

Qube Cinema's end-to-end solutions for Digital Cinema provide the ultimate combination of quality, reliability, ease-of-use, security and flexibility. Designed from the ground up to operate in mission-critical applications, the architecture of the Qube product family has been conceived with the future in mind and provides an integrated workflow, from mastering to distribution to playback to reporting to archival. Being almost entirely software based allows the Qube system to leverage developments in the computer industry and bring to market format-independent, powerful and flexible products.

Qube Cinema has an entire suite of products required for a practical, commercially viable, end-to-end implementation of Digital Cinema. Qube Cinema is a company that has proven expertise in managing complex technology transformations in traditional workflows; a company with a passion for cinema and a thorough understanding of film, video, audio and computer technology as well as the production, post-production and exhibition industries.

It is this passion and deep understanding of this complex domain that is reflected in every aspect of our path-breaking products.

QubeMaster is a uniquely flexible and powerful Digital Cinema encoding and packaging solution designed to integrate fully into the modern post environment. It is a database-driven software solution for the Microsoft Windows™ platform with an intuitive and familiar user interface that is simple to understand. For power users, the software provides fast keyboard-based control over virtually all operations.

QubeMaster's DCI Object Model

The architecture of QubeMaster closely mirrors the *Digital Cinema Initiatives* (DCI) Object Model with a hierarchy of *Shows*, *Compositions*, *Reels* and *Track Files*. It is this design that makes QubeMaster unarguably the best choice for every digital cinema mastering application. [{QubeMaster's DCI Object Model}](#)

While QubeMaster has been designed from the ground up to conform to the DCI Specification and is the ideal product to go from a *Digital Cinema Distribution Master* (DCDM) to a *Digital Cinema Package* (DCP), it has also been designed to operate in the real world where workflows don't always represent the ideal.

The Virtual DCDM

QubeMaster has powerful pre-processing capabilities that allow it to crop, scale and add borders to the image, and to combine multiple audio files with flexible channel assignments. QubeMaster can perform Log to Linear conversions, handle 1-D and 3-D Lookup Tables as well as convert between XYZ, RGB and YCbCr color spaces with user defined R, G, B and White Point colour coordinates. For more advanced pre-processing, QubeMaster includes *Color Transform Language* (CTL) Script Processing. The software handles all pre-processing calculations with the highest internal precision to preserve every bit of image quality.

Together, these pre-processing capabilities allow QubeMaster to work directly on the Digital Intermediate data where there is insufficient time or budget to create a DCDM – a concept that we refer to as the Virtual DCDM! And since the DCDM is the ideal archival format for a film, QubeMaster can also generate a standards-compliant DCDM even as it encodes, thus saving considerable time and money.

Flexible Source File Formats

The software supports multiple methods of bringing in picture and sound elements including digitizing from tape-based sources, file import and image sequence import. Numerous picture formats are supported including TIFF, DPX, Cineon, TGA and BMP image sequences apart from MXF, Quicktime, QT Reference and AVI based sources. Since QubeMaster works with any existing local or shared storage, its flexible support of

multiple file formats will quickly become a boon in a post facility without the need to copy or convert.

Simple, Intuitive Workflow

QubeMaster provides a very powerful mastering interface which allows picture, sound and subtitle *Track Files* to be added to the database by a simple drag-and-drop operation. These files are then synced accurately using a Sync Point such as the 2-Pop to form *Reels*. Sync Points are marked for each Track File using the *Clip Editor* as are In and Out Points representing the *First Frame of Action* (FFOA) and the *Last Frame of Action* (LFOA) of each Reel.

Subtitles are xml files in the CineCanvas™ format and can be created by the QubeMaster application directly from plain text files in multiple popular formats or the system can directly use xml files created in other applications.

Multiple Reels are ordered and chained together to form a *Composition* along with additional metadata that is entered by the user. The Composition is the basic unit of distribution in the digital cinema world and QubeMaster produces standards compliant *Digital Cinema Packages (DCPs)* and *Key Delivery Messages (KDMs)* for distribution to digital screens.

Encoding, Encryption and MXF Wrapping

In order to retain maximum flexibility, QubeMaster allows MXF wrapping and encryption at the Track File level while one-step encoding, encryption and MXF wrapping is performed at the Composition level. Encoding of Compositions into JPEG2000, MPEG-2 and VC-1 can be performed in software and, where speed is of the essence, optional distributed processing capability is available to achieve performance limited only by source file throughput. QubeMaster fully utilizes every CPU in a multi-core system and processing throughput increases linearly with the number and speed of the processors.

While QubeMaster has the capability to encode into all supported image compression formats, it fully supports MXF wrapping and/or 128-bit AES encryption of already encoded material to the DCI specification. This allows post-houses to take advantage of their custom encoding solutions for JPEG2000 or to continue to utilize their fast and dependable hardware MPEG-2 encoders, whether these output Elementary Streams or MXF files with unencrypted essence.

