End-to-end video infrastructure solutions
Any content on any screen, anytime, anywhere. It’s one of the key challenges that broadcasters, networks and other video content providers face as audiences expand their viewing across TVs, PCs and mobile phones. Not only are consumers viewing video on more devices, they are creating more content themselves and distributing that content to the global masses.

Hence the importance of taking an end-to-end view of video from creation to delivery and consumption. Texas Instruments takes that view by providing a suite of video solutions that span virtually every application and device, from studios and live trucks out to headends, then to set-top boxes and mobile phones.

The foundation of TI’s video solutions is digital signal processing (DSP), which is ideal not only for today’s video applications but tomorrow’s, too. That’s because unlike rigid application-specific integrated circuits (ASICs), DSPs are flexible enough to be upgraded in the field to support new technologies and compression standards, such as the latest codecs. That flexibility is particularly important for equipment vendors and their customers at times when standards are still in flux, yet market conditions propel them toward the latest technology available.

This brochure provides an overview of the challenges that broadcasters and other video content providers face in five major areas: creation, management, commerce, distribution and delivery, and consumption. Each section also includes TI’s solutions for these areas.
The TMS320DM648 DSP is designed for the most demanding digital media applications, with performance as high as 7,200 million instructions per second (MIPS) at a clock rate of 900 MHz. The DM648 device has five configurable 16-bit video port peripherals, providing a glueless interface to common video decoder and encoder devices. The video port peripherals also support multiple resolutions and video standards. In addition, the video port peripherals are configurable and can support either video capture and/or video display modes.

The TMS320DM6467 DSP-based system-on-chip (SoC) supports a variety of HD video processing and multichannel applications, such as video transcoding. It includes a 600-/675-MHz TMS320C64x+™ DSP core paired with an HD video coprocessor, conversion engine and targeted video port interfaces – a package that delivers 10 times the performance of previous generation processors while adding high-definition processing.

The DM6467 handles tasks such as simultaneous, multiformat HD encode, decode and transcoding up to MPEG-2 HP and H.264 HP@L4. That flexibility allows broadcasters, networks and other content providers to deliver video on myriad devices, from TVs to PCs to mobile phones, in formats that best match each device’s capabilities.

The DM6467’s flexibility also helps content providers monetize these various applications by transcoding their assets for the online and mobile worlds. All of this is key for providing both a superior development platform and targeting the widest possible audience.
The TMS320C6455 DSP has proven itself in demanding applications, including video and telecom infrastructures. Using 90-nm process technology, the C6455 supports as many as 9,600 MIPS at a 1.2-GHz clock rate. The C6455 also features Serial RapidIO™ for high-speed, low latency interprocessor communications, critical in real-time systems such as video processing equipment.

The TMS320TCI6486 DSP is a multicore device with large, on-chip shared memory, a DDR interface and Serial RapidIO for inter-DSP communications. Gigabit Ethernet is embedded for native connectivity to IP-based systems. The TCI6486 is ideal for high-density transcoding in mobile video distribution systems.
Encoder

**Encoder Diagram**

- **Audio in** to **Audio ADC**
- **Audio line out** to **Audio amp**
- **Audio transmitter** to **Sample rate converter**
- **Sample rate converter** to **Audio receiver**
- **Audio receiver** to **Sample rate converter**
- **Sample rate converter** to **Audio transmitter**
- **Audio in** to **Audio line out**
- **Digital HD video in** to **Video filter**
- **Video filter** to **This cell 2x**
- **This cell 2x** to **Digital HD video in**
- **ESD protection** to **Video receiver**
- **Video receiver** to **Video MUX**
- **Video MUX** to **Video DAC**
- **Video DAC** to **Audio amp**
- **Audio amp** to **Audio out**

**Power management**

- **AC adapter**
- **AC line**
- **Digital system power**
- **Audio system power**
- **Supply voltage supervisor**

**LEGEND**

- **Processor**
- **Power**
- **Interface**
- **ADC/DAC**
- **Amplifier**
- **Other**

**GbE hub**

- **4:2:2/4:4:4 video content processing**
- **DDR2 power**
- **Clock**
- **DDR2 power**
- **PCI**
- **Video port**
- **PCI**

**ROM Codecs:** AMR, EFR, FR, G.729AB, G.726, WB-AMR
**Decoder**

Additional interface DM6467 allows modular design to support H.264, H.264 HD transcoding.

Audio codec

Audio transmitter

Sample rate converter

Audio amp

Audio ADC

Video filter

HDMI receiver

Video MUX

Video DAC

LAN port

HD video display

Digital HD video in

ESD protection

AES3 out

Audio in

Analog video in (1080i)

Gigabit ethernet PHY

HDMI Transmitter

Video filter

Video ADC

HD video display

Digital HD video in

LAN port

Plug

AC adapter

AC line

Power management

Digital system power

Analog system power

Supply voltage supervisor

General purpose logic

Sensing and monitoring

RTC

LEGEND

Processor

Power

Interface

ADC/DAC

Amplifier

Other

Logic

**Transcoder**

Additional interface DM6467 allows modular design to support H.264, H.264 HD transcoding.

