



From ZTF to Rubin

What we learned in the last 5 years

Julien Peloton (IJCLab/CNRS)

28/11/2024



Fink in a nutshell

Brokers are software serving the scientific community by **ingesting**, classifying, filtering, and **redistributing** alerts from telescopes and surveys.

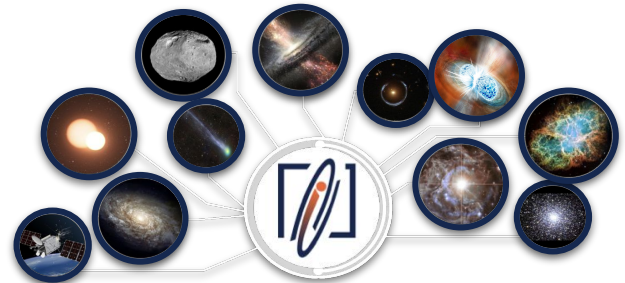
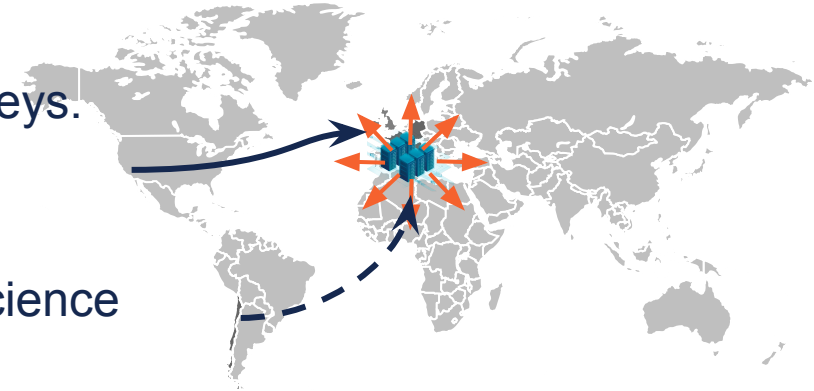
60+ members, 15+ scientific topics covered

- Solar system, galactic and extragalactic science

Services deployed on large **OpenStack clouds** (UPSaclay & CC-IN2P3)

- Scalable to millions of alerts per night

Operating 24/7 since 2019, serving 100+ unique users per day (**scientists, follow-up facilities & amateurs**)



Fink turned 5!

- We started processing ZTF data in November 2019
- As of now, 1235 observing nights
 - 262M/178M alerts received/processed
- Many versions of the broker thanks to **community** contributions!
- 14 science publications from Fink members, (way) more indirectly using Fink tools!



First Fink PhDs

First students working in Fink successfully defended in 2024:

Roman Le Montagner (IJCLab) : High-Energy Transient Universe in the Era of Large Optical Surveys

Etienne Russeil (LPCA) : Feature engineering and machine learning for 21st century astronomy


































Biswajit Biswas (APC) : Designing Novel Machine Learning Techniques to Address the Volume and Complexity of the Rubin LSST Data: Separation of Blended Galaxies and Transients Classification in Alert Streams

Science corner

We started in 2019 with SN Ia. We end-up being useful for others as well:

- Satellites & debris detection
- Solar System science
- Galactic science: microlensing events, cataclysmic variables, Young stellar objects...
- Extra-galactic science: supernovae, gamma-ray bursts, AGN, Blazars, kilonovae, tidal disruptive events, ...

