



Documentation

ABC-CPU Systems

Global Data Xchange – GDX v2

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1. New in the version v2

1.2 Compatibility

Version v2 of the GDX method is backward compatible with older versions.

With the firmware version v18 build 0214 the GDX method is an integral part and thus also always active. Activation by assigning a GDXCID in 'cmdline.txt' can be omitted. The current firmware of each CPU is in the download area on the ABC IT website at www.abcit.eu.

1.3 Assignment of GDXCID

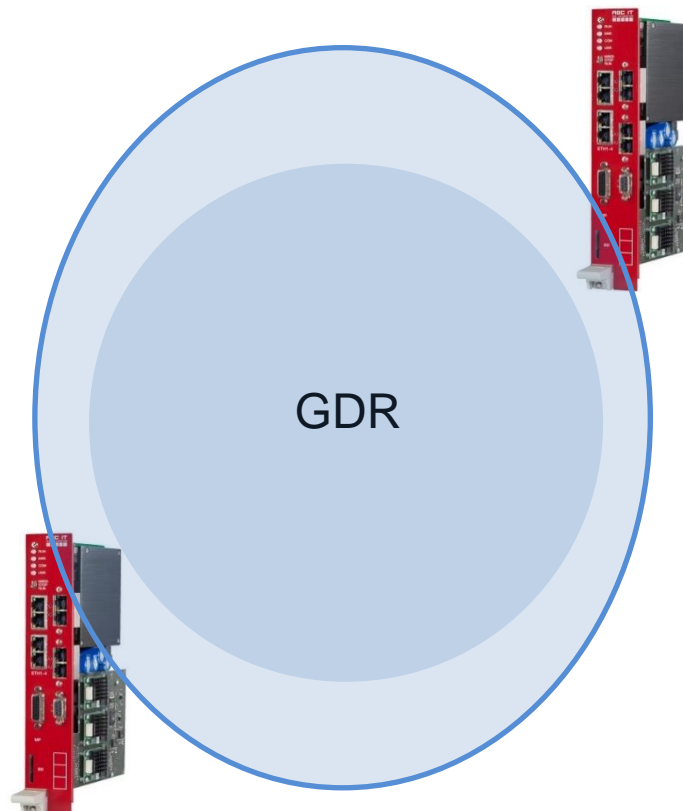
An X-CPU-6 m57 can manage up to 100 GDXCIDs with version v2. This means, that up to 100 S7 data blocks can be parameterized as send data blocks (see 3.2 in this document).

2. Basics

2.1 The global data room

In the X-CPU technology, we interpret the global data space, that data from the other controllers is automatically available to one controller via the Ethernet medium, without parametrization of communication relationships / programming.

We call the global data room of the X-CPU –technology '*Global Data Room*', or simply '*GDR*'.

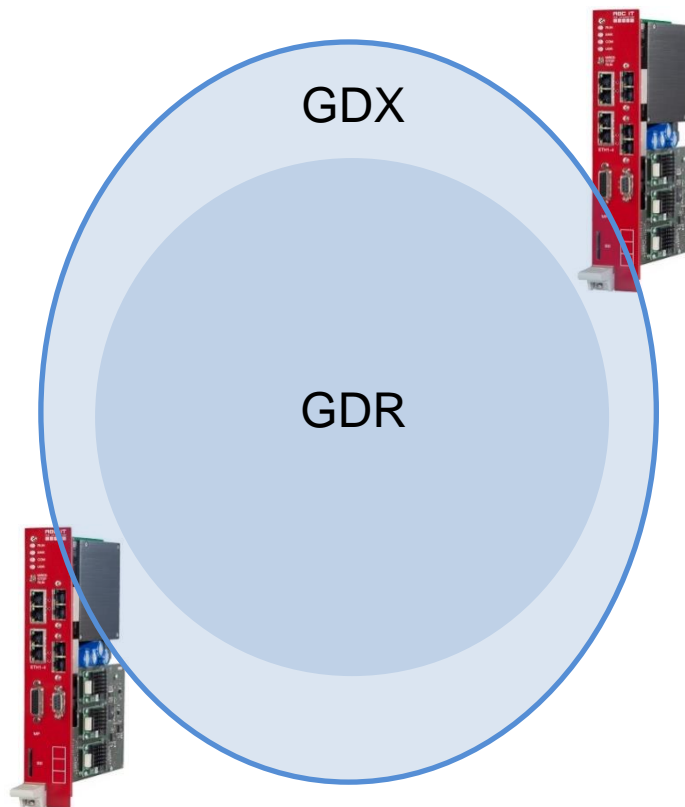


Global Data Room - GDR

2.2 The global data exchange

In the X-CPU technology, the global data exchange is the leading development, that data of the other controllers are automatically available to one controller via the medium Ethernet, without parameterization of communication relationships / programming.

