



Online activities in KM3NeT

WP7: Report from the Rome group

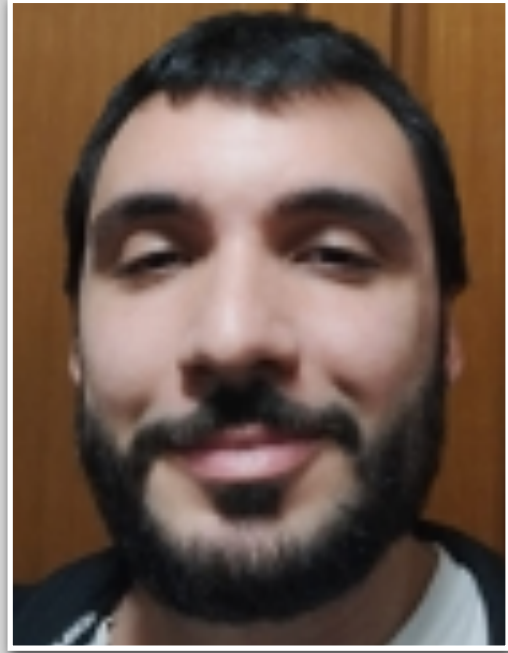
Angela Zegarelli,
on behalf of Irene Di Palma

First KM3NeT4RR Annual Meeting, Catania (Italy), 24/11/2023

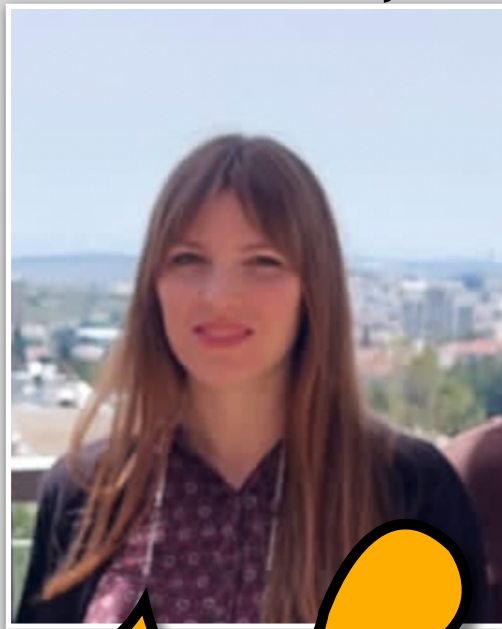


The Rome group

Alessandro Veutro,
PhD 2nd year



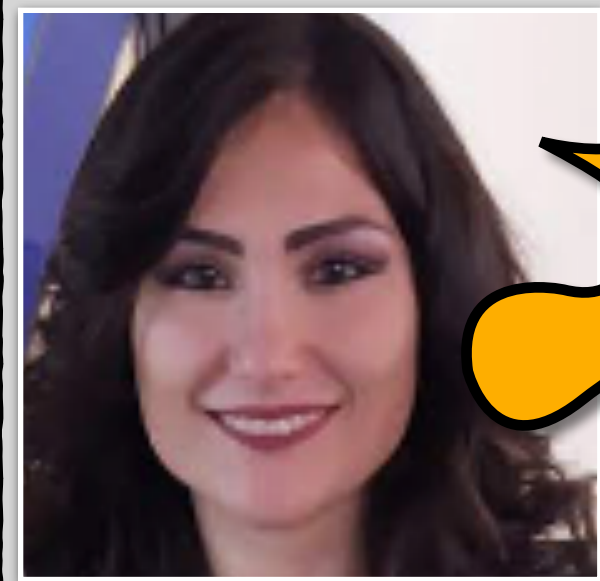
Silvia Gagliardini,
PhD 1st year



Silvia Celli,
RTDA



Multimessenger
&
Online activities



Angela Zegarelli,
Assegnista di ricerca



Massimo Mastrodicasa,
RTDA

Prof.ssa Irene Di Palma



Prof. Antonio Capone

Fabrizio Ameli,
Primo tecnologo



Electronics and
Power



