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A SpaceWire Implementation of Chainless Boundary Scan Architecture for Embedded Testing

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EADS ASTRIUM

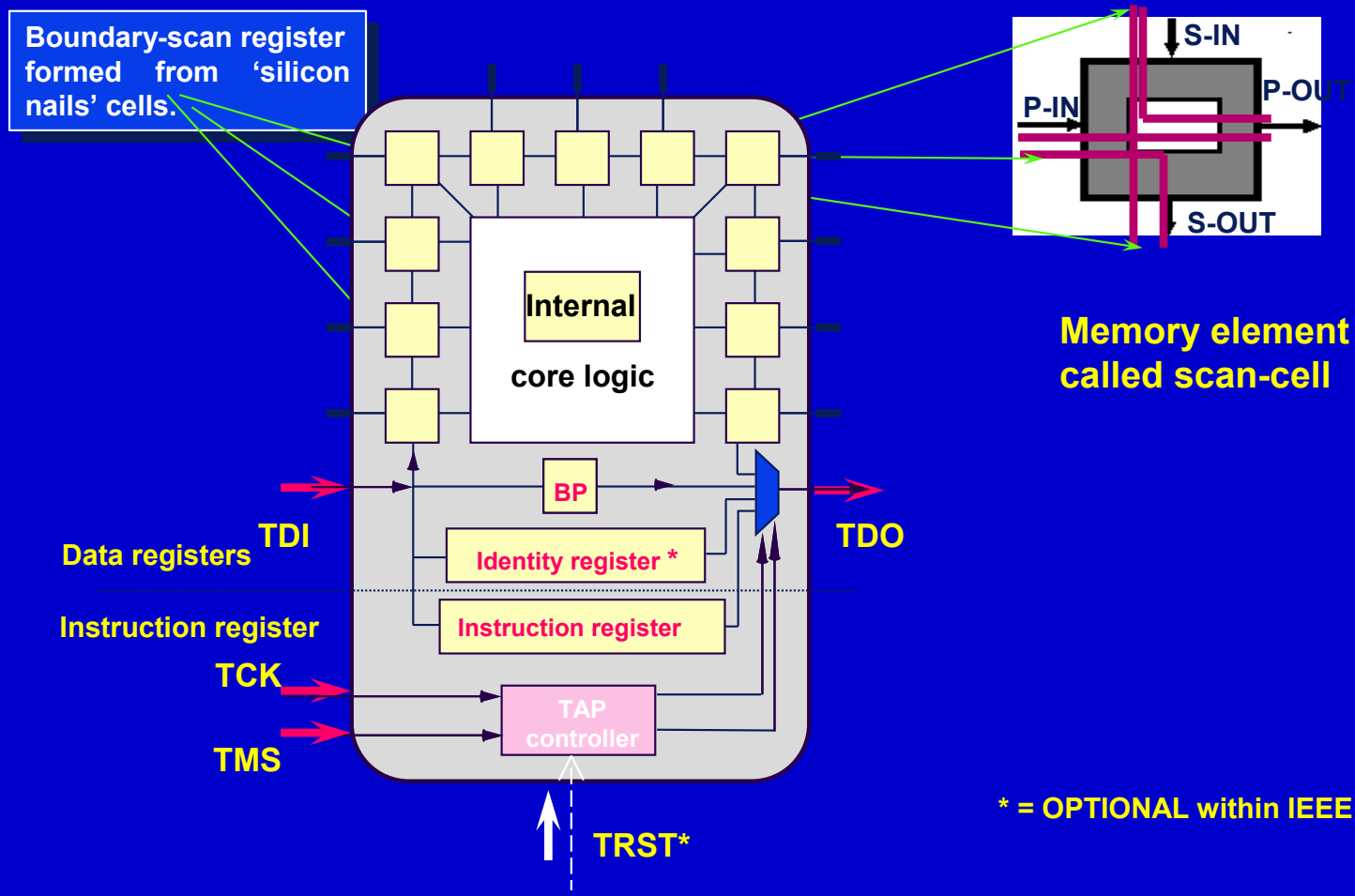
Introduction

- Currently Astrium Ltd uses JTAG boundary scan to perform embedded testing.
- This has been successful on missions such as Inmarsat 4 and Skynet 5.
- This presentation proposes a novel boundary scan architecture “Chainless Boundary Scan” (Patent filed) which is well suited to SpaceWire based systems.
- What is JTAG boundary Scan and how does it work?

