



# STAM: The Final Frontiers of System Test Access Management

2018 International Test Conference



# STAM: System Test Access Management

*Its continuing mission: to explore strange new worlds of test & diagnosis.... To boldly go where no one has gone before.*



*Prime Directive: Don't impose (many) new requirements on sub-system designs. Instead, leverage existing interfaces and protocols.*

# Outline



- STAM: Need → Purpose → Scope
- Timeline
- Leverage heterogeneous standards and interfaces

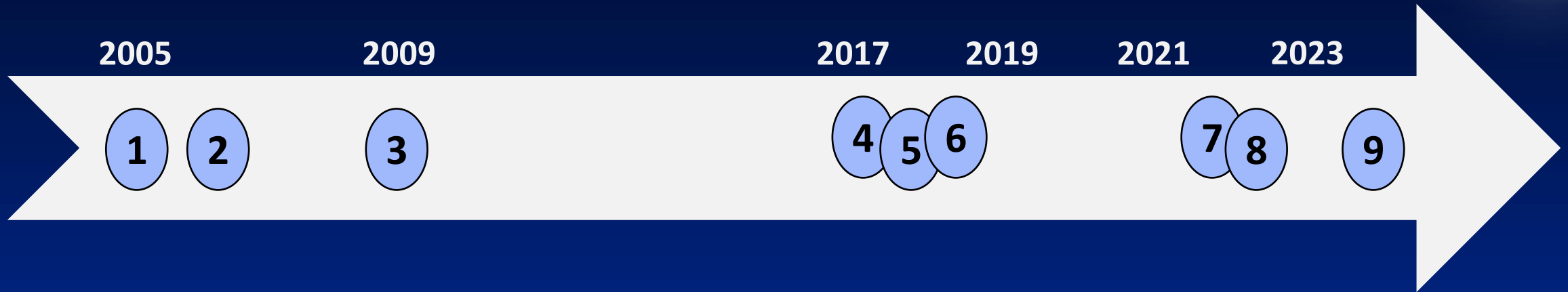
# STAM: Need → Purpose → Scope



## System Test Access Management

- **NEED:** Standards exist to manage access at device level, but access from board or system level is currently *ad hoc*.
- **PURPOSE:** Leverage existing standards for seamless integration of component access topologies, interface constraints, and other dependencies.
- **SCOPE:** Behavioral (not structural) descriptions and methods

# Timeline for SJTAG: STAM, ...



- 1) 2005: SJTAG created
- 2) 2006: Survey SJTAG members
- 3) 2009: Survey user & industry experts
- 4) 2017-Q3: STAM Study Group created
- 5) 2018-Q3: STAM PAR submitted
- 6) 2018-Q4: PAR approved, STAM WG formed
- 7) 2022-Q2: Initial draft of standard for STAM
- 8) 2022-Q4: Close of balloting for STAM
- 9) 202x: Develop follow-on standard(s)

Regular meetings to identify problems, needs, requirements, analyze existing standards, and...

develop one or more standards documents.

