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Cloud & Virtualization

Monitoring and Troubleshooting at Scale with Advanced Analytics

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2021 Fall Technical Forum
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OVERVIEW

Troubleshooting Challenges

Cloud Native Solutions

“Time Travel” Debugging

Advanced Analytics

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Challenges

Limited Storage

- Log rotation
  - Limited data samples (logs, debug info) stored
  - History of events unavailable
- Logging levels turned down

Result: Issue needs to be reproduced with additional debug info

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Challenges

Availability of Expertise

- Analysis requires domain experts

- Result: Delayed problem resolution due to expertise constraints from increased scale and troubleshooting workload

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Challenges

Security

- Login lists
  - IP addresses, usernames & passwords or other auth info
    - Passwords shared for debugging
  - Jump hosts

- Result: Compromised accounts and hosts jeopardize critical infrastructure

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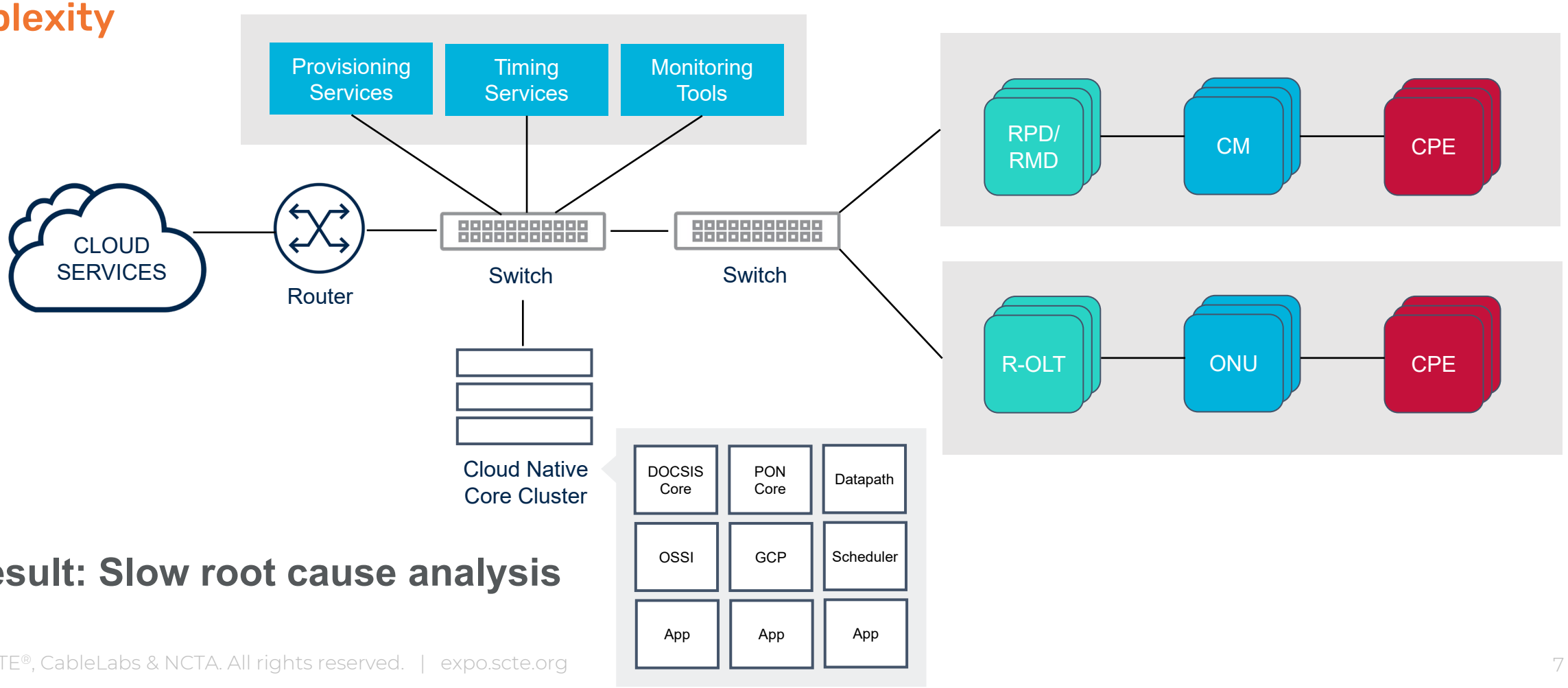
Challenges

