

TV and the Internet

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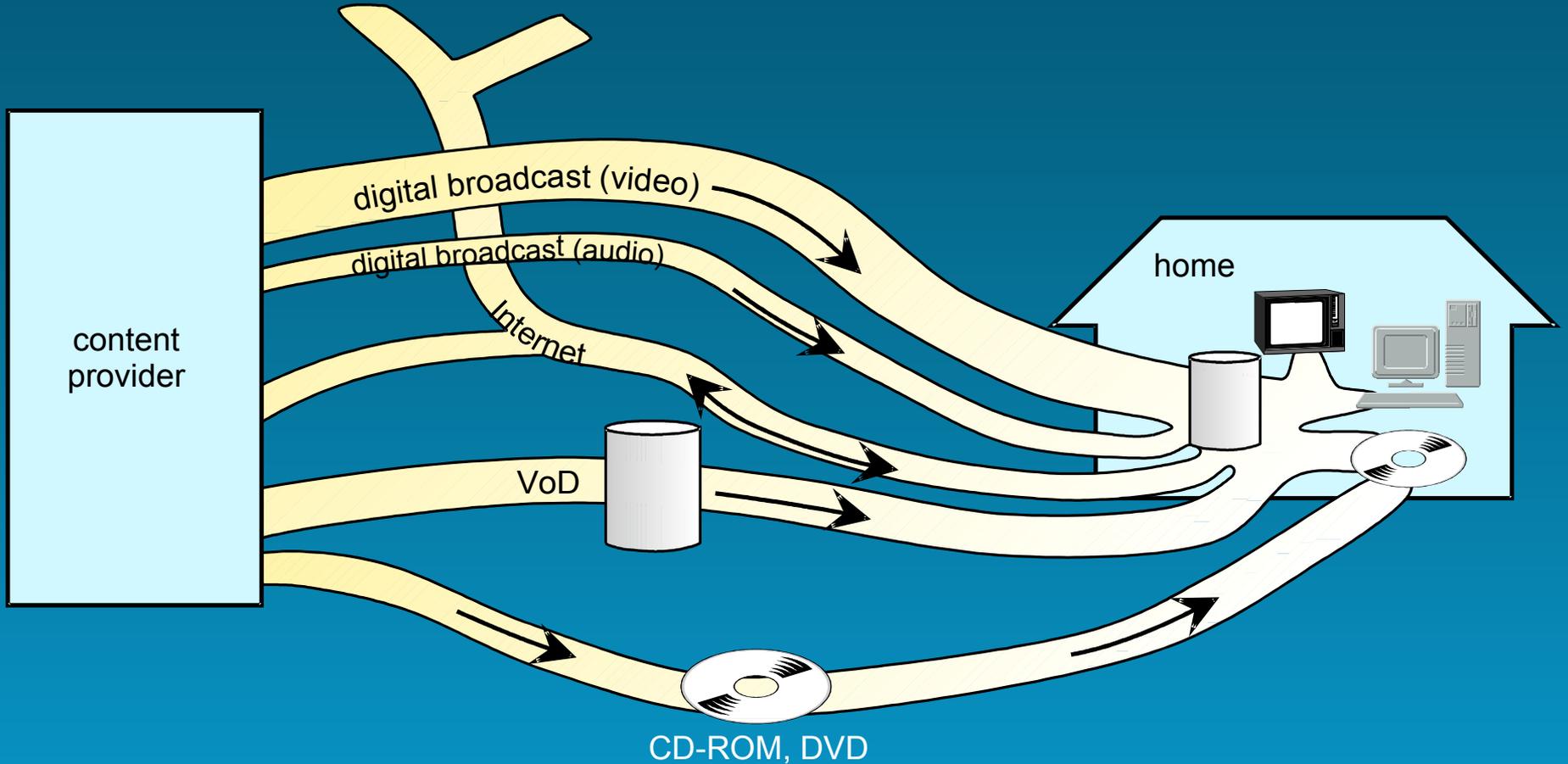


TV and the Internet



- Traditional broadcasting and the Internet compared
- Opportunities
- Making TV and the Internet work together
- Technical issues
 - Identifiers
 - synchronisation
- Conclusions

All roads lead to home...



