

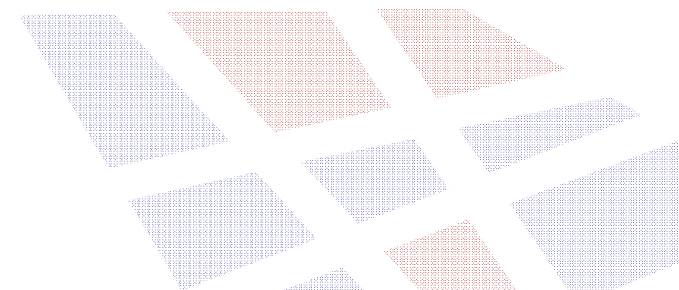
WebMGS 2010

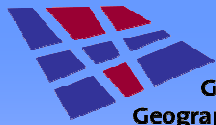
# A Spatial Decision Service for BPEL

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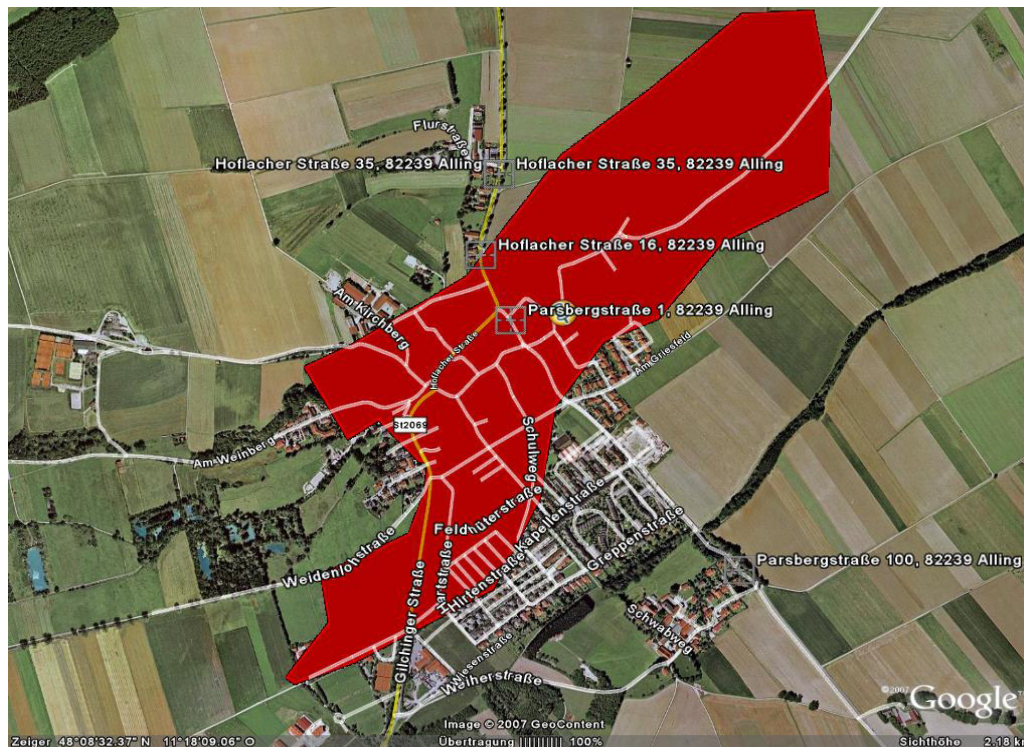




# A Insurance Company Use Case

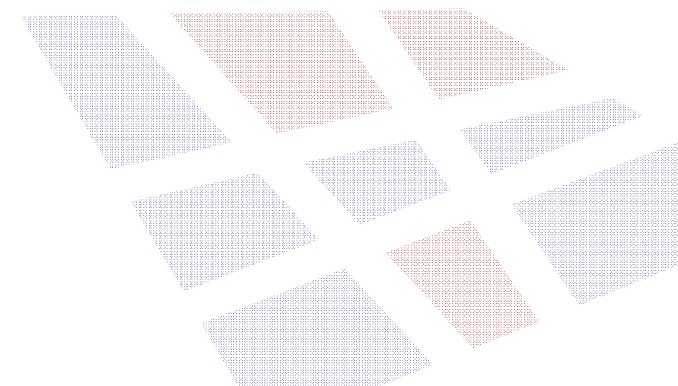
## The Business Process:

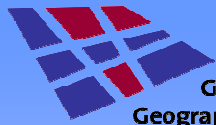
Check if real estate to be insured against natural hazards is situated in a natural hazard prone area, e.g. a floodplain → decide on insurance rate  
→ Generate insurance policy automatically



## The System Architecture:

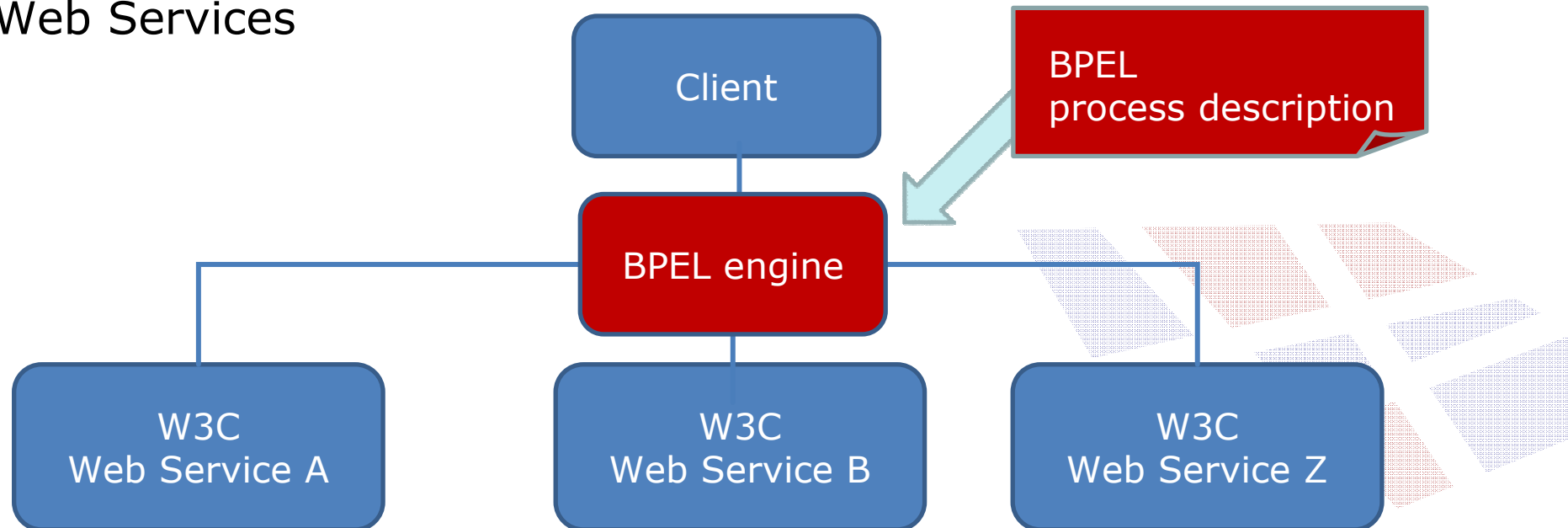
- SOA
- Service Orchestration using the Business Process Execution Language (BPEL)