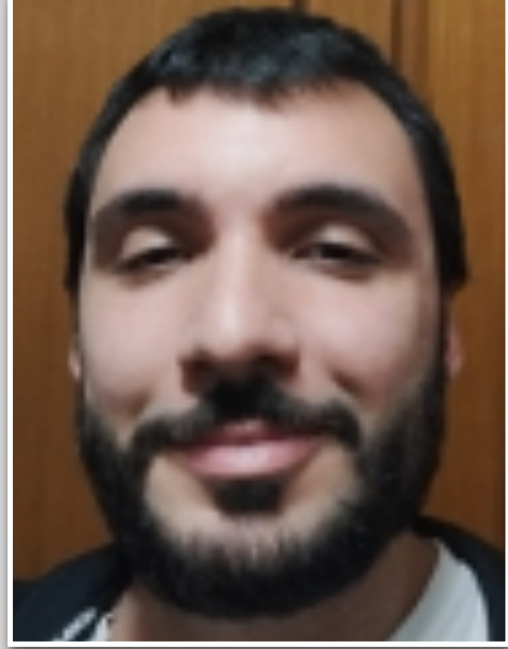
Carlo A. Nicolau,
Tecnologo

Alexandru Tudorache,
CTER elettronico

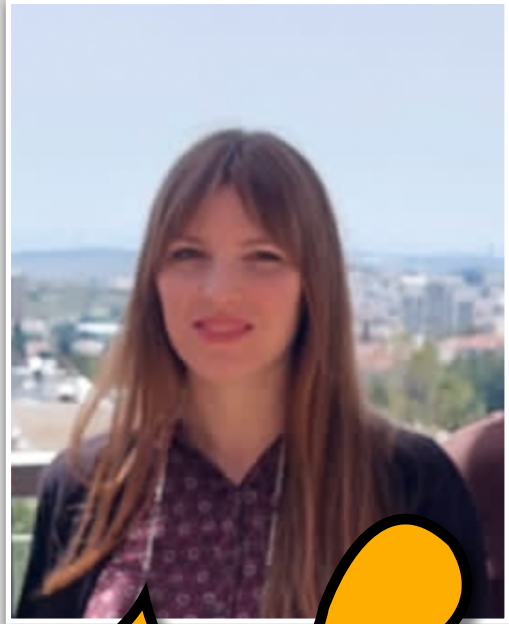


The Rome group

Alessandro Veutro,
PhD 2nd year



Silvia Gagliardini,
PhD 1st year



From KM3NeT4RR 2 units of personnel

Fabrizio Ameli,
Primo tecnologo



Carlo A. Nicolau,
Tecnologo

Prof.ssa Irene Di Palma

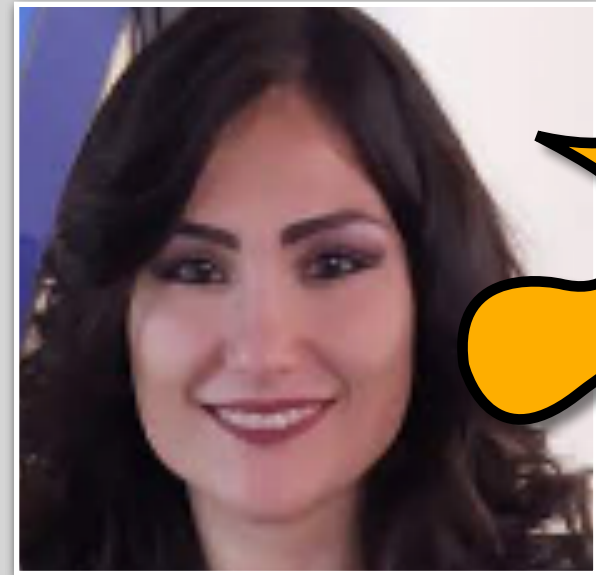


Silvia Celli,
RTDA



Prof. Antonio Capone

**Multimessenger
&
Online activities**



Angela Zegarelli,
Assegnista di ricerca

**Electronics and
Power**



Massimo Mastrodicasa,
RTDA
Co-fund Sapienza
Start contract: 9/6/2023

