

# MainConcept

*A DivX Company*

NVIDIA WEBINAR

Introduction to MainConcept's  
CUDA H.264/AVC Encoder



**2010, JUNE 29**

**9:00 AM - 10:30 AM PDT**

6:00 PM - 7:30 PM CEST

## CUDA H.264/AVC

### Encoding Solutions

2010

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## AGENDA

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1. MainConcept Overview
2. CUDA AVC Description
3. Reference Platform Description
4. Demonstration CUDA H.264/AVC Encoder
5. Answering of the questions

# Key Data / History

Headquarters: **Germany**, Aachen

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Locations: **Russia**, Tomsk (R&D, Engineering Support, Product Management)  
**Croatia**, Zagreb (R&D)  
**USA**, Pleasanton (CA) (US Sales, Engineering Support)  
**Japan**, Osaka (Sales, R&D, Engineering Support)

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Founded / Acquired: 1993 / 2007

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Employees: 100 +

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Market Focus:

- Broadcast , Film, Production
- HD Encoding and Editing
- Streaming Technologies

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Business Fields:

- Commercial Licensing
- Software Development Kits
- Plug-Ins and Applications

# Key Markets and Customers

Broadcast & Professional

**Panasonic**



**SONY**



**SONIC™**

IPTV & Streaming

**NETFLIX**



**kULAbYTE**



Multimedia



**DIVX**

**COREL**

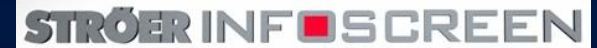


**PEGASYS**

Digital Signage



**SONY**



Security & Surveillance



**sensing**



Medical



**HITACHI**  
Inspire the Next



GE Healthcare  
Deutschland, Österreich & Schweiz

## Audio & Video

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Encoding      Decoding      Streaming  
Transcoding (Conversion)



**SDKs**  
(Software Development Kits  
for Programmers)

Content Creation Industry,  
Developers, Industrial,  
Vertical Markets

**Plug-Ins &  
Applications**

Producers, Film & Video,  
Content Creation

# MainConcept Technology Structure

## MainConcept Core Technology

- World's largest codec library
- Multi platform (Win, Mac, Linux, etc.)
- Toolbox

## MainConcept Core Technology



## Apps / Plug-Ins

- To fill technology gaps in video/audio products
- Ready-to-use Reference platform
- Plug-Ins for 3<sup>rd</sup> party products (Adobe, Sony, Final Cut, etc.)

## Transcoding Engine

- Easy to implement
- Short time to market
- Flexible solution

# Product Overview



## Solutions

Powerful Transcoding Platform

- [Reference Transcoding Platform](#)

## SDKs

Developer Tools

- [Codec SDK](#)
- [Reference SDK](#)
- [CUDA H.264/AVC Encoder](#)
- [MVC/ Blu-ray 3D SDK](#)
- [SVC SDK](#)
- [Flash SDK](#)
- [Dolby Digital SDKs](#)

## Apps & Plug-Ins

Professional & Consumer Products

- [Plug-In for Adobe Premiere Pro - CUDA H.264/AVC Encoder](#)
- [Plug-In for MainConcept Reference - CUDA H.264/AVC Encoder](#)
- [Plug-In for Final Cut](#)
- [Plug-Ins for Sony Clip Browser](#)
- [Decoder Packs](#)
- [Transport Stream Analyzer](#)
- [BD-Live Transcoder](#)
- [DivX Plus HD Transcoder](#)
- [AAC Encoder Plug-In](#)





## CUDA H.264/AVC ENCODER

MainConcept GPU ACCELERATION

# Why CUDA?

## Why CUDA?

Compute Unified Device Architecture

- NVIDIA is our strong partner
- Millions of cards sold worldwide
- Market ranges from the Consumer to the Professional solutions

## Challenges:

- Split the encoding on hundreds of cores
- Quality loss

## Advantages:

- Amazing performance compare to CPU
- free CPU resources for additional tasks
- unlimited opportunities for different approaches



## CUDA H.264/AVC ENCODER USE CASES



- Live H.264 Streaming
- Offline Transcode
- Realtime Transcode and Encode
- Exporting Tool (Adobe Premiere Pro)

