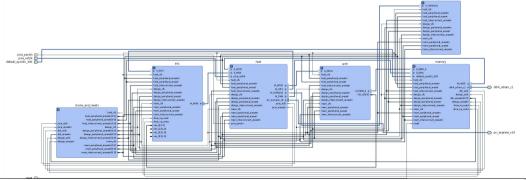
Architekturen und Entwurf von Rechnersystemen Besprechung Theorieblatt 4



Wintersemester 2022/2023

Johannes Wirth

Fachgebiet Eingebettete Systeme und ihre Anwendungen





Dies und das



- Klausur am 27.02.2023 um 13 Uhr
- Zur Klausurvorbereitung:
 - Bluespec und SoC Wrapup-Blätter mit klausurähnlichen Fragen
 - Sprechstunden
 - Mögliche Änderungen werden in Moodle bekanntgegeben
 - Moodle Forum für Fragen



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- Heute:
 - Theorieübungsblatt 4
 - BSV-Übung 6
 - Beispielaufgaben
 - Weiterführende Veranstaltungen





Theorieübungsblatt 4

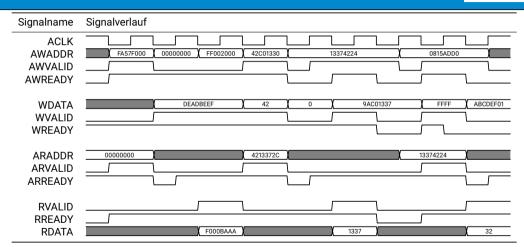




AXI4

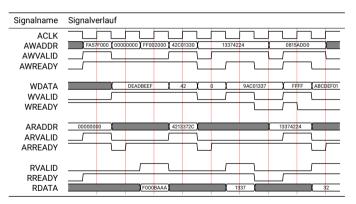








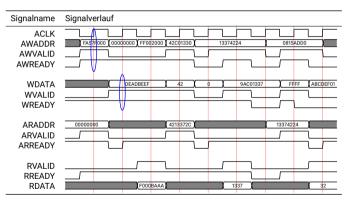




Adresse	Daten
0x00000000	
0x0815ADD0	
0x13374224	
0x4213372C	
0x42C01330	
0xFA57F000	



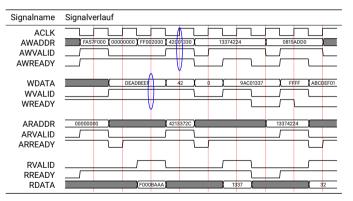




Adresse	Daten	
0x00000000		
0x0815ADD0		
0x13374224		
0x4213372C		
0x42C01330		
0xFA57F000	OxDEADBEEF	



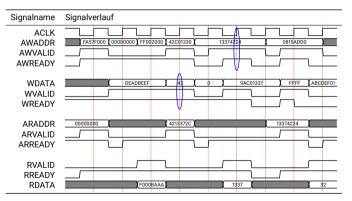




Adresse	Daten	
0x00000000		
0x0815ADD0		
0x13374224		
0x4213372C		
0x42C01330	0xDEADBEEF	
0xFA57F000	0xDEADBEEF	



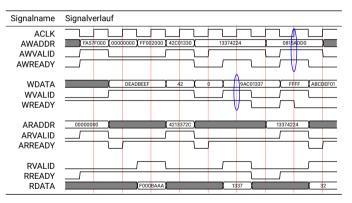




Adresse	Daten
0x00000000	
0x0815ADD0	
0x13374224	0x00000042
0x4213372C	
0x42C01330	0xDEADBEEF
0xFA57F000	0xDEADBEEF



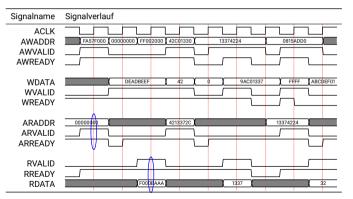




Adresse	Daten	
0x00000000		
0x0815ADD0	0x9AC01337	
0x13374224	0x00000042	
0x4213372C		
0x42C01330	0xDEADBEEF	
0xFA57F000	0xDEADBEEF	
		_



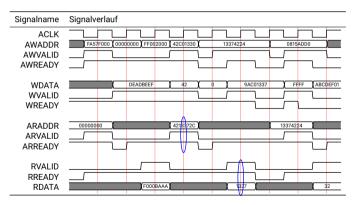




Adresse	Daten
0x00000000	0xF000BAAA
0x0815ADD0	0x9AC01337
0x13374224	0x00000042
0x4213372C	
0x42C01330	0xDEADBEEF
0xFA57F000	0xDEADBEEF



