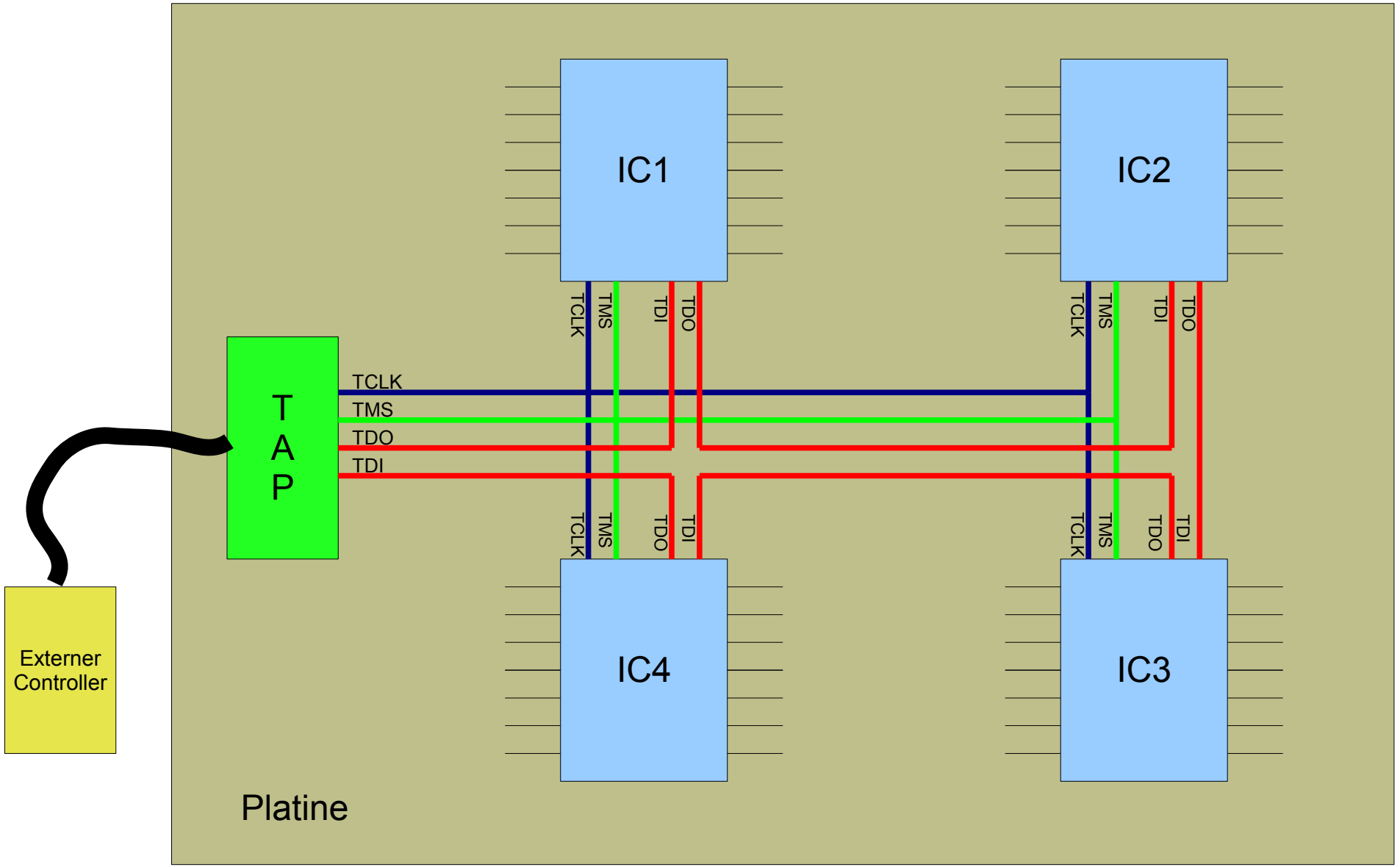
JTAG – IEEE 1149.1

- Problem
  - Testbarkeit von Platinen und ICs
- JTAG = Joint Test Action Group
  - 1985 (Philips, TI, AT&T, IBM, ...)
- Ziel:
  - Definition neuer Testmethoden für ICs und Platinen
- Ergebnis:
  - 1990: Boundary Scan Test angenommen als IEEE1149.1

