



EtherCAT Master Stack in brief

The EtherCAT Master Stack is based on the Beckhoff Master Sample Code and optimized to meet the requirements of hard real-time operation under the supported Operating Systems. The cycle time can go down to 50µs depending on CPU-performance, number of slaves and data size. EtherCAT Master is ENI based, thus accepts any configuration created in accordance with EtherCAT specifications. EtherCAT Master has a modular architecture and consists of the following layers to adapt the programmers need to create user applications on different convenience and complexity levels.

Level One, the EtherCAT Master Task

The user application coexists to the EtherCAT master task. The user application communicates event synchronized over shared memory with the EtherCAT master task. The access by the user application to the EtherCAT field I/O is based on configured symbolic field variable names. The configuration is done by an EtherCAT configuration tool or by the application writer himself. Level one is today's preferred model of usage.

Please note! Not all but most level two features are available in level one.

Level Two, the EtherCAT Library

The EtherCAT Mastertask itself uses the EtherCAT library for all communication purposes. Actually from the point of view of the EtherCAT library the EtherCAT master task is just an "ordinary" user application. So for advanced programmers familiar to the EtherCAT communication standards can use the library directly, especially if the complete feature set is intended to be used directly on

the application level. Then the user application is direct plugged in to the EtherCAT library bypassing all intermediate levels.

Functional Overview Level One and Two: EtherCAT Library

*The EtherCAT Library (ethercat_protocol.l) provides the following functionality (Level one functions are indicated by a *sign and level two by a # sign!):*

Process Image (*)

- No file systems needed
- Cyclic Data Exchange (periodic frames down to 50µs, depends on hardware performance, numbers of slaves and data size)
- Acyclic Process Data Exchange (PDO in SDO)
- Different Process Image Update Cycle Times (as specified in the XML configuration file)
- Process Image memory may be provided eternally by application e.g. EtherCAT master task (*, #)
- Large Process Images (exceeding Ethernet frame length) (*, #)

Master Configuration (*, #)

- XML Schema (Conforming ENI Specification)
- No ESI (EtherCAT Slave Information File) upload from EEPROM

Mailbox Communication (MBX) (*, #)

- Application Interface installable User-Callbacks
- Mailbox Protocols
- CAN application protocol over EtherCAT (CoE)
- Application uses standard Mailbox Communication Interface
- SDO upload, SDO download, SDO information service, Emergency Request (library only)

Ethernet over EtherCAT (EoE) (*, #)

- OS-9 Driver available on demand

Servo drive profile according to IEC 61491 over EtherCAT (SoE) (Level 2 only)

File Access over EtherCAT (FoE) (*, #)

- Firmware up and download

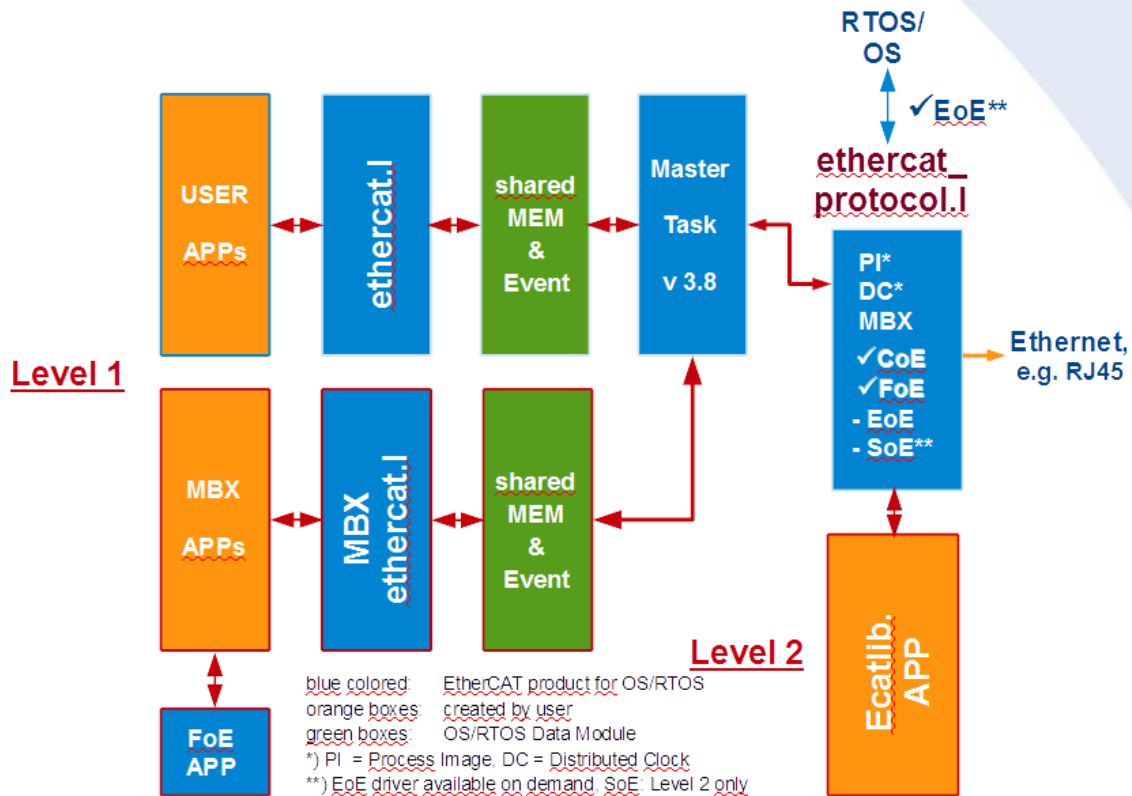
Distributed Clocks (DC) (*, #)

