Contents	Page number
1. APPLYING A METHODOLOGY TO NETWORK DESIGN.	1
1.1. Network	2
Local Area Network (LAN)	3
Metropolitan Area Network (MAN)	3
Wide Area Network (WAN).	4
1.2. Network Components and OSI Layer	4
1.3. Network Topology	6
Prints Print Translate	
Point to Point Topology	6
Dua Tanalagu	7
Bus Topology	1
Star Topology	7
Ring Topology	8
Mesh Topology	9
Tree Topology	10
Daisy Chain Topology.	10
Hybrid Topology	11
1.4. Transmission Technologies	12
Token Ring	12
FDDI	12

Ethernet	13
1.5. Transmission Media	13
Coaxial Cable	14
Twisted Pair	14
Fibre Optics	15
1.6. CSMA/CD and CSMA/CA	16
Carrier Sense Multiple Access/Collision Detect (CSMA/CD)	16
Wireless LAN and CSMA/CA	17
1.7. Collision Domain and Broadcast Domain	17
Collision Domain	17
Broadcast Domain	18
1,8. Internetworking Devices 18	18
Repeaters	20
Hubs 20	20
Bridges	21
switches	25
Routers	26

1.9. Addresses	27
Physical Address	27
Logical Address	28
1.10. Routing and Network Layer Addresses	28
,	
IP Addresses	28
Private and Public IP Address	29
Subnet	30
Virtual Lans	31
STP and VLANS	32
INTERVLAN ROUTING	32
Old Network vs Current Network,	33
Overview of Network Analysis, Architecture and Design Process	34
Hierarchy and Diversity	35
1.15. Network Services, Characteristics and Metrics	36
1.13. Network Services, Characteristics and Metrics	30
Network Services and Metrics	36
Performance Characteristics	37

1.16. Cisco Service-Oriented Network Architecture	37
Evolution of Network Architecture.	38
Intelligent Network	39
Cisco SONA Framework.	40
1.17. Network Design Methodology	43
PPDIOO Methodology	43
Benefits of PPDIOO on Network Design Methodology	45
Design Methodology.	47
1.18 Identifying Customer Requirements.	48
Assessing the Scope of a Network Design Project.	48
-> Identifying Required Information	49
Planned Applications and Network Services	51
Organisational Constraints	53
Organisational Goals	53
Technical Goals	54
Technical Constraints	55
1.19. Characterising the Existing Network and Sites	56
Sample Site Contact Information	57
Sample High-Level Network Diagram.	58
- Auditing or Assessing the Existing Network	59
Analysing Network Traffic and Applications	
Network Health Checklist	60

Summary Report	61
Creating a Draft Design Document	62
Using the Top-Down Approach to Network Design	62
Bottom-Up Approach to Network Design	63
5	
Top-Down Approach to Network Design	63
Decision Tables in Network Design	64
Decision rapies in Network Design	04
Structured Design	66
1.21.	
Design Implementation Process	67
1] Planning a Design Implementation	68
Implementing and Verifying the Design	69
Monitoring and Redesigning the Network	69
1.22. Summary	70
STRUCTURING AND MODULARISING THE NETWORK	71
2.1. Network Hierarchy	72

Hierarchical Network Model	72
2.2. Using A Modular Approach To Network Design	80
-) Cisco SONA Framework.	81
-> Functional Areas of Cisco Enterprise Architecture	81
Guidelines for Creating an Enterprise Network	84
Enterprise Campus Modules	85
-> Enterprise Edge Modules	88
-> Service Provider Modules.	92
-> Remote Enterprise Modules.	93
2.3. Services within Modular Networks	94
Interactive Services	94
Security Services in Modular Network Design	96
High-Availability Services in a Modular Network Design	100
Voice Services in a Modular Network Design	104
-> Wireless Services in a Modular Network	107
Application Networking Services in a Modular Network Design	108
2.4. Network Management Protocols and Features	109
Simple Network Management Protocol (SNMP)	112

