Mobile Cloud Computing

EINSTEIN CENTER Digital Future

Technische Universität Berlin

Zeebe
The Process Automation Engine

Zeebe

Definition: Zeebe is a process automation engine.

With Zeebe you can: *[Source. 1]*

- Define processes graphically in BPMN 2.0.
- Choose any gRPC-supported programming language to implement your workers.
- Build processes that react to events from Apache Kafka and other messaging platforms.
- Scale horizontally to handle very high throughput.
- Rely on fault tolerance and high availability for your processes.
- Export processes data for monitoring and analysis.

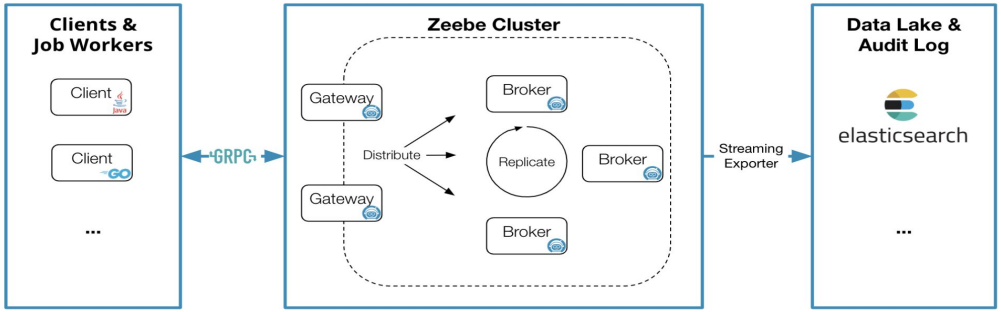


Fig. 1: The four main components in Zeebe's architecture: clients, gateways, brokers, and exporters

Business Process Modeling Notation

Definition: The Business Process Model and Notation (BPMN) specification provides a graphical notation for specifying business processes in a Business Process Diagram. Its goal is to support Business Process Modeling by providing a standard notation that is comprehensible to business users yet represents complex process semantics for technical users. *[Source. 2]*

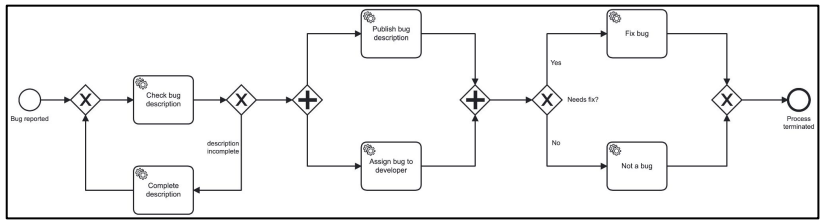


Fig. 2: Bug Report

Figure 2: Control-Flow Complexity of 5
Figure 3: Control-Flow Complexity of 31 *[Source. 3]*

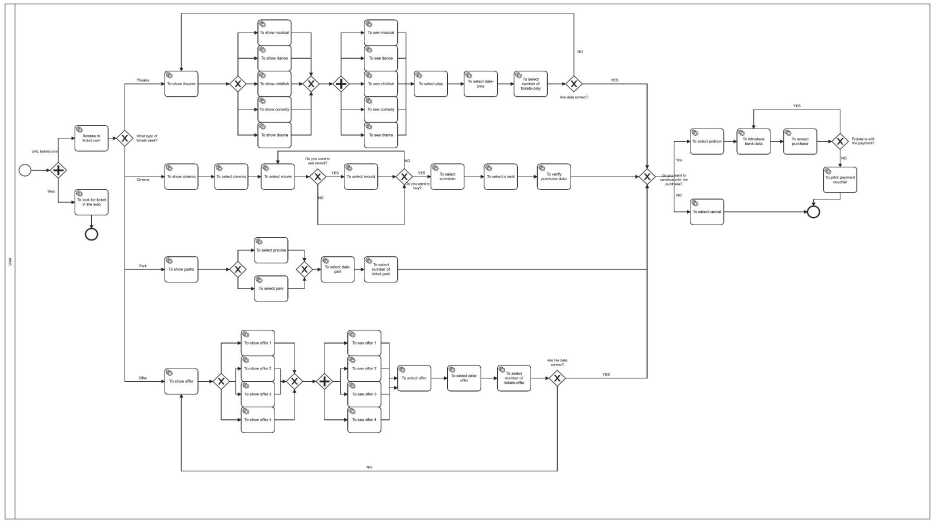


Fig. 3: Online ticket purchase process

Research Question

What are we benchmarking?

