Microservices-based Business Process Model Automation

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Overview

- What are Microservices?
- Microservices vs. Monolith
- Microservices vs. SOA
- Microservices Framework + BPM
- Challenges of Microservices-BP Automation
What is a Microservice?

The term "Microservice Architecture" has sprung up over the last few years to describe a particular way of designing software applications as suites of independently deployable services. While there is no precise definition of this architectural style, there are certain common characteristics around organization around business capability, automated deployment, intelligence in the endpoints, and decentralized control of languages and data.

Martin Fowler
(https://martinfowler.com/)
Characteristics of Microservices

- Organizational Dimension

Classical Organization

Team setup by business functions
Characteristics of Microservices

- **Technical Dimension**

Smart endpoints, dumb pipes: (i.e., only the endpoints are smart and pipes only forward information)

Decentralized Governance/
Decentralized Data Management
Microservices target Products and not Projects
Microservices vs. Monolith

- Several modules in one process
- Comprise the whole technology stack
- Technology independent
Microservices vs. SOA

- A microservice comprise the **whole technology stack**
  - By packaging the whole technology stack (data, business, UI) a microservice is easily deployable since all inter-service dependencies are shipped and deployed at the same time.

- **Technology independent** to other microservices
  - Each team responsible for developing and maintaining a microservice can choose the technology stack suitable for their teams. The team is independent of choices made by other teams. Only the CI infrastructure has influences on the technologies.

- No heavyweight messaging (no ESB), **simple protocols** (REST)
  - The microservice architecture follows the principle smart endpoint and dump point. Meaning, that a microservice knows exactly with which other microservice it needs to communicate with.

- **Deployable individually**, testable (better support of DevOps)
  - Due to the independency to other services and loose coupling, each microservice can be deployed on its own. Same holds for testing the functionality because a microservice is self contained.

- No statement in SOA

- Oppositional Statement
## Microservices Framework

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Container</strong></td>
<td>Docker as most commonly used virtualization mechanism for finegrained Microservices (one container per microservice)</td>
</tr>
<tr>
<td><strong>Orchestrator</strong></td>
<td>Orchestration and Replication tools available such as Kubernetes</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td>Performance Monitoring</td>
</tr>
</tbody>
</table>

![Diagram of microservices framework](image_url)
### Microservices Technologies

#### (Micro)Service Framework

<table>
<thead>
<tr>
<th>Service Fabric</th>
<th>Spark</th>
<th>Grape</th>
<th>Flask</th>
<th>Ninja</th>
<th>Jodd</th>
<th>Ratpack</th>
<th>msf4</th>
<th>Spring IO</th>
<th>Drop Wizard</th>
<th>Play</th>
<th>GO-Kit</th>
<th>Django</th>
<th>Cherry Py</th>
</tr>
</thead>
</table>

#### Container Management

- Docker
- Marathon
- Kubernetes

#### Cloud Environment

- Apache Cloudstack
- Amazon Web Services
- Microsoft Azure
- IBM Bluemix
- Bluemix Openwhisk
- Google Engine
- Openstack

#### Business Process Management

- BPMN
- Process Mining
Microservices-based BP Automation

**Challenge:** *What is an appropriate visualization and assignment of microservices in a business process model?* It remains to investigate if microservices are specified as events or as a new type of process activities (then an icon is attached to the activity) or if a process model fragment defines a microservice.
Microservices-based BP Automation

- **Search MS**
  - REST API
  - Backend
  - DB

- **Flight Selection MS**
  - REST API
  - Backend
  - DB

- **Seat Block MS**
  - REST API
  - Backend
  - DB

Flowchart:
- **Start**
  - enter search function
  - MS
  - select flight
  - MS
Microservices-based BP Automation

**Challenge:** What are appropriate strategies for business process model orchestration (e.g., routing of business process activities). The control-flow of process models could make the unpredictable flow of microservices instances more transparent.

**Challenge:** How to deal with processes containing “automatic tasks” and “semi-automatic tasks” and thus how to combine process-based engines and containerized application orchestrator?
Microservices-based BP Automation

- **Challenge:** *How to specify the dependencies of microservices executed within distributed business process models?* Microservices require only a minimum of central control, which also raises the challenge of

- **Challenge:** *Who takes care of the process?* Microservices communicate with lightweight mechanisms but have so called “dumb pipes“ raising the challenge of:

- **Challenge:** *How to implement processes according to „smart endpoints and dumb pipes“ characteristic? Does „smart endpoints and dumb pipes“ allow business process improvement?*
Roadmap

- Alignment MS and BP
- Visualization
- MS-based BP Automation

Do you want to contribute
→ Contact me 😊
Szenario:
On-demand Services for Autonomous Car Sharing
“If you can’t build a monolith, what makes you think microservices are the answer?”