We call the global data exchange of the X-CPU –technology '*Global Data Xchange*', or simply '*GDX*'.

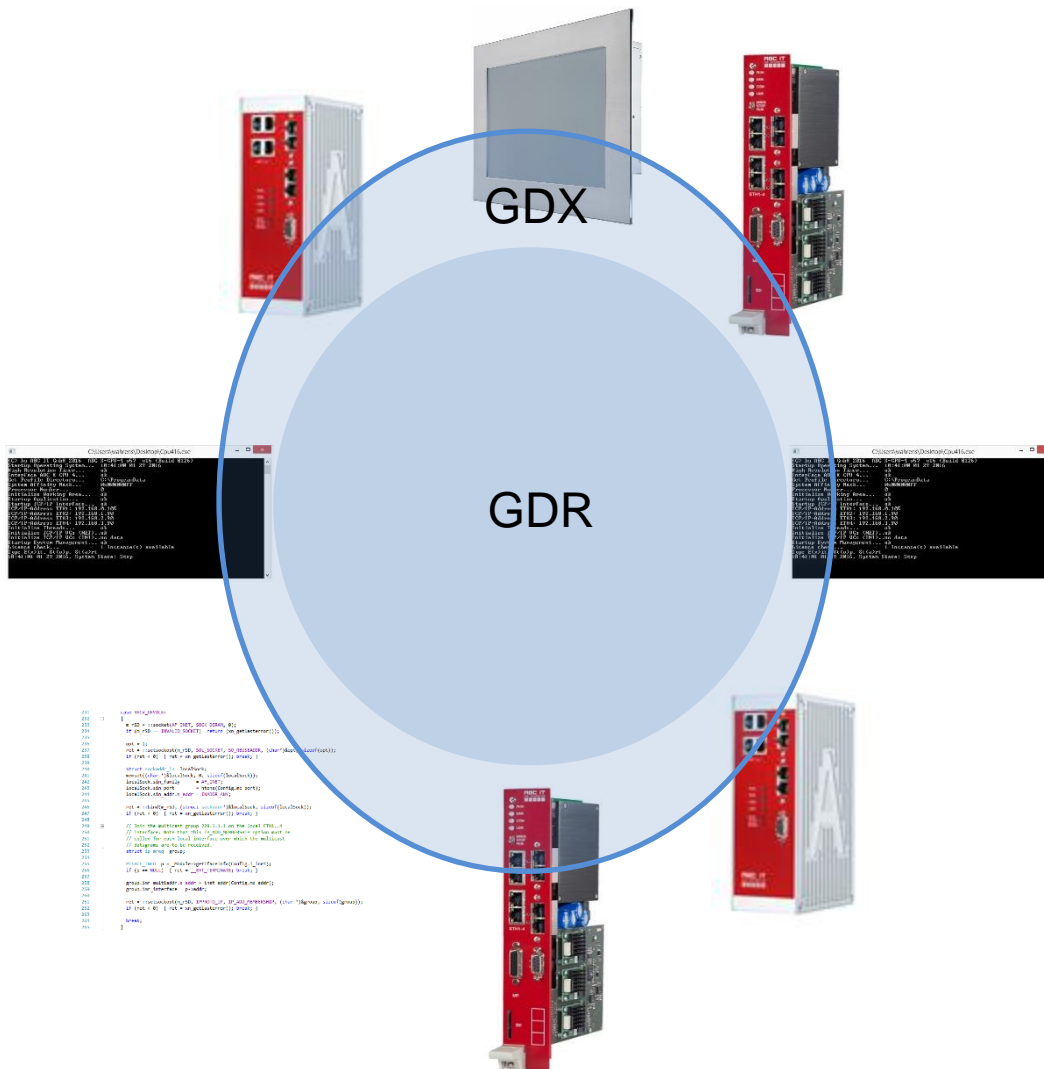


Global Data Xchange - GDX

2.3 Heterogeneous network topology

The network is Ethernet, the topology is star-shaped (Y) interconnected by switch architecture.

