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Billing with Cloudstack



About Me

- Cloud Infrastructure Architect @itelligence
- Experience in Vmware, KVM, Nagios and Ansible
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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>

Ceph Dresden, Germany
<https://www.meetup.com/Ceph-Dresden/>

itelligence Worldwide in Numbers

Founded



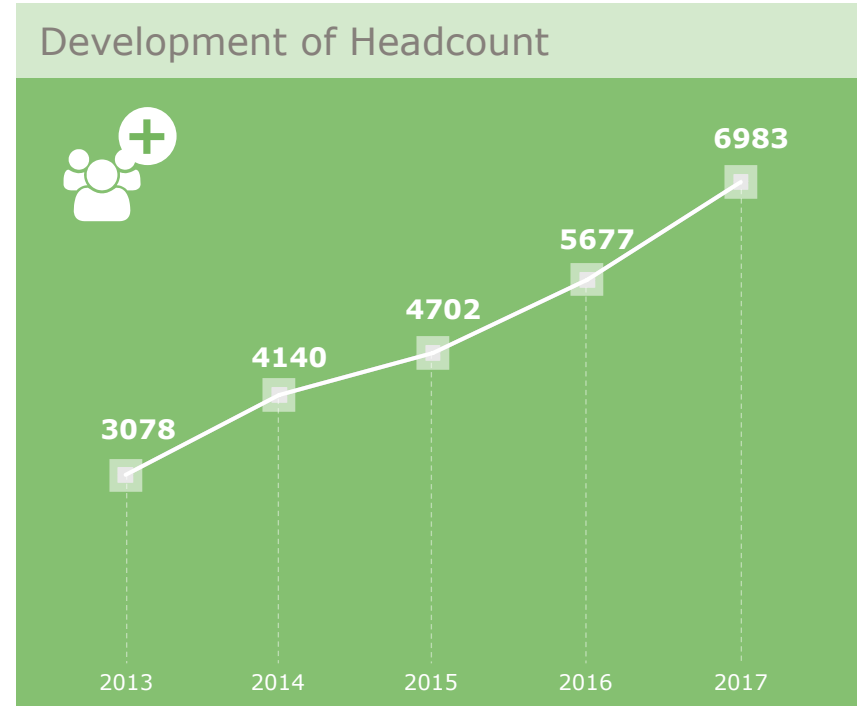
1989

Employees




7,300+

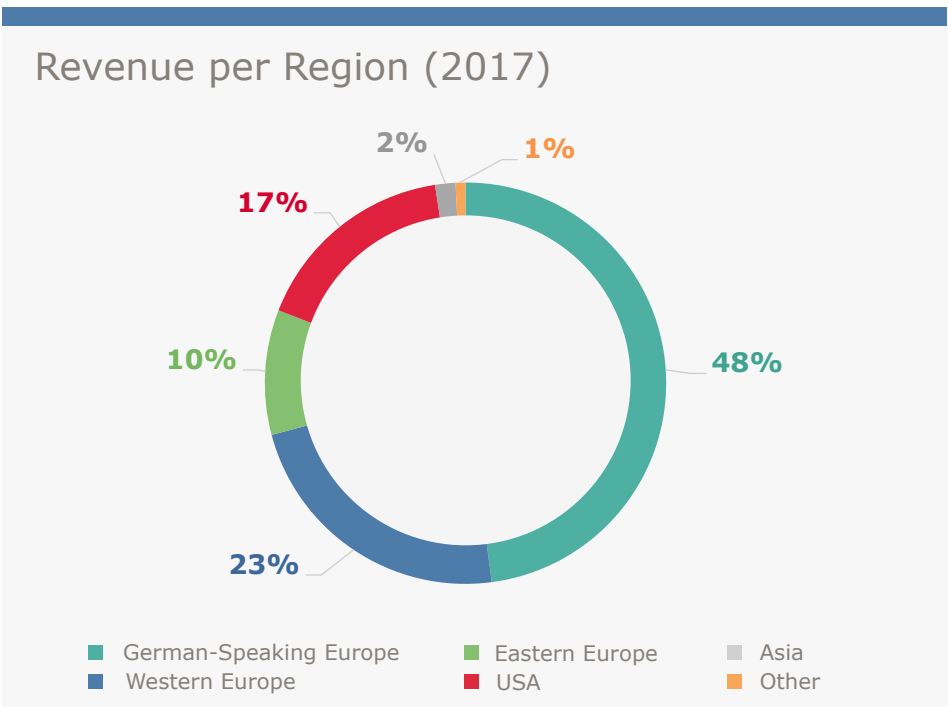
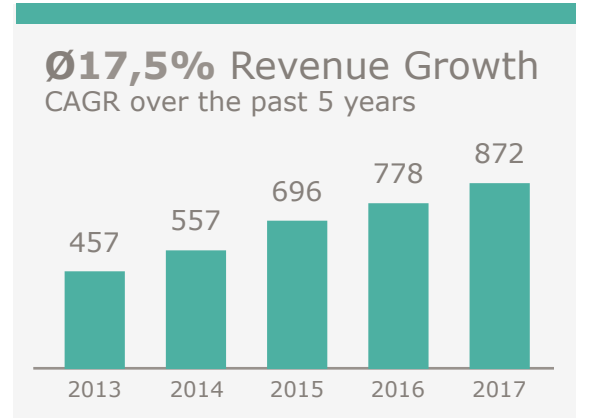
(as of June 2018)




