Chapter XVI
Topic–Based Transparent Replication of Digital Assets

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ABSTRACT

In this chapter we propose a platform-independent concept for the transparent replication of digital assets in hybrid wireless networks. The concept allows a seamless integration with existing standards and technologies. It tackles and overcomes typical problems of common file sharing applications, such as the mixing of the logical property of a file being shared with its physical location. The identification mechanism introduced allows sharing on a per file basis, completely independent of their physical location, even tolerating subsequent relocation. RSS feeds are used as a basis to disseminate the files together with attached meta-information, such as tags, in a platform-independent manner. To optimize the communication flow among the mobile devices, a clustering algorithm for mobile networks is employed. The current prototype acts as proof-of-concept for the proposed concept.

INTRODUCTION

Nowadays, more and more people are using mobile devices, such as laptops, tablet PCs, smartphones, and PDAs. Typically, these devices are able to communicate with each other via Bluetooth or Wi-Fi in ad hoc mode. Spontaneous groups are formed and maintained in a self-organizing fash-

ion, enabling users to exchange and share data. However, pure mobile ad hoc networks (MANETs) limit the accessible data to information available in the local environment. Wireless networking technologies, such as GPRS, UMTS, or Wi-Fi, are used to establish communication links to a backbone network—or more generally to the Internet. Devices capable to establish such uplinks

can share their connection with other devices (Papadopouli & Schulzrinne, 1999). In this way devices currently unable to connect to the Internet directly are enabled to stay connected. Through such uplinks it is also possible to interconnect different ad hoc partitions (Brust, Rothkugel, & Ribeiro, 2006). The augmentation of mobile ad hoc network partitions with links to infrastructure networks is called hybrid wireless network throughout this chapter. Figure 1 illustrates such a scenario where two ad hoc network partitions are connected to the Internet.

Sharing digital assets such as documents or pictures is an essential daily task. This includes for instance the sharing of podcasts, pictures, learning materials, and so forth. However, typical peer-to-peer file sharing applications, such as BearShare (2007) or LimeWire (2007), are not suitable for hybrid wireless networks. The biggest problem is the large amount of network traffic induced by the Gnutella protocol (2007), which causes problems to mobile devices (Hu, Thai, & Seneviratne, 2003), as links can break down suddenly.

In this chapter a file sharing application for hybrid wireless networks based on the concept of *Spaces* (Wehling & Rothkugel, 2007) is proposed. Spaces is a replication scheme for sharing digital assets in hybrid wireless networks. It enables users to share digital assets in a transparent manner on a per-file basis without imposing any folder structure for the local organization of the files. It is based on a publish/subscribe paradigm to reduce the amount of information presented to the user. In addition to that, tags are employed enabling users to retrieve and group files. The proposed concept allows a seamless integration with existing technologies and operating systems. As a proof-of-concept the proposed concept is prototypically implemented. The prototype consists of two modules, one platform-specific module that is responsible for the local file organization and another one that is in charge of the communication.

The remainder of this chapter is organized as follows. In the next section we discuss some problems that have to be tackled when designing a file sharing application, followed by a brief overview of the concept of Spaces. Then a concrete application scenario is given, which further motivates this work. The next section covers related work. Then an insight in the local organization of files is given and the dissemination of the information is discussed. Before concluding this chapter, an outlook on future trends is given.

PROBLEMS TO BE TACKLED

Besides the technical issues concerning the amount of network traffic induced, some other

Figure 1. Hybrid wireless network
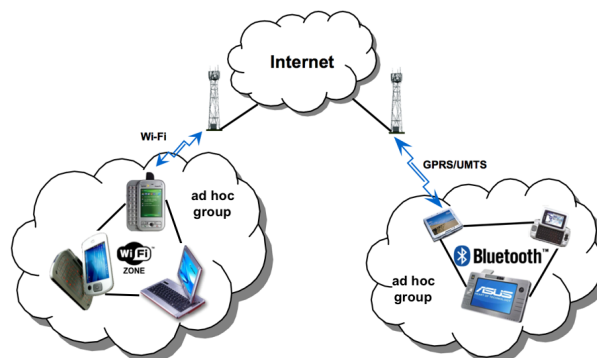
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