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ENC Support Files – an Alternative Approach for S-101

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Executive Summary:	This paper proposes alternative formats for encoding ENC support (text and picture) files and an alternative method of storing and indexing these resources.
Related Documents:	TSMAD18-16.3H (S-101 Support Files) and TSMAD18-16.3F (S-101 Grid Referencing System - Discussion Paper).
Related Projects:	

ENC support files (text and picture) file formats.

S-57 makes provision for text and raster (.tiff) files to be linked to ENC features. S-101 includes additional formats such as .jpg and video .mpg which may require ECDIS manufacturers to develop additional viewers that implement the S-52 presentation day/night display for each new format.

It is proposed that the S-101 product specification should make provision for associated support information to be provided in the W3Cs Extensible Hyper Text Markup Language (XHTML) language. This would pave the way for data producers to provide better structured ENC support information and may also assist OEMs to implement a wider range of data formats. It may also facilitate better control and management of support data files, due to more comprehensive metadata being made available.

HTML4 and XML/XSLT may also be suitable for this purpose however XHTML is considered to be a good option as it conforms to a strict document object model and better enables semantic web applications to take advantage of the content within a document. Using XHTML for instance would also make provision for including other XML formats such as MathML, SMIL and SVG. Probably the most important reasons however must be its ability to include rich metadata content either embedded within a files header or via an associated linked metadata file.

Earlier versions of HTML and XHTML made provision for only one means of including metadata within a document, that being the <meta> element. This is an empty element that contains no child elements or character data. The attributes on the <meta> element have evolved slightly over the years and now include the seven attributes listed below;

Attribute Name	Description
xmlns	default XML Namespace declaration
lang	language code
dir	language direction
http-equiv	HTTP response header name
name	property name (i.e., metainformation name)
content	property value (i.e., associated metainformation content)
scheme	refinement of property name or schema of property value

These elements may however not be sufficient for S-101 requirements. Fortunately they can be extended to include additional Dublin Core metadata elements.

The Dublin Core (DC) metadata initiative [DCHOME] has produced a sub set of resource description categories [DC1], or elements that can be embedded within an XHTML file. Each Dublin Core element uses the “DC” prefix and is separated by a (.) from the element name following it, as shown in the example below;

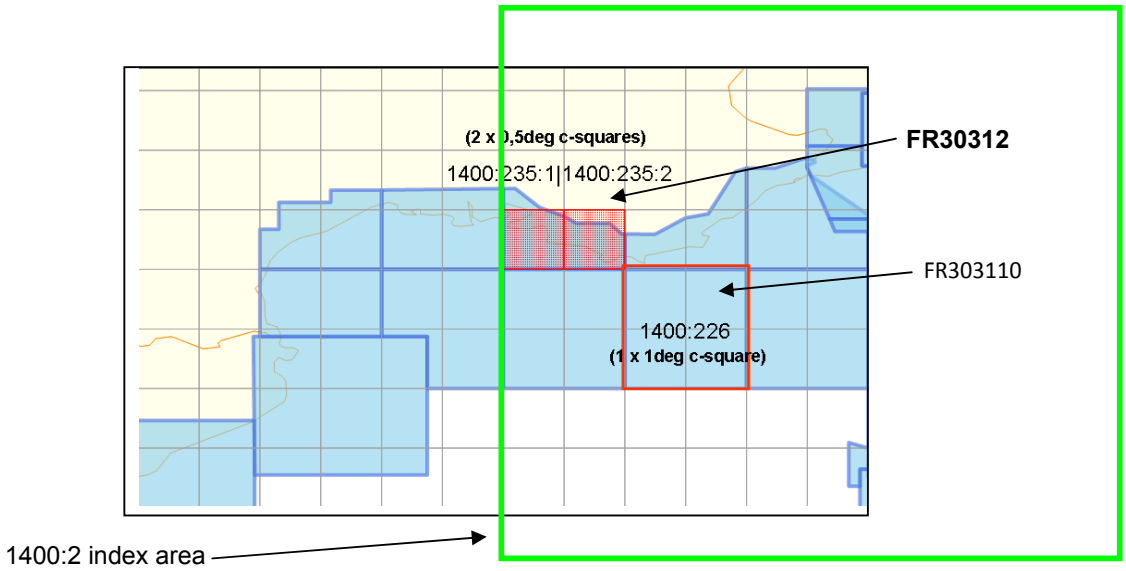
```
    <meta name    = "DC.Creator"
          content = "UKHO;">
    <meta name    = "DC.Email"
          content = "j.soap@ukho.gov.uk">
      <meta name    = "DC.Title"
          content = "Description and picture of Roman Rock Light">
<html>

 </head>
    <body>
          text/picture/video file content included here . . .
    </body>
 </html>
```

It is proposed that a new mechanism (e.g. href or xlink) be used for linking XHTML support files to ENC features. (TXTDSC and PICREP could be maintained for backward compatibility).

Storage and Referencing ENC Support Files

TSMAD18-16.3H paper concerning the “Formatting and Management of ENC Support Files” proposes a file and directory structure that is based on file types (e.g. .txt, .png .MP3, .jpg …etc). The metadata field “encLink” (within the SupportFileDiscoveryMetadata file) is used to list all ENC cells which have features that link to a particular support file. This is a big improvement on the existing random method used for associating S-57 ENC and their support files, however it is proposed that this may be better achieved using a file structure and association that is based on a c-square spatial index mechanism (see TSMAD18-16.3F). The c-square code could be stored within the SupportFileDiscoveryMetadata, or within the support files XHTMLs header metadata. Using this method, it would not be necessary to update the encLink field whenever a new cell is added or deleted from an exchange set. The following example proposes a method of arranging support files for an ENC exchange set. It is based on the example used in TSMAD18-16.3F.



Support file structure

The support file directory structure could be based on various criteria such as producer code, or for the purpose of this example, the c-square code.

C-squares spatial queries simply test whether a text string representing the search box is matched anywhere in the c-squares string. In the diagram above, any ENC cells (e.g. 1400:226|1400:235:1|1400:235:2) that fall within the 1400:2 index area could be easily identified using a simple text comparison. The hierarchical naming system for c-squares means that finer resolution squares are automatically picked up in any “coarser resolution” search

A directory structure based on larger c-square cells could be used for storing and arranging support files within an exchange set. Alternatively support files could be arranged as described in TSMAD18-16.3H and c-square indexes could be included as file metadata. Either mechanism would enable coverage information to be easily extracted and used to determine which support files should be association with each ENC cell. This could be achieved using a simple text comparison. This also applies to additional products such as bathymetric grids, nautical publications information, AMLs etc …