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Query Log Analysis

Detecting anomalies in DNS traffic

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Presentation

- *Goal*
- *Challenges*
- *Implementation*

- *DEMO*

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Goal

Design and build a working query log analysis platform using available components and custom development, able to predict, detect and report on common attack and abuse patterns in an open architecture, allowing for future growth and improvement.

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Challenges

- Huge data volume
  - efficiency and scalability !
  - easy to stay under the hood
- Wide range of attacks, under constant evolution
- Specific nature of DNS traffic
  - periodicity and trends
  - few (typically two) packets per flow

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Implementation

- Masters thesis (University of Leuven)
- Main components
  - Entrada
  - QLAD-flow
  - QLAD-global
  - QLAD-UI

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Implementation Entrada: why

- Efficiently store the data
- Efficiently query the data
- Designed to work with DNS

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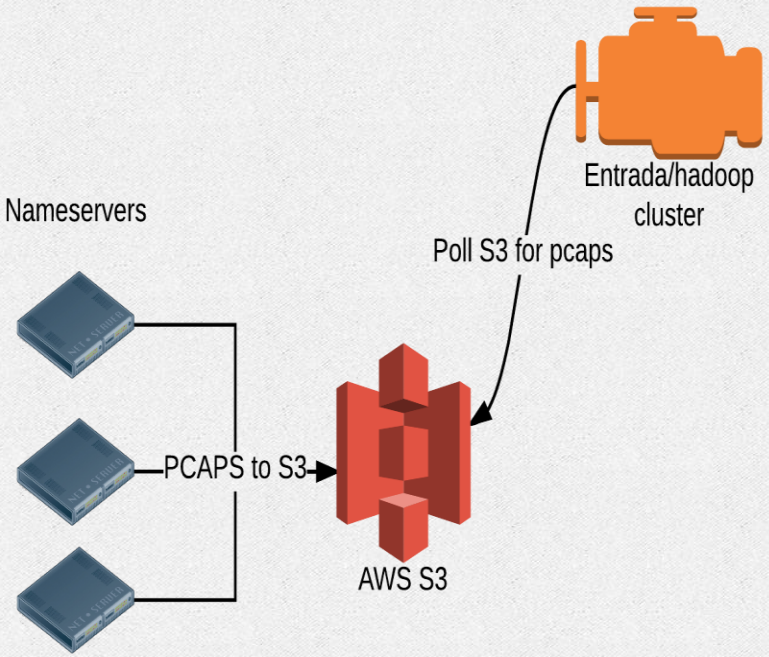
Implementation Entrada: architecture



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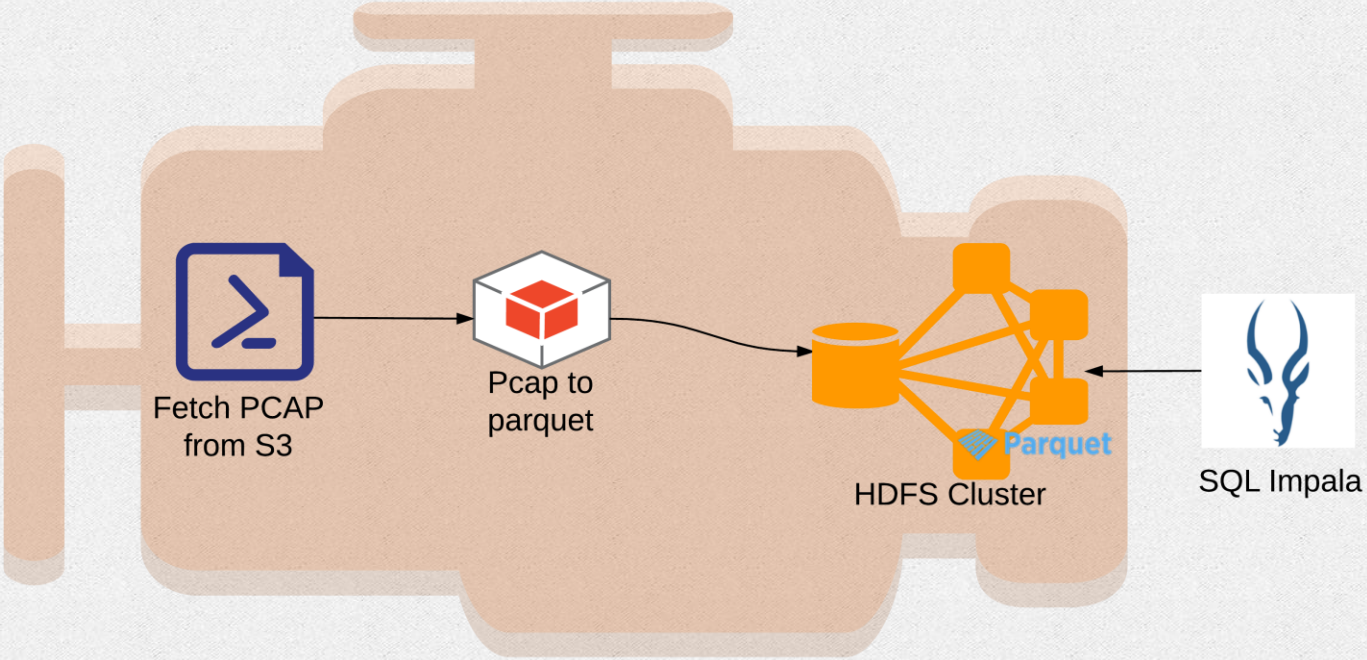
Implementation Entrada: flow



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Implementation QLAD-flow: why

- Focus on anomalies (≠ attacks/abuses)
- Inspiration from network anomaly detection
- Able to detect low traffic anomalies
- Uses the algorithm developed by CZ.NIC