Revenue



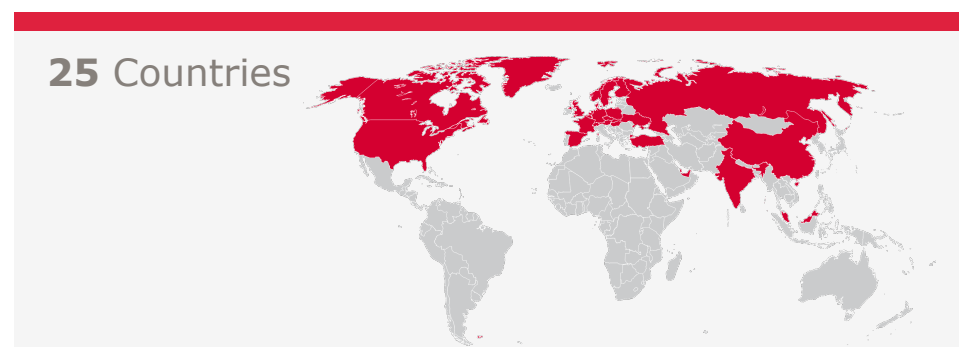
872.2 MEUR (2017)



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 Cloudstack billing functions



Short introduction to Cloudstack billing

- What information does Cloudstack provide
 - The following metrics can be queries for a specific time range:
 - 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
usage.stats.job.aggregation.range	The range of time for aggregating the user statistics specified in minutes (e.g. 1440 for daily, 60 for hourly).	60	
usage.stats.job.exec.time	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 = testhost
cpunumber = 1
cpuspeed = 2000
description = testhost running time (ServiceOffering: 18) (Template: 242)
domain = itelligence
domainid = <domain-id>
enddate = 2018-09-19'T'03:59:59+00:00
memory = 1024
offeringid = <offering-id>
project = play
projectid = <project-id>
rawusage = 1
startdate = 2018-09-19'T'03:00:00+00:00
tags:
templateid = <template-id>
type = KVM
usage = 1 Hrs
usageid = <usage-id>
usagetype = 1
virtualmachineid = <vm-id>
zoneid = <zone-id>
```

Short introduction to Cloudstack billing

- Alternative ways to get usage data:
 - Direct SQL access:
 - PRO: Access to deleted objects possible
 - CON: security risk, more complicated than API calls

 - Capture Cloudstack events over API or RabbitMQ
 - PRO: saves synchronisation resources through eventbased handling
 - CON: complex setup needed (RabbitMQ,...)

Our infrastructure and customer design



Our infrastructure and customer design

■ Our Setup:

- We offer: automated Application/SAP setups
- Cloudstack 4.11.2
- 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

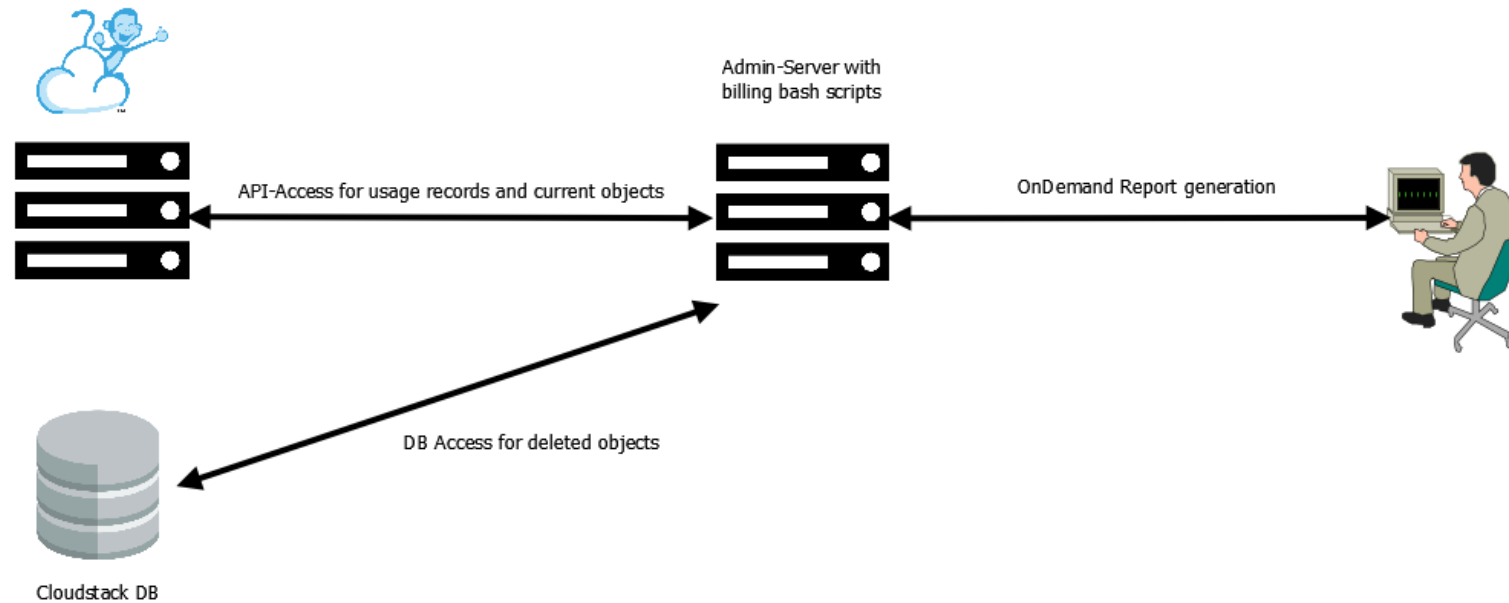
- Cloudstack Domain:
 - represents the customer, like the internal customer „itelligence“
- Cloudstack Project:
 - projects are used to separate different customer landscapes inside domains
 - infrastructure Services instance in each project/landscape (automation,mon,bkp)

Our first steps with Cloudstack billing



Our first steps with Cloudstack billing

- Quick solution to get an overview of the consumed resources
- Former team member wrote bash scripts in a very short amount of time
- 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 information from MySQL)
 - No own database for prices/discounts and other information
 - 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 which can also work with filters:
 - Start date and end date
 - 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-Package, Silver-Package)
 - 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 service levels 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
 - Consider moving tagging directly to billing-tool for next version

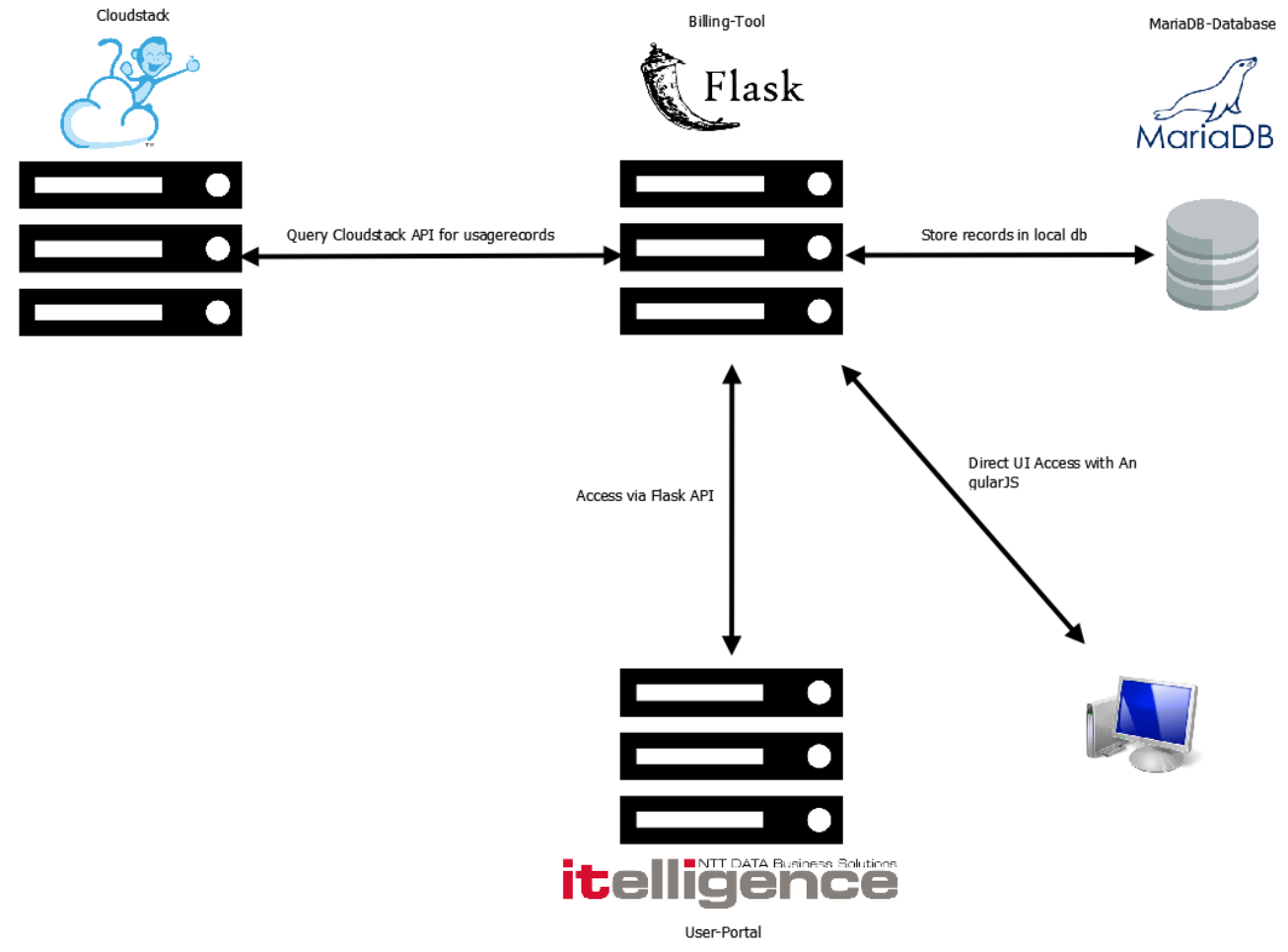
New approach as a webservice

- Components used:
 - database: MariaDB
 - backend framework: Flask (Python)
 - frontend framework: AngularJS + Bootstrap



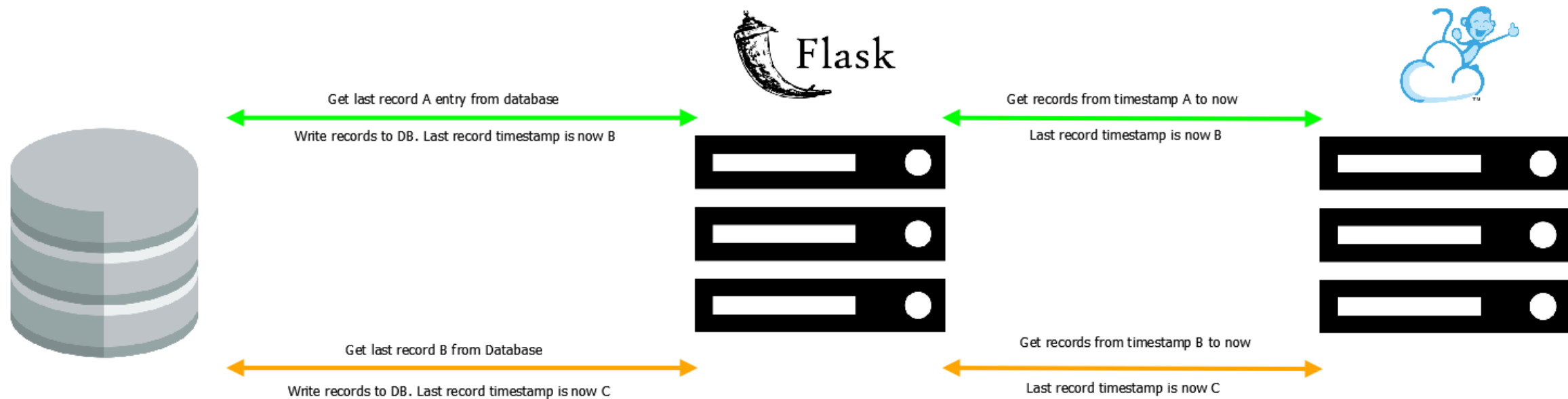
New approach as a webservice

- The big picture:



New approach as a webservice

- The sync process:



New approach as a webservice

- Functions of Report-Module:
 - Selection of different reporttypes and export to xls, csv (PDF planned)
 - Filtering: start, end, domain, project, vm, costcenter

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		
		christiantest	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
		christiantest	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-845	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, services, packages, OS Images

RESOURCE Prices

Name	Description	Price (€)	Action
cpu	CPU price per hour	0.01735	Edit
disk	Disk price per hour	<input type="text" value="0.0003208"/>	Save Save New
mem	Memory price per hour	0.005806	Edit

SERVICE Prices

Name	Description	Price	Unit	Period	Action
Billing-APP-Hana	Cost for HANA-Automation	5	%	none	Edit
Billing-APP-S4	Cost for S4-Automation	5	%	none	Edit
Billing-APP-SAPRouter	<input type="text" value="Cost for SAPRouter-Automation"/>	<input type="text" value="5"/>	<input style="width: 50px;" type="text" value="%"/>	<input style="width: 50px;" type="text" value="none"/>	Save Save New Delete
Billing-APP-SAPWebdispatcher	Cost for SAPWebdispatcher-Automation	5	%	none	Edit
Billing-Service-Backup	Service-Backup	10	€	monthly	Edit
Billing-Service-Monitoring	Service-Monitoring	20	€	monthly	Edit

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

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)

