Prioritisation and Flow Control in Messaging Middleware

Master's thesis presentation

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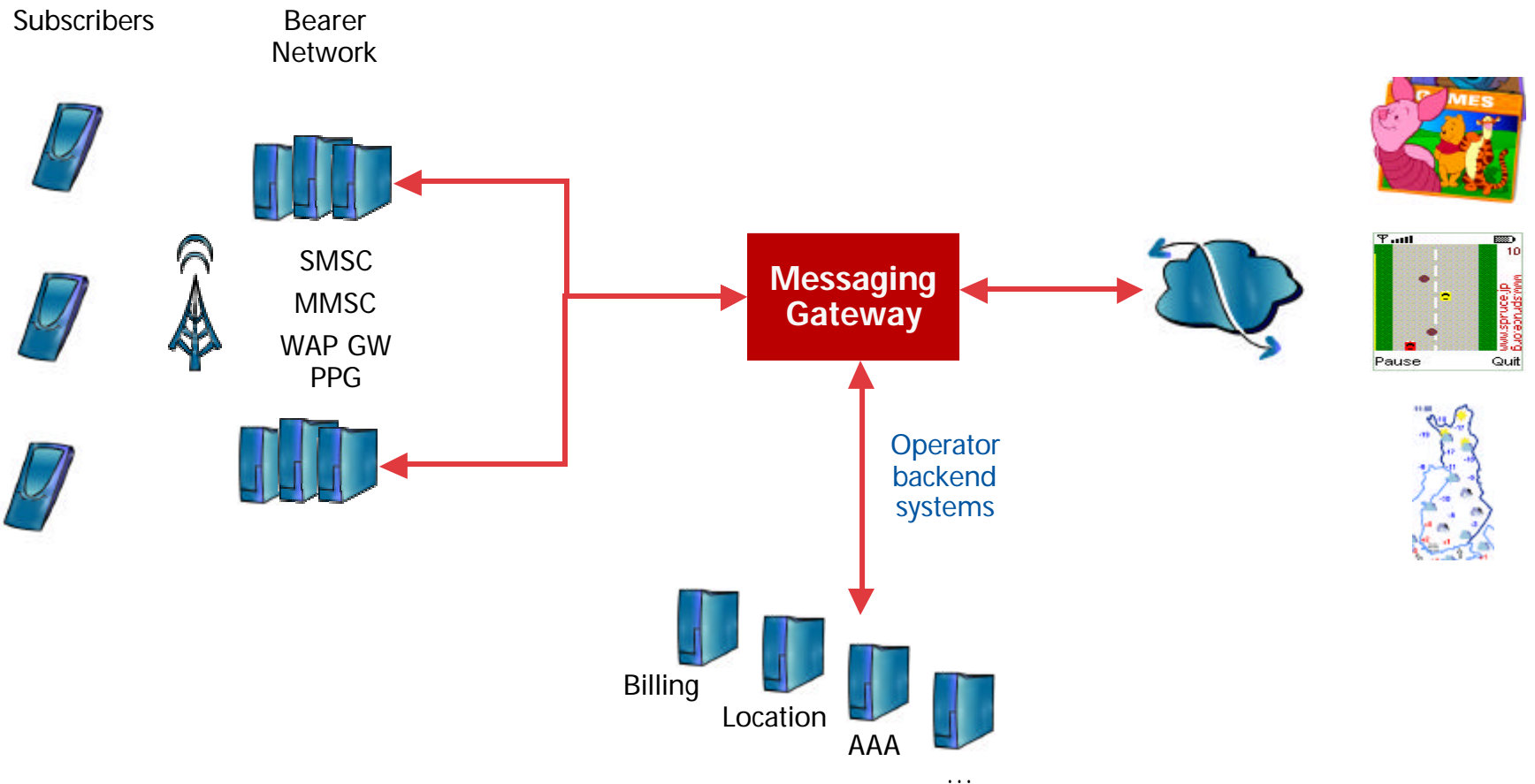Networking Laboratory

Agenda

- Background for the thesis

- Messaging Gateway introduction

- Structure of the thesis

- Results of the analysis and measurements

- Conclusions

Messaging Gateway
Background

- Prioritisation one of the strong selling points of the Messaging Gateway product

- Demand for validation of the message prioritisation functionality

  - Internal results and improvement proposals
  - Results for the customers
  - Adherence to the system requirements

