Analyzing Incoming Workload in Cloud Business Services

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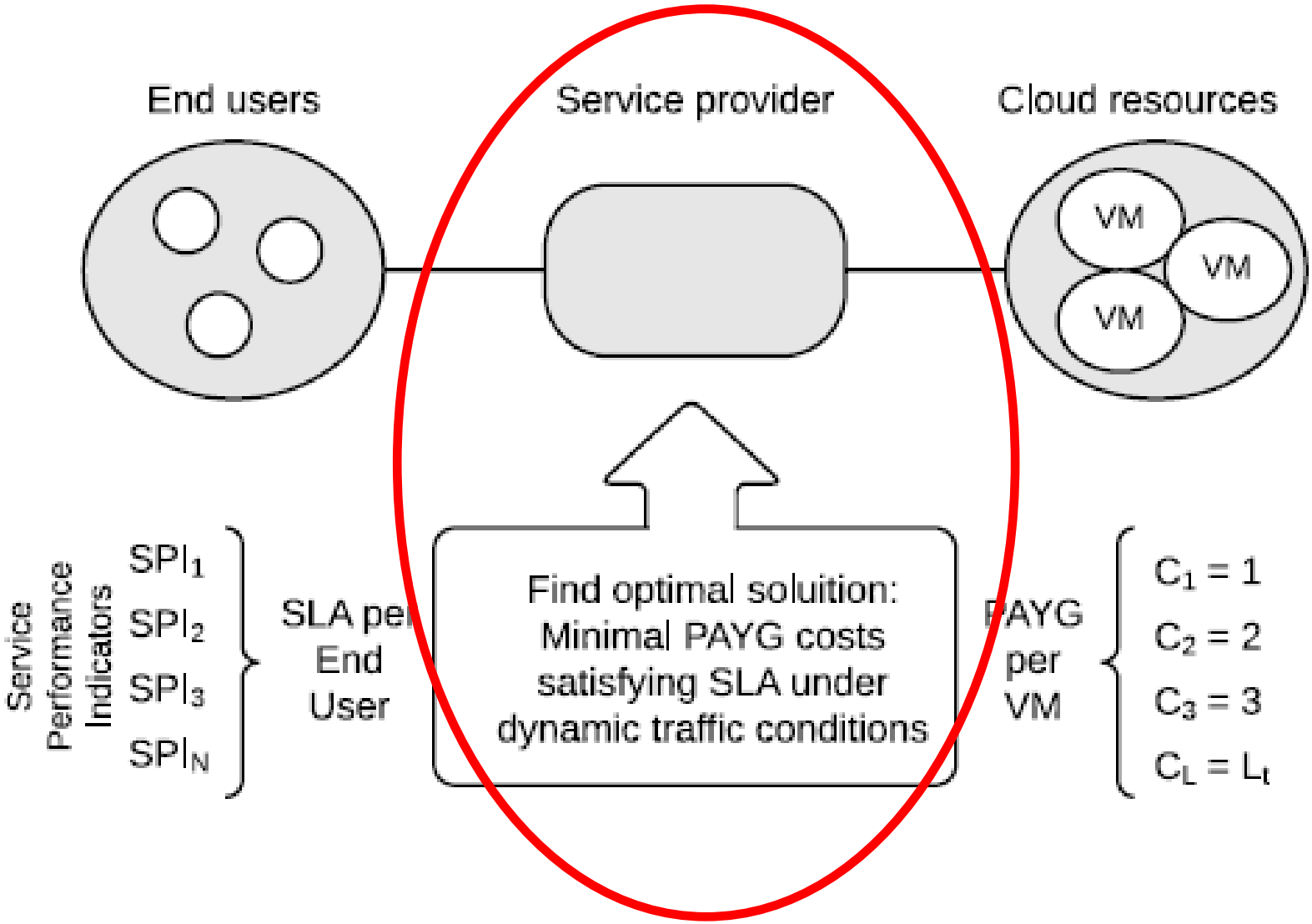
Problem domain

