

Contents

1	Introduction	1
1.1	Background	1
1.2	Requirements and Challenges	3
1.3	Limitation of Current Approaches	4
1.4	Goals	5
1.5	Summary of Contributions	5
1.6	Organization of this Book	6
	References	6
2	Foundations of Context Management in Distributed and Dynamic Environments	9
2.1	Introduction	9
2.2	General Concepts	11
2.2.1	Context, Entity, Types and Instances	11
2.2.2	Context Model and Modeling Approach	12
2.2.3	Context Providers and Consumers	13
2.2.4	Contextual Event and Context Interest	14
2.2.5	Context Selection and Matching	15
2.2.6	Context Management System	16
2.3	Conceptual Layers of Context Interest Management	17
2.4	Context Interest Management in a Dynamic Context-Aware Ecosystem	20
2.4.1	Requirements of the Interest Delivery Layer	22
2.4.2	Requirements for Interest Description Layer	23
2.5	Summary	25
	References	26

3	State of the Art	29
3.1	Introduction	29
3.2	Distributed Middleware Systems	30
3.2.1	Gaia	30
3.2.2	PACE	31
3.2.3	Confab.	32
3.2.4	AURA CIS.	32
3.2.5	Vade	33
3.2.6	CMF	33
3.3	Peer-to-Peer Approaches for Context Management	34
3.3.1	Contory	34
3.3.2	Springer et al.'s Work	35
3.4	Federation-Based Approaches	35
3.4.1	CAMUS.	35
3.4.2	Nexus	36
3.4.3	GLOSS	36
3.4.4	Interoperability-Centered Work.	37
3.5	Bridging Approaches	37
3.6	Summary	37
	References	38
4	Domain-Based Context Management	41
4.1	Introduction	41
4.2	Requirements	42
4.2.1	Primitives for Describing Context Interests	42
4.2.2	Efficient Mechanisms for Interest Delivery Layer	42
4.2.3	Adequate Context Modeling Approach	42
4.3	Context Domains.	43
4.3.1	Description of Context Interests	44
4.4	Managing Context Interests Through Domain-Addressable Entities	45
4.5	Summary	47
5	Usage Scenario	49
5.1	Introduction	49
5.2	Application Description	50
5.3	Usage Scenario	50
5.4	Context-Aware Infrastructure	51
5.4.1	Context Domains	52
5.4.2	Context Models and Providers	52
5.5	Implementation of Application's Context Interests.	55
5.6	Analysis of Interest Dissemination.	55
5.7	Summary	57

6	Middleware for Context Management Based on Context Domains.	59
6.1	Introduction	59
6.2	Design Rationale	60
6.3	Architecture and Services	61
6.3.1	Management Tier	62
6.3.2	Proxy Tier	64
6.3.3	Context Distribution and Entity Management Tier	65
6.3.4	Distributed Domain Tier	67
6.4	Client Node	68
6.5	Modeling and Deployment of Context Types	68
6.5.1	Context Modeling and Representation	69
6.6	Programming Model	70
	References	71
7	Implementation and Evaluation	73
7.1	Introduction	73
7.2	Implementation	73
7.2.1	Client Node	74
7.2.2	Context Management Node	76
7.3	Testing Scenario	76
7.4	Scalability Tests	77
7.4.1	Service Performance	77
7.4.2	Mobility Impact	80
7.5	Limitations	81
7.5.1	Basic Mechanism for Context-Based Adaptation.	81
7.5.2	Chain of Providers and Consumers Causes Delays of Context Reasoning	82
7.5.3	Context Domains Strongly Based on Network Domain	83
7.5.4	Interoperability Among Domains Enforced by the Adoption of Standards	83
	References	83
8	Conclusions	85
8.1	Introduction	85
8.2	Summary of Contributions	87
8.3	Future Research.	88
8.3.1	Context Domains Based on Physical Location	88
8.3.2	Extension of Constraint Operation in a Context Interest	89

- 8.3.3 Composition of Notifications Based
on Context Meta-Attributes 89
- 8.3.4 Implementation Policies for Optimized
Context Access 89
- 8.3.5 Security Mechanisms for Inter-Domain
Context Management 90
- 8.3.6 Enhanced Model of Interaction Among Providers,
Consumers and CMS 90
- References 91