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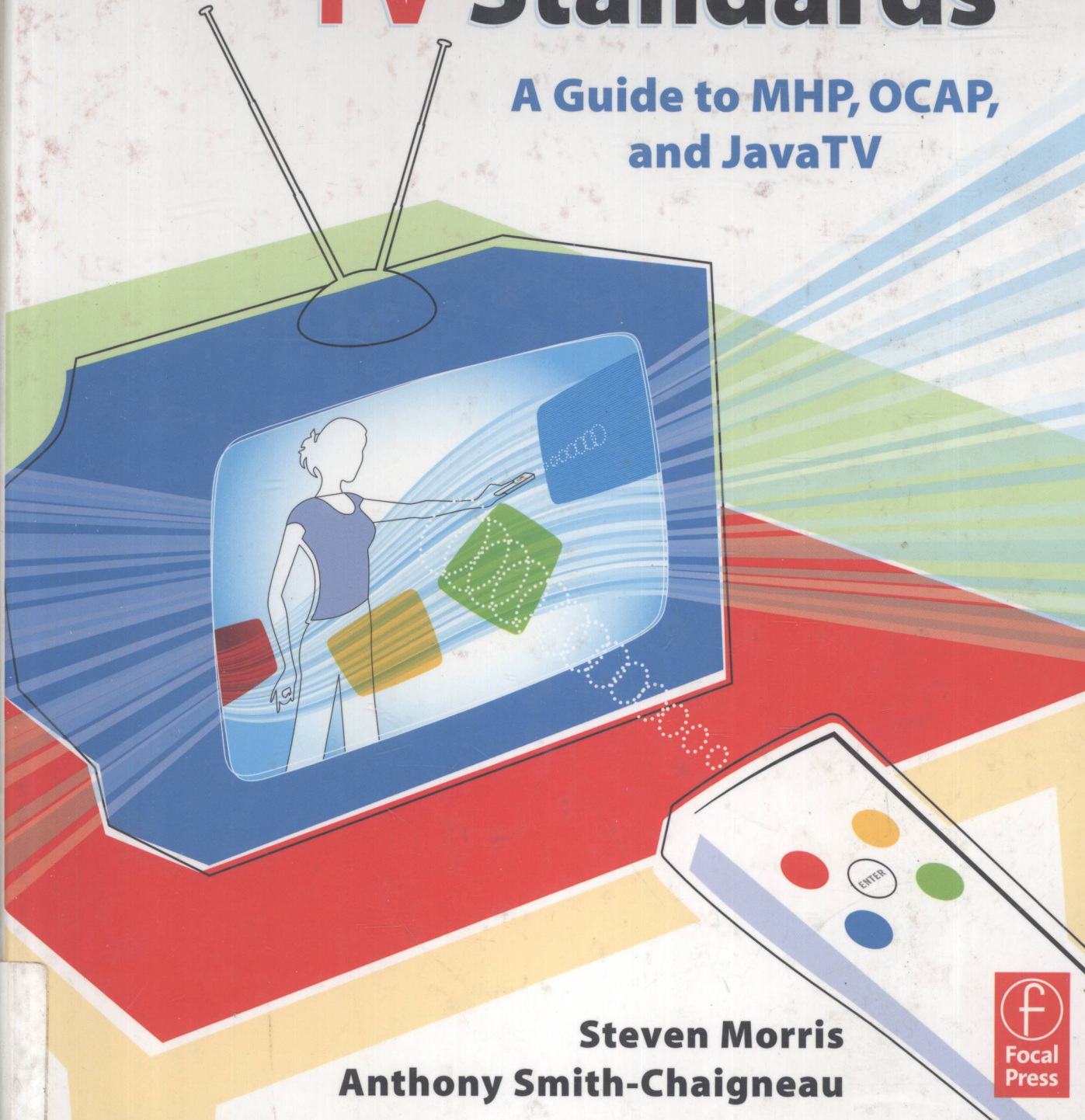
Interactive TV Standards

A Guide to MHP, OCAP, and JavaTV



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To Jasmine and Dylan, for their
patience and support and for just being there;
and to Joan and Emyr Morris

—Steven Morris

To Peter MacAvock, for bringing
me into the world of TV technology;
and my family who think I am
really an international spy!

