

Vodcasting for everyone¹

Lars Lindberg Christensen¹ & Robert L. Hurt²

¹ ESA/Hubble (lars@eso.org)

² Spitzer Science Center (hurt@ipac.caltech.edu)

Abstract

Video podcasting, or vodcasting, is the latest evolution of the podcast revolution. The market for on-demand content spans the gamut, ranging from portable media players to computers, and increasingly to televisions through home media centres. This new mode of accessing video content is rapidly growing in popularity, particularly among younger audiences. Because it allows a direct link between consumer and content producer, bypassing traditional media networks, it is ideal for EPO efforts. Even modest budgets can yield compelling astronomy vodcasts that will appeal to a large audience. Gateways like the iTunes Music Store and YouTube have created new content markets where none existed before. This paper highlights the key steps for producing a vodcast. The reader will see how to make (or improve) a video podcast for science communication purposes learn about some of the latest developments in this rapidly-evolving field.

Introduction

Up through the 1970s virtually all video content in the United States was produced by one of three networks, and could only be seen during specific time slots. By the 1980s this “TV 1.0” era gave way to a fundamentally new paradigm of flexibility and choice. In the “TV 2.0” era viewers now had dozens, even hundreds, of niche-market networks offering a much broader variety of programming. The advent of the VCR, and more recently the digital video recorder (DVR), has also increased flexibility by “time-shifting” content from its broadcast time to a convenient viewing time.

Widespread broadband internet access is enabling a new revolution, dubbed “TV 3.0.” Viewers now have the option of bypassing networks and schedules altogether, instead downloading content on-demand for viewing on their computer, portable media player, or television. There is no longer a network executive and programming schedule standing between the content producer and the audience; it has become a direct relationship!

The instrument of change is the podcast. The “Personal On-Demand broadCAST” is really no more than an online media file posted alongside an XML file (a feed), that is updated as new

¹ Parts of this paper appeared in the proceedings from the 2007 ASP EPO meeting.

content becomes available. Media aggregators (such as iTunes) allow subscriptions to the feed and will automatically download new content to their computers in the background as it becomes available.

While the roots of podcasting are in the audio MP3 format, video has become overwhelmingly common in recent years. The video podcast, or vodcast, has become a competitor for traditional television viewers, thus defining the TV 3.0 revolution.

Why vodcast?

Vodcasting allows producers of compelling content to connect directly to an audience. This opens up incredible opportunities for astronomy outreach. There are a number of compelling reasons science communicators should consider vodcasting.

Astronomy is visual

Of all the sciences astronomy is arguably the most visual and is responsible for some of the most memorable images of our time. Video is a natural medium for astronomy communication because of the readily available image, illustration, and animation resources for production. Astronomy themed vodcast content is highly appealing to audiences and is a natural fit to the medium.

Easy to produce

The standards for online video content are dramatically more forgiving than for broadcast television. The “Do-It-Yourself style” of many of the established vodcasts lowers the technical expectations among the audience, and puts emphasis on the content — the idea and the messages. While a broadcast documentary can cost tens of thousands of dollars or more to produce, effective vodcasts can be made on a shoestring and thus are within reach of even the smallest EPO groups.

It’s the future, not just a fad

The explosion of downloaded content over recent years makes it clear this is an inescapable trend, not just a fad of the moment. It is supported by powerful industries such as Apple, Google, and video community websites such as Veoh and YouTube; vodcasting is not going away anytime soon.

Connect to large audiences

There are increasing numbers of people actively searching for compelling online content. This is particularly true for younger audiences, including children, who are growing up online rather than in front of the TV. Astronomy vodcasts can attract large audiences simply by existing; viewers will find the content without having to be told about it (“pull” as opposed to “push”).



Figure 1 – Who needs convincing? After introducing a high definition format, the Hidden Universe briefly reached the top spot in the US rankings of all podcasts in September, 2007, ahead of major players such as National Geographic, ESPN and HBO. New episodes are routinely downloaded 80,000 times in their first month online.

iTunes Music Store

Vodcasting examples

As examples of vodcasts we will examine the production of two successful video podcast series: *Hidden Universe* and *Hubblecast*.