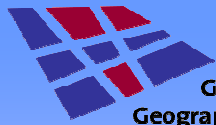




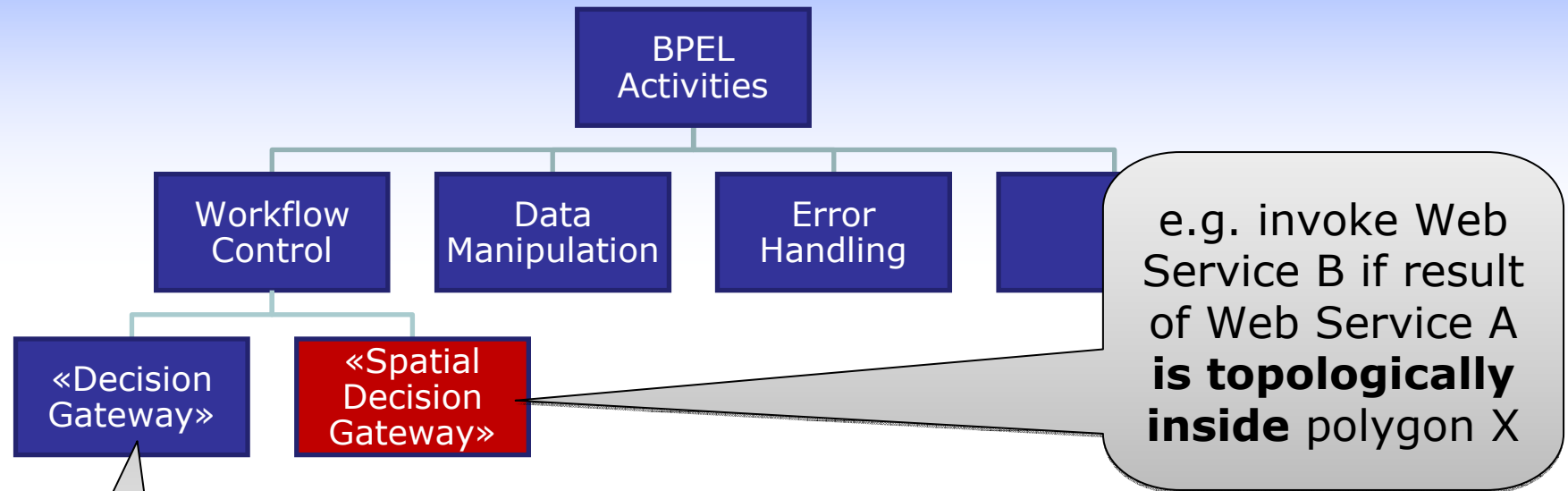
## Business Process Execution Language (BPEL)

- BPEL = short for Web Services Business Process Execution Language (OASIS WS-BPEL 2.0)
- XML language for describing and executing business processes in a SOA
- Each BPEL process itself is a Web Service
- BPEL processes are executed using a BPEL-Engine which invokes Web Services





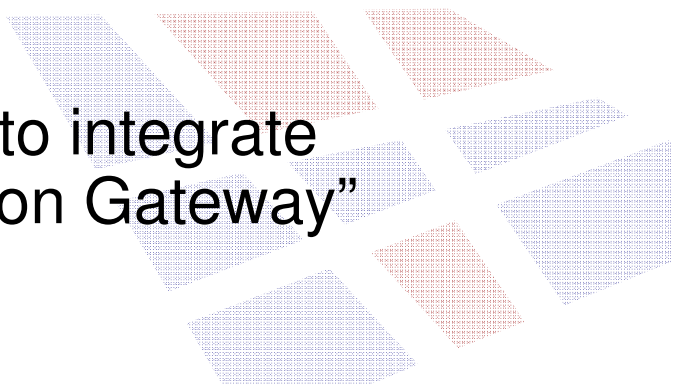
## A Spatial Decision Gateway for BPEL - Overview

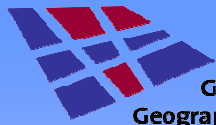


e.g. invoke Web Service B **<if>** result of Web Service A **is greater than 100**

### The Research Question:

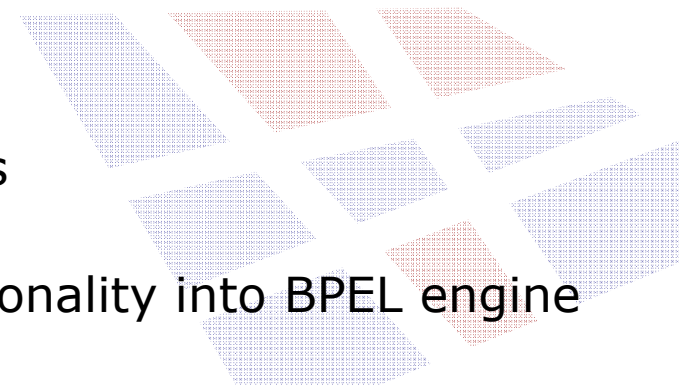
What is the best approach to integrate the concept “Spatial Decision Gateway” into BPEL?

