Національний університет "Львівська політехніка"
Кафедра електронних обчислювальних машин (ЕОМ)

Автоматизоване проектування комп'ютерних систем

спеціальність 123 "Комп'ютерна інженерія"
спеціалізація 123.01 "Комп'ютерні системи"
4-ий курс

Лекція 5. Високорівневі засоби системного проектування (3)

2021

01.1. Системна шина AMBA.

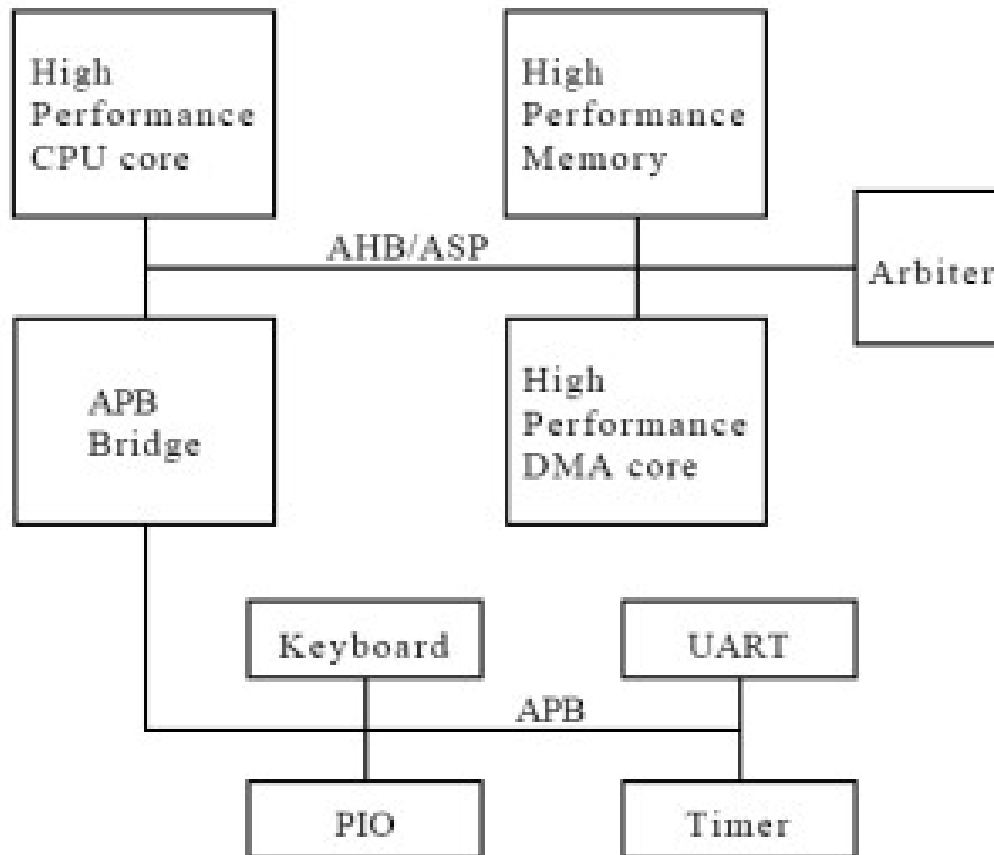**AMBA specification (First version) defines two buses/interfaces:**
- *Advanced System Bus (ASB)*
- *Advanced Peripheral Bus (APB)*