The *Hidden Universe* of the Spitzer Space Telescope, produced by NASA's Spitzer Science Center, was the first astronomy video podcast. The first episode went online in May 2006, and one year later it became the first astronomy vodcast to also offer a high definition (HD) version. The focus is science, not human interest stories. It uses two show formats: Showcase episodes are mini-documentaries (~5 min) featuring a host, rich visuals, and interviews, and Gallery Explorer episodes (~2 min) that display one or more related images with simple overlay text for background.

The *Hubblecast* is produced by the European Space Agency's Hubble group and started in March 2007. It features the latest news and images from the NASA/ESA Hubble Space Telescope. The host is Dr. Joe Liske a.k.a. "Dr. J" from ESO, who was selected at a screening session from ten other very promising scientists by a panel consisting of several men and women from different backgrounds in a "reality television" casting session. The production time for an episode

is roughly five working days. The duration of an episode is five to six minutes. Hubblecast has three channels: SD (Standard Definition), HD (from June 2007) and Full HD (possibly the first Full HD Vodcast in the world). In addition eight other video formats are made available online at spacetelescope.org. Further information about Hubblecast is available in Christensen et al. (2007) and online².

Production design & resources

In a vodcast production where manpower is often restricted it is vital to manage resources and make the best of existing assets. These assets include (but are not limited to) images, animations, a host and scientists. In designing a vodcast, one should identify which assets are available and develop a show format to use as much in-hand material as possible. Minimising custom production needs is critical for maintaining a sustainable production.

Images

Astronomy images are abundant and are a key resource for any vodcast. Most of the third party astronomy images on the web are free to use for educational and communication purposes. Even static images can be fantastic for video by adding slow zoom and/or pan effects.

Animations

One or two well-chosen animations, either artistic or derived from science data/simulations, can help communicate a difficult science concept. While they can be time-consuming or expensive to produce, many institutions have broadcast-quality content available online that may eliminate the need for custom work.

Host

A regular host can give a personal touch and can help establish an identity for a vodcast. A host can also provide a visual focus when images or animations are not available to illustrate a point. He or she can even make low resolution content less obvious if it is presented as a “newscaster” style inset. It is critical to cast someone with clear speech patterns and good presentation skills with technical material; it is even better if they can memorise material rather than read from cue cards.

Interviews

Scientists can bring a personal angle to technical results, and can be a great resource for video. By interviewing them several times on the subject it is often possible to get a good, clear “take” that gets across key ideas. Plus, anything covered in an interview does not have to be written

² <http://www.spacetelescope.org/videos/hubblecast.html>

into the script, simplifying production. Note that not all scientists are equally suited to appearing in front of a camera and it is good to screen a potential guest scientist in advance for his or her ability to present the material in a lively and concise way.

Both *Hidden Universe* and *Hubblecast* utilise all of these assets for their productions. Typical end-to-end production times are on the order of a week. However, the Hidden Universe Gallery Explorer format was specifically designed to include only readily available images and animations to provide a rapid-production option (less than a day) to assure timely updates to the feed when a full Showcase production is not possible.

The script

Vodcasting is a very “light” medium; the format is short and it is essential to focus on key facts and make them as engaging as possible. The script can make or break a production. It must encompass both the narrative and the visual content and effectively link them.

The first step is to identify the target audience. Is the product intended for children, laypeople, or the informed public? This determines the number of ideas and the level of background information needed to explain them. Traditional news criteria can help determine the elements that make for interesting stories (see for instance Christensen, 2007).

Adapting pre-existing material, such as a news release, can be a shortcut to researching and writing on a new topic. However, spoken dialogue has a significantly different character from written text, and it is important to rewrite such material carefully so it sounds right to an audience. It is also critical to make adjustments to the content if the source material was intended for a different audience level.

Audiovisual Production

Once the script is ready, the visuals for the vodcast must be assessed. Image and animation segments need to be located online or developed using animation software. This process can start even before audio and video footage has been acquired if the timings for the script are recorded; this can be done with timed read-throughs or even by using text-to-speech software.