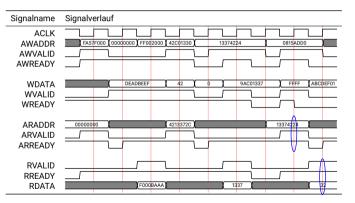




Adresse	Daten
0x00000000	0xF000BAAA
0x0815ADD0	0x9AC01337
0x13374224	0x00000042
0x4213372C	0x00001337
0x42C01330	0xDEADBEEF
0xFA57F000	0xDEADBEEF



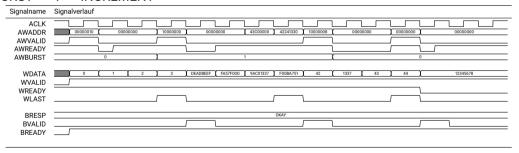




Adresse	Daten
0x00000000	0xF000BAAA
0x0815ADD0	0x9AC01337
0x13374224	0x00000032
0x4213372C	0x00001337
0x42C01330	0xDEADBEEF
0xFA57F000	0xDEADBEEF



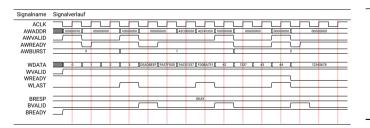








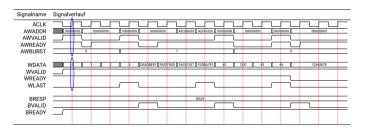
AxLEN=3, AxSIZE=2 AxBURST == 0 => FIXED AxBURST == 1 => INCREMENT



Adresse Daten







Adresse	Daten
0x00000010	0x00000000





Signalname	Signalverlauf
ACLK AWADDR AWVALID	
AWREADY AWBURST	0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
WDATA WVALID WREADY	0 N 2 3 GOLOGREP (ALSTSCO) SALCHISSZ (FORMATS) 42 1327 43 44 123/46/28
WLAST	OKAY
BVALID BREADY	

Adresse	Daten
0x0000010	0x00000001





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	0 1 A 1 DEAGREE [ANTYGO [ACCUSED] [COMATS] 40 1307 43 44 1 7324659
BRESP BVALID BREADY	OUAY COLOR

Adresse	Daten
0x00000010	0x00000002





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	2 3 GAAGREE FRANCO 144002 17000 144 122668
BRESP BVALID BREADY	

Adresse	Daten
0x00000010	0x00000003





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	2 3 SEASHET FASSYOOD SAC(5132) FOOMAN11 42 1527 43 44 12246678
BRESP BVALID BREADY	OKAY COLOR

Adresse	Daten
0x00000010 0x10000000	0x00000003 0xDEADBEEF





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	0 3 3 360/04EF [7/5/8/00] (84/5/33) [7/5/8/1] 0 1327 43 44 132/4/52
BRESP BVALID BREADY	OMY OMY

Adresse	Daten
0x00000010 0x10000000 0x10000004	0x00000003 0xDEADBEEF 0xFA57F00D





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	0 GEOGRAFI (TAGSYOC) (SAGSIST) (TORANY) C 1237 43 44 12346478
BRESP BVALID BREADY	COAN COAN COAN COAN COAN COAN COAN COAN

Adresse	Daten
0x00000010	0x00000003
0x10000000	0xDEADBEEF
0x10000004	0xFA57F00D
0x10000008	0x9AC01337





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	0 9 GAGGER FACEOGO GACESSIS FORMESS & 1837 40 44 12346478
BRESP BVALID BREADY	OMY OMY

Adresse	Daten
0x00000010	0x00000003
0x10000000	0xDEADBEEF
0x10000004	0xFA57F00D
0x10000008	0x9AC01337
0x1000000C	0xF00BA751





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	0 GOAGHET [TACTYCO [MACHIST] [TOOLATS] 43 44 T2364078
BRESP BVALID BREADY	

Adresse	Daten
0x00000010	0x00000003
0x10000000	0xDEADBEEF
0x10000004	0xFA57F00D
0x10000008	0x00000042
0x1000000C	0xF00BA751