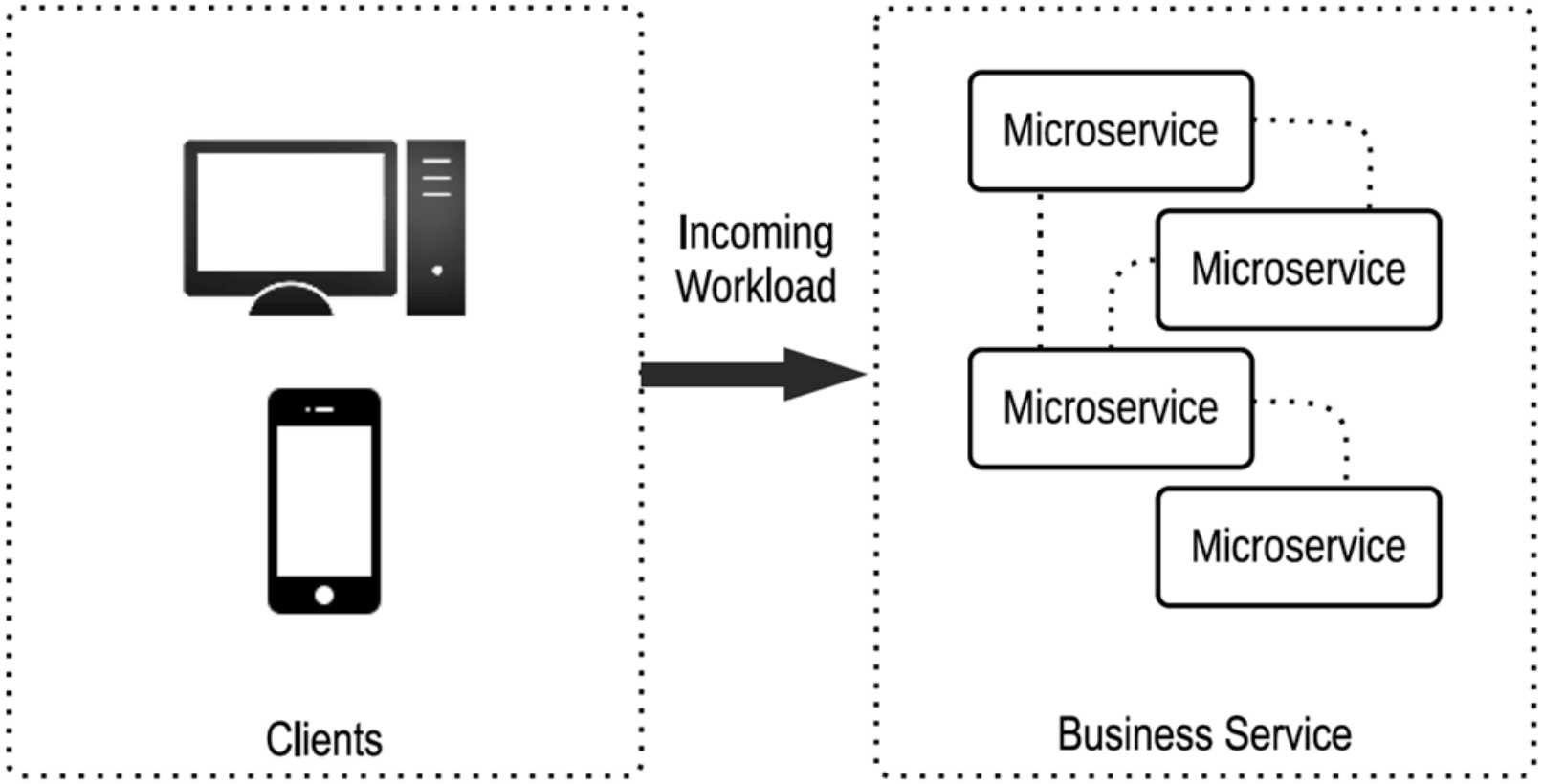


Problem statement

Cloud Business Service

- An interactive business software service adapted for usage over Internet
- “Pay-as-you-grow” model offers costs savings by applying software elasticity of business service
- If service is composed of multiple web services, software distribution plays an important role [Tankovic et al. 2015]
- To apply optimal software distribution, one needs to understand and continuously monitor **incoming workload**

