Chapter 1: Introduction

A major industry trend is evident in the deployment of Web services technology to enhance existing services and to create new and innovative services. Web services are being widely deployed to facilitate interoperability across different hardware and software implementations, machine architectures and *application programming interfaces (APIs)*. Such interoperability offers near-term benefits by enabling quicker and cheaper integration of existing services.

It also promises a future where applications can be created by combining multiple services in a single workflow. This will make it easy to adjust application functionality, because services can be added or removed from the application workflow. In addition, interoperability will allow application designers to replace one service implementation with another for technical or business reasons. This vision of *Service-Oriented Architectures (SOAs)* is rapidly becoming a reality through the standardization and deployment of Web services technology.

The increasing use of mobile terminals and infrastructure is another industry trend, one that is making it possible to communicate and access information from any location at any time. The convergence of mobile and Web service technologies enables new services and business models, and accelerates the development of mobile and fixed Internet technologies. The mobile industry is poised to take advantage of the benefits of interoperability that Web services provide. Interoperable

message structures can reduce the time and cost of business integration, creating a tremendous business driver for the adoption of Web service technologies. This book provides an introduction to Web service technologies for those familiar with mobile technologies, and information on mobile applications for those familiar with Web services.

The mobile environment poses unique requirements and challenges. Mobile devices, also referred to as terminals in this book, are generally constrained in terms of processing power, battery life and user interface. Mobile networks have different characteristics depending on their implementation, but disconnected operation of terminals is the norm, asynchronous communication is an accepted practice, and limited capacity (bandwidth) and large delay (latency) are to be expected. Today, Web service applications cannot usually access terminals directly.

Mobile device application developers may need to work with a different operating system, such as Symbian, even though they may also work with Java to accelerate the learning curve. This book describes a mobile Web services platform, which enables application developers to work faster and more effectively with mobile devices.

CASE STUDY: TNT PACKAGE TRACKING

The TNT Package Tracking service is another proof-of-concept project by TNT, SysOpen Digia, and Nokia.
This case is an excellent example how basic Web services can be used as the technology of choice for enabling logistics reporting.
In the example, we assume that a subcontractor of TNT needs to report a package delivery status to TNT's package delivery server. In this example, the user captures an image of the package's barcode using the camera phone (such as the Nokia 9500 Communicator). The Web services client in the device then translates the barcode into XML code by means of Optical Character Recognition (OCR), and embeds the results into a SOAP message. The client also provides menus for reporting the status of the package delivery, the shipper's identity, and so on. Finally, a VPN session is set up and the status report is transmitted to the TNT package delivery server as a Web service message.

This use case offers several benefits:

- Easy integration into back-end systems by using end-to-end Web services
- Decreased cost from being able to use off-the-shelf mobile phones
- Real-time, accurate status reports

For the mobile industry, Web services offer at least three major application areas. First, mobile terminals can be made to act as Web service clients, enabling many business and consumer scenarios. For example, applications that allow access from any location to backend databases enable powerful customer relationship management, inventory management, and remote diagnostic applications. Second, mobile terminals can offer Web services to other service providers. For example,

a mobile terminal can offer a service providing information stored in the terminal, such as contact, calendar, or other personal information. Third, service providers can leverage information provided by the mobile infrastructure. For example, a service provider can obtain the geographic location of a mobile terminal from a mobile infrastructure Web service. This can be used to provide customized information, such weather or restaurants in or near the terminal user's current geographic location. Other potential areas are related to billing and user presence in the mobile network.

Creating effective mobile Web services requires an architecture that addresses issues related to identity management, security, the machine-readable description of Web services, and methods for discovering Web service instances. This book outlines these issues and related technical approaches. The presentation is made concrete with the discussion of a Nokia software platform designed to simplify the development of Web service applications for mobile terminals. The platform supports core Web services standards, as well as the Liberty Identity Web Services Framework (ID-WSF), which is designed to enable identity-aware Web services. The book outlines core Web services and identity management concepts, and the implementation of the Nokia platform. The book also provides concrete examples and next steps for developers.