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	0
BRESP BVALID BREADY	OWA CONTRACTOR OF THE CONTRACT

Adresse	Daten
0x00000010	0x00000003
0x10000000	0xDEADBEEF
0x10000004	0xFA57F00D
0x10000008	0x00000042
0x1000000C	0x00001337





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	00000 00000 00000 00000 00000 00000 0000
WDATA WVALID WREADY WLAST	0 3 30000EEF [TACSYOO (9AC9333) [T008A93]]
BRESP BVALID BREADY	OWA CONTRACTOR OF THE CONTRACT

Adresse	Daten
0x00000010	0x00000003
0x10000000	0xDEADBEEF
0x10000004	0xFA57F00D
0x10000008	0x00000042
0x1000000C	0x00001337
0x10000010	0x00000043





Signalname	Signalverlauf
ACLK AWADDR AWVALID AWREADY AWBURST	
WDATA WVALID WREADY WLAST	0 GEAGUET TACTYCO (MC5333) [100M531] 42 1207 43 4 123440/8
BRESP BVALID BREADY	

Adresse	Daten
0x00000010	0x00000003
0x10000000	0xDEADBEEF
0x10000004	0xFA57F00D
0x10000008	0x00000042
0x1000000C	0x00001337
0x10000010	0x00000043
0x10000014	0x00000044





