

Dynamic Migration of Cloud Services on the Basis of Changable Parameters

Masterstudium:
Business Informatics

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Cloud computing is a popular possibility for service providers to host their applications. It enables the usage of scalable, elastic infrastructures that are charged according to their usage, and do not have to be maintained. Due to the increasing demand of such services, lots of cloud providers are arising. It gets more difficult for users to compare offerings and chose a proper provider for a specific service. Furthermore, the demand of changing the provider results from the growing market.

Problem Definition

Major issues that occure:

- Finding a proper cloud for a service
- Cloud providers use different environments
- Services have to be adapted
- Seamless migration of stateful service

A solution to handle the problems is a framework that enables the migration of services between different cloud environments. It abstracts existing clouds, their pricing parameters and their technical issues. It finds the optimal cloud for a specific service and monitors the prameters of both. Whenever the requirments of the service changes the framework migrates the service dynamically to another cloud.

IaaS Pricing

IaaS providers are offering computing infrastructure. 32 IaaS cloud providers were reviewed to identify, which pricing parameters they use. It was shown that:

- 27 pricing parameters are used
- They are not presented in a unified way
- 2/3 of all providers are offering resources bundled in instances and do not allow a detailed specification of the included infrastructure
- It is difficult for users to compare different clouds

Related Work

3 different approaches to service migration were reviewed to find advantages and disadvantages of existing frameworks. Characteristics a framework should have were identified:

- Abstraction of clouds
- Autonomous peers
- Shared management
- Resource unification
- SLA consideration
- Dynamic migration
- Permanent optimization
- Service optimization
- Security

PaaS Pricing

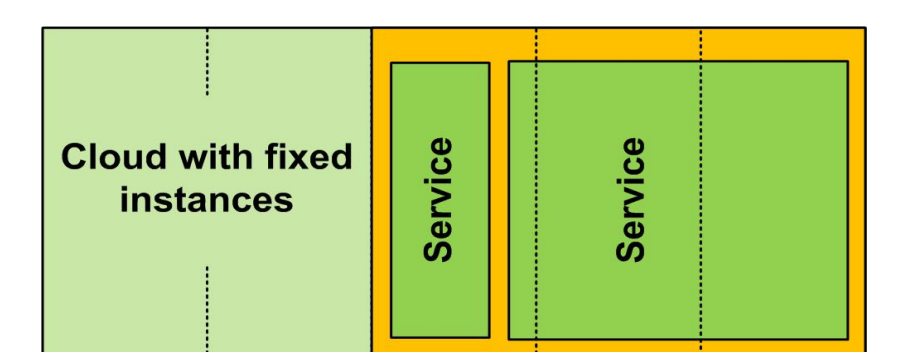
PaaS providers are offering platforms to abstract the underlying infrastructure. 17 PaaS offerings were reviewed. It was shown that:

- 38 pricing parameters are used
- Pricing is more service oriented
- 1/2 of all providers are using instances
- It is difficult for users to estimate the computing performance of PaaS offerings.

dynamic Platform as a Service (dynPaaS)

The dynamic Platform as a Service is not only a migration framework. It is a new form of PaaS Provider that offers the following unique abilities:

- Finding the optimal cloud for a given service
- Providing transparency about the used clouds
- Dynamic migration of services due to the change of service or cloud parameters
- Optimization of cloud instance usage
- Cost optimization for the dynPaaS provider
- Dynamic migration of services due to the change of pricing parameters