The GDX method is integrated in all X-CPU systems. Furthermore, we provide C++ / C # source code for free use.

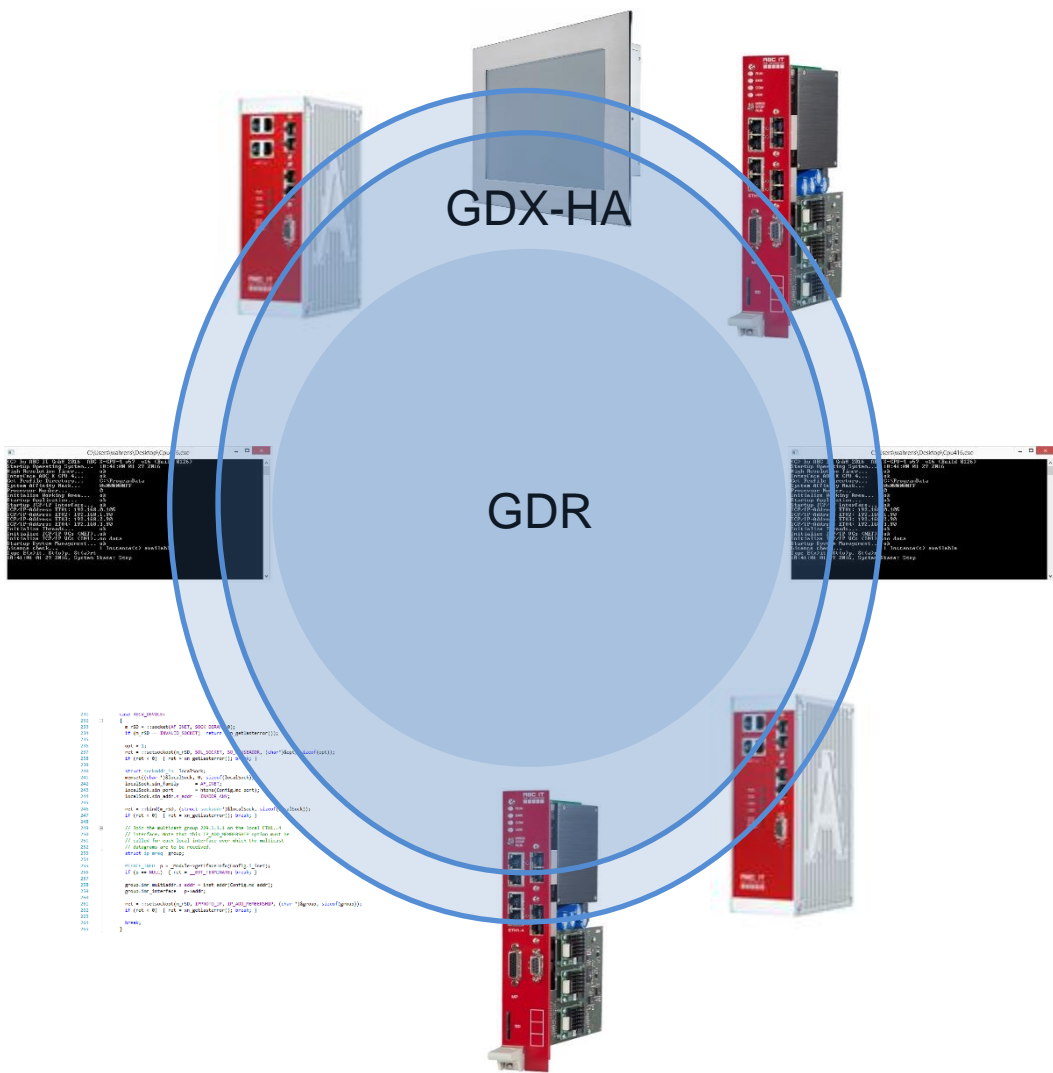


Heterogeneous network topology

2.4 Highly available network topology

The network is Ethernet, the topology is circular (O) connected from controller to controller.

