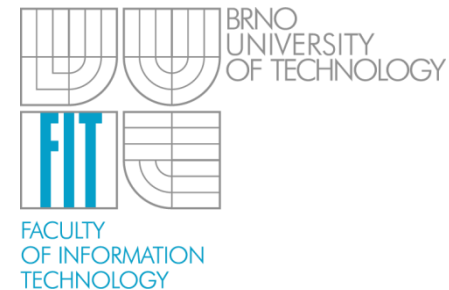


# Web Service Migration using the Analytic Hierarchy Process

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## Introduction

- Web service Migration in SOA and Software mobility
- Service and Provider Context Profiles

## Web service Migration Framework

- Web service Migration Architecture
- Migration Decision Making Based on the Analytic Hierarchy Process

## Summary and Future Work

- Web Services provided by mobile/embedded devices
  - have to utilize limited resources (CPU, RAM, battery, etc.)
  - run in unreliable environment (network connection, etc.)
- In such cases the challenge is to ensure QoS
- Software mobility can be comprehended as service migration in Service-oriented Architectures (SOA)
  - by enabling services to be moved across the service providers at runtime
  - by enabling service re-usability that is one of SOA principles

1. Enable ontology reasoning to discover migration necessity.
2. Define service and service provider static and runtime properties
3. Include criteria to be considered during a migration decision making process.
4. Define service and service provider static preferences in Jena rules form.