TaPaSCo





Host/ps7					
► 🚻 Data (32 address bits : 0x40000000	[1G],0x80000000) [1G])			
InterruptControl/axi_intc_00	s_axi	Reg	0x8180_0000	64K	▼ 0x8180_FFFF
- Threadpool/target_ip_00_000	s_axi_AXILiteS	Reg	0x43C0_0000	64K	▼ 0x43C0_FFFF
— Threadpool/target_ip_00_001	s_axi_AXILiteS	Reg	0x43C1_0000	64K	▼ 0x43C1_FFFF
- Threadpool/target_ip_00_002	s_axi_AXILiteS	Reg	0x43C2_0000	64K	▼ 0x43C2_FFFF
— Threadpool/target_ip_00_003	s_axi_AXILiteS	Reg	0x43C3_0000	64K	▼ 0x43C3_FFFF
- Threadpool/target_ip_00_004	s_axi_AXILiteS	Reg	0x43C4_0000	64K	▼ 0x43C4_FFFF
- Threadpool/target_ip_00_005	s_axi_AXILiteS	Reg	0x43C5_0000	64K	▼ 0x43C5_FFFF
- Threadpool/target_ip_00_006	s_axi_AXILiteS	Reg	0x43C6_0000	64K	▼ 0x43C6_FFFF
— == Threadpool/target_ip_00_007	s_axi_AXILiteS	Reg	0x43C7_0000	64K	▼ 0x43C7_FFFF
- Threadpool/target_ip_00_008	s_axi_AXILiteS	Reg	0x43C8_0000	64K	▼ 0x43C8_FFFF
- Threadpool/target_ip_00_009	s_axi_AXILiteS	Reg	0x43C9_0000	64K	▼ 0x43C9_FFFF
- Threadpool/target_ip_00_010	s_axi_AXILiteS	Reg	0x43CA_0000	64K	▼ 0x43CA_FFFF
— Threadpool/target_ip_00_011	s_axi_AXILiteS	Reg	0x43CB_0000	64K	▼ 0x43CB_FFFF
- Threadpool/target_ip_00_012	s_axi_AXILiteS	Reg	0x43CC_0000	64K	▼ 0x43CC_FFFF
- Threadpool/target_ip_00_013	s_axi_AXILiteS	Reg	0x43CD_0000	64K	▼ 0x43CD_FFFF
- Threadpool/target_ip_00_014	s_axi_AXILiteS	Reg	0x43CE_0000	64K	▼ 0x43CE_FFFF
- Threadpool/target_ip_00_015	s_axi_AXILiteS	Reg	0x43CF_0000	64K	▼ 0x43CF_FFFF
- m tpc_status	S00_AXI	S00_AXI_reg	0x7777_0000	64K	▼ 0x7777_FFFF





```
⊕- III Host/ps7
  ♦-III Data (32 address bits: 0x40000000 [ 1G ].0x80000000 [ 1G ])
       InterruptControl/axi intc 00
                                                                          0x8180 0000
                                                                                            64K
                                                                                                    ▼ 0x8180 FFFF
                                             s axi
                                                            Rea
                                                                                            64K
      - Threadpool/target_ip_00_000
                                             s axi AXILiteS
                                                            Rea
                                                                          0x43C0 0000
                                                                                                    ▼ 0x43C0 FFFF
       Threadpool/target ip 00 001
                                             s axi AXII iteS
                                                           Rea
                                                                          0x43C1 0000
                                                                                            64K
                                                                                                    ▼ 0x43C1 FFFF
                                                                          0x43C2 0000
                                                                                            64K
                                                                                                    ▼ 0x43C2 FEFF

    Threadpool/target_ip_00_002

                                             s axi AXILiteS
                                                           Rea
       Threadpool/target_ip_00_003
                                                            Rea
                                                                          0x43C3_0000
                                                                                            64K
                                                                                                    ▼ 0x43C3_FFFF
                                             s axi AXILiteS
       Threadpool/target_ip_00_004
                                             s axi AXILiteS
                                                            Rea
                                                                          0x4304 00000
                                                                                            64K
                                                                                                    ▼ 0x43C4 FFFF
       Threadpool/target_ip_00_005
                                                            Rea
                                                                          0x43C5_0000
                                                                                            64K
                                                                                                    ▼ 0x43C5_FFFF
                                             s axi AXILiteS
                                                                                            64K
       Threadpool/target_ip_00_006
                                             s axi AXILiteS
                                                            Rea
                                                                          0x4306_0000
                                                                                                    ▼ 0x4306 FFFF
       Threadpool/target_ip_00_007
                                                                          0x43C7_0000
                                                                                            64K
                                                                                                    ▼ 0x43C7_FFFF
                                             s_axi_AXILiteS
                                                            Rea
      Threadpool/target in 00 008
                                             s axi AXILiteS
                                                            Rea
                                                                          0x4308 0000
                                                                                            64K
                                                                                                    ▼ 0x4308 FFFF
       Threadpool/target_ip_00_009
                                                                          0x43C9_0000
                                                                                            64K
                                                                                                    ▼ 0x43C9_FFFF
                                             s_axi_AXILiteS
                                                            Rea
                                                                                            64K

    Threadpool/target_ip_00_010

                                             s axi AXILiteS
                                                            Rea
                                                                          0x43CA 0000
                                                                                                    ▼ 0x43CA FFFF
       Threadpool/target ip 00 011
                                             s_axi_AXILiteS
                                                            Rea
                                                                          0x43CB 0000
                                                                                            64K
                                                                                                    ▼ 0x43CB FFFF
                                                                                            64K
       Threadpool/target_ip_00_012
                                             s axi AXILiteS
                                                            Rea
                                                                          0x43CC_0000
                                                                                                    ▼ 0x43CC FEFE
       Threadpool/target ip 00 013
                                                                          0x43CD 0000
                                                                                            64K
                                                                                                    ▼ 0x43CD FFFF
                                             s axi AXII iteS
                                                            Rea
       Threadpool/target_ip_00_014
                                             s_axi_AXILiteS
                                                            Reg
                                                                          0x43CE 0000
                                                                                            64K
                                                                                                    ▼ 0x43CE FFFF
       Threadpool/target ip 00 015
                                                            Rea
                                                                          0x43CF 0000
                                                                                            64K
                                                                                                    ▼ 0x43CF FFFF
                                             s axi AXII iteS
                                                                          0x7777 0000
                                                                                            64K
                                                                                                    ▼ Ox7777 FEFF
      - tpc_status
                                             SOO AXI
                                                            S00_AXI_rea
```