Alexandru Tudorache,
CTER elettronico
Start contract: 1/9/2023

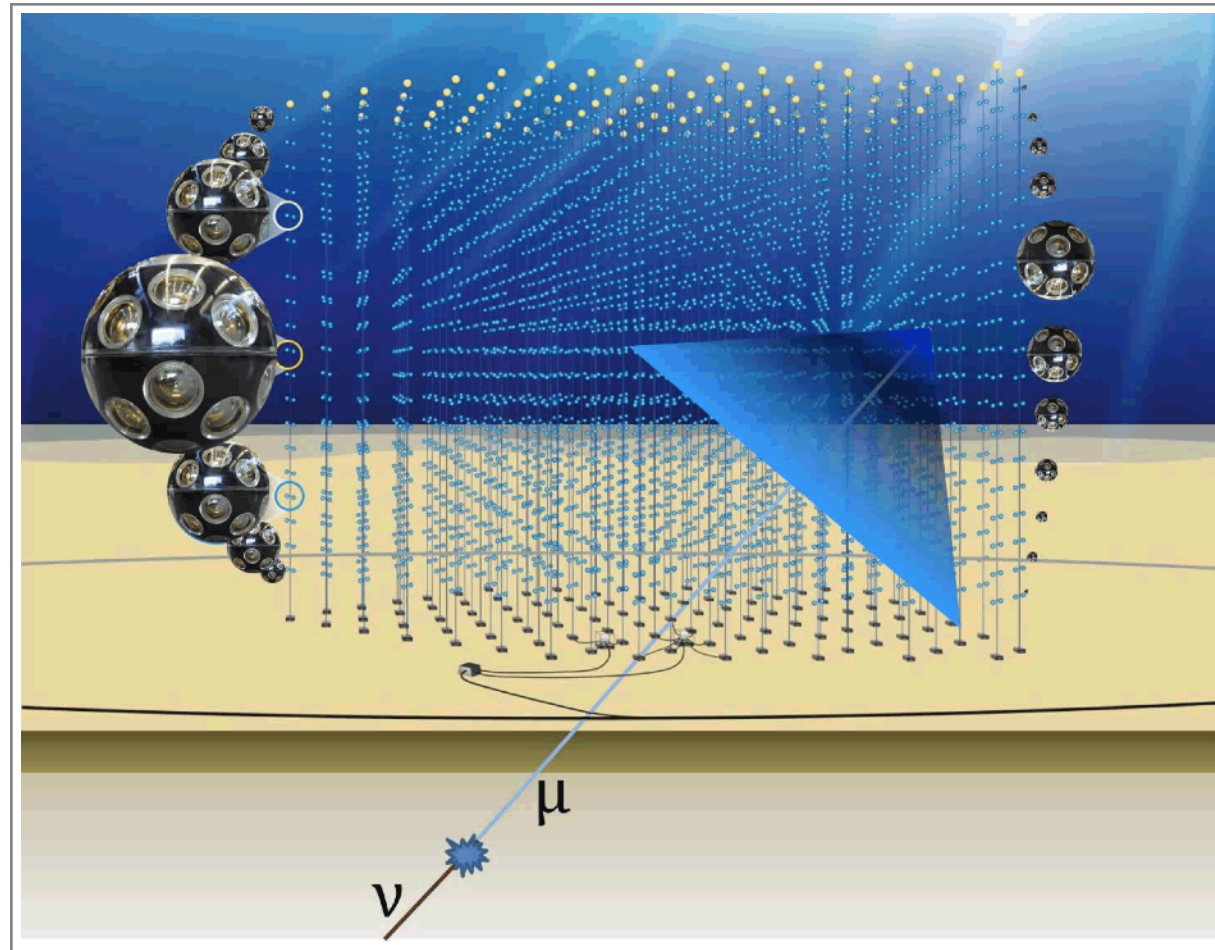


WP2

WP7

KM3NeT multimessenger program

Data AcQuisition (DAQ)

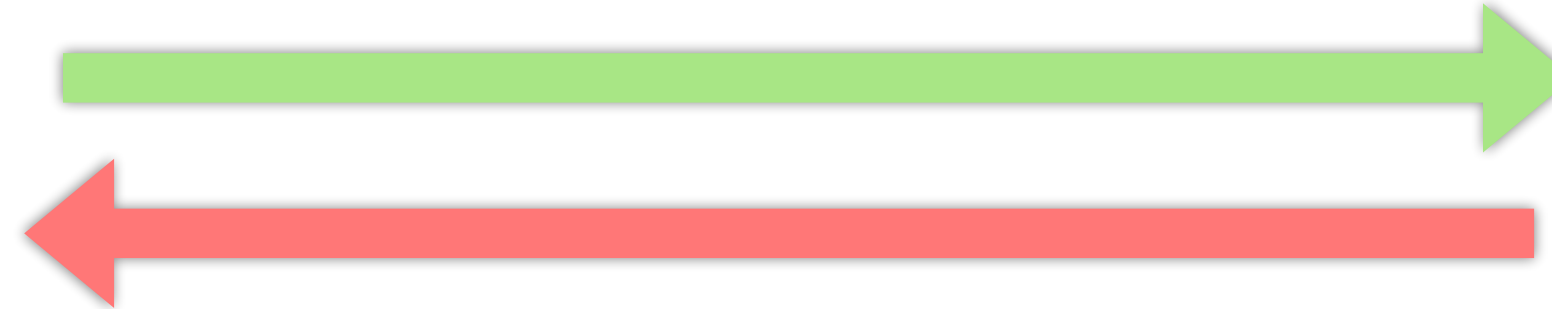


KM3NeT ORCA and ARCA

- Dedicated software installed at both shore stations for real-time analyses (RTA)
- Events reconstructed and classified in real-time, within 4 seconds (RTA platform active since more than 2 years)
- Receiving alert system operative (automatic online analyses running since ~1 year)
- Sending alert system ongoing (high-energy neutrino alerts will be sent in real-time by the end of 2024)

