

Quality Attributes of Cloud Services from User's View

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1. Cloud Service Lifecycle

- Analysis & Definition

2. Cloud Computing Management Systems

- Comparison & Service Lifecycle Assistance

3. Cloud User Roles

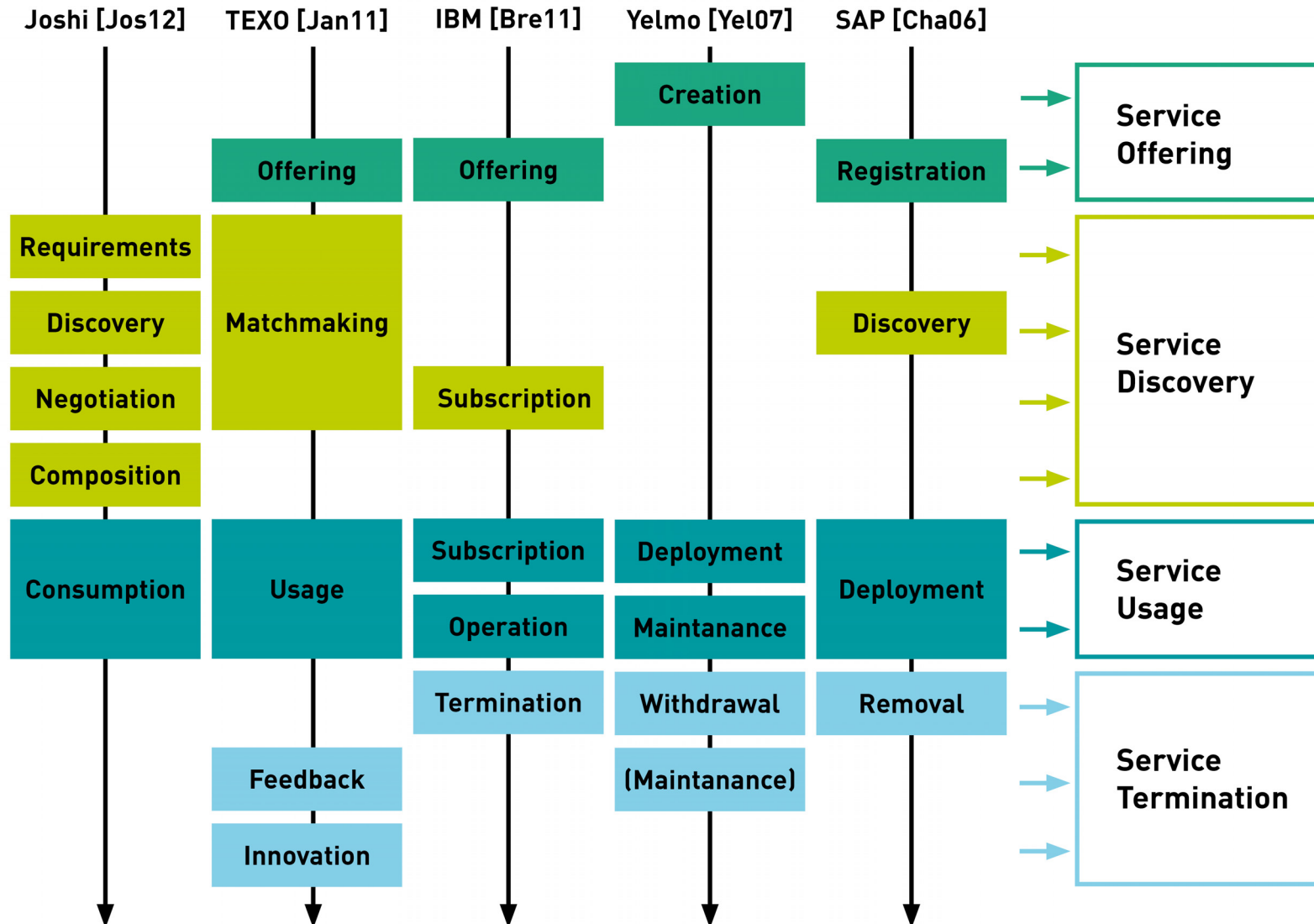
- Characteristics & Activities of the Cloud Service Consumer

