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Robust and Resilient Service Assurance System Design with Observability

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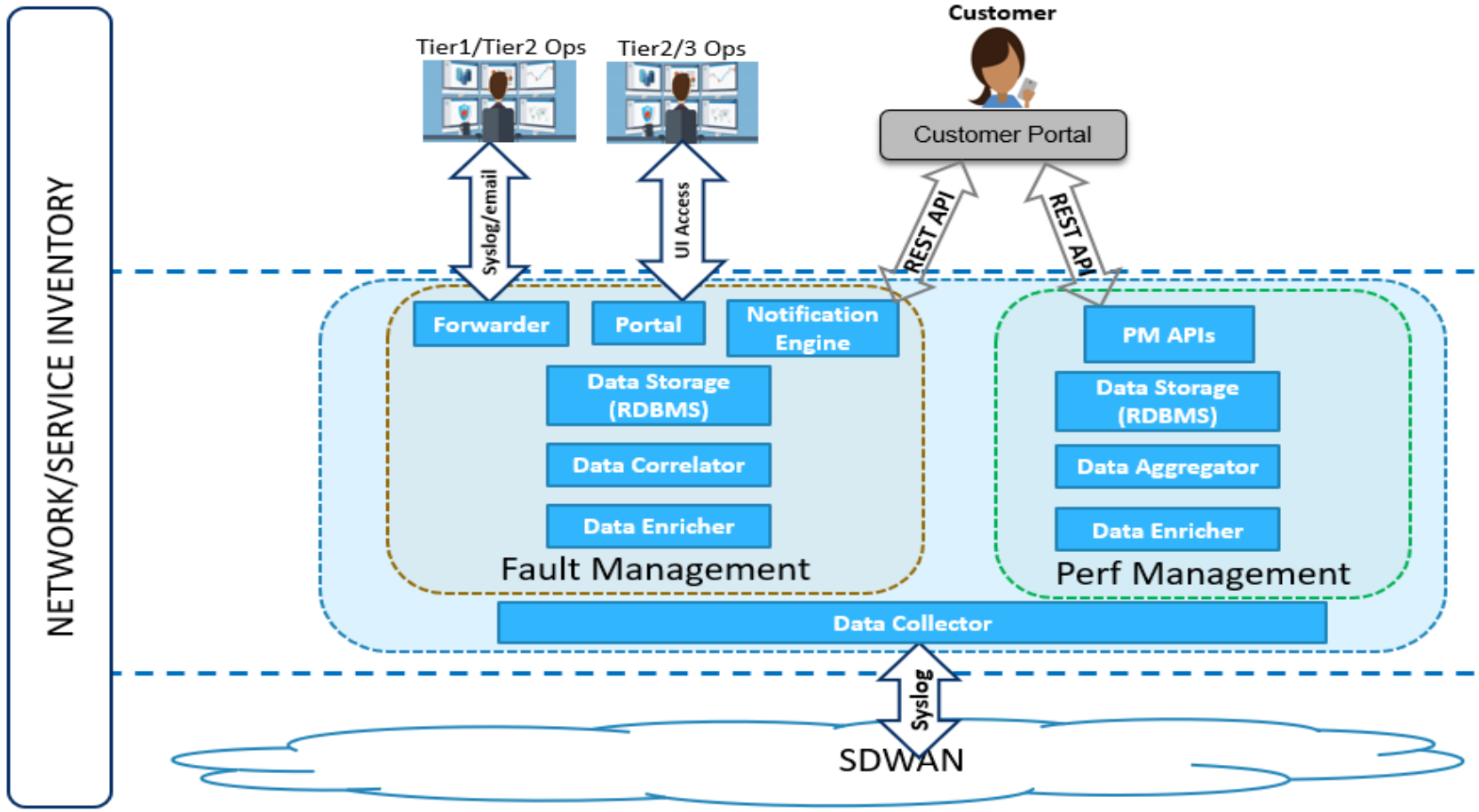
Introduction

The service assurance (SA) system, as a subset of the operational support system (OSS), plays an important role in the internet service provider (ISP) ecosystem. However, the rapidly evolving internet service provider (ISP) technologies, enterprise services offerings, and customer expectations bring great challenges to the modern service assurance system design.

This paper discusses several general design principles and best practices that are essential to build a robust and resilient service assurance system with observability and awareness that could stay ahead of these fast-paced industry transformations.

High-level Service Assurance System Design and Challenges



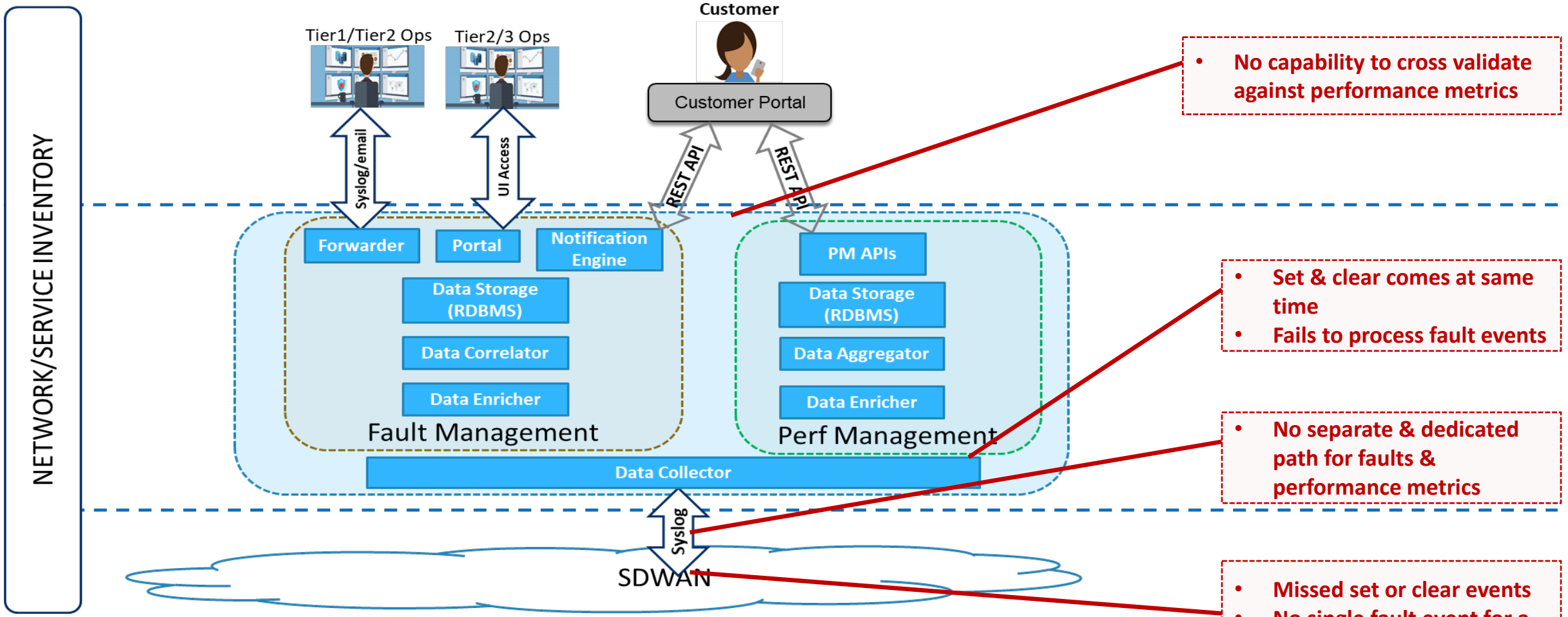
1. Inconsistent API responses leading to report timeouts
2. Out of sync fault status
3. No fully integrated dashboards
4. No message bus