SENDING ALERTS

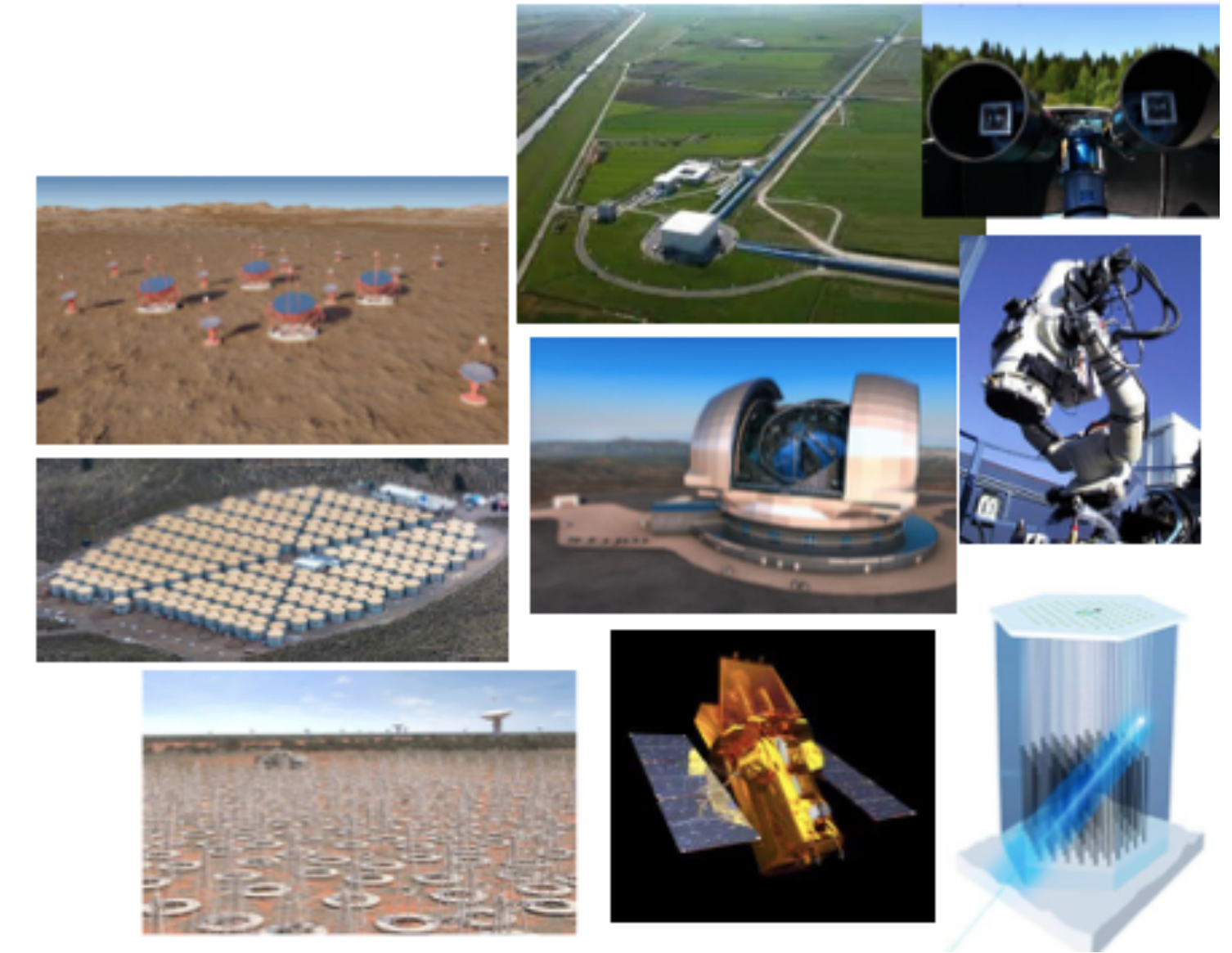
Send neutrino alerts to external communities for subsequent follow-ups



- Follow-up of EM/GW alerts
- Offline time/space correlation search with catalogues (GRB, AGN, SN, etc.)