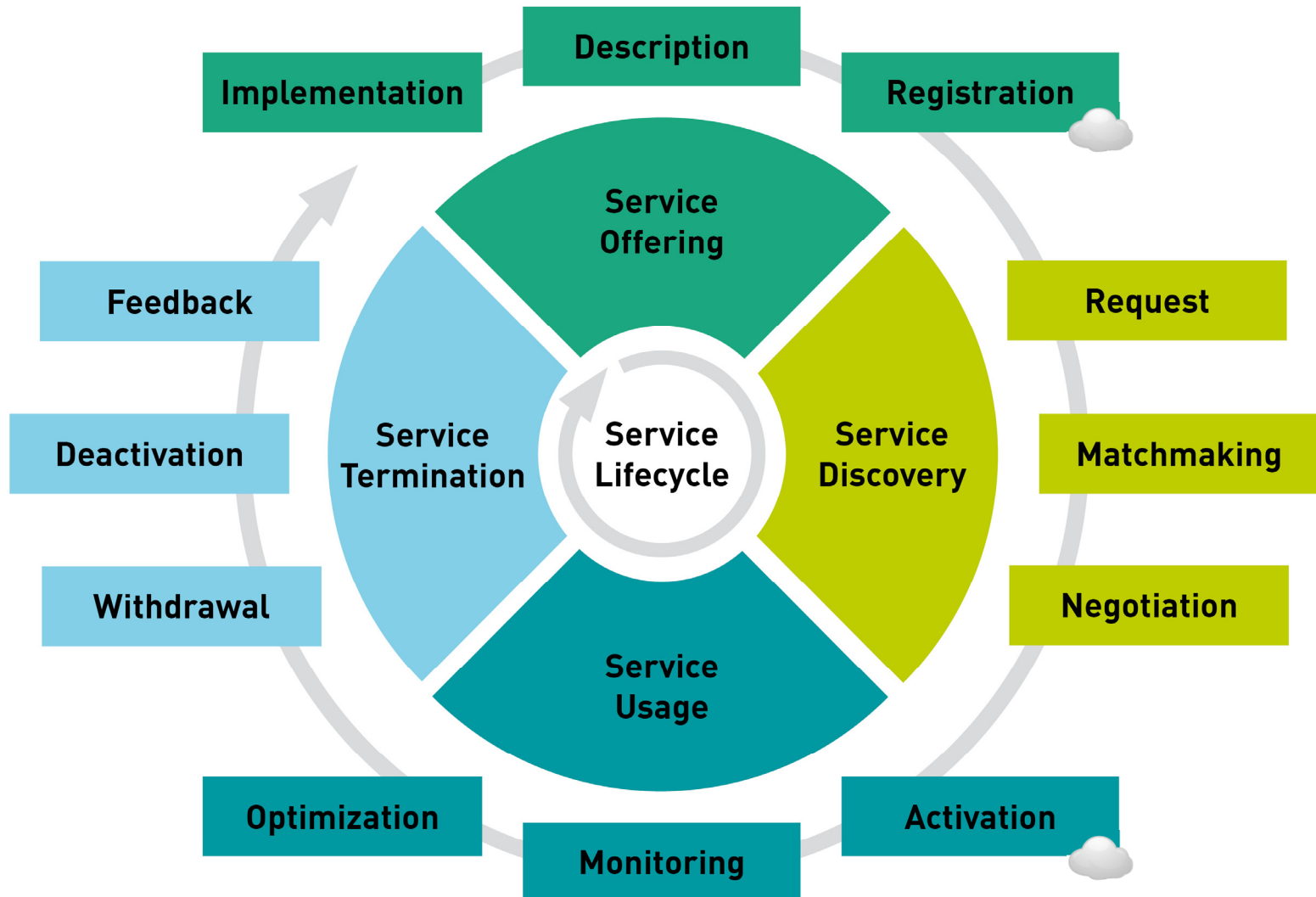
4. Cloud Usage

- Management & Usage Optimization
- Examples: Amazon CloudWatch, enStratus

5. Initial Concept Idea

6. Next Steps





■ Cloud Computing Management

- Register, search and purchase services
- Monitor and optimize service usage
- Terminate and evaluate services

■ Cloud Computing Management Systems

(1) Service marketplaces

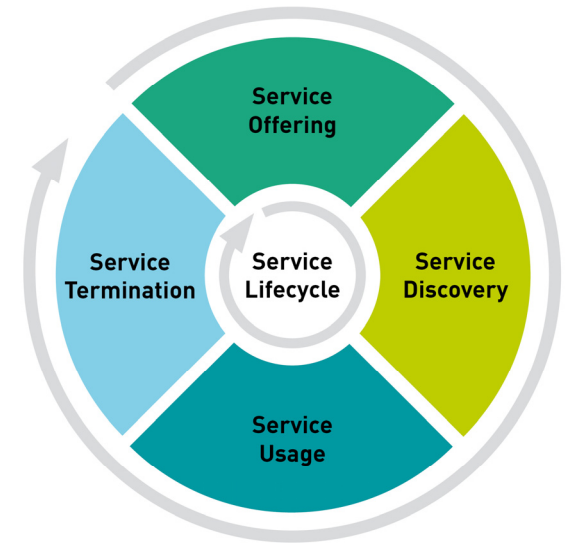


- Service offering (implementation, description, registration)
- Service discovery (request, matchmaking, negotiation)
- Service feedback
- *E. g. AWS Marketplace, Google Apps Marketplace, SPACE*

