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Alexander Stock

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# Billing with Cloudstack



# About Me

- Cloud Infrastructure Architect @itelligence
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**CloudStack Berlin & Dresden, Germany**


<https://www.meetup.com/german-CloudStack-user-group>

**Ansible Dresden, Germany**

<https://www.meetup.com/Ansible-Dresden>

# itelligence Worldwide in Numbers

Founded



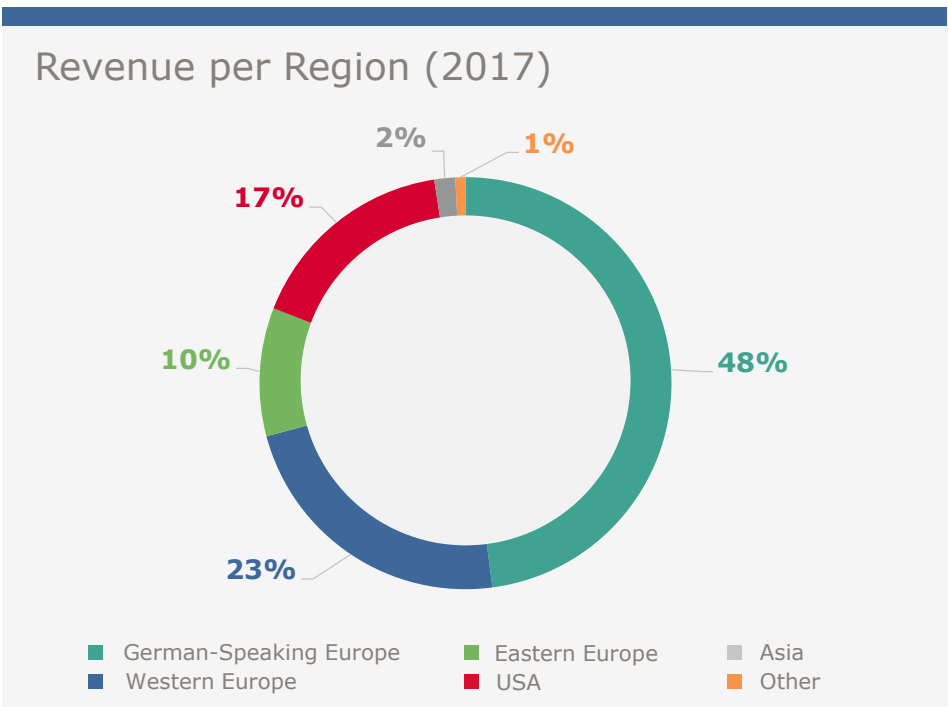
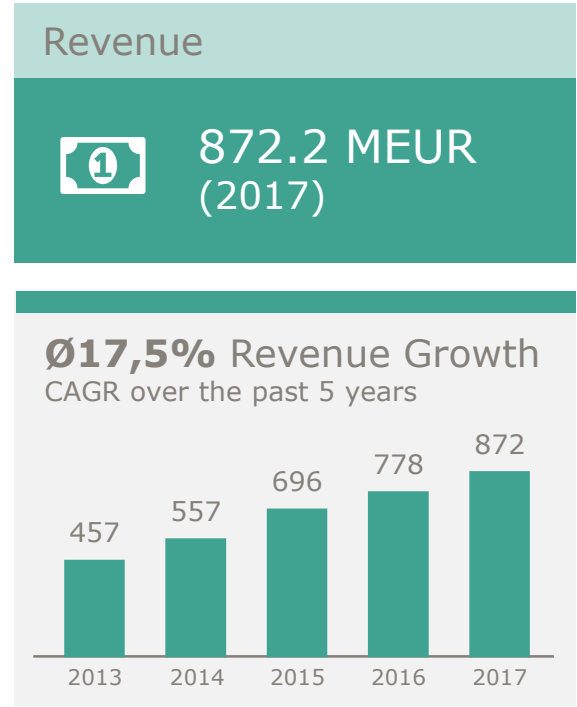
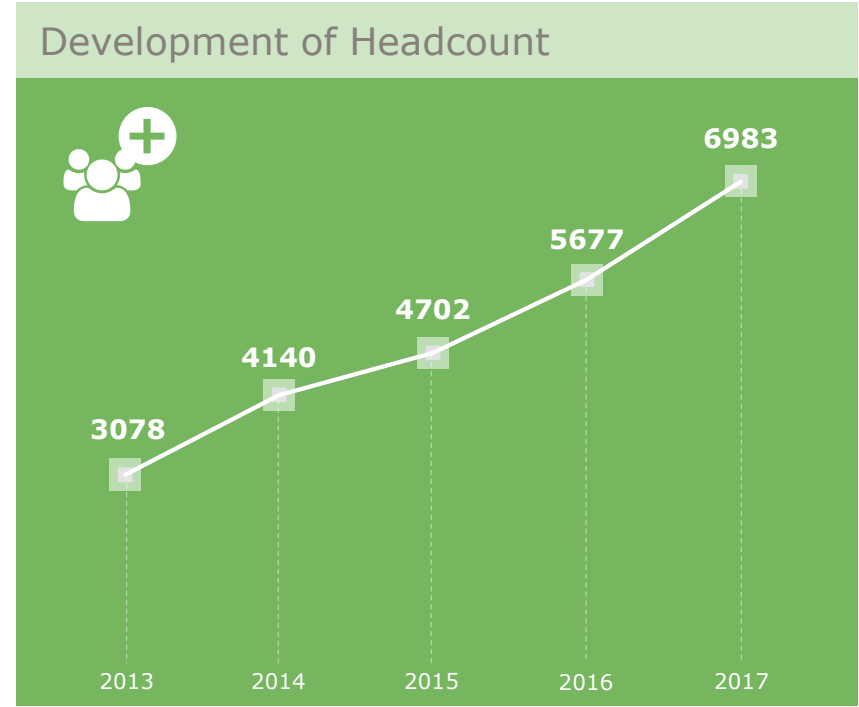
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Employees