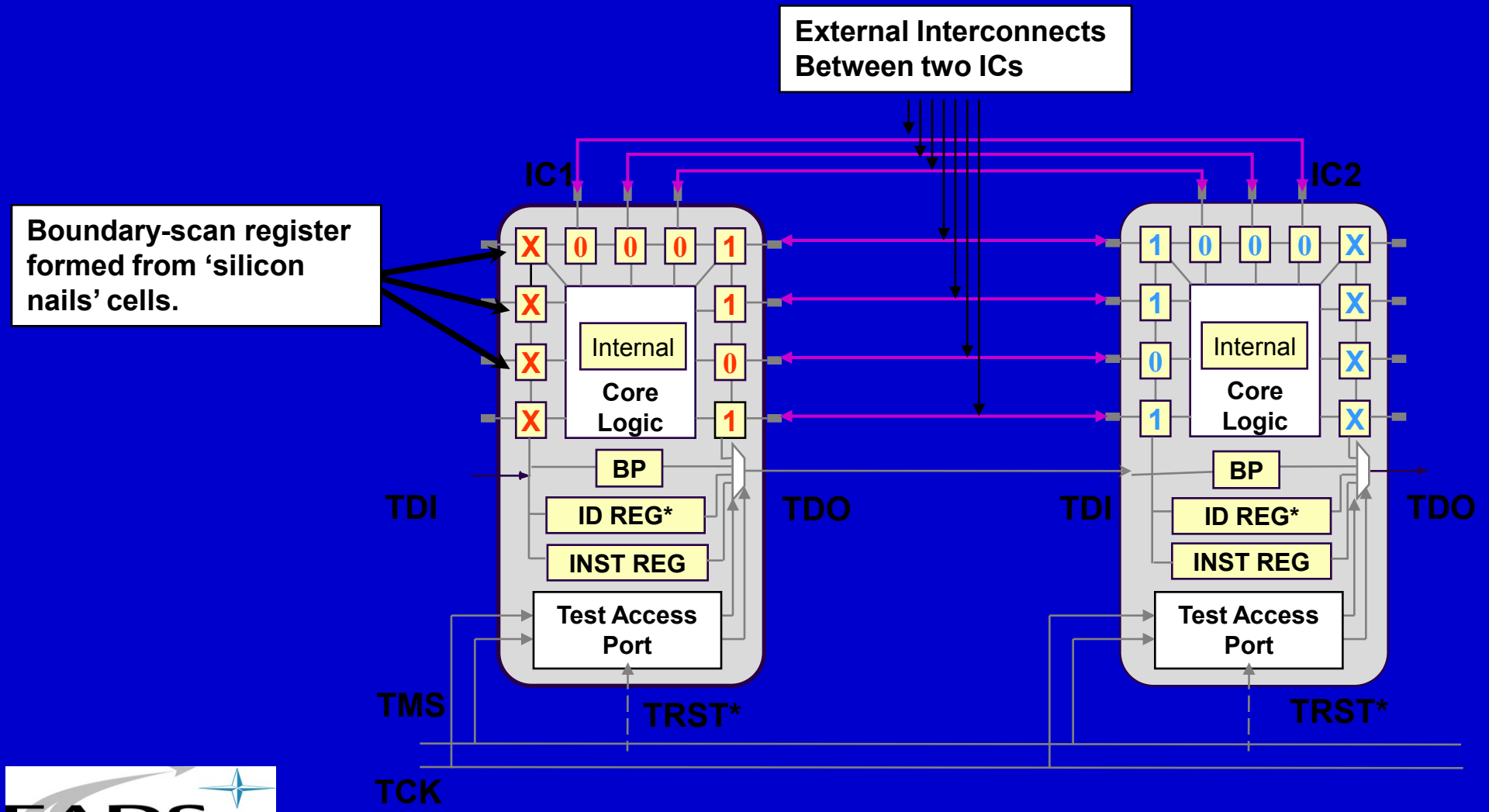
JTAG Boundary Scan- Background

- JTAG Stands for:
  "**J**oint **T**est **A**ction **G**roup"
- The Group was setup in 1985 in Europe (Known as JETAG)
- In 1986, It expanded to include members outside of Europe and hence dropped the 'E' from JETAG to become **JTAG**)