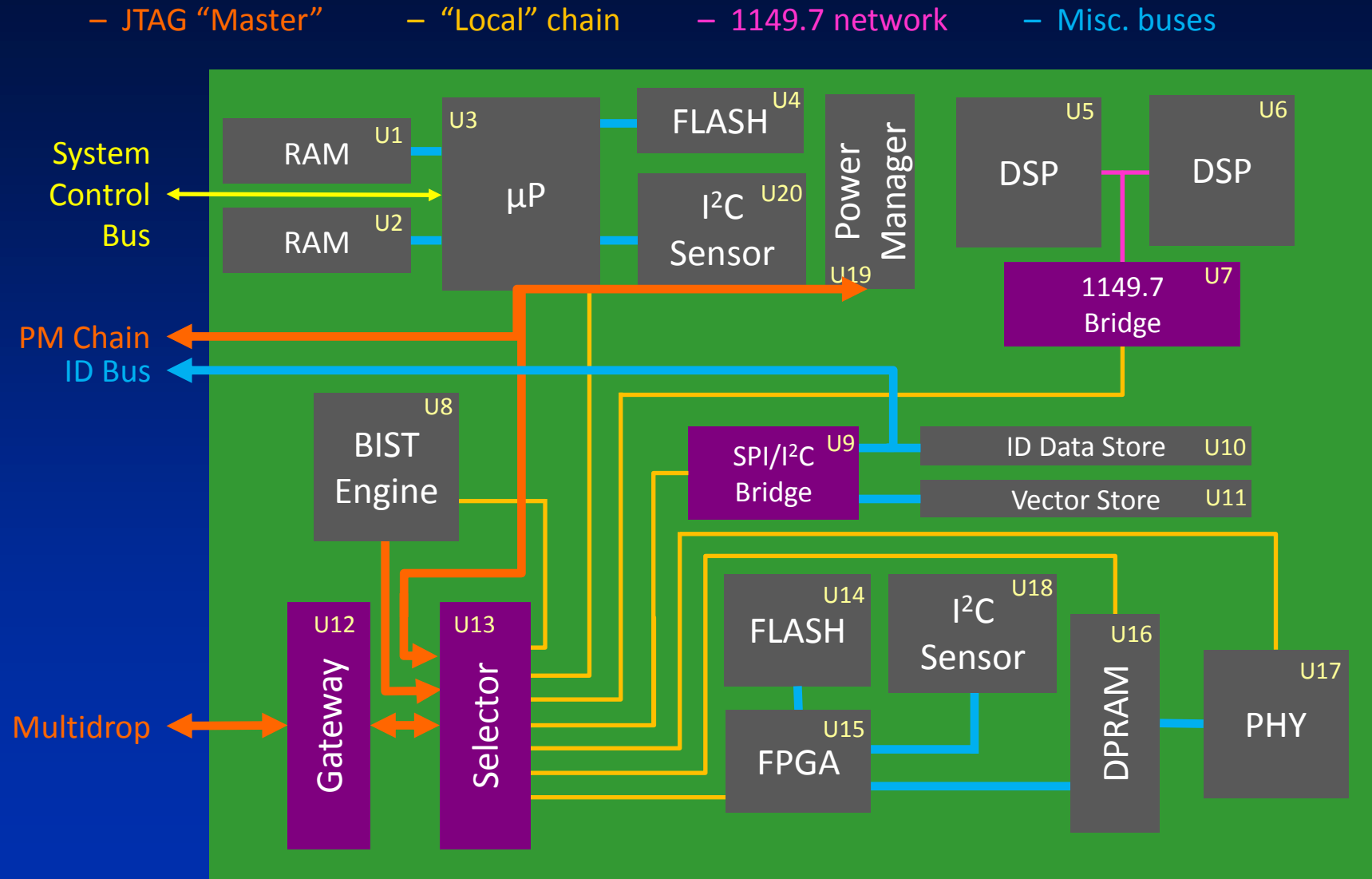
# Standards and Interfaces



- IEEE 1149.1 (JTAG), 1687 (iJTAG)
- SPI, I<sup>2</sup>C, USB
- IEEE 1856: prognostics
- IEEE P1838 (3-D test), P2427 (analog test)
- 6LowPAN, ZigBee, Z-Wave, Bluetooth/BLE



