

What Do Embedded Instruments Look Like?

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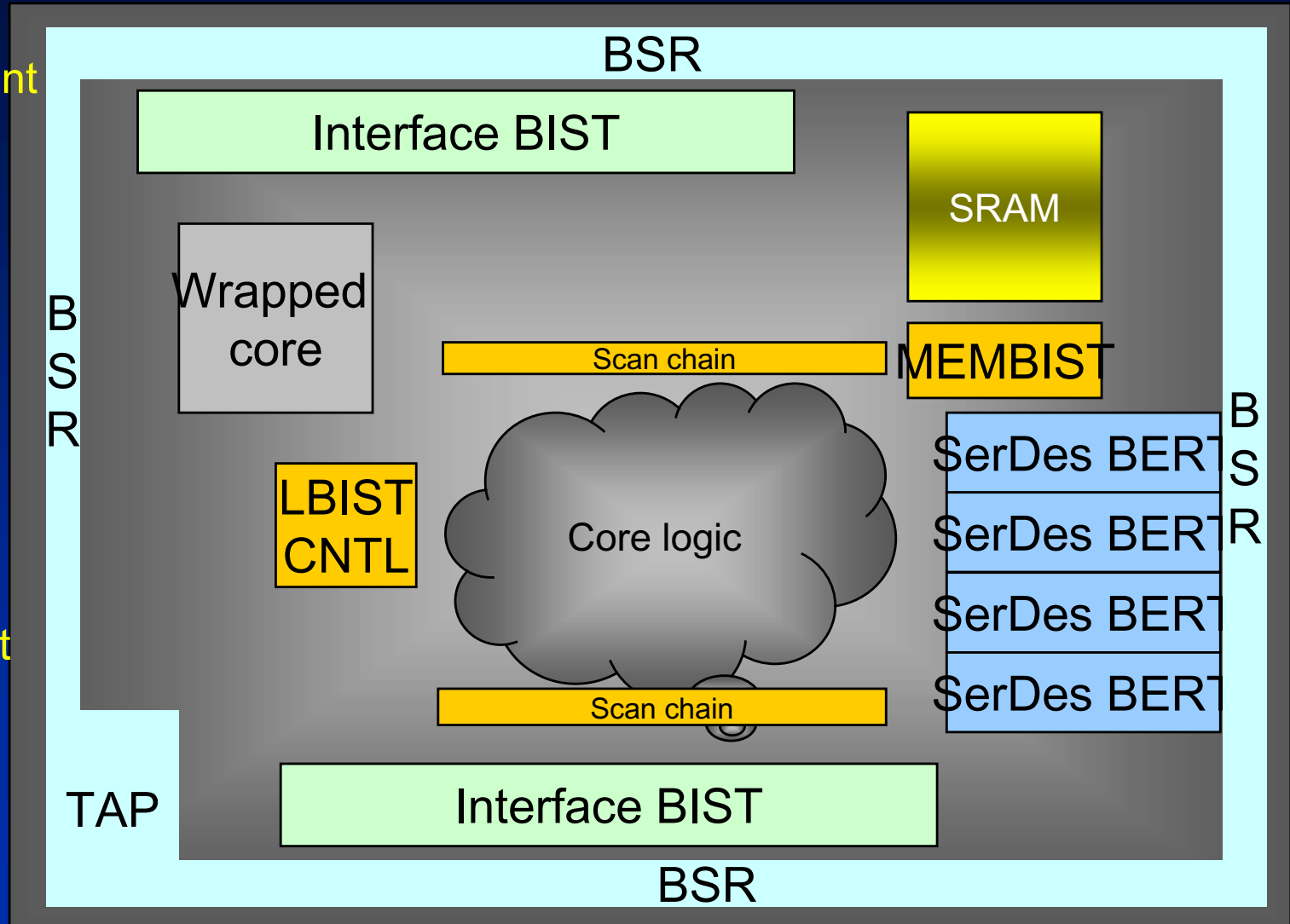


Outline

- ❑ IEEE P1687 Background
- ❑ HSSIO Background
- ❑ Embedded Instruments for HSSIO
- ❑ P1687-based HSSIO Characterization Results
- ❑ Implementation and P1687 API Suggestion
- ❑ Conclusion

TAP Access to Chip Test Features

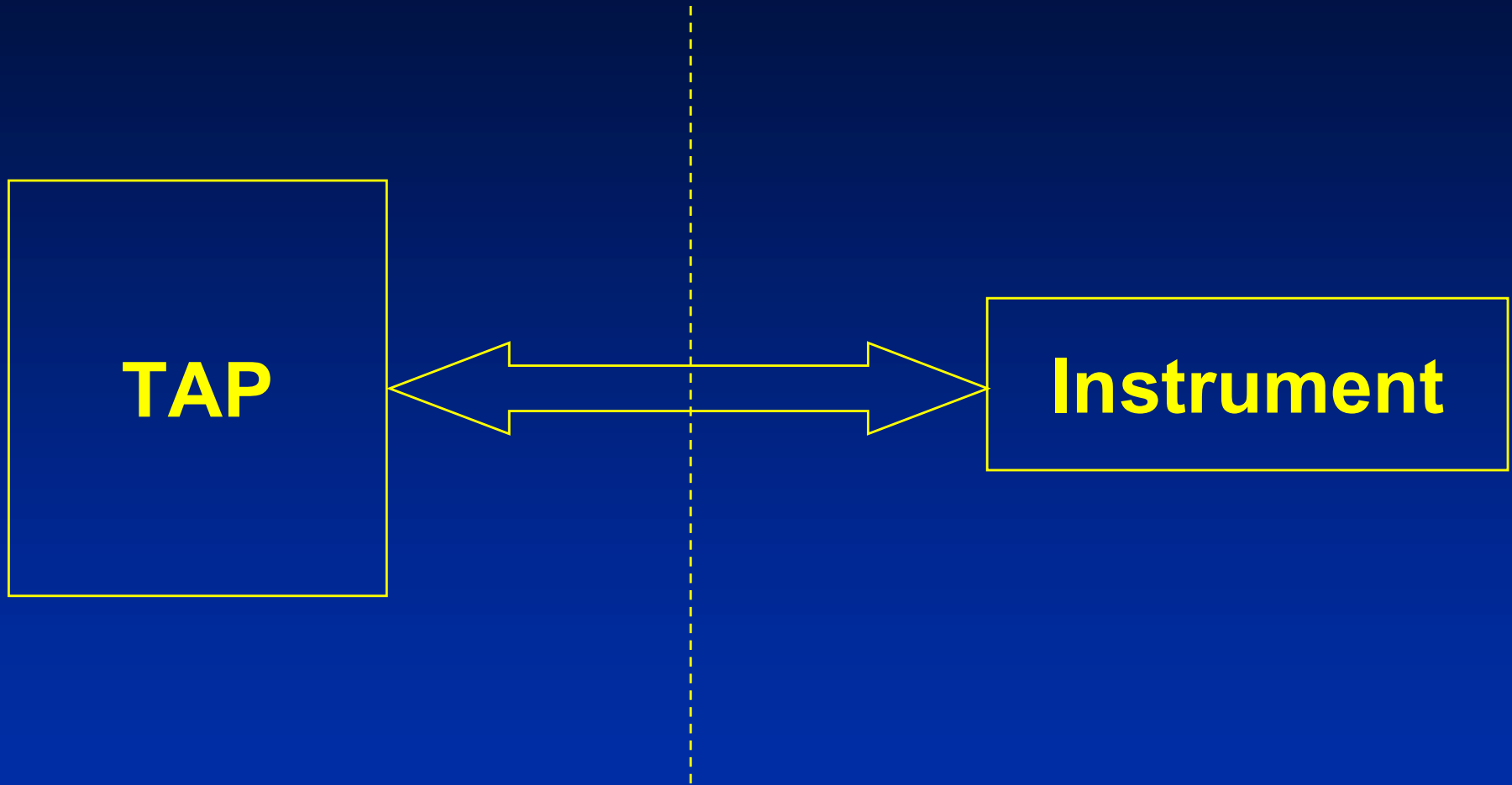
- Power management
- Clock control
- Chip configuration
- Memory test
- Scan test
- Logic BIST
- Debug/diagnosis
- PLL control
- Reduced pin count test
- Fault insertion
- Embedded instruments