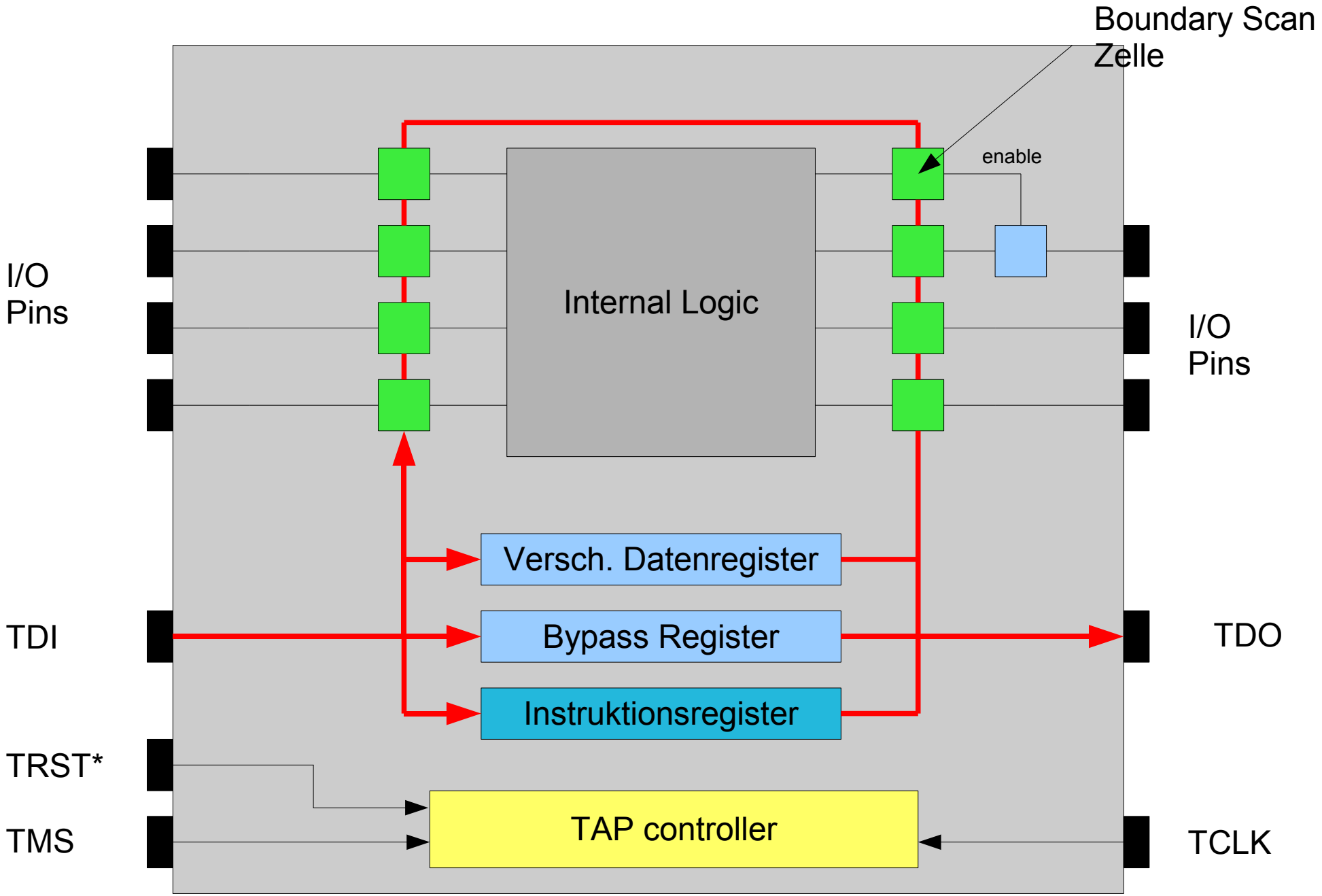
Boundary Scan

- Grundidee:
  - Jeder IC hat 4 wesentliche Hardwareelemente:
    - Test Access Port (TAP)
    - TAP Controller
    - Instruktionsregister
    - Mehrere Datenregister
  - BSDL (Boundary Scan Description Language)
    - Subset von VHDL, beschreibt Boundary Scan Eigenschaften
  - Test Access Port (TAP)
    - 4(5) Pins:
      - TDI : Test Data in
      - TDO: Test Data out
      - TCK: Test Clock
      - TMS: Test Mode Select
      - TRST: Test Reset (optional)