(2) Service deployment and monitoring systems



- Service usage (activation, monitoring, optimization)
- Service termination (withdrawal, deactivation)
- *E. g. AWS Management Console, KOALA, enStratus, SPACE*



	MARKETPLACES		DEPLOYMENT AND MONITORING SYSTEMS			RESEARCH
	AWS Marketplace [Ama12b]	Google Apps Marketplace [Goo10]	AWS Management Console [Ama12a]	KOALA [Bau11]	enStratus [Ens12]	SPACE [Spa12]
Level of deployment	Productive use (++)	Productive use (++)	Productive use (++)	Productive use (++)	Productive use (++)	Prototype (-)
Execution within	Public Cloud (+)	Public Cloud (+)	Public Cloud (+)	Public/Private Cloud (++)	Public/Private Cloud (++)	Personal Secure Cloud (++)
Execution via	Web browser	Web browser	Web browser	Web browser	Web browser	SPACE platform
Service model support	SaaS, AMI (+)	SaaS, other services (+)	IaaS from AWS (+)	IaaS (+)	IaaS (+)	SaaS, PaaS, IaaS (++)
Expense	Free of costs (++)	Free of costs (++)	Free of costs , charge for extra functions (+)	Free of costs (++)	0-5.000 \$/month (-)	Free of costs (++)
Vendor lock-in	Yes (AWS executable software (-))	No (++)	Yes, just AWS offers (-)	partly, just AWS compatible solutions (+)	Low, many cloud solutions supported (++)	Own cloud solutions, Amazon EC2 compatible solutions (-)
Lifecycle support	48 % (+)	27 % (-)	49 % (+)	32 % (-)	44 % (+)	78 % (++)

++ = meets criteria very well

+ = meets criteria partially

- = does not meet criteria (adequate)

Service lifecycle	Phases in [Mol12]	MARKETPLACES		DEPLOYMENT AND MONITORING SYSTEMS			RESEARCH
		AWS Marketplace	Google Apps Marketplace	AWS Management Console	KOALA	enStratus	SPACE
Offering	Provisioning	+	+				+
Discovery	User requirements	+	+				++
	Procurement	+	+				+
	Negotiation	—					++
Usage	Execution	+		+	+	+	+
	Monitoring	—		++		++	+
	Analysis			++		++	+
	Adaptation	—		++	+	++	+
Termination	Termination	+	—	+	+	—	+
Lifecycle support		48 % (+)	27 % (-)	49 % (+)	32 % (-)	44 % (+)	78 % (++)

++ = supports lifecycle well

+ = supports lifecycle partially

— = supports lifecycle not adequate (ca. 25 %)

Service Creator

- Hard- and software components

Service Provider

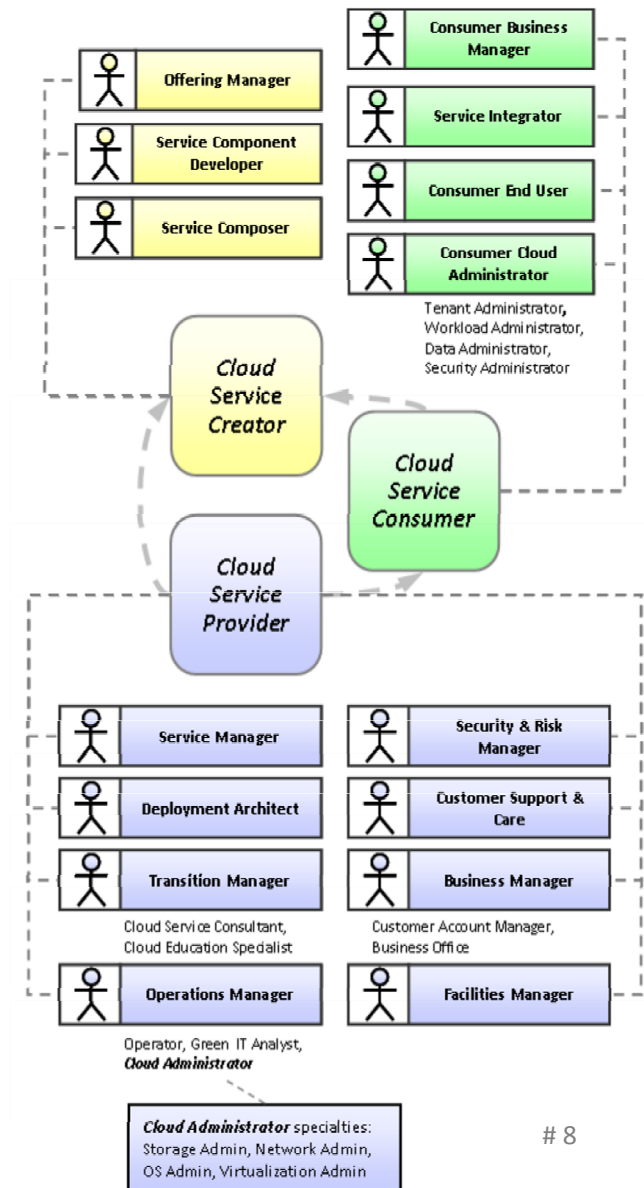
- Hard- and software infrastructure including management, maintenance
- Warranty of quality of service attributes
- Reporting, billing