With the wide adoption of Web services, the industry is entering a new phase in which more difficult issues are being addressed to bring the technology and related opportunities to the next level. It is clear that additional standards will be needed to address policy, reliability and other issues.

1.1 Structure of this Book

Chapter 2: Introduction to XML
Chapter 2 introduces the Extensible Markup Language (XML), which provides the technological foundation for Web Service technologies. The chapter aims to provide readers with enough information to be able to understand the XML-based features of Web Service technologies.

Chapter 3: Introduction to Service-Oriented Architectures
Chapter 3 provides an overview of key concepts and technologies necessary for understanding the rest of the book. This includes an overview of the concepts related to the Service-Oriented Architecture (SOA) and Web Services, and details related to SOAP messaging, Web service description using WSDL, and discovery using UDDI or a Liberty ID-WSF discovery service.

Chapter 4: Agreement
Chapter 4 describes how policies can be used to govern message exchanges in Web services, as well as the features required in the exchanges. Examples include the need for message correlation, reliable messaging, and the use of appropriate security mechanisms. In addition to the WS-Policy set of specifications, the chapter covers the WS-Addressing specification, which supports message correlation and defines means to specify messaging endpoints.

Chapter 5: Identity and Security
Chapter 5 introduces the concept of identity-based Web services, and the requirements and core technologies related to this concept. The chapter describes how services can be enhanced with identity-based information, and discusses technological aspects, such as the relationship between Single Sign-On and Web services. Discussed technologies include mechanisms to establish identity through authentication, ways to describe the various aspects of an authenticated identity (for example, the quality and type of identity verification used to associate an authentication mechanism with a real identity, and methods for key protection), and the use of security tokens in Web service messages. The chapter concludes with an overview of security mechanisms needed to support Web services, and particularly identity Web services. Such mechanisms include protocol-layer interaction and security options, as well as security services (including integrity and confidentiality).

Chapter 6: Liberty Alliance Identity Specifications
Chapter 6 continues the identity technology discussion started in Chapter 5, and presents a more detailed look at the Liberty Alliance identity specification portfolio. The chapter begins with a description of the three main specification portfolios, followed by an introduction to the main features of each individual specification. The discussion is kept at a general level – the relevant technical details are available in the actual specifications.

Chapter 7: Enabling Mobile Web Services
Chapter 7 introduces two solutions that enable mobile Web services: the SOA for S60 platform and the Nokia Web Services Framework (NWSF) for Series 80. The chapter introduces the platform architectures and their support for extensibility. The support for plug-in frameworks is also discussed, including a detailed description of support for Liberty ID-WSF. The chapter concludes with a detailed description of the platform API and extensibility to support a variety of Web service architectures.

Chapter 8: Summary and Next Steps
Chapter 8 presents a brief summary of all the topics covered in this book, and also provides information on how to start developing Web services by using the SOA for S60 platform.

Chapter 9: Developing Mobile Web Services with Java
While the previous chapters focused on presenting general information and concepts related to mobile Web services, the last two chapters link the concepts to concrete technical information on application development. Chapter 9 describes how to create mobile Web service clients by using Java. The examples range from basic, unsecure Web service messaging to secure, identity-based client applications.

Chapter 10: Developing Mobile Web Services with C++
Chapter 10 follows the pattern presented in chapter 9. At a conceptual level, the C++ application examples are identical to the Java examples. Chapter 10 provides detailed information about the NWSF APIs used in developing mobile Web service clients with C++.

Appendix A: Web Service Standards Organizations
Appendix A provides an overview of relevant standards organizations. It describes the organizations and their structure, as well as their standardization work.

Appendix B: SOA for S60 platform Quick Reference
Appendix B provides a quick reference for the SOA for S60 platform.

Appendix C: References

For more information on Nokia's approach to Web services, visit <http://www.nokia.com/webservices>.

For more information on the Nokia Web Services architecture, visit the Nokia Architecture Update Web site at <http://www.nokia.com/architecture>. Select Technical Architectures, and then Web Services.

For more information on the SOA for S60 platform, visit the Forum Nokia Web site at <http://www.forum.nokia.com>. Select Web Services from the Technologies drop-down menu (on the left under Resources).