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USING PODCASTS TO DISTRIBUTE REAL TIME MULTIMEDIA METEOROLOGICAL PRODUCTS

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1. OVERVIEW

It has been nearly ten years since the usage of the Internet and World Wide Web has hit the mainstream community. As bandwidth to business and consumer clients has increased, additional capacity has allowed major media corporations and individuals to begin to distribute products over the Internet using a subscription or pull based technology. Officially listed in the Oxford American Dictionary as word of the year in 2005, *podcast* is traditionally defined as a digital recording of a radio broadcast or similar program, made available on the Internet for downloading to a personal audio player. Indeed, the definition is already outdated as individuals and media conglomerates regularly distribute video via podcast as well. Although more than 80% of podcast downloads never actually make it to a portable device (Dixon and Gresson, 2006) they may be consumed by users on personal computers and other devices.

2. ORIGINS

The Plymouth State University Meteorology Program has offered formal practicum courses in producing weather forecasts for television and radio for a number of years. Tapes of student produced weather forecasts are regularly aired on a local public access television station. In past years, students would prepare forecasts to be read during newscasts on the local student operated campus radio station, WPCR. However, between 2000 and 2006, it became increasingly difficult to coordinate and distribute broadcasts with station personnel. As a result, the few students who did occasionally enroll in the class often dropped the course because it was impossible for them to produce a forecast product

After speaking with current and former students who already possessed some radio broadcast experience, it was decided that students enrolled in the forecasting/radio practicum course during the Spring 2006 would produce audio files using a personal computer on a daily basis. Each forecast, 30 seconds in length, would simulate the actions performed by broadcast professionals. The forecasts would be recorded and saved as an MP3 audio file, which lends itself easily to redistribution via the web.

3. HARDWARE/SOFTWARE REQUIREMENTS

In order to produce the MP3 file, it was decided that a PC housed within the program's existing television studio facility would be utilized. This would provide a quiet, private space to produce the forecast with minimal background noise. The PC already had an onboard sound card with a microphone-in jack. An inexpensive microphone was procured from a local electronics store.

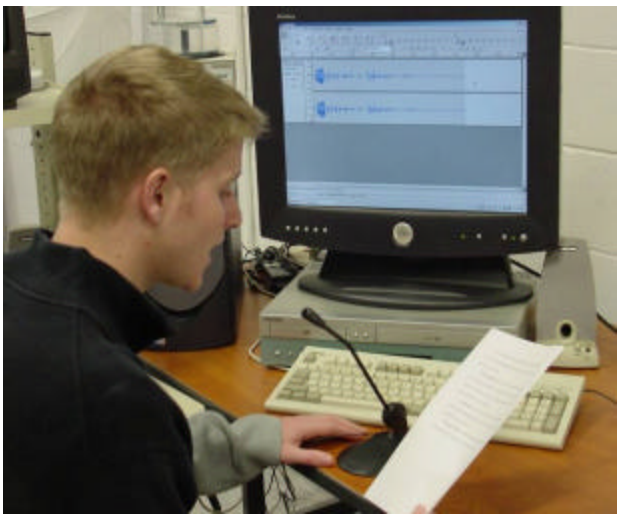

Figure 1. A Plymouth State University student prepares an audio forecast using Audacity

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Audacity was selected as the software package to record audio forecasts. Available for Windows, Mac, and Linux platforms, the software is an open source package and is distributed under the GNU General Public License (GPL). Students have the option of downloading and installing the software on a personal computer if they wish; this allows them to potentially enroll in the course on a distance-learning basis. The software has a wide range of features for changing pitch, editing sound, and noise removal. The system requirements for the software are minimal: a 300 mhz processor and 64 MB of RAM. In order to encode the sound file to the MP3 format, the LAME MP3 encoder was integrated into the Audacity package. LAME is also an open source package which is distributed under the terms of the GNU Lesser General Public License (LGPL). The software documentation for both packages provided simple instructions and installed successfully without major modifications.

After the student records the forecast to an MP3 file, it needs to be uploaded to a web accessible server for individuals to be able to download. Since our program already has a web server configured for a variety of real time meteorological content, it was easy to add additional links to our home page. The challenge was in producing a file that would truly make the MP3 file a podcast.

4. XML and RSS

In order to create a podcast that will be recognized by other applications, the content must be referenced in a common format. Although an ordinary Hypertext Markup Language (HTML) can provide a link to the MP3 file, it truly is not a podcast unless there is a means to tell an application to pull the content at a regular interval.