7,300+

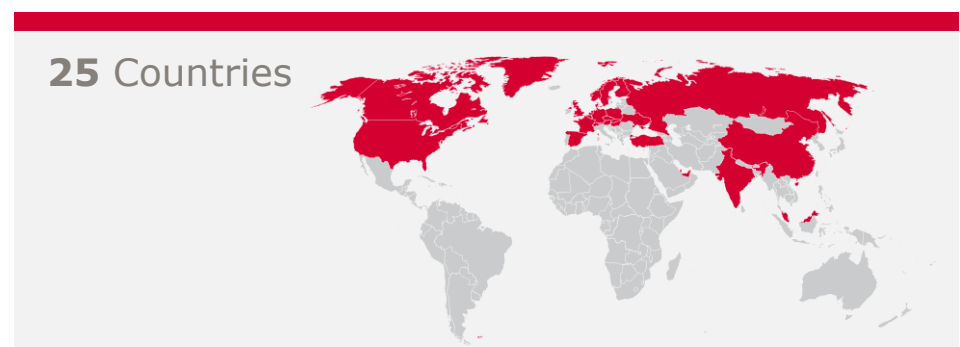
(as of June 2018)



Customers



6,000+



# Agenda

1. Short introduction to cloudstack billing functions
2. Our infrastructure and customer design
3. Our first steps with cloudstack billing
4. New approach as a webservice
5. Outlook

# Short introduction to cloustack billing functions




# Short introduction to cloudstack billing



- What information does Cloudstack provide
  - Following metrics can be queried for a specific timerange:
    - CPU and memory usage of a VM.
    - Disk size of a volume and snapshots
    - Network Usage of a virtual router
    - IP address usage
    - Template, ISO usage
    - Loadbalancer/VPN usage

# Short introduction to cloudstack billing

- The usage service:
  - Runs periodic jobs to generate usage records
  - Standard period: 24 hours
  - Standard settings: VM/Volume with runtime < 24 hours will not be tracked
  - Can be changed in global Cloudstack settings:

Home > Global Settings >

Select view: Global Setting  

Name	Description	Value	Actions
<a href="#">usage.stats.job.aggregation.range</a>	The range of time for aggregating the user statistics specified in minutes (e.g. 1440 for daily, 60 for hourly).	60	
<a href="#">usage.stats.job.exec.time</a>	The time at which the usage statistics aggregation job will run as an HH24:MM time, e.g. 00:30 to run at 12:30am.	00:15	