5. Consider performance during processing of the model in Jena.

```
<hasProperty>
  <!-- contains the related properties. -->
  <ExampleProperty>
    <!-- An example of service's or provider's property -->
    <propertyValue rdf:datatype="http://www.w3.org/2001/XMLSchema#int">
      <!-- The value of the property is noted here. -->
    </propertyValue>
    <propertyType rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
      <!--
        The type of the property is noted here. i.e., "INT"
      -->
    </propertyType>
    <criteria rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
      <!--
        The 'criteria' node specifies a criterion that controls this property.
      -->
    </criteria>
  </ExampleProperty>
</hasProperty>
<rules>
  <!--
    contains service's/provider's preferences represented in JENA rules.
  -->
  <rule>
    <!-- [JENA rule: ...] -->
  </rule>
</rules>
<noPreferenceRules rdf:datatype="http://www.w3.org/2001/XMLSchema#boolean">
  <!--
    "true" if there is 'rules' node in the model, "false" if there is not
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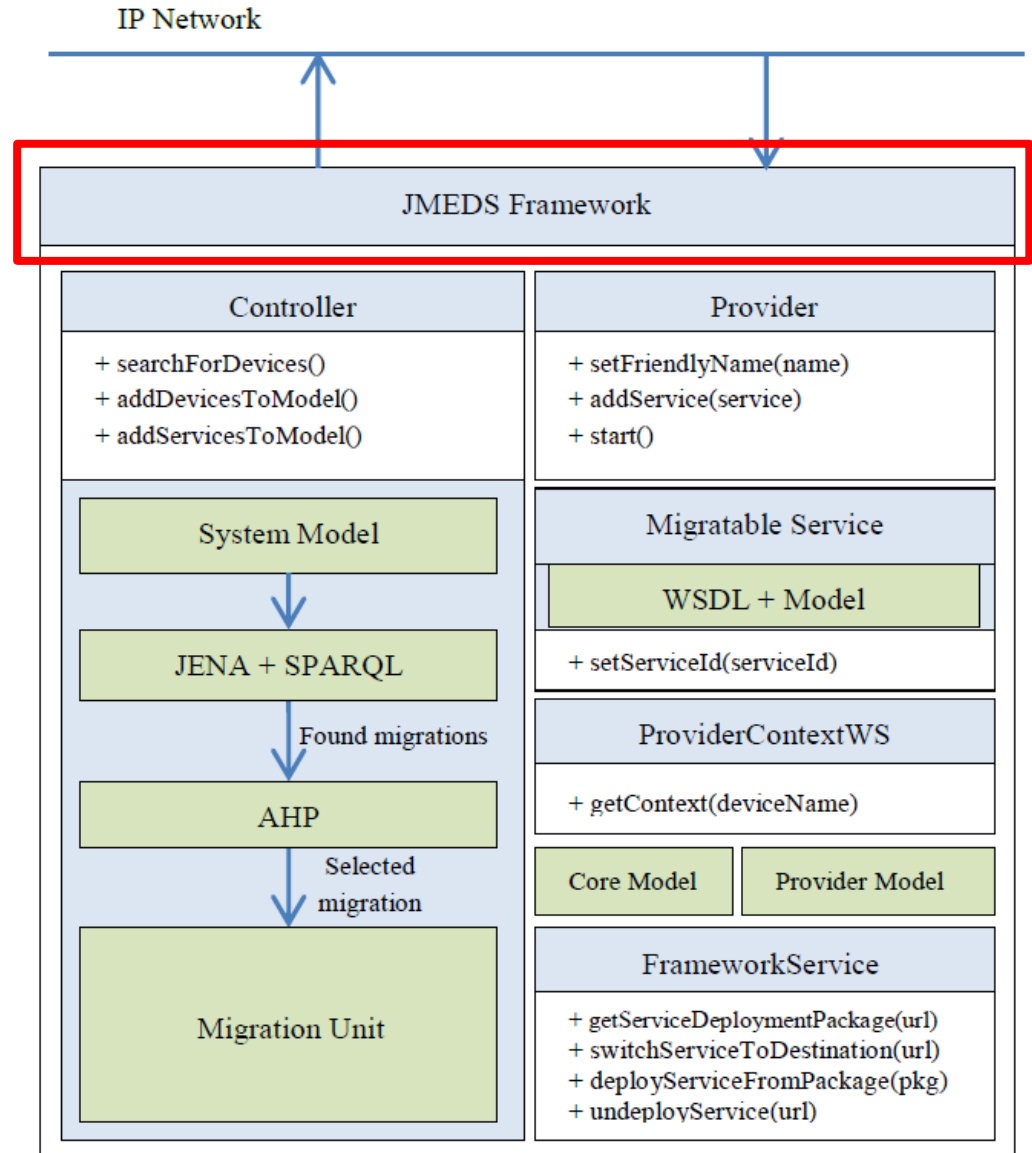
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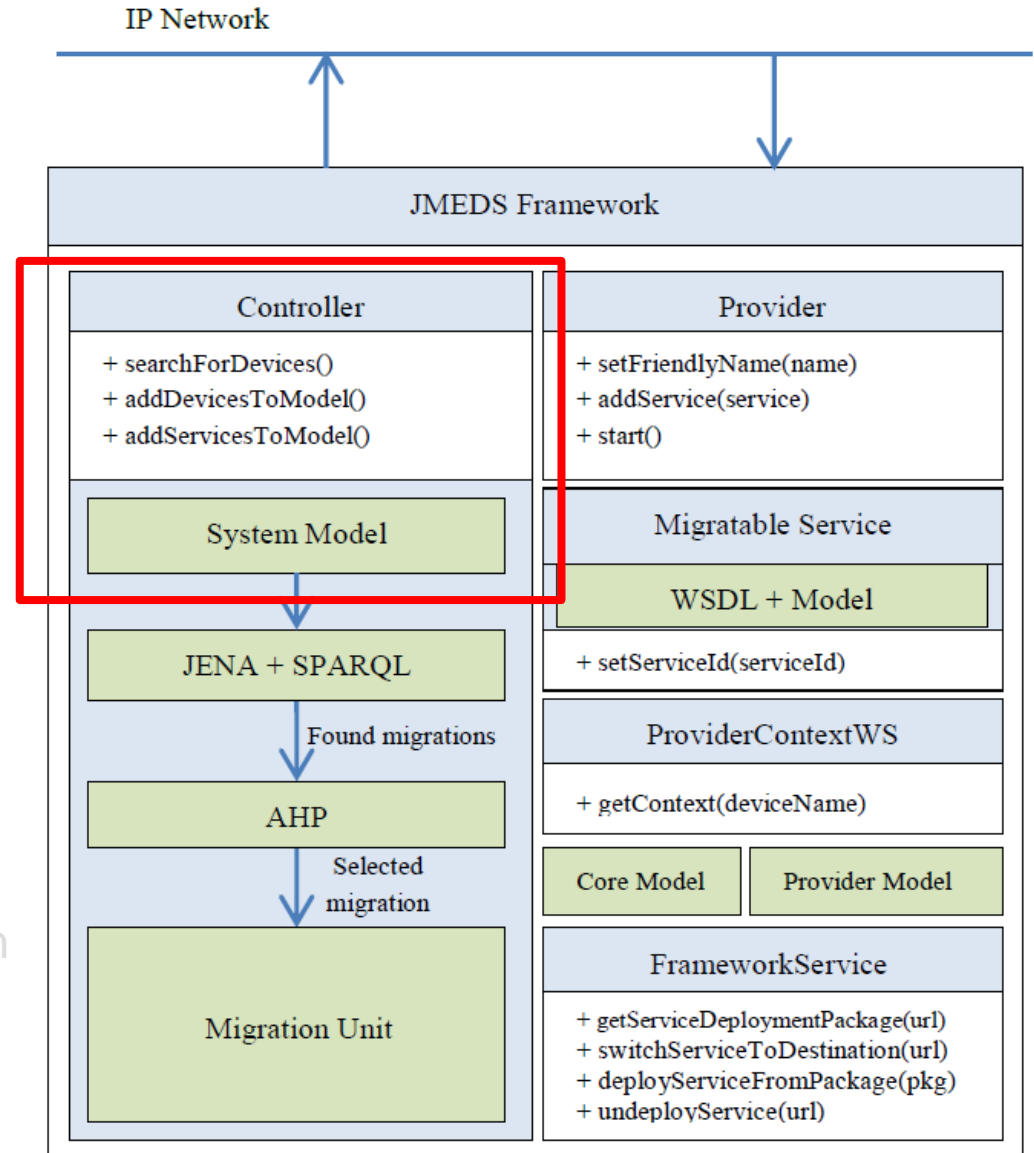
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</hasProperty>
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</hasProperty>
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    <propertyValue rdf:datatype="http://www.w3.org/2001/XMLSchema#int">2</propertyValue>
    <propertyType rdf:datatype="http://www.w3.org/2001/XMLSchema#string">INT</propertyType>
    <criteria
      rdf:datatype="http://www.w3.org/2001/XMLSchema#string">core:OriginBatteryLifeTimeCriteria</criteria>
    <criteria
      rdf:datatype="http://www.w3.org/2001/XMLSchema#string">core:DestinationBatteryLifeTimeCriteria</criteria>
  </BatteryLifeTime>
</hasProperty>
<rules>
  <rule>
    [YProviderPreference: (?service rdf:type core:MigratableService), (?origin rdf:type
    core:CandidateOriginServiceProvider), (?destination rdf:type core:CandidateDestinationServiceProvider),
    equal(?destination, core:YProvider), (?origin core:provides ?service), (?service core:hasProperty ?
    property),(?property rdf:type core:ServiceType), (?property core:propertyValue ?v1), eq(?v1,
    "major"^^http://www.w3.org/2001/XMLSchema#sting) -> (?destination core:possibleProvidedService ?
