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BASMATI Glossary

Term/Acronym	Definition
Mobile cloud services	Online services offered by cloud resources to support mobile apps. The backend of the mobile apps.
CP	Cloud Provider. The actor that provides the cloud infrastructure/resources, such as VMs
CSP	Cloud Service Provider. The actor that provides cloud services on top of a rent infrastructure from a CP
Cloudlet	Limited capacity infrastructures with virtualization capabilities, often used to support a limited amount of users or perform a limited set of operations on behalf of the central cloud infrastructure that hosts the complete application
Edge resources	Resources aimed to operate specialized functionality, located at the "edge" of the network infrastructure, thus, closer to the end users. Examples are (clusters of) RaspberryPis or cloudlets
BUDaMaF	BASMATI Unified Data Management Framework
KE	Knowledge Extractor
DM	Decision Maker
RB	Resource Broker
MVD	Mobile Virtual Desktop
DASFEST	An 3-day long music festival taking place in Karlsruhe, Germany every July
ACE	Amenesik Cloud Engine. The cloud service deployment tool through which actual federation is achieved
BEAM	BASMATI Enhanced Application Model. An extension of the TOSCA specification
ASP	Application Service Provider. A Federation user that rents resource services in order to provide an Application services to End-users
Brokering	The matchmaking support provided by BASMATI platform to decide about the best cloud resources to exploit for the execution of the back-end of BASMATI applications. This activity regards the placement of the services or data on computational resources and storages belonging to the cloud data centre and the cloudlets within the federation.
End user	A user who benefits the various application and infrastructure services provided by the Cloud. Within BASMATI, the most typical example is exploiting the Cloud federation via a mobile device (possibly a laptop) using specialized apps or a web browser.
Offloading	The ability of BASMATI platform supporting the runtime placement of the components composing the front-end of BASMATI applications on edge resources available nearby the end user. This activity takes place both when edge and mobiles exchange one each other their own workload or when such devices transfer some workload to the clouds or cloudlets. In BASMATI we often distinguish Front-end offloading, related to the mobile part of application, from Back-end offloading, concerning the server side of applications. The latter roughly translates to the known concept of Cloudbursting.
QoE	Quality of experience. It is a measure of a customer's experiences with a service. It may be related to some aspects of the QoS and QoP, but can also take into account other metrics.

Service handover	Service handover refers to the activity of transferring an active service between two computational resources (e.g. Cloudlets) with minimal or no disruption on the availability of the service. Ideally, service handover is transparent with respect to the user.
Situational Awareness	The ability of the BASMATI platform to recognise the “situation” characterising the actual combined status of users, applications and resources, aimed at achieving an effective and efficient management of applications and resources.

Executive Summary

This deliverable document addresses the Dynamic Cloud Federation Prototype and the deployment of the components that are related to the demonstration of cloud federation. Each of the components will be described in terms of their contribution to the overall architecture. A detailed description will be provided allowing easy deployment and configuration of the resulting platforms for the demonstration of automated mutualization of cloud provisioning resources between commercial operators of the resulting cloud service federation.



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1 Introduction

1.1 Overview of Cloud Federation

Besides market places, cloud federation has been seen as a possible solution for the volatility in the number of user requests and for the anti-competitive externalities of the economies of scale in the cloud service sector. Horizontally dynamic cloud federation allows small cloud providers to collaborate and gain access to economies of scale by increasing the amount of infrastructure resources available to them. It also helps ensuring the users' quality of service and minimizing costs.

Extensive research has been done on optimizing the performance of certain federations and on dealing with challenges, such as resource sharing and interoperability. Factors hindering providers to adopt cloud federation have also been investigated. Despite the promises of cloud federation, it is important to state that there is no functional federation in the commercial market.

After a thorough review of the cloud federation literature, several factors were identified as important for incentivizing federations and coalitions. Amongst them, the concept of capacity-based revenue sharing is perhaps the most prominent one. It is a resource and revenue sharing mechanisms, which determines how CPs in a federation share their computational resources, and more importantly, the profits that result from the collaboration. Having an efficient mechanism is of paramount importance as well since they encourage CPs to participate in a federation.

1.2 Purpose of the Deliverable

This deliverable document describes the demonstrator software of the Dynamic Cloud Federation Prototype that results from the research and development performed during the BASMATI project.

1.3 Relation to other Deliverables

This deliverable is based on the cloud federation principles that are described in detail in the deliverable D4.1 "Dynamic Cloud Federation: Design and Specification".

1.4 Outline of Deliverable

This deliverable is organized as follows. Section 2 provides an overview of the demonstration scenario, the components of which will be introduced in Section 3. Following on from this, Section 4 describes the steps required to be taken for the deployment and configuration of the components as individual operator platforms. Finally, Section 5 refers to the actual code and a usage scenario.