Argument Register 1 an Stelle 'h20 der PE





P III Data (32 address bits: 0x40000000) [1G] ,0x80000000) [1G])			
— InterruptControl/axi_intc_00	s_axi	Reg	0x8180_0000	64K	▼ 0x8180_FFFF
- Threadpool/target_ip_00_000	s_axi_AXILiteS	Reg	0x43C0_0000	64K	▼ 0x43C0_FFFF
- Threadpool/target_ip_00_001	s_axi_AXILiteS	Reg	0x43C1_0000	64K	▼ 0x43C1_FFFF
- Threadpool/target_ip_00_002	s_axi_AXILiteS	Reg	0x43C2_0000	64K	▼ 0x43C2_FFFF
 — Threadpool/target_ip_00_003 	s_axi_AXILiteS	Reg	0x43C3_0000	64K	▼ 0x43C3_FFFF
- Threadpool/target_ip_00_004	s_axi_AXILiteS	Reg	0x43C4_0000	64K	▼ 0x43C4_FFFF
- Threadpool/target_ip_00_005	s_axi_AXILiteS	Reg	0x43C5_0000	64K	▼ 0x43C5_FFFF
- Threadpool/target_ip_00_006	s_axi_AXILiteS	Reg	0x43C6_0000	64K	▼ 0x43C6_FFFF
- Threadpool/target_ip_00_007	s_axi_AXILiteS	Reg	0x43C7_0000	64K	▼ 0x43C7_FFFF
- Threadpool/target_ip_00_008	s_axi_AXILiteS	Reg	0x43C8_0000	64K	▼ 0x43C8_FFFF
- Threadpool/target_ip_00_009	s_axi_AXILiteS	Reg	0x43C9_0000	64K	 ▼ 0x43C9_FFFF
- Threadpool/target_ip_00_010	s_axi_AXILiteS	Reg	0x43C4_0000	54K	- 0x43CA_FFFF
- Threadpool/target_ip_00_011	s_axi_AXILiteS	Reg	0x43CB_0000	64K	▼ 0x43CB_FFFF
- Threadpool/target_ip_00_012	s_axi_AXILiteS	Reg	0x43CC_0000	64K	▼ 0x43CC_FFFF
- Threadpool/target_ip_00_013	s_axi_AXILiteS	Reg	0x43CD_0000	64K	▼ 0x43CD_FFFF
- Threadpool/target_ip_00_014	s_axi_AXILiteS	Reg	0x43CE_0000	64K	▼ 0x43CE_FFFF
- Threadpool/target_ip_00_015	s_axi_AXILiteS	Reg	0x43CF_0000	64K	▼ 0x43CF_FFFF
- m tpc_status	S00_AXI	S00_AXI_reg	0x7777_0000	64K	▼ 0x7777_FFFF

- Argument Register 1 an Stelle 'h20 der PE
- target_ip_00_011 an Adresse 'h43CB0000





	ess bits : 0x40000000		1 1/			
	ntrol/axi_intc_00	s_axi	Reg	0x8180_0000	64K	▼ 0x8180_FFFF
- Threadpoo	/target_ip_00_000	s_axi_AXILiteS	Reg	0x43C0_0000	64K	▼ 0x43C0_FFFF
Threadpoo	/target_ip_00_001	s_axi_AXILiteS	Reg	0x43C1_0000	64K	0x43C1_FFFF
Threadpoo	/target_ip_00_002	s_axi_AXILiteS	Reg	0x43C2_0000	64K	▼ 0x43C2_FFFF
Threadpoo	/target_ip_00_003	s_axi_AXILiteS	Reg	0x43C3_0000	64K	▼ 0x43C3_FFFF
Threadpoo	/target_ip_00_004	s_axi_AXILiteS	Reg	0x43C4_0000	64K	▼ 0x43C4_FFFF
Threadpoo	/target_ip_00_005	s_axi_AXILiteS	Reg	0x43C5_0000	64K	▼ 0x43C5_FFFF
Threadpoo	/target_ip_00_006	s_axi_AXILiteS	Reg	0x43C6_0000	64K	 ▼ 0x43C6_FFFF
Threadpoo	/target_ip_00_007	s_axi_AXILiteS	Reg	0x43C7_0000	64K	▼ 0x43C7_FFFF
Threadpoo	/target_ip_00_008	s_axi_AXILiteS	Reg	0x43C8_0000	64K	 ▼ 0x43C8_FFFF
Threadpoo	/target_ip_00_009	s_axi_AXILiteS	Reg	0x43C9_0000	64K	▼ 0x43C9_FFFF
- Threadpoo	/target_ip_00_010	s_axi_AXILiteS	Reg	0x43C/L0000	54K	- 0x43GA_FFFF
Threadpoo	/target_ip_00_011	s_axi_AXILiteS	Reg	0x43CB_0000	64K	▼ 0x43CB_FFFF
Threadpoo	/target_ip_00_012	s_axi_AXILiteS	Reg	0x43CC_0000	64K	▼ 0x43CC_FFFF
Threadpoo	/target_ip_00_013	s_axi_AXILiteS	Reg	0x43CD_0000	64K	▼ 0x43CD_FFFF
Threadpoo	/target_ip_00_014	s_axi_AXILiteS	Reg	0x43CE_0000	64K	▼ 0x43CE_FFFF
- m Threadpoo	/target_ip_00_015	s_axi_AXILiteS	Reg	0x43CF_0000	64K	▼ 0x43CF_FFFF
tpc_status		S00_AXI	S00_AXI_rea	0x7777_0000	64K	 ▼ 0x7777_FFFF