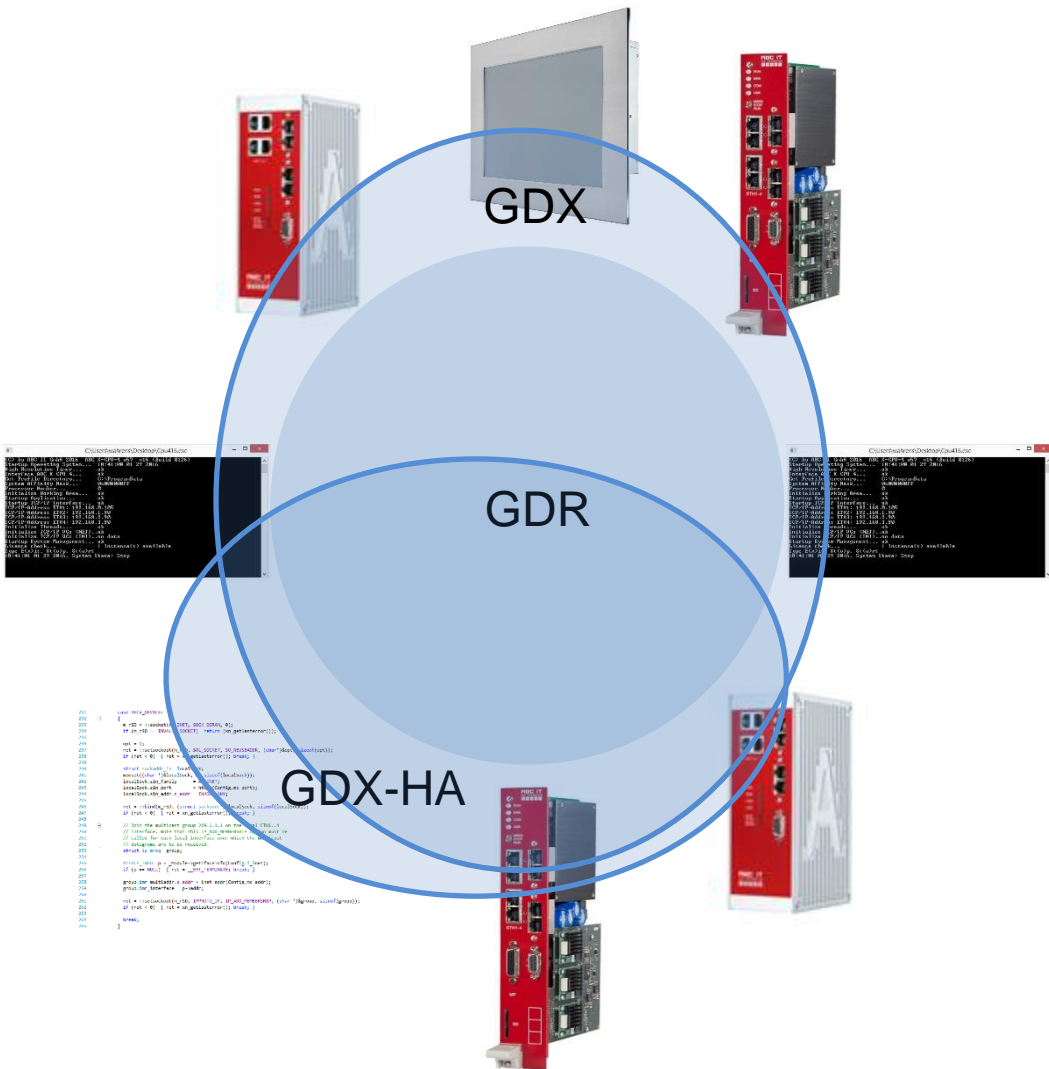
The *GDX-HA* method is integrated in all X-CPU systems. Furthermore, we provide C++ / C# source code for free use.



Global Data Xchange – High Available

2.5 O/Y – network topology

GDX-HA can be 'tapped' on any controller and continued as GDX. This allows an almost unlimited possibility of O / Y topologies. The GDR remains across all topologies.