- Distributed Clocks of slaves synchronized by master
- Offset and delay compensation

Supported CPU-architectures to date

- Freescales Power Architecture, QorIQ, i.MX, Layerscape
- Intel Architecture
- ARM

Functional Overview



EtherCAT Master v3.8 ETG.1500 Master Class Conformance March 2015: Feature Set Summary

Feature Set	Detailed Features	EtherCAT Master Master 3.8	ETG.1500 Class A	ETG.1500 Class B
Basic Features				
	Service Commands	conformed	shall	shall
	IRQ field in datagram	conformed	should	should
	Slaves with Device Emulation	conformed	shall	shall
	EtherCAT State Machine	conformed	shall	shall
	Error Handling	conformed	shall	shall
	VLAN	on user request	may	may
	EtherCAT Frame Types	conformed	shall	shall
	UDP Frame Types	on user request	may	may
Process Data Exchange				
	Cyclic PDO	conformed	shall	shall
	Multiple Tasks	conformed	may	may
	Frame repetition	conformed	may	may
Network Configuration				
	Online scanning	on user request	at least	at least
	Reading ENI	conformed	one of them	one of them
	Compare Network Configuration	conformed	shall	shall
	Explicit Device Identification	on user request	should	should
	Station Alias Addressing	on user request	may	may
	Access to EEPROM	conformed	R: shall, W: may	R: shall, W: may
Mailbox Support				
	Support Mailbox	conformed	shall	shall
	Multiple Mailbox Channels	conformed	may	may
	Mailbox Resilient Layer	conformed	shall	shall
	Mailbox Polling	conformed	shall	shall

Feature Set	Detailed Features	EtherCAT Master Master 3.8	ETG.1500 Class A	ETG.1500 Class B
CAN application layer over EtherCAT (CoE)				
	SDO Up/Download	conformed	shall	shall
	Segmented Transfer	conformed	shall	should
	Complete Access	conformed	shall	should (shall if ENI Import)
	SDO Info service	conformed	shall	should
	Emergency Message	conformed	shall	shall
	PDO in CoE	conformed	may	may
Ethernet over EtherCAT (EoE)				
	EoE protocol	conformed	shall	shall (if EoE)
	Virtual Switch	conformed	shall	shall (if EoE)
	EoE Endpoint to OS	conformed	should	should
File access over EtherCAT (FoE)				
	FoE Protocol	conformed	shall	shall (if FoE)
	Firmware Up-/Downlaod	conformed	shall	should
	Boot State	conformed	shall	shall (if FW up/down)
Servo drive profile over EtherCAT (SoE)				
	SoE Services	conformed	shall	should (if SoE)
ADS over EtherCAT (AoE)				
	AoE Protocol	on user request	should	should
Vendor specific over EtherCAT (VoE)				
	VoE Protocol	on user request	may	may
Synchronisation with Distributed Clock (DC)				
	DC support	conformed	shall	shall (if DC)
	Continuous Propagation Delay compensation	conformed	should	should
	Sync window monitoring	on user request	should	should
Slave-to-Slave Communication				
	via Master	conformed	shall	shall
Master Information				
	Master Object Dictionary: conformed	on user request	should	may
Feature Pack Cable Redundancy				
	Basic Functions	on user request		
	Diagnosis Functions	on user request		
	Redundancy with Hot Connect	no plans		
	Redundancy with Hot Connect	no plans		
Feature Pack Motion Control				
	Support Profile CiA402	on user request		
	Support Profile SERCOS drive profile	on user request		
	Support Synchronisation with DC	conformed		
Feature Pack Hot Connect				
		on user request		
Feature Pack External Synchronisaion				
		on user request		
Feature Pack EtherCAT Automation Protocol				
		no plans		
Featuer Pack Device Replacement				
		no plans		
Featuer pack Mailbox Gateway				
		no plans		