AMBA 2 specification defines three buses/interfaces:
- *Advanced High-performance Bus (AHB) - widely used on ARM7, ARM9 and ARM Cortex-M based designs*
- *Advanced System Bus (ASB)*
- *Advanced Peripheral Bus (APB2 or APB)*
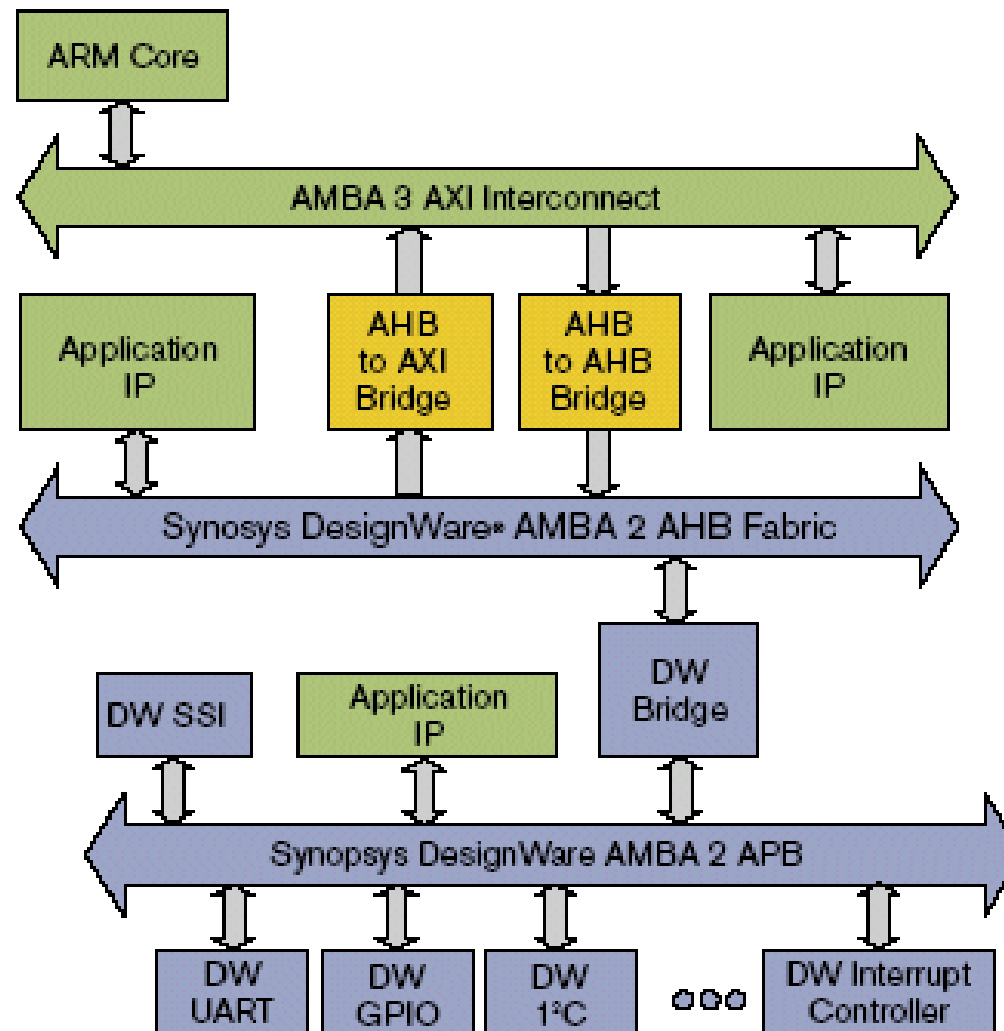
Logical Bus Structure

01.3. Системна шина AMBA.