- **Scale throughput:** By increasing the number of Partitions
- **Fault tolerance:** By increasing the number of Replication Factor (the number of replications pro partition); that stores the data in different Brokers, to quickly react in case of failures

What metrics?

- *zeebe_executed_instances_total*
- *zeebe_gateway_total_requests_total:* Used as a control variable, to analyse what percentage of the deployed instances are executed.

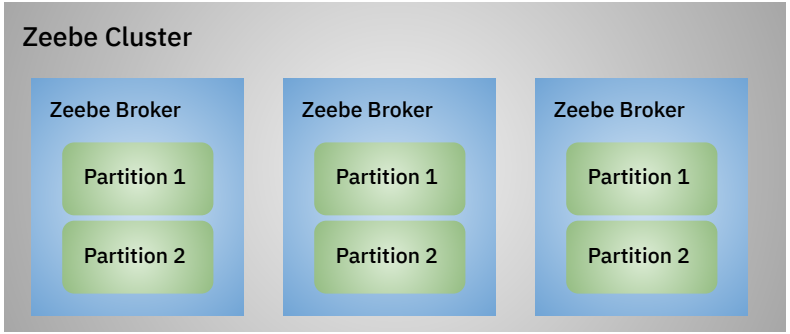


Fig. 4: Zeebe Cluster Config with 2 Partitions and 3 Brokers

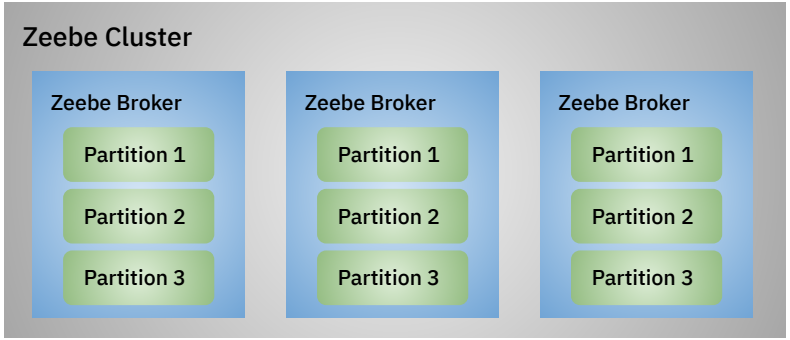


Fig. 5: Zeebe Cluster Config with 3 Partitions and 3 Brokers

Benchmark Setup

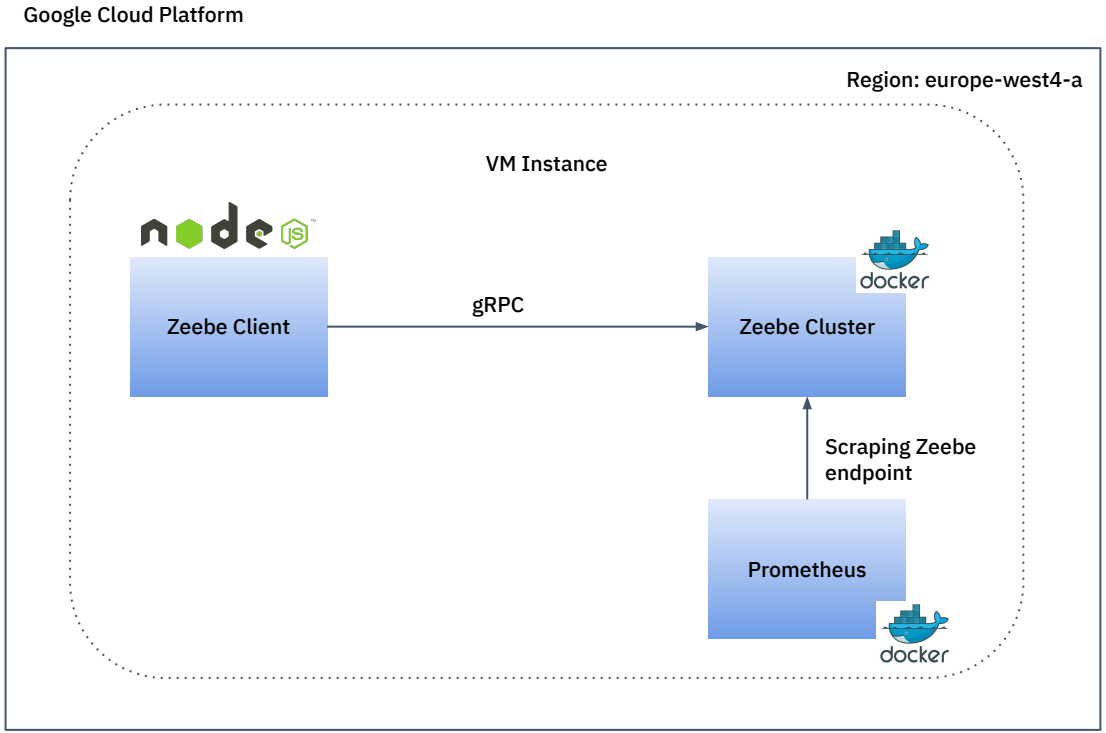
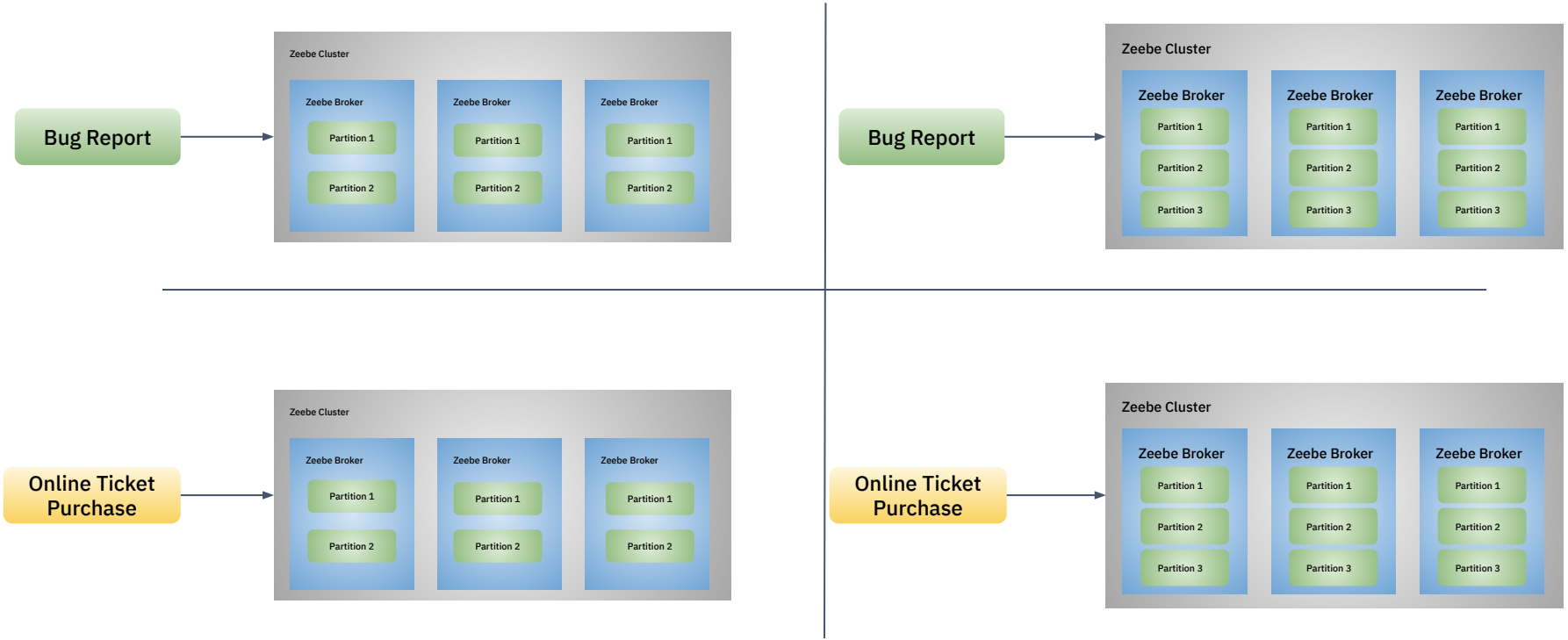


