Predicting Enterprise Application Performance Measures through Time-series Forecasting

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Agenda

Motivation and Approach

Research Artifact

Research Questions

Data Architecture

Project Plan

Motivation

Problem Domains in Application Performance Monitoring (APM)

Performance

Availability

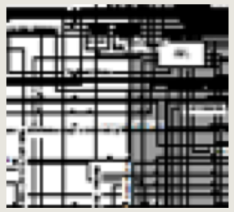
Maintainability

"Companies are sitting on a **treasure trove** – if only they knew how to use it."

A. Samuel, Wall Street Journal, 2015

Evolution of Enterprise Architecture (EA)

Growing complexity and **high business relevance** of **Enterprise Architecture (EA)**



Harness potential of **monitoring data**

Detect root causes, reduce complexity and lead to a **higher agility** in EA management

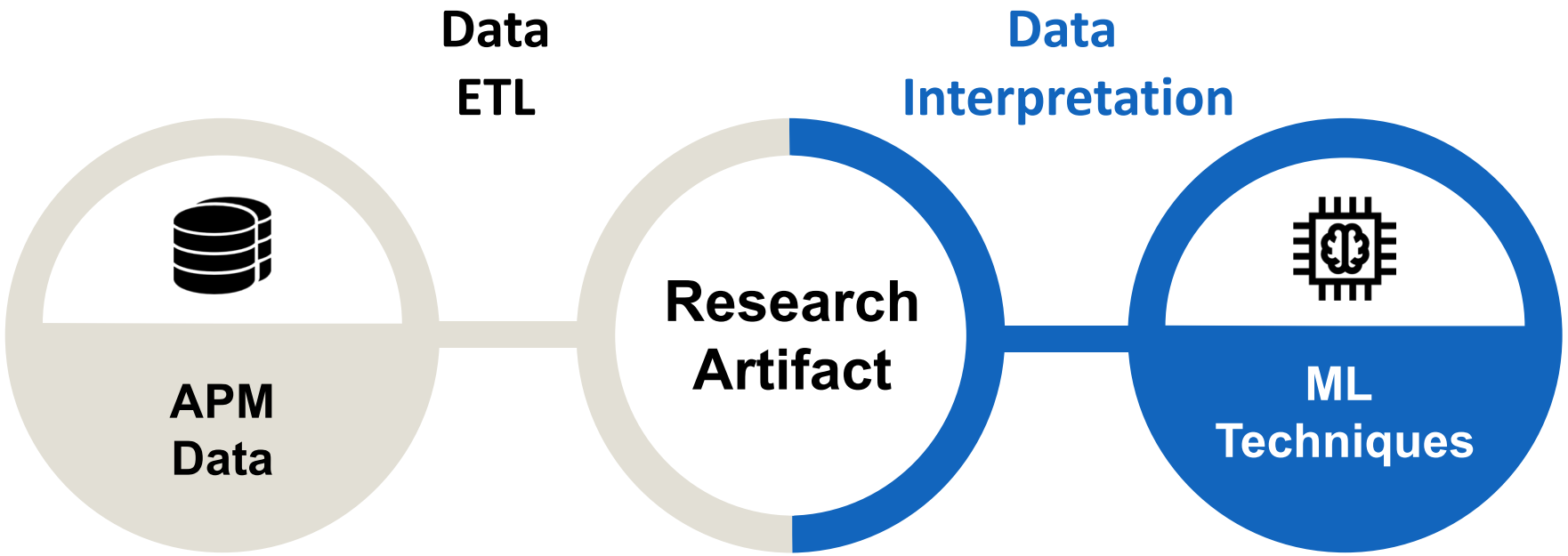
Initial Research Questions

1. What consecutive patterns can be identified by analyzing **performance flaws** in APM data?

2. How can APM data be used to forecast **availability insufficiencies** in advance of occurrence?

3. What **proactive actions** can be derived to avoid the identified patterns and increase performance and availability?

Approach



Gain insights and create value from **Application Performance Monitoring (APM)** data by applying **machine learning techniques.**