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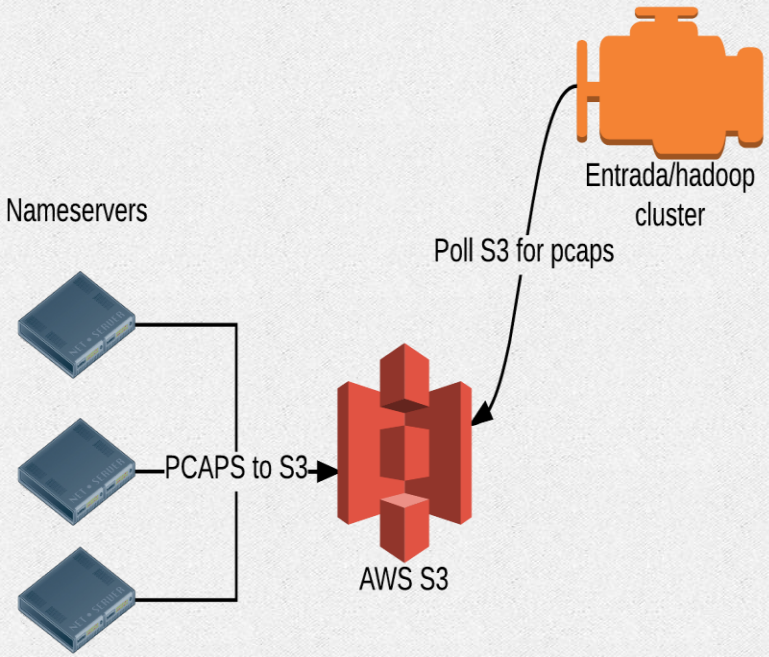
Implementation QLAD-flow: architecture



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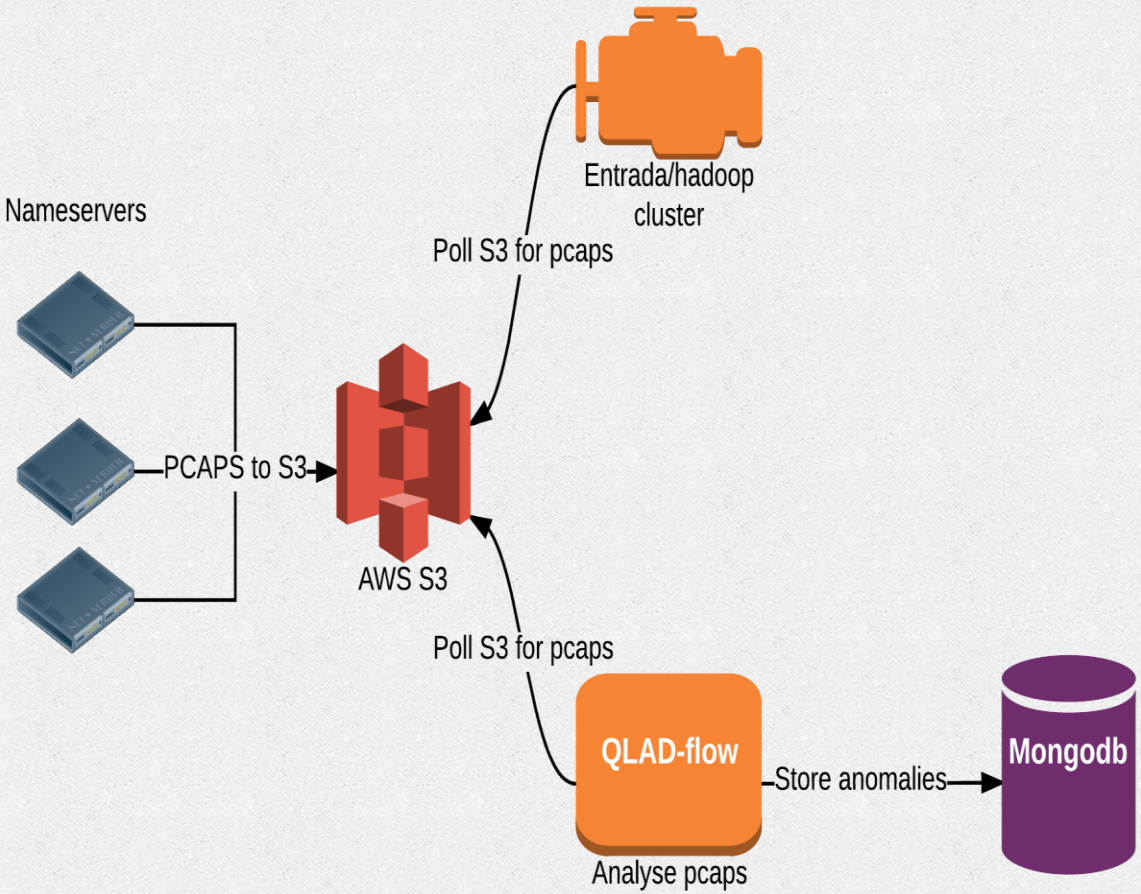
Implementation QLAD-flow: architecture