Service Consumer

- Service purchase and usage

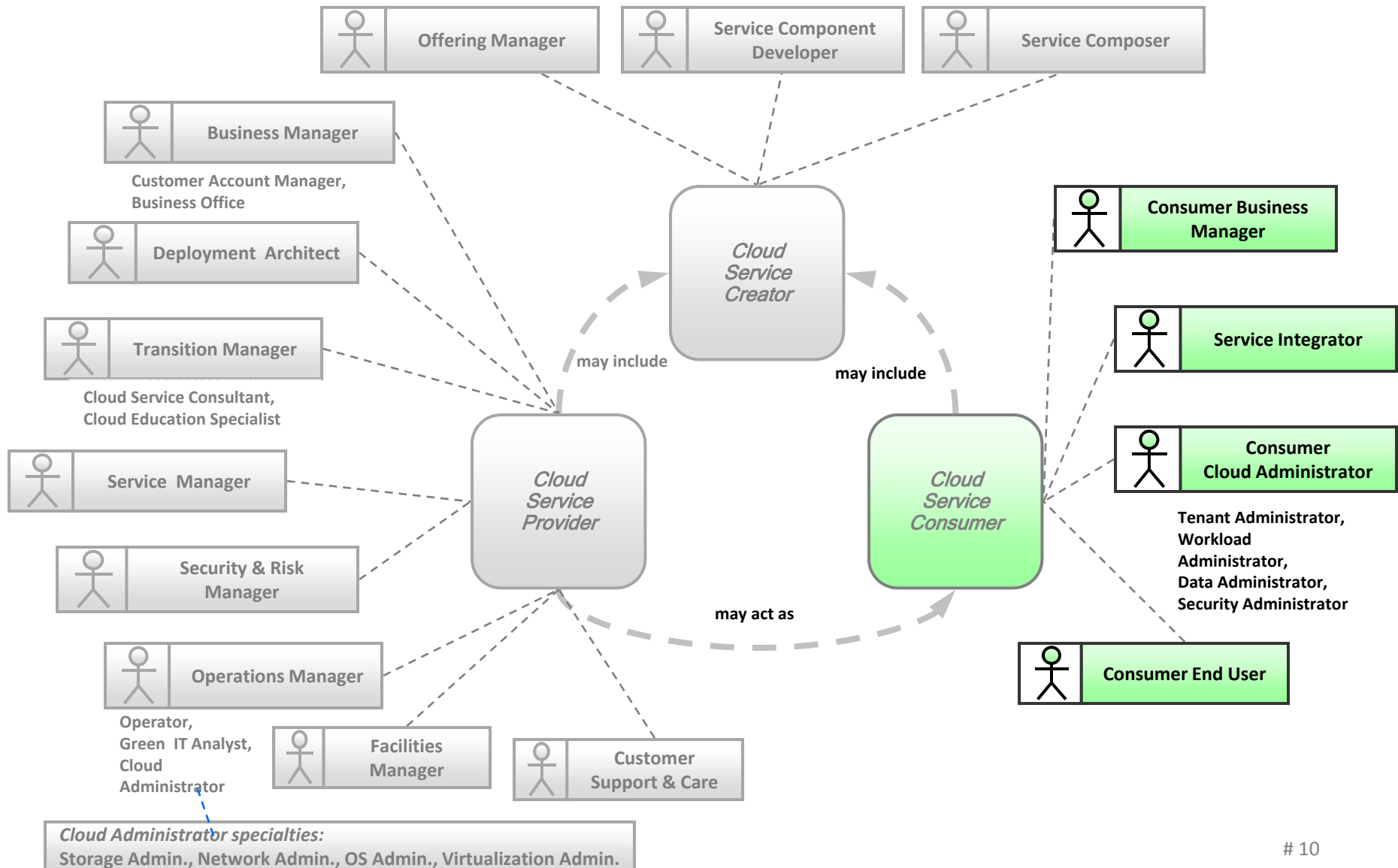
Task oriented roles:

- Administrator, operator, manager, supporter, developer, end user

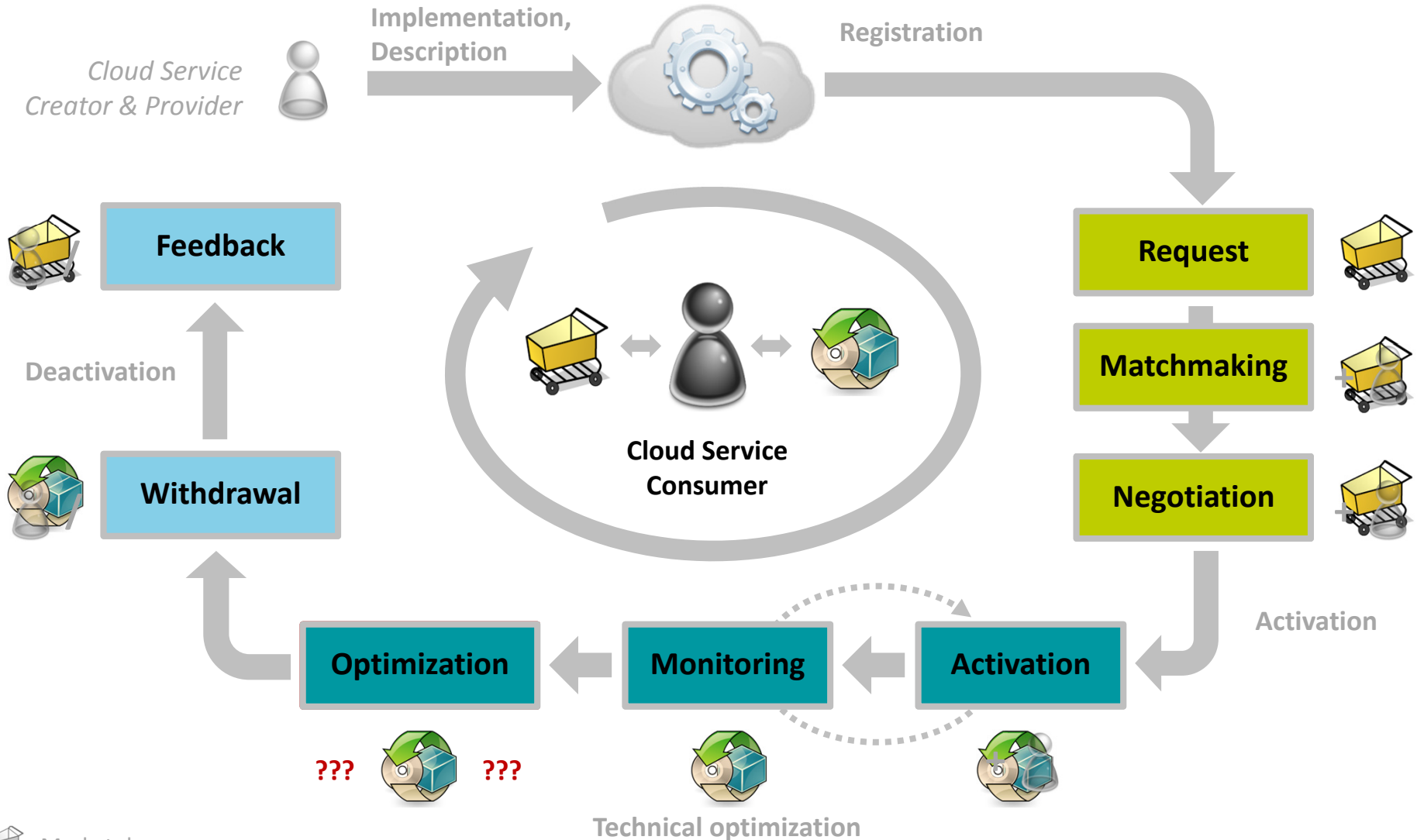


■ Activities of user roles within cloud service lifecycle

		Cloud Service Creator	Cloud Service Provider	Cloud Service Consumer
Service Offering	Implementation	Active	–	–
	Description	Active	Active/Passive	–
	Registration	– / Active	Active	–
Service Discovery	Request	–	Passive	Active
	Matchmaking	–	Active	Active/Passive
	Negotiation	–	Active	Active
Service Usage	Activation	–	Active	Active
	Monitoring	–	Active/Passive	Passive
	Optimization	–	Active	Active
Service Termination	Withdrawal	–	Active/Passive	Active/Passive
	Deactivation	–	Active	–
	Feedback	Passive	Active/Passive	Active