# MainConcept CUDA SDK - Overview

## MainConcept™ CUDA H.264/AVC Encoder

*Transcoding & encoding into H.264/AVC using CUDA GPU Acceleration based on NVidia's graphics boards.*

- Possible input video formats:
  - RAW/Uncompressed RGB, YV12, YUV2
  - MPEG-2, H.264/AVC, VC-1 (CUDA architecture 1.1 and above)
- Baseline, Main and High Profile support (High Profile with limitations)
- I, P and B frames support
- CABAC/CAVLC entropy
- Deblocking filter
- Sub-pel motion estimation
- Intra-blocks in P-frames
- ABR rate control (Average bit rate)
- 4x4 intra partitioning



# MainConcept CUDA SDK - Technical Details

- Windows, XP, Vista, Windows 7 (32-bit/64-bit).
  - Linux expected Q3.
  - Mac expected Q3.
- NVIDIA video card with CUDA support.
  - CUDA architecture 1.0 required
  - Revision 1.1 is recommended to support GPU based transcode.
  - Fermi boards with CUDA architecture 2.0 supported.
- Driver version 191.07 or higher.
- Plain C API for LowLevel Encoder DLL.
- C++ API for DirectShow Encoder Filter.
- Similar API to all other MainConcept Encoders.
- Sample Source Code included.
- Encoder runs on single GPU.
- Multiple Boards can be used with separate Encoder Instances in parallel.



# CUDA Sample Source Code

```
v_cuda_settings.device_idx = 0;
v_cuda_settings.input_format = -1; // raw video

// retrieve encoders default parameters for specific video type
h264CudaOutVideoDefaults(&v_cuda_settings, H264_GPU_1080P, 0);

v_cuda_settings.base.frame_rate = frame_rate > 0.0 ? frame_rate : v_cuda_settings.base.frame_rate;
v_cuda_settings.base.bit_rate = bit_rate >= 0 ? bit_rate * 1000 : v_cuda_settings.base.bit_rate;

// check settings for correctness
if (h264CudaOutVideoChkSettings(get_rc, &v_cuda_settings, NULL, NULL))
{
    printf("\nInvalid settings, h264OutVideoChkSettings failed. Terminating...\n");
    return 0;
}

// create the encoder instance
v_encoder = h264CudaOutVideoNew(get_rc, &v_cuda_settings, 0, 0xFFFFFFFF, 0, 0);

if(!v_encoder)
{
    printf("h264OutVideoNew failed\n");
    return 0;
}

// initialize the encoder for encoding
if(h264CudaOutVideoInit(v_encoder, videobs, init_options, &opt_list[0]))
{
    printf("h264OutVideoInit fails.\n");
    return 0;
}

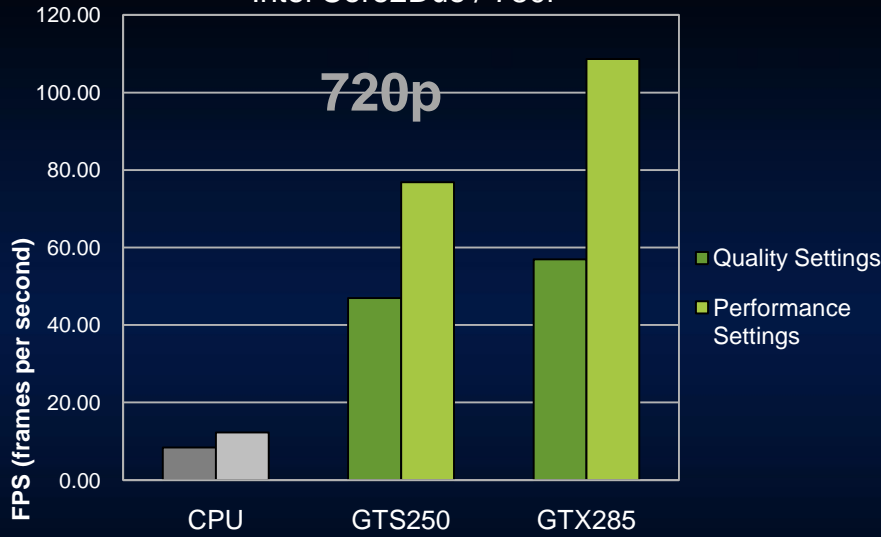
// loop over input data and pass video to the encoder function
while (1)
{
    if (h264CudaOutVideoPutFrame(v_encoder,
                                input_video_buffer + img_start,
                                line_size,
                                width,
                                height,
                                fourcc,
                                option_flags,
                                ext_info))
    {
        break;
    }
}
```