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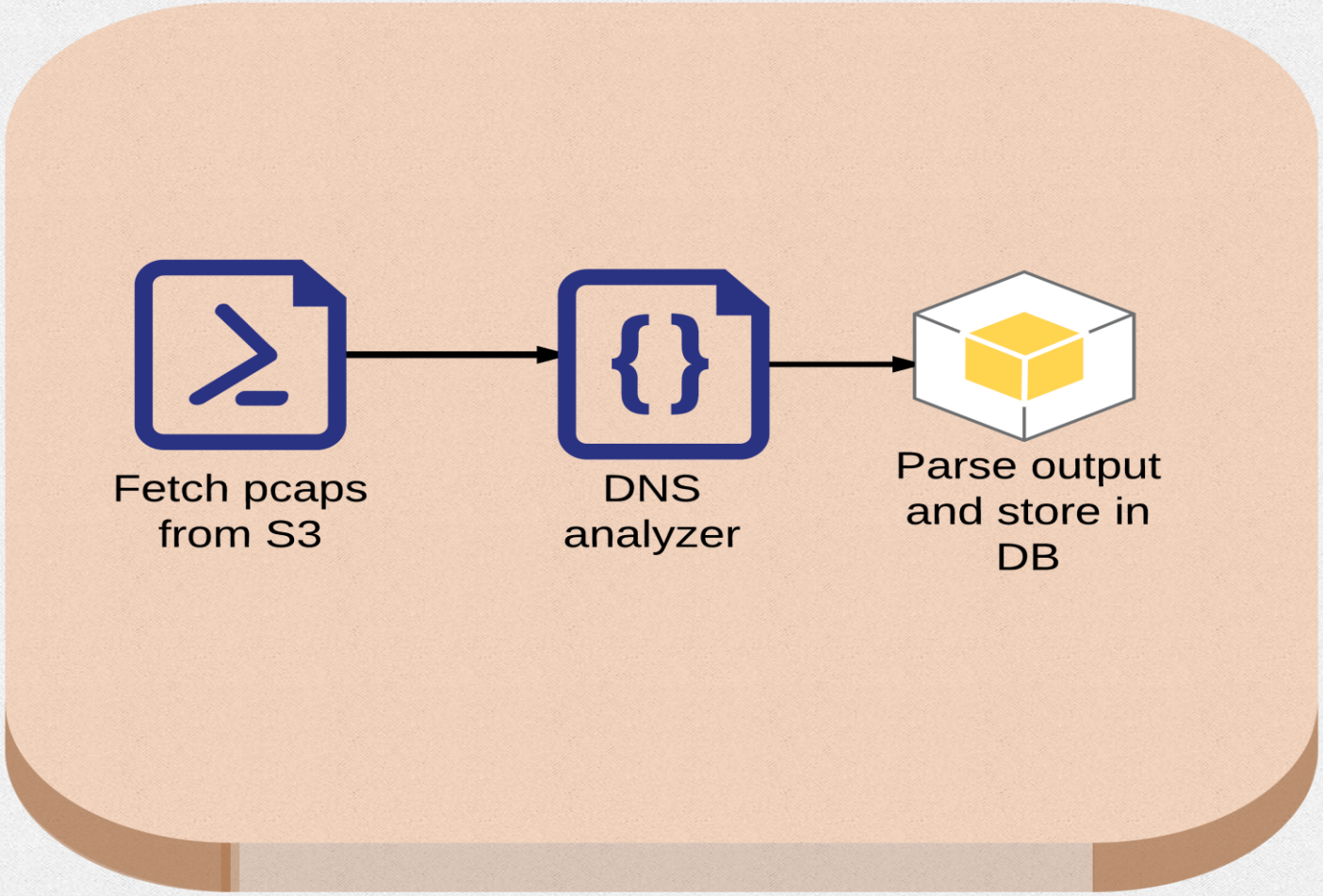
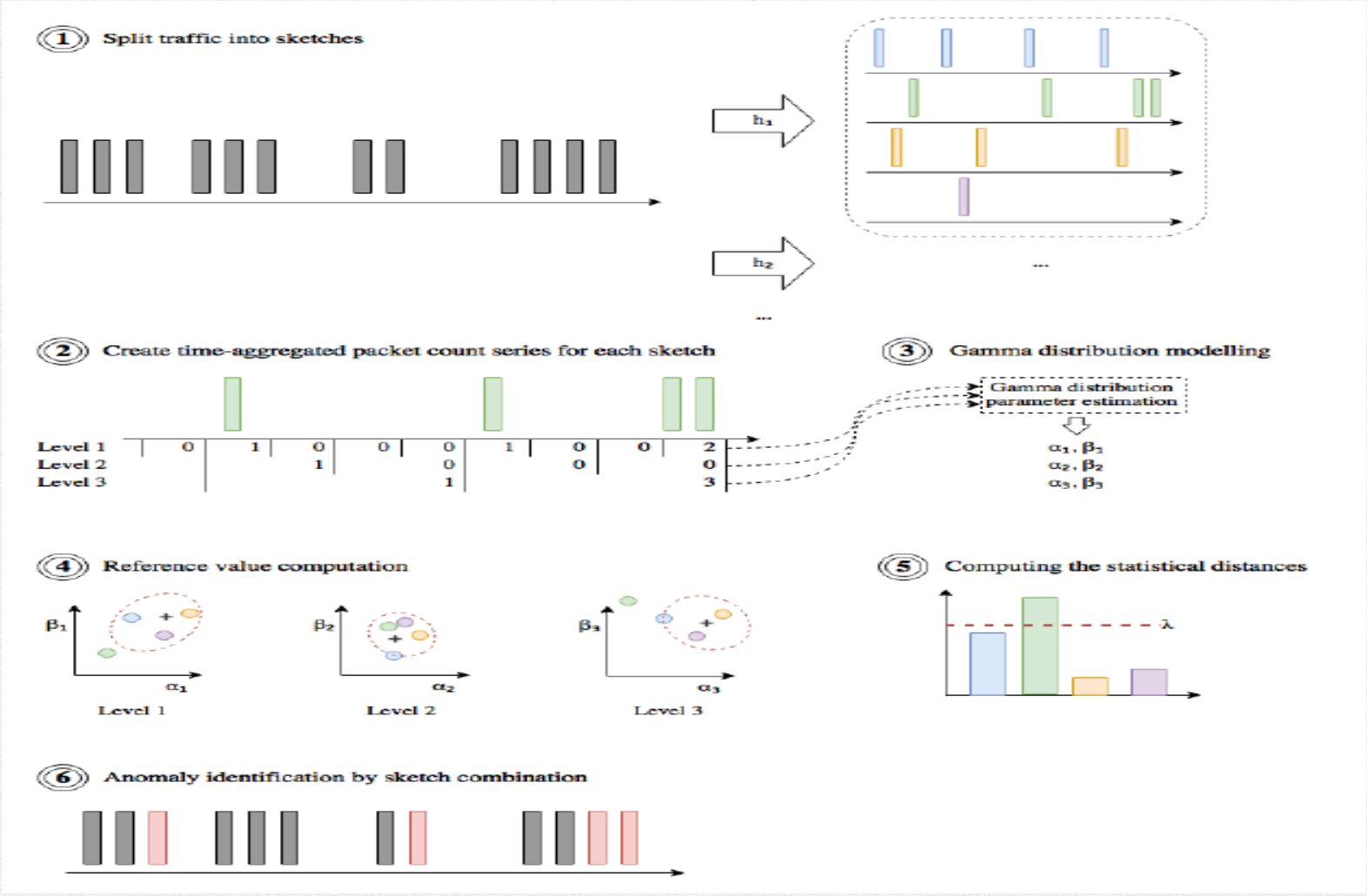
Implementation QLAD-flow: flow



Implementation QLAD-flow: algorithm



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Implementation QLAD-flow: shortcomings