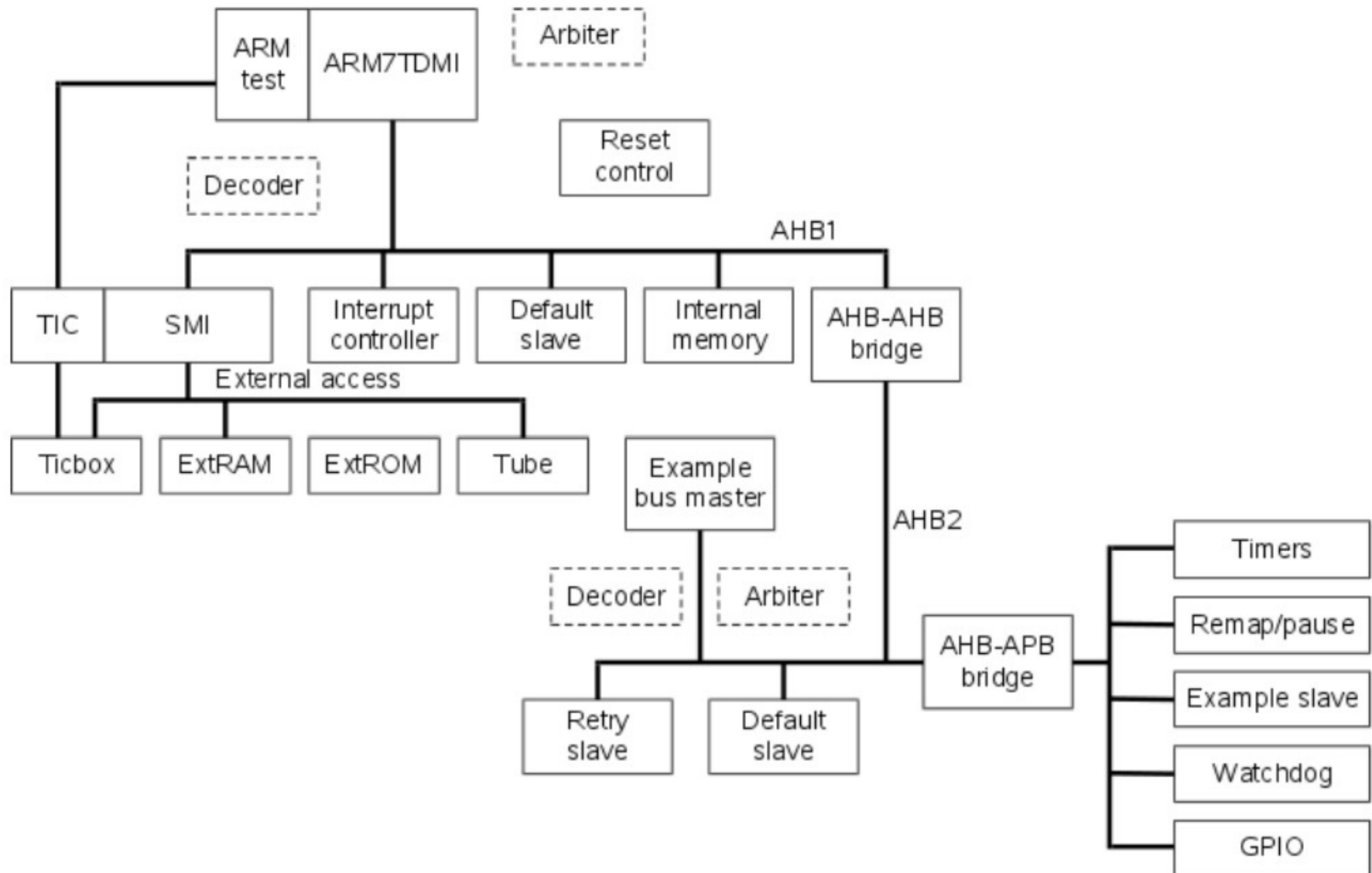***AMBA 3 specification defines four buses/interfaces:***
- *Advanced eXtensible Interface (AXI3 or AXI v1.0) - widely used on ARM Cortex-A processors including Cortex-A9*
- *Advanced High-performance Bus Lite (AHB-Lite v1.0)*
- *Advanced Peripheral Bus (APB3 v1.0)*
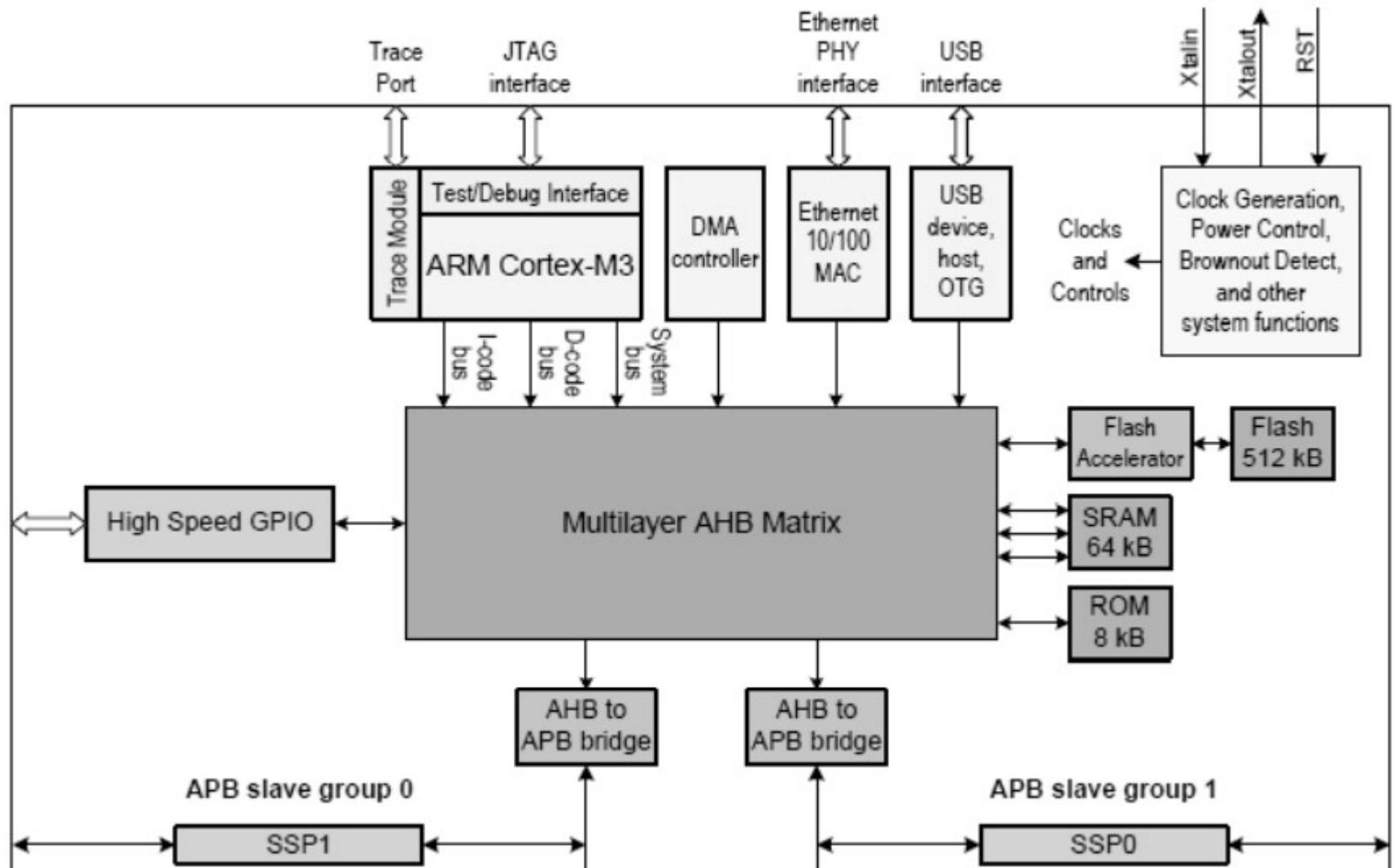- *Advanced Trace Bus (ATB v1.0)*