1. Traditional RDBMS limits storage & process of big data
2. No correlation between fault & performance metrics
3. No ML Applications
4. No raw syslog browser
5. No message bus
6. No mediation layer
7. Few integration options with no visibility to different layers of network

1. Syslog tcp forwarding backpressure during high volume leading to highly delayed or dropped FM events

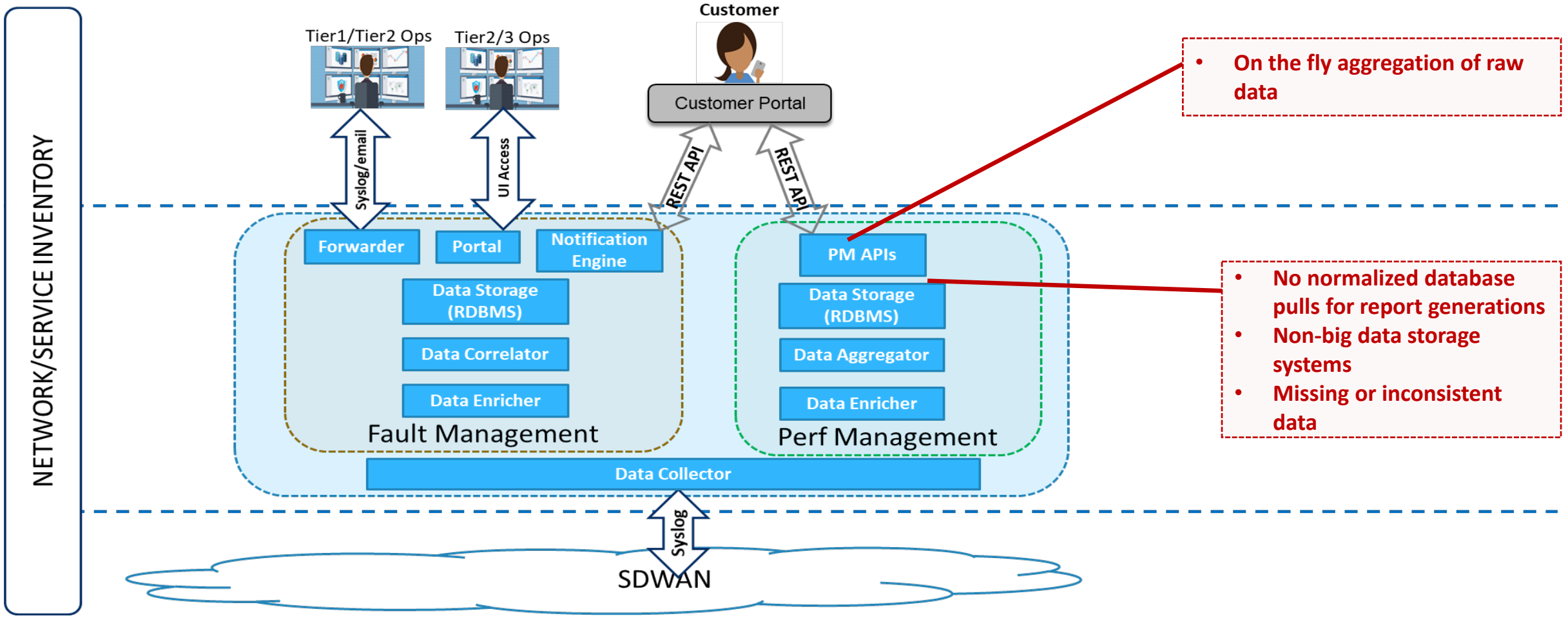
High-level Service Assurance System Design and Challenges

Out of sync device/port status between systems



High-level Service Assurance System Design and Challenges

Very high response time & timeouts for data presentations

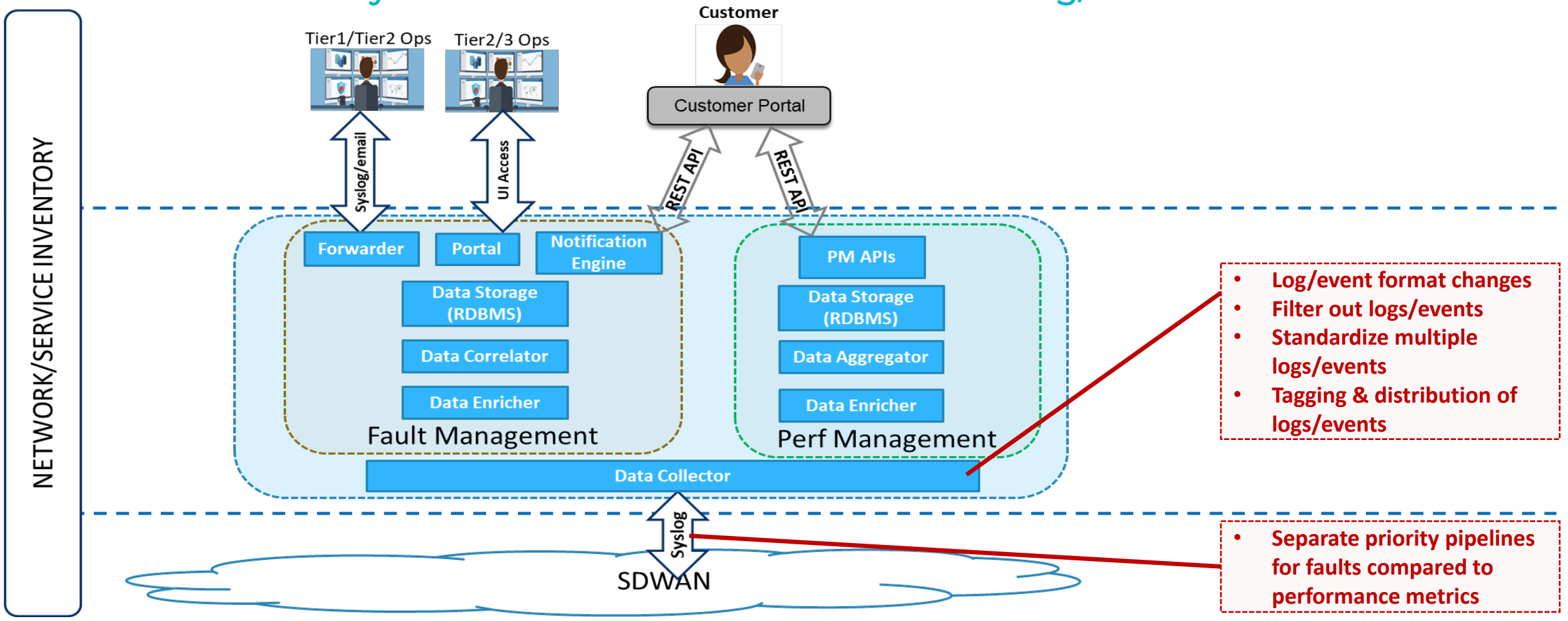


- On the fly aggregation of raw data

- No normalized database pulls for report generations
- Non-big data storage systems
- Missing or inconsistent data