Really Simple Syndication (RSS) is a dialect of Extensible Markup Language (XML) that allows for common tags. All RSS files must conform to the XML 1.0 specification. The RSS document provides metadata to the web browser or feed aggregator about the content, such as who authored the forecast, where and when the forecast was produced and other information. By creating a RSS document with enclosure references to the MP3 file, podcast aggregator applications will be able to pull the file to the device for consumption.

A RSS document is similar to a HTML document in that a set of tags provides information about how the application should treat elements within the document. Although most web browsers will attempt to render HTML even if it has not been correctly implemented, RSS and XML will not behave correctly within applications unless it is precisely organized. To validate an RSS document, there are a variety of both software applications and online tools available.

The RSS specification requires a number of elements to be present in order to be valid. Each RSS document contains a channel with a channel with a number of required and optional sub-elements. Although not required, the RSS document produced also included some elements which are part of the iTunes namespace. These elements provide extended information about the product to certain applications.

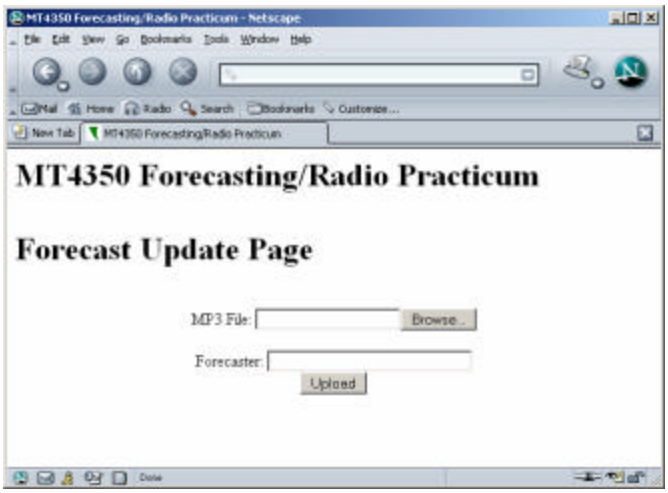

Figure 2 Web form used by students to upload the MP3 file to the server.

5. ASSEMBLING THE PODCAST

Once the student has prepared the forecast file in MP3 format, s/he must upload it to the server and update the RSS/XML page. In order to simplify this process, a web accessible, password protected Perl script was composed. This allows the students to simply visit an internal URL on the department web server, identify themselves as the forecaster, and upload the file. Figure 2 shows the web form as seen by the student. The script automatically calculates the size of MP3 file, determines the time/date it was uploaded, and writes other required metadata to the RSS file. In order to enhance the content, introductory and closing music approximately 5 seconds in length is automatically added to the MP3 file as part of the upload process. Appendix A contains the HTML code for the web form as well as an example of

the script used to upload the MP3 file and generate the associated RSS file.

6. LISTENING TO THE FORECASTS

There are a variety of methods in which the forecasts can be obtained. Users can visit the homepage for the meteorology program (http://vortex.plymouth.edu) and click on the link for MP3; they will be able to hear the latest version of the forecast with a media player application. Alternatively, they may subscribe to the podcast through the use of a compatible web browser or feed aggregator. The latest versions of Internet Explorer, Firefox or Opera all have the ability to subscribe to podcasts. Many music software applications such as iTunes also allow for subscriptions to podcasts. Users may add the URL for the podcast of the forecast product (http://vortex.plymouth.edu/podcast.xml) to the list of feeds so that the application may download content on a scheduled basis. Some Digital Media Recorders (DMR) such as TiVo® also allow users to listen to podcasts through a broadband connection (Figure 3).

7. EDUCATIONAL VALUE

By producing weather forecasts for radio, students gain and improve various skills. These include the construction of a forecast in a language appropriate to the general public, oral communication skills (diction, intonation, clarity, etc.) as well as meeting deadlines and time limits which are necessary in a professional radio environment. They also gain experience in producing and editing appropriate sound files. Finally, they learn to deal with the collaboration needed in order to make a quality forecast available to the public in a timely fashion. Instructors evaluate forecast products based on the rubric found in Table 1 and review forecasts with individual students as appropriate.

8. FUTURE DIRECTIONS

Although the traditional definition of podcast refers to distributing audio, any type content (text, images, video) may be syndicated using procedures similar to those outlined. With additional equipment to record video to a digital format, it would be easy to use the same methods to create a video podcast for distribution. Ideally, many of our products available from our website could also be syndicated using RSS, which would allow users greater flexibility in customizing content of interest. Podcasting could also be included in other courses, both traditional and distance learning to allow students to gain experience in producing content for a variety of audiences.