DAVIC

(Digital Audio-Visual Council)

“TV Anywhere, Anytime”

Achieved by Internet delivery (anywhere)
and Storage (anytime)

Traditional broadcasting and Internet publishing: comparisons - 1

- Internet content, once published, remains available for some time
- Content has to be requested by the audience, unless a push-service is in place
- the audience is self-scheduling in many respects - they decide when and where they will access the site

Traditional broadcasting and Internet publishing: comparisons - 2

- linkages between different parts of a Web site enable the audience to receive a variety of different experiences depending on which routes they choose to follow;
- connection is not guaranteed and the quality of delivered service is variable depending on the number of users;

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- new facilities can be added to browsers by downloading the appropriate plug-in.

Opportunities - 1

- duplication of the normal programme carried by broadcast transmitters
- longer coverage of events with less editing to meet tight programme schedules.
- stored programmes and clips can be made available to the audience
- allows material to be made available that would be of interest to only a small audience

Opportunities - 2

- integration with the conventional broadcasting channels to give a richer experience to the audience
 - Web content delivered via DVB/DAB channel
 - TV incorporated into Internet-delivered content
 - TV and Internet-delivered content combined in display

TV and Internet delivered services can be mutually supportive

The Internet

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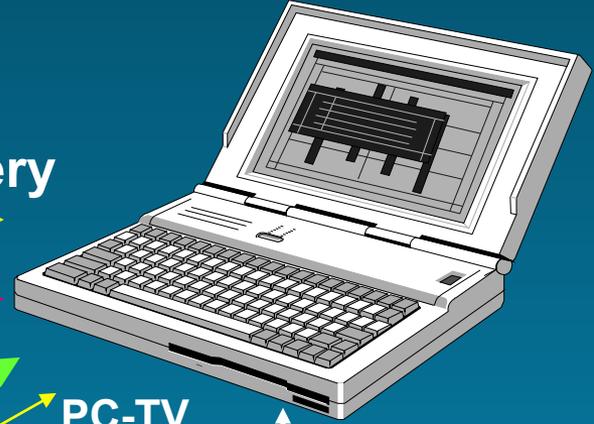
The Internet

- can be used to access additional information, e.g. historical context, cast and location details
- can be used to extend the reach, both geographical and temporal, of programmes through the use of streaming technologies and storage
- allows closer contact between a broadcaster and its audience through interactivity
- is a better delivery medium for some content

- TV can
 - ➔ provide rich and vital content for Internet delivered pages, e.g. as streamed video
 - ➔ be accessed from a broadcast transmission via a PC tuner card, provided link information is available - a TV URL scheme is required (also applies to stored video)