- Some attacks span a lot of flows -> QLAD-flow is unable to detect these (e.g. like DoS with spoofed IP address)
- QLAD-global was implemented to fill the gap

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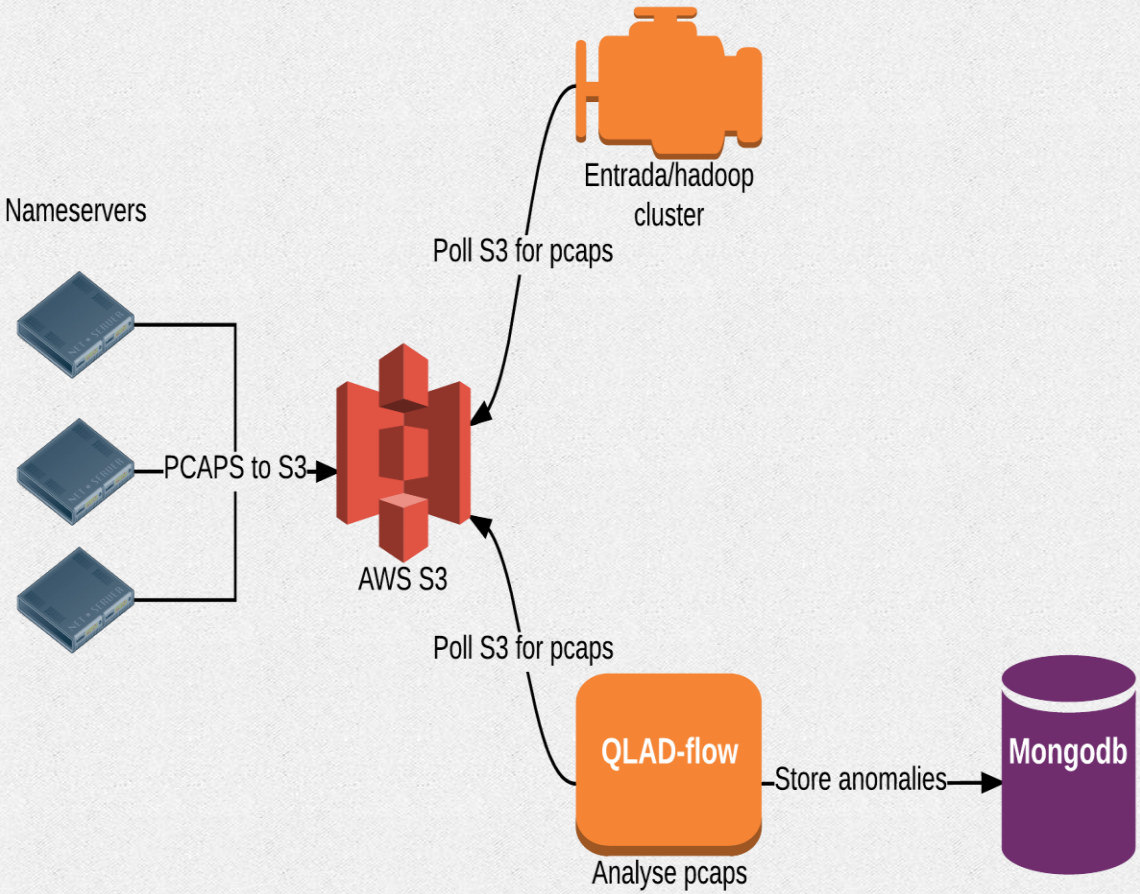
Implementation QLAD-global: architecture



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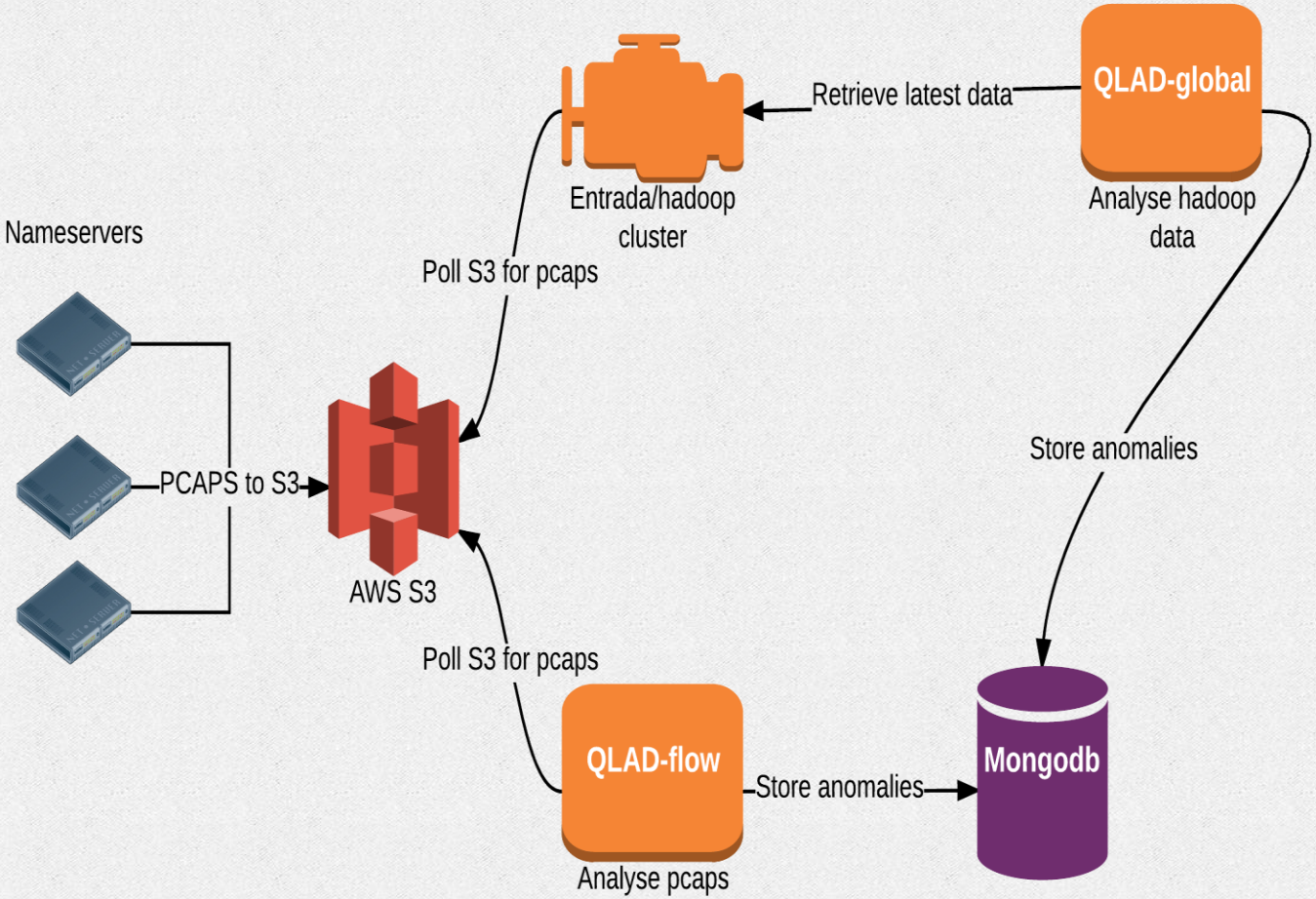
Implementation QLAD-global: architecture