9. ACKNOWLEDGEMENTS

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Figure 3. Listening to a Podcast using a TiVo®

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		4 (Outstanding)	3 (Average)	2 (Poor)	1 (Unacceptable)
Forecast	**Content**	Containsall required elements	Missing one required element	Missing a few required elements	Lacks most required elements
	Meteorological Terminology	Correct usage of meteorological terminology	Only one meteorological term used incorrectly	A few meteorological terms used incorrectly	Too many instances of incorrect usage of meteorological terms
	Audience Awareness	Appropriate level for general public	Level mostly appropriate for general public.	Some jargon. A little too technical for general public	Too much jargon. Inappropriate for general public
	Overall Quality	Excellent Forecast . Well crafted, professional quality forecast.	Mostly good forecast, but one detail of lesser quality.	Forecast still OK, but a few instances of unprofessional wording.	Childish wording, completely unprofessional.
Technical	**Deadline**	On Time	Slightly late	About an hour late	Unacceptably late
	Sound Quality	Excellent sound quality	Slight sound problem.	Sound quality bad enough that is distracting, but still possible to listen to forecast.	Poor sound quality. Hard to listen because of poor sound.
	Length	Thirty second forecast or no more than 60 seconds when special weather events	Slightly longer or shorter than required	More than five seconds too long or too short.	Excessively long or excessively short.
	Editing	Forecast flows from beginning to end with no words cut in half and no unnatural pauses.	Slight presence of unnatural pauses. No words cut in half.	Excessive amount of unnatural pauses, but no words cut in half.	Words cut in half by editing or excessive amount of pauses.
Presentation	**Quality of Voice**	Clear, pleasant voice	Only one word is hard to understand.	A few words are hard to understand. Slightly unpleasant voice.	Hard to understand. Unpleasantly pitched voice.
	Enunciation	All words clearly enunciated and correctly pronounced.	Good enunciation but one word incorrectly pronounced.	Some enunciation problems or a few words pronounced incorrectly.	Sloppy enunciation. Excessive use of incorrectly pronounced words.
	Speed	Appropriate pace.	Slightly faster or slower than pleasant to listen to.	Fast or slow enough that is distracting, but still able to follow the forecast	Excessively fast or excessively slow delivery. Hard to understand or keep up because of speed.
	Language	Correct grammar and syntax. Correct use of language.	One grammatical or syntax error	A few grammatical or syntax errors	Excessive amount of grammatical o syntax errors
Style	**Voice Intonation**	Good intonation. Grabs your attention. Makes you feel that knows what it is talking about.	Intonation OK but sounds a little insecure.	Somewhat monotonic or some weird changes in intonation or obviously nervous	Excessively monotonic or excessive unnatural changes in intonation. Boring or weird to listen to or way too nervous.
	Appeal	Forecast is made interesting by using different descriptive adjectives or by making forecast relevant to audience. Ex: ski forecast, game-time forecast, etc.	Noticeable attempt to include relevance or interest, even if not very successful.	Only slight attempt to include interest elements. Not successful.	Boring, robotic listing of required elements. No interest elements of any kind

Table 1: Grading Rubric for Radio Forecasting Practicum

APPENDIX

Example A: HTML Code for Web form used for upload

```
<html>
<TITLE>MT4350 Forecasting/Radio Practicum</title>
<h1>MT4350 Forecasting/Radio Practicum<br><br>Forecast Update Page</h1>
<BODY BGCOLOR="#FFFFFF" TEXT="#000000">
<CENTER>
<FORM ACTION="/cgi-bin/mp3update" METHOD="POST" ENCTYPE="multipart/form-data"
>
<BR>MP3 File: <INPUT NAME="mp3file" TYPE="FILE"><BR>
<br>Forecaster: <input name="fname" type="text" size="30"><br>
<INPUT TYPE="SUBMIT" VALUE="Upload">

</FORM>
</CENTER>
</BODY>
</HTML>
```

