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"Federated Cloud resource brokerage for mobile cloud services"

D5.2
Scalable big data management: Software Prototype

Project acronym: BASMATI

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1.0	24/04/2018	Incorporated final comments from internal review	V. Psomakelis/ICCS

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

The BASMATI platform is about providing advanced cloud services to any application that needs to get into the world of cloud computing. It connects different cloud providers together in order to create a federated resource pool that application providers can use to enhance the quality of service that they are able to provide.

The Data Management in BASMATI is about creating a unified method of performing data and data store related tasks inside the BASMATI platform. It aims to provide the ability of easily and seamlessly relocating and offloading data between the different cloud providers that contribute to the federation. Amongst the provided services are the following: data migration, data replication, data reads and writes, data store scaling, data store creation and destruction, data store migration and replication. This ability will aid the application providers in their efforts to uphold their quality of service requirements, as agreed in their SLAs, especially in tasks that are highly dependent on quick response times and big data.

This document is just the accompanying report to the actual prototype and it is tied to the associated demonstration video.

Table of Contents

1 Relationship to Other Deliverables

The design and specification of the demonstrated component is presented in the BASMATI deliverable D5.1: "Scalable big data management". One may find there, the description of the prototype, its components, use case diagrams and many other aspects of the framework that will help understand the inner workings of the tasks taking place in the demonstration video.

2 Demonstration Location

For the purposes of this demonstrator, we provide the URLs for a video presenting how the component can be used, an endpoint to the working service, the endpoint of the GUI and the link to the source code (gitlab).

Youtube URL : https://youtu.be/_zp54nc7KNQ

RestFul web service root: http://snf-755174.vm.okeanos.grnet.gr:8080/federation_data_management/webresources/

Graphical User Interface: http://snf-755174.vm.okeanos.grnet.gr:8080/federation_data_management/index.jsp

Source Code:
http://basmati.amenesik.com/code/platform/modules/federation_data_management

(GitLab Credentials):

- User: Guest
- Pass: basmati_review7012

3 Demonstration Summary

The demonstration video is explaining each step in detail, using subtitles in English. The video starts by showing the web graphical user interface (wGUI) which is created for demonstration purposes. After loading a pre-created configuration file, containing the details of one user with 4 machines available to him and one mongoDB cluster set up on these machines, the video goes on showing the machine and database management capabilities of the user interface and the underlying RestFul web services that it uses.

After a short demonstration of the main data store management services, we present the experimental data of a real use case, automated scaling to support rapidly increasing user activity in a large event. The results are compared to a baseline that did not use scaling of any kind and we see that the main target, which is to uphold quality of service restrictions, is

achieved. The effects of the increasing user activity are countered, proving the necessity of such a mechanism. After that we are showing an estimation of the Service Level Agreement (SLA) violations, concerning the promised response times by the application provider. We show that with scaling enabled the violations are dropping greatly, reducing the costs to the service provider.

4 Prototype Installation Guide

The prototype can be downloaded from the provided GitLab link in section 2. Then it needs to be compiled into a war file and be deployed on a java enabled web server. The framework was developed and tested on the Glassfish 4.0 server.

Code Snippet of the Installation process
git clone "http://basmati.amenesik.com/code/platform/modules/federation_data_management"

These instructions concern the process of deploying the services on a new server, in order to use the framework we can just call the already available services on the end points provided in section 2.

5 Conclusions

To conclude, we have demonstrated the BUDaMaF component of the BASMATI framework, which handles data and data store management inside the federation. We also have proven its usefulness testing it against a realistic scenario, tied to one of the BASMATI use cases, the large events application, or DasFest App. Finally, we have proven that the automated scaling provided by BUDaMaF, using the federated resources inside BASMATI, is enough to limit the costs to the application providers, derived from SLA violations.

6 Annex

Following is a list of supported interfaces, which are used in a restful web service form. Details about the expected arguments are available by making a post request at: http://snf-755174.vm.okeanos.grnet.gr:8080/federation_data_management/webresources/budamaf_core

Interface Type	Responsible End Point	Description
Data Retrieval Request	BUDaMaF Core Component	An interface that receives data requests from the hosted applications, concerning the retrieval of offloaded or replicated application data.
Data Replication Request	BUDaMaF Core Component	An interface that receives data requests from the hosted applications, concerning the replication of application data.
Data Offloading Request	BUDaMaF Core Component	An interface that receives data requests from the hosted applications, concerning the offloading of application data.
Scale request	BUDaMaF Core Component	An interface that enables a hosted application to request a data store scale up or down according to its current needs.