

OpenSwarm

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Contents

1	OpenSwarm documentation	1
1.1	Introduction	1
1.2	Links	1
1.3	License	1
1.4	Thanks	2
2	Todo List	3
3	Module Index	5
3.1	Modules	5
4	Data Structure Index	7
4.1	Data Structures	7
5	File Index	9
5.1	File List	9
6	Module Documentation	13
6.1	Base	13
6.1.1	Detailed Description	14
6.1.2	Introduction	14
6.1.2.1	Definitions	14
6.1.2.2	Memory Management	14
6.1.2.3	Interrupt Management	14
6.1.2.4	Dependencies	14
6.2	Event Management	16
6.2.1	Detailed Description	16
6.2.2	Usage	16
6.2.3	Example	16
6.2.4	License	17
6.3	I/O Management	18
6.3.1	Detailed Description	19
6.3.2	Introduction	20

6.3.3	Usage	20
6.3.4	License	20
6.4	Camera Module	21
6.4.1	Detailed Description	21
6.4.2	Introduction	21
6.4.3	Usage	21
6.4.4	License	22
6.5	Shefpuck	23
6.5.1	Detailed Description	23
6.5.2	License	23
6.6	e-puck specific modules	24
6.6.1	Detailed Description	26
6.6.2	Sensors:	26
6.6.2.1	8 infra-red proximity sensors	26
6.6.2.2	accelerometer	26
6.6.2.3	3 microphones	26
6.6.2.4	camera:	26
6.6.2.5	remote control receiver:	27
6.6.3	Actuators:	27
6.6.3.1	differential drive \sa motors	27
6.6.3.2	leds:	27
6.6.3.3	speaker:	27
6.6.4	communication:	27
6.6.4.1	Bluetooth:	27
6.6.4.2	Infra-red communication	27
6.6.5	License	27
6.7	I2C interface	28
6.7.1	Detailed Description	28
6.7.2	Usage	29
6.7.3	License	29
6.8	Motor Control	30
6.8.1	Detailed Description	30
6.8.2	Usage	30
6.8.3	License	30
6.9	Remote Control	31
6.9.1	Detailed Description	31
6.9.2	Usage	31
6.9.3	License	32
6.10	UART 1&2	33
6.10.1	Detailed Description	33

6.10.2	Usage	33
6.10.3	License	34
6.11	Process Manages	35
6.11.1	Detailed Description	35
6.11.2	Usage	35
6.11.2.1	User code:	36
6.11.2.2	Internal function (shouldn't be used by the user)	36
6.11.3	Example	36
6.11.4	License	37
7	Data Structure Documentation	39
7.1	sys_event_data_s Struct Reference	39
7.1.1	Detailed Description	39
7.1.2	Field Documentation	39
7.1.2.1	next	39
7.1.2.2	size	40
7.1.2.3	value	40
7.2	sys_i2c_message_s Struct Reference	40
7.2.1	Detailed Description	40
7.2.2	Field Documentation	40
7.2.2.1	data	40
7.2.2.2	handler	41
7.2.2.3	i2c_device_address	41
7.2.2.4	length	41
7.2.2.5	next	41
7.2.2.6	write	41
7.3	sys_motors_s Struct Reference	41
7.3.1	Detailed Description	41
7.3.2	Field Documentation	41
7.3.2.1	speed	41
7.4	sys_occurred_event_s Struct Reference	42
7.5	sys_periodical_IOHandler_s Struct Reference	42
7.5.1	Detailed Description	42
7.5.2	Field Documentation	42
7.5.2.1	function	42
7.5.2.2	next	42
7.6	sys_process_control_block_list_element_s Struct Reference	43
7.6.1	Detailed Description	43
7.6.2	Field Documentation	43
7.6.2.1	next	43

7.6.2.2	pcb	43
7.6.2.3	previous	43
7.7	sys_process_control_block_s Struct Reference	43
7.7.1	Detailed Description	44
7.7.2	Field Documentation	44
7.7.2.1	event_register	44
7.7.2.2	framePointer	44
7.7.2.3	process_ID	44
7.7.2.4	process_stack	44
7.7.2.5	sheduler_info	44
7.7.2.6	stackPointer	44
7.7.2.7	stackPointerLimit	44
7.8	sys_process_event_handler_s Struct Reference	45
7.8.1	Detailed Description	45
7.8.2	Field Documentation	45
7.8.2.1	buffered_data	45
7.8.2.2	condition	45
7.8.2.3	eventID	45
7.8.2.4	handler	45
7.8.2.5	next	45
7.8.2.6	previous	46
7.9	sys_registered_event_s Struct Reference	46
7.9.1	Detailed Description	46
7.9.2	Field Documentation	46
7.9.2.1	id	46
7.9.2.2	next	46
7.9.2.3	subscribers	46
7.10	sys_rgb_pixel_s Struct Reference	47
7.10.1	Detailed Description	47
7.10.2	Field Documentation	47
7.10.2.1	blue	47
7.10.2.2	green	47
7.10.2.3	red	47
7.11	sys_scheduler_info_s Struct Reference	47
7.11.1	Detailed Description	47
7.11.2	Field Documentation	48
7.11.2.1	priority	48
7.11.2.2	state	48
7.12	sys_subscribed_process_s Struct Reference	48
7.12.1	Detailed Description	48

7.12.2	Field Documentation	48
7.12.2.1	next	48
7.12.2.2	pid	49
7.13	sys_uart_tx_data_s Struct Reference	49
7.13.1	Detailed Description	49
7.13.2	Field Documentation	49
7.13.2.1	data	49
7.13.2.2	length	49
7.13.2.3	next	49
8	File Documentation	51
8.1	definitions.h File Reference	51
8.1.1	Detailed Description	53
8.1.2	Macro Definition Documentation	53
8.1.2.1	ALL_FUNCTIONS	53
8.1.2.2	EPUCK_USED	53
8.1.2.3	RC_BUTTON_0	54
8.1.2.4	RC_BUTTON_1	54
8.1.2.5	RC_BUTTON_2	54
8.1.2.6	RC_BUTTON_3	54
8.1.2.7	RC_BUTTON_4	54
8.1.2.8	RC_BUTTON_5	54
8.1.2.9	RC_BUTTON_6	54
8.1.2.10	RC_BUTTON_7	54
8.1.2.11	RC_BUTTON_8	54
8.1.2.12	RC_BUTTON_9	54
8.1.2.13	RC_BUTTON_BACK	54
8.1.2.14	RC_BUTTON_BLUE	54
8.1.2.15	RC_BUTTON_CHANNEL_DOWN	55
8.1.2.16	RC_BUTTON_CHANNEL_UP	55
8.1.2.17	RC_BUTTON_CURSOR_DOWN	55
8.1.2.18	RC_BUTTON_CURSOR_LEFT	55
8.1.2.19	RC_BUTTON_CURSOR_RIGHT	55
8.1.2.20	RC_BUTTON_CURSOR_UP	55
8.1.2.21	RC_BUTTON_EPG	55
8.1.2.22	RC_BUTTON_FAV	55
8.1.2.23	RC_BUTTON_GREEN	55
8.1.2.24	RC_BUTTON_INFO	55
8.1.2.25	RC_BUTTON_INTERNET	55
8.1.2.26	RC_BUTTON_LANG	55

8.1.2.27	RC_BUTTON_MENU	56
8.1.2.28	RC_BUTTON_MUTE	56
8.1.2.29	RC_BUTTON_OK	56
8.1.2.30	RC_BUTTON_PAUSE	56
8.1.2.31	RC_BUTTON_PLAY	56
8.1.2.32	RC_BUTTON_PRESETS	56
8.1.2.33	RC_BUTTON_RECORD	56
8.1.2.34	RC_BUTTON_RED	56
8.1.2.35	RC_BUTTON_REWIND	56
8.1.2.36	RC_BUTTON_SCREEN	56
8.1.2.37	RC_BUTTON_SLEEP	56
8.1.2.38	RC_BUTTON_SOURCE	56
8.1.2.39	RC_BUTTON_STANDBY	57
8.1.2.40	RC_BUTTON_STOP	57
8.1.2.41	RC_BUTTON_SUBTTL	57
8.1.2.42	RC_BUTTON_SWAP	57
8.1.2.43	RC_BUTTON_TELE_TEXT	57
8.1.2.44	RC_BUTTON_VOLUME_DOWN	57
8.1.2.45	RC_BUTTON_VOLUME_UP	57
8.1.2.46	RC_BUTTON_WIND	57
8.1.2.47	RC_BUTTON_YELLOW	57
8.1.2.48	SYS_EVENT_1ms_CLOCK	57
8.1.2.49	SYS_EVENT_IO_CAMERA	57
8.1.2.50	SYS_EVENT_IO_MOTOR_LEFT	57
8.1.2.51	SYS_EVENT_IO_MOTOR_RIGHT	58
8.1.2.52	SYS_EVENT_IO_REMOECONTROL	58
8.1.2.53	SYS_EVENT_IO_TO_BLUETOOTH	58
8.1.2.54	SYS_EVENT_TERMINATION	58
8.1.2.55	UART1_RX	58
8.1.2.56	UART1_RX_DIR	58
8.1.2.57	UART1_TX	58
8.1.2.58	UART1_TX_DIR	58
8.1.2.59	UART2_RX	58
8.1.2.60	UART2_RX_DIR	58
8.1.2.61	UART2_TX	58
8.1.2.62	UART2_TX_DIR	58
8.1.3	Typedef Documentation	59
8.1.3.1	pByteFunction	59
8.1.3.2	pFunction	59
8.1.3.3	pUART_reader	59

8.1.3.4	sint	59
8.1.3.5	sint16	59
8.1.3.6	sint32	59
8.1.3.7	sint8	59
8.1.3.8	sys_colour	59
8.1.3.9	uint	59
8.1.3.10	uint16	60
8.1.3.11	uint32	60
8.1.3.12	uint8	60
8.1.4	Enumeration Type Documentation	60
8.1.4.1	sys_colour	60
8.2	events/events.c File Reference	60
8.2.1	Detailed Description	62
8.2.2	Typedef Documentation	62
8.2.2.1	sys_registered_event	62
8.2.2.2	sys_subscribed_process	62
8.2.3	Function Documentation	62
8.2.3.1	Sys_Find_Event	62
8.2.3.2	Sys_IsEventRegistered	62
8.2.3.3	Sys_Register_Event	63
8.2.3.4	Sys_Send_Event	63
8.2.3.5	Sys_Send_IntEvent	63
8.2.3.6	Sys_Subscribe_to_Event	64
8.2.3.7	Sys_Unregister_Event	64
8.2.3.8	Sys_Unsubscribe_from_Event	64
8.2.3.9	Sys_Unsubscribe_Handler_from_Event	64
8.2.3.10	Sys_Unsubscribe_Process	64
8.2.4	Variable Documentation	66
8.2.4.1	registered_events	66
8.3	events/events.h File Reference	66
8.3.1	Detailed Description	67
8.3.2	Typedef Documentation	67
8.3.2.1	pConditionFunction	67
8.3.2.2	pEventHandlerFunction	67
8.3.2.3	sys_event_data	68
8.3.3	Function Documentation	68
8.3.3.1	Sys_IsEventRegistered	68
8.3.3.2	Sys_Register_Event	68
8.3.3.3	Sys_Send_Event	68
8.3.3.4	Sys_Send_IntEvent	68

8.3.3.5	Sys_Subscribe_to_Event	69
8.3.3.6	Sys_Unregister_Event	69
8.3.3.7	Sys_Unsubscribe_from_Event	69
8.3.3.8	Sys_Unsubscribe_Process	69
8.4	interrupts.c File Reference	70
8.4.1	Detailed Description	70
8.4.2	Function Documentation	71
8.4.2.1	Sys_End_AtomicSection	71
8.4.2.2	Sys_Start_AtomicSection	71
8.5	interrupts.h File Reference	71
8.5.1	Detailed Description	72
8.5.2	Macro Definition Documentation	72
8.5.2.1	SYS_IRQP_CAMERA_FRAME	72
8.5.2.2	SYS_IRQP_CAMERA_LINE	72
8.5.2.3	SYS_IRQP_CAMERA_PIXEL	73
8.5.2.4	SYS_IRQP_I2C	73
8.5.2.5	SYS_IRQP_IO_TIMER	73
8.5.2.6	SYS_IRQP_MAX	73
8.5.2.7	SYS_IRQP_REMOTECONTROL	73
8.5.2.8	SYS_IRQP_SYSTEM_TIMER	73
8.5.2.9	SYS_IRQP_UART1	73
8.5.2.10	SYS_IRQP_UART2	73
8.5.3	Function Documentation	73
8.5.3.1	Sys_End_AtomicSection	73
8.5.3.2	Sys_Start_AtomicSection	74
8.6	io/io.c File Reference	74
8.6.1	Detailed Description	75
8.6.2	Function Documentation	75
8.6.2.1	Sys_Continue_IOTimer	75
8.6.2.2	Sys_Disable_IOTimerInterrupt	75
8.6.2.3	Sys_Enable_IOTimerInterrupt	75
8.6.2.4	Sys_Force_IOTimerInterrupt	76
8.6.2.5	Sys_Init_IOManagement	76
8.6.2.6	Sys_Register_IOHandler	76
8.6.2.7	Sys_Reset_IOTimer	76
8.6.2.8	Sys_Start_IOManagement	76
8.6.2.9	Sys_Stop_IOManagement	76
8.6.2.10	Sys_Stop_IOTimer	76
8.6.2.11	Sys_Unregister_IOHandler	77
8.7	io/io.h File Reference	77

8.7.1	Detailed Description	78
8.7.2	Function Documentation	78
8.7.2.1	Sys_Continue_IOTimer	78
8.7.2.2	Sys_Disable_IOTimerInterrupt	78
8.7.2.3	Sys_Enable_IOTimerInterrupt	78
8.7.2.4	Sys_Force_IOTimerInterrupt	78
8.7.2.5	Sys_Init_IOManagement	79
8.7.2.6	Sys_Register_IOHandler	79
8.7.2.7	Sys_Reset_IOTimer	79
8.7.2.8	Sys_Start_IOManagement	79
8.7.2.9	Sys_Stop_IOManagement	79
8.7.2.10	Sys_Stop_IOTimer	79
8.7.2.11	Sys_Unregister_IOHandler	79
8.8	io/io_clock.c File Reference	80
8.8.1	Detailed Description	80
8.8.2	Function Documentation	81
8.8.2.1	Sys_Get_SystemClock	81
8.8.2.2	Sys_Get_SystemTime	81
8.8.2.3	Sys_Init_Clock	81
8.8.2.4	Sys_Init_SystemTime	81
8.8.2.5	Sys_SystemClock_Counter	81
8.9	io/io_clock.h File Reference	82
8.9.1	Detailed Description	82
8.9.2	Function Documentation	83
8.9.2.1	Sys_Get_SystemClock	83
8.9.2.2	Sys_Get_SystemTime	83
8.9.2.3	Sys_Init_Clock	83
8.9.2.4	Sys_Init_SystemTime	83
8.10	memory.c File Reference	84
8.10.1	Detailed Description	84
8.10.2	Function Documentation	85
8.10.2.1	Sys_Free	85
8.10.2.2	Sys_Malloc	86
8.10.2.3	Sys_Memcpy	86
8.11	memory.h File Reference	86
8.11.1	Detailed Description	87
8.11.2	Function Documentation	87
8.11.2.1	Sys_Free	87
8.11.2.2	Sys_Malloc	87
8.11.2.3	Sys_Memcpy	88

8.12 platform/e-puck/camera.c File Reference	88
8.12.1 Detailed Description	89
8.12.2 Macro Definition Documentation	90
8.12.2.1 BLUE_MAX	90
8.12.2.2 BLUE_THRESHOLD	90
8.12.2.3 CAM_H_SIZE	90
8.12.2.4 CAM_HEIGHT	90
8.12.2.5 CAM_W_SIZE	90
8.12.2.6 CAM_WIDTH	90
8.12.2.7 CAM_ZOOM_X	90
8.12.2.8 CAM_ZOOM_Y	90
8.12.2.9 CAMERA_I2C_ADDRESS	91
8.12.2.10 COLOUR_THRESHOLD	91
8.12.2.11 CP_BI	91
8.12.2.12 CP_GI	91
8.12.2.13 CP_RI	91
8.12.2.14 CP_WI	91
8.12.2.15 FRAME_HEIGHT	91
8.12.2.16 FRAME_WIDTH	91
8.12.2.17 GREEN_MAX	91
8.12.2.18 GREEN_THRESHOLD	92
8.12.2.19 RED_MAX	92
8.12.2.20 RED_THRESHOLD	92
8.12.3 Function Documentation	92
8.12.3.1 Sys_Camera_PreProcessor	92
8.12.3.2 Sys_Init_Camera	92
8.12.3.3 Sys_Process_newFrame	92
8.12.3.4 Sys_Process_newLine	92
8.12.3.5 Sys_Process_newPixel	92
8.12.3.6 Sys_Set_Preprocessing	92
8.12.3.7 Sys_Start_Camera	93
8.13 platform/e-puck/camera.h File Reference	93
8.13.1 Detailed Description	94
8.13.2 Macro Definition Documentation	94
8.13.2.1 SYS_MAX_BLUE	94
8.13.2.2 SYS_MAX_GREEN	95
8.13.2.3 SYS_MAX_RED	95
8.13.3 Typedef Documentation	95
8.13.3.1 pCameraPreProcessor	95
8.13.3.2 sys_rgb	95

8.13.3.3	sys_rgb_pixel	95
8.13.4	Function Documentation	95
8.13.4.1	getFinishedFrame	95
8.13.4.2	isNewFrameAvailable	95
8.13.4.3	Sys_Init_Camera	95
8.13.4.4	Sys_Set_Preprocessing	95
8.13.4.5	Sys_Start_Camera	96
8.14	platform/e-puck/camera_processing.c File Reference	96
8.14.1	Detailed Description	97
8.14.2	Macro Definition Documentation	97
8.14.2.1	CBP_BI	97
8.14.2.2	CBP_DI	97
8.14.2.3	CBP_GI	97
8.14.2.4	CBP_RI	97
8.14.2.5	CBP_WI	97
8.14.2.6	CP_BI	97
8.14.2.7	CP_GI	97
8.14.2.8	CP_RI	98
8.14.2.9	CP_WGB_I	98
8.14.2.10	CP_WI	98
8.14.3	Function Documentation	98
8.14.3.1	brushedColorFromRGB565	98
8.14.3.2	convertRGB565ToRGB888	98
8.14.3.3	getBrushedColorAt	98
8.14.3.4	getRGB565at	98
8.14.3.5	getRGB888at	98
8.14.3.6	nearestNeighborRGB	98
8.14.4	Variable Documentation	98
8.14.4.1	colorBrushedPositions	98
8.14.4.2	colorPositions	99
8.14.4.3	powerTbl	99
8.15	platform/e-puck/camera_processing.h File Reference	99
8.15.1	Detailed Description	100
8.15.2	Function Documentation	100
8.15.2.1	brushedColorFromRGB565	100
8.15.2.2	convertRGB565ToRGB888	100
8.15.2.3	getBrushedColorAt	100
8.15.2.4	getRGB565at	100
8.15.2.5	getRGB888at	100
8.15.2.6	nearestNeighborRGB	100

8.16	platform/e-puck/DSPIC30F6014A_HDI.h File Reference	100
8.16.1	Detailed Description	101
8.16.2	Macro Definition Documentation	102
8.16.2.1	ADDRESS_AITV_ADDRESS_ERROR	102
8.16.2.2	ADDRESS_AITV_MATH_ERROR	102
8.16.2.3	ADDRESS_AITV_OSC_FAIL	102
8.16.2.4	ADDRESS_AITV_STACK_ERROR	102
8.16.2.5	ADDRESS_AIVT	102
8.16.2.6	ADDRESS_AIVT_T1	102
8.16.2.7	ADDRESS_ITV_ADDRESS_ERROR	102
8.16.2.8	ADDRESS_ITV_MATH_ERROR	102
8.16.2.9	ADDRESS_ITV_OSC_FAIL	102
8.16.2.10	ADDRESS_ITV_STACK_ERROR	102
8.16.2.11	ADDRESS_IVT	103
8.16.2.12	ADDRESS_IVT_T1	103
8.17	platform/e-puck/i2c.c File Reference	103
8.17.1	Detailed Description	104
8.17.2	Function Documentation	104
8.17.2.1	Sys_Contine_I2C	104
8.17.2.2	Sys_I2C_Read	104
8.17.2.3	Sys_I2C_ReadByte	104
8.17.2.4	Sys_I2C_Send_ACK	105
8.17.2.5	Sys_I2C_Send_NACK	105
8.17.2.6	Sys_I2C_Send_Restart	105
8.17.2.7	Sys_I2C_Send_Start	105
8.17.2.8	Sys_I2C_Send_Stop	105
8.17.2.9	Sys_I2C_SentBytes	105
8.17.2.10	Sys_I2C_Start_Reading	106
8.17.2.11	Sys_I2C_WriteByte	106
8.17.2.12	Sys_Init_I2C	106
8.17.2.13	Sys_Pause_I2C	106
8.17.2.14	Sys_Start_I2C	106
8.17.2.15	Sys_Stop_I2C	106
8.18	platform/e-puck/i2c.h File Reference	106
8.18.1	Detailed Description	107
8.18.2	Function Documentation	108
8.18.2.1	Sys_Contine_I2C	108
8.18.2.2	Sys_I2C_Read	108
8.18.2.3	Sys_I2C_SentBytes	108
8.18.2.4	Sys_Init_I2C	108

8.18.2.5	Sys_Pause_I2C	109
8.18.2.6	Sys_Start_I2C	109
8.18.2.7	Sys_Stop_I2C	109
8.19	platform/e-puck/i2c_data.c File Reference	109
8.19.1	Detailed Description	110
8.19.2	Function Documentation	110
8.19.2.1	Sys_I2C_AppendMessages	110
8.19.2.2	Sys_I2C_FreeMessages	110
8.19.2.3	Sys_I2C_RemoveOldestMessage	110
8.19.3	Variable Documentation	111
8.19.3.1	sys_i2c_msgs	111
8.20	platform/e-puck/i2c_data.h File Reference	111
8.20.1	Detailed Description	112
8.20.2	Typedef Documentation	113
8.20.2.1	sys_i2c_message	113
8.20.2.2	sys_i2c_messages	113
8.20.2.3	sys_i2c_msg	113
8.20.3	Enumeration Type Documentation	113
8.20.3.1	sys_I2C_mode	113
8.20.3.2	sys_I2C_state	113
8.20.4	Function Documentation	113
8.20.4.1	Sys_I2C_AppendMessages	113
8.20.4.2	Sys_I2C_FreeMessages	114
8.20.4.3	Sys_I2C_RemoveOldestMessage	114
8.20.5	Variable Documentation	114
8.20.5.1	sys_i2c_msgs	114
8.21	platform/e-puck/i2c_HDI.c File Reference	114
8.21.1	Detailed Description	115
8.21.2	Function Documentation	116
8.21.2.1	Sys_Contine_I2C_HDI	116
8.21.2.2	Sys_I2C_ReadByte_HDI	116
8.21.2.3	Sys_I2C_Send_ACK_HDI	116
8.21.2.4	Sys_I2C_Send_NACK_HDI	116
8.21.2.5	Sys_I2C_Send_Restart_HDI	116
8.21.2.6	Sys_I2C_Send_Start_HDI	116
8.21.2.7	Sys_I2C_Send_Stop_HDI	116
8.21.2.8	Sys_I2C_Start_Reading_HDI	117
8.21.2.9	Sys_I2C_WriteByte_HDI	117
8.21.2.10	Sys_Init_I2C_HDI	117
8.21.2.11	Sys_Pause_I2C_HDI	117

8.21.2.12 Sys_Start_I2C_HDI	117
8.21.2.13 Sys_Stop_I2C_HDI	117
8.22 platform/e-puck/i2c_HDI.h File Reference	117
8.22.1 Detailed Description	119
8.22.2 Function Documentation	119
8.22.2.1 Sys_Contine_I2C_HDI	119
8.22.2.2 Sys_I2C_Read	119
8.22.2.3 Sys_I2C_ReadByte_HDI	119
8.22.2.4 Sys_I2C_Send_ACK_HDI	119
8.22.2.5 Sys_I2C_Send_NACK_HDI	120
8.22.2.6 Sys_I2C_Send_Restart_HDI	120
8.22.2.7 Sys_I2C_Send_Start_HDI	120
8.22.2.8 Sys_I2C_Send_Stop_HDI	120
8.22.2.9 Sys_I2C_SentBytes	120
8.22.2.10 Sys_I2C_Start_Reading_HDI	120
8.22.2.11 Sys_I2C_WriteByte_HDI	121
8.22.2.12 Sys_Init_I2C_HDI	122
8.22.2.13 Sys_Pause_I2C_HDI	122
8.22.2.14 Sys_Start_I2C_HDI	122
8.22.2.15 Sys_Stop_I2C_HDI	122
8.23 platform/e-puck/io_HDI.c File Reference	122
8.23.1 Detailed Description	123
8.23.2 Function Documentation	124
8.23.2.1 __attribute__	124
8.23.2.2 Sys_Continue_IOTimer_HDI	124
8.23.2.3 Sys_Disable_IOTimerInterrupt_HDI	125
8.23.2.4 Sys_Enable_IOTimerInterrupt_HDI	125
8.23.2.5 Sys_Force_IOTimerInterrupt_HDI	125
8.23.2.6 Sys_Init_IOTimer_HDI	125
8.23.2.7 Sys_IOTimer_code_HDI	125
8.23.2.8 Sys_Reset_IOTimer_HDI	125
8.23.2.9 Sys_Start_IOTimer_HDI	125
8.23.2.10 Sys_Stop_IOTimer_HDI	125
8.23.3 Variable Documentation	126
8.23.3.1 sys_iohandlers	126
8.24 platform/e-puck/io_HDI.h File Reference	126
8.24.1 Detailed Description	127
8.24.2 Macro Definition Documentation	127
8.24.2.1 STEPS_PER_MILLISECOND	127
8.24.2.2 STEPS_PER_SECOND	128

8.24.3	Typedef Documentation	128
8.24.3.1	sys_periodical_IOHandler	128
8.24.3.2	sys_pIOHandler	128
8.24.4	Function Documentation	128
8.24.4.1	Sys_Continue_IOTimer_HDI	128
8.24.4.2	Sys_Disable_IOTimerInterrupt_HDI	128
8.24.4.3	Sys_Enable_IOTimerInterrupt_HDI	128
8.24.4.4	Sys_Force_IOTimerInterrupt_HDI	128
8.24.4.5	Sys_Init_IOTimer_HDI	128
8.24.4.6	Sys_IOTimer_code_HDI	129
8.24.4.7	Sys_Reset_IOTimer_HDI	129
8.24.4.8	Sys_Start_IOTimer_HDI	129
8.24.4.9	Sys_Stop_IOTimer_HDI	129
8.24.5	Variable Documentation	129
8.24.5.1	sys_iohandlers	129
8.25	platform/e-puck/motors.c File Reference	129
8.25.1	Detailed Description	131
8.25.2	Macro Definition Documentation	131
8.25.2.1	MAX_WHEEL_SPEED	131
8.25.2.2	POWER_SAVE_WAIT	131
8.25.3	Typedef Documentation	131
8.25.3.1	sys_motors	131
8.25.4	Function Documentation	131
8.25.4.1	Sys_Get_LeftWheelSpeed	131
8.25.4.2	Sys_Get_RightWheelSpeed	131
8.25.4.3	Sys_Init_Motors	132
8.25.4.4	Sys_LeftMotor_Controller	132
8.25.4.5	Sys_LeftMotor_EventHandler	132
8.25.4.6	Sys_LeftMotor_Reset	132
8.25.4.7	Sys_RightMotor_Controller	132
8.25.4.8	Sys_RightMotor_EventHandler	132
8.25.4.9	Sys_RightMotor_Reset	133
8.25.4.10	Sys_Set_LeftWheelSpeed	133
8.25.4.11	Sys_Set_RightWheelSpeed	133
8.26	platform/e-puck/motors.h File Reference	133
8.26.1	Detailed Description	134
8.26.2	Macro Definition Documentation	135
8.26.2.1	MAX_WHEEL_SPEED_MM_S	135
8.26.3	Function Documentation	135
8.26.3.1	Sys_Get_LeftWheelSpeed	135

8.26.3.2	Sys_Get_RightWheelSpeed	135
8.26.3.3	Sys_Init_Motors	135
8.26.3.4	Sys_Set_LeftWheelSpeed	135
8.26.3.5	Sys_Set_RightWheelSpeed	136
8.27	platform/e-puck/motors_HDI.c File Reference	136
8.27.1	Detailed Description	136
8.27.2	Function Documentation	137
8.27.2.1	Sys_LeftMotor_SetPhase_HDI	137
8.27.2.2	Sys_RightMotor_SetPhase_HDI	137
8.28	platform/e-puck/motors_HDI.h File Reference	137
8.28.1	Detailed Description	138
8.28.2	Macro Definition Documentation	138
8.28.2.1	MOTORPHASE_RESET	138
8.28.3	Function Documentation	139
8.28.3.1	Sys_LeftMotor_SetPhase_HDI	139
8.28.3.2	Sys_RightMotor_SetPhase_HDI	139
8.29	platform/e-puck/process_Management_HDI.c File Reference	139
8.29.1	Detailed Description	140
8.29.2	Function Documentation	140
8.29.2.1	Sys_Change_Stack_HDI	140
8.29.2.2	Sys_Init_Process_Management_HDI	140
8.29.2.3	Sys_Save_Running_Process_HDI	140
8.29.2.4	Sys_Start_Process_HDI	141
8.29.2.5	Sys_Switch_Process_HDI	141
8.30	platform/e-puck/process_Management_HDI.h File Reference	141
8.30.1	Detailed Description	142
8.30.2	Function Documentation	142
8.30.2.1	Sys_Change_Stack_HDI	142
8.30.2.2	Sys_Init_Process_Management_HDI	143
8.30.2.3	Sys_Save_Running_Process_HDI	143
8.30.2.4	Sys_Start_Process_HDI	143
8.30.2.5	Sys_Switch_Process_HDI	143
8.31	platform/e-puck/remoteControl.c File Reference	143
8.31.1	Detailed Description	144
8.31.2	Function Documentation	144
8.31.2.1	Sys_HasRemoteC_Sent_New_Data	144
8.31.2.2	Sys_Init_RemoteControl	145
8.31.2.3	Sys_Receive_RemoteControl_Msg	145
8.31.2.4	Sys_RemoteC_Get_Address	145
8.31.2.5	Sys_RemoteC_Get_CheckBit	145

8.31.2.6	Sys_RemoteC_Get_Data	145
8.31.2.7	Sys_Start_RemoteControl	146
8.32	platform/e-puck/remoteControl.h File Reference	146
8.32.1	Detailed Description	148
8.32.2	Macro Definition Documentation	148
8.32.2.1	RC_BUTTON_0	148
8.32.2.2	RC_BUTTON_1	148
8.32.2.3	RC_BUTTON_2	148
8.32.2.4	RC_BUTTON_3	148
8.32.2.5	RC_BUTTON_4	148
8.32.2.6	RC_BUTTON_5	148
8.32.2.7	RC_BUTTON_6	149
8.32.2.8	RC_BUTTON_7	149
8.32.2.9	RC_BUTTON_8	149
8.32.2.10	RC_BUTTON_9	149
8.32.2.11	RC_BUTTON_BACK	149
8.32.2.12	RC_BUTTON_BLUE	149
8.32.2.13	RC_BUTTON_CHANNEL_DOWN	149
8.32.2.14	RC_BUTTON_CHANNEL_UP	149
8.32.2.15	RC_BUTTON_CURSOR_DOWN	149
8.32.2.16	RC_BUTTON_CURSOR_LEFT	150
8.32.2.17	RC_BUTTON_CURSOR_RIGHT	150
8.32.2.18	RC_BUTTON_CURSOR_UP	150
8.32.2.19	RC_BUTTON_EPG	150
8.32.2.20	RC_BUTTON_FAV	150
8.32.2.21	RC_BUTTON_GREEN	150
8.32.2.22	RC_BUTTON_INFO	150
8.32.2.23	RC_BUTTON_INTERNET	150
8.32.2.24	RC_BUTTON_LANG	150
8.32.2.25	RC_BUTTON_MENU	151
8.32.2.26	RC_BUTTON_MUTE	151
8.32.2.27	RC_BUTTON_OK	151
8.32.2.28	RC_BUTTON_PAUSE	151
8.32.2.29	RC_BUTTON_PLAY	151
8.32.2.30	RC_BUTTON_PRESETS	151
8.32.2.31	RC_BUTTON_RECORD	151
8.32.2.32	RC_BUTTON_RED	151
8.32.2.33	RC_BUTTON_REWIND	151
8.32.2.34	RC_BUTTON_SCREEN	152
8.32.2.35	RC_BUTTON_SLEEP	152

8.32.2.36 RC_BUTTON_SOURCE	152
8.32.2.37 RC_BUTTON_STANDBY	152
8.32.2.38 RC_BUTTON_STOP	152
8.32.2.39 RC_BUTTON_SUBTTL	152
8.32.2.40 RC_BUTTON_SWAP	152
8.32.2.41 RC_BUTTON_TELE_TEXT	152
8.32.2.42 RC_BUTTON_VOLUME_DOWN	152
8.32.2.43 RC_BUTTON_VOLUME_UP	153
8.32.2.44 RC_BUTTON_WIND	153
8.32.2.45 RC_BUTTON_YELLOW	153
8.32.3 Function Documentation	153
8.32.3.1 Sys_Init_RemoteControl	153
8.32.3.2 Sys_Receive_RemoteControl_Msg	153
8.32.3.3 Sys_RemoteC_Get_Address	153
8.32.3.4 Sys_RemoteC_Get_CheckBit	153
8.32.3.5 Sys_RemoteC_Get_Data	154
8.32.3.6 Sys_RemoteC_Received_New_Data	154
8.32.3.7 Sys_Start_RemoteControl	154
8.33 platform/e-puck/remoteControl_HDI.c File Reference	154
8.33.1 Detailed Description	155
8.33.2 Function Documentation	155
8.33.2.1 __attribute__	155
8.33.2.2 Sys_Init_RemoteControl_HDI	155
8.33.2.3 Sys_Start_RemoteControl_HDI	156
8.33.3 Variable Documentation	156
8.33.3.1 isNewDataAvailable	156
8.33.3.2 message_arriving	156
8.33.3.3 receiving_bit	156
8.33.3.4 rx_buffer	156
8.33.3.5 waiting_cycles	156
8.34 platform/e-puck/remoteControl_HDI.h File Reference	156
8.34.1 Detailed Description	158
8.34.2 Macro Definition Documentation	158
8.34.2.1 RC_NOT_STARTED	158
8.34.2.2 RC_WAIT_FOR_BIT	158
8.34.2.3 RC_WAIT_FOR_HALFBIT	158
8.34.2.4 RC_WAIT_FOR_QUARTERBIT	158
8.34.2.5 RC_WAIT_INITIALLY	158
8.34.3 Function Documentation	159
8.34.3.1 Sys_Init_RemoteControl_HDI	159

8.34.3.2	Sys_Start_RemoteControl_HDI	159
8.34.4	Variable Documentation	159
8.34.4.1	isNewDataAvailable	159
8.34.4.2	message_arriving	159
8.34.4.3	receiving_bit	159
8.34.4.4	rx_buffer	159
8.34.4.5	waiting_cycles	159
8.35	platform/e-puck/system_Timer_HDI.c File Reference	159
8.35.1	Detailed Description	160
8.35.2	Function Documentation	161
8.35.2.1	__attribute__	161
8.35.2.2	Sys_Continue_SystemTimer_HDI	161
8.35.2.3	Sys_Disable_TimerInterrupt_HDI	161
8.35.2.4	Sys_Enable_TimerInterrupt_HDI	161
8.35.2.5	Sys_Force_TimerInterrupt_HDI	161
8.35.2.6	Sys_Init_SystemTimer_HDI	161
8.35.2.7	Sys_Reset_SystemTimer_HDI	162
8.35.2.8	Sys_Start_SystemTimer_HDI	162
8.35.2.9	Sys_Stop_SystemTimer_HDI	162
8.35.3	Variable Documentation	162
8.35.3.1	sys_process_scheduler	162
8.36	platform/e-puck/system_Timer_HDI.h File Reference	162
8.36.1	Detailed Description	163
8.36.2	Function Documentation	164
8.36.2.1	Sys_Continue_SystemTimer_HDI	164
8.36.2.2	Sys_Disable_TimerInterrupt_HDI	164
8.36.2.3	Sys_Enable_TimerInterrupt_HDI	164
8.36.2.4	Sys_Force_TimerInterrupt_HDI	164
8.36.2.5	Sys_Init_SystemTimer_HDI	164
8.36.2.6	Sys_Reset_SystemTimer_HDI	165
8.36.2.7	Sys_Start_SystemTimer_HDI	165
8.36.2.8	Sys_Stop_SystemTimer_HDI	165
8.36.2.9	Sys_todo_SystemTimer	165
8.36.3	Variable Documentation	165
8.36.3.1	sys_process_scheduler	165
8.37	platform/e-puck/traps.c File Reference	165
8.37.1	Detailed Description	166
8.37.2	Function Documentation	166
8.37.2.1	__attribute__	166
8.38	platform/e-puck/uart.c File Reference	167

8.38.1	Detailed Description	168
8.38.2	Macro Definition Documentation	168
8.38.2.1	SYS_UART1_BAUDRATE	168
8.38.2.2	SYS_UART2_BAUDRATE	168
8.38.3	Function Documentation	168
8.38.3.1	Sys_Init_UART1	168
8.38.3.2	Sys_Init_UART2	169
8.38.3.3	Sys_SetReadingFunction_UART1	169
8.38.3.4	Sys_SetReadingFunction_UART2	169
8.38.3.5	Sys_Start_UART1	169
8.38.3.6	Sys_Start_UART2	169
8.38.3.7	Sys_Writeto_UART1	169
8.38.3.8	Sys_Writeto_UART2	170
8.39	platform/e-puck/uart.h File Reference	170
8.39.1	Detailed Description	171
8.39.2	Function Documentation	171
8.39.2.1	Sys_Init_UART1	171
8.39.2.2	Sys_Init_UART2	172
8.39.2.3	Sys_SetReadingFunction_UART1	172
8.39.2.4	Sys_SetReadingFunction_UART2	172
8.39.2.5	Sys_Start_UART1	172
8.39.2.6	Sys_Start_UART2	172
8.39.2.7	Sys_Writeto_UART1	172
8.39.2.8	Sys_Writeto_UART2	173
8.40	platform/e-puck/uart_HDI.c File Reference	173
8.40.1	Detailed Description	174
8.40.2	Function Documentation	174
8.40.2.1	__attribute__	174
8.40.2.2	Sys_Init_UART1_HDI	175
8.40.2.3	Sys_Init_UART2_HDI	175
8.40.2.4	Sys_Read_UART1_ISR	175
8.40.2.5	Sys_Read_UART2_ISR	175
8.40.2.6	Sys_Start_UART1_HDI	175
8.40.2.7	Sys_Start_UART2_HDI	176
8.40.2.8	Sys_Write_UART1_ISR	176
8.40.2.9	Sys_Write_UART2_ISR	176
8.40.3	Variable Documentation	176
8.40.3.1	byte_counter_uart1	176
8.40.3.2	byte_counter_uart2	176
8.40.3.3	read_uart_1	176

8.40.3.4	read_uart_2	176
8.40.3.5	sys_UART1_TX_data	176
8.40.3.6	sys_UART2_TX_data	177
8.41	platform/e-puck/uart_HDI.h File Reference	177
8.41.1	Detailed Description	178
8.41.2	Macro Definition Documentation	179
8.41.2.1	SYS_UART1_BAUDRATE	179
8.41.2.2	SYS_UART2_BAUDRATE	179
8.41.2.3	UART1_RX	179
8.41.2.4	UART1_RX_DIR	179
8.41.2.5	UART1_TX	179
8.41.2.6	UART1_TX_DIR	179
8.41.2.7	UART2_RX	179
8.41.2.8	UART2_RX_DIR	179
8.41.2.9	UART2_TX	179
8.41.2.10	UART2_TX_DIR	180
8.41.3	Typedef Documentation	180
8.41.3.1	sys_uart_txdata	180
8.41.4	Function Documentation	180
8.41.4.1	Sys_Init_UART1_HDI	180
8.41.4.2	Sys_Init_UART2_HDI	180
8.41.4.3	Sys_Read_UART1_ISR	180
8.41.4.4	Sys_Read_UART2_ISR	180
8.41.4.5	Sys_Start_UART1_HDI	180
8.41.4.6	Sys_Start_UART2_HDI	181
8.41.4.7	Sys_Write_UART1_ISR	181
8.41.4.8	Sys_Write_UART2_ISR	181
8.41.5	Variable Documentation	181
8.41.5.1	byte_counter_uart1	181
8.41.5.2	byte_counter_uart2	181
8.41.5.3	read_uart_1	181
8.41.5.4	read_uart_2	181
8.41.5.5	sys_UART1_TX_data	181
8.41.5.6	sys_UART2_TX_data	182
8.42	processes/data.c File Reference	182
8.42.1	Detailed Description	183
8.42.2	Function Documentation	183
8.42.2.1	Sys_Clear_EventData	183
8.42.2.2	Sys_Clear_EventRegister	183
8.42.2.3	Sys_Delete_Process	184

8.42.2.4	Sys_Find_Process	184
8.42.2.5	Sys_Insert_Process_to_List	184
8.42.2.6	Sys_Next_EventHandler	184
8.42.2.7	Sys_Remove_Event_from_EventRegister	185
8.42.2.8	Sys_Remove_Process_from_List	185
8.42.2.9	Sys_Set_Defaults_PCB	185
8.42.3	Variable Documentation	186
8.42.3.1	sys_blocked_processes	186
8.42.3.2	sys_occurred_events	186
8.42.3.3	sys_ready_processes	186
8.42.3.4	sys_running_process	186
8.42.3.5	sys_zombies	186
8.43	processes/data.h File Reference	186
8.43.1	Detailed Description	188
8.43.2	Typedef Documentation	189
8.43.2.1	sys_occurred_event	189
8.43.2.2	sys_pcb	189
8.43.2.3	sys_pcb_list_element	189
8.43.2.4	sys_peh	189
8.43.2.5	sys_process_control_block	189
8.43.2.6	sys_process_control_block_list_element	189
8.43.2.7	sys_process_event_handler	189
8.43.3	Function Documentation	189
8.43.3.1	Sys_Clear_EventData	189
8.43.3.2	Sys_Clear_EventRegister	189
8.43.3.3	Sys_Delete_Process	190
8.43.3.4	Sys_Find_EventHandler	190
8.43.3.5	Sys_Find_Process	190
8.43.3.6	Sys_Insert_Process_to_List	190
8.43.3.7	Sys_Next_EventHandler	191
8.43.3.8	Sys_Remove_Event_from_EventRegister	191
8.43.3.9	Sys_Remove_Process_from_List	191
8.43.3.10	Sys_Set_Defaults_PCB	192
8.43.4	Variable Documentation	192
8.43.4.1	sys_blocked_processes	192
8.43.4.2	sys_occurred_events	192
8.43.4.3	sys_ready_processes	192
8.43.4.4	sys_running_process	192
8.43.4.5	sys_zombies	193
8.44	processes/process_Management.c File Reference	193

8.44.1	Detailed Description	194
8.44.2	Function Documentation	194
8.44.2.1	Sys_Add_Event_Subscription	194
8.44.2.2	Sys_Add_Event_to_Process	194
8.44.2.3	Sys_Block_Process	195
8.44.2.4	Sys_Continue_Pocess	195
8.44.2.5	Sys_End_CriticalSection	195
8.44.2.6	Sys_Execute_All_EventHandler	195
8.44.2.7	Sys_Execute_Events_in_ProcessList	195
8.44.2.8	Sys_Get_Number_Processes	196
8.44.2.9	Sys_Init_Process_Management	196
8.44.2.10	Sys_Interprocess_EventHandling	196
8.44.2.11	Sys_Kill_Process	196
8.44.2.12	Sys_Kill_Zombies	196
8.44.2.13	Sys_Remove_All_Event_Subscriptions	196
8.44.2.14	Sys_Remove_Event_Subscription	197
8.44.2.15	Sys_Set_Running_Process_to_Zombie	197
8.44.2.16	Sys_Start_CriticalSection	197
8.44.2.17	Sys_Start_Process	197
8.44.2.18	Sys_Switch_Process	197
8.44.2.19	Sys_Switch_to_next_Process	198
8.44.2.20	Sys_Wait_For_Condition	198
8.44.2.21	Sys_Wait_For_Event	198
8.44.2.22	Sys_Yield	198
8.45	processes/process_Management.h File Reference	198
8.45.1	Detailed Description	200
8.45.2	Macro Definition Documentation	200
8.45.2.1	DEFAULT_PROCESS_STACK_SIZE	200
8.45.3	Function Documentation	200
8.45.3.1	Sys_Add_Event_Subscription	200
8.45.3.2	Sys_Add_Event_to_Process	200
8.45.3.3	Sys_Clear_EventData	201
8.45.3.4	Sys_End_CriticalSection	201
8.45.3.5	Sys_Execute_All_EventHandler	201
8.45.3.6	Sys_Get_Number_Processes	201
8.45.3.7	Sys_Init_Process_Management	201
8.45.3.8	Sys_Kill_Process	202
8.45.3.9	Sys_Kill_Zombies	202
8.45.3.10	Sys_Remove_All_Event_Subscriptions	202
8.45.3.11	Sys_Remove_Event_Subscription	202

8.45.3.12 Sys_Start_CriticalSection	202
8.45.3.13 Sys_Start_Process	202
8.45.3.14 Sys_Switch_Process	203
8.45.3.15 Sys_Switch_to_next_Process	203
8.45.3.16 Sys_Wait_For_Condition	203
8.45.3.17 Sys_Wait_For_Event	203
8.45.3.18 Sys_Yield	204
8.46 processes/scheduler.c File Reference	204
8.46.1 Detailed Description	204
8.46.2 Function Documentation	205
8.46.2.1 Sys_Scheduler_RoundRobin	205
8.46.2.2 Sys_Set_Defaults_Info	205
8.47 processes/scheduler.h File Reference	205
8.47.1 Detailed Description	206
8.47.2 Macro Definition Documentation	206
8.47.2.1 SYS_PROCESS_PRIORITY_HIGH	206
8.47.2.2 SYS_PROCESS_PRIORITY_LOW	206
8.47.2.3 SYS_PROCESS_PRIORITY_NORMAL	206
8.47.2.4 SYS_PROCESS_PRIORITY_SYSTEM	206
8.47.2.5 SYS_PROCESS_STATE_BABY	207
8.47.2.6 SYS_PROCESS_STATE_BLOCKED	207
8.47.2.7 SYS_PROCESS_STATE_RUNNING	207
8.47.2.8 SYS_PROCESS_STATE_WAITING	207
8.47.2.9 SYS_PROCESS_STATE_ZOMBIE	207
8.47.3 Typedef Documentation	207
8.47.3.1 sys_scheduler_info	207
8.47.4 Function Documentation	207
8.47.4.1 Sys_Scheduler_RoundRobin	207
8.47.4.2 Sys_Set_Defaults_Info	207
8.48 processes/system_Timer.c File Reference	208
8.48.1 Detailed Description	208
8.48.2 Function Documentation	209
8.48.2.1 Sys_Continue_SystemTimer	209
8.48.2.2 Sys_Disable_TimerInterrupt	209
8.48.2.3 Sys_Enable_TimerInterrupt	209
8.48.2.4 Sys_Force_TimerInterrupt	209
8.48.2.5 Sys_Init_SystemTimer	209
8.48.2.6 Sys_Reset_SystemTimer	210
8.48.2.7 Sys_Start_SystemTimer	210
8.48.2.8 Sys_Stop_SystemTimer	210

8.48.2.9	Sys_todo_SystemTimer	210
8.49	processes/system_Timer.h File Reference	210
8.49.1	Detailed Description	211
8.49.2	Function Documentation	212
8.49.2.1	Sys_Continue_SystemTimer	212
8.49.2.2	Sys_Disable_TimerInterrupt	212
8.49.2.3	Sys_Enable_TimerInterrupt	212
8.49.2.4	Sys_Force_TimerInterrupt	212
8.49.2.5	Sys_Init_SystemTimer	212
8.49.2.6	Sys_Reset_SystemTimer	213
8.49.2.7	Sys_Start_SystemTimer	213
8.49.2.8	Sys_Stop_SystemTimer	213
8.49.2.9	Sys_todo_SystemTimer	213
8.50	system.c File Reference	213
8.50.1	Detailed Description	214
8.50.2	Function Documentation	215
8.50.2.1	Sys_Init_Kernel	215
8.50.2.2	Sys_Start_Kernel	215
8.51	system.h File Reference	215
8.51.1	Detailed Description	216
8.51.2	Macro Definition Documentation	216
8.51.2.1	SYS_CAMERA_USED	216
8.51.2.2	SYS_MOTOR_USED	217
8.51.2.3	SYS_REMOTECONTROL_USED	217
8.51.2.4	SYS_UART1_USED	217
8.51.3	Function Documentation	217
8.51.3.1	Sys_Init_Kernel	217
8.51.3.2	Sys_Start_Kernel	217
Index		219

Chapter 1

OpenSwarm documentation

1.1 Introduction

OpenSwarm is an easy-to-use event-driven preemptive operating system for miniature robots. It offers abstract hardware-independent functions to make user code more extendible, maintainable, and portable. The hybrid kernel provides preemptive and cooperative scheduling, asynchronous and synchronous programming models with events, and inter-process communication functions.

OpenSwarm was created during the PhD of Stefan M Trenkwalder (<http://trenkwalder.tech>) at the University of Sheffield (<http://www.sheffield.ac.uk/>) under the Supervision of Dr. Roderich Gross and Dr. Andreas Kolling.

The code of OpenSwarm can be basically divided into 3 different modules:

- [Process Manages](#)
- [Event Management](#)
- [I/O Management](#) (This includes device specific sensors and actuators)

All modules are, then, combined in OpenSwarm's [Base](#) .

1.2 Links

- <http://www.openswarm.org/> The official OpenSwarm website
- <http://trenkwalder.tech/> The academic webpage of Stefan Trenkwalder
- <http://naturalrobotics.group.shef.ac.uk/> The website of the research group
- <http://openswarm.org/license/> The link to the newest license (in case it changed)

1.3 License

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1.4 Thanks

OpenSwarm is part of the PhD of Stefan M. Trenkwalder (<http://trenkwalder.tech>) who is recipient of a DOC Fellowship of the Austrian Academy of Sciences (<http://www.oeaw.ac.at/>).

Chapter 2

Todo List

Module **camera**

The used functions from the e-puck library are very time and computational intensive. These function can be rewritten to decrease the processing load.

File **camera.c**

The used functions from the e-puck library are very time and computational intensive. These function can be rewritten to decrease the processing load.

Module **i2c**

testing and debugging of this module.

globalScope> Global **Sys_Camera_PreProcessor (void)**

rewrite the camera to computational less intensive functions

globalScope> Global **Sys_Init_Camera (void)**

rewrite the camera to computational less intensive functions

globalScope> Global **Sys_Init_Camera (void)**

rewrite the camera to computational less intensive functions

globalScope> Global **Sys_Start_Camera (void)**

rewrite the camera to computational less intensive functions

globalScope> Global **Sys_Start_Camera (void)**

rewrite the camera to computational less intensive functions

Chapter 3

Module Index

3.1 Modules

Here is a list of all modules:

Base	13
Event Management	16
I/O Management	18
Shefpuck	23
e-puck specific modules	24
Camera Module	21
I2C interface	28
Motor Control	30
Remote Control	31
UART 1&2	33
Process Manages	35

Chapter 4

Data Structure Index

4.1 Data Structures

Here are the data structures with brief descriptions:

sys_event_data_s	It is a single linked list element and contains data of an occurred event	??
sys_i2c_message_s	It is a single linked list element containing messages that need to be sent via I2C	??
sys_motors_s	This struct contains the speed for a motor	??
sys_occurred_event_s	Linked list element containing an occurred events	??
sys_periodical_IOHandler_s	Linked list element containing IO Handler function pointers	??
sys_process_control_block_list_element_s	Double linked list element containing sys_process_control_block	??
sys_process_control_block_s	Process Control Block for a single process	??
sys_process_event_handler_s	Double linked list element of process event-handlers	??
sys_registered_event_s	A single linked element containing a registered event and its subscribers	??
sys_rgb_pixel_s	This bitfield contains the structure of a received camera pixel	??
sys_scheduler_info_s	The scheduling information for each process	??
sys_subscribed_process_s	A single linked list element containing the ID of a subscribed process	??
sys_uart_tx_data_s	Linked list element to store transmission data	??