2 Overview of the Dynamic Cloud Federation Prototype

The Basmati Dynamic Cloud Federation Prototype demonstration will simulate the involvement of five individual cloud service providers each with the intention of operating their own commercial cloud services platform. The operator's platforms will be based on the Generic Cloud Federation Platform software from Basmati. Each of the operators will have pre-negotiated cloud provisioning subscription accounts with different third party public cloud vendors and may perhaps offer access to their own private cloud resources. In the demonstration scenario, the first platform operator will bring their AMAZON AWS public cloud provisioning subscription to the federation and their associated technical expertise for the support of resources deployed through the Elastic Compute Cloud service EC2. The second operator will bring their OVH public cloud provisioning subscription to the federation and associated expertise. The third platform operator will bring their catalogue of application software solutions and a collection of associated added values application service offerings. After the initial deployment and configuration of the three individual operator platforms, the three operators will then be brought together to form a dynamic cloud federation through the negotiation and exchange of cloud federation service level agreements. Each service level agreement will be used to represent the relationship between two of the federation members, the initiator and responder of the agreement. These agreements will stipulate the details and afferent conditions and guarantees of the provisioning made available to the other party to the agreements and eventually through to other secondary members of the resulting federation. Finally, applications and services, that are made available by the third operator, will be instanced for use by a hypothetical customer of that platform operator, making seamless use of the mutualized cloud provisioning resources made available through their federation agreements with the two other operator members of the federation. During the creation of an instance of an application service for a customer, the operators platform will request the selection and placement of the cloud resources as required to satisfy the topology of the application. These resource placement requests will be forwarded automatically to other operator members of the federation across the corresponding federation links under the guidance of the associated service level agreements. In this way, the application service operator delivers their application service, to their customers, without having any cloud resource provisioning subscriptions of their own. All provisioning cloud resources being the responsibility of the federation member operator that was selected during the resource placement phase of service instantiation. Payment by the customer will be in response to invoices presented by the application service operator which will be invoiced, in turn, by the other federation members that have contributed resources in support of the delivery of service to the customer.

3 Software Components

The sources of all software components are available from the BASMATI GIT repository but to facilitate the demonstration we shall be using the component packages which have been pre-prepared and made available for the purposes of the prototype.

The Dynamic Cloud Federation Prototype comprises the following collection of software packages which are to be installed and configured for each Federation Member Platform instance.

3.1 Platform Publication Service

The Publication Services component provides the centralised service directory of each instance of a Cloud Federation Member Platform. All secondary technical service endpoints will be published here as they are brought online during platform deployment making their binding information available for use by other components of the platform and providing the fundamental generic linkage required for remote resolution of federation support services by other federation member platforms.

3.2 Platform Security Service

The Security Services component is responsible for providing account, identity, and organisational role-based access control and management. As such this component performs the role of both policy definition point PDF and policy enforcement point for an instance of the platform.

3.3 Platform Kernel Service

The Kernel Services component is responsible for providing the technical services required in support of the generic resource and application modelling, service level agreements and their conditions and guarantees, service instance with monitoring and life cycle management and financial pricing costing and invoicing services.

3.4 Platform Cloud Provider Service

This Cloud Provider Services component encapsulates the collection of third party cloud provisioning interfaces and their associated subscription management systems. This component will be responsible for the ordinance and coordination of all deployment operations through the private, public and edge resource and service provisioning APIs made available by the commercial operator of a platform instance.

3.5 Platform Remote Command Service

The Remote Command Service component provides remote access for the launch of bulk platform service operations including application service models and description, service level agreements, subscription and configuration data import and export.

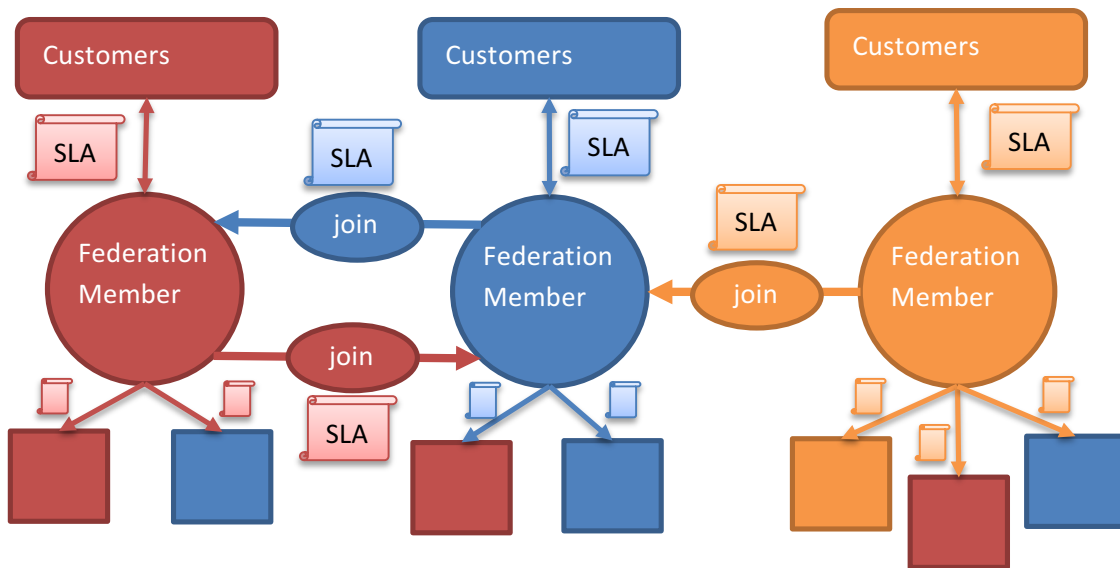
3.6 Platform Web User Interface

The Web User Interface not only allows a platform operator to manage the day to day operation of their instance of the platform but also allow their customers to procure and manage the deployment consumed application service instances.