Shooting Video

Any production with host or interview segments will need to shoot video. There are many options, ranging from on-location in an office, working in a controlled studio setting, or even using substituted backgrounds by shooting against a green screen.

Real footage is recorded with a camcorder either in-house or with the assistance of a small hired camera team, depending on the budget. Naturally, the better the real footage is, the more “cinema-like” the final result, and so using the best equipment that fits the budget is helpful.

High definition video cameras today start at just a few hundred dollars (US) but the better quality equipment starts in the thousands of dollars.

Background removal & virtual sets

It is not too difficult to create a completely imaginary set for your host or interview subjects. The backdrop can be as simple as an image, an animated background pattern, or even a “virtual set” constructed in image and 3D graphics editing programs.

The technique requires shooting the subject against a distinctively coloured backdrop that can be digitally removed, or “keyed” out. Typically these are bright blue or green screens; green is more commonly used as it is less likely to match common clothing or skin tones. Note that these green screen studio installations need not be permanent, but can be set up in about an hour or so. Common editing applications have tools for removing these backgrounds (see Figure 2).

Shooting green screen footage does place stronger technical requirements on your video equipment. The least expensive digital video cameras will tend to blur out colours, making it difficult to separate the subject from the background cleanly. This leaves an unnatural border that can ruin the effect. It is useful to check online forums to see what results filmmakers have had with specific video equipment before committing to a particular camera.

Recording audio

The audio quality is dramatically better through an external microphone instead of the camera’s built-in system. This can include shotgun/boom microphones near the camera or lavalier microphones that clip onto the shirt (either wired or wireless). Even for narrations without video, using a high quality microphone will make a big difference to how professional the production feels as audio problems are difficult or impossible to fix after the fact.

Anyone speaking on camera or in a voiceover must have good pronunciation and clarity. Very strong accents can be distracting. If a speaker is important to a story but is difficult to understand, try to use them to reinforce established points and not introduce new material.

Music and sound effects

Music and sound effects can dramatically improve the impact of a video. Free sound tracks and effects from the web, as well as copyrighted “pay-per-use” stock music are available for the sound. Many so-called “net labels” exist that have favourable conditions for the use of the music. See Testtube³ for an example. However, it may be interesting to collaborate with artists who can compose music and sound effects that will fit the specific needs of the project better.

³ <http://testtube.monocromatica.com>

Editing

The post-production stage follows the recording of the audio and video. At this point the video footage is screened and the best “takes” chosen and trimmed to remove unwanted parts. The remaining video, animation, and audio assets are assembled. Using the script as a template the project is pieced together in the editing software like a jigsaw puzzle. Video and audio clips are added to the timeline to tell the story. Audio levels are adjusted to be consistent, video colours are corrected, and transitions are added where they improve the storytelling. Finally, extras like music and sound effects are laid into the timeline for the final polish.

Naturally somewhat specialised hardware and software is needed for these tasks, but we are in a much better situation today than just a few years ago. Mac and Windows computers now come standard with incredible computing power and data input/output rates, and basically any new high-end computer can be used for video editing. Key considerations are lots of storage space (7200 rpm drives, internal or Firewire, but not USB). High definition editing is particularly demanding and requires larger monitors and high performance video cards (this technology changes rapidly; it is worth consulting computer experts to find the best current video card options).

There are many powerful options for video editing software today. Industry standards now include suites like Final Cut Studio and Adobe® Premiere®, but even entry-level products like iMovie can produce a solid vodcast.



Figure 2 – The different steps of the keying process. The first image shows the unprocessed scene. Then the green colour is replaced with computer graphics and the scene is cleaned up digitally.

Video formats

Today the broadcaster is faced with an almost dizzying array of image sizes and formats. Traditional US (NTSC) and European (PAL) formats have different frame rates and dimensions but share a common aspect ratio (4:3). Now a new set of high definition (HD) formats are becoming the new broadcast standard. They are differentiated by two image sizes (both with widescreen 16:9 aspect ratios) and a variety of frame rates.