- Argument Register 1 an Stelle 'h20 der PE
- target_ip_00_011 an Adresse 'h43CB0000
- Argument Register 1 von target_ip_00_011 an Adresse 'h43CB0020



TaPaSCo Addressmap: Ergebnis und Interrupt bestätigen



```
O-II Host/ps7

◆-III Data (32 address bits: 0x40000000 [ 1G ] .0x80000000 [ 1G ])

                                                                         0x8180_0000
                                                                                                   ▼ 0x8180 FFFF
       InterruptControl/axi_intc_00
                                            s axi
                                                           Rea
                                                                                            64K
       Threadpool/target ip 00 000
                                                           Rea
                                                                         0x43C0 0000
                                                                                            64K
                                                                                                   ▼ 0x43C0 FFFF
                                            s axi AXII iteS
       Threadpool/target_ip_00_001
                                            s_axi_AXILiteS
                                                           Reg
                                                                         0x43C1 0000
                                                                                            64K
                                                                                                   ▼ 0x43C1 FEFF
       Threadpool/target ip 00 002
                                            s axi AXII iteS
                                                           Rea
                                                                         0x43C2 0000
                                                                                            64K
                                                                                                   ▼ 0x43C2 FFFF
                                                                         0x43C3 0000
                                                                                            64K
                                                                                                   ▼ 0x43C3 FFFF
       Threadpool/target_ip_00_003
                                            s_axi_AXILiteS
                                                           Reg
       Threadpool/target ip 00 004
                                                                         0x43C4 0000
                                                                                            64K
                                                                                                   ▼ 0x43C4 FFFF
                                            s_axi_AXILiteS
                                                           Rea
                                                                         0x43C5 0000
                                                                                            64K
                                                                                                   ▼ 0x43C5 FFFF
       Threadpool/target_ip_00_005
                                            s axi AXILiteS
                                                           Rea
       Threadpool/target ip 00 006
                                                                         0x4306 0000
                                                                                            64K
                                                                                                   ▼ 0x43C6 FFFF
                                            s axi AXII iteS
                                                           Rea
                                                                                            64K
       Threadpool/target_ip_00_007
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43C7 0000
                                                                                                   ▼ 0x43C7 FFFF
       Threadpool/target ip 00 008
                                            s_axi_AXILiteS
                                                           Rea
                                                                         0x43C8 0000
                                                                                            64K
                                                                                                   ▼ 0x43C8 FFFF
                                                                                            64K
                                                                                                   ▼ 0x43C9 FFFF
       Threadpool/target_ip_00_009
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43C9 0000
       Threadpool/target ip 00 010
                                                           Rea
                                                                         0x43CA 0000
                                                                                            64K
                                                                                                   ▼ 0x43CA FFFF
                                            s axi AXII iteS
       Threadpool/target_ip_00_011
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CB 0000
                                                                                            64K
                                                                                                   ▼ 0x43CB FFFF
       Threadpool/target ip 00 012
                                                           Rea
                                                                         0x43CC 0000
                                                                                            64K
                                                                                                   ▼ 0x43CC FFFF
                                            s axi AXII iteS
                                                                                            64K
                                                                                                   ▼ 0x43CD FFFF
       Threadpool/target_ip_00_013
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CD 0000
       Threadpool/target_ip_00_014
                                                                         0x43CE_0000
                                                                                            64K
                                                                                                   ▼ 0x43CE_FFFF
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CF_0000
                                                                                            64K
                                                                                                   ▼ 0x43CE FFFF
       Threadpool/target_ip_00_015
                                            s axi AXILiteS
                                                           Rea
       m toc status
                                            SOO AXI
                                                           S00 AXI rea
                                                                         0x7777 0000
                                                                                            64K
                                                                                                   ▼ 0x7777 FFFF
```



