



QTube Global Media Workflow

QTube is an exciting new development from Quantel that will enable truly global broadcast workflows to be created.

QTube delivers:

- Instant access to
- Live assets with
- Frame accurate editing from
- Anywhere over the
- Internet

QTube products will be delivered in Q2 2011.

Technology and application details are in this whitepaper

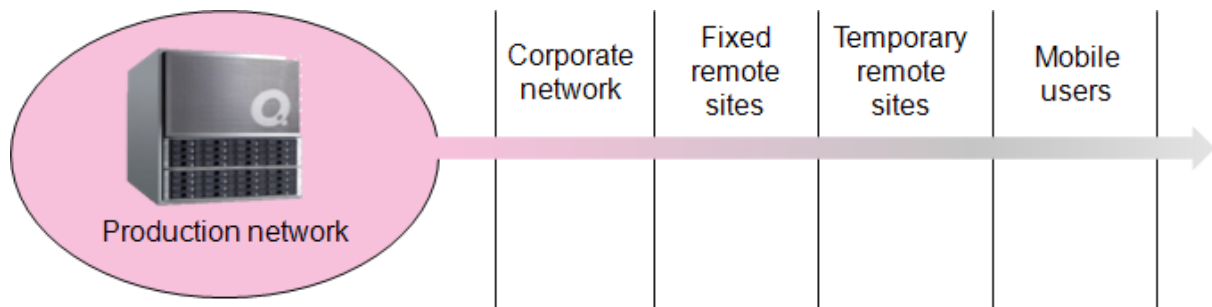
Trevor Francis, Quantel

QTube Global Media Workflow

Introduction

QTube is an exciting new development which adds global workflow to Quantel Enterprise sQ production systems over the internet. QTube enables users anywhere in the world with an internet connection to interact with media in other locations. The workflow remains the same independent of geography. With QTube users can view, log, select and frame accurately edit content anywhere.

Beyond the corporate network



Fixed remote sites, such as regional stations or partner broadcasters in other cities or countries may access content, create edits and initiate transfers between sites.

Temporary remote sites, like outside broadcast units or facilities at major sports, cultural or political events are connected to the home base. Production tasks, such as logging, editing and approval may be shared, with reduced requirement for on-site staffing and better access to home content.

Mobile users include staff who need to work from home and roving ENG units creating finished stories for broadcast that combine locally-acquired and studio-based content.

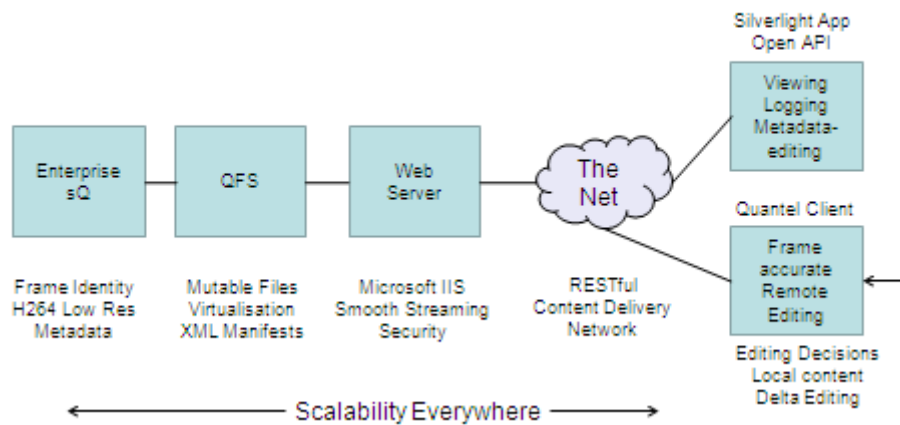
QTube technology

QTube combines off-the-shelf technologies including Microsoft SMB2, Silverlight and IIS Smooth Streaming with Quantel-developed file virtualization and FrameMagic media management. Together they build into a powerful and versatile set of workflow tools which is scalable in many dimensions:

- Number of sites
- Quality of connection
- Production tools

The first QTube products will be designed to work with the Quantel Enterprise sQ system, but the techniques may be applied to any storage and filing system in the future.