**Internet
Publisher**

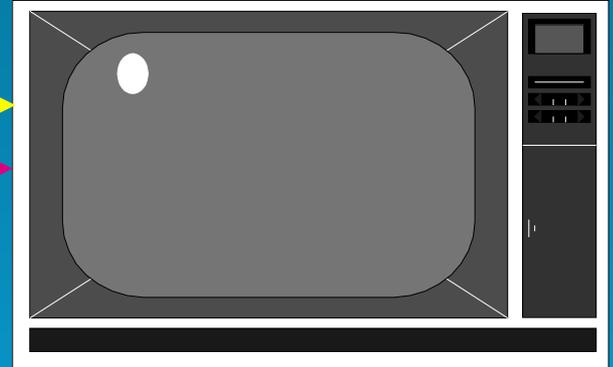
Internet delivery

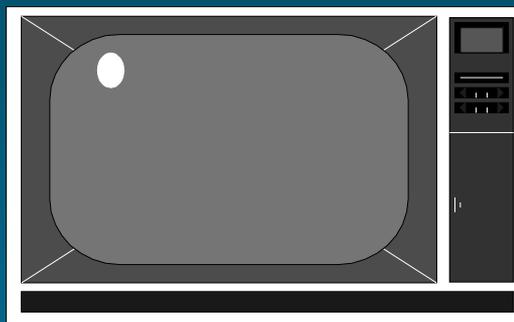


**PC-TV
Tuner**

Broadcaster

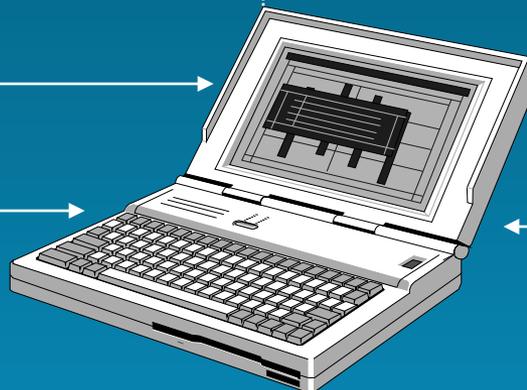
Broadcast delivery





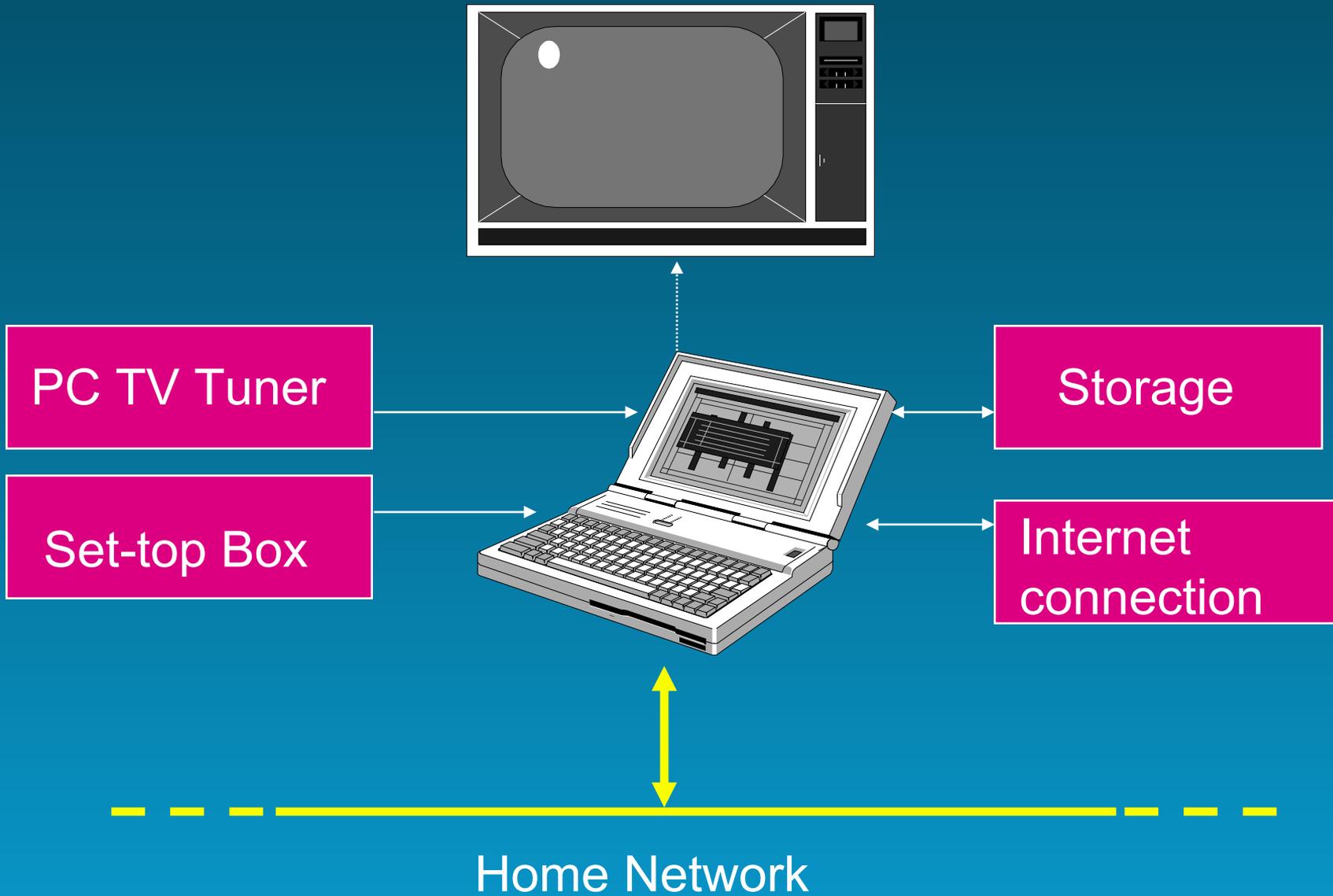
PC TV Tuner

Set-top Box



Storage

Internet connection



Making TV and Internet work together

- TV access from HTML etc.
 - We need to create method of identifying and locating a television programme stream, the individual programmes and items within them
- HTML access from TV
 - HTML content could be transmitted as DVB digital text (MHEG5 at present in UK) with the TV signal
 - A parallel application could download HTML from the Internet during a broadcast and combine with the video.

Technical issues

- Both TV-“HTML” and “HTML”-TV require identifiers to enable resources to be located
 - work needed on URLs
- Internet-delivered content needs to be able to be changed in synchronism with the TV content, at both the intra-page and inter-page levels
 - work needed on event triggers and synchronisation mechanisms

URI-related activities

- A number of organisations are working on URIs for TV, including:

DAVIC

DVB

ATSC

ATVEF

WebTV

W3C TV Interest Group (www.w3.org/TV/TVWeb/)

URI Requirements -1

- It must be possible for the resource identified by a URI to be a service, an event, or just a single component. Fragments are outside the current scope of requirements.
- Given a URI, it must be possible for a receiver to actually locate the resource, or conclude that it is not reachable.

URI Requirements -2

- Must support OPTIONAL information from which a receiver can determine the time period(s) within which the resource can be retrieved from the (also resolved) location.
- A URI should be invariant with respect to the normal range of transport stream transformations, both in referencing the time and the location of the resource in that transport stream.

URI Requirements -3

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- A URI should be resolvable under any of the following network access conditions:
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- Should interoperate with Internet access schemes, so as to enable seamless transition in referencing resources at TV Broadcast or Internet sites.
- Ideally, should support referencing various instantiations of the same content (encoding, quality/ compression ratio, versions/edits).

URI Requirements -6

- Should support relative referencing such that a TV-program with all its associated resources can be referenced against a common base, which is the TV Broadcast URI of that aggregate.
- The URI scheme should comply with RFC 2396.

Exceptions

- The host is not necessarily a server identifiable through an IP-address: the 'host' is a transport stream.
- The resource access and retrieval scheme is not necessarily IP-stack based.
- The resource's availability implicitly depends on, or at least relates to, a transmission schedule.

URIs for TV stations, channels, networks?

Simple example:

tv station	tv:wqed	the WQED station
tv channel	tv:12	channel 12
tv network	tv:nbc	the NBC network

But what about recorded material? Finer resolution, e.g. particular programmes? Items within programmes?

