

IQmulus - Cloud Platform for Point Cloud Processing

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IQmulus – Big Geo Data



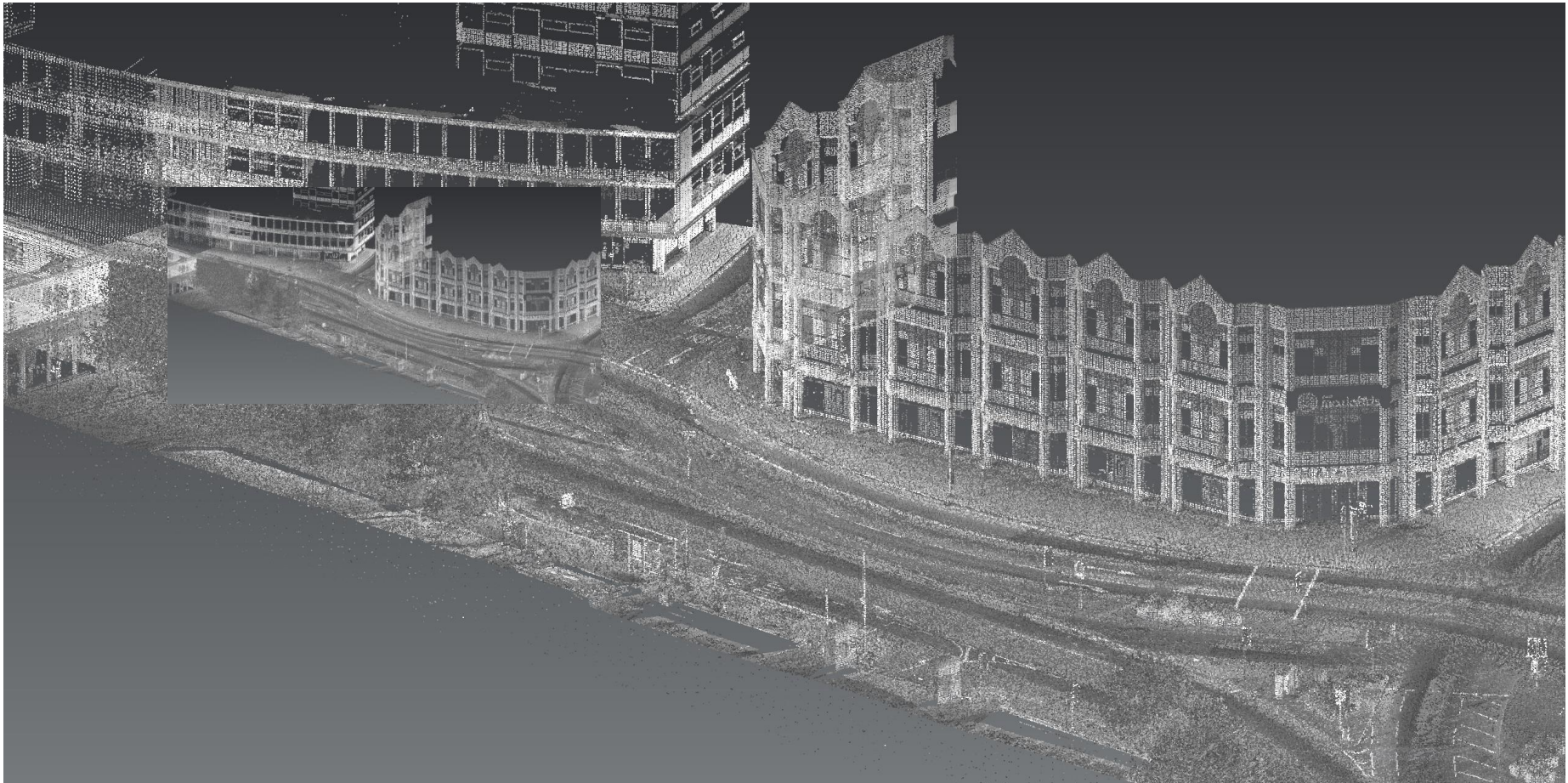
- 4 year EU FP7 Research Project (8.1 Mio EUR)
- A High-volume Fusion and Analysis Platform for Geospatial Point Clouds, Coverages and Volumetric Data Sets
- IQmulus will leverage the information hidden in large heterogeneous geospatial data sets and make them a practical choice to support reliable decision making
- www.iqmulus.eu



