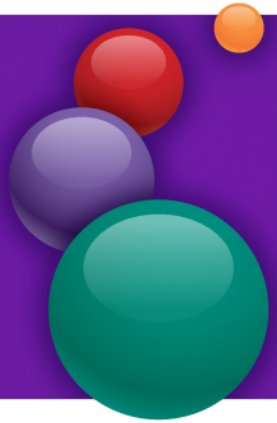
MIPI Touch: Getting in Touch with Your Phone



MIPI Display Working Group
Presented by Dale Stolitzka, Samsung Display Co. & Display WG Chair

10 November 2016

Originally presented by David Johnson, Qualcomm Technologies, Inc.
MIPI Developers Conference, 14-15 September 2016

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Agenda

- MIPI Overview
- MIPI Touch Architecture
- Q & A

MIPI Overview

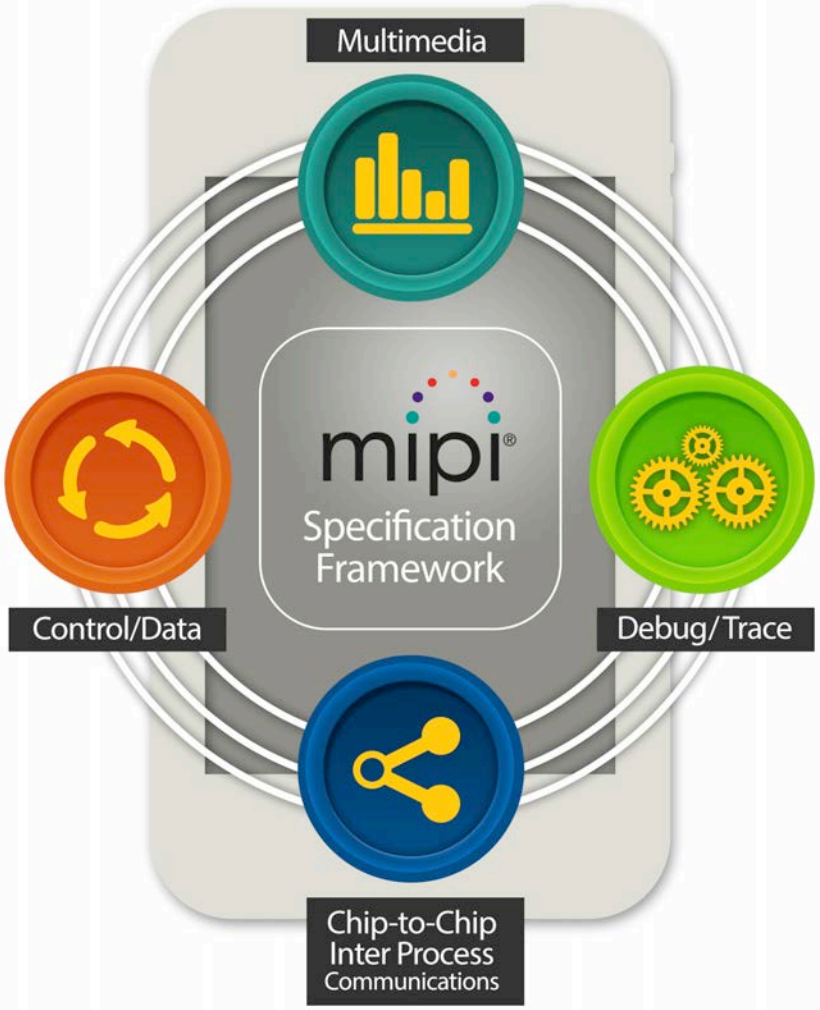
Peter Lefkin
MIPI Alliance
Managing Director