There is an IETF draft specification for TV URIs:

```
tvurl      = "tv:" broadcast
broadcast  = call-sign | network-id | channel-number

call-sign  = 1*[ alpha | digit ]
network-id = 1*[ alpha | digit ]
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This has insufficient resolution to locate an individual TV programme or programme segment but could be used to locate a TV channel, e.g. BBC1.

Result of auto-tuning a PC tuner is an internal look-up table:

tv:bbc1	UHF channel X
tv:bbc2	UHF channel Y
tv:itv-carlton	UHF channel Z
tv:channel_4	UHF channel A
tv:channel_5	UHF channel B

The URI would be standard, using information from Teletext. It allows TV channels to be referenced from WWW pages, so references can be made from HTML, XML etc., and there could even be a HTML / XML / JAVA / MHEG / WebTV based navigator resident in a TV receiver. So, one could channel hop by requesting a URI!

WWW pages that come via the internet could use this URI format but, preferably, they would use a URN. There would be an extra column in the PC's tuning resolution info table:

URN:	bbc1	tv:bbc1	UHF ch X
URN	bbc2	tv:bbc2	UHF ch Y
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This would mean a WWW page could refer to a programme stream independently of the transmission medium.

Finding a URN, and knowing there is only an analogue tuner, the application selects the analogue URI, which then gives the tuning info. If a DVB tuner is installed, the URN would resolve to a DVB URI.

- **DAVIC are considering a URL format for DVB:**

```
dvb://<orig_net_id>.<trans_stream_id>[.<service_id>.  
[<component_tag>][;event_id]][/<...>]
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This identifies a TV channel (e.g. BBC1) in a multiplex. The entire format need not be used for a 'simple link', i.e., a 'switch to this channel now' link. The <event_id> would identify a particular programme within a TV channel (e.g. "Panorama")