Chapter 5

File Index

5.1 File List

Here is a list of all files with brief descriptions:

definitions.h	This file declares general preprocessor variables and types	??
interrupts.c	It defines the functions to create atomic sections	??
interrupts.h	It declares interrupt priority levels and functions to create atomic sections	??
memory.c	Defines functions to allocate, free, and copy memory	??
memory.h	Declares functions to allocate, free, and copy memory	??
system.c	Defines functions to initialise and start OpenSwarm	??
system.h	Declares functions to initialise and start OpenSwarm	??
events/events.c	Defines functions to create, (un)subscribe, (un)register, and delete events and related handler .	??
events/events.h	Declares functions to create, (un)subscribe, (un)register, and delete events and related handler	??
io/io.c	Defines functions to control the IO timer and to (un)register IO Handler	??
io/io.h	Declares functions to control the IO timer and to (un)register IO Handler	??
io/io_clock.c	Defines the system clock that provides a continuous time value (granulation of 1 ms)	??
io/io_clock.h	Declares the system clock that provides a continuous time value (granulation of 1 ms)	??
platform/e-puck/camera.c	This file includes functions to process data retrieved by a camera	??
platform/e-puck/camera.h	This file includes functions to process data retrieved by a camera	??
platform/e-puck/camera_processing.c		??
platform/e-puck/camera_processing.h		??
platform/e-puck/DSPIC30F6014A_HDI.h	Declares e-puck specific types and preprocessor variables	??
platform/e-puck/i2c.c	Defines functions to read and write on the I2C interface	??
platform/e-puck/i2c.h	This file includes functions to read and write on the I2C interface	??

platform/e-puck/i2c_data.c	Defines functions to manage the I2C queue	??
platform/e-puck/i2c_data.h	This file includes functions to read and write on the I2C interface	??
platform/e-puck/i2c_HDI.c	Hardware dependent implementations to read and write on the I2C interface	??
platform/e-puck/i2c_HDI.h	Hardware dependent implementations to read and write on the I2C interface	??
platform/e-puck/io_HDI.c	Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically	??
platform/e-puck/io_HDI.h	Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically	??
platform/e-puck/motors.c	This file provides the function needed to actuate the motors	??
platform/e-puck/motors.h	This file provides the function needed to actuate the motors	??
platform/e-puck/motors_HDI.c	Hardware dependent implementations to actuate the motors	??
platform/e-puck/motors_HDI.h	Hardware dependent implementations to actuate the motors	??
platform/e-puck/process_Management_HDI.c	Hardware dependent implementations to manage processes (e.g. task swichting)	??
platform/e-puck/process_Management_HDI.h	Hardware dependent implementations to manage processes (e.g. task swichting)	??
platform/e-puck/remoteControl.c	This file includes functions needed to receive and decode messages from a remote control	??
platform/e-puck/remoteControl.h	This file includes functions needed to receive and decode messages from a remote control	??
platform/e-puck/remoteControl_HDI.c	Hardware dependent implementations to receive and decode messages from a remote control	??
platform/e-puck/remoteControl_HDI.h	Hardware dependent implementations to receive and decode messages from a remote control	??
platform/e-puck/system_Timer_HDI.c	Hardware dependent implementations to initialise, configure and the operating system	??
platform/e-puck/system_Timer_HDI.h	Hardware dependent implementations to initialise, configure and the operating system	??
platform/e-puck/traps.c	Hardware dependent implementations to catch hardware traps	??
platform/e-puck/uart.c	This file includes functions needed to transmit data via uart(1 & 2)	??
platform/e-puck/uart.h	This file includes functions needed to transmit data via uart(1 & 2)	??
platform/e-puck/uart_HDI.c	Hardware dependent implementations to control the message flow of the UART interface	??
platform/e-puck/uart_HDI.h	Hardware dependent implementations to control the message flow of the UART interface	??
processes/data.c	This file includes all functions which are needed to manage data structures needed by the processes management	??
processes/data.h	This file includes all functions which are needed to manage data structures needed by the processes management	??
processes/process_Management.c	This file includes all functions wich are needed to manage processes (e.g. task swichting)	??

processes/ process_Management.h	
This file includes all functions wich are needed to manage processes (e.g. task creation, switch- ing, termination)	??
processes/ scheduler.c	
This file includes all functions wich are needed to specify a scheduling algorithm	??
processes/ scheduler.h	
This file includes all functions wich are needed to specify a scheduling algorithm	??
processes/ system_Timer.c	
This file includes all hardware dependent functions, which are nesessary to initialise, configure and run the system Time	??
processes/ system_Timer.h	
This file includes all hardware dependent functions, which are nesessary to initialise, configure and run the system Time	??

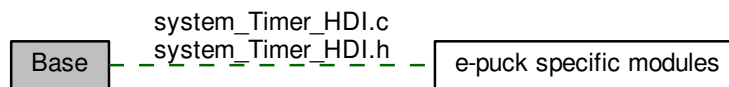
Chapter 6

Module Documentation

6.1 Base

Basic functions to start and initialise the operating system; allocate, free and copy memory, and create and end atomic sections.

Collaboration diagram for Base:



Files

- file [interrupts.c](#)
It defines the functions to create atomic sections.
- file [interrupts.h](#)
It declares interrupt priority levels and functions to create atomic sections.
- file [memory.c](#)
defines functions to allocate, free, and copy memory
- file [memory.h](#)
declares functions to allocate, free, and copy memory
- file [system.c](#)
defines functions to initialise and start OpenSwarm.
- file [system.h](#)
declares functions to initialise and start OpenSwarm.
- file [system_Timer_HDI.c](#)
Hardware dependent implementations to initialise, configure and the operating system.
- file [system_Timer_HDI.h](#)
Hardware dependent implementations to initialise, configure and the operating system.

6.1.1 Detailed Description

Basic functions to start and initialise the operating system; allocate, free and copy memory, and create and end atomic sections.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

6.1.2 Introduction

This package contains basic functions to initialise and start all modules of OpenSwarm. This part of OpenSwarm executes all three modules

1. [Process Manages](#)
2. [Event Management](#)
3. [I/O Management](#)

It first defines global preprocessor option to configure OpenSwarm. It initialises the system and I/O according to its configuration (preprocessor definitions) and with an additional command the system can be started. In addition, functions to define atomic sections (sections that cannot be interrupted by anything), allocate and free memory are also provided.

6.1.2.1 Definitions

definition.h provides standardised ports, configuration the used platform, and general preprocessor/type definitions that are needed in the entire OpenSwarm project.

6.1.2.2 Memory Management

OpenSwarm is designed for processing unit that lack a MMU (Memory Management Unit). As a consequence, advance memory management functions as virtual memory cannot be implemented without a significant reduction of efficiency. OpenSwarm provides atomic functions to allocate, free and copy memory in [memory.h](#).

6.1.2.3 Interrupt Management

OpenSwarm provides a clear structure of interrupt priorities and functions to create atomic sections in [interrupts.h](#).

6.1.2.4 Dependencies

This part of OpenSwarm executes all three modules and depends on the configuration of each part and its implementation:

- Process Management

See also

procMan

- Event System

See also

EventSys

- I/O Management (This includes device specific sensors and actuators of used platform)

See also

IOMan

6.2 Event Management

Functions to emit, create, (un)subscribe, (un)register, and manage events.

Files

- file [events.c](#)
defines functions to create, (un)subscribe, (un)register, and delete events and related handler.
- file [events.h](#)
declares functions to create, (un)subscribe, (un)register, and delete events and related handler.

6.2.1 Detailed Description

Functions to emit, create, (un)subscribe, (un)register, and manage events.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Events are a main component of OpenSwarm. It can be used to synchronise and communicate with processes, to implement asynchronous programming model, and process incoming data/signals.

6.2.2 Usage

The event system doesn't need to be initialised. Any event is identified by an integer **eventID**. To use an event the following steps have to be taken:

1. An event (**eventID**) can be (un)registered by [Sys_Register_Event\(uint16 eventID\)](#) and [Sys_Unregister_Event\(uint16 eventID\)](#). When an event is registered, it means that an event (**eventID**) can occur and handled by OpenSwarm.
2. After the event was registered, processes can be subscribed to it with [Sys_Subscribe_to_Event\(uint16 eventID, uint16 pid, pEventHandlerFunction handler, pConditionFunction condition\)](#) and [Sys_Unsubscribe_from_Event\(uint16 eventID, uint16 pid\)](#). During the subscription, an event handler (i.e. a function to process data that was sent by events) is subscribed to a specific event (**eventID**) and a process. Each event handler of a process for an specific event is unique. As a result the same handler function can be assigned to the same event if they are assigned to other processes.
3. After an event is registered, events can be sent with [Sys_Send_Event\(uint16 eventID, void *data, uint16 data_size\)](#) and [Sys_Send_IntEvent\(uint16 eventID, uint16 data\)](#).

6.2.3 Example

```
#include "os/system.h"
#include "os/events/events.h"

#define USER_EVENT_ID 0xCC

bool pConditionFunction(void *data){//only execute the the eventHandler every 5th time.
    static int counter = 0;

    if(++counter >= 4){//if event occurred 5 times
        counter = 0;
        return true;//execute eventHandler
    }

    return false;//don't execute eventHandler
}

bool eventHandler(uint16 pid, uint16 eventID, sys_event_data *data){
```

```
        //do something with the data
    }

int main(void){
    //initialise some global or local variables

    int variable;

    Sys_Init_Kernel();

    Sys_Register_Event (USER_EVENT_ID);

    Sys_Start_Kernel();
    while(1){

        if( condition ){
            Sys_Send_Event (USER_EVENT_ID, &variable, sizeof(int));
        }
        //do something
    }
}
```

6.2.4 License

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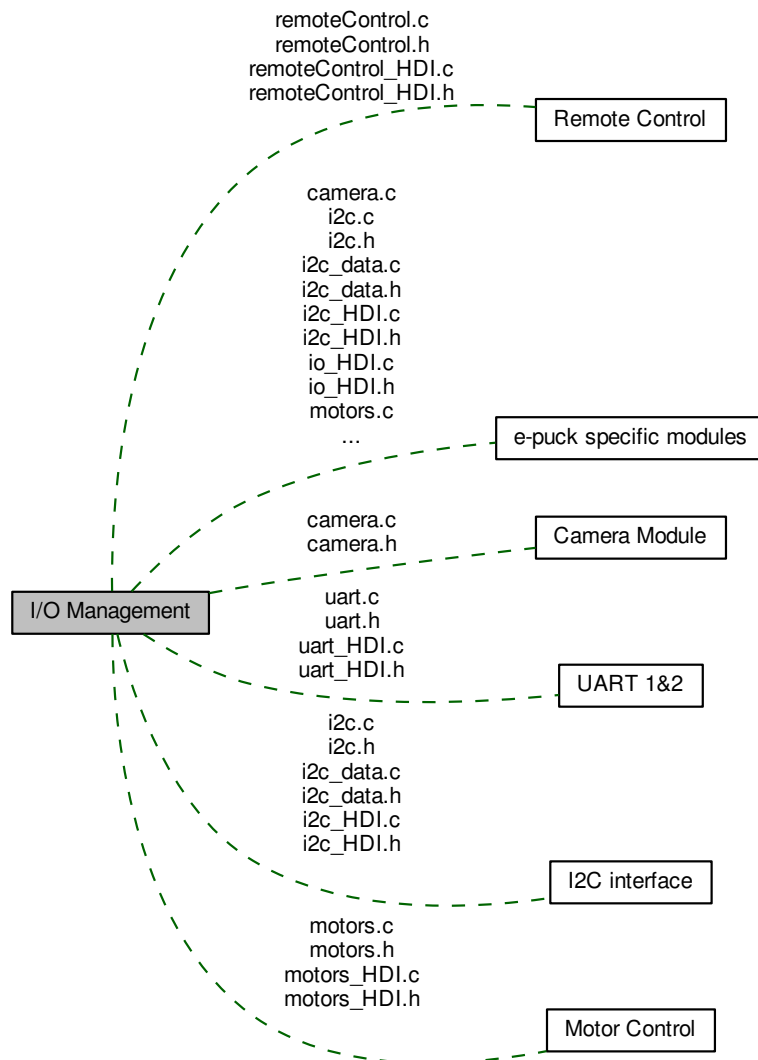
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6.3 I/O Management

Functions and mechanisms to use I/O devices (e.g. sensors and actuators) to interact with the environment.

Collaboration diagram for I/O Management:



Files

- file [io.c](#)
defines functions to control the IO timer and to (un)register IO Handler.
- file [io.h](#)
declares functions to control the IO timer and to (un)register IO Handler.
- file [io_clock.c](#)
defines the system clock that provides a continuous time value (granulation of 1 ms).
- file [io_clock.h](#)
declares the system clock that provides a continuous time value (granulation of 1 ms).

- file [camera.c](#)
This file includes functions to process data retrieved by a camera.
- file [camera.h](#)
This file includes functions to process data retrieved by a camera.
- file [i2c.c](#)
defines functions to read and write on the I2C interface.
- file [i2c.h](#)
This file includes functions to read and write on the I2C interface.
- file [i2c_data.c](#)
defines functions to manage the I2C queue.
- file [i2c_data.h](#)
This file includes functions to read and write on the I2C interface.
- file [i2c_HDI.c](#)
Hardware dependent implementations to read and write on the I2C interface.
- file [i2c_HDI.h](#)
Hardware dependent implementations to read and write on the I2C interface.
- file [io_HDI.c](#)
Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.
- file [io_HDI.h](#)
Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.
- file [motors.c](#)
This file provides the function needed to actuate the motors.
- file [motors.h](#)
This file provides the function needed to actuate the motors.
- file [motors_HDI.c](#)
Hardware dependent implementations to actuate the motors.
- file [motors_HDI.h](#)
Hardware dependent implementations to actuate the motors.
- file [remoteControl.c](#)
This file includes functions needed to receive and decode messages from a remote control.
- file [remoteControl.h](#)
This file includes functions needed to receive and decode messages from a remote control.
- file [remoteControl_HDI.c](#)
Hardware dependent implementations to receive and decode messages from a remote control.
- file [remoteControl_HDI.h](#)
Hardware dependent implementations to receive and decode messages from a remote control.
- file [uart.c](#)
This file includes functions needed to transmit data via uart(1 & 2).
- file [uart.h](#)
This file includes functions needed to transmit data via uart(1 & 2).
- file [uart_HDI.c](#)
Hardware dependent implementations to control the message flow of the UART interface.
- file [uart_HDI.h](#)
Hardware dependent implementations to control the message flow of the UART interface.

6.3.1 Detailed Description

Functions and mechanisms to use I/O devices (e.g. sensors and actuators) to interact with the environment.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

6.3.2 Introduction

I/O device are managed by this module. I/O devices interfacing and interacting with the environment of the robot. These sensors and actuators might be a camera, motors, or gripper.

In general I/O devices might be independent and uses their own interrupts - such as UART, ADC, I2C. These functions act independently and only need to be initialised and started. No further interaction is needed.

Many I/O devices however need periodic interactions - such as remote control receiver, motor controller, or system clock.

6.3.3 Usage

The I/O management is initialised with [Sys_Init_IOManagement\(void\)](#), which initialised the System Timer (100us) and initialises a list of I/O devices that need to be executed periodically. After starting the timer with [Sys_Start_IOManagement\(void\)](#), it can be the stopped with [Sys_Stop_IOManagement\(void\)](#).

The I/O Timer can be manipulated as follows

- Stop: [Sys_Stop_IOTimer\(void\)](#)
- Continue: [Sys_Continue_IOTimer\(void\)](#)
- Reset (starts the 100us again): [Sys_Reset_IOTimer\(void\)](#)
- Disable: [Sys_Disable_IOTimerInterrupt\(void\)](#)
- Enable: [Sys_Enable_IOTimerInterrupt\(void\)](#)
- Force an I/O Timer interrupt: [Sys_Force_IOTimerInterrupt\(void\)](#)

New I/O devices can be added and removed by (un)registering with [Sys_Register_IOHandler\(pFunction func\)](#) and [Sys_Unregister_IOHandler\(pFunction func\)](#).

The I/O management is started by initialising & starting of the kernel

See also

[Base](#)

6.3.4 License

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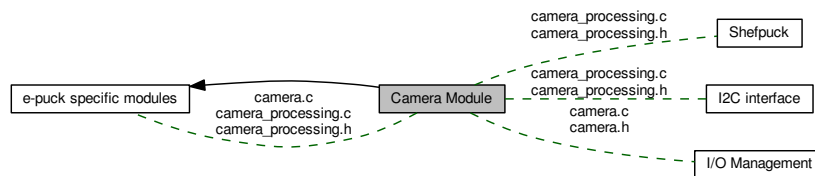
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6.4 Camera Module

Functions to process incoming frames from a camera module.

Collaboration diagram for Camera Module:



Files

- file [camera.c](#)
This file includes functions to process data retrieved by a camera.
- file [camera.h](#)
This file includes functions to process data retrieved by a camera.
- file [camera_processing.c](#)
- file [camera_processing.h](#)

6.4.1 Detailed Description

Functions to process incoming frames from a camera module.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

6.4.2 Introduction

This module is part of the I/O handler.

See also

[I/O Management](#)

This module currently is under development and is using functions of the e-puck library provided using Subversion at [svn://svn.gna.org/svn/e-puck/trunk](http://svn.gna.org/svn/e-puck/trunk).

Todo The used functions from the e-puck library are very time and computational intensive. These function can be rewritten to decrease the processing load.

6.4.3 Usage

The camera is initialised and started by `Sys_Init_Camera` and `Sys_Start_Camera` respectively.

The camera uses a preprocessor to process a frame and generate the required events. This preprocessor can be defined by `Sys_Set_Preprocessing(pCameraPreProcessor)`.

A received frame, if available (`isNewFrameAvailable()`) can be obtained with `getFinishedFrame()`.

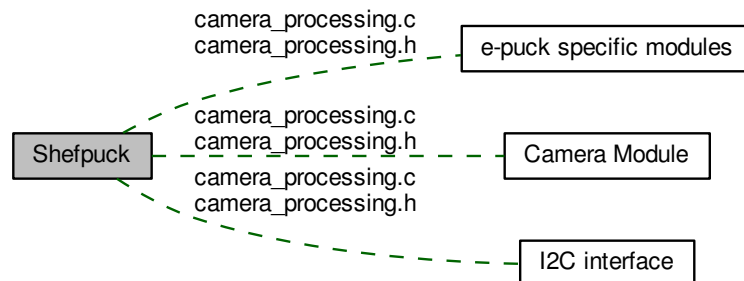
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6.5 Shefpuck

External set of functions to assist the programming of the e-Puck.

Collaboration diagram for Shefpuck:



Files

- file [camera_processing.c](#)
- file [camera_processing.h](#)

6.5.1 Detailed Description

External set of functions to assist the programming of the e-Puck.

Author

Yuri Kaszubowski Lopes yurikazuba@gmail.com

This file is part of shefpuck.

This library is in development.

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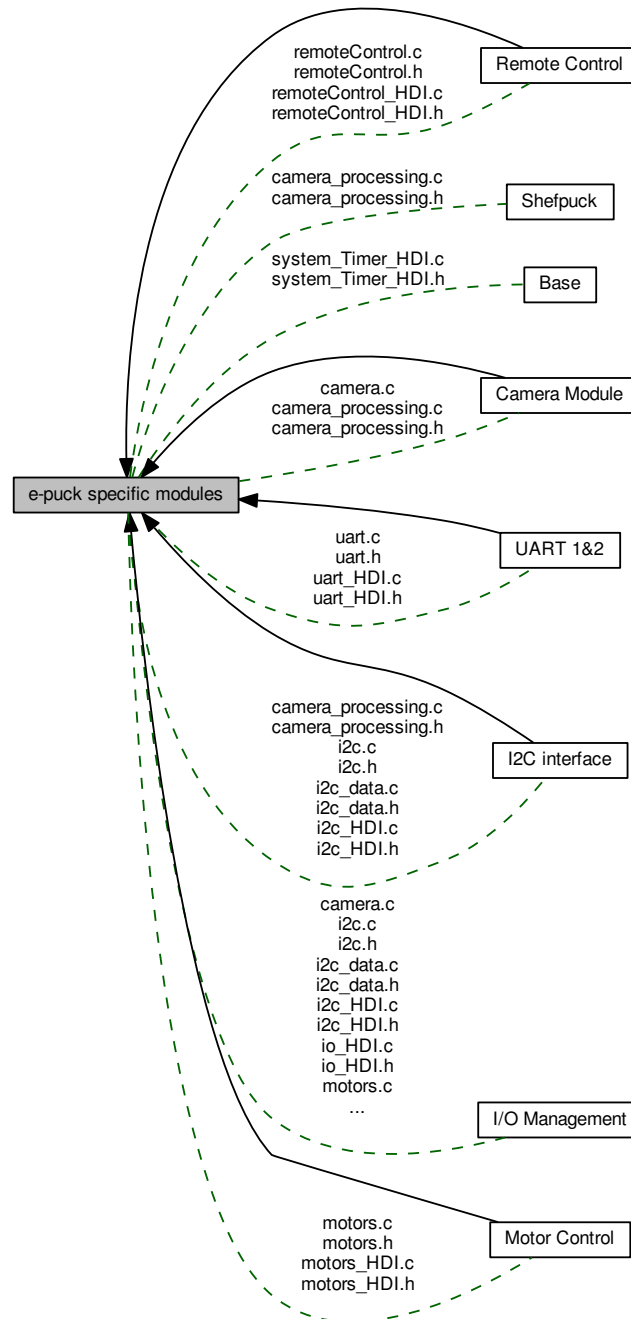
Note

This module is used because the e-puck library functions are used to access the camera. This module as well as the e-puck camera will be replaced.

6.6 e-puck specific modules

Modules and functions that are needed to use the e-puck platform.

Collaboration diagram for e-puck specific modules:



Modules

- [Camera Module](#)

Functions to process incoming frames from a camera module.

- [I2C interface](#)
Functions to read from and write on the I2C interface.
- [Motor Control](#)
Functions to control the motors.
- [Remote Control](#)
Functions to receive data from a remote control.
- [UART 1&2](#)
Functions to control the message flow of the UART interface.

Files

- file [camera.c](#)
This file includes functions to process data retrieved by a camera.
- file [camera_processing.c](#)
- file [camera_processing.h](#)
- file [DSPIC30F6014A_HDI.h](#)
declares e-puck specific types and preprocessor variables
- file [i2c.c](#)
defines functions to read and write on the I2C interface.
- file [i2c.h](#)
This file includes functions to read and write on the I2C interface.
- file [i2c_data.c](#)
defines functions to manage the I2C queue.
- file [i2c_data.h](#)
This file includes functions to read and write on the I2C interface.
- file [i2c_HDI.c](#)
Hardware dependent implementations to read and write on the I2C interface.
- file [i2c_HDI.h](#)
Hardware dependent implementations to read and write on the I2C interface.
- file [io_HDI.c](#)
Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.
- file [io_HDI.h](#)
Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.
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Hardware dependent implementations to receive and decode messages from a remote control.
- file [remoteControl_HDI.h](#)
Hardware dependent implementations to receive and decode messages from a remote control.
- file [system_Timer_HDI.c](#)

- Hardware dependent implementations to initialise, configure and the operating system.*

 - file [system_Timer_HDI.h](#)

Hardware dependent implementations to initialise, configure and the operating system.
- file [traps.c](#)

Hardware dependent implementations to catch hardware traps.
- file [uart.c](#)

This file includes functions needed to transmit data via uart(1 & 2).
- file [uart.h](#)

This file includes functions needed to transmit data via uart(1 & 2).
- file [uart_HDI.c](#)

Hardware dependent implementations to control the message flow of the UART interface.
- file [uart_HDI.h](#)

Hardware dependent implementations to control the message flow of the UART interface.

6.6.1 Detailed Description

Modules and functions that are needed to use the e-puck platform.

See also

<http://www.gctronic.com/doc/index.php/E-Puck>

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

This module includes all other modules that are specific to the e-puck platform.

The e-puck provides the following features:

6.6.2 Sensors:

6.6.2.1 8 infra-red proximity sensors

The infra-red proximity sensors are currently under implementation. Therefore not ready yet.

6.6.2.2 accelerometer

The accelerometer weren't needed for many applications and, therefore, the priority to implement the speakers is small.

6.6.2.3 3 microphones

The microphones weren't needed for many applications and, therefore, the priority to implement the speakers is small.

6.6.2.4 camera:

The camera functions can be found at

See also

[Camera Module](#)

6.6.2.5 remote control receiver:

This function is fully implemented.

See also

[Remote Control](#)

6.6.3 Actuators:

6.6.3.1 differential drive \sa motors

6.6.3.2 leds:

Hardware independent functions to control the LEDs are not yet implemented, due to it's simple nature. Currently you can use the MACROs LED0, LED1, ..., LED7, BODYLED, FRONTLED to use the LEDs.

6.6.3.3 speaker:

The speakers weren't needed for many applications and, therefore, the priority to implement the speakers is small.

6.6.4 communication:

6.6.4.1 Bluetooth:

The Bluetooth can be used by sending and receiving bytes via UART1

See also

[UART 1&2](#)

6.6.4.2 Infra-red communication

The infra-red proximity sensors can be used to transmit and receive data. This function leads to a local broadcasting. However, this function has not been implemented yet.

6.6.5 License

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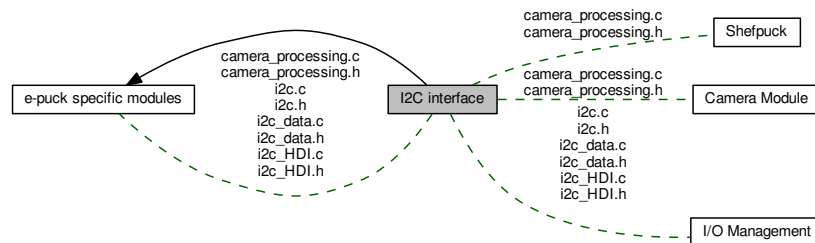
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6.7 I2C interface

Functions to read from and write on the I2C interface.

Collaboration diagram for I2C interface:



Files

- file [camera_processing.c](#)
- file [camera_processing.h](#)
- file [i2c.c](#)
defines functions to read and write on the I2C interface.
- file [i2c.h](#)
This file includes functions to read and write on the I2C interface.
- file [i2c_data.c](#)
defines functions to manage the I2C queue.
- file [i2c_data.h](#)
This file includes functions to read and write on the I2C interface.
- file [i2c_HDI.c](#)
Hardware dependent implementations to read and write on the I2C interface.
- file [i2c_HDI.h](#)
Hardware dependent implementations to read and write on the I2C interface.

6.7.1 Detailed Description

Functions to read from and write on the I2C interface.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Inter-Integrated Circuit bus is a multi-master, multi-slave, serial bus (see also <https://en.wikipedia.org/wiki/I%C2%B2C>)

OpenSwarm organises processes in three lists of processes (pid sorted):

1. running list: includes all processes are ready to be executed and are scheduled according to the scheduling algorithm.
2. blocked list: includes all processes that are waiting for events to occur.
3. Zombie list: includes all processes that are about to be terminated but not deleted yet.

6.7.2 Usage

The I2C interface can be initialised and started with `Sys_Init_I2C` and `Sys_Start_I2C` respectively. Similarly, it can be paused, continued, or stopped by `Sys_Pause_I2C`, `Sys_Continue_I2C`, or `Sys_Stop_I2C` respectively. While the interface is running, data can be written with `Sys_I2C_SentBytes`. Values can be read with `Sys_I2C_Read` where the request message has also to be specified.

Todo testing and debugging of this module.

Note

This module is currently untested. Might doesn't work or includes some bugs. The interrupt handler `_M_I2CInterrupt` is also out commented, because it might interfere with the e-Puck library used in the camera module.

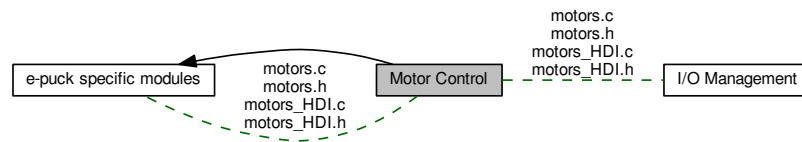
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6.8 Motor Control

Functions to control the motors.

Collaboration diagram for Motor Control:



Files

- file [motors.c](#)
This file provides the function needed to actuate the motors.
- file [motors.h](#)
This file provides the function needed to actuate the motors.
- file [motors_HDI.c](#)
Hardware dependent implementations to actuate the motors.
- file [motors_HDI.h](#)
Hardware dependent implementations to actuate the motors.

6.8.1 Detailed Description

Functions to control the motors.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

The motor control module controls the speed and motion of motors

6.8.2 Usage

After the initialisation with [Sys_Init_Motors\(\)](#), the motors can be used by setting the motor speed. This can be done by sending the motor velocities via events to `SYS_EVENT_IO_MOTOR_LEFT` and `SYS_EVENT_IO_MOTOR_RIGHT` or by setting the speed directly by calling [Sys_Set_LeftWheelSpeed\(sint16\)](#) and [Sys_Set_RightWheelSpeed\(sint16\)](#). The current speed can be obtained [Sys_get_LeftWheelSpeed\(\)](#) and [Sys_get_RightWheelSpeed\(\)](#).

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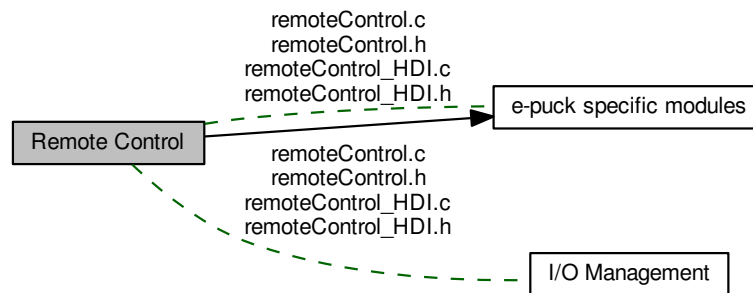
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6.9 Remote Control

Functions to receive data from a remote control.

Collaboration diagram for Remote Control:



Files

- file [remoteControl.c](#)

This file includes functions needed to receive and decode messages from a remote control.

- file [remoteControl.h](#)

This file includes functions needed to receive and decode messages from a remote control.

- file [remoteControl_HDI.c](#)

Hardware dependent implementations to receive and decode messages from a remote control.

- file [remoteControl_HDI.h](#)

Hardware dependent implementations to receive and decode messages from a remote control.

6.9.1 Detailed Description

Functions to receive data from a remote control.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

This module is based on the RC-5 coding for the (Toshiba RC-3910)

6.9.2 Usage

After the initialisation with [Sys_Init_RemoteControl\(\)](#), the interface needs to be started to be able to receive or transmit bytes with [Sys_Start_RemoteControl\(\)](#).

After this every button pressed on the remote control is received as an event (SYS_EVENT_IO_REMOTECONTROL).

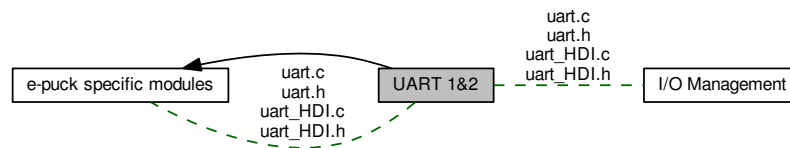
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6.10 UART 1&2

Functions to control the message flow of the UART interface.

Collaboration diagram for UART 1&2:



Files

- file [uart.c](#)
This file includes functions needed to transmit data via uart(1 & 2).
- file [uart.h](#)
This file includes functions needed to transmit data via uart(1 & 2).
- file [uart_HDI.c](#)
Hardware dependent implementations to control the message flow of the UART interface.
- file [uart_HDI.h](#)
Hardware dependent implementations to control the message flow of the UART interface.

6.10.1 Detailed Description

Functions to control the message flow of the UART interface.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

A UART (Universal Asynchronous Receiver Transmitter) interface is common on microcontroller to communicate with other devices on a serial bus.

See also

https://en.wikipedia.org/wiki/Universal_asynchronous_receiver/transmitter

The UART 1 is used on the [e-puck specific modules](#) to communicate with the Bluetooth transceiver.

6.10.2 Usage

After the initialisation with [Sys_Init_UART1\(\)](#) (same applies to UART2), the UART interface needs to be started to be able to receive or transmit bytes. This can be done by sending the bytes via event to `SYS_EVENT_IO_TO_BLUETOOTH` (UART1) or by handing over the bytes directly by calling `Sys_Writeto_UART1` and `Sys_Writeto_UART2`. Incoming bytes can be received by defining a reading function with [Sys_SetReadingFunction_UART1\(pUART_reader\)](#) and [Sys_SetReadingFunction_UART2\(pUART_reader\)](#). This function is executed every time a new byte arrives.

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6.11 Process Manages

Functions to create, switch, block, yield, and terminate processes and start critical sections.

Files

- file [process_Management_HDI.c](#)
Hardware dependent implementations to manage processes (e.g. task swiching)
- file [process_Management_HDI.h](#)
Hardware dependent implementations to manage processes (e.g. task swiching)
- file [data.c](#)
This file includes all functions which are needed to manage data structures needed by the processes management.
- file [data.h](#)
This file includes all functions which are needed to manage data structures needed by the processes management.
- file [process_Management.c](#)
This file includes all functions wich are needed to manage processes (e.g. task swiching)
- file [process_Management.h](#)
This file includes all functions wich are needed to manage processes (e.g. task creation, switching, termination)
- file [scheduler.c](#)
This file includes all functions wich are needed to specify a scheduling algorithm.
- file [scheduler.h](#)
This file includes all functions wich are needed to specify a scheduling algorithm.
- file [system_Timer.c](#)
This file includes all hardware dependent functions, which are nesessary to initialise, configure and run the system Time.
- file [system_Timer.h](#)
This file includes all hardware dependent functions, which are nesessary to initialise, configure and run the system Time.

6.11.1 Detailed Description

Functions to create, switch, block, yield, and terminate processes and start critical sections.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

A process is a basic form to execute functions in OpenSwarm. OpenSwarm does not provide functions to separate memory in pages or segments due to target device architecture. Because all processes are executed in the same memory area, each process can be seen as a single thread and all threads share the same memory. A thread is just represented by a common function. One function can be executed multiple times as individual threads.

OpenSwarm organises processes in three lists of processes (pid sorted):

1. running list: includes all processes are ready to be executed and are scheduled according to the scheduling algorithm.
2. blocked list: includes all processes that are waiting for events to occur.
3. Zombie list: includes all processes that are about to be terminated but not deleted yet.

6.11.2 Usage

The process management is initialised with [Sys_Init_Process_Management\(void\)](#), which generated the System Thread (pid: 0) and initialises all data structures. After initialising, the following functions are available.

6.11.2.1 User code:

1. Processes are started and terminated with `Sys_Start_Process(pFunction function)` and `Sys_Kill_Process(uint16 pid)` respectively.
2. A Process can be yield with `Sys_Yield(void)` and remains in the ready list. The process can be rescheduled by the scheduler.
3. A thread/process can be suspended while waiting for arriving events with `Sys_Wait_For_Event(uint16 eventId)` and `Sys_Wait_For_Condition(uint16 eventId, pConditionFunction function)`. Processes that are suspended are on the block list and are not rescheduled whilst in it.

6.11.2.2 Internal function (shouldn't be used by the user)

6.11.2.2.1 Scheduling (functions to decide which process is executed at which time)

Functions can be found regarding the scheduling process can be found in `scheduler.h` and `process_Management.h`.

- The executing process can be switched by using `Sys_Switch_Process(uint16 pid)` and `Sys_Switch_to_next_Process(void)`.
- To implement a new scheduling algorithm, struct `sys_scheduler_info_s`, a function to implement the algorithm (void function(void)), and a function to set the values of the struct (void `Sys_Set_Defaults_Info(sys_scheduler_info *sct)`) needs to be implemented (found in `scheduler.h`).

6.11.2.2.2 System Timer (timer to start the scheduling, found in `system_Timer.h`):

1. The System Timer needs to be initialised and started by `Sys_Init_SystemTimer(pFunction)` and `Sys_Start_SystemTimer(void)` respectively (these functions are used when the process Management is initialised and started).
2. It can be stopped, continued, and reset by `Sys_Stop_SystemTimer()`, `Sys_Continue_SystemTimer()`, and `Sys_Reset_SystemTimer()` respectively.
3. The timer can be disabled and enabled (no interrupts) by `Sys_Disable_TimerInterrupt(void)` and `Sys_Enable_TimerInterrupt(void)`.
4. To force a system timer and therefore an scheduling process, `Sys_Force_TimerInterrupt()` will cause the system timer interrupt to occur.

6.11.2.2.3 Process Event handling (functions to store/process events with it's subscribed process and add/remove subscriptions) \sa events

- Event subscription to a process can be added and removed by `Sys_Add_Event_Subscription` and `Sys_Remove_Event_Subscription`.
- Removing all subscription to any process of a single event can be done `Sys_Remove_All_Event_Subscriptions(uint16 eventId)`.
- To copy the data of an occurred event to a specific process, `Sys_Add_Event_to_Process` can be used.
- All stored data is processed by its registered event handler by `Sys_Execute_All_EventHandler`.
- The event data can be cleared with `Sys_Clear_EventData`.

6.11.3 Example

```
#include "os/system.h"
#include "os/events/events.h"
#include "os/processes/process_Management.h"

#define WAIT_FOR_ME 0x0F
```



```
Sys_Wait_For_Event(uint16 eventID)

void thread(void){//thread definition
    while(ture){
        //do something as an thread
        sys_event_data * data = Sys_Wait_For_Event (WAIT_FOR_ME);
        Sys_Clear_EventData(data);
    }
}

int main(void){
    //initialise some global or local variables

    int variable;

    Sys_Init_Kernel();

    Sys_Register_Event (WAIT_FOR_ME);

    Sys_Start_Kernel();
    while(1){

        if( condition ){
            Sys_Send_Event(WAIT_FOR_ME, &variable, sizeof(int));
        }
        //do something
    }
}
```

6.11.4 License

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Chapter 7

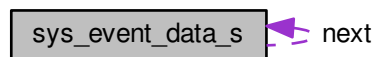
Data Structure Documentation

7.1 sys_event_data_s Struct Reference

It is a single linked list element and contains data of an occurred event.

```
#include <events.h>
```

Collaboration diagram for sys_event_data_s:



Data Fields

- void * [value](#)
- [uint16](#) [size](#)
- struct [sys_event_data_s](#) * [next](#)

7.1.1 Detailed Description

It is a single linked list element and contains data of an occurred event.

Definition at line 89 of file events.h.

7.1.2 Field Documentation

7.1.2.1 struct sys_event_data_s* sys_event_data_s::next

pointer to the next element in the List

Definition at line 93 of file events.h.

7.1.2.2 uint16 sys_event_data_s::size

size of the transferred data (bytes)

Definition at line 91 of file events.h.

7.1.2.3 void* sys_event_data_s::value

pointer to the data transferred by an event

Definition at line 90 of file events.h.

The documentation for this struct was generated from the following file:

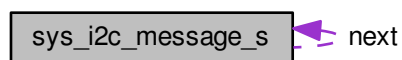
- [events/events.h](#)

7.2 sys_i2c_message_s Struct Reference

It is a single linked list element containing messages that need to be sent via I2C.

```
#include <i2c_data.h>
```

Collaboration diagram for sys_i2c_message_s:



Data Fields

- [uint8 i2c_device_address](#)
- [uint8 * data](#)
- [uint16 length](#)
- [bool write](#)
- [pByteFunction handler](#)
- [struct sys_i2c_message_s * next](#)

7.2.1 Detailed Description

It is a single linked list element containing messages that need to be sent via I2C.

Definition at line 32 of file i2c_data.h.

7.2.2 Field Documentation

7.2.2.1 uint8* sys_i2c_message_s::data

Definition at line 34 of file i2c_data.h.

7.2.2.2 pByteFunction sys_i2c_message_s::handler

Definition at line 37 of file i2c_data.h.

7.2.2.3 uint8 sys_i2c_message_s::i2c_device_address

Definition at line 33 of file i2c_data.h.

7.2.2.4 uint16 sys_i2c_message_s::length

Definition at line 35 of file i2c_data.h.

7.2.2.5 struct sys_i2c_message_s* sys_i2c_message_s::next

Definition at line 38 of file i2c_data.h.

7.2.2.6 bool sys_i2c_message_s::write

Definition at line 36 of file i2c_data.h.

The documentation for this struct was generated from the following file:

- platform/e-puck/[i2c_data.h](#)

7.3 sys_motors_s Struct Reference

This struct contains the speed for a motor.

Data Fields

- [sint16 speed](#)

7.3.1 Detailed Description

This struct contains the speed for a motor.

Definition at line 33 of file motors.c.

7.3.2 Field Documentation

7.3.2.1 sint16 sys_motors_s::speed

Definition at line 34 of file motors.c.

The documentation for this struct was generated from the following file:

- platform/e-puck/[motors.c](#)

7.4 `sys_occurred_event_s` Struct Reference

Linked list element containing an occurred events.

```
#include <data.h>
```

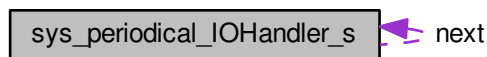
Collaboration diagram for `sys_occurred_event_s`:

7.5 `sys_periodical_IOHandler_s` Struct Reference

Linked list element containing IO Handler function pointers.

```
#include <io_HDI.h>
```

Collaboration diagram for `sys_periodical_IOHandler_s`:



Data Fields

- [pFunction](#) function
- struct [sys_periodical_IOHandler_s](#) * `next`

7.5.1 Detailed Description

Linked list element containing IO Handler function pointers.

It is a single linked list element containing a function pointer to an IO handler.

Definition at line 33 of file `io_HDI.h`.

7.5.2 Field Documentation

7.5.2.1 `pFunction sys_periodical_IOHandler_s::function`

Definition at line 34 of file `io_HDI.h`.

7.5.2.2 `struct sys_periodical_IOHandler_s* sys_periodical_IOHandler_s::next`

Definition at line 36 of file `io_HDI.h`.

The documentation for this struct was generated from the following file:

- [platform/e-puck/io_HDI.h](#)

7.6 sys_process_control_block_list_element_s Struct Reference

Double linked list element containing sys_process_control_block.

```
#include <data.h>
```

Collaboration diagram for sys_process_control_block_list_element_s:

Data Fields

- [sys_process_control_block pcb](#)
- struct [sys_process_control_block_list_element_s](#) * [previous](#)
- struct [sys_process_control_block_list_element_s](#) * [next](#)

7.6.1 Detailed Description

Double linked list element containing sys_process_control_block.

It is a double linked list element containing the PCB of a process

Definition at line 77 of file data.h.

7.6.2 Field Documentation

7.6.2.1 struct [sys_process_control_block_list_element_s](#)* [sys_process_control_block_list_element_s::next](#)

Definition at line 82 of file data.h.

7.6.2.2 [sys_process_control_block](#) [sys_process_control_block_list_element_s::pcb](#)

Definition at line 79 of file data.h.

7.6.2.3 struct [sys_process_control_block_list_element_s](#)* [sys_process_control_block_list_element_s::previous](#)

Definition at line 81 of file data.h.

The documentation for this struct was generated from the following file:

- [processes/data.h](#)

7.7 sys_process_control_block_s Struct Reference

Process Control Block for a single process.

```
#include <data.h>
```

Collaboration diagram for sys_process_control_block_s:

Data Fields

- [uint16 process_ID](#)
- [uint16 stackPointer](#)
- [uint16 framePointer](#)
- [uint16 stackPointerLimit](#)

- [sys_scheduler_info](#) [sheduler_info](#)
- [sys_process_event_handler](#) * [event_register](#)
- [uint16](#) * [process_stack](#)

7.7.1 Detailed Description

Process Control Block for a single process.

It contains all information related to a single process. (including stack pointer, frame pointer, stack, etc.)

Definition at line 58 of file data.h.

7.7.2 Field Documentation

7.7.2.1 [sys_process_event_handler](#)* [sys_process_control_block_s::event_register](#)

Definition at line 66 of file data.h.

7.7.2.2 [uint16](#) [sys_process_control_block_s::framePointer](#)

Definition at line 62 of file data.h.

7.7.2.3 [uint16](#) [sys_process_control_block_s::process_ID](#)

Definition at line 60 of file data.h.

7.7.2.4 [uint16](#)* [sys_process_control_block_s::process_stack](#)

Definition at line 68 of file data.h.

7.7.2.5 [sys_scheduler_info](#) [sys_process_control_block_s::sheduler_info](#)

Definition at line 65 of file data.h.

7.7.2.6 [uint16](#) [sys_process_control_block_s::stackPointer](#)

Stack Pointer to TOP

Definition at line 61 of file data.h.

7.7.2.7 [uint16](#) [sys_process_control_block_s::stackPointerLimit](#)

Stack Pointer + MAX SIZE

Definition at line 63 of file data.h.

The documentation for this struct was generated from the following file:

- [processes/data.h](#)

7.8 sys_process_event_handler_s Struct Reference

Double linked list element of process event-handlers.

```
#include <data.h>
```

Collaboration diagram for sys_process_event_handler_s:

Data Fields

- [uint16 eventID](#)
- [pEventHandlerFunction handler](#)
- [pConditionFunction condition](#)
- [sys_event_data * buffered_data](#)
- [struct sys_process_event_handler_s * previous](#)
- [struct sys_process_event_handler_s * next](#)

7.8.1 Detailed Description

Double linked list element of process event-handlers.

It is a double linked list containing all information needed to decide if the event-handler should be executed for an occurred event or not. It stores the pointer to the handler the condition function and data.

Definition at line 44 of file data.h.

7.8.2 Field Documentation

7.8.2.1 sys_event_data* sys_process_event_handler_s::buffered_data

stores a list of recieved event data that need to be processed

Definition at line 48 of file data.h.

7.8.2.2 pConditionFunction sys_process_event_handler_s::condition

Pointer to a function which checks if the event-handler should be executed (true) or not (false)

Definition at line 47 of file data.h.

7.8.2.3 uint16 sys_process_event_handler_s::eventID

Definition at line 45 of file data.h.

7.8.2.4 pEventHandlerFunction sys_process_event_handler_s::handler

Pointer to a function which processes occurred events

Definition at line 46 of file data.h.

7.8.2.5 struct sys_process_event_handler_s* sys_process_event_handler_s::next

Definition at line 51 of file data.h.

7.8.2.6 struct `sys_process_event_handler_s`* `sys_process_event_handler_s::previous`

Definition at line 50 of file `data.h`.

The documentation for this struct was generated from the following file:

- [processes/data.h](#)

7.9 sys_registered_event_s Struct Reference

A single linked element containing a registered event and its subscribers.

Collaboration diagram for `sys_registered_event_s`:

Data Fields

- [uint16 id](#)
- [sys_subscribed_process](#) * [subscribers](#)
- struct [sys_registered_event_s](#) * [next](#)

7.9.1 Detailed Description

A single linked element containing a registered event and its subscribers.

It is a single linked list element that contains registered events and a list of processes that are subscribed to it.

Definition at line 34 of file `events.c`.

7.9.2 Field Documentation

7.9.2.1 uint16 `sys_registered_event_s::id`

event identifier

Definition at line 35 of file `events.c`.

7.9.2.2 struct `sys_registered_event_s`* `sys_registered_event_s::next`

pointer to the next element in the List

Definition at line 37 of file `events.c`.

7.9.2.3 `sys_subscribed_process`* `sys_registered_event_s::subscribers`

pointer to a list of subscribed processes

Definition at line 36 of file `events.c`.

The documentation for this struct was generated from the following file:

- [events/events.c](#)

7.10 sys_rgb_pixel_s Struct Reference

This bitfield contains the structure of a received camera pixel.

```
#include <camera.h>
```

Data Fields

- [uint8 red](#): 5
- [uint8 green](#): 6
- [uint8 blue](#): 5

7.10.1 Detailed Description

This bitfield contains the structure of a received camera pixel.

Definition at line 57 of file camera.h.

7.10.2 Field Documentation

7.10.2.1 uint8 sys_rgb_pixel_s::blue

Definition at line 60 of file camera.h.

7.10.2.2 uint8 sys_rgb_pixel_s::green

Definition at line 59 of file camera.h.

7.10.2.3 uint8 sys_rgb_pixel_s::red

Definition at line 58 of file camera.h.

The documentation for this struct was generated from the following file:

- platform/e-puck/[camera.h](#)

7.11 sys_scheduler_info_s Struct Reference

The scheduling information for each process.

```
#include <scheduler.h>
```

Data Fields

- unsigned short [state](#)
- unsigned short [priority](#)

7.11.1 Detailed Description

The scheduling information for each process.

This struct defines all values wich are needed for the scheduling algorithm.

Definition at line 37 of file scheduler.h.

7.11.2 Field Documentation

7.11.2.1 unsigned short sys_scheduler_info_s::priority

process priority level

Definition at line 39 of file scheduler.h.

7.11.2.2 unsigned short sys_scheduler_info_s::state

Process state information

Definition at line 38 of file scheduler.h.

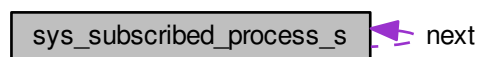
The documentation for this struct was generated from the following file:

- processes/[scheduler.h](#)

7.12 sys_subscribed_process_s Struct Reference

A single linked list element containing the ID of a subscribed process.

Collaboration diagram for sys_subscribed_process_s:



Data Fields

- [uint16](#) pid
- struct [sys_subscribed_process_s](#) * next

7.12.1 Detailed Description

A single linked list element containing the ID of a subscribed process.

Definition at line 24 of file events.c.

7.12.2 Field Documentation

7.12.2.1 struct sys_subscribed_process_s* sys_subscribed_process_s::next

pointer to the next element in the List

Definition at line 26 of file events.c.

7.12.2.2 uint16 sys_subscribed_process_s::pid

process identifier

Definition at line 25 of file events.c.

The documentation for this struct was generated from the following file:

- [events/events.c](#)

7.13 sys_uart_tx_data_s Struct Reference

Linked list element to store transmission data.

```
#include <uart_HDI.h>
```

Collaboration diagram for sys_uart_tx_data_s:

Data Fields

- [uint8 * data](#)
- [uint16 length](#)
- [struct sys_uart_tx_data_s * next](#)

7.13.1 Detailed Description

Linked list element to store transmission data.

It is a single linked list containing a set of bytes that should be sent via UART.

Definition at line 47 of file uart_HDI.h.

7.13.2 Field Documentation

7.13.2.1 uint8* sys_uart_tx_data_s::data

Definition at line 48 of file uart_HDI.h.

7.13.2.2 uint16 sys_uart_tx_data_s::length

Definition at line 49 of file uart_HDI.h.

7.13.2.3 struct sys_uart_tx_data_s* sys_uart_tx_data_s::next

Definition at line 51 of file uart_HDI.h.

The documentation for this struct was generated from the following file:

- [platform/e-puck/uart_HDI.h](#)

Chapter 8

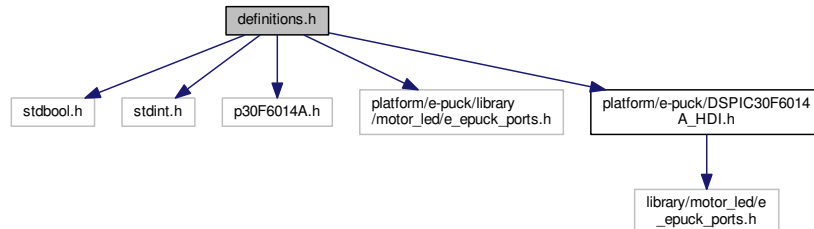
File Documentation

8.1 definitions.h File Reference

This file declares general preprocessor variables and types.

```
#include <stdbool.h>
#include <stdint.h>
#include <p30F6014A.h>
#include "platform/e-puck/library/motor_led/e_epuck_ports.h"
#include "platform/e-puck/DSPIC30F6014A_HDI.h"
```

Include dependency graph for definitions.h:



This graph shows which files directly or indirectly include this file:



Macros

- #define `EPUCK_USED`
- #define `UART1_RX_RF2`
- #define `UART1_TX_RF3`
- #define `UART2_RX_RF4`
- #define `UART2_TX_RF5`
- #define `UART1_RX_DIR_TRISF2`
- #define `UART1_TX_DIR_TRISF3`

- `#define UART2_RX_DIR_TRISF4`
- `#define UART2_TX_DIR_TRISF5`
- `#define RC_BUTTON_STANDBY 12`
- `#define RC_BUTTON_SCREEN 11`
- `#define RC_BUTTON_LANG 15`
- `#define RC_BUTTON_SUBTTL 31`
- `#define RC_BUTTON_INTERNET 46`
- `#define RC_BUTTON_RED 55`
- `#define RC_BUTTON_GREEN 54`
- `#define RC_BUTTON_YELLOW 50`
- `#define RC_BUTTON_BLUE 52`
- `#define RC_BUTTON_0 0`
- `#define RC_BUTTON_1 1`
- `#define RC_BUTTON_2 2`
- `#define RC_BUTTON_3 3`
- `#define RC_BUTTON_4 4`
- `#define RC_BUTTON_5 5`
- `#define RC_BUTTON_6 6`
- `#define RC_BUTTON_7 7`
- `#define RC_BUTTON_8 8`
- `#define RC_BUTTON_9 9`
- `#define RC_BUTTON_TELE_TEXT 60`
- `#define RC_BUTTON_SWAP 34`
- `#define RC_BUTTON_OK 53`
- `#define RC_BUTTON_CURSOR_UP 20`
- `#define RC_BUTTON_CURSOR_DOWN 19`
- `#define RC_BUTTON_CURSOR_LEFT 21`
- `#define RC_BUTTON_CURSOR_RIGHT 22`
- `#define RC_BUTTON_BACK 10`
- `#define RC_BUTTON_MENU 48`
- `#define RC_BUTTON_EPG 47`
- `#define RC_BUTTON_FAV 40`
- `#define RC_BUTTON_SOURCE 56`
- `#define RC_BUTTON_INFO 18`
- `#define RC_BUTTON_PRESETS 14`
- `#define RC_BUTTON_SLEEP 42`
- `#define RC_BUTTON_VOLUME_UP 16`
- `#define RC_BUTTON_VOLUME_DOWN 17`
- `#define RC_BUTTON_MUTE 13`
- `#define RC_BUTTON_CHANNEL_UP 32`
- `#define RC_BUTTON_CHANNEL_DOWN 33`
- `#define RC_BUTTON_PAUSE 48`
- `#define RC_BUTTON_REWIND 50`
- `#define RC_BUTTON_WIND 52`
- `#define RC_BUTTON_PLAY 53`
- `#define RC_BUTTON_STOP 54`
- `#define RC_BUTTON_RECORD 55`
- `#define SYS_EVENT_TERMINATION 0x01`
- `#define SYS_EVENT_IO_MOTOR_LEFT 0x02`
- `#define SYS_EVENT_IO_MOTOR_RIGHT 0x03`
- `#define SYS_EVENT_IO_CAMERA 0x04`
- `#define SYS_EVENT_IO_REMOECONTROL 0x05`
- `#define SYS_EVENT_IO_TO_BLUETOOTH 0x06`
- `#define SYS_EVENT_1ms_CLOCK 0x07`
- `#define ALL_FUNCTIONS ((pEventHandlerFunction) 0xFFFFFFFF)`

Typedefs

- typedef enum [sys_colour](#) [sys_colour](#)
defines a system-wide colour definition
- typedef unsigned char [uint8](#)
- typedef unsigned short [uint16](#)
- typedef unsigned int [uint32](#)
- typedef signed char [sint8](#)
- typedef signed short [sint16](#)
- typedef signed int [sint32](#)
- typedef signed short [sint](#)
- typedef unsigned short [uint](#)
- typedef void(* [pFunction](#)) (void)
- typedef void(* [pByteFunction](#)) ([uint8](#))
- typedef void(* [pUART_reader](#)) ([uint8](#) data)

Enumerations

- enum [sys_colour](#) {
 [BLACK](#) = 0b00000000, [RED](#) = 0b000000100, [YELLOW](#) = 0b000000110, [GREEN](#) = 0b000000010,
 [CYAN](#) = 0b000000011, [BLUE](#) = 0b000000001, [MAGENTA](#) = 0b000000101, [WHITE](#) = 0b000000111 }
defines a system-wide colour definition

8.1.1 Detailed Description

This file declares general preprocessor variables and types.