—Anthony Smith-Chaigneau

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Introduction

Millions of people worldwide watch digital TV (DTV) every day, and this number is growing fast as more network operators and governments see the benefits of digital broadcasting. In recent years, interactive TV (ITV) has become the "next big thing" for the broadcasting industry as broadcasters and network operators seek new ways of making money and keeping viewers watching.

Although open standards are nothing new to the broadcasting industry, both public broadcasters and pay-TV operators are starting to use open standards for ITV middleware, to try to bring ITV to a wider audience. Hand in hand with this, governments are requiring the use of open standards for publicly funded DTV systems, and this includes the middleware those systems use.

Around the world, JavaTV and MHP form the core of the open middleware systems that are being built and deployed. Broadcasters, receiver manufacturers, and application developers are all jumping on the MHP bandwagon. In the United States, the OCAP standard (based on MHP) looks poised for a very successful introduction into the marketplace.

Unfortunately, this is still a confusing area for people who are trying to use the technology. This is partly because the market is still young, partly because these standards can have a profound effect on the business models of companies that use them, and partly because the available documentation is spread across many sources and is not always consistent. Both the pro– and anti–open standards camps are pushing their own views of these standards, and impartially researched information is difficult to come by.

The book you are holding is one of the first truly independent discussions of these technologies. Both of the authors have been involved in MHP since the early days. We have been part of the standardization process, both on the technical side and on the commercial side. We have written business cases for MHP and OCAP deployments, we have built middle-

ware implementations, and we have built and deployed applications. We have heard the questions project managers, application developers, and middleware manufacturers are asking, and we hope that this book will answer some of those questions for you.

With this book, we will give you an insight into the background of the MHP and OCAP standards and the issues involved in implementing them. We look at how the different standards fit together, and at how you can use them to build good products and get them to market quickly. This book also acts as a companion to the underlying standards that make up MHP and OCAP. We take an in-depth look at the MHP and OCAP APIs and architecture, at how middleware developers can build efficient and reliable middleware, and at how application developers can exploit these standards to build cool applications. Most importantly, we examine how we can actually make some money from our products once we have built them.

This is not an introduction to DTV. It is not a book on Java programming. We concentrate on the practical issues involved in working with these new middleware technologies and in building products that people want to purchase and use. By looking "under the hood" of these standards, we hope that both new and experienced developers and managers can learn how to exploit these standards to their full potential.

Intended Audience

This book is of interest to anyone who works with MHP and OCAP, building applications, building middleware stacks, or deploying MHP or OCAP in a real network. We assume that you have some knowledge of digital broadcasting, and (for developers) we assume that you have some experience in developing software in Java. We do not assume any familiarity with other middleware standards, however, or with the technical details of how DTV works. At the same time, we cover the material in enough depth that even experienced OCAP or MHP developers will find it useful. In particular, this book is of interest to the entities discussed in the following sections.

Project Managers

If you are responsible for deploying an OCAP or MHP solution (whether it is a receiver, an application, or a complete set of MHP services) you need to make sure you can deliver a successful product on time. Deploying MHP or OCAP is similar to deploying other DTV systems, but this book highlights the differences in the business models and in the way products need to be deployed, and it will help you make sure your products interoperate with others in the marketplace.

Application Developers

You may already be familiar with Java and with programming for DTV systems, and thus this book does more than just cover the basics. It also covers the practical details of how we build an MHP or OCAP application and how we can get the most out of the various APIs. We also examine how you can make your application portable across middleware stacks.

Middleware Developers

The challenges of building an MHP or OCAP middleware stack are very different from those involved in working with other middleware stacks. The design and implementation of the middleware plays a vital role in the success of a project, and thus we examine how you can build the most reliable and efficient middleware stack possible, looking at the design and implementation issues that can affect your entire project. We will also look at the rationale behind some of the design choices in the standard, to help you make more informed decisions about how you should build your software.

Senior Management, Sales and Marketing Staff, and Network Operators

In addition to looking at the technical details of MHP and OCAP, this book examines the commercial aspects of the new crop of open standards. This includes business models for ITV, the advantages and disadvantages of open middleware standards, and the market situations that can affect an MHP or OCAP deployment.

