ELASTIC

A Software Architecture for Extreme-ScaLe
Big-Data AnalyticS in Fog CompuTIng Ecosystems

A novel software architecture
for analytics workload distribution
fulfilling real-time, energy, communication and secure properties

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04/11/2020

Challenges in the fog computing ecosystem

Massive & disperse data

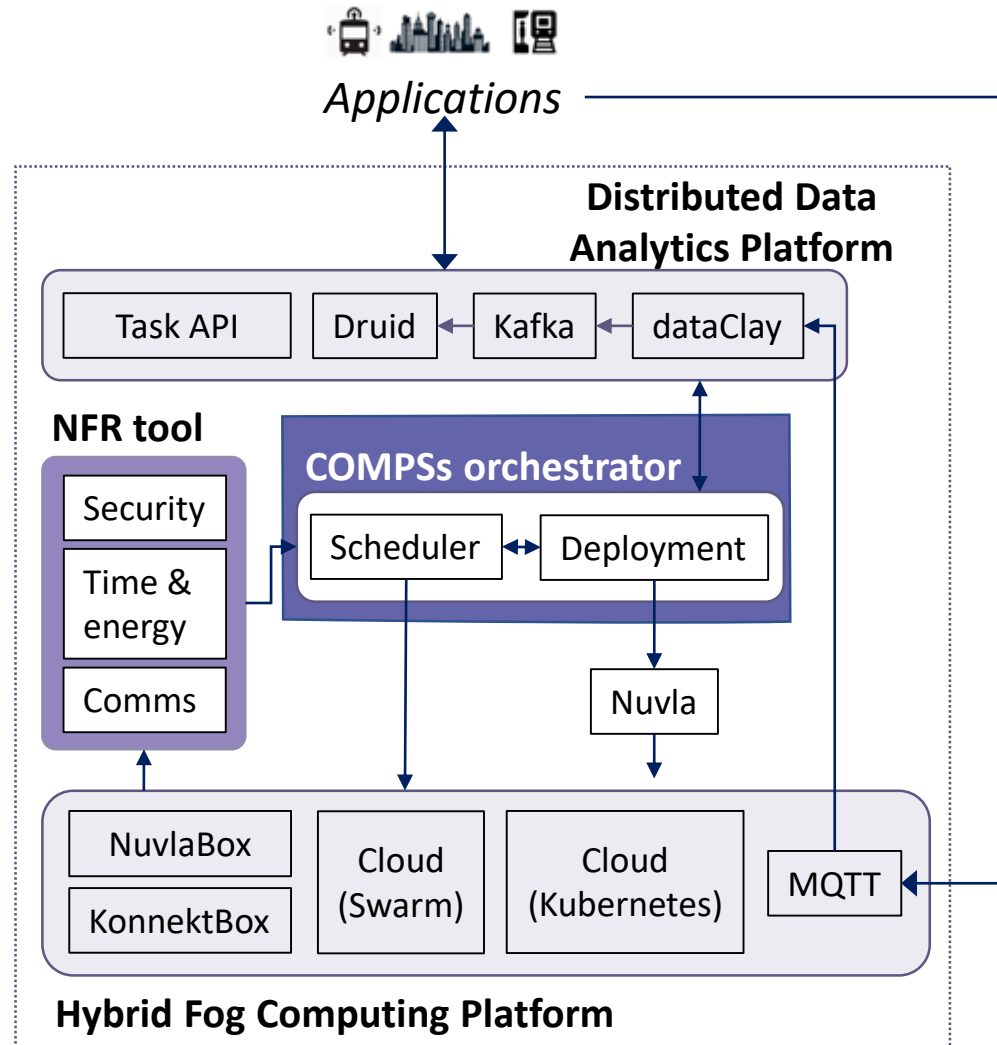**Heterogeneous computing infrastructures**

Heterogeneous networking
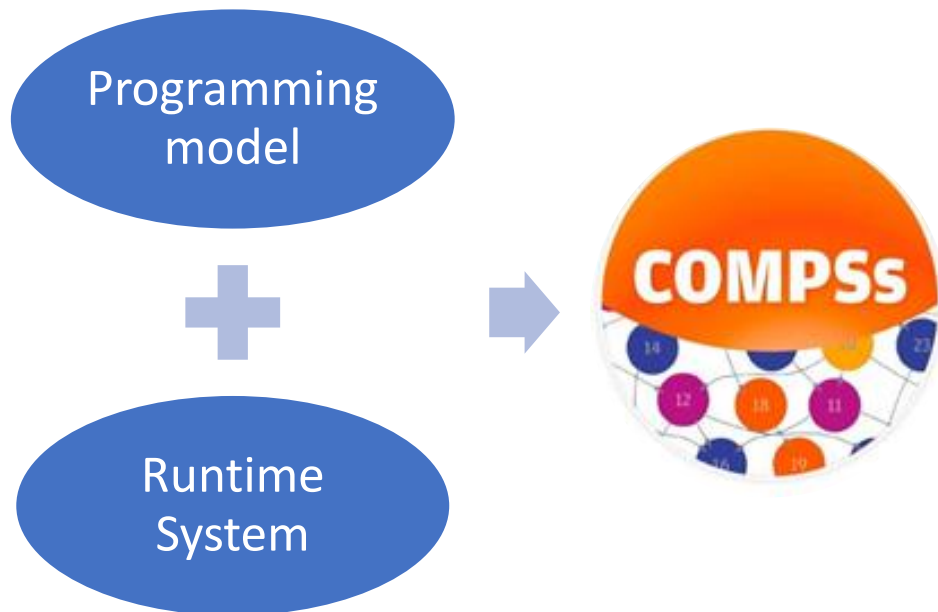
Software architecture

Diverse application-driven requirements

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ELASTIC Software Architecture

- Open-source framework for development and execution of applications over distributed infrastructures
  - http://compss.bsc.es

Programming model

Runtime System

- *"Sequential programming with parallel execution"*
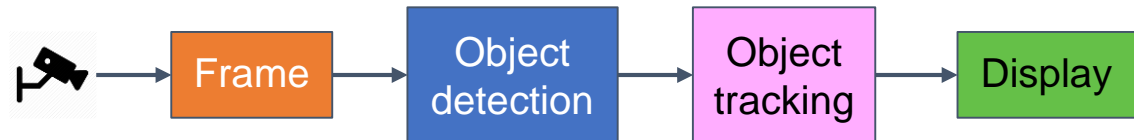- Agnostic of the underlying infrastructure

```python
@task(returns=numpy.ndarray)
def get_frame():
    return get_next_frame_from_video()

@task(frame=IN, returns=list)
def get_objects_from_frame(frame):
    return yolo.detect(frame)

@task(list_objects=IN)
def tracker(list_objects):
    return track(list_objects)

@task(list_objects=IN, frame = IN)
def collect_and_display(list_objects, frame):
    for obj in list_objects:
        display(obj, frame)

## Main function ##
while True:
    frame = get_frame()
    list_obj = get_objects_from_frame(frame)
    for i in range(len(list_obj)):
        list_obj[i] = tracker (list_obj)
    collect_and_display (list_obj, frame)
```
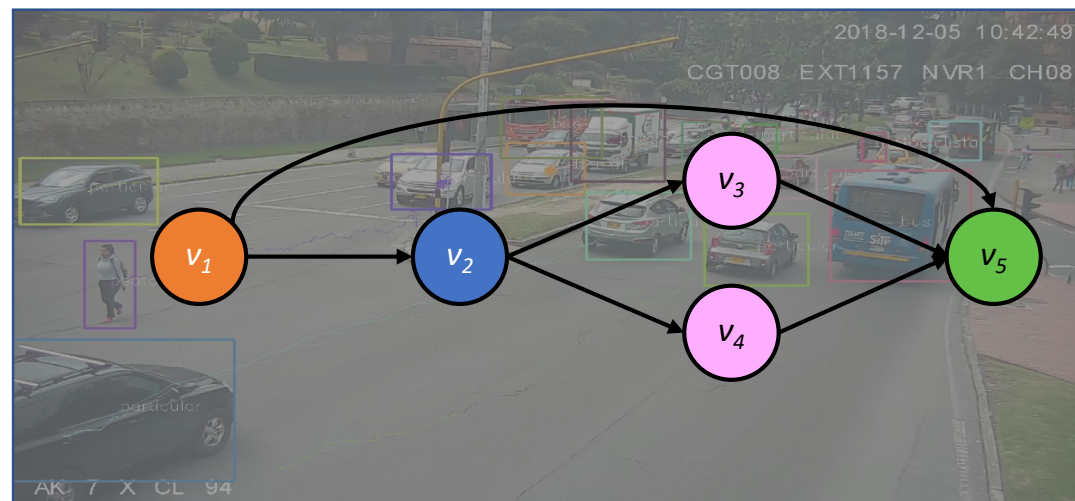

- Write sequential code
- Annotate tasks to be distributed with @task and identify their dependencies
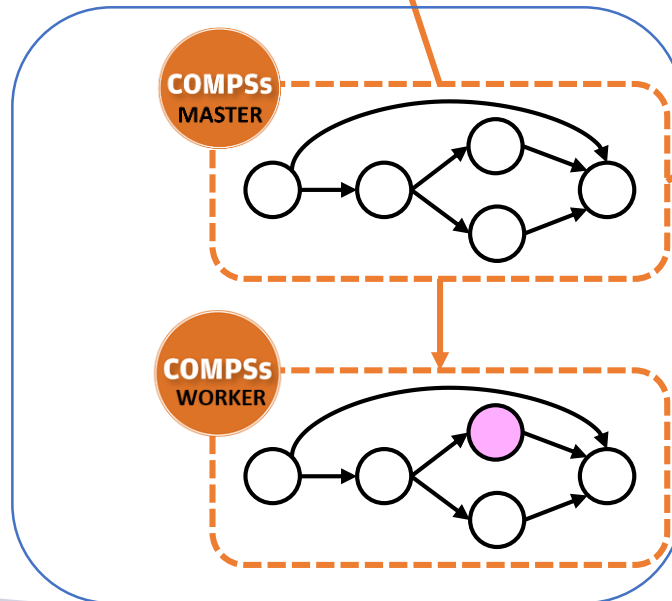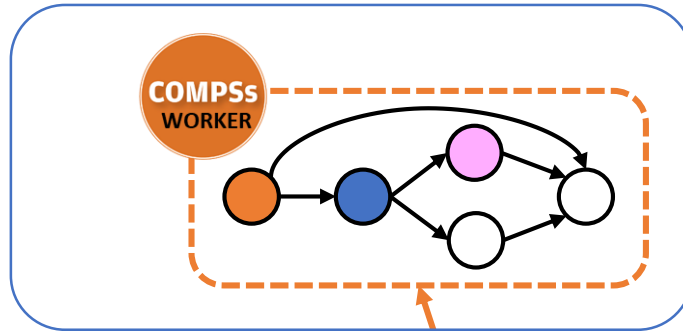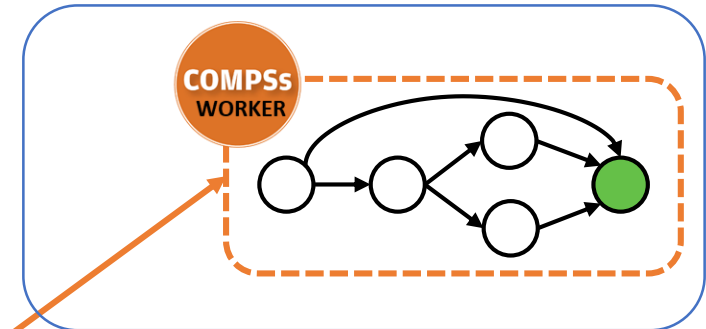- ✓ COMPSs will create the task graph and distribute the tasks
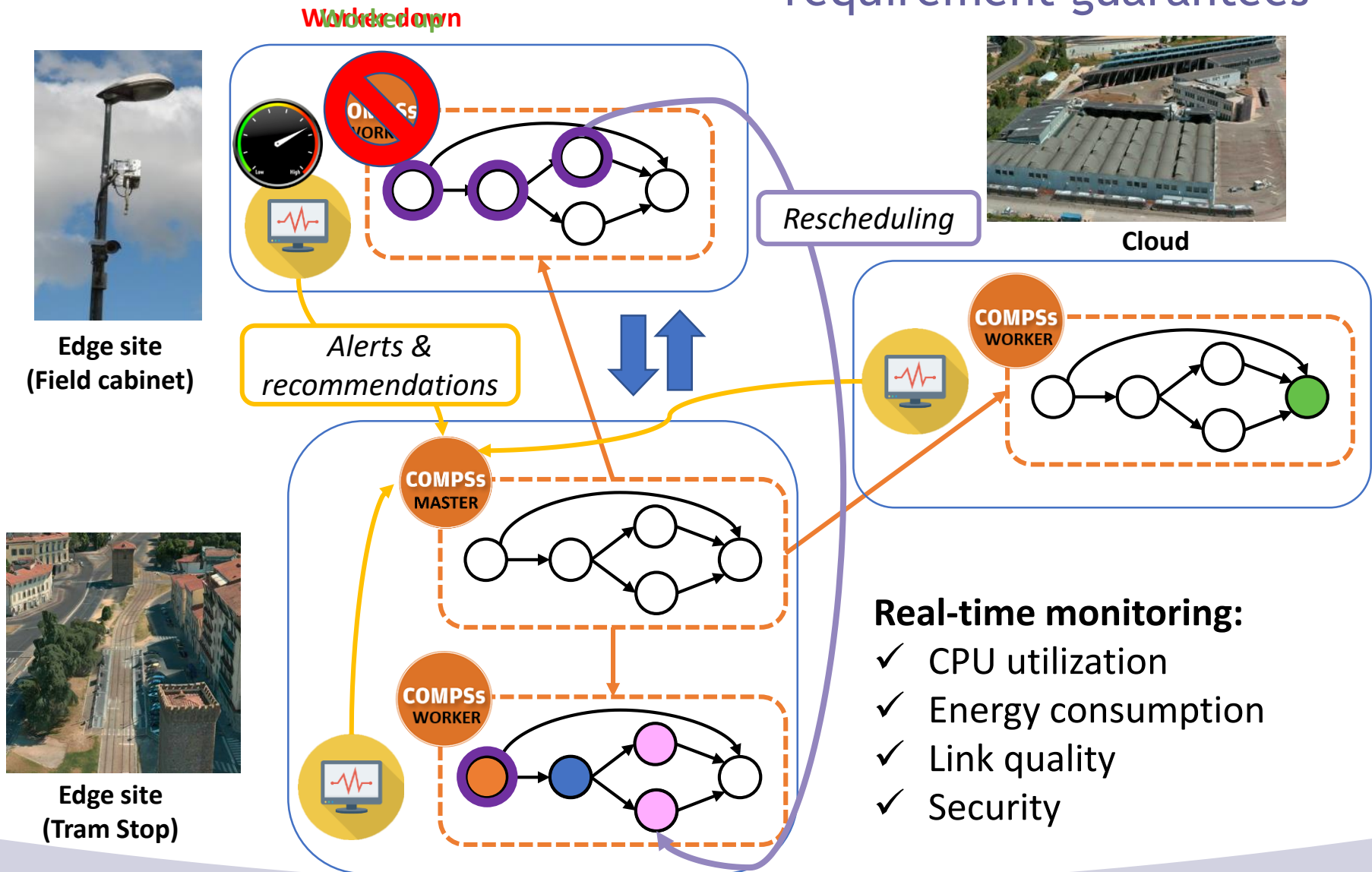
Edge site
(Field cabinet)

Cloud

Edge site
(Tram Stop)

- COMPSs deploys workers across the compute continuum
- Runtime manages task distribution based on scheduling policy

**Edge site
(Field cabinet)**

*Alerts &
recommendations*

Rescheduling

Cloud

**Edge site
(Tram Stop)**

Real-time monitoring:
- ✓ CPU utilization
- ✓ Energy consumption
- ✓ Link quality
- ✓ Security

- ✓ Elasticity
- ✓ Transparency for application programmer
- ✓ Real-time performance guarantees

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www.elastic-project.eu

Stay Tuned!

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