# BRIEFING PAPER

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# PAPER

## Resource Oriented Architectures and Moodle Manifests

## Introduction

It's not uncommon to hear course developers, instructional designers and e-learning managers come out with statements like "FutureLearn does it this way …" or "Blackboard wants me to do this …". They are hostages to the technological framework that they allow to dictate their learning strategies.

Surely we should be hearing statement to quite the opposite effect, such as "my learning materials should include this learning feature... so I will include it". It is the job of the environment to support the learning requirements dictated by the content. It is not acceptable to have the restrictions of the environment to dictate what you – the expert – can include

Typically learning environments offer a remarkably limited, packaged set of features, though they do usually – sometimes uncomfortably – allow other packaged functionality to be bolted on. The user gets whatever the system allows. These systems have been built with a systems orientation. No surprise here.

Surely it would be better if the architecture was driven directly by the learning materials and their needs? The emphasis should be on a Resource Oriented Architecture (ROA). Isn't it about time that the educationalists dictate what is required, not the technologists. It is the job of the latter to ensure that the needs of the former can be interpreted and delivered through the technology.

## Content: still all-important

CAPDM has always contended that at the heart of every good online learning development is good content. This was reinforced at a recent Online Educa conference where the importance of 'Hollywood' content was emphasised.

Imagine, while developing your content, being able to make reference to the various features and supporting content that would enhance the student experience. For example being able to include highly integrated supporting materials, functional features such as Forums or Quizzes, etc. but in the knowledge that the mere mention of a Forum, for example, will guarantee its presence and availability in the delivery learning environment through a direct link.

This approach – where the mention of the resources required to support the learning actually invokes them – would put power and control directly back into the hands of the people who know best what is needed – the teacher. This also begins to cut out the 'middle man', the instructional designers or 'e-learning expert', who can sometimes strangle educational ambition with a subjective and fanatical desire to use technology for the sake of technology.

With an ROA approach, content development can absolutely concentrate on the overall learning needs of the course or subject. However this does not begin to suggest that such development should be a free for all. Of course it is essential to ensure that there is good design, strategy and implementation so that the resulting courses are fit for purpose.

Fitness for purpose is an absolute goal, and this is one reason why a possible ROA approach is seen as an essential. There are a number of essential elements required to be able to piece together such an approach before it can be called an architecture. Subsequent briefing papers will uncover additional detail but as a starting point let's see how this might be achieved within the 'confines' of a popular learning environment – Moodle.

## Moodle and Manifests: the Concept

Moodle is a good starting point to explore the potential and requirement of an ROA approach as it is obviously extremely flexible, given that the source code is readily available. In CAPDM's approach to an ROA, we have utilised two core technologies:

1. XML (generally with the DocBook DTD) as the standard means of semantic ally marking up good learning materials , including simple tags for forums, links to other content, etc.

2. Manifests, which are symbolic descriptions of the environment needed to support the learning requirements, driven partly from the contents themselves and from the overall environmental design needs

Manifests are used to automatically construct the Moodle front page and all of the structure underneath. Manifests will absolutely contain an 'end point' for all features (e.g. Forums, Quizzes, Assignments) included, or mentioned, in the learning content.

For example, if a teacher has made mention of a Forum ("Now participate in Form X to debate Y") in the body of the materials, then this Forum will become an item in the Manifest. Here are some examples of include resources as a driver for the resulting environment's architecture:

- Including a Forum link in learning materials. The link is a very simple tag carrying an attribute that is a symbolic name for the Forum (which will later be automatically created when the Manifest is loaded into the learning environment).

- Including a Reflective Input at an appropriate point in the materials. The Reflective Activities (shown below) are aggregated into a 'Digital Workbook', which is basically a personal e-portfolio (see final page).

### 1.2 What is a Sole Trader?

In the UK there are three main forms of private businesses: companies, partnerships and sole traders.

Where an individual sets up his/her own business using their own capital, they are known as a sole trader.

You may have already come across a sole trader yourself; perhaps you buy small items from a sole trader business or maybe you have worked for a sole trader.

**Reflection**
In the space below, list some examples of sole trader businesses of which you know.

Show Workbook ⬚

Examples of sole trader businesses may include your local newsagent or your local grocer. Even Marks and Spencer was once a sole trader in the early years when Michael Marks traded from a small market stall.

**Figure 1: Example of a "Reflective Activity"**

- Adding a link in an assessment question's answer to the appropriate part of the content that the student should refer to. This may seem a rather obvious functionality to build in, since this is exactly what the web is about, however when a teacher is preparing learning materials s/he has no idea where the referenced page might appear in the learning environment. If, through some simple symbolic referencing, s/he indicates that the link should be to 'that page' then the Manifest can ensure the link is implemented correctly. What's more, when the referenced content is updated and the page potentially moved around, then the Manifest still knows where to find it and resolve the link.