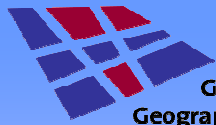




## Approach 1: Spatial Decision Gateway as New Activity Type

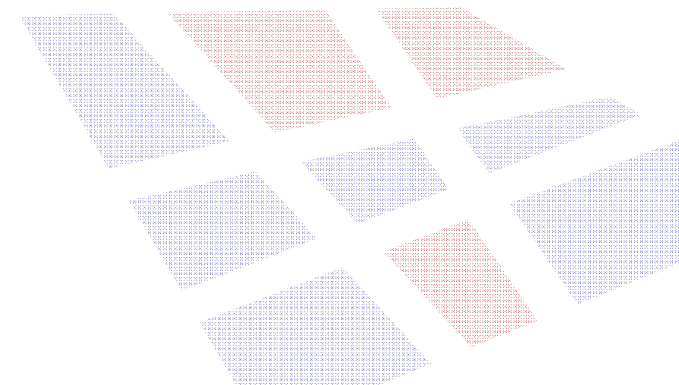
- WS-BPEL 2.0 contains extension mechanism
  - New activity types could be defined for branching workflows based on spatial conditions
  - Analogy with <if> activity for branching workflows based on non-spatial conditions
  - Spatial Comparison Operators defined by OGC Filter Encoding could be used as part of the <condition>
- 
- Pros:
    - Fits well into BPEL syntax
    - Easy to achieve
  - Cons:
    - New activities unknown to current BPEL engines and modelling tools
    - Requires integration of spatial processing functionality into BPEL engine

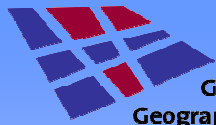




## Approach 2: Spatial Decision Gateway as Sub-Processes

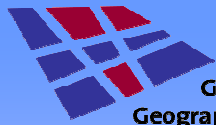
- White paper by IBM and SAP defines BPEL-extension-mechanism called "Sub-Process"
- Sub-Process = code fragment which can be reused inside a process or in other processes
- Spatial comparison operators could be implemented as individual Sub-Processes
  
- Pros:
  - Very flexible
- Cons:
  - Concept not part of BPEL 2.0 standard
  - Concept unknown to current BPEL-Engines



