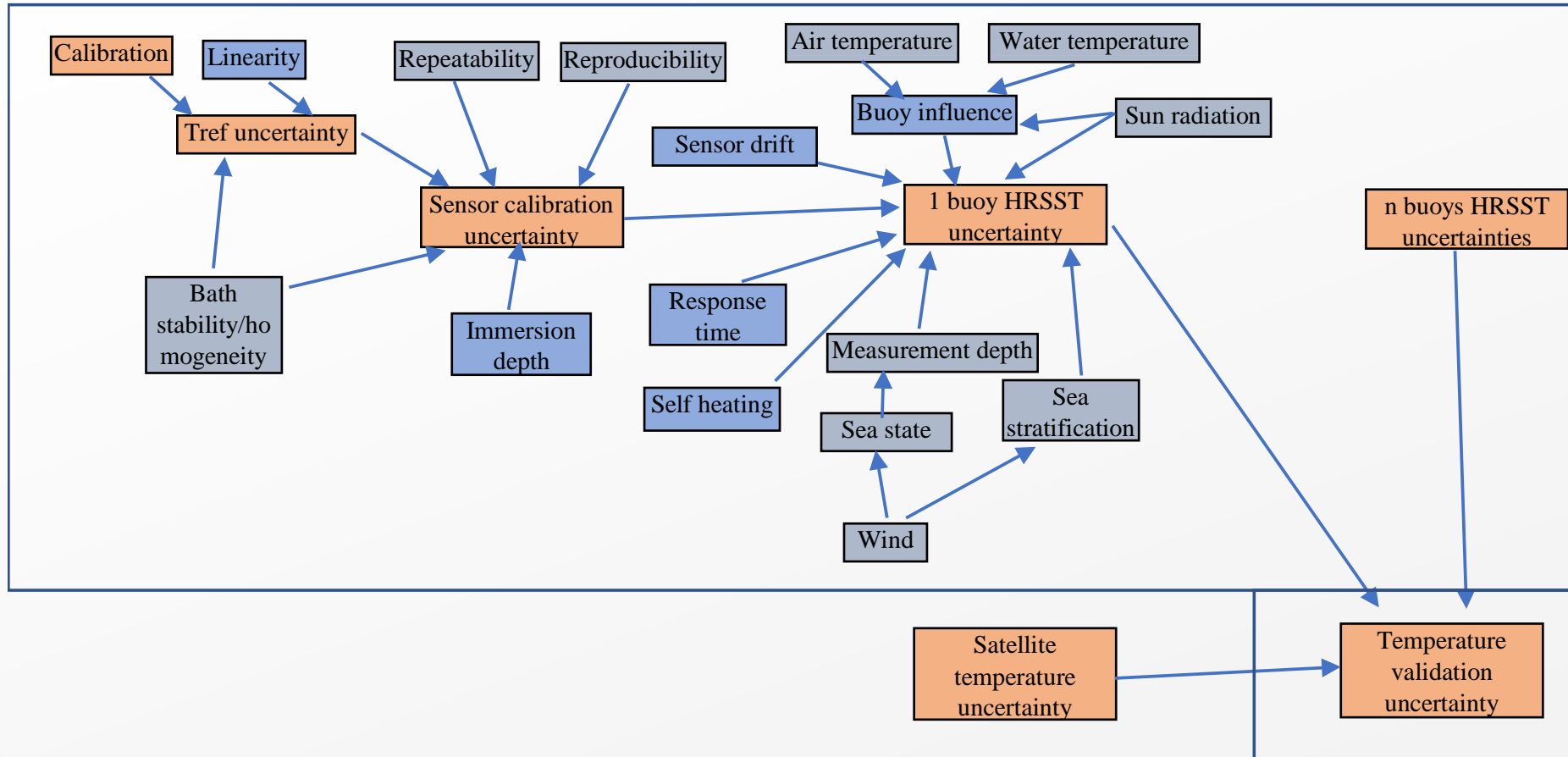


# Instrument Comparison

- Experiment performed on AMT29 Cruise:
  - 2 MoSens sensor
  - CTD cell
  - HART 1504
  - KYOCERA Thermistor



# Origin of uncertainties: the traceability Diagram







# Thank You

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