    service)]
  </rule>
</rules>
<noPreferenceRules rdf:datatype="http://www.w3.org/2001/XMLSchema#boolean">>false</noPreferenceRules>
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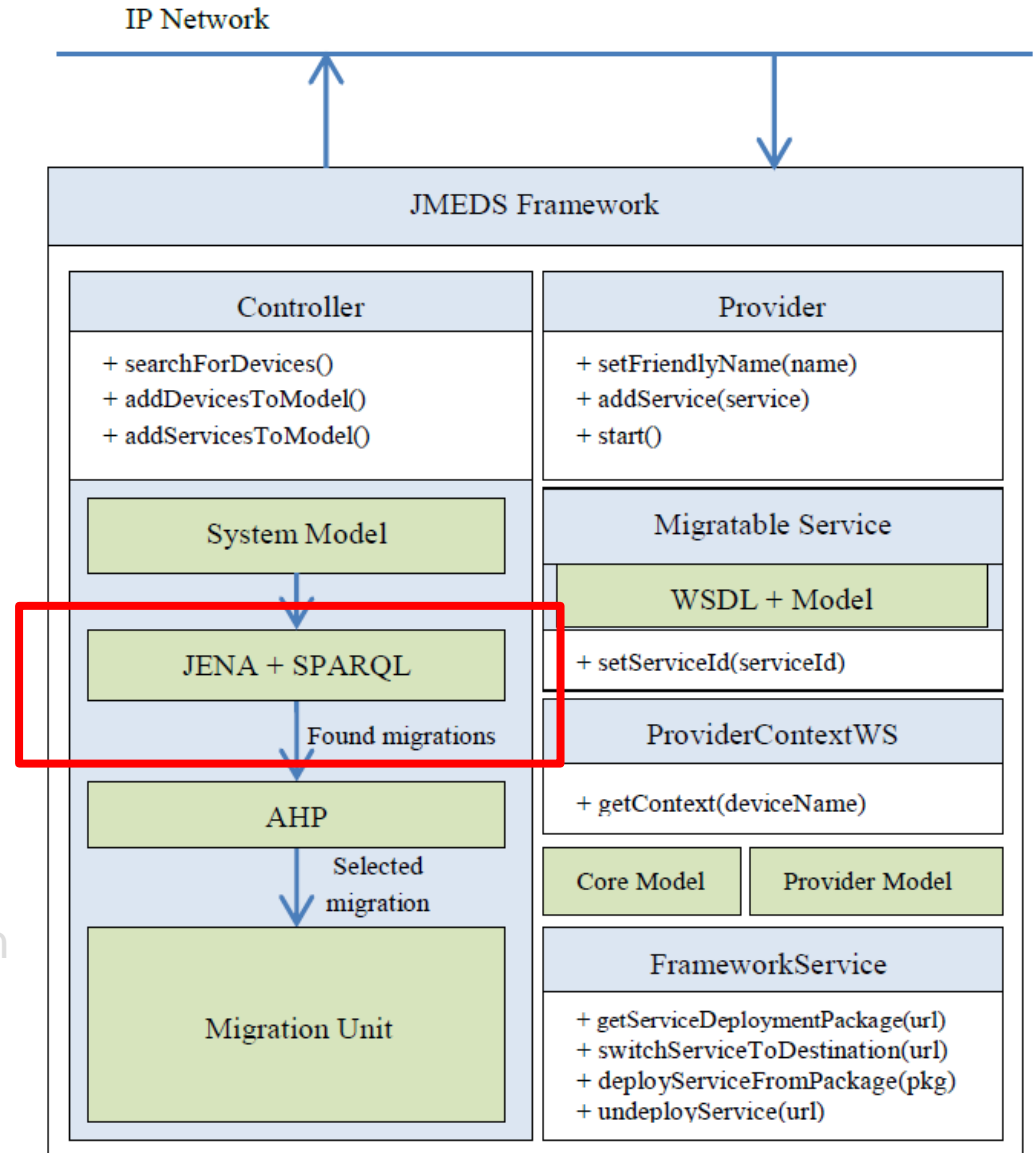
- Utilize JMEDS framework for services and devices discovery.
- Retrieve providers and services models to create a system model.
- Perform context reasoning using Jena reasoners.
- Query the system model for possible migrations.
- Initiate migration AHP matrices.
- Take the best migration decision using the AHP.
- Perform Web service migration to a new provider.