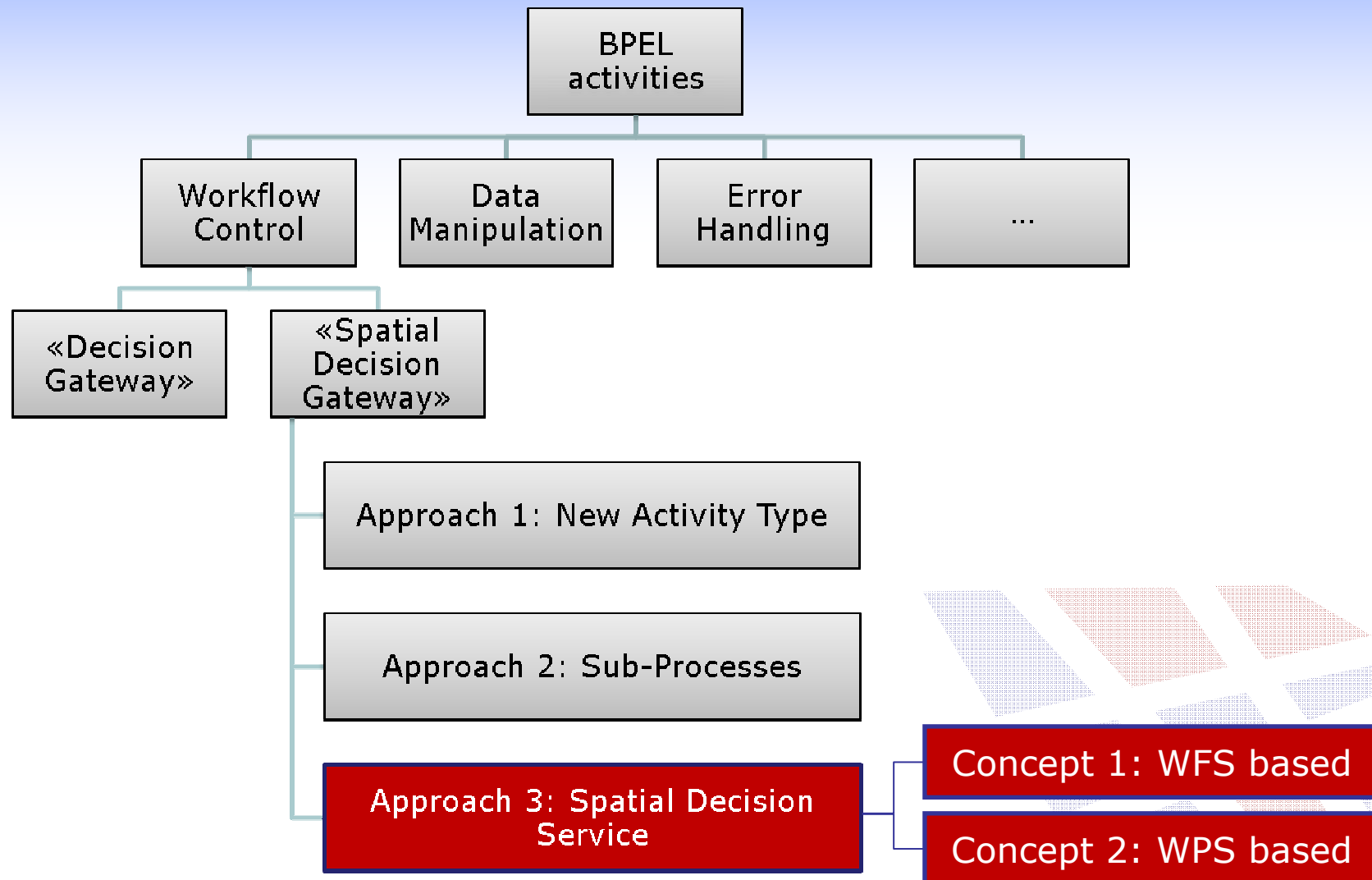


## Approach 3: Spatial Decision Gateway as Web Service

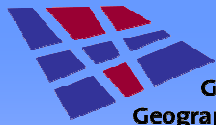
- Spatial Operations encapsulated by Web Service  
→ **“Spatial Decision Service”**
- Each Spatial Operation represented by WSDL-operation
- Spatial Operation could be integrated in BPEL process using BPEL activity <invoke>
- Spatial Operation returns boolean expression which can then be evaluated in standard BPEL <condition> tag using XPath
- Pros:
  - Interoperability with existing tools
  - Depending on design of Spatial Decision Service it is not even required to handle spatial data inside the BPEL process  
→ lower complexity, higher performance
- Cons:
  - Syntax and Semantics of “Spatial Decision Service” need to be defined  
→ see concepts as follows



