Contents

1 Introduction 1
- 1.1 What's So Special About Digital Things? 2
- 1.2 Terminology 5
- 1.3 Summary 5

2 The Really Foolproof Solution for Digital Preservation 7

Part I Theory – The Concepts and Techniques Which Are Essential for Preserving Digitally Encoded Information

3 Introduction to OAIS Concepts and Terminology 13
- 3.1 Preserve What, for How Long and for Whom? 13
- 3.2 What "Metadata", How Much "Metadata"? 16
- 3.3 Recursion – A Pervasive Concept 26
- 3.4 Disincentives Against Digital Preservation 28
- 3.5 Summary 30

4 Types of Digital Objects 31
- 4.1 Simple vs. Composite 31
- 4.2 Rendered vs. Non-rendered 33
- 4.3 Static vs. Dynamic 38
- 4.4 Active vs. Passive 38
- 4.5 Multiple-Classifications 39
- 4.6 Summary 39

5 Threats to Digital Preservation and Possible Solutions 41
- 5.1 What Can Be Relied on in the Long-Term? 43
- 5.2 What Others Think About Major Threats to Digital Preservation 44
- 5.3 Summary 45

6 OAIS in More Depth 47
- 6.1 OAIS Conformance 49
- 6.2 OAIS Mandatory Responsibilities 50
- 6.3 OAIS Information Model 53
- 6.4 OAIS Functional Model 63

Bibliografische Informationen
http://d-nb.info/1007589477

digitalisiert durch DEUTSCHE NATIONAL BIBLIOTHEK

6.5 Information Flows and Layering 65
6.6 Issues Not Covered in Detail by OAIS 65
6.7 Summary 67

7 Understanding a Digital Object: Basic Representation Information 69
Co-author Stephen Rankin
7.1 Levels of Application of Representation Information Concept 69
7.2 Overview of Techniques for Describing Digital Objects 71
7.3 Structure Representation Information 75
7.4 Format Identification 96
7.5 Semantic Representation Information 97
7.6 Other Representation Information 101
7.7 Application to Types of Digital Objects 102
7.8 Virtualisation 112
7.9 Emulation 123
7.10 Summary 137

8 Preservation of Intelligibility of Digital Objects 139
Co-authors Yannis Tzitzikas, Yannis Marketakis, and Vassilis Christophides
8.1 On Digital Objects and Dependencies 139
8.2 A Formal Model for the Intelligibility of Digital Objects 142
8.3 Modelling and Implementation Frameworks 163
8.4 Summary 166

9 Understandability and Usability of Data 167
9.1 Re-Use of Digital Objects – Interoperability and Preservation 168
9.2 Use of Existing Software 171
9.3 Creation of New Software 173
9.4 Without Software 173
9.5 Software as the Digital Object Being Preserved 174
9.6 Digital Archaeology, Digital Forensics and Re-Use 174
9.7 Multiple Objects 175
9.8 Summary 175

10 In Addition to Understanding It – What Is It?: Preservation Description Information 177
10.1 Introduction 177
10.2 Fixity Information 177
10.3 Reference Information 178
10.4 Context Information 184
10.5 Provenance Information 184
10.6 Access Rights Management 185
10.7 Summary 190

11 Linking Data and "Metadata": Packaging 191
11.1 Information Packaging Overview 191
11.2 Archival Information Packaging 192
11.3 XFDU 193
11.4 Summary 196

12 Basic Preservation Strategies 197
12.1 Description – Adding Representation Information 198
12.2 Maintaining Access 198
12.3 Migration/Transformation 200
12.4 Summary 202

13 Authenticity 203
13.1 Background to Authenticity 204
13.2 OAIS Definition of Authenticity 205
13.3 Elements of the Authenticity Conceptual Model 208
13.4 Overall Authenticity Model 212
13.5 Authenticity Evidence 214
13.6 Significant Properties 214
13.7 Prototype Authenticity Evidence Capture Tool 221
13.8 Summary 232

14 Advanced Preservation Analysis 233
Co-author Esther Conway
14.1 Preliminary Investigation of Data Holdings 234
14.2 Stakeholder and Archive Analysis 235
14.3 Defining a Preservation Objective 237
14.4 Defining a Designated User Community 238
14.5 Preservation Information Flows 240
14.6 Preservation Strategy Topics 243
14.7 Preservation Plans 245
14.8 Cost/Benefit/Risk Analysis 245
14.9 Preservation Analysis Summary 246
14.10 Preservation Analysis and Representation Information in More Detail 246
14.11 Network Modelling Approach 247
14.12 Summary 264