Author

Stefan M. Trenkwalder

Version

1.0

Date

2015

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8.1.2 Macro Definition Documentation

8.1.2.1 #define ALL_FUNCTIONS ((pEventHandlerFunction) 0xFFFFFFFF)

Definition at line 111 of file definitions.h.

8.1.2.2 #define EPUCK_USED

Definition at line 19 of file definitions.h.

8.1.2.3 #define RC_BUTTON_0 0

Definition at line 61 of file definitions.h.

8.1.2.4 #define RC_BUTTON_1 1

Definition at line 62 of file definitions.h.

8.1.2.5 #define RC_BUTTON_2 2

Definition at line 63 of file definitions.h.

8.1.2.6 #define RC_BUTTON_3 3

Definition at line 64 of file definitions.h.

8.1.2.7 #define RC_BUTTON_4 4

Definition at line 65 of file definitions.h.

8.1.2.8 #define RC_BUTTON_5 5

Definition at line 66 of file definitions.h.

8.1.2.9 #define RC_BUTTON_6 6

Definition at line 67 of file definitions.h.

8.1.2.10 #define RC_BUTTON_7 7

Definition at line 68 of file definitions.h.

8.1.2.11 #define RC_BUTTON_8 8

Definition at line 69 of file definitions.h.

8.1.2.12 #define RC_BUTTON_9 9

Definition at line 70 of file definitions.h.

8.1.2.13 #define RC_BUTTON_BACK 10

Definition at line 79 of file definitions.h.

8.1.2.14 #define RC_BUTTON_BLUE 52

Definition at line 59 of file definitions.h.

8.1.2.15 #define RC_BUTTON_CHANNEL_DOWN 33

Definition at line 93 of file definitions.h.

8.1.2.16 #define RC_BUTTON_CHANNEL_UP 32

Definition at line 92 of file definitions.h.

8.1.2.17 #define RC_BUTTON_CURSOR_DOWN 19

Definition at line 76 of file definitions.h.

8.1.2.18 #define RC_BUTTON_CURSOR_LEFT 21

Definition at line 77 of file definitions.h.

8.1.2.19 #define RC_BUTTON_CURSOR_RIGHT 22

Definition at line 78 of file definitions.h.

8.1.2.20 #define RC_BUTTON_CURSOR_UP 20

Definition at line 75 of file definitions.h.

8.1.2.21 #define RC_BUTTON_EPG 47

Definition at line 81 of file definitions.h.

8.1.2.22 #define RC_BUTTON_FAV 40

Definition at line 82 of file definitions.h.

8.1.2.23 #define RC_BUTTON_GREEN 54

Definition at line 57 of file definitions.h.

8.1.2.24 #define RC_BUTTON_INFO 18

Definition at line 85 of file definitions.h.

8.1.2.25 #define RC_BUTTON_INTERNET 46

Definition at line 54 of file definitions.h.

8.1.2.26 #define RC_BUTTON_LANG 15

Definition at line 52 of file definitions.h.

8.1.2.27 #define RC_BUTTON_MENU 48

Definition at line 80 of file definitions.h.

8.1.2.28 #define RC_BUTTON_MUTE 13

Definition at line 91 of file definitions.h.

8.1.2.29 #define RC_BUTTON_OK 53

Definition at line 74 of file definitions.h.

8.1.2.30 #define RC_BUTTON_PAUSE 48

Definition at line 96 of file definitions.h.

8.1.2.31 #define RC_BUTTON_PLAY 53

Definition at line 99 of file definitions.h.

8.1.2.32 #define RC_BUTTON_PRESETS 14

Definition at line 86 of file definitions.h.

8.1.2.33 #define RC_BUTTON_RECORD 55

Definition at line 101 of file definitions.h.

8.1.2.34 #define RC_BUTTON_RED 55

Definition at line 56 of file definitions.h.

8.1.2.35 #define RC_BUTTON_REWIND 50

Definition at line 97 of file definitions.h.

8.1.2.36 #define RC_BUTTON_SCREEN 11

Definition at line 51 of file definitions.h.

8.1.2.37 #define RC_BUTTON_SLEEP 42

Definition at line 87 of file definitions.h.

8.1.2.38 #define RC_BUTTON_SOURCE 56

Definition at line 84 of file definitions.h.

8.1.2.39 #define RC_BUTTON_STANDBY 12

Definition at line 49 of file definitions.h.

8.1.2.40 #define RC_BUTTON_STOP 54

Definition at line 100 of file definitions.h.

8.1.2.41 #define RC_BUTTON_SUBTTL 31

Definition at line 53 of file definitions.h.

8.1.2.42 #define RC_BUTTON_SWAP 34

Definition at line 72 of file definitions.h.

8.1.2.43 #define RC_BUTTON_TELE_TEXT 60

Definition at line 71 of file definitions.h.

8.1.2.44 #define RC_BUTTON_VOLUME_DOWN 17

Definition at line 90 of file definitions.h.

8.1.2.45 #define RC_BUTTON_VOLUME_UP 16

Definition at line 89 of file definitions.h.

8.1.2.46 #define RC_BUTTON_WIND 52

Definition at line 98 of file definitions.h.

8.1.2.47 #define RC_BUTTON_YELLOW 50

Definition at line 58 of file definitions.h.

8.1.2.48 #define SYS_EVENT_1ms_CLOCK 0x07

Definition at line 109 of file definitions.h.

8.1.2.49 #define SYS_EVENT_IO_CAMERA 0x04

Definition at line 106 of file definitions.h.

8.1.2.50 #define SYS_EVENT_IO_MOTOR_LEFT 0x02

Definition at line 104 of file definitions.h.

8.1.2.51 `#define SYS_EVENT_IO_MOTOR_RIGHT 0x03`

Definition at line 105 of file definitions.h.

8.1.2.52 `#define SYS_EVENT_IO_REMOECONTROL 0x05`

Definition at line 107 of file definitions.h.

8.1.2.53 `#define SYS_EVENT_IO_TO_BLUETOOTH 0x06`

Definition at line 108 of file definitions.h.

8.1.2.54 `#define SYS_EVENT_TERMINATION 0x01`

Definition at line 103 of file definitions.h.

8.1.2.55 `#define UART1_RX_RF2`

Definition at line 37 of file definitions.h.

8.1.2.56 `#define UART1_RX_DIR_TRISF2`

Definition at line 42 of file definitions.h.

8.1.2.57 `#define UART1_TX_RF3`

Definition at line 38 of file definitions.h.

8.1.2.58 `#define UART1_TX_DIR_TRISF3`

Definition at line 43 of file definitions.h.

8.1.2.59 `#define UART2_RX_RF4`

Definition at line 39 of file definitions.h.

8.1.2.60 `#define UART2_RX_DIR_TRISF4`

Definition at line 44 of file definitions.h.

8.1.2.61 `#define UART2_TX_RF5`

Definition at line 40 of file definitions.h.

8.1.2.62 `#define UART2_TX_DIR_TRISF5`

Definition at line 45 of file definitions.h.

8.1.3 Typedef Documentation

8.1.3.1 `typedef void(* pByteFunction) (uint8)`

Defines a pointer to a function with no return value and one argument

Definition at line 141 of file definitions.h.

8.1.3.2 `typedef void(* pFunction) (void)`

Defines a pointer to a function with no return value and argument

Definition at line 140 of file definitions.h.

8.1.3.3 `typedef void(* pUART_reader) (uint8 data)`

Defines a pointer to a function with no return value and one argument

Definition at line 143 of file definitions.h.

8.1.3.4 `typedef signed short sint`

Definition at line 136 of file definitions.h.

8.1.3.5 `typedef signed short sint16`

Defines a signed 16bit integer

Definition at line 132 of file definitions.h.

8.1.3.6 `typedef signed int sint32`

Defines a signed 32bit integer

Definition at line 133 of file definitions.h.

8.1.3.7 `typedef signed char sint8`

Defines a signed 8bit integer

Definition at line 131 of file definitions.h.

8.1.3.8 `typedef enum sys_colour sys_colour`

defines a system-wide colour definition

This enum defines a system-wide colour. (it is based on one bit for red, blue, and green). In total, 8 colours are defined with the first three bits.

8.1.3.9 `typedef unsigned short uint`

Definition at line 137 of file definitions.h.

8.1.3.10 typedef unsigned short uint16

Defines an unsigned 16bit integer

Definition at line 129 of file definitions.h.

8.1.3.11 typedef unsigned int uint32

Defines an unsigned 32bit integer

Definition at line 130 of file definitions.h.

8.1.3.12 typedef unsigned char uint8

Defines an unsigned 8bit integer

Definition at line 128 of file definitions.h.

8.1.4 Enumeration Type Documentation

8.1.4.1 enum sys_colour

defines a system-wide colour definition

This enum defines a system-wide colour. (it is based on one bit for red, blue, and green). In total, 8 colours are defined with the first three bits.

Enumerator

BLACK

RED

YELLOW

GREEN

CYAN

BLUE

MAGENTA

WHITE

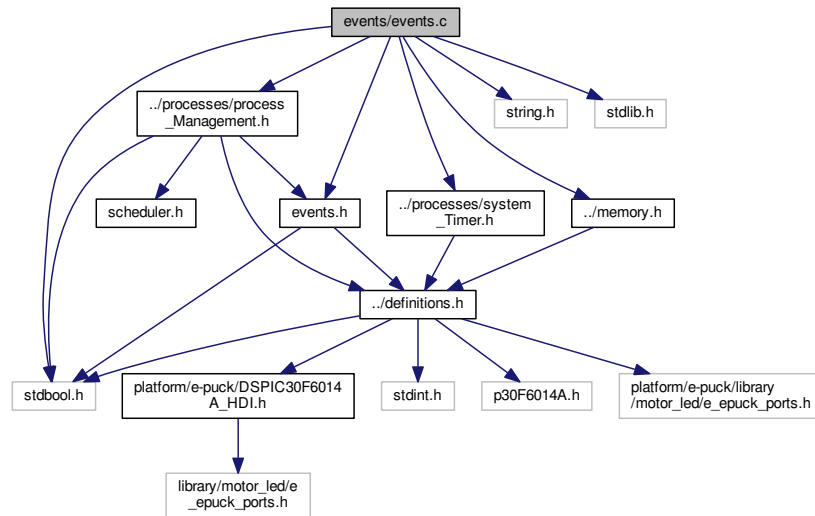
Definition at line 118 of file definitions.h.

8.2 events/events.c File Reference

defines functions to create, (un)subscribe, (un)register, and delete events and related handler.

```
#include "events.h"
#include "../processes/process_Management.h"
#include "../processes/system_Timer.h"
#include "../memory.h"
#include <string.h>
#include <stdlib.h>
#include <stdbool.h>
```


Include dependency graph for events.c:



Data Structures

- struct [sys_subscribed_process_s](#)
A single linked list element containing the ID of a subscribed process.
- struct [sys_registered_event_s](#)
A single linked element containing a registered event and its subscribers.

Typedefs

- typedef struct [sys_subscribed_process_s](#) [sys_subscribed_process](#)
A single linked list element containing the ID of a subscribed process.
- typedef struct [sys_registered_event_s](#) [sys_registered_event](#)
A single linked element containing a registered event and its subscribers.

Functions

- [sys_registered_event *](#) [Sys_Find_Event](#) ([uint16](#) eventID)
- [bool](#) [Sys_Send_Event](#) ([uint16](#) eventID, void *data, [uint16](#) data_size)
- [bool](#) [Sys_Send_IntEvent](#) ([uint16](#) eventID, [uint16](#) data)
- [bool](#) [Sys_Register_Event](#) ([uint16](#) eventID)
- [bool](#) [Sys_Subscribe_to_Event](#) ([uint16](#) eventID, [uint16](#) pid, [pEventHandlerFunction](#) handler, [pConditionFunction](#) condition)
- void [Sys_Unregister_Event](#) ([uint16](#) eventID)
- void [Sys_Unsubscribe_from_Event](#) ([uint16](#) eventID, [uint16](#) pid)
- void [Sys_Unsubscribe_Handler_from_Event](#) ([uint16](#) eventID, [pEventHandlerFunction](#) func, [uint16](#) pid)
- [bool](#) [Sys_IsEventRegistered](#) ([uint16](#) eventID)
- void [Sys_Unsubscribe_Process](#) ([uint16](#) pid)

Variables

- [sys_registered_event *](#) [registered_events](#) = 0

8.2.1 Detailed Description

defines functions to create, (un)subscribe, (un)register, and delete events and related handler.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

23 March 2015

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8.2.2 Typedef Documentation

8.2.2.1 typedef struct sys_registered_event_s sys_registered_event

A single linked element containing a registered event and its subscribers.

It is a single linked list element that contains registered events and a list of processes that are subscribed to it.

8.2.2.2 typedef struct sys_subscribed_process_s sys_subscribed_process

A single linked list element containing the ID of a subscribed process.

8.2.3 Function Documentation

8.2.3.1 sys_registered_event * Sys_Find_Event (uint16 eventId)

finds the registered event

This function returns the data structure of an event if the eventId was registered otherwise it's 0.

Parameters

in	<i>eventId</i>	ID of the event
----	----------------	-----------------

Returns

pointer to the data structure of the found event (or 0 if it wasn't found)

Definition at line 315 of file events.c.

8.2.3.2 bool Sys_IsEventRegistered (uint16 eventId)

returns true if the event was registered

returns true if the event was registered

Parameters

in	<i>eventID</i>	ID of the event
----	----------------	-----------------

Returns

is the event registered?

Definition at line 337 of file events.c.

8.2.3.3 bool Sys_Register_Event (uint16 eventID)

Function to register an event

This function registers a new event. The registration tells the operating system that this event can occur.

Parameters

in	<i>eventID</i>	ID of the event
----	----------------	-----------------

Returns

was it successful.

Definition at line 103 of file events.c.

8.2.3.4 bool Sys_Send_Event (uint16 eventID, void * data, uint16 data_size)

Function to send an event

This function sends an event to all subscribers.

Parameters

in	<i>eventID</i>	ID of the event
in	<i>data</i>	pointer to the data that want to be sent as an event
in	<i>data_size</i>	size of the data in bytes

Returns

was it successful.

Definition at line 62 of file events.c.

8.2.3.5 bool Sys_Send_IntEvent (uint16 eventID, uint16 data) [inline]

Function to send an integer event

This function sends an integer (16-bit) to all subscribers.

Parameters

in	<i>eventID</i>	ID of the event
in	<i>data</i>	integer value that should be sent as an event

Returns

was it successful.

Definition at line 90 of file events.c.

8.2.3.6 `bool Sys_Subscribe_to_Event (uint16 eventID, uint16 pid, pEventHandlerFunction handler, pConditionFunction condition)`

subscribes a specific handler function to an process and a specific event

This function subscribes a specific handler function to an process and a specific event

Parameters

in	<i>eventID</i>	ID of the event
in	<i>pid</i>	ID of the process
in	<i>handler</i>	pointer to the function that should handle the event data
in	<i>condition</i>	pointer to the function that decides if the handler should be executed or not

Returns

was it successful.

Definition at line 146 of file events.c.

8.2.3.7 `void Sys_Unregister_Event (uint16 eventID)`

unregisters an event

This function unregisters an event

Parameters

in	<i>eventID</i>	ID of the event
----	----------------	-----------------

Definition at line 192 of file events.c.

8.2.3.8 `void Sys_Unsubscribe_from_Event (uint16 eventID, uint16 pid)`

unsubscribes an event

This function unsubscribes an event

Parameters

in	<i>eventID</i>	ID of the event
in	<i>pid</i>	ID of the process

Definition at line 244 of file events.c.

8.2.3.9 `void Sys_Unsubscribe_Handler_from_Event (uint16 eventID, pEventHandlerFunction func, uint16 pid)`

only unsubscribes a specific handler function

This function only unsubscribes a specific handler function

Parameters

in	<i>eventID</i>	ID of the event
in	<i>func</i>	pointer to the handler function
in	<i>pid</i>	ID of the process

Definition at line 280 of file events.c.

8.2.3.10 `void Sys_Unsubscribe_Process (uint16 pid)`

unsubscribes all events that were subscribed to a process

unsubscribes all events that were subscribed to a process

It is a single linked list element and contains data of an occurred event.

- typedef bool(* [pEventHandlerFunction](#)) (uint16, uint16, [sys_event_data](#) *)
Event handler function pointer type (process id, event id, received data)
- typedef bool(* [pConditionFunction](#)) (void *)
Condition function pointer type.

Functions

- bool [Sys_Send_Event](#) (uint16 eventId, void *data, uint16 data_size)
- bool [Sys_Send_IntEvent](#) (uint16 eventId, uint16 data)
- bool [Sys_Register_Event](#) (uint16 eventId)
- void [Sys_Unregister_Event](#) (uint16 eventId)
- bool [Sys_Subscribe_to_Event](#) (uint16 eventId, uint16 pid, [pEventHandlerFunction](#) handler, [pConditionFunction](#) condition)
- void [Sys_Unsubscribe_from_Event](#) (uint16 eventId, uint16 pid)
- void [Sys_Unsubscribe_Process](#) (uint16 pid)
- bool [Sys_IsEventRegistered](#) (uint16 eventId)

8.3.1 Detailed Description

declares functions to create, (un)subscribe, (un)register, and delete events and related handler.

Author

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Version

1.0

Date

23 March 2015

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8.3.2 Typedef Documentation

8.3.2.1 typedef bool(* pConditionFunction) (void *)

Condition function pointer type.

This function points to a condition function, which defines if an event handler should be executed or not.

Definition at line 109 of file events.h.

8.3.2.2 typedef bool(* pEventHandlerFunction) (uint16, uint16, [sys_event_data](#) *)

Event handler function pointer type (process id, event id, received data)

This function points to an event handler function, which processes incoming events and its data.

Definition at line 102 of file events.h.

8.3.2.3 typedef struct `sys_event_data_s` `sys_event_data`

It is a single linked list element and contains data of an occurred event.

8.3.3 Function Documentation

8.3.3.1 bool `Sys_IsEventRegistered (uint16 eventID)`

returns true if the event was registered

returns true if the event was registered

Parameters

in	<i>eventID</i>	ID of the event
----	----------------	-----------------

Returns

is the event registered?

Definition at line 337 of file events.c.

8.3.3.2 bool `Sys_Register_Event (uint16 eventID)`

Function to register an event

This function registers an new event. The registration tells the operating system that this event can occur.

Parameters

in	<i>eventID</i>	ID of the event
----	----------------	-----------------

Returns

was it successful.

Definition at line 103 of file events.c.

8.3.3.3 bool `Sys_Send_Event (uint16 eventID, void * data, uint16 data_size)`

Function to send an event

This function sends an event to all subscribers.

Parameters

in	<i>eventID</i>	ID of the event
in	<i>data</i>	pointer to the data that want to be sent as an event
in	<i>data_size</i>	size of the data in bytes

Returns

was it successful.

Definition at line 62 of file events.c.

8.3.3.4 bool `Sys_Send_IntEvent (uint16 eventID, uint16 data)` `[inline]`

Function to send an integer event

This function sends an integer (16-bit) to all subscribers.

Parameters

in	<i>eventID</i>	ID of the event
in	<i>data</i>	integer value that should be sent as an event

Returns

was it successful.

Definition at line 90 of file events.c.

8.3.3.5 `bool Sys_Subscribe_to_Event (uint16 eventID, uint16 pid, pEventHandlerFunction handler, pConditionFunction condition)`

subscribes a specific handler function to an process and a specific event

This function subscribes a specific handler function to an process and a specific event

Parameters

in	<i>eventID</i>	ID of the event
in	<i>pid</i>	ID of the process
in	<i>handler</i>	pointer to the function that should handle the event data
in	<i>condition</i>	pointer to the function that decides if the handler should be executed or not

Returns

was it successful.

Definition at line 146 of file events.c.

8.3.3.6 `void Sys_Unregister_Event (uint16 eventID)`

unregisters an event

This function unregisters an event

Parameters

in	<i>eventID</i>	ID of the event
----	----------------	-----------------

Definition at line 192 of file events.c.

8.3.3.7 `void Sys_Unsubscribe_from_Event (uint16 eventID, uint16 pid)`

unsubscribes an event

This function unsubscribes an event

Parameters

in	<i>eventID</i>	ID of the event
in	<i>pid</i>	ID of the process

Definition at line 244 of file events.c.

8.3.3.8 `void Sys_Unsubscribe_Process (uint16 pid)`

unsubscribes all events that were subscribed to a process

unsubscribes all events that were subscribed to a process

Parameters

<code>in</code>	<code>pid</code>	process identifier
-----------------	------------------	--------------------

Definition at line 358 of file events.c.

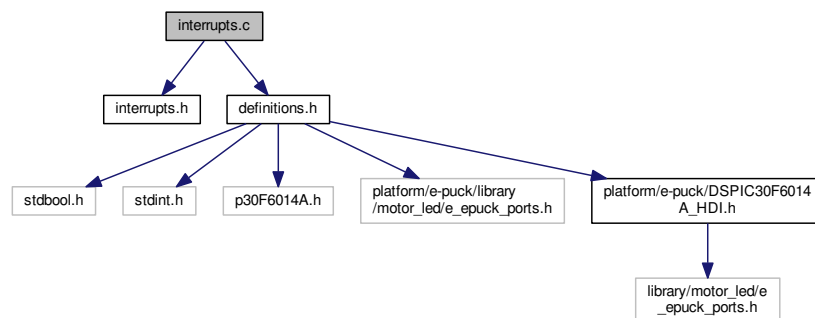
8.4 interrupts.c File Reference

It defines the functions to create atomic sections.

```
#include "interrupts.h"
```

```
#include "definitions.h"
```

Include dependency graph for interrupts.c:



Functions

- void [Sys_Start_AtomicSection](#) ()
- void [Sys_End_AtomicSection](#) ()

8.4.1 Detailed Description

It defines the functions to create atomic sections.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

2015

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To protect sections of code from any interruptions one has to use the following code:

```
// do something
Sys_Start_AtomicSection();

    //do something which should not be interrupted
Sys_End_AtomicSection();

// do something else
```

8.4.2 Function Documentation

8.4.2.1 void Sys_End_AtomicSection (void) [inline]

Starts an atomic section

This Function starts an atomic section. This means the code afterwards cannot be interrupted by any interrupt.

Precondition

[Sys_Start_AtomicSection\(\)](#) must have been called.

Definition at line 58 of file interrupts.c.

8.4.2.2 void Sys_Start_AtomicSection (void) [inline]

Starts an atomic section

This Function starts an atomic section. This means the code afterwards cannot be interrupted by any interrupt.

Note

This function can be called within an atomic section. However, it doesn't change the behaviour when called within an atomic section. To end an atomic section, [Sys_End_AtomicSection\(\)](#) must be called as often as [Sys_Start_AtomicSection\(\)](#) was called.

Postcondition

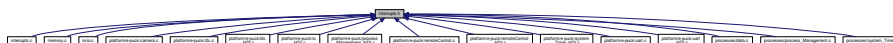
[Sys_End_AtomicSection\(\)](#) must be called to execute any interrupt that happened or will happen.

Definition at line 43 of file interrupts.c.

8.5 interrupts.h File Reference

It declares interrupt priority levels and functions to create atomic sections.

This graph shows which files directly or indirectly include this file:



Macros

- `#define SYS_IRQP_MAX` 7
- `#define SYS_IRQP_SYSTEM_TIMER` 2
- `#define SYS_IRQP_IO_TIMER` 3
- `#define SYS_IRQP_UART1` 4
- `#define SYS_IRQP_UART2` 4
- `#define SYS_IRQP_I2C` 5
- `#define SYS_IRQP_REMOTECONTROL` 4
- `#define SYS_IRQP_CAMERA_PIXEL` 5
- `#define SYS_IRQP_CAMERA_LINE` 6
- `#define SYS_IRQP_CAMERA_FRAME` 7

Functions

- void `Sys_Start_AtomicSection` (void)
- void `Sys_End_AtomicSection` (void)

8.5.1 Detailed Description

It declares interrupt priority levels and functions to create atomic sections.

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Version

1.0

Date

{03 September 2015}

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8.5.2 Macro Definition Documentation

8.5.2.1 `#define SYS_IRQP_CAMERA_FRAME` 7

interrupt priority for the camera frame interrupt

Definition at line 35 of file interrupts.h.

8.5.2.2 `#define SYS_IRQP_CAMERA_LINE` 6

interrupt priority for the camera line interrupt

Definition at line 34 of file interrupts.h.

8.5.2.3 `#define SYS_IRQP_CAMERA_PIXEL 5`

interrupt priority for the camera pixel interrupt

Definition at line 33 of file interrupts.h.

8.5.2.4 `#define SYS_IRQP_I2C 5`

interrupt priority for the I2C interrupt

Definition at line 29 of file interrupts.h.

8.5.2.5 `#define SYS_IRQP_IO_TIMER 3`

interrupt priority for the I/O timer interrupt

Definition at line 24 of file interrupts.h.

8.5.2.6 `#define SYS_IRQP_MAX 7`

maximum interrupt priority

Definition at line 20 of file interrupts.h.

8.5.2.7 `#define SYS_IRQP_REMOTECONTROL 4`

interrupt priority for the remote control interrupt

Definition at line 31 of file interrupts.h.

8.5.2.8 `#define SYS_IRQP_SYSTEM_TIMER 2`

interrupt priority for the system timer interrupt

Definition at line 22 of file interrupts.h.

8.5.2.9 `#define SYS_IRQP_UART1 4`

interrupt priority for the UART1 interrupt

Definition at line 26 of file interrupts.h.

8.5.2.10 `#define SYS_IRQP_UART2 4`

interrupt priority for the UART2 interrupt

Definition at line 27 of file interrupts.h.

8.5.3 Function Documentation

8.5.3.1 `void Sys_End_AtomicSection (void) [inline]`

Starts an atomic section

This Function starts an atomic section. This means the code afterwards cannot be interrupted by any interrupt.

Precondition

[Sys_Start_AtomicSection\(\)](#) must have been called.

Definition at line 58 of file interrupts.c.

8.5.3.2 void Sys_Start_AtomicSection (void) [inline]

Starts an atomic section

This Function starts an atomic section. This means the code afterwards cannot be interrupted by any interrupt.

Note

This function can be called within an atomic section. However, it doesn't change the behaviour when called within an atomic section. To end an atomic section, [Sys_End_AtomicSection\(\)](#) must be called as often as [Sys_Start_AtomicSection\(\)](#) was called.

Postcondition

[Sys_End_AtomicSection\(\)](#) must be called to execute any interrupt that happened or will happen.

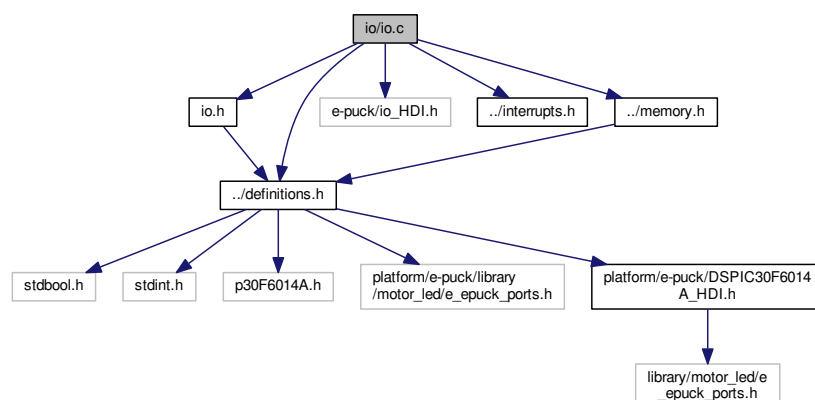
Definition at line 43 of file interrupts.c.

8.6 io/io.c File Reference

defines functions to control the IO timer and to (un)register IO Handler.

```
#include "io.h"
#include "../definitions.h"
#include "e-puck/io_HDI.h"
#include "../interrupts.h"
#include "../memory.h"
```

Include dependency graph for io.c:

**Functions**

- void [Sys_Init_IOManagement](#) (void)

- void `Sys_Start_IOManagement` (void)
- void `Sys_Stop_IOManagement` (void)
- void `Sys_Stop_IOTimer` ()
- void `Sys_Continue_IOTimer` ()
- void `Sys_Reset_IOTimer` ()
- void `Sys_Disable_IOTimerInterrupt` ()
- void `Sys_Enable_IOTimerInterrupt` ()
- void `Sys_Force_IOTimerInterrupt` ()
- bool `Sys_Register_IOHandler` (pFunction func)
- void `Sys_Unregister_IOHandler` (pFunction func)

8.6.1 Detailed Description

defines functions to control the IO timer and to (un)register IO Handler.

Author

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Version

1.0

Date

10 August 2015

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8.6.2 Function Documentation

8.6.2.1 void `Sys_Continue_IOTimer` (void) [inline]

Continues the I/O Timer

This function continues the I/O Timer. Note that the timer continues to count where it stops.

Definition at line 71 of file io.c.

8.6.2.2 void `Sys_Disable_IOTimerInterrupt` (void) [inline]

Disables the I/O Timer

This function disables the I/O Timer interrupt. Note that the timer still continues to count.

Definition at line 91 of file io.c.

8.6.2.3 void `Sys_Enable_IOTimerInterrupt` (void) [inline]

Enables the I/O Timer

This function enables the I/O Timer interrupt.

Definition at line 101 of file io.c.

8.6.2.4 void Sys_Force_IOTimerInterrupt (void) [inline]

Force the I/O Timer interrupt.

This function forces a new I/O Timer interrupt even if the timer hasn't reached its threshold.

Definition at line 111 of file io.c.

8.6.2.5 void Sys_Init_IOManagement (void) [inline]

Initialises the I/O Management

This function initialises the I/O Timer and therefore the I/O Management.

Definition at line 31 of file io.c.

8.6.2.6 bool Sys_Register_IOHandler (pFunction func)

registers new I/O handler.

This function registers a new I/O handler which is executed every time the I/O timer interrupt occurs.

Parameters

<i>func</i>	pointer to the function that should be executed by the I/O timer periodically
-------------	---

Returns

bool was it successful?

Definition at line 123 of file io.c.

8.6.2.7 void Sys_Reset_IOTimer (void) [inline]

resets the I/O Timer

This function sets the I/O Timer counter to 0 and the I/O timer needs the full time duration to throw the interrupt.

Definition at line 81 of file io.c.

8.6.2.8 void Sys_Start_IOManagement (void) [inline]

Starts the I/O Management

This function starts the I/O Timer and therefore the I/O Management.

Definition at line 41 of file io.c.

8.6.2.9 void Sys_Stop_IOManagement (void) [inline]

Stops the I/O Management

This function stops the I/O Timer and therefore the I/O Management.

Definition at line 51 of file io.c.

8.6.2.10 void Sys_Stop_IOTimer (void) [inline]

Stops the I/O Timer

This function stops the I/O Timer.

Definition at line 61 of file io.c.

8.6.2.11 void Sys_Unregister_IOHandler (pFunction *func*)

unregisters new I/O handler.

This function unregisters a I/O handler identified by its function address.

Parameters

<i>func</i>	pointer to the function that should be executed by the I/O timer periodically
-------------	---

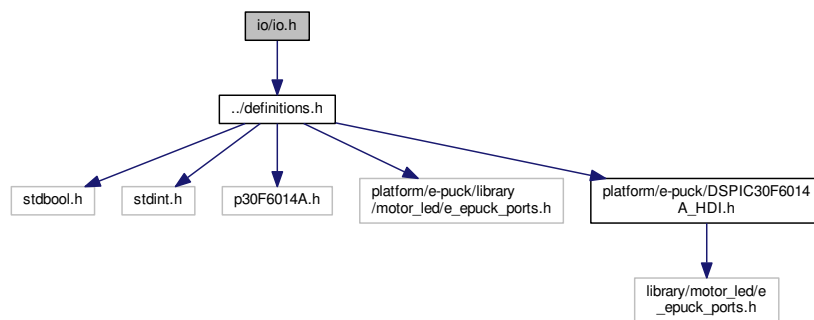
Definition at line 158 of file io.c.

8.7 io/io.h File Reference

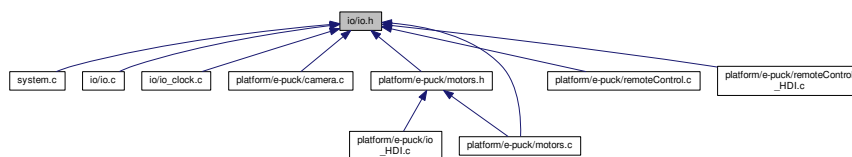
declares functions to control the IO timer and to (un)register IO Handler.

```
#include "../definitions.h"
```

Include dependency graph for io.h:



This graph shows which files directly or indirectly include this file:



Functions

- void [Sys_Init_IOManagement](#) (void)
- void [Sys_Start_IOManagement](#) (void)
- void [Sys_Stop_IOManagement](#) (void)
- void [Sys_Stop_IOTimer](#) (void)
- void [Sys_Continue_IOTimer](#) (void)
- void [Sys_Reset_IOTimer](#) (void)
- void [Sys_Disable_IOTimerInterrupt](#) (void)

- void `Sys_Enable_IOTimerInterrupt` (void)
- void `Sys_Force_IOTimerInterrupt` (void)
- bool `Sys_Register_IOHandler` (pFunction func)
- void `Sys_Unregister_IOHandler` (pFunction func)

8.7.1 Detailed Description

declares functions to control the IO timer and to (un)register IO Handler.

Author

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Version

1.0

Date

28 July 2015

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8.7.2 Function Documentation

8.7.2.1 void `Sys_Continue_IOTimer` (void) [inline]

Continues the I/O Timer

This function continues the I/O Timer. Note that the timer continues to count where it stops.

Definition at line 71 of file io.c.

8.7.2.2 void `Sys_Disable_IOTimerInterrupt` (void) [inline]

Disables the I/O Timer

This function disables the I/O Timer interrupt. Note that the timer still continues to count.

Definition at line 91 of file io.c.

8.7.2.3 void `Sys_Enable_IOTimerInterrupt` (void) [inline]

Enables the I/O Timer

This function enables the I/O Timer interrupt.

Definition at line 101 of file io.c.

8.7.2.4 void `Sys_Force_IOTimerInterrupt` (void) [inline]

Force the I/O Timer interrupt.

This function forces a new I/O Timer interrupt even if the timer hasn't reached its threshold.

Definition at line 111 of file io.c.

8.7.2.5 void Sys_Init_IOManagement (void) [inline]

Initialises the I/O Management

This function initialises the I/O Timer and therefore the I/O Management.

Definition at line 31 of file io.c.

8.7.2.6 bool Sys_Register_IOHandler (pFunction func)

registers new I/O handler.

This function registers a new I/O handler which is executed every time the I/O timer interrupt occurs.

Parameters

<i>func</i>	pointer to the function that should be executed by the I/O timer periodically
-------------	---

Returns

bool was it successful?

Definition at line 123 of file io.c.

8.7.2.7 void Sys_Reset_IOTimer (void) [inline]

resets the I/O Timer

This function sets the I/O Timer counter to 0 and the I/O timer needs the full time duration to throw the interrupt.

Definition at line 81 of file io.c.

8.7.2.8 void Sys_Start_IOManagement (void) [inline]

Starts the I/O Management

This function starts the I/O Timer and therefore the I/O Management.

Definition at line 41 of file io.c.

8.7.2.9 void Sys_Stop_IOManagement (void) [inline]

Stops the I/O Management

This function stops the I/O Timer and therefore the I/O Management.

Definition at line 51 of file io.c.

8.7.2.10 void Sys_Stop_IOTimer (void) [inline]

Stops the I/O Timer

This function stops the I/O Timer.

Definition at line 61 of file io.c.

8.7.2.11 void Sys_Unregister_IOHandler (pFunction func)

unregisters new I/O handler.

This function unregisters a I/O handler identified by its function address.

Parameters

<i>func</i>	pointer to the function that should be executed by the I/O timer periodically
-------------	---

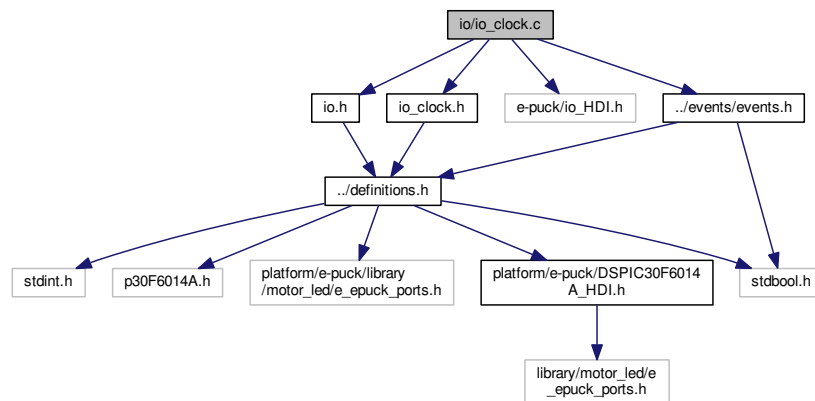
Definition at line 158 of file io.c.

8.8 io/io_clock.c File Reference

defines the system clock that provides a continuous time value (granulation of 1 ms).

```
#include "io.h"
#include "io_clock.h"
#include "e-puck/io_HDI.h"
#include "../events/events.h"
```

Include dependency graph for io_clock.c:



Functions

- void [Sys_SystemClock_Counter](#) (void)
- void [Sys_Init_Clock](#) ()
- void [Sys_Init_SystemTime](#) ()
- uint32 [Sys_Get_SystemTime](#) ()
- uint32 [Sys_Get_SystemClock](#) ()

8.8.1 Detailed Description

defines the system clock that provides a continuous time value (granulation of 1 ms).

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

28 July 2015

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8.8.2 Function Documentation**8.8.2.1 uint32 Sys_Get_SystemClock(void) [inline]**

returns the system clock/time in milliseconds

returns the system clock/time in milliseconds

Returns

uint32 time that has passed since OpenSwarm was started

Definition at line 82 of file io_clock.c.

8.8.2.2 uint32 Sys_Get_SystemTime(void) [inline]

Renaming of the function [Sys_Get_SystemClock\(\)](#).

Renaming of the function [Sys_Get_SystemClock\(\)](#).

Returns

uint32 time that has passed since OpenSwarm was started

Definition at line 71 of file io_clock.c.

8.8.2.3 void Sys_Init_Clock(void) [inline]

This function initialises the system clock

This function initialises the system clock which is in principle a counter that indicates passed milli seconds.

Definition at line 30 of file io_clock.c.

8.8.2.4 void Sys_Init_SystemTime(void) [inline]

Renaming of the function [Sys_Init_Clock\(\)](#).

Renaming of the function [Sys_Init_Clock\(\)](#).

Definition at line 41 of file io_clock.c.

8.8.2.5 void Sys_SystemClock_Counter()

calculates the system clock

This function calculates the system clock tick and increases the counter if a millisecond passed.

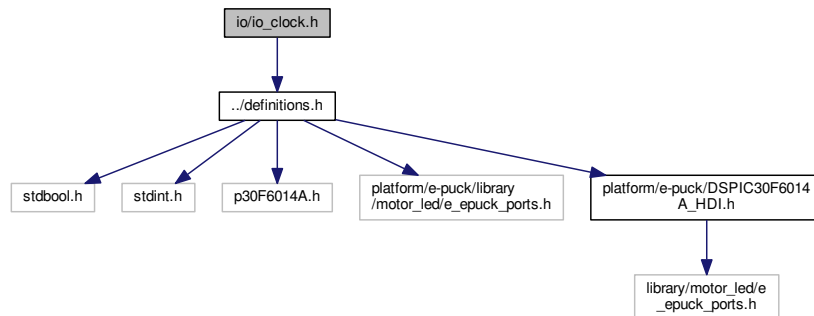
Definition at line 51 of file io_clock.c.

8.9 io/io_clock.h File Reference

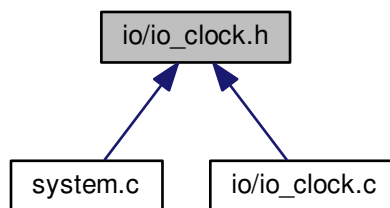
declares the system clock that provides a continuous time value (granulation of 1 ms).

```
#include "../definitions.h"
```

Include dependency graph for io_clock.h:



This graph shows which files directly or indirectly include this file:



Functions

- void `Sys_Init_Clock` (void)
- void `Sys_Init_SystemTime` (void)
- `uint32` `Sys_Get_SystemTime` (void)
- `uint32` `Sys_Get_SystemClock` (void)

8.9.1 Detailed Description

declares the system clock that provides a continuous time value (granulation of 1 ms).

Author

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Version

1.0

Date

28 July 2015

Copyrightadapted FreeBSD License (see <http://openswarm.org/license>)**8.9.2 Function Documentation****8.9.2.1 uint32 Sys_Get_SystemClock (void) [inline]**

returns the system clock/time in milliseconds

returns the system clock/time in milliseconds

Returns

uint32 time that has passed since OpenSwarm was started

Definition at line 82 of file io_clock.c.

8.9.2.2 uint32 Sys_Get_SystemTime (void) [inline]Renaming of the function [Sys_Get_SystemClock\(\)](#).Renaming of the function [Sys_Get_SystemClock\(\)](#).**Returns**

uint32 time that has passed since OpenSwarm was started

Definition at line 71 of file io_clock.c.

8.9.2.3 void Sys_Init_Clock (void) [inline]

This function initialises the system clock

This function initialises the system clock which is in principle a counter that indicates passed milli seconds.

Definition at line 30 of file io_clock.c.

8.9.2.4 void Sys_Init_SystemTime (void) [inline]Renaming of the function [Sys_Init_Clock\(\)](#).Renaming of the function [Sys_Init_Clock\(\)](#).

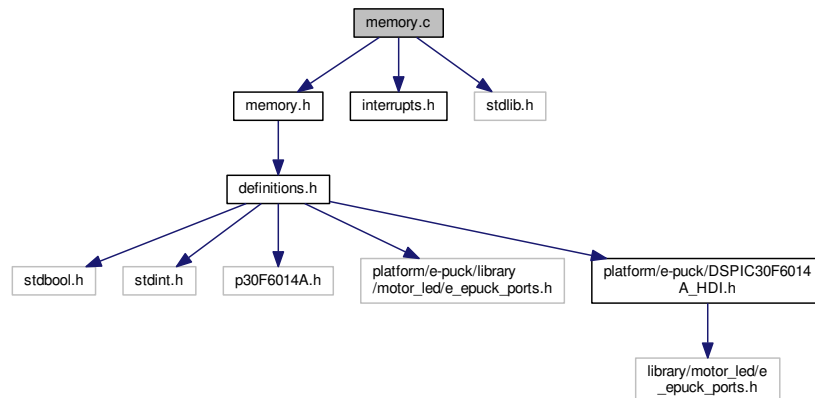
Definition at line 41 of file io_clock.c.

8.10 memory.c File Reference

defines functions to allocate, free, and copy memory

```
#include "memory.h"
#include "interrupts.h"
#include <stdlib.h>
```

Include dependency graph for memory.c:



Functions

- void * [Sys_Malloc](#) (uint16 length)
- void [Sys_Free](#) (void *data)
- void [Sys_Memcpy](#) (void *source_i, void *destination_o, uint16 length)

8.10.1 Detailed Description

defines functions to allocate, free, and copy memory

Author

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Version

1.0

Date

{05 September 2015}

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8.10.2 Function Documentation

8.10.2.1 void Sys_Free (void * *data*)

Function to free memory

This Function frees dynamic allocated memory. This freeing is performed as atomic action.

Parameters

<i>data</i>	pointer to memory that should be freed.
-------------	---

Definition at line 45 of file memory.c.

8.10.2.2 void* Sys_Malloc (uint16 length)

Function to allocate **length** bytes of memory

This Function allocates memory of the size **length**. This allocation is performed as atomic action.

Parameters

<i>length</i>	value how many bytes should be allocated
---------------	--

Returns

pointer to the allocated memory

Definition at line 26 of file memory.c.

8.10.2.3 void Sys_Memcpy (void * source_i, void * destination_o, uint16 length)

Function to copies memory of the size **length** from **source_i** to **destination_o**.

Function to copies memory of the size **length** from **source_i** to **destination_o**. This copying is performed as atomic action.

Parameters

<i>source_i</i>	pointer to the source
<i>destination_o</i>	pointer to the destination
<i>length</i>	size of the memory that has to be copied

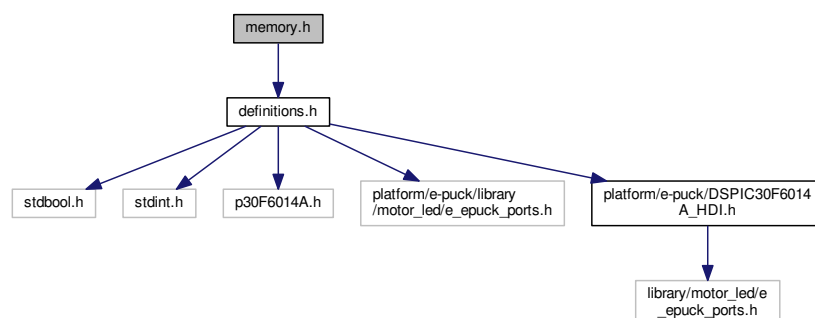
Definition at line 64 of file memory.c.

8.11 memory.h File Reference

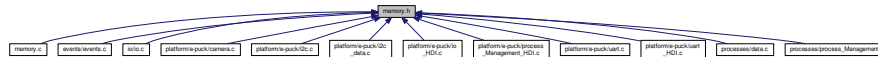
declares functions to allocate, free, and copy memory

```
#include "definitions.h"
```

Include dependency graph for memory.h:



This graph shows which files directly or indirectly include this file:



Functions

- void * [Sys_Malloc](#) (uint16 length)
- void [Sys_Free](#) (void *)
- void [Sys_Memcpy](#) (void *source, void *destination, uint16 length)

8.11.1 Detailed Description

declares functions to allocate, free, and copy memory

Author

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Version

1.0

Date

{05 September 2015}

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8.11.2 Function Documentation

8.11.2.1 void Sys_Free (void * data)

Function to free memory

This Function frees dynamic allocated memory. This freeing is performed as atomic action.

Parameters

<i>data</i>	pointer to memory that should be freed.
-------------	---

Definition at line 45 of file memory.c.

8.11.2.2 void* Sys_Malloc (uint16 length)

Function to allocate **length** bytes of memory

This Function allocates memory of the size **length**. This allocation is performed as atomic action.

Parameters

<i>length</i>	value how many bytes should be allocated
---------------	--

Returns

pointer to the allocated memory

Definition at line 26 of file memory.c.

8.11.2.3 void Sys_Memcpy (void * *source_i*, void * *destination_o*, uint16 *length*)

Function to copies memory of the size **length** from **source_i** to **destination_o**.

Function to copies memory of the size **length** from **source_i** to **destination_o**. This copying is performed as atomic action.

Parameters

<i>source_i</i>	pointer to the source
<i>destination_o</i>	pointer to the destination
<i>length</i>	size of the memory that has to be copied

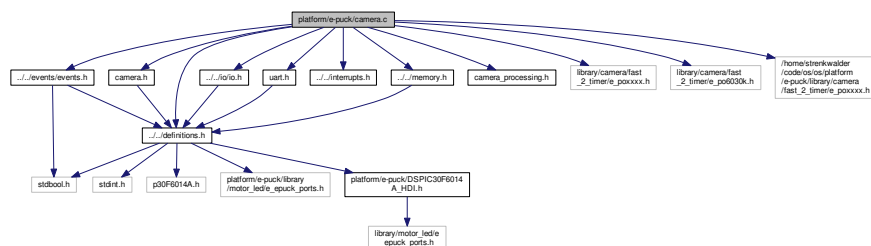
Definition at line 64 of file memory.c.

8.12 platform/e-puck/camera.c File Reference

This file includes functions to process data retrieved by a camera.

```
#include "camera.h"
#include "../io/io.h"
#include "uart.h"
#include "../definitions.h"
#include "../events/events.h"
#include "../interrupts.h"
#include "../memory.h"
#include "camera_processing.h"
#include "library/camera/fast_2_timer/e_poxxxx.h"
#include "library/camera/fast_2_timer/e_po6030k.h"
```

Include dependency graph for camera.c:



Macros

- #define **FRAME_WIDTH** 10
- #define **FRAME_HEIGHT** 10
- #define **CAMERA_I2C_ADDRESS** 0xDC

- #define [RED_MAX](#) 0x0C1C
- #define [GREEN_MAX](#) 0x189C
- #define [BLUE_MAX](#) 0x0C1C
- #define [RED_THRESHOLD](#) 0x060E
- #define [GREEN_THRESHOLD](#) 0x0E4E
- #define [BLUE_THRESHOLD](#) 0x060E
- #define [CAM_WIDTH](#) 160
- #define [CAM_HEIGHT](#) 160
- #define [CAM_ZOOM_X](#) 8
- #define [CAM_ZOOM_Y](#) 8
- #define [CAM_W_SIZE](#) 20
- #define [CAM_H_SIZE](#) 20
- #define [CP_WI](#) 120
- #define [CP_RI](#) 80
- #define [CP_GI](#) 80
- #define [CP_BI](#) 100
- #define [COLOUR_THRESHOLD](#) 766

Functions

- void [Sys_Process_newPixel](#) (void)
- void [Sys_Process_newLine](#) (void)
- void [Sys_Process_newFrame](#) (void)
- void [Sys_Camera_PreProcessor](#) (void)
- void [Sys_Init_Camera](#) ()
- void [Sys_Start_Camera](#) ()
- void [Sys_Set_Preprocessing](#) (pCameraPreProcessor func)

8.12.1 Detailed Description

This file includes functions to process data retrieved by a camera.

Author

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Version

1.0

Date

27 August 2015

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Todo The used functions from the e-puck library are very time and computational intensive. These function can be rewritten to decrease the processing load.

8.12.2 Macro Definition Documentation

8.12.2.1 #define BLUE_MAX 0x0C1C

maximum value for received blue

Definition at line 44 of file camera.c.

8.12.2.2 #define BLUE_THRESHOLD 0x060E

threshold value for received blue

Definition at line 47 of file camera.c.

8.12.2.3 #define CAM_H_SIZE 20

post scale height frame

Definition at line 88 of file camera.c.

8.12.2.4 #define CAM_HEIGHT 160

height of the camera input frame

Definition at line 84 of file camera.c.

8.12.2.5 #define CAM_W_SIZE 20

post scale width frame

Definition at line 87 of file camera.c.

8.12.2.6 #define CAM_WIDTH 160

Initialises the I/O Management

This function initialises the I/O Timer and therefore the I/O Management.

param void return void

```
inline void Sys_Write_to_Camera(uint8 address, uint8* data, uint16 length){ uint8 *i2c_data = (uint8 *) Sys_Malloc(length+1);
```

```
i2c_data[0] = address;
```

```
Sys_Memcpy(data, i2c_data+1,length);
```

```
Sys_I2C_SentBytes(CAMERA_I2C_ADDRESS, i2c_data, length+1); }width of the camera input frame
```

Definition at line 83 of file camera.c.

8.12.2.7 #define CAM_ZOOM_X 8

zoom factor to scale the frame

Definition at line 85 of file camera.c.

8.12.2.8 #define CAM_ZOOM_Y 8

zoom factor to scale the frame

Definition at line 86 of file camera.c.

8.12.2.9 `#define CAMERA_I2C_ADDRESS 0xDC`

I2C address of the camera

Definition at line 40 of file camera.c.

8.12.2.10 `#define COLOUR_THRESHOLD 766`

threshold to decide if a colour pixel has been measured

Definition at line 540 of file camera.c.

8.12.2.11 `#define CP_BI 100`

blue factor to process and calibrate the camera

Definition at line 539 of file camera.c.

8.12.2.12 `#define CP_GI 80`

green factor to process and calibrate the camera

Definition at line 538 of file camera.c.

8.12.2.13 `#define CP_RI 80`

red factor to process and calibrate the camera

Definition at line 537 of file camera.c.

