RTT TECHNOLOGY TOPIC
February 2002

Declarative applications

In our last HOT TOPIC, '3G Software' (January 2002), we discussed how handset software form factor and functionality influenced user behaviour and (by implication) network loading.

We described how multi-tasking provided the basis for managing multiple inputs - voice, image, video and application streaming, how these multiple inputs could be individually modulated on to separate coded channel streams on the (radio) physical layer and then managed through the network to preserve time inter-dependence.

This month's HOT TOPIC discusses how the application layer can perform 'network discovery'. We show how 'network discovery' potentially works better than the more generally assumed practice of 'device discovery' (where the network sets out to discover the target device hardware and software form factor prior to sending a file). We also explore the inter-relationship of 'declarative content' and 'declarative applications'.

Figure 1 shows the various industry groups who have an interest in or who are actively promoting a 'declarative content' standard.

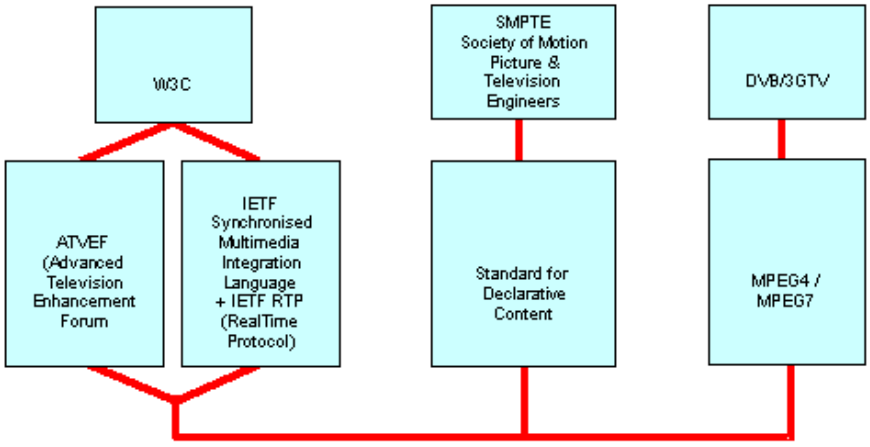

Figure 1 - Declarative Content Interest Groups

The declarative content standard is notionally hosted by the Society of Motion Picture and Television Engineers but with inputs from the Digital Video Broadcasting community, W3C (World Wide Web Consortium) and the Advanced Television Enhancement Forum (ATVEF).

The idea is that the content, i.e. the media, should be able to 'declare' its requirements in terms of delivery bandwidth (bandwidth quantity and quality) and memory bandwidth (buffer size). For instance, a media file (containing a mix of voice,

image, video and application streaming) might require a kilobyte of memory to be made available in the receiver for session 'cookies' (for example a series of software objects needed to support inter-activity) and a megabyte of local memory to support local caching of simultaneous content. If DVB is being used, the media could define the delivery bandwidth needed - either LDTV low definition (video quality), standard definition or enhanced definition and how many (per user) channel streams were needed. Alternatively, the media requirement might be for HDTV (single channel 1080 lines x 1920 pixels) or MMBD (a multi-media broadcast channel stream with a supplementary data stream for simultaneous software downloading). The display format request would / could include resolution, refresh rate, colour depth, screen format (16 x 9, 4 x 3, 1 x 1) or size.

The idea is to make the device (in this example a digital TV) content aware rather than make the content device aware. The objective is to avoid the need for transcoding and/or filtering content to suit (thousands of different) target devices. The assumption also is that devices will have at least some capability to reconfigure hardware and software (for instance allocation of memory and processor partitioning) to adapt to the content being delivered.

M-PEG7 goes some way towards the same idea with a proposal for a Multi-media Content Description Interface Standard in which the media will have physical measures (file size, dynamic range of information content, latency sensitivity) and time information (media time interdependence) embedded in the file.

This in turn is based on M-PEG4 in which the meta description (meta means information about information) of the 'complex content' defines the quality of service requirements - whether the packet stream needs to be isochronous (packets arrive in the same order they are sent), the buffer requirements, how the elementary streams from the encoders are mapped to a complex transport channel (ie multiple per user channel streams) and elementary stream time stamping (for re-clocking of mislaid or misrouted packets).

In essence, this provides all the ingredients needed for 'declarative content' in which the **content** (rather than the user) undertakes a process of network discovery and (assuming multiple choices are available) decide on the network best suited to delivering the file, an option unlikely to appeal to most network operators.

Similar ideas surface in the MEGACO standard (the Media Gateway Control Standard developed by the Internet Engineering Task Force), in which a media gateway identifies the 'properties' of a stream entering or leaving the gateway including transport and termination requirements (buffer size) and 'ephemerals' (short lived attributes that have to be preserved).

Finally, we find the issue of perhaps not content driven but certainly client driven negotiation addressed by the MExE work groups (Mobile Execution Environment work groups reporting as part of the 3GPP development process).

In the MExE standard it is intended to provide for the translation of QOS requirements from a client's application to the bearer network, i.e. to match the application requirement to the four service classes - conversational, streaming, interactive and

background.

In practice, it is likely that the process of matching application requirements to bearer properties will need to be far more pro-active than just an arbitrary division into four service classes and will need to take into account real time changes in the radio environment (which in turn may trigger real time changes in the coding scheme used which in turn will trigger real time changes in data rate which in turn will impact buffer occupancy which in turn will influence packet loss, re-tries, delay and delay variability, which in turn will compromise the time inter-dependence of the media being delivered).

Remember also that the network operator wants to send a bill (preferably a large bill) to an end user for the privilege of collecting and delivering multi-media content and as such will need some form of 'proof of performance' reporting.

This is very hard to achieve in a centralised network. It is easier to achieve at point of delivery, ie in the user's appliance. This is why 'declarative applications' provide a possible way forward. Declarative applications monitor the requirements of the 'declarative content' that make up the application.

The application (not, note, the user) declares it's QoS requirements, works out a least cost routing option, clears that option with the user, sends the file then measures the result and (if satisfied) clears the transaction for billing by the network (an application audit trail).

The application is in control, **not** the network.

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