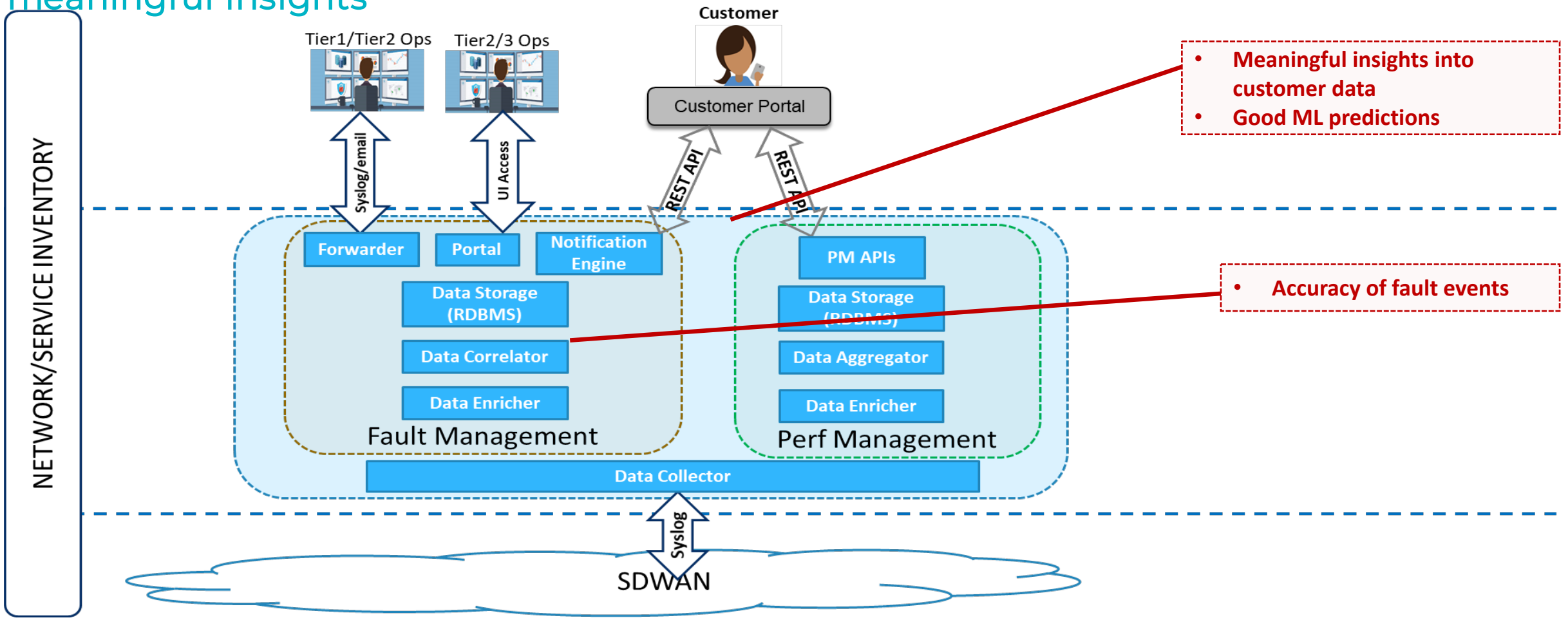
High-level Service Assurance System Design and Challenges

Lack of mediation layer to standardize the multi-vendor log/event formats



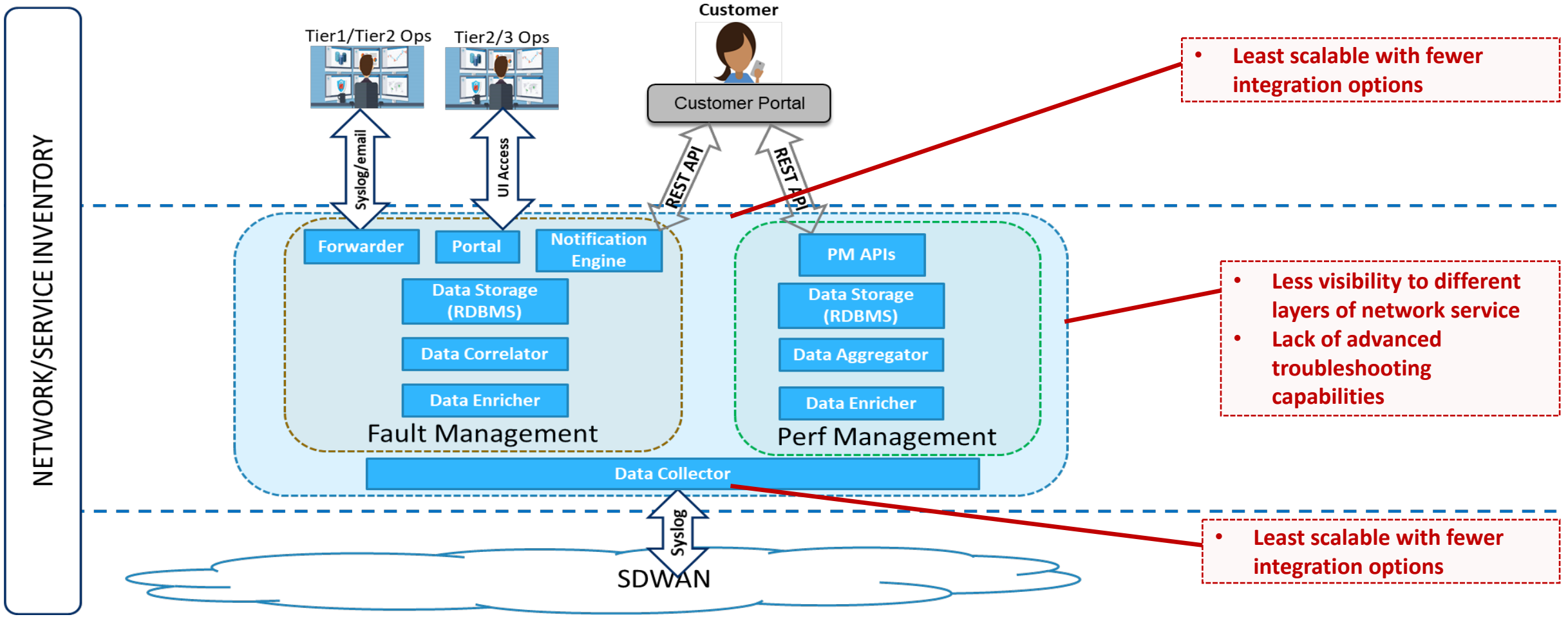
High-level Service Assurance System Design and Challenges

Lack of advanced correlation between faults and performance metrics to provide meaningful insights