Approach

Reviewed work from

EA

APM

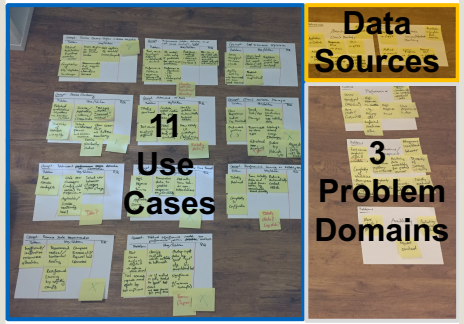
Software Engineering

Performance Analysis

Machine Learning

Literature Review

10+ potential use cases identified



Use Case Conceptualization

Evaluate use cases by

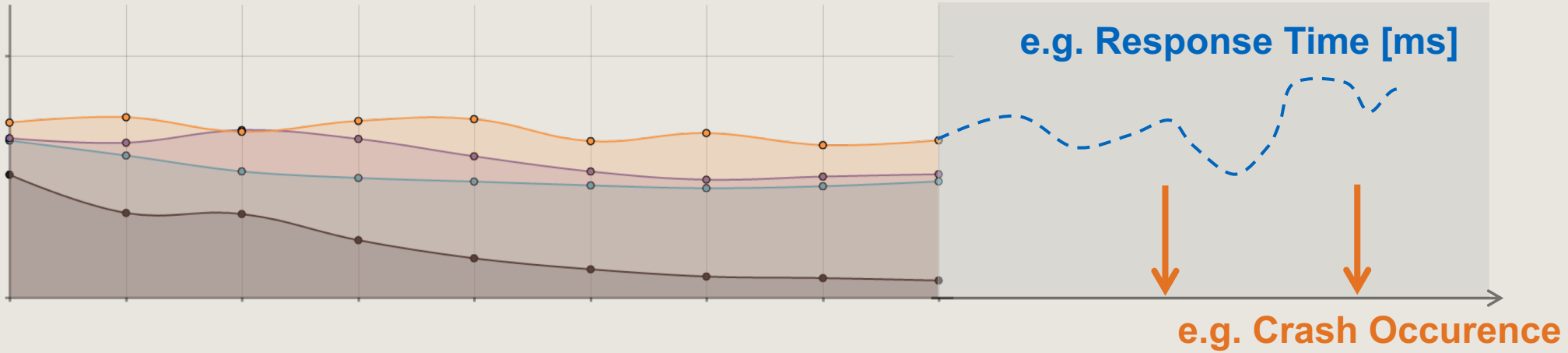
Interviewing Experts

Discussing with Researchers

→ **Define Use Case**

Use Case Evaluation

Time-series Forecasting



From historical sequential APM data create forecasts
for **performance measures** and **incident probabilities**.

1. Forecasting of relevant performance measures
2. Incident prediction
3. **Optional** Automatic ticket severity evaluation driven by ML