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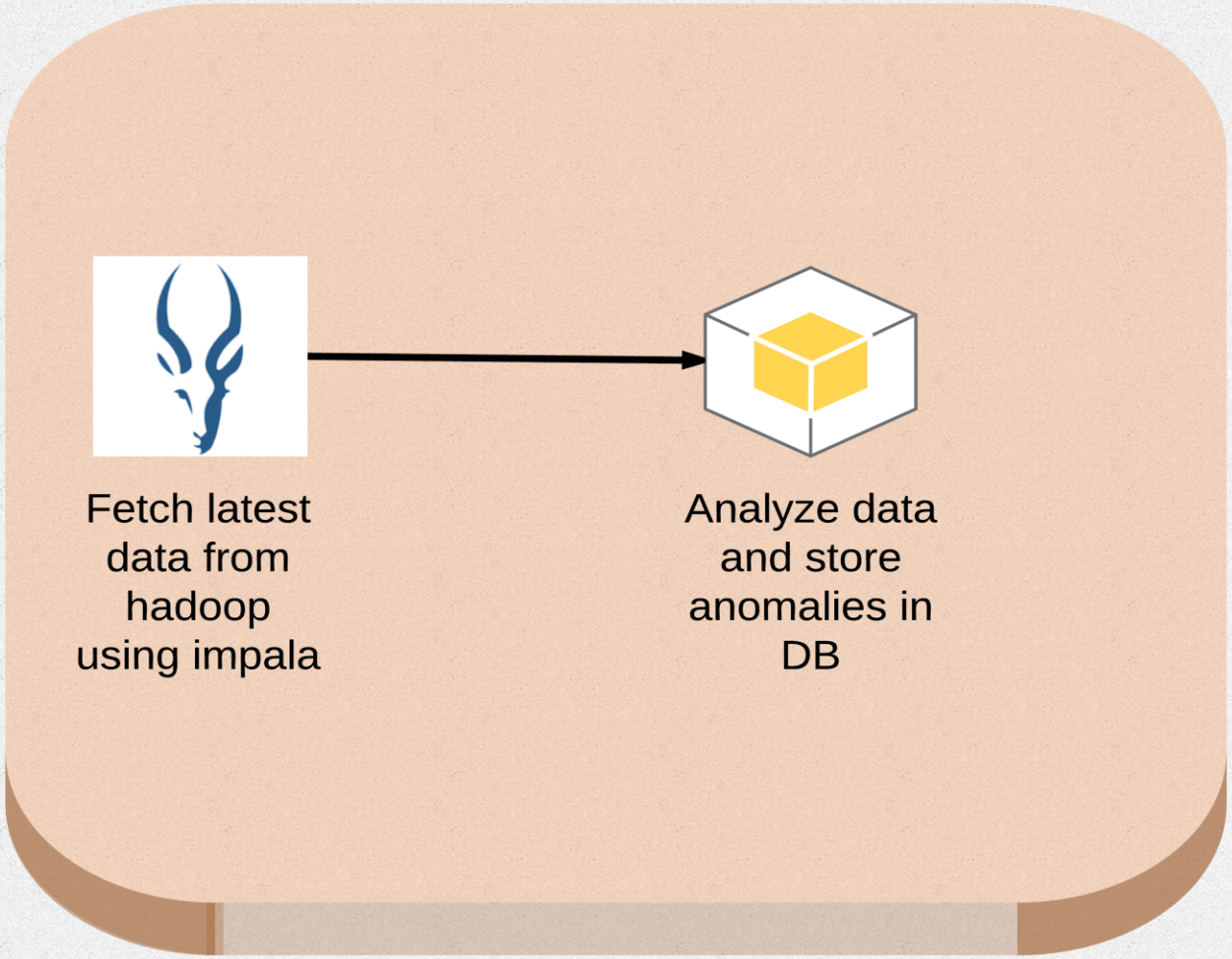
Implementation QLAD-global: flow



