

List of Figures

1.1	Cloud Usage Scenario	3
2.1	System model of NIST Working Definition of Cloud Computing.	11
2.2	Behavior of Cloud Computing Service Models	15
2.3	Cloud Computing Service Models	15
2.4	The Cloud Computing Stack	16
2.5	(a) Private and (b) public cloud deployment models.	17
2.6	Community cloud deployment models.	17
2.7	Hybrid cloud deployment models.	18
2.8	Cloud Deployment Models	18
2.9	Virtualization technology	20
2.10	Three different types of system virtual machine	21
2.11	VM provisioning operation	24
2.12	VM management dynamic shutdown technique	25
2.13	Life cycle of Virtual Machines	26
2.14	Virtual Machine Provisioning Process	26
3.1	A Schematic representation for a multi server queueing system.	33
3.2	System model.	34
3.3	Queue Model of Web Application on Cloud.	36
3.4	State transition diagram for a multi server queueing model. . .	37
3.5	Impact of L on λ for model I.	40
3.6	Impact of L on λ for model II.	41
3.7	Impact of L on λ for Model I.	45

3.8	Impact of L on λ for Model II.	45
4.1	System model.	49
4.2	Rate transition diagram for policy-1.	50
4.3	Impact of L_s on λ	53
4.4	Impact of W_q on λ	53
4.5	Impact of \bar{S} on K	54
4.6	Impact of N on U_t	55
4.7	Effect of N on \bar{c}	55
4.8	Rate transition diagram for policy-2.	57
4.9	Impact of λ on L_s	61
4.10	The Server utilization U_s for different values of ρ and c	61
4.11	Impact of ρ on PBL	62
4.12	Impact of ρ on L_s for different policies.	62
4.13	Impact of N on U_t for different policies.	63
4.14	Impact of N on \bar{c} for different policies.	63
5.1	Cloud Architecture to support scheduling.	69
5.2	State-transition-rate diagram for an M/M/c/N system with two client arrival modes and $c = 3$	72
5.3	Impact of L_s on ρ_1	78
5.4	Impact of L_1 on ρ_1	78
5.5	Impact of L_2 on ρ_1	80
5.6	Impact of L_s on ρ_1	81
5.7	Impact of $E[B]$ on ρ_1	82
5.8	Cost Versus buffer size.	82
5.9	Cost Versus μ_2	83
6.1	A typical 3-tier application in cloud.	86
6.2	Data Center architecture.	87
6.3	The dynamic resource provisioning of cloud data center.	88
6.4	Impact of λ on L_q for fixed and variable service rate.	95
6.5	Impact of N on P_{loss} for different distributions.	96

6.6	Impact of N on P_{loss} for different distributions.	96
6.7	Impact of λ on w_q for different distributions.	97
6.8	Impact of λ on L_q for different service rates.	97
6.9	λ Vs W_q for constant and variable service rate.	98
6.10	The W_q for different values of N and λ	99
6.11	The blocking probability for different values of N and λ	99
7.1	The Service Oriented Resource Broker Architecture for Resource Reservation.	104
7.2	System model of bulk service on cloud.	106
7.3	Effect of buffer size on PBL with varying c	110
7.4	Effect of μ on PBL with varying b	110
7.5	Effect of ρ on W_q with varying c	112
7.6	Effect of blocking probability for different values of b and N	113
7.7	Effect of W_q for different values of c and b	113
7.8	Effect of P_{is} on buffer size.	114