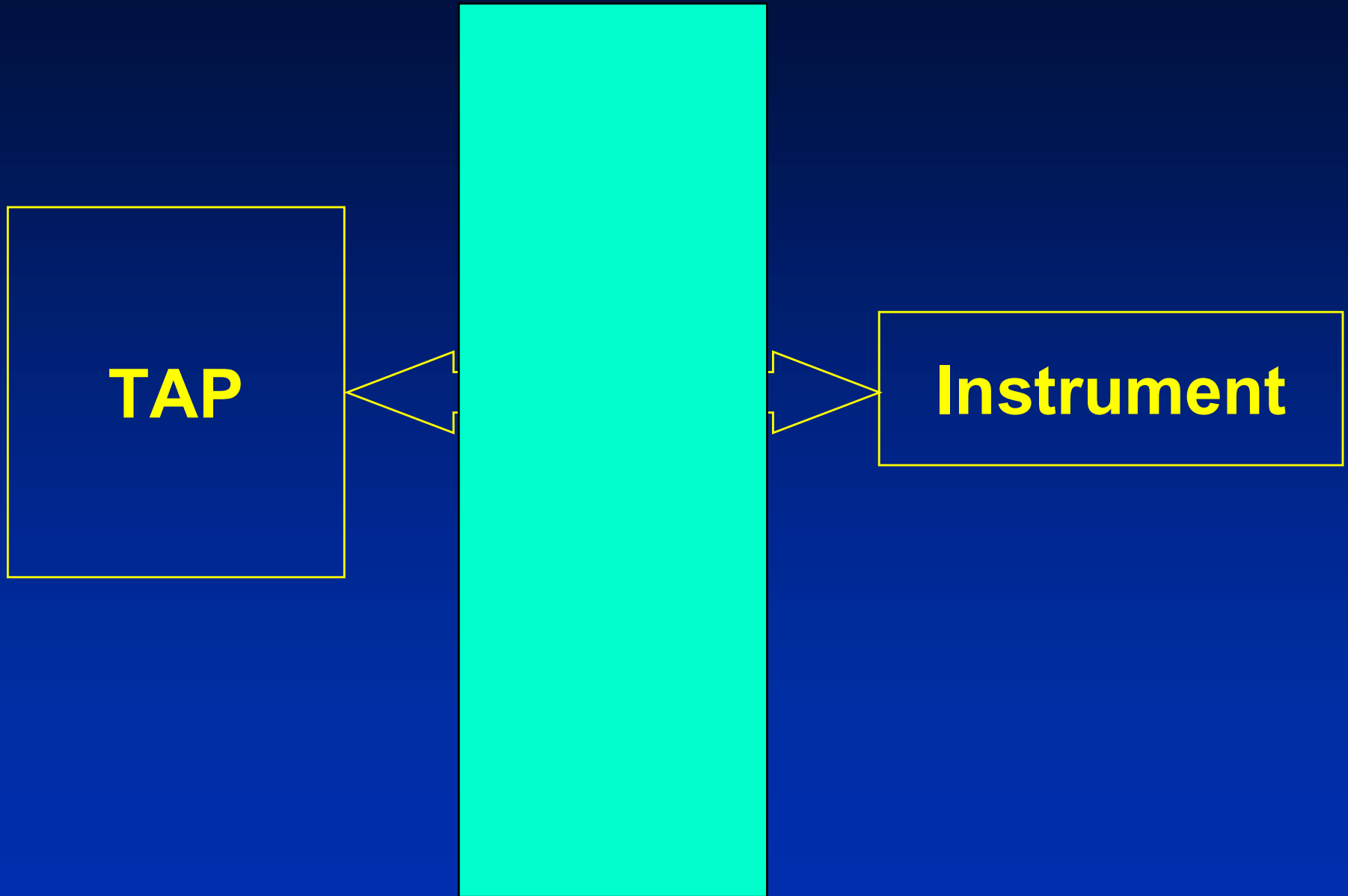
4 Basic Instrument Types

- [A] Simple or “Self-Contained”
- [B] JTAG or “1149.1 Compatible”
- [C] Local-IR or “Self-Instructed”
- [D] Complex or “Non-1149.1 Compatible”

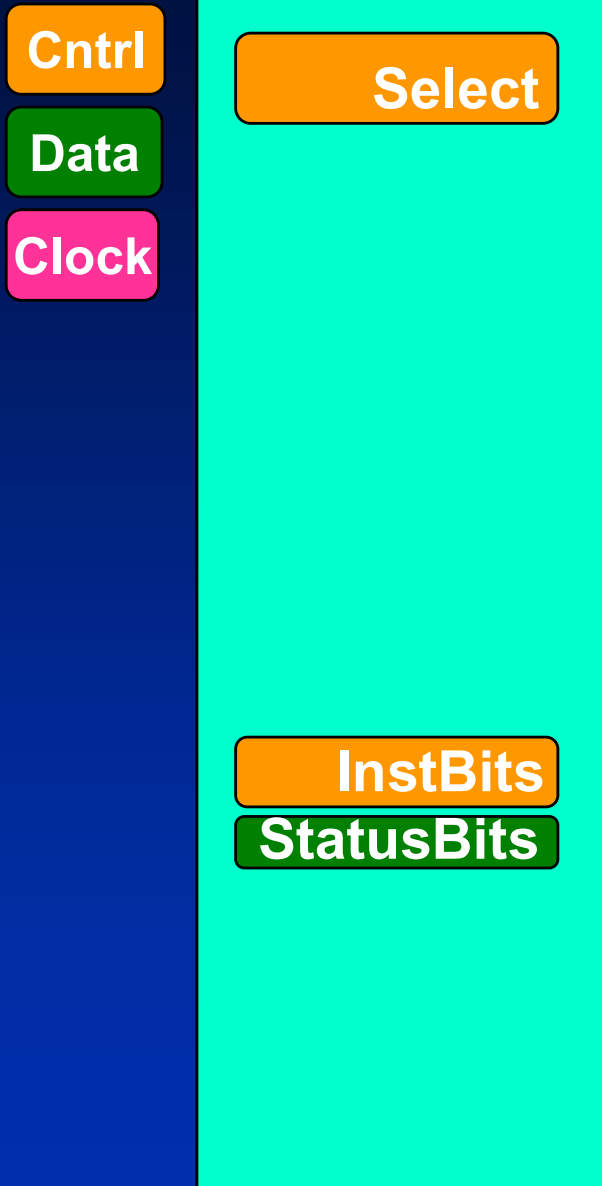
P1687 Interface



P1687 Interface

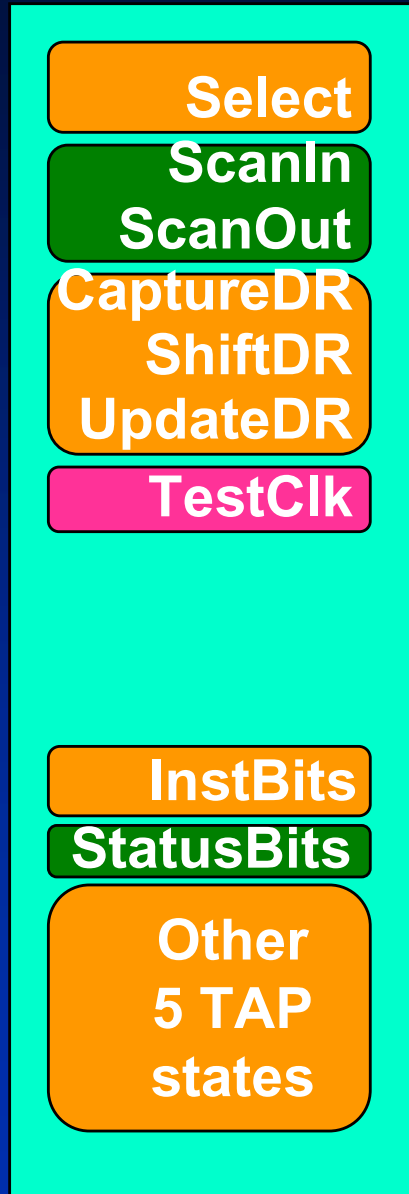


P1687 Interface: Flavors



(Type A)