4 Deployment of the Dynamic Federation Prototype

4.1 Deployment Overview

The following diagram shows an overview of a simple three-member Federation example that will be used as the basis for the demonstration of the operation of the Dynamic Cloud Federation Prototype.



The Dynamic Cloud Federation Software will be deployed for each of the individual cloud application services provider platforms. The individual platforms will then be configured in terms of their offers of service, both resource provisioning and application services. The individual platforms will then be joined to form a federation through their service level agreements.

Depending on the scale of the required platform, each of the individual software components or packages may be deployed either in their own virtual machine environment or in a load balanced cluster. For the purposes of the demonstration of the prototype the components will be deployed and configured in a single deployed machine.

4.2 Cloud Operator One

The platform representing the first cloud operator will be deployed on a virtual machine at AMAZON AWS in Paris, France as outlined in the following steps:

1. Start an EC2 medium compute node running Ubuntu 14.04 on Amazon AWS in the Paris France region.
2. Setup the DNS name with the resulting IP address allocated for the platform.
3. Logon to the machine and download the Dynamic Cloud Federation Prototype installation script from the BASMATI GIT repository.

4. Set the environment variables describing operator platforms details and then the Launch the installation script.
5. Connect to the user interface of the machine and create a new account.
6. Logon to the Dashboard.

4.3 Cloud Operator Two

The platform representing the first cloud operator will be deployed on a virtual machine at AMAZON AWS in Paris, France as outlined in the following steps:

1. Start an EC2 medium compute node running Ubuntu 14.04 on Amazon AWS in the Paris France region.
2. Setup the DNS name with the resulting IP address allocated for the platform.
3. Logon to the machine and download the Dynamic Cloud Federation Prototype installation script from the BASMATI GIT repository.
4. Set the environment variables describing operator platforms details and then the Launch the installation script.
5. Connect to the user interface of the machine and create a new account.
6. Logon to the Dashboard.

4.4 Cloud Operator Three

The platform representing the first cloud operator will be deployed on a virtual machine at AMAZON AWS in Paris, France as outlined in the following steps:

1. Start an EC2 medium compute node running Ubuntu 14.04 on Amazon AWS in the Paris France region.
2. Setup the DNS name with the resulting IP address allocated for the platform.
3. Logon to the machine and download the Dynamic Cloud Federation Prototype installation script from the BASMATI GIT repository.
4. Set the environment variables describing operator platforms details and then the Launch the installation script.
5. Connect to the user interface of the machine and create a new account.
6. Logon to the Dashboard.

4.5 Cloud Operator Four

The platform representing the fourth cloud operator will be deployed on a physical machine on-site at the DAS FEST in Karlsruhe Germany, as described in the following steps:

7. Start an EC2 medium compute node running Ubuntu 14.04 on Amazon AWS in the Paris France region.
8. Setup the DNS name with the resulting IP address allocated for the platform.
9. Logon to the machine and download the Dynamic Cloud Federation Prototype installation script from the BASMATI GIT repository.

10. Set the environment variables describing operator platforms details and then the Launch the installation script.
11. Connect to the user interface of the machine and create a new account.
12. Logon to the Dashboard.

4.6 Cloud Operator Five

The platform representing the fifth cloud operator will be deployed on the Private OpenStack Cloud at ETRI in South Korea, as described in the following steps:

13. Start an EC2 medium compute node running Ubuntu 14.04 on Amazon AWS in the Paris France region.
14. Setup the DNS name with the resulting IP address allocated for the platform.
15. Logon to the machine and download the Dynamic Cloud Federation Prototype installation script from the BASMATI GIT repository.
16. Set the environment variables describing operator platforms details and then the Launch the installation script.
17. Connect to the user interface of the machine and create a new account.
18. Logon to the Dashboard.

5 Operation

The Dynamic Cloud Federation Prototype, that was deployed as described in the preceding section, can be used to demonstrate the mutualization of cloud provisioning resources in support of federation members providing application services to their customers, based on the scenario described in the README.md document of the gitlab repository.

The source code of the BASMATI Federation Business Logic can be downloaded from the Basmati Git Lab repository, located at the following URI:

```
basmati.amenesik.com/code/platform/modules/federation_business_logic.git
```

using the following credentials:

- username: guest
- password: basmati_review7012

The five operator Platforms will be started as indicated in the sections above and when the ACE Dashboard of each becomes available the actions described in the README.md are to be performed.