- The IEEE1149.1 std. was approved on the 15th September 1990 and is known as:
- **"IEEE Standard Test Access Port and Boundary Scan Architecture"**
- How does boundary scan work?

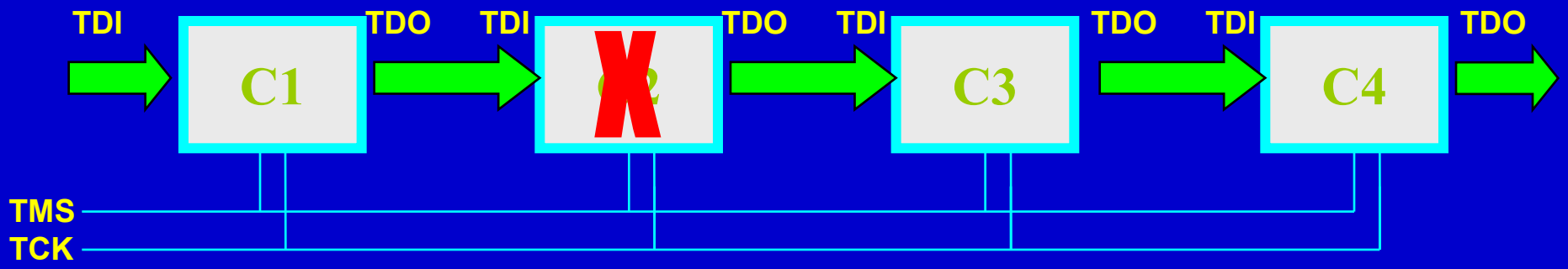
Boundary Scan Cell



Example: Performing interconnect Testing



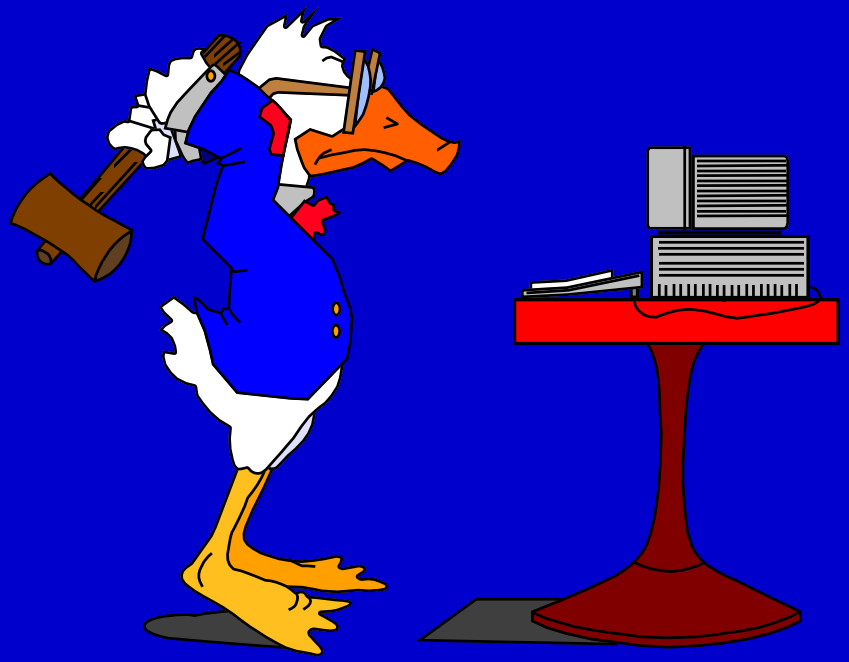
Daisy-chaining Boundary Scan Components & Issues



