mipi® DEVCON

Sriram Balasubramanian, Director, IP Engineering
Synopsys

Building Intelligent, High-Speed Sensor Connectivity with MIPI I3C℠ – Design Examples

2017
MIPI ALLIANCE DEVELOPERS CONFERENCE

BANGALORE, INDIA
MIPI.ORG/DEVCON

Agenda

- MIPI I3C overview
- MIPI I3C use cases
- MIPI I3C eco-system: enablers

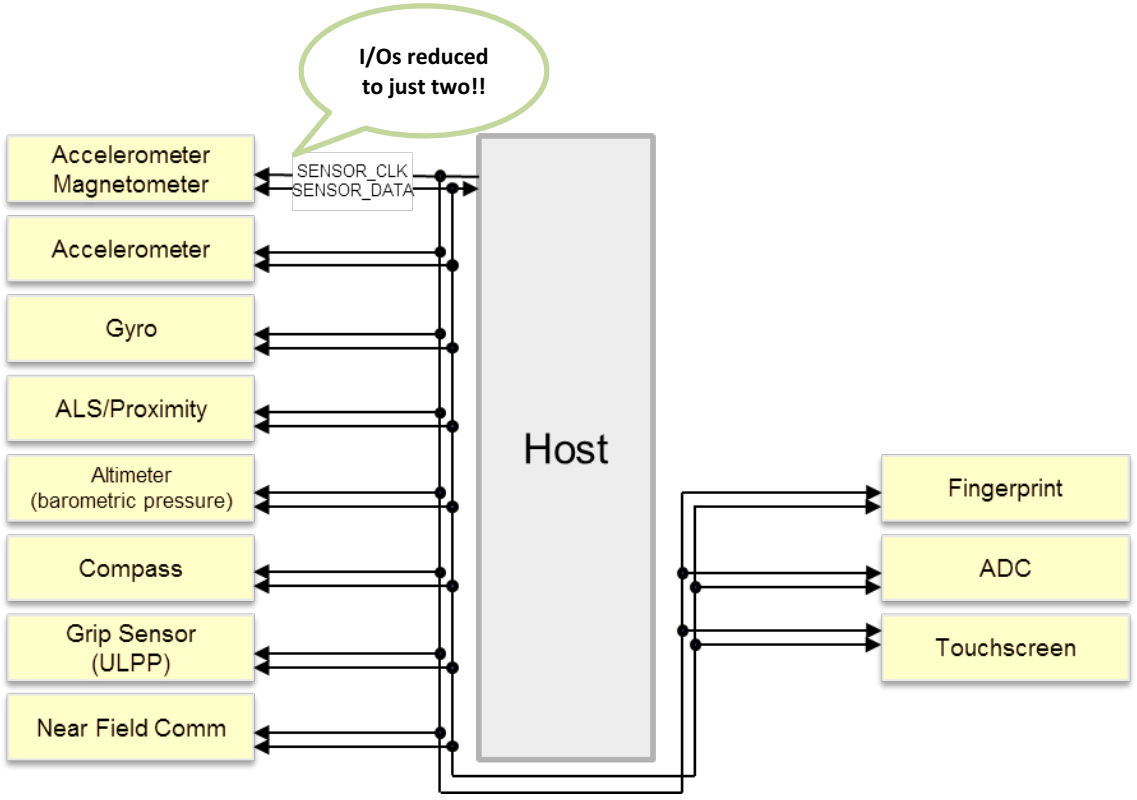
Synopsys

I3C Overview

- Two wire serial interface up to **12.5 MHz**
- Only **current master** can drive SCL
- **Supports legacy I2C slave** devices and messages.
  - FM(+): Fast mode (Plus)
- I3C Single Data Rate (**SDR**) Mode
- I3C High Data Rate (**HDR**) Modes
  - DDR: Dual Data Rate
  - TSL: Ternary Symbol Legacy
  - TSP: Ternary Symbol Pure