Complexity



- **Result: Slow root cause analysis**

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Challenges

Legacy Tools

- OSSI data models
  - Limited information reported
    - Granular monitoring data not defined
  - CLI and SNMP performance
    - Does not scale to large amounts of data
    - Low time resolution

- Result: Stale data and lack of essential troubleshooting information

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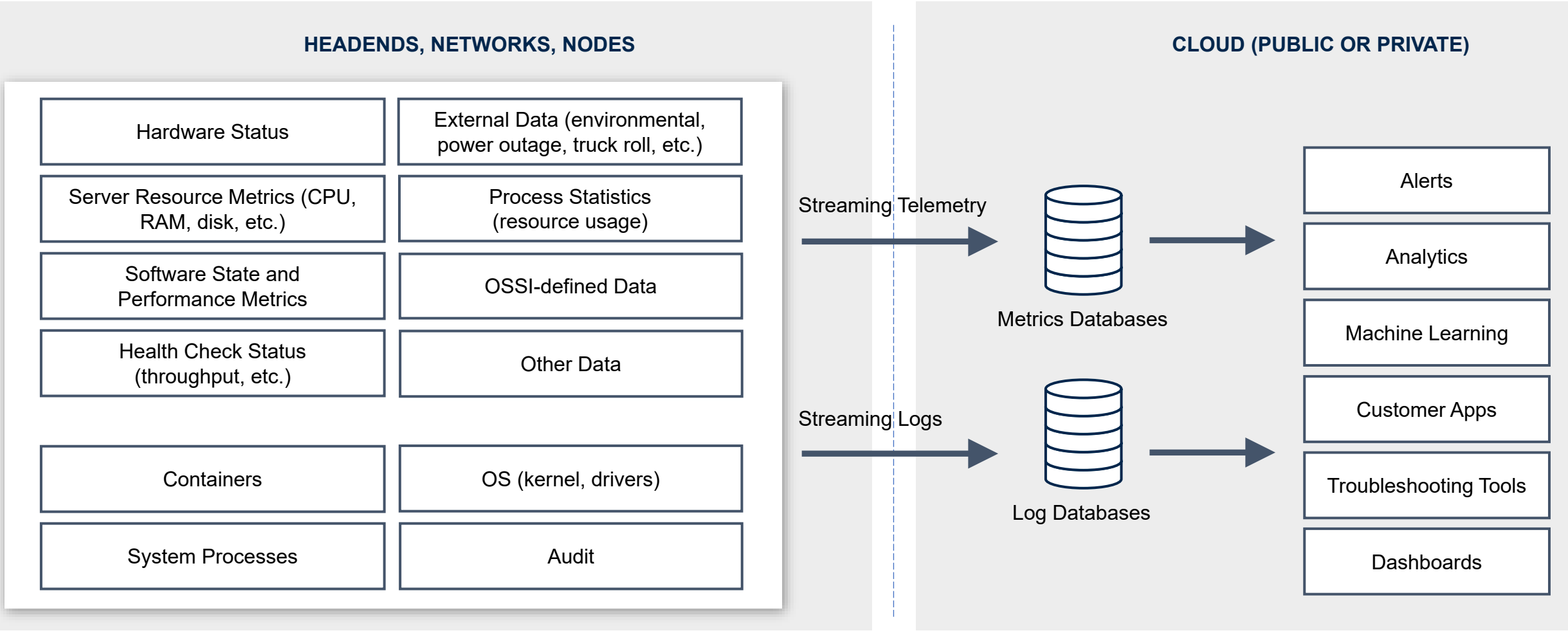
Streaming Logs and Telemetry