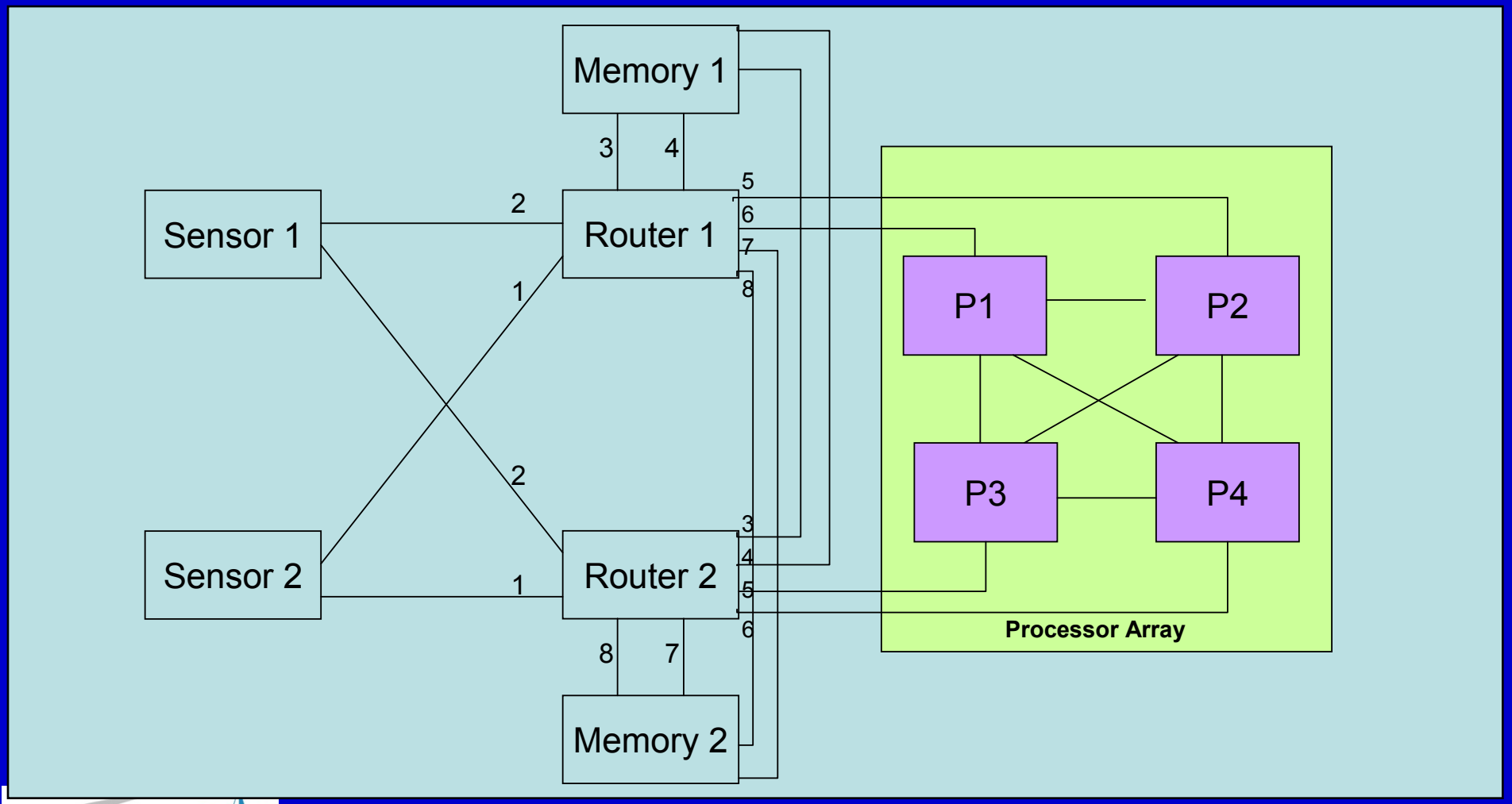
Issues:

- **Breaks in the chain**
- **Connecting many components into small number of chains (conventional test equipment provides 4 Chains).**
  - **Throughput, management of different logic and different supply levels, redundancy.**