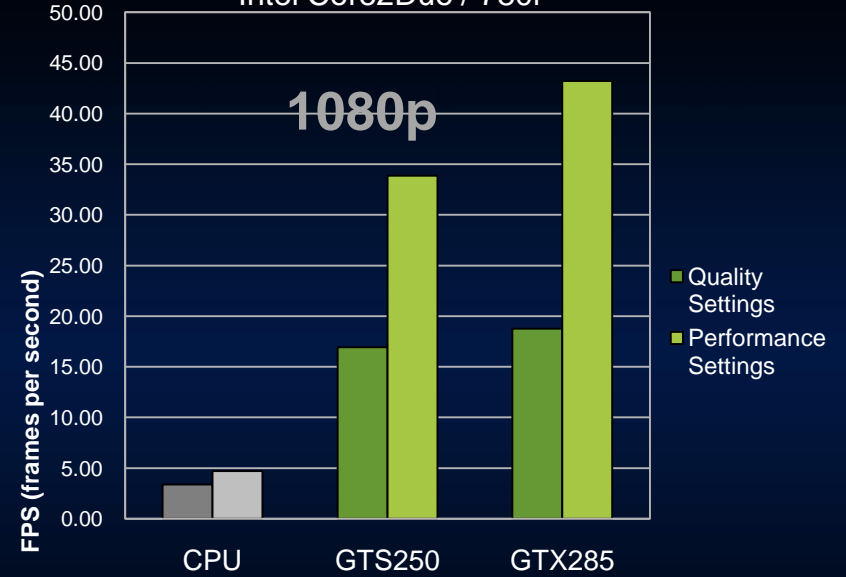
## NVIDIA SPEED RESULTS

# Comparison Performance Chart (E8400 / 780i)

## MPEG-2 to H.264 Transcode Intel Core2Duo / 780i



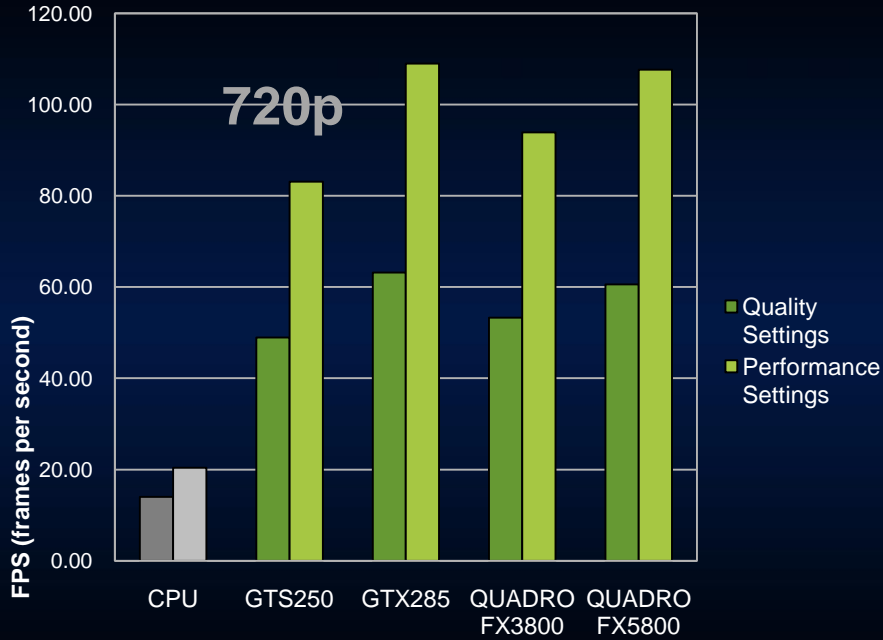
## MPEG-2 to H.264 Transcode Intel Core2Duo / 780i