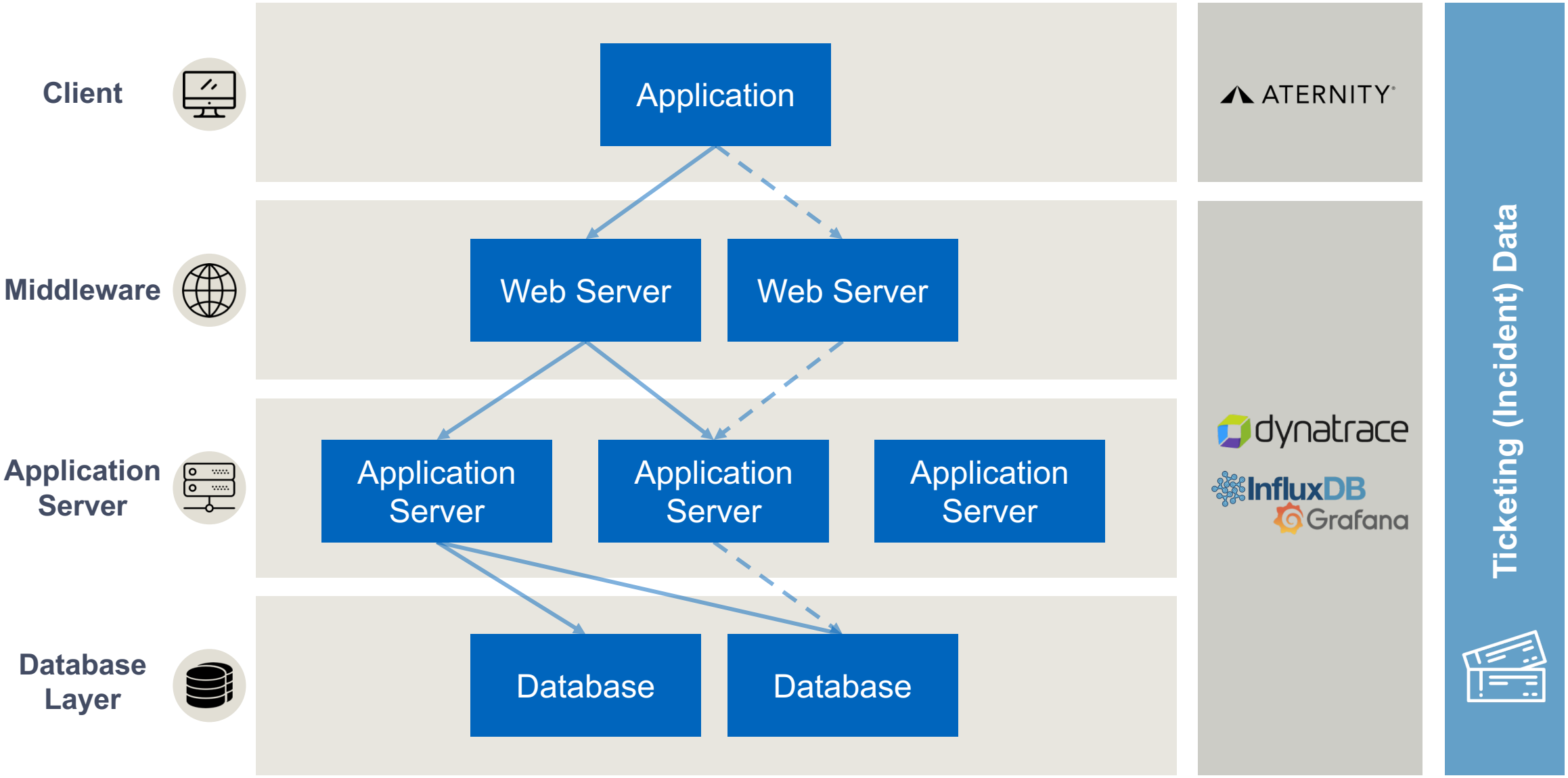
Research Questions

1. How accurately can a time-series forecasting model predict APM measures?

2. How well can a time-series forecasting model predict availability lacks (i.e. application crashes) in enterprise applications/services?