TaPaSCo Addressmap: Ergebnis und Interrupt bestätigen



```
O-II Host/ps7
  Ø-Ⅲ Data (32 address bits: 0x40000000 [ 1G ] .0x80000000 [ 1G ])
                                                                                                   ▼ 0x8180 FFFF
       InterruptControl/axi_intc_00
                                            s axi
                                                           Rea
                                                                         0x8180 0000
                                                                                            64K
       Threadpool/target ip 00 000
                                                           Rea
                                                                         0x43C0 0000
                                                                                            64K
                                                                                                   ▼ 0x43C0 FFFF
                                            s axi AXII iteS
       Threadpool/target_ip_00_001
                                            s_axi_AXILiteS
                                                           Reg
                                                                         0x43C1 0000
                                                                                            64K
                                                                                                   ▼ 0x43C1 FEFE
       Threadpool/target ip 00 002
                                            s axi AXII iteS
                                                           Rea
                                                                         0x43C2 0000
                                                                                            64K
                                                                                                   ▼ 0x43C2 FFFF
                                                                         0x43C3 0000
                                                                                            64K
                                                                                                   ▼ 0x43C3 FFFF
       Threadpool/target_ip_00_003
                                            s_axi_AXILiteS
                                                           Reg
       Threadpool/target ip 00 004
                                                                         0x43C4 0000
                                                                                            64K
                                                                                                   ▼ 0x43C4 FFFF
                                            s_axi_AXILiteS
                                                           Rea
                                                                         0x43C5 0000
                                                                                            64K
                                                                                                   ▼ 0x43C5 FFFF
       Threadpool/target_ip_00_005
                                            s axi AXILiteS
                                                           Rea
       Threadpool/target ip 00 006
                                                                         0x4306 0000
                                                                                            64K
                                                                                                   ▼ 0x43C6 FFFF
                                            s axi AXII iteS
                                                           Rea
                                                                                            64K
       Threadpool/target_ip_00_007
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43C7 0000
                                                                                                   ▼ 0x43C7 FFFF
       Threadpool/target ip 00 008
                                            s_axi_AXILiteS
                                                           Rea
                                                                         0x43C8 0000
                                                                                            64K
                                                                                                   ▼ 0x43C8 FFFF
                                                                                            64K
       Threadpool/target_ip_00_009
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43C9 0000
                                                                                                   ▼ 0x43C9 FFFF
       Threadpool/target ip 00 010
                                                                         0x43CA 0000
                                                                                            64K
                                                                                                   ▼ 0x43CA FFFF
                                            s axi AXII iteS
                                                           Rea
       Threadpool/target_ip_00_011
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CB 0000
                                                                                            64K
                                                                                                   ▼ 0x43CB FFFF
       Threadpool/target_ip_00_012
                                                           Rea
                                                                         0x43CC 0000
                                                                                            64K
                                                                                                   ▼ 0x43CC FFFF
                                            s axi AXII iteS
                                                                                            64K
       Threadpool/target_ip_00_013
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CD 0000
                                                                                                   ▼ 0×43CD FFFF
       Threadpool/target_ip_00_014
                                                                         0x43CE_0000
                                                                                            64K
                                                                                                   ▼ 0x43CE_FFFF
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CE 0000
                                                                                            64K
                                                                                                   ▼ 0x43CE FFFF
       Threadpool/target_ip_00_015
                                            s axi AXILiteS
                                                           Rea
                                            SOO AXI
                                                           S00 AXI rea
                                                                         0x7777 0000
                                                                                            64K
                                                                                                   ▼ 0x7777 FFFF
      - toc status
```

