Personal and Federated Cloud Management Cockpit

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Abstract—**Following the Everything-as-a-Service paradigm, digital and physical assets such as software, data and hardware resources can be offered and delivered as services by their respective owners. The rise of service-oriented personal cloud computing requires new techniques for users to perform asset discovery, exchange and management. These techniques must be easy to use and yet powerful enough to result in large-scale distributed systems over federated personal clouds. With CloudRemix, an interactive cockpit to manage personal clouds and their federations, we achieve a reduced reliance on central infrastructures and a raised balance of service provisioning and consumption. Attached to a novel local device discovery tool named FlexiSource, to a service registry and to a social network, the CloudRemix prototype demonstrates its utility to manage personal clouds in both social and market-driven environments.**

I. Problem Statement

Everything-as-a-Service (XaaS) is a paradigm to deliver digital assets or access to these assets such as software applications and datasets as well as access to physical assets such as compute and storage resources to whoever needs them, on demand, according to conditions specified in non-binding service descriptions and binding service level agreements. With the increasing use of online resources and services due to the industry push towards cloud computing, the client-side issue of keeping an overview about which assets belong to whom becomes very real. Furthermore, finding new assets across providers while at the same time reducing the dependency on particular providers becomes challenging. A software stack for client devices, accessible to service consumers and casual asset providers, is notably missing. Personal clouds, a context-dependent variant of home clouds, summarise a recent conceptual flavour of cloud computing environments. They let users manage their assets and control which assets are entrusted to which provider in which locations and social contexts [1]. The techniques to build and manage personal clouds and the assets contained in these clouds have not yet been systematically presented. Our work contributes solutions to this problem with a set of techniques for both the management and the social and market-oriented sharing of cloud assets, for instance, just-in-time resource provisioning.

Hence, we envision CloudRemix, a user interface to allow users to build and manage their personal clouds and all assets therein. The goal of CloudRemix is to be open, user-centric regarding the manageable assets, and flexible regarding their free or commercial exchange, with or without explicit contract negotiation.

II. Solution Demonstration

CloudRemix is an open-source web-based cockpit application with support for multiple users. Each user gets to see an aggregated list of both local and remote services of each of the asset types Resource (RaaS), Data (DaaS) and Software (SaaS). The locally hosted services, which can be offered to other users following a peer-to-peer topology, require a certain provisioning scheme. For RaaS, CloudRemix refers to a dynamic device discovery tool called FlexiSource which generates service descriptions about idle resources. For DaaS, it refers to a data clustering and packaging tool. For SaaS, more advanced service engineering approaches are required which are out of scope of the cockpit. Complementary to the assets, social networks (e.g. Noosfero) and markets with service registries (e.g. SPACE) can be attached to the cockpit to exchange services. All services are uniformly described with XaaS ontologies which are dynamically updated with the user's location information. Figure 1 shows the asset management screen presented to the user in a personal cloud.
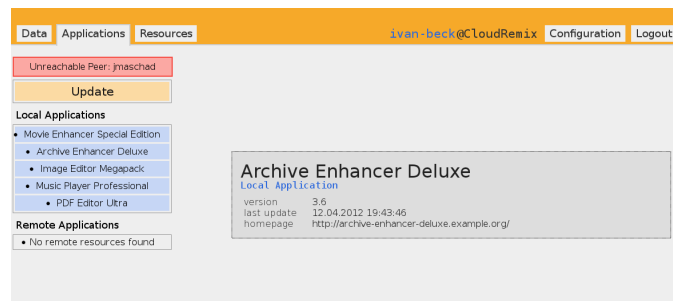

Fig. 1.   Screenshot of the CloudRemix user interface

The implementation of the CloudRemix software, which is based on PHP with an SQlite database as well as the provisioning tools, is publicly available from a Git repository on `serviceplatform.org`. Furthermore, it is integrated as a central component into a π-*Box Live* virtual machine which, if run as a VM or as appliance, acts as gateway between personal and public clouds and hence relies on both a cockpit and local device discovery and integration [1].

References

[1] S. Groß and A. Schill, "Towards User Centric Data Governance and Control in the Cloud," in *Open Problems in Network Security (IFIP WG 11.4 International Workshop iNetSec)*, ser. LNCS, vol. 7039, June 2012, pp. 132–144, Lucerne, Switzerland.