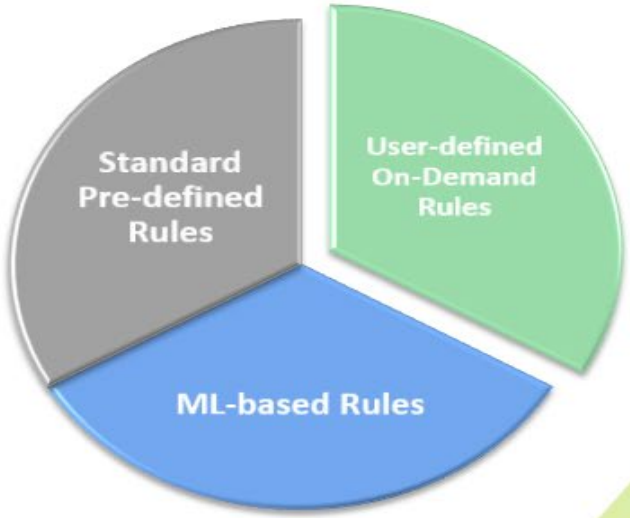


High-level Service Assurance System Design and Challenges

Other Challenges



Advanced Service Assurance System Design with Observability and Awareness



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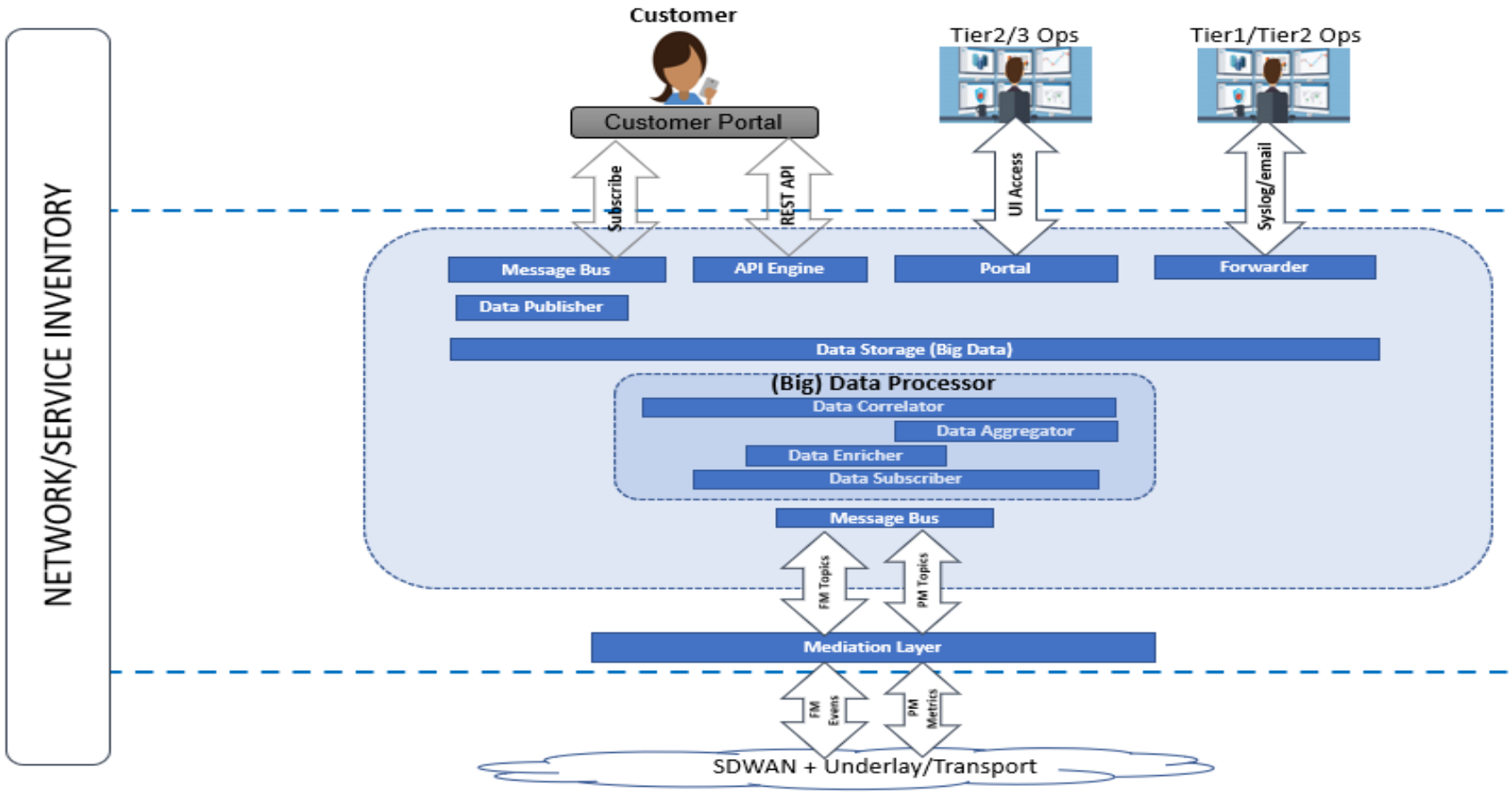
Advanced Service Assurance System Design with Observability and Awareness

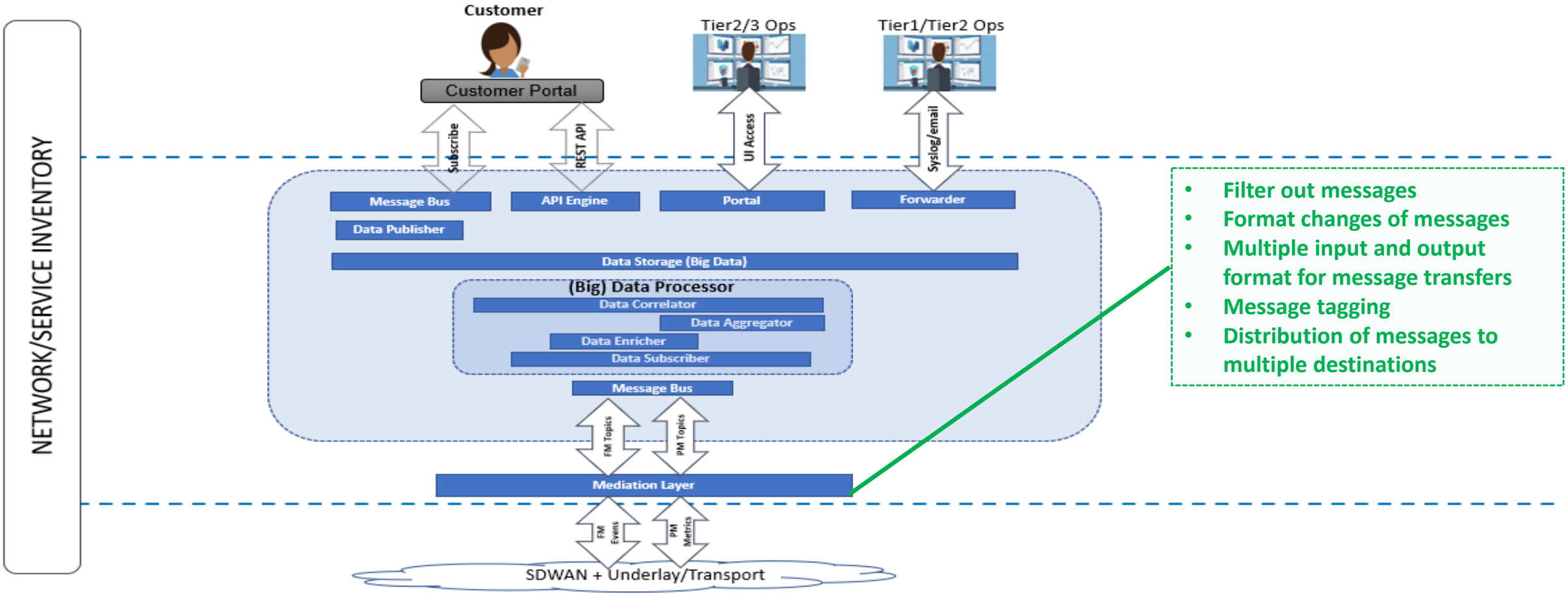


1. Consistent & Fast API responses
2. Accurate & In Sync fault status
3. Fully integrated dashboards with dynamic dashboard options
4. New message bus