Students

With the growth in DTV systems worldwide, more universities are running courses in DTV technology and application development. This book introduces you to MHP and OCAP, and provides you with practical advice based on many years of experience in the industry. By combining practical examples and real-world experience, this book offers you more than just the theory.

Book Organization

This book consists of four main sections. Starting from a basic introduction to DTV and the issues involved in broadcasting DTV services (both commercial and technical), we then move on to look at the basic features of MHP and OCAP from a technical perspective. This provides a grounding in the essentials of building applications and middleware, after which we look at more advanced topics. Finally, we take a look at the practical issues of building and deploying MHP and OCAP systems, discussing both the technical aspects and looking at how we can actually make money from an open system once we have deployed it. A more detailed breakdown by chapter content follows.

Chapter 1 discusses the current state of the DTV industry and how open systems and proprietary middleware solutions coexist in the marketplace. It looks at the driving forces behind the open middleware systems, and at how the various standards are related.

Chapter 2 introduces the basic technical concepts of DTV and looks at how we get signals from the camera to the receiver. It also discusses the various types of DTV networks and the technical issues that affect them.

Chapter 3 provides an overview of the MHP and OCAP middleware and looks at the different components that make up the middleware stack. We also discuss the high-level decisions that middleware implementers face.

In Chapter 4 we look at a simple MHP and OCAP application, and at the most important things we need to consider when we develop applications for these systems. We also cover the various types of OCAP and MHP applications we may come across, and offer practical tips for application developers.

Chapter 5 is a basic introduction to the concept of services and how they affect the life cycle of MHP and OCAP applications.

Chapter 6 introduces the concept of resource management, and looks at how many of the MHP and OCAP APIs manage resources. The chapter also examines how we make our middleware and applications more resilient to resource contention problems.

Chapter 7 discusses the graphics model in MHP and OCAP, including problems specific to a TV-based display. We discuss how to configure and manage the different parts of the display, at how we can use the user interface widgets provided by MHP and OCAP, and at how we can integrate video and graphics in our application.

In Chapter 8 we look at the basic concepts we need for referring to broadcast content.

Chapter 9 looks at service information, and examines how applications can get information about services and content being broadcast. The chapter also examines how a middleware stack can manage this data most effectively and efficiently.

Chapter 10 discusses how applications can get access to raw data from the broadcast stream using MPEG section filters. We look at the various types of filtering we can perform, the advantages and disadvantages of each type, and the problems the middleware faces in handling these types of filtering.

Chapter 11 looks at the model used by MHP and OCAP for playing video and other media, and discusses the extensions DTV systems use. The chapter also examines the special content formats available to OCAP and MHP applications, and takes a look at how we can control how video is displayed on the screen.

In Chapter 12 we examine data broadcasting and see how we get data from the transmission center to the receiver. You will see the various ways we can send files and other data. This is an area that can make or break a receiver or an application, and thus we also discuss how we can give the best performance possible when loading data from a broadcast stream.

Chapter 13 introduces the MHP and OCAP security model. We cover how the middleware can stop applications from doing things they are not allowed to, and how broadcasters can tell the receiver what an application is allowed to do.

Chapter 14 discusses how applications can communicate with one another, and examines the architectural choices that led to the design of the inter-application communication mechanism in MHP and OCAP. The chapter also looks at one possible implementation of that mechanism.

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Chapter 15 looks at how we can use HTML in MHP 1.1 and OCAP 2.0. We look at the HTML application model, and at what has changed from the W3C standards. The chapter also explores how application developers can take advantage of the new HTML and CSS features MHP and OCAP support.

Chapter 16 is an introduction to the new features introduced in MHP 1.1, such as the Internet access API and the API for communicating with smart cards. The chapter also discusses the current state of MHP 1.1 and its place in the market.

Chapter 17 examines some of the advanced features of MHP and OCAP, including advanced techniques for controlling applications, using the return channel to communicate with a remote server, and tuning to a new broadcast stream.