RECEIVING ALERTS

EM/MM external facilities




Relevant contribution by the Rome group in these activities

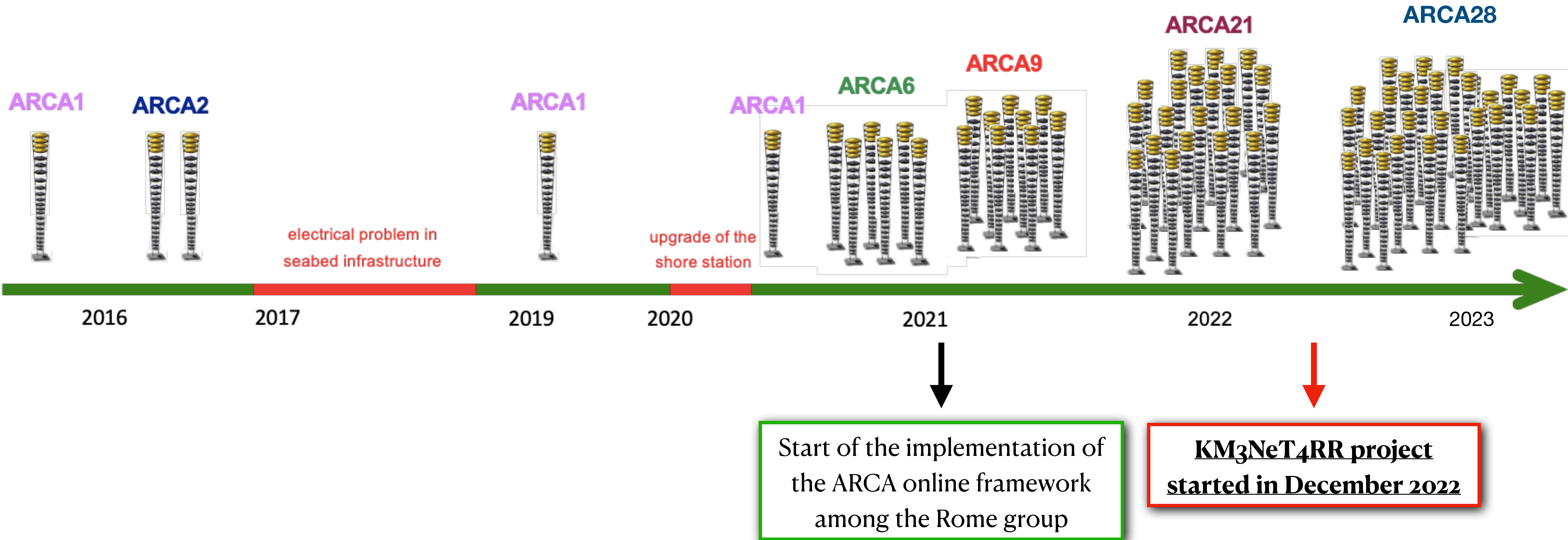
WORK IN PROGRESS

Main outcomes of WP7 for the Rome group

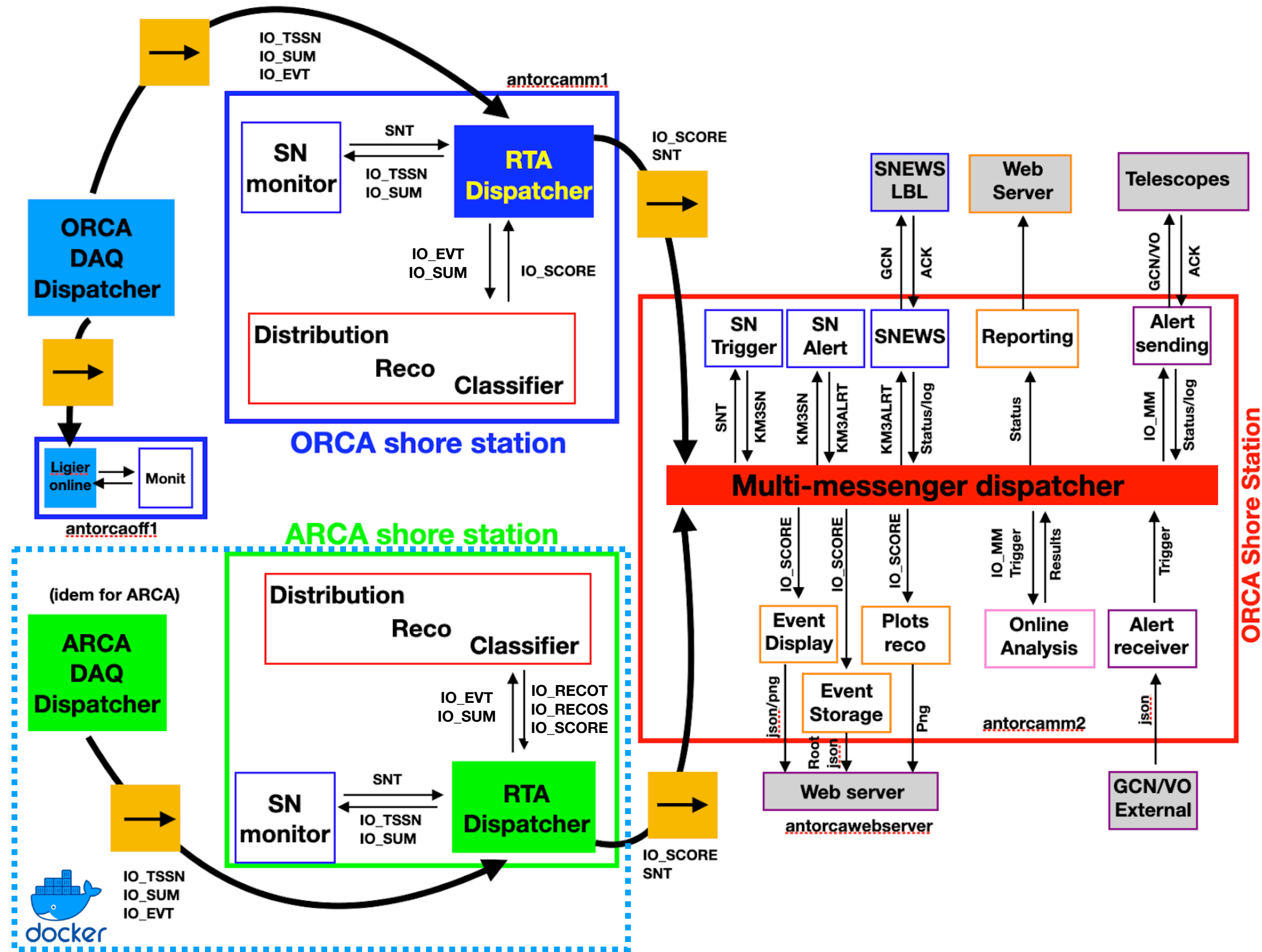
✓ Fast reconstruction algorithm

- **Event selection** to alert the astronomical community in real-time and follow external alerts
- **Gamma-Ray Bursts (GRB) follow-ups** 