Example B: Perl script for MP3 file upload and production of RSS file

```
#!/usr/bin/perl -w

  use CGI;
  my $cgi = new CGI;
$ENV{"TZ"} = ':/usr/share/zoneinfo/EST5EDT';
# Get date, time information, generate filename

 $lt = localtime;
 ($dow, $mon, $day, $tim, $yr) = split ' ',$lt;
 ($hr, $min, $sec) = split ':',$tim;
 $mm = "am";
 if ($hr >= 12){
        $mm = "pm";
        }
 if ($hr > 12) {
        $hr = $hr - 12;
        }
 if ($hr == 0){
        $hr = 12;
        }

chomp ($zone = `date +%Z`);

  my $dir = "/usr/apache/htdocs";
  my $pdir = "$dir/podcast";
  my $file = $cgi->param('mp3file');
  my $fname = $cgi->param('fname');

  $file=~m/^.*(\\|\/)(.*)/; # strip the remote path and keep the filename
  @mp3file = <$file>;
  $name="file.mp3";
  $rssfile="podcast.xml";
 # write opening music
  open(LOCAL, ">$pdir/$name") or die $!;
```

```
  open(INTRO, "$pdir/intro.mp3") or die $!;
  while(<INTRO>){
        print LOCAL $_;
}
  close LOCAL;
  close INTRO;

  # write actual forecast file (append)
  open (LOCALA, ">>$pdir/$name") or die $!;
  print LOCALA @mp3file;

  # write closing music (append)
  open (CLOS, "$pdir/close.mp3") or die $!;
  while (<CLOS>){
    print LOCALA $_;
  }
  close LOCALA;
  close CLOS;
$size = (stat("$pdir/$name"))[7];

&printrssfile;
 &printhtml;

 sub printhtml {
 print $cgi->header();
 print "<title>upload successful</title>\n";
 print "$fname,<br><br>\n";
 print "$file has been successfully uploaded ...<br><br>\n";
 print "Click on <a href=http://vortex.plymouth.edu/podcast/$name>link</a> to
listen<br><br>\n";
 print "<a
href=http://vortex.plymouth.edu/psufx/loadmp3.html>resubmit</a>\n";

}

sub printrssfile {

open (RSS, ">$dir/$rssfile") or die $!;
print RSS<<"eof2";
<?xml version="1.0" encoding="utf-8" ?>


<rss version="2.0" xmlns:itunes="http://www.itunes.com/dtds/podcast-1.0.dtd"
>
<channel>
        <ttl>30</ttl>
        <title>Plymouth State Podcast Weather</title>

        <itunes:author>Plymouth State University</itunes:author>

        <link>http://vortex.plymouth.edu</link>

        <itunes:subtitle>From the Judd Gregg Meteorology
Institute</itunes:subtitle>
        <itunes:owner>
           <itunes:name>Technology Manager</itunes:name>
           <itunes:email>weather&#064;plymouth.edu</itunes:email>
```

```
        </itunes:owner>

        <itunes:summary>A complete, detailed weather report available weekday
afternoons</itunes:summary>

        <description>A complete, detailed weather report available weekday
afternoons</description>
                <language>en-us</language>

        <copyright>&#169; $yr Plymouth State University, All Rights
Reserved.</copyright>

        <itunes:category text="News" />

        <!-- iTunes image -->

        <itunes:image href="http://vortex.plymouth.edu/icons/psu_sm.png" />
        <image>
                <url>http://vortex.plymouth.edu/icons/psu_sm2.gif</url>
                <title>Plymouth State Meteorology</title>
                <link>http://vortex.plymouth.edu</link>
        </image>

        <item>
        <title>Plymouth State Podcast Weather - $dow, $day $mon $yr $hr:$min
$mm $zone</title>

        <itunes:author>$fname , Student Meteorologist</itunes:author>

        <itunes:subtitle>Central New Hampshire Forecast - Updated: $dow, $day
$mon $yr $hr:$min $mm $zone</itunes:subtitle>

        <description>Forecast for the Plymouth, NH area - Updated: $dow, $day
$mon $yr $hr:$min $mm $zone</description>
        <itunes:summary>Forecast for the Plymouth, NH area - Updated: $dow,
$day $mon $yr $hr:$min $mm $zone</itunes:summary>
                <enclosure
url="http://vortex.plymouth.edu/podcast/$day$mon$yr$hr$min$sec.mp3"
length="$size" type="audio/mp3" />
        <link>http://vortex.plymouth.edu/podcast/$name</link>

        <pubDate>$dow, $day $mon $yr $tim $zone</pubDate>
        <guid isPermaLink="false">psuvortex$day$mon$yr$hr$min$sec</guid>

        <itunes:keywords>wx, weather,  podcast, download, plymouth state,
,new hampshire, nh, forecast </itunes:keywords>
        </item>

</channel>
</rss>

eof2

close RSS;
# add symbolic link
symlink ("$pdir/file.mp3", "$pdir/$day$mon$yr$hr$min$sec.mp3");
}
```