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Streaming Logs and Telemetry

Scalability

- Elastic cloud storage
  - Store vast amounts of data
    - No log rotation
    - Richer logs and metrics
- Centrally accessible ➔ Scalable operations
    - No need to maintain access to large number of deployments

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Streaming Logs and Telemetry

Advanced Tools

- Automated data analysis
  - Failure detection
  - SLA violations
  - Alerts
- Data visualization
  - Dashboards ➔ A picture is worth a thousand words
- Explorative analysis
  - Searchable databases
  - Filter out or drill down
- Continuous improvements
  - New algorithms, alerts, dashboards, etc. easily deployable

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Streaming Logs and Telemetry

Security

- Centrally accessible
  - No need to login to systems for accessing debug data
  - Easy to manage access to centrally-located data and troubleshooting tools
- Streamed **out**
  - No incoming connections to deployments

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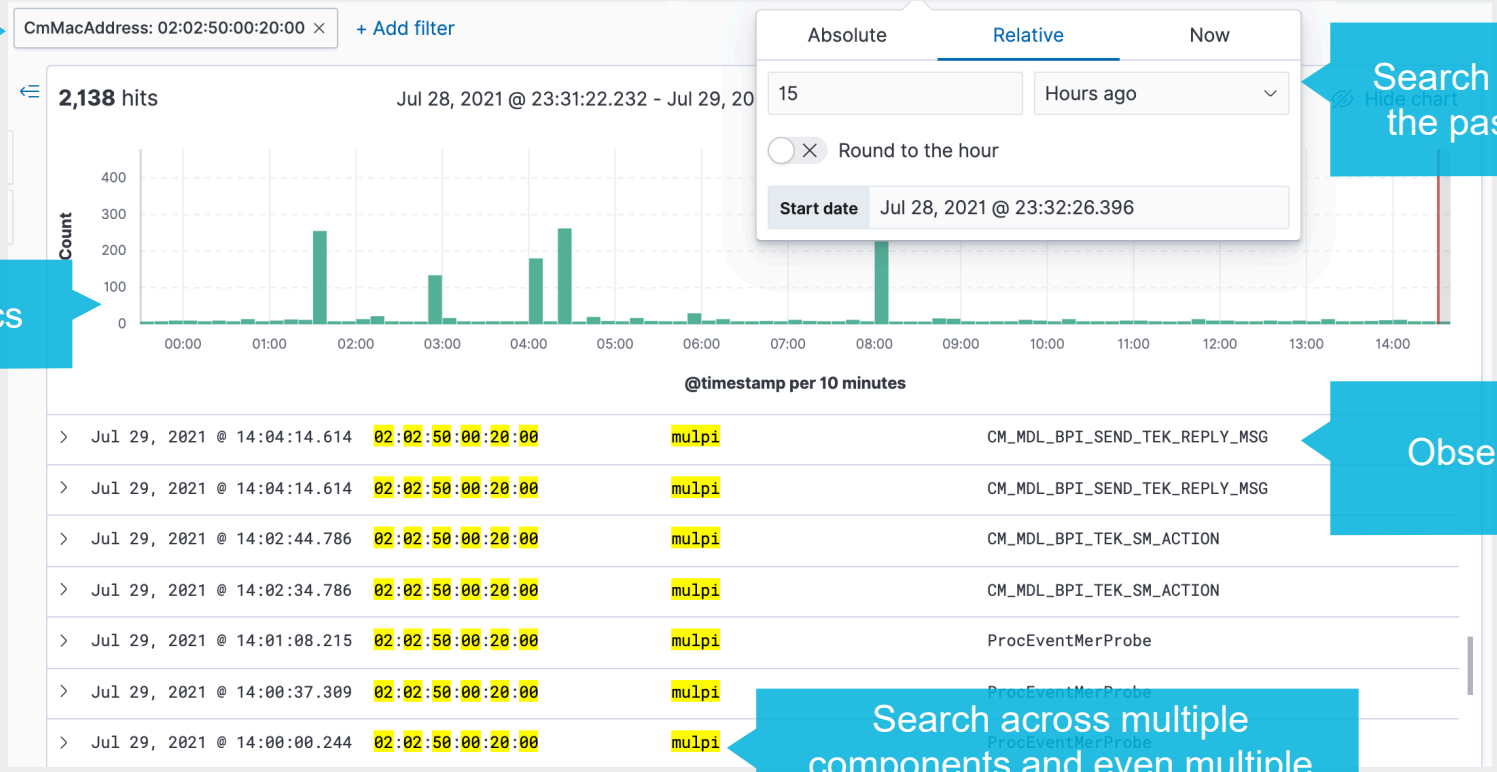
Logs and Events