	CONSUMER BUSINESS MANAGER	SERVICE INTEGRATOR	CONSUMER CLOUD ADMINISTRATOR	CONSUMER END USER
Tasks	Business responsibility <ul style="list-style-type: none"> ▪ Business plan management/tracking ▪ (Re-)Negotiation ▪ Accounting 	Service integration <ul style="list-style-type: none"> ▪ Integration between off-premise cloud entities and on-premise IT environment ▪ Administer integration related operations 	IT environment <ul style="list-style-type: none"> ▪ Installation, configuration, administration of hard-/software systems, virtualization ▪ System monitoring ▪ Trouble detection, troubleshooting ▪ Cloud vendor management 	Service instance <ul style="list-style-type: none"> ▪ Request ▪ Usage
Skills	Business competence <ul style="list-style-type: none"> ▪ Market analysis ▪ Strategy ▪ Financial processing ▪ Negotiation 	Business processes <ul style="list-style-type: none"> ▪ Profound knowledge of the business data and applications Integration tools <ul style="list-style-type: none"> ▪ Detailed knowledge of relevant integration tools 	IT infrastructure <ul style="list-style-type: none"> ▪ Expert knowledge of infrastructure ▪ good judgment of the impact of changes Capacity and performance <ul style="list-style-type: none"> ▪ Proficient understanding, within and across systems Script languages <ul style="list-style-type: none"> ▪ Proficient knowledge 	Depending on the type of cloud service
Sub-roles	(no)	(no)	Tenant, Workload, Data, Security, Admin	(no)
Expert knowledge level	Medium/high	High/very high	High/very high	Depending on the type of cloud service



ASSUMPTION: The service usage is perceived as optimal by a consumer, if ...

(1) ...he receives the offered and promised service quality.

- Real time measurable quality of services are consistent with the (contractual) assured quality of services
 - *Performance: throughput, capacity, speed, scalability*
 - *Security: privacy, integrity, availability, authorization, data protection*

(2) ... his individual values and needs are taken into account.

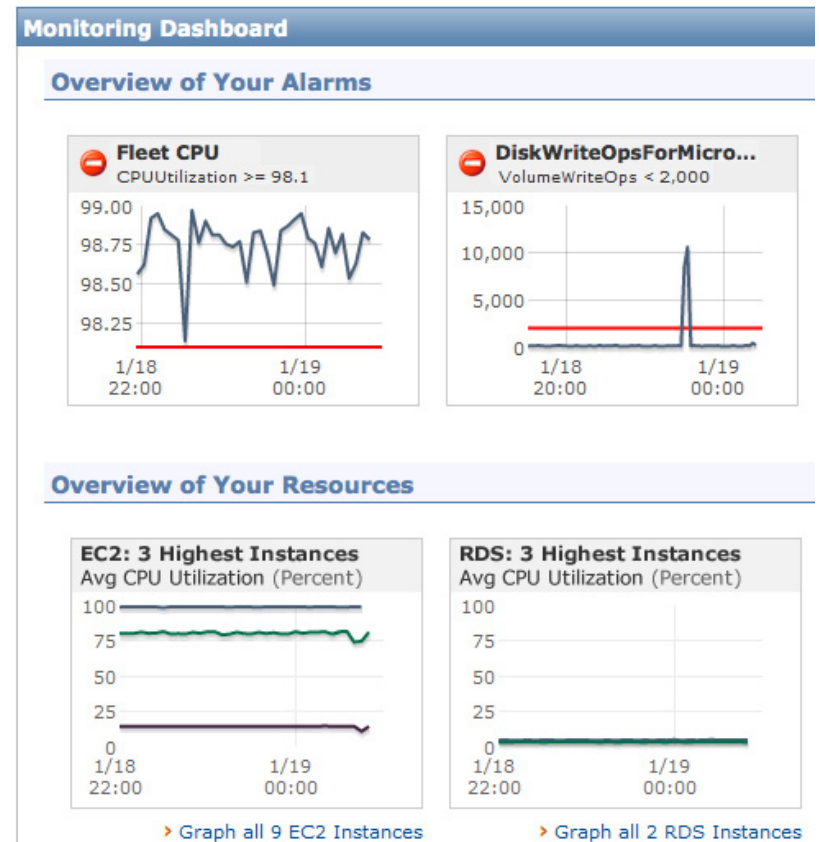
- Fix and variable non-functional service attributes satisfy individual user needs
 - *Usability, sustainability (e. g. energy efficiency), portability, origin*
 - *Cost-effectiveness, user feedback (community)*

(3) ... the monitoring of the services requires minimal additional expenditures.