O/Y – network topology

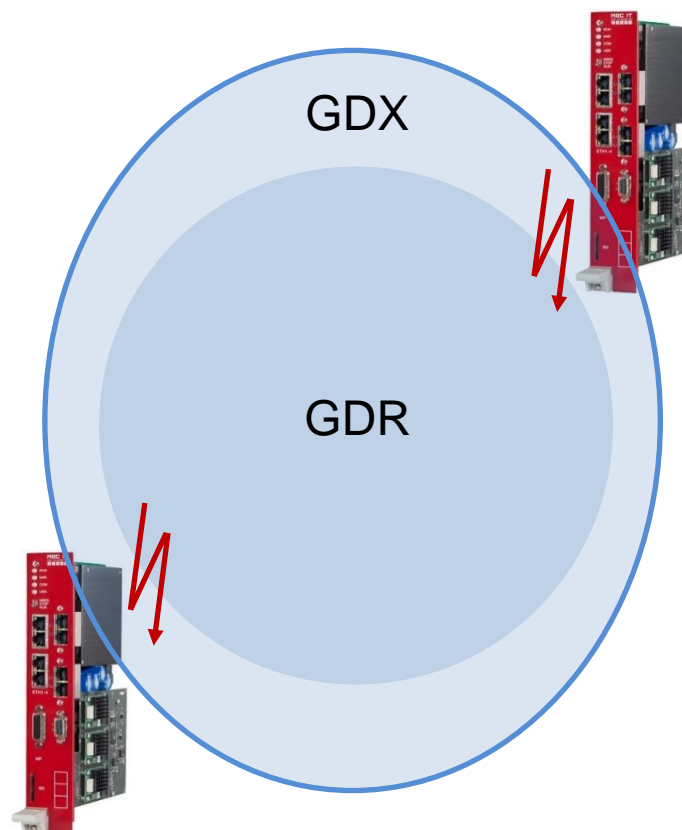
2.6 Telegram and data reduced communication

GDX works on data-level, which is event-controlled. This means, that the data area of the *GDR* is monitored for data change.

The telegram and data transportation can be greatly reduced.

The monitoring takes place at the binary level and records every change. A typified data monitoring will not take place.

If a change in the data area is detected, the entire data area will be available to the *GDR*.



