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

Newsletter

November 2016 - Issue 4

Message from the Coordinator

Since the last newsletter in May 2016, major attention was drawn to the finalisation of the use-case requirements, leading to the specifications describing the use-cases. Also the implementation of the demonstrators was one of the main focus during the last project months. Several correlation conference calls to discuss suitable solutions and detailed concepts were dedicated to the project development. As a result, the 1st project period (M01-M18) could successfully be concluded at the end of July, having reached the two planned milestones of that period:

- **MS1 " Successful Project Start" (M01)**
- **MS2 "Architecture Specification" (M09)**

In this Issue

SUPERCLOUD Technical and 1st Review Meeting in Evry and Brussels

The SUPERCLOUD consortium met for the preparation and technical meeting that was hosted by partner IMT from 13th to 14th September in Evry, near Paris, France. The main purpose of the meeting was the preparation of the first review meeting. On the first day of the meeting, partners concentrated on the refinement of the work package (WP) presentations and performed a final rehearsal of the demonstrations. Altogether, six demonstrations have been prepared for the review meeting. The second day of the face-to-face meeting was dedicated to synchronize on individual work packages and deliverables. The roadmap for the upcoming work has been discussed and responsibilities for certain tasks have been defined. First components to build forthcoming demonstrators were also identified. The review meeting took place the next day, on 15th September in Brussels. The reviewers showed great interest in the work of the SUPERCLOUD project, they raised interesting and qualified questions, and provided valuable feedback. The consortium will consider the comments and recommendations in the further project work.

Publications

XFT: Practical Fault Tolerance Beyond Crashes
S. Liu, P. Viotti, C. Cachin, V. Quéma, M. Vukolic, 12th USENIX Symposium on Operating Systems Design and Implementation (OSDI 2016), Savannah, GA, USA, November 2016.

PhishEye: Live Monitoring of Sandboxed Phishing Kits
X. Han, N. Kheir, D. Balzarotti, 23rd ACM conference on Computer and Communications Security (CCS), Vienna, Austria, October 2016.

Towards Management of Chains of Trust for Multi-Clouds with Intel SGX
H. Kanzari, M. Lacoste, 2nd Workshop on Security in Clouds (SEC2 2016), Lorient, France, July 2016.

Verifiable Message-Locked Encryption
S. Canard, F. Laguillaumie, M. Paindavoine, 2nd Workshop on Security in Clouds (SEC2 2016), Lorient, France, July 2016.

A Novel Proof of Data Possession Scheme based on Set-Homomorphic Operations
N. Kaaniche, M. Laurent, S. Canard, 2nd Workshop on Security in Clouds (SEC2 2016), Lorient, France, July 2016.

All SUPERCLOUD publications are accessible via the project website. Furthermore, we provide open access to all scientific peer-reviewed publications and underlying research data via ZENODO. For an easy and convenient overview of all SUPERCLOUD publications and research data, please visit our SUPERCLOUD Community on Zenodo.

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)
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SUPER CLOUD

Technical progress and achieved results

Since the last issue of the SUPERCLOUD Newsletter in May, **WP1** has started activities towards the **implementation of an integrated demonstrator** of the SUPERCLOUD architecture. The design of the demonstrator will include core components from each of the sub-architectures required to realize SUPERCLOUD services in a multi-cloud provider setting and the required security self-management components for enabling SUPERCLOUD user control over security settings of their respective User Clouds (U-Clouds). Next steps include the **identification of components to be included** in the demonstrator and drafting of the technical **design** of required **integration components**. This will be done in close cooperation with the technical work packages responsible for the sub-architecture planes.

WP2 focused on prototypes illustrating functionalities of the SUPERCLOUD computation infrastructure. A "U-Cloud as code" virtualization prototype based on the ORBITS orchestration framework was demonstrated during the SUPERCLOUD mid-term review meeting, with a paper accepted in a special issue of **IEEE Cloud Computing**: distributed U-Clouds run over multiple Open Stack platforms, with security services selectively "weaved" under user control, infrastructure elements being specified using TOSCA templates. U-Cloud fine-grained control over multiple infrastructure layers was also proven possible through a functional U-Cloud prototype running nested VMs over Xen and NOVA micro-hypervisor. Progress was made on implementing secure computation environments based on Intel SGX enclaves, in isolation from the cloud provider. A first framework was proposed to manage trust between chains of such enclaves with encouraging scalability results, and a paper published at the SEC2 2016 workshop on cloud security. A new, highly promising direction of research was also launched to explore virtualized FPGAs as extension to SUPERCLOUD to boost performance and security. For policy specification and enforcement, aWP2-WP4 integrated prototype for usage control in SDN-based clouds was demonstrated on an availability use case, with a paper accepted at HPCC'16. A new geolocation-restricted data replication solution was showcased, enabling data owners not to trust that multi-cloud deployments will use only allowed geographical regions for replication. Finally, a solution called Medusa was developed to run specific computing workloads across multiple clouds, tolerating arbitrary faults with a paper published at CCGrid'16.

In **WP3** we finalized D3.2 "Specification of security enablers for data management". This deliverable specifies SUPERCLOUD data management components. In the meantime some of the components have been accepted to prestigious conferences. IBM's work on XFT has been accepted to OSDI 2016. In addition, work of FFCUL on multi-writer multi-cloud storage has been accepted to OPODIS 2016, just like IBM's work on non-deterministic Byzantine fault-tolerant replication. The concepts from the last paper have been driving the new architecture of the Hyperledger fabric blockchain to which IBM is intensively contributing in the context of SUPERCLOUD.

The network virtualization part of SUPERCLOUD (**WP4**) intends to **give tenants the freedom to specify virtual network topologies** and addressing schemes of their choosing, which are then deployed across multiple (public or/and private) clouds. In order to support this vision, the project has been designing several components, such as network embedding solutions that take into consideration the requirements of the user in terms of security and privacy, and an approach that supports the chaining of security services (e.g. firewall, malware detection) to be placed at various locations in the physical network. In order to **improve the resilience of the control plane**, we have also been exploring a solution that facilitates the replication of the SDN controller while keeping a consistent view of the state of the network.

The use-case and testbed work package (**WP5**) enables to **demonstrate and validate the SUPERCLOUD core technology**. A testbed that enables the reproduction in realistic settings of the two use cased, using component configuration and virtualization is set up. Partners are collaborating on the finalization of a detailed description of specifications of the use-cases and requirements in order to demonstrate and validate the project result.

SUPERCLOUD SEC2 Workshop at ComPAS'16

In July 2016 the 2nd edition of the SEC2 workshop on Cloud Security was organised in Lorient, France. The workshop was associated with the French ComPAS'16, which is one of the main Operating Systems Conferences in France and aims at contributing to federate the cloud security systems community in France and beyond. This workshop was very successful and several keynotes and paper presentations from several SUPERCLOUD partners could be given.

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