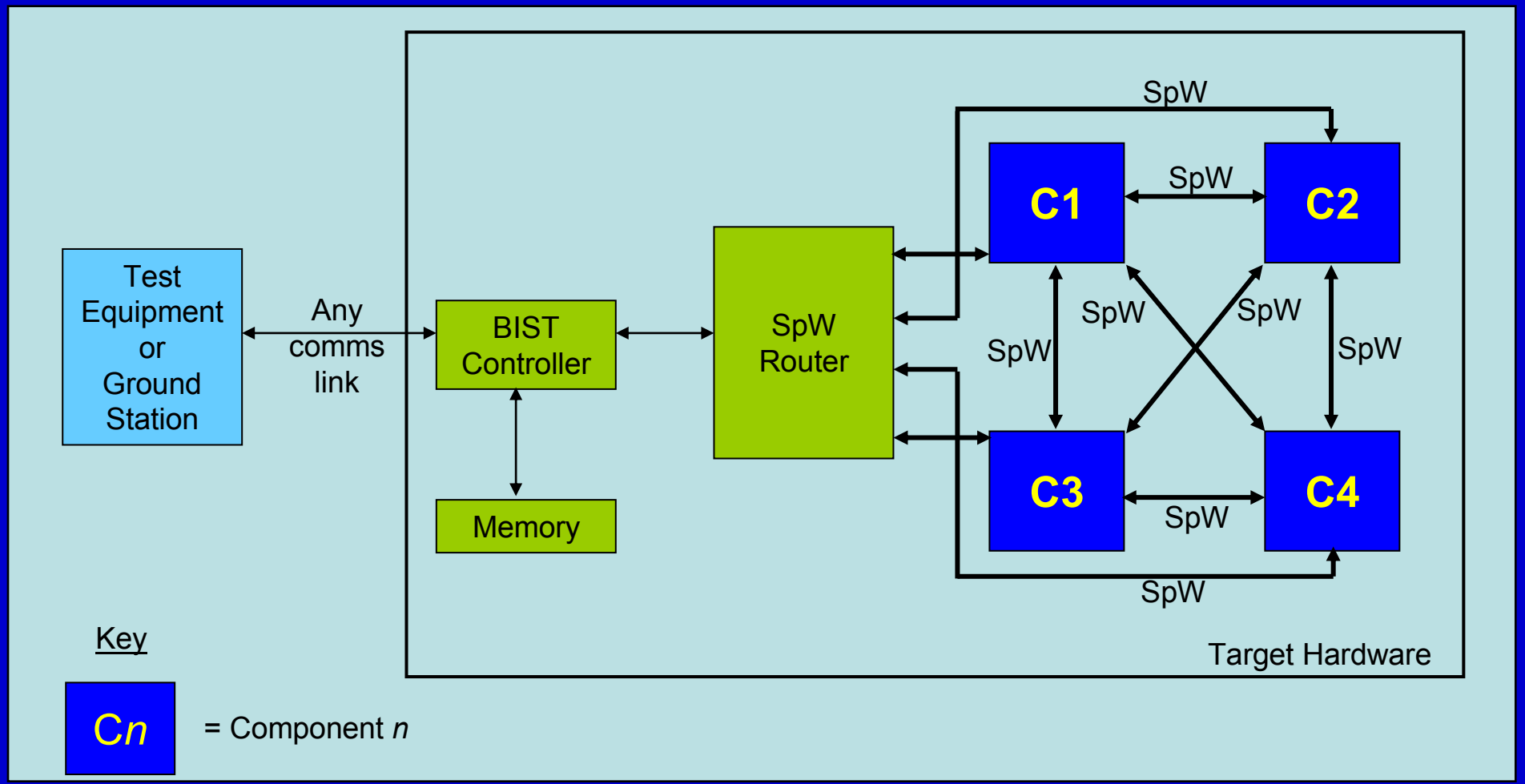
Time for a change