1. Big Data Storage
2. Ability to correlate between fault & performance metrics
3. Out of box ML algorithms at different layers with ability to customize
4. Raw syslog browser
5. New message bus
6. Mediation layer
7. More integration options
8. Visibility to different layers of network

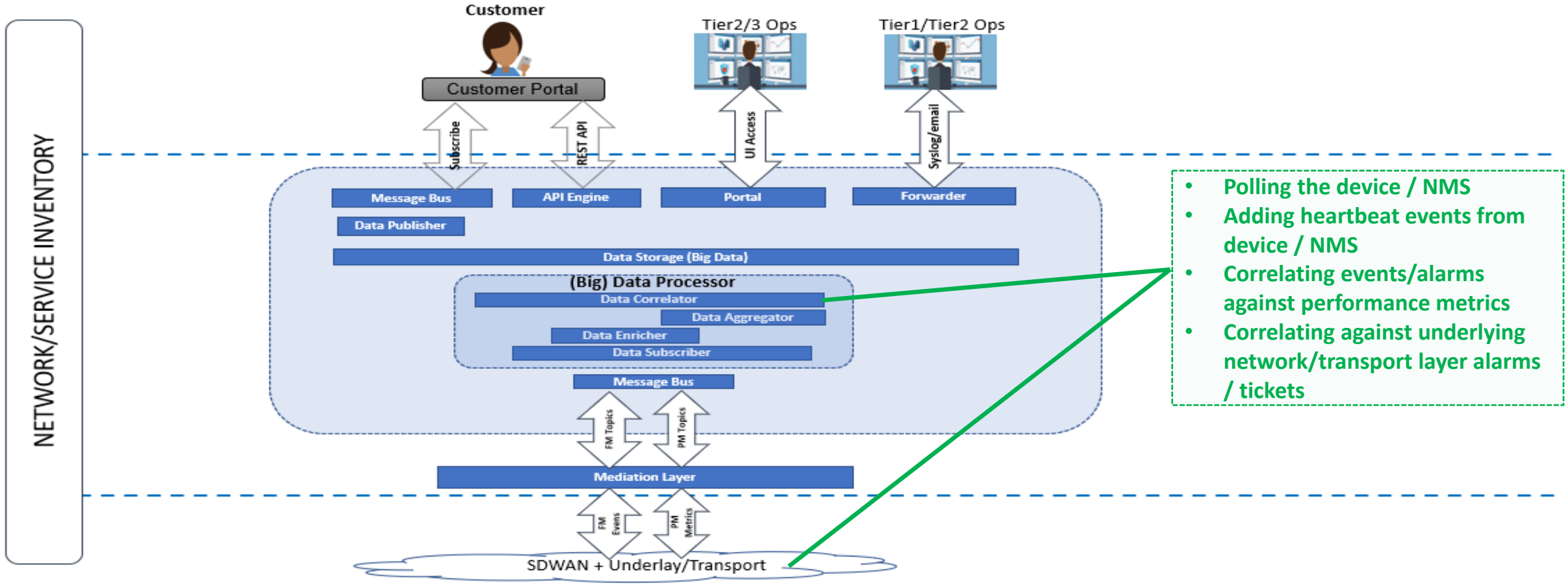
1. Separate path for fault & performance metrics which removes any latency or drops of FM events when PM metrics are high

New mediation Layer

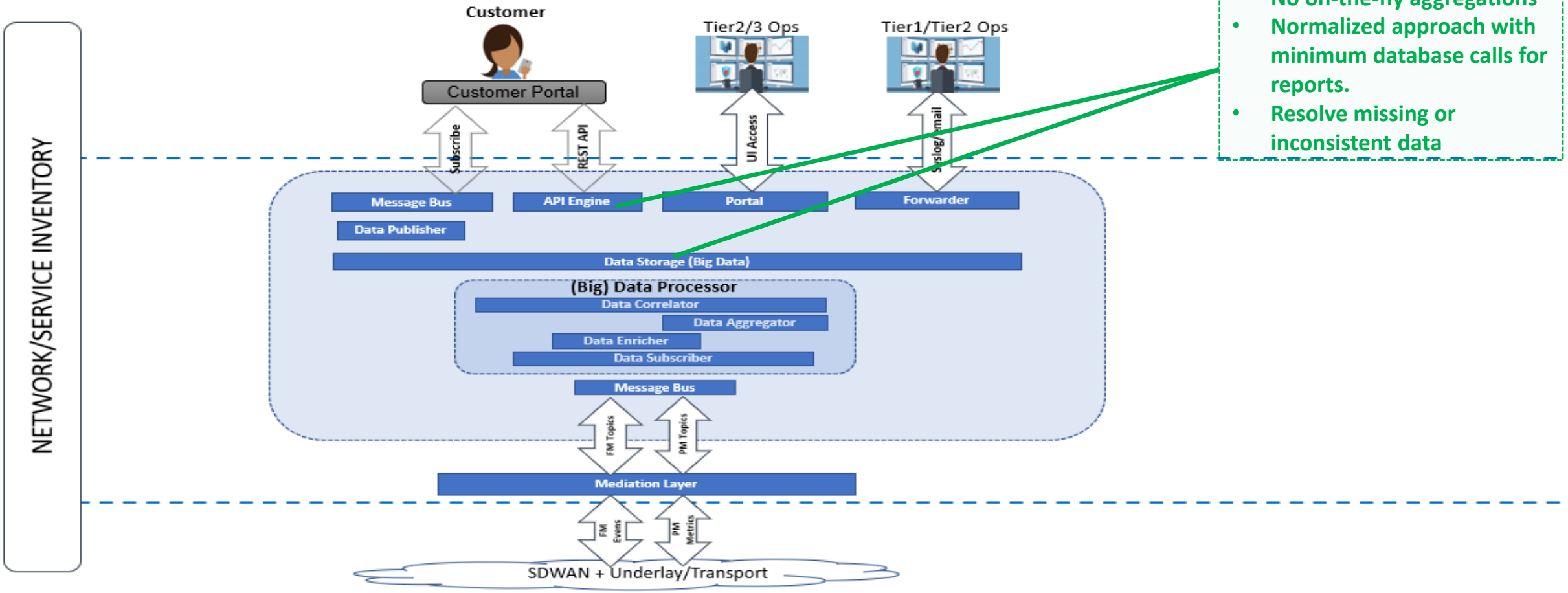


- Filter out messages
- Format changes of messages
- Multiple input and output format for message transfers
- Message tagging
- Distribution of messages to multiple destinations