Incoming Workload



Analyzed dataset

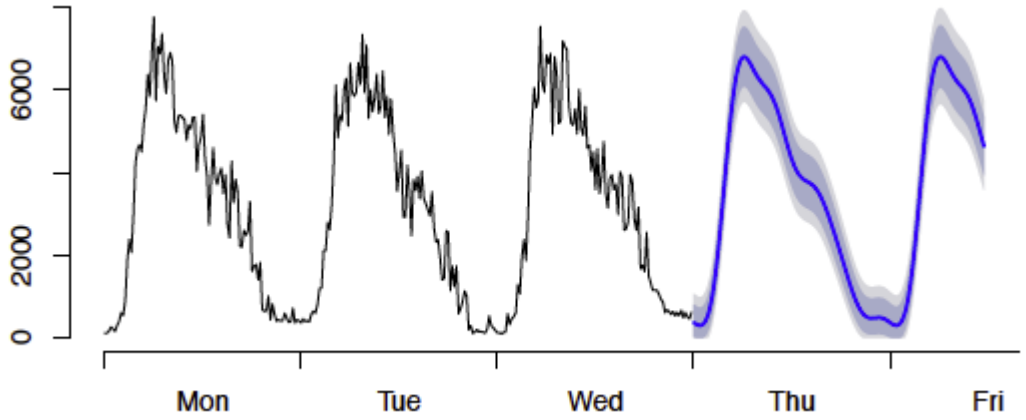
Superius ECR (Electronic Cash Register)

- Cloud business service used by 3000+ clients in Croatia and Slovenia
- Collected every service request over a period of 45 days

Incoming workload definition

Time-series of incoming requests

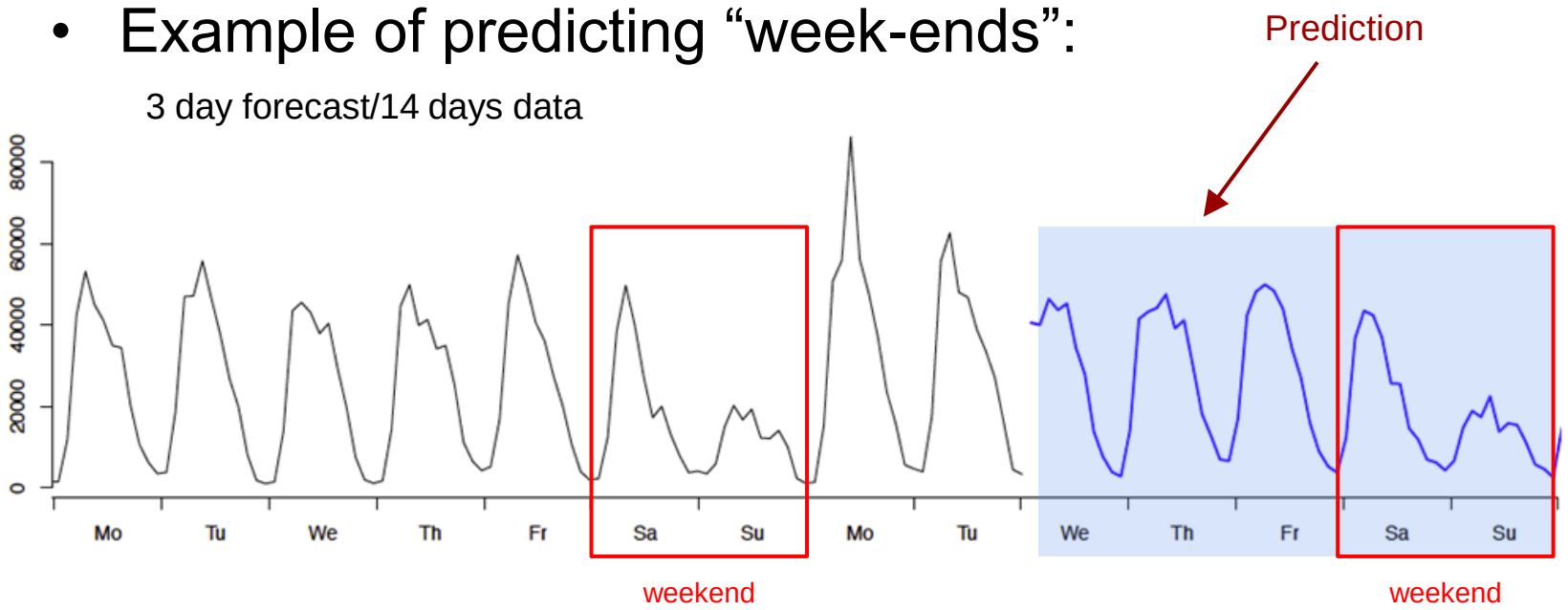
- typically time series whose values represent unique request arrivals on time intervals
- typical business service workload reveals daily patterns