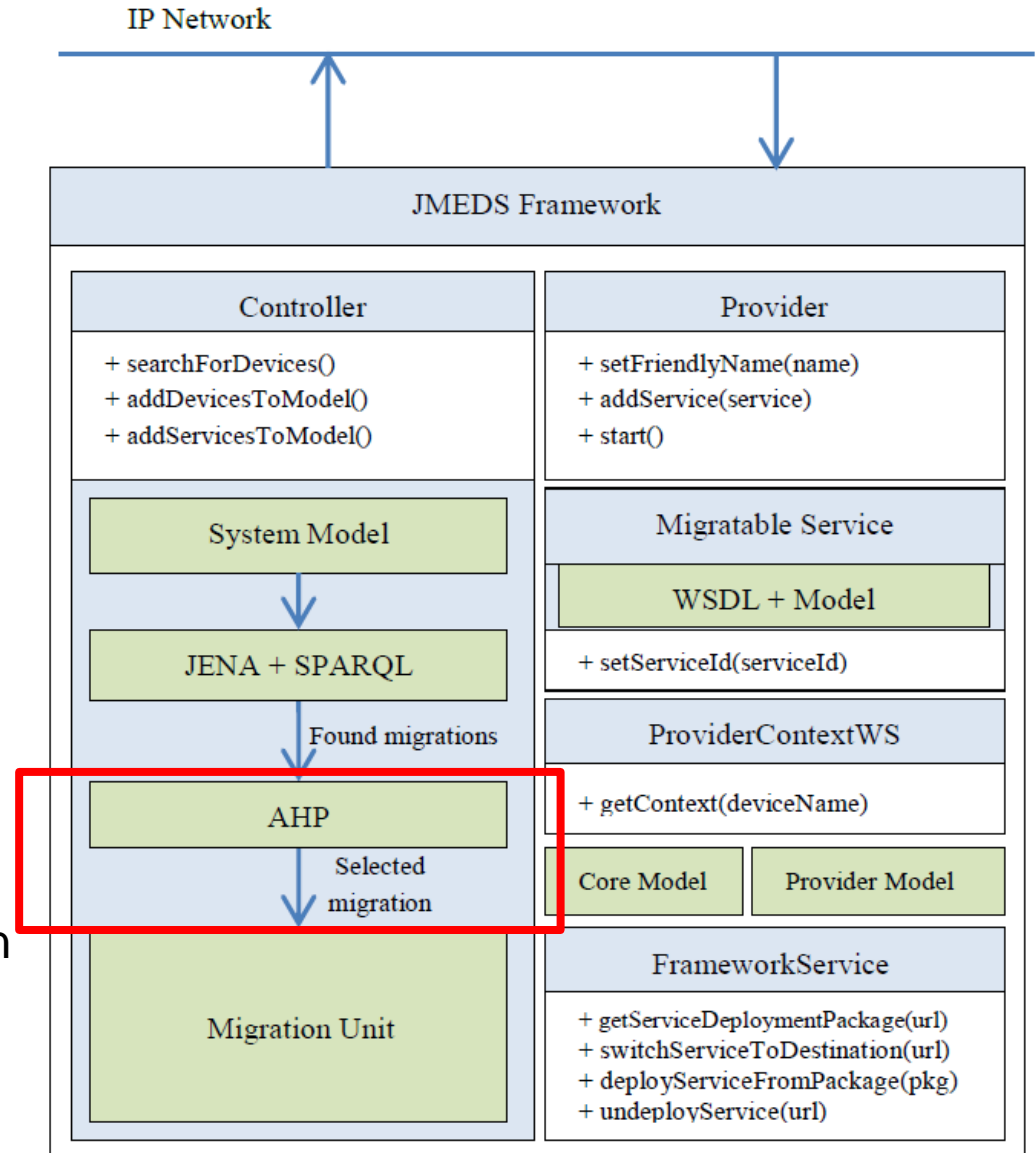
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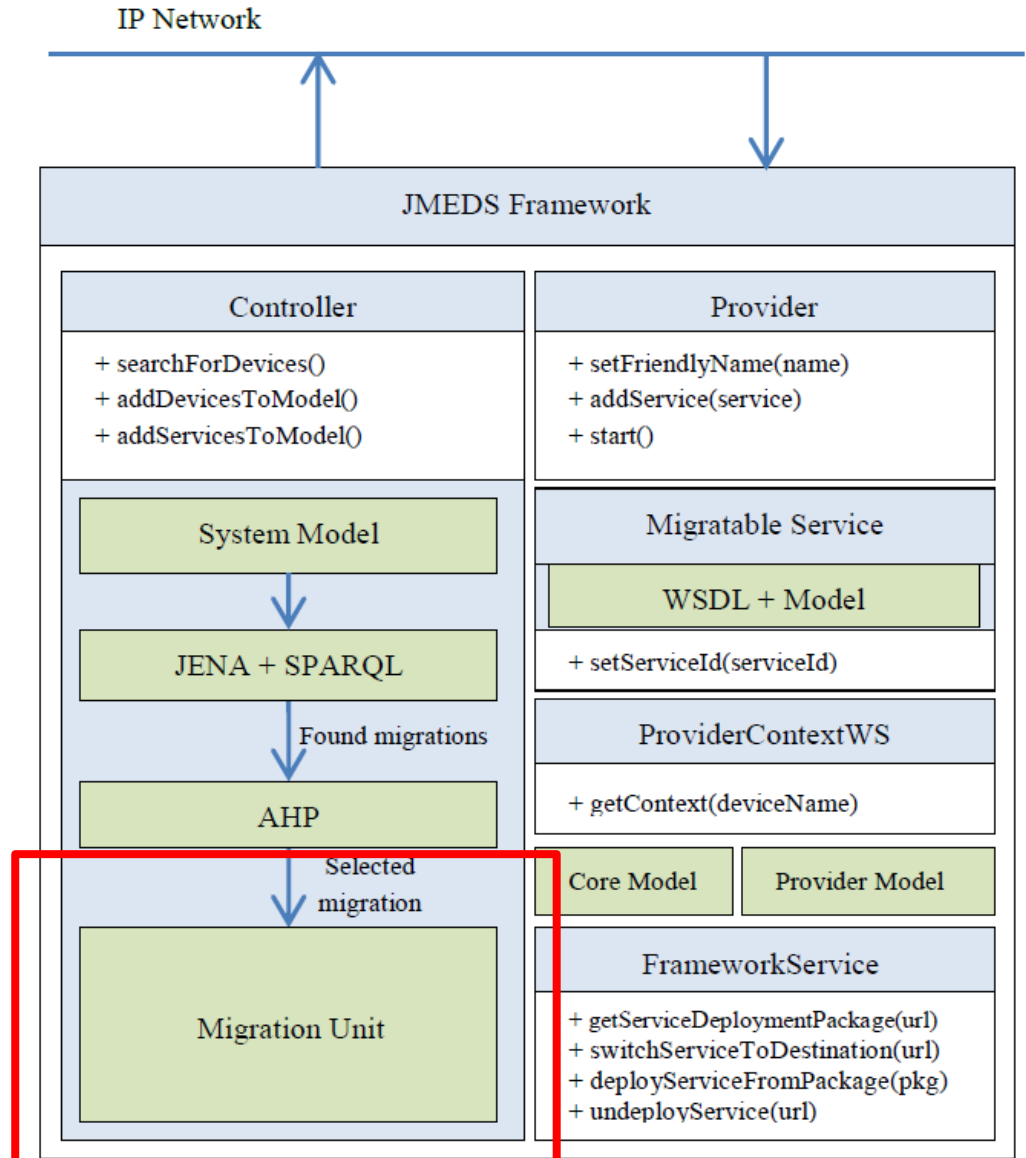
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- AHP computes the composite weight vector  $p$  of all possible  $n$  migrations

$$P = V \cdot w$$

- AHP requires:
  1. List of  $n$  possible migrations  
(the result of reasoning process of system services and service provider preferences + SPARQL query)
  2. List of  $m$  considered criteria  
(extracted from system model)
  3. Criteria comparison Matrix  $A$  to compute  $w$  vector  
(automatically generated by implementing *InitializeCriteriaMatrix* algorithm based on *CriteriaPriorities* of individual criteria)
  4. Migration comparison Matrix for each criterion to compute  $V$  vector  
(automatically generated by implementing *InitializeMigrationMatrices* algorithm)

- 1. Service migration between devices is utilized to increase the adaptability of SOA in a mobile environment.**
- 2. Automatic discovery of new providers and services joining a system.**
- 3. Web service migration based on services and providers preferences reasoning process by Jena reasoners.**
- 4. Analytic Hierarchy Process (AHP) decision making method is used to find the best possible Web service migrations.**
- 5. Web service migration is proposed to keep a required quality of services (QOS).**

## **Future work**

- 1. Improve scalability and performance of the framework.**
- 2. Extend the implementation with other mobile cloud computing features.**

Thank you for your attention!