10 November 2016

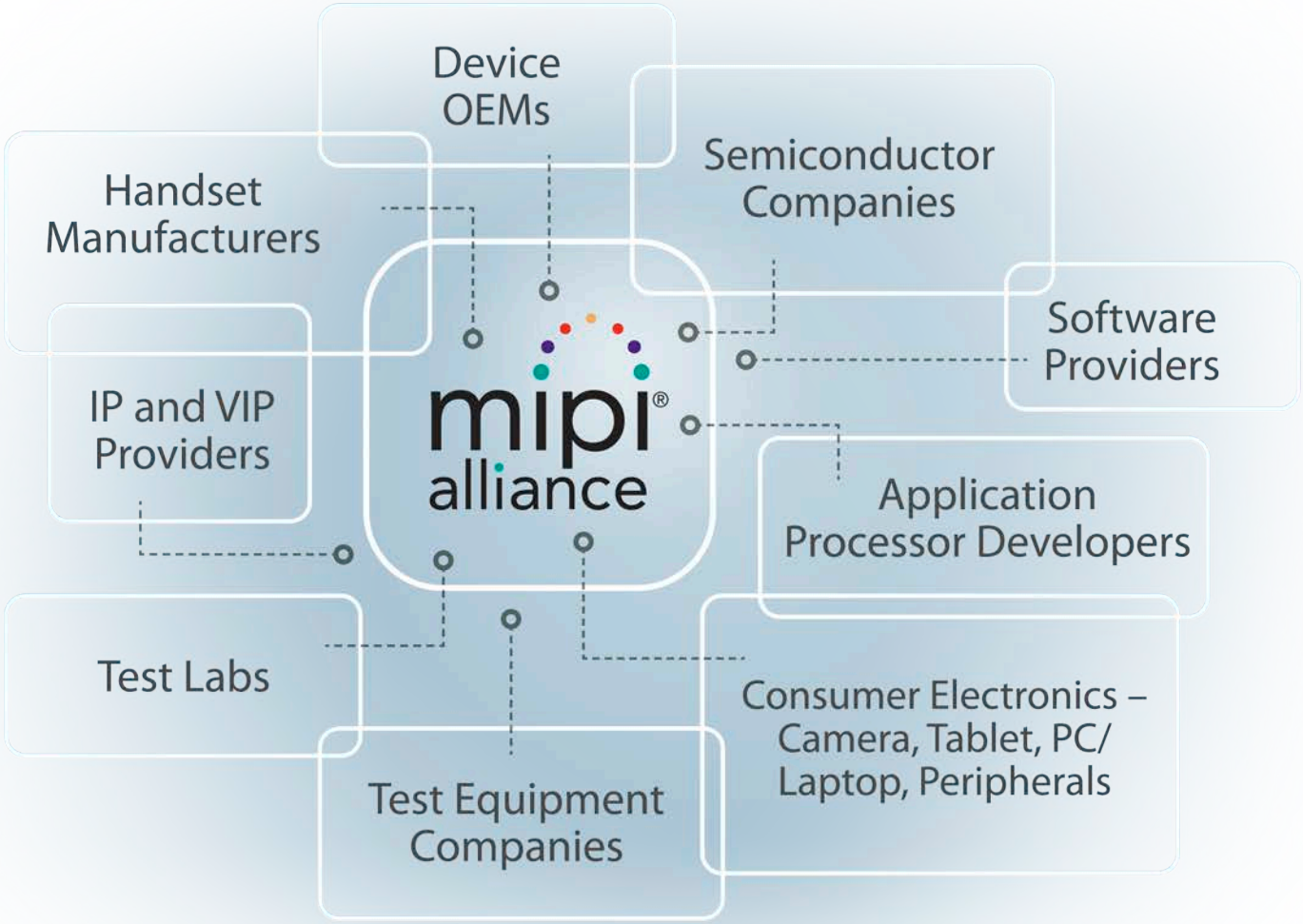
About MIPI Alliance

We are a global, collaborative organization comprised of over 280 member companies spanning the mobile and mobile-influenced ecosystems.

MIPI Alliance is leading innovation in mobile interface technology.



MIPI Alliance Member Ecosystem



Active Technical Working Groups

Camera	Debug	Display	Low Latency Interface
Low Speed Multipoint Link	PHY (C/D/M)	Reduced Input Output	RF Front End
Sensor / I3C℠	Software	Test	UniPro℠

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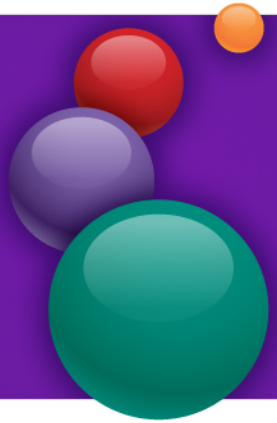

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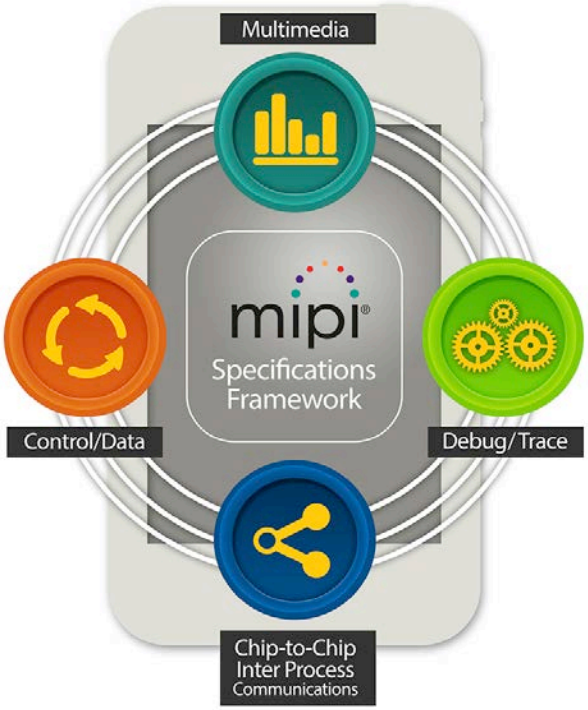
New