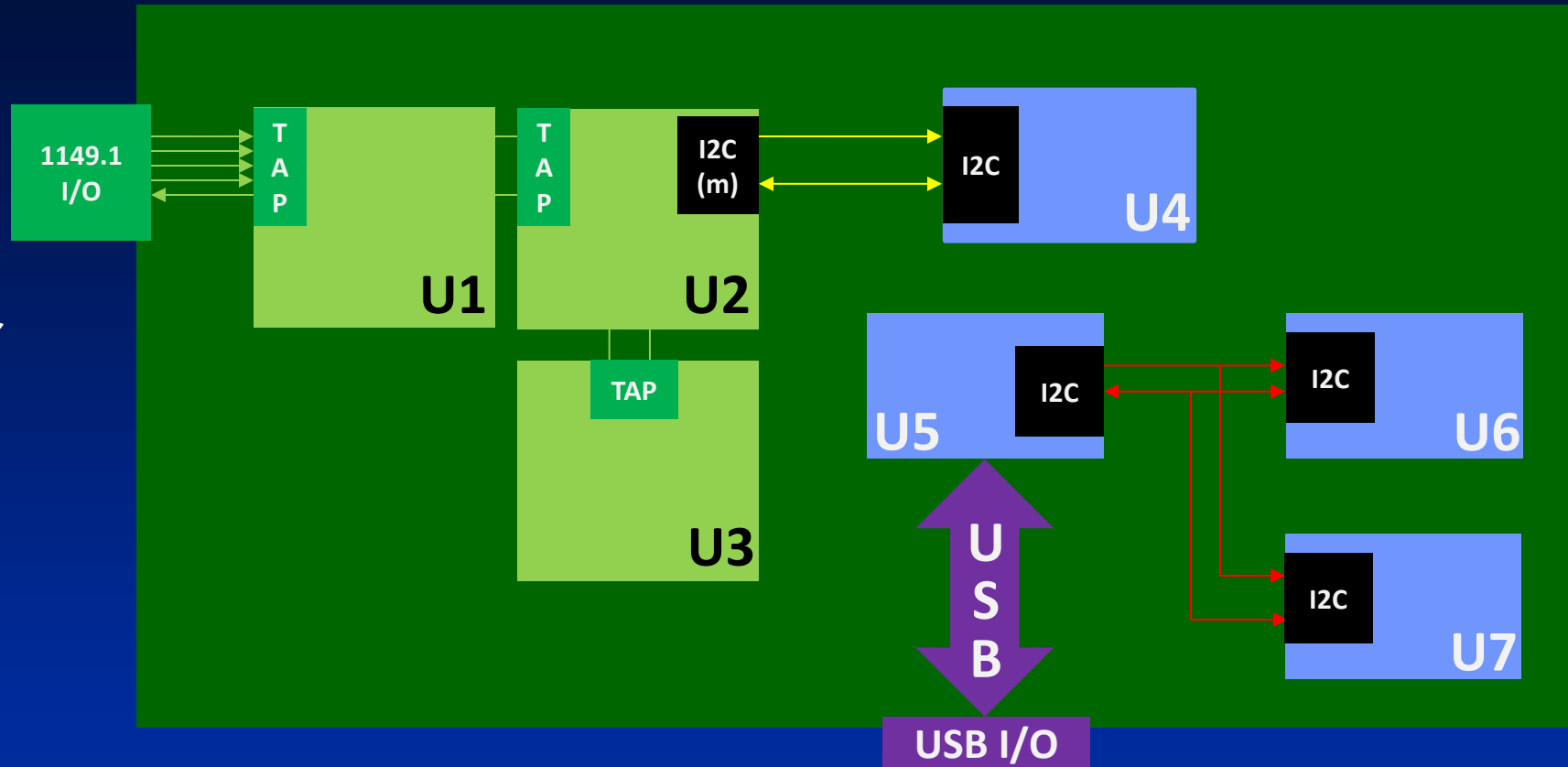
# Illustrative SJTAG Infrastructure



# Board test use model: JTAG + I2C



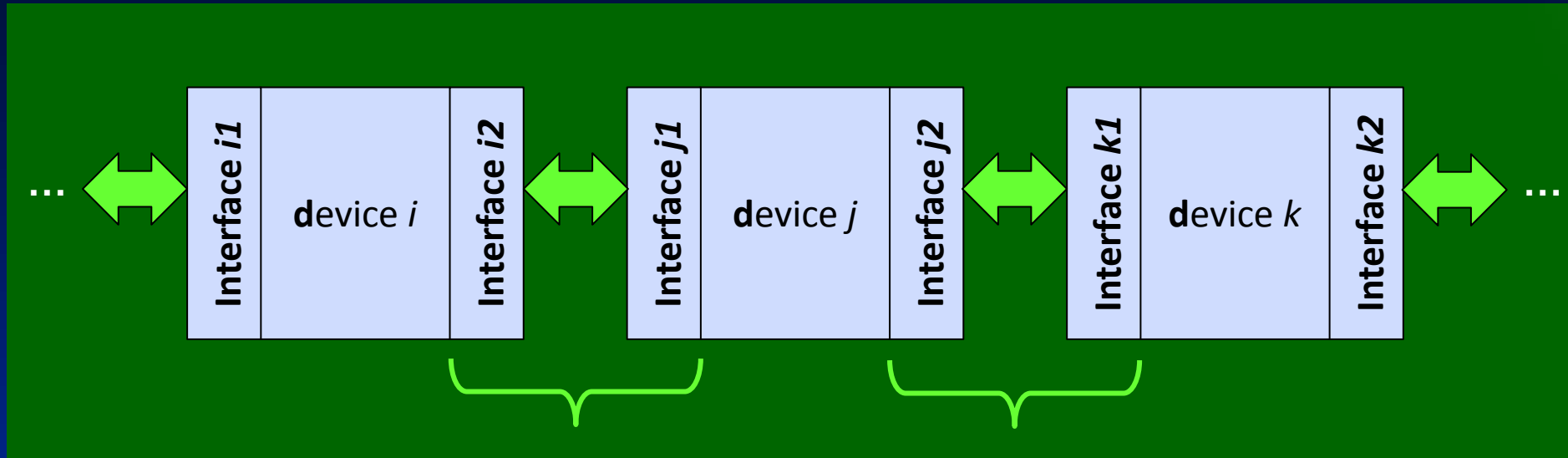
Hand-Off  
Paradox



- U1, U2, U3 are accessible by JTAG (1149.1) board test interface.
- U4 may be accessible *if* U2's I2C master can be accessed via JTAG.
- How do we access U5, U6, and U7, which have a captive I2C bus?
  - Treat the functional (non-TAP) interfaces as “instruments” to retarget through.



