

## Online Resources — A Systematic Solution

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### Strategic background

In 1997 the Faculty of Science at the University of Adelaide re-assessed the nature of its commitment to the provision and use of information technology into the future. We sought to articulate the IT needs of staff and students and describe the key attributes of a system that would best meet those needs.

While flexible and remote delivery haven't been seen as priorities for the University of Adelaide (as an established sandstone University with a desirable address) but, for obvious reasons, the need to participate in this area is growing.

It is recognised that IT can and must support effectively our teaching, research and administrative activities but will fail to do so without careful planning and a strategic approach.

The description of the characteristics of a suitable IT system for us has encouraged us to adopt a particular approach to the development and management of our on-line resources.

### Phase change

As always in the area of IT, we appear to be on the cusp of a new era. In the past, enthusiasts have created WWW sites based on HTML files organised in rudimentary directory systems. A substantial personal commitment has been needed to come to terms with a fairly ugly mark-up system and the server directory structure of the on-line resources has been manually hard-coded into the hyperlinks needed for WWW navigation.

We have realised that such an approach is no longer feasible. If we are to manageably place online a substantial proportion of our teaching, research and administrative business then we need a system that will allow the development of online resources, their management and access systems that will be scalable and minimise contact with the seamy side of WWW publication.

### Characteristics of a supportive system

#### What would such a WWW system be like?

Firstly, it should not require ordinary users to deal with the technical details of WWW publishing while allowing enthusiasts to use advanced features if necessary – WWW publication without HTML etc. expertise.

We also need to preserve our content uncontaminated by the artefacts of WWW delivery.

We need to ensure that links for WWW access are automatically generated and maintained for resources as they are created.

### Flexible container

A suitable system must be able to accommodate the range of resources currently in use, being produced or envisaged including:

- content (syllabus material, quizzes, interactive simulations, etc); and
- conduits for access to other resources (discussion groups, FAQ facilities...).

Whatever their content or format, these items can be considered to be documents that need to be shared with others.

## Access control

WWW publishing must be viewed as a continuum ranging from narrow-casting (sending a message to a colleague or group of collaborators) to broadcasting a report on the WWW for open and anonymous access. We need to be able to devolve the ability to create and upload these resources and share the authorship of that material if necessary without compromising the security of the server and its operating system. The system must readily support editorial access where appropriate. Such a shared environment requires the provision of an audit trail that automatically tracks data on the date, source, revision history, etc. of each item. Multiple levels of access must be able to be provided systematically.

## WWW Navigation systems

Is it any wonder that the wilfully unstructured and anarchic WWW so often frustrates surfers intent on a systematic pursuit?

The WWW stands on two pillars (hangs by two threads) – the content of the WWW pages being viewed and the hypertext links associated with that content. Perhaps the biggest management nightmare associated with the WWW is associated with these links. Of these, I identify two categories: heuristic and systematic.

The heuristic links embody the structureless WWW metaphor. Those familiar, perhaps idiosyncratic snail trails that can be followed throughout the WWW. Typically each one of these links is manually created and vulnerable to changes. The creation of these links requires source and destinations information to be provided and remain valid. These links are time-consuming and remain indispensable.

However, to date, a similar technique has been used to develop the systematic links that are essential to provide formal, structured access to WWW resources. Akin to the table of contents of a reference book, these have been manually created and maintained on millions of home pages throughout the WWW.

While the first set of links remains substantially within the province of teachers and students to define and maintain, the latter is amenable to a systematic treatment - such as those provided by any contemporary database.

Whether heuristic or systematic, hypertext must be as reliable as possible. Semi-automatic checking and manual updating is the only option for non-systematic links.

However, a sophisticated approach to WWW delivery can automatically create and update systematic links within a WWW site. This makes the provision of multiple routes feasible. Indexing systems are possible to meet the different needs of different users or the same user at different times.

We should not regress as we move from existing technology to new media. Any text book provides the reader with at least three approaches to its contents:

- Browsing (linear or random page turning);
- Table of Contents; and



- Index.

This should set a lower limit on the level of the service our WWW systems provide.

## Databases

The terms in which we have described the problem make it clear that a database solution is needed to manage our online resources. We opted to give *Lotus Notes* a try as its core functionality appeared to match our needs – the reliable and secure sharing of documents.

Perhaps the most attractive aspect of the current version(s) of *Lotus Notes* is the automatic and relatively seamless WWW access provided to Notes databases by Lotus's Domino server technology. We have adopted the principle that fairly standard WWW-browsers should be the delivery mechanism while a mixture of browser and Notes clients should be used for authoring tasks.

But we needed to determine whether the product lives up to the claims made for it? Our experience to date looks promising with stable and fast server performance (10K hits/day).

In particular the rendering and caching of massive number of dynamically generated index pages is remarkable.

Automatic full text indexing and searching is effective – the Notes server even drills into the contents of attached files (of common formats)!

We've also used database devices to automatically expire WWW notices etc.

## Multi-level access

We have been able to create a multi-level system for WWW publication based on three main groups:

- Public;
- Student; and
- Staff.

Public access resources allow anonymous access while users are challenged for a user-name and password for the other resources and the information is checked against pre-defined groups of registered users.

Access control is managed with standard Notes database tools using data from the University's Student and Management Information Systems. A spin off of the access control lists so developed is that they also serve as e-mail lists.

Access restrictions are currently being maintained at database and document level. Further security can be implemented including field encryption and Secure Sockets Layer although we have not yet felt that need.

## Free lunch?

No. By redefining the task of WWW-publication to suit a database treatment we are replacing one set of challenges with another. We need not:

- get our hands dirty with HTML;
- settle for limited indexing of resources; or
- manually update time-dependent notices.

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However we need to address the challenge of cataloguing our online resources in a manner that is helpful to a range of readers. This task is non-trivial but the rewards are much greater.

Much larger resource sets can be managed and accessed and within the meta-data of the database lies the knowledge. This approach allows substantial value to be added to the resources.

## Database design

ASO has been working with a number of staff to refine a number of templates for WWW teaching. We have developed several applications from scratch and used some of the standard templates as-is or with minor modifications.

## Documents

An important step in database conception and design has been to define what a document might be. A Notes document is equivalent to a record in other databases and can contain the typical range of data types up to and including Rich Text Fields into which can be:

- imported a reasonable range of file formats (including Macintosh and MS-Windows clipboard formats);
- attached any file at all – these need appropriate browser plugins or other run-time software.

Databases have been deployed with documents that hold:

- individual teaching resources such as image files, spreadsheets, *HyperStudio* stacks;
- lecture aids such as *PowerPoint* presentations;
- student and staff submissions to guided, online discussion groups;
- student project submissions;
- complete course information and material;
- clinical and research reference material; and
- general notices.

## Metadata

Perhaps the hardest task is to explain the process by which apparent structure created by building sorted and categorised views that combine a number of database fields – a few minutes of hands-on experience proves very convincing.

## Summary

I believe that we're addressing the needs of the second phase of innovation of delivery of teaching material.

While we can rely on the enthusiasts to march ahead and make course elements for use in their courses we need to help them cope with the growth of their resources and, more importantly, we need to provide a supportive environment that will allow other interested (but less skilled/committed) staff to fill in behind these ground breakers.

The range of resources being created and purchased need to be assembled in a systematic way and convenient access provided.

*Lotus Notes* appears to be providing us with the tools we need to build a system for the management of a WWW-based learning environment.