Additional sources for alarm validations



New Data Delivery Methodology for Faster & Consistent API Responses

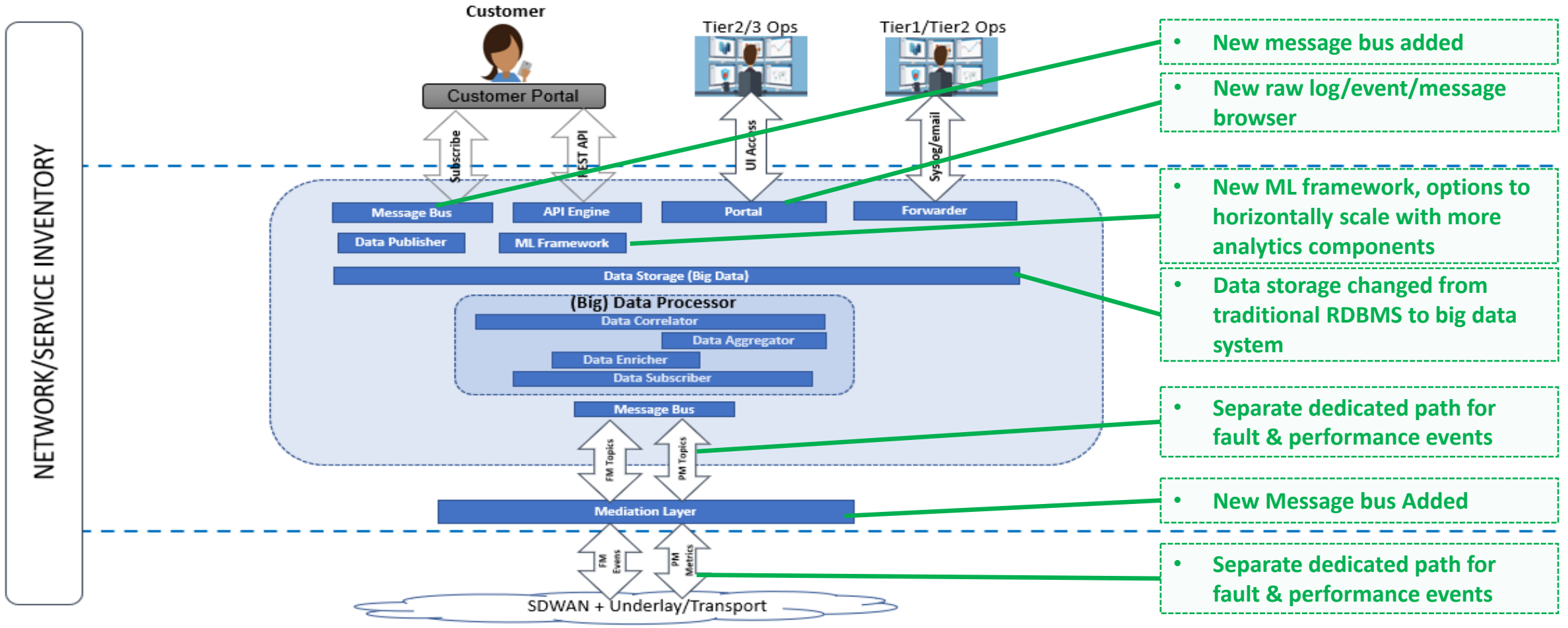


- No on-the-fly aggregations
- Normalized approach with minimum database calls for reports.
- Resolve missing or inconsistent data

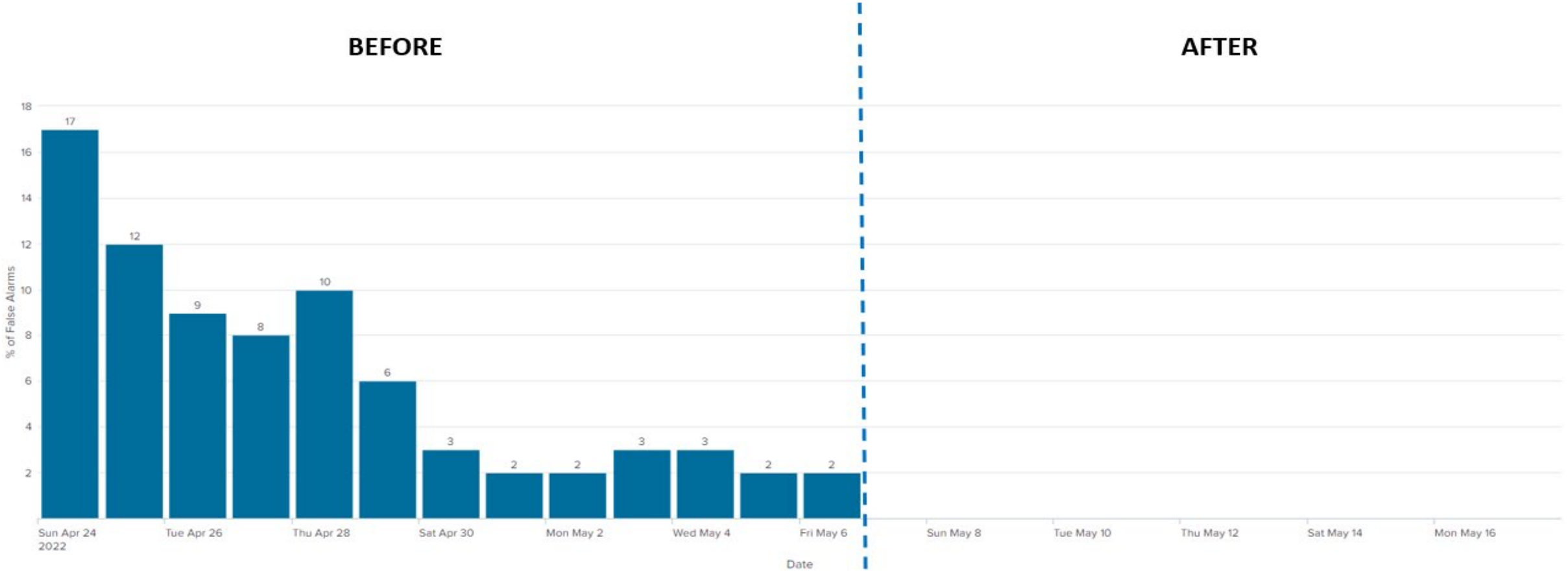
Hybrid Notification Approach

Category	Status	Realtime / Soaked	Source	Notification Severity	Notification Message
Device / Port / Path Health Notifications	Down	Realtime	Network Set Alarms	Major	Instead of reporting as down, should say something like “there seems to be an issue with the device / port / path. Hold on for further updates”
Underlying Transport Ticket Notifications for the Device / Port / Path Health notifications	Down	Soaked (‘X’ mins)	PM Metrics / Transport Alarms / Tickets	Critical ↑	Change severity to Critical and say the device / port / path as down.
Device / Port / Path Health Notifications	Up	Realtime	Network Clear Alarms	Major ↓	Change severity from Critical to Major, should say something like “issue seems to be resolved. Hold on for further updates”
Underlying Transport Ticket Resolution Notification for the Device / Port / Path Health notifications	Up	Soaked (‘X’ mins)	Transport Alarms / Tickets	Cleared ↓	Clear the status of device / port / path