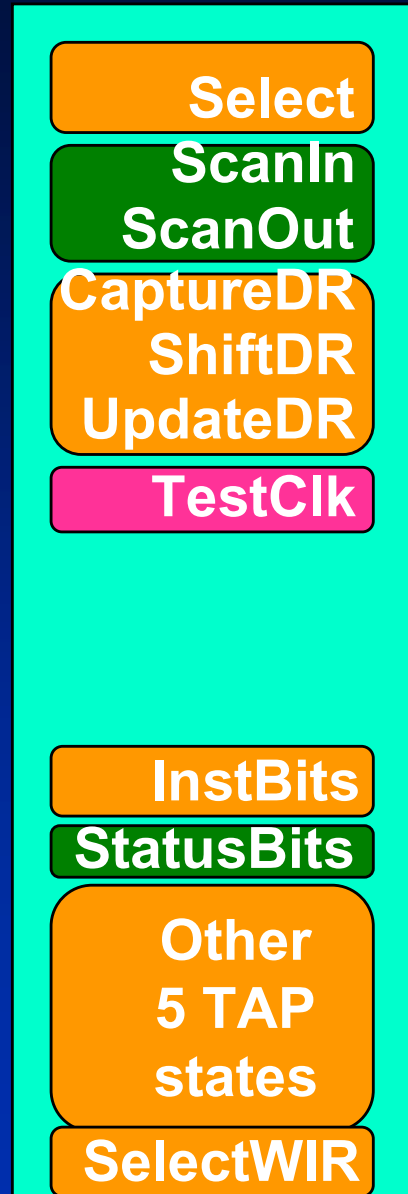
P1687 Interface: Flavors



(Type B)

P1687 Interface: Flavors

- Cntrl
- Data
- Clock



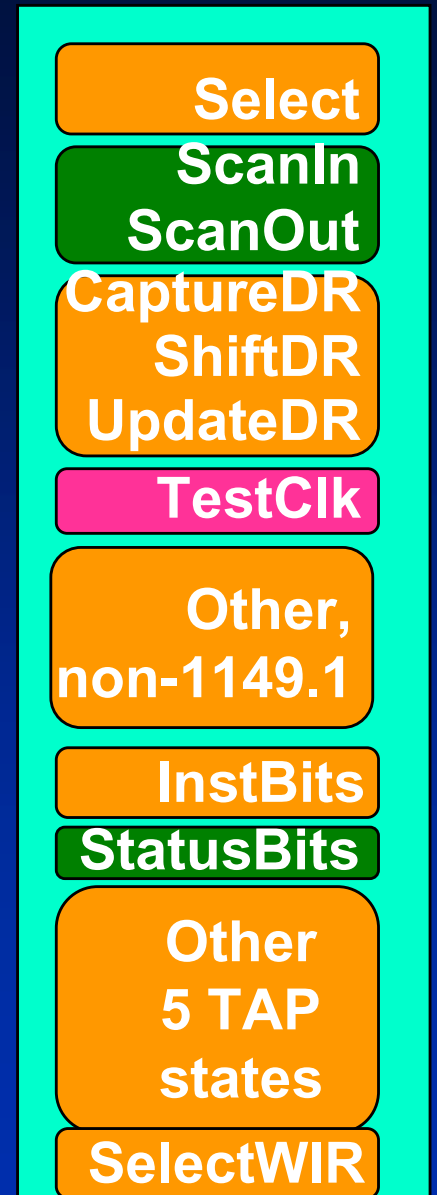
(Type C)

P1687 Interface: Flavors

Cntrl

Data

Clock



(Type A)

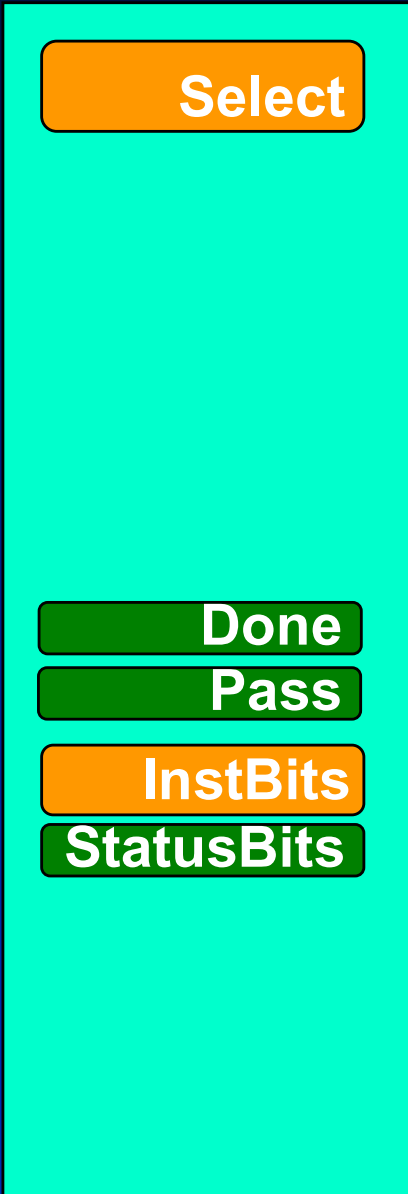
(Type B)

(Type C)

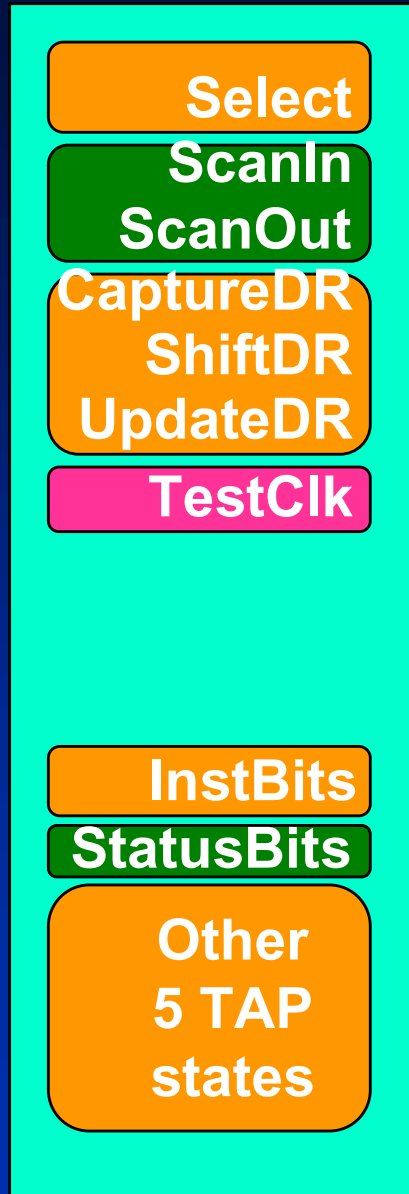
(Type D)

P1687 Interface: Flavors

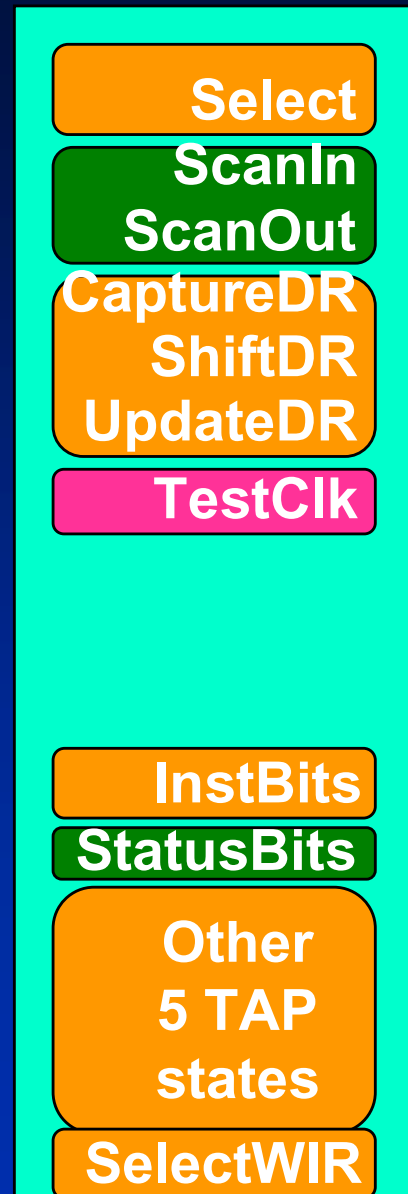
Cntrl
Data
Clock



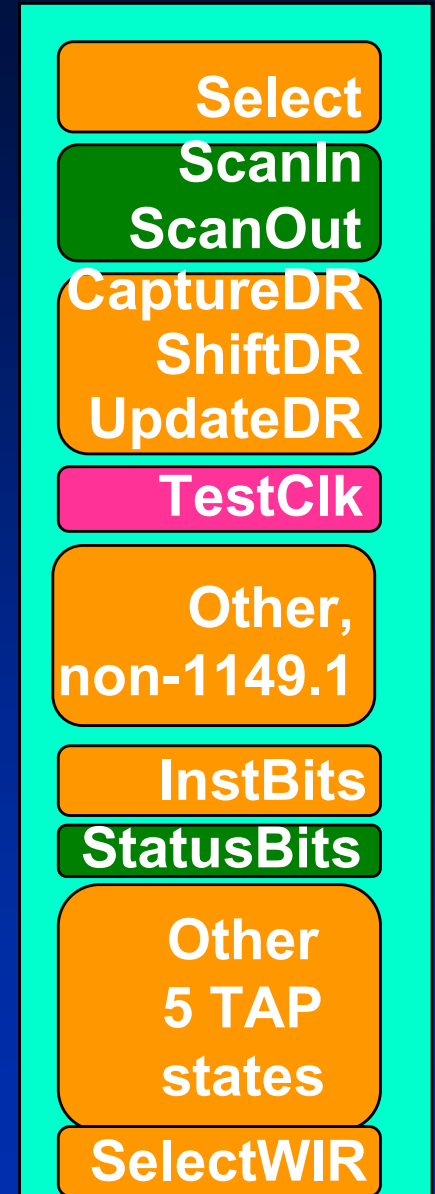
(Type A)