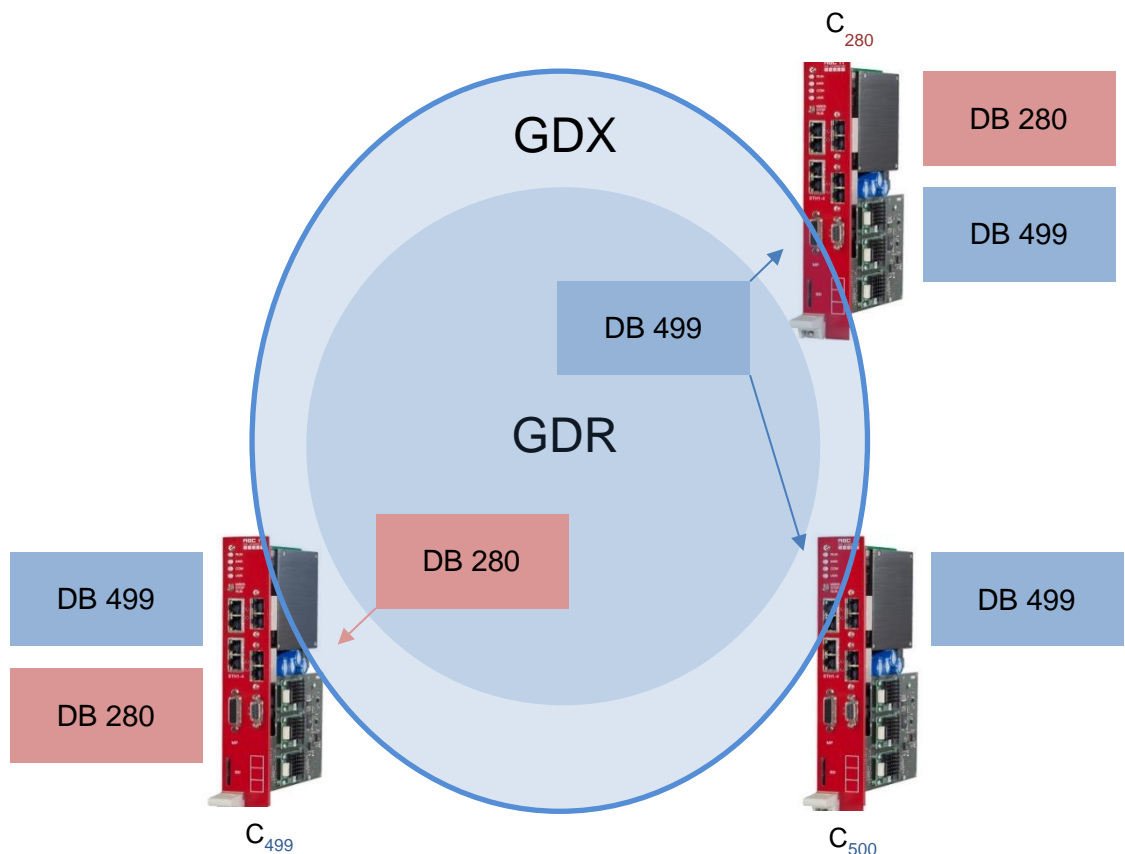
Change Management

3. Global Data Room – GDR

3.1 Areas under STEP7

Global data areas are transparent areas for each controller. These should be easy to address and manage. Data blocks are the first choice here.

Each controller provides the areas that are interesting and important to him. The DB number range 1 .. 65535 composes the *GDR*. Controllers can be addressed in the range 1..65535.



Data area under STEP7

In this case, an X-CPU-6 m57 with the controller number 280, the second and third one with the controller numbers 499 and 500 have been parameterized

Each individual data block corresponds to the controller number. The data of this data block, if there is any, will be provided in the *GDR*.

Controller 280 will receive the data from controller 499, because there is a local DB499 under it. Conversely, controller 499 may also access to the data of controller 280.

The controller 500 doesn't have its own data for the *GDR* (the corresponding S7 data block should be DB500). But it accesses to the data of controller 499.

At the controller level, it is decided whether and which data will be provided to the *GDR* and which data will be accessed in the *GDR*.

3.2 GDX v2 under STEP7 parameterizing

With version 2 of the GDX protocol, an S7-DB of the GDX family and version 2.0 correspond to a CID. Up to 100 CIDs can be managed dynamically by an X-CPU. The CIDs must be always uniquely assigned.

Objektname	Symbolischer Name	Erstelsprache	Größe im Arbeitsspe...	Typ	Version (Header)	Name (Header)	Unlinked	Autor
Systemdaten	...	...	...	SDB	...	...	...	...
OB1	CYCL_EXC	AWL	166	Organisationsbaustein	0.0	...	...	...
OB32	CYCL_INT2	AWL	56	Organisationsbaustein	0.1	...	...	...
OB80	CYCL_FLT	AWL	38	Organisationsbaustein	0.1	...	...	...
DB107	DB	DB	40	Datenbaustein	2.0	CID107	...	ABCIT
DB108	DB	DB	40	Datenbaustein	2.0	CID108	...	ABCIT
DB115	...	...	...	...	0.1	...	...	...
DB805	...	...	...	...	0.1	...	...	...
DB806	...	...	...	...	0.1	...	...	...
DB807	...	...	...	...	0.1	...	...	...
UDT115	...	...	...	...	0.1	GDR	...	ABCIT
SFC252	...	...	...	...	1.0	XCODE	...	ABCIT

Eigenschaften - Datenbaustein

Name (Header): Version (Header):

Familie: Autor:

Längen:

Lokaldaten:

Daten: 4 Bytes

Ladespeicherbedarf: 94 Bytes

Arbeitsspeicherbedarf: 40 Bytes

DB ist schreibgeschützt in der AS Standard Baustein

KNOX/HGW Schutz Unlinked

Non-Retain Baustein schreibgeschützt

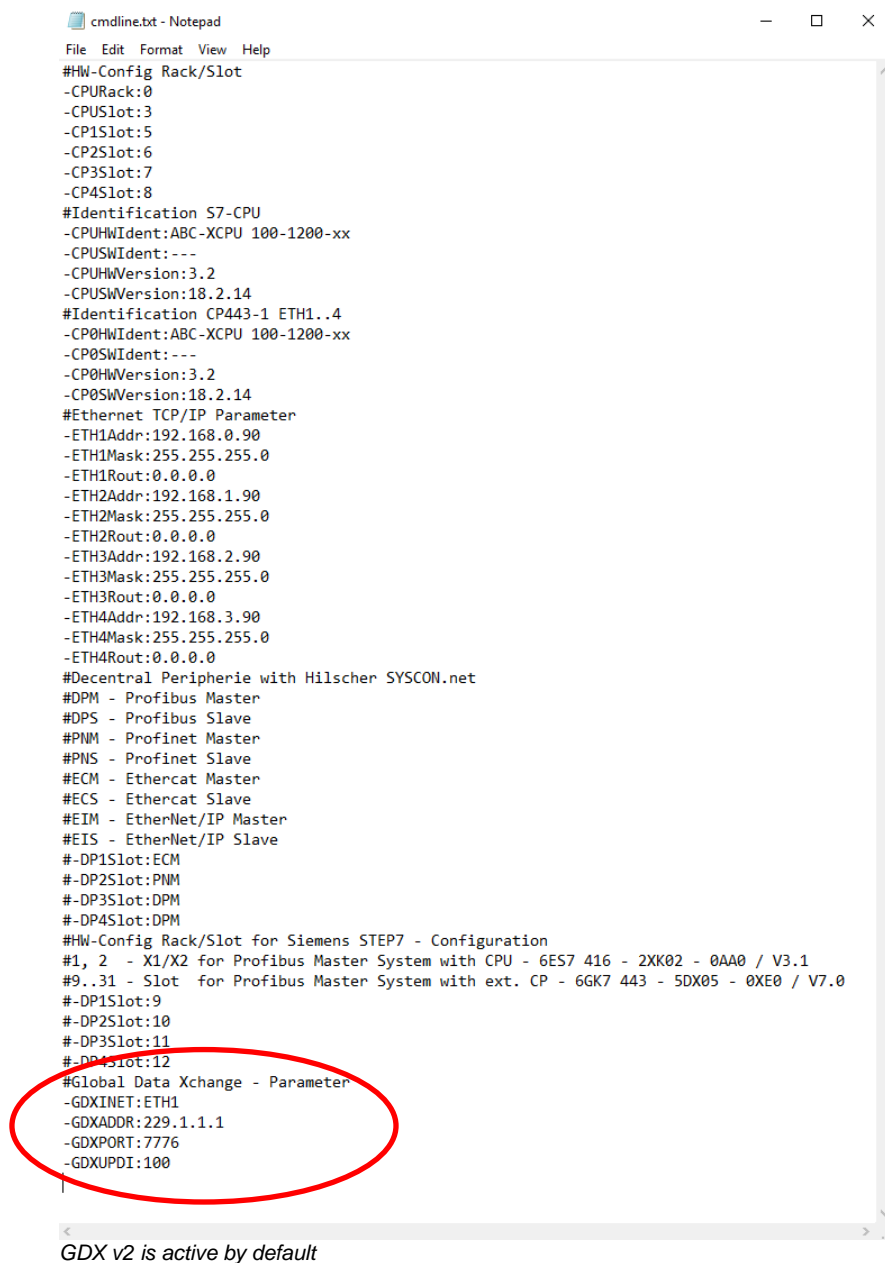
OK Abbrechen Hilfe

CID108 referenced by the S7-DB108

4. Parameterization

4.1 cmdline.txt

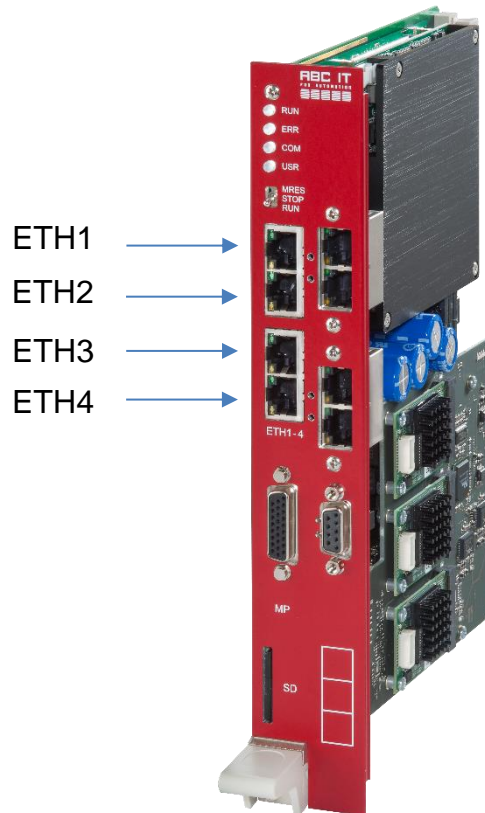
The parameterization of the Global Data Xchange can be done via '*cmdline.txt*'.



```
cmdline.txt - Notepad
File Edit Format View Help
#HW-Config Rack/Slot
-CPURack:0
-CPUslot:3
-CP1Slot:5
-CP2Slot:6
-CP3Slot:7
-CP4Slot:8
#Identification S7-CPU
-CPUHWIdent:ABC-XCPU 100-1200-xx
-CPUHWIdent:---
-CPUHWVersion:3.2
-CPUHWVersion:18.2.14
#Identification CP443-1 ETH1..4
-CP0HWIdent:ABC-XCPU 100-1200-xx
-CP0HWIdent:---
-CP0HWVersion:3.2
-CP0HWVersion:18.2.14
#Ethernet TCP/IP Parameter
-ETH1Addr:192.168.0.90
-ETH1Mask:255.255.255.0
-ETH1Route:0.0.0.0
-ETH2Addr:192.168.1.90
-ETH2Mask:255.255.255.0
-ETH2Route:0.0.0.0
-ETH3Addr:192.168.2.90
-ETH3Mask:255.255.255.0
-ETH3Route:0.0.0.0
-ETH4Addr:192.168.3.90
-ETH4Mask:255.255.255.0
-ETH4Route:0.0.0.0
#Decentral Peripherie with Hilscher SYSCON.net
#DPM - Profibus Master
#DPS - Profibus Slave
#PNM - Profinet Master
#PNS - Profinet Slave
#ECM - Ethercat Master
#ECS - Ethercat Slave