Shared instances to optimize used resources

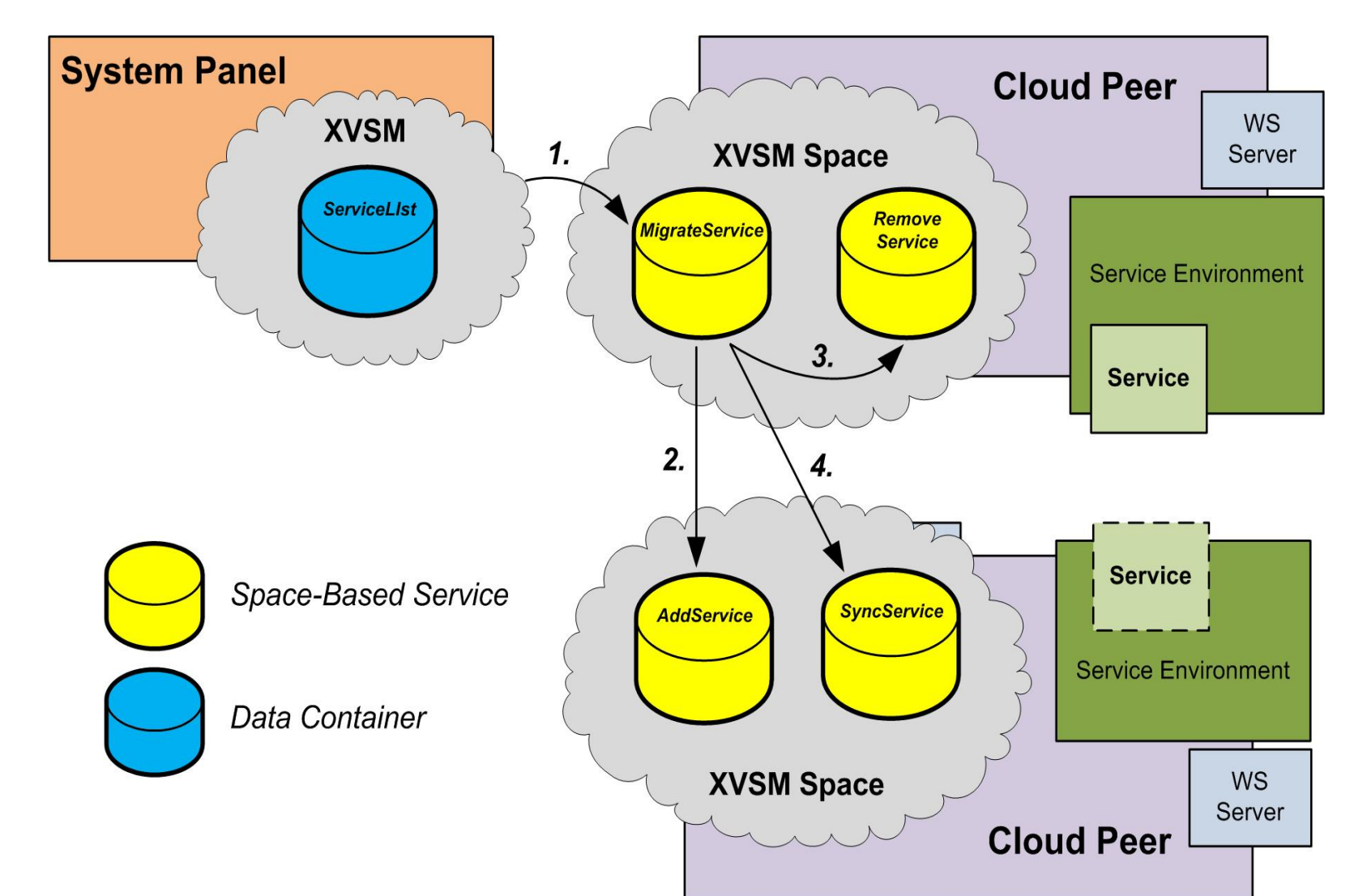
Prototype

The space-based computing middleware concept XVSM was used to build a P2P network, to enable autonomous peers and to share management between the peers.

Space-Based Services were implemented to provide a secure, flexible and scaleable communication between different peers.

The single parts of each peer were implemented as pluggable modules. This makes it easy to use different approaches for the resource unification and the different optimizations.

A client object was implemented to wrap a service client and cover the migration of connected services.



Migration process

dynPaaS architecture

Evaluation

To measure the migration overhead a client performed service calls on different hosted services, while the services migrated permanently. It was shown that:

- For stateless services the mean unavailability time is 1,5 seconds.
- The migration overhead stays constant for stateless services.
- Migrations do not cause a total interruption of the service.

To simulate the total costs for services and the system 3 scenarios were tested with a set of 8 clouds and 16 services. For the used scenarios it was shown that:

- 11/16 services benefit from migrations.
- The mean cost reduction for services is about 14%.
- For the dynPaaS provider the cost reduction is about 25%.

Conclusion

The evaluation of the dynPaaS concept showed that the used optimization approaches bring a cost reduction for service providers and the dynPaas provider.

The optimization is only of interest for services that have usage peaks and periods of low usage or other changing parameters.

The instance optimization can only be applied to very small services or to services that have periods with very low usage.

XVSM and the Space-Based Service concept provide a perfect environment to implement the P2P network and to coordinate all processes.