Announcing a MIPI Touch Interface architecture



Leveraging MIPI Specifications

Motivation for MIPI Touch

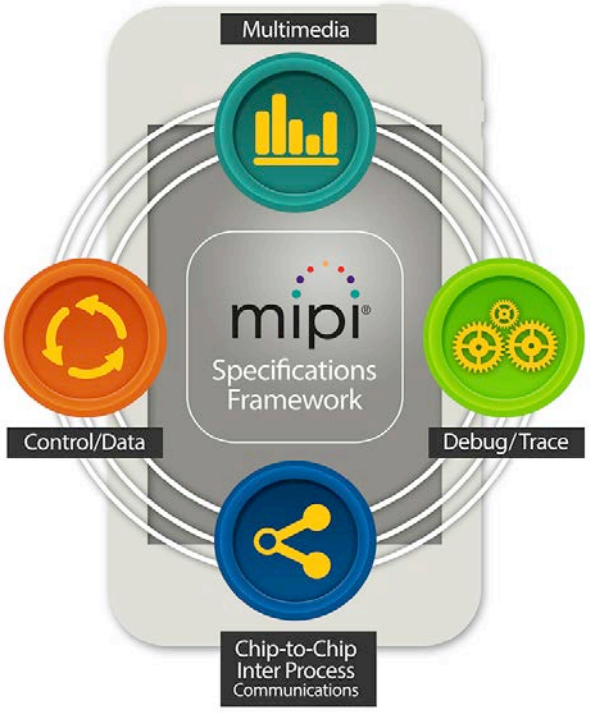
Current industry touch status

- Non-standard software or commands
- Multiple interfaces use a non-standard protocol
  - SPI
  - I^2C-bus
- Not optimized
  - low-power mobile performance
  - low-cost pin-count interfaces
- Require more touch bandwidth