Part II Practice – Use and Validation of the Tools and Techniques that Can Be Used for Preserving Digitally Encoded Information

15 Testing Claims About Digital Preservation 267
15.1 "Accelerated Lifetime" Testing of Digital Preservation Techniques 267
15.2 Summary 269

16 Tools for Countering the Threats to Digital Preservation 271
16.1 Key Preservation Components and Infrastructure 272
16.2 Discipline Independent Aspects 276
16.3 Discipline Dependence: Toolboxes/Libraries 284
16.4 Key Infrastructure Components 284
16.5 Information Package Management 285
16.6 Information Access 287
16.7 Designated Community, Knowledge and Provenance Management 287
16.8 Communication Management 288
16.9 Security Management 289

17 The CASPAR Key Components Implementation 291
17.1 Design Considerations 291
17.2 Registry/Repository of Representation Information Details . . . 291
17.3 Virtualizer 297
17.4 Knowledge Gap Manager 301
17.5 Preservation Orchestration Manager 303
17.6 Preservation DataStores 305
17.7 Data Access and Security 315
17.8 Digital Rights Management Details 318
17.9 Find – Finding Manager 321
17.10 Information Packaging Details 322
17.11 Authenticity Manager Toolkit 332
17.12 Representation Information Toolkit 333
17.13 Key Components – Summary 335
17.14 Integrated tools 337

18 Overview of the Testbeds 341
18.1 Typical Preservation Scenarios 341
18.2 Generic Criteria and Method to Organise and to Evaluate the Testbeds 342
18.3 Cross References Between Scenarios and Changes 343

19 STFC Science Testbed 345
19.1 Dataset Selection 345
19.2 Challenges Addressed 345
19.3 Preservation Aims 347
19.4 Preservation Analysis 347
19.5 MST RADAR Scenarios 347
19.6 Ionosonde Data and the WDC Scenarios 361
19.7 Summary of Testbed Checks 366

20 European Space Agency Testbed 367
20.1 Dataset Selection 369
20.2 Challenge Addressed 370
20.3 Preservation Aim 372

20.4 Preservation Analysis . . . 372
20.5 Scenario ESA1 – Operating System Change . . . 372
20.6 Additional Workflow Scenarios . . . 384
20.7 Conclusions . . . 386

21 Cultural Heritage Testbed . . . 387
21.1 Dataset Selection . . . 388
21.2 Challenges Addressed . . . 396
21.3 Preservation Aim . . . 396
21.4 Preservation Analysis . . . 396
21.5 Scenario UNESCO1: Villa LIVIA . . . 397
21.6 Related Documentation . . . 406
21.7 Other Misc Data with a Brief Description . . . 406
21.8 Glossary . . . 406

22 Contemporary Performing Arts Testbed . . . 407
22.1 Historical Introduction to the Issue . . . 407
22.2 An Insight into Objects . . . 409
22.3 Challenges of Preservation . . . 411
22.4 Preserving the Real-Time Processes . . . 412
22.5 Interactive Multimedia Performance . . . 419
22.6 CIANT Testbed . . . 426
22.7 Summary . . . 428

Part III Is Money Well Spent? Cutting the Cost and Making Sure Money Is Not Wasted

23 Sharing the Effort . . . 431
23.1 Chain of Preservation . . . 431
23.2 Mechanisms for Sharing the Burden of Preservation . . . 431

24 Infrastructure Roadmap . . . 435
24.1 Requirements for a Science Data Infrastructure . . . 435
24.2 Possible Financial Infrastructure Concepts and Components . . . 436
24.3 Possible Organisational and Social Infrastructure Concepts and Components . . . 437
24.4 Possible Policy Infrastructure Concepts and Components . . . 446
24.5 Virtualisation of Policies, Resources and Processes . . . 448
24.6 Technical Science Data Concepts and Components . . . 449
24.7 Aspects Excluded from This Roadmap . . . 456
24.8 Relationship to Other Infrastructures . . . 457
24.9 Summary . . . 459

25 Who Is Doing a Good Job? Audit and Certification . . . 461
25.1 Background . . . 461
25.2 TRAC and Related Documents . . . 463

25.3 Development of an ISO Accreditation and Certification Process 464
25.4 Understanding the ISO Trusted Digital Repository Metrics . . . 465
25.5 Summary 480

26 Final Thoughts 481

References 483

Contributors 495

Index 505