



A Development Framework Enabling the Design of Service-based Cloud Applications

Fotis Gonidis

South East European Research Centre, Thessaloniki, Greece







- Cloud Application Platforms
- Service-based Cloud Applications

Development Framework

High-Level Architecture

➤The case of Payment Service

➤Conclusions





Software as a Service

Platform as a Service

Infrastructure as a Service

> Focus on designing cloud applications, deployed in cloud platforms





Platform classification into 3 categories



- Support for widely used technologies: SQL, Java, PhP, etc
- Generic application scope, high application development time
- Low level lock-in effect



- Support for widely used technologies: SQL, Java, PhP, etc
- Generic application scope, medium application development time
- Medium level lock-in effect
- Additional functionality through platform services via API



- No support for widely used technologies
- Specific application scope
- Short application development time
- High level lock-in
 effect
- Online development via web-browser and visual interfaces





Cloud Application Platform¹



- Kourtesis et al. puts forwards the idea of cloud application platforms. Provisioning of traditional platform resources and platform services: e-mail, message queue, sms, authentication, payment service etc.
- Cloud applications are composed of multiple platform services. Therefore
 - Reduced application development time, upfront and maintenance costs, increased functionality

^{1.} Dimitrios Kourtesis, Konstantinos Bratanis, Dimitris Bibikas, Iraklis Paraskakis: Software Co-development in the Era of Cloud Application Platforms and Ecosystems: The case of CAST. PRO-VE 2012: 196-204





Service-based Cloud Application



- Service-based cloud application is deployed in a cloud application platform and use a combination of platform services
- > Plethora of platform services and service providers, need for seamless use of the services





Cloud Application Development



> Design of service-based cloud application independent from the concrete service providers





Variability points in consuming Platform Services

- > Different workflows required to complete the operations
- > Differences in the web API exposed by the service providers
- Managing the configuration settings, the credentials and the authentication tokens required by each service provider





Handling the workflow required to complete an operation









Deal with the service provider`s web API

E-mail Service

send an e-mail

Heroku (SendGrid)	from	to	subject	text
Amazon Simple E-mail Service	Source	Destination. ToAddresses	Message. Subject	Message.Body. Text
Heroku (PostMark)	From	То	Subject	TextBody

Payment Service

send a payment transaction request

Heroku (Spreedly)	amount	Payment_method_ token	currency_code
Amazon (Stripe)	amount	card	currency





Managing configuration settings, credentials and authentication tokens

> Payment service

Heroku (Spreedly)	Username	Password	Redirect URL	Gateway Token
	_			

Authentication service

Google	Client_Id	Client_Secret	State	Scope
Authentication				







Development Framework

High-level Architecture



- > Platform Service Manager: coordinates the interaction between the application and the platform services
- Platform Service Connector: contains a reference abstract description of the functionality of the service.
 One connector for each platform service
- > **Provider Connector**: detailed implementation for each concrete service provider







Development Framework



Meta-model

- Cloud Action
 Handles the incoming requests
- Cloud Message
 Sends requests via web API
- Platform Service States Lists the states and the action to be invoked
- ConfigurationData
 Settings, credentials, tokens
- API Service Description Describes the web API
- Platform Service
 Packages the components of the Platform Service Connector







Development Framework



Platform Service Manager

- Front Controller Receives incoming requests
- Dispatcher
 Calls the CloudAction to handle the request
- ICloudAction
 Interface to the CloudAction
- Communication
 Servlet, REST/SOAP implementation
- Platform Service Registry
 Keeps track of the registered services

API Client Generator Generates provider specific adapters





The case of Payment Service







The case of Payment Service







API Service Description



- 1. The user of the framework describes the Provider Specific API and the Configuration Settings
- 2. The Provider Specific API is mapped on the Reference API used by the application
- 3. The API Client Generator, based on the service provider description, generates the Provider Specific Adapter





API Service Description

type filter text	Information is related to the specific operation and is the same for all users			
▼	Name: [©] F	PurchaseRequest		
Refund Stripe (Amazon) PurchaseRequest Refund Refund	User Specific Ir	nformation	on and is unique for the specific user	EY2
▼ VivaPayments	GatewayToker	n: [©] 526117a4-f9ab-4abf-96	515-caf2266cae0d	
	Dynamically M These are the time. They are parameter as s specific provid	apped Parameters parameters that are included i mapped to the parameters de specified in the reference mode er	n the web call and their values are not known at design fined in the reference model. The "KEY" holds the el. The "VALUE" holds the parameter as required by the	EYE
	Parameters:	KEY	VALUE	4
		CurrencyCode CardIdentifier ChargedAmount	currency_code payment_method_token amount	× ↔

Contacts Source







- Plethora of cloud application platforms
- Service-based cloud application are becoming increasingly popular Need for seamless and transparent use of platform services
- > 3 points to consider when consuming platform services
 - Handle the flow to complete an operation
 - Deal with the web API exposed by the service providers
 - Manage the configuration settings, credentials, tokens for each service provider

Future Work

Refine the API service description. Investigate the role of ontologies for the semantic description of the services.







An International Faculty Of The University.

Thank you



E-mail: <u>fgonidis@seerc.org</u> LinkedIn: Fotis Gonidis Tel: +30 2310 253477