- Development of analysis and measurement methodology

Messaging Gateway
System introduction

Subscribers

Bearer
Network

SMSC

MMSC

WAP GW
PPG

**Messaging
Gateway**

Operator
backend
systems

Billing

Location

AAA

…

Messaging Gateway
Main functionality 1/2

- Full store-and-forward system

  - Message prioritisation
  - Message flow control
  - Load-balancing of both ingress and egress links

- Integrations to different mobile operator backend systems

- Message route selection using a scripting language

- Large set of supported SMSC and MMSC protocols

  - Protocol translations
  - Ideal for multi-vendor environment

- Message prioritisation based on DiffServ concepts

  - Messages divided into priority classes
  - Classes entitled to a relative share of system capacity

- Extensions to the DiffServ model

  - Grouping priority classes into priority class groups in order to create virtual parallel systems
  - Store-and-forward capabilities taken into account

- Message flow control

  - Dynamically adjusted link speeds according to the destination load conditions
  - Load-balancing between different ingress and egress links
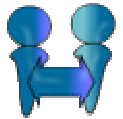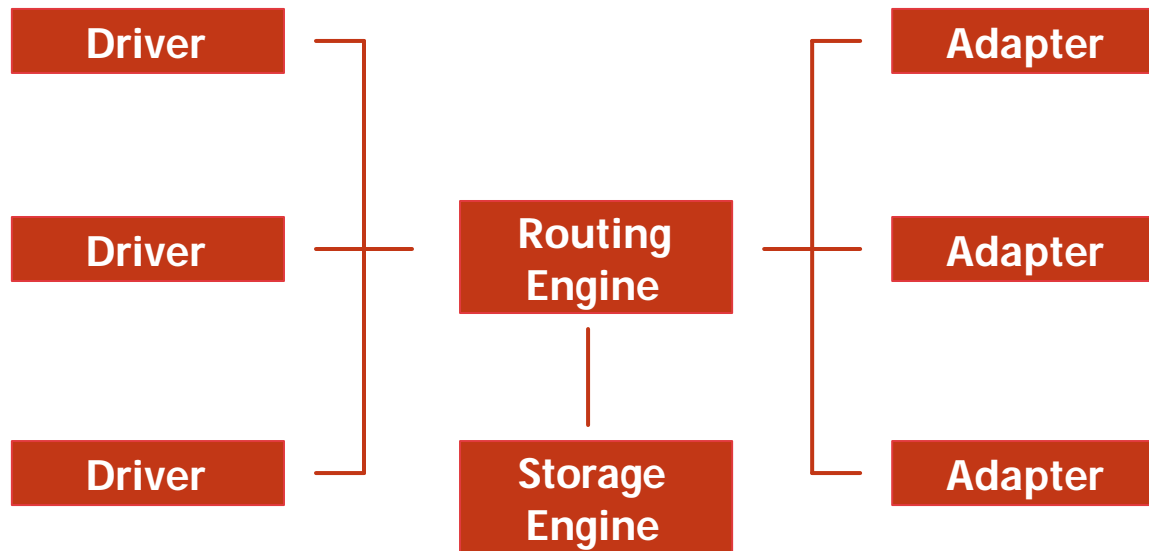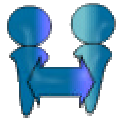
Messaging Gateway
System architecture