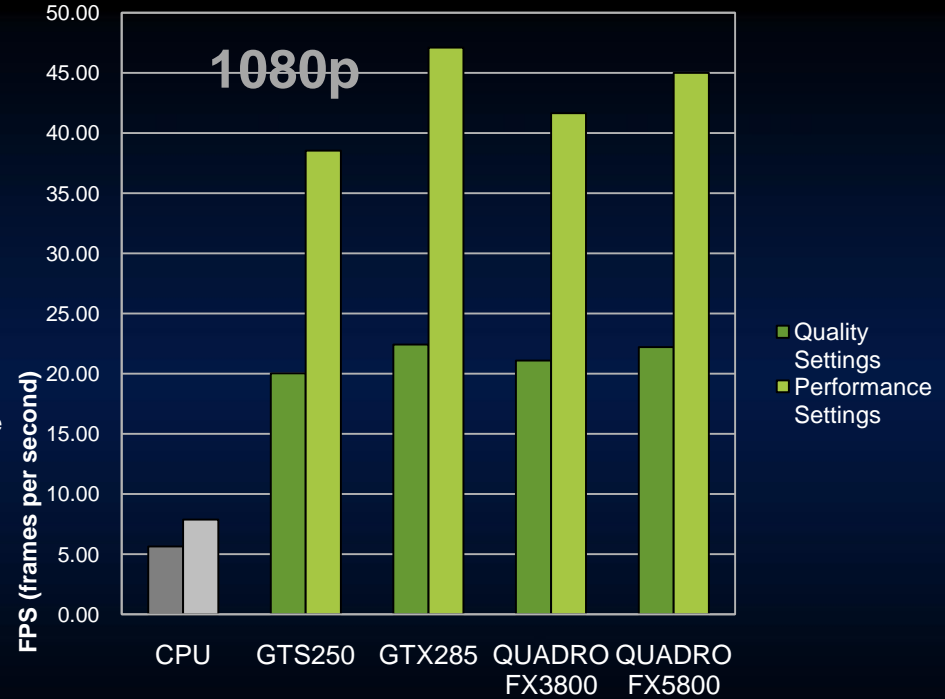


# Comparison Performance Chart (Core i5 670 / P7H57D-V EVO)

## MPEG-2 to H.264 Transcode Core i5 670 / P7H57D-V EVO

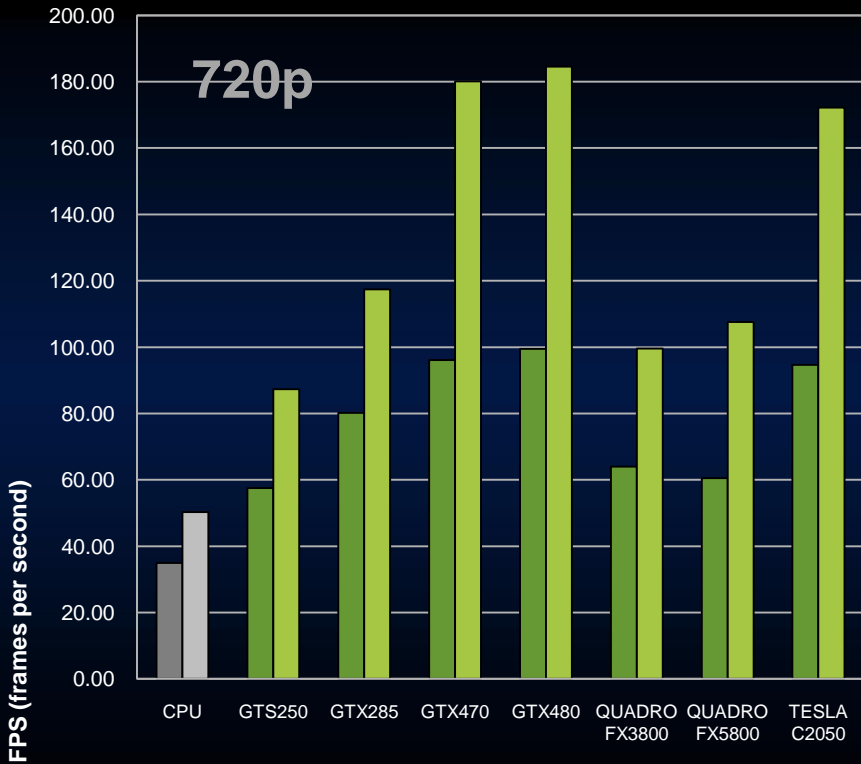


