VIDEO ELECTRONICS STANDARDS ASSOCIATIONS

Direct Chip-to-Chip Interface Spanning the Automotive Box-to-Box Connection

- Based on DP/eDP
- Functional Safety Provision
- Transport with Link Training
- High Speed Sideband Channel
- 8K Display Support and Beyond
- HDCP Support

Adaptation to Alternate Long Reach Automotive Transport

- Single Pair Alternative Transport for Longer Reach Applications
**AREA OF VESA AUTOMOTIVE DEVELOPMENT**

**Chip-to-Chip eDP Implementation (including across box-to-box interface)**

- **Module PCB**
  - eDP TX
  - SoC
  - AUX & HPD
  - Side Band Bridge

- **Video Source Module**
  - 1, 2, or 4 Main Link Lanes
  - High Speed Sideband Bus

- **Module PCB**
  - Side Band Bridge
  - Other System Functions
  - AUX & HPD

- **Video Display Module**
  - eDP Cable

- **Panel Assembly**
  - eDP RX
  - Display Driver
  - Display Panel
  - Backlight Control
  - Touch Controller

**Multi-Display Topology Support**

- **SoC**
- **Source**

- **Multi-Stream Transport Hub**
- **Panel**

- **Display**

**Long-Reach SERDES Adaptation**

- **SoC**
  - eDP
  - Serializer
  - Source

- **Long Reach Interface**

- **De-serializer**
  - eDP
  - Display
  - Panel

**Come See Our Demos!**

- Box-to-Box AUX Bridge Concept
- Parade Technologies
- Atom-based Automotive Reference Design
- Intel
VESAs Automotive Special Interest Group (SIG)

- Held 10 meetings February-September 2018
- Objectives of Automotive SIG:
  - Provide guidance for VESA regarding requirements for automotive display interface applications.
  - Short term focus on possible updates to current VESA standards.
  - Longer term focus on requirements for new VESA standards.
- Automotive SIG disbanded in September 2018

- VESA Vehicular Task Group (VTG) formation approved by VESA BoD
  - First meeting early October 2018
  - Will pursue standards development based on requirements defined by Automotive SIG
VESA Vehicular Task Group (VTG)

- Formation approved by VESA Board of Directors in September 2018
- Summarized Charter:

1. Definition of a direct chip-to-chip (including box-to-box) automotive display interface (perhaps named “vDP”) based on eDP and DisplayPort specifications.

2. Definition of a DisplayPort (including eDP and “vDP”) adaptation layer for long-reach serialized transports designed for automotive applications.
VTG Charter Objective (1) – Conceptual Diagram

Head Unit
- Application Processor (SoC)
- eDP Main Link
  - OPTIONAL: Outbuffer (redriver or retimer)
  - AUX + HPD
- HS Bus Bridge
- AE PHY
- I2C and other interfaces

Remote Display Assembly with HS Bus Bridge
- eDP Cable
- PCB
- eDP Display Module
- eDP Main Link
  - OPTIONAL: Inbuffer (redriver or retimer)
  - AUX + HPD
- AE PHY
- HS Bus Bridge
- I2C and other interfaces
  - (with interrupts)
- Automotive Ethernet
- AUX + HPD

Connectors:
- Ethernet MII
- AE PHY
- HS Bus Bridge
- AUX + HPD

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VTG Charter Objective (2) – Conceptual Diagram

- **Video Source Assembly**
  - DP/eDP/vDP Source or Branch Device (DFP)
  - Main Link Data
  - AUX and HPD
  - Vertical Plane (PCB)
  - DP/eDP/vDP Source Protocol Adaptation Layer
  - DP/eDP/vDP UFP Branch
  - DP/eDP/vDP Sink Protocol Adaptation Layer
  - Serialized Transport Interface