8.12.2.14 `#define CP_WI 120`

whitiness factor to process and calibrate the camera

Definition at line 536 of file camera.c.

8.12.2.15 `#define FRAME_HEIGHT 10`

Height of the subframe of the image

Definition at line 39 of file camera.c.

8.12.2.16 `#define FRAME_WIDTH 10`

Width of the subframe of the image

Definition at line 38 of file camera.c.

8.12.2.17 `#define GREEN_MAX 0x189C`

maximum value for received green

Definition at line 43 of file camera.c.

8.12.2.18 #define GREEN_THRESHOLD 0x0E4E

threshold value for received green

Definition at line 46 of file camera.c.

8.12.2.19 #define RED_MAX 0x0C1C

maximum value for received red

Definition at line 42 of file camera.c.

8.12.2.20 #define RED_THRESHOLD 0x060E

threshold value for received red

Definition at line 45 of file camera.c.

8.12.3 Function Documentation**8.12.3.1 void Sys_Camera_PreProcessor (void)**

processes an incoming camera frame and emits events according to used algorithm

This function processes an incoming camera frame and emits events according to used algorithm.

Todo rewrite the camera to computational less intensive functions

Definition at line 551 of file camera.c.

8.12.3.2 void Sys_Init_Camera (void)

Initialises the Camera

This function initialises the camera using e-puck library from Subversion at [svn://svn.gna.org/svn/e-puck/trunk](http://svn.gna.org/svn/e-puck/trunk)

Todo rewrite the camera to computational less intensive functions

Definition at line 99 of file camera.c.

8.12.3.3 void Sys_Process_newFrame (void) [inline]**8.12.3.4 void Sys_Process_newLine (void) [inline]****8.12.3.5 void Sys_Process_newPixel (void) [inline]****8.12.3.6 void Sys_Set_Preprocessing (pCameraPreProcessor func)**

Defines a preprocessor callback functions.

Defines a preprocessor callback functions to process the frame.

Parameters

<i>in</i>	<i>func</i>	camera preprocessor which computes events out of the raw image
-----------	-------------	--

Definition at line 319 of file camera.c.

8.12.3.7 void Sys_Start_Camera (void)

Starts the Camera

This function starts the capturing using e-puck library from Subversion at [svn://svn.gna.org/svn/e-puck/trunk](http://svn.gna.org/svn/e-puck/trunk)

Todo rewrite the camera to computational less intensive functions

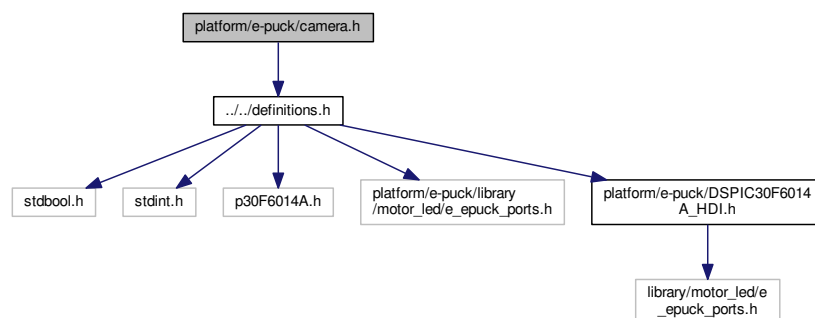
Definition at line 298 of file camera.c.

8.13 platform/e-puck/camera.h File Reference

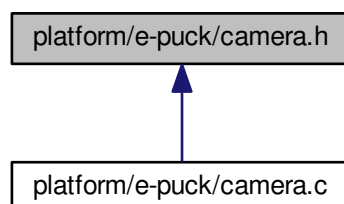
This file includes functions to process data retrieved by a camera.

```
#include "../definitions.h"
```

Include dependency graph for camera.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [sys_rgb_pixel_s](#)

This bitfield contains the structure of a received camera pixel.

Macros

- #define [SYS_MAX_RED](#) 0b00011111;
- #define [SYS_MAX_GREEN](#) 0b00111111;
- #define [SYS_MAX_BLUE](#) 0b00011111;

Typedefs

- typedef struct [sys_rgb_pixel_s](#) [sys_rgb](#)
This bitfield contains the structure of a received camera pixel.
- typedef struct [sys_rgb_pixel_s](#) [sys_rgb_pixel](#)
- typedef void(* [pCameraPreProcessor](#)) ([sys_rgb_pixel](#) **frame, [uint16](#) width, [uint16](#) height)

Functions

- void [Sys_Init_Camera](#) (void)
- void [Sys_Start_Camera](#) (void)
- void [Sys_Set_Preprocessing](#) ([pCameraPreProcessor](#) func)
- [sys_rgb_pixel](#) * [getFinishedFrame](#) ()
- bool [isNewFrameAvailable](#) ()

8.13.1 Detailed Description

This file includes functions to process data retrieved by a camera.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

27 August 2015

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8.13.2 Macro Definition Documentation

8.13.2.1 #define SYS_MAX_BLUE 0b00011111;

blue bits received

Definition at line 52 of file camera.h.

8.13.2.2 `#define SYS_MAX_GREEN 0b00111111;`

green bits received

Definition at line 51 of file camera.h.

8.13.2.3 `#define SYS_MAX_RED 0b00011111;`

red bits received

Definition at line 50 of file camera.h.

8.13.3 Typedef Documentation

8.13.3.1 `typedef void(* pCameraPreProcessor)(sys_rgb_pixel **frame, uint16 width, uint16 height)`

pointer to a camera preprocessor

Definition at line 63 of file camera.h.

8.13.3.2 `typedef struct sys_rgb_pixel_s sys_rgb`

This bitfield contains the structure of a received camera pixel.

8.13.3.3 `typedef struct sys_rgb_pixel_s sys_rgb_pixel`

8.13.4 Function Documentation

8.13.4.1 `sys_rgb_pixel* getFinishedFrame ()`

8.13.4.2 `bool isNewFrameAvailable ()`

8.13.4.3 `void Sys_Init_Camera (void)`

Initialises the Camera

This function initialises the camera using e-puck library from Subversion at [svn://svn.gna.org/svn/e-puck/trunk](http://svn.gna.org/svn/e-puck/trunk)

Todo rewrite the camera to computational less intensive functions

Definition at line 99 of file camera.c.

8.13.4.4 `void Sys_Set_Preprocessing (pCameraPreProcessor func)`

Defines a preprocessor callback functions.

Defines a preprocessor callback functions to process the frame.

Parameters

<i>in</i>	<i>func</i>	camera preprocessor which computes events out of the raw image
-----------	-------------	--

Definition at line 319 of file camera.c.

8.13.4.5 void Sys_Start_Camera (void)

Starts the Camera

This function starts the capturing using e-puck library from Subversion at [svn://svn.gna.org/svn/e-puck/trunk](http://svn.gna.org/svn/e-puck/trunk)

Todo rewrite the camera to computational less intensive functions

Definition at line 298 of file camera.c.

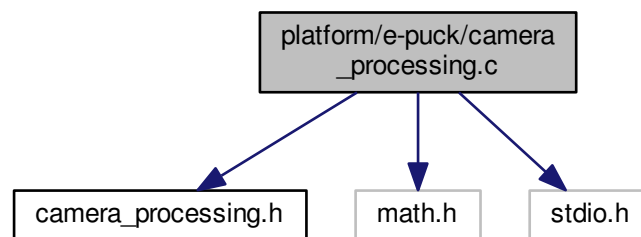
8.14 platform/e-puck/camera_processing.c File Reference

```
#include "camera_processing.h"
```

```
#include <math.h>
```

```
#include <stdio.h>
```

Include dependency graph for camera_processing.c:



Macros

- #define [CP_WI](#) 100
- #define [CP_WGB_I](#) 80
- #define [CP_RI](#) 80
- #define [CP_GI](#) 40
- #define [CP_BI](#) 100
- #define [CBP_WI](#) 16
- #define [CBP_RI](#) 11
- #define [CBP_GI](#) 11
- #define [CBP_BI](#) 13
- #define [CBP_DI](#) 2

Functions

- void [convertRGB565ToRGB888](#) (unsigned char rgb565[], unsigned char rgb888[])
- void [getRGB565at](#) (char *buffer, unsigned char rgb585[], int x, int y)
- void [getRGB888at](#) (char *buffer, unsigned char rgb888[], int x, int y)
- char [nearestNeighborRGB](#) (unsigned char *rbg888, char flag)
- char [brushedColorFromRGB565](#) (unsigned char rgb565[], char flag)
- char [getBrushedColorAt](#) (char *buffer, char flag, int x, int y, int w)

Variables

- const unsigned char [colorPositions](#) [8][4]
- const int [powerTbl](#) [33] = {0,1,4,9,16,25,36,49,64,81,100,121,144,169,196,225,256,289,324,361,400,441,484,529,576,625,676}
- const unsigned char [colorBrushedPositions](#) [8][4]

8.14.1 Detailed Description

Author

Yuri Kaszubowski Lopes yurikazuba@gmail.com

Version

1.0

Date

2014

8.14.2 Macro Definition Documentation

8.14.2.1 `#define CBP_BI 13`

Definition at line 74 of file camera_processing.c.

8.14.2.2 `#define CBP_DI 2`

Definition at line 75 of file camera_processing.c.

8.14.2.3 `#define CBP_GI 11`

Definition at line 73 of file camera_processing.c.

8.14.2.4 `#define CBP_RI 11`

Definition at line 72 of file camera_processing.c.

8.14.2.5 `#define CBP_WI 16`

Definition at line 71 of file camera_processing.c.

8.14.2.6 `#define CP_BI 100`

Definition at line 38 of file camera_processing.c.

8.14.2.7 `#define CP_GI 40`

Definition at line 37 of file camera_processing.c.

8.14.2.8 `#define CP_RI 80`

Definition at line 36 of file camera_processing.c.

8.14.2.9 `#define CP_WGB_I 80`

Definition at line 35 of file camera_processing.c.

8.14.2.10 `#define CP_WI 100`

Definition at line 34 of file camera_processing.c.

8.14.3 Function Documentation

8.14.3.1 `char brushedColorFromRGB565 (unsigned char rgb565[], char flag)`

Definition at line 88 of file camera_processing.c.

8.14.3.2 `void convertRGB565ToRGB888 (unsigned char rgb565[], unsigned char rgb888[])`

Definition at line 17 of file camera_processing.c.

8.14.3.3 `char getBrushedColorAt (char * buffer, char flag, int x, int y, int w)`

Definition at line 111 of file camera_processing.c.

8.14.3.4 `void getRGB565at (char * buffer, unsigned char rgb565[], int x, int y)`

Definition at line 23 of file camera_processing.c.

8.14.3.5 `void getRGB888at (char * buffer, unsigned char rgb888[], int x, int y)`

Definition at line 28 of file camera_processing.c.

8.14.3.6 `char nearestNeighborRGB (unsigned char * rbg888, char flag)`

Definition at line 52 of file camera_processing.c.

8.14.4 Variable Documentation

8.14.4.1 `const unsigned char colorBrushedPositions[8][4]`

Initial value:

```
= {
    { CBP_DI, CBP_DI, CBP_DI, 'd' },
    { CBP_DI, CBP_GI, CBP_BI, 'c' },
    { CBP_RI, CBP_DI, CBP_BI, 'm' },
    { CBP_RI, CBP_GI, CBP_DI, 'y' },
    { CBP_DI, CBP_DI, CBP_BI, 'b' },
    { CBP_DI, CBP_GI, CBP_DI, 'g' },
    { CBP_RI, CBP_DI, CBP_DI, 'x' },
    { CBP_WI, CBP_WI, CBP_WI, 'w' }
}
```

Definition at line 76 of file camera_processing.c.

8.14.4.2 const unsigned char colorPositions[8][4]

Initial value:

```
= {
    { 0, 0, 0, 'd' },
    { 0, CP_GI, CP_BI, 'c' },
    { CP_RI, 0, CP_BI, 'm' },
    { CP_RI, CP_GI, 0, 'y' },
    { 0, 0, CP_BI, 'b' },
    { 0, CP_GI, 0, 'g' },
    { CP_RI, 0, 0, 'r' },
    { CP_WI, CP_WGB_I, CP_WGB_I, 'w' }
}
```

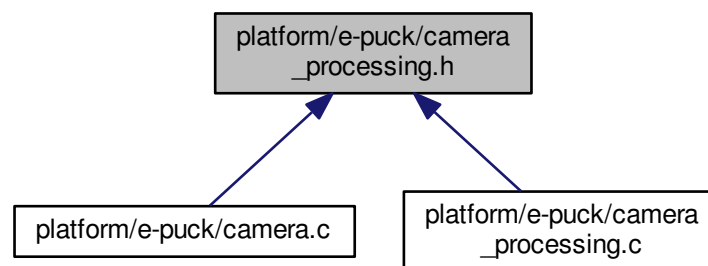
Definition at line 39 of file camera_processing.c.

8.14.4.3 const int powerTbl[33] = {0,1,4,9,16,25,36,49,64,81,100,121,144,169,196,225,256,289,324,361,400,441,484,529,576,625,676,729,784,841,900,961,

Definition at line 70 of file camera_processing.c.

8.15 platform/e-puck/camera_processing.h File Reference

This graph shows which files directly or indirectly include this file:



Functions

- void [convertRGB565ToRGB888](#) (unsigned char rgb565[], unsigned char rgb888[])
- void [getRGB565at](#) (char *buffer, unsigned char rgb585[], int x, int y)
- void [getRGB888at](#) (char *buffer, unsigned char rgb888[], int x, int y)
- char [nearestNeighborRGB](#) (unsigned char *rbg888, char flag)
- char [brushedColorFromRGB565](#) (unsigned char rgb565[], char flag)
- char [getBrushedColorAt](#) (char *buffer, char flag, int x, int y, int w)

8.15.1 Detailed Description

Author

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Version

1.0

Date

2014

8.15.2 Function Documentation

8.15.2.1 `char brushedColorFromRGB565 (unsigned char rgb565[], char flag)`

Definition at line 88 of file `camera_processing.c`.

8.15.2.2 `void convertRGB565ToRGB888 (unsigned char rgb565[], unsigned char rgb888[])`

Definition at line 17 of file `camera_processing.c`.

8.15.2.3 `char getBrushedColorAt (char * buffer, char flag, int x, int y, int w)`

Definition at line 111 of file `camera_processing.c`.

8.15.2.4 `void getRGB565at (char * buffer, unsigned char rgb585[], int x, int y)`

Definition at line 23 of file `camera_processing.c`.

8.15.2.5 `void getRGB888at (char * buffer, unsigned char rgb888[], int x, int y)`

Definition at line 28 of file `camera_processing.c`.

8.15.2.6 `char nearestNeighborRGB (unsigned char * rbg888, char flag)`

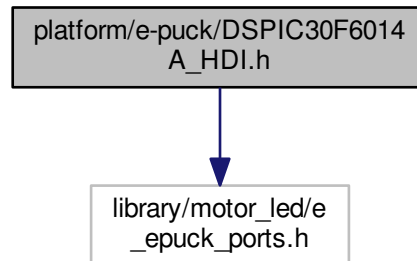
Definition at line 52 of file `camera_processing.c`.

8.16 platform/e-puck/DSPIC30F6014A_HDI.h File Reference

declares e-puck specific types and preprocessor variables


```
#include "library/motor_led/e_epuck_ports.h"
```

Include dependency graph for DSPIC30F6014A_HDI.h:



This graph shows which files directly or indirectly include this file:



Macros

- `#define ADDRESS_IVT 0x000004`
- `#define ADDRESS_ITV_OSC_FAIL ADDRESS_IVT+2`
- `#define ADDRESS_ITV_ADDRESS_ERROR ADDRESS_IVT+4`
- `#define ADDRESS_ITV_STACK_ERROR ADDRESS_IVT+6`
- `#define ADDRESS_ITV_MATH_ERROR ADDRESS_IVT+8`
- `#define ADDRESS_IVT_T1 0x00001A`
- `#define ADDRESS_AIVT 0x000084`
- `#define ADDRESS_AITV_OSC_FAIL ADDRESS_AIVT+2`
- `#define ADDRESS_AITV_ADDRESS_ERROR ADDRESS_AIVT+4`
- `#define ADDRESS_AITV_STACK_ERROR ADDRESS_AIVT+6`
- `#define ADDRESS_AITV_MATH_ERROR ADDRESS_AIVT+8`
- `#define ADDRESS_AIVT_T1 0x00009A`

8.16.1 Detailed Description

declares e-puck specific types and preprocessor variables

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

07 July 2014

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8.16.2 Macro Definition Documentation**8.16.2.1 #define ADDRESS_AITV_ADDRESS_ERROR ADDRESS_AIVT+4**

Definition at line 74 of file DSPIC30F6014A_HDI.h.

8.16.2.2 #define ADDRESS_AITV_MATH_ERROR ADDRESS_AIVT+8

Definition at line 76 of file DSPIC30F6014A_HDI.h.

8.16.2.3 #define ADDRESS_AITV_OSC_FAIL ADDRESS_AIVT+2

Definition at line 73 of file DSPIC30F6014A_HDI.h.

8.16.2.4 #define ADDRESS_AITV_STACK_ERROR ADDRESS_AIVT+6

Definition at line 75 of file DSPIC30F6014A_HDI.h.

8.16.2.5 #define ADDRESS_AIVT 0x000084

Definition at line 72 of file DSPIC30F6014A_HDI.h.

8.16.2.6 #define ADDRESS_AIVT_T1 0x00009A

Definition at line 77 of file DSPIC30F6014A_HDI.h.

8.16.2.7 #define ADDRESS_ITV_ADDRESS_ERROR ADDRESS_IVT+4

Definition at line 66 of file DSPIC30F6014A_HDI.h.

8.16.2.8 #define ADDRESS_ITV_MATH_ERROR ADDRESS_IVT+8

Definition at line 68 of file DSPIC30F6014A_HDI.h.

8.16.2.9 #define ADDRESS_ITV_OSC_FAIL ADDRESS_IVT+2

Definition at line 65 of file DSPIC30F6014A_HDI.h.

8.16.2.10 #define ADDRESS_ITV_STACK_ERROR ADDRESS_IVT+6

Definition at line 67 of file DSPIC30F6014A_HDI.h.

8.16.2.11 `#define ADDRESS_I2T 0x000004`

Definition at line 64 of file DSPIC30F6014A_HDI.h.

8.16.2.12 `#define ADDRESS_I2T_T1 0x00001A`

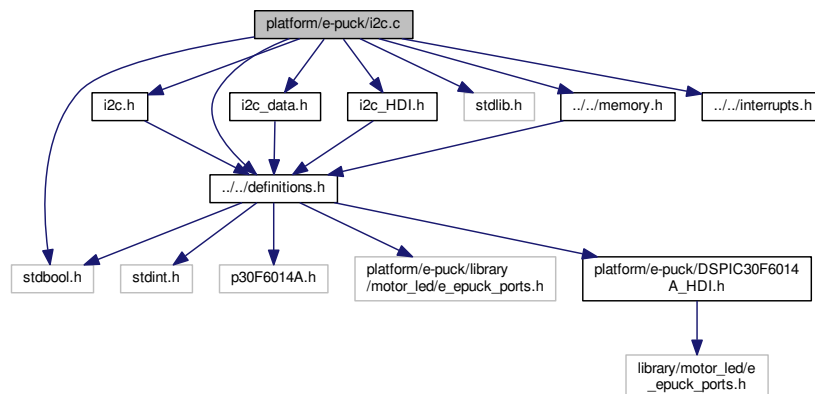
Definition at line 69 of file DSPIC30F6014A_HDI.h.

8.17 platform/e-puck/i2c.c File Reference

defines functions to read and write on the I2C interface.

```
#include "i2c.h"
#include "i2c_data.h"
#include "i2c_HDI.h"
#include <stdlib.h>
#include <stdbool.h>
#include "../definitions.h"
#include "../memory.h"
#include "../interrupts.h"
```

Include dependency graph for i2c.c:



Functions

- void [Sys_I2C_Send_Start](#) ()
- void [Sys_I2C_Send_Restart](#) (void)
- void [Sys_I2C_Send_Stop](#) (void)
- void [Sys_I2C_Send_ACK](#) (void)
- void [Sys_I2C_Send_NACK](#) (void)
- void [Sys_I2C_Start_Reading](#) (void)
- char [Sys_I2C_ReadByte](#) (void)
- void [Sys_I2C_WriteByte](#) (uint8 byte)
- void [Sys_Init_I2C](#) ()
- void [Sys_Start_I2C](#) ()
- void [Sys_Pause_I2C](#) ()
- void [Sys_Continue_I2C](#) ()
- void [Sys_Stop_I2C](#) ()

- void `Sys_I2C_SentBytes` (`uint8` address, `uint8` *bytes, `uint16` length)
- void `Sys_I2C_Read` (`uint8` address, `uint8` *intern_address, `uint16` length, `pByteFunction` bytehandler)

8.17.1 Detailed Description

defines functions to read and write on the I2C interface.

Author

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Version

1.0

Date

10 August 2015

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8.17.2 Function Documentation

8.17.2.1 void Sys_Contine_I2C (void) [inline]

continues the I2C interface

This function continues the I2C interface.

Definition at line 72 of file i2c.c.

8.17.2.2 void Sys_I2C_Read (uint8 address, uint8 * intern_address, uint16 length, pByteFunction bytehandler)

reads bytes from an I2C device

This function first sends a reading request to the I2C device and, then, handles the incoming bytes with a callback function.

Parameters

in	<i>address</i>	The address of the I2C device that should receive the request
in	<i>intern_address</i>	A pointer to the address which should be read
in	<i>length</i>	the number of bytes of the address
in	<i>bytehandler</i>	a pointer to the handler function that processes the incoming bytes.

Definition at line 367 of file i2c.c.

8.17.2.3 char Sys_I2C_ReadByte () [inline]

reads a byte via the I2C interface

This function reads a byte.

Definition at line 316 of file i2c.c.

8.17.2.4 void Sys_I2C_Send_ACK () [inline]

sends a ack bits via the I2C interface

This function sends a ack bits.

Definition at line 286 of file i2c.c.

8.17.2.5 void Sys_I2C_Send_NACK () [inline]

sends a nack bits via the I2C interface

This function sends a nack bits.

Definition at line 296 of file i2c.c.

8.17.2.6 void Sys_I2C_Send_Restart () [inline]

sends a restart bits via the I2C interface

This function sends a restart bits.

Definition at line 266 of file i2c.c.

8.17.2.7 void Sys_I2C_Send_Start () [inline]

sends a start bits via the I2C interface

This function sends a start bits.

Definition at line 256 of file i2c.c.

8.17.2.8 void Sys_I2C_Send_Stop () [inline]

sends a stop bits via the I2C interface

This function sends a stop bits.

Definition at line 276 of file i2c.c.

8.17.2.9 void Sys_I2C_SentBytes (uint8 address, uint8 * bytes, uint16 length)

adds bytes into a writing buffer

This function adds bytes into a writing buffer that are written as soon as the I2C is idle.

Note

all bytes are written in sequence

Parameters

in	<i>address</i>	The address of the I2C device that should receive the data
in	<i>bytes</i>	A pointer to the data which should be sent
in	<i>length</i>	the number of bytes to send

Definition at line 341 of file i2c.c.

8.17.2.10 void Sys_I2C_Start_Reading () [inline]

sends a reading bits via the I2C interface

This function sends a reading bits.

Definition at line 306 of file i2c.c.

8.17.2.11 void Sys_I2C_WriteByte (uint8 byte) [inline]

writes a byte via the I2C interface

This function writes a byte.

Parameters

<i>byte</i>	the byte that has to be written
-------------	---------------------------------

Definition at line 327 of file i2c.c.

8.17.2.12 void Sys_Init_I2C (void) [inline]

Initialises the I2C interface

This function initialises the I2C interface.

Definition at line 42 of file i2c.c.

8.17.2.13 void Sys_Pause_I2C (void) [inline]

pauses the I2C interface

This function pauses the I2C interface.

Definition at line 62 of file i2c.c.

8.17.2.14 void Sys_Start_I2C (void) [inline]

Starts the I2C interface

This function starts the I2C interface.

Definition at line 52 of file i2c.c.

8.17.2.15 void Sys_Stop_I2C (void) [inline]

stops the I2C interface

This function stops the I2C interface.

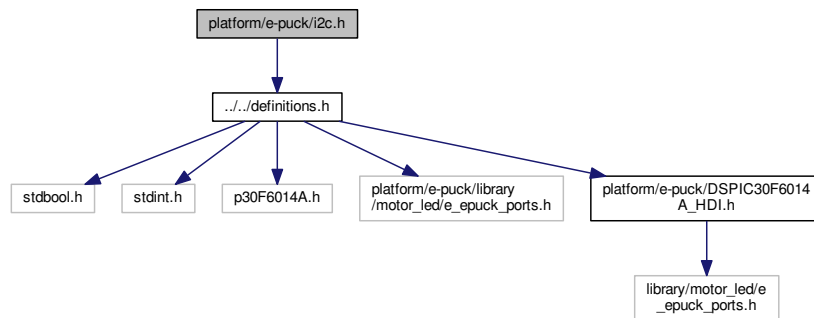
Definition at line 82 of file i2c.c.

8.18 platform/e-puck/i2c.h File Reference

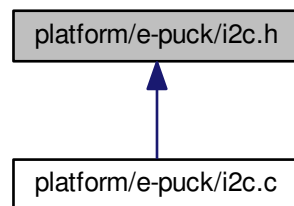
This file includes functions to read and write on the I2C interface.

```
#include "../../definitions.h"
```

Include dependency graph for i2c.h:



This graph shows which files directly or indirectly include this file:



Functions

- void `Sys_Init_I2C` (void)
- void `Sys_Start_I2C` (void)
- void `Sys_Pause_I2C` (void)
- void `Sys_Contine_I2C` (void)
- void `Sys_Stop_I2C` (void)
- void `Sys_I2C_SentBytes` (uint8 address, uint8 *bytes, uint16 length)
- void `Sys_I2C_Read` (uint8 address, uint8 *intern_address, uint16 length, pByteFunction bytehandler)

8.18.1 Detailed Description

This file includes functions to read and write on the I2C interface.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

10 August 2015

Copyrightadapted FreeBSD License (see <http://openswarm.org/license>)**8.18.2 Function Documentation****8.18.2.1 void Sys_Contine_I2C (void) [inline]**

continues the I2C interface

This function continues the I2C interface.

Definition at line 72 of file i2c.c.

8.18.2.2 void Sys_I2C_Read (uint8 address, uint8 * intern_address, uint16 length, pByteFunction bytehandler)

reads bytes from an I2C device

This function first sends a reading request to the I2C device and, then, handles the incoming bytes with a callback function.

Parameters

in	<i>address</i>	The address of the I2C device that should receive the request
in	<i>intern_address</i>	A pointer to the address which should be read
in	<i>length</i>	the number of bytes of the address
in	<i>bytehandler</i>	a pointer to the handler function that processes the incoming bytes.

Definition at line 367 of file i2c.c.

8.18.2.3 void Sys_I2C_SentBytes (uint8 address, uint8 * bytes, uint16 length)

adds bytes into a writing buffer

This function adds bytes into a writing buffer that are written as soon as the I2C is idle.

Note

all bytes are written in sequence

Parameters

in	<i>address</i>	The address of the I2C device that should receive the data
in	<i>bytes</i>	A pointer to the data which should be sent
in	<i>length</i>	the number of bytes to send

Definition at line 341 of file i2c.c.

8.18.2.4 void Sys_Init_I2C (void) [inline]

Initialises the I2C interface

This function initialises the I2C interface.

Definition at line 42 of file i2c.c.

8.18.2.5 void Sys_Pause_I2C (void) [inline]

pauses the I2C interface

This function pauses the I2C interface.

Definition at line 62 of file i2c.c.

8.18.2.6 void Sys_Start_I2C (void) [inline]

Starts the I2C interface

This function starts the I2C interface.

Definition at line 52 of file i2c.c.

8.18.2.7 void Sys_Stop_I2C (void) [inline]

stops the I2C interface

This function stops the I2C interface.

Definition at line 82 of file i2c.c.

8.19 platform/e-puck/i2c_data.c File Reference

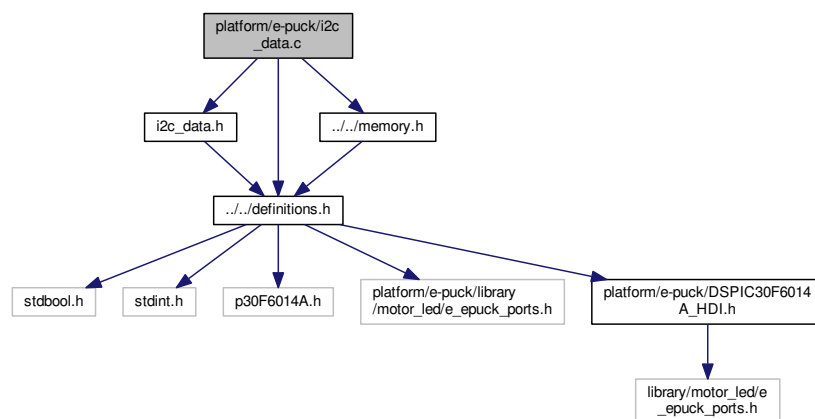
defines functions to manage the I2C queue.

```
#include "i2c_data.h"
```

```
#include "../definitions.h"
```

```
#include "../memory.h"
```

Include dependency graph for i2c_data.c:

**Functions**

- void [Sys_I2C_RemoveOldestMessage](#) (sys_i2c_messages **list)
- void [Sys_I2C_FreeMessages](#) (sys_i2c_messages *list)
- void [Sys_I2C_AppendMessages](#) (sys_i2c_msg *item)

Variables

- `sys_i2c_messages * sys_i2c_msgs = 0`

8.19.1 Detailed Description

defines functions to manage the I2C queue.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

10 August 2015

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8.19.2 Function Documentation

8.19.2.1 void Sys_I2C_AppendMessages (sys_i2c_msg * item)

appends an element to the linked list.

This function appends on the bottom of the linked list.

Parameters

<i>in, out</i>	<i>item</i>	pointer to a element that should be added
----------------	-------------	---

Definition at line 69 of file i2c_data.c.

8.19.2.2 void Sys_I2C_FreeMessages (sys_i2c_messages * list)

frees all messages of the linked list

This function frees all messages of the linked list.

Parameters

<i>in</i>	<i>list</i>	pointer to a list of elements that should be removed
-----------	-------------	--

Definition at line 47 of file i2c_data.c.

8.19.2.3 void Sys_I2C_RemoveOldestMessage (sys_i2c_messages ** list)

removes oldest message from the linked list

This function removes the oldest message (first element) of the linked list

Parameters

<code>in, out</code>	<code>list</code>	pointer to the linked list
----------------------	-------------------	----------------------------

Definition at line 30 of file i2c_data.c.

8.19.3 Variable Documentation

8.19.3.1 `sys_i2c_messages* sys_i2c_msgs = 0`

Pointer to the linked list of messages

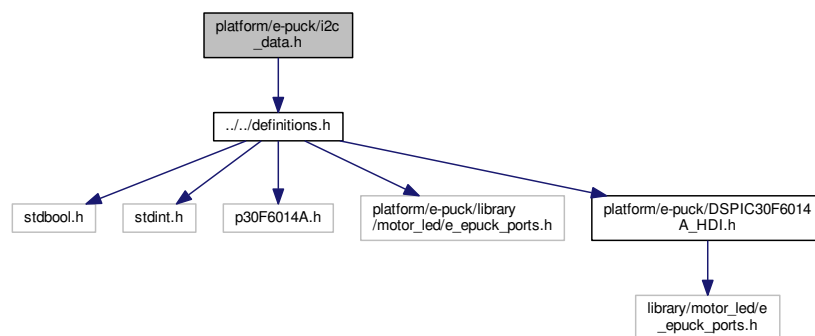
Definition at line 21 of file i2c_data.c.

8.20 platform/e-puck/i2c_data.h File Reference

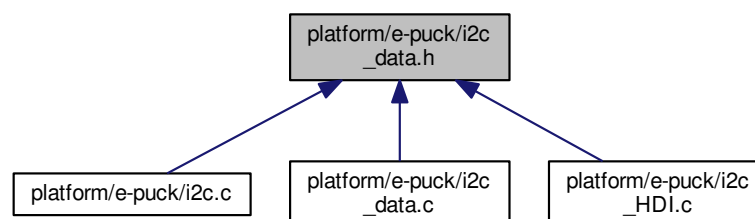
This file includes functions to read and write on the I2C interface.

```
#include "../definitions.h"
```

Include dependency graph for i2c_data.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [sys_i2c_message_s](#)

It is a single linked list element containing messages that need to be sent via I2C.

Typedefs

- typedef struct [sys_i2c_message_s](#) [sys_i2c_message](#)
It is a single linked list element containing messages that need to be sent via I2C.
- typedef struct [sys_i2c_message_s](#) [sys_i2c_messages](#)
- typedef struct [sys_i2c_message_s](#) [sys_i2c_msg](#)

Enumerations

- enum [sys_I2C_state](#) {
[I2C_IDLE](#) = 0, [I2C_IS_STARTING](#), [I2C_STARTED](#), [I2C_IS_READING](#),
[I2C_IS_SENDING](#), [I2C_SENT](#), [I2C_ACKNOWLEDGED](#), [I2C_IS_STOPPING](#),
[I2C_ERROR](#) }
- enum [sys_I2C_mode](#) {
[I2C_IDLE_MODE](#) = 0, [I2C_WRITING_ADDRESS_MODE](#), [I2C_READING_BYTES_MODE](#), [I2C_WRITING_BYTES_MODE](#),
[I2C_ERROR_MODE](#) }

Functions

- void [Sys_I2C_AppendMessages](#) ([sys_i2c_msg](#) *item)
- void [Sys_I2C_RemoveOldestMessage](#) ([sys_i2c_messages](#) **list)
- void [Sys_I2C_FreeMessages](#) ([sys_i2c_messages](#) *list)

Variables

- [sys_i2c_messages](#) * [sys_i2c_msgs](#)

8.20.1 Detailed Description

This file includes functions to read and write on the I2C interface.

Author

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Version

1.0

Date

10 August 2015

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8.20.2 Typedef Documentation

8.20.2.1 typedef struct sys_i2c_message_s sys_i2c_message

It is a single linked list element containing messages that need to be sent via I2C.

8.20.2.2 typedef struct sys_i2c_message_s sys_i2c_messages

8.20.2.3 typedef struct sys_i2c_message_s sys_i2c_msg

8.20.3 Enumeration Type Documentation

8.20.3.1 enum sys_I2C_mode

Enumerator

I2C_IDLE_MODE
I2C_WRITING_ADDRESS_MODE
I2C_READING_BYTES_MODE
I2C_WRITING_BYTES_MODE
I2C_ERROR_MODE

Definition at line 25 of file i2c_data.h.

8.20.3.2 enum sys_I2C_state

Enumerator

I2C_IDLE
I2C_IS_STARTING
I2C_STARTED
I2C_IS_READING
I2C_IS_SENDING
I2C_SENT
I2C_ACKNOWLEDGED
I2C_IS_STOPPING
I2C_ERROR

Definition at line 24 of file i2c_data.h.

8.20.4 Function Documentation

8.20.4.1 void Sys_I2C_AppendMessages (sys_i2c_msg * item)

appends an element to the linked list.

This function appends on the bottom of the linked list.

Parameters

<i>in, out</i>	<i>item</i>	pointer to a element that should be added
----------------	-------------	---

Definition at line 69 of file i2c_data.c.

8.20.4.2 void Sys_I2C_FreeMessages (sys_i2c_messages * *list*)

frees all messages of the linked list

This function frees all messages of the linked list.

Parameters

<i>in</i>	<i>list</i>	pointer to a list of elements that should be removed
-----------	-------------	--

Definition at line 47 of file i2c_data.c.

8.20.4.3 void Sys_I2C_RemoveOldestMessage (sys_i2c_messages ** *list*)

removes oldest message from the linked list

This function removes the oldest message (first element) of the linked list

Parameters

<i>in, out</i>	<i>list</i>	pointer to the linked list
----------------	-------------	----------------------------

Definition at line 30 of file i2c_data.c.

8.20.5 Variable Documentation

8.20.5.1 sys_i2c_messages* sys_i2c_msgs

Pointer to the linked list of messages

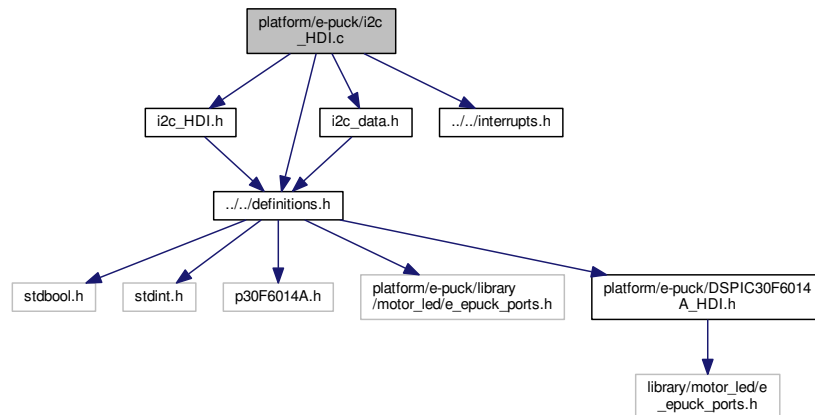
Definition at line 21 of file i2c_data.c.

8.21 platform/e-puck/i2c_HDI.c File Reference

Hardware dependent implementations to read and write on the I2C interface.

```
#include "i2c_HDI.h"
#include "i2c_data.h"
#include "../definitions.h"
#include "../interrupts.h"
```

Include dependency graph for i2c_HDI.c:



Functions

- void [Sys_Init_I2C_HDI](#) ()
- void [Sys_Start_I2C_HDI](#) (void)
- void [Sys_Pause_I2C_HDI](#) (void)
- void [Sys_Continue_I2C_HDI](#) (void)
- void [Sys_Stop_I2C_HDI](#) (void)
- void [Sys_I2C_Send_Start_HDI](#) ()
- void [Sys_I2C_Send_Restart_HDI](#) (void)
- void [Sys_I2C_Send_Stop_HDI](#) (void)
- void [Sys_I2C_Send_ACK_HDI](#) (void)
- void [Sys_I2C_Send_NACK_HDI](#) (void)
- void [Sys_I2C_Start_Reading_HDI](#) ()
- char [Sys_I2C_ReadByte_HDI](#) ()
- void [Sys_I2C_WriteByte_HDI](#) (uint8 byte)

8.21.1 Detailed Description

Hardware dependent implementations to read and write on the I2C interface.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

10 August 2015

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8.21.2 Function Documentation

8.21.2.1 void Sys_Contine_I2C_HDI (void) [inline]

continues the I2C interface

This function continues the I2C interface.

Definition at line 74 of file i2c_HDI.c.

8.21.2.2 char Sys_I2C_ReadByte_HDI (void) [inline]

reads a byte via the I2C interface

This function reads a byte.

Definition at line 178 of file i2c_HDI.c.

8.21.2.3 void Sys_I2C_Send_ACK_HDI (void) [inline]

sends a ack bits via the I2C interface

This function sends a ack bits.

Definition at line 130 of file i2c_HDI.c.

8.21.2.4 void Sys_I2C_Send_NACK_HDI (void) [inline]

sends a nack bits via the I2C interface

This function sends a nack bits.

Definition at line 146 of file i2c_HDI.c.

8.21.2.5 void Sys_I2C_Send_Restart_HDI (void) [inline]

sends a restart bits via the I2C interface

This function sends a restart bits.

Definition at line 108 of file i2c_HDI.c.

8.21.2.6 void Sys_I2C_Send_Start_HDI () [inline]

sends a start bits via the I2C interface

This function sends a start bits.

Definition at line 96 of file i2c_HDI.c.

8.21.2.7 void Sys_I2C_Send_Stop_HDI (void) [inline]

sends a stop bits via the I2C interface

This function sends a stop bits.

Definition at line 120 of file i2c_HDI.c.

8.21.2.8 void Sys_I2C_Start_Reading_HDI(void) [inline]

sends a reading bits via the I2C interface

This function sends a reading bits.

Definition at line 162 of file i2c_HDI.c.

8.21.2.9 void Sys_I2C_WriteByte_HDI(uint8 byte) [inline]

writes a byte via the I2C interface

This function writes a byte.

Parameters

<i>byte</i>	the byte that has to be written
-------------	---------------------------------

Definition at line 189 of file i2c_HDI.c.

8.21.2.10 void Sys_Init_I2C_HDI(void) [inline]

Initialises the I2C interface

This function initialises the I2C interface.

Definition at line 27 of file i2c_HDI.c.

8.21.2.11 void Sys_Pause_I2C_HDI(void) [inline]

pauses the I2C interface

This function pauses the I2C interface.

Definition at line 64 of file i2c_HDI.c.

8.21.2.12 void Sys_Start_I2C_HDI(void) [inline]

Starts the I2C interface

This function starts the I2C interface.

Definition at line 52 of file i2c_HDI.c.

8.21.2.13 void Sys_Stop_I2C_HDI(void) [inline]

stops the I2C interface

This function stops the I2C interface.

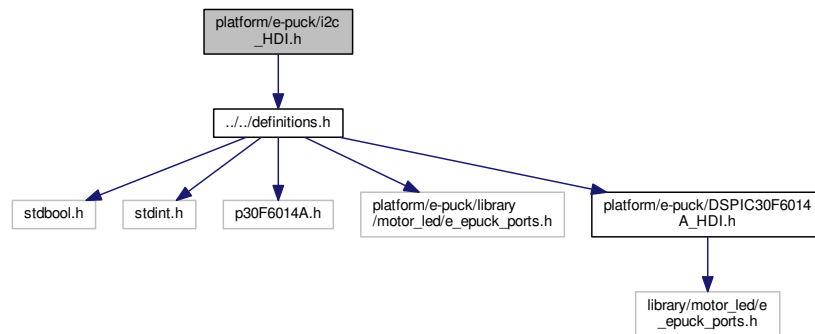
Definition at line 84 of file i2c_HDI.c.

8.22 platform/e-puck/i2c_HDI.h File Reference

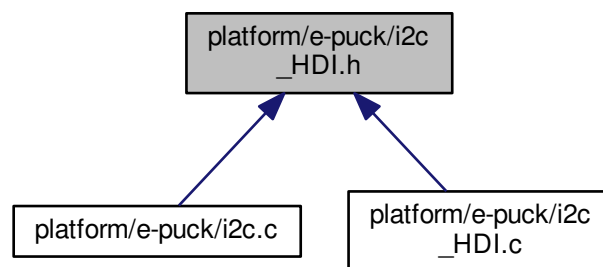
Hardware dependent implementations to read and write on the I2C interface.

```
#include "../../definitions.h"
```

Include dependency graph for i2c_HDI.h:



This graph shows which files directly or indirectly include this file:



Functions

- void `Sys_I2C_Send_Start_HDI` ()
- void `Sys_I2C_Send_Restart_HDI` (void)
- void `Sys_I2C_Send_Stop_HDI` (void)
- void `Sys_I2C_Send_ACK_HDI` (void)
- void `Sys_I2C_Send_NACK_HDI` (void)
- void `Sys_I2C_Start_Reading_HDI` (void)
- char `Sys_I2C_ReadByte_HDI` (void)
- void `Sys_I2C_WriteByte_HDI` (uint8 byte)
- void `Sys_Init_I2C_HDI` (void)
- void `Sys_Start_I2C_HDI` (void)
- void `Sys_Pause_I2C_HDI` (void)
- void `Sys_Contine_I2C_HDI` (void)
- void `Sys_Stop_I2C_HDI` (void)
- void `Sys_I2C_SentBytes` (uint8 address, uint8 *bytes, uint16 length)
- void `Sys_I2C_Read` (uint8 address, uint8 *intern_address, uint16 length, pByteFunction bytehandler)

8.22.1 Detailed Description

Hardware dependent implementations to read and write on the I2C interface.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

10 August 2015

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8.22.2 Function Documentation

8.22.2.1 void Sys_Contine_I2C_HDI (void) [inline]

continues the I2C interface

This function continues the I2C interface.

Definition at line 74 of file i2c_HDI.c.

8.22.2.2 void Sys_I2C_Read (uint8 address, uint8 * intern_address, uint16 length, pByteFunction bytehandler)

reads bytes from an I2C device

This function first sends a reading request to the I2C device and, then, handles the incoming bytes with a callback function.

Parameters

in	<i>address</i>	The address of the I2C device that should receive the request
in	<i>intern_address</i>	A pointer to the address which should be read
in	<i>length</i>	the number of bytes of the address
in	<i>bytehandler</i>	a pointer to the handler function that processes the incoming bytes.

Definition at line 367 of file i2c.c.

8.22.2.3 char Sys_I2C_ReadByte_HDI (void) [inline]

reads a byte via the I2C interface

This function reads a byte.

Definition at line 178 of file i2c_HDI.c.

8.22.2.4 void Sys_I2C_Send_ACK_HDI (void) [inline]

sends a ack bits via the I2C interface

This function sends a ack bits.

Definition at line 130 of file i2c_HDI.c.

8.22.2.5 void Sys_I2C_Send_NACK_HDI(void) [inline]

sends a nack bits via the I2C interface

This function sends a nack bits.

Definition at line 146 of file i2c_HDI.c.

8.22.2.6 void Sys_I2C_Send_Restart_HDI(void) [inline]

sends a restart bits via the I2C interface

This function sends a restart bits.

Definition at line 108 of file i2c_HDI.c.

8.22.2.7 void Sys_I2C_Send_Start_HDI() [inline]

sends a start bits via the I2C interface

This function sends a start bits.

Definition at line 96 of file i2c_HDI.c.

8.22.2.8 void Sys_I2C_Send_Stop_HDI(void) [inline]

sends a stop bits via the I2C interface

This function sends a stop bits.

Definition at line 120 of file i2c_HDI.c.

8.22.2.9 void Sys_I2C_SentBytes(uint8 address, uint8 * bytes, uint16 length)

adds bytes into a writing buffer

This function adds bytes into a writing buffer that are written as soon as the I2C is idle.

Note

all bytes are written in sequence

Parameters

in	<i>address</i>	The address of the I2C device that should receive the data
in	<i>bytes</i>	A pointer to the data which should be sent
in	<i>length</i>	the number of bytes to send

Definition at line 341 of file i2c.c.

8.22.2.10 void Sys_I2C_Start_Reading_HDI(void) [inline]

sends a reading bits via the I2C interface

This function sends a reading bits.

Definition at line 162 of file i2c_HDI.c.

8.22.2.11 void Sys_I2C_WriteByte_HDI (uint8 *byte*) [inline]

writes a byte via the I2C interface

This function writes a byte.

Parameters

<i>byte</i>	the byte that has to be written
-------------	---------------------------------

Definition at line 189 of file i2c_HDI.c.

8.22.2.12 void Sys_Init_I2C_HDI(void) [inline]

Initialises the I2C interface

This function initialises the I2C interface.

Definition at line 27 of file i2c_HDI.c.

8.22.2.13 void Sys_Pause_I2C_HDI(void) [inline]

pauses the I2C interface

This function pauses the I2C interface.

Definition at line 64 of file i2c_HDI.c.

8.22.2.14 void Sys_Start_I2C_HDI(void) [inline]

Starts the I2C interface

This function starts the I2C interface.

Definition at line 52 of file i2c_HDI.c.

8.22.2.15 void Sys_Stop_I2C_HDI(void) [inline]

stops the I2C interface

This function stops the I2C interface.

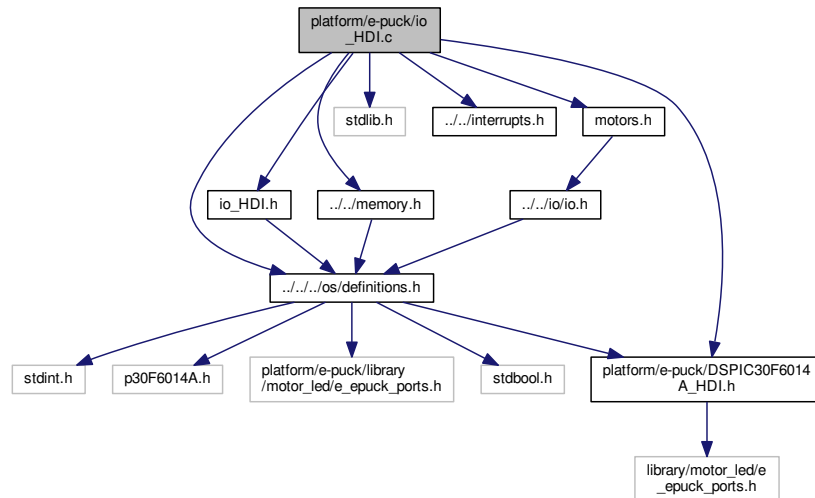
Definition at line 84 of file i2c_HDI.c.

8.23 platform/e-puck/io_HDI.c File Reference

Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.

```
#include "io_HDI.h"
#include <stdlib.h>
#include "DSPIC30F6014A_HDI.h"
#include "../definitions.h"
#include "../interrupts.h"
#include "../memory.h"
#include "motors.h"
```

Include dependency graph for io_HDI.c:



Functions

- void [Sys_Init_IOTimer_HDI](#) ()
- void [Sys_Start_IOTimer_HDI](#) ()
- void [Sys_Stop_IOTimer_HDI](#) ()
- void [Sys_Continue_IOTimer_HDI](#) ()
- void [Sys_Reset_IOTimer_HDI](#) ()
- void [__attribute__](#) ((interrupt, no_auto_psv))
- void [Sys_Disable_IOTimerInterrupt_HDI](#) ()
- void [Sys_Enable_IOTimerInterrupt_HDI](#) ()
- void [Sys_Force_IOTimerInterrupt_HDI](#) ()
- void [Sys_IOTimer_code_HDI](#) ()

Variables

- [sys_periodical_IOHandler](#) * [sys_iohandlers](#)

8.23.1 Detailed Description

Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

10 August 2015

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8.23.2 Function Documentation**8.23.2.1 void __attribute__ ((interrupt, no_auto_psv))**

Interrupt Service Routine for the Timer1 HDI

This Function starts the task-scheduling algorithm

Interrupt Service Routine for the Timer1 HDI (alternate)

This Function starts the task-scheduling algorithm

Interrupt Service Routine for the Timer2 HDI (alternate)

This Function starts the task-scheduling algorithm

Address error trap.

This function is called when an address error occurs. That means that a call address of a function or in the stack addresses an area outside the memory. Similarly, if a pointer points to memory outside the range, this trap happens.

Stack error trap.

This function is called when an stack error occurs. That means that the stack pointer, stack pointer limit, or frame pointer are pointing outside their range.

Math error trap.

This function is called when an math error occurs. That means an illegal math operation was performed (such as division by 0 or NaN).

Alternative Oscillator fail trap.

This function is called when an oscillator fail occurs. This should never happen.

Alternative address error trap.

This function is called when an address error occurs. That means that a call address of a function or in the stack addresses an area outside the memory. Similarly, if a pointer points to memory outside the range, this trap happens.

Alternative stack error trap.

This function is called when an stack error occurs. That means that the stack pointer, stack pointer limit, or frame pointer are pointing outside their range.

Alternative math error trap.

This function is called when an math error occurs. That means an illegal math operation was performed (such as division by 0 or NaN).

Default interrupt service routine.

This function is called when no other interrupt routine is specified.

Definition at line 110 of file io_HDI.c.

8.23.2.2 void Sys_Continue_IOTimer_HDI(void) [inline]

continues the I/O Timer

This function continues the I/O Timer.

Definition at line 86 of file io_HDI.c.

8.23.2.3 void Sys_Disable_IOTimerInterrupt_HDI(void) [inline]

Disables the Timer1 interrupt

Disables the Timer1 interrupt and sets the interrupt flag to 0

Definition at line 132 of file io_HDI.c.

8.23.2.4 void Sys_Enable_IOTimerInterrupt_HDI(void) [inline]

Enables the Timer1 interrupt

Enables the Timer1 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 143 of file io_HDI.c.

8.23.2.5 void Sys_Force_IOTimerInterrupt_HDI(void) [inline]

forces the Timer1 interrupt

forces the Timer1 interrupt to occur.

Definition at line 152 of file io_HDI.c.

8.23.2.6 void Sys_Init_IOTimer_HDI() [inline]

initialises the I/O Timer

This function initialises the I/O Timer.

Definition at line 35 of file io_HDI.c.

8.23.2.7 void Sys_IOTimer_code_HDI() [inline]

execution of all I/O handlers.

This function is executed every time the I/O timer is active and executes all I/O handlers

Definition at line 162 of file io_HDI.c.

8.23.2.8 void Sys_Reset_IOTimer_HDI(void) [inline]

resets the I/O Timer

This function resets the I/O Timer.

Definition at line 99 of file io_HDI.c.

8.23.2.9 void Sys_Start_IOTimer_HDI() [inline]

starts the I/O Timer

This function starts the I/O Timer.

Definition at line 60 of file io_HDI.c.

8.23.2.10 void Sys_Stop_IOTimer_HDI(void) [inline]

stops the I/O Timer

This function stops the I/O Timer.

Definition at line 73 of file io_HDI.c.