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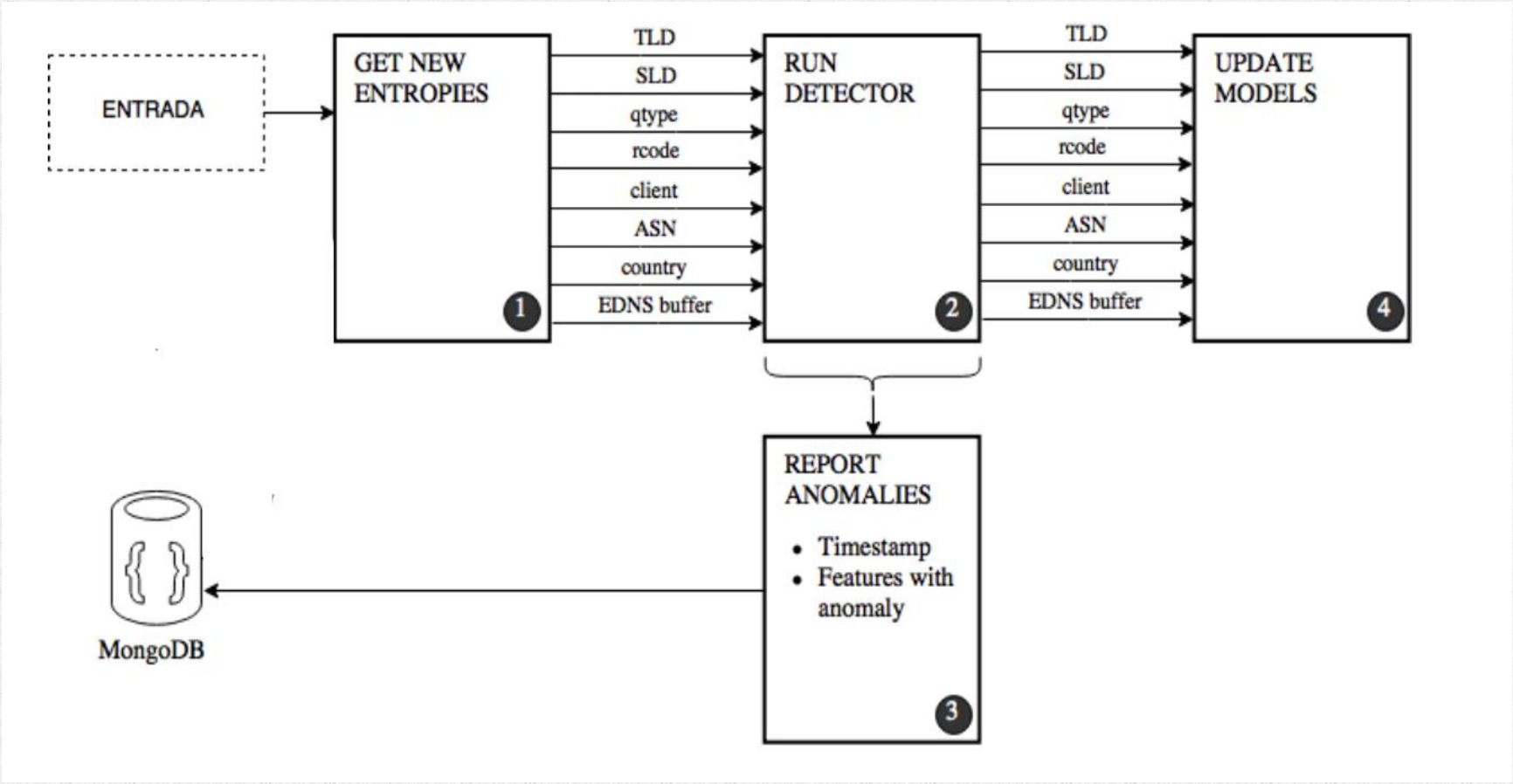
Implementation: QLAD-global: algorithm



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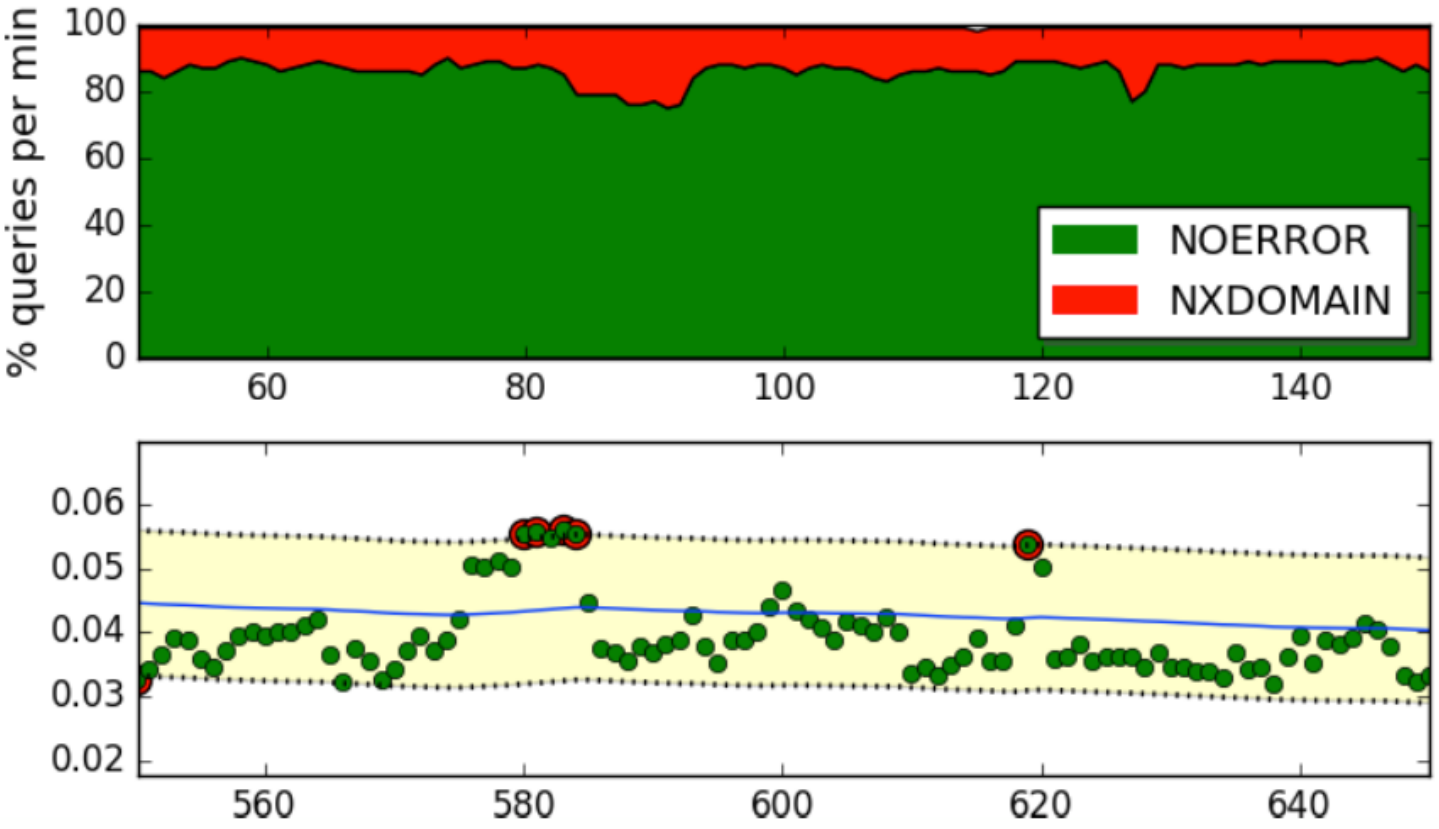
Implementation: QLAD-global: algorithm result