Forecast analysis

Applied well-known algorithms:

- ARIMA, tBATS and ANN (Artificial Neural Networks)
- ANN yields positive results (speed vs. precision) for modeling non-linear relationships
- Example of predicting “week-ends”:

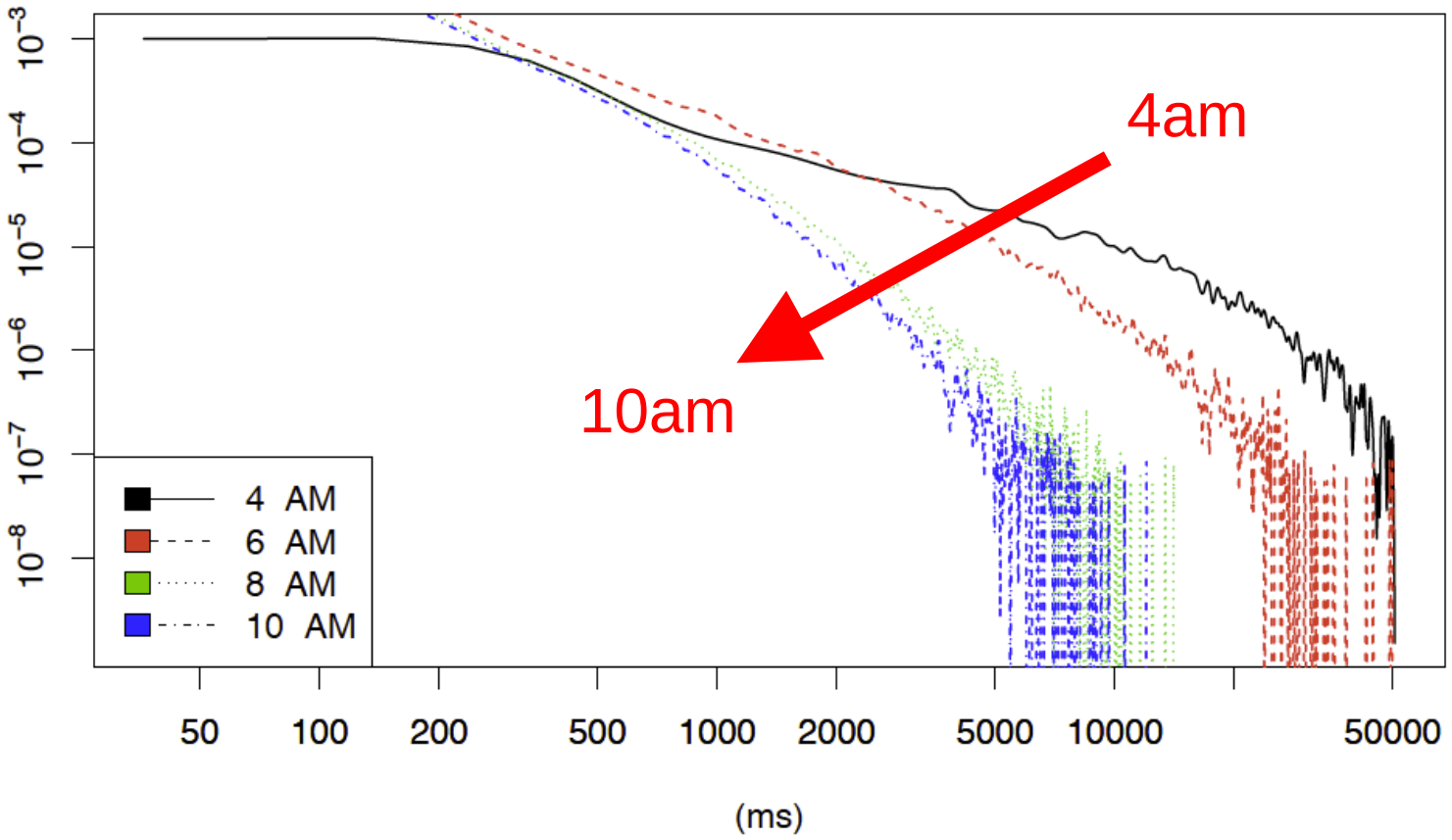


Workload Distribution Analysis

- We analyzed incoming interarrival times distribution (time between consequtive requests)
- Closest fit was a *log-normal* distribution
- Can be explained due to large amount of customers (independent sources of events)
- We examined the dynamic nature of this distribution (its change over time and service types)