Online activities of KM3NeT-ARCA

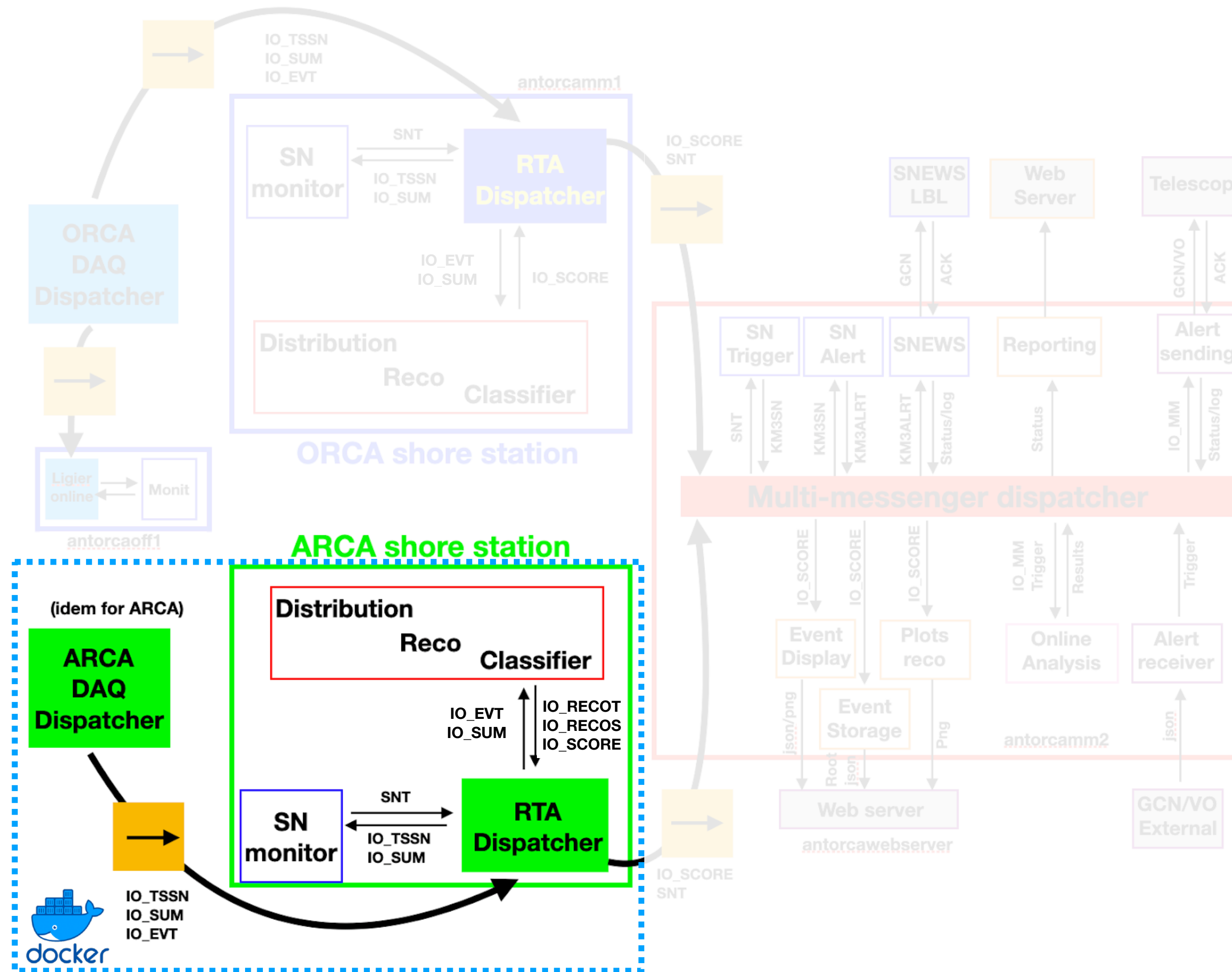


KM3NeT Online Framework



KM3NeT Online Framework

Tasks completed within the Rome group

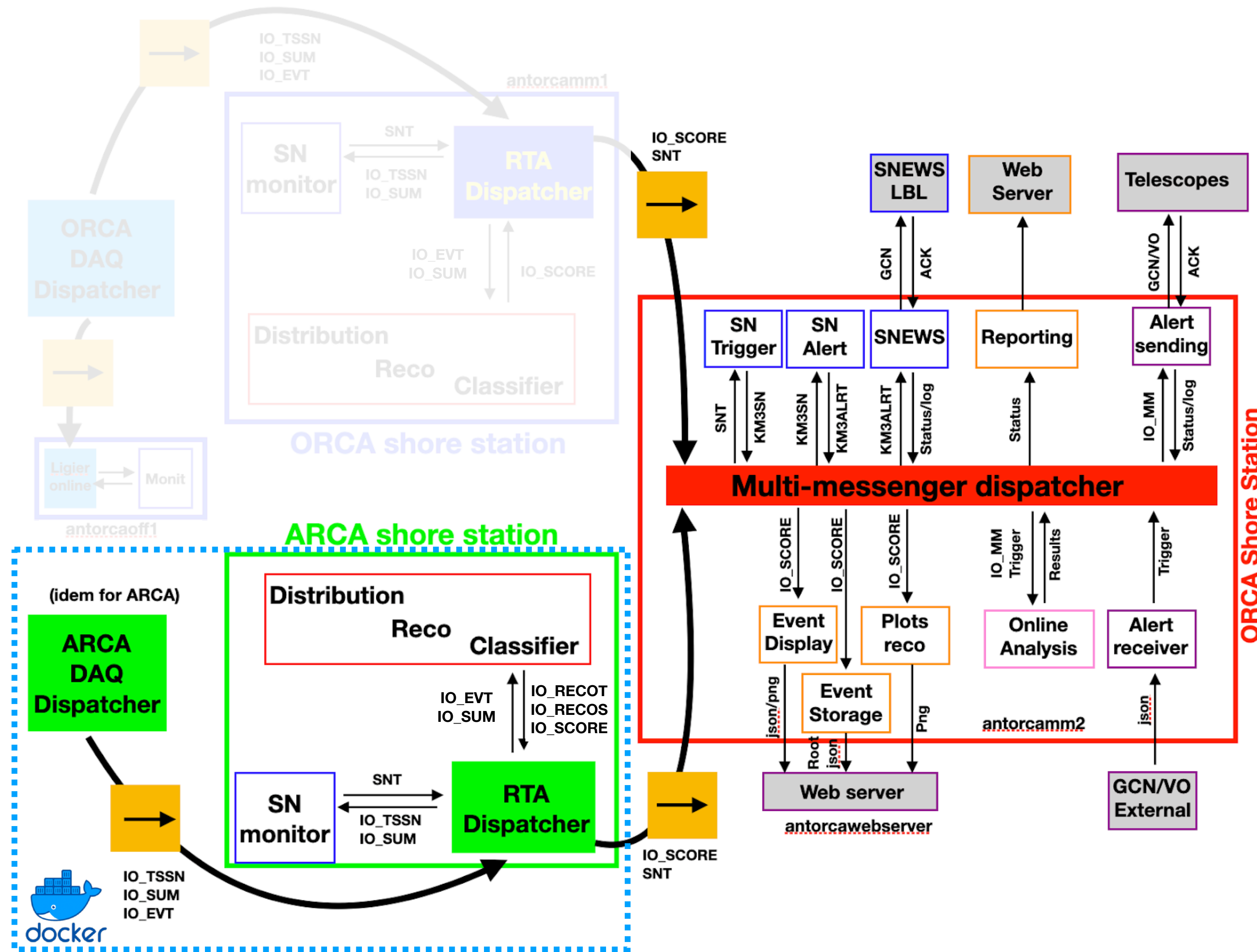


- ✓ Setup of the whole complex framework of software adopted for online processing
- ✓ Online reconstruction of triggered events (both track and shower reconstruction implemented)
- ✓ Classification of each event (muon/neutrino) via machine learning techniques
- ✓ Implementation of dashboards monitoring in real-time the status of all processes