# Short introduction to cloudstack billing

- How does Cloudstack generate usage records
  - Step1:
    - Every event like „create“, „destroy“, „start“ or „stop“ will be written to cloud.usage\_event table
  - Step2:
    - Usageserver: copy new events to various table in cloud\_usage database (helpertables)
    - Aggregate all data in cloud\_usage.cloud\_usage
    - Records can now be queried over the API



# Short introduction to cloudstack billing

- How does cloudstack provide these information over API
  - **listUsageTypes (get mapping for usagetypes)**
    - Output:
      - usagetypeid
      - description
  - **listUsageRecords (get records):**
    - Input:
      - startdate (Date in Format: yyyy-MM-dd HH:mm:ss)
      - enddate (Date in Format: yyyy-MM-dd HH:mm:ss)
      - type (Integer for the specific usage: VM, Volume...)
      - domainid
      - projectid
      - usageid

# Short introduction to cloudstack billing

- How the information is structured:
  - Sample for type 1 (Running VM):

```
name = itcS4P
cpunumber = 24
cpuspeed = 2000
description = itcS4P running time (ServiceOffering: 33) (Template: 239)
domain = itelligence
domainid = 36493690-f727-4e79-8aa8-db20a68bfee1
enddate = 2018-06-24'T'23:59:59+00:00
memory = 256000
offeringid = b17f9251-45c9-4b85-a2ac-9af12f7fd422
project = gbs01
projectid = 62ab2fb4-6c9b-48ea-9f4c-b8d430dd06c1
rawusage = 1
startdate = 2018-06-24'T'23:00:00+00:00
tags:
templateid = 0c45e334-5018-477c-b87b-9229e6c33e35
type = KVM
usage = 1 Hrs
usageid = 75871a3e-22ed-4acc-8a80-ffb0d4ac8ec4
usagetype = 1
virtualmachineid = 75871a3e-22ed-4acc-8a80-ffb0d4ac8ec4
zoneid = b12744d5-a8f3-4328-91f7-3419bfea12b2
```

# Our infrastructure and customer design



# Our infrastructure and customer design

## ■ Our Setup:

- We offer: automated Application/SAP setups
- Cloudstack 4.11.0
- Advanced Networking
- KVM as Hypervisor
- Ceph as Storage Backend
- Check\_MK as Monitoring Solution
- Ansible is responsible for deploying and configuring our VMs
- We use projects the separate resources for the customer
- We have a self written user portal which manages cloudstack and ansible
- Customers doesn ´t have Cloudstack access



# Our infrastructure and customer design

## ■ Structure of resources

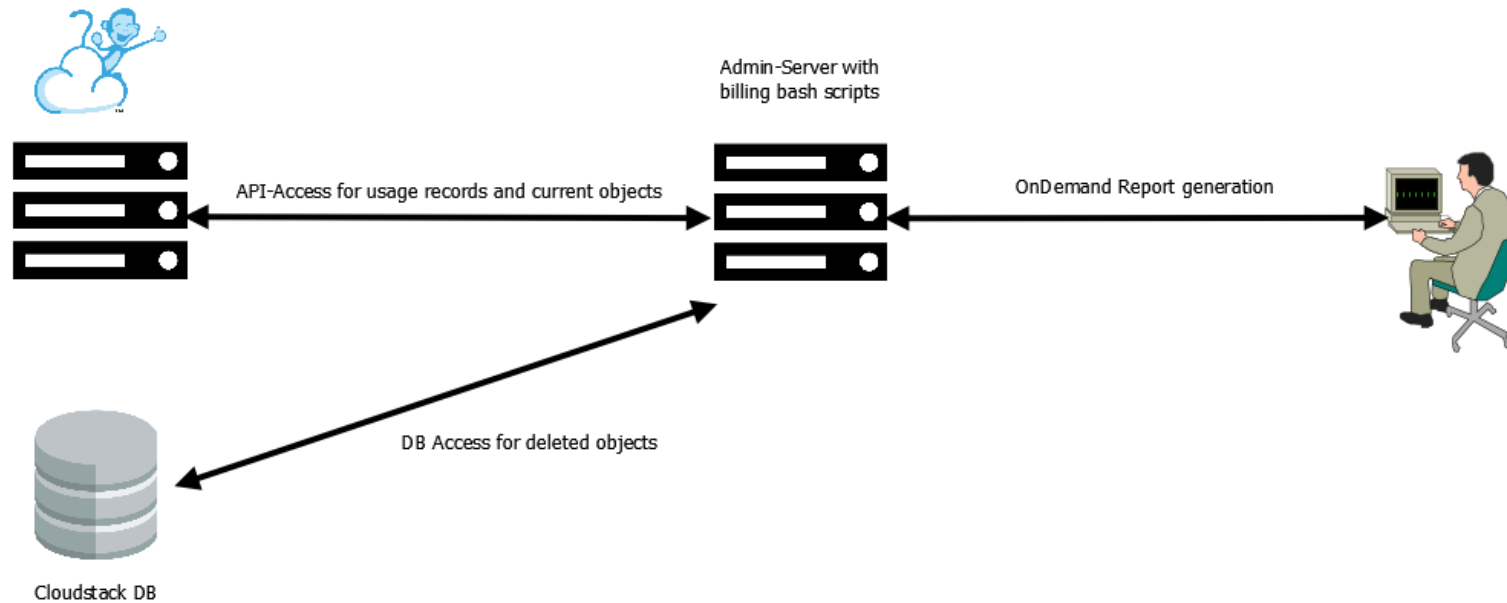
- Cloudstack Domain:
  - represents the customer like the internal customer „itelligence“
  - useraccounts will be setup per customer in our LDAP structure
- Cloudstack Project:
  - projects are used to separate different customer landscapes inside domains
  - infrastructure Services instance in each project/landscape (automation,mon,bkp)