Big Point Cloud Data

- Point cloud data is ubiquitous
 - Airborne LiDAR & Photogrammetry
 - Mobile mapping vehicles
 - Consumer range camera & Mobile phones
- Point cloud processing
 - Typically object localization and classification
- Point cloud segmentation is fundamental
 - Automatic
 - Interactive

Problem: data is challenging

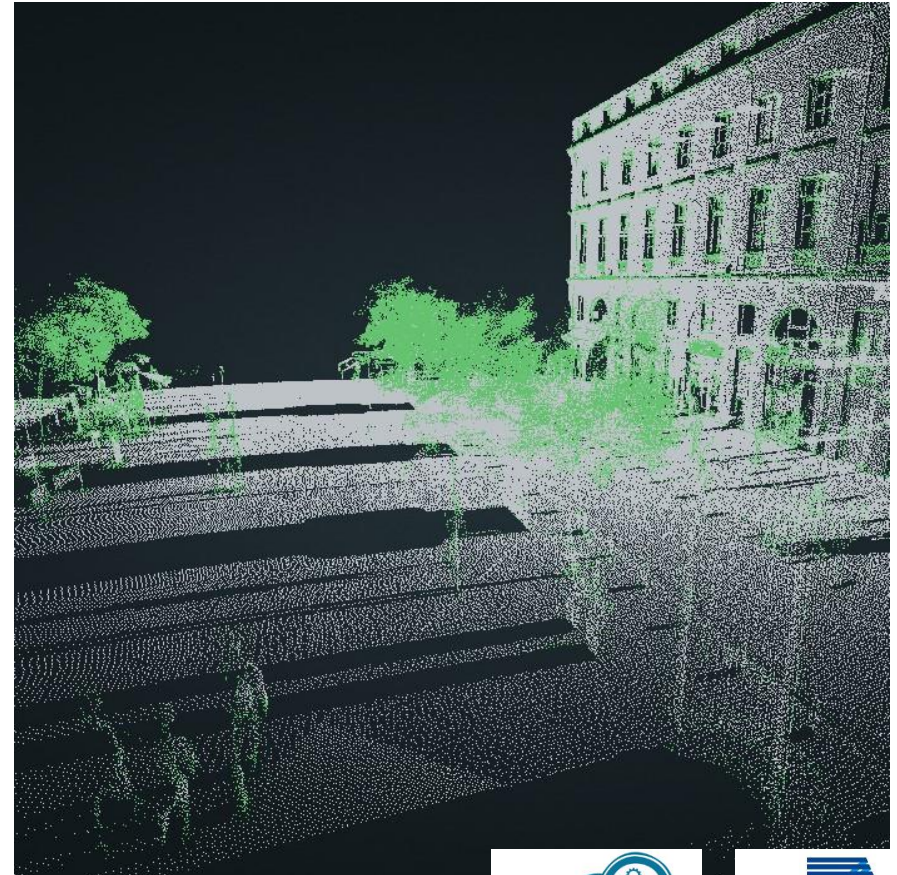
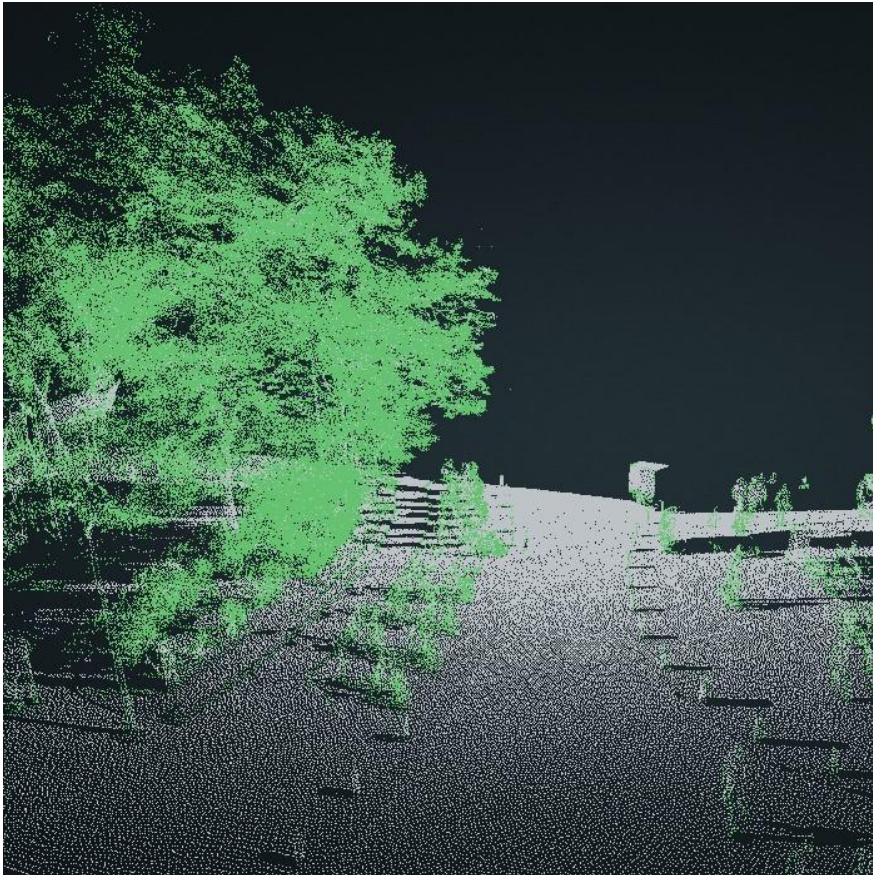