Filter on objects of interest

Visualize statistics



Search for events and logs from the past leading up to a failure

Observe timeline of events

Search across multiple components and even multiple deployments

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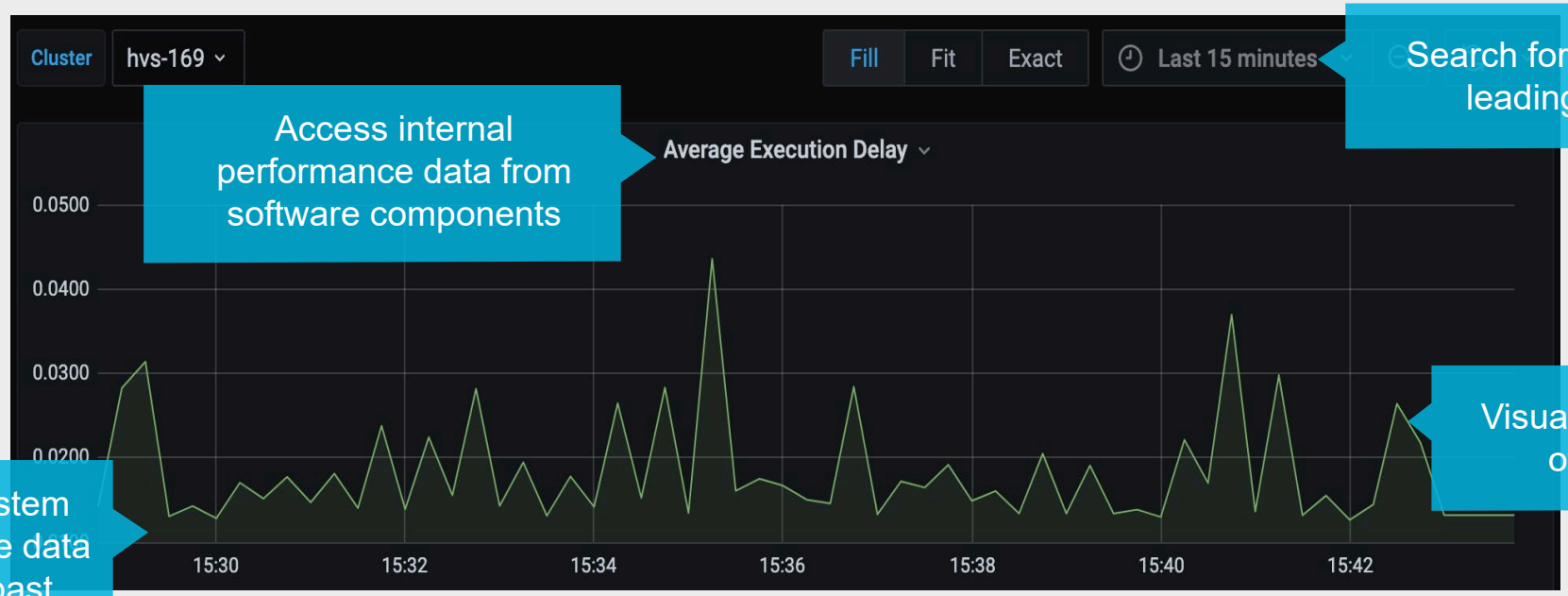
State and Metrics