Other Enhancements

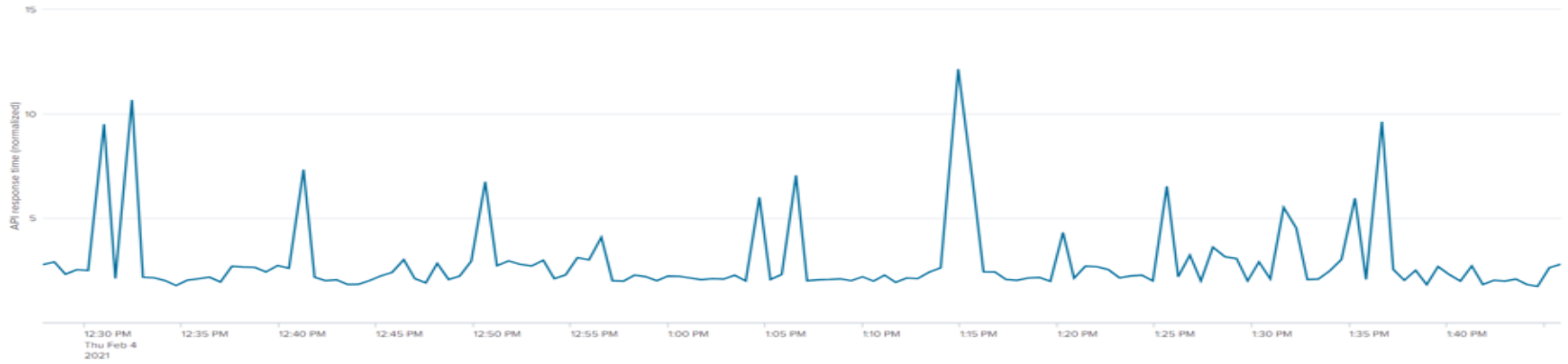


Out-of-sync device/port status between systems improvement

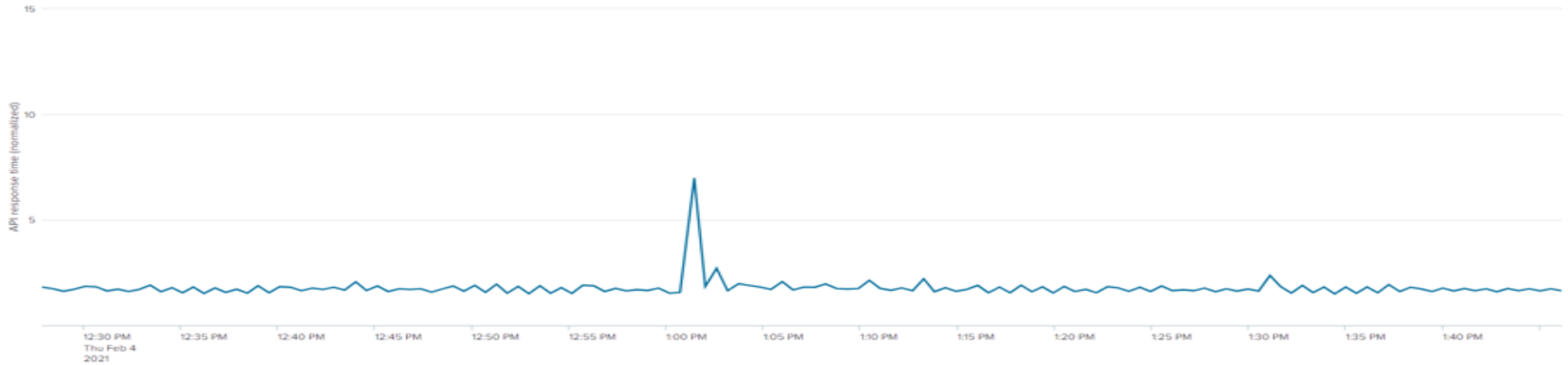


Very high response time & timeouts for data presentations improvement (Customer

Response Times (BEFORE):



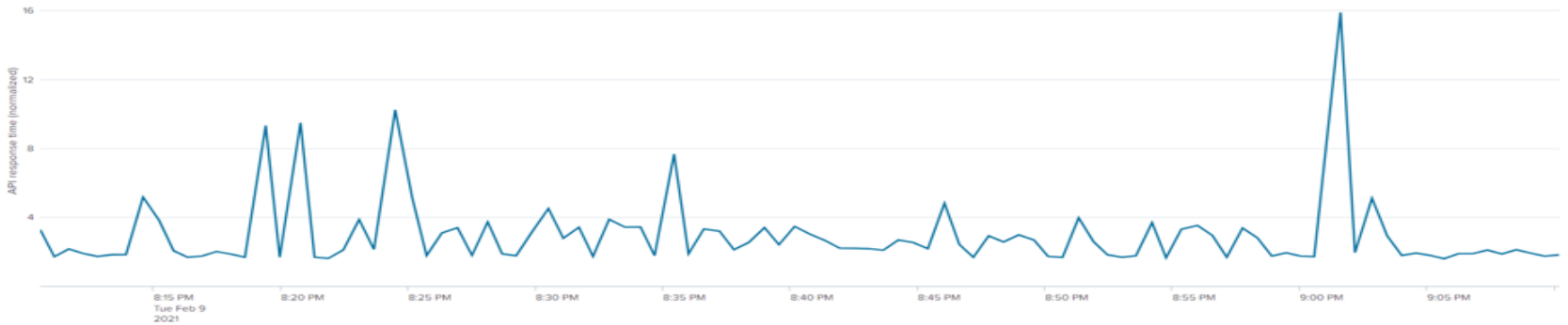
Response Times (AFTER):



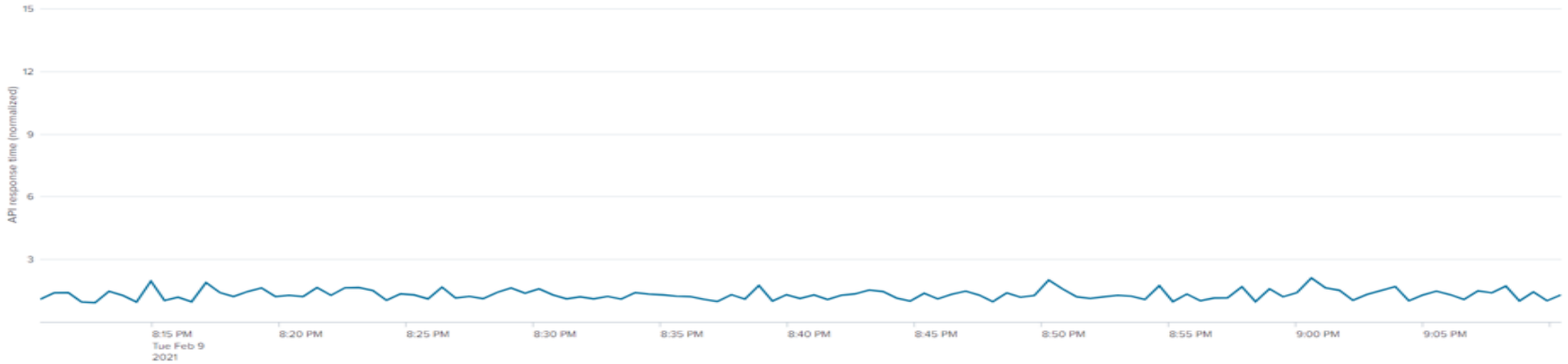
- **Key Highlights:**
  - API response times are consistent and lower
  - Supports more aggregation types
  - More flexible filtering with ease-of-use APIs

Very high response time & timeouts for data presentations improvement (Site Level)