(Type B)

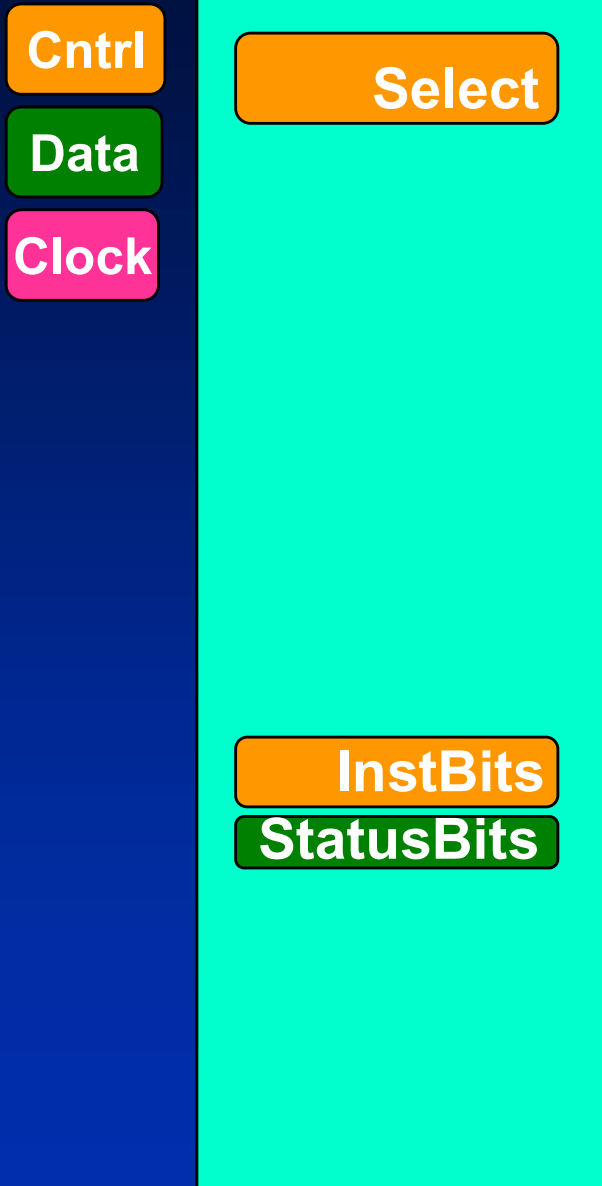


(Type C)



(Type D)

P1687 Interface: Flavors

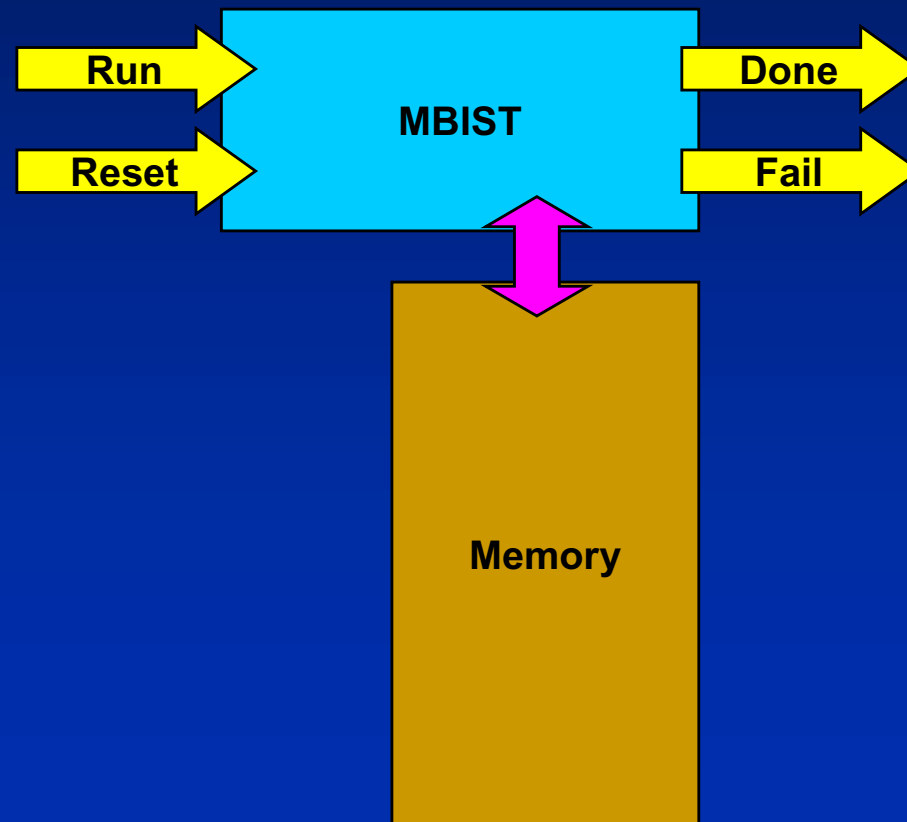


(Type A)

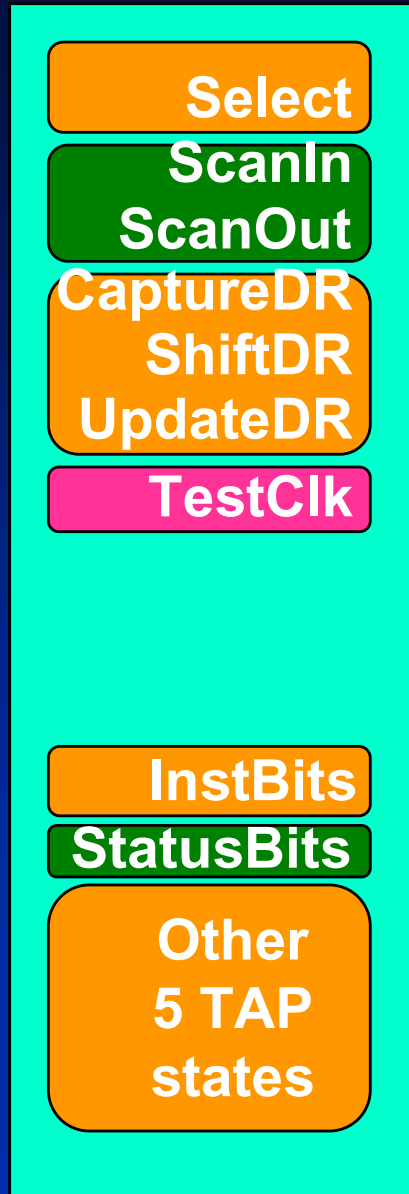
Instrument Examples

Type A: Self-Contained: Simple MBIST

- Clock used doesn't matter to P1687 if there is no configuration/control of the clock required
- Control and Report structure is comprised only of static signals