During autotune, a list of URLs is built up:

```
dvb://bbc....bbc1  
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dvb://itv....carlton  
etc...
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Synchronisation

- This is unresolved at present
- Possible solution is use of the MPEG-2 Presentation Time Stamp (PTS)
 - the value of this will probably not be known at the time of authoring HTML content
 - Ties application to MPEG-2
 - Offset from start of programme may be more useful, but what about “late joiners”
 - Coupled with work on SMIL, HTML+time, script tags and triggers

Conclusion

- The major issues of resource location and event synchronisation are being tackled.
- There are commercial interests in getting this work done, particularly in the USA
- There will be rapid progress
- Someone needs to think about the business model
- I expect solutions to be in place by end'99.

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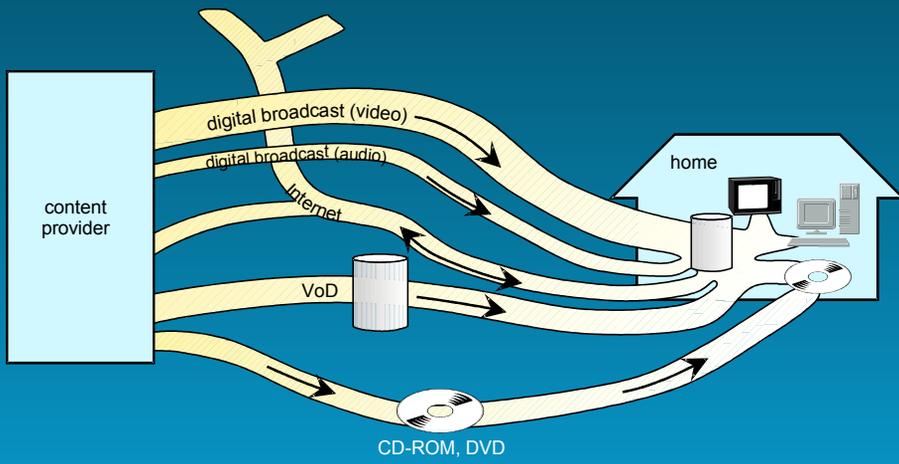


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Published content remains available to the audience for some time. The audience expects this and the publisher wants it - after all, he has spent time and money creating the content and wants it to be seen by a large audience. So the site gets bigger and bigger and navigation can become an issue.

Unlike the normal single stream of programmes from a broadcaster delivered to a relatively passive audience, internet delivery is like a multitude of parallel channels, requiring the audience to make selections throughout a session.

Unless one is dealing with streaming audio or video of a live event, the audience is not, in general, sharing an experience at the same time as it is happening or as each other. This leads to need to keep content on the site and up to date. Also, links to other parts of the site have to be checked to ensure they are still correct.

Traditional broadcasting and Internet publishing: comparisons - 2

- linkages between different parts of a Web site enable the audience to receive a variety of different experiences depending on which routes they choose to follow;
- connection is not guaranteed and the quality of delivered service is variable depending on the number of users;



In traditional broadcasting, a programme is designed by the programme maker to achieve a particular effect through the various time-sequential elements of which it is composed. By contrast, the linkages between the parts of a web site mean that two visitors could elect to follow completely different paths within the site and leave with totally different experiences.

The variability of the quality of the Internet connection to the content distributor is a challenge that needs to be met. Congestion can be caused at points in the Internet remote from the distributor but he still gets the blame!

Traditional broadcasting and Internet publishing: comparisons - 3

- there is a wide variation in the capabilities of the receiving devices, ranging from text-only browsers on slow modems to the latest browsers from Microsoft and Netscape with their incompatible extensions to HTML
- new facilities can be added to browsers by downloading the appropriate plug-in.