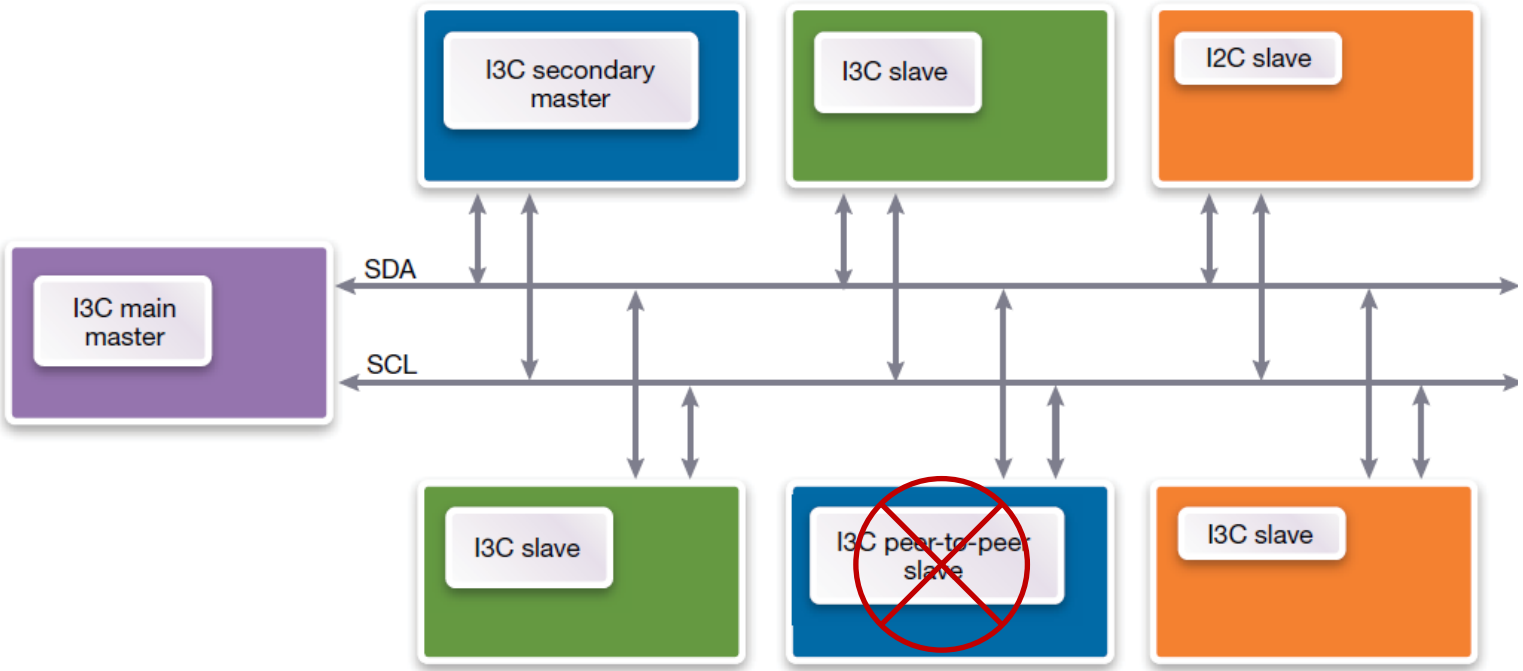
I2C FM	**: Upto 400Kbps**
I2C FM+	**: Upto 1Mbps**
I3C SDR	**: 11.1 Mbps***
I3C HDR-DDR	**: 22.2 Mbps***
I3C HDR-TSL	**: 25.6 Mbps***
I3C HDR-TSP	**: 33.4 Mbps***