3. To what extend can we evaluate automatic ticket severity classification by analyzing APM data?

Data Architecture – Layers and Data Sources



Data Architecture – Dimensions and Measures

ATERNITY®

Dimensions

User	Device	Application
Activity	Location	Time

Measures

Crash rate	Response Time	Hang Time
Resource Util.	Network I/O	

dynatrace InfluxDB Grafana

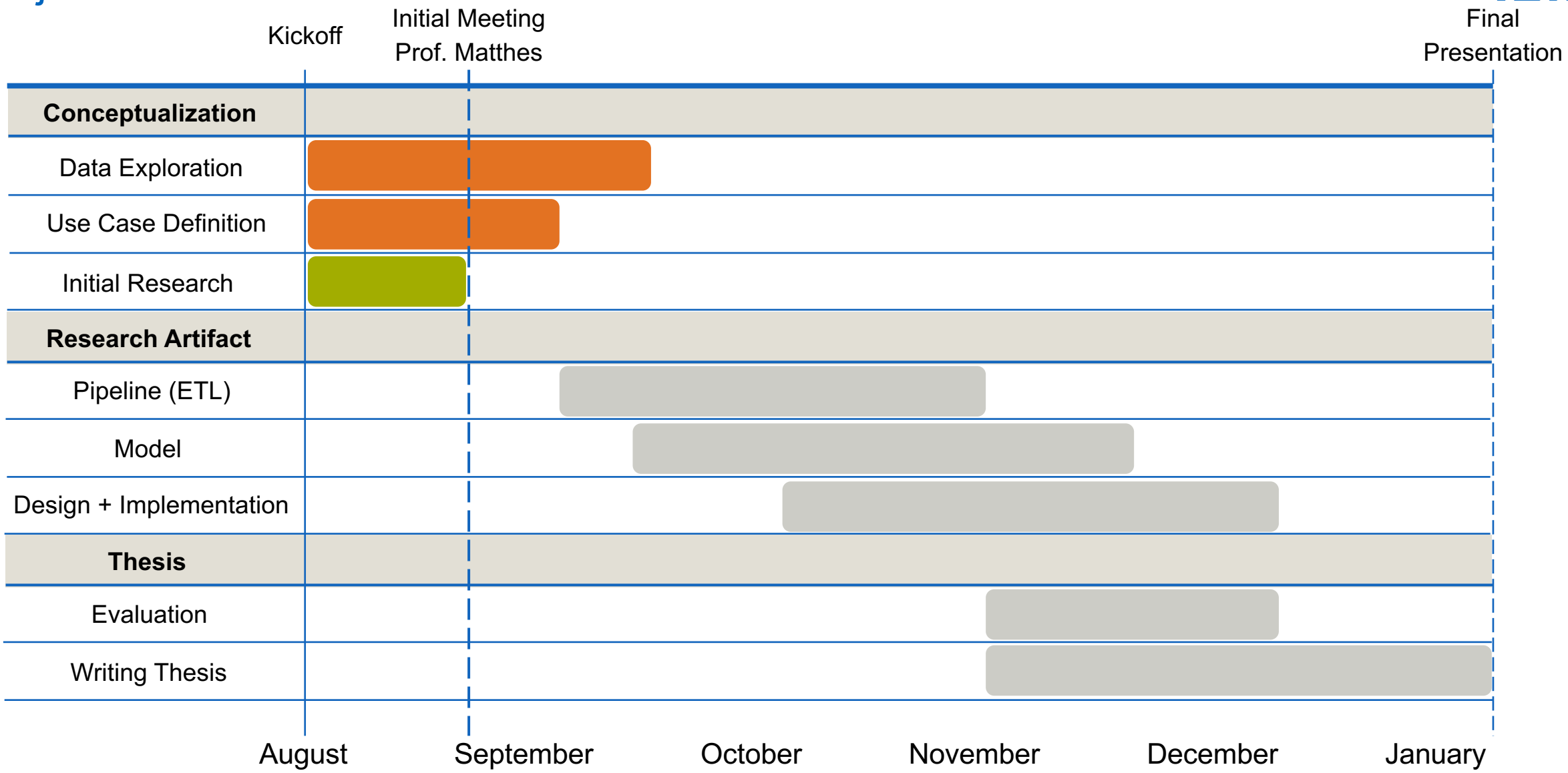
Dimensions

Application	App. Server	Webserver
Database	Event	Time
Method	Endpoint	

Measures

Crash Rate	Response Time	Request Load
Resource Util.	Network I/O	Method Count

Project Plan