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Implementation: QLAD-UI

Automatic classification is challenging

- wide range of anomalies
- subtle differences

=> Rely on human interpretation of the detected anomalies by QLAD-global and QLAD-flow

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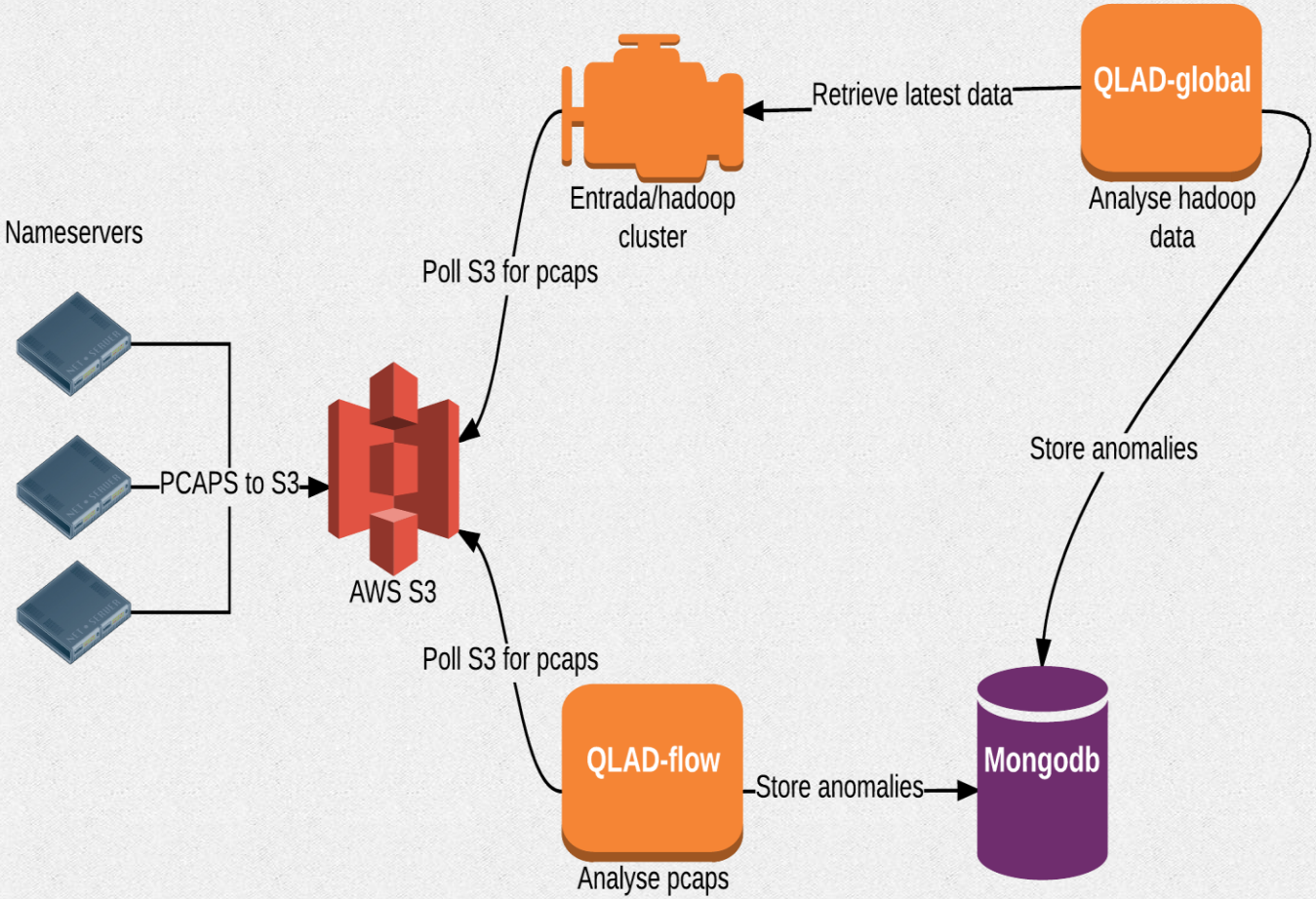