** SCL@12.5Mhz*



Synopsys

I3C Device Roles



Synopsys

I3C Use cases

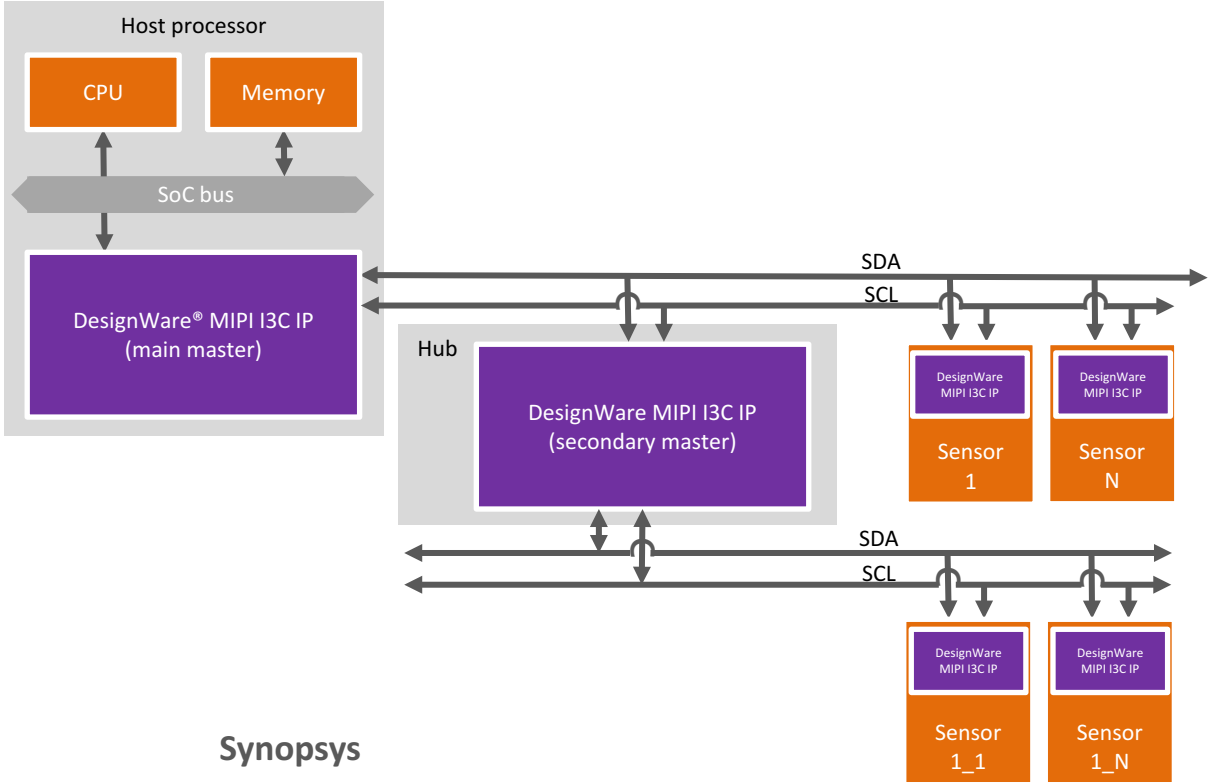
- Automotive
- Mobile
- IoT
- Touch
- Debug Ports

Synopsys

I3C Use Cases : Automotive

Sensor Hub

- Secondary master, apart from the main master connected to multiple sensors as an I3C hub
- As soon as the secondary master has the relevant sensor data available in its I3C bus, it can communicate to the main master, which propagates the data to the CPU