Audio codec

Audio transmitter

Sample rate converter

Audio amp

Audio ADC

Video filter

HDMI receiver

Video MUX

Video DAC

LAN port

Gigabit ethernet PHY

Plug

AC adapter

AC line

Power management

Digital system power

Analog system power

Supply voltage supervisor

General purpose logic

Sensing and monitoring

RTC

LEGEND

Processor

Power

Interface

ADC/DAC

Amplifier

Other

Logic
Applications: A high-quality video experience begins with high-quality production, whether the source is sports, news, weather and traffic services, subtitles, closed captioning, or stock footage. This type of content requires compression, stabilization and image-quality enhancements.

Concerns and challenges: Broadcasters and other content producers need flexibility to leverage technological advances – such as new compression schemes – without replacing equipment. Because of their inherent flexibility and field upgradeability, DSPs are ideal for applications where existing codecs are upgraded, or when new ones emerge to accommodate the latest applications. As a result, DSP-based designs extend the life of video infrastructure equipment.

TI solutions:
- TMS320DM648 DSP
- TMS320TCI6486 DSP

Applications: Once content is created, it must be managed, including format conversion, mastering and duplication, and video processing. Video content servers, media gateways and radio network controllers are on the front line of this critical function.

Concerns and challenges: The more video that stations and networks add to their archives, the more challenging it becomes to index that content and quickly find relevant clips – particularly in fast-paced situations such as breaking news coverage.

Although having good content is key, having a flexible content management platform is critical to efficient operations. The explosion in user-generated content and increased channels pose a daunting challenge for content asset management. Efficiently handing video content, as well as adding metadata, allows subscribers to select their preferred content to watch on their preferred device. Evolving compression and metadata management standards require a flexible DSP solution to meet ever-changing requirements.

TI solutions:
- TMS320DM648 DSP
- TMS320TCI6486 DSP

Applications: This emerging area includes new applications such as content aggregation, inclusion of stock footage, logo insertion, imported user-generated content, purchase-enabled interactive TV and informational scrolls.

Concerns and challenges: Broadcasting is no longer a one-way medium. Today’s audiences increasingly expect to interact not only with content providers but with their fellow viewers as well. For broadcasters, this means adding capabilities such as viewer-generated tickers, which display comments submitted via e-mail, instant message (IM) or short message service (SMS).

Advertisers, meanwhile, want new options for placing their messages on the valuable screen real estate. Broadcasters adding such capabilities will create new revenue opportunities. A solution based on DSPs allows the needed flexibility to include next-generation content commerce methods.

TI solutions:
- TMS320DM6467 SoC
- TMS320DM648 DSP
- TMS320TCI6486 DSP
Applications: Once content is captured, groomed and ad-infused, the task of distribution begins. Distribution is available through sources including broadband, IP-based systems, satellite, wireless and fiber.

Concerns and challenges: Audiences want to watch content on their terms: on-demand and on devices such as high- or standard-definition TVs, PCs, mobile phones or handheld devices. Broadcasters and other content providers must address these preferences within the network through equipment that includes cable headends or edge-located base stations, remote radio headends, and video servers.

As broadcast providers deliver more programming in MPEG-4/H.264 AVC, network equipment must add transcoding capability to convert content to MPEG-2, especially if providers do not plan on migrating their installed base of MPEG-2 set-top boxes to hybrid units in the near future.

Considering that more than 50 million MPEG-2 set-top boxes are deployed with an average lifecycle of more than five years, the challenge of balancing the two technologies will continue for at least the rest of this decade. Transcoding solutions based on DSPs provide the flexibility to handle many standards and resolutions. More importantly, manufactures can offer solutions while standards are in flux, and as new formats and devices enter the market at a rapid pace.

TI solutions:
• TMS320DM648 DSP
• TMS320DM6467 SoC
• TMS320TCI6486 DSP

Applications: Consumers want to experience video content in living rooms, work environments and on the move – regardless of the transmission medium – on devices such as TVs, PCs, smartphones and handheld devices.

Concerns and challenges: The wide variety of video consumption devices is both a challenge and an opportunity. On one hand, broadcasters and other content providers have more ways to reach more audiences. On the other, those devices each have different capabilities in terms of screen size, resolution and codecs.

As networks deliver contents in MPEG-2 and H.264 formats, solutions based on DSPs allow manufacturers to offer solutions that are flexible and able to respond to the needs of emerging devices.

TI solutions:
• TMS320DM6467 SoC

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