MIB	115
IVIID	113
RMON	116
Syslog Accounting	118
2.5. Summary	120
DESIGNING BASIC CAMPUS AND DATA CENTRE NETWORKS	121
3.1. Campus Design Considerations,	122
Application Considerations.	122
-> Environmental Considerations	126
-> Infrastructure Considerations	129
3.2. Enterprise Campus Design	132
-) Building Access Layer Design Considerations	132
-> Building Distribution Layer Design Considerations	133
Campus Core Design Considerations	135
Server Placement	138
3.3. Enterprise Data Centre Design Considerations	141
-> The Enterprise Data Centre	141
→ Enterprise Data Centre Infrastructure,	144
	1

3.4. Summary	146
DESIGNING REMOTE CONNECTIVITY	147
4.1. Enterprise Edge Wan Technologies.	147
Introduction to WANS	148
WAN Interconnections	148
Traditional WAN Technologies	149
WAN Transport Technologies	151
4.2. WAN Design	160
Application Requirements.	161
Technical Requirements	163
WAN Ownership	166
Bandwidth Optimisation	166
4.3. Using WAN Technologies.	168
Remote Access Network Design	168
VPN Design	168
WAN Backup Strategies	170
-> The Internet as a WAN Backup Technology .	173

4.4. Enterprise Edge WAN and MAN Architecture	173
- Enterprise WAN Architecture Technologies	174
4.5. Selecting Enterprise Edge Components	178
4.6. Enterprise Branch and Teleworker Design.	179
Enterprise Branch Architecture.	179
Enterprise Branch Design	181
Enterprise Teleworker Design	185
4.7. Summary	186
5. DESIGNING IP ADDRESSING IN THE NETWORK & SELECTING ROUTING	187
5.1. Designing an IP Addressing Plan.	188
Determine the Size of the Network.	188
IP address Hierarchy and Routing	188
Route Summarisation- Route Supernetting	188
Benefit of Hierarchical Addressing for large networks	188
-> Summarisation Groups in Multilevel Hierarchical Network,	189
- Disadvantages of Poorly Designed IP Addressing	190

-> Fixed and Variable length Subnet mask and Routing Protocol Consideration	191
-> Classful Routing protocols uses following rules while updating the routing table	192
-> Method of Assigning IP addresses	192
5.2. Introduction To IPV6.	193
IPV6 Features	195
Types of IPv6 Addresses	196
IPV6 Address Notation and Header Format	196
Address Assignment Strategies	197
-> IPV6 Name Resolution	198
-> IPV4-to-IPV6 Transition Strategies and Deployments.	199
5.3. Routing Protocols	199
-> Types of Routes	202
Routing Protocol Features	202
5.4. Routing Protocols for Enterprise	209
5.5. Routing Protocol Deployment	214
5.6. Route Redistribution	216
5.7. Route Filtering	218

5.8. Redistributing And Filtering With Bgp.	218
5.9. Route Summarisation	220
Summary	221
6. SOFTWARE DEFINED NETWORKING	223
0. SOFTWARE DEFINED NETWORKING	223
6.1. Understanding Software Defined Networking (SDN)	224
->Networking the Traditional Way:	224
Networking the SDN Way	225
SDN Architecture	226
6.2. SDN Building Blocks	228
6.3. Open Flow Protocol.	229
6.4. Openflow Message Types	230
Controller-to-Switch Messages:	230
Asynchronous Messages	231
Symmetric messages	231
6.5. Implementing Openflow Switch	232

-> OpenFlow Reference Switch:	232
. Structure of a Flow-table.	233
Open Flow Operation	234
Flow Table Entry Field	235
-> SDN OpenFlow Laboratory Implementation	236
6.6. Openflow Controllers	244
6.7. NOX	247
6.8. POX.	248
» Running POX Application	249
6.9. Open Flow in Cloud Computing.	252
-> OpenStack and Neutron.	252
-> OpenStack Process Workflow	254
-> Neutron Plugins	256
6.10. Case Study: How Sdn Changed Traditional	
Enterprise Network Design	256
Effect of SDN on Traditional Enterprise Network Design	256
The features considered in case study	257

Use cases	259
Summary	260