SUPERCLOUD - User-centric management of security and dependability in clouds of clouds

Newsletter

December 2015 - Issue 2

The SUPERCLOUD approach

Despite its unravelling business benefits, distributed cloud computing raises many security and dependability concerns today. Root causes include an increase in complexity and lack of interoperability between heterogeneous, often proprietary infrastructure technologies. **SUPERCLOUD** researches and develops new security and dependability infrastructure management paradigm. Our approach is on one hand, User-Centric for self-service clouds-of-clouds, i.e., customers can define their own protection requirements and avoid provider lock-ins. On the other hand we focus on Self-Managed services for self-protecting clouds-of-clouds which can reduce administration complexity through automation.

In this Issue

SUPERCLOUD technical meeting in Lisbon

From 30th September to 2nd October 2015 the third SUPERCLOUD technical meeting was hosted by partner FFCUL in Lisbon, Portugal. The aim of the project was to review the current status and progress of the project and to discuss the status of a number of upcoming deliverables (D1.1, D1.2, D2.1, D3.1 and D4.1). Another focus was put on the component architecture as well as on data and service architecture discussions. Based on the discussions constructive decisions could be taken with regards to two fundamental deliverables. Furthermore, the face-to-face meeting was used to engage in use case discussions, to identify the requirements and to agree upon a framework. First brainstorming for the next meeting, to which the Advisory Board members will be invited, was done and several parameters have already been defined.

Publications

Software-Defined Networks: On the Road to the Softwarization of Networking
F. M. V. Ramos, D. Kreutz, P. Veríssimo, Cutter IT Journal, May 2015.

Proactive Security Analysis of Changes in Virtualized Infrastructures
S. Bleikertz, C. Vogel, T. Groß, S. Mödersheim, Annual Computer Security Applications Conference (ACSAC), Los Angeles, USA, 2015.

Towards User-Centric Management of Security and Dependability in Clouds of Clouds
M. Lacoste, F. Charmet, 6th International Conference on E-Democracy, Athens, Greece, December 2015.

Similarity Measures for Security Policies in Service Provider Selection
Y. Li, N. Cuppens-Boulahia, J.-M. Crom, F. Cuppens, V. Frey, X. Ji, 11th International Conference on Information Systems Security (ICISS2015), Kolkata, India, December 2015.

SUPERCLOUD on the web - www.supercloud-project.eu/

Apart from general SUPERCLOUD **project information**, related **news**, like upcoming **meetings** and **conferences**, as well as SUPERCLOUD scientific **publications** and other dissemination material can be found on our project website. In addition to that, all public **deliverables** will be uploaded and made accessible on our project website after they have gone through the internal review process.

Key Data:

Start Date:	1 February 2015
End Date:	31 January 2018
Duration:	36 months
Project Reference:	643964
Project Costs:	€ 6.863.279
Project Funding:	€ 5.398.280

Consortium:	9 partners (6 countries)
Project Coordinator:	Dr. Klaus-Michael Koch coordination@supercloud-project.eu
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SUPER CLOUD

Technical concept and achieved results

During the last couple of months one of the main focus was put on the SUPERCLOUD component architecture as well as on the **data and service architecture**. As a result two reports describing the SUPERCLOUD Architecture Specification (D1.1) and SUPERCLOUD Self-Management of Security Specification (D1.2) were finalized. These twodocuments describe the static components of SUPERCLOUD and the abstract view of the services they provide to each other and the data they need to exchange. The SUPERCLOUD vision for cloud-of-clouds security also contributed to the Summer School on Secure and Trustworthy Computing organized by TUDA and the FP7 PRACTICE project in Bucharest in September 2015, with three presentations on SUPERCLOUD architecture (Orange), cryptographic protocols for data protection (IBM), and secure replication and Byzantine fault tolerance (FFCUL). A further focus was put on defining the architecture of the **SUPERCLOUD infrastructure** enabling secure computation with self-managed protection across heterogeneous cloud providers, released in D2.1. A preliminary **architecture for virtualization and security self-management** for computation was proposed. The virtualization architecture combines nested virtualization, micro-hypervisor, and component-based hypervisor designs, which enables to reach a trade-off between interoperability across clouds and fine-grained security control between layers. A preliminary **trust management framework** was defined and a **self-management architecture** for VM security automation and a generic and lightweight method were proposed. The architecture also includes a component for configuration compliance checking: a 'Cloud Configuration Through Versioning' system was proposed for **automating configuration** of VMs and analysis of configuration changes in virtualized infrastructures. Partners worked towards a **convergent security policy model** allowing specification of security objectives to be homogeneously deployed and monitored across multiple provider infrastructures, integrating usage-control, authorization, or application-level dimensions. Partners started prototyping different components of the architecture to reach a first version of the **computation** and **self-management infrastructure**.

The **Data Management Architecture** deliverable D3.1, which is the first milestone of the WP was finalized. The architecture emphasizes innovative features SUPERCLOUD data management will support, including privacy, secure data sharing and dependability mechanisms for geo-replication. Several papers were accepted, e.g. FCUL's recent paper at Symposium on Reliable and Distributed Systems describes how to use spare replicas to lower the latency of geo-replicated protocols. IBM's Distributed Cloud Computing workshop paper describes how to dynamically reconfigure the leader set in a geo-replicated system. Orange and IMT's joint paper on matching users' security policies with those of providers was published in International Conference on Information Systems Security. Several additional papers have been submitted to top conferences such as Eurosys, DSN and Eurocrypt, and are currently under review. SUPERCLOUD aims to propose a **new architecture** that allows network virtualization to extend across multiple cloud providers, therefore increasing the versatility of the network infrastructure. In this setting, the tenant can specify the required network resources as usual but now they can be spread over the datacenters of several cloud operators. This is achieved by creating a **new network layer** above the existing cloud hypervisor to hide the heterogeneity of the resources from the different providers while offering the level of control to setup the required inks among the VMs. We follow an **SDN approach**, where the new network layer contains an Open vSwitch that is configured by an SDN controller, in order to perform the necessary virtual-to-physical mappings and the set up of tunnels to allow the network to be virtualized. Our preliminary implementation and experiments show that this extra level of indirection results in a relatively modest overhead in our target scenarios. The preliminary **architecture of the multi-cloud network virtualization infrastructure** has been described in D4.1. In order to validate the SUPERCLOUD core technology, a **testbed** that enables the reproduction in realistic settings of the two **use cases** will be set up. Therefore, a draft version of the use case descriptions and high level requirements have been recently developed. This draft has been further detailed out and has been considered in the respective deliverables .

SUPERCLOUD public deliverables submitted

As a result of the work carried out so far, the following deliverables have been submitted to the European Commission:

- D1.2 SUPERCLOUD Self-Management of Security Specification (M09)
- D2.1 Architecture for Secure Computation Infrastructure and Self-Management of VM Security (M09)
- D3.1 Architecture for data management (M09)
- D4.1 Preliminary Architecture for Multi-Cloud Network Virtualization Infrastructure (M09)
- D1.1 SUPERCLOUD Architecture Specification (M10)

MS2 Architecture Specification has been successfully achieved with the finalization of D1.1 in M10.

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