# Our first steps with cloudstack billing



# Our first steps with cloudstack billing

- Quick solution to get an overview of the consumed resources
- Former teammember wrote bash scripts in a very short amount
- Queried data from cloudmonkey (API) and directly from the MySQL Database
- Small part of Jasper Reports used to generated documents in different formats
- Files were sent via mail to the administrators



# Our first steps with cloudstack billing

- Problems:
  - High amount of bashscripts which depended on each other were hard to maintain
  - No unique datasource (API + some informations from MySQL)
  - No own database for prices/discounts and other informations
  - No UI/API
  - All information had to be queried from cloudstack each time
  
- Solution attempt:
  - Own database
  - Sync with Cloudstack
  - Build UI/API



# New approach as a webservice



# New approach as a webservice

- Features of the billing system:
  - Creation of different reports wich can also work with filters:
    - Startdate and enddate
    - Domainid, Projectid, Virtualmachineid, Volumeid
  - Export reports in different formats
  - Sync of usage and metadata from cloudstack → implemented as cronjob
  - Managing prices for Resources (CPU,RAM,DISK) Services (Backup, Monitoring) and Packages (Gold-Support, Silver-Support)
  - Managing the allocation of services to packages (Tags on VM objects in Cloudstack)
  - Managing Discounts on Domain, Project, VM and Volume level
  - Webui and API with LDAP and local User authentication
  - Permissions based on API endpoints which can be managed via the UI

# New approach as a webservice

- Synchronisation of Tags:
  - All tags of a VM or volume will be synced
  - We define special tags to represent Servicelevels or packages
  - Billing can be deactivated through tags like „Billing:noCPU“, „Billing:noRAM“ or „Billing:noDisk“
  - Creation and removed dates will be considered in the reports
  - For next version we maybe move tagging directly to billing-tool