The variety of capabilities of browsers can be a constraint, but in practice one tends to cater for “recent” browsers rather than the latest offerings. We get the occasional complaint from someone with a text-only browser.

The ability to download “plug-ins” to allow, for example, streaming video to be decoded is an advantage but the variety of plug-ins for different proprietary coding schemes is a problem.

Opportunities - 1

- duplication of the normal programme carried by broadcast transmitters
- longer coverage of events with less editing to meet tight programme schedules.
- stored programmes and clips can be made available to the audience
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One man's challenge is another's opportunity, and the Internet creates an opportunity to reach new audiences with new types of programming. But this all costs money and so one is looking to achieve this at lowest cost.

Duplicating a programme transmitted conventionally may seem trivial, but, if the programme remains on the server, it does allow a wider audience to enjoy it, albeit in reduced resolution. We serve our three TV news bulletins each day, but they remain available on the servers until the next bulletin.

Since each web "page" exists without regard to other pages, extended coverage of events does not cause scheduling problems, so there is no need to compress a programme to just highlights. We covered the Glastonbury rock festival for BBC Radio 1 and were able to include much material that would have been dropped from a conventional programme.

As mentioned previously, programmes can remain available on servers for as long as they remain of interest. Material not used in the programme can also be made available, as well as supporting information and links to other, related, pages.

A web site supporting a conventional programme can be used to promote that programme, give information about cast, location, plot, historical significance and other related information that creates a richer experience for the audience.

The Internet allows material to be made available that would be of interest to only a small audience. An example of such material would be a camera focussed on the nest of a rare bird in a remote area of Scotland, the audience for which would be numbered in dozens rather than the thousands needed to justify a conventional programme. At this time we have a camera looking at the dome building being constructed for the UK's Millenium Exhibition

Opportunities - 2

- integration with the conventional broadcasting channels to give a richer experience to the audience
 - ▶ Web content delivered via DVB/DAB channel
 - ▶ TV incorporated into Internet-delivered content
 - ▶ TV and Internet-delivered content combined in display



Remember that “All routes lead to home”. There are a number of ways in which Web technology can be used to support conventional broadcasting.

Web authoring tools can be used for the creation of content which is delivered, much like teletext or WebTV, along with the digital Radio or TV service.

It is desirable to be able to make references to a TV channel and programme from within a Web page, for example, to respond to a promotional page with a command to record a particular programme when it is broadcast or to access a live programme as part of a learning package involving interaction through the Internet combined with live broadcast content.