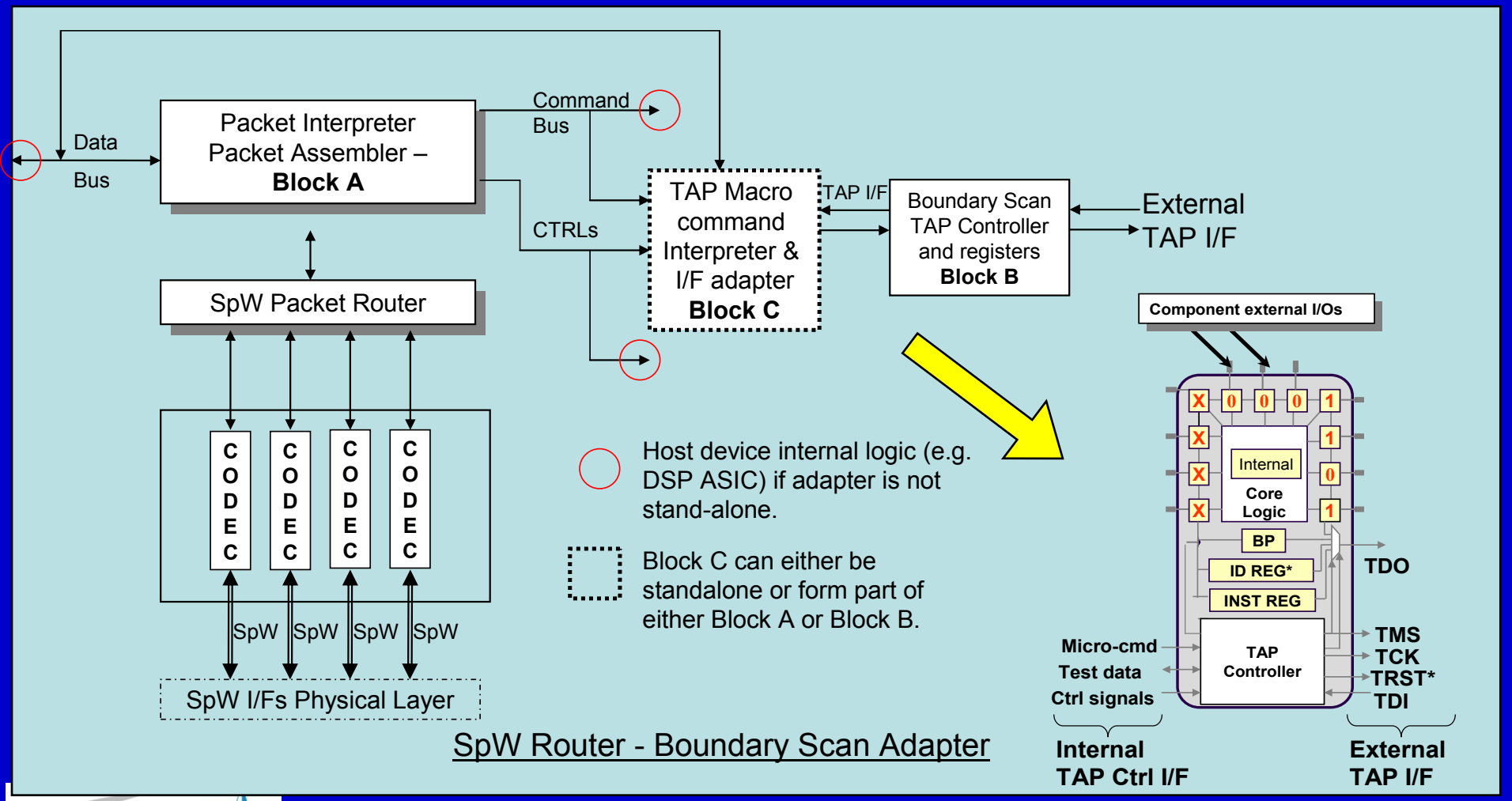
Typical SpW based Architecture



“Chainless Boundary Scan”