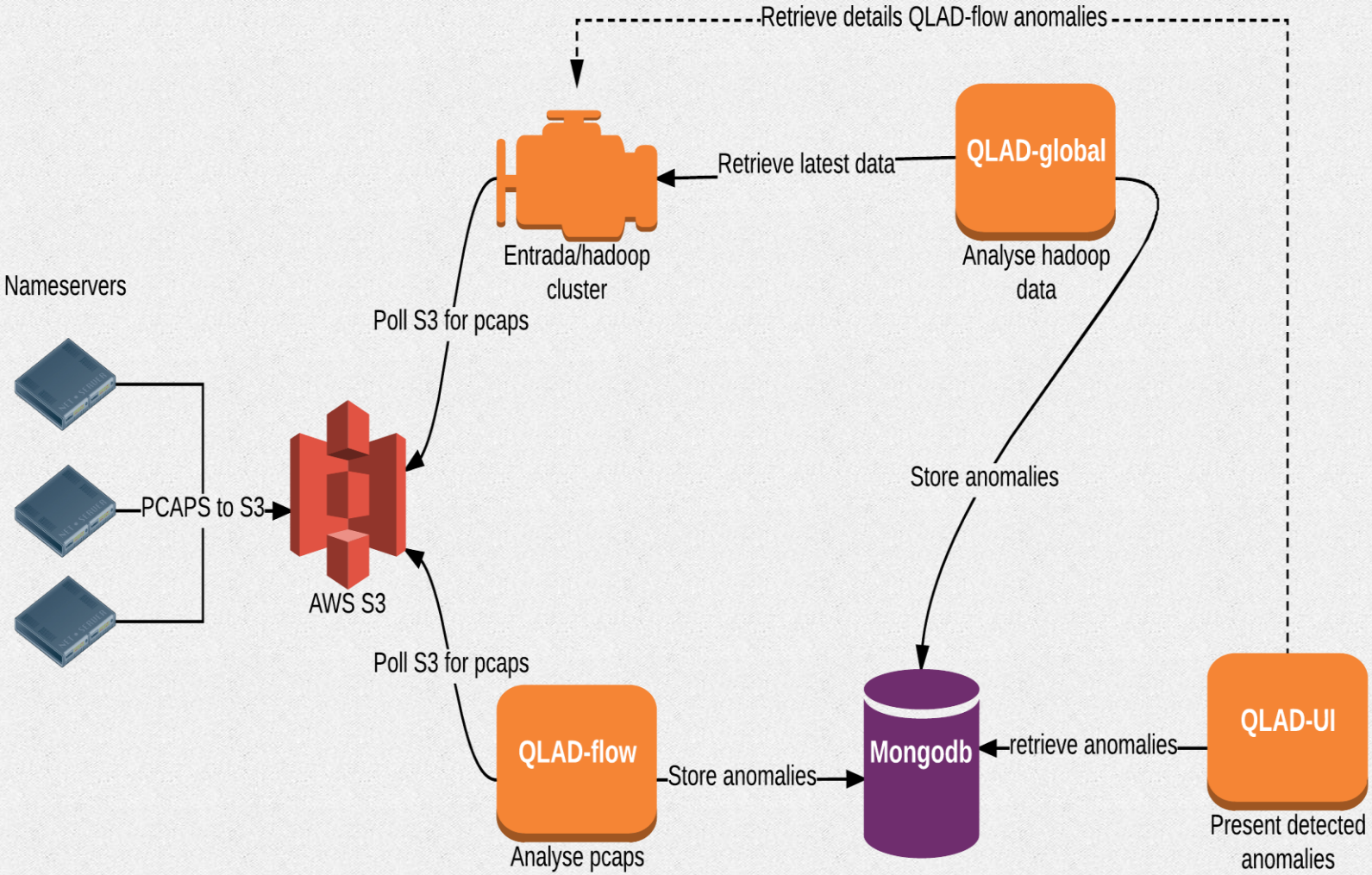
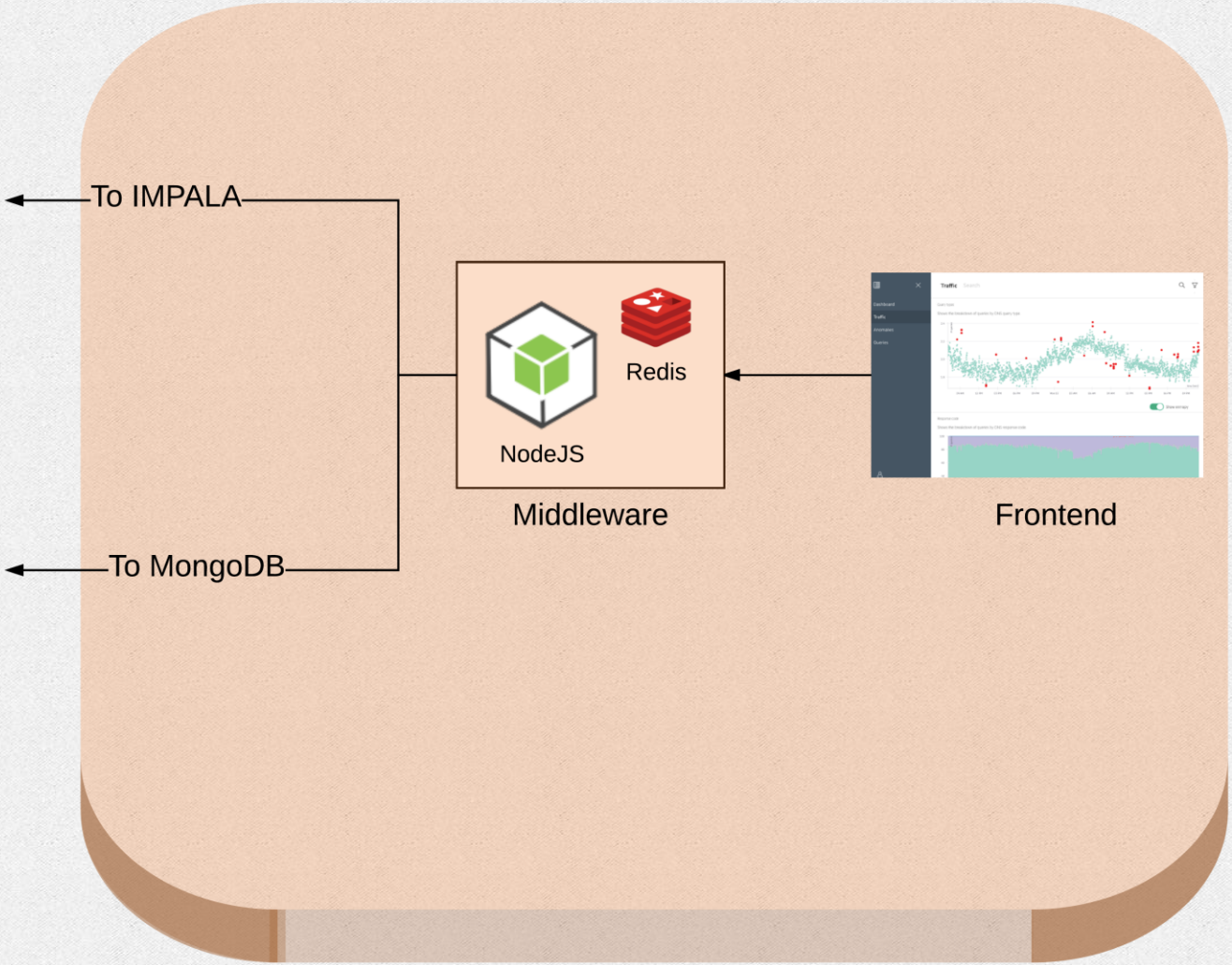
Implementation QLAD-UI: architecture



Implementation QLAD-UI: architecture



Implementation QLAD-UI: flow



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Demo

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Questions?