- **Display Assembly**
  - Main Link Data
  - AUX and HPD
  - Vertical Plane (PCB)
  - DP/eDP/vDP Source Protocol Adaptation Layer
  - DP/eDP/vDP UFP Branch
  - DP/eDP/vDP Sink Protocol Adaptation Layer
  - Serialized Transport Interface

- **Box-to-Box Interconnect Cable**
  - High Speed Uni-Directional Forward Data Channel (~2 to 20Gbps)
  - Bi-Directional Control / Sideband Data Channel (~100Mbps)

- **Video Source Assembly**
  - Other High Speed Data
  - Other Control Data applications

- **Display Assembly**
  - Other High Speed Data
  - Other Control Data applications

- **Other High Speed Data**
  - Other Control Data applications

Originally posted for SIG meeting #8
Review of General Requirements for VTG

Apply to both Charter Objectives (1) and (2)

1. Display Topology Targets
2. Downstream Transport Requirements
3. Bi-Directional Sideband Bus Requirements
4. Automotive Functional Safety Requirements
5. Automotive Signal Integrity Requirements
6. Power Management
1. Display Topology Targets

a. Single SST Connection
b. Multiple SST Connections Across a Single Interface
c. Display Panel MSO (Multi-Segment Operation) Support
d. Multi-Stream Enabling Multiple Displays in a Display Assembly
e. Multi-Stream Enabling the Daisy Chaining of Display Assemblies
1. Display Topology Targets
   a. Single SST Connection

- Simplest configuration
- Could also apply to a video control unit that has multiple outputs, each to a different display assembly
1. Display Topology Targets
   b. Multiple SST Connections Across a Single Interface

- Example use case is multiple panels in a display assembly, each driven by a dedicated DPTX in the SoC
1. Display Topology Targets
   c. Display Panel MSO (Multi-Segment Operation) Support

- Multi-Segment Operation (MSO) as defined in eDP 1.4b
1. Display Topology Targets
   d. Multi-Stream Enabling Multiple Displays in a Display Assembly

- Assumes the use of the MST protocol (not currently used in eDP applications)
- Use could include multiple panels or a tiled array
1. Display Topology Targets
   e. Multi-Stream Enabling the Daisy Chaining of Display Assemblies

- The daisy-chaining of display modules in automotive applications is highly desirable
- Assumes the use of the MST protocol
2. Downstream Transport Requirements

a. Bit Rate Capability – Support for displays of 4K and above
b. Scalability
c. DisplayPort, eDP, and Other Protocol Support, such as
   i. SST
   ii. MST
   iii. HDCP
   iv. PSR/PSR2
   v. MSO (including over an MST topology)
   vi. DSC / VDC-M?
   vii. Low Latency
   viii. Audio
3. Bi-Directional Sideband Bus Requirements

a. Support of normal DisplayPort and eDP features

b. Support of Function Safety features

c. Support of additional functionality to minimize box-to-box I/O
   i. Display Touch and other user interface functions
   ii. System self-test
   iii. System firmware update
   iv. Flexibility to allow other uses
4. Automotive Functional Safety Requirements

a. VTG will establish safety requirements, such as ISO 26262 ASIL Level Requirements
   - Currently it is assumed that ASIL level A and B is required

b. Defined required protocols to support these requirements
   - Currently assume this will mean:
     - Transport data protection such as using FEC or CRC
     - Display segment signatures (for tell tale symbols, for example)
     - Freeze-frame detection
5. Automotive Signal Integrity Requirements

a. Controlled sensitivity to alien signal ingress
   - Need to define requirements
   - Will include cross-talk interference from other interfaces as well as impulse noise rejection

b. Controlled EMI/RFI and cross-talk to other interconnect
   - Need to define requirements
6. Power Management

a. Power state requirements of devices and interconnect
   i. Power state use cases
   ii. Power state definitions
   iii. Target power draw for power states

b. Entry and exit from power states
   i. Control within interconnect topology
   ii. Control outside of interconnect topology