8.23.3 Variable Documentation

8.23.3.1 `sys_periodical_IOHandler*` `sys_iohandlers`

List of I/O handlers

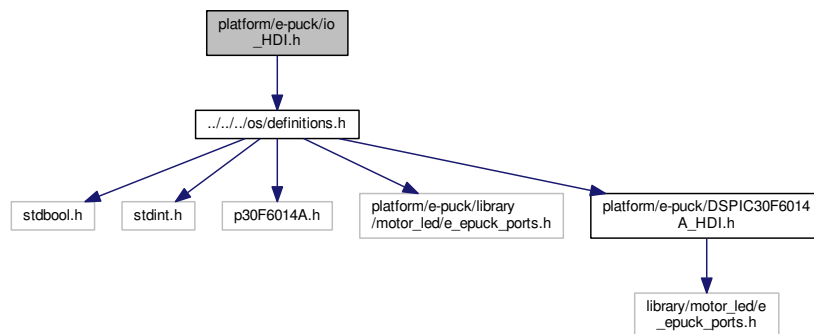
Definition at line 26 of file io_HDI.c.

8.24 platform/e-puck/io_HDI.h File Reference

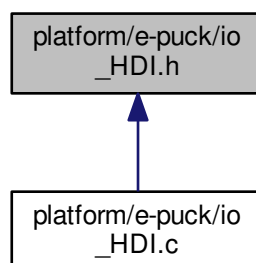
Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.

```
#include "../../os/definitions.h"
```

Include dependency graph for io_HDI.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [sys_periodical_IOHandler_s](#)

Linked list element containing IO Handler function pointers.

Macros

- `#define STEPS_PER_SECOND 10000`
- `#define STEPS_PER_MILLISECOND 10`

Typedefs

- typedef struct `sys_periodical_IOHandler_s` `sys_periodical_IOHandler`
Linked list element containing IO Handler function pointers.
- typedef struct `sys_periodical_IOHandler_s` `sys_plIOHandler`

Functions

- void `Sys_Init_IOTimer_HDI` ()
- void `Sys_Start_IOTimer_HDI` ()
- void `Sys_IOTimer_code_HDI` ()
- void `Sys_Stop_IOTimer_HDI` (void)
- void `Sys_Continue_IOTimer_HDI` (void)
- void `Sys_Reset_IOTimer_HDI` (void)
- void `Sys_Disable_IOTimerInterrupt_HDI` (void)
- void `Sys_Enable_IOTimerInterrupt_HDI` (void)
- void `Sys_Force_IOTimerInterrupt_HDI` (void)

Variables

- `sys_periodical_IOHandler * sys_iohandlers`

8.24.1 Detailed Description

Hardware dependent implementations to start and stop the I/O timer. This timer executes IO functions periodically.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

10 August 2015

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8.24.2 Macro Definition Documentation

8.24.2.1 `#define STEPS_PER_MILLISECOND 10`

Definition at line 26 of file `io_HDI.h`.

8.24.2.2 `#define STEPS_PER_SECOND 10000`

Definition at line 25 of file `io_HDI.h`.

8.24.3 Typedef Documentation

8.24.3.1 `typedef struct sys_periodical_IOHandler_s sys_periodical_IOHandler`

Linked list element containing IO Handler function pointers.

It is a single linked list element containing a function pointer to an IO handler.

8.24.3.2 `typedef struct sys_periodical_IOHandler_s sys_pIOHandler`

8.24.4 Function Documentation

8.24.4.1 `void Sys_Continue_IOTimer_HDI(void) [inline]`

continues the I/O Timer

This function continues the I/O Timer.

Definition at line 86 of file `io_HDI.c`.

8.24.4.2 `void Sys_Disable_IOTimerInterrupt_HDI(void) [inline]`

Disables the Timer1 interrupt

Disables the Timer1 interrupt and sets the interrupt flag to 0

Definition at line 132 of file `io_HDI.c`.

8.24.4.3 `void Sys_Enable_IOTimerInterrupt_HDI(void) [inline]`

Enables the Timer1 interrupt

Enables the Timer1 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 143 of file `io_HDI.c`.

8.24.4.4 `void Sys_Force_IOTimerInterrupt_HDI(void) [inline]`

forces the Timer1 interrupt

forces the Timer1 interrupt to occur.

Definition at line 152 of file `io_HDI.c`.

8.24.4.5 `void Sys_Init_IOTimer_HDI() [inline]`

initialises the I/O Timer

This function initialises the I/O Timer.

Definition at line 35 of file `io_HDI.c`.

8.24.4.6 void Sys_IOTimer_code_HDI () [inline]

execution of all I/O handlers.

This function is executed every time the I/O timer is active and executes all I/O handlers

Definition at line 162 of file io_HDI.c.

8.24.4.7 void Sys_Reset_IOTimer_HDI (void) [inline]

resets the I/O Timer

This function resets the I/O Timer.

Definition at line 99 of file io_HDI.c.

8.24.4.8 void Sys_Start_IOTimer_HDI () [inline]

starts the I/O Timer

This function starts the I/O Timer.

Definition at line 60 of file io_HDI.c.

8.24.4.9 void Sys_Stop_IOTimer_HDI (void) [inline]

stops the I/O Timer

This function stops the I/O Timer.

Definition at line 73 of file io_HDI.c.

8.24.5 Variable Documentation

8.24.5.1 sys_periodical_IOHandler* sys_iohandlers

List of I/O handlers

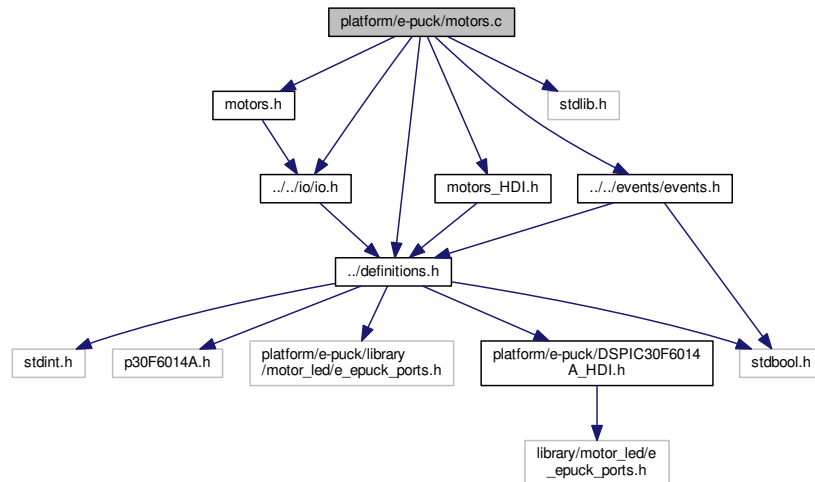
Definition at line 26 of file io_HDI.c.

8.25 platform/e-puck/motors.c File Reference

This file provides the function needed to actuate the motors.

```
#include "motors.h"
#include "motors_HDI.h"
#include "../io/io.h"
#include "../events/events.h"
#include "../definitions.h"
#include <stdlib.h>
```

Include dependency graph for motors.c:



Data Structures

- struct [sys_motors_s](#)

This struct contains the speed for a motor.

Macros

- #define [MAX_WHEEL_SPEED](#) 128
- #define [POWER_SAVE_WAIT](#) 15

Typedefs

- typedef struct [sys_motors_s](#) [sys_motors](#)

This struct contains the speed for a motor.

Functions

- void [Sys_LeftMotor_Controller](#) (void)
- void [Sys_RightMotor_Controller](#) (void)
- bool [Sys_LeftMotor_EventHandler](#) (uint16, uint16, sys_event_data *)
- bool [Sys_RightMotor_EventHandler](#) (uint16, uint16, sys_event_data *)
- void [Sys_Init_Motors](#) ()
- void [Sys_LeftMotor_Reset](#) ()
- void [Sys_RightMotor_Reset](#) ()
- void [Sys_Set_LeftWheelSpeed](#) (sint16 speed)
- void [Sys_Set_RightWheelSpeed](#) (sint16 speed)
- sint16 [Sys_Get_LeftWheelSpeed](#) (void)
- sint16 [Sys_Get_RightWheelSpeed](#) (void)

8.25.1 Detailed Description

This file provides the function needed to actuate the motors.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org
Gabriel Kapellmann Zafra <gkapellmann@gmail.com>

Version

1.0

Date

30 July 2015

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8.25.2 Macro Definition Documentation

8.25.2.1 #define MAX_WHEEL_SPEED 128

Maximum wheel speed in steps

Definition at line 27 of file motors.c.

8.25.2.2 #define POWER_SAVE_WAIT 15

amount of steps needed to move the motor one step further

Definition at line 28 of file motors.c.

8.25.3 Typedef Documentation

8.25.3.1 typedef struct sys_motors_s sys_motors

This struct contains the speed for a motor.

8.25.4 Function Documentation

8.25.4.1 sint16 Sys_Get_LeftWheelSpeed (void)

returns the left wheel speed

This function returns the speed of the left motor.

Definition at line 281 of file motors.c.

8.25.4.2 sint16 Sys_Get_RightWheelSpeed (void)

returns the right wheel speed

This function returns the speed of the right motor.

Definition at line 291 of file motors.c.

8.25.4.3 void Sys_Init_Motors (void)

Initialises the Motor Module

This function initialises the motor module including both left and right motor.

Definition at line 52 of file motors.c.

8.25.4.4 void Sys_LeftMotor_Controller ()

I/O handler for the left motor

This function controls the speed of the left motor. The speed is set by moving the to the next step within the appropriate time step.

Definition at line 116 of file motors.c.

8.25.4.5 bool Sys_LeftMotor_EventHandler (uint16 pid, uint16 eventID, sys_event_data * data)

Left motor event handler to set the speed

This function sets the left motor speed that is received by the event SYS_EVENT_IO_MOTOR_LEFT.

Parameters

in	<i>pid</i>	the process id to which the event handler is registered
in	<i>eventID</i>	the event id which identifies the event that is handled
in	<i>data</i>	the event data that contain the motor speed.

Definition at line 215 of file motors.c.

8.25.4.6 void Sys_LeftMotor_Reset () [inline]

resets the left motor

This function resets the left motor to a reset state.

Definition at line 96 of file motors.c.

8.25.4.7 void Sys_RightMotor_Controller ()

I/O handler for the right motor

This function controls the speed of the right motor. The speed is set by moving the to the next step within the appropriate time step.

Definition at line 163 of file motors.c.

8.25.4.8 bool Sys_RightMotor_EventHandler (uint16 pid, uint16 eventID, sys_event_data * data)

Right motor event handler to set the speed

This function sets the right motor speed that is received by the event SYS_EVENT_IO_MOTOR_RIGHT.

Parameters

in	<i>pid</i>	the process id to which the event handler is registered
----	------------	---

in	<i>eventID</i>	the event id which identifies the event that is handled
in	<i>data</i>	the event data that contain the motor speed.

Definition at line 230 of file motors.c.

8.25.4.9 void Sys_RightMotor_Reset () [inline]

resets the right motor

This function resets the right motor to a reset state.

Definition at line 106 of file motors.c.

8.25.4.10 void Sys_Set_LeftWheelSpeed (sint16 speed)

sets left wheel speed

This function sets the value for the speed of the left motor.

Parameters

<i>speed</i>	of the left wheel
--------------	-------------------

Definition at line 246 of file motors.c.

8.25.4.11 void Sys_Set_RightWheelSpeed (sint16 speed)

sets right wheel speed

This function sets the value for the speed of the right motor.

Parameters

<i>speed</i>	of the right wheel
--------------	--------------------

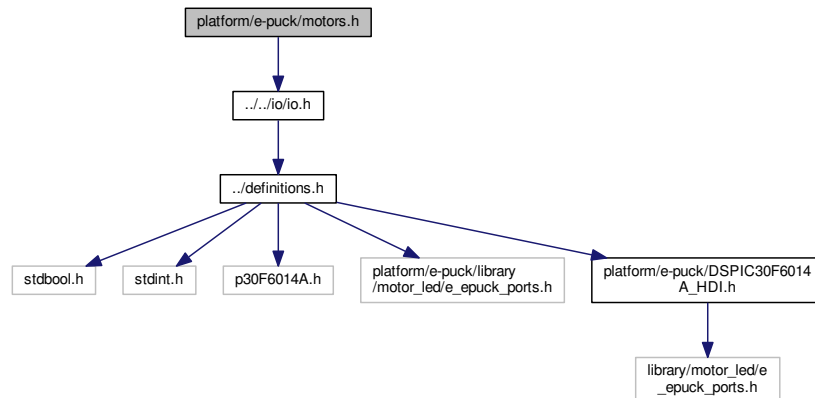
Definition at line 264 of file motors.c.

8.26 platform/e-puck/motors.h File Reference

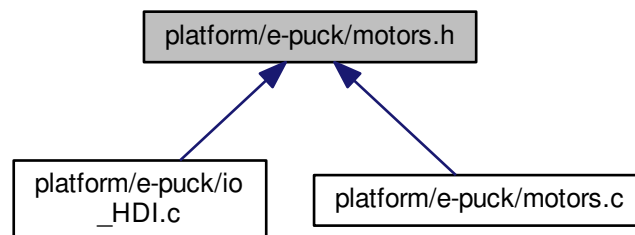
This file provides the function needed to actuate the motors.

```
#include "../../io/io.h"
```

Include dependency graph for motors.h:



This graph shows which files directly or indirectly include this file:



Macros

- `#define MAX_WHEEL_SPEED_MM_S 129 /*mm/s*/`

Functions

- void `Sys_Init_Motors` (void)
- void `Sys_Set_LeftWheelSpeed` (sint16 speed)
- void `Sys_Set_RightWheelSpeed` (sint16 speed)
- sint16 `Sys_Get_LeftWheelSpeed` (void)
- sint16 `Sys_Get_RightWheelSpeed` (void)

8.26.1 Detailed Description

This file provides the function needed to actuate the motors.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org
Gabriel Kapellmann Zafra <gkapellmann@gmail.com>

Version

1.0

Date

30 July 2015

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8.26.2 Macro Definition Documentation

8.26.2.1 `#define MAX_WHEEL_SPEED_MM_S 129 /*mm/s*/`

Maximum wheel speed in mm/s

Definition at line 46 of file motors.h.

8.26.3 Function Documentation

8.26.3.1 `sint16 Sys_Get_LeftWheelSpeed (void)`

returns the left wheel speed

This function returns the speed of the left motor.

Definition at line 281 of file motors.c.

8.26.3.2 `sint16 Sys_Get_RightWheelSpeed (void)`

returns the right wheel speed

This function returns the speed of the right motor.

Definition at line 291 of file motors.c.

8.26.3.3 `void Sys_Init_Motors (void)`

Initialises the Motor Module

This function initialises the motor module including both left and right motor.

Definition at line 52 of file motors.c.

8.26.3.4 `void Sys_Set_LeftWheelSpeed (sint16 speed)`

sets left wheel speed

This function sets the value for the speed of the left motor.

Parameters

<i>speed</i>	of the left wheel
--------------	-------------------

Definition at line 246 of file motors.c.

8.26.3.5 void Sys_Set_RightWheelSpeed (sint16 speed)

sets right wheel speed

This function sets the value for the speed of the right motor.

Parameters

<i>speed</i>	of the right wheel
--------------	--------------------

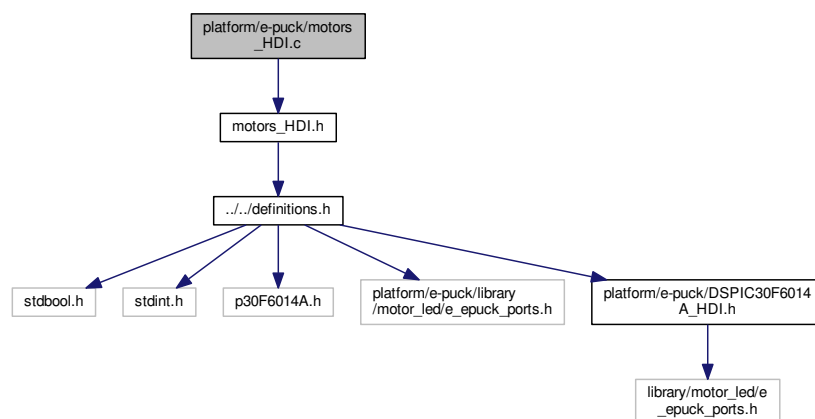
Definition at line 264 of file motors.c.

8.27 platform/e-puck/motors_HDI.c File Reference

Hardware dependent implementations to actuate the motors.

```
#include "motors_HDI.h"
```

Include dependency graph for motors_HDI.c:



Functions

- void [Sys_LeftMotor_SetPhase_HDI](#) (sint8 phase)
- void [Sys_RightMotor_SetPhase_HDI](#) (sint8 phase)

8.27.1 Detailed Description

Hardware dependent implementations to actuate the motors.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

27 August 2015

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8.27.2 Function Documentation

8.27.2.1 void Sys_LeftMotor_SetPhase_HDI(sint8 phase) [inline]

sets the left motor phase

This function sets the left motor phase

Parameters

in	<i>phase</i>	indicates the phase of the left motor
----	--------------	---------------------------------------

Definition at line 28 of file motors_HDI.c.

8.27.2.2 void Sys_RightMotor_SetPhase_HDI(sint8 phase) [inline]

sets the right motor phase

This function sets the right motor phase

Parameters

in	<i>phase</i>	indicates the phase of the right motor
----	--------------	--

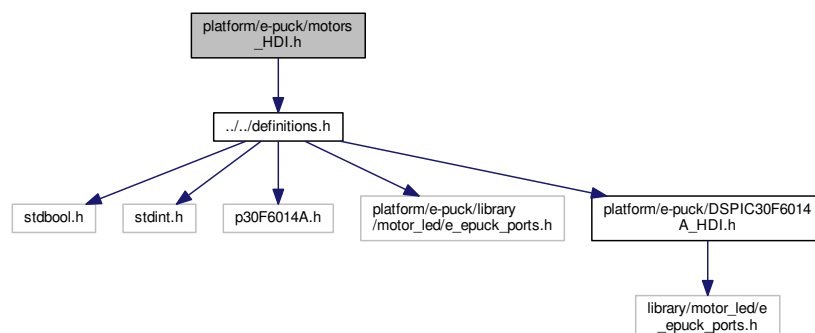
Definition at line 82 of file motors_HDI.c.

8.28 platform/e-puck/motors_HDI.h File Reference

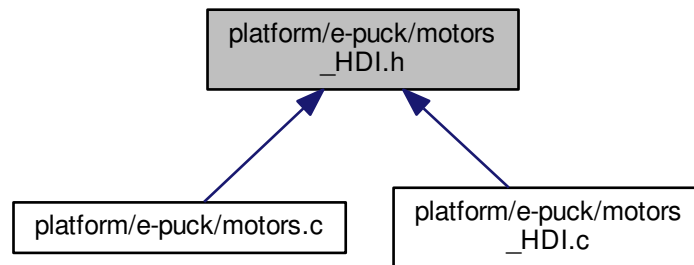
Hardware dependent implementations to actuate the motors.

#include "../././definitions.h"

Include dependency graph for motors_HDI.h:



This graph shows which files directly or indirectly include this file:



Macros

- `#define MOTORPHASE_RESET -1`

Functions

- void `Sys_LeftMotor_SetPhase_HDI` (sint8 phase)
- void `Sys_RightMotor_SetPhase_HDI` (sint8 phase)

8.28.1 Detailed Description

Hardware dependent implementations to actuate the motors.

Author

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Version

1.0

Date

27 August 2015

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8.28.2 Macro Definition Documentation

8.28.2.1 `#define MOTORPHASE_RESET -1`

the reset value for the motor phase

Definition at line 26 of file `motors_HDI.h`.

8.28.3.1 void Sys_LeftMotor_SetPhase_HDI (sint8 *phase*) [inline]

This function sets the left motor phase

in	<i>phase</i>	indicates the phase of the left motor
----	--------------	---------------------------------------

8.28.3.2 void Sys_RightMotor_SetPhase_HDI (sint8 *phase*) [inline]

This function sets the right motor phase

in	<i>phase</i>	indicates the phase of the right motor
----	--------------	--

8.29 platform/e-puck/process_Management_HDI.c File Reference

```
#include "process_Management_HDI.h"
#include "../..//processes/process_Management.h"
#include <stdlib.h>
#include "system_Timer_HDI.h"
#include "../..//interrupts.h"
#include "../..//memory.h"
#include "../..//definitions.h"
#include <p30F6014A.h>
#include "library/motor_led/e_epuck_ports.h"
```

```

graph TD
    PMHDI["platform/e-puck/process_Management_HDI.c"]
    PMHDI --> PMHDI_h["process_Management_HDI.h"]
    PMHDI --> stdlib["stdlib.h"]
    PMHDI --> interrupts["./interrupts.h"]
    PMHDI --> system_Timer_HDI_h["system_Timer_HDI.h"]
    PMHDI --> memory_h["./memory.h"]
    PMHDI --> events_h["./os/events/events.h"]
    PMHDI --> scheduler_h["scheduler.h"]
    PMHDI --> definitions_h["./os/definitions.h"]
    PMHDI --> stdbool_h["stdbool.h"]
    PMHDI --> stdint_h["stdint.h"]
    PMHDI --> motor_led_e_epuck_ports_h["platform/e-puck/library/motor_led_e_epuck_ports.h"]
    PMHDI --> DSPIC30F6014_A_HDI_h["platform/e-puck/DSPIC30F6014_A_HDI.h"]
    PMHDI --> p30F6014A_h["p30F6014A.h"]

    PMHDI_h --> processes_data_h["./os/processes/data.h"]
    PMHDI_h --> processes_process_Management_h["./os/processes/process_Management.h"]
    PMHDI_h --> definitions_h

    processes_data_h --> events_h
    processes_data_h --> scheduler_h
    processes_data_h --> definitions_h

    processes_process_Management_h --> scheduler_h
    processes_process_Management_h --> definitions_h

    system_Timer_HDI_h --> definitions_h

    memory_h --> definitions_h

    events_h --> definitions_h

    scheduler_h --> definitions_h

    definitions_h --> stdbool_h
    definitions_h --> stdint_h
    definitions_h --> motor_led_e_epuck_ports_h
    definitions_h --> DSPIC30F6014_A_HDI_h
    definitions_h --> p30F6014A_h

    DSPIC30F6014_A_HDI_h --> motor_led_e_epuck_ports_h
  
```

Functions

- void [Sys_Init_Process_Management_HDI](#) ()
- bool [Sys_Start_Process_HDI](#) (pFunction function)
- void [Sys_Save_Running_Process_HDI](#) ()
- void [Sys_Change_Stack_HDI](#) (unsigned short fp, unsigned short sp, unsigned short lm)
- void [Sys_Switch_Process_HDI](#) (sys_pcb_list_element *new_process)

8.29.1 Detailed Description

Hardware dependent implementations to manage processes (e.g. task swichting)

Author

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Version

1.0

Date

{08 July 2014}

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8.29.2 Function Documentation

8.29.2.1 void Sys_Change_Stack_HDI (unsigned short fp, unsigned short sp, unsigned short lm)

This function changes stackpointers to the new stack

This function changes stackpointers to the new stack

Parameters

in	<i>fp</i>	FramePointer address
in	<i>sp</i>	StackPointer address
in	<i>lm</i>	StackPointer Limit

Definition at line 215 of file process_Management_HDI.c.

8.29.2.2 void Sys_Init_Process_Management_HDI (void)

This function initialises the process management

This function initialises the process management and creates the first elements in the linked list

Definition at line 44 of file process_Management_HDI.c.

8.29.2.3 void Sys_Save_Running_Process_HDI (void) [inline]

This function stores all registers and information of the running process into the corresponding struct

This function stores all registers and information of the running process into the corresponding struct

Definition at line 151 of file process_Management_HDI.c.

8.29.2.4 bool Sys_Start_Process_HDI (pFunction *function*)

This function creates a new sys_process_control_block and add all needed info

This function creates a new sys_process_control_block (in a sys_process_control_block_list_element) which contains all information which is used to execute this process.

Parameters

in	<i>function</i>	This argument points to a function in memory which should be executed as an new task
----	-----------------	--

Definition at line 95 of file process_Management_HDI.c.

8.29.2.5 void Sys_Switch_Process_HDI (sys_pcb_list_element * *new_process*)

This function switches from sys_running_process to new_process

This function switches from sys_running_process to new_process

Parameters

in	<i>new_process</i>	pointer to the process which should be executed
----	--------------------	---

Definition at line 248 of file process_Management_HDI.c.

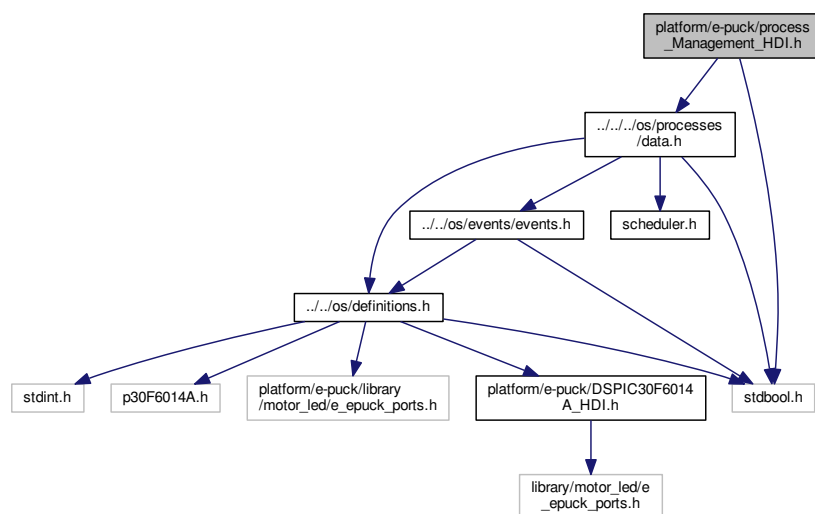
8.30 platform/e-puck/process_Management_HDI.h File Reference

Hardware dependent implementations to manage processes (e.g. task swichting)

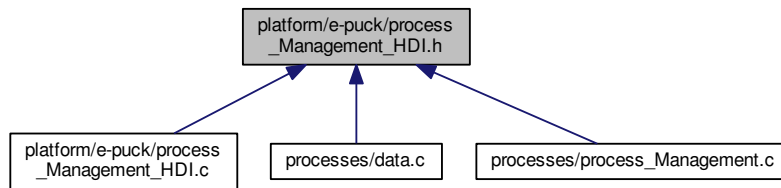
```
#include "../os/processes/data.h"
```

```
#include <stdbool.h>
```

Include dependency graph for process_Management_HDI.h:



This graph shows which files directly or indirectly include this file:



Functions

- void [Sys_Init_Process_Management_HDI](#) (void)
- bool [Sys_Start_Process_HDI](#) (pFunction function)
- void [Sys_Save_Running_Process_HDI](#) (void)
- void [Sys_Change_Stack_HDI](#) (unsigned short fp, unsigned short sp, unsigned short lm)
- void [Sys_Switch_Process_HDI](#) (sys_pcb_list_element *new_process)

8.30.1 Detailed Description

Hardware dependent implementations to manage processes (e.g. task swichting)

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

{08 July 2014}

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8.30.2 Function Documentation

8.30.2.1 void Sys_Change_Stack_HDI (unsigned short fp, unsigned short sp, unsigned short lm)

This function changes stackpointers to the new stack

This function changes stackpointers to the new stack

Parameters

in	<i>fp</i>	FramePointer address
in	<i>sp</i>	StackPointer address
in	<i>lm</i>	StackPointer Limit

Definition at line 215 of file process_Management_HDI.c.

8.30.2.2 void Sys_Init_Process_Management_HDI (void)

This function initialises the process management

This function initialises the process management and creates the first elements in the linked list

Definition at line 44 of file process_Management_HDI.c.

8.30.2.3 void Sys_Save_Running_Process_HDI (void) [inline]

This function stores all registers and information of the running process into the corresponding struct

This function stores all registers and information of the running process into the corresponding struct

Definition at line 151 of file process_Management_HDI.c.

8.30.2.4 bool Sys_Start_Process_HDI (pFunction function)

This function creates a new sys_process_control_block and add all needed info

This function creates a new sys_process_control_block (in a sys_process_control_block_list_element) which contains all information which is used to execute this process.

Parameters

in	<i>function</i>	This argument points to a function in memory which should be executed as a new task
----	-----------------	---

Definition at line 95 of file process_Management_HDI.c.

8.30.2.5 void Sys_Switch_Process_HDI (sys_pcb_list_element * new_process)

This function switches from sys_running_process to new_process

This function switches from sys_running_process to new_process

Parameters

in	<i>new_process</i>	pointer to the process which should be executed
----	--------------------	---

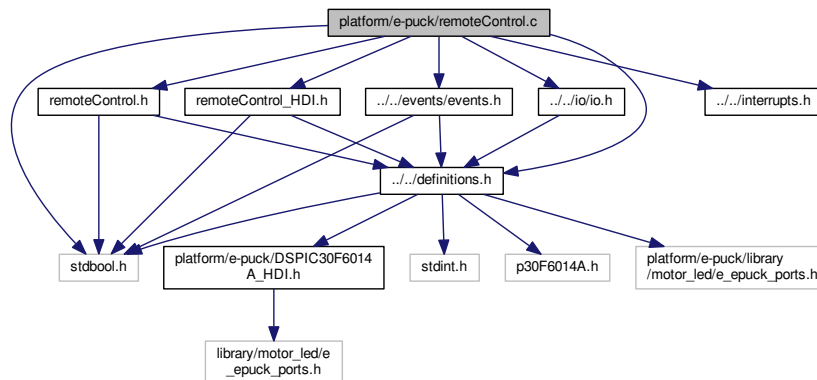
Definition at line 248 of file process_Management_HDI.c.

8.31 platform/e-puck/remoteControl.c File Reference

This file includes functions needed to receive and decode messages from a remote control.

```
#include "remoteControl.h"
#include "remoteControl_HDI.h"
#include <stdbool.h>
#include "../io/io.h"
#include "../events/events.h"
#include "../definitions.h"
#include "../interrupts.h"
```

Include dependency graph for remoteControl.c:



Functions

- void [Sys_Init_RemoteControl](#) (void)
- void [Sys_Start_RemoteControl](#) (void)
- void [Sys_Receive_RemoteControl_Msg](#) ()
- bool [Sys_HasRemoteC_Sent_New_Data](#) ()
- uint8 [Sys_RemoteC_Get_CheckBit](#) ()
- uint8 [Sys_RemoteC_Get_Address](#) ()
- uint8 [Sys_RemoteC_Get_Data](#) ()

8.31.1 Detailed Description

This file includes functions needed to receive and decode messages from a remote control.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org
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Version

1.0

Date

27 August 2015

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8.31.2 Function Documentation

8.31.2.1 bool Sys_HasRemoteC_Sent_New_Data ()

returns if a new command was read

This function returns true if a new remote control command has arrived

Returns

bool true if a new remote control command has arrived

Definition at line 124 of file remoteControl.c.

8.31.2.2 void Sys_Init_RemoteControl (void) [inline]

Initialises the remote control handler

This function initialises the handler of the remote control to receive signals from the remote control.

Definition at line 37 of file remoteControl.c.

8.31.2.3 void Sys_Receive_RemoteControl_Msg (void)

handles incoming remote control signals

This function reads a remote control signal and reads it's transmitted value. When a signal arrives, an external interrupt is triggered. The remaining values are obtained by using time not interrupts.

Definition at line 57 of file remoteControl.c.

8.31.2.4 uint8 Sys_RemoteC_Get_Address (void)

returns the address of the remote control

This function returns the address of an remote control.

Returns

address of the remote control

Definition at line 146 of file remoteControl.c.

8.31.2.5 uint8 Sys_RemoteC_Get_CheckBit (void)

returns the check bit value

This function returns the check bit value of an remote control to indicate if a button was pressed continuously or sequential.

Returns

bit to indicate the check bit

Definition at line 135 of file remoteControl.c.

8.31.2.6 uint8 Sys_RemoteC_Get_Data (void)

returns the value received by the remote control

returns the value received by the remote control

Returns

value received by the remote control

Definition at line 157 of file remoteControl.c.

8.31.2.7 void Sys_Start_RemoteControl (void) [inline]

start the remote control handler

This function start the handler of the remote control to receive signals from the remote control.

Definition at line 47 of file remoteControl.c.

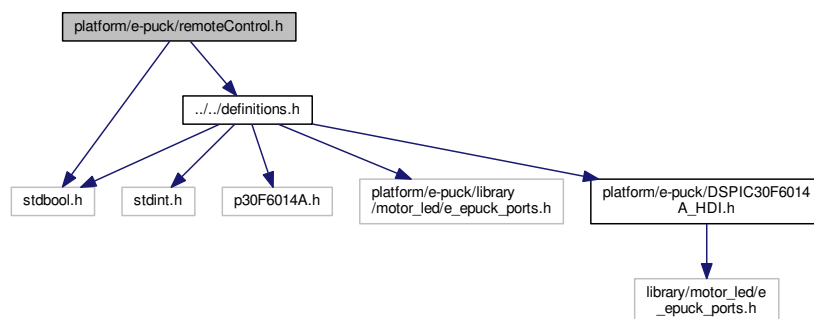
8.32 platform/e-puck/remoteControl.h File Reference

This file includes functions needed to receive and decode messages from a remote control.

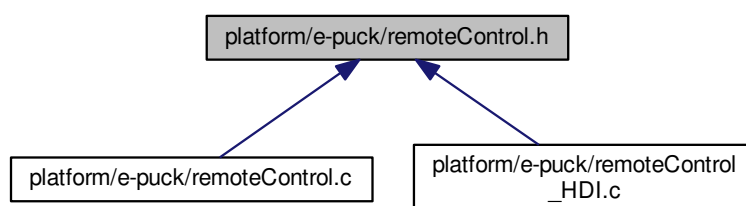
```
#include <stdbool.h>
```

```
#include "../..../definitions.h"
```

Include dependency graph for remoteControl.h:



This graph shows which files directly or indirectly include this file:



Macros

- #define RC_BUTTON_STANDBY 12
- #define RC_BUTTON_SCREEN 11
- #define RC_BUTTON_LANG 15
- #define RC_BUTTON_SUBTTL 31
- #define RC_BUTTON_INTERNET 46
- #define RC_BUTTON_RED 55
- #define RC_BUTTON_GREEN 54

- `#define RC_BUTTON_YELLOW` 50
- `#define RC_BUTTON_BLUE` 52
- `#define RC_BUTTON_0` 0
- `#define RC_BUTTON_1` 1
- `#define RC_BUTTON_2` 2
- `#define RC_BUTTON_3` 3
- `#define RC_BUTTON_4` 4
- `#define RC_BUTTON_5` 5
- `#define RC_BUTTON_6` 6
- `#define RC_BUTTON_7` 7
- `#define RC_BUTTON_8` 8
- `#define RC_BUTTON_9` 9
- `#define RC_BUTTON_TELE_TEXT` 60
- `#define RC_BUTTON_SWAP` 34
- `#define RC_BUTTON_OK` 53
- `#define RC_BUTTON_CURSOR_UP` 20
- `#define RC_BUTTON_CURSOR_DOWN` 19
- `#define RC_BUTTON_CURSOR_LEFT` 21
- `#define RC_BUTTON_CURSOR_RIGHT` 22
- `#define RC_BUTTON_BACK` 10
- `#define RC_BUTTON_MENU` 48
- `#define RC_BUTTON_EPG` 47
- `#define RC_BUTTON_FAV` 40
- `#define RC_BUTTON_SOURCE` 56
- `#define RC_BUTTON_INFO` 18
- `#define RC_BUTTON_PRESETS` 14
- `#define RC_BUTTON_SLEEP` 42
- `#define RC_BUTTON_VOLUME_UP` 16
- `#define RC_BUTTON_VOLUME_DOWN` 17
- `#define RC_BUTTON_MUTE` 13
- `#define RC_BUTTON_CHANNEL_UP` 32
- `#define RC_BUTTON_CHANNEL_DOWN` 33
- `#define RC_BUTTON_PAUSE` 48
- `#define RC_BUTTON_REWIND` 50
- `#define RC_BUTTON_WIND` 52
- `#define RC_BUTTON_PLAY` 53
- `#define RC_BUTTON_STOP` 54
- `#define RC_BUTTON_RECORD` 55

Functions

- void `Sys_Init_RemoteControl` (void)
- void `Sys_Start_RemoteControl` (void)
- bool `Sys_RemoteC_Received_New_Data` (void)
- uint8 `Sys_RemoteC_Get_CheckBit` (void)
- uint8 `Sys_RemoteC_Get_Address` (void)
- uint8 `Sys_RemoteC_Get_Data` (void)
- void `Sys_Receive_RemoteControl_Msg` (void)

8.32.1 Detailed Description

This file includes functions needed to receive and decode messages from a remote control.

Author

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Yuri Kaszubowski Lopes yurikazuba@gmail.com

Version

1.0

Date

27 August 2015

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8.32.2 Macro Definition Documentation

8.32.2.1 `#define RC_BUTTON_0 0`

Value for the 0 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 61 of file `remoteControl.h`.

8.32.2.2 `#define RC_BUTTON_1 1`

Value for the 1 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 62 of file `remoteControl.h`.

8.32.2.3 `#define RC_BUTTON_2 2`

Value for the 2 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 63 of file `remoteControl.h`.

8.32.2.4 `#define RC_BUTTON_3 3`

Value for the 3 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 64 of file `remoteControl.h`.

8.32.2.5 `#define RC_BUTTON_4 4`

Value for the 4 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 65 of file `remoteControl.h`.

8.32.2.6 `#define RC_BUTTON_5 5`

Value for the 5 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 66 of file `remoteControl.h`.

8.32.2.7 #define RC_BUTTON_6 6

Value for the 6 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 67 of file remoteControl.h.

8.32.2.8 #define RC_BUTTON_7 7

Value for the 7 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 68 of file remoteControl.h.

8.32.2.9 #define RC_BUTTON_8 8

Value for the 8 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 69 of file remoteControl.h.

8.32.2.10 #define RC_BUTTON_9 9

Value for the 9 button (RC-5 coding for a Toshiba RC-3910)

Definition at line 70 of file remoteControl.h.

8.32.2.11 #define RC_BUTTON_BACK 10

Value for the back button (RC-5 coding for a Toshiba RC-3910)

Definition at line 79 of file remoteControl.h.

8.32.2.12 #define RC_BUTTON_BLUE 52

Value for the blue button (RC-5 coding for a Toshiba RC-3910)

Definition at line 59 of file remoteControl.h.

8.32.2.13 #define RC_BUTTON_CHANNEL_DOWN 33

Value for the channel down button (RC-5 coding for a Toshiba RC-3910)

Definition at line 93 of file remoteControl.h.

8.32.2.14 #define RC_BUTTON_CHANNEL_UP 32

Value for the channel up button (RC-5 coding for a Toshiba RC-3910)

Definition at line 92 of file remoteControl.h.

8.32.2.15 #define RC_BUTTON_CURSOR_DOWN 19

Value for the courser down button (RC-5 coding for a Toshiba RC-3910)

Definition at line 76 of file remoteControl.h.

8.32.2.16 #define RC_BUTTON_CURSOR_LEFT 21

Value for the courser left button (RC-5 coding for a Toshiba RC-3910)

Definition at line 77 of file remoteControl.h.

8.32.2.17 #define RC_BUTTON_CURSOR_RIGHT 22

Value for the courser right button (RC-5 coding for a Toshiba RC-3910)

Definition at line 78 of file remoteControl.h.

8.32.2.18 #define RC_BUTTON_CURSOR_UP 20

Value for the cursor up button (RC-5 coding for a Toshiba RC-3910)

Definition at line 75 of file remoteControl.h.

8.32.2.19 #define RC_BUTTON_EPG 47

Value for the epg button (RC-5 coding for a Toshiba RC-3910)

Definition at line 81 of file remoteControl.h.

8.32.2.20 #define RC_BUTTON_FAV 40

Value for the favourite button (RC-5 coding for a Toshiba RC-3910)

Definition at line 82 of file remoteControl.h.

8.32.2.21 #define RC_BUTTON_GREEN 54

Value for the green button (RC-5 coding for a Toshiba RC-3910)

Definition at line 57 of file remoteControl.h.

8.32.2.22 #define RC_BUTTON_INFO 18

Value for the info button (RC-5 coding for a Toshiba RC-3910)

Definition at line 85 of file remoteControl.h.

8.32.2.23 #define RC_BUTTON_INTERNET 46

Value for the internet button (RC-5 coding for a Toshiba RC-3910)

Definition at line 54 of file remoteControl.h.

8.32.2.24 #define RC_BUTTON_LANG 15

Value for the language button (RC-5 coding for a Toshiba RC-3910)

Definition at line 52 of file remoteControl.h.

8.32.2.25 #define RC_BUTTON_MENU 48

Value for the menu button (RC-5 coding for a Toshiba RC-3910)

Definition at line 80 of file remoteControl.h.

8.32.2.26 #define RC_BUTTON_MUTE 13

Value for the mute button (RC-5 coding for a Toshiba RC-3910)

Definition at line 91 of file remoteControl.h.

8.32.2.27 #define RC_BUTTON_OK 53

Value for the OK button (RC-5 coding for a Toshiba RC-3910)

Definition at line 74 of file remoteControl.h.

8.32.2.28 #define RC_BUTTON_PAUSE 48

Value for the pause button (RC-5 coding for a Toshiba RC-3910)

Definition at line 96 of file remoteControl.h.

8.32.2.29 #define RC_BUTTON_PLAY 53

Value for the play button (RC-5 coding for a Toshiba RC-3910)

Definition at line 99 of file remoteControl.h.

8.32.2.30 #define RC_BUTTON_PRESETS 14

Value for the preset button (RC-5 coding for a Toshiba RC-3910)

Definition at line 86 of file remoteControl.h.

8.32.2.31 #define RC_BUTTON_RECORD 55

Value for the record button (RC-5 coding for a Toshiba RC-3910)

Definition at line 101 of file remoteControl.h.

8.32.2.32 #define RC_BUTTON_RED 55

Value for the red button (RC-5 coding for a Toshiba RC-3910)

Definition at line 56 of file remoteControl.h.

8.32.2.33 #define RC_BUTTON_REWIND 50

Value for the rewind button (RC-5 coding for a Toshiba RC-3910)

Definition at line 97 of file remoteControl.h.

8.32.2.34 #define RC_BUTTON_SCREEN 11

Value for the screen button (RC-5 coding for a Toshiba RC-3910)

Definition at line 51 of file remoteControl.h.

8.32.2.35 #define RC_BUTTON_SLEEP 42

Value for the sleep button (RC-5 coding for a Toshiba RC-3910)

Definition at line 87 of file remoteControl.h.

8.32.2.36 #define RC_BUTTON_SOURCE 56

Value for the source button (RC-5 coding for a Toshiba RC-3910)

Definition at line 84 of file remoteControl.h.

8.32.2.37 #define RC_BUTTON_STANDBY 12

Value for the standby button (RC-5 coding for a Toshiba RC-3910)

Definition at line 49 of file remoteControl.h.

8.32.2.38 #define RC_BUTTON_STOP 54

Value for the stop button (RC-5 coding for a Toshiba RC-3910)

Definition at line 100 of file remoteControl.h.

8.32.2.39 #define RC_BUTTON_SUBTTL 31

Value for the subtitle button (RC-5 coding for a Toshiba RC-3910)

Definition at line 53 of file remoteControl.h.

8.32.2.40 #define RC_BUTTON_SWAP 34

Value for the swap button (RC-5 coding for a Toshiba RC-3910)

Definition at line 72 of file remoteControl.h.

8.32.2.41 #define RC_BUTTON_TELE_TEXT 60

Value for the tele text button (RC-5 coding for a Toshiba RC-3910)

Definition at line 71 of file remoteControl.h.

8.32.2.42 #define RC_BUTTON_VOLUME_DOWN 17

Value for the volume down button (RC-5 coding for a Toshiba RC-3910)

Definition at line 90 of file remoteControl.h.

8.32.2.43 #define RC_BUTTON_VOLUME_UP 16

Value for the volume up button (RC-5 coding for a Toshiba RC-3910)

Definition at line 89 of file remoteControl.h.

8.32.2.44 #define RC_BUTTON_WIND 52

Value for the wind button (RC-5 coding for a Toshiba RC-3910)

Definition at line 98 of file remoteControl.h.

8.32.2.45 #define RC_BUTTON_YELLOW 50

Value for the yellow button (RC-5 coding for a Toshiba RC-3910)

Definition at line 58 of file remoteControl.h.

8.32.3 Function Documentation**8.32.3.1 void Sys_Init_RemoteControl (void) [inline]**

Initialises the remote control handler

This function initialises the handler of the remote control to receive signals from the remote control.

Definition at line 37 of file remoteControl.c.

8.32.3.2 void Sys_Receive_RemoteControl_Msg (void)

handles incoming remote control signals

This function reads a remote control signal and reads it's transmitted value. When a signal arrives, an external interrupt is triggered. The remaining values are obtained by using time not interrupts.

Definition at line 57 of file remoteControl.c.

8.32.3.3 uint8 Sys_RemoteC_Get_Address (void)

returns the address of the remote control

This function returns the address of an remote control.

Returns

address of the remote control

Definition at line 146 of file remoteControl.c.

8.32.3.4 uint8 Sys_RemoteC_Get_CheckBit (void)

returns the check bit value

This function returns the check bit value of an remote control to indicate if a button was pressed continuously or sequential.

Returns

bit to indicate the check bit

Definition at line 135 of file remoteControl.c.

8.32.3.5 uint8 Sys_RemoteC_Get_Data (void)

returns the value received by the remote control

returns the value received by the remote control

Returns

value received by the remote control

Definition at line 157 of file remoteControl.c.

8.32.3.6 bool Sys_RemoteC_Received_New_Data (void)**8.32.3.7 void Sys_Start_RemoteControl (void) [inline]**

start the remote control handler

This function start the handler of the remote control to receive signals from the remote control.

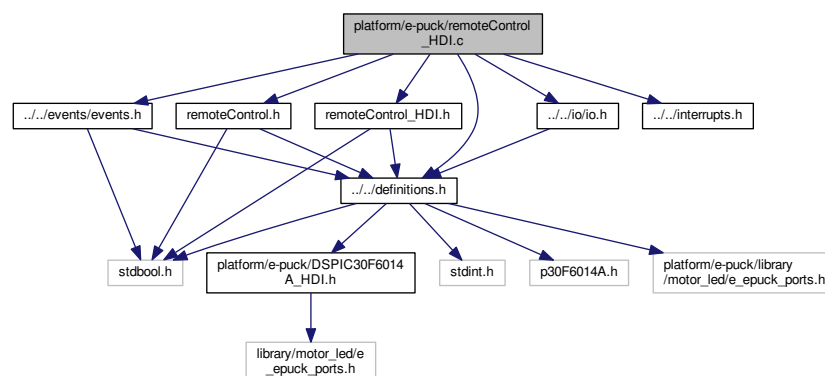
Definition at line 47 of file remoteControl.c.

8.33 platform/e-puck/remoteControl_HDI.c File Reference

Hardware dependent implementations to receive and decode messages from a remote control.

```
#include "remoteControl_HDI.h"
#include "../definitions.h"
#include "../interrupts.h"
#include "../io/io.h"
#include "remoteControl.h"
#include "../events/events.h"
```

Include dependency graph for remoteControl_HDI.c:



Functions

- void [Sys_Init_RemoteControl_HDI](#) (void)
- void [Sys_Start_RemoteControl_HDI](#) (void)
- void [__attribute__](#) ((__interrupt__, auto_psv))

Variables

- bool [message_arriving](#) = false
- [sint8 waiting_cycles](#) = 20
- [uint16 rx_buffer](#) = 0
- bool [isNewDataAvailable](#) = false
- [sint8 receiving_bit](#) = RC_NOT_STARTED

8.33.1 Detailed Description

Hardware dependent implementations to receive and decode messages from a remote control.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org
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Version

1.0

Date

27 August 2015

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8.33.2 Function Documentation

8.33.2.1 void [__attribute__](#) ((__interrupt__, auto_psv))

external interrupt handler for the remote control

This function is executed at the arrival of a new remote control message.

Definition at line 74 of file remoteControl_HDI.c.

8.33.2.2 void [Sys_Init_RemoteControl_HDI](#) (void) [\[inline\]](#)

Initialises the remote control handler

This function initialises the handler of the remote control to receive signals from the remote control.

Definition at line 43 of file remoteControl_HDI.c.

8.33.2.3 void Sys_Start_RemoteControl_HDI(void) [inline]

start the remote control handler

This function start the handler of the remote control to receive signals from the remote control. clear to IRQ flag

Definition at line 63 of file remoteControl_HDI.c.

8.33.3 Variable Documentation

8.33.3.1 bool isNewDataAvailable = false

a flag to indicate that a new message was received

Definition at line 33 of file remoteControl_HDI.c.

8.33.3.2 bool message_arriving = false

A flag that is set as soon as a message is received

Definition at line 28 of file remoteControl_HDI.c.

8.33.3.3 sint8 receiving_bit = RC_NOT_STARTED

State indicator (for the state machine)

Definition at line 35 of file remoteControl_HDI.c.

8.33.3.4 uint16 rx_buffer = 0

The initial state of the state machine to decode a remote control message

Definition at line 31 of file remoteControl_HDI.c.

8.33.3.5 sint8 waiting_cycles = 20

The cycles that need to be waited until the next stage (set for 100us)

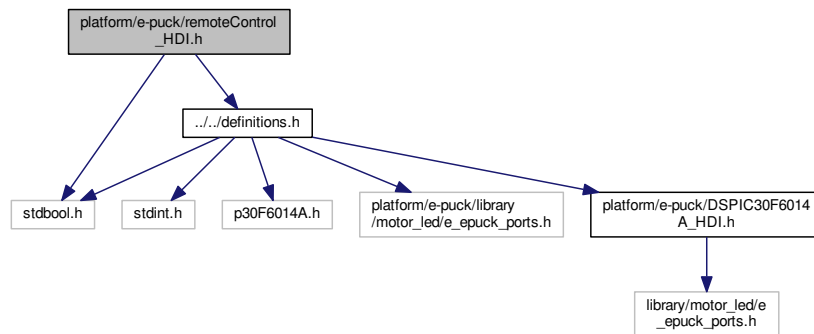
Definition at line 29 of file remoteControl_HDI.c.

8.34 platform/e-puck/remoteControl_HDI.h File Reference

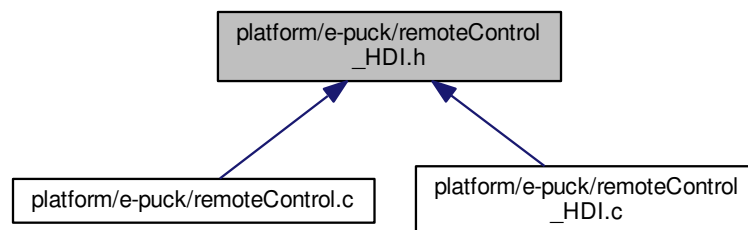
Hardware dependent implementations to receive and decode messages from a remote control.

```
#include <stdbool.h>
#include "../definitions.h"
```


Include dependency graph for remoteControl_HDI.h:



This graph shows which files directly or indirectly include this file:



Macros

- `#define RC_WAIT_FOR_QUARTERBIT 4`
- `#define RC_WAIT_FOR_HALFBIT 8`
- `#define RC_WAIT_FOR_BIT 18`
- `#define RC_WAIT_INITIALLY RC_WAIT_FOR_BIT+RC_WAIT_FOR_QUARTERBIT`
- `#define RC_NOT_STARTED -1`

Functions

- void `Sys_Init_RemoteControl_HDI` (void)
- void `Sys_Start_RemoteControl_HDI` (void)

Variables

- bool `message_arriving`
- `sint8` `waiting_cycles`
- `uint16` `rx_buffer`
- bool `isNewDataAvailable`
- `sint8` `receiving_bit`

8.34.1 Detailed Description

Hardware dependent implementations to receive and decode messages from a remote control.

Author

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Version

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Date

27 August 2015

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8.34.2 Macro Definition Documentation

8.34.2.1 `#define RC_NOT_STARTED -1`

The initial state of the state machine to decode a remote control message

Definition at line 35 of file `remoteControl_HDI.h`.

8.34.2.2 `#define RC_WAIT_FOR_BIT 18`

Cycles that are needed to wait a single bit duration

Definition at line 33 of file `remoteControl_HDI.h`.

8.34.2.3 `#define RC_WAIT_FOR_HALFBIT 8`

Cycles that are needed to wait a half of a single bit duration

Definition at line 32 of file `remoteControl_HDI.h`.

8.34.2.4 `#define RC_WAIT_FOR_QUARTERBIT 4`

Cycles that are needed to wait a quarter of a single bit duration

Definition at line 31 of file `remoteControl_HDI.h`.

8.34.2.5 `#define RC_WAIT_INITIALLY RC_WAIT_FOR_BIT+RC_WAIT_FOR_QUARTERBIT`

Cycles that are needed to wait at the beginning of a message

Definition at line 34 of file `remoteControl_HDI.h`.

8.34.3 Function Documentation

8.34.3.1 void Sys_Init_RemoteControl_HDI (void) [inline]

Initialises the remote control handler

This function initialises the handler of the remote control to receive signals from the remote control.

Definition at line 43 of file remoteControl_HDI.c.

8.34.3.2 void Sys_Start_RemoteControl_HDI (void) [inline]

start the remote control handler

This function start the handler of the remote control to receive signals from the remote control. clear to IRQ flag

Definition at line 63 of file remoteControl_HDI.c.

8.34.4 Variable Documentation

8.34.4.1 bool isNewDataAvailable

a flag to indicate that a new message was received

Definition at line 33 of file remoteControl_HDI.c.

8.34.4.2 bool message_arriving

A flag that is set as soon as a message is recieved

Definition at line 28 of file remoteControl_HDI.c.

8.34.4.3 sint8 receiving_bit

State indicator (for the state machine)

Definition at line 35 of file remoteControl_HDI.c.

8.34.4.4 uint16 rx_buffer

The initial state of the state machine to decode a remote control message

Definition at line 31 of file remoteControl_HDI.c.