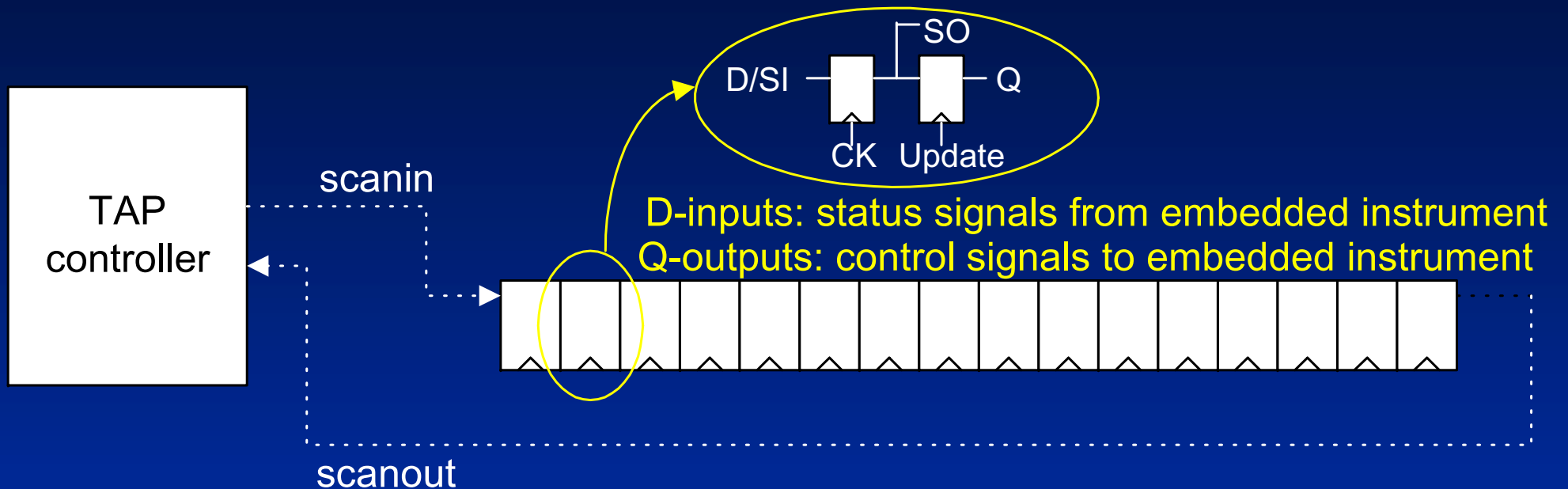


P1687 Interface: Flavors



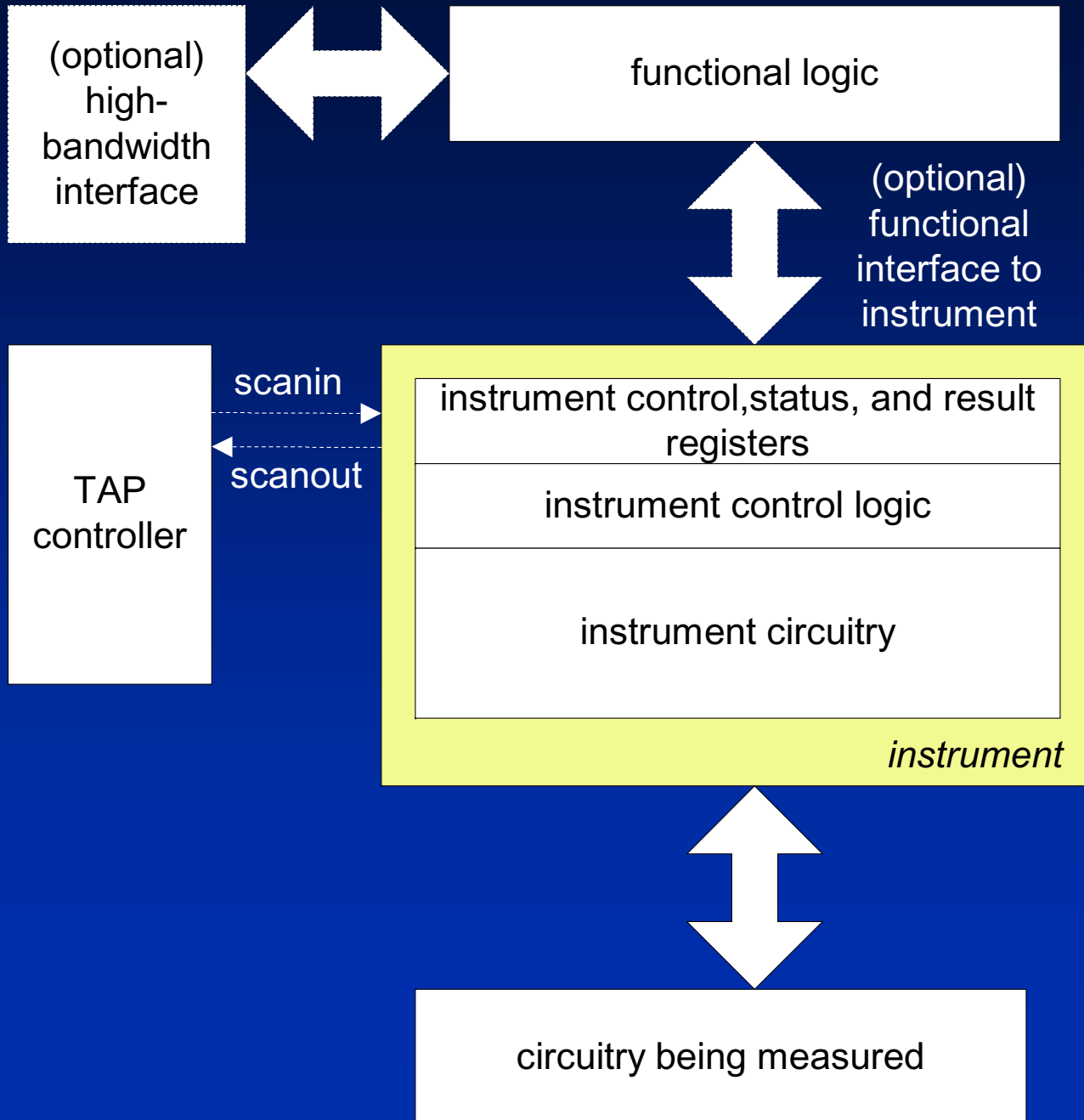
(Type B)

Instrument Scan Interface



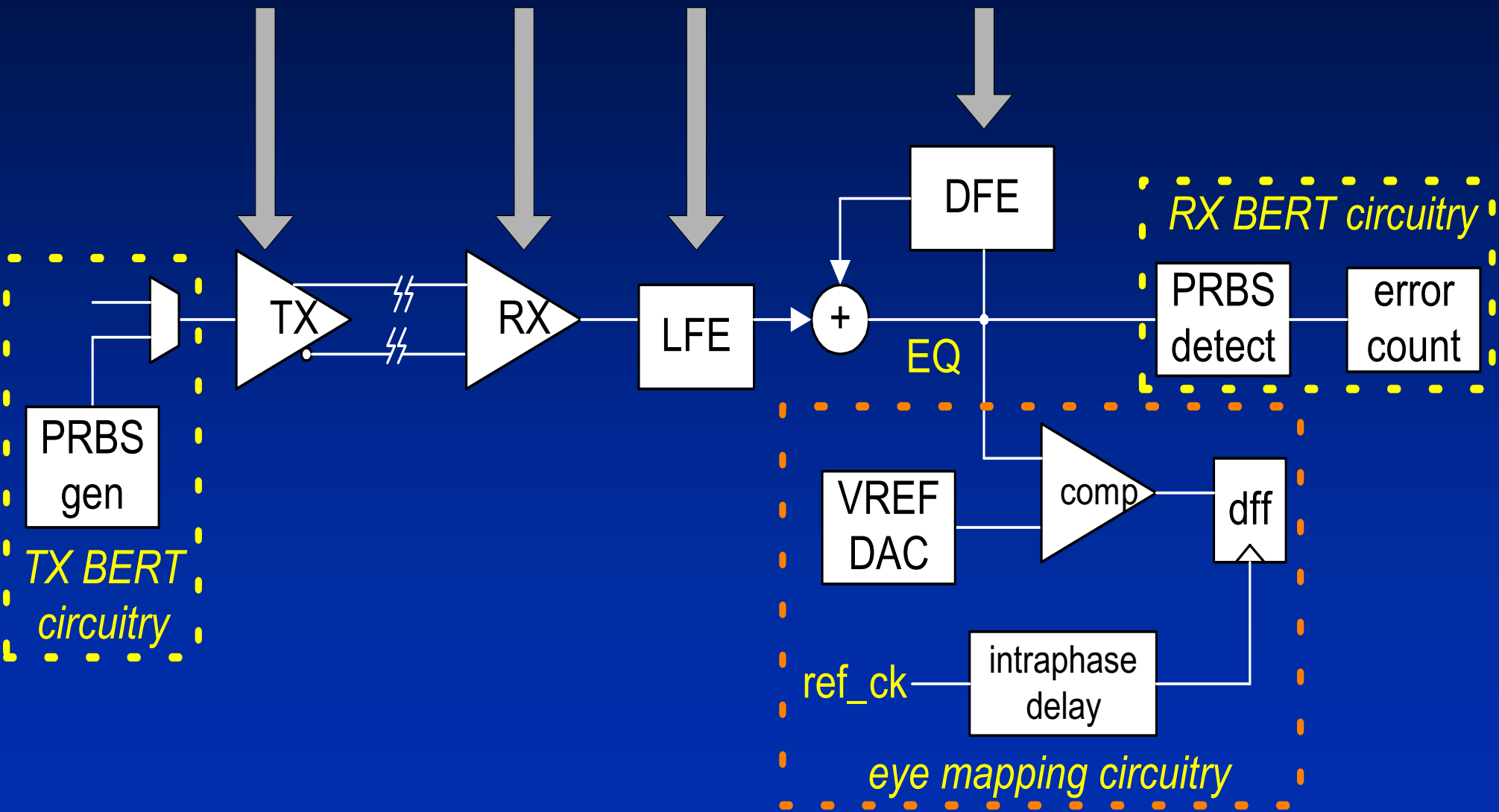
- ✓ Update fired after scanin complete
- ✓ Scan chain safely polled for “done” bit