KM3NeT Online Framework

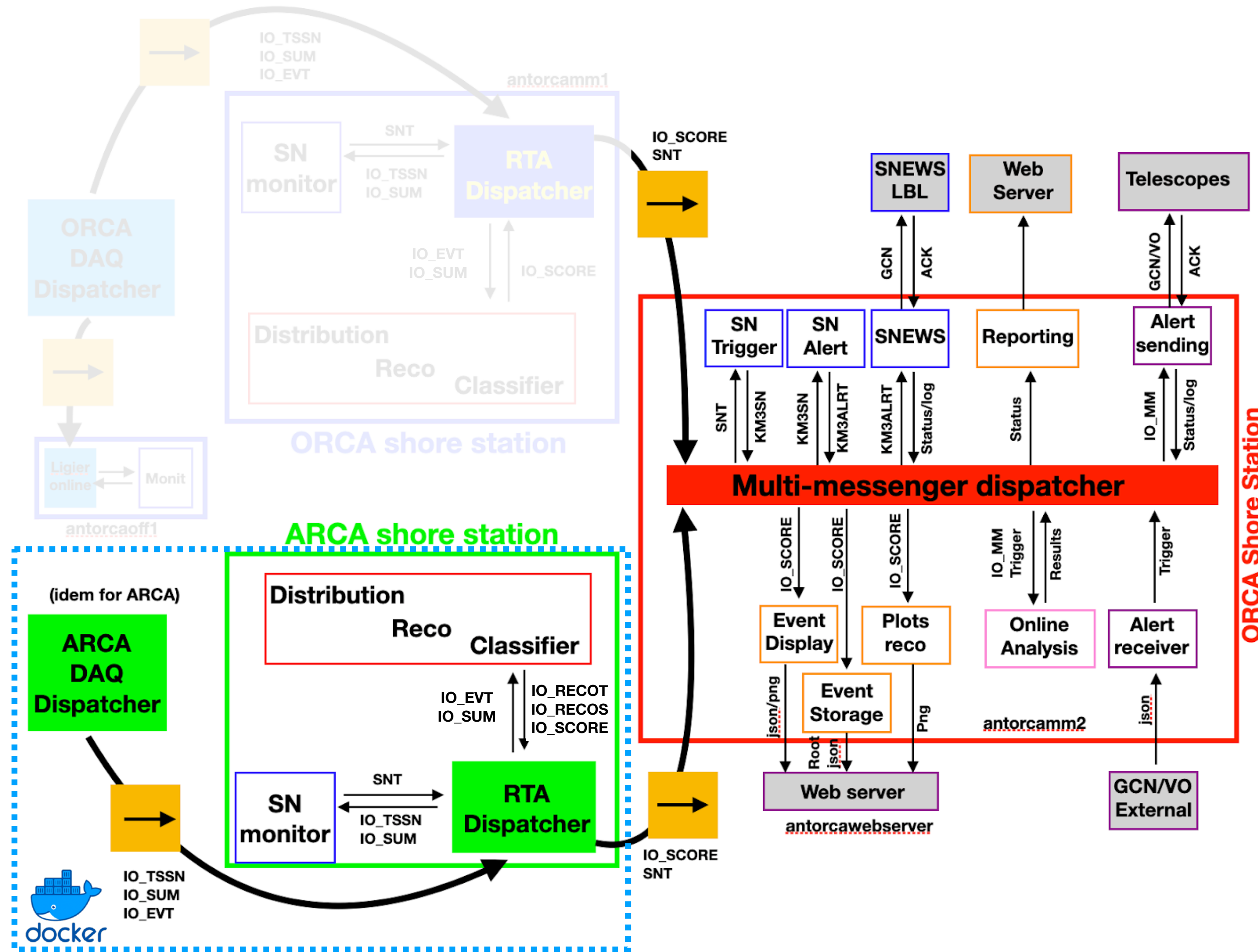
Tasks completed within the Rome group

- ✓ Implementation of the High-Level Monitoring of online processing (used by online shifters)



KM3NeT Online Framework

WORK IN PROGRESS



- ➔ Analysis optimization for online GRB analyses
- ➔ Classification score to distinguish between track and shower events
- ➔ Study of how the classifier information can be adopted at analysis level in order to use as soon as possible this information in online follow-ups
- ➔ Adaptation of the current online analysis pipeline for the continuous neutrino follow-ups of astrophysical sources in known catalogues
- ➔ ARCA KM₃NeT local database of outputs from reconstruction and classification

Additional contributions of the Rome group to online activities

- **Constant maintenance and optimization of the ARCA system** (software upgrade and optimization, check of the stability of the system, solving eventually occurring issues, whole framework adapted and validated at each new detector deployment, etc.)
- Study of the outputs and check of compatibility of the results with offline processing chain
- Preliminary studies before new detector deployments (e.g., stress tests to study the performances of the whole system for future detector configurations in test machines)
- **Constant support to online shifters** throughout the week, as well as **participation as shifters** (*Multimessenger Online Shifts* , different from *Regular Shifts*, started in November 2022)



Thank you for the attention!