## MPEG-2 to H.264 Transcode Core i5 670 / P7H57D-V EVO



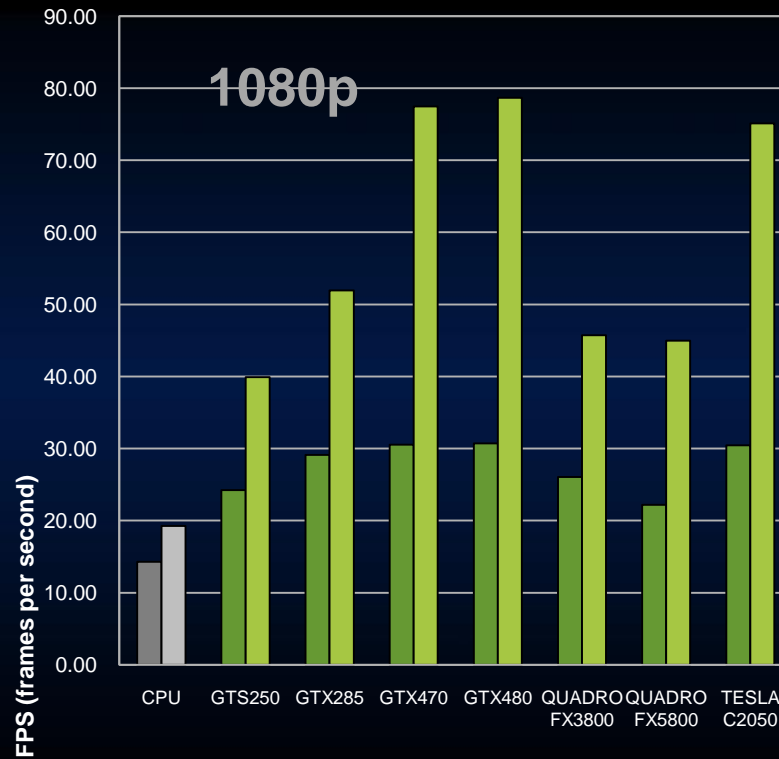
# Comparison Performance Chart (Core X980 / RAMPAGE II Extreme)