And the two delivery methods could operate independently but be combined at the home so that Internet delivered content could be merged with broadcast material or be displayed separately but changing in synchronism with the programme.

TV and Internet delivered services can be mutually supportive

The Internet

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- ▶ can supply enhancement information for a programme *as it is being broadcast*
- ▶ can provide a trading facility (the “*buy now*” button) where a return path would not otherwise exist.



Here are some examples of how the Internet could support TV broadcasts.

The Internet

- ▶ can be used to access additional information, e.g. historical context, cast and location details
- ▶ can be used to extend the reach, both geographical and temporal, of programmes through the use of streaming technologies and storage
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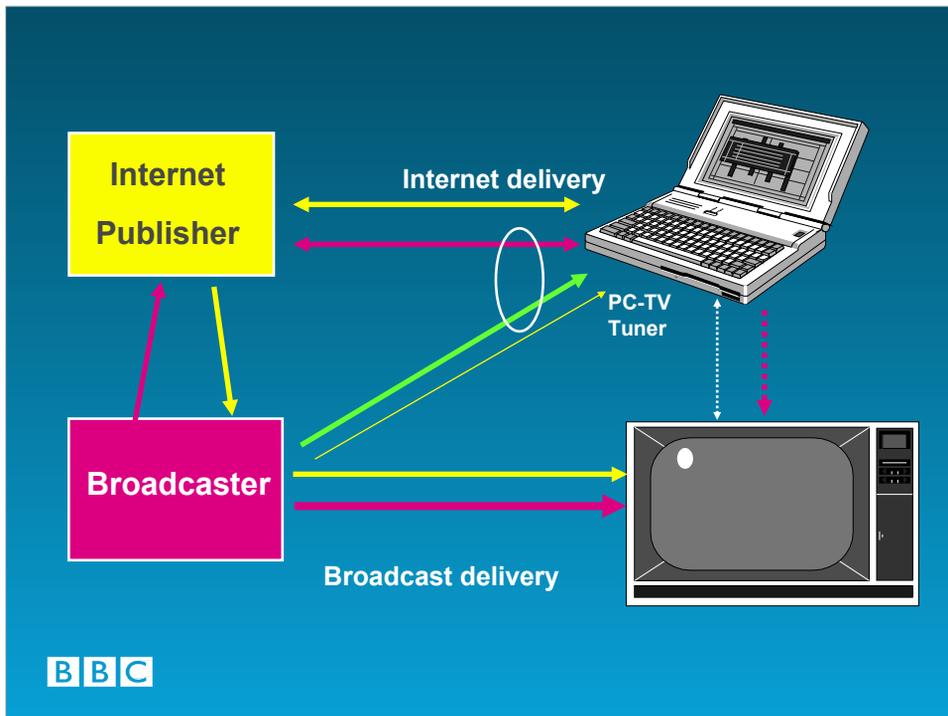


And a few more..

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 - ▶ provide rich and vital content for Internet delivered pages, e.g. as streamed video
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Apart from its content, TV seems to have less to offer...

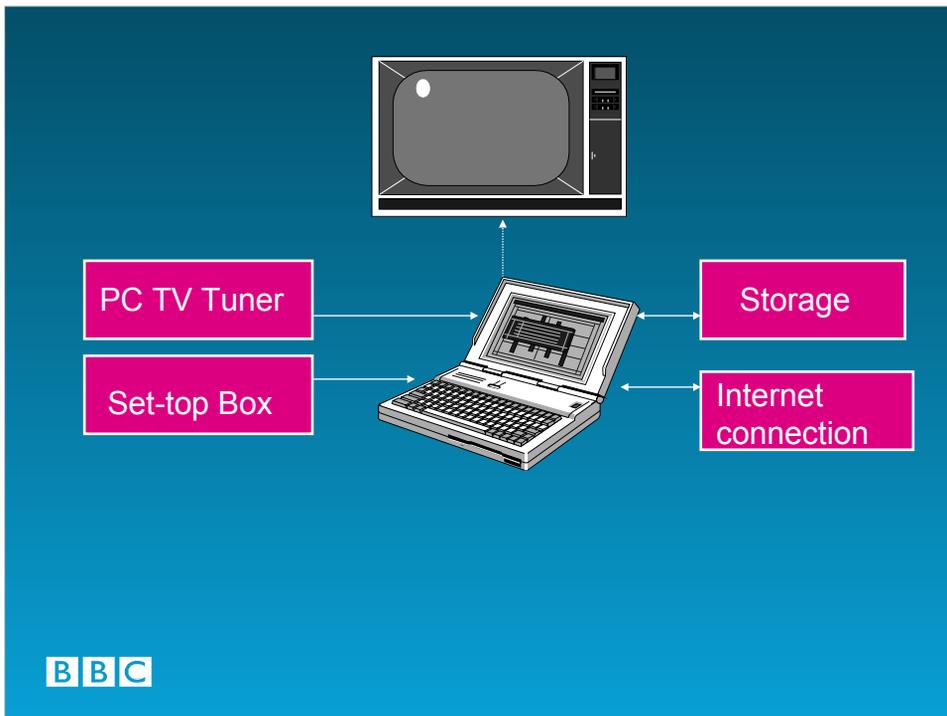


This slide shows some of the possible delivery methods.

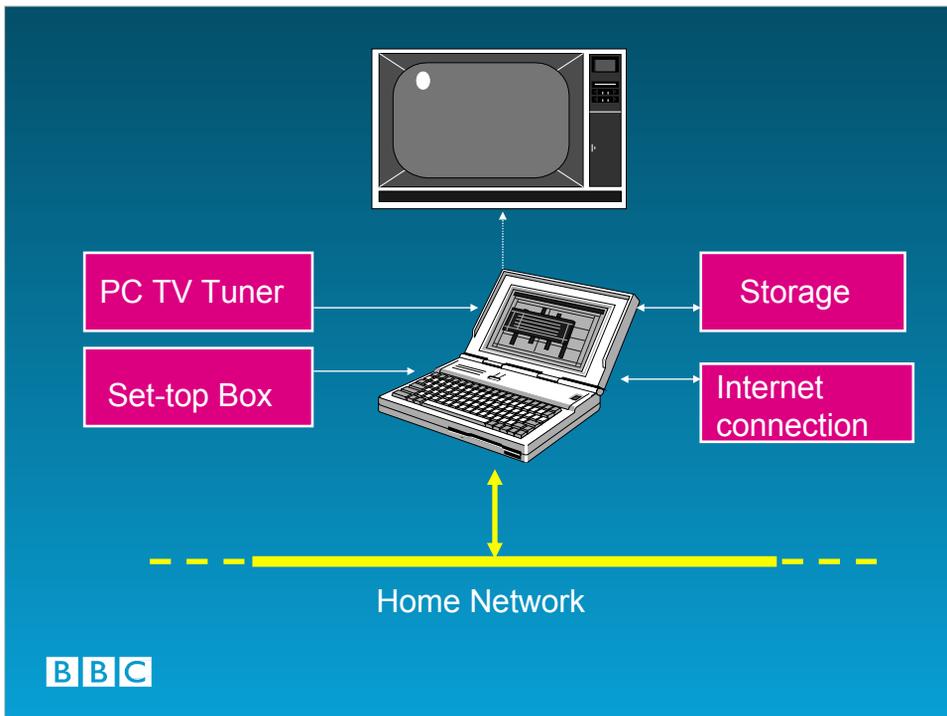
We have the traditional broadcast channel at the bottom, but being used to carry additional information, possibly HTML-like in nature.

We have Internet delivery at the top. Here some of the content may have been supplied from a broadcaster to support or accompany a particular programme or be more general in nature.

Across the centre we have the case where broadcast content is being received on a PC equipped with a tuner card and where broadcast TV content can be immediately referenced from Web pages delivered via the Internet.



So we could end up with a controller of some kind, not necessarily a PC as we know it, connected to the various incoming programme and data sources and combining or selecting between these as required and feeding the result to a display.



And in the future the whole arrangement could be connected to, and controlled over, a home network.

Making TV and Internet work together

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So how do we go about achieving this objective of making the different services work together in mutual support?

Clearly we need to be able to identify TV networks, channels, programmes and even items in some unique way, and to be able to find them from the many services available.

We also need to reach agreement on the way that broadcast services would carry additional content, “digital text” as it is called in the UK, and how the home devices should respond. Work is in progress in DVB in Europe and the ATSC in the USA on this subject.

And the home platforms need to be able to carry out the combination process; this requires agreement about how this should be done.

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