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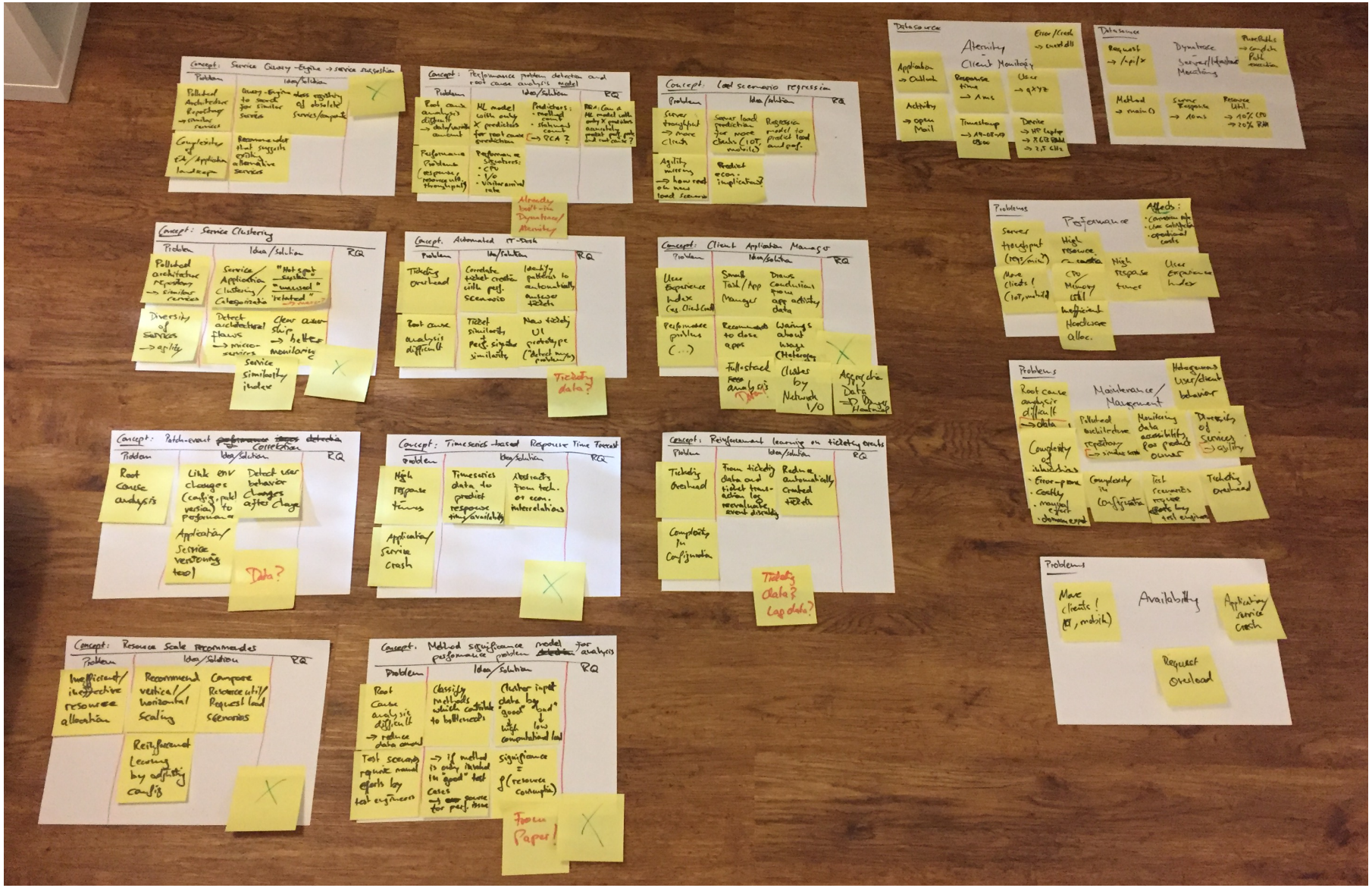
Backup


Concept: Service Clustery
Problem
Idea/Solution
RQ
Concept: Performance problem detection and root cause analysis model
Concept: Load scenario regression
Concept: Automated IT-Desk
Concept: Client Application Manager
Concept: Service Clustering
Concept: Timeseries-based Response Time Forecast
Concept: Reinforcement learning on ticketing events
Concept: Resource Scale Recommender
Concept: Method significance model for performance problem analysis
Problems
Performance
Availability
Maintenance / Management
Data Source
Data Sink
Ticketing data?
Data?
From Paper!