Control Over Every Asset in the DCP

One of QubeMaster's most powerful features is its versioning capability. Not only can multiple Reels refer to the same Track File and multiple compositions refer to the same Reel, but making copies of Reels and Compositions is also quick and easy. The software

also has very powerful Packaging features including the ability to merge multiple items into a single DCP and to include or exclude every element of one or more Compositions in a DCP. [{The Packager's Asset Map}](#)

The Clip Editor

Another powerful tool in the application is the Clip Editor. This is used throughout the QubeMaster application to mark Sync Points and In & Out Points, and to check Reels and Compositions for Sync and Transitions. The Clip Editor uses familiar icons and keyboard commands that will make the user instantly comfortable with the system. [{The Clip Editor}](#)

Powerful Localization Capability

QubeMaster also allows for Compositions to be edited for censorship or localization requirements of different territories. Existing Compositions may be loaded into the system along with a valid KDM using the *Qube Ingestion Controller* and then modified with total control of all parameters.

A Version for Every Need

The QubeMaster software is available in three versions to optimally cater to various applications. *QubeMaster PE* allows MXF Wrapping and Encryption of already encoded material and editing of existing packages for localization purposes but has no encoding capability. *QubeMaster SE* has all the functions of QubeMaster PE with the addition of software-based encoding of JPEG2000, MPEG-2 and VC-1 formats. *QubeMaster XE* has all the features of QubeMaster SE with the addition of support for distributed encoding.

Whatever your digital cinema mastering application, QubeMaster is one system that has the power and flexibility to support it!

Qube XP – Servers

The **Qube XP Digital Cinema Server** is the core component of the Qube system that plays picture and sound, and provides theatre-automation support. Redundant power supplies and RAID 1,0 hard drives bring a high level of reliability to the system, while a detachable Qube Remote Panel provides familiar operational controls such as Play, Pause and Stop along with an LCD Display and Menu Keys. Unlike more complex interfaces such as touch-screens or the mouse and keyboard, the Qube Remote Panel is a simple, familiar hardware interface that makes projectionists feel instantly comfortable with the system.

The second generation Qube software is also database driven and has a flexible core media architecture that can work with multiple copies of picture, sound, subtitling and metadata files stored on local and shared central storage systems. Qube Cinema is based on the modular Microsoft Windows XP™ Embedded Operating System to maximize reliability and security while deriving benefit from Microsoft's powerful DirectShow™ architecture.

Qube XP-D is aimed at the D-cinema market and has CineLink™ 2 equipped dual-link HD-SDI outputs and AES3 audio outputs apart from providing analog audio outputs and optional automation support through GPI inputs and outputs.

The Qube XP-D server is standards-based and designed for interoperability. It has been certified to conform to the MXF Interop Specification and utilizes DCI specified MXF containers with 128-bit AES encryption for media and xml for compositions and shows. 2048-bit RSA encryption is utilized for keys. Watermarking support is optionally available using both Thomson and Phillips technologies.

The base system handles DCI JPEG2000, high bit-rate MPEG-2 and Windows Media 9 picture while also being expandable with additional software codecs. Audio is uncompressed 16-bit or 24-bit at 48 KHz and 96 KHz.

Qube XP-E is aimed at the E-cinema and Pre-show market with a HDCP enabled HDMI picture output and analog audio outputs.

The Qube XP-E server is also standards-based and designed for interoperability. The system utilizes DCI specified MXF containers with 128-bit AES encryption for media and xml for compositions and shows. RSA encryption is utilized for keys.

The base system handles high bit-rate MPEG-2 pictures, supports Windows Media 9 and is expandable with additional software codecs. Audio is uncompressed 16-bit or 24-bit at 48 KHz and 96 KHz.

The **QubeMini** Digital Cinema Server is a powerful solution for high definition cinema in alternative venues and for pre-show applications in a quiet, reliable package.

QubeMini has a HDCP equipped HDMI picture output, stereo analog and S/PDIF digital audio outputs as well as an optional 5.1 Surround Sound interface. Like the rest of the Qube family, the system is standards-based and designed for interoperability. It utilizes DCI specified MXF containers with 128-bit AES encryption for media and xml for compositions and shows. 2048-bit RSA encryption is utilized for keys.

The base system handles high bit-rate MPEG-2, supports Windows Media 9 pictures and is expandable with additional software codecs. Audio can be uncompressed 16-bit at 48 KHz or Windows Media 9.

All Qube XP servers support subtitling in the TI CineCanvas™ file format. Subtitles can be internally rendered or, in the case of the Qube XP-D, can be sent along with timing information to a DLP Cinema™ projector over Ethernet.

Media transport is possible using portable USB-2 or 1394a/b hard drives over Gigabit Ethernet using http, ftp and CIFS (SMB) protocols. Optionally, satellite or network multicast transmissions can be used via the QubeCast system.

Qube XP Servers can manage media automatically by deleting older, unused media when additional space is required to ingest new media. This makes the system entirely automatic in operation for the projectionist and theatre manager and simplifies their lives considerably while reducing the possibility of human-error.

Qube XP systems can be managed and operated locally or remotely via a powerful web-based UI. The interface shows status and, with the proper login credentials, allows status viewing, transport control, show building, scheduling, content ingestion(?), key management as well as setup and maintenance. System logs can also be viewed over the web interface and can be downloaded as digitally signed xml files for verification of authenticity.