RTT TECHNOLOGY TOPIC
April 2003

Multi user multi format multi media using MPEG 4

In this month's HOT TOPIC we consider some of the issues involved in delivering interoperability between multi-media mobile devices and the related impact on handset hardware and software partitioning.

Multi-User to Multi-User Multi-Media

Multi-user to multi-user multi-media implies being able to support a diversity of users with a diversity of devices (across multiple networks in multiple countries).

Let's put to one side for the moment the issues of global roaming and network to network inter-operability and focus on device to device capability.

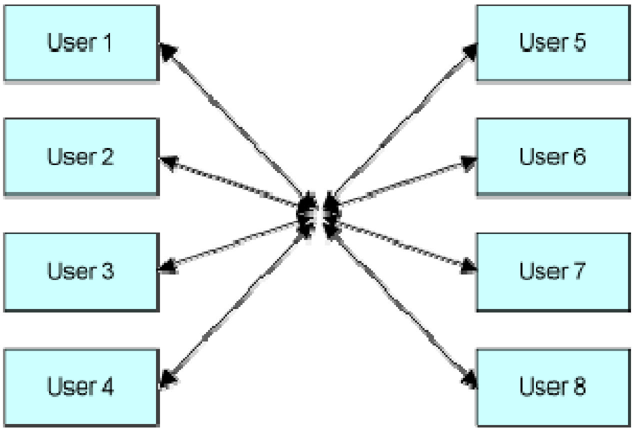

Figure 1

The present assumption is that there will be an increasing amount of device diversification which will require a complex and potentially time consuming process of device discovery.
Device discovery includes the need to discover device hardware form factor and device software form factor.

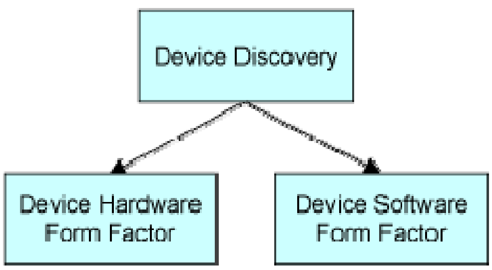

Figure 2

Device hardware form factor divides into RF hardware (how many simultaneous radio bearers are supported) and application hardware. Device software form factor divides into the operating system and any higher layer functions performed in software. M-PEG4 encoding/decoding may for example be performed in hardware or software so this process in itself can be quite ambiguous.

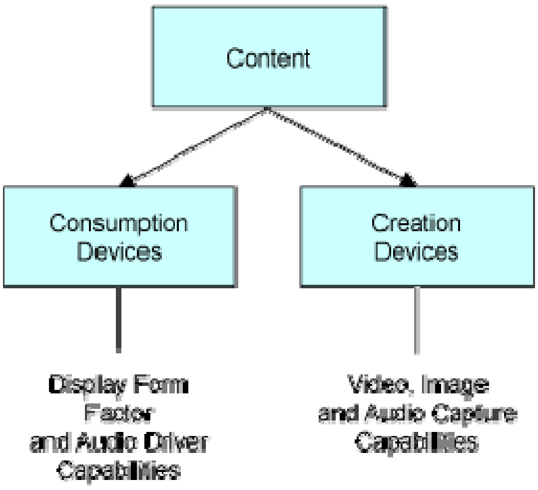

Figure 3

Conceptually the functions combined within a handset can be divided into content consumption and content creation.

Content consumption is a consequence of the display form factor and audio driver capabilities, content creation is a consequence of image/video capture capability (CCD or CMOS imaging) and audio capture capability (AMR-W codec or M-PEG4 audio codec support).

Let's take an example.

Hantro (**www.hantro.com** or **www.hantro.fi**) have an M-PEG4 encoder/decoder which is presently promoted as part of the Series 60 platform. The implementation can either be software or hardware based. The encoder produces either a QQVGA (sub-QVGA) 160 x 120 pixel picture or a sub QCIF 128 x 96 pixel picture at ten frames a second. The sub QCIF picture is combined with the AMR codec (an MMS simple visual profile with added audio).

Note the need to support both VGA and CIF formats.

The decoder can handle QQVGA, sub-QCIF and QCIF (176 x 144 pixels at 15 fps), ie the decoder has more bandwidth than the encoder (a consequence of processor overhead constraints).

This resolution issue can be quite problematic.

Let's consider why we have to support both VGA and CIF.

TV Monitor (CIF) and Computer Monitor (VGA) Resolution Formats

CIF Formats	Sub-QCIF	QCIF	CIF						
No of Pixels	128 x 96	176 x 144	352 x 288						
VGA Formats		**QQVGA**	**QVGA**	**VGA**	**SVGA**	**XGA**	**SXGA**	**UXGA**	**HDTV**	**QXGA**
No of Pixels		160 x 120	320 x 240	640 x 480	800 x 600	1024 x 768	1280 x 1024	1600 x 1200	1920 x 1080	2048 x 1536

It's all to do with history. The CIF (common intermediate format) standards evolved to deliver scaling compatibility with NTSC and PAL signals. CIF is nominally 288 lines x 352 pixels at 30 frames per second, ie the format is potentially compatible with present and possible future TV display standards. VGA (video graphics array) is the standard that first saw the light of day in 1987 and has been the de-facto way of describing computer monitor resolution but also (as you can see from the above table), HDTV.

Does this duality of standards matter? Well, not really but it would be nice not to have it, particularly when you consider that we also have to take on board the difference in aspect ratio - typically 1:1 for microdisplays, 4:3 for standard TV and 16:9 (wide screen) for digital TV.

It's also inescapable that the more involved we get with M-PEG4 the more we will need to comprehend emerging digital TV content production, content management and content presentation standards.

This process is already producing some potential conflicts. The Hantro encoder used as our earlier example uses the AMR codec, with the option to extend this to the AMR-W codec. M-PEG4 has a completely parallel audio codec standard activity presently focussed on 64 kbps high quality stereo encoding and 5:1 surround sound support!

This gives us a clue to how future 'complex content' will be treated both at the application layer and over the radio physical layer.

One of the purposes of M-PEG4 is to encourage the evolution of optimal coding schemes for each individual component in the multi-media mix - video, text, graphics, audio, voice, image. Note that we are treating audio and voice as separate components. The emphasis in audio coding is on fidelity, stereo and surround sound support. The emphasis on voice coding is (probably) going to be bandwidth efficiency (delivery cost reduction).

Each of these media components can be delivered on individual OVSF uplink and downlink code streams in which the radio bearer properties can be matched to the source coding and channel coding used.

But a word of warning. The M-PEG4 standards have evolved from M-PEG2 and M-PEG3. These existing standards were as much about optimising content for storage (eg DVD) rather than delivery and are arguably really not optimal when used over high error rate channels, particularly high error rate channels with end to end delay and delay variability.

The need to minimise delay and delay variability will tend to favour the increasing use of hardware to do source coding in handsets (in addition to power budget constraints), and the radio layer will need to be made more robust and consistent than it is at present. It's obvious, really, that multi-media is going to need more power and speed and power and speed cost money.

Resources:

Some good information on display standards is available on the VESA site **www.vesa.org** (video electronic standards association).

In addition to Hantro, other useful sites for information on imaging include Kodak (**www.kodak.com**), Transchip (**www.transchip.com**), ATMEL (**www.atmel.com**) and Philips (**www.philips.com**).

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