# Concepts for a Spatial Decision Service for BPEL

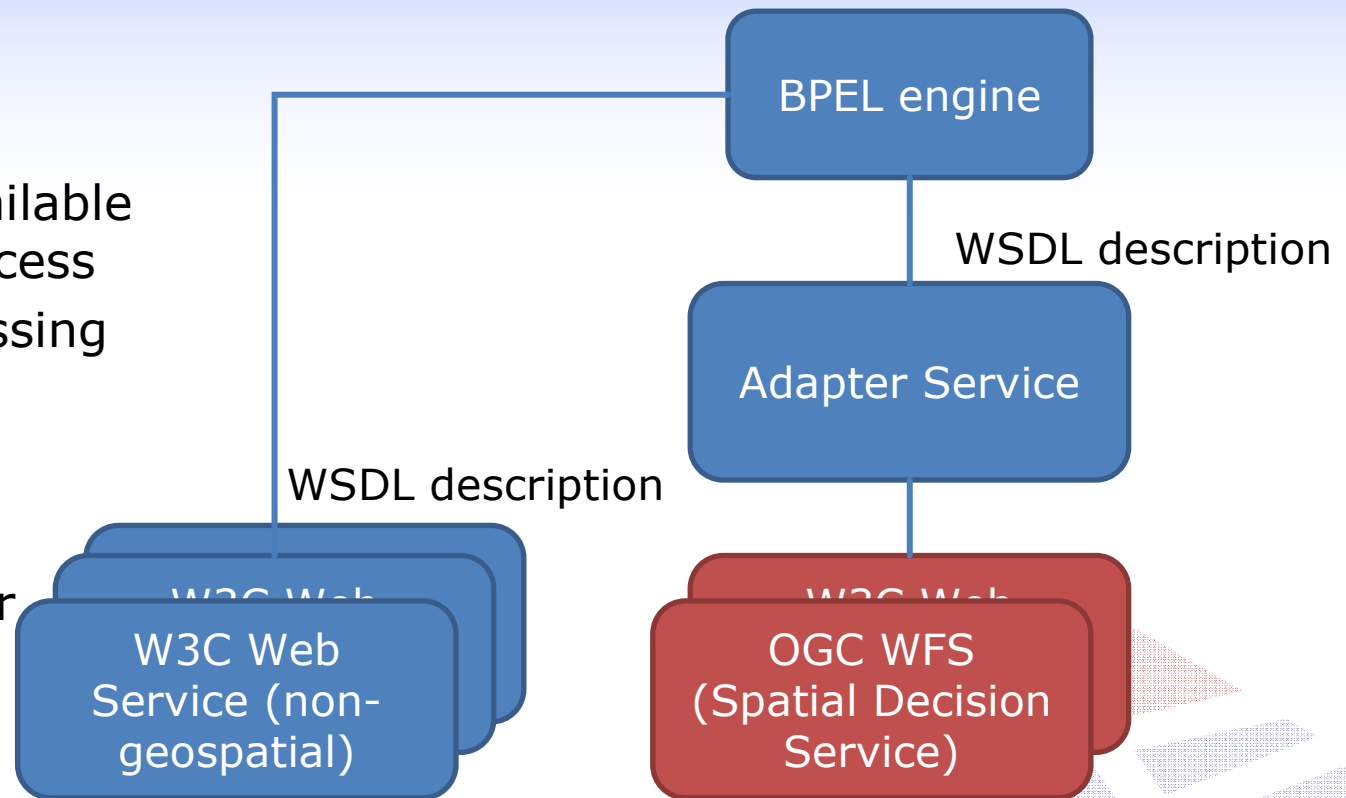


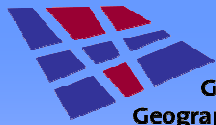




## Concept 1: WFS-based Spatial Decision Service

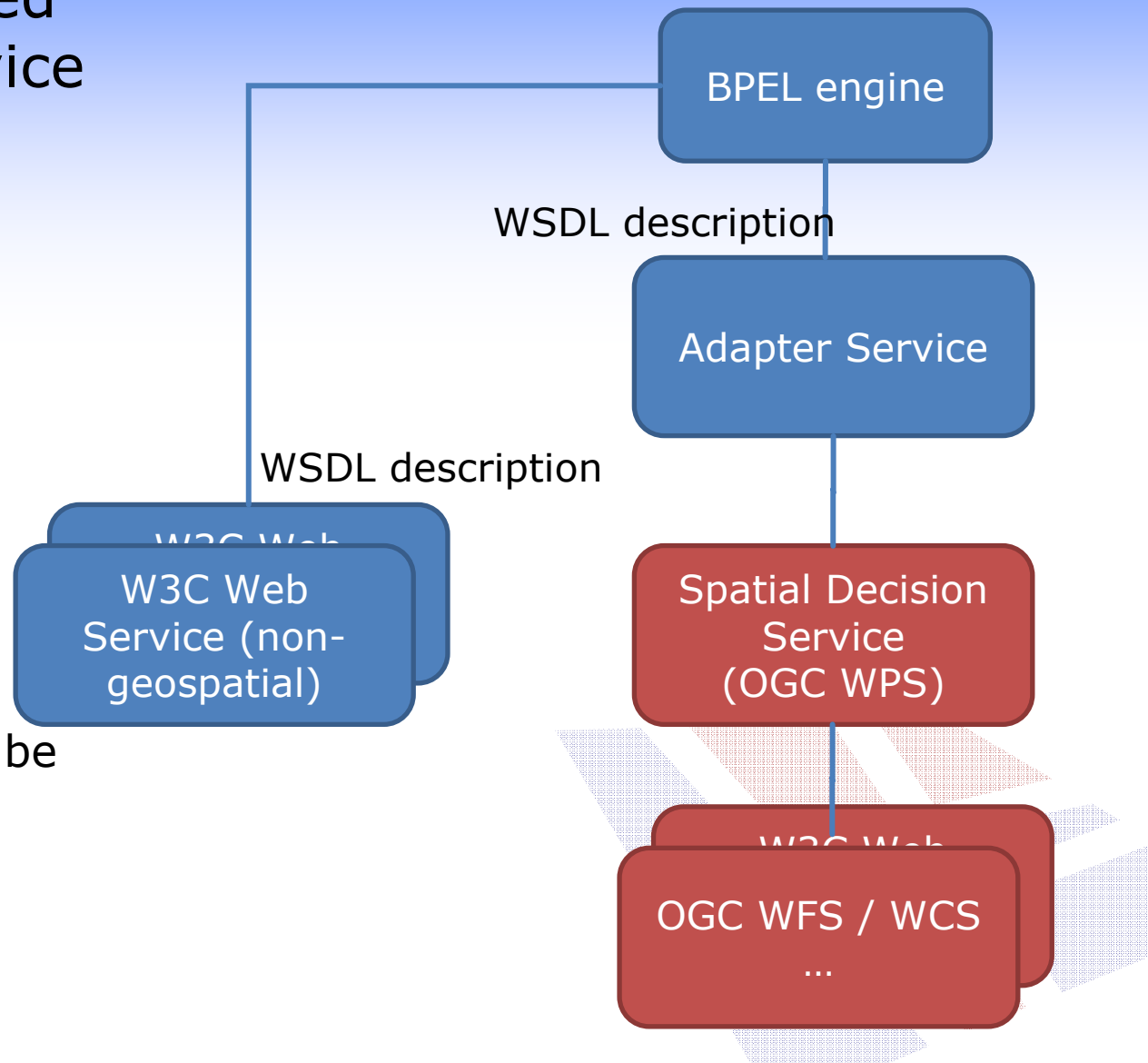
- Pros:
  - Geospatial Data available within the BPEL process
  - No dedicated processing service needed
- Cons:
  - Complexity
  - Limited to WFS filter capabilities