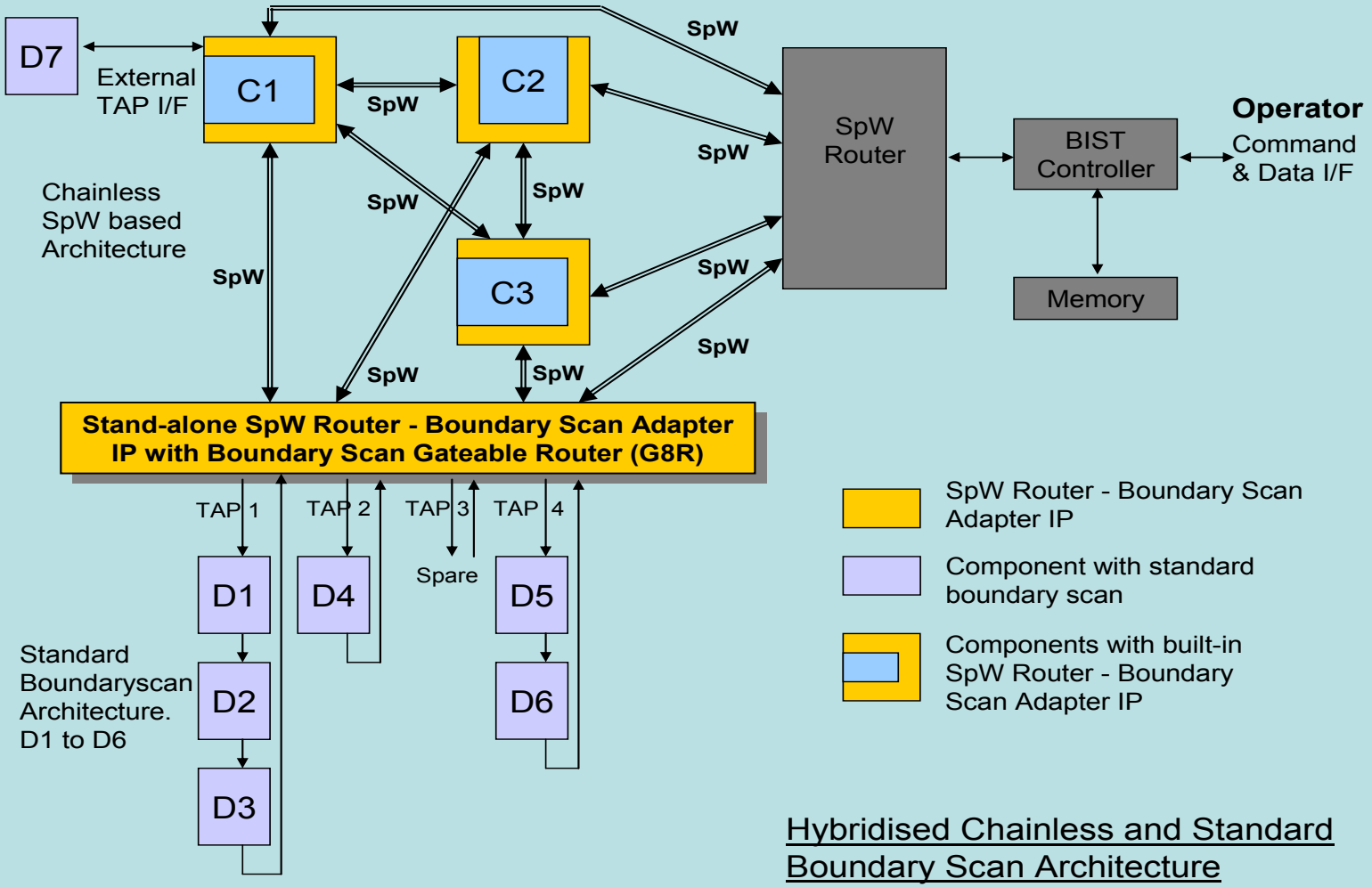


SpW Router to Boundary Scan Adapter



SpW Router - Boundary Scan Adapter

Hybrid Solution



Hybridised Chainless and Standard Boundary Scan Architecture

Conclusion

- Chainless Boundary scan using SpW based architecture provides the following advantages:
  - Tests can still be performed even after one or more components have been configured in functional mode or if a failure of a component occurs.
  - The boundary scan vectors can be transported across the network in macro-command and data packets without having to translate them into IEEE1149.1 signal compatible format.
  - Allows in-orbit testing possible as no additional test infrastructure is required.