01.4. Системна шина AMBA.

01.5. Системна шина AMBA.
(Застосування AMBA AHB та AMBA APB для ARM7)

01.6. Системна шина AMBA.
(AMBA AHB в мікроконтролері NXP LPC1768 на Cortex-M3)

01.7. Системна шина AMBA.

The AMBA 4 specification defines following buses/interfaces:
- AXI Coherency Extensions (ACE) - widely used on the latest ARM Cortex-A processors including Cortex-A7 and Cortex-A15
- AXI Coherency Extensions Lite (ACE-Lite)
- Advanced Extensible Interface 4 (AXI4)
- Advanced Extensible Interface 4 Lite (AXI4-Lite)
- Advanced Extensible Interface 4 Stream (AXI4-Stream v1.0)
- Advanced Trace Bus (ATB v1.1)
- Advanced Peripheral Bus (APB4 v2.0)
- AMBA Low Power Interfaces (Q-Channel and P-Channel)

01.8. Системна шина AMBA.

The AMBA 5 specification defines the following buses/interfaces:

- AXI5, AXI5-Lite and ACE5 Protocol Specification
- Advanced High-performance Bus (AHB5, AHB-Lite)
- Coherent Hub Interface (CHI)
- Distributed Translation Interface (DTI)
- Generic Flash Bus (GFB)

01.9. Шина ASP(частина шини AMBA).

The ASP is the general purpose system bus. It is a high performance interconnect for micro controller and system peripherals. The main features are:

- *First Generation System Bus*
- *Multiple Masters*
- *Burst Transfers*
- *Pipeline Transfers*
- *32 - 128+ bit bus width*
- *Includes a access protection mechanism, to distinguish between such access as privileged and non privileged modes, instruction and data fetch, etc.*
- *Bidirectional data bus*
- *Address space limited to 32 bits*
- *Throttling of data for slower devices provided*
- *Arbitration support, REQ, GNT and LOCK*
- *Supports transfers of bytes, half-word and word*

01.10. Шина AHB(частина шини AMBA). (появився в AMBA 2)

The AHB is the advanced system bus. It's main purpose if for interconnecting high performance, high through put devices, such as CPU, DMA and DSP. It's main features are:

- *High Performance Bus (New Generation Bus)*
- *Multi Master*
- *Split transfers*
- *Single cycle bus master handover*
- *Non tristate implementation*
- *32 - 128+ bit bus width*
- *Includes a access protection mechanism, to distinguish between such access as privileged and non privileged modes, instruction and data fetch, etc.*
- *Bursts limited to 16 'beats' max*
- *Address space limited to 32 bits*
- *Throttling of data for slower devices provided*
- *Arbitration support, REQ, GNT and LOCK*
- *Supports transfers of bytes, half-word and word*

01.11. Шина APB(частина шини AMBA).

***The APB is the peripheral interconnect bus. Focus here was minimal power consumption
and ease of use. The main features include:***

- *Low performance, low power peripheral bus*
- *Single Master*
- *Very Simple, only 4 control signals (plus clock and reset)*
- *32 bit address space*
- *up to 32 bit data bus*
- *separate read and write data bus*