The screenshot shows a web interface for managing discounts. On the left is a sidebar with filters: 'Choose Startdate' (01.07.2018), 'Choose Enddate' (31.07.2018), 'Choose Discount in %' (5), 'Choose Description' (Special Test VM), and dropdown filters for 'Filter Domain' (itelligence), 'Filter Project' (tools), 'Filter Virtual Machine' (cs-work01), and 'Filter Volume' (---). An 'Add Discount' button is at the bottom of the sidebar.

The main area contains three sections:

- Discount for DOMAIN:** A table with columns: Object-Path, Description, Percent (%), Start, End, Action. It contains one row with a 10% discount starting on 01.07.2018. Action buttons: Save, Save New, Delete.
- Discount for PROJECT:** A table with columns: Object-Path, Description, Percent (%), Start, End, Action. It contains one row with a 20% discount from 01.07.2018 to 31.08.2018. Action button: Edit.
- Discount for VOLUME:** A section header for a currently empty table.

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 attached to users at a later stage

Roles

Name	Description	Action
admins	Admin Group	Edit
read-only	Just read access	Edit
users	Can manipulate Data except for users	Edit

[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)
 - Also planned for LDAP users

Local Accounts

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

Choose Name Choose Description Choose Password Choose Role

[Add Account](#)

Outlook

- Add new export formats like PDF
- Improve UI
- Enable automatic mail generation for the customer
- Enable hard linked prices for special customers

Questions?

Contact

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