P1687-Friendly Instrument/TAP Interface



High Speed Serial I/O Circuitry DFT

parametric adjustment interfaces and circuitry

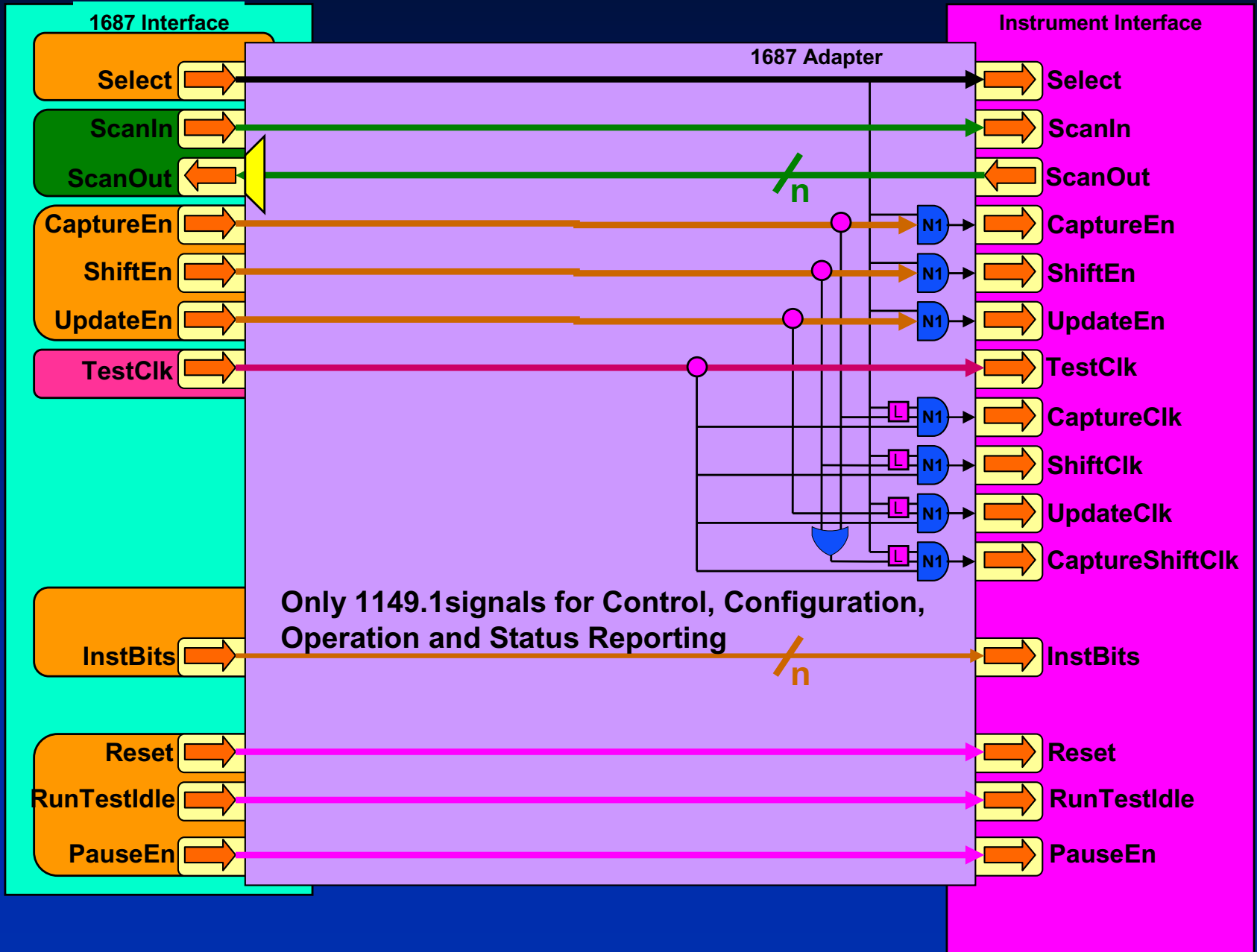


[B] 1149.1 Compatible

Control

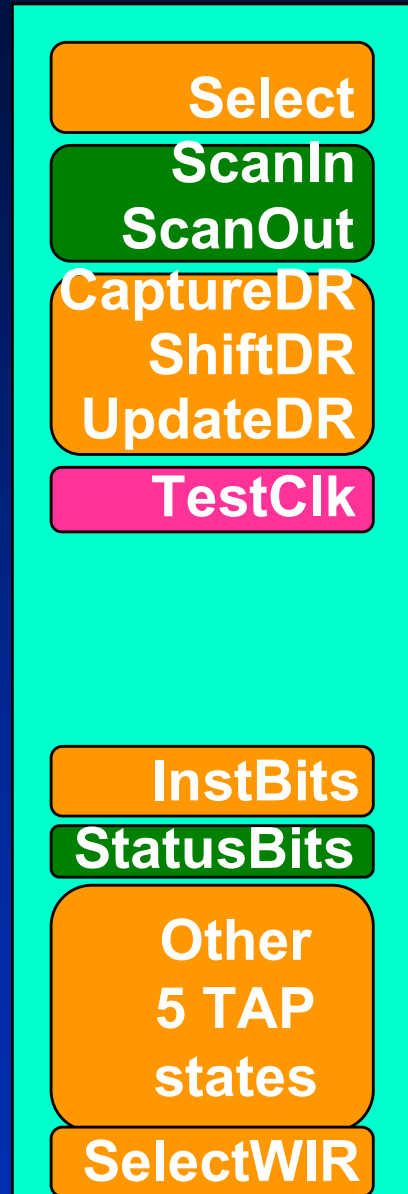
Data

Clock



P1687 Interface: Flavors

- Cntrl
- Data
- Clock



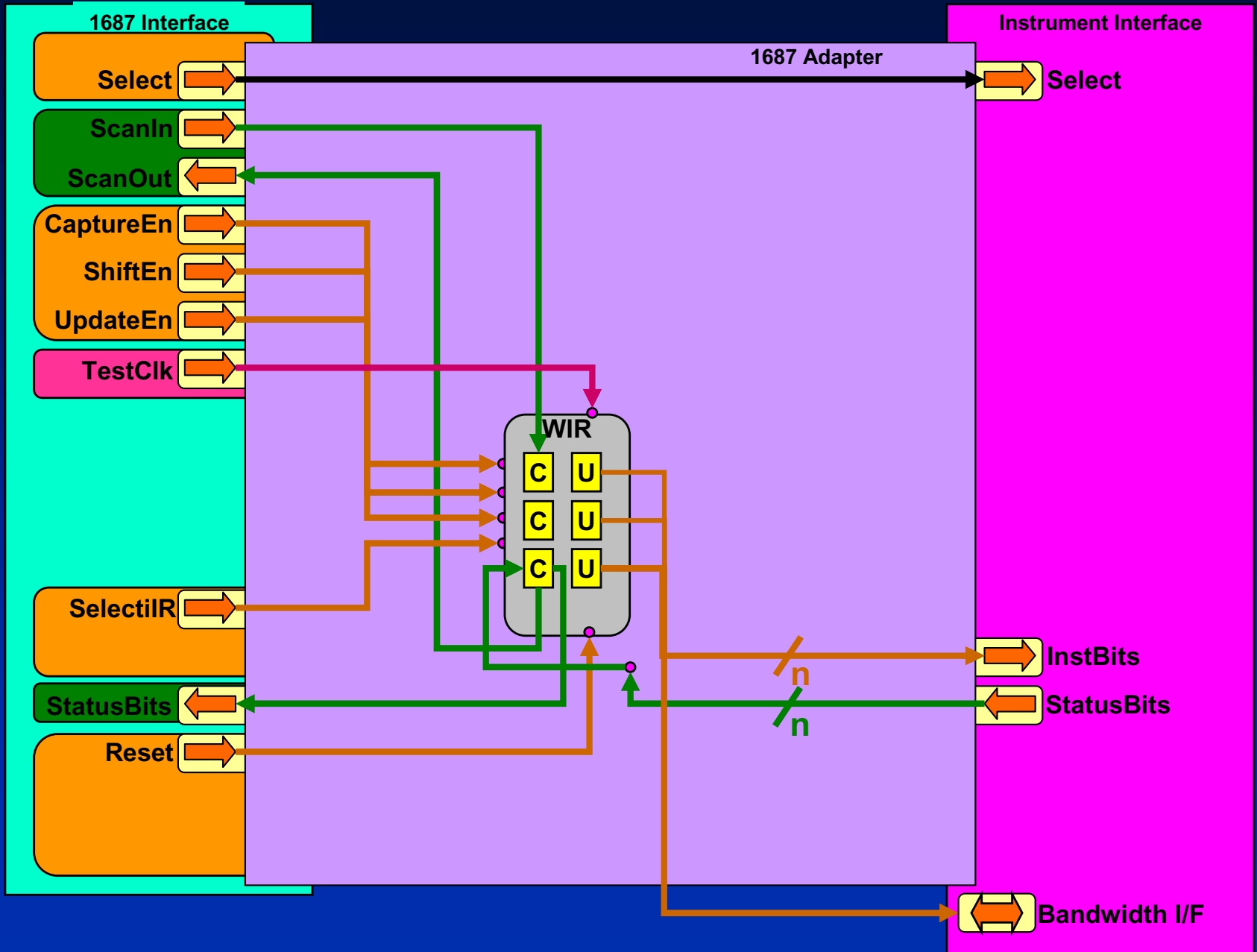
(Type C)

