ON THE ROAD TO BENCHMARKING BPMN 2.0 WORKFLOW ENGINES

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What is a Workflow Engine?

Workflow Engine
- Task Dispatcher
- Process Navigator
- Job Executor
- Core Engine
- Service Invoker
- Transaction Manager
- Persistent Manager

Application Server

Users

Web Service

Instance Database

DBMS
Many Business Process Modeling/Execution Languages

- EPC: 1992
- XPDL: 1998
- BPEL: 2002
- YAWL: 2004
- BPMN: 2008
- PNML: 2008
BPMN 2.0: A Widely Adopted Standard

ISO/IEC 19510

BPMN 2.0  BPMN 2.0.2

Jan 2011  Jan 2014

[Graph showing the number of BPMN 2.0 engines from 2009 to 2015]

https://en.wikipedia.org/wiki/List_of_BPMN_2.0_engines
Why do we need a benchmark?

*companies, developers*
Why do we need a benchmark?

companies, developers

1. How to choose the best engine according to the company requirements?

2. How to choose the best engine according to the company business process models?
Why do we need a benchmark? companies, developers

1. How to choose the best engine according to the company requirements?

2. How to choose the best engine according to the company business process models?

3. How to evaluate performance improvements during the engine development?

4. How to find out the engine bottlenecks?
Main Challenges in Benchmarking BPMN 2.0 Workflow Engines
Main Challenges in Benchmarking BPMN 2.0 Workflow Engines

WORKLOAD CHARACTERIZATION

BENCHMARK EXECUTION
Main Challenges in Benchmarking BPMN 2.0 Workflow Engines

WORKLOAD CHARACTERIZATION

1. Define the Workload Mix

2. Define the Load Functions

BENCHMARK EXECUTION
Main Challenges in Benchmarking BPMN 2.0 Workflow Engines

WORKLOAD CHARACTERIZATION

1. Define the Workload Mix
2. Define the Load Functions

BENCHMARK EXECUTION

3. Deal with engine-specific interfaces and BPMN 2.0 customizations
4. Asynchronous execution of business processes
5. Define meaningful and reliable KPIs
1. Define the Workload Mix
1. Define the Workload Mix

Control Flow

Data Flow

Events

Activities

Task Types

Execution Behavior
I. Define the Workload Mix

NUMBER OF REAL-WORLD MODELS

NUMBER OF ENGINES SUPPORTING THE FEATURE
1. Define the Workload Mix

NUMBER OF REAL-WORLD MODELS

NUMBER OF ENGINES SUPPORTING THE FEATURE

200

0
I. Define the Workload Mix

NUMBER OF REAL-WORLD MODELS

NUMBER OF ENGINES SUPPORTING THE FEATURE

0

200

950

12

Context » BPMN 2.0 Adoption » Why a Benchmark? » Challenges » BenchFlow » Next Steps » Conclusions
1. Define the Workload Mix

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2. Define the Load Functions

Context » BPMN 2.0 Adoption » Why a Benchmark? » Challenges » BenchFlow » Next Steps » Conclusions
3. Deal with engine-specific interfaces and BPMN 2.0 customizations
4. Asynchronous execution of processes
4. Asynchronous execution of processes

![Diagram showing workflow process with nodes A, B, C, D, and connections indicating asynchronous execution.]

Loading Driver  \(\rightarrow\) Workflow Engine  \(\rightarrow\) Application Server  \(\rightarrow\) Instance Database  \(\rightarrow\) DBMS

Users  \(\rightarrow\) Web Service

Start  \(\rightarrow\) End
The BenchFlow Project

“Design the first benchmark to assess and compare the performance of Workflow Engines that are compliant with Business Process Model and Notation 2.0 (BPMN 2.0) standard,”
1. Define the Workload Mix

What we need: even more (anonymized) real-world BPMN 2.0 process models
1. Define the Workload Mix

Skouradaki et al. [SOSE2015]

What we need: even more (anonymized) real-world BPMN 2.0 process models
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What we need: even more (anonymized) real-world BPMN 2.0 process models

REAL-WORLD PROCESSES

REOCCURRING STRUCTURES

WORKLOAD MIX
Enabling the Benchmark Execution

Workflow Engine

Application Server

Instance Database

DBMS

Users

Web Service

Loading Driver

Context » BPMN 2.0 Adoption » Why a Benchmark? » Challenges » BenchFlow » Next Steps » Conclusions
Enabling the Benchmark Execution

- Faban
- Harness
- Faban Drivers
- Workflow Engine
- Application Server
- DBMS
- Loading Functions

Context » BPMN 2.0 Adoption » Why a Benchmark? » Challenges » BenchFlow » Next Steps » Conclusions
Enabling the Benchmark Execution

1. Flexible deployment
2. Flexible HW Resources
3. Frozen Initial Condition

Faban Drivers

Workflow Engine

DBMS

Web Service

Servers

Docker Containers

Loading Functions
Enabling the Benchmark Execution

Faban Drivers

Workflow Engine

DBMS

Faban Drivers

docker
Enabling the Benchmark Execution

1. Automatically deploy and start the benchmark environment;
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2. Automatically deploy the workload mix;
1. Automatically deploy and start the benchmark environment;
2. Automatically deploy the workload mix;
3. Determine when the benchmark ends;
1. Automatically deploy and start the benchmark environment;
2. Automatically deploy the workload mix;
3. Determine when the benchmark ends;
4. Collect the execution and process logs.
The BenchFlow Project Next Steps

• **Release the first prototype of the Benchmark environment**
  » **Yes:** Abstract the Interaction with the Engines; Automatic Deploy and Undeploy of the S.U.T.; Execution and Process Log Gathering
  » **No:** Automatic Generation of Drivers; Users, Web Services and External Catching Business Events

• **Release the first prototype of the Workload Mix synthesizer**

• **First Experiments with KPIs Definition and Computation**

• **Collect More Process Models and Process Execution Logs**

BACKUP SLIDES

- Cited Works;
- Related Works.

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Cited Works

[SOSE2015]
Related Works


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