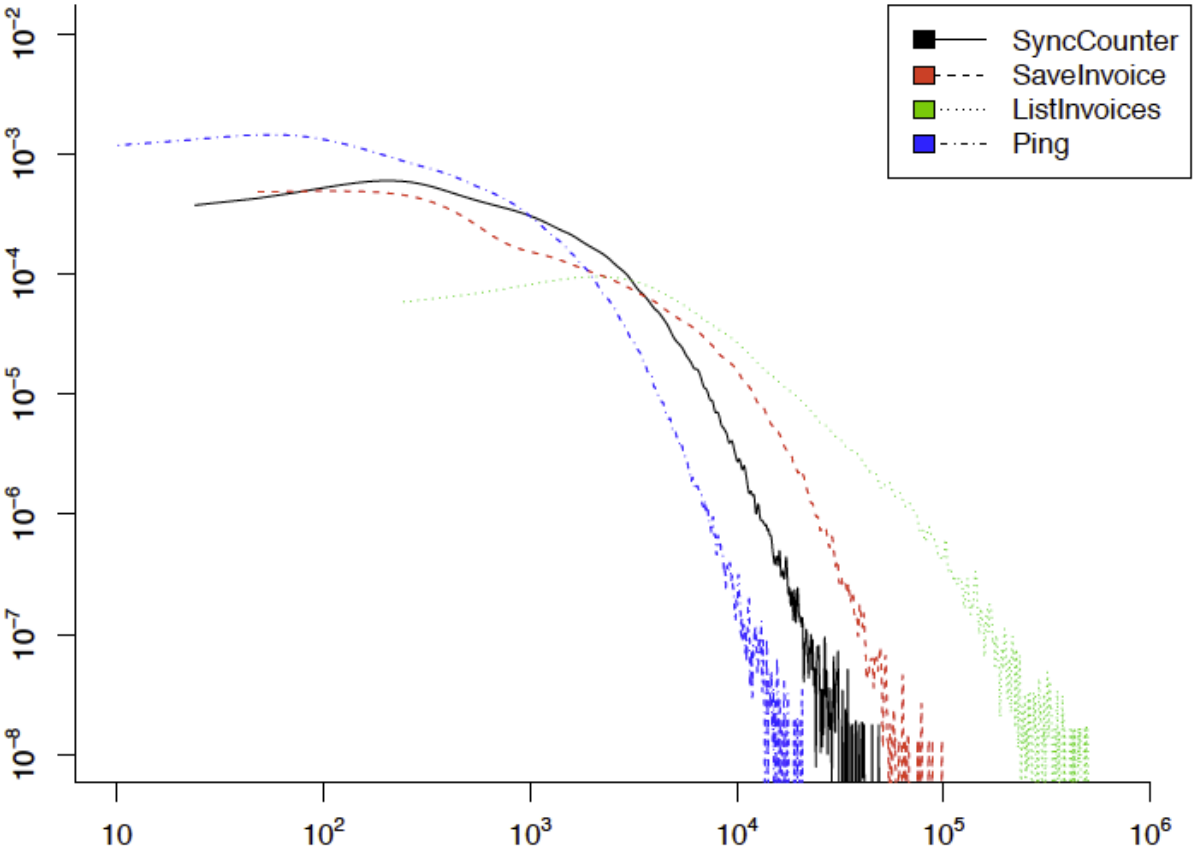
Workload Distribution Analysis

Non-uniform distribution