Fig. 6: Benchmark Set Up in a VM Instance

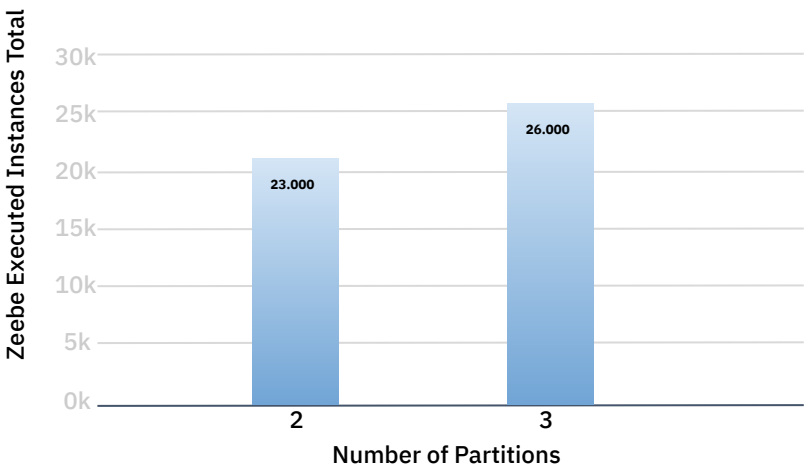
Benchmark Setup



Result Analysis

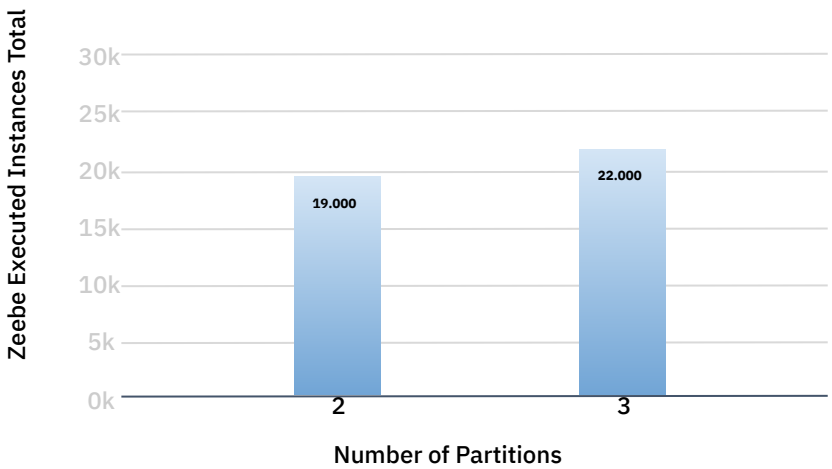
Bug Report

Replication factor = 3



Online Ticket Purchase

Replication factor = 3



Discussion & Conclusion

- **Number of Partition:** The throughput increases by **13%** when changing the Partition No. from 2 to 3.
- **Complexity of a BPMN:** When deploying a more complex BPMN process, we see a decrease of the throughput by circa. **19%**.
- **Replication Factor:** For simplicity reasons the replication factor remains unchanged in all four scenarios.
- **Number of brokers:** For simplicity reasons the replication factor remains unchanged in all four scenarios.
- **Execution rate:** Our control variable ***zeebe_gateway_total_requests_total*** indicates a 100% execute rate. All the processes deployed were also executed.

References

- [Source 1] https://docs.camunda.io/docs/components/zeebe/zeebe-overview/
- [Source 2] https://www.omg.org/bpmn/
- [Source 3] Rolón, E., Cardoso, J., García, F., Ruiz, F. and Piattini, M., 2009. Analysis and validation of control-flow complexity measures with bpmn process models. In *Enterprise, Business-Process and Information Systems Modeling: 10th International Workshop, BPMDS 2009, and 14th International Conference, EMMSAD 2009, held at CAiSE 2009, Amsterdam, The Netherlands, June 8-9, 2009. Proceedings* (pp. 58-70). Springer Berlin Heidelberg.

List of Figures

- [Figure 1] https://docs.camunda.io/docs/components/zeebe/technical-concepts/architecture/
- [Figure 3] Rolón, E., Cardoso, J., García, F., Ruiz, F. and Piattini, M., 2009. Analysis and validation of control-flow complexity measures with bpmn process models. In *Enterprise, Business-Process and Information Systems Modeling: 10th International Workshop, BPMDS 2009, and 14th International Conference, EMMSAD 2009, held at CAiSE 2009, Amsterdam, The Netherlands, June 8-9, 2009. Proceedings* (pp. 58-70). Springer Berlin Heidelberg.
- [Figure 4] https://camunda.com/blog/2018/06/benchmarking-zeebe-horizontal-scaling/
- [Figure 5] https://camunda.com/blog/2018/06/benchmarking-zeebe-horizontal-scaling/