8.34.4.5 sint8 waiting_cycles

The cycles that need to be waited until the next stage (set for 100us)

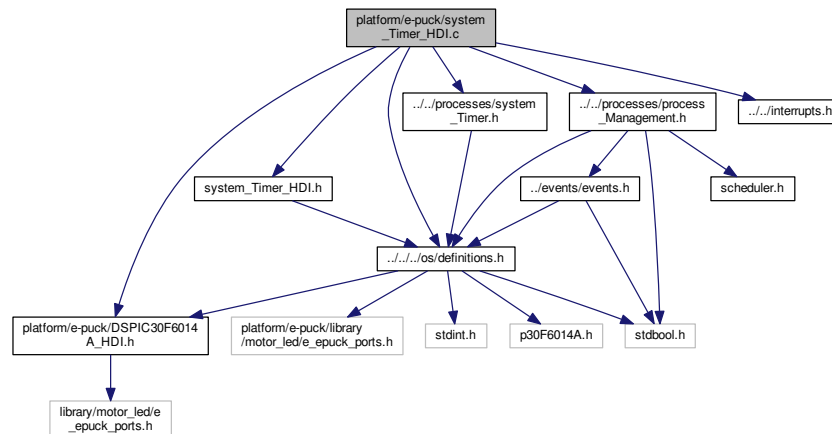
Definition at line 29 of file remoteControl_HDI.c.

8.35 platform/e-puck/system_Timer_HDI.c File Reference

Hardware dependent implementations to initialise, configure and the operating system.

```
#include "system_Timer_HDI.h"
#include "../../processes/system_Timer.h"
#include "../../processes/process_Management.h"
#include "DSPIC30F6014A_HDI.h"
#include "../../interrupts.h"
#include "../../definitions.h"
```

Include dependency graph for system_Timer_HDI.c:



Functions

- void [Sys_Init_SystemTimer_HDI](#) (pFunction scheduler)
- void [Sys_Start_SystemTimer_HDI](#) ()
- void [Sys_Stop_SystemTimer_HDI](#) ()
- void [Sys_Continue_SystemTimer_HDI](#) ()
- void [Sys_Reset_SystemTimer_HDI](#) ()
- void [__attribute__](#) ((interrupt, no_auto_psv))
- void [Sys_Disable_TimerInterrupt_HDI](#) (void)
- void [Sys_Enable_TimerInterrupt_HDI](#) (void)
- void [Sys_Force_TimerInterrupt_HDI](#) (void)

Variables

- pFunction [sys_process_scheduler](#) = 0

8.35.1 Detailed Description

Hardware dependent implementations to initialise, configure and the operating system.

Author

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Version

1.0

Date

07 July 2014

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8.35.2 Function Documentation

8.35.2.1 void __attribute__ ((interrupt, no_auto_psv))

Interrupt Service Routine for the Timer2 HDI

This Function starts the task-scheduling algorithm

Interrupt Service Routine for the Timer2 HDI (alternate)

This Function starts the task-scheduling algorithm

Definition at line 112 of file system_Timer_HDI.c.

8.35.2.2 void Sys_Continue_SystemTimer_HDI() [inline]

Deactivates the Timer2 Interrupt

This Function deactivated the Timer2 Interrupt

Definition at line 89 of file system_Timer_HDI.c.

8.35.2.3 void Sys_Disable_TimerInterrupt_HDI(void) [inline]

Disables the Timer2 interrupt

Disables the Timer2 interrupt and sets the interrupt flag to 0

Definition at line 132 of file system_Timer_HDI.c.

8.35.2.4 void Sys_Enable_TimerInterrupt_HDI(void) [inline]

Enables the Timer2 interrupt

Enables the Timer2 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 143 of file system_Timer_HDI.c.

8.35.2.5 void Sys_Force_TimerInterrupt_HDI(void) [inline]

forces the Timer2 interrupt

forces the Timer2 interrupt.

Definition at line 153 of file system_Timer_HDI.c.

8.35.2.6 void Sys_Init_SystemTimer_HDI(pFunction scheduler)

Function to initialise the system timer

This Function sets the Timer0 of the DSPIC 30F6014A for timer intervals of 10 ms. The timer will be startet with Start_SystemTimer_HDI()

Parameters

<code>in, out</code>	<code>scheduler</code>	This is a pointer to a callback function, which should be called whenever a timer interrupt is emitted.
----------------------	------------------------	---

Definition at line 36 of file `system_Timer_HDI.c`.

8.35.2.7 `void Sys_Reset_SystemTimer_HDI () [inline]`

Resets the Timer2 value to the initial value

This Function resets the Timer2 value

Definition at line 102 of file `system_Timer_HDI.c`.

8.35.2.8 `void Sys_Start_SystemTimer_HDI (void)`

Function to start the initialised system timer

This Function starts the Timer2 of the DSPIC 30F6014A for timer intervals of 10 ms. The MUST be initialised first with `Init_SystemTimer_HDI()`

Definition at line 62 of file `system_Timer_HDI.c`.

8.35.2.9 `void Sys_Stop_SystemTimer_HDI () [inline]`

Activates the Timer2 Interrupt

This Function activated the Timer2 Interrupt

Definition at line 76 of file `system_Timer_HDI.c`.

8.35.3 Variable Documentation

8.35.3.1 `pFunction sys_process_scheduler = 0`

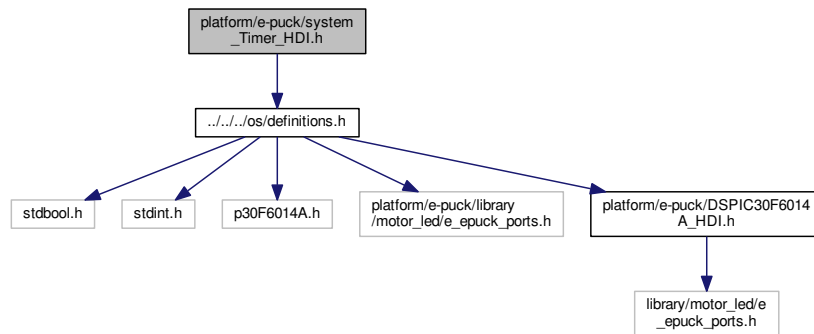
Definition at line 27 of file `system_Timer_HDI.c`.

8.36 `platform/e-puck/system_Timer_HDI.h` File Reference

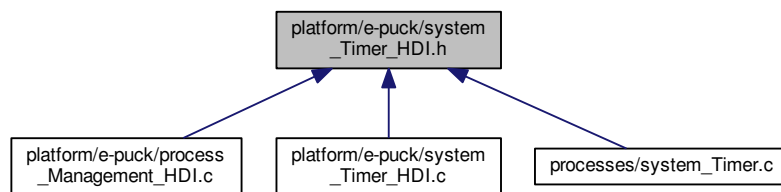
Hardware dependent implementations to initialise, configure and the operating system.

```
#include "../../../os/definitions.h"
```

Include dependency graph for system_Timer_HDI.h:



This graph shows which files directly or indirectly include this file:



Functions

- void [Sys_Init_SystemTimer_HDI](#) (pFunction)
- void [Sys_Start_SystemTimer_HDI](#) (void)
- void [Sys_Stop_SystemTimer_HDI](#) ()
- void [Sys_Continue_SystemTimer_HDI](#) ()
- void [Sys_Disable_TimerInterrupt_HDI](#) (void)
- void [Sys_Enable_TimerInterrupt_HDI](#) (void)
- void [Sys_Force_TimerInterrupt_HDI](#) (void)
- void [Sys_Reset_SystemTimer_HDI](#) ()
- void [Sys_todo_SystemTimer](#) ()

Variables

- pFunction [sys_process_scheduler](#)

8.36.1 Detailed Description

Hardware dependent implementations to initialise, configure and the operating system.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

07 July 2014

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8.36.2 Function Documentation

8.36.2.1 void Sys_Continue_SystemTimer_HDI () [inline]

Deactivates the Timer2 Interrupt

This Function deactivated the Timer2 Interrupt

Definition at line 89 of file system_Timer_HDI.c.

8.36.2.2 void Sys_Disable_TimerInterrupt_HDI (void) [inline]

Disables the Timer2 interrupt

Disables the Timer2 interrupt and sets the interrupt flag to 0

Definition at line 132 of file system_Timer_HDI.c.

8.36.2.3 void Sys_Enable_TimerInterrupt_HDI (void) [inline]

Enables the Timer2 interrupt

Enables the Timer2 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 143 of file system_Timer_HDI.c.

8.36.2.4 void Sys_Force_TimerInterrupt_HDI (void) [inline]

forces the Timer2 interrupt

forces the Timer2 interrupt.

Definition at line 153 of file system_Timer_HDI.c.

8.36.2.5 void Sys_Init_SystemTimer_HDI (pFunction scheduler)

Function to initialise the system timer

This Function sets the Timer0 of the DSPIC 30F6014A for timer intervals of 10 ms. The timer will be startet with Start_SystemTimer_HDI()

Parameters

<i>in, out</i>	<i>scheduler</i>	This is a pointer to a callback function, which should be called whenever a timer interrupt is emitted.
----------------	------------------	---

Definition at line 36 of file `system_Timer_HDI.c`.

8.36.2.6 void Sys_Reset_SystemTimer_HDI () [inline]

Resets the Timer2 value to the initial value

This Function resets the Timer2 value

Definition at line 102 of file `system_Timer_HDI.c`.

8.36.2.7 void Sys_Start_SystemTimer_HDI (void)

Function to start the initialised system timer

This Function starts the Timer2 of the DSPIC 30F6014A for timer intervals of 10 ms. The MUST be initialised first with `Init_SystemTimer_HDI()`

Definition at line 62 of file `system_Timer_HDI.c`.

8.36.2.8 void Sys_Stop_SystemTimer_HDI () [inline]

Activates the Timer2 Interrupt

This Function activates the Timer2 Interrupt

Definition at line 76 of file `system_Timer_HDI.c`.

8.36.2.9 void Sys_todo_SystemTimer () [inline]

This function is executed periodically by the system timer interrupt

This function is executed periodically by the system timer interrupt. It kills all zombies, executes event handlers and executes the scheduling algorithm.

Definition at line 79 of file `system_Timer.c`.

8.36.3 Variable Documentation

8.36.3.1 pFunction sys_process_scheduler

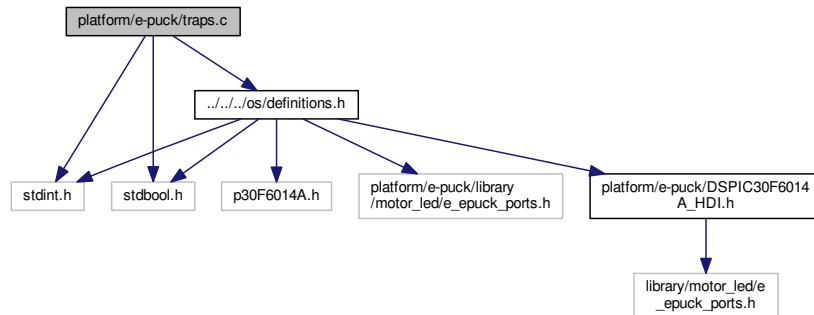
Definition at line 27 of file `system_Timer_HDI.c`.

8.37 platform/e-puck/traps.c File Reference

Hardware dependent implementations to catch hardware traps.

```
#include <stdint.h>
#include <stdbool.h>
#include "../os/definitions.h"
```

Include dependency graph for traps.c:



Functions

- void `__attribute__` ((interrupt, no_auto_psv))

8.37.1 Detailed Description

Hardware dependent implementations to catch hardware traps.

Author

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Version

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Date

07 July 2014

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8.37.2 Function Documentation

8.37.2.1 void `__attribute__` ((interrupt, no_auto_psv))

Address error trap.

This function is called when an address error occurs. That means that a call address of a function or in the stack addresses an area outside the memory. Similarly, if a pointer points to memory outside the range, this trap happens.

Stack error trap.

This function is called when an stack error occurs. That means that the stack pointer, stack pointer limit, or frame pointer are pointing outside their range.

Math error trap.

This function is called when an math error occurs. That means an illegal math operation was performed (such as division by 0 or NaN).

Alternative Oscillator fail trap.

This function is called when an oscillator fail occurs. This should never happen.

Alternative address error trap.

This function is called when an address error occurs. That means that a call address of a function or in the stack addresses an area outside the memory. Similarly, if a pointer points to memory outside the range, this trap happens.

Alternative stack error trap.

This function is called when an stack error occurs. That means that the stack pointer, stack pointer limit, or frame pointer are pointing outside their range.

Alternative math error trap.

This function is called when an math error occurs. That means an illegal math operation was performed (such as division by 0 or NaN).

Default interrupt service routine.

This function is called when no other interrupt routine is specified.

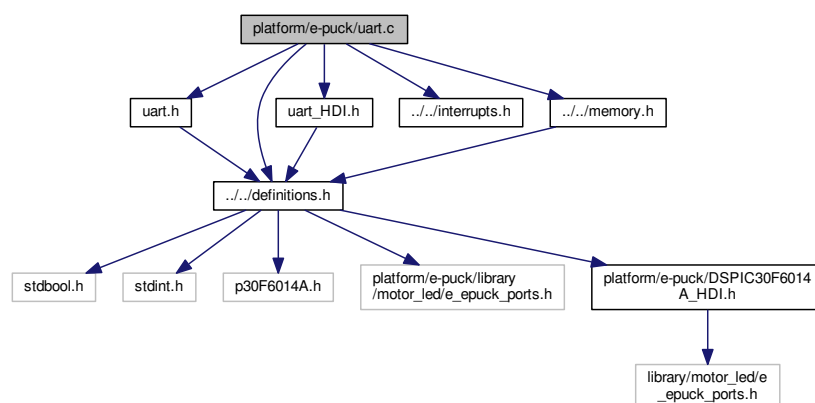
Definition at line 68 of file traps.c.

8.38 platform/e-puck/uart.c File Reference

This file includes functions needed to transmit data via uart(1 & 2).

```
#include "uart.h"
#include "uart_HDI.h"
#include "../definitions.h"
#include "../interrupts.h"
#include "../memory.h"
```

Include dependency graph for uart.c:



Macros

- `#define SYS_UART1_BAUDRATE 115000`
- `#define SYS_UART2_BAUDRATE 115000`

Functions

- void [Sys_Init_UART1](#) (void)
- void [Sys_Init_UART2](#) (void)
- void [Sys_Start_UART1](#) (void)
- void [Sys_Start_UART2](#) (void)
- void [Sys_SetReadingFunction_UART1](#) (pUART_reader func)
- void [Sys_SetReadingFunction_UART2](#) (pUART_reader func)
- void [Sys_Writeto_UART1](#) (void *data, uint16 length)
- void [Sys_Writeto_UART2](#) (void *data, uint16 length)

8.38.1 Detailed Description

This file includes functions needed to transmit data via uart(1 & 2).

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Version

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Date

27 August 2015

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8.38.2 Macro Definition Documentation

8.38.2.1 `#define SYS_UART1_BAUDRATE 115000`

Baudrate for UART 1 (bits/s)

Definition at line 24 of file uart.c.

8.38.2.2 `#define SYS_UART2_BAUDRATE 115000`

Baudrate for UART 2 (bits/s)

Definition at line 25 of file uart.c.

8.38.3 Function Documentation

8.38.3.1 `void Sys_Init_UART1 (void) [inline]`

Initialises UART1

This function initialises UART1.

Definition at line 34 of file uart.c.

8.38.3.2 void Sys_Init_UART2 (void) [inline]

Initialises UART2

This function initialises UART2.

Definition at line 44 of file uart.c.

8.38.3.3 void Sys_SetReadingFunction_UART1 (pUART_reader func)

defines a function that processes received bytes (UART1)

defines a function that processes received bytes (UART1). This defined callback function is only executed once by arrival of one byte.

Parameters

<i>in</i>	<i>func</i>	pointer to the function that should process the received byte(s).
-----------	-------------	---

Definition at line 79 of file uart.c.

8.38.3.4 void Sys_SetReadingFunction_UART2 (pUART_reader func)

defines a function that processes received bytes (UART2)

defines a function that processes received bytes (UART2). This defined callback function is only executed once by arrival of one byte.

Parameters

<i>in</i>	<i>func</i>	pointer to the function that should process the received byte(s).
-----------	-------------	---

Definition at line 90 of file uart.c.

8.38.3.5 void Sys_Start_UART1 (void) [inline]

starts UART1

This function starts UART1.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 56 of file uart.c.

8.38.3.6 void Sys_Start_UART2 (void) [inline]

starts UART2

This function starts UART2.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 68 of file uart.c.

8.38.3.7 void Sys_Writeto_UART1 (void * data, uint16 length)

writes a set of bytes to UART1

This function writes sequentially the bytes on the UART1.

Note

The data will be put into a queue, where it will be sent as soon as the UART is idle

Parameters

in	<i>data</i>	pointer to the bytes that should be transmitted.
in	<i>length</i>	number of bytes to send.

Definition at line 104 of file uart.c.

8.38.3.8 void Sys_Writeto_UART2 (void * *data*, uint16 *length*)

writes a set of bytes to UART2

This function writes sequentially the bytes on the UART2.

Note

The data will be put into a queue, where it will be sent as soon as the UART is idle

Parameters

in	<i>data</i>	pointer to the bytes that should be transmitted.
in	<i>length</i>	number of bytes to send.

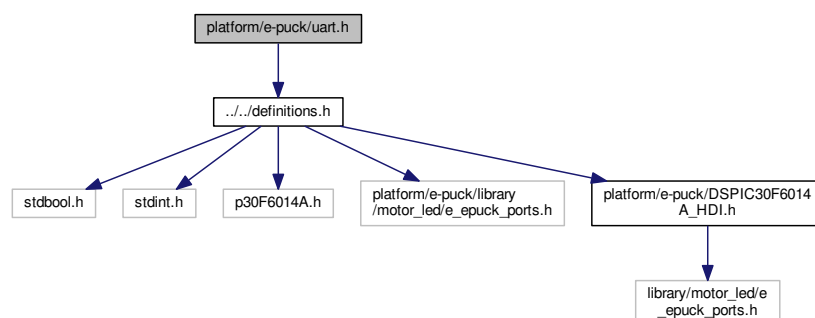
Definition at line 144 of file uart.c.

8.39 platform/e-puck/uart.h File Reference

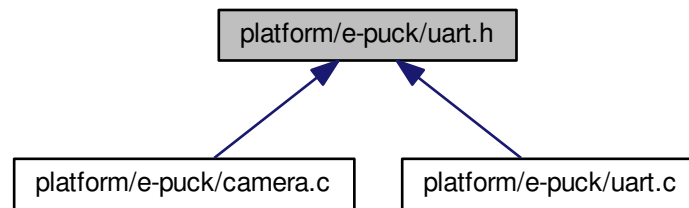
This file includes functions needed to transmit data via uart(1 & 2).

```
#include "../definitions.h"
```

Include dependency graph for uart.h:



This graph shows which files directly or indirectly include this file:



Functions

- void [Sys_Init_UART1](#) (void)
- void [Sys_Init_UART2](#) (void)
- void [Sys_Start_UART1](#) (void)
- void [Sys_Start_UART2](#) (void)
- void [Sys_SetReadingFunction_UART1](#) (pUART_reader func)
- void [Sys_SetReadingFunction_UART2](#) (pUART_reader func)
- void [Sys_Writeto_UART1](#) (void *data, uint16 length)
- void [Sys_Writeto_UART2](#) (void *data, uint16 length)

8.39.1 Detailed Description

This file includes functions needed to transmit data via uart(1 & 2).

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Version

1.0

Date

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8.39.2 Function Documentation

8.39.2.1 void Sys_Init_UART1 (void) [inline]

Initialises UART1

This function initialises UART1.

Definition at line 34 of file uart.c.

8.39.2.2 void Sys_Init_UART2 (void) [inline]

Initialises UART2

This function initialises UART2.

Definition at line 44 of file uart.c.

8.39.2.3 void Sys_SetReadingFunction_UART1 (pUART_reader func)

defines a function that processes received bytes (UART1)

defines a function that processes received bytes (UART1). This defined callback function is only executed once by arrival of one byte.

Parameters

<i>in</i>	<i>func</i>	pointer to the function that should process the received byte(s).
-----------	-------------	---

Definition at line 79 of file uart.c.

8.39.2.4 void Sys_SetReadingFunction_UART2 (pUART_reader func)

defines a function that processes received bytes (UART2)

defines a function that processes received bytes (UART2). This defined callback function is only executed once by arrival of one byte.

Parameters

<i>in</i>	<i>func</i>	pointer to the function that should process the received byte(s).
-----------	-------------	---

Definition at line 90 of file uart.c.

8.39.2.5 void Sys_Start_UART1 (void) [inline]

starts UART1

This function starts UART1.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 56 of file uart.c.

8.39.2.6 void Sys_Start_UART2 (void) [inline]

starts UART2

This function starts UART2.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 68 of file uart.c.

8.39.2.7 void Sys_Writeto_UART1 (void * data, uint16 length)

writes a set of bytes to UART1

This function writes sequentially the bytes on the UART1.

Note

The data will be put into a queue, where it will be sent as soon as the UART is idle

Parameters

in	<i>data</i>	pointer to the bytes that should be transmitted.
in	<i>length</i>	number of bytes to send.

Definition at line 104 of file uart.c.

8.39.2.8 void Sys_Writeto_UART2 (void * *data*, uint16 *length*)

writes a set of bytes to UART2

This function writes sequentially the bytes on the UART2.

Note

The data will be put into a queue, where it will be sent as soon as the UART is idle

Parameters

in	<i>data</i>	pointer to the bytes that should be transmitted.
in	<i>length</i>	number of bytes to send.

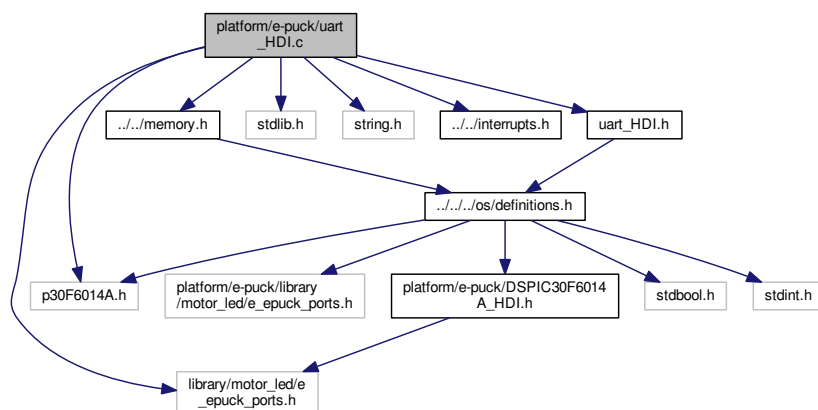
Definition at line 144 of file uart.c.

8.40 platform/e-puck/uart_HDI.c File Reference

Hardware dependent implementations to control the message flow of the UART interface.

```
#include "uart_HDI.h"
#include <p30F6014A.h>
#include <stdlib.h>
#include <string.h>
#include "library/motor_led/e_epuck_ports.h"
#include "../interrupts.h"
#include "../memory.h"
```

Include dependency graph for uart_HDI.c:



Functions

- void [Sys_Init_UART1_HDI](#) (void)
- void [Sys_Init_UART2_HDI](#) (void)
- void [Sys_Start_UART1_HDI](#) (void)
- void [Sys_Start_UART2_HDI](#) (void)
- void [__attribute__](#) ((interrupt, auto_psv))
- void [Sys_Read_UART1_ISR](#) ()
- void [Sys_Write_UART1_ISR](#) ()
- void [Sys_Read_UART2_ISR](#) ()
- void [Sys_Write_UART2_ISR](#) ()

Variables

- [pUART_reader read_uart_1](#) = 0
- [pUART_reader read_uart_2](#) = 0
- [sys_uart_txdata * sys_UART1_TX_data](#) = 0
- [sys_uart_txdata * sys_UART2_TX_data](#) = 0
- [uint16 byte_counter_uart1](#) = 0
- [uint16 byte_counter_uart2](#) = 0

8.40.1 Detailed Description

Hardware dependent implementations to control the message flow of the UART interface.

Author

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Version

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Date

27 August 2015

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8.40.2 Function Documentation

8.40.2.1 void [__attribute__](#) ((interrupt, auto_psv))

UART1 reading interrupt

UART1 reading interrupt.

Alternative UART1 reading interrupt

Alternative UART1 reading interrupt.

UART1 writing interrupt

UART1 writing interrupt.

Alternative UART1 writing interrupt

Alternative UART1 writing interrupt.

UART2 reading interrupt

UART2 reading interrupt.

Alternative UART2 reading interrupt

Alternative UART2 reading interrupt.

UART2 writing interrupt

UART2 writing interrupt.

Alternative UART2 writing interrupt

Alternative UART2 writing interrupt.

Definition at line 143 of file uart_HDI.c.

8.40.2.2 void Sys_Init_UART1_HDI (void)

Initialises UART1

This function initialises UART1.

Definition at line 45 of file uart_HDI.c.

8.40.2.3 void Sys_Init_UART2_HDI (void)

Initialises UART2

This function initialises UART2.

Definition at line 83 of file uart_HDI.c.

8.40.2.4 void Sys_Read_UART1_ISR () [inline]

UART1 reading function

This function is executed at occurrence of the UART1 reading interrupt.

Definition at line 228 of file uart_HDI.c.

8.40.2.5 void Sys_Read_UART2_ISR () [inline]

UART2 reading function

This function is executed at occurrence of the UART2 reading interrupt.

Definition at line 288 of file uart_HDI.c.

8.40.2.6 void Sys_Start_UART1_HDI (void)

starts UART2

This function starts UART2.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 111 of file uart_HDI.c.

8.40.2.7 void Sys_Start_UART2_HDI (void)

starts UART2

This function starts UART2.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 128 of file uart_HDI.c.

8.40.2.8 void Sys_Write_UART1_ISR () [inline]

UART1 writing function

This function is executed at occurrence of the UART1 writing interrupt.

Definition at line 249 of file uart_HDI.c.

8.40.2.9 void Sys_Write_UART2_ISR () [inline]

UART1 writing function

This function is executed at occurrence of the UART1 writing interrupt.

Definition at line 309 of file uart_HDI.c.

8.40.3 Variable Documentation

8.40.3.1 uint16 byte_counter_uart1 = 0

Bytes that were written

Definition at line 36 of file uart_HDI.c.

8.40.3.2 uint16 byte_counter_uart2 = 0

Bytes that were written

Definition at line 37 of file uart_HDI.c.

8.40.3.3 pUART_reader read_uart_1 = 0

pointer to the functions that processes incoming bytes from UART1

Definition at line 30 of file uart_HDI.c.

8.40.3.4 pUART_reader read_uart_2 = 0

pointer to the functions that processes incoming bytes from UART2

Definition at line 31 of file uart_HDI.c.

8.40.3.5 sys_uart_txdata* sys_UART1_TX_data = 0

Linked list of messages that need to be sent via UART1

Definition at line 33 of file uart_HDI.c.

8.40.3.6 `sys_uart_txdata* sys_UART2_TX_data = 0`

Linked list of messages that need to be sent via UART2

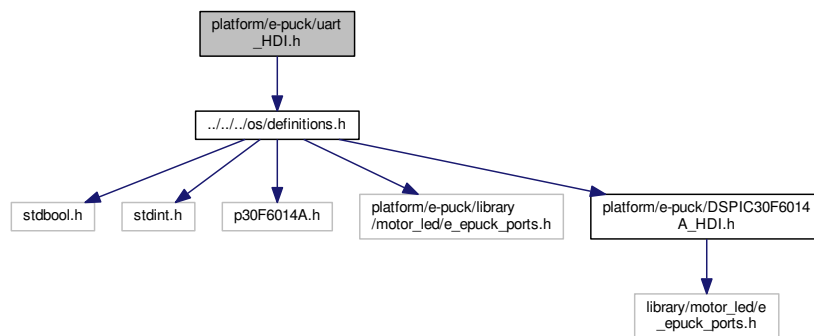
Definition at line 34 of file `uart_HDI.c`.

8.41 platform/e-puck/uart_HDI.h File Reference

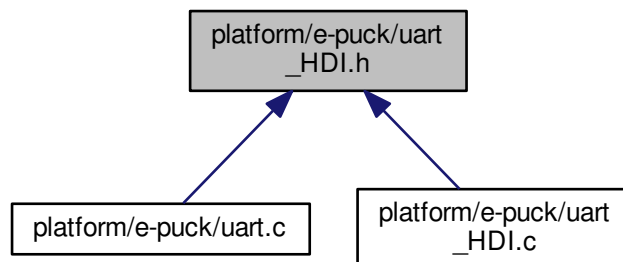
Hardware dependent implementations to control the message flow of the UART interface.

```
#include "../..../definitions.h"
```

Include dependency graph for `uart_HDI.h`:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [sys_uart_tx_data_s](#)
Linked list element to store transmission data.

Macros

- `#define` [UART1_RX_RF2](#)

- `#define UART1_TX_RF3`
- `#define UART2_RX_RF4`
- `#define UART2_TX_RF5`
- `#define UART1_RX_DIR_TRISF2`
- `#define UART1_TX_DIR_TRISF3`
- `#define UART2_RX_DIR_TRISF4`
- `#define UART2_TX_DIR_TRISF5`
- `#define SYS_UART1_BAUDRATE 115000`
- `#define SYS_UART2_BAUDRATE 115000`

Typedefs

- typedef struct `sys_uart_tx_data_s` `sys_uart_txdata`
Linked list element to store transmission data.

Functions

- void `Sys_Init_UART1_HDI` (void)
- void `Sys_Init_UART2_HDI` (void)
- void `Sys_Start_UART1_HDI` (void)
- void `Sys_Start_UART2_HDI` (void)
- void `Sys_Read_UART1_ISR` ()
- void `Sys_Write_UART1_ISR` ()
- void `Sys_Read_UART2_ISR` ()
- void `Sys_Write_UART2_ISR` ()

Variables

- `sys_uart_txdata` * `sys_UART1_TX_data`
- `sys_uart_txdata` * `sys_UART2_TX_data`
- uint16 `byte_counter_uart1`
- uint16 `byte_counter_uart2`
- pUART_reader `read_uart_1`
- pUART_reader `read_uart_2`

8.41.1 Detailed Description

Hardware dependent implementations to control the message flow of the UART interface.

Author

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Version

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Date

27 August 2015

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8.41.2 Macro Definition Documentation

8.41.2.1 `#define SYS_UART1_BAUDRATE 115000`

Baud rate for UART1

Definition at line 38 of file uart_HDI.h.

8.41.2.2 `#define SYS_UART2_BAUDRATE 115000`

Baud rate for UART2

Definition at line 39 of file uart_HDI.h.

8.41.2.3 `#define UART1_RX_RF2`

Used port on the microcontroller to read from the UART1

Definition at line 28 of file uart_HDI.h.

8.41.2.4 `#define UART1_RX_DIR_TRISF2`

direction of the used port on the microcontroller (reading from the UART1)

Definition at line 33 of file uart_HDI.h.

8.41.2.5 `#define UART1_TX_RF3`

Used port on the microcontroller to write on the UART1

Definition at line 29 of file uart_HDI.h.

8.41.2.6 `#define UART1_TX_DIR_TRISF3`

direction of the used port on the microcontroller (writing from the UART1)

Definition at line 34 of file uart_HDI.h.

8.41.2.7 `#define UART2_RX_RF4`

Used port on the microcontroller to read from the UART2

Definition at line 30 of file uart_HDI.h.

8.41.2.8 `#define UART2_RX_DIR_TRISF4`

direction of the used port on the microcontroller (reading from the UART2)

Definition at line 35 of file uart_HDI.h.

8.41.2.9 `#define UART2_TX_RF5`

Used port on the microcontroller to write on the UART2

Definition at line 31 of file uart_HDI.h.

8.41.2.10 `#define UART2_TX_DIR_TRISF5`

direction of the used port on the microcontroller (writing from the UART2)

Definition at line 36 of file `uart_HDI.h`.

8.41.3 Typedef Documentation

8.41.3.1 `typedef struct sys_uart_tx_data_s sys_uart_txdata`

Linked list element to store transmission data.

It is a single linked list containing a set of bytes that should be sent via UART.

8.41.4 Function Documentation

8.41.4.1 `void Sys_Init_UART1_HDI (void)`

Initialises UART1

This function initialises UART1.

Definition at line 45 of file `uart_HDI.c`.

8.41.4.2 `void Sys_Init_UART2_HDI (void)`

Initialises UART2

This function initialises UART2.

Definition at line 83 of file `uart_HDI.c`.

8.41.4.3 `void Sys_Read_UART1_ISR () [inline]`

UART1 reading function

This function is executed at occurrence of the UART1 reading interrupt.

Definition at line 228 of file `uart_HDI.c`.

8.41.4.4 `void Sys_Read_UART2_ISR () [inline]`

UART2 reading function

This function is executed at occurrence of the UART2 reading interrupt.

Definition at line 288 of file `uart_HDI.c`.

8.41.4.5 `void Sys_Start_UART1_HDI (void)`

starts UART2

This function starts UART2.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 111 of file `uart_HDI.c`.

8.41.4.6 void Sys_Start_UART2_HDI (void)

starts UART2

This function starts UART2.

Note

When executed this function, bytes can be received or transmitted at any time.

Definition at line 128 of file uart_HDI.c.

8.41.4.7 void Sys_Write_UART1_ISR () [inline]

UART1 writing function

This function is executed at occurrence of the UART1 writing interrupt.

Definition at line 249 of file uart_HDI.c.

8.41.4.8 void Sys_Write_UART2_ISR () [inline]

UART1 writing function

This function is executed at occurrence of the UART1 writing interrupt.

Definition at line 309 of file uart_HDI.c.

8.41.5 Variable Documentation**8.41.5.1 uint16 byte_counter_uart1**

Bytes that were written

Definition at line 36 of file uart_HDI.c.

8.41.5.2 uint16 byte_counter_uart2

Bytes that were written

Definition at line 37 of file uart_HDI.c.

8.41.5.3 pUART_reader read_uart_1

pointer to the functions that processes incoming bytes from UART1

Definition at line 30 of file uart_HDI.c.

8.41.5.4 pUART_reader read_uart_2

pointer to the functions that processes incoming bytes from UART2

Definition at line 31 of file uart_HDI.c.

8.41.5.5 sys_uart_txdata* sys_UART1_TX_data

Linked list of messages that need to be sent via UART1

Definition at line 33 of file uart_HDI.c.

- `sys_pcb_list_element * sys_running_process = 0`
- `sys_pcb_list_element * sys_blocked_processes = 0`
- `sys_pcb_list_element * sys_zombies = 0`
- `sys_occurred_event * sys_occurred_events = 0`

8.42.1 Detailed Description

This file includes all functions which are needed to manage data structures needed by the processes management.

Author

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Version

1.0

Date

08 July 2014

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8.42.2 Function Documentation

8.42.2.1 void Sys_Clear_EventData (sys_event_data ** data) [inline]

This function removes and frees a list of `sys_event_data`

This function removes and frees a list of `sys_event_data`

Parameters

<i>in, out</i>	<i>data</i>	pointer to the <code>event_data</code> (list)
----------------	-------------	---

Returns

void

Definition at line 219 of file `data.c`.

8.42.2.2 void Sys_Clear_EventRegister (sys_pcb_list_element * element) [inline]

This function clears and frees all elements of a process

This function clears and frees all elements of a process. The process is also unsubscribed from any event, because an empty event register cannot handle any events.

Parameters

<i>in, out</i>	<i>element</i>	pointer to the <code>pcb</code> of the process
----------------	----------------	--

Returns

void

Definition at line 241 of file `data.c`.

8.42.2.3 void Sys_Delete_Process (sys_pcb_list_element * element)

This function deletes container elements

This function deletes container elements. Warning: this function only deletes the process. All the elements which are linked with next are lost in memory, if you haven't take care of that on advance.

Parameters

in	<i>element</i>	pointer to the element which should be deleted
----	----------------	--

Returns

void

Definition at line 264 of file data.c.

8.42.2.4 sys_pcb_list_element* Sys_Find_Process (uint16 pid) [inline]

This function return the pointer to the PCB of process with pid

This function return the pointer to the PCB of process with pid

Parameters

in	<i>pid</i>	process ID
----	------------	------------

Returns

void

Definition at line 108 of file data.c.

8.42.2.5 void Sys_Insert_Process_to_List (sys_pcb_list_element * process, sys_pcb_list_element ** list)

This function inserts a process into a process list.

This function inserts a process into a process list. Note: The elements are sorted (process ID)

Parameters

in	<i>process</i>	the process struct
in, out	<i>**list</i>	the process list which has to be seached

Returns

void

Definition at line 318 of file data.c.

8.42.2.6 sys_process_event_handler* Sys_Next_EventHandler (sys_process_event_handler * list, uint16 eventID) [inline]

This function searches (sequentially) all event handler for an event (eventID)

This function searches (sequentially) all event handler for an event (eventID). The list contains a list of eventhandler and this function return the first occurrence of eventID. To search the list entirely, use the function on a list and after resulting an element use the same function on the next element (sublist).

Parameters

in	<i>list</i>	list of event handler
in	<i>eventID</i>	The Id of the event which can put the process (PID) back on the ready list

Returns

sys_process_event_handler * pointer to the next event handler for the event (eventID) in list (0 if not found)

Definition at line 145 of file data.c.

8.42.2.7 sys_process_event_handler* Sys_Remove_Event_from_EventRegister (uint16 eventID, pEventHandlerFunction func, sys_process_event_handler ** list) [inline]

This function removes subscribed handler function from event-handler list

This function removes subscribed handler function from event-handler list

Parameters

in	<i>eventID</i>	Identifier of the event that has to be removed
in	<i>func</i>	pointer to the subscribed handler function
in	<i>list</i>	list of event handlers

Returns

sys_process_event_handler * (New) top of the list (if changed)

Definition at line 174 of file data.c.

8.42.2.8 sys_pcb_list_element* Sys_Remove_Process_from_List (uint16 pID, sys_pcb_list_element ** list)

This function removed a pcb element from the list

This function seaches all elements of a process list and removes the processs pID from it. Note: The element is not deleted. The pointer to it is returned.

Parameters

in	<i>pID</i>	the process identifier
in, out	<i>**list</i>	the process list which has to be seached

Returns

sys_pcb_list_element* the pointer to the removed element

Definition at line 53 of file data.c.

8.42.2.9 bool Sys_Set_Defaults_PCB (sys_pcb * element, uint16 stacksize) [inline]

This function sets default values to the sys_process_control_block struct

This function sets the default values in a sys_process_control_block struct

Parameters

<i>in, out</i>	<i>element</i>	This is a pointer to a <code>sys_process_control_block</code> struct
<i>in</i>	<i>stacksize</i>	This is a <code>uint16</code> which represents the size of the stack which should be allocated for this process. The default value (=0) is in <code>DEFAULT_PROCESS_STACK_SIZE</code> .

Returns

void

Definition at line 285 of file `data.c`.

8.42.3 Variable Documentation**8.42.3.1 `sys_pcb_list_element* sys_blocked_processes = 0`**

pointer to the blocked process

Definition at line 34 of file `data.c`.

8.42.3.2 `sys_occurred_event* sys_occurred_events = 0`

pointer to the occurred events

Definition at line 36 of file `data.c`.

8.42.3.3 `sys_pcb_list_element* sys_ready_processes = 0`

pointer to the ready processes (linked list)

Definition at line 32 of file `data.c`.

8.42.3.4 `sys_pcb_list_element* sys_running_process = 0`

pointer to the running process

Definition at line 33 of file `data.c`.

8.42.3.5 `sys_pcb_list_element* sys_zombies = 0`

pointer to the zombie process

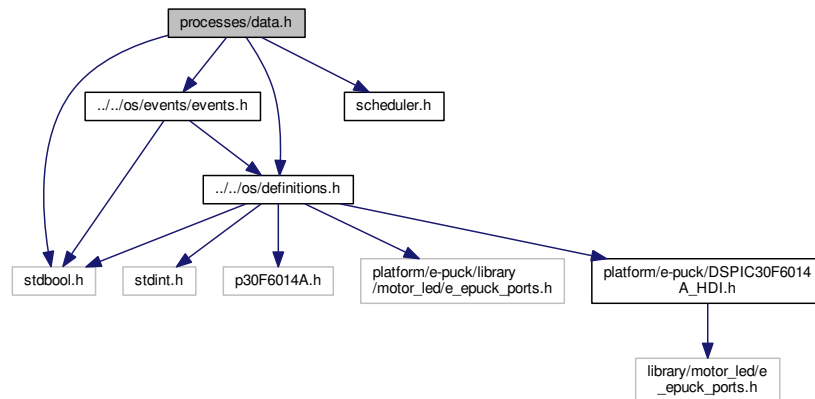
Definition at line 35 of file `data.c`.

8.43 `processes/data.h` File Reference

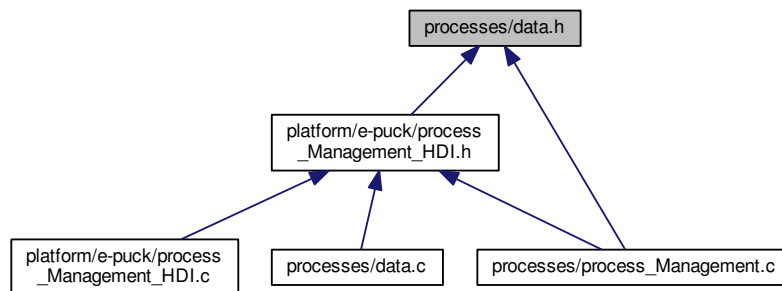
This file includes all functions which are needed to manage data structures needed by the processes management.

```
#include <stdbool.h>
#include "../os/definitions.h"
#include "../os/events/events.h"
#include "scheduler.h"
```

Include dependency graph for data.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [sys_occurred_event_s](#)
Linked list element containing an occurred events.
- struct [sys_process_event_handler_s](#)
Double linked list element of process event-handlers.
- struct [sys_process_control_block_s](#)
Process Control Block for a single process.
- struct [sys_process_control_block_list_element_s](#)
Double linked list element containing sys_process_control_block.

Typedefs

- typedef struct [sys_occurred_event_s](#) [sys_occurred_event](#)
Linked list element containing an occurred events.
- typedef struct [sys_process_event_handler_s](#) [sys_process_event_handler](#)
Double linked list element of process event-handlers.

- typedef struct `sys_process_event_handler_s` `sys_peh`
- typedef struct `sys_process_control_block_s` `sys_process_control_block`
Process Control Block for a single process.
- typedef struct `sys_process_control_block_s` `sys_pcb`
- typedef struct `sys_process_control_block_list_element_s` `sys_process_control_block_list_element`
Double linked list element containing `sys_process_control_block`.
- typedef struct `sys_process_control_block_list_element_s` `sys_pcb_list_element`

Functions

- `sys_pcb_list_element *` `Sys_Find_Process` (`uint16` pid)
- `sys_pcb_list_element *` `Sys_Remove_Process_from_List` (`uint16` pID, `sys_pcb_list_element **`list)
- void `Sys_Delete_Process` (`sys_pcb_list_element *`element)
- bool `Sys_Set_Defaults_PCB` (`sys_process_control_block *`element, `uint16` stacksize)
- void `Sys_Insert_Process_to_List` (`sys_pcb_list_element *`process, `sys_pcb_list_element **`list)
- `sys_process_event_handler *` `Sys_Next_EventHandler` (`sys_process_event_handler *`list, `uint16` eventID)
- void `Sys_Clear_EventRegister` (`sys_pcb_list_element *`element)
- void `Sys_Clear_EventData` (`sys_event_data **`data)
- `sys_process_event_handler *` `Sys_Find_EventHandler` (`sys_process_event_handler *`process, `uint16` eventID)
- `sys_process_event_handler *` `Sys_Remove_Event_from_EventRegister` (`uint16` eventID, `pEventHandler`←
Function func, `sys_process_event_handler **`list)

Variables

- `sys_pcb_list_element *` `sys_ready_processes`
- `sys_pcb_list_element *` `sys_running_process`
- `sys_pcb_list_element *` `sys_blocked_processes`
- `sys_pcb_list_element *` `sys_zombies`
- `sys_occurred_event *` `sys_occurred_events`

8.43.1 Detailed Description

This file includes all functions which are needed to manage data structures needed by the processes management.

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Version

1.0

Date

08 July 2014

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8.43.2 Typedef Documentation

8.43.2.1 typedef struct `sys_occurred_event_s` `sys_occurred_event`

Linked list element containing an occurred events.

It is a single linked list element that stores the id on an occurred event.

8.43.2.2 typedef struct `sys_process_control_block_s` `sys_pcb`

8.43.2.3 typedef struct `sys_process_control_block_list_element_s` `sys_pcb_list_element`

8.43.2.4 typedef struct `sys_process_event_handler_s` `sys_peh`

8.43.2.5 typedef struct `sys_process_control_block_s` `sys_process_control_block`

Process Control Block for a single process.

It contains all information related to a single process. (including stack pointer, frame pointer, stack, etc.)

8.43.2.6 typedef struct `sys_process_control_block_list_element_s` `sys_process_control_block_list_element`

Double linked list element containing `sys_process_control_block`.

It is a double linked list element containing the PCB of a process

8.43.2.7 typedef struct `sys_process_event_handler_s` `sys_process_event_handler`

Double linked list element of process event-handlers.

It is a double linked list containing all information needed to decide if the event-handler should be executed for an occurred event or not. It sores the pointer to the handler the condition function and data.

8.43.3 Function Documentation

8.43.3.1 void `Sys_Clear_EventData (sys_event_data ** data)` `[inline]`

This function removes and frees a list of `sys_event_data`

This function removes and frees a list of `sys_event_data`

Parameters

<code>in, out</code>	<code>data</code>	pointer to the <code>event_data</code> (list)
----------------------	-------------------	---

Returns

void

Definition at line 219 of file `data.c`.

8.43.3.2 void `Sys_Clear_EventRegister (sys_pcb_list_element * element)` `[inline]`

This function clears and frees all elements of a process

This function clears and frees all elements of a process. The process is also unsubscribed from any event, because and empty event register cannot handle any events.

Parameters

<i>in, out</i>	<i>element</i>	pointer to the pcb of the process
----------------	----------------	-----------------------------------

Returns

void

Definition at line 241 of file data.c.

8.43.3.3 void Sys_Delete_Process (sys_pcb_list_element * *element*)

This function deletes container elements

This function deletes container elements. Warning: this function only deletes the process. All the elements which are linked with next are lost in memory, if you haven't take care of that on advance.

Parameters

<i>in</i>	<i>element</i>	pointer to the element which should be deleted
-----------	----------------	--

Returns

void

Definition at line 264 of file data.c.

8.43.3.4 sys_process_event_handler* Sys_Find_EventHandler (sys_process_event_handler * *process*, uint16 *eventID*) [inline]**8.43.3.5 sys_pcb_list_element* Sys_Find_Process (uint16 *pid*) [inline]**

This function return the pointer to the PCB of process with pid

This function return the pointer to the PCB of process with pid

Parameters

<i>in</i>	<i>pid</i>	process ID
-----------	------------	------------

Returns

void

Definition at line 108 of file data.c.

8.43.3.6 void Sys_Insert_Process_to_List (sys_pcb_list_element * *process*, sys_pcb_list_element ** *list*)

This function inserts a process into a process list.

This function inserts a process into a process list. Note: The elements are sorted (process ID)

Parameters

<i>in</i>	<i>process</i>	the process struct
-----------	----------------	--------------------

<i>in, out</i>	<i>**list</i>	the process list which has to be seached
----------------	----------------------	--

Returns

void

Definition at line 318 of file data.c.

8.43.3.7 **sys_process_event_handler*** Sys_Next_EventHandler (**sys_process_event_handler *** *list*, **uint16** *eventID*) **[inline]**

This function searches (sequentially) all event handler for an event (eventID)

This function searches (sequentially) all event handler for an event (eventID). The list contains a list of eventhandler and this function return the first occurrence of eventID. To search the list entirely, use the function on a list and after resulting an element use the same function on the next element (sublist).

Parameters

<i>in</i>	<i>list</i>	list of event handler
<i>in</i>	<i>eventID</i>	The Id of the event which can put the process (PID) back on the ready list

Returns

sys_process_event_handler * pointer to the next event handler for the event (eventID) in list (0 if not found)

Definition at line 145 of file data.c.

8.43.3.8 **sys_process_event_handler*** Sys_Remove_Event_from_EventRegister (**uint16** *eventID*, **pEventHandlerFunction** *func*, **sys_process_event_handler **** *list*) **[inline]**

This function removes subscribed handler function from event-handler list

This function removes subscribed handler function from event-handler list

Parameters

<i>in</i>	<i>eventID</i>	Identifier of the event that has to be removed
<i>in</i>	<i>func</i>	pointer to the subscribed handler function
<i>in</i>	<i>list</i>	list of event handlers

Returns

sys_process_event_handler * (New) top of the list (if changed)

Definition at line 174 of file data.c.

8.43.3.9 **sys_pcb_list_element*** Sys_Remove_Process_from_List (**uint16** *pID*, **sys_pcb_list_element **** *list*)

This function removed a pcb element from the list

This function seaches all elements of a process list and removes the processs pID from it. Note: The element is not deleted. The pointer to it is returned.

Parameters

<i>in</i>	<i>pID</i>	the process identifier
<i>in, out</i>	<i>**list</i>	the process list which has to be seached

Returns

`sys_pcb_list_element*` the pointer to the removed element

Definition at line 53 of file data.c.

8.43.3.10 `bool Sys_Set_Defaults_PCB (sys_pcb * element, uint16 stacksize) [inline]`

This function sets default values to the `sys_process_control_block` struct

This function sets the default values in a `sys_process_control_block` struct

Parameters

<i>in, out</i>	<i>element</i>	This is a pointer to a <code>sys_process_control_block</code> struct
<i>in</i>	<i>stacksize</i>	This is a <code>uint16</code> which represents the size of the stack which should be allocated for this process. The default value (=0) is in <code>DEFAULT_PROCESS_STACK↵_SIZE</code> .

Returns

`void`

Definition at line 285 of file data.c.

8.43.4 Variable Documentation

8.43.4.1 `sys_pcb_list_element* sys_blocked_processes`

pointer to the blocked process

Definition at line 34 of file data.c.

8.43.4.2 `sys_occurred_event* sys_occurred_events`

pointer to the occurred events

Definition at line 36 of file data.c.

8.43.4.3 `sys_pcb_list_element* sys_ready_processes`

pointer to the ready processes (linked list)

Definition at line 32 of file data.c.

8.43.4.4 `sys_pcb_list_element* sys_running_process`

pointer to the running process

Definition at line 33 of file data.c.

8.43.4.5 sys_pcb_list_element* sys_zombies

pointer to the zombie process

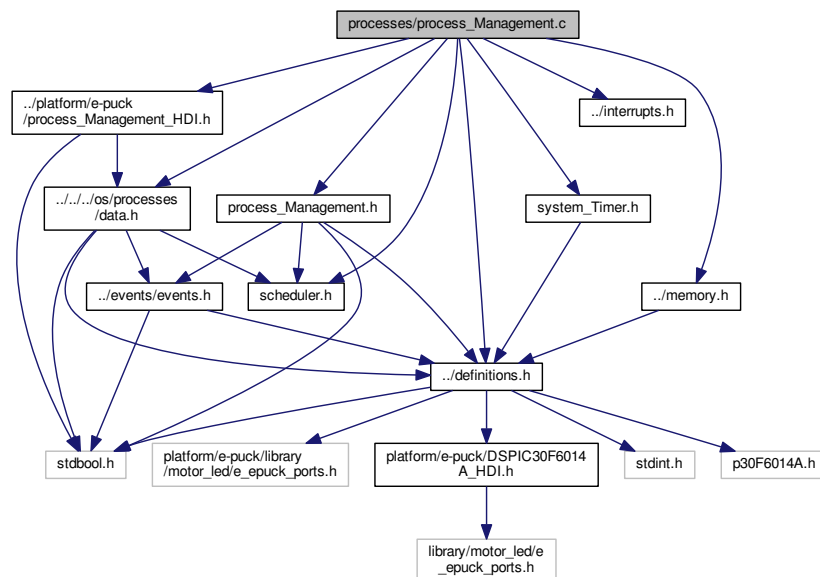
Definition at line 35 of file data.c.