- Time and cognitive expenditures

Amazon CloudWatch: Web service that provides real-time monitoring of AWS resources (e. g. EC2, RDS-DB instances) and applications

- Resource utilization, application performance, „health situation“ of operational procedures
- Goal-oriented request of monitoring data (automatic or user-defined application or system metrics)
- Statistics and graphical visualization
- Alarm configuration (Correction of errors, detection of trends, configuration of automated actions)














- **enStratus: Infrastructure management platform**
 - Supports more than 20 public and private clouds
(z. B. AWS, Rackspace, VMware, Windows Azure, Eucalyptus, CloudSigma)


▶ Demo User
▶ enStratus Imaging - Amazon
🇺🇸 N. Virginia (us-east-1)
 aws.amazon.com

Console
Automation
Configuration Management
Compute
Network
Platform
Users
Company Settings
Account Settings
Resources

Servers (show inactive servers)

Bulk actions ▶
 Show 10 entries
Filter:

ID	OS	Name	Label	Provider ID	Image	IP Address	State	Launched	
26028		SUSE10SP3		i-93400bfe	sles-10-sp3-v1.00.i386		Paused	11/30/2010 16:04:26	actions ▶
30388		chef Server	--	i-a35acacf	xtraLogging6		Paused	4/13/2011 10:02:51	actions ▶
20802		Win08x32		i-39451753	Windows-Server2008-i386-Base-v103		Paused	5/20/2011 21:50:43	actions ▶
37454		stageServer		i-36b13859	enStratus12Ubuntu1004LucidLTS32-bitEBS-20110309	184.73.6.21	Paused	7/5/2011 15:36:07	actions ▶
49284		Grails-Demo		i-abe81aca	enStratus14Ubuntu1004LucidLTS64-bit-EBS-Cloudfoundry-20110713	10.116.239.232 (Private)	Paused	7/13/2011 20:08:57	actions ▶
60842		Test-2	--	i-1b04217a	enStratus12 - Windows 2008 DC (64-bit) EBS 20100908	10.64.86.169 (Private)	Paused	8/18/2011 13:57:51	actions ▶
44055		CloudFoundryBaseComp		i-c99333a7	ubuntu-10.0.4-x_86-64-vcap-installed	50.19.149.159	Paused	8/20/2011 03:35:07	actions ▶

Support
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- enStratus: Extensive cost control of resources, cost centers, users or groups

System Status
Usage

Usage Report
Show usage by: Resource for date: 4 / 2012 Get Report

Bulk actions>
Show 10 entries
Filter:

ID	Resource Type	Resource Name	Number of Units	Amazon Web Services Total	enStratus Total	Total
2403	Load Balancer	DemoLB	263.0	\$5.26	\$0.00	\$5.26
2501	Load Balancer	Demo3	263.0	\$5.26	\$0.00	\$5.26
7400	Load Balancer	aLoadBalancer	263.0	\$5.26	\$0.00	\$5.26
10807	Load Balancer	dpando-drupal7	263.0	\$5.26	\$0.00	\$5.26
44088	Server	cf-3-64	260.0	\$98.80	\$0.00	\$98.80
49555	Server	dpando-centoscloning	259.0	\$24.60	\$0.00	\$24.60
58080	Server	esInstall	128.0	\$12.16	\$0.00	\$12.16
100680	Server	dpando-imaging-centos5-64bits	260.0	\$98.80	\$0.00	\$98.80
114049	Server	CF-Mongo-3tier-independent-node-1	91.0	\$30.94	\$0.00	\$30.94
114050	Server	CF-DEA-3Tier-independent-node-1	91.0	\$30.94	\$0.00	\$30.94
Total for all entries:				\$1,278.93	\$0.00	\$1,278.93

1 - 10 / 258
First Previous 1 2 3 4 5 Next Last

Expert knowledge required (e. g. developer, system administrator)

- Analysis and interpretation of monitoring metrics for strategic optimization of the service usage
- Determination of critical measurement limits for defining alarms

Partial „high“ expenditure of time

- Information overflow
- Only partly statistical analysis and graphical visualization
- Periodical active monitoring necessary (alarm functions not obligatory)

