In the previous chapters our discussion was focused on research issues in cloud computing. Now we

examine computer clouds from the perspective of an application developer. This chapter presents a few

recipes that are useful in assembling a cloud computing environment on a local system and in using

basic cloud functions.

It is fair to assume that the population of application developers and cloud users is and will continue

to be very diverse. Some cloud users have developed and run parallel applications on clusters or other

types of systems for many years and expect an easy transition to the cloud. Others are less experienced

but willing to learn and expect a smooth learning curve. Many view cloud computing as an opportunity

to develop new businesses with minimum investment in computing equipment and human resources.

The questions we address here are: How easy is it to use the cloud? How knowledgeable should an

application developer be about networking and security? How easy is it to port an existing application

to the cloud? How easy is it to develop a new cloud application?

The answers to these questions are different for the three cloud delivery models, SaaS, PaaS, and

IaaS; the level of difficulty increases as we move toward the base of the cloud service pyramid, as shown

in Figure 11.1. Recall that SaaS applications are designed for end users and are accessed over theWeb;

in this case, users must be familiar with the API of a particular application. PaaS provides a set of tools

and services designed to facilitate application coding and deploying; IaaS provides the hardware and

the software for servers, storage, and networks, including operating systems and storage management

software. The IaaS model poses the most challenges; thus, we restrict our discussion to the IaaS cloud

computing model and concentrate on the most popular services offered at this time, the Amazon Web

Services (AWS).

Though the AWS are well documented, the environment they provide for cloud computing requires

some effort to benefit from the full spectrum of services offered. In this section we report on lessons

learned from the experience of a group of students with a strong background in programming, networking,

and operating systems; each of them was asked to develop a cloud application for a problem of

interest in his or her own research area. Here we first discuss several issues related to cloud security,

a major stumbling block for many cloud users; then we present a few recipes for the development of

cloud applications, and finally we analyze several cloud applications developed by individuals in this

group over a period of less than three months.

In the second part of this chapter we discuss several applications. Cognitive radio networks (CRNs)

and a cloud-based simulation of a distributed trust management system are investigated in Section 11.10.

In Section 11.11 we discuss a cloud service for CRN trust management using a history-based algorithm,

and we analyze adaptive audio streaming from a cloud in Section 11.12. A cloud-based optimal FPGA (Field-Programmable Gate Arrays) synthesis with multiple instances running different design options

is presented in Section 11.13.