QTube technology was first shown at IBC 2010 and you can watch the demo [here](#)>

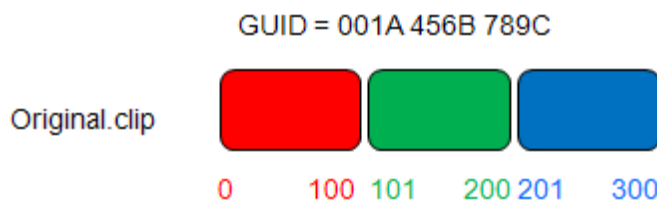


QTube Technology Components

Today QTube operates around an Enterprise sQ system, which comprises one or more sQ servers, managed by an ISA database/management unit. The sQ Server ingests and stores broadcast-quality content alongside an H.264 proxy copy. Quantel’s frame-based Identity model is asserted on this content, (See [Tracking media assets in a shared-storage production system](#)) binding together the two media resolutions and associated metadata. Any clip in the system, whether a live or completed recording, shot selection or complex edit is represented to the outside world via the QVFS or Quantel Virtual Filing System.

The QVFS is central to the operation of the Enterprise sQ architecture. The standard server holds two qualities of media, distributed across many disks, each with its own filing system. The Virtual Filing System is an abstraction layer which presents all the media assets as a list of clips. The user has no regard for their file type or the actual storage location; the system delivers the media in the form required, automatically. For example, users of studio-based desktop editors will be delivered proxy copies; craft editors will see broadcast quality. [An unsatisfactory alternative would be to present two lists of media objects with different file extensions and require the user to select the one appropriate to their task.]


The management of media in sQ server is based on a principle called ‘FrameMagic’, described in detail in the above referenced paper. Acquired media is stored and managed as a (typically large) number of files, each representing a video frame and more files representing audio samples. The Identity model attaches a unique reference to each frame, based on a GUID (Globally Unique Identifier) plus frame offset.



In this example, the logical clip “Original” contains three scenes: red, green and blue. The green scene could be described in the form: 001A456B789C {Start 101; End 200}

Editing may generate new frames, through keying, transitions or color-correction; these are stored as new 'Delta' (difference) frames, with a unique Identity of their own. A real clip may point to many sequences of frames derived from multiple acquired 'clips' as well as sequences of delta frames.

The Quantel VFS generates a 'manifest', in xml form, which is a list of the identities of the frames comprising a logical clip. In the picture below we have generated an edit, based on the 'Original' clip. The manifest shows the references to the original frames.

Editclip	
GUID:	019F 779E 631A (It has a GUID of its own)
Title:	"Edit"
Type:	.clip
Length	200 frames
	Source1 001A 456B 789D {Start 101; End 200}
	Source2 001A 456B 789D {Start 201; End 300}

The manifest performs an essential function in QTube. It allows us to refer to a large media object, the original frames, using only a few lines of xml. We can generate a cuts-only edit by creating a new manifest describing the chosen frames and send this back to the home server. In this simple example, the data travelling the return path is extremely small.

Another problem to be solved is how to deliver the best viewing experience at a remote location. QTube uses the off-the-shelf internet streaming technology Microsoft Smooth Streaming combined with Quantel's unique live 'mutation' of virtualized files. The ability to service requests for a range of files containing different image sizes and compression quality levels, on demand, is at the heart of QTube.

Microsoft Smooth Streaming demands files of varying image qualities according to the instantaneous performance of the internet path. It would be possible to create all of these and store them, but this would be expensive in resources, limited in scalability and could introduce unwanted latency. Quantel's solution is to effectively 'fool' Smooth Streaming that the necessary files of different quality exist by presenting them as virtual files but only actually create them on demand. A request for a file of a given type is automatically translated into a live transcoding (or mutation) of the original data to populate the virtual file.

Building on the foundation of Quantel's Virtual Filing System means that QTube can work on live recordings, not just completed files. A live recording is represented as a complete set of video frames which are initially 'blank' and gradually are replaced with incoming video and audio data. News and Sports applications depend on the ability to access media during acquisition; with QTube this access is unrestricted by location. The sQ workflow has gone global.

QTube user experience

The user is offered two choices of interface, based on their operational requirements.

Passive viewing of content plus creation/editing of metadata is offered via a Silverlight-based viewer. This web client requires no local install of software and works on vanilla PCs. It can also be used to initiate transfers between different QTube enabled locations.



The prototype Quantel Silverlight viewer

A pop-up search tool allows users to interrogate the database of remote servers and select the required content using a filtered search of the standard sQ metadata fields. Users are able to navigate randomly through the clip; the QVFS virtualization reacts immediately to create a view of the chosen frames from the source file at the resolution/quality demanded by Smooth Streaming to match the current performance of the internet connection.