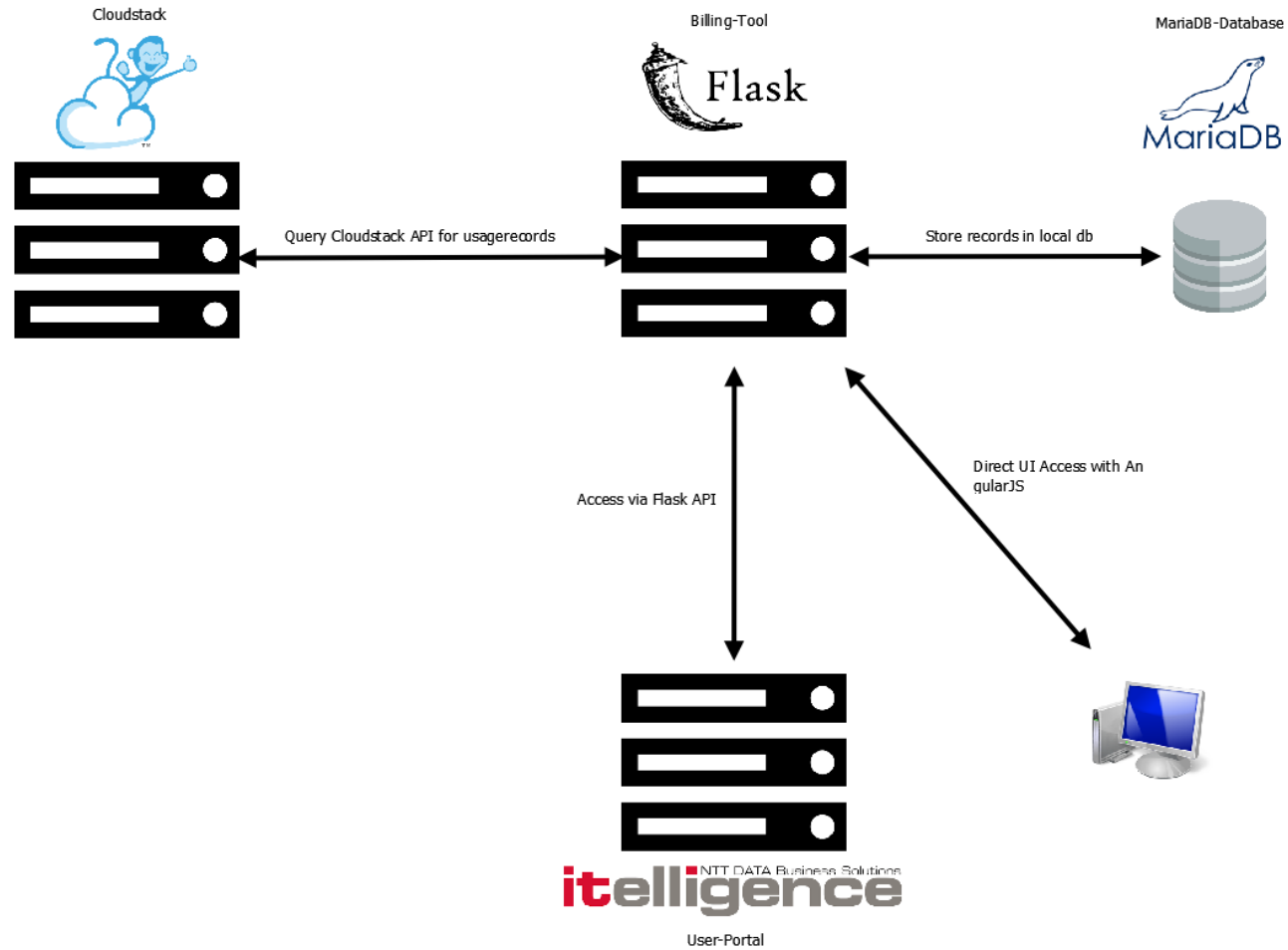
# New approach as a webservice

- Used components:
  - Database: MariaDB
    - Reasons: Knowledge already existing, good and solid foundation
  - Backend Framework: Flask (Python)
    - Reasons: perfect for building APIs, not overloaded as other frameworks, no steep learning curve
  - Frontend Framework: AngularJS + Bootstrap
    - Reasons: Knowledge already existing, easy to learn