Access internal performance data from software components

Search for data from the past leading up to a failure

Visualize change in value of critical metrics

Access complete system state and performance data at any point in the past

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DATA-DRIVEN APPS AND ANALYTICS

Billing and Reports

Predictive Analysis

Closed-Loop Optimizations

Machine Learning

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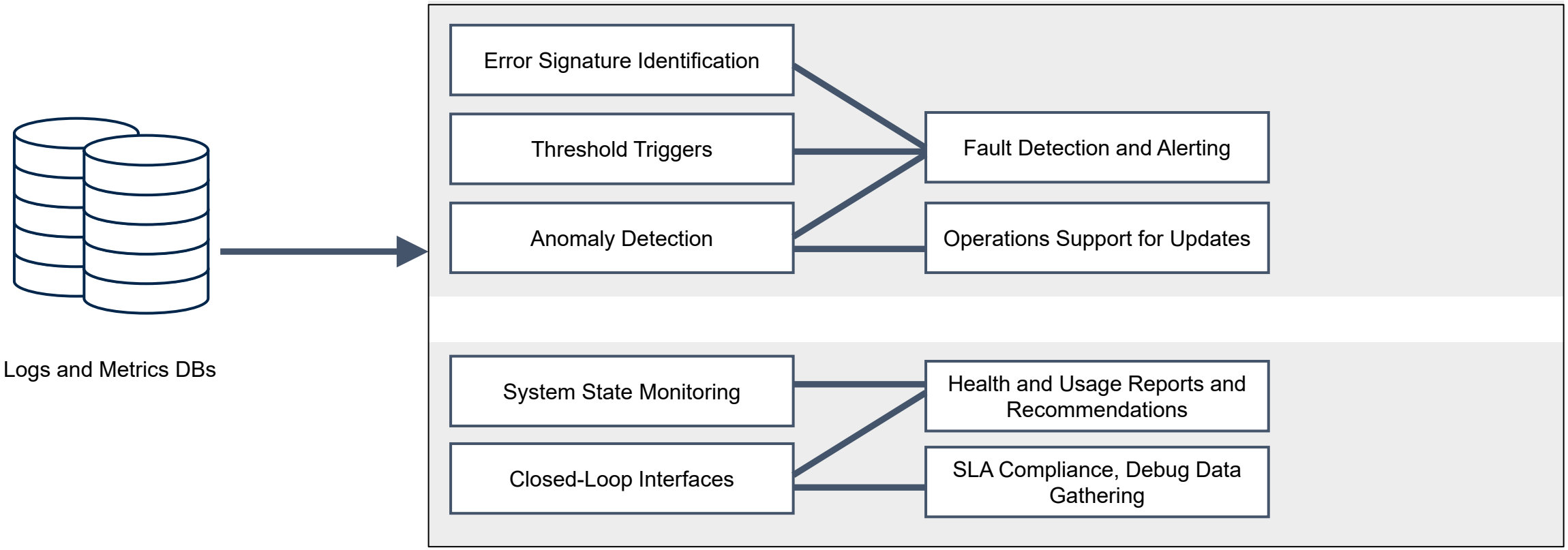
Auto Observability