Automation: Machine Learning

- Classification using Random Forrest
- Flexible to adapt to new classes & objects using Machine Learning
- Strictly local
- Easy to parallelize
- Libraries for Cluster available



Results

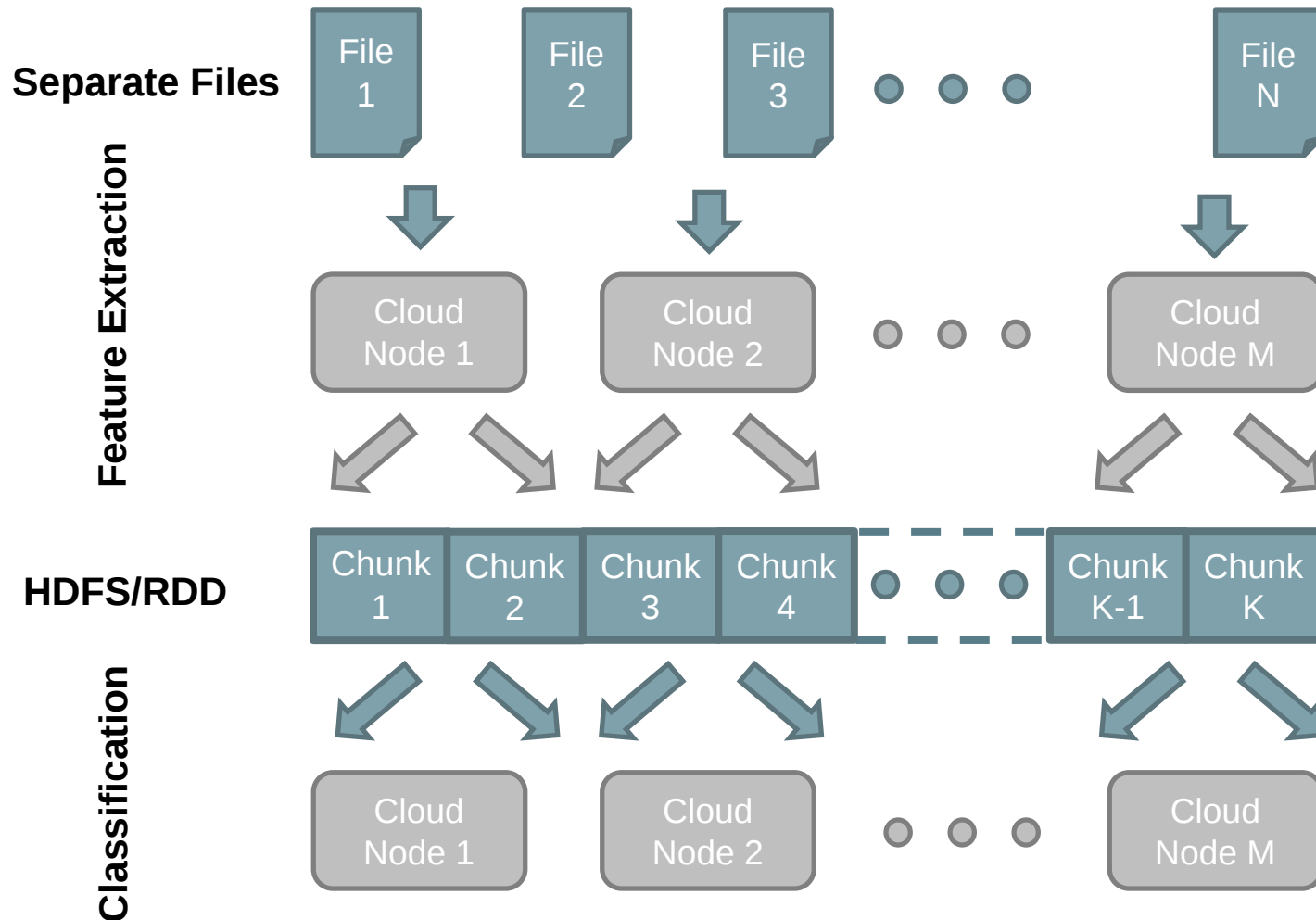


Big Data: Cloud Computing for Geospatial Data

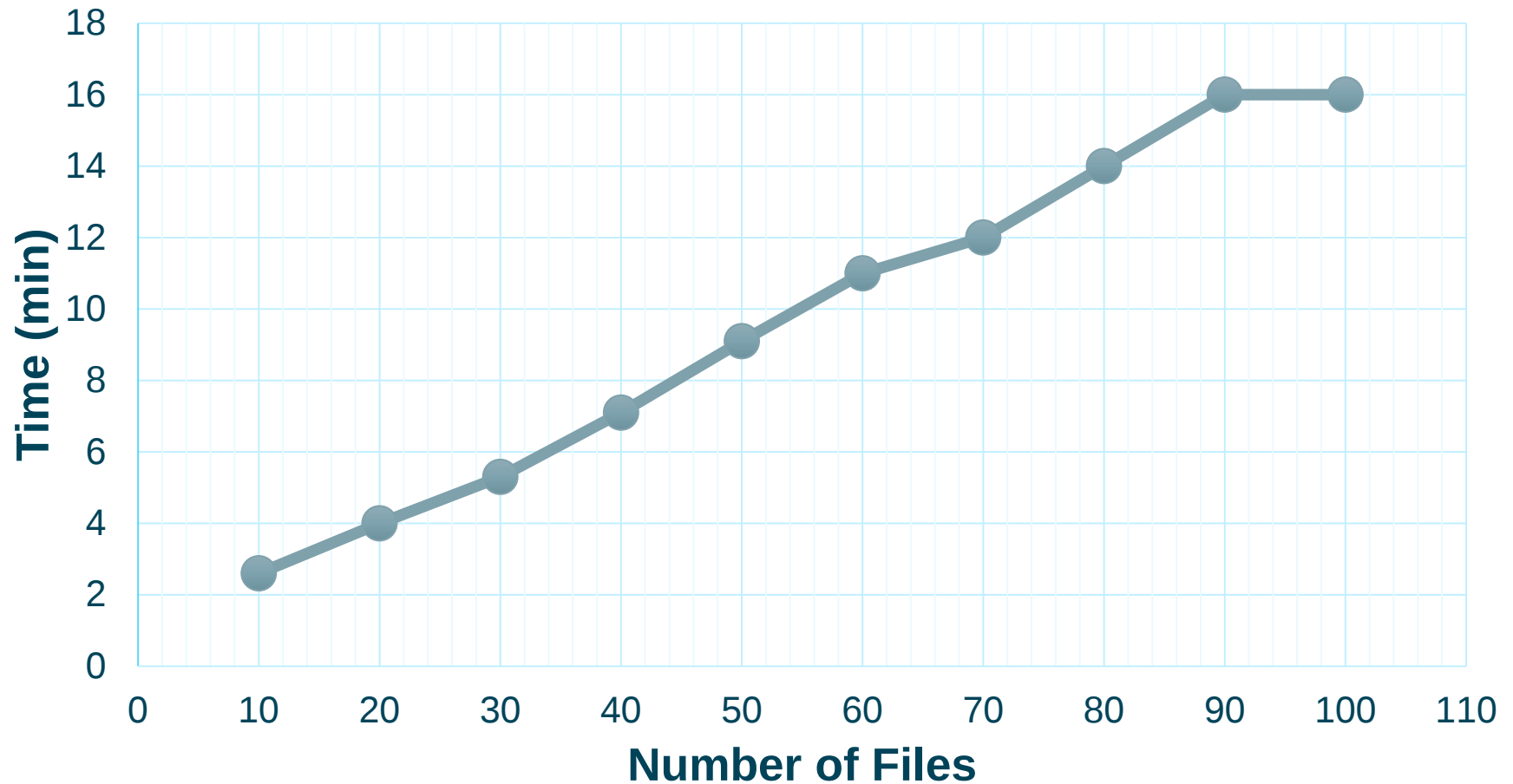
Simple Experiment:

- 100 Tiles (Files) of Land-based Mobile Mapping Data
- Around 300 Million points
- About 50 GB in binary storage
- Using Feature Computation & Automated Classification
- Use new in-memory framework from Spark
- Uploaded to Amazon Simple Storage Solution (S3)
- Using 10 nodes of Amazon Elastic Compute Cloud (EC2)