[C] Self-Instructed

Control

Data

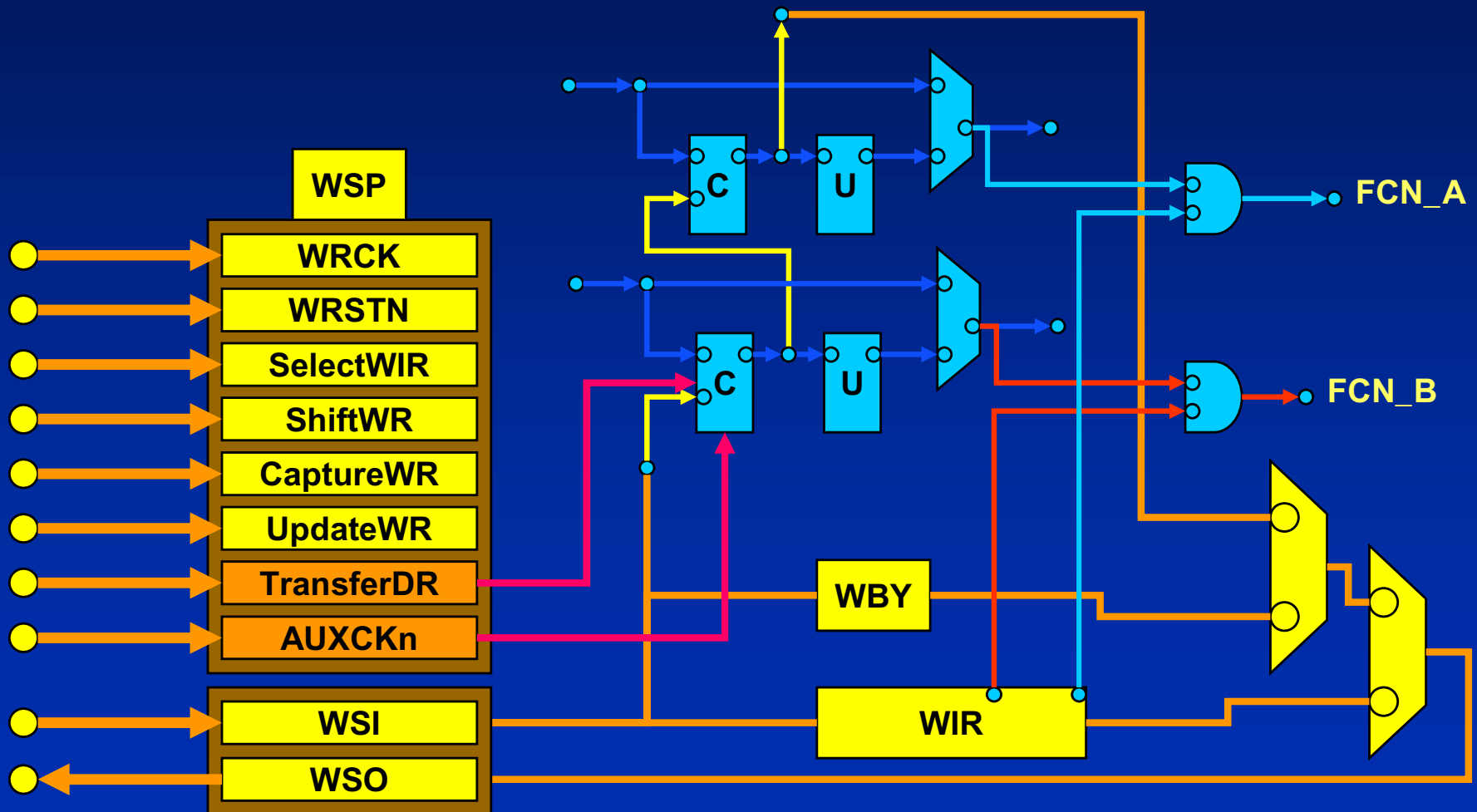
Clock



Instrument Examples

Type C: Self-Instructed: 1500 Boundary Register with WIR

- Instrument Control/Report are from a Local IR
- IR Control/Report from 1149.1 TAP Controller

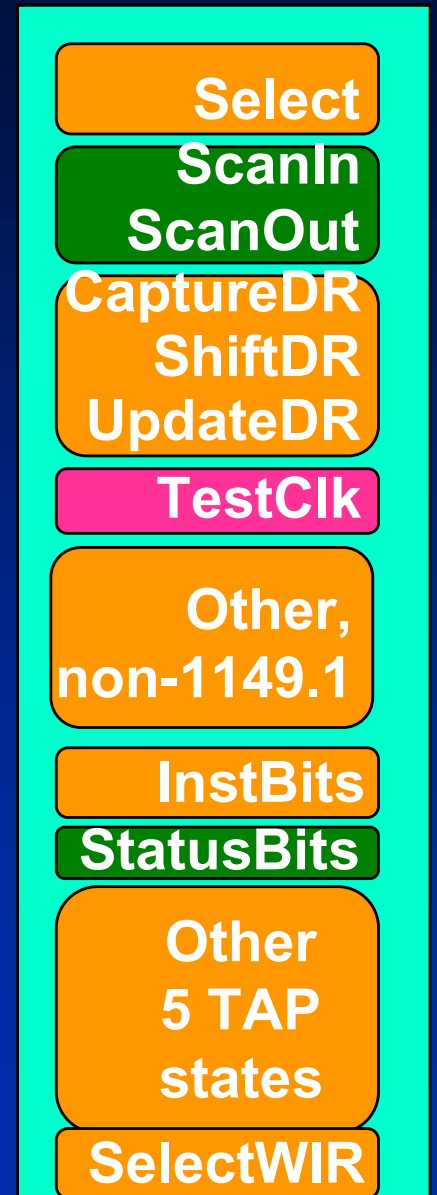


P1687 Interface: Flavors

Cntrl

Data

Clock



(Type A)

(Type B)