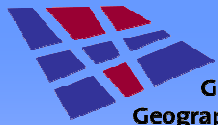




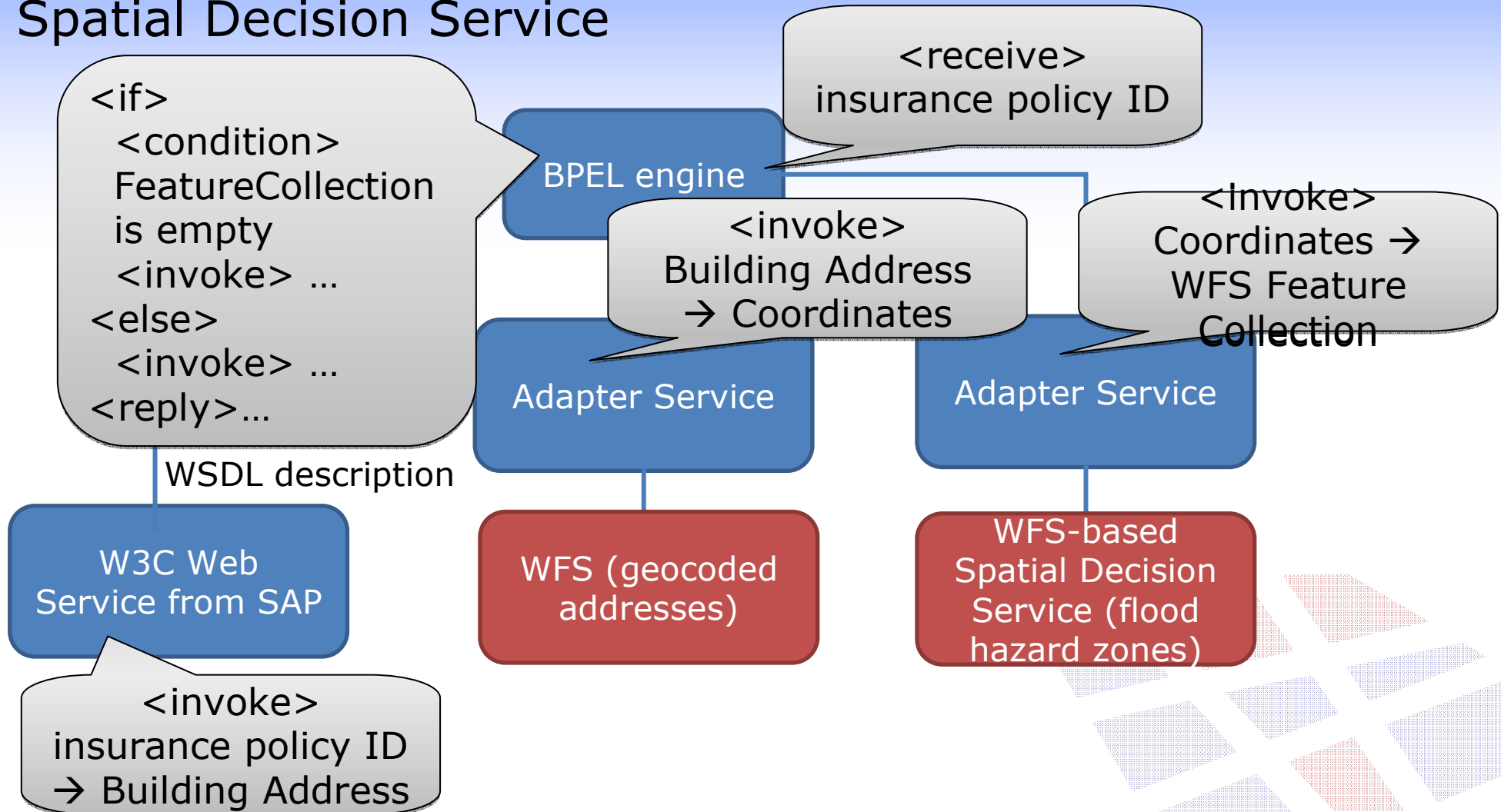
## Concept 2: WPS-based Spatial Decision Service