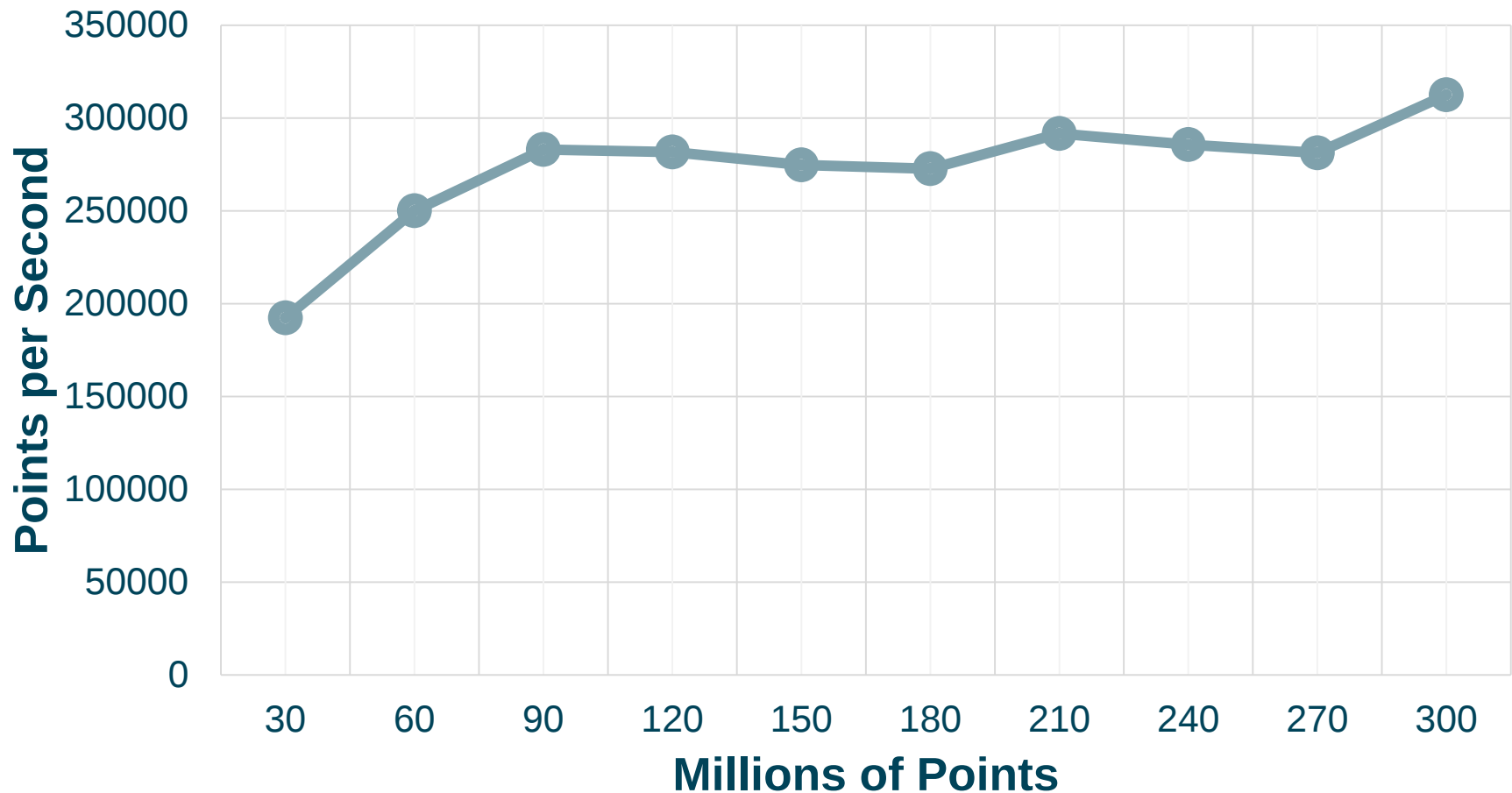
Computational Framework



Performance



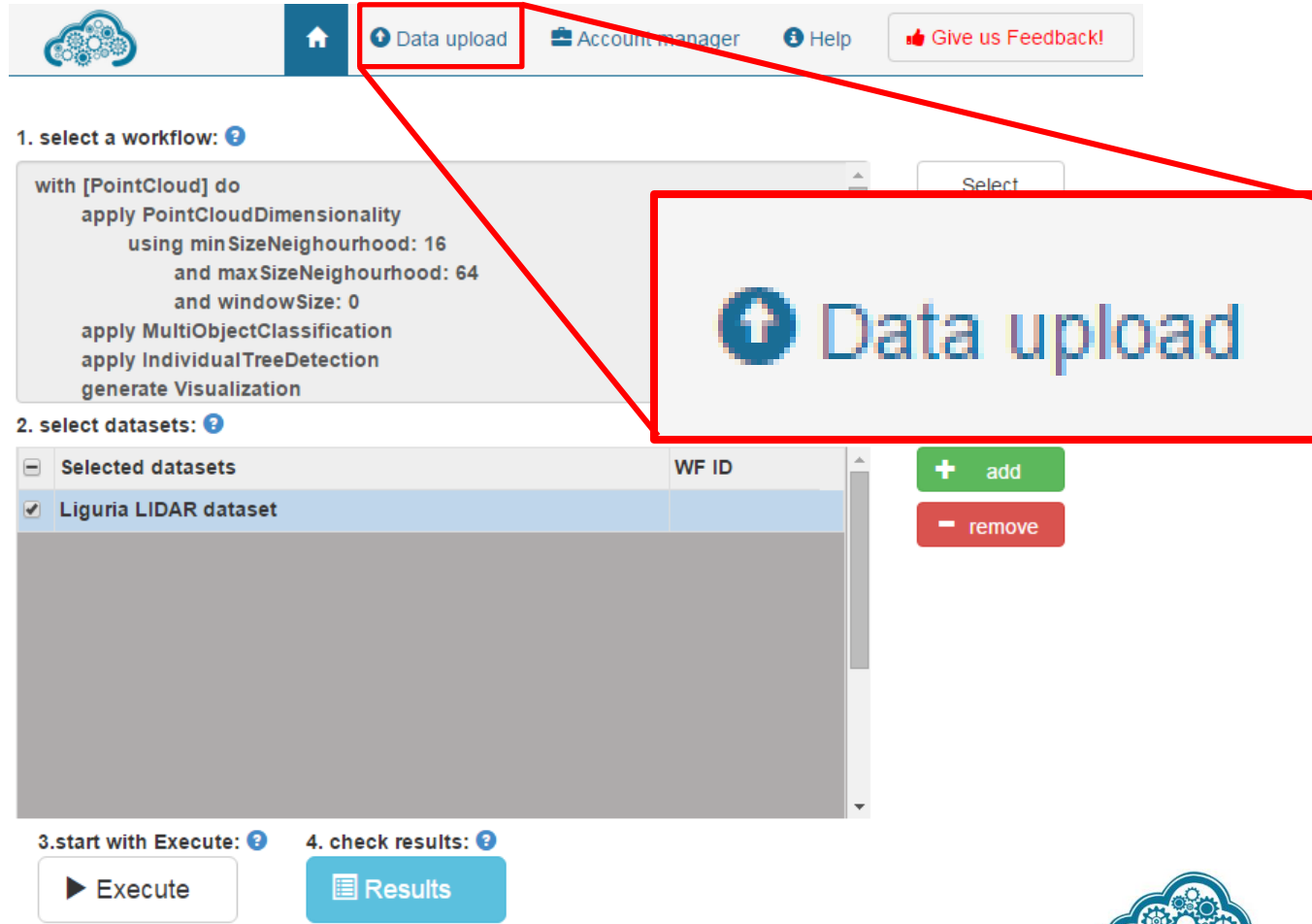
Performance (throughput)



Comparison (for 100 tiles)

Functionality	Single Node	10 Nodes Amazon AWS
Feature Extraction	271 Minutes	21 Minutes
Classification	225 Minutes	\$0.50

IQmulus – service on a web page



The screenshot displays the IQmulus web interface. At the top, a navigation bar includes a home icon, a 'Data upload' button (highlighted with a red box), an 'Account manager' link, a 'Help' link, and a 'Give us Feedback!' button. Below the navigation bar, the main content area is divided into four steps:

- 1. select a workflow:** A list of workflows is shown, including 'with [PointCloud] do', 'apply PointCloudDimensionality', 'using minSizeNeighbourhood: 16', 'and maxSizeNeighbourhood: 64', 'and windowSize: 0', 'apply MultiObjectClassification', 'apply IndividualTreeDetection', and 'generate Visualization'. A 'Select' button is visible.
- 2. select datasets:** A table titled 'Selected datasets' is shown, with a 'WF ID' column. The 'Liguria LIDAR dataset' is selected (checked). To the right of the table are '+ add' and '- remove' buttons.
- 3. start with Execute:** An 'Execute' button is visible.
- 4. check results:** A 'Results' button is visible.

A red box highlights the 'Data upload' button in the top navigation bar, and another red box highlights a larger 'Data upload' button in the workflow selection area.

Supported Data Format

- LAS (ASPRS)
 - Industry standard
 - Compression supported (via LASZip)
 - Difficult to extend
- PLY (Stanford)
 - Very flexible
 - Binary and ASCII
 - Research only
- Flexible Standard needed
- GeoNetwork support