

# Patterns for SLA Aggregation in Cloud Computing



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A thesis submitted for the degree of  
*MS(Software Engineering)*

February 2015

*I certify that the research work presented in this thesis is to the best of my knowledge my own. All sources used and any help received in the preparation of this thesis have been acknowledged. I hereby declare that I have not submitted this material, either in whole or in part, for any other degree at this or any other institution.*

Signature\_\_\_\_\_

Dedicated to my *Ami*, *Abu*, *Baji* and *Brothers...*

## Acknowledgements

*“In my life, whenever two roads have diverged in a yellow wood, I have always had someone to guide me”.*

In the name of **ALLAH** (Subhana hu Taala), Who blessed me with all what I am able to achieve in this world. Again, I am thankful to **ALLAH**. I am thankful to my **Parents** who were a constant source of encouragement during my whole life and specially in my course of studies. I owe a special thanks to my Supervisor **Dr. Irfan ul Haq**, who inspired me both as a human and as a supervisor. His analytical and critical skills polished my research abilities and made me achieve this target. He was always there for me during my bad health patches and never lost faith in me. This research work could not have been completed without him and I feel lucky to find him as my research supervisor.

I am very thankful to Mr. Altaf Hussian Huqqani from University of Vienna, as I got so much help from him whenever I needed. I had to contact him several times while his stay in Austria and he always managed to be available for help even having very busy routines.

I am thankful to all my friends who helped me during this research, especially Irfan M Khan, Farhan Elahi and Sayed Yawar Hussain Naqvi for keeping me motivated during my thesis write-up and understanding.

I am especially thankful to my mother, my brothers, my sister and my all other relatives who prayed for my success and always cared for my comfort and appreciated me all the time.

Last, but not least, I would like to thank my best friend and fiancee, Faiza Khan, for her abundant support, understanding and hearteous prayers which made me able to do this thesis.

**Asad Hanif**

Islamabad, Pakistan

March, 2015

I use “**We**” and “**Our**” in my thesis as a gesture of respect to the research community. This convention is part of my attitude towards that community.

## Abstract

In Cloud Computing Infrastructure or other eBusiness raised areas, Service Level Agreement (SLA) is an important element as it decreases the consumer's dependency on corresponding providers. In Service Oriented Infrastructure (SOI), Service Level Agreements are electronic contracts among service providers, consumers and its services. In this thesis, we are aiming to describe a SLA Aggregation model with hierarchal arrangements like service value chains and Business Value Network (BVN). In the hierarchy of SLAs, SLAs alongwith contractual information, are desired to be controlled for security, trust and privacy concerns; we applied our proposed SLA-ViewZone Pattern on novel business scenarios resulting in SLA aggregation patterns represented on our SLA Business Process Model Notations (BPN). Proposed SLA-ViewZone template is used to assure the trust and privacy of stakeholders in SLA Choreography as by business point of view each business has its own private information. The whole network of SLAs along with service Choreography which describes its proper approach is recognized as SLA Choreography. We introduced several SLA aggregation Patterns and extended SLA Aggregation Functions based on SLA aggregation formal and notational model. This approach makes the process of SLA aggregation corresponding to the hierarchical service composition simple and understandable. We applied our proposed notations, SLA Aggregation Patterns and Aggregation functions on several business models to fostering BVNs. Further we classify SLA Aggregation Patterns into main classes; Topological Patterns and Value Network Patterns which sortouts the aggregation patterns at hierarchical level. These SLA Aggregation Patterns and SLA Aggregation Functions play a pivotal role in the formation of inter-organizational business process management, BVNs and service value chains etc.

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## Abbreviations

AP.....	Aggregation Point
BPM.....	Business Process Modeling
VAP.....	Virtual Aggregation Point
PAP.....	Physical Aggregation Point
VO.....	Virtual Organization
SLA.....	Service Level Agreement
AF.....	Aggregation Function
BPN.....	Business Process Network
SME.....	Small and Medium Enterprise
BVN.....	Business Value Network
SLO.....	Service Level Objective
OGF.....	Open Grid Forum
WSA.....	Web Service Agreement
BVL.....	Business Value List
SOC.....	Service Oriented Computing
SOA.....	Service Oriented Architecture
ICT.....	Information Communication Technology
RAVO.....	Reference Architecture for Virtual Organizations
CSP.....	Composite Service Provider
QoS.....	Quality of Service
N2Sky.....	Neural Network to Sky
SLI.....	Service Level Indicators
SP.....	Service Provider
IaaS.....	Infrastructure as a Service
PaaS.....	Platform as a Service
SaaS.....	Software as a Service
XaaS.....	Everything as a Service
SPI.....	Service, Platform, Infrastructure as a Service
SOI.....	Service Oriented Infrastructure
HaaS.....	Hardware as a Service
CaaS.....	Communication as a Service
NaaS.....	Network as a Service
ASPs.....	Application Service Providers
NIST.....	National Institute of Standards and Technology

NESSI..... Networked European Software and Services Initiative  
AWS..... Amazon Web Services  
BPO..... Business Process Outsourcing  
BPEL..... Business Process Execution Language  
XML..... eXtensible Markup Language  
KB..... Knowledge Base  
P2P..... Peer to Peer  
TPTM..... Third Party Trust Manager