

Enriching the

Digital Experience

Radical advancements in digital video & audio technologies have created new opportunities in many industries. Today, convergence is reality, offering consumers several options to access information and entertainment, and driving demands for a superior digital experience.

The engineering challenges facing your organization involve:

- Developing efficient, fast and high quality codecs
- Integration with technologies and products from diverse vendors for varied experience
- Testing for compliance and inter-operability
- Optimization for compact final configurations, and
- Enhancing the streaming process

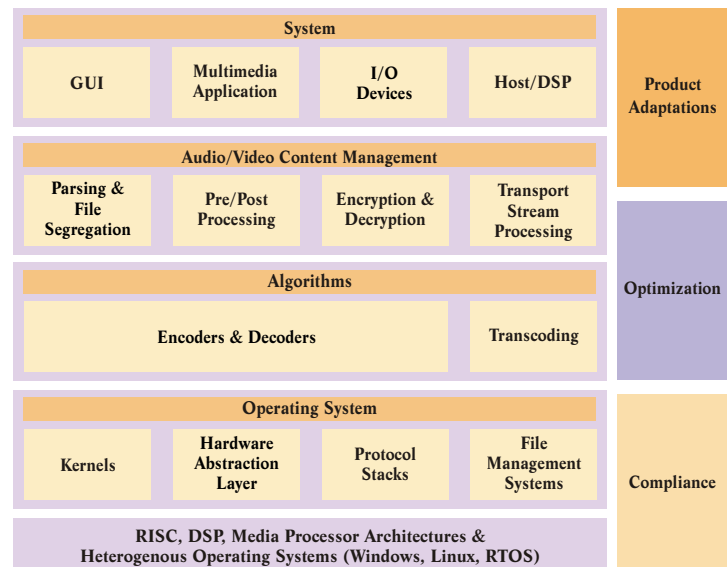
With our strong expertise in digital multimedia, Celstream offers an entire range of services for building products that create an enriched digital experience. Our engineers have developed and optimized video, audio and speech encoders & decoders that have been applied in products addressing the entertainment, consumer electronics and corporate markets such as: audio players, video players, set-top boxes, CD/DVD systems, video surveillance, streaming, professional video cameras and online education.

Areas of Expertise

Encoders & Decoders

Our engineers are expert in the development & optimization of codecs, which meet your requirements for delivering high-quality experience efficiently. Celstream's technology expertise encompasses:

- Video: H.264, MPEG-2, JPEG, JPEG 2000, MPEG4-2, DV 25/50/100, WMV9/VC1, VP7, Real Video, Baseline, Main and High profile, Standard and High definition formats
- Audio: MPEG2-AAC LC, MPEG4-AAC LC, HE-AAC v1 (HQ, LP) & HE-AAC v2 (PS), Dolby® AC3 decoder, SBC, WMA9, iLBC speech encoder & decoder
- Platforms: ARM®, TI, ADI, Intel®, CEVA, proprietary, multi-core x 86-64
- Environments: RISC, DSP, Media Processor architectures & heterogenous Operating Systems (Windows®, Linux®, RTOS)



Streaming

Celstream can deliver modular, high-performance streaming media solutions that integrate video, voice and data and allow your end-users to experience an event seamlessly. Areas where we have strong competencies include:

- Streaming Protocols: MPEG2-TS, RTP, RTCP, 3GP, MPEG4 ES-RFCs 3984, 3640, 3016 etc.
- Celstream has developed a configurable framework that receives the RTP packets from the server through unicast or multicast, does a RTP depacketization and parses the codec specific payload that goes as input to a DRM system, the output of which is repacketized and sent to the receiver. The framework fits is any DRM technology for real-time streaming applications. This had been well tested for H264, MPEG4 and AAC RTP streams with as far as 15-20 channels in parallel without any packet loss. This whole framework can be controlled by a remote UI. The framework is designed in such a way that a DRM is plug and play component.

Software Systems Integration

We possess the requisite software & systems expertise to integrate video, audio and data to an application or a product resulting in rich end-user experience. Celstream's experience covers:

- Heterogenous OS and Programming environment
- Embedded software and Web services integration

Validation and Compliance

We have the capability for validating your multimedia systems for robustness and flexibility, and at the same time ensuring their compliance to industry standards. In addition, Celstream has a library of custom and industry standard test streams that will ensure high efficiency and effectiveness of your systems. Some of the Test suites developed by our engineers include:

- MPEG4-AAC, HE-AAC v1 (HQ, LP), HE-AAC v2 (PS), AC3 & MPEG4-2 for validating MPEG4-2 decoder

Portfolio of Services

Celstream provides a range of services in digital multimedia technology, spanning audio/video compression and decompression, image processing, system integration and testing. Our comprehensive product engineering services and support include:

- System definition & design
- Reference code evaluation
- Format conversion
- Optimization
- Porting to different hardware platforms
- Integration with various software modules



For further information, please contact Celstream:

USA
Ph: +1 (503) 293 3598
+1 877 ASK CELSTREAM (275-2357)
Fax: +1 (503) 293 3578
Email: sales.usa@celstream.com

INDIA
Ph: +91 (80) 4119 1919
Fax: +91 (80) 4119 1900
Email: sales.india@celstream.com

Encoder, Decoder

- **Implementation:**
 - H.264 on ARM® platform
 - MPEG4-2 on proprietary platform & validation
 - DV 25/50 encoder+decoder on proprietary platform & validation
 - HE-AAC v1(HQ, LP) & HE-AAC v2 (PS) dual decoding implementation, error handling & fixed point implementation
 - i-LBC Speech Decoder: fixed point implementation
- **Porting:**
 - WMA, AAC, AC3 on ARM® platform
 - Embedded Linux® on ARM® platform
 - SBC
- **Optimization:**
 - AC3, HE-AAC v1(HQ, LP) & HE-AAC v2 (PS) on ARM® platform
 - WMA & WMV modules on proprietary platform
 - Real Video codec optimization on CEVA architecture

Streaming

- MPEG2 on proprietary hardware
 - MPEG4 ES - RFCs 3984, 3640, 3016 etc.

System Integration

- 3GP, H.264 & AAC for a single mobile application
 - Integration of DRM solution with VLC player on Mac & Linux

System Validation

- Validation of entire Audio Processing System for CD Player
- Maintenance of complete control & data path
- Validation of CD Standards (CDDA, CDROM)

Application Development

- Disassembler on Linux®
- Debugger on Linux®

Test Stream

- Erroneous bit-streams for HE-AAC v1(HQ, LP) & HE-AAC v2 (PS), AC3
- MPEG4-2 streams for validating MPEG4-2 decoder

In addition, we offer full-lifecycle services encompassing:

- Codebase evaluation
- Implementation
- Integration
- Test plan and test bench preparation
- Test stream generation
- Compliance & certifications
- Verification & validation

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EUROPE
Ph: +49-89-5908-2109
Fax: +49-89-5908-1200
Email: sales.europe@celstream.com

AUSTRALIA
Ph: +61 (0) 2 9416 0475
Fax: +61 (0) 2 9416 2583
Email: sales.australia@celstream.com