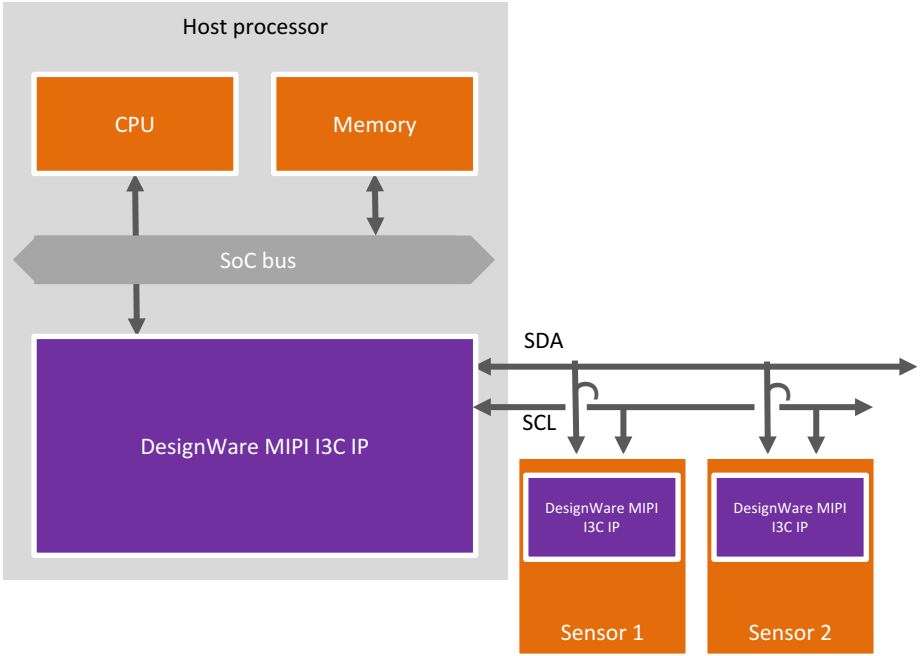


Synopsys

I3C Use Cases: Mobile (1/2): Sensor Subsystem

Sensor Subsystem

- Multiple sensor devices, based on their capabilities, are connected to the I3C bus, which can operate in different modes and speeds of operations
- Typical examples of such sensors are the touchpad sensor in a mobile device, gyroscopes, and camera interface, all of which use the I3C bus to communicate back to the CPU in the SoC

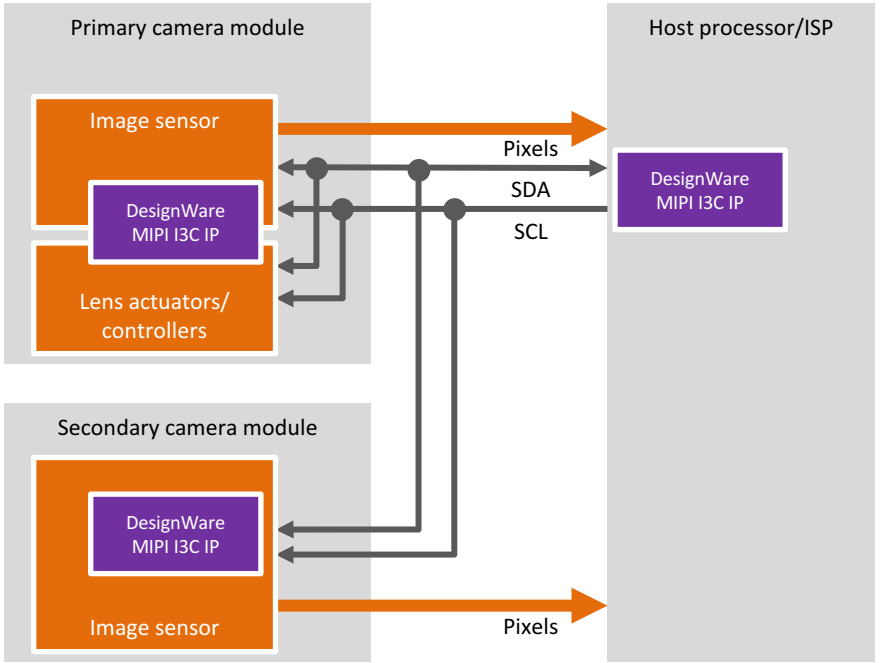


Synopsys

I3C Use Cases: Mobile (2/2): Image Sensors

Image Sensors

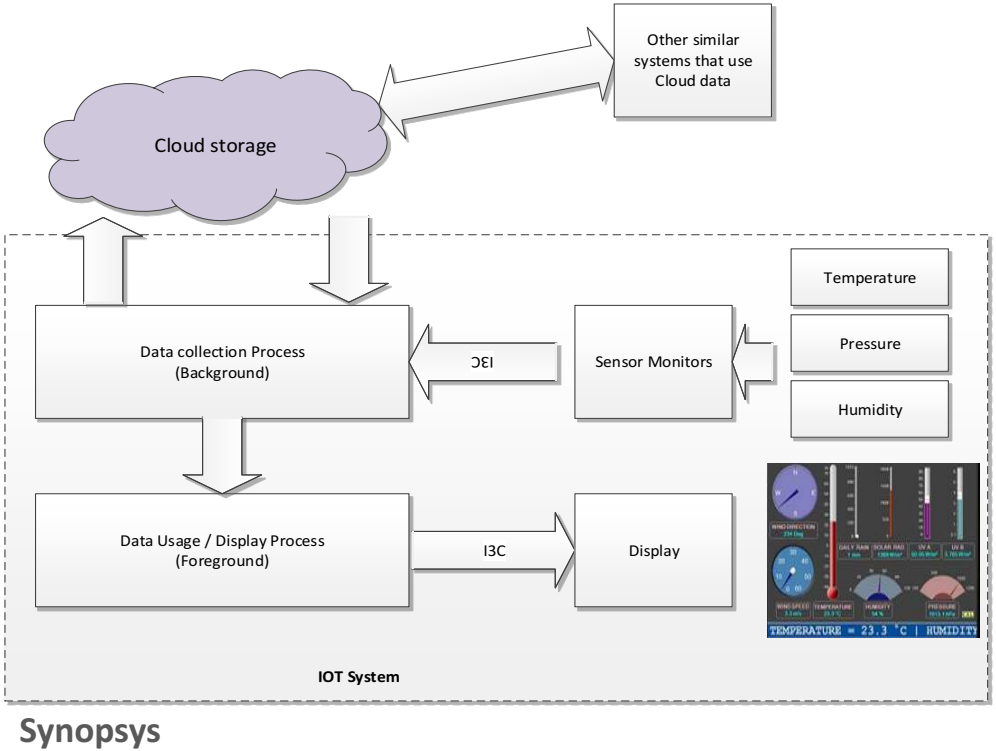
- Replace I2C with the side band control channel - the Camera Control Interface (CCI)
- Image sensors can utilize I3C's higher performance capability to communicate control information and to actually transmit image data