Response Times (BEFORE):



Response Times (AFTER):



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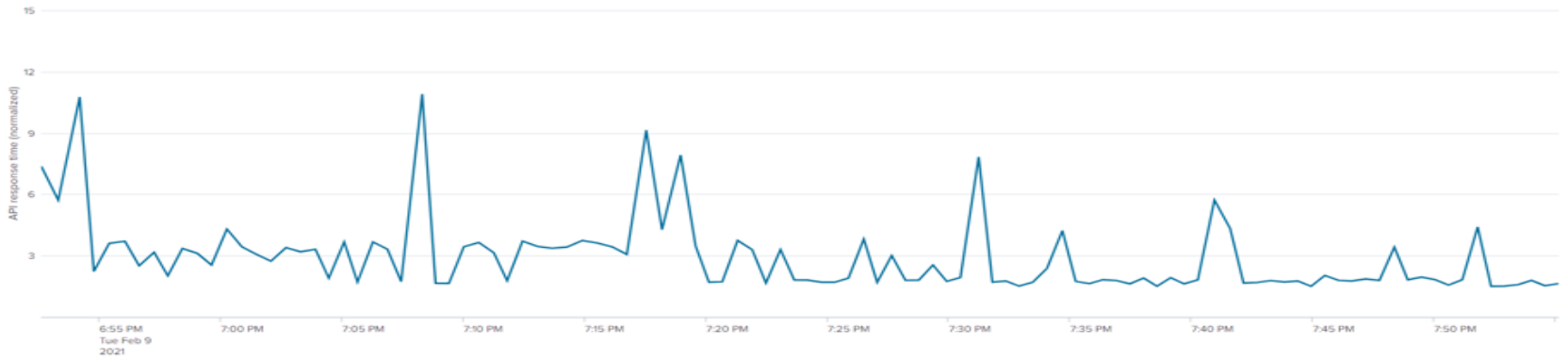
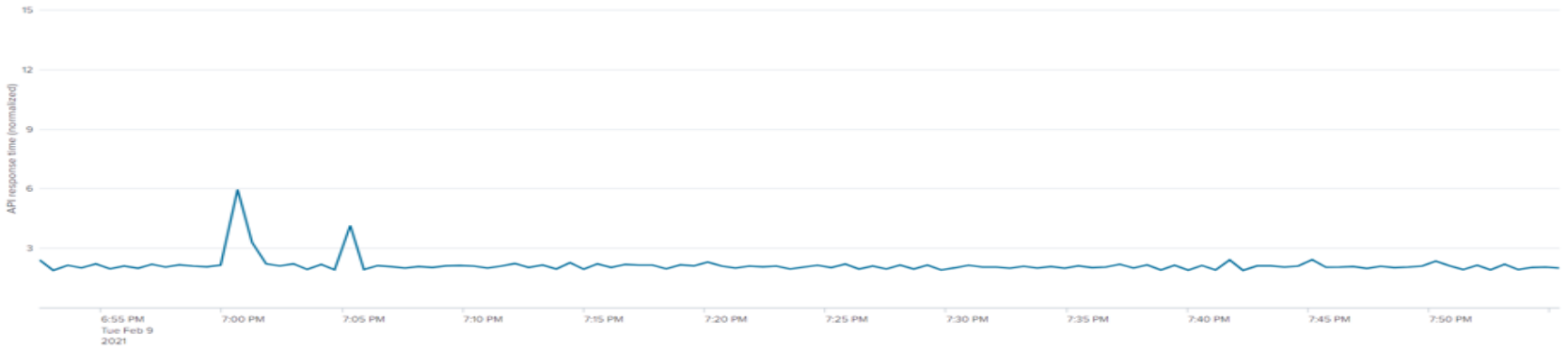
Very high response time & timeouts for data presentations improvement (Multi-Site

Response Times (BEFORE):



Response Times (AFTER):



- **Key Highlights:**
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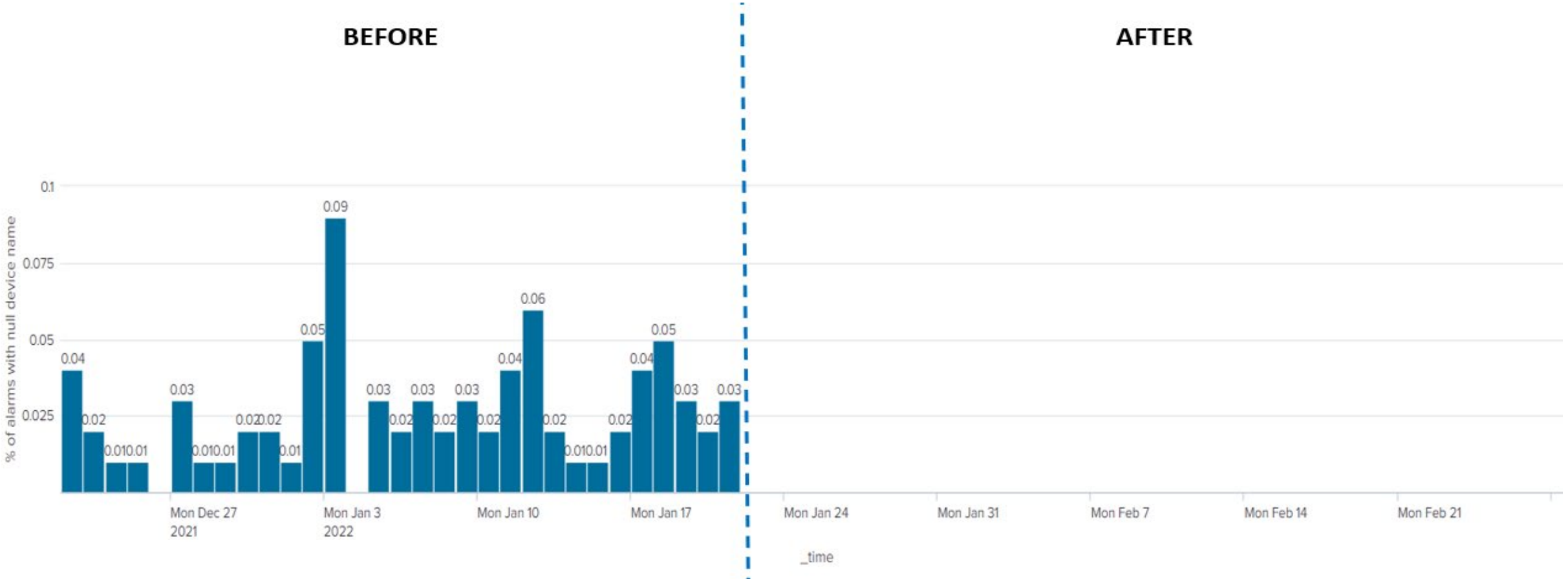
Mediation layer improvements



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Conclusion & Future Work

Summary

Conclusion

This re-architecture has shown a lot of improvements. For example:

- Minimum out of sync issues (reduced from around 15% errors to 0% based on 30-day data between April and May 2022)
- Faster API response times and no time outs for API responses (80% reduction)
- Better integration capabilities

Future Work

This new robust and resilient service assurance architecture with observability and awareness has enabled to add more advanced correlations with capability to use ML algorithms to build data models for better prediction, trending, and forecasting.

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Thank You!

Anil Mohan & Xin Huang

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