during the day



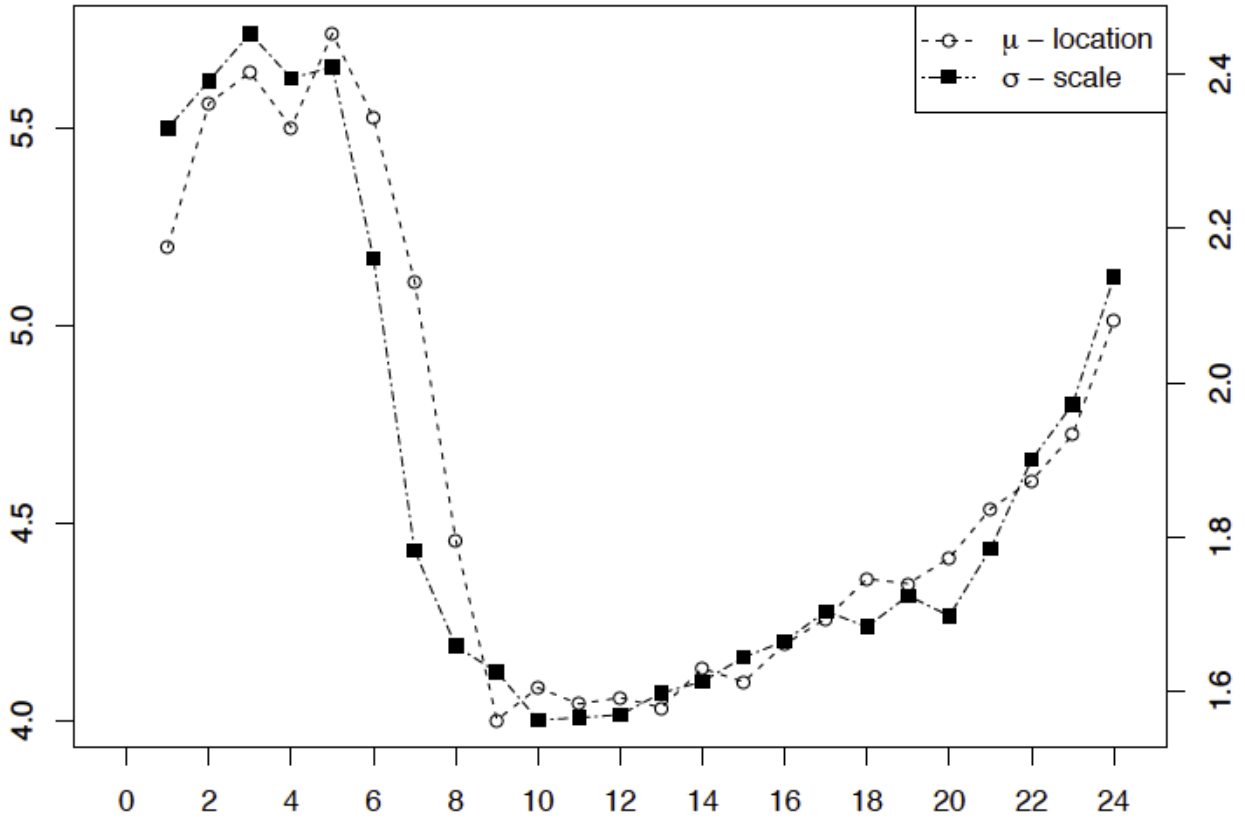
Workload Distribution Analysis (2)