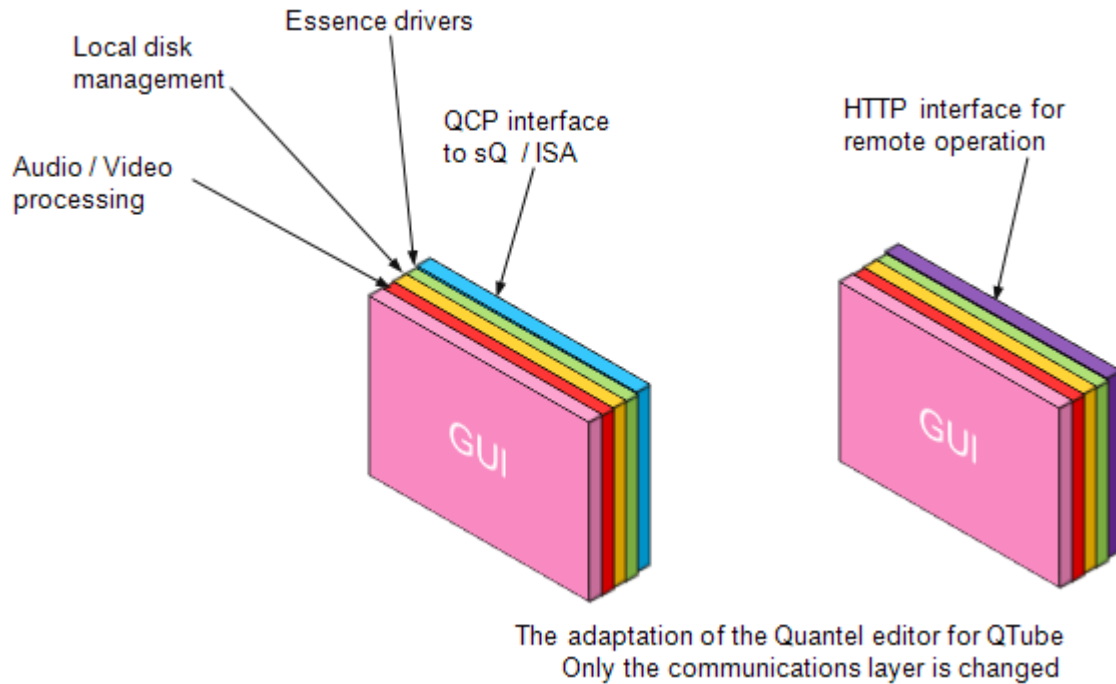
A Quantel client provides frame accurate remote editing.



QTube Remote Editor showing the server bin and clip viewer

The Quantel client uses the standard, scalable Quantel interface and is key to preserving the integrity of the Quantel workflow beyond the confines of the studio. The editor looks and works in the same way at base or on the road.

This has been achieved by re-engineering the server communications back-end to the editor while leaving the user interface and all the other processes totally unchanged.

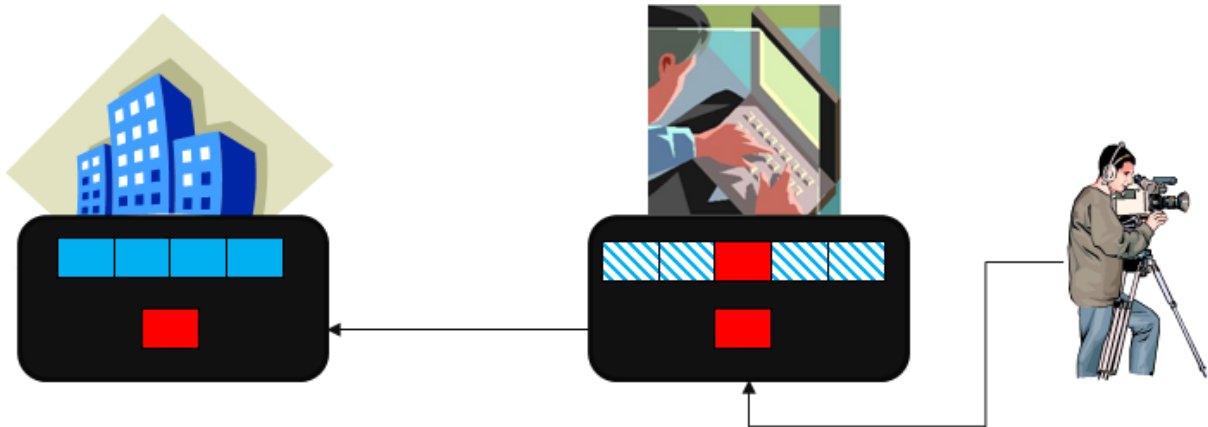


Media caching techniques used in the studio-based editors are retained in the remote version. Once content has been viewed it is stored locally on the client PC.