Synopsys

I3C Use Cases: IoT: Weather Telemetry

- IoT enables other sensor applications such as:
  - Auto sensing
  - Access control
  - Image recognition



Synopsys

I3C for Touch

Single Touch
Stylus
400kbps
Smartphone, Tablets < 6”

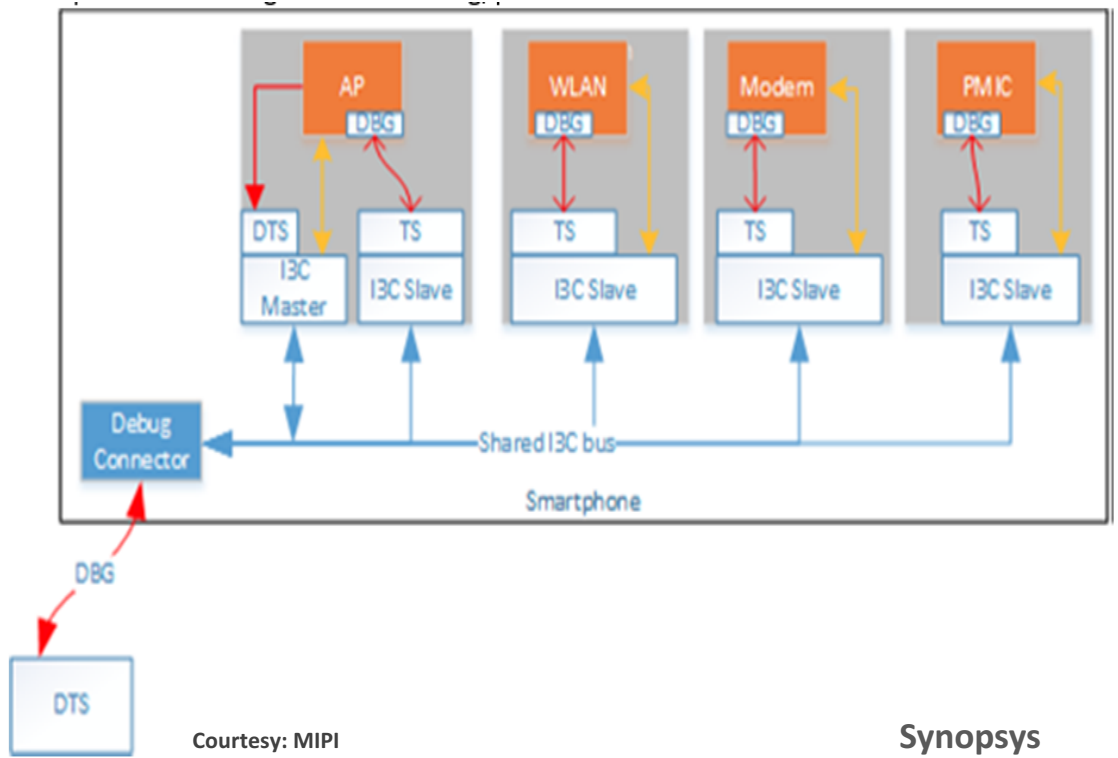
Multi Touch
Two different displays with simultaneous stylus and multi finger
1.5 Mbps to 32 Mbps
(eg:- > 15” advanced usage models)