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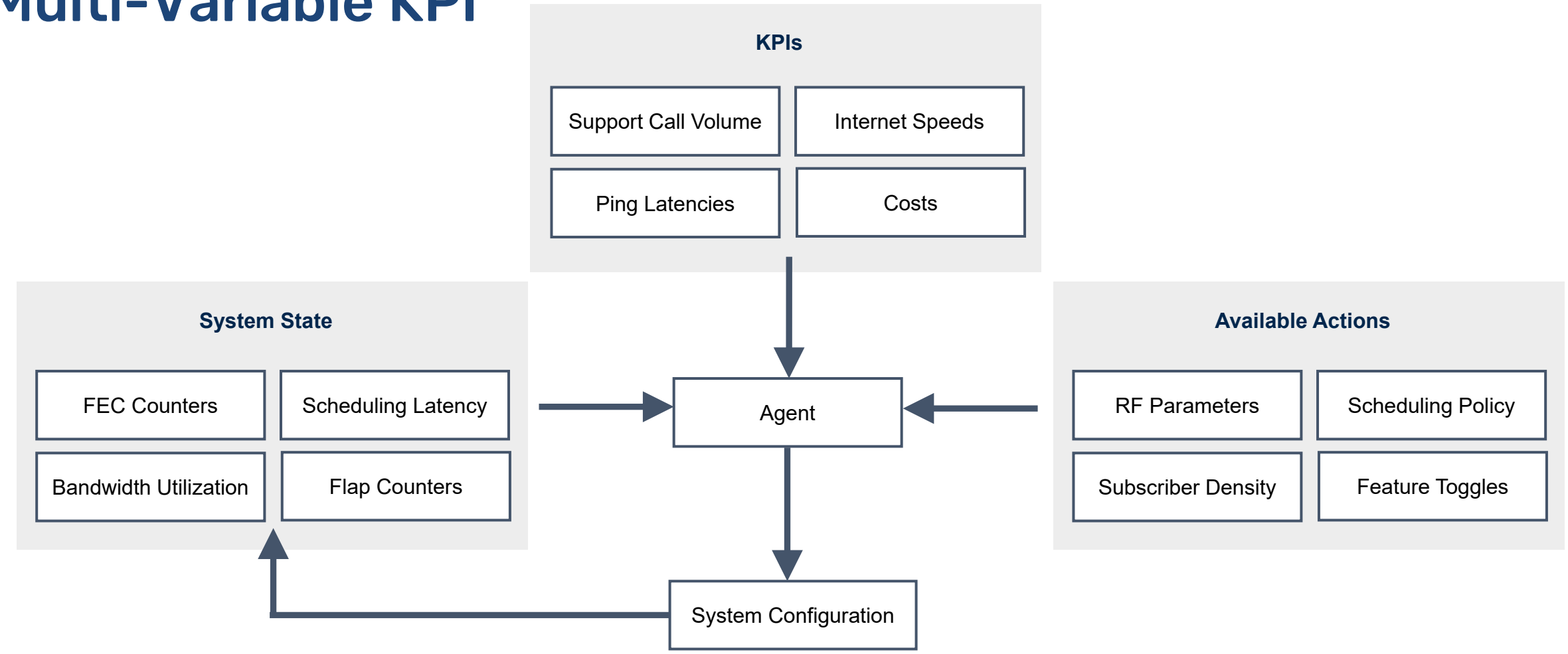
Multi-Variable KPI