These elements are simple, but their interpretation can have enormous value.

## Manifests: the reality

So what does the Manifest look like and contain?

Snippets of a Manifest are show in the two examples below. There are two basic sections to it:

1. A set of <item> tags that define the basic structure;

```xml
- <manifest>
  - <course id="swim_ac">
      <title>Principles of Swimming Technique</title>
      <shorttitle>Swimming</shorttitle>
      <summary>Swimming (SPCG7022)</summary>
    - <sections>
        <!-- Intro -->
      - <section id="swim_ac">
          <intro ref="swim_ac_introtext"/>
        - <item ref="starthere">
            <title>START HERE: Requirements of this module (PDF)</title>
          - <item ref="toc">
              <title>Table of Contents</title>
            </item>
          - <item ref="newsforum">
              <title>Module News Forum</title>
            </item>
          </item>
        </section>
        <!-- Topic 1 -->
      - <section id="swim_ac-uf">
          <intro ref="swim_ac-uf-_title"/>
        - <item ref="swim_ac-uf-learningmaterials">
            <title>Learning Materials</title>
          </item>
        - <item>
            <title>Comment Papers</title>
          - <item ref="cp1-1">
              <title>Which stroke should be taught first?</title>
            </item>
          - <item ref="cp1-2">
              <title>Propulsion in Swimming</title>
            </item>
          </item>
```

2. A set of resource tags that fill in the details.

```xml
<!-- Topic 1 -->
- <resource id="swim_ac-uf-_title" type="webcontent">
    <h3>Topic 1: Using Forces from the Water for Support and Propulsion<br/></h3>
  </resource>
  <resource id="swim_ac-uf-learningmaterials" type="inline" href="course_files/swim_ac/moodlepages/cis-swim_ac-bk0101.html"/>
  <resource id="cp1-1" type="commentpaper" href="course_files/swim_ac/content/swim_ac/moodlepages/cis-forces-dp01.html"/>
  <resource id="ep1-2" type="commentpaper" href="course_files/swim_ac/content/swim_ac/moodlepages/cis-forces-dp02.html"/>
  <resource id="forum-usingforces" type="assignment" href="forums/usingforcesforum.xml"/>
  <resource id="swim_ac-uf-assignment" type="assignment" href="assignment/topic1assignment.xml"/>
  <resource id="swim_ac-uf-quiz" type="assessment" grade="5" href="assessments/topic1assessment.xml"/>
```

This particular Manifest is obviously for Moodle. It is a VLE specific Manifest, but it is generated from a generic Manifest created in XML using the DocBook DTD.

CAPDM have extended Moodle to include a Manifest loader which automatically generates the entire structure of a complex, but completely consistent, Moodle course as shown in the snapshot on the next page. All content is loaded in, and all links and functionality are in place, and everything works.

The level of integration of content and environment is extremely high, and laborious to achieve by hand.

Manifests also make it easy to port the course to different Moodle instances (e.g. development instance to delivery instance). They also ensure that the same course can be instanced in other VLEs – provided they are extended to support Manifests too.

CAPDM is constantly working to determine what level of support can be achieved in some of the popular commercial environments too, but they are in general more restrictive.

Manifests play another very important role, particularly when putting together very complex courses. The Manifest acts as a ... manifest. It ensures that all of the constituent content is pieced together and earmarked to perform a role. The Manifest itself is constructed both to describe a structure, but also from features explicitly included in the learning materials. It provides a simple working focus for a working manifest, but one which then explicitly builds the delivery environment it describes.



**Figure 2: Example of a Manifest in a Moodle course**

## Conclusion

Our foray into Manifests started with packaging specifications and standards, such as SCORM and Common Cartridge (CC). Both still fall short of what can be achieved in terms of portability and integration. XML still, in many cases, provides all the portability one might require and in a standards-oriented fashion.

It was patently obvious to us that Manifests are more than just packaging – they provide a mechanism for the content developers (the educationalists) to begin to take back control of the learning potential. If they, the experts, feel that a course needs a set of particular features then they should be free to make reference to these features as they prepare the materials. This in turn should translate into functionality provided by the learning environment.

The Manifest makes this entirely possible. If it is also used as a description of the structure required of the learning environment too, then this provides portability around environments (though not all environments are flexible enough, perhaps) and it saves an enormous amount of time in actually structuring the environment. The Manifest can also be used as a packaging mechanism. Three bangs for the buck.

What we now deliver, and use ourselves, is yet another applications of XML and flexible, extensible, learning environments to harness and deliver a truly **Resource Oriented Architecture**. The results are extremely impressive.

If you have further interest in this topic then we can offer a registration on a sample course. Please contact us at enquiries@capdm.com for further information and access.

Visit http://www.capdm.com/resources for more CAPDM briefing papers.

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