#EIM - EtherNet/IP Master
#EIS - EtherNet/IP Slave
#-DP1Slot:ECM
#-DP2Slot:PNM
#-DP3Slot:DPM
#-DP4Slot:DPM
#HW-Config Rack/Slot for Siemens STEP7 - Configuration
#1, 2 - X1/X2 for Profibus Master System with CPU - 6ES7 416 - 2XX02 - 0AA0 / V3.1
#9..31 - Slot for Profibus Master System with ext. CP - 6GK7 443 - 5DX05 - 0XE0 / V7.0
#-DP1Slot:9
#-DP2Slot:10
#-DP3Slot:11
#-DP4Slot:12
#Global Data Xchange - Parameter
-GDXINET:ETH1
-GDXADDR:229.1.1.1
-GDXPORT:7776
-GDXUPDI:100
GDx v2 is active by default
```

4.2 GDXINET:ETH1

GDXINET defines the interface ETH1..ETH4 of the X-CPU –systems, on which GDX should run. Two interfaces will be needed for GDX-HA.



X-CPU-6 m57 Interface

Special feature of *GDX-HA* in O-topology

Assignment of two Ethernet interfaces:

- GDXINET:ETH3
- GDXINET:ETH4

Looping through the Ethernet always takes place at the identical interfaces:

3-HA Controller

C₂₈₀ ETH4 to C₅₀₀ ETH4
C₅₀₀ ETH3 to C₄₉₉ ETH3
C₄₉₉ ETH2 to C₂₈₀ ETH2

4-HA Controller

C₂₈₀ ETH4 to C₅₀₀ ETH4
C₅₀₀ ETH3 to C₄₉₉ ETH3
C₄₉₉ ETH4 to C₃₁₃ ETH4
C₃₁₃ ETH3 to C₂₈₀ ETH3

4.3 GDXADDR:229.1.1.1

This parameter should be changed only after having consulted with the support of ABC IT GmbH.

4.4 GDXPORT:7776

This parameter should be changed only after having consulted with the support of ABC IT GmbH.