Table 1 summarises all of the major video formats. These affect even vodcasters since common production formats mirror those for television broadcast work. Interlacing becomes a key issue in choosing formats; this process is a kind of workaround for limited signal bandwidth in which every other line of an image is sent (a field), and the remaining interlaced field is filled in on the next pass. While this does create a faster-refreshing screen, the resulting interlace artefacts create an unpleasant effect for online viewing and should be avoided for all vodcast work.

What is the best format for vodcasting? There is no easy answer. Standard definition (SD) formats and lower frame rates make for smaller files and faster downloads that are compatible with a wider cross-section of hardware. However, new computers are able to play back and display HD material on the computer screens. Many consumers already have HD or Full HD plasma or LCD screens in their home, and media centres and HD players such as Apple TV are becoming increasingly common. Paradoxically most normal consumers are not able to find much HD content to display on the computers or TVs and this is definitely a niche that can be exploited for science communication purposes.

In the production sense, perhaps the most important difference between SD and HD is the change of aspect ratio (the ratio between the two sides of a video frame) from 4:3 of the traditional SD frames to 16:9 for HD frames. As current video production is moving rapidly towards the widescreen 16:9 aspect ratio, even for SD shows, this is arguably the more forward-looking choice today.

The other consideration is the target hardware platform. For instance, video iPods can handle images up to 640 x 480 at frame rates up to 30 fps. The newer Apple TVs have an added potential to handle 1280 x 720 frames at up to 25 fps. Most new computers can display 1920 x 1080 at up to 25 or 30 fps. Of course once a master video file has been created it is easy to downsample it to lower resolutions using encoding tools.

Final distribution videos are far too large in their raw, uncompressed state to distribute and play, so it is necessary to “encode” them into a compressed format designed for easy playback. One of the best video “codecs” in use now is H.264 (MPEG4 part 10). Within the limits stated above, this format is compatible with iPods, many other portable media players, and computers running Quicktime. However, offering vodcasts in multiple formats can reach audiences with older hardware; common choices are MPEG1 and Sorenson 3 Quicktime. Also posting minimally-compressed high-quality formats makes it easy for broadcasters to include the content in news and documentary programming for television.

Using a good batch compression tool can simplify the creation of media files. It is simple to take a final source file and create multiple versions using different compression codecs and at different

image dimensions. Naturally it makes sense to produce a vodcast at the highest desired dimension and frame rate, and downsample to lower qualities as needed. On Macs, Compressor — part of Final Cut Studio — is used by many. On PCs, ProCoder is a good tool to batch compress many

Format	Dimensions [pixels]	Interlacing	Field/FrameRate [fps]
NTSC (broadcast)	640 [720] x 480	Interlaced	60 (fields)
NTSC	640 [720] x 480	Progressive	24, 30
PAL	720 [768] x 576	Progressive	25
HD (720p)	720 [768] x 576	Progressive	24, 25, 30, 50, 60
HD (1080i)	1920 x 1080	Interlaced	50, 60 (fields)
HD (1080p, "Full HD")	1920 x 1080	Progressive	24, 25, 30