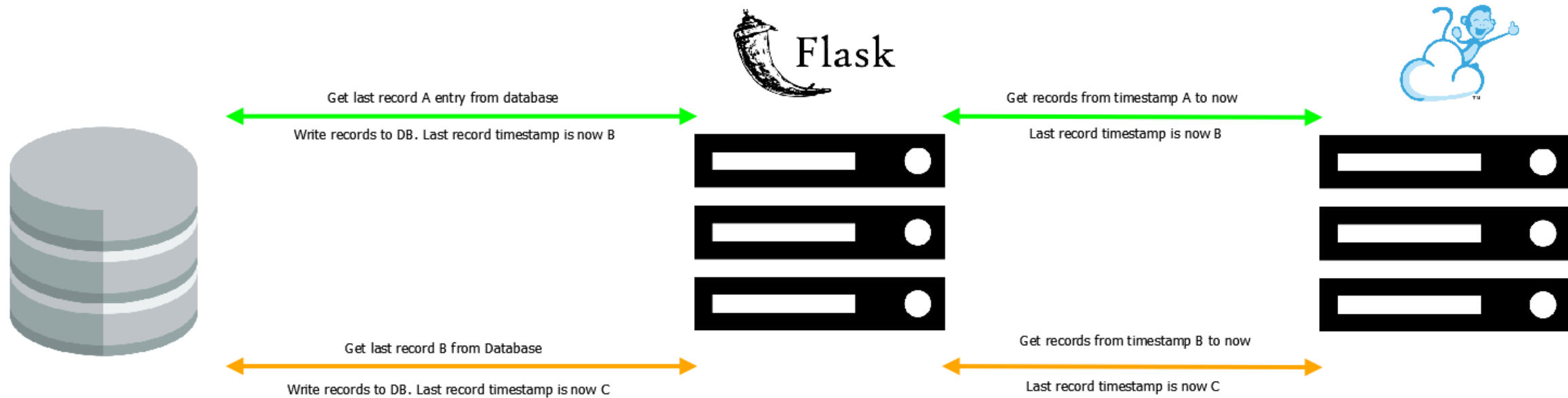
# New approach as a webservice

- The big picture:



# New approach as a webservice

- The sync process:



# New approach as a webservice

- Functions of Report-Module:
  - Selection of different reporttypes
  - Selection of timerange (start,end)
  - Selection of filters (domain,project,vm...)
  - Filter by CostCenter (special for our needs)
  - Export to CSV and XLS (PDF planned)

# New approach as a webservice

- Reports:

Choose Report  
Domain-Project-Report

Choose startdate  
01.07.2018

Choose enddate  
18.07.2018

Filter Domain  
itelligence

Filter Project  
tools

Filter Virtual Machine  
---

Filter Volume  
---

Filter Costcenter  
---

Generate Report

### Report Output

Domain	Project	Name	Type	OS-Template	Costcenter	Billing-Tags	Duration	Cores	Memory	Disksize	SUM	Price (Euro)	Network IN	Network OUT	Begin	End
itelligence											Domain Sum	393.74	627.0	744.0		
tools											Project Sum	393.74	627.0	372.0		
		christianest	VM with offering: XXS	CentOS 5.5(64-bit) no GUI (KVM)	b0000		351.0	1	1,00			8.13			2018-07-04 09:00:00	2018-07-18 23:59:59
		ROOT-775	Volume with size: 8,00		b0000		351.0			8,00		0.9			2018-07-04 09:00:00	2018-07-18 23:59:59
		christianest	Volume with size: 5,00		b0000		351.0			5,00		0.56			2018-07-04 09:00:00	2018-07-18 23:59:59
											VM Sum	9.59				
		cs01	VM with offering: XS	Ubuntu 16.04	b0000		432.0	1	4,00			17.53			2018-07-01 00:00:00	2018-07-18 23:59:59
		ROOT-645	Volume with size: 20,00		b0000		432.0			20,00		2.77			2018-07-01 00:00:00	2018-07-18 23:59:59
		cs01-data	Volume with size: 200,00		b0000		432.0			200,00		27.72			2018-07-01 00:00:00	2018-07-18 23:59:59

Download



# New approach as a webservice

- Functions of Price-Module:
  - Manage prices for:
    - Resources (CPU,Memory,Disk)
    - Services (Backup,Monitoring...)
    - Packages (Offers which represent service levels which include services)
    - OS Images (SLES,Windows...)
  - Create new prices (valid from time of adding)
  - Change prices (will be valid also for old reports)
  - Change prices with new tuple (will be valid for new reports)
  - Select unit and period of price

# New approach as a webservice

- Prices:

### RESOURCE Prices

Name	Description	Price (€)	Action
cpu	CPU price per hour	0.01735	<a href="#">Edit</a>
disk	Disk price per hour	<input type="text" value="0.0003208"/>	<a href="#">Save</a> <a href="#">Save New</a>
mem	Memory price per hour	0.005808	<a href="#">Edit</a>