## MPEG-2 to H.264 Transcode Core i7 X980 / RAMPAGE II Extreme



■ Quality Settings  
■ Performance Settings

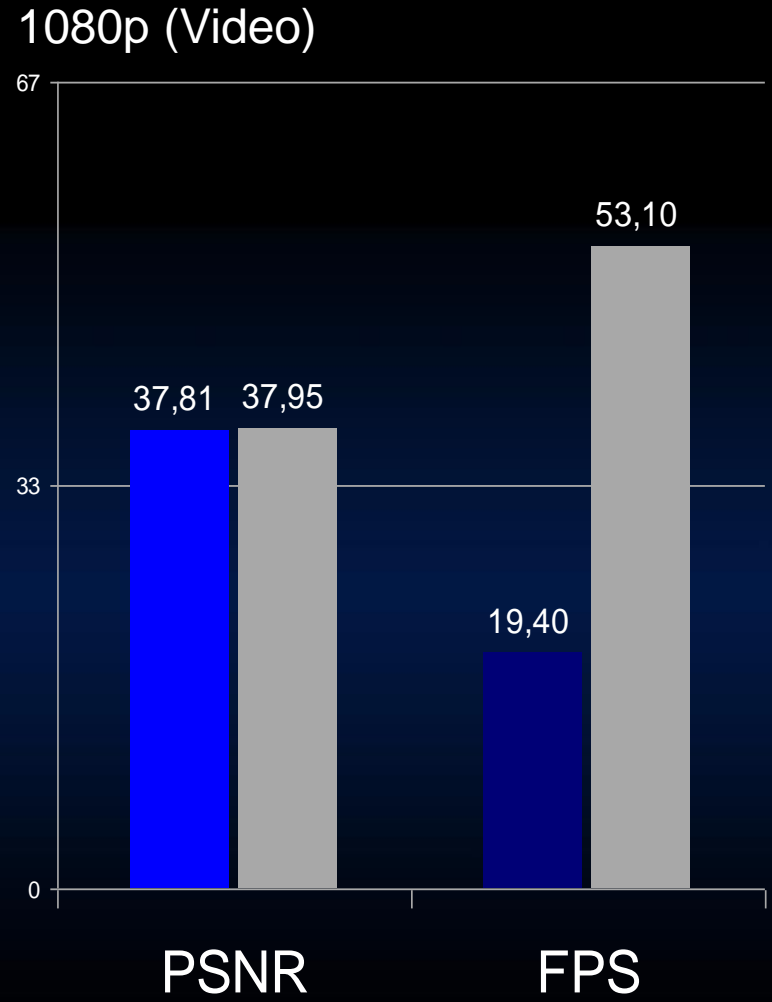
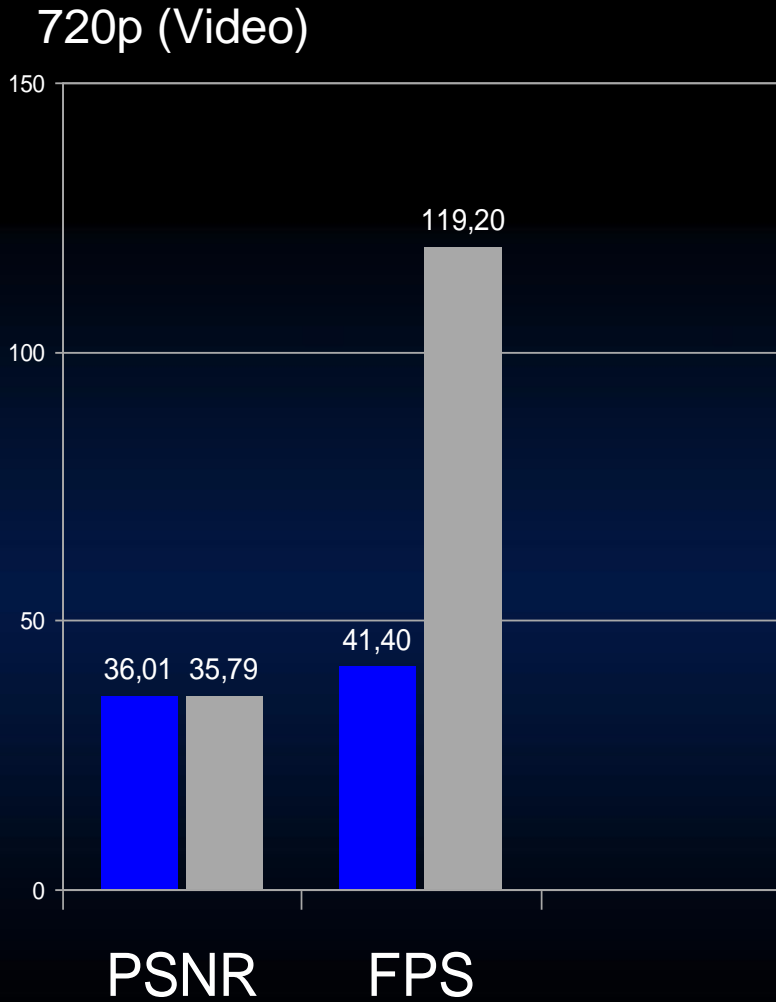
## MPEG-2 to H.264 Transcode Core i7 X980 / RAMPAGE II Extreme