Chapter 18 familiarizes you with the efforts under way to harmonize MHP, OCAP, and the other open middleware standards in use today. We look at the Globally Executable MHP (GEM) specification, and at how middleware developers can design their middleware so that they can reuse as many components as possible between implementations of the different standards. The chapter also explores how GEM affects application developers, and how they can ensure portability between the different GEM-based standards.

Chapter 19 is a discussion of the commercial issues involved in deploying MHP. This covers interoperability and conformance testing, and looks at some potentially successful MHP applications. It also discusses movement toward analog switch-off in various countries, and at how the migration to digital broadcasting is progressing.

Appendix A provides further information on the basic concepts behind DVB service information, one of the most important building concepts in digital broadcasting in Europe and Asia. The appendix provides a technical discussion of DVB-SI for people who are new to DTV systems, and serves as a reference for developers who already know about DVB-SI.

Appendix B covers the ATSC Program and System Information Protocol, the service information format used in North America and parts of Asia. The appendix serves as an introduction to PSIP for beginners and as a reference to the more important components for developers who are familiar with the PSIP standards.

Versions

This book covers the most recent versions of MHP and OCAP at the time of writing. Both MHP 1.0.3 (including errata 2) and MHP 1.1.1 are covered, as are version I13 of the OCAP 1.0 profile and version I01 of the OCAP 2.0 profile.

At the time of writing, most MHP receivers in the market are based on version 1.0.2 of MHP, although they sometimes include minor elements of later MHP versions in order to fix specific problems. OCAP receivers are typically based on a recent version of the OCAP 1.0 profile, but the lack of conformance tests means that some middleware vendors will track new versions of the standard more closely than others.

Shelving Code: Broadcast Technology

Interactive TV Standards by Steven Morris and Anthony Smith-Chaigneau

For any digital TV developer or manager, the maze of standards and specifications related to MHP and OCAP is daunting. You have to patch together pieces from several standards to gather all of the necessary knowledge you need to compete worldwide. The standards themselves can be confusing, and contain many inconsistencies and missing pieces. *Interactive TV Standards* provides a guide for actually deploying these technologies for a broadcaster or product and application developer.

Understanding what the APIs do is essential for your job, but understanding how the APIs work and how they relate to one another at a deeper level helps you do it better, faster, and easier. Learn how to spot when something that looks like a good solution to a problem really is not. Understand how the many standards that make up MHP fit together, and implement them effectively and quickly. Two DVB insiders teach you which elements of the standards are needed for digital TV, highlight those elements that are not needed, and explain the special requirements MHP places on implementations of these standards.

Once you have mastered the basics, you will learn how to develop products for U.S., European, and Asian markets, saving time and money. By detailing how a team can develop products for both the OCAP and MHP markets, *Interactive TV Standards* teaches you how to leverage your experience with one of these standards into the skills and knowledge needed to work with the critical related standards.

Does the team developing a receiver have all of the knowledge they need to succeed, or have they missed important information in an apparently unrelated standard? Does an application developer really know how to write a reliable piece of software that runs on any MHP or OCAP receiver? Does the broadcaster understand the business and technical issues well enough to deploy MHP successfully, or will their project fail? Increase your chances of success the first time with *Interactive TV Standards*.

About the authors:

Steven Morris is an experienced developer in the area of interactive digital television. Formerly of Philips Electronics, one of the major players in the development of MHP, he was heavily involved in the development of the standard, its predecessors, and related standards such as JavaTV and OpenCable. In addition to work on the standard itself, Steven is the Webmaster and content author for the Interactive TV Web web site (*www.interactivetvweb.org* and *www.mhp-interactive.org*), a key resource for MHP, JavaTV, and OCAP developers.

Anthony Smith-Chaigneau is the former Head of Marketing & Communications for the DVB Consortium. In that role, he created the first MHP website *www.mhp.org* and was responsible for driving the market implementation of this specification. Anthony left the DVB to join Advanced Digital Broadcast, where he helped them bring the first commercial MHP receivers to market. He is still heavily involved in the DVB MHP committees with Osmosys, an MHP and OCAP licensing company, based out of Switzerland.

Related Titles by Focal Press:

The MPEG Handbook by John Watkinson, ISBN: 0-240-51657-6
Digital Television by Herve Benoit, ISBN: 0-240-51695-8

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