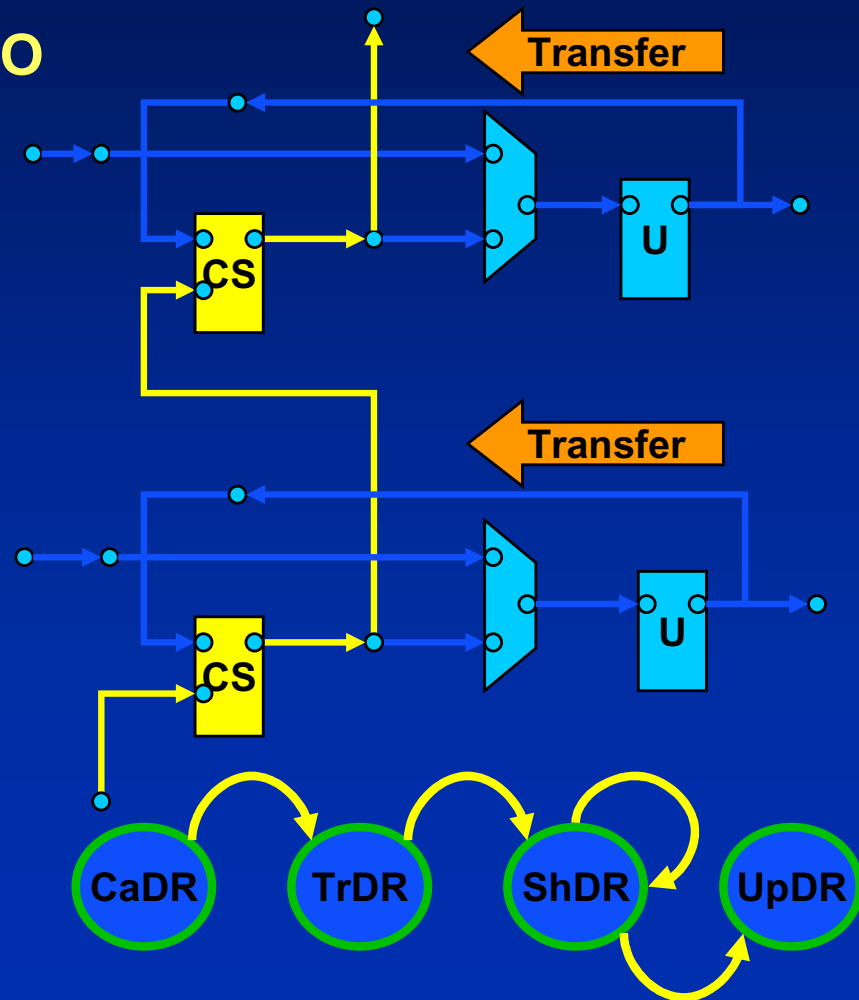
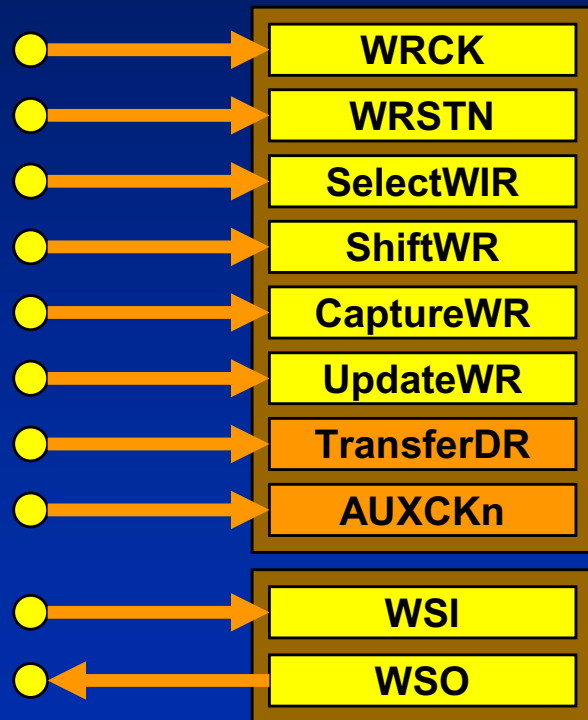
(Type C)

(Type D)

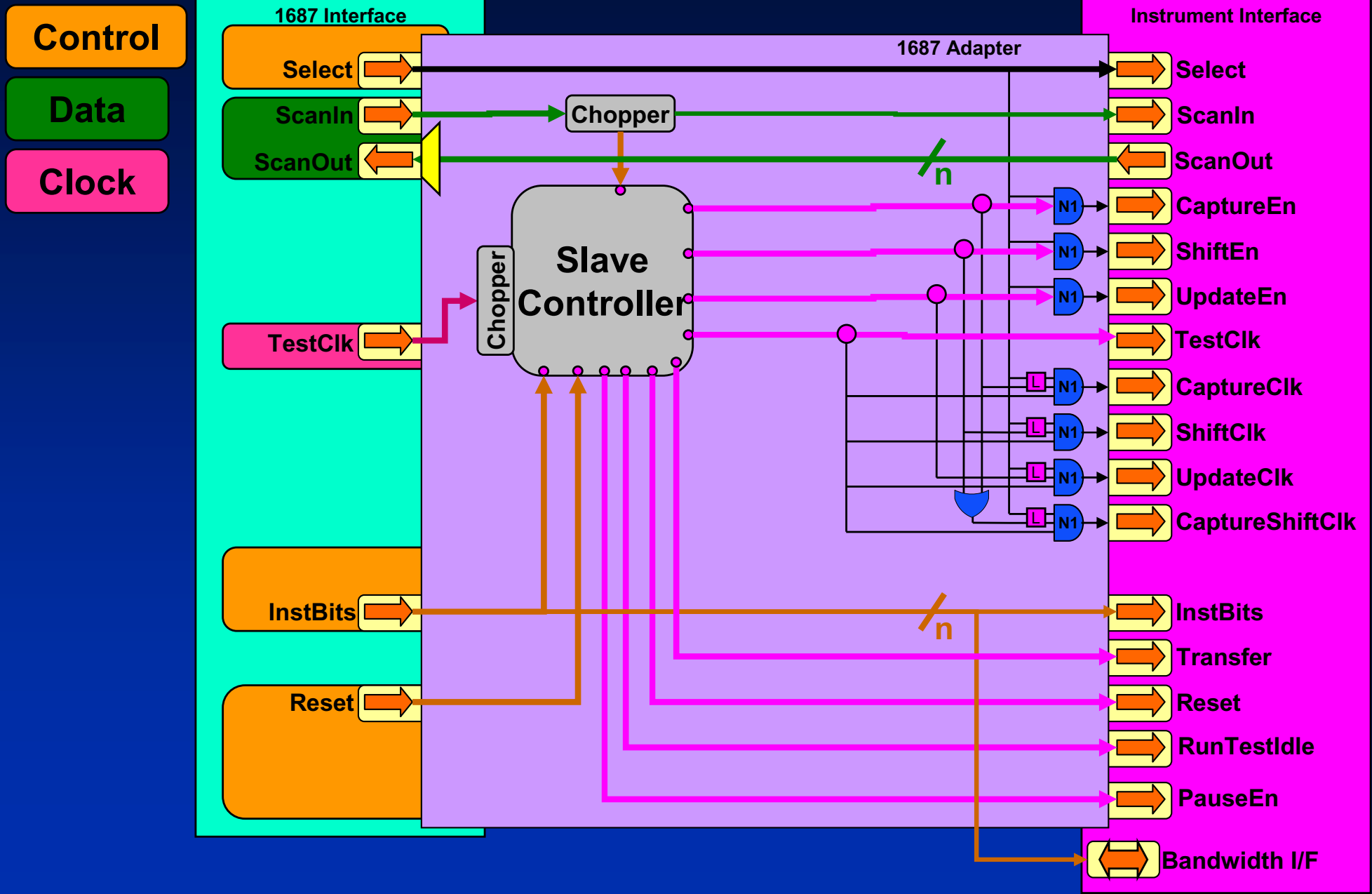
Instrument Examples

Type D: Non-1149.1-Compatible: Complex Wrapper I/F

- A Control or Report signal requires a sequence/signal not available from a compliant 1149.1 TAP Controller
- ...or a Clock other than TCK
- ...or Data from other than TDI-TDO



[D] Complex (non-1149.1 compatible)



Some Real Instrument Examples

- I/O drive strength control **A**
- Memory BIST **A/B**
- AC_CAL clock stretch calibrator **B**
- SerDes BERT **B/C**
- Temperature diode with ADC **B**
- Ring Oscillators for process monitoring **B**
- Vdd droop monitors **A/B**