Later in the development cycle it is expected that the HTTP interface will become standardized for all workstations, whether on the production LAN or elsewhere.

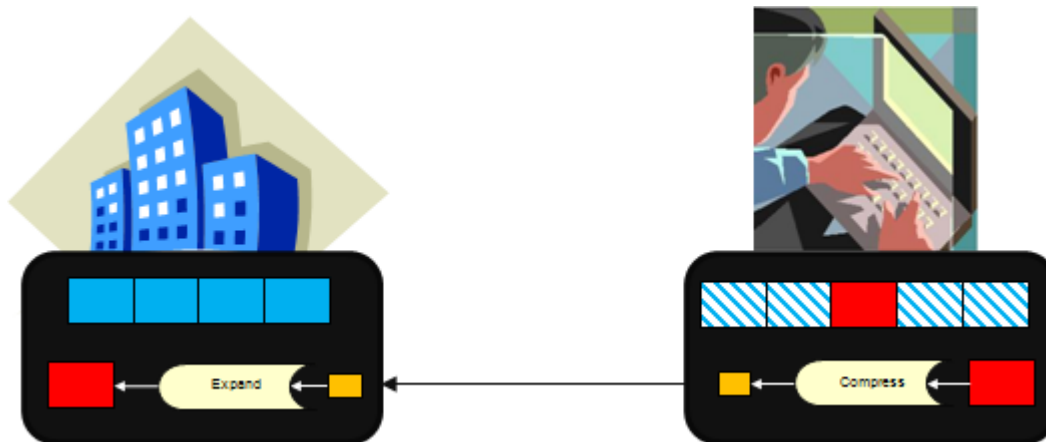
FrameMagic

During the viewing and editing of remote content, no media is moved from the home servers to the remote clients. The picture shows the virtualized blue home clips viewed in the remote editor. Movement of clips between remote clients and studio-based sQ servers obeys Quantel's FrameMagic rules. These state that no individual frames are moved more than once.



In an ENG operation, selected sequences from locally-acquired content (the red frames) may be mixed with server content. On publish, only the red frames are moved, minimising the transfer of what could be 100 Mb/s essence. The published edit AAF file (and the manifest) will point to these selected red frames and the blue frames of the server-based footage.

To speed publish times still further, QTube will offer secondary compression of remote essence before it is sent over the internet. It is transcoded back to a supported server file format at the receiving station.



The user will select the degree of additional compression based on time available, moderated by the organisation's quality standards, of course. As part of the development, Quantel plans to include automatic calculation of extra compression based on the quality of media to be moved, the available network bandwidth and the time allowed. There will be an option, of course, to re-send later with less or no additional compression. Additional compression is never lossless, but the subjective quality is adequate to the needs of breaking news, where a perfect edit delivered late may be worthless.

QTube Media Mover

QTube will enable the automatic transfer of content at one QTube-enabled site to another. An additional metadata field will identify clips that need to be transferred between sites and QTube will

move clips to the correct destination. System configuration will allow human friendly destinations to be translated into the IP addresses needed by QTube. Remote publishes will also support this new metadata field so a remote editor could easily publish back to its home base and flag the clip for transfer to another location.

There are many new workflows, including the accessing of content from unmanned stations out of normal working hours or even when evacuated during a disaster-recovery event.

Anticipated use cases for QTube technology

1. Viewing of server-based content anywhere there is an internet connection
2. Editing clip metadata including logging via the internet
3. Remote frame accurate video/audio editing
4. Picture research
5. Review / quality control
6. Loading of content – example: upload of field-acquired media
7. Remote editing with only occasional server connection
8. Super User / Media Management
9. Inter-site media movements

Product timeline

Quantel plans to start shipping QTube products in Q2 2011. The first products will be:

- Silverlight web browser with viewing of video and audio content plus Quantel 'rush-tag' metadata
- Frame accurate remote editor
 - Viewing
 - Drag/drop and timeline editing
 - Appending and publishing of locally-ingested content
- MediaMover to enable clips published to one location to be automatically transferred to any other

Detailed product specifications and pricing will be available by the end of 2010.