# From IEEE 1687.1 WG Meeting: April 17, 2018

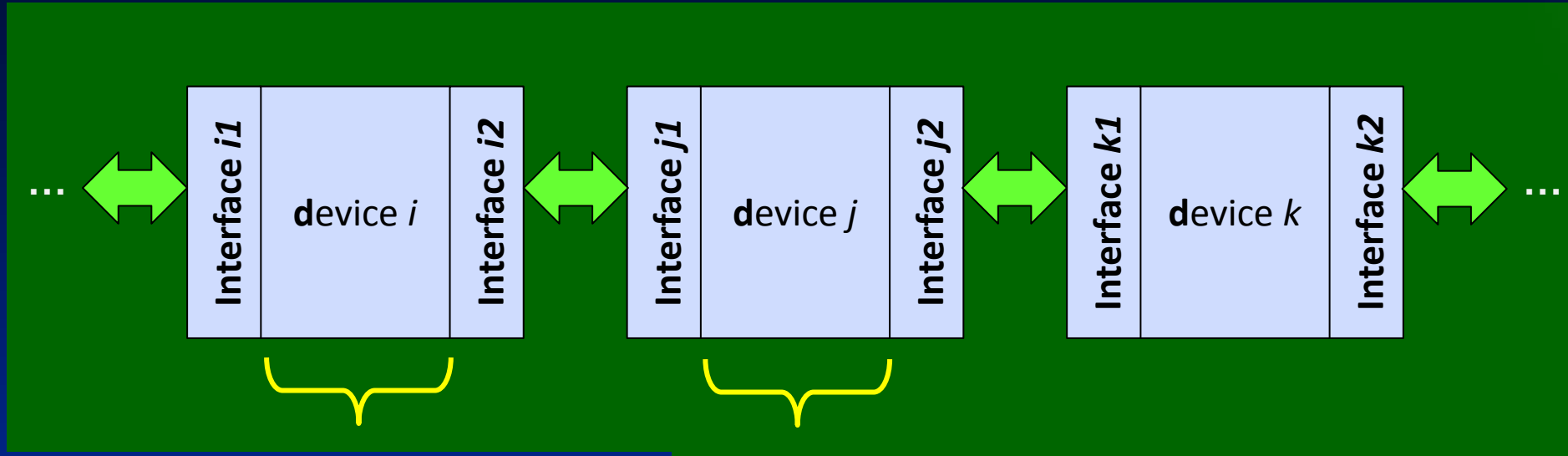


This is an interface-to-interface connection using some defined protocol (e.g. I2C master to I2C slave)

... and so is this (e.g. 1687 scan host to 1687 scan client)

- These are **easy**; they are well-defined protocols designed for plug-and-play usage.
- Protocol transactions can be represented in some relocatable vector format.