Jul 2024 → Nov 2024

1	2024PASP...136k4201A	2024/11	  
	Searching for Gravitational Wave Optical Counterparts with the Zwicky Transient Facility: Summary of O4a Ahumada, Tomás; Anand, Shreya; Coughlin, Michael W. <i>and 49 more</i>		
2	2024arXiv241103258C	2024/11	  
	Tuning into spatial frequency space: Satellite and space debris detection in the ZTF alert stream Carvajal, J. P.; Bauer, F. E.; Reyes-Jainaga, I. <i>and 6 more</i>		
3	2024A&A...691A.181P	2024/11	  
	ELEPHANT: Extragalactic aLErt Pipeline for Hostless AstroNomial Transients Pessi, P. J.; Durgesh, R.; Nakazono, L. <i>and 11 more</i>		
4	2024ApJ...974..172A	2024/10	  
	Anomaly Detection and Approximate Similarity Searches of Transients in Real-time Data Streams Aleo, P. D.; Engel, A. W.; Narayan, G. <i>and 29 more</i>		
5	2024arXiv241017322J	2024/10	  
	Blast: a Web Application for Characterizing the Host Galaxies of Astrophysical Transients Jones, D. O.; McGill, P.; Manning, T. A. <i>and 14 more</i>		
6	2024ApJ...974..214S	2024/10	  
	Machine-directed Gravitational-wave Counterpart Discovery Sravan, Niharika; Graham, Matthew J.; Coughlin, Michael W. <i>and 2 more</i>		
7	2024MNRAS 533.2073M	2024/09	  
	The Dark Energy Survey 5-yr photometrically classified type Ia supernovae without host-galaxy redshifts Möller, A.; Wiseman, P.; Smith, M. <i>and 60 more</i>		
8	2024A&A...689A.289C	2024/09	  
	ATAT: Astronomical Transformer for time series and Tabular data Cabrera-Vives, G.; Moreno-Cartagena, D.; Astorga, N. <i>and 14 more</i>		
9	2024ApJ...972..194Y	2024/09	  
	SN 2022oqm: A Bright and Multipeaked Calcium-rich Transient Yadavalli, S. Karthik; Villar, V. Ashley; Izzo, Luca <i>and 60 more</i>		
10	2024AJ...168..56G	2024/08	  
	The Solar System Notification Alert Processing System (SNAPS): Asteroid Population Outlier Detection Gowanlock, Michael; Trilling, David E.; Kramer, Daniel <i>and 2 more</i>		
11	2024A&A...687A..38C	2024/07	  
	Combined spin orientation and phase function of asteroids Carry, B.; Peloton, J.; Le Montagner, R. <i>and 2 more</i>		

Community

• 2024 Organised workshops

- *Fink collaboration workshop (IJCLab)*
- *Fink@Brazil (CBPF, Rio de Janeiro)*

• 2024 Invited talks

- *LSST@ESO, CTAO Science Symposium, LSST SSSC, XMM2ATHENA, Annual meeting of the Brazilian Astronomical Society - 50th anniversary, Astro-COLIBRI Multi-Messenger Astrophysics Workshop, Exploring the Dark Side of the Universe Tools 2024 - 5th World Summit*

EU project: *ACME (INFRA SERV)*

Industry conference : *Kubecon 2024*

Outreach: *Rencontres Ciel et Espace 2024*



... But now it is time to open a new chapter with LSST data!



Road to LSST

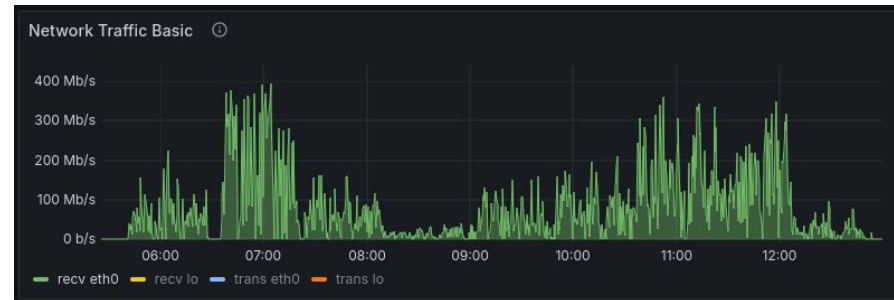
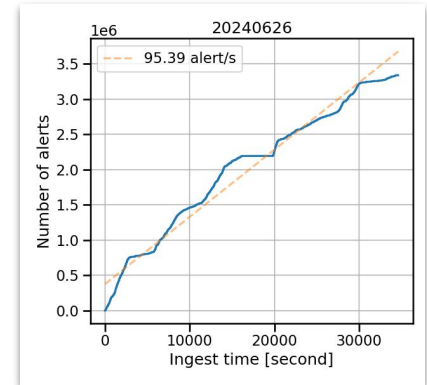
- 100+ users of



Road to LSST



- 100+ users on services (>10k requests/day)
- Migration to **CC-IN2P3** almost done
 - Machines & (almost) all services deployed
 - 500 vCPU, 1TB RAM, 1PB disk
 - Fink/ZTF stays at Paris-Saclay (2027)
- **Large-scale tests mid-2024 (OR4)**
 - End-to-end real-time simulation, from telescope to brokers
 - 10 millions alerts processed & transferred from USDF to CC-IN2P3
 - No major difficulties



Fink data services

<https://fink-broker.readthedocs.io>



Thank you

<https://fink-broker.org>