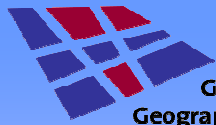
- Pros:
  - Low Complexity
- Cons:
  - Explicit Spatial Decision Service needed in addition to WFS
  - Decision Service might be application-specific





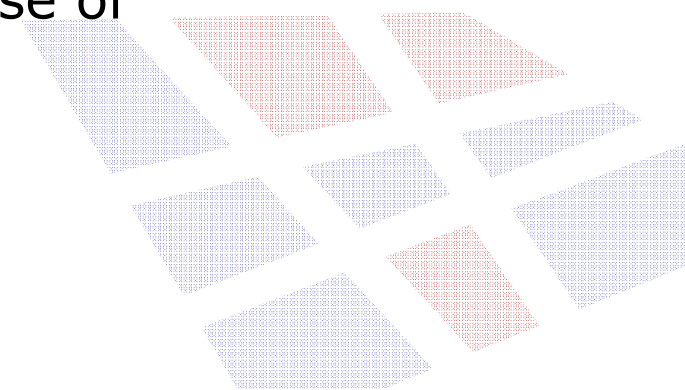
# Insurance Use Case with WFS-based Spatial Decision Service

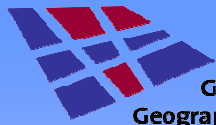




## Conclusions

- BPEL lacks “Spatial Decision Gateways” = spatial operators for branching business process workflows
- Three approaches to integrate the concept of Spatial Decision Gateways into BPEL discussed
- Approach “Spatial Decision Service” is most promising
- Standards-based concepts for a Spatial Decision Service Interface:
  - WFS-based
  - WPS-based
- Not trivial to integrate OWS into BPEL because of
  - generic nature
  - vague WSDL and SOAP support





## BPEL Process fragment for the Insurance Use Case – WFS-based Spatial Decision Service

```
<sequence>
  <receive/><!-- input from client -->
  <assign/><!-- define inputs for service invocation -->
  <invoke/><!-- get address of building from SAP service -->
  <assign/><!-- define inputs for service invocation -->
  <invoke/><!-- get co-ordinates from address geocoding service -->
  <scope>
    <sequence>
      <assign/><!-- define inputs for service invocation -->
      <invoke/><!-- invoke Spatial Decision Service (WFS for flood hazard zones) -->
      <if>
        <condition/>
          <!-- Spatial Decision Service returns empty result -->
          <assign/><!-- assign value to output variable of the process -->
        <else>
          <!-- Spatial Decision Service returns flood hazard zone
            features -->
          <assign/><!-- assign value to output variable of the process -->
        </else>
      </if>
    </sequence>
  </scope>
  <reply/><!-- return output variable to client -->
</sequence>
```