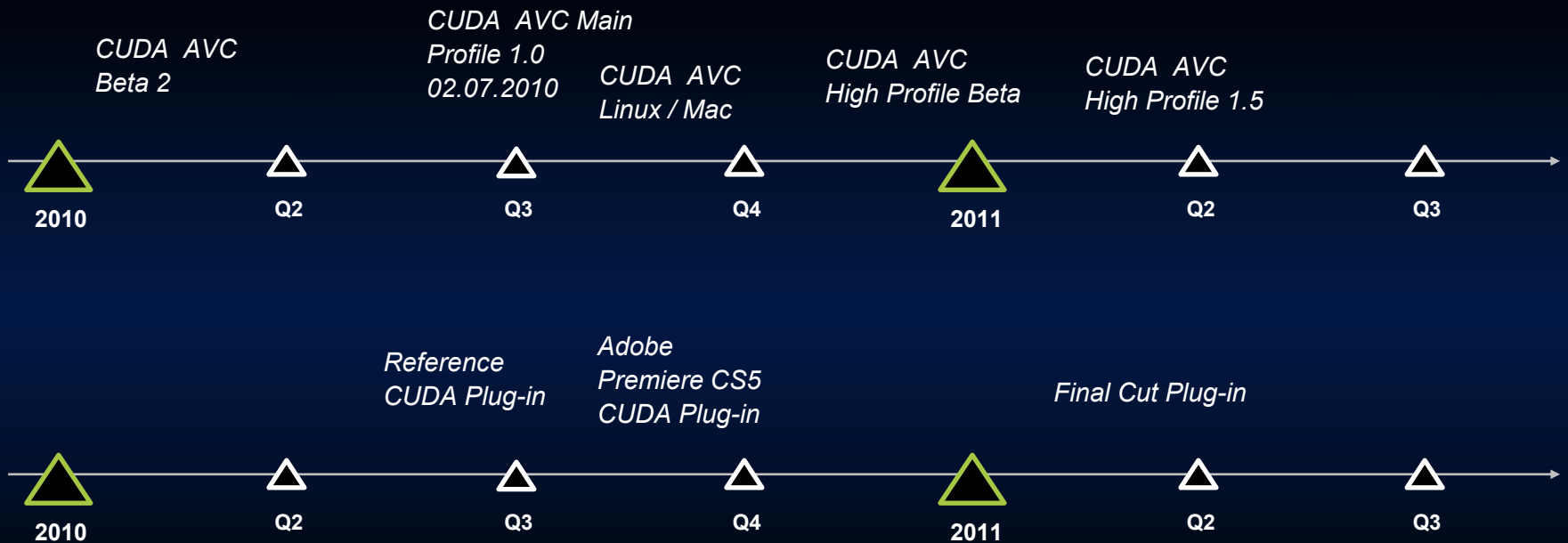
## MAINCONCEPT QUALITY COMPARISON

# Comparison Sheet



■ CPU ■ GPU GeForce GTX 295

## ROADMAP



# Licensing Process

- **No-Charge Eval SDK**

- Fill in Licensing Request form at <http://www.mainconcept.com/sales/licensing.html>
- Regional MC Salesperson will contact you with Eval NDA
- MC Provides Login to Customer Portal
  - Watermarked Eval SDK
  - API Docs
  - Sample Code
  - Developer Support

- **Demo Version of Apps and Plug-Ins**

- Download Watermarked Demo Version

The screenshot shows a web form titled "2. SDK AND CODEC SELECTION". At the top, there are four navigation tabs: "1. GENERAL INFORMATION", "2. SDK AND CODEC SELECTION", "3. ADDITIONAL INFORMATION", and "4. ADDRESS INFORMATION". The main content area contains the following sections:

- Which MainConcept SDK(s) are you interested in? (Please check as many as you like.)**
  - MainConcept Codec SDK
  - MainConcept Reference SDK
  - MainConcept Network Streaming SDK
  - MainConcept Converter and Scaler Pack
- Which codecs are you interested in?**
  - H.264/AVC Standard
  - H.264/AVC Pro
  - H.264/AVC Broadcast
  - MPEG-1/2
  - MPEG-4 Part 2/H.263
  - VC-1
  - JPEG2000
  - Motion JPEG
  - DV/IDVC/PRO 25/50/HD
  - SVC
  - AAC
  - AC3/Dolby Digital
  - Dolby Digital Pro
  - Dolby Digital Plus
  - AMR
- Other codecs:**
- Which components and formats are you interested in?**
  - Blu-ray
  - Flash
  - DVB
  - AVC-Intra
  - MXF
  - XDCAM
  - AVCHD
- Other components/formats:**

