Chapter 6

Teaching Clouds: Lessons Taught and Lessons Learnt

Lee Gillam
University of Surrey, UK

Bin Li
University of Surrey, UK

John O’Loughlin
University of Surrey, UK

ABSTRACT

In this chapter, the authors discuss the scope, content, and technical challenges offered up in the construction and delivery of a 10 week long Cloud Computing module that combines discussions of the principles and key characteristics of Cloud Computing with a series of practical exercises and an implementation-based coursework. The authors present an overview of the core of this module, which starts from the Software, Platform, and Infrastructure (SPI) model and builds from this around SOAP and REST, Hadoop, related paradigms such as Grids and Peer-to-Peer (P2P) computing, and the all-important Service Level Agreement (SLA). The chapter further describes the practical exercises undertaken in lab-based sessions, and the nature of the assessment. It concludes with a brief discussion of the lessons learned to date through this delivery.

INTRODUCTION

The emergence of Cloud Computing as a topic of mass market interest is beginning to be matched by the emergence of the subject in its own right in Higher Education. In 2009, numerous departments of Computer Science, Informatics, and so forth could readily claim to be teaching students about myriad aspects of the subject that they would deem inherently relevant to Cloud, from data structures and algorithms, through object oriented programming, to information retrieval. However, there was relatively little by way of teaching that was geared entirely to Cloud Computing per se. Our view was that it would be necessary to begin by
considering fundamental definitional questions for the subject, and the very discussion of what Cloud Computing was all about would lead to development of an appropriate understanding. We constructed and delivered just such a module in early 2010 to a cohort of Masters students, geared towards developing Cloud Computing literacy for the future IT professionals who, we expected, would be very much entering into a marketplace in which Cloud is becoming a key component of the IT landscape. At the second iteration of this teaching, it is apparent that the word Cloud in relation to Computing is beginning to become part of everyday parlance, with industry, government, and other sectors at various stages of Cloud adoption. This is allied to an increasingly clear demand from industry for those with Cloud knowledge and skills evidenced through job advertisements – and such demand is only likely to increase in the near term.

Our Cloud Computing module is delivered over 10 weeks, with 2 hours of lectures in each, and 2 hours of guided hands-on during the first 6 weeks; the remaining 4 weeks of hands-on is geared to providing assistance to students with their assessments. We have also featured guest lectures from Amazon, IBM, and Imagination Group to provide an industrial flavour.

In this Chapter, we discuss the scope, content, and technical challenges offered up in the construction and delivery of this Cloud Computing module. Since the subject – and the technology, by and large - is still in relative infancy despite the increases apparent in uptake, it is expected that the scope, content, and technical challenges will all vary significantly over the coming years; furthermore, the principles of Cloud Computing are likely to find themselves more deeply ingrained into other aspects of programme delivery as the subject emerges such that Cloud might become more clearly signposted throughout programmes, as well as potentially offering the technological vehicle upon which to develop such programmes.

OUTLINE OF THE MODULE: LECTURES

To introduce both the principles and practical applications of the Cloud, the important first step for us was to establish the set of seed definitions and distinctions of Cloud from which the subject should grow. It is not necessary to have the perfect set of definitions or defining characteristics – indeed, discussion of fuzziness of definition offers substantial opportunity for discussion based around attempting to interpret such definitions and determine their application to things which might, or might not, be Clouds. Such a set of definitions enables us at least to appraise offerings which are labeled “Cloud” and determine whether they fit such a label. In certain cases, the rebranding of extant products may not necessarily result in a good fit, especially if it is merely cosmetic – for example, adding ‘cloud’ to product names.

Our starting set of definitions comes from Mell and Grance (2011) at the U.S. National Institute of Science and Technology (NIST). The NIST definitions necessitate time spent dealing with the expansion of their defining characteristics (emphasized below in bold):

“A model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models”.  

The five characteristics introduce notions that Cloud technologies should be widely accessible using a range of networked devices, self-service, and metered such that usage can be assessed and likely charged for. From the Cloud user’s
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