Multi Finger Touch
Smartphone
0.4 to 1 Mbps
Smartphone, Tablets > 6”

I3C subsystem

Synopsys

I3C for Debug Ports



Courtesy: MIPI

External Debug & Test System (DTS)

Connected to all existing modules (i.e., Modem, Power Management IC, etc.) of smartphone through Debug connector

Capabilities of Debug for I3C

Debug over 2 Pins

Multi Master / Drop capable

Include debug devices Use (i.e. Hot Join) via generic CCC

Debug messaging via dedicated debug CCC

Event indication and detection via the in band interrupt method

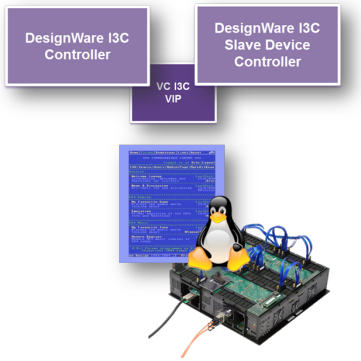
Debug and event capable slaves are able to passively detect debug IBIs

DTS implemented as bus master

Synopsys

Interested in I3C? Eco System is Ready!

- IP, VIP solutions are available
- FPGA-based prototypes available for HW validation & early SW development
- Multiple Interoperability events
- Already being adopted in mobile APs, drone, IoT , sensors, etc.

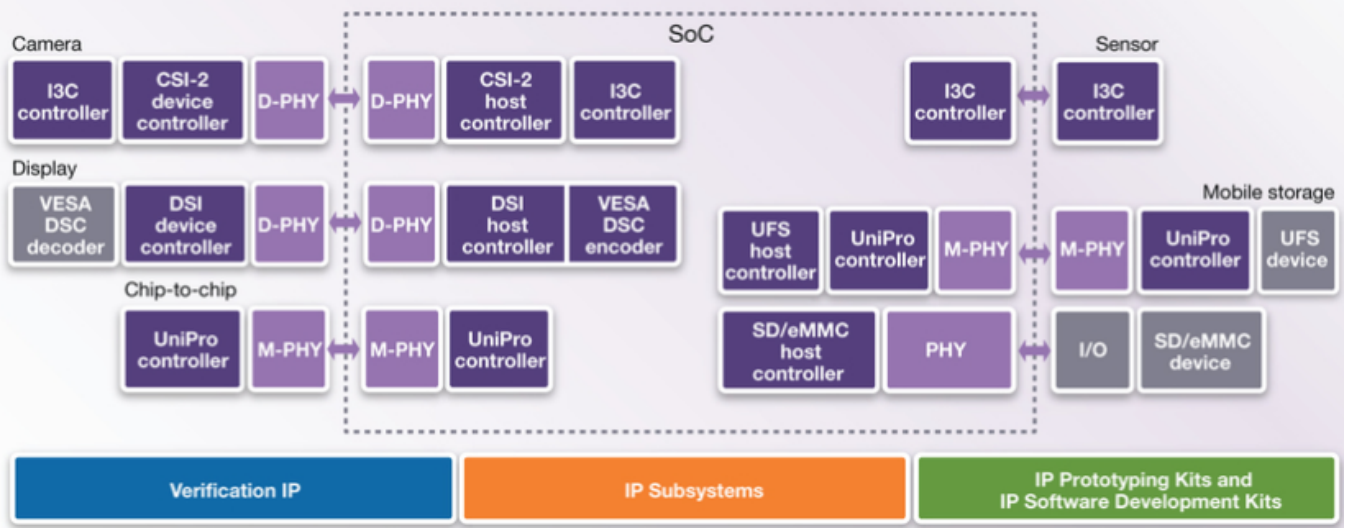


Smooth transition path from I2C/SPI to I3C

SDR mode
IBI w/o payload

Up to HDR ternary modes
IBI with payload
Timing control - time stamp

Synopsys® DesignWare® MIPI IP Portfolio



Synopsys

mipi®
DEVCON

THANK YOU

2017
MIPI ALLIANCE
DEVELOPERS
CONFERENCE

BANGALORE, INDIA

MIPI.ORG/DEVCON