8.44 processes/process_Management.c File Reference

This file includes all functions which are needed to manage processes (e.g. task switching)

```
#include "process_Management.h"
#include "../platform/e-puck/process_Management_HDI.h"
#include "data.h"
#include "scheduler.h"
#include "system_Timer.h"
#include "../interrupts.h"
#include "../memory.h"
#include "../definitions.h"
```

Include dependency graph for process_Management.c:



Functions

- void [Sys_Block_Process](#) (uint16 pid, uint16 eventID, [pConditionFunction](#) condition)
- bool [Sys_Continue_Pocess](#) (uint16 pid, uint16 eventID, [sys_event_data](#) *data)
- void [Sys_Set_Running_Process_to_Zombie](#) ()
- void [Sys_Init_Process_Management](#) ()
- unsigned short [Sys_Get_Number_Processes](#) ()
- bool [Sys_Start_Process](#) (pFunction function)
- void [Sys_Kill_Process](#) (uint16 pid)
- void [Sys_Kill_Zombies](#) ()
- void [Sys_Switch_Process](#) (uint16 pid)
- void [Sys_Switch_to_next_Process](#) ()
- void [Sys_Start_CriticalSection](#) (void)

- void `Sys_End_CriticalSection` (void)
- bool `Sys_Add_Event_Subscription` (uint16 pid, uint16 eventID, pEventHandlerFunction func, pConditionFunction cond)
- void `Sys_Add_Event_to_Process` (uint16 pid, uint16 eventID, void *data, uint16 length)
- void `Sys_Execute_Events_in_ProcessList` (uint16 eventID, sys_pcb_list_element *elements)
- void `Sys_Execute_All_EventHandler` ()
- void `Sys_Interprocess_EventHandling` ()
- void `Sys_Remove_All_Event_Subscriptions` (uint16 eventID)
- void `Sys_Remove_Event_Subscription` (uint16 pid, uint16 eventID, pEventHandlerFunction func)
- sys_event_data * `Sys_Wait_For_Condition` (uint16 eventID, pConditionFunction function)
- sys_event_data * `Sys_Wait_For_Event` (uint16 eventID)
- void `Sys_Yield` ()

8.44.1 Detailed Description

This file includes all functions which are needed to manage processes (e.g. task switching)

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Version

1.0

Date

{08 July 2014}

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8.44.2 Function Documentation

8.44.2.1 bool Sys_Add_Event_Subscription (uint16 pid, uint16 eventID, pEventHandlerFunction func, pConditionFunction cond)

Puts a process on the blocked list and stops its execution (if it's executed)

Puts a process on the blocked list and stops its execution (if it's executed)

Parameters

in	<i>pid</i>	Process ID
in	<i>eventID</i>	The Id of the event which can put the process (PID) back on the ready list
in	<i>func</i>	The function that handles the event
in	<i>cond</i>	The condition under which the handler is executed

Returns

bool Was the event-handler successfully added?

Definition at line 336 of file process_Management.c.

8.44.2.2 void Sys_Add_Event_to_Process (uint16 pid, uint16 eventID, void * data, uint16 length)

This function adds the event-data to the local list of the process (pid).

This function adds the event-data to the local list of the process (pid).

Parameters

in	<i>pid</i>	process identifier
in	<i>eventID</i>	event identifier
in	<i>data</i>	memory that contains the value of the occurred event
in	<i>length</i>	length of the data (bytes)

Definition at line 390 of file process_Management.c.

8.44.2.3 void Sys_Block_Process (uint16 *pid*, uint16 *eventID*, pConditionFunction *condition*)

Puts a process on the blocked list and stops its execution (if it's executed)

Puts a process on the blocked list and stops its execution (if it's executed)

Parameters

in	<i>pid</i>	Process ID
in	<i>eventID</i>	The Id of the event which can put the process (PID) back on the ready list
in	<i>condition</i>	the condition under which the process is released

Definition at line 260 of file process_Management.c.

8.44.2.4 bool Sys_Continue_Pocess (uint16 *pid*, uint16 *eventID*, sys_event_data * *data*)

Puts a process on the ready list

Puts a process with the process ID (PID) back on the ready list. Consequently the process can be executed again.

Parameters

in	<i>pid</i>	Process ID
in	<i>eventID</i>	Event ID
in	<i>data</i>	pointer to the data of the event

Definition at line 290 of file process_Management.c.

8.44.2.5 void Sys_End_CriticalSection (void) [inline]

Ends a critical section

This Function ends a critical section. The task-scheduling can now occure. Note: if a critical section was started once or more, it only takes a single call of this function to end all critical sections.

Definition at line 242 of file process_Management.c.

8.44.2.6 void Sys_Execute_All_EventHandler () [inline]

This function executes all event handlers and processes stored event data

This function executes all event handlers and processes stored event data. First it checks the list of occurred events and then it executes all event handlers of these events

Definition at line 507 of file process_Management.c.

8.44.2.7 void Sys_Execute_Events_in_ProcessList (uint16 *eventID*, sys_pcb_list_element * *elements*) [inline]

This function executes all event handlers and processes stored event data

This function executes all event handlers and processes stored event data. First it checks the list of occurred events and then it executes all event handlers of these events

Parameters

in	<i>eventID</i>	event identifier
in	<i>elements</i>	list of processes

Definition at line 480 of file process_Management.c.

8.44.2.8 unsigned short Sys_Get_Number_Processes (void) [inline]

This function counts the number of process

This function counts the number of process

Definition at line 65 of file process_Management.c.

8.44.2.9 void Sys_Init_Process_Management (void) [inline]

This function initialises the process management

This function initialises the process management and creates the first elements in the linked list

Definition at line 55 of file process_Management.c.

8.44.2.10 void Sys_Interprocess_EventHandling ()

This function starts the execution of the event handler and resets the execution time of the process

This function starts the execution of the event handler and resets the execution time of the process

Definition at line 531 of file process_Management.c.

8.44.2.11 void Sys_Kill_Process (uint16 pid) [inline]

This function kills a process

This function deletes the syss_process_control_block element and stops a process

Parameters

in	<i>pid</i>	This argument is the process identifier
----	------------	---

Definition at line 103 of file process_Management.c.

8.44.2.12 void Sys_Kill_Zombies (void) [inline]

This function kills all zombie process

This function deletes all processes which are marked as zombies.

Definition at line 180 of file process_Management.c.

8.44.2.13 void Sys_Remove_All_Event_Subscriptions (uint16 eventID)

This function removes all subscriptions of any process to event (eventID)

This function removes all subscriptions of any process to event (eventID)

.

Parameters

in	<i>eventID</i>	Identifier of the event that has to be removed
----	----------------	--

Definition at line 547 of file process_Management.c.

8.44.2.14 void Sys_Remove_Event_Subscription (uint16 *pid*, uint16 *eventID*, pEventHandlerFunction *func*)

This function removes subscribed handler function for process (*pid*) to event (*eventID*)

This function removes subscribed handler function for process (*pid*) to event (*eventID*)

Parameters

in	<i>pid</i>	Identifier of the process
in	<i>eventID</i>	Identifier of the event that has to be removed
in	<i>func</i>	pointer to the subscribed handler function

Definition at line 565 of file process_Management.c.

8.44.2.15 void Sys_Set_Running_Process_to_Zombie ()

This function puts the running process in the zombie list and switches content to the next ready process

This function puts the running process in the zombie list and switches content to the next ready process

Definition at line 137 of file process_Management.c.

8.44.2.16 void Sys_Start_CriticalSection (void) [inline]

Starts a critical section

This Function starts a critical section to prevent the task-scheduling during its execution

Definition at line 232 of file process_Management.c.

8.44.2.17 bool Sys_Start_Process (pFunction *function*) [inline]

This function creates a new sys_process_control_block and add all needed info

This function creates a new sys_process_control_block (in a sys_process_control_block_list_element) which contains all information which is used to execute this process.

Parameters

in	<i>function</i>	This argument points to a function in memory which should be executed as a new task
----	-----------------	---

Definition at line 92 of file process_Management.c.

8.44.2.18 void Sys_Switch_Process (uint16 *pid*)

This function loads all values into the registers of a process with the PID

This function loads all values into the registers of a process with the PID

Parameters

<i>in</i>	<i>pid</i>	process id
-----------	------------	------------

Definition at line 199 of file process_Management.c.

8.44.2.19 void Sys_Switch_to_next_Process (void)

This function loads all values into the registers of the process which is next in the list.

This function loads all values into the registers of the process which is next in the list.

Definition at line 218 of file process_Management.c.

8.44.2.20 sys_event_data* Sys_Wait_For_Condition (uint16 eventID, pConditionFunction function)

This function blocks the current process.

This function blocks the current process while waiting for an event that sends data which meet the condition.

Parameters

<i>in</i>	<i>eventID</i>	Identifier of the event that need to occur
<i>in</i>	<i>function</i>	Pointer to the function that represents the condition function (return true if condition is met and continues the process). If function = 0 .. condition is always met.

Returns

sys_event_data * Pointer to the event data struct that contains the values carried by the event

Definition at line 589 of file process_Management.c.

8.44.2.21 sys_event_data* Sys_Wait_For_Event (uint16 eventID) [inline]

This function blocks the current process.

This function blocks the current process and waits for the occurrence of event (eventID).

Parameters

<i>eventID</i>	ID of the event
----------------	-----------------

Returns

sys_event_data* Pointer to the event data struct that contains the values carried by the event

Definition at line 626 of file process_Management.c.

8.44.2.22 void Sys_Yield (void)

This function blocks the current process.

This function blocks the current process and let the next process be executed.

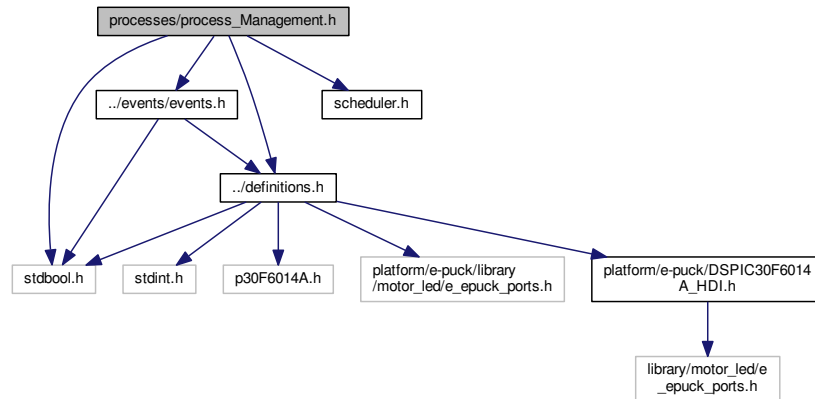
Definition at line 636 of file process_Management.c.

8.45 processes/process_Management.h File Reference

This file includes all functions wich are needed to manage processes (e.g. task creation, switching, termination)

```
#include <stdbool.h>
#include "../definitions.h"
#include "../events/events.h"
#include "scheduler.h"
```

Include dependency graph for process_Management.h:



This graph shows which files directly or indirectly include this file:



Macros

- `#define` [DEFAULT_PROCESS_STACK_SIZE](#) 200

Functions

- void [Sys_Switch_Process](#) (uint16 pid)
- void [Sys_Switch_to_next_Process](#) (void)
- bool [Sys_Start_Process](#) (pFunction function)
- void [Sys_Kill_Process](#) (uint16 pid)
- void [Sys_Kill_Zombies](#) (void)
- void [Sys_Yield](#) (void)
- void [Sys_Init_Process_Management](#) (void)
- unsigned short [Sys_Get_Number_Processes](#) (void)
- void [Sys_Start_CriticalSection](#) (void)
- void [Sys_End_CriticalSection](#) (void)
- bool [Sys_Add_Event_Subscription](#) (uint16 pid, uint16 eventID, pEventHandlerFunction func, pConditionFunction cond)
- void [Sys_Remove_Event_Subscription](#) (uint16 pid, uint16 eventID, pEventHandlerFunction func)
- void [Sys_Remove_All_Event_Subscriptions](#) (uint16 eventID)
- void [Sys_Add_Event_to_Process](#) (uint16 pid, uint16 eventID, void *data, uint16 length)
- void [Sys_Execute_All_EventHandler](#) ()
- void [Sys_Clear_EventData](#) (sys_event_data **data)

- `sys_event_data * Sys_Wait_For_Event (uint16 eventID)`
- `sys_event_data * Sys_Wait_For_Condition (uint16 eventID, pConditionFunction function)`

8.45.1 Detailed Description

This file includes all functions which are needed to manage processes (e.g. task creation, switching, termination)

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

08 July 2014

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8.45.2 Macro Definition Documentation

8.45.2.1 `#define DEFAULT_PROCESS_STACK_SIZE 200`

process default stack size

Definition at line 110 of file `process_Management.h`.

8.45.3 Function Documentation

8.45.3.1 `bool Sys_Add_Event_Subscription (uint16 pid, uint16 eventID, pEventHandlerFunction func, pConditionFunction cond)`

Puts a process on the blocked list and stops its execution (if it's executed)

Puts a process on the blocked list and stops its execution (if it's executed)

Parameters

in	<i>pid</i>	Process ID
in	<i>eventID</i>	The Id of the event which can put the process (PID) back on the ready list
in	<i>func</i>	The function that handles the event
in	<i>cond</i>	The condition under which the handler is executed

Returns

bool Was the event-handler successfully added?

Definition at line 336 of file `process_Management.c`.

8.45.3.2 `void Sys_Add_Event_to_Process (uint16 pid, uint16 eventID, void * data, uint16 length)`

This function adds the event-data to the local list of the process (pid).

This function adds the event-data to the local list of the process (pid).

Parameters

in	<i>pid</i>	process identifier
in	<i>eventID</i>	event identifier
in	<i>data</i>	memory that contains the value of the occurred event
in	<i>length</i>	length of the data (bytes)

Definition at line 390 of file process_Management.c.

8.45.3.3 void Sys_Clear_EventData (sys_event_data ** data) [inline]

This function removes and frees a list of sys_event_data

This function removes and frees a list of sys_event_data

Parameters

in, out	<i>data</i>	pointer to the event_data (list)
---------	-------------	----------------------------------

Returns

void

Definition at line 219 of file data.c.

8.45.3.4 void Sys_End_CriticalSection (void) [inline]

Ends a critical section

This Function ends a critical section. The task-scheduling can now occure. Note: if a critical section was started once or more, it only takes a single call of this function to end all critical sections.

Definition at line 242 of file process_Management.c.

8.45.3.5 void Sys_Execute_All_EventHandler () [inline]

This function executes all event handlers and processes stored event data

This function executes all event handlers and processes stored event data. First it checks the list of occurred events and then it executes all event handlers of these events

Definition at line 507 of file process_Management.c.

8.45.3.6 unsigned short Sys_Get_Number_Processes (void) [inline]

This function counts the number of process

This function counts the number of process

Definition at line 65 of file process_Management.c.

8.45.3.7 void Sys_Init_Process_Management (void) [inline]

This function initialises the process management

This function initialises the process management and creates the first elements in the linked list

Definition at line 55 of file process_Management.c.

8.45.3.8 void Sys_Kill_Process (uint16 *pid*) [inline]

This function kills a process

This function deletes the `sys_process_control_block` element and stops a process

Parameters

<i>in</i>	<i>pid</i>	This argument is the process identifier
-----------	------------	---

Definition at line 103 of file `process_Management.c`.

8.45.3.9 void Sys_Kill_Zombies (void) [inline]

This function kills all zombie process

This function deletes all processes which are marked as zombies.

Definition at line 180 of file `process_Management.c`.

8.45.3.10 void Sys_Remove_All_Event_Subscriptions (uint16 *eventID*)

This function removes all subscriptions of any process to event (*eventID*)

This function removes all subscriptions of any process to event (*eventID*)

Parameters

<i>in</i>	<i>eventID</i>	Identifier of the event that has to be removed
-----------	----------------	--

Definition at line 547 of file `process_Management.c`.

8.45.3.11 void Sys_Remove_Event_Subscription (uint16 *pid*, uint16 *eventID*, pEventHandlerFunction *func*)

This function removes subscribed handler function for process (*pid*) to event (*eventID*)

This function removes subscribed handler function for process (*pid*) to event (*eventID*)

Parameters

<i>in</i>	<i>pid</i>	Identifier of the process
<i>in</i>	<i>eventID</i>	Identifier of the event that has to be removed
<i>in</i>	<i>func</i>	pointer to the subscribed handler function

Definition at line 565 of file `process_Management.c`.

8.45.3.12 void Sys_Start_CriticalSection (void) [inline]

Starts a critical section

This Function starts a critical section to prevent the task-scheduling during its execution

Definition at line 232 of file `process_Management.c`.

8.45.3.13 bool Sys_Start_Process (pFunction *function*) [inline]

This function creates a new `sys_process_control_block` and add all needed info

This function creates a new `sys_process_control_block` (in a `sys_process_control_block_list_element`) which contains all information which is used to execute this process.

Parameters

<i>in</i>	<i>function</i>	This argument points to a function in memory which should be executed as an new task
-----------	-----------------	--

Definition at line 92 of file process_Management.c.

8.45.3.14 void Sys_Switch_Process (uint16 pid)

This function loads all values into the registers of a process with the PID

This function loads all values into the registers of a process with the PID

Parameters

<i>in</i>	<i>pid</i>	process id
-----------	------------	------------

Definition at line 199 of file process_Management.c.

8.45.3.15 void Sys_Switch_to_next_Process (void)

This function loads all values into the registers of the process which is next in the list.

This function loads all values into the registers of the process which is next in the list.

Definition at line 218 of file process_Management.c.

8.45.3.16 sys_event_data* Sys_Wait_For_Condition (uint16 eventID, pConditionFunction function)

This function blocks the current process.

This function blocks the current process while waiting for an event that sends data which meet the condition.

Parameters

<i>in</i>	<i>eventID</i>	Identifier of the event that need to occur
<i>in</i>	<i>function</i>	Pointer to the function that represents the condition function (return true if condition is met and continues the process). If function = 0 .. condition is always met.

Returns

sys_event_data * Pointer to the event data struct that contains the values carried by the event

Definition at line 589 of file process_Management.c.

8.45.3.17 sys_event_data* Sys_Wait_For_Event (uint16 eventID) [inline]

This function blocks the current process.

This function blocks the current process and waits for the occurrence of event (eventID).

Parameters

<i>eventID</i>	ID of the event
----------------	-----------------

Returns

sys_event_data* Pointer to the event data struct that contains the values carried by the event

Definition at line 626 of file process_Management.c.

8.45.3.18 void Sys_Yield (void)

This function blocks the current process.

This function blocks the current process and let the next process be executed.

Definition at line 636 of file process_Management.c.

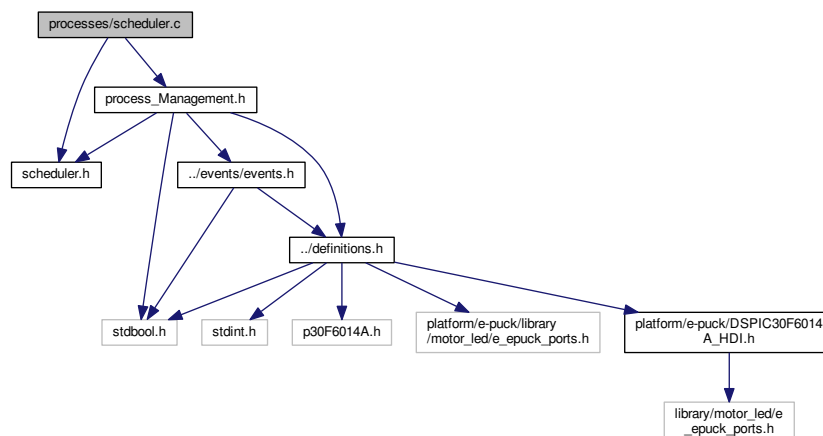
8.46 processes/scheduler.c File Reference

This file includes all functions wich are needed to specify a scheduling algorithm.

```
#include "scheduler.h"
```

```
#include "process_Management.h"
```

Include dependency graph for scheduler.c:



Functions

- void [Sys_Scheduler_RoundRobin](#) (void)
- void [Sys_Set_Defaults_Info](#) (sys_scheduler_info *sct)

8.46.1 Detailed Description

This file includes all functions wich are needed to specify a scheduling algorithm.

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Version

1.0

Date

{07 July 2014}

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8.46.2 Function Documentation

8.46.2.1 void Sys_Scheduler_RoundRobin (void)

This function represents the Scheduling algorithm

This function shows the implementation of the RoundRobin Scheduling algorithm

Definition at line 25 of file scheduler.c.

8.46.2.2 void Sys_Set_Defaults_Info (sys_scheduler_info * sct) [inline]

This function sets default values to the scheduling struct

This function sets the default values in a sys_scheduler_info struct

Parameters

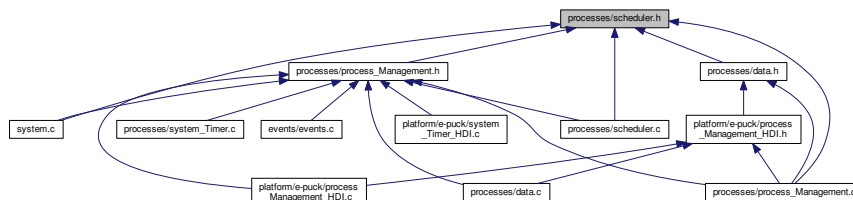
in, out	sct	This is a pointer to a sys_scheduler_info struct
---------	-----	--

Definition at line 47 of file scheduler.c.

8.47 processes/scheduler.h File Reference

This file includes all functions which are needed to specify a scheduling algorithm.

This graph shows which files directly or indirectly include this file:



Data Structures

- struct [sys_scheduler_info_s](#)
The scheduling information for each process.

Macros

- #define [SYS_PROCESS_STATE_BABY](#) 0xBABE
- #define [SYS_PROCESS_STATE_RUNNING](#) 0xFFFF
- #define [SYS_PROCESS_STATE_BLOCKED](#) 0xBCED
- #define [SYS_PROCESS_STATE_WAITING](#) 0x5555
- #define [SYS_PROCESS_STATE_ZOMBIE](#) 0xDEAD
- #define [SYS_PROCESS_PRIORITY_SYSTEM](#) 0xFFFF
- #define [SYS_PROCESS_PRIORITY_HIGH](#) 0x0FFF

- `#define SYS_PROCESS_PRIORITY_NORMAL 0x00FF`
- `#define SYS_PROCESS_PRIORITY_LOW 0x000F`

Typedefs

- typedef struct `sys_scheduler_info_s` `sys_scheduler_info`
The scheduling information for each process.

Functions

- void `Sys_Scheduler_RoundRobin` (void)
- void `Sys_Set_Defaults_Info` (`sys_scheduler_info` *sct)

8.47.1 Detailed Description

This file includes all functions which are needed to specify a scheduling algorithm.

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Version

1.0

Date

{07 July 2014}

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8.47.2 Macro Definition Documentation

8.47.2.1 `#define SYS_PROCESS_PRIORITY_HIGH 0x0FFF`

Definition at line 29 of file scheduler.h.

8.47.2.2 `#define SYS_PROCESS_PRIORITY_LOW 0x000F`

Definition at line 31 of file scheduler.h.

8.47.2.3 `#define SYS_PROCESS_PRIORITY_NORMAL 0x00FF`

Definition at line 30 of file scheduler.h.

8.47.2.4 `#define SYS_PROCESS_PRIORITY_SYSTEM 0xFFFF`

process priority values Process priority: System = highest

Definition at line 28 of file scheduler.h.

8.47.2.5 `#define SYS_PROCESS_STATE_BABY 0xBABE`

process state values State to indicate that a process is created but not yet ready to be executed

Definition at line 21 of file scheduler.h.

8.47.2.6 `#define SYS_PROCESS_STATE_BLOCKED 0xBCED`

State to indicate that a process is blocked and waits till an event occurs

Definition at line 23 of file scheduler.h.

8.47.2.7 `#define SYS_PROCESS_STATE_RUNNING 0xFFFF`

State to indicate that a process is executed

Definition at line 22 of file scheduler.h.

8.47.2.8 `#define SYS_PROCESS_STATE_WAITING 0x5555`

State to indicate that a process is waiting to be executed

Definition at line 24 of file scheduler.h.

8.47.2.9 `#define SYS_PROCESS_STATE_ZOMBIE 0xDEAD`

State to indicate that a process is about to be deleted

Definition at line 25 of file scheduler.h.

8.47.3 Typedef Documentation

8.47.3.1 `typedef struct sys_scheduler_info_s sys_scheduler_info`

The scheduling information for each process.

This struct defines all values wich are needed for the scheduling algorithm.

8.47.4 Function Documentation

8.47.4.1 `void Sys_Scheduler_RoundRobin (void)`

This function represents the Schedling algorithm

This function shows the implementation of the RoundRobin Scheduling algorithm

Definition at line 25 of file scheduler.c.

8.47.4.2 `void Sys_Set_Defaults_Info (sys_scheduler_info * sct) [inline]`

This function sets default values to the scheduling struct

This function sets the default values in a sys_scheduler_info struct

Parameters

<code>in, out</code>	<code>sct</code>	This is a pointer to a <code>sys_scheduler_info</code> struct
----------------------	------------------	---

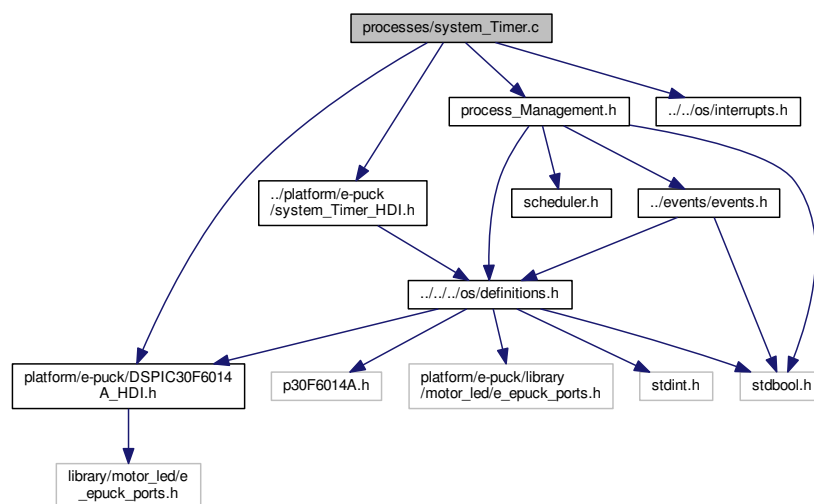
Definition at line 47 of file `scheduler.c`.

8.48 processes/system_Timer.c File Reference

This file includes all hardware dependent functions, which are necessary to initialise, configure and run the system Time.

```
#include "../platform/e-puck/system_Timer_HDI.h"
#include "process_Management.h"
#include "../platform/e-puck/DSPIC30F6014A_HDI.h"
#include "../../os/interrupts.h"
```

Include dependency graph for `system_Timer.c`:



Functions

- void `Sys_todo_SystemTimer` ()
- void `Sys_Init_SystemTimer` (pFunction scheduler)
- void `Sys_Start_SystemTimer` ()
- void `Sys_Stop_SystemTimer` ()
- void `Sys_Continue_SystemTimer` ()
- void `Sys_Reset_SystemTimer` ()
- void `Sys_Disable_TimerInterrupt` (void)
- void `Sys_Enable_TimerInterrupt` (void)
- void `Sys_Force_TimerInterrupt` (void)

8.48.1 Detailed Description

This file includes all hardware dependent functions, which are necessary to initialise, configure and run the system Time.

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Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

{07 July 2014}

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8.48.2 Function Documentation**8.48.2.1 void Sys_Continue_SystemTimer () [inline]**

Deactivates the Timer1 Interrupt

This Function deactivated the Timer1 Interrupt

Definition at line 59 of file system_Timer.c.

8.48.2.2 void Sys_Disable_TimerInterrupt (void) [inline]

Disables the Timer1 interrupt

Disables the Timer1 interrupt and sets the interrupt flag to 0

Definition at line 101 of file system_Timer.c.

8.48.2.3 void Sys_Enable_TimerInterrupt (void) [inline]

Enables the Timer1 interrupt

Enables the Timer1 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 111 of file system_Timer.c.

8.48.2.4 void Sys_Force_TimerInterrupt (void) [inline]

Enables the Timer1 interrupt

Enables the Timer1 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 121 of file system_Timer.c.

8.48.2.5 void Sys_Init_SystemTimer (pFunction scheduler) [inline]

Function to initialise the system timer

This Function sets the Timer0 of the DSPIC 30F6014A for timer intervals of 10 ms. The timer will be startet with Start_SystemTimer_HDI()

Parameters

<code>in, out</code>	<code>scheduler</code>	This is a pointer to a callback function, which should be called whenever a timer interrupt is emitted.
----------------------	------------------------	---

Definition at line 28 of file `system_Timer.c`.

8.48.2.6 `void Sys_Reset_SystemTimer () [inline]`

Resets the Timer1 value to the initial value

This Function resets the Timer1 value

Definition at line 69 of file `system_Timer.c`.

8.48.2.7 `void Sys_Start_SystemTimer (void) [inline]`

Function to start the initialised system timer

This Function starts the Timer0 of the DSPIC 30F6014A for timer intervals of 10 ms. The MUST be initialised first with `Init_SystemTimer_HDI()`

Definition at line 39 of file `system_Timer.c`.

8.48.2.8 `void Sys_Stop_SystemTimer () [inline]`

Activates the Timer1 Interrupt

This Function activated the Timer1 Interrupt

Definition at line 49 of file `system_Timer.c`.

8.48.2.9 `void Sys_todo_SystemTimer () [inline]`

This function is executed periodically by the system timer interrupt

This function is executed periodically by the system timer interrupt. It kills all zombies, executes event handlers and executes the scheduling algorithm.

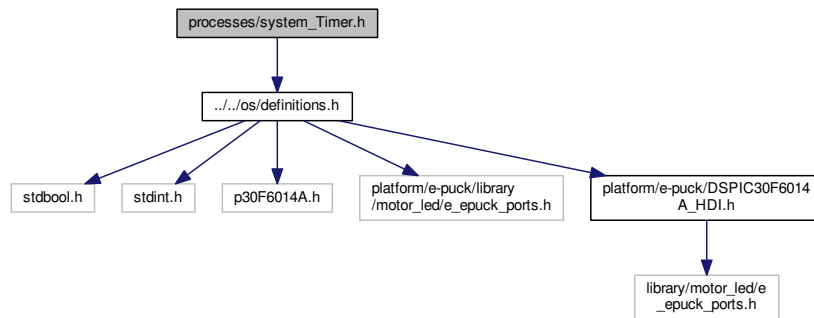
Definition at line 79 of file `system_Timer.c`.

8.49 `processes/system_Timer.h` File Reference

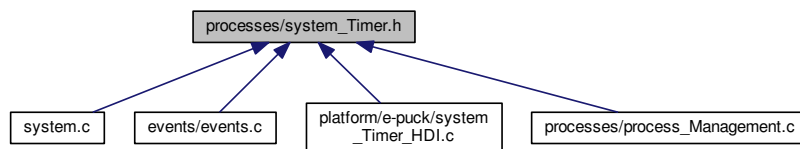
This file includes all hardware dependent functions, which are necessary to initialise, configure and run the system Time.

```
#include "../../os/definitions.h"
```

Include dependency graph for system_Timer.h:



This graph shows which files directly or indirectly include this file:



Functions

- void [Sys_Init_SystemTimer](#) (pFunction)
- void [Sys_Start_SystemTimer](#) (void)
- void [Sys_Stop_SystemTimer](#) ()
- void [Sys_Continue_SystemTimer](#) ()
- void [Sys_Disable_TimerInterrupt](#) (void)
- void [Sys_Enable_TimerInterrupt](#) (void)
- void [Sys_Force_TimerInterrupt](#) (void)
- void [Sys_Reset_SystemTimer](#) ()
- void [Sys_todo_SystemTimer](#) ()

8.49.1 Detailed Description

This file includes all hardware dependent functions, which are necessary to initialise, configure and run the system Time.

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8.49.2 Function Documentation

8.49.2.1 void Sys_Continue_SystemTimer () [inline]

Deactivates the Timer1 Interrupt

This Function deactivated the Timer1 Interrupt

Definition at line 59 of file system_Timer.c.

8.49.2.2 void Sys_Disable_TimerInterrupt (void) [inline]

Disables the Timer1 interrupt

Disables the Timer1 interrupt and sets the interrupt flag to 0

Definition at line 101 of file system_Timer.c.

8.49.2.3 void Sys_Enable_TimerInterrupt (void) [inline]

Enables the Timer1 interrupt

Enables the Timer1 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 111 of file system_Timer.c.

8.49.2.4 void Sys_Force_TimerInterrupt (void) [inline]

Enables the Timer1 interrupt

Enables the Timer1 interrupt and leaves the interrupt flag to its value. If the flag was set, the Timer1 interrupt will be emitted after executing this function.

Definition at line 121 of file system_Timer.c.

8.49.2.5 void Sys_Init_SystemTimer (pFunction scheduler) [inline]

Function to initialise the system timer

This Function sets the Timer0 of the DSPIC 30F6014A for timer intervals of 10 ms. The timer will be startet with Start_SystemTimer_HDI()

Parameters

<code>in, out</code>	<code>scheduler</code>	This is a pointer to a callback function, which should be called whenever a timer interrupt is emitted.
----------------------	------------------------	---

Definition at line 28 of file system_Timer.c.

8.49.2.6 void Sys_Reset_SystemTimer () [inline]

Resets the Timer1 value to the initial value

This Function resets the Timer1 value

Definition at line 69 of file system_Timer.c.

8.49.2.7 void Sys_Start_SystemTimer (void) [inline]

Function to starts the initialised system timer

This Function starts the Timer0 of the DSPIC 30F6014A for timer intervals of 10 ms. The MUST be initialised first with Init_SystemTimer_HDI()

Definition at line 39 of file system_Timer.c.

8.49.2.8 void Sys_Stop_SystemTimer () [inline]

Activates the Timer1 Interrupt

This Function activated the Timer1 Interrupt

Definition at line 49 of file system_Timer.c.

8.49.2.9 void Sys_todo_SystemTimer () [inline]

This function is executed periodically by the system timer interrupt

This function is executed periodically by the system timer interrupt. It kills all zombies, executes event handlers and executes the scheduling algorithm.

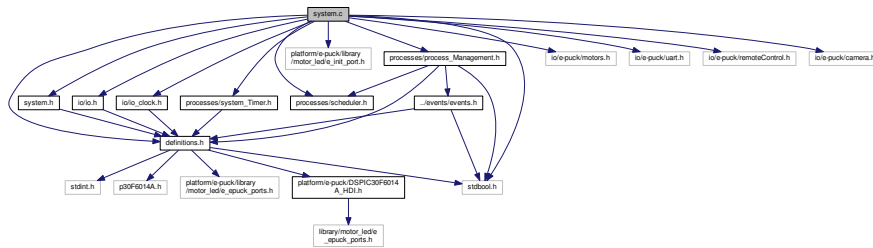
Definition at line 79 of file system_Timer.c.

8.50 system.c File Reference

defines functions to initialise and start OpenSwarm.

```
#include "definitions.h"
#include "system.h"
#include "processes/system_Timer.h"
#include "processes/scheduler.h"
#include "processes/process_Management.h"
#include "platform/e-puck/library/motor_led/e_init_port.h"
#include "io/io.h"
#include "io/io_clock.h"
#include "io/e-puck/motors.h"
#include "io/e-puck/uart.h"
#include "io/e-puck/remoteControl.h"
#include "io/e-puck/camera.h"
```

Include dependency graph for system.c:



Functions

- void [Sys_Init_Kernel](#) ()
- void [Sys_Start_Kernel](#) (void)

8.50.1 Detailed Description

defines functions to initialise and start OpenSwarm.

Author

Stefan M. Trenkwalder s.trenkwalder@openswarm.org

Version

1.0

Date

2015

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In short, Openswarm can be executed as shown in the following example

```

#include "os/system.h"

int main(void) {
    //initialise some global or local variables

    Sys_Init_Kernel();

    //do some preperation before executing OpenSwarm and user applications

    Sys_Start_Kernel();
    while(1) {
        //do nothing
    }
}

```

8.50.2 Function Documentation

8.50.2.1 void Sys_Init_Kernel (void)

Function to initialise the hardware

This Function sets the system Timer (Timer0) and sets an scheduling algorithm. It also intitalises I/O devices (e.g. if e-puck is used: motor, UART, remote control, and camera)

Postcondition

To start OpenSwarm, [Sys_Start_Kernel\(\)](#) mast be executed after the initialisation.

Remarks

Code can be executed between initialisation and start of the kernel. But, note that you can only execute code that does not depend on an active OpenSwarm.

Definition at line 64 of file system.c.

8.50.2.2 void Sys_Start_Kernel (void)

Function to start the the system timer

This Function starts all functions of the operating system. The system MUST HAVE BEEN INITIALISED before.

Precondition

System must be initialised with [Sys_Init_Kernel\(\)](#).

Remarks

Code can be executed between initialisation and start of the kernel. But, note that you can only execute code that does not depend on an active OpenSwarm.

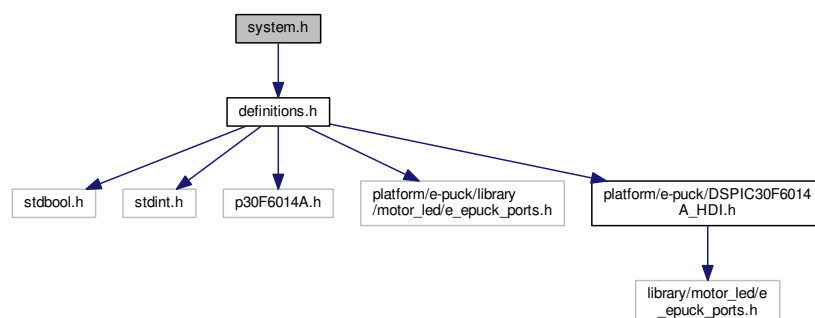
Definition at line 104 of file system.c.

8.51 system.h File Reference

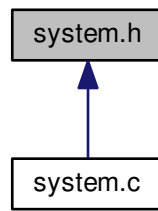
declares functions to initialise and start OpenSwarm.

```
#include "definitions.h"
```

Include dependency graph for system.h:



This graph shows which files directly or indirectly include this file:



Macros

- `#define SYS_MOTOR_USED`
- `#define SYS_UART1_USED`
- `#define SYS_REMOTECONTROL_USED`
- `#define SYS_CAMERA_USED`

Functions

- `void Sys_Init_Kernel (void)`
- `void Sys_Start_Kernel (void)`

8.51.1 Detailed Description

declares functions to initialise and start OpenSwarm.

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8.51.2 Macro Definition Documentation

8.51.2.1 `#define SYS_CAMERA_USED`

Define this preprocessor symbol to use the camera

Definition at line 88 of file system.h.

8.51.2.2 `#define SYS_MOTOR_USED`

Define this preprocessor symbol to use motors

Definition at line 85 of file system.h.

8.51.2.3 `#define SYS_REMOTECONTROL_USED`

Define this preprocessor symbol to receive remote control signals

Definition at line 87 of file system.h.

8.51.2.4 `#define SYS_UART1_USED`

Define this preprocessor symbol to use UART1

Definition at line 86 of file system.h.

8.51.3 Function Documentation

8.51.3.1 `void Sys_Init_Kernel (void)`

Function to initialise the hardware

This Function sets the system Timer (Timer0) and sets an scheduling algorithm. It also intitalises I/O devices (e.g. if e-puck is used: motor, UART, remote control, and camera)

Postcondition

To start OpenSwarm, [Sys_Start_Kernel\(\)](#) must be executed after the initialisation.

Remarks

Code can be executed between initialisation and start of the kernel. But, note that you can only execute code that does not depend on an active OpenSwarm.

Definition at line 64 of file system.c.

8.51.3.2 `void Sys_Start_Kernel (void)`

Function to start the the system timer

This Function starts all functions of the operating system. The system MUST HAVE BEEN INITIALISED before.

Precondition

System must be initialised with [Sys_Init_Kernel\(\)](#).

Remarks

Code can be executed between initialisation and start of the kernel. But, note that you can only execute code that does not depend on an active OpenSwarm.

Definition at line 104 of file system.c.

Index

- __attribute__
 - io_HDI.c, [124](#)
 - remoteControl_HDI.c, [155](#)
 - system_Timer_HDI.c, [161](#)
 - traps.c, [166](#)
 - uart_HDI.c, [174](#)
- ADDRESS_AITV_ADDRESS_ERROR
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_AITV_MATH_ERROR
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_AITV_OSC_FAIL
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_AITV_STACK_ERROR
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_AIVT
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_AIVT_T1
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_ITV_ADDRESS_ERROR
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_ITV_MATH_ERROR
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_ITV_OSC_FAIL
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_ITV_STACK_ERROR
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_IVT
 - DSPIC30F6014A_HDI.h, [102](#)
- ADDRESS_IVT_T1
 - DSPIC30F6014A_HDI.h, [103](#)
- ALL_FUNCTIONS
 - definitions.h, [53](#)
- BLACK
 - definitions.h, [60](#)
- BLUE
 - definitions.h, [60](#)
- BLUE_MAX
 - camera.c, [90](#)
- BLUE_THRESHOLD
 - camera.c, [90](#)
- Base, [13](#)
- blue
 - sys_rgb_pixel_s, [47](#)
- brushedColorFromRGB565
 - camera_processing.c, [98](#)
 - camera_processing.h, [100](#)
- buffered_data
 - sys_process_event_handler_s, [45](#)
- byte_counter_uart1
 - uart_HDI.c, [176](#)
 - uart_HDI.h, [181](#)
- byte_counter_uart2
 - uart_HDI.c, [176](#)
 - uart_HDI.h, [181](#)
- CAM_H_SIZE
 - camera.c, [90](#)
- CAM_HEIGHT
 - camera.c, [90](#)
- CAM_W_SIZE
 - camera.c, [90](#)
- CAM_WIDTH
 - camera.c, [90](#)
- CAM_ZOOM_X
 - camera.c, [90](#)
- CAM_ZOOM_Y
 - camera.c, [90](#)
- CAMERA_I2C_ADDRESS
 - camera.c, [91](#)
- CBP_BI
 - camera_processing.c, [97](#)
- CBP_DI
 - camera_processing.c, [97](#)
- CBP_GI
 - camera_processing.c, [97](#)
- CBP_RI
 - camera_processing.c, [97](#)
- CBP_WI
 - camera_processing.c, [97](#)
- COLOUR_THRESHOLD
 - camera.c, [91](#)
- CP_BI
 - camera.c, [91](#)
 - camera_processing.c, [97](#)
- CP_GI
 - camera.c, [91](#)
 - camera_processing.c, [97](#)
- CP_RI
 - camera.c, [91](#)
 - camera_processing.c, [97](#)
- CP_WGB_I
 - camera_processing.c, [98](#)
- CP_WI
 - camera.c, [91](#)
 - camera_processing.c, [98](#)
- CYAN
 - definitions.h, [60](#)
- Camera Module, [21](#)

- camera.c
 - BLUE_MAX, 90
 - BLUE_THRESHOLD, 90
 - CAM_H_SIZE, 90
 - CAM_HEIGHT, 90
 - CAM_W_SIZE, 90
 - CAM_WIDTH, 90
 - CAM_ZOOM_X, 90
 - CAM_ZOOM_Y, 90
 - CAMERA_I2C_ADDRESS, 91
 - COLOUR_THRESHOLD, 91
 - CP_BI, 91
 - CP_GI, 91
 - CP_RI, 91
 - CP_WI, 91
 - FRAME_HEIGHT, 91
 - FRAME_WIDTH, 91
 - GREEN_MAX, 91
 - GREEN_THRESHOLD, 91
 - RED_MAX, 92
 - RED_THRESHOLD, 92
 - Sys_Camera_PreProcessor, 92
 - Sys_Init_Camera, 92
 - Sys_Process_newFrame, 92
 - Sys_Process_newLine, 92
 - Sys_Process_newPixel, 92
 - Sys_Set_Preprocessing, 92
 - Sys_Start_Camera, 93
- camera.h
 - getFinishedFrame, 95
 - isNewFrameAvailable, 95
 - pCameraPreProcessor, 95
 - SYS_MAX_BLUE, 94
 - SYS_MAX_GREEN, 94
 - SYS_MAX_RED, 95
 - Sys_Init_Camera, 95
 - Sys_Set_Preprocessing, 95
 - Sys_Start_Camera, 95
 - sys_rgb, 95
 - sys_rgb_pixel, 95
- camera_processing.c
 - brushedColorFromRGB565, 98
 - CBP_BI, 97
 - CBP_DI, 97
 - CBP_GI, 97
 - CBP_RI, 97
 - CBP_WI, 97
 - CP_BI, 97
 - CP_GI, 97
 - CP_RI, 97
 - CP_WGB_I, 98
 - CP_WI, 98
 - colorBrushedPositions, 98
 - colorPositions, 99
 - convertRGB565ToRGB888, 98
 - getBrushedColorAt, 98
 - getRGB565at, 98
 - getRGB888at, 98
 - nearestNeighborRGB, 98
 - powerTbl, 99
- camera_processing.h
 - brushedColorFromRGB565, 100
 - convertRGB565ToRGB888, 100
 - getBrushedColorAt, 100
 - getRGB565at, 100
 - getRGB888at, 100
 - nearestNeighborRGB, 100
- colorBrushedPositions
 - camera_processing.c, 98
- colorPositions
 - camera_processing.c, 99
- condition
 - sys_process_event_handler_s, 45
- convertRGB565ToRGB888
 - camera_processing.c, 98
 - camera_processing.h, 100
- DEFAULT_PROCESS_STACK_SIZE
 - process_Management.h, 200
- DSPIC30F6014A_HDI.h
 - ADDRESS_AITV_ADDRESS_ERROR, 102
 - ADDRESS_AITV_MATH_ERROR, 102
 - ADDRESS_AITV_OSC_FAIL, 102
 - ADDRESS_AITV_STACK_ERROR, 102
 - ADDRESS_AIVT, 102
 - ADDRESS_AIVT_T1, 102
 - ADDRESS_ITV_ADDRESS_ERROR, 102
 - ADDRESS_ITV_MATH_ERROR, 102
 - ADDRESS_ITV_OSC_FAIL, 102
 - ADDRESS_ITV_STACK_ERROR, 102
 - ADDRESS_IVT, 102
 - ADDRESS_IVT_T1, 103
- data
 - sys_i2c_message_s, 40
 - sys_uart_tx_data_s, 49
- data.c
 - Sys_Clear_EventData, 183
 - Sys_Clear_EventRegister, 183
 - Sys_Delete_Process, 183
 - Sys_Find_Process, 184
 - Sys_Insert_Process_to_List, 184
 - Sys_Next_EventHandler, 184
 - Sys_Remove_Event_from_EventRegister, 185
 - Sys_Remove_Process_from_List, 185
 - Sys_Set_Defaults_PCB, 185
 - sys_blocked_processes, 186
 - sys_occurred_events, 186
 - sys_ready_processes, 186
 - sys_running_process, 186
 - sys_zombies, 186
- data.h
 - Sys_Clear_EventData, 189
 - Sys_Clear_EventRegister, 189
 - Sys_Delete_Process, 190
 - Sys_Find_EventHandler, 190
 - Sys_Find_Process, 190
 - Sys_Insert_Process_to_List, 190

- Sys_Next_EventHandler, [191](#)
- Sys_Remove_Event_from_EventRegister, [191](#)
- Sys_Remove_Process_from_List, [191](#)
- Sys_Set_Defaults_PCB, [192](#)
- sys_blocked_processes, [192](#)
- sys_occurred_event, [189](#)
- sys_occurred_events, [192](#)
- sys_pcb, [189](#)
- sys_pcb_list_element, [189](#)
- sys_peh, [189](#)
- sys_process_control_block, [189](#)
- sys_process_control_block_list_element, [189](#)
- sys_process_event_handler, [189](#)
- sys_ready_processes, [192](#)
- sys_running_process, [192](#)
- sys_zombies, [192](#)
- definitions.h, [51](#)
 - ALL_FUNCTIONS, [53](#)
 - BLACK, [60](#)
 - BLUE, [60](#)
 - CYAN, [60](#)
 - EPUCK_USED, [53](#)
 - GREEN, [60](#)
 - MAGENTA, [60](#)
 - pByteFunction, [59](#)
 - pFunction, [59](#)
 - pUART_reader, [59](#)
 - RC_BUTTON_0, [53](#)
 - RC_BUTTON_1, [54](#)
 - RC_BUTTON_2, [54](#)
 - RC_BUTTON_3, [54](#)
 - RC_BUTTON_4, [54](#)
 - RC_BUTTON_5, [54](#)
 - RC_BUTTON_6, [54](#)
 - RC_BUTTON_7, [54](#)
 - RC_BUTTON_8, [54](#)
 - RC_BUTTON_9, [54](#)
 - RC_BUTTON_BACK, [54](#)
 - RC_BUTTON_BLUE, [54](#)
 - RC_BUTTON_CHANNEL_DOWN, [54](#)
 - RC_BUTTON_CHANNEL_UP, [55](#)
 - RC_BUTTON_CURSOR_DOWN, [55](#)
 - RC_BUTTON_CURSOR_LEFT, [55](#)
 - RC_BUTTON_CURSOR_RIGHT, [55](#)
 - RC_BUTTON_CURSOR_UP, [55](#)
 - RC_BUTTON_EPG, [55](#)
 - RC_BUTTON_FAV, [55](#)
 - RC_BUTTON_GREEN, [55](#)
 - RC_BUTTON_INFO, [55](#)
 - RC_BUTTON_INTERNET, [55](#)
 - RC_BUTTON_LANG, [55](#)
 - RC_BUTTON_MENU, [55](#)
 - RC_BUTTON_MUTE, [56](#)
 - RC_BUTTON_OK, [56](#)
 - RC_BUTTON_PAUSE, [56](#)
 - RC_BUTTON_PLAY, [56](#)
 - RC_BUTTON_PRESETS, [56](#)
 - RC_BUTTON_RECORD, [56](#)
 - RC_BUTTON_RED, [56](#)
 - RC_BUTTON_REWIND, [56](#)
 - RC_BUTTON_SCREEN, [56](#)
 - RC_BUTTON_SLEEP, [56](#)
 - RC_BUTTON_SOURCE, [56](#)
 - RC_BUTTON_STANDBY, [56](#)
 - RC_BUTTON_STOP, [57](#)
 - RC_BUTTON_SUBTTL, [57](#)
 - RC_BUTTON_SWAP, [57](#)
 - RC_BUTTON_TELE_TEXT, [57](#)
 - RC_BUTTON_VOLUME_DOWN, [57](#)
 - RC_BUTTON_VOLUME_UP, [57](#)
 - RC_BUTTON_WIND, [57](#)
 - RC_BUTTON_YELLOW, [57](#)
 - RED, [60](#)
 - SYS_EVENT_1ms_CLOCK, [57](#)
 - SYS_EVENT_IO_CAMERA, [57](#)
 - SYS_EVENT_IO_MOTOR_LEFT, [57](#)
 - SYS_EVENT_IO_MOTOR_RIGHT, [57](#)
 - SYS_EVENT_IO_REMOECONTROL, [58](#)
 - SYS_EVENT_IO_TO_BLUETOOTH, [58](#)
 - SYS_EVENT_TERMINATION, [58](#)
 - sint, [59](#)
 - sint16, [59](#)
 - sint32, [59](#)
 - sint8, [59](#)
 - sys_colour, [59](#), [60](#)
 - UART1_RX, [58](#)
 - UART1_RX_DIR, [58](#)
 - UART1_TX, [58](#)
 - UART1_TX_DIR, [58](#)
 - UART2_RX, [58](#)
 - UART2_RX_DIR, [58](#)
 - UART2_TX, [58](#)
 - UART2_TX_DIR, [58](#)
 - uint, [59](#)
 - uint16, [59](#)
 - uint32, [60](#)
 - uint8, [60](#)
 - WHITE, [60](#)
 - YELLOW, [60](#)
- e-puck specific modules, [24](#)
- EPUCK_USED
 - definitions.h, [53](#)
- Event Management, [16](#)
- event_register
 - sys_process_control_block_s, [44](#)
- eventID
 - sys_process_event_handler_s, [45](#)
- events.c
 - registered_events, [66](#)
 - Sys_Find_Event, [62](#)
 - Sys_IsEventRegistered, [62](#)
 - Sys_Register_Event, [63](#)
 - Sys_Send_Event, [63](#)
 - Sys_Send_IntEvent, [63](#)
 - Sys_Subscribe_to_Event, [63](#)
 - Sys_Unregister_Event, [64](#)

- Sys_Unsubscribe_Handler_from_Event, 64
- Sys_Unsubscribe_Process, 64
- Sys_Unsubscribe_from_Event, 64
- sys_registered_event, 62
- sys_subscribed_process, 62
- events.h
 - pConditionFunction, 67
 - pEventHandlerFunction, 67
 - Sys_IsEventRegistered, 68
 - Sys_Register_Event, 68
 - Sys_Send_Event, 68
 - Sys_Send_IntEvent, 68
 - Sys_Subscribe_to_Event, 69
 - Sys_Unregister_Event, 69
 - Sys_Unsubscribe_Process, 69
 - Sys_Unsubscribe_from_Event, 69
 - sys_event_data, 67
- events/events.c, 60
- events/events.h, 66
- FRAME_HEIGHT
 - camera.c, 91
- FRAME_WIDTH
 - camera.c, 91
- framePointer
 - sys_process_control_block_s, 44
- function
 - sys_periodical_IOHandler_s, 42
- GREEN
 - definitions.h, 60
- GREEN_MAX
 - camera.c, 91
- GREEN_THRESHOLD
 - camera.c, 91
- getBrushedColorAt
 - camera_processing.c, 98
 - camera_processing.h, 100
- getFinishedFrame
 - camera.h, 95
- getRGB565at
 - camera_processing.c, 98
 - camera_processing.h, 100
- getRGB888at
 - camera_processing.c, 98
 - camera_processing.h, 100
- green
 - sys_rgb_pixel_s, 47
- handler
 - sys_i2c_message_s, 40
 - sys_process_event_handler_s, 45
- I/O Management, 18
- I2C interface, 28
- I2C_ACKNOWLEDGED
 - i2c_data.h, 113
- I2C_ERROR
 - i2c_data.h, 113
- I2C_ERROR_MODE
 - i2c_data.h, 113
- I2C_IDLE
 - i2c_data.h, 113
- I2C_IDLE_MODE
 - i2c_data.h, 113
- I2C_IS_READING
 - i2c_data.h, 113
- I2C_IS_SENDING
 - i2c_data.h, 113
- I2C_IS_STARTING
 - i2c_data.h, 113
- I2C_IS_STOPPING
 - i2c_data.h, 113
- I2C_READING_BYTES_MODE
 - i2c_data.h, 113
- I2C_SENT
 - i2c_data.h, 113
- I2C_STARTED
 - i2c_data.h, 113
- I2C_WRITING_ADDRESS_MODE
 - i2c_data.h, 113
- I2C_WRITING_BYTES_MODE
 - i2c_data.h, 113
- i2c.c
 - Sys_Contine_I2C, 104
 - Sys_I2C_Read, 104
 - Sys_I2C_ReadByte, 104
 - Sys_I2C_Send_ACK, 104
 - Sys_I2C_Send_NACK, 105
 - Sys_I2C_Send_Restart, 105
 - Sys_I2C_Send_Start, 105
 - Sys_I2C_Send_Stop, 105
 - Sys_I2C_SentBytes, 105
 - Sys_I2C_Start_Reading, 105
 - Sys_I2C_WriteByte, 106
 - Sys_Init_I2C, 106
 - Sys_Pause_I2C, 106
 - Sys_Start_I2C, 106
 - Sys_Stop_I2C, 106
- i2c.h
 - Sys_Contine_I2C, 108
 - Sys_I2C_Read, 108
 - Sys_I2C_SentBytes, 108
 - Sys_Init_I2C, 108
 - Sys_Pause_I2C, 108
 - Sys_Start_I2C, 109
 - Sys_Stop_I2C, 109
- i2c_HDI.c
 - Sys_Contine_I2C_HDI, 116
 - Sys_I2C_ReadByte_HDI, 116
 - Sys_I2C_Send_ACK_HDI, 116
 - Sys_I2C_Send_NACK_HDI, 116
 - Sys_I2C_Send_Restart_HDI, 116
 - Sys_I2C_Send_Start_HDI, 116
 - Sys_I2C_Send_Stop_HDI, 116
 - Sys_I2C_Start_Reading_HDI, 116
 - Sys_I2C_WriteByte_HDI, 117