Boundary Scan

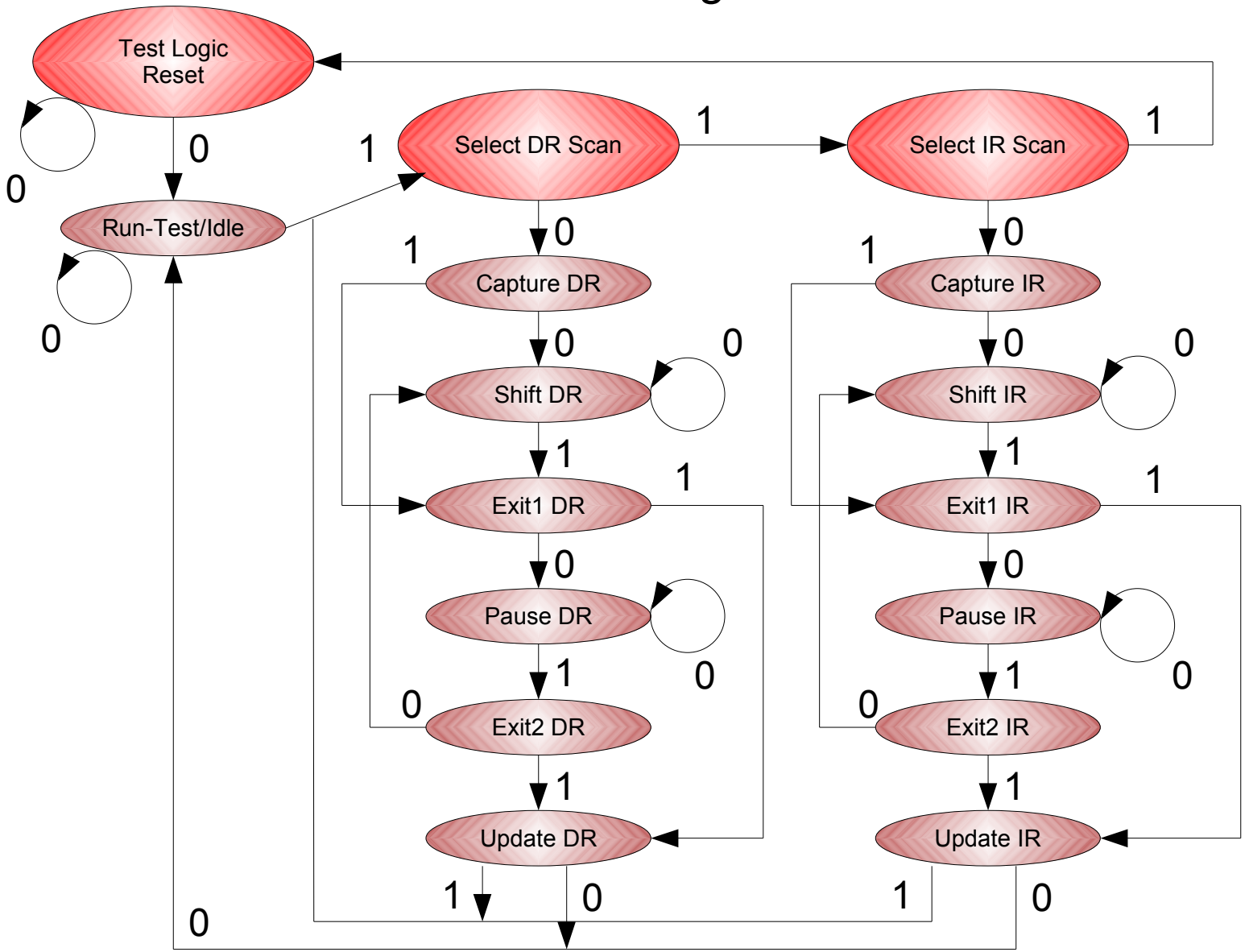


IC mit Test Controller und Boundary Scan Registern



- TAP Controller
  - gesteuert durch TMS Signal

State Diagramm des TAP Controllers

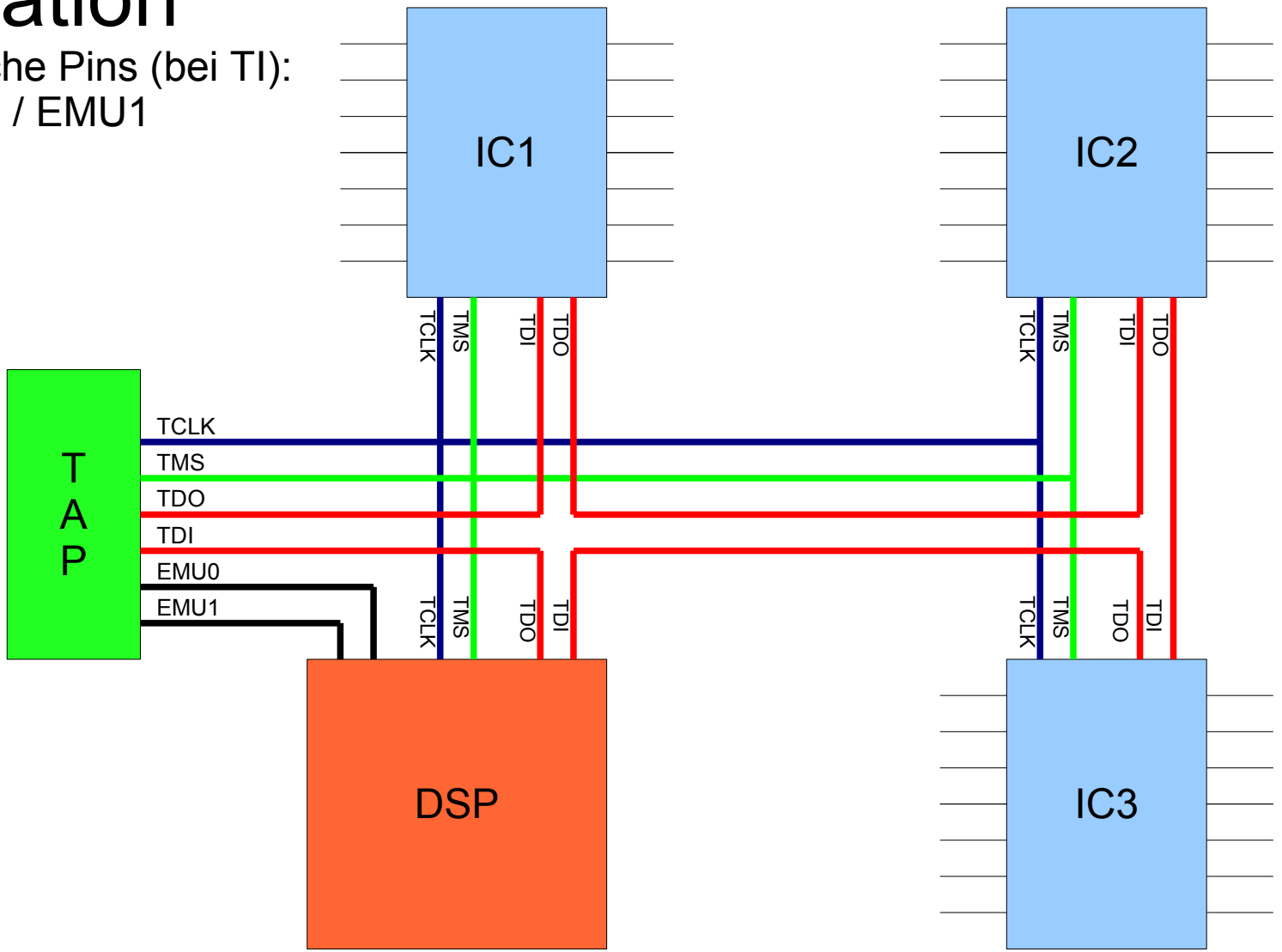


Boundary Scan

- Instruktionsregister IR
  - Instruktionen:
    - obligatorisch:
      - Bypass, Sample/Preload, Extest
    - optional:
      - Intest, Runbist, Clamp, ...
    - Herstellerspezifisch
      - private Instruktionen für Spezialanwendungen
- Datenregister
  - Boundary Scan Register
  - Bypass Register
  - Device ID Register
  - Designspezifische Register

Spezielle Anwendungen

- Emulation
  - 2 zusätzliche Pins (bei TI):
    - EMU0 / EMU1



Boundary Scan bei ELEX

Since 1995 used Functions

1. Test of Printed Board, (SAM2)
2. DSP Emulation, (C40....C6000)
3. CPLD In Circuit Configuration.
4. Other.

Software

ASSET for PCB tests.

Code Composer for DSP emulation.

MAX+2: CPLD, FPGA. (ISP used since 1995).

PHILIPS: CPLDs. since 1998.

XILINX: FPGAs, CPLDs since 2001.

BSD files.

JTAG chain description.

Hardware

PCB with BS devices, path and connectors.

Emulator Interface.

Parallel or USB cable adapter for ISP.

BSD Devices

CPLDs
FPGAs
DSPs
LOGIC
TDCs
others

Problems

Chain debugging.

I/O common with JTAG pins.

FPGA in false mode.

Signal integrity.