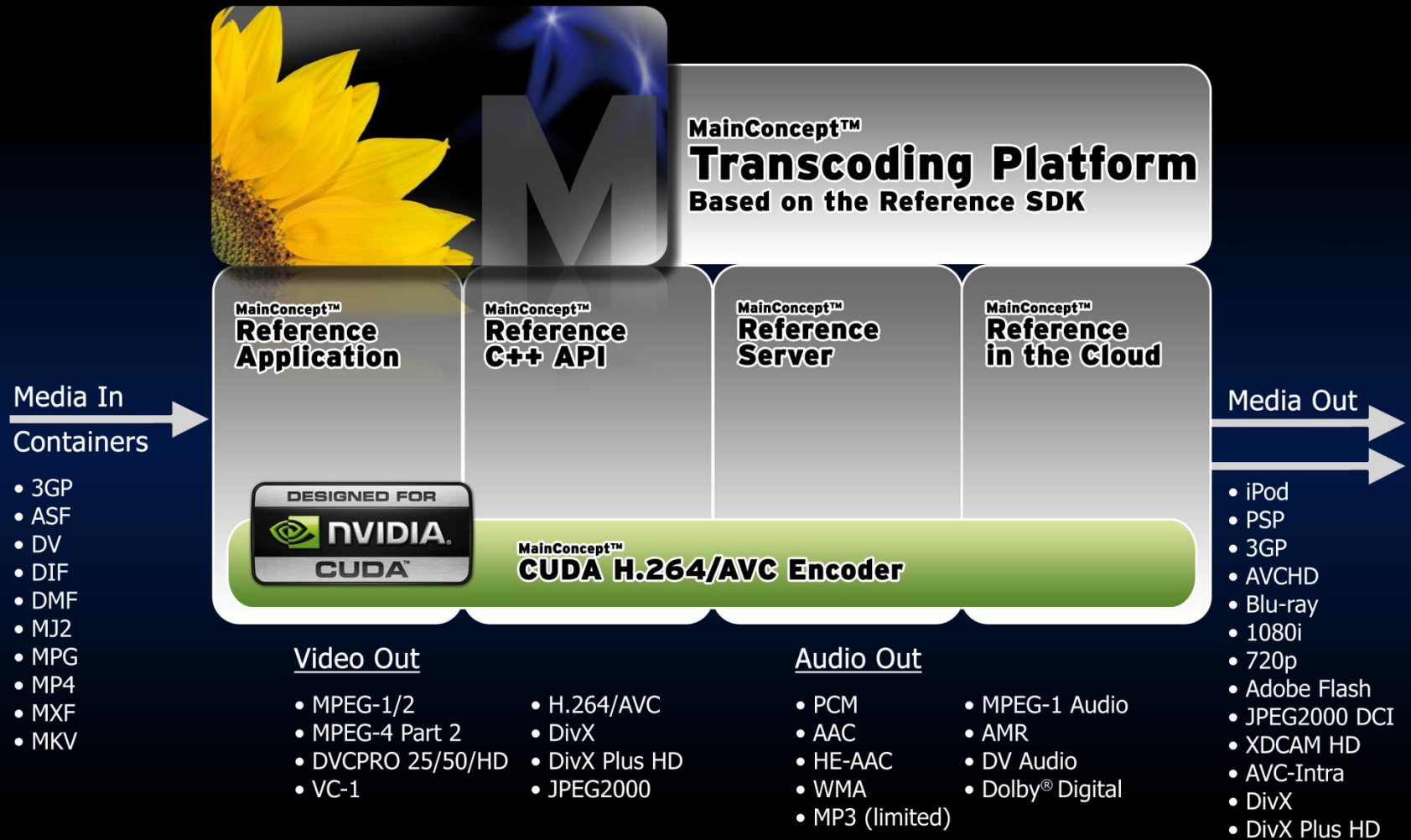
A "NEXT STEP" button with a right-pointing arrow is located at the bottom right of the form.



## REFERENCE

MainConcept™ Transcoding Platform

# MainConcept Reference SDK







## LIVE DEMONSTRATION

# Thank You



# THANK YOU

[www.mainconcept.com](http://www.mainconcept.com)

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