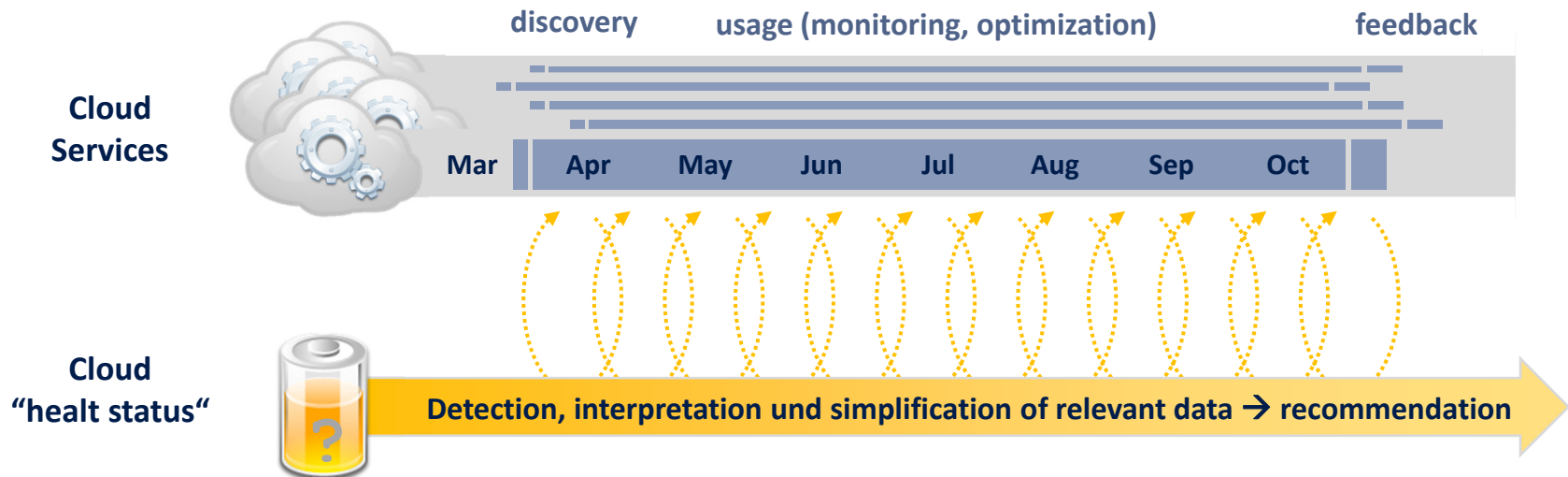
Limited information scope

- Mainly monitoring of quality of services (e. g. status) or cost overview
- No periodical monitoring of security criteria
- No consideration of individual needs, etc.

Goal: Create transparency, build up quality consciousness, optimize cloud usage!

Solution: Impart the „health status“ of used cloud services

- Considers all relevant positive and negative influencing factors (e. g. quality of service, individual interests) and their relevance for the overall condition
- Creates a continuous awareness regarding the quality of the services in use



Influencing Factor				
Obligatory quality of service attributes	Availability	Available	—	Not available
	Response time	Fast	Medium	Slow
	Scalability	Automatic	—	Not available
	Security & Privacy	Secure	—	Insecure
	Costs	Low	Average	High
	??	??	??
Subjective wishes & needs & preferences	Sustainability	Efficient	Average	Inefficient
	Cost-effectiveness	Very good	Good	Not good
	Community Feedback	Positive	Average	Negative
	Usability	Easy	Average	Difficult
	Compliance policies	Met	—	Not met
	...	??	??	??
Own infrastructure	Device connection	Trouble-free	—	Troubled
...	...	??	??	??

Limited/no expert knowledge

- Supporting the detection and execution of strategic optimization actions
- Goal-oriented understanding of „anomalies“ to deduce recommendations for all lifecycle stages (service discovery and negotiation, monitoring, termination and evaluation)

Fast, efficient and clear information brokering

- Causing limited cognitive overhead
 - Automated analysis and interpretation of relevant influence factors
- Causing limited time overhead
 - Reduction of active monitoring mechanisms
 - Less emphasis on monitoring tasks compared to service usage

(1) Analysis of influencing factors

- Which factors influence the „health status“?
- How much do they influence it and is the weight user-specific?

(2) User-oriented visualization

- How will the „health status“ be visualized?
 - Designing different concepts
 - Evaluating the concepts by the target group

(3) Data interpretation and further processing

- How to request the information (interface definition)?
- How to interpret the information and give recommendations?

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