Table 1 – Summary of video formats

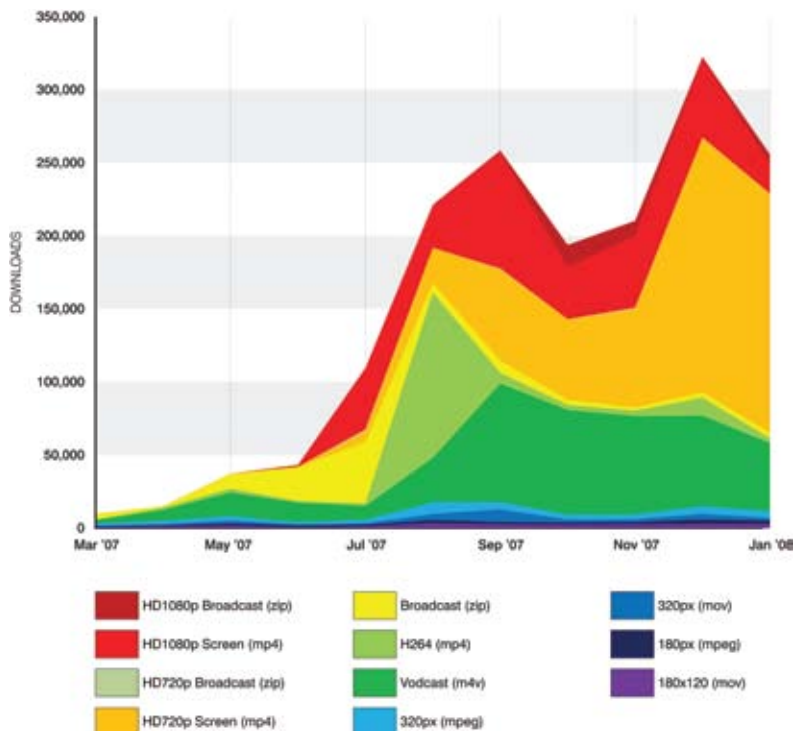


Figure 3 – What is the best distribution format? As this download chart for Hubblecast shows, it can be hard to tell! Increasing image resolutions are arranged vertically with the Full HD format on top. HD and Full HD are on the rise and started to dominate in October 2007, especially the formats aimed at on-screen viewing. For Hidden Universe the HD ready format is also extremely popular and has begun to outperform SD, but across all formats the vodcast has seen over a million downloads.

ES/Hubble (N. Marques / R. Shida)

In a time of rapidly advancing technology and consumer interests there is no simple answer to the seemingly simple question: “What is the best format to use for vodcasting?” But with the rapidly increasing market for HD televisions and related hardware, there is already a surprisingly strong trend towards large-format content. Since introducing both 720p and 1080p formats of *Hubble-*

cast, recent months have shown these HD options account for about half of the total downloads. For *Hidden Universe* the 720p format produced an even more dramatic ratings spike; it is downloaded about 10 times more frequently than SD!

Distribution — It's all about the ratings!

The final important step is the distribution and promotion of the video. The primary distribution of vodcasts today is through the iTunes Music Store. As the XML feed is updated with information on new episodes, this information is displayed for casual browsers looking through the podcast section. Video community sites such as YouTube, DailyMotion, blip.tv and veoh can be excellent channels for promoting a vodcast. Download numbers from these pages can be substantial (up to 20-25% of the total).

As with TV, better visibility will give higher ratings. A good name to the vodcast channel, a sexy description and recognisable icon are critical elements in your success. Learn from other vodcasts — what looks interesting and why? Episode titles and descriptions are important since casual browsers often sample an episode before subscribing. Waste nothing in your description; the first few words can be pivotal in capturing a potential subscriber's interest!

Conclusion

With the experiences from the two successful vodcasts *Hidden Universe* and *Hubblecast* we feel confident in saying that the vodcasts are here to stay. Delivering content in multiple formats to appease both the desires of instant gratification and of premium viewing quality seems to maximise the potential audience. Our experiences show that being one of the first providers of a new format can pay off, so watch for new trends, platforms and formats!

At the time of writing, 10 episodes of *Hubblecast* and 14 episodes of *Hidden Universe* have been released and both vodcasts have been downloaded close to a million times. The two podcasts are — at least for the time being — regularly ranked among the 10 most-viewed podcasts in the science category in iTunes, and among the Top 100 podcasts in total.

We plan to keep up with the steady stream of exciting vistas of space seen through the eyes of Hubble and Spitzer and presenting the latest science to the young generations as long as the segment of young viewers enjoys our work. Who knows what the next trend will be? Podcasts in 3D-HD? Will there be another even more exciting medium that can help us bring the stars to everyone on Earth? Only the future can tell...

Acknowledgements

The authors would like to acknowledge the two vodcast teams from both *Hidden Universe* and the *Hubblecast*, as well as Will Gater for his editorial contribution to the paper.

References

- Christensen L.L, Kommesser M., Shida R.Y., Gater W. & Liske J. (2007), The Hubblecast — the world's first full HD video podcast? In Christensen, L., Zoulias, M. & Robson, I. (eds.) Proceedings from Communicating Astronomy with the Public 2007
- Christensen L.L (2007), The Hands-On Guide For Science Communicators, Springer, 2007