IM2 - Display Port 1.1a

This course covers the Display Port multimedia interface

Objectives

- The course describes the architecture of a DisplayPort source-cable-sink system.
- An introduction to Video and Audio standards is done prior to clarifying how this standards are transported through DisplayPort.
- The analog interface is studied in detail.
- The course clarifies information 8b10b coding / decoding schemes.
- Content protection mechanisms are also studied.

A more detailed course description is available on request at training@ac6-training.com

Prerequisites

- A basic knowledge of multimedia standards (audio & video).

Environnement du cours

- Cours théorique
  - Support de cours au format PDF (en anglais) et une version imprimée lors des sessions en présentiel
  - Cours dispensé via le système de visioconférence Teams (si à distance)
  - Le formateur répond aux questions des stagiaires en direct pendant la formation et fournit une assistance technique et pédagogique
- Au début de chaque demi-journée une période est réservée à une interaction avec les stagiaires pour s'assurer que le cours répond à leurs attentes et l'adapter si nécessaire

Audience visée

- Tout ingénieur ou technicien en systèmes embarqués possédant les prérequis ci-dessus.

Plan du cours

First day

INTRODUCTION TO DISPLAYPORT

- Chip-to-Chip or box-to-box utilization
- Layered architecture
- Pinout
- Forward drive channel and bi-directional auxiliary channel
- Mechanical specification
- Dual mode devices

PHYSICAL LAYER

- Hot plug / Unplug detect circuitry
- Main channel
  - 8b10b coding scheme, running disparity
  - Clock recovery logic

    - Channel equalization sequence
    - Scrambling, whitening the spectrum, Scrambler reset
    - Link quality measurement
    - Transmitter and receiver electrical specifications
    - Drive current and pre-emphasis level control
    - Jitter requirements
- Auxiliary channel
    - Manchester II coding, self-clocking
    - Sync pattern, Stop condition
    - AC coupling
- Compliance test specification

LINK LAYER

- Isochronous transport services over the main link
    - Enhanced framing mode
    - Link symbols over the main Link without video stream
    - Adapting the stream rate to the link rate
    - Stream reconstruction in the Sink
    - Extracting the secondary data packet
    - Stream clock recovery, synchronous vs asynchronous clock modes
    - Secondary data packet types, purpose of InfoFrames packets
- Auxiliary channel
    - Link and device management over the auxiliary channel
    - Source state machine
    - Arbitration control
    - Policy maker
    - Mapping of I2C onto AUX CH syntax
    - Address mapping for DPCD
- Compliance test specification
    - Device services test procedures
    - Device Link services test procedures

Second day

VIDEO STREAMS

- Video standard basics, SDTV, EDTV, HDTV
- Pixel mapping onto link lanes according to pixel coding
- Video timing format
- Direct drive display specification
- Embedded Display Port

AUDIO STREAMS

- Audio basics, L-PCM coding, IEC standards
- Speakers mapping
- Scheduling of audio stream packet transmission
- Source / Sink device interoperability, audio format
- Structure of audio stream packets

CONTROL AND CONFIGURATION

- The Display Data Channel [DDC] usage during configuration
- AVI info frame
- Audio info frame
- E-EDID data structure

- Source device behavior upon HPD pulse detection

CONTENT PROTECTION

- HDCP specification (DRM)
  - Authentication of devices allowed to play HD content
  - Computation of shared key
  - HDCP over Display Port
  - Application to DVD-audio and super-audio CD
- DPCP specification
  - DPCP bulk encryption / decryption blocks
  - AUX CH transactions for DPCP