# From IEEE 1687.1 WG Meeting: April 17, 2018

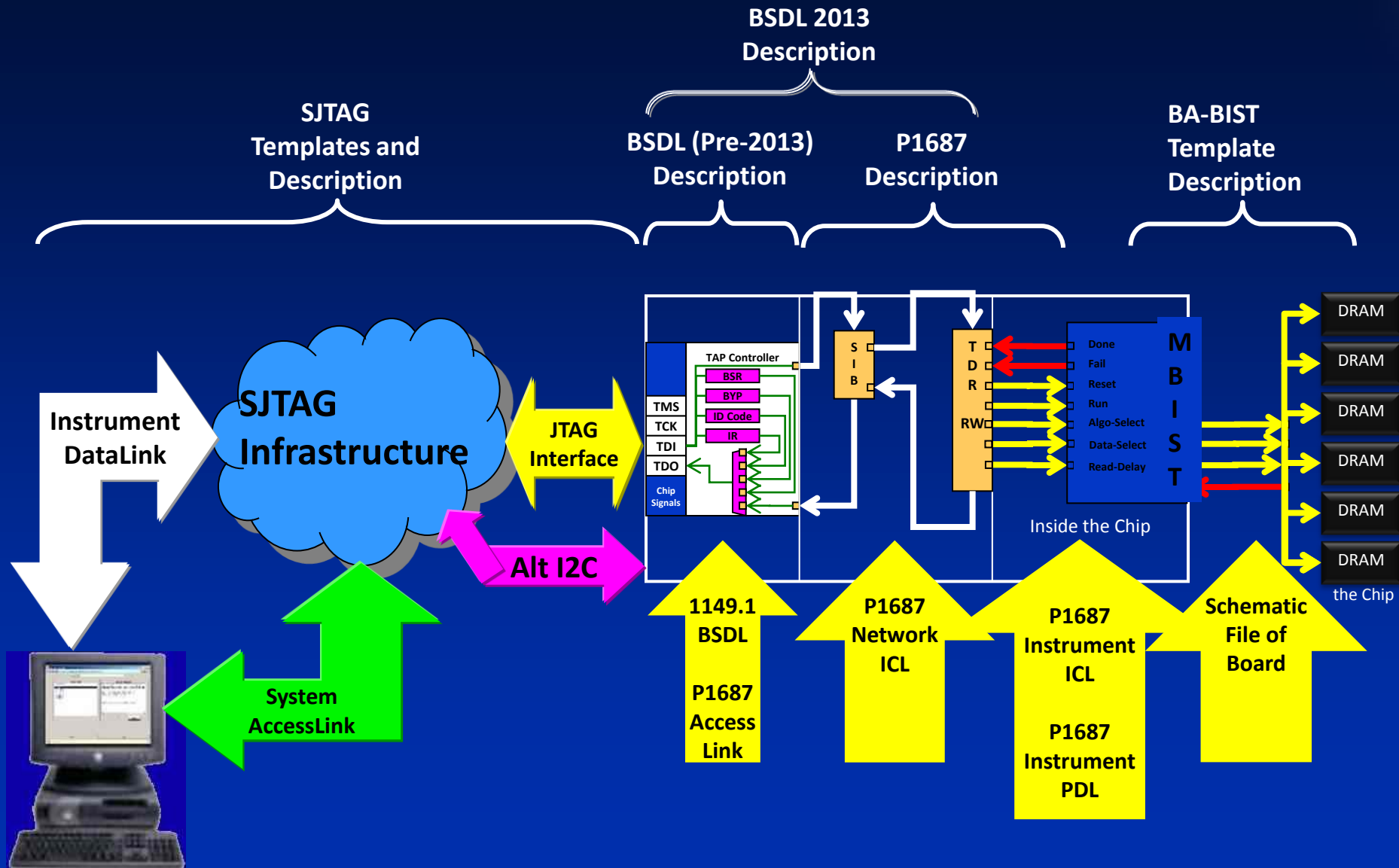


This is a device which (presumably) can transport data from one of its interfaces to another of its interfaces (but how?)...  
(example: USB RX -to- I2C master)