- Sys_Init_I2C_HDI, 117
 - Sys_Pause_I2C_HDI, 117
 - Sys_Start_I2C_HDI, 117
 - Sys_Stop_I2C_HDI, 117
- i2c_HDI.h
 - Sys_Continue_I2C_HDI, 119
 - Sys_I2C_Read, 119
 - Sys_I2C_ReadByte_HDI, 119
 - Sys_I2C_Send_ACK_HDI, 119
 - Sys_I2C_Send_NACK_HDI, 119
 - Sys_I2C_Send_Restart_HDI, 120
 - Sys_I2C_Send_Start_HDI, 120
 - Sys_I2C_Send_Stop_HDI, 120
 - Sys_I2C_SentBytes, 120
 - Sys_I2C_Start_Reading_HDI, 120
 - Sys_I2C_WriteByte_HDI, 120
 - Sys_Init_I2C_HDI, 122
 - Sys_Pause_I2C_HDI, 122
 - Sys_Start_I2C_HDI, 122
 - Sys_Stop_I2C_HDI, 122
- i2c_data.c
 - Sys_I2C_AppendMessages, 110
 - Sys_I2C_FreeMessages, 110
 - Sys_I2C_RemoveOldestMessage, 110
 - sys_i2c_msgs, 111
- i2c_data.h
 - I2C_ACKNOWLEDGED, 113
 - I2C_ERROR, 113
 - I2C_ERROR_MODE, 113
 - I2C_IDLE, 113
 - I2C_IDLE_MODE, 113
 - I2C_IS_READING, 113
 - I2C_IS_SENDING, 113
 - I2C_IS_STARTING, 113
 - I2C_IS_STOPPING, 113
 - I2C_READING_BYTES_MODE, 113
 - I2C_SENT, 113
 - I2C_STARTED, 113
 - I2C_WRITING_ADDRESS_MODE, 113
 - I2C_WRITING_BYTES_MODE, 113
 - Sys_I2C_AppendMessages, 113
 - Sys_I2C_FreeMessages, 114
 - Sys_I2C_RemoveOldestMessage, 114
 - sys_i2c_mode, 113
 - sys_i2c_state, 113
 - sys_i2c_message, 113
 - sys_i2c_messages, 113
 - sys_i2c_msg, 113
 - sys_i2c_msgs, 114
- i2c_device_address
 - sys_i2c_message_s, 41
- id
 - sys_registered_event_s, 46
- interrupts.c, 70
 - Sys_End_AtomicSection, 71
 - Sys_Start_AtomicSection, 71
- interrupts.h, 71
 - SYS_IRQP_CAMERA_FRAME, 72
 - SYS_IRQP_CAMERA_LINE, 72
 - SYS_IRQP_CAMERA_PIXEL, 72
 - SYS_IRQP_I2C, 73
 - SYS_IRQP_IO_TIMER, 73
 - SYS_IRQP_MAX, 73
 - SYS_IRQP_REMOTECONTROL, 73
 - SYS_IRQP_SYSTEM_TIMER, 73
 - SYS_IRQP_UART1, 73
 - SYS_IRQP_UART2, 73
 - Sys_End_AtomicSection, 73
 - Sys_Start_AtomicSection, 74
- io.c
 - Sys_Continue_IOTimer, 75
 - Sys_Disable_IOTimerInterrupt, 75
 - Sys_Enable_IOTimerInterrupt, 75
 - Sys_Force_IOTimerInterrupt, 75
 - Sys_Init_IOManagement, 76
 - Sys_Register_IOHandler, 76
 - Sys_Reset_IOTimer, 76
 - Sys_Start_IOManagement, 76
 - Sys_Stop_IOManagement, 76
 - Sys_Stop_IOTimer, 76
 - Sys_Unregister_IOHandler, 77
- io.h
 - Sys_Continue_IOTimer, 78
 - Sys_Disable_IOTimerInterrupt, 78
 - Sys_Enable_IOTimerInterrupt, 78
 - Sys_Force_IOTimerInterrupt, 78
 - Sys_Init_IOManagement, 78
 - Sys_Register_IOHandler, 79
 - Sys_Reset_IOTimer, 79
 - Sys_Start_IOManagement, 79
 - Sys_Stop_IOManagement, 79
 - Sys_Stop_IOTimer, 79
 - Sys_Unregister_IOHandler, 79
- io/io.c, 74
- io/io.h, 77
- io/io_clock.c, 80
- io/io_clock.h, 82
- io_HDI.c
 - __attribute__, 124
 - Sys_Continue_IOTimer_HDI, 124
 - Sys_Disable_IOTimerInterrupt_HDI, 124
 - Sys_Enable_IOTimerInterrupt_HDI, 125
 - Sys_Force_IOTimerInterrupt_HDI, 125
 - Sys_IOTimer_code_HDI, 125
 - Sys_Init_IOTimer_HDI, 125
 - Sys_Reset_IOTimer_HDI, 125
 - Sys_Start_IOTimer_HDI, 125
 - Sys_Stop_IOTimer_HDI, 125
 - sys_iohandlers, 126
- io_HDI.h
 - STEPS_PER_MILLISECOND, 127
 - STEPS_PER_SECOND, 127
 - Sys_Continue_IOTimer_HDI, 128
 - Sys_Disable_IOTimerInterrupt_HDI, 128
 - Sys_Enable_IOTimerInterrupt_HDI, 128
 - Sys_Force_IOTimerInterrupt_HDI, 128

- Sys_IOTimer_code_HDI, 128
- Sys_Init_IOTimer_HDI, 128
- Sys_Reset_IOTimer_HDI, 129
- Sys_Start_IOTimer_HDI, 129
- Sys_Stop_IOTimer_HDI, 129
- sys_iohandlers, 129
- sys_pIOHandler, 128
- sys_periodical_IOHandler, 128
- io_clock.c
 - Sys_Get_SystemClock, 81
 - Sys_Get_SystemTime, 81
 - Sys_Init_Clock, 81
 - Sys_Init_SystemTime, 81
 - Sys_SystemClock_Counter, 81
- io_clock.h
 - Sys_Get_SystemClock, 83
 - Sys_Get_SystemTime, 83
 - Sys_Init_Clock, 83
 - Sys_Init_SystemTime, 83
- isNewDataAvailable
 - remoteControl_HDI.c, 156
 - remoteControl_HDI.h, 159
- isNewFrameAvailable
 - camera.h, 95
- length
 - sys_i2c_message_s, 41
 - sys_uart_tx_data_s, 49
- MAGENTA
 - definitions.h, 60
- MAX_WHEEL_SPEED
 - motors.c, 131
- MAX_WHEEL_SPEED_MM_S
 - motors.h, 135
- MOTORPHASE_RESET
 - motors_HDI.h, 138
- memory.c, 84
 - Sys_Free, 85
 - Sys_Malloc, 86
 - Sys_Memcpy, 86
- memory.h, 86
 - Sys_Free, 87
 - Sys_Malloc, 87
 - Sys_Memcpy, 88
- message_arriving
 - remoteControl_HDI.c, 156
 - remoteControl_HDI.h, 159
- Motor Control, 30
- motors.c
 - MAX_WHEEL_SPEED, 131
 - POWER_SAVE_WAIT, 131
 - Sys_Get_LeftWheelSpeed, 131
 - Sys_Get_RightWheelSpeed, 131
 - Sys_Init_Motors, 131
 - Sys_LeftMotor_Controller, 132
 - Sys_LeftMotor_EventHandler, 132
 - Sys_LeftMotor_Reset, 132
 - Sys_RightMotor_Controller, 132
 - Sys_RightMotor_EventHandler, 132
 - Sys_RightMotor_Reset, 133
 - Sys_Set_LeftWheelSpeed, 133
 - Sys_Set_RightWheelSpeed, 133
 - sys_motors, 131
- motors.h
 - MAX_WHEEL_SPEED_MM_S, 135
 - Sys_Get_LeftWheelSpeed, 135
 - Sys_Get_RightWheelSpeed, 135
 - Sys_Init_Motors, 135
 - Sys_Set_LeftWheelSpeed, 135
 - Sys_Set_RightWheelSpeed, 136
- motors_HDI.c
 - Sys_LeftMotor_SetPhase_HDI, 137
 - Sys_RightMotor_SetPhase_HDI, 137
- motors_HDI.h
 - MOTORPHASE_RESET, 138
 - Sys_LeftMotor_SetPhase_HDI, 139
 - Sys_RightMotor_SetPhase_HDI, 139
- nearestNeighborRGB
 - camera_processing.c, 98
 - camera_processing.h, 100
- next
 - sys_event_data_s, 39
 - sys_i2c_message_s, 41
 - sys_periodical_IOHandler_s, 42
 - sys_process_control_block_list_element_s, 43
 - sys_process_event_handler_s, 45
 - sys_registered_event_s, 46
 - sys_subscribed_process_s, 48
 - sys_uart_tx_data_s, 49
- pByteFunction
 - definitions.h, 59
- pCameraPreProcessor
 - camera.h, 95
- pConditionFunction
 - events.h, 67
- pEventHandlerFunction
 - events.h, 67
- pFunction
 - definitions.h, 59
- POWER_SAVE_WAIT
 - motors.c, 131
- pUART_reader
 - definitions.h, 59
- pcb
 - sys_process_control_block_list_element_s, 43
- pid
 - sys_subscribed_process_s, 48
- platform/e-puck/DSPIC30F6014A_HDI.h, 100
- platform/e-puck/camera.c, 88
- platform/e-puck/camera.h, 93
- platform/e-puck/camera_processing.c, 96
- platform/e-puck/camera_processing.h, 99
- platform/e-puck/i2c.c, 103
- platform/e-puck/i2c.h, 106
- platform/e-puck/i2c_HDI.c, 114

- platform/e-puck/i2c_HDI.h, 117
- platform/e-puck/i2c_data.c, 109
- platform/e-puck/i2c_data.h, 111
- platform/e-puck/io_HDI.c, 122
- platform/e-puck/io_HDI.h, 126
- platform/e-puck/motors.c, 129
- platform/e-puck/motors.h, 133
- platform/e-puck/motors_HDI.c, 136
- platform/e-puck/motors_HDI.h, 137
- platform/e-puck/process_Management_HDI.c, 139
- platform/e-puck/process_Management_HDI.h, 141
- platform/e-puck/remoteControl.c, 143
- platform/e-puck/remoteControl.h, 146
- platform/e-puck/remoteControl_HDI.c, 154
- platform/e-puck/remoteControl_HDI.h, 156
- platform/e-puck/system_Timer_HDI.c, 159
- platform/e-puck/system_Timer_HDI.h, 162
- platform/e-puck/traps.c, 165
- platform/e-puck/uart.c, 167
- platform/e-puck/uart.h, 170
- platform/e-puck/uart_HDI.c, 173
- platform/e-puck/uart_HDI.h, 177
- powerTbl
 - camera_processing.c, 99
- previous
 - sys_process_control_block_list_element_s, 43
 - sys_process_event_handler_s, 45
- priority
 - sys_scheduler_info_s, 48
- Process Manages, 35
- process_ID
 - sys_process_control_block_s, 44
- process_Management.c
 - Sys_Add_Event_Subscription, 194
 - Sys_Add_Event_to_Process, 194
 - Sys_Block_Process, 195
 - Sys_Continue_Pocess, 195
 - Sys_End_CriticalSection, 195
 - Sys_Execute_All_EventHandler, 195
 - Sys_Execute_Events_in_ProcessList, 195
 - Sys_Get_Number_Processes, 196
 - Sys_Init_Process_Management, 196
 - Sys_Interprocess_EventHandling, 196
 - Sys_Kill_Process, 196
 - Sys_Kill_Zombies, 196
 - Sys_Remove_All_Event_Subscriptions, 196
 - Sys_Remove_Event_Subscription, 197
 - Sys_Set_Running_Process_to_Zombie, 197
 - Sys_Start_CriticalSection, 197
 - Sys_Start_Process, 197
 - Sys_Switch_Process, 197
 - Sys_Switch_to_next_Process, 198
 - Sys_Wait_For_Condition, 198
 - Sys_Wait_For_Event, 198
 - Sys_Yield, 198
- process_Management.h
 - DEFAULT_PROCESS_STACK_SIZE, 200
 - Sys_Add_Event_Subscription, 200
 - Sys_Add_Event_to_Process, 200
 - Sys_Clear_EventData, 201
 - Sys_End_CriticalSection, 201
 - Sys_Execute_All_EventHandler, 201
 - Sys_Get_Number_Processes, 201
 - Sys_Init_Process_Management, 201
 - Sys_Kill_Process, 201
 - Sys_Kill_Zombies, 202
 - Sys_Remove_All_Event_Subscriptions, 202
 - Sys_Remove_Event_Subscription, 202
 - Sys_Start_CriticalSection, 202
 - Sys_Start_Process, 202
 - Sys_Switch_Process, 203
 - Sys_Switch_to_next_Process, 203
 - Sys_Wait_For_Condition, 203
 - Sys_Wait_For_Event, 203
 - Sys_Yield, 203
- process_Management_HDI.c
 - Sys_Change_Stack_HDI, 140
 - Sys_Init_Process_Management_HDI, 140
 - Sys_Save_Running_Process_HDI, 140
 - Sys_Start_Process_HDI, 140
 - Sys_Switch_Process_HDI, 141
- process_Management_HDI.h
 - Sys_Change_Stack_HDI, 142
 - Sys_Init_Process_Management_HDI, 143
 - Sys_Save_Running_Process_HDI, 143
 - Sys_Start_Process_HDI, 143
 - Sys_Switch_Process_HDI, 143
- process_stack
 - sys_process_control_block_s, 44
- processes/data.c, 182
- processes/data.h, 186
- processes/process_Management.c, 193
- processes/process_Management.h, 198
- processes/scheduler.c, 204
- processes/scheduler.h, 205
- processes/system_Timer.c, 208
- processes/system_Timer.h, 210
- RC_BUTTON_0
 - definitions.h, 53
 - remoteControl.h, 148
- RC_BUTTON_1
 - definitions.h, 54
 - remoteControl.h, 148
- RC_BUTTON_2
 - definitions.h, 54
 - remoteControl.h, 148
- RC_BUTTON_3
 - definitions.h, 54
 - remoteControl.h, 148
- RC_BUTTON_4
 - definitions.h, 54
 - remoteControl.h, 148
- RC_BUTTON_5
 - definitions.h, 54
 - remoteControl.h, 148
- RC_BUTTON_6

- definitions.h, [54](#)
- remoteControl.h, [148](#)
- RC_BUTTON_7
 - definitions.h, [54](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_8
 - definitions.h, [54](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_9
 - definitions.h, [54](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_BACK
 - definitions.h, [54](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_BLUE
 - definitions.h, [54](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_CHANNEL_DOWN
 - definitions.h, [54](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_CHANNEL_UP
 - definitions.h, [55](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_CURSOR_DOWN
 - definitions.h, [55](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_CURSOR_LEFT
 - definitions.h, [55](#)
 - remoteControl.h, [149](#)
- RC_BUTTON_CURSOR_RIGHT
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_CURSOR_UP
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_EPG
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_FAV
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_GREEN
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_INFO
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_INTERNET
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_LANG
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_MENU
 - definitions.h, [55](#)
 - remoteControl.h, [150](#)
- RC_BUTTON_MUTE
 - definitions.h, [56](#)
- remoteControl.h, [151](#)
- RC_BUTTON_OK
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_PAUSE
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_PLAY
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_PRESETS
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_RECORD
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_RED
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_REWIND
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_SCREEN
 - definitions.h, [56](#)
 - remoteControl.h, [151](#)
- RC_BUTTON_SLEEP
 - definitions.h, [56](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_SOURCE
 - definitions.h, [56](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_STANDBY
 - definitions.h, [56](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_STOP
 - definitions.h, [57](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_SUBTTL
 - definitions.h, [57](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_SWAP
 - definitions.h, [57](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_TELE_TEXT
 - definitions.h, [57](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_VOLUME_DOWN
 - definitions.h, [57](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_VOLUME_UP
 - definitions.h, [57](#)
 - remoteControl.h, [152](#)
- RC_BUTTON_WIND
 - definitions.h, [57](#)
 - remoteControl.h, [153](#)
- RC_BUTTON_YELLOW
 - definitions.h, [57](#)
 - remoteControl.h, [153](#)

- RC_NOT_STARTED
 - remoteControl_HDI.h, 158
- RC_WAIT_FOR_BIT
 - remoteControl_HDI.h, 158
- RC_WAIT_FOR_HALFBIT
 - remoteControl_HDI.h, 158
- RC_WAIT_FOR_QUARTERBIT
 - remoteControl_HDI.h, 158
- RC_WAIT_INITIALLY
 - remoteControl_HDI.h, 158
- RED
 - definitions.h, 60
- RED_MAX
 - camera.c, 92
- RED_THRESHOLD
 - camera.c, 92
- read_uart_1
 - uart_HDI.c, 176
 - uart_HDI.h, 181
- read_uart_2
 - uart_HDI.c, 176
 - uart_HDI.h, 181
- receiving_bit
 - remoteControl_HDI.c, 156
 - remoteControl_HDI.h, 159
- red
 - sys_rgb_pixel_s, 47
- registered_events
 - events.c, 66
- Remote Control, 31
- remoteControl.c
 - Sys_HasRemoteC_Sent_New_Data, 144
 - Sys_Init_RemoteControl, 145
 - Sys_Receive_RemoteControl_Msg, 145
 - Sys_RemoteC_Get_Address, 145
 - Sys_RemoteC_Get_CheckBit, 145
 - Sys_RemoteC_Get_Data, 145
 - Sys_Start_RemoteControl, 145
- remoteControl.h
 - RC_BUTTON_0, 148
 - RC_BUTTON_1, 148
 - RC_BUTTON_2, 148
 - RC_BUTTON_3, 148
 - RC_BUTTON_4, 148
 - RC_BUTTON_5, 148
 - RC_BUTTON_6, 148
 - RC_BUTTON_7, 149
 - RC_BUTTON_8, 149
 - RC_BUTTON_9, 149
 - RC_BUTTON_BACK, 149
 - RC_BUTTON_BLUE, 149
 - RC_BUTTON_CHANNEL_DOWN, 149
 - RC_BUTTON_CHANNEL_UP, 149
 - RC_BUTTON_CURSOR_DOWN, 149
 - RC_BUTTON_CURSOR_LEFT, 149
 - RC_BUTTON_CURSOR_RIGHT, 150
 - RC_BUTTON_CURSOR_UP, 150
 - RC_BUTTON_EPG, 150
 - RC_BUTTON_FAV, 150
 - RC_BUTTON_GREEN, 150
 - RC_BUTTON_INFO, 150
 - RC_BUTTON_INTERNET, 150
 - RC_BUTTON_LANG, 150
 - RC_BUTTON_MENU, 150
 - RC_BUTTON_MUTE, 151
 - RC_BUTTON_OK, 151
 - RC_BUTTON_PAUSE, 151
 - RC_BUTTON_PLAY, 151
 - RC_BUTTON_PRESETS, 151
 - RC_BUTTON_RECORD, 151
 - RC_BUTTON_RED, 151
 - RC_BUTTON_REWIND, 151
 - RC_BUTTON_SCREEN, 151
 - RC_BUTTON_SLEEP, 152
 - RC_BUTTON_SOURCE, 152
 - RC_BUTTON_STANDBY, 152
 - RC_BUTTON_STOP, 152
 - RC_BUTTON_SUBTTL, 152
 - RC_BUTTON_SWAP, 152
 - RC_BUTTON_TELE_TEXT, 152
 - RC_BUTTON_VOLUME_DOWN, 152
 - RC_BUTTON_VOLUME_UP, 152
 - RC_BUTTON_WIND, 153
 - RC_BUTTON_YELLOW, 153
 - Sys_Init_RemoteControl, 153
 - Sys_Receive_RemoteControl_Msg, 153
 - Sys_RemoteC_Get_Address, 153
 - Sys_RemoteC_Get_CheckBit, 153
 - Sys_RemoteC_Get_Data, 154
 - Sys_RemoteC_Received_New_Data, 154
 - Sys_Start_RemoteControl, 154
- remoteControl_HDI.c
 - __attribute__, 155
 - isNewDataAvailable, 156
 - message_arriving, 156
 - receiving_bit, 156
 - rx_buffer, 156
 - Sys_Init_RemoteControl_HDI, 155
 - Sys_Start_RemoteControl_HDI, 155
 - waiting_cycles, 156
- remoteControl_HDI.h
 - isNewDataAvailable, 159
 - message_arriving, 159
 - RC_NOT_STARTED, 158
 - RC_WAIT_FOR_BIT, 158
 - RC_WAIT_FOR_HALFBIT, 158
 - RC_WAIT_FOR_QUARTERBIT, 158
 - RC_WAIT_INITIALLY, 158
 - receiving_bit, 159
 - rx_buffer, 159
 - Sys_Init_RemoteControl_HDI, 159
 - Sys_Start_RemoteControl_HDI, 159
 - waiting_cycles, 159
- rx_buffer
 - remoteControl_HDI.c, 156
 - remoteControl_HDI.h, 159

- STEPS_PER_MILLISECOND
 - io_HDI.h, [127](#)
- STEPS_PER_SECOND
 - io_HDI.h, [127](#)
- SYS_CAMERA_USED
 - system.h, [216](#)
- SYS_EVENT_1ms_CLOCK
 - definitions.h, [57](#)
- SYS_EVENT_IO_CAMERA
 - definitions.h, [57](#)
- SYS_EVENT_IO_MOTOR_LEFT
 - definitions.h, [57](#)
- SYS_EVENT_IO_MOTOR_RIGHT
 - definitions.h, [57](#)
- SYS_EVENT_IO_REMOTECONTROL
 - definitions.h, [58](#)
- SYS_EVENT_IO_TO_BLUETOOTH
 - definitions.h, [58](#)
- SYS_EVENT_TERMINATION
 - definitions.h, [58](#)
- SYS_IRQP_CAMERA_FRAME
 - interrupts.h, [72](#)
- SYS_IRQP_CAMERA_LINE
 - interrupts.h, [72](#)
- SYS_IRQP_CAMERA_PIXEL
 - interrupts.h, [72](#)
- SYS_IRQP_I2C
 - interrupts.h, [73](#)
- SYS_IRQP_IO_TIMER
 - interrupts.h, [73](#)
- SYS_IRQP_MAX
 - interrupts.h, [73](#)
- SYS_IRQP_REMOTECONTROL
 - interrupts.h, [73](#)
- SYS_IRQP_SYSTEM_TIMER
 - interrupts.h, [73](#)
- SYS_IRQP_UART1
 - interrupts.h, [73](#)
- SYS_IRQP_UART2
 - interrupts.h, [73](#)
- SYS_MAX_BLUE
 - camera.h, [94](#)
- SYS_MAX_GREEN
 - camera.h, [94](#)
- SYS_MAX_RED
 - camera.h, [95](#)
- SYS_MOTOR_USED
 - system.h, [216](#)
- SYS_PROCESS_PRIORITY_HIGH
 - scheduler.h, [206](#)
- SYS_PROCESS_PRIORITY_LOW
 - scheduler.h, [206](#)
- SYS_PROCESS_PRIORITY_NORMAL
 - scheduler.h, [206](#)
- SYS_PROCESS_PRIORITY_SYSTEM
 - scheduler.h, [206](#)
- SYS_PROCESS_STATE_BABY
 - scheduler.h, [206](#)
- SYS_PROCESS_STATE_BLOCKED
 - scheduler.h, [207](#)
- SYS_PROCESS_STATE_RUNNING
 - scheduler.h, [207](#)
- SYS_PROCESS_STATE_WAITING
 - scheduler.h, [207](#)
- SYS_PROCESS_STATE_ZOMBIE
 - scheduler.h, [207](#)
- SYS_REMOTECONTROL_USED
 - system.h, [217](#)
- SYS_UART1_BAUDRATE
 - uart.c, [168](#)
 - uart_HDI.h, [179](#)
- SYS_UART1_USED
 - system.h, [217](#)
- SYS_UART2_BAUDRATE
 - uart.c, [168](#)
 - uart_HDI.h, [179](#)
- scheduler.c
 - Sys_Scheduler_RoundRobin, [205](#)
 - Sys_Set_Defaults_Info, [205](#)
- scheduler.h
 - SYS_PROCESS_PRIORITY_HIGH, [206](#)
 - SYS_PROCESS_PRIORITY_LOW, [206](#)
 - SYS_PROCESS_PRIORITY_NORMAL, [206](#)
 - SYS_PROCESS_PRIORITY_SYSTEM, [206](#)
 - SYS_PROCESS_STATE_BABY, [206](#)
 - SYS_PROCESS_STATE_BLOCKED, [207](#)
 - SYS_PROCESS_STATE_RUNNING, [207](#)
 - SYS_PROCESS_STATE_WAITING, [207](#)
 - SYS_PROCESS_STATE_ZOMBIE, [207](#)
 - Sys_Scheduler_RoundRobin, [207](#)
 - Sys_Set_Defaults_Info, [207](#)
 - sys_scheduler_info, [207](#)
- sheduler_info
 - sys_process_control_block_s, [44](#)
- Shefpuck, [23](#)
- sint
 - definitions.h, [59](#)
- sint16
 - definitions.h, [59](#)
- sint32
 - definitions.h, [59](#)
- sint8
 - definitions.h, [59](#)
- size
 - sys_event_data_s, [39](#)
- speed
 - sys_motors_s, [41](#)
- stackPointer
 - sys_process_control_block_s, [44](#)
- stackPointerLimit
 - sys_process_control_block_s, [44](#)
- state
 - sys_scheduler_info_s, [48](#)
- subscribers
 - sys_registered_event_s, [46](#)
- Sys_Add_Event_Subscription

- process_Management.c, 194
- process_Management.h, 200
- Sys_Add_Event_to_Process
 - process_Management.c, 194
 - process_Management.h, 200
- Sys_Block_Process
 - process_Management.c, 195
- Sys_Camera_PreProcessor
 - camera.c, 92
- Sys_Change_Stack_HDI
 - process_Management_HDI.c, 140
 - process_Management_HDI.h, 142
- Sys_Clear_EventData
 - data.c, 183
 - data.h, 189
 - process_Management.h, 201
- Sys_Clear_EventRegister
 - data.c, 183
 - data.h, 189
- Sys_Contine_I2C
 - i2c.c, 104
 - i2c.h, 108
- Sys_Contine_I2C_HDI
 - i2c_HDI.c, 116
 - i2c_HDI.h, 119
- Sys_Continue_IOTimer
 - io.c, 75
 - io.h, 78
- Sys_Continue_IOTimer_HDI
 - io_HDI.c, 124
 - io_HDI.h, 128
- Sys_Continue_Pocess
 - process_Management.c, 195
- Sys_Continue_SystemTimer
 - system_Timer.c, 209
 - system_Timer.h, 212
- Sys_Continue_SystemTimer_HDI
 - system_Timer_HDI.c, 161
 - system_Timer_HDI.h, 164
- Sys_Delete_Process
 - data.c, 183
 - data.h, 190
- Sys_Disable_IOTimerInterrupt
 - io.c, 75
 - io.h, 78
- Sys_Disable_IOTimerInterrupt_HDI
 - io_HDI.c, 124
 - io_HDI.h, 128
- Sys_Disable_TimerInterrupt
 - system_Timer.c, 209
 - system_Timer.h, 212
- Sys_Disable_TimerInterrupt_HDI
 - system_Timer_HDI.c, 161
 - system_Timer_HDI.h, 164
- Sys_Enable_IOTimerInterrupt
 - io.c, 75
 - io.h, 78
- Sys_Enable_IOTimerInterrupt_HDI
 - io_HDI.c, 125
 - io_HDI.h, 128
- Sys_Enable_TimerInterrupt
 - system_Timer.c, 209
 - system_Timer.h, 212
- Sys_Enable_TimerInterrupt_HDI
 - system_Timer_HDI.c, 161
 - system_Timer_HDI.h, 164
- Sys_End_AtomicSection
 - interrupts.c, 71
 - interrupts.h, 73
- Sys_End_CriticalSection
 - process_Management.c, 195
 - process_Management.h, 201
- Sys_Execute_All_EventHandler
 - process_Management.c, 195
 - process_Management.h, 201
- Sys_Execute_Events_in_ProcessList
 - process_Management.c, 195
- Sys_Find_Event
 - events.c, 62
- Sys_Find_EventHandler
 - data.h, 190
- Sys_Find_Process
 - data.c, 184
 - data.h, 190
- Sys_Force_IOTimerInterrupt
 - io.c, 75
 - io.h, 78
- Sys_Force_IOTimerInterrupt_HDI
 - io_HDI.c, 125
 - io_HDI.h, 128
- Sys_Force_TimerInterrupt
 - system_Timer.c, 209
 - system_Timer.h, 212
- Sys_Force_TimerInterrupt_HDI
 - system_Timer_HDI.c, 161
 - system_Timer_HDI.h, 164
- Sys_Free
 - memory.c, 85
 - memory.h, 87
- Sys_Get_LeftWheelSpeed
 - motors.c, 131
 - motors.h, 135
- Sys_Get_Number_Processes
 - process_Management.c, 196
 - process_Management.h, 201
- Sys_Get_RightWheelSpeed
 - motors.c, 131
 - motors.h, 135
- Sys_Get_SystemClock
 - io_clock.c, 81
 - io_clock.h, 83
- Sys_Get_SystemTime
 - io_clock.c, 81
 - io_clock.h, 83
- Sys_HasRemoteC_Sent_New_Data
 - remoteControl.c, 144

Sys_I2C_AppendMessages
 i2c_data.c, 110
 i2c_data.h, 113
 Sys_I2C_FreeMessages
 i2c_data.c, 110
 i2c_data.h, 114
 Sys_I2C_Read
 i2c.c, 104
 i2c.h, 108
 i2c_HDI.h, 119
 Sys_I2C_ReadByte
 i2c.c, 104
 Sys_I2C_ReadByte_HDI
 i2c_HDI.c, 116
 i2c_HDI.h, 119
 Sys_I2C_RemoveOldestMessage
 i2c_data.c, 110
 i2c_data.h, 114
 Sys_I2C_Send_ACK
 i2c.c, 104
 Sys_I2C_Send_ACK_HDI
 i2c_HDI.c, 116
 i2c_HDI.h, 119
 Sys_I2C_Send_NACK
 i2c.c, 105
 Sys_I2C_Send_NACK_HDI
 i2c_HDI.c, 116
 i2c_HDI.h, 119
 Sys_I2C_Send_Restart
 i2c.c, 105
 Sys_I2C_Send_Restart_HDI
 i2c_HDI.c, 116
 i2c_HDI.h, 120
 Sys_I2C_Send_Start
 i2c.c, 105
 Sys_I2C_Send_Start_HDI
 i2c_HDI.c, 116
 i2c_HDI.h, 120
 Sys_I2C_Send_Stop
 i2c.c, 105
 Sys_I2C_Send_Stop_HDI
 i2c_HDI.c, 116
 i2c_HDI.h, 120
 Sys_I2C_SentBytes
 i2c.c, 105
 i2c.h, 108
 i2c_HDI.h, 120
 Sys_I2C_Start_Reading
 i2c.c, 105
 Sys_I2C_Start_Reading_HDI
 i2c_HDI.c, 116
 i2c_HDI.h, 120
 Sys_I2C_WriteByte
 i2c.c, 106
 Sys_I2C_WriteByte_HDI
 i2c_HDI.c, 117
 i2c_HDI.h, 120
 sys_I2C_mode
 i2c_data.h, 113
 sys_I2C_state
 i2c_data.h, 113
 Sys_IOTimer_code_HDI
 io_HDI.c, 125
 io_HDI.h, 128
 Sys_Init_Camera
 camera.c, 92
 camera.h, 95
 Sys_Init_Clock
 io_clock.c, 81
 io_clock.h, 83
 Sys_Init_I2C
 i2c.c, 106
 i2c.h, 108
 Sys_Init_I2C_HDI
 i2c_HDI.c, 117
 i2c_HDI.h, 122
 Sys_Init_IOManagement
 io.c, 76
 io.h, 78
 Sys_Init_IOTimer_HDI
 io_HDI.c, 125
 io_HDI.h, 128
 Sys_Init_Kernel
 system.c, 215
 system.h, 217
 Sys_Init_Motors
 motors.c, 131
 motors.h, 135
 Sys_Init_Process_Management
 process_Management.c, 196
 process_Management.h, 201
 Sys_Init_Process_Management_HDI
 process_Management_HDI.c, 140
 process_Management_HDI.h, 143
 Sys_Init_RemoteControl
 remoteControl.c, 145
 remoteControl.h, 153
 Sys_Init_RemoteControl_HDI
 remoteControl_HDI.c, 155
 remoteControl_HDI.h, 159
 Sys_Init_SystemTime
 io_clock.c, 81
 io_clock.h, 83
 Sys_Init_SystemTimer
 system_Timer.c, 209
 system_Timer.h, 212
 Sys_Init_SystemTimer_HDI
 system_Timer_HDI.c, 161
 system_Timer_HDI.h, 164
 Sys_Init_UART1
 uart.c, 168
 uart.h, 171
 Sys_Init_UART1_HDI
 uart_HDI.c, 175
 uart_HDI.h, 180
 Sys_Init_UART2

- uart.c, [168](#)
- uart.h, [171](#)
- Sys_Init_UART2_HDI
 - uart_HDI.c, [175](#)
 - uart_HDI.h, [180](#)
- Sys_Insert_Process_to_List
 - data.c, [184](#)
 - data.h, [190](#)
- Sys_Interprocess_EventHandling
 - process_Management.c, [196](#)
- Sys_IsEventRegistered
 - events.c, [62](#)
 - events.h, [68](#)
- Sys_Kill_Process
 - process_Management.c, [196](#)
 - process_Management.h, [201](#)
- Sys_Kill_Zombies
 - process_Management.c, [196](#)
 - process_Management.h, [202](#)
- Sys_LeftMotor_Controller
 - motors.c, [132](#)
- Sys_LeftMotor_EventHandler
 - motors.c, [132](#)
- Sys_LeftMotor_Reset
 - motors.c, [132](#)
- Sys_LeftMotor_SetPhase_HDI
 - motors_HDI.c, [137](#)
 - motors_HDI.h, [139](#)
- Sys_Malloc
 - memory.c, [86](#)
 - memory.h, [87](#)
- Sys_Memcpy
 - memory.c, [86](#)
 - memory.h, [88](#)
- Sys_Next_EventHandler
 - data.c, [184](#)
 - data.h, [191](#)
- Sys_Pause_I2C
 - i2c.c, [106](#)
 - i2c.h, [108](#)
- Sys_Pause_I2C_HDI
 - i2c_HDI.c, [117](#)
 - i2c_HDI.h, [122](#)
- Sys_Process_newFrame
 - camera.c, [92](#)
- Sys_Process_newLine
 - camera.c, [92](#)
- Sys_Process_newPixel
 - camera.c, [92](#)
- Sys_Read_UART1_ISR
 - uart_HDI.c, [175](#)
 - uart_HDI.h, [180](#)
- Sys_Read_UART2_ISR
 - uart_HDI.c, [175](#)
 - uart_HDI.h, [180](#)
- Sys_Receive_RemoteControl_Msg
 - remoteControl.c, [145](#)
 - remoteControl.h, [153](#)
- Sys_Register_Event
 - events.c, [63](#)
 - events.h, [68](#)
- Sys_Register_IOHandler
 - io.c, [76](#)
 - io.h, [79](#)
- Sys_RemoteC_Get_Address
 - remoteControl.c, [145](#)
 - remoteControl.h, [153](#)
- Sys_RemoteC_Get_CheckBit
 - remoteControl.c, [145](#)
 - remoteControl.h, [153](#)
- Sys_RemoteC_Get_Data
 - remoteControl.c, [145](#)
 - remoteControl.h, [154](#)
- Sys_RemoteC_Received_New_Data
 - remoteControl.h, [154](#)
- Sys_Remove_All_Event_Subscriptions
 - process_Management.c, [196](#)
 - process_Management.h, [202](#)
- Sys_Remove_Event_Subscription
 - process_Management.c, [197](#)
 - process_Management.h, [202](#)
- Sys_Remove_Event_from_EventRegister
 - data.c, [185](#)
 - data.h, [191](#)
- Sys_Remove_Process_from_List
 - data.c, [185](#)
 - data.h, [191](#)
- Sys_Reset_IOTimer
 - io.c, [76](#)
 - io.h, [79](#)
- Sys_Reset_IOTimer_HDI
 - io_HDI.c, [125](#)
 - io_HDI.h, [129](#)
- Sys_Reset_SystemTimer
 - system_Timer.c, [210](#)
 - system_Timer.h, [212](#)
- Sys_Reset_SystemTimer_HDI
 - system_Timer_HDI.c, [162](#)
 - system_Timer_HDI.h, [165](#)
- Sys_RightMotor_Controller
 - motors.c, [132](#)
- Sys_RightMotor_EventHandler
 - motors.c, [132](#)
- Sys_RightMotor_Reset
 - motors.c, [133](#)
- Sys_RightMotor_SetPhase_HDI
 - motors_HDI.c, [137](#)
 - motors_HDI.h, [139](#)
- Sys_Save_Running_Process_HDI
 - process_Management_HDI.c, [140](#)
 - process_Management_HDI.h, [143](#)
- Sys_Scheduler_RoundRobin
 - scheduler.c, [205](#)
 - scheduler.h, [207](#)
- Sys_Send_Event
 - events.c, [63](#)

- events.h, 68
- Sys_Send_IntEvent
 - events.c, 63
 - events.h, 68
- Sys_Set_Defaults_Info
 - scheduler.c, 205
 - scheduler.h, 207
- Sys_Set_Defaults_PCB
 - data.c, 185
 - data.h, 192
- Sys_Set_LeftWheelSpeed
 - motors.c, 133
 - motors.h, 135
- Sys_Set_Preprocessing
 - camera.c, 92
 - camera.h, 95
- Sys_Set_RightWheelSpeed
 - motors.c, 133
 - motors.h, 136
- Sys_Set_Running_Process_to_Zombie
 - process_Management.c, 197
- Sys_SetReadingFunction_UART1
 - uart.c, 169
 - uart.h, 172
- Sys_SetReadingFunction_UART2
 - uart.c, 169
 - uart.h, 172
- Sys_Start_AtomicSection
 - interrupts.c, 71
 - interrupts.h, 74
- Sys_Start_Camera
 - camera.c, 93
 - camera.h, 95
- Sys_Start_CriticalSection
 - process_Management.c, 197
 - process_Management.h, 202
- Sys_Start_I2C
 - i2c.c, 106
 - i2c.h, 109
- Sys_Start_I2C_HDI
 - i2c_HDI.c, 117
 - i2c_HDI.h, 122
- Sys_Start_IOManagement
 - io.c, 76
 - io.h, 79
- Sys_Start_IOTimer_HDI
 - io_HDI.c, 125
 - io_HDI.h, 129
- Sys_Start_Kernel
 - system.c, 215
 - system.h, 217
- Sys_Start_Process
 - process_Management.c, 197
 - process_Management.h, 202
- Sys_Start_Process_HDI
 - process_Management_HDI.c, 140
 - process_Management_HDI.h, 143
- Sys_Start_RemoteControl
 - remoteControl.c, 145
 - remoteControl.h, 154
- Sys_Start_RemoteControl_HDI
 - remoteControl_HDI.c, 155
 - remoteControl_HDI.h, 159
- Sys_Start_SystemTimer
 - system_Timer.c, 210
 - system_Timer.h, 213
- Sys_Start_SystemTimer_HDI
 - system_Timer_HDI.c, 162
 - system_Timer_HDI.h, 165
- Sys_Start_UART1
 - uart.c, 169
 - uart.h, 172
- Sys_Start_UART1_HDI
 - uart_HDI.c, 175
 - uart_HDI.h, 180
- Sys_Start_UART2
 - uart.c, 169
 - uart.h, 172
- Sys_Start_UART2_HDI
 - uart_HDI.c, 175
 - uart_HDI.h, 180
- Sys_Stop_I2C
 - i2c.c, 106
 - i2c.h, 109
- Sys_Stop_I2C_HDI
 - i2c_HDI.c, 117
 - i2c_HDI.h, 122
- Sys_Stop_IOManagement
 - io.c, 76
 - io.h, 79
- Sys_Stop_IOTimer
 - io.c, 76
 - io.h, 79
- Sys_Stop_IOTimer_HDI
 - io_HDI.c, 125
 - io_HDI.h, 129
- Sys_Stop_SystemTimer
 - system_Timer.c, 210
 - system_Timer.h, 213
- Sys_Stop_SystemTimer_HDI
 - system_Timer_HDI.c, 162
 - system_Timer_HDI.h, 165
- Sys_Subscribe_to_Event
 - events.c, 63
 - events.h, 69
- Sys_Switch_Process
 - process_Management.c, 197
 - process_Management.h, 203
- Sys_Switch_Process_HDI
 - process_Management_HDI.c, 141
 - process_Management_HDI.h, 143
- Sys_Switch_to_next_Process
 - process_Management.c, 198
 - process_Management.h, 203
- Sys_SystemClock_Counter
 - io_clock.c, 81

- sys_UART1_TX_data
 - uart_HDI.c, [176](#)
 - uart_HDI.h, [181](#)
- sys_UART2_TX_data
 - uart_HDI.c, [176](#)
 - uart_HDI.h, [181](#)
- Sys_Unregister_Event
 - events.c, [64](#)
 - events.h, [69](#)
- Sys_Unregister_IOHandler
 - io.c, [77](#)
 - io.h, [79](#)
- Sys_Unsubscribe_Handler_from_Event
 - events.c, [64](#)
- Sys_Unsubscribe_Process
 - events.c, [64](#)
 - events.h, [69](#)
- Sys_Unsubscribe_from_Event
 - events.c, [64](#)
 - events.h, [69](#)
- Sys_Wait_For_Condition
 - process_Management.c, [198](#)
 - process_Management.h, [203](#)
- Sys_Wait_For_Event
 - process_Management.c, [198](#)
 - process_Management.h, [203](#)
- Sys_Write_UART1_ISR
 - uart_HDI.c, [176](#)
 - uart_HDI.h, [181](#)
- Sys_Write_UART2_ISR
 - uart_HDI.c, [176](#)
 - uart_HDI.h, [181](#)
- Sys_Writeto_UART1
 - uart.c, [169](#)
 - uart.h, [172](#)
- Sys_Writeto_UART2
 - uart.c, [170](#)
 - uart.h, [173](#)
- Sys_Yield
 - process_Management.c, [198](#)
 - process_Management.h, [203](#)
- sys_blocked_processes
 - data.c, [186](#)
 - data.h, [192](#)
- sys_colour
 - definitions.h, [59](#), [60](#)
- sys_event_data
 - events.h, [67](#)
- sys_event_data_s, [39](#)
 - next, [39](#)
 - size, [39](#)
 - value, [40](#)
- sys_i2c_message
 - i2c_data.h, [113](#)
- sys_i2c_message_s, [40](#)
 - data, [40](#)
 - handler, [40](#)
 - i2c_device_address, [41](#)
 - length, [41](#)
 - next, [41](#)
 - write, [41](#)
- sys_i2c_messages
 - i2c_data.h, [113](#)
- sys_i2c_msg
 - i2c_data.h, [113](#)
- sys_i2c_msgs
 - i2c_data.c, [111](#)
 - i2c_data.h, [114](#)
- sys_iohandlers
 - io_HDI.c, [126](#)
 - io_HDI.h, [129](#)
- sys_motors
 - motors.c, [131](#)
- sys_motors_s, [41](#)
 - speed, [41](#)
- sys_occurred_event
 - data.h, [189](#)
- sys_occurred_event_s, [42](#)
- sys_occurred_events
 - data.c, [186](#)
 - data.h, [192](#)
- sys_pIOHandler
 - io_HDI.h, [128](#)
- sys_pcb
 - data.h, [189](#)
- sys_pcb_list_element
 - data.h, [189](#)
- sys_peh
 - data.h, [189](#)
- sys_periodical_IOHandler
 - io_HDI.h, [128](#)
- sys_periodical_IOHandler_s, [42](#)
 - function, [42](#)
 - next, [42](#)
- sys_process_control_block
 - data.h, [189](#)
- sys_process_control_block_list_element
 - data.h, [189](#)
- sys_process_control_block_list_element_s, [43](#)
 - next, [43](#)
 - pcb, [43](#)
 - previous, [43](#)
- sys_process_control_block_s, [43](#)
 - event_register, [44](#)
 - framePointer, [44](#)
 - process_ID, [44](#)
 - process_stack, [44](#)
 - sheduler_info, [44](#)
 - stackPointer, [44](#)
 - stackPointerLimit, [44](#)
- sys_process_event_handler
 - data.h, [189](#)
- sys_process_event_handler_s, [45](#)
 - buffered_data, [45](#)
 - condition, [45](#)
 - eventID, [45](#)

- handler, 45
 - next, 45
 - previous, 45
- sys_process_scheduler
 - system_Timer_HDI.c, 162
 - system_Timer_HDI.h, 165
- sys_ready_processes
 - data.c, 186
 - data.h, 192
- sys_registered_event
 - events.c, 62
- sys_registered_event_s, 46
 - id, 46
 - next, 46
 - subscribers, 46
- sys_rgb
 - camera.h, 95
- sys_rgb_pixel
 - camera.h, 95
- sys_rgb_pixel_s, 47
 - blue, 47
 - green, 47
 - red, 47
- sys_running_process
 - data.c, 186
 - data.h, 192
- sys_scheduler_info
 - scheduler.h, 207
- sys_scheduler_info_s, 47
 - priority, 48
 - state, 48
- sys_subscribed_process
 - events.c, 62
- sys_subscribed_process_s, 48
 - next, 48
 - pid, 48
- Sys_todo_SystemTimer
 - system_Timer.c, 210
 - system_Timer.h, 213
 - system_Timer_HDI.h, 165
- sys_uart_tx_data_s, 49
 - data, 49
 - length, 49
 - next, 49
- sys_uart_txdata
 - uart_HDI.h, 180
- sys_zombies
 - data.c, 186
 - data.h, 192
- system.c, 213
 - Sys_Init_Kernel, 215
 - Sys_Start_Kernel, 215
- system.h, 215
 - SYS_CAMERA_USED, 216
 - SYS_MOTOR_USED, 216
 - SYS_REMOTECONTROL_USED, 217
 - SYS_UART1_USED, 217
 - Sys_Init_Kernel, 217
 - Sys_Start_Kernel, 217
- system_Timer.c
 - Sys_Continue_SystemTimer, 209
 - Sys_Disable_TimerInterrupt, 209
 - Sys_Enable_TimerInterrupt, 209
 - Sys_Force_TimerInterrupt, 209
 - Sys_Init_SystemTimer, 209
 - Sys_Reset_SystemTimer, 210
 - Sys_Start_SystemTimer, 210
 - Sys_Stop_SystemTimer, 210
 - Sys_todo_SystemTimer, 210
- system_Timer.h
 - Sys_Continue_SystemTimer, 212
 - Sys_Disable_TimerInterrupt, 212
 - Sys_Enable_TimerInterrupt, 212
 - Sys_Force_TimerInterrupt, 212
 - Sys_Init_SystemTimer, 212
 - Sys_Reset_SystemTimer, 212
 - Sys_Start_SystemTimer, 213
 - Sys_Stop_SystemTimer, 213
 - Sys_todo_SystemTimer, 213
- system_Timer_HDI.c
 - __attribute__, 161
 - Sys_Continue_SystemTimer_HDI, 161
 - Sys_Disable_TimerInterrupt_HDI, 161
 - Sys_Enable_TimerInterrupt_HDI, 161
 - Sys_Force_TimerInterrupt_HDI, 161
 - Sys_Init_SystemTimer_HDI, 161
 - Sys_Reset_SystemTimer_HDI, 162
 - Sys_Start_SystemTimer_HDI, 162
 - Sys_Stop_SystemTimer_HDI, 162
 - sys_process_scheduler, 162
- system_Timer_HDI.h
 - Sys_Continue_SystemTimer_HDI, 164
 - Sys_Disable_TimerInterrupt_HDI, 164
 - Sys_Enable_TimerInterrupt_HDI, 164
 - Sys_Force_TimerInterrupt_HDI, 164
 - Sys_Init_SystemTimer_HDI, 164
 - Sys_Reset_SystemTimer_HDI, 165
 - Sys_Start_SystemTimer_HDI, 165
 - Sys_Stop_SystemTimer_HDI, 165
 - sys_process_scheduler, 165
 - Sys_todo_SystemTimer, 165
- traps.c
 - __attribute__, 166
- UART 1&2, 33
- UART1_RX
 - definitions.h, 58
 - uart_HDI.h, 179
- UART1_RX_DIR
 - definitions.h, 58
 - uart_HDI.h, 179
- UART1_TX
 - definitions.h, 58
 - uart_HDI.h, 179
- UART1_TX_DIR
 - definitions.h, 58

- uart_HDI.h, 179
- UART2_RX
 - definitions.h, 58
 - uart_HDI.h, 179
- UART2_RX_DIR
 - definitions.h, 58
 - uart_HDI.h, 179
- UART2_TX
 - definitions.h, 58
 - uart_HDI.h, 179
- UART2_TX_DIR
 - definitions.h, 58
 - uart_HDI.h, 179
- uart.c
 - SYS_UART1_BAUDRATE, 168
 - SYS_UART2_BAUDRATE, 168
 - Sys_Init_UART1, 168
 - Sys_Init_UART2, 168
 - Sys_SetReadingFunction_UART1, 169
 - Sys_SetReadingFunction_UART2, 169
 - Sys_Start_UART1, 169
 - Sys_Start_UART2, 169
 - Sys_Writeto_UART1, 169
 - Sys_Writeto_UART2, 170
- uart.h
 - Sys_Init_UART1, 171
 - Sys_Init_UART2, 171
 - Sys_SetReadingFunction_UART1, 172
 - Sys_SetReadingFunction_UART2, 172
 - Sys_Start_UART1, 172
 - Sys_Start_UART2, 172
 - Sys_Writeto_UART1, 172
 - Sys_Writeto_UART2, 173
- uart_HDI.c
 - __attribute__, 174
 - byte_counter_uart1, 176
 - byte_counter_uart2, 176
 - read_uart_1, 176
 - read_uart_2, 176
 - Sys_Init_UART1_HDI, 175
 - Sys_Init_UART2_HDI, 175
 - Sys_Read_UART1_ISR, 175
 - Sys_Read_UART2_ISR, 175
 - Sys_Start_UART1_HDI, 175
 - Sys_Start_UART2_HDI, 175
 - sys_UART1_TX_data, 176
 - sys_UART2_TX_data, 176
 - Sys_Write_UART1_ISR, 176
 - Sys_Write_UART2_ISR, 176
- uart_HDI.h
 - byte_counter_uart1, 181
 - byte_counter_uart2, 181
 - read_uart_1, 181
 - read_uart_2, 181
 - SYS_UART1_BAUDRATE, 179
 - SYS_UART2_BAUDRATE, 179
 - Sys_Init_UART1_HDI, 180
 - Sys_Init_UART2_HDI, 180
 - Sys_Read_UART1_ISR, 180
 - Sys_Read_UART2_ISR, 180
 - Sys_Start_UART1_HDI, 180
 - Sys_Start_UART2_HDI, 180
 - sys_UART1_TX_data, 181
 - sys_UART2_TX_data, 181
 - Sys_Write_UART1_ISR, 181
 - Sys_Write_UART2_ISR, 181
 - sys_uart_txdata, 180
 - UART1_RX, 179
 - UART1_RX_DIR, 179
 - UART1_TX, 179
 - UART1_TX_DIR, 179
 - UART2_RX, 179
 - UART2_RX_DIR, 179
 - UART2_TX, 179
 - UART2_TX_DIR, 179
- uint
 - definitions.h, 59
- uint16
 - definitions.h, 59
- uint32
 - definitions.h, 60
- uint8
 - definitions.h, 60
- value
 - sys_event_data_s, 40
- WHITE
 - definitions.h, 60
- waiting_cycles
 - remoteControl_HDI.c, 156
 - remoteControl_HDI.h, 159
- write
 - sys_i2c_message_s, 41
- YELLOW
 - definitions.h, 60