■ Return Value Register an Stelle 'h10 der PE => 'h43CB0010



TaPaSCo Addressmap: Ergebnis und Interrupt bestätigen



```
O-II Host/ps7
  Ø-Ⅲ Data (32 address bits: 0x40000000 [ 1G ] .0x80000000 [ 1G ])
                                                                                                   ▼ 0x8180 FFFF
       InterruptControl/axi_intc_00
                                            s axi
                                                           Rea
                                                                         0x8180 0000
                                                                                            64K
       Threadpool/target ip 00 000
                                                                         0x43C0 0000
                                                                                            64K
                                                                                                   ▼ 0x43C0 FFFF
                                            s axi AXII iteS
                                                           Rea
       Threadpool/target_ip_00_001
                                            s_axi_AXILiteS
                                                           Reg
                                                                         0x43C1 0000
                                                                                            64K
                                                                                                   ▼ 0x43C1 FEFE
       Threadpool/target ip 00 002
                                            s axi AXII iteS
                                                           Rea
                                                                         0x43C2 0000
                                                                                            64K
                                                                                                   ▼ 0x43C2 FFFF
                                                                         0x43C3 0000
                                                                                            64K
                                                                                                   ▼ 0x43C3 FFFF
       Threadpool/target_ip_00_003
                                            s_axi_AXILiteS
                                                           Reg
       Threadpool/target ip 00 004
                                                                         0x43C4 0000
                                                                                            64K
                                                                                                   ▼ 0x43C4 FFFF
                                            s_axi_AXILiteS
                                                           Rea
                                                                         0x43C5 0000
                                                                                            64K
                                                                                                   ▼ 0x43C5 FFFF
       Threadpool/target_ip_00_005
                                            s axi AXILiteS
                                                           Rea
       Threadpool/target ip 00 006
                                                                         0x4306 0000
                                                                                            64K
                                                                                                   ▼ 0x43C6 FFFF
                                            s axi AXII iteS
                                                           Rea
                                                                                            64K
       Threadpool/target_ip_00_007
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43C7 0000
                                                                                                   ▼ 0x43C7 FFFF
       Threadpool/target ip 00 008
                                            s_axi_AXILiteS
                                                           Rea
                                                                         0x43C8 0000
                                                                                            64K
                                                                                                   ▼ 0x43C8 FFFF
                                                                                            64K
       Threadpool/target_ip_00_009
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43C9 0000
                                                                                                   ▼ 0x43C9 FFFF
       Threadpool/target ip 00 010
                                                                         0x43CA 0000
                                                                                            64K
                                                                                                   ▼ 0x43CA FFFF
                                            s axi AXII iteS
                                                           Rea
       Threadpool/target_ip_00_011
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CB 0000
                                                                                            64K
                                                                                                   ▼ 0x43CB FFFF
       Threadpool/target_ip_00_012
                                                                         0x43CC 0000
                                                                                            64K
                                                                                                   ▼ 0x43CC FFFF
                                            s axi AXII iteS
                                                           Rea
                                                                                            64K
       Threadpool/target_ip_00_013
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CD 0000
                                                                                                   ▼ 0×43CD FFFF
       Threadpool/target_ip_00_014
                                                                         0x43CE_0000
                                                                                            64K
                                                                                                   ▼ 0x43CE_FFFF
                                            s axi AXILiteS
                                                           Rea
                                                                         0x43CE 0000
                                                                                            64K
                                                                                                   ▼ 0x43CE FFFF
       Threadpool/target_ip_00_015
                                            s axi AXILiteS
                                                           Rea
                                            SOO AXI
                                                           S00 AXI rea
                                                                         0x7777 0000
                                                                                            64K
                                                                                                   ▼ 0x7777 FFFF
      - toc status
```

- Return Value Register an Stelle 'h10 der PE => 'h43CB0010
- Interrupt Acknowledge Register an Stelle 'hoc der PE => 'h43CB000C





Weiterführende Veranstaltungen



Weiterführende Veranstaltungen



- Sommersemester
 - Embedded Systems Hands-On 1
 - Praktische FPGA-Programmierung mit Hochsprachen
- Wintersemester
 - Embedded Systems Hands-On 2
 - Algorithmen für Chip-Entwurfswerkzeuge

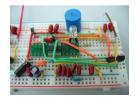


Embedded Systems Hands-On 1 - Entwurf und Realisierung von Hardware/Software-Systemen



- Themen:
 - Embedded Linux auf Raspberry Pi
 - Programmierung von Mikrocontrollern
 - Einfache elektronische Schaltungen
- → 6 Aufgaben + Projekt in Gruppenarbeit









Embedded Systems Hands-On 2 - Entwurf von Hardware-Beschleunigern für Systems-on-Chip



- Ziel: Hardwarebeschleunigung eines Sobel-Bildfilters
- Themen:
 - Einführung in TaPaSCo-RISCV
 - Embedded Linux auf Xilinx ZyngMP
 - Linux Treiber
 - Hardware-Modul in Bluespec
 - Genaue Analyse der FPGA Implementierung: Resourcenverbrauch, Taktfrequenz





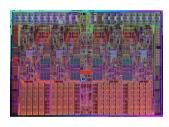




Algorithmen für Chip-Entwurfswerkzeuge



- Ziel: Physikalischer Schaltkreis
- Algorithmische Graphentheorie und mathematische Optimierungsverfahren im VLSI Entwurf
- Themen:
 - Partitionierung
 - Floorplanning
 - Platzierung
 - Verdrahtung
 - Kompaktierung
- 3 CP Vorlesung + 6 CP Praktikum



Quelle: Intel (Nehalem)





Fragen zur Vorlesung oder zur Übung?