### SERVICE Prices

Name	Description	Price	Unit	Period	Action
Billing:APP-Hana	Cost for HANA-Automation	5	%	none	<a href="#">Edit</a>
Billing:APP-S4	Cost for S4-Automation	5	%	none	<a href="#">Edit</a>
Billing:APP-SAPRouter	<input type="text" value="Cost for SAPRouter-Automation"/>	<input type="text" value="5"/>	<input type="text" value="%"/>	<input type="text" value="none"/>	<a href="#">Save</a> <a href="#">Save New</a> <a href="#">Delete</a>
Billing:APP-SAPWebdispatcher	Cost for SAPWebdispatcher-Automation	5	%	none	<a href="#">Edit</a>
Billing:Service-Backup	Service-Backup	10	€	monthly	<a href="#">Edit</a>
Billing:Service-Monitoring	Service-Monitoring	20	€	monthly	<a href="#">Edit</a>

Choose Name:  Choose Description:  Choose Price:  Choose Unit:  Choose Period:  [Add Price](#)

### PACKET Prices

### OS Prices

## New approach as a webservice

- Functions Package-Matrix-Module:
  - Add or remove services from packages
  - Prices of services included in packages
    - will not be included when customer has booked the package
  - Information for services and packages of each VM/Volume taken from Cloudstack tags

# New approach as a webservice

- Package Mapping:

Package Matrix		
	Billing:Package-Basic	Billing:Package-Comfort
Billing:APP-Hana	<input type="checkbox"/>	<input type="checkbox"/>
Billing:APP-S4	<input type="checkbox"/>	<input type="checkbox"/>
Billing:APP-SAPRouter	<input type="checkbox"/>	<input type="checkbox"/>
Billing:APP-SAPWebdispatcher	<input type="checkbox"/>	<input type="checkbox"/>
Billing:Service-Backup	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Billing:Service-Monitoring	<input type="checkbox"/>	<input checked="" type="checkbox"/>

# New approach as a webservice

- Functions of Discount-Module:
  - Manage discounts for domains, projects, VMs and volumes
  - Choose duration for discounts (start, end)
  - Change discounts (save for all reports or save for new reports)
  - Permanent discounts are also possible

# New approach as a webservice

- Discounts:

Choose Startdate  
01.07.2018

Choose Enddate  
31.07.2018

Choose Discount in %  
5

Choose Description  
Special Test VM

Filter Domain  
itelligence

Filter Project  
tools

Filter Virtual Machine  
cs-work01

Filter Volume  
---

Add Discount

### Discount for DOMAIN

Object-Path	Description	Percent (%)	Start	End	Action
[REDACTED]	sdsa	10	01.07.2018		Save Save New Delete

### Discount for PROJECT

Object-Path	Description	Percent (%)	Start	End	Action
[REDACTED]	sdsa	20	01.07.2018	31.08.2018	Edit

### Discount for VIRTUALMACHINE

### Discount for VOLUME

# New approach as a webservice

- Functions of Role-Module:
  - Management rights of roles for accessing the system
  - Rights management for different categories (Create,Read,Update,Delete)
  - Roles can be later attached to users

# New approach as a webservice

- Access (Roles):

### Roles

Name	Description	Action
admins	Admin Group	<a href="#">Edit</a>
read-only	Just read access	<a href="#">Edit</a>
users	Can manipulate Data except for users	<a href="#">Edit</a>

[Add Role](#)

### New role:

Role name:

Role Description:

Name	Create	Read	Update	Delete
Meta objects	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Costcenter	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prices	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Packet mappings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Account	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Password	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Discounts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reports	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Roles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Offer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

[Add](#)



# New approach as a webservice

- Functions of User-Module:
  - Manage local users (MariaDB)
  - Change/Set passwords for users
  - Change/Set Role of a User
  - Also planned for LDAP users

# New approach as a webservice

- Access (User):

Local Accounts

Name	Description	Role	Password	Action
admin	Admin Account	admins	*****	<a href="#">Edit</a> <a href="#">Password</a>
portal	Portal Account	portal-role	*****	<a href="#">Edit</a> <a href="#">Password</a>
ansible	Ansible Account	read-only	*****	<a href="#">Edit</a> <a href="#">Password</a>
mailgenerator	<input type="text" value="User for generating Mails of Reports"/>	<input type="text" value="read-reports"/> ▼	*****	<a href="#">Save</a> <a href="#">Remove</a>

Choose Name  Choose Description  Choose Password  Choose Role  ▼ [Add Account](#)

# Outlook

- Build forecasting module for planned installations
- Add new export formats like PDF
- Improve UI
- Enable automatic mail generation for the customer
- Add visualization for cloudstack statistics
- Enable hardlinked prices for special customers

# Questions?

## Contact

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