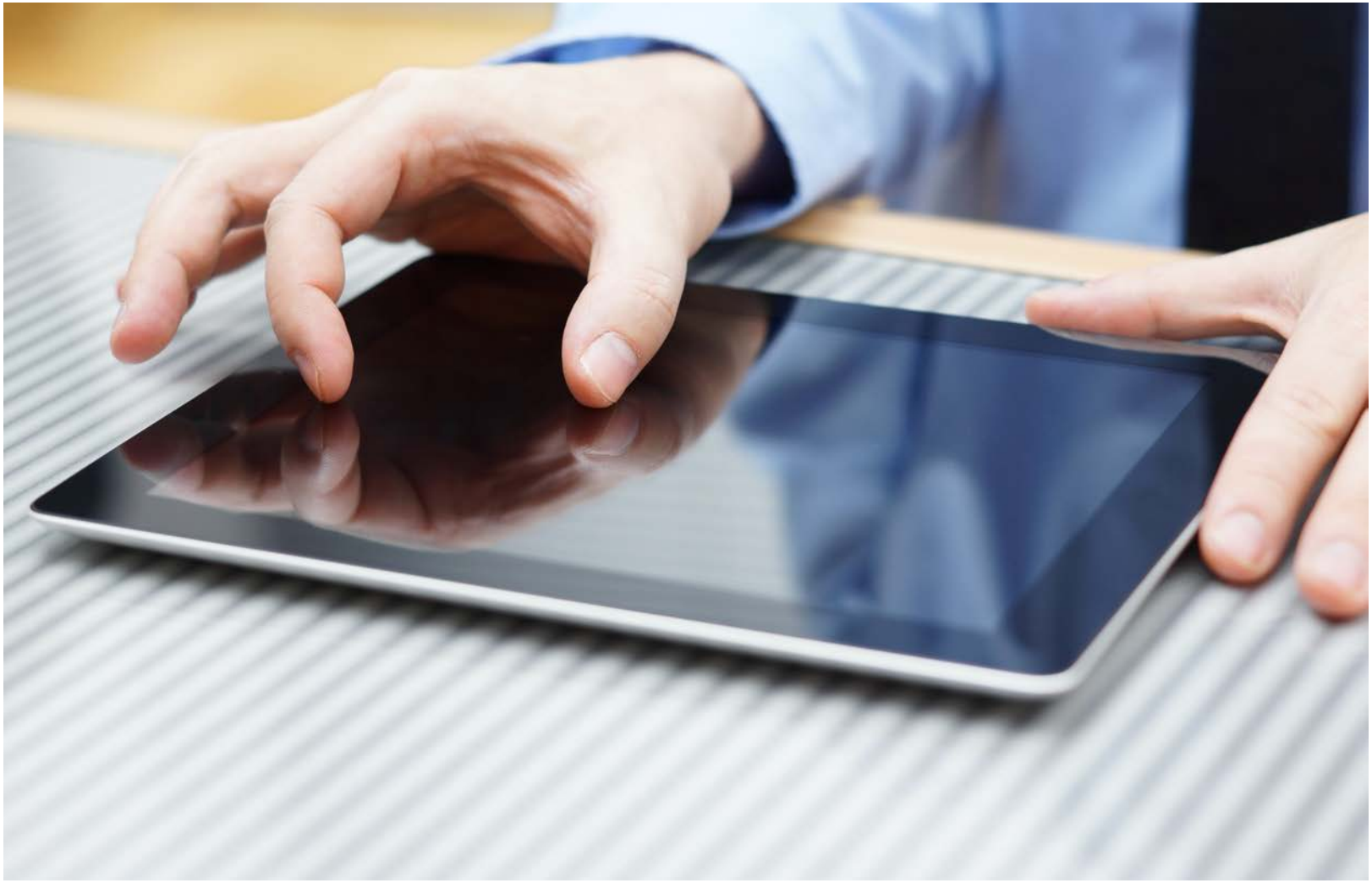
Standardizing touch

1. MIPI identified multiple usages for standard touch and stylus

2. Build MIPI Touch from within the MIPI ecosystem



Multi-touch



Stylus

Automotive

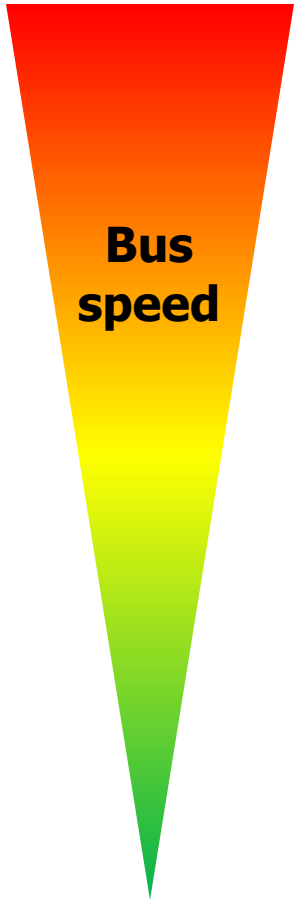
Requirements

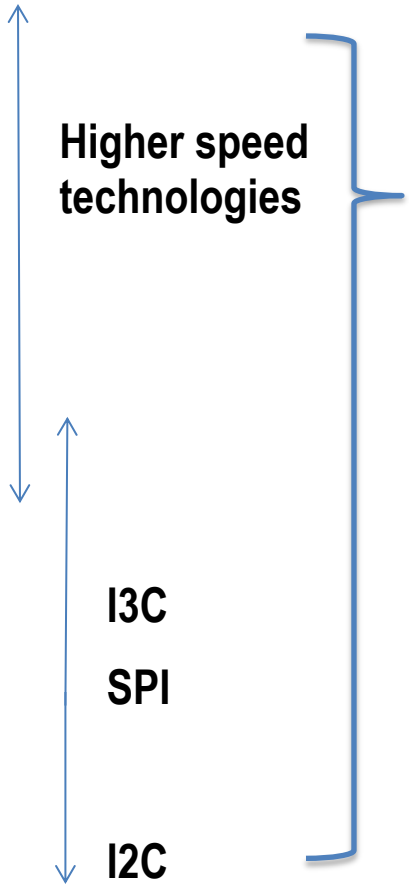
Requirements[1]

- Usages: Phones, tablets, automotive, appliances
- < 50 cm trace length
- FCC compliancy
- Improve time to market
- OS-agnostic approach
- Standard software
- PHY-agnostic approach
- Plus…

1. All members *Call for Proposals* (2016)

MIPI Touch bandwidth

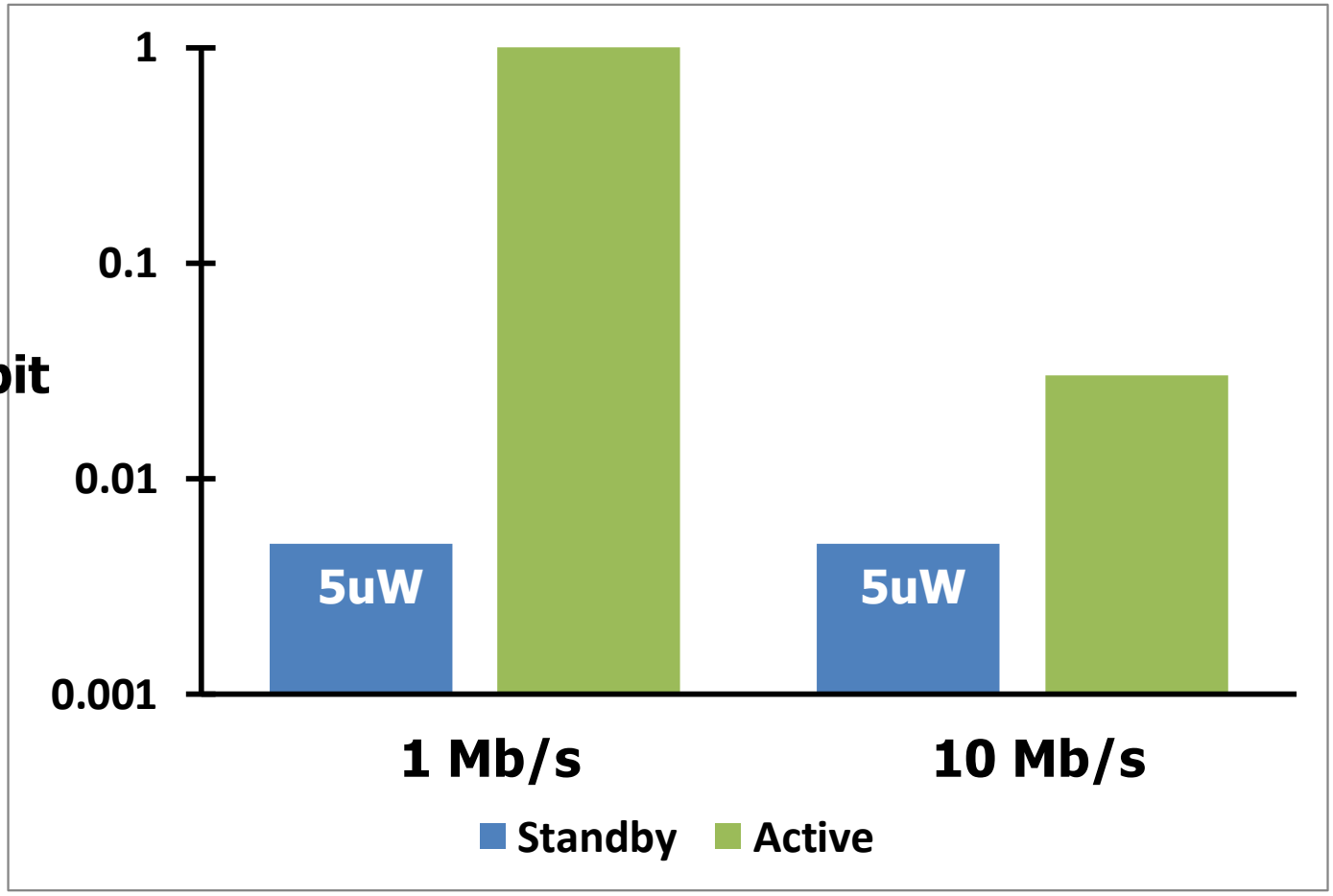




- Lowest power
- Transports sufficient data
- Effective latency
- Low protocol burden

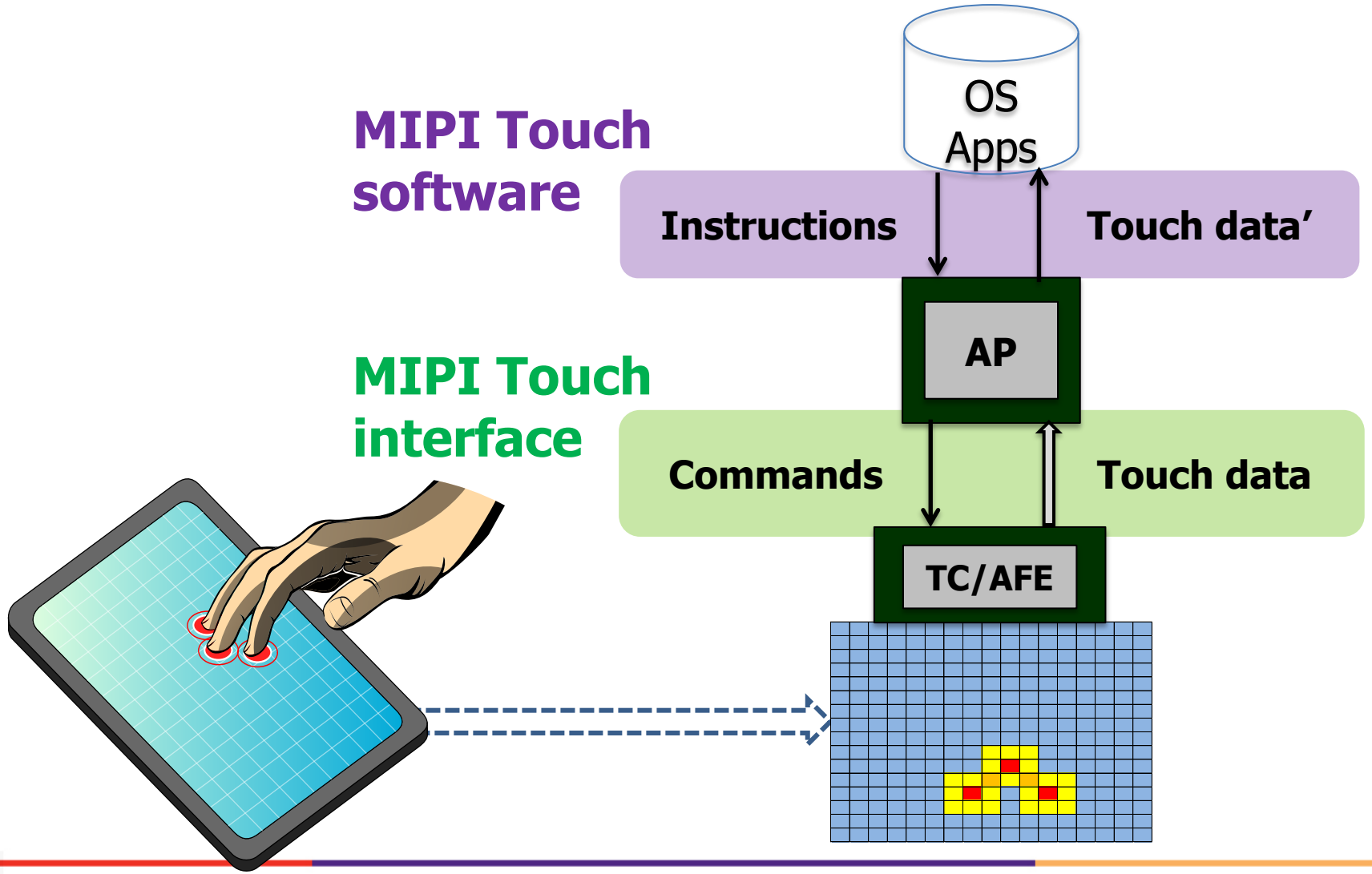
> 40 Mb/s	Higher speed technologies
< 40 Mb/s	MIPI I3C
< 10 Mb/s	I3C | SPI
< 1 Mb/s	I^2C-bus

Power vs. bit rate requirement



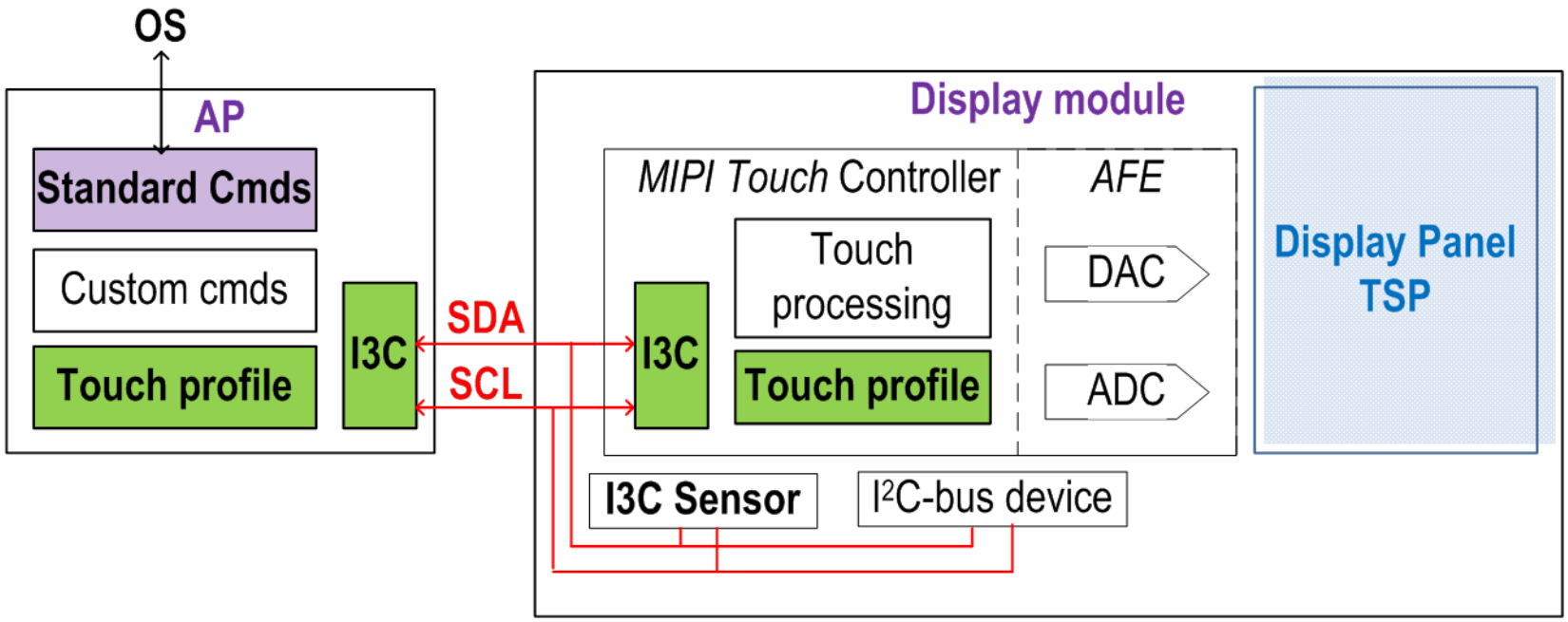
System topology

MIPI Touch / topology



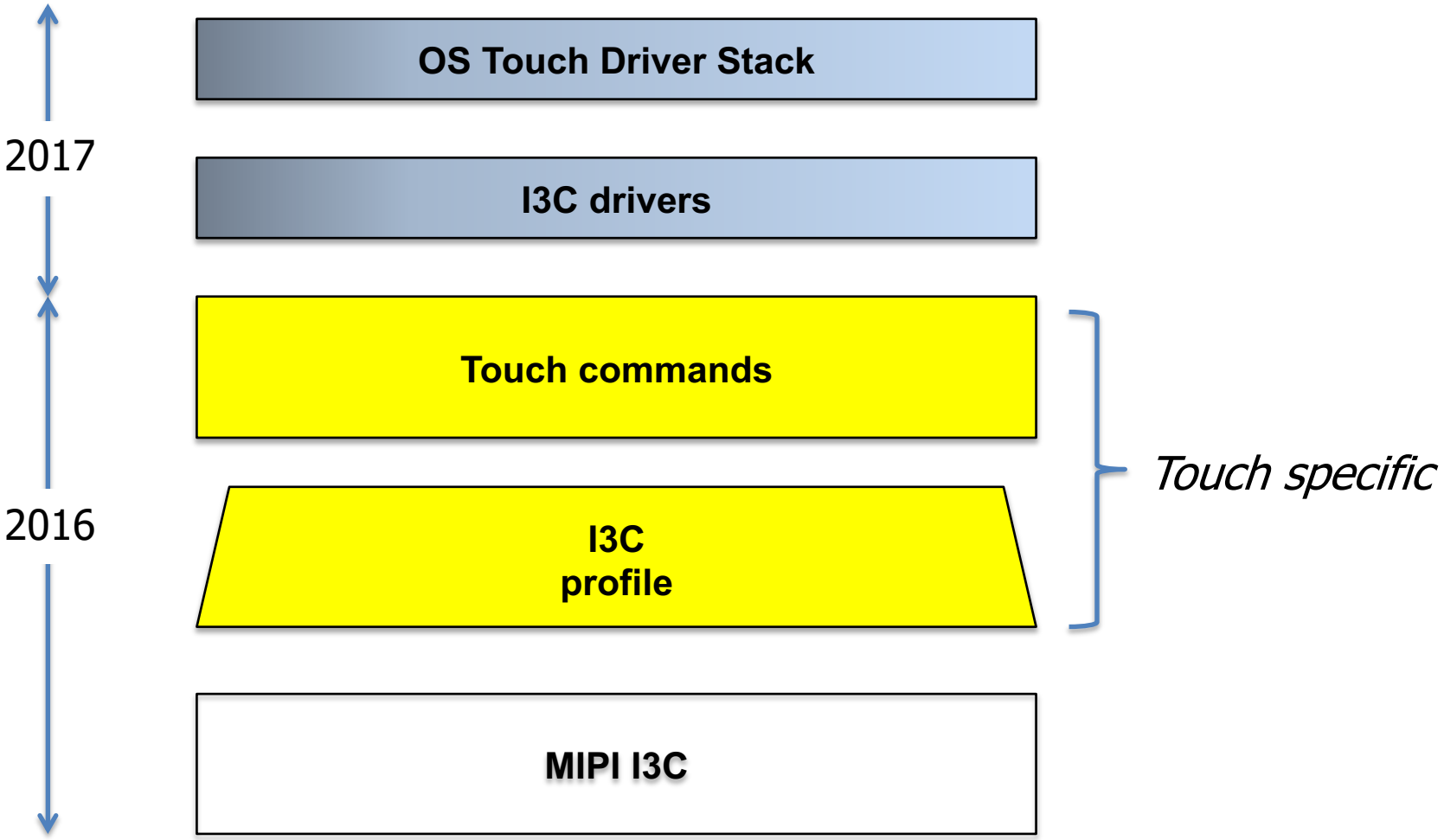
Topology inside the module

- Point-to-point or
- Multi-drop



Solution architecture

MIPI Touch architecture



Page 23

MIPI Touch architecture keys

- Standardized command set
  - OS agnostic and OS independent
  - Reduced effort for software development
- A two-way street for sensing and feedback
- To support touch or pen data
- MIPI Touch uses the new MIPI I3C℠

24

MIPI Touch leverages MIPI I3C

- Optimized for speed and power
- Pin-optimized using in-band interrupt eliminated GPIO interrupts
- Robust protocols for bus management
- Improved bandwidth

25

Example touch commands

Class	Example commands
Power	S/W Reset, Configure Normal / Idle / Sleep
Diagnostics	Activate self-test, calibrate, Get diagnostics
RAW touch data	Get/set RAW tixel coordinate mapping Read proprietary raw | processed formats Get/set other commands
Processed touch data	Get/set processed tixel coordinate mapping Read standard processed touch reports Get/set other commands
Mapping for proprietary registers	Get/set vendor specific information or data

Cross-functional support for MIPI Touch

Software WG	Drivers and OS compatibility
Sensor WG	I3C Specification
USI (Universal Stylus Initiative)	Liaisons on active stylus and touch data commands
OS vendors and published information	OS compatibility and analysis of touch data structures

Planning

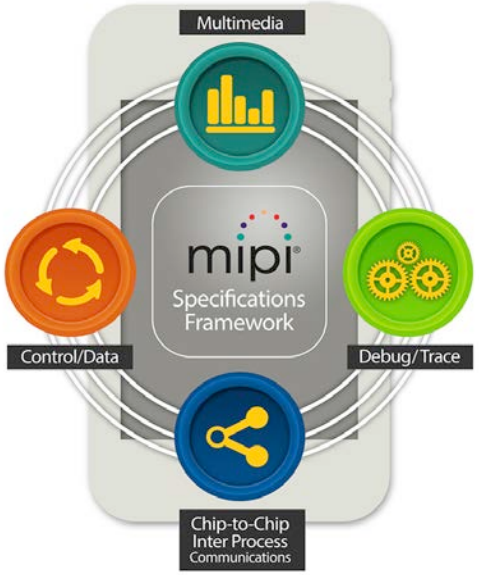
Execution plan / schedule

2016 AUG	SEPT	OCT	NOV	DEC	2017
Drafts 0.2 to 0.4		Draft 0.5	Draft 0.7		Final Specification

Conclusions and call

Conclusions

- Standard open software
- Touch profiles simplifies design for touch
- Standard commands speed TTM
- MIPI I3C is optimized for speed/power
- MIPI I3C has in-band interrupts
  no extra "IRQ" pins



Next steps

- If not a member, join the MIPI Alliance
- Join the MIPI Display Working Group to engage with experts on touch specifications
- Start implementations of MIPI I3C
- Refer to the MIPI I3C webinar and white paper for more information (www.mipi.org)

Acknowledgements

The authors wish to thank the Display Working Group Touch team and in particular the following contributors and reviewers of this presentation's content, Robert Gough and Nobu Suzuki, Intel Corporation, Peter Lefkin and Laura Nixon, MIPI Alliance, Paul Kimmelman, NXP, James Goel, and Radu Pitogoi-Aron, Qualcomm Technologies, Inc., Dale Stolitzka, Samsung Display Co., Jeff Lukanc, Synaptics, Inc.

Q&A

Thank you!