Messaging Gateway

SMSC

SMSC

SMSC

| Driver |

| Driver |

| Driver |

| Routing Engine |

| Storage Engine |

| Adapter |

| Adapter |

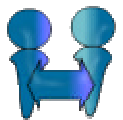| Adapter |

Service

Service

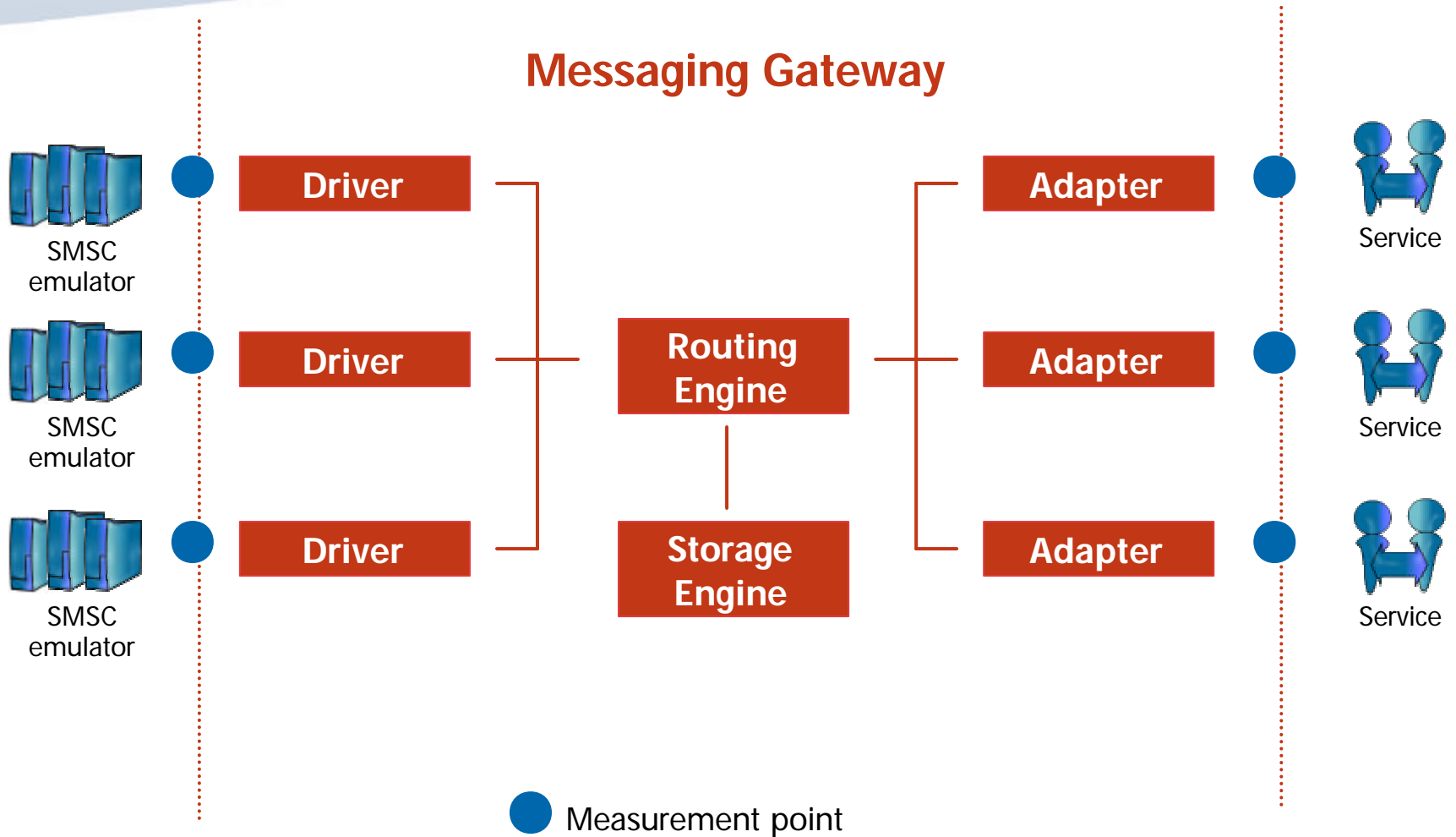Service

Messaging Gateway
Structure of thesis

- Analysis and comparison

  - Introduction of service quality concepts and DiffServ router conceptual model

  - Analysis of Messaging Gateway requirements and design

  - Comparison of the functions of DiffServ router conceptual model and Messaging Gateway

- Measurements using message prioritisation

  - Black-box measurements for throughput, latency and their variances

  - Aimed at verifying the service level differentiation or illustrating deviations from the modelled system

- Results and validation

Messaging Gateway
Results of the analysis

- Design theoretically sound

  - Implements all functional blocks of the conceptual model of DiffServ router

  - Design solves common prioritisation system caveats such as priority inversion and low priority starvation

- All system requirements addressed

- Prioritisation may not be adhered to in all parts of the system

Messaging Gateway
Measurements

Messaging Gateway
Measurement results 1/2

- Service levels clearly differentiated

  - Averages in both throughput and latency on appropriate level
  - Total system capacity not affected because of prioritisation functions

- System maintains the throughput and latencies well

- Priority inversion and low priority class starvation avoided under all conditions

Messaging Gateway
Measurement results 2/2

- Variances in throughput and latency are affected

  - Services connected to same adapter have effects on each other
  - Increase in variance can be as high as three-fold

- Messages with multiple segments reserve more than assigned share of system capacity

- Message flow control system, especially filtering function, not capable of full message stream separation

Messaging Gateway
Conclusions

- System fulfills the requirements

    - Provides clearly differentiated service levels
    - Implements the prioritisation and flow control functionality

- Enhancement proposals

    - Message stream separation improvements
    - Message latency and latency variance elimination
    - Flow control to operate on the right level of message streams

- Further work

    - Extend the work to MMS functionality of Messaging Gateway
    - Include load-balancing and messaging clusters to the measurements