

Contents

1	Software Architecture: An Introduction	3
1.1	Subject Matter and Goals	3
1.1.1	Software Systems	4
1.1.2	Structures of Software Systems	6
1.1.3	Goals and Problems of Software Architecture	8
1.2	Architecture of Software Systems	11
1.2.1	The Architecture of a Software System	11
1.2.2	Generic Architectures and Patterns	14
1.3	Relation to other Disciplines	15
1.4	Overview and Further Reading	17
2	Software Systems and Architecture	19
2.1	A Closer Look at Software Systems	19
2.1.1	Software Systems and their Contexts	19
2.1.2	Characteristics of Software Systems	21
2.1.3	What is Software? What is a Software System?	23
2.2	Examples of Software Systems and Architectures	25
2.2.1	GCC: The GNU Compiler Collection	26
2.2.2	A Three Tier Architecture	26
3	Architectural View and Aspects	33
3.1	Architectural Structures and Views	33
3.1.1	An Introduction to Views	34
3.1.2	The Dynamic View of Software Systems	36
3.1.3	The Static View of Software Systems	38
3.1.4	The Relationship between Dynamic and Static View	39
3.1.5	An Example Based Discussion of Views	42
3.2	Architectural Aspects	49
3.2.1	Availability	50
4	Architectural Patterns	53
4.1	Introduction	54
4.2	Layered Organization	56

4.3	Repositories	57
4.4	Compound Object Pattern	59
4.5	Pipes and Filters	60
4.6	Process-Control Pattern	61
5	Program Frameworks	67
5.1	Introduction to Program Frameworks	67
5.2	A Program Framework for User Interfaces	70
5.2.1	Architectural Properties of Graphical User Interfaces	70
5.2.2	The Abstract Window Toolkit of Java	73
6	Architectures for Component Software	79
6.1	Component Frameworks: An Introduction	80
6.2	Microsoft's Component Object Model	82
6.2.1	Component Model	83
6.2.2	Component Infrastructure	85
6.2.3	Further Features of the COM Framework	88
6.3	Enterprise JavaBeans	89
6.3.1	Component Model	90
6.3.2	Component Infrastructure	98
7	Description Techniques for Architectures	105
7.1	Unified Modeling Language: An Overview	106
7.1.1	UML Diagrams	106
7.1.2	UML Class Diagrams	109
7.1.3	UML Interaction Diagrams	111
7.1.4	Unified Modeling Language as ADL	113
7.2	Architectural Frameworks	114
7.2.1	An Introduction to Architectural Frameworks	114
7.2.2	A Tiny Architectural Framework	115
7.3	Connectors in Architectural Descriptions	121
8	Designing Software Architectures	123
8.1	Software Design and Architecture	123
8.1.1	Methods and Techniques for Design	124
8.1.2	The Role of Architectural Structures for Design	126
8.2	Architectures and Evaluation	127
8.2.1	General Design Rules for Architectures	127
8.2.2	Architectures and their Relation to Requirements	128