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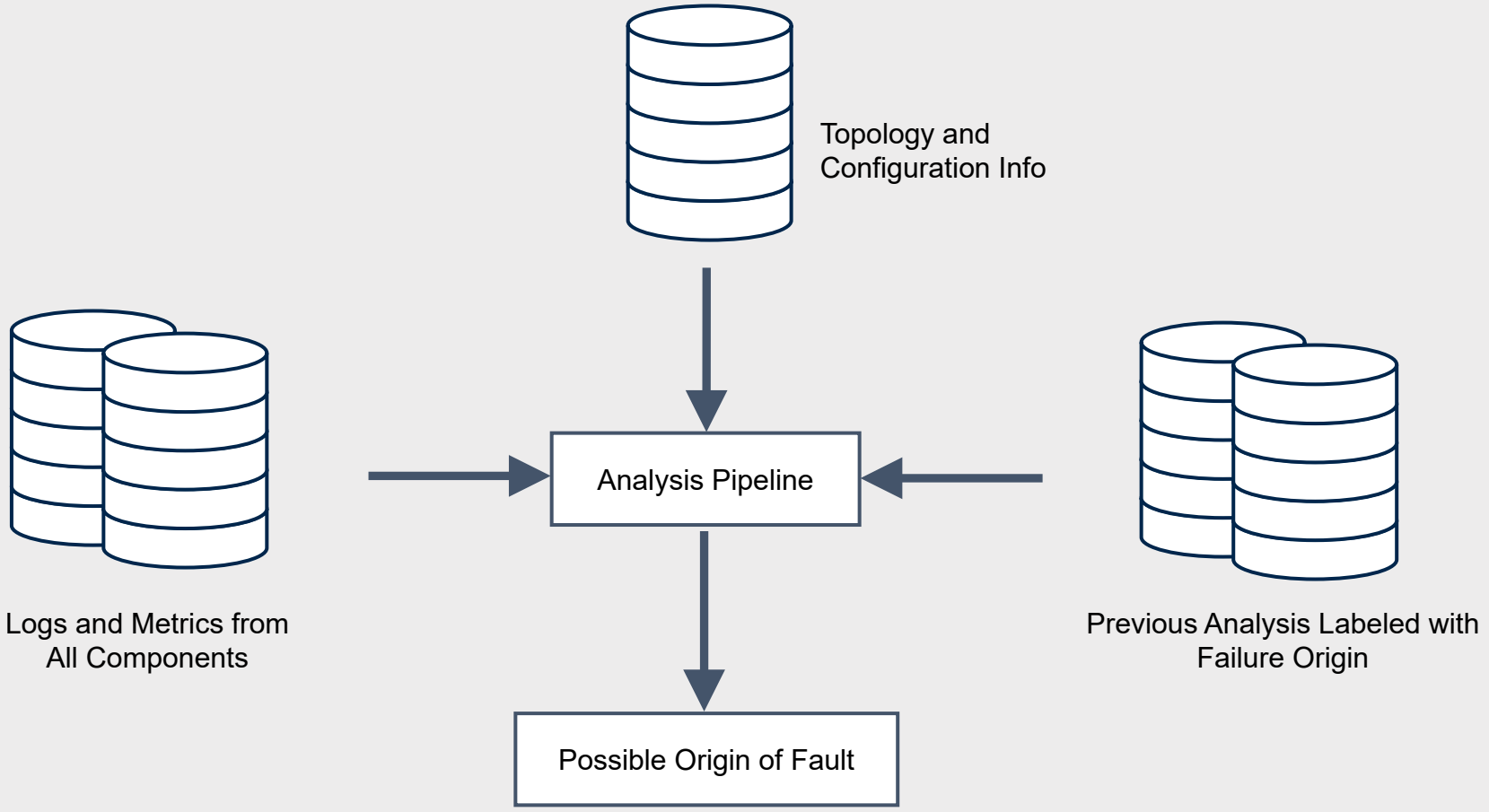
Fault Isolation



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Privacy

- Logs and metrics can reveal privacy-sensitive subscriber data
  - Ethical and legal considerations
- Default: Do not collect such data
- Anonymize identifiers

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Cost

Value

- Challenging to calculate
  - Troubleshooting time vs development time
  - Operational improvements
  - Downtime reduction
  - Support costs reduction
  - Customer satisfaction
  - Revenue generation

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Cost

Compute vs Storage

- Compute costlier than storage
- Store raw data, Process on demand
  - Increased data access latency

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Cost

Public Cloud vs On-Prem Infrastructure

- Private can be cheaper
- Service expense vs Capital expenditure
- Support costs
- Scale and elasticity
- Domain still evolving ➔ Prefer public cloud services

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Cost

Data Retention

- Huge amounts of data ➔ High storage costs
- Warm or cold storage for older data
  - Higher latency to access
- Discard older data
  - Long-term patterns and seasonal traits may be missed
- Feature generation
  - Store data traits instead of all data

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Advanced Analytics Applications are Essential

- Modern solutions generate rich data sets
  - Require new tools and processes to handle scale
- Powerful troubleshooting capabilities
  - ”Time travel” debugging
- Advanced applications
  - Automated data analysis
  - Machine learning applications
- Essential for customer satisfaction and successful operations

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Thank You!

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