Each service has different distribution



Workload Distribution Analysis

Log-normal fit parameters throughout the day

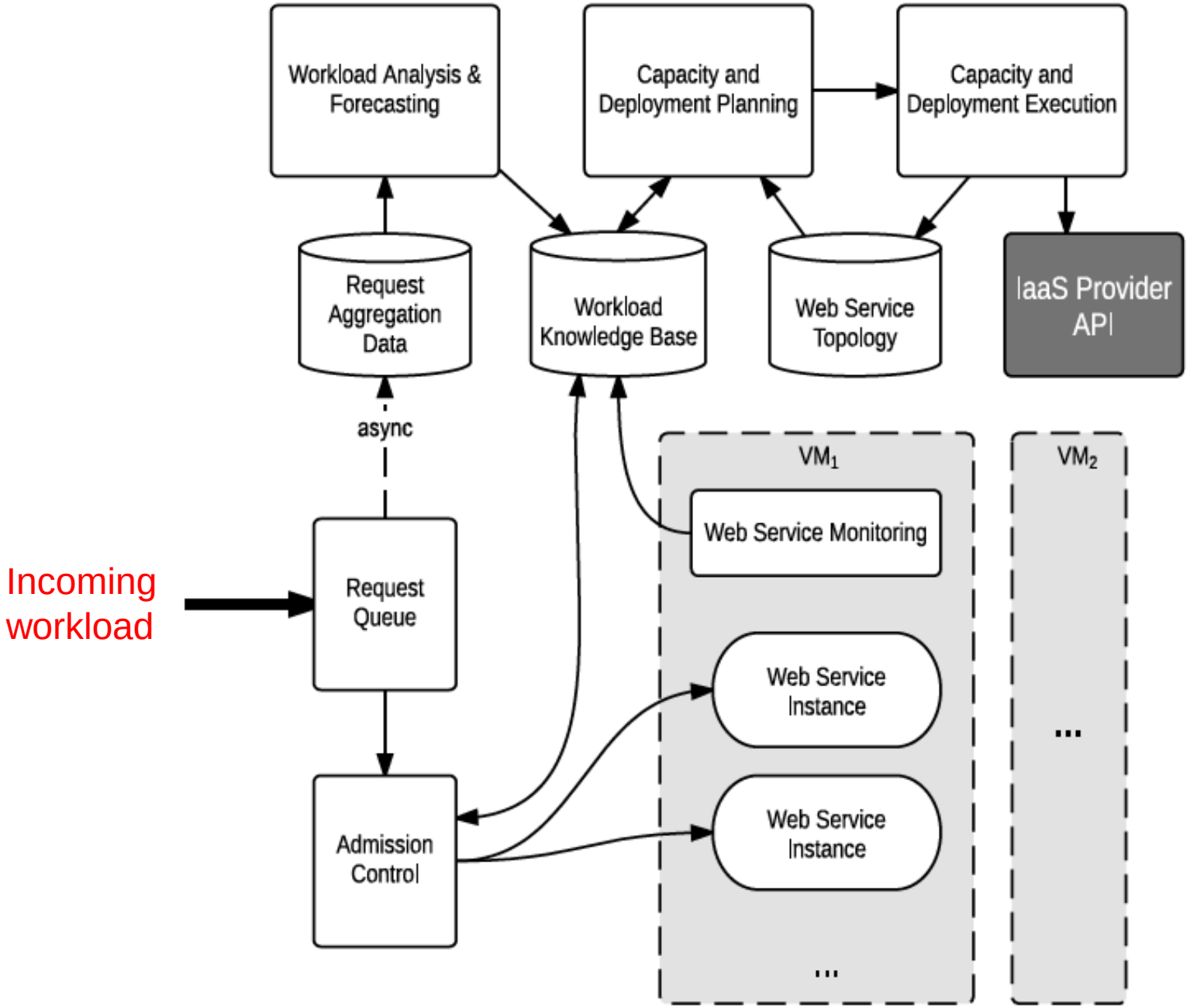


Proposal: QoS controller

- Automate this whole process
- A software module for continuous knowledge generation on incoming workload
- This module can be used for:
  - admission control - managing variability of workload
  - forecasting - deducing future workloads
  - capacity planning - scheduling future infrastructure requirements (e.g. number of virtual machines)

Key components

- Workload analysis (continuous)
- Knowledge base (models and forecasts on intensity and distribution)
- Web service topology database (holds current deployment description: infrastructure, services and their dependencies)
- Capacity and Deployment Execution (responsible for scaling infrastructure)


Workload Analysis & Forecasting
Capacity and Deployment Planning
Capacity and Deployment Execution
Request Aggregation Data
Workload Knowledge Base
Web Service Topology
IaaS Provider API
async
Incoming workload
Request Queue
Admission Control
VM1
Web Service Monitoring
Web Service Instance
Web Service Instance
...
VM2
...

Web page: http://elaclo.com/

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Thank you!

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