
Contents

Part I Foundations

| | | |
|----------|---|----|
| 1 | From Web to Semantic Web | 3 |
| 1.1 | The Web – A Familiar Starting Point | 3 |
| 1.2 | Architectural Principles of the World Wide Web | 5 |
| 1.3 | The World Wide Web Consortium – W3C | 7 |
| 1.4 | Spawning the Semantic Web | 9 |
| 1.5 | The Semantic Web | 14 |
| 1.6 | The Semantic Web – Future Prospects | 24 |
| 1.7 | Summary | 25 |
| 2 | Semantic Web Services | 27 |
| 2.1 | Behavioral Perspective of the World Wide Web | 27 |
| 2.2 | Web Services | 34 |
| 2.3 | Semantic Web Services: The Future of Integration! | 37 |
| 2.4 | The Ideal World | 40 |
| 2.5 | Summary | 41 |
| 3 | WSMO and WSML | 43 |
| 3.1 | The Web Service Modeling Ontology | 43 |
| 3.2 | The Web Service Modeling Language | 53 |
| 3.3 | Summary | 65 |

Part II SESA Environment

| | | |
|----------|--|----|
| 4 | Introduction to Semantically Enabled Service-oriented Architectures | 69 |
| 4.1 | SESA Background | 69 |
| 4.2 | Service Orientation | 70 |
| 4.3 | Execution Environment for Semantic Web Services | 74 |
| 4.4 | Governing Principles | 76 |

XII Contents

| | | |
|----------|--|------------|
| 4.5 | SESA Vision – Global View | 76 |
| 4.6 | SESA Roadmap | 82 |
| 4.7 | SESA Research Areas and Goals | 83 |
| 4.8 | Summary | 97 |
| 5 | SESA Middleware | 99 |
| 5.1 | Services Viewpoint | 100 |
| 5.2 | Technology Viewpoint | 112 |
| 5.3 | Summary | 117 |
| 6 | SESA Execution Semantics | 119 |
| 6.1 | Motivation | 120 |
| 6.2 | Proposed Description Formalism | 121 |
| 6.3 | Mandatory Execution Semantics | 122 |
| 6.4 | Case Study Example of SESA Execution Semantics | 126 |
| 6.5 | Technical Perspective on Execution Semantics | 131 |
| 6.6 | Summary | 134 |

Part III SESA Services

| | | |
|----------|---|------------|
| 7 | Reasoning | 137 |
| 7.1 | Reasoning Requirements | 137 |
| 7.2 | Logical Background | 140 |
| 7.3 | Reasoning Tasks | 144 |
| 7.4 | Reasoning Within SESA | 155 |
| 7.5 | A Generic Framework for Reasoning with WSML | 156 |
| 7.6 | Rule Interchange Format | 162 |
| 7.7 | Conclusion | 164 |
| 8 | Discovery | 167 |
| 8.1 | A Conceptual Model for Discovery | 167 |
| 8.2 | Web Services at Various Levels of Abstraction | 168 |
| 8.3 | Keyword-Based Discovery | 169 |
| 8.4 | Discovery Based on Simple Semantic Descriptions | 174 |
| 8.5 | Discovery Based on Rich Semantic Descriptions | 182 |
| 8.6 | Summary | 191 |
| 9 | Selection | 193 |
| 9.1 | Introduction | 193 |
| 9.2 | Nonfunctional Properties | 194 |
| 9.3 | Selecting Services | 201 |
| 9.4 | Related Work | 207 |
| 9.5 | Summary | 208 |

| | | |
|-----------|---|-----|
| 10 | Mediation | 211 |
| | 10.1 Preliminaries | 211 |
| | 10.2 Ontology-Based Data Mediation | 214 |
| | 10.3 Behavioral Mediation | 223 |
| | 10.4 Summary | 231 |
| 11 | Storage and Internal Communication | 233 |
| | 11.1 Introduction to Triple Space Computing | 234 |
| | 11.2 Triple Space Kernel | 237 |
| | 11.3 Role of Triple Space Computing in SESA | 247 |
| | 11.4 Evaluation | 255 |
| | 11.5 Summary | 256 |

Part IV SESA Application and Compatible Systems

| | | |
|-----------|--|-----|
| 12 | SESA Application | 261 |
| | 12.1 Case Scenario: B2B Integration | 261 |
| | 12.2 Case Scenario: Voice and Data Integration | 270 |
| | 12.3 Summary | 284 |
| 13 | Compatible and Related Systems | 285 |
| | 13.1 The Internet Reasoning Service | 285 |
| | 13.2 Other WSMO-Compatible Tools | 293 |
| | 13.3 Tools Based on OWL-S | 294 |
| | 13.4 METEOR-S | 296 |
| 14 | Conclusions and Outlook | 303 |
| | 14.1 Why SOA? | 303 |
| | 14.2 Future Work | 305 |
| | 14.3 Commercialization | 306 |
| | References | 307 |
| | Index | 319 |