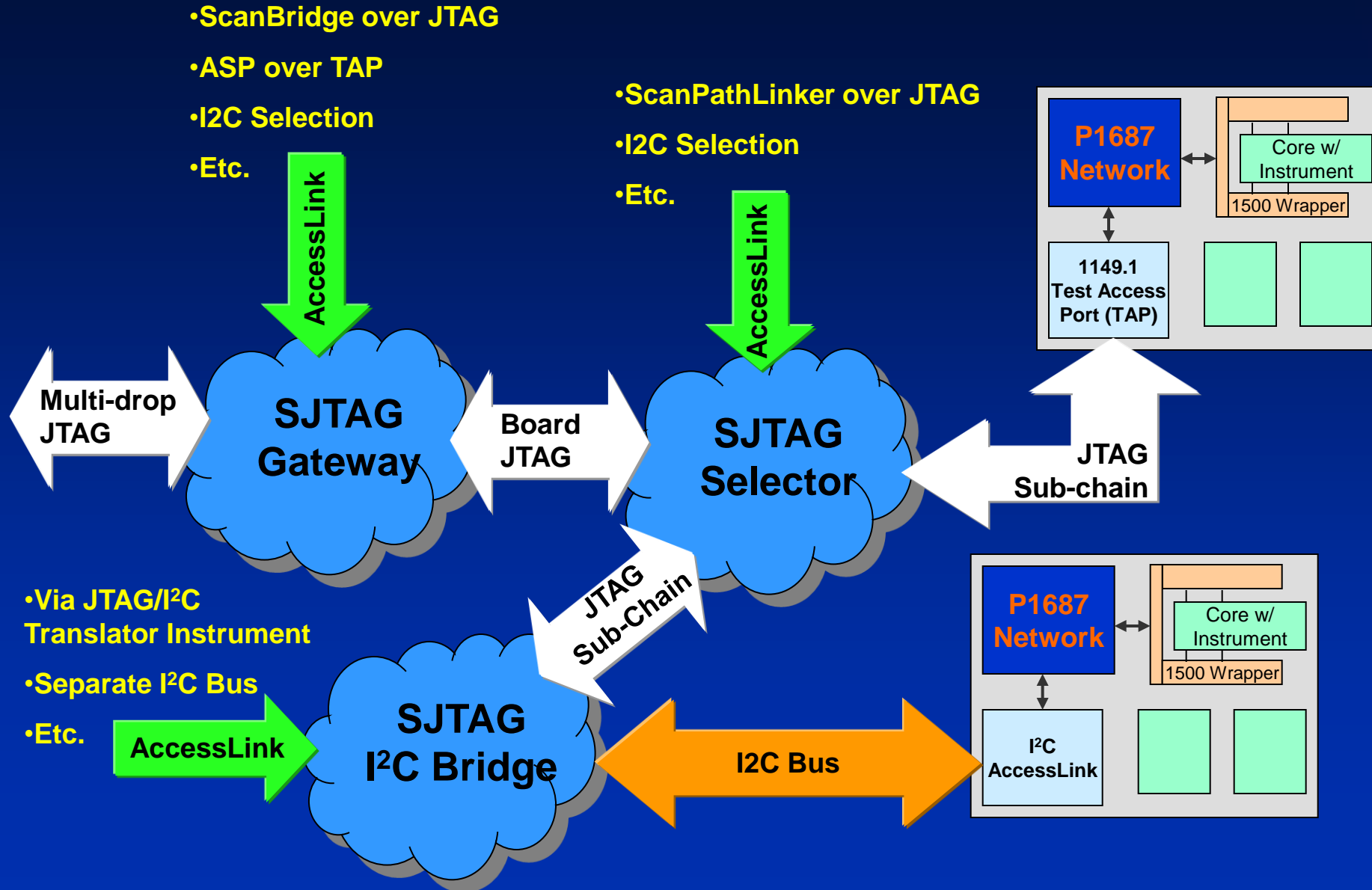
and so is this (but how?)  
(example: I2C slave -to- 1687 scan host)

- These are hard; they require device knowledge and have no well-defined structure.
- Transport can be modeled in a high-level programming language.

# E-MBIST Ecosystem for Data Transfer



# System-Level Access/Data Path Concept



# Call to Action / Next Steps



Join the STAM Working Group to...

- develop protocols for design/verification by EDA; and
- define security requirements.

Any other concerns?

# Conclusion



- **PROBLEM:** As 2-D Moore's "Law" scaling gains diminish, heterogeneous integration of sub-system assemblies will drive cost and performance gains while complicating test/diagnosis.
- **SOLUTION:** STAM-compliant IP designs and EDA tools enabling seamless access to sub-systems for test, diagnosis, and prognosis