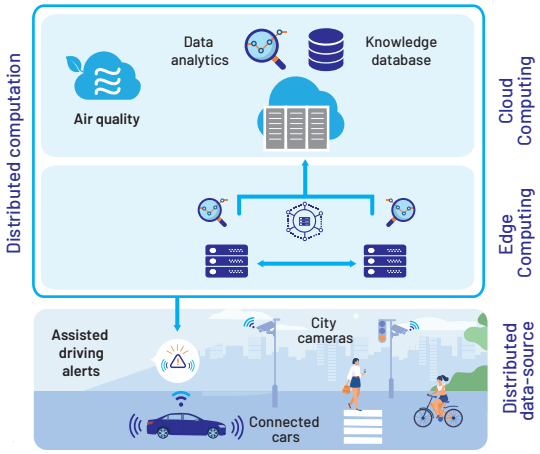
CLASS

EDGE AND CLOUD COMPUTATION:
A HIGHLY DISTRIBUTED SOFTWARE
FOR BIG DATA ANALYTICS

The CLASS software architecture

CLASS has introduced a novel software architecture to facilitate the development and deployment of complex **big data analytics applications over heterogeneous cloud and edge infrastructures.** This new approach:

- Facilitates the development of complex big data analytics, supporting both task-based and map-reduce analytics engines
- Handles the distribution of data analytics methods in a way transparent to the underlying infrastructure, boosting interoperability and portability
- Supports concurrency through parallel and serverless execution framework
- Offers scalability mechanisms to match the allocation of cloud resources to the QoS requirements of the application



The key components of the CLASS software architecture are:

- The **computation distribution layer** based on the COMPSs framework, handling the scheduling and distribution of the application tasks over the compute continuum, from edge to cloud, while honoring the required data dependencies
- The **data analytics platform**, built over the OpenWhisk serverless platform and providing support for multiple data analytics back-ends, including the Lithops map-reduce framework, the COMPs task-based programming model and Deep Neural Network (DNN) platforms for object detection
- The **edge analytics platform**, exploiting the NVIDIA GPU-Accelerated libraries to run object detection, tracking and deduplication over live video streams
- The **cloud computing platform**, employing Rotterdam, a Container-as-a-Service which facilitates the deployment and lifecycle management of containerized applications

The CLASS software architecture has been validated in a smart city use case in the City of Modena, offering two real-time applications for collision detection and air pollution estimation and one offline simulation environment for the digital traffic signs application:

1. Collect a high volume of data from street cameras and connected vehicles
2. Perform object detection and tracking for all vehicles and vulnerable road users, using the edge platform
3. Federate all useful information at the cloud, maintaining a Data Knowledge Base (DKB)
4. Apply trajectory prediction and collision detection analytics at the cloud, on the objects available in the DKB
5. Generate and send alerts to all connected vehicles involved in any detected hazardous situation
6. Use DKB information to estimate the level of vehicle related pollutants, with granularity that can vary from a few seconds to hours
7. Use the historical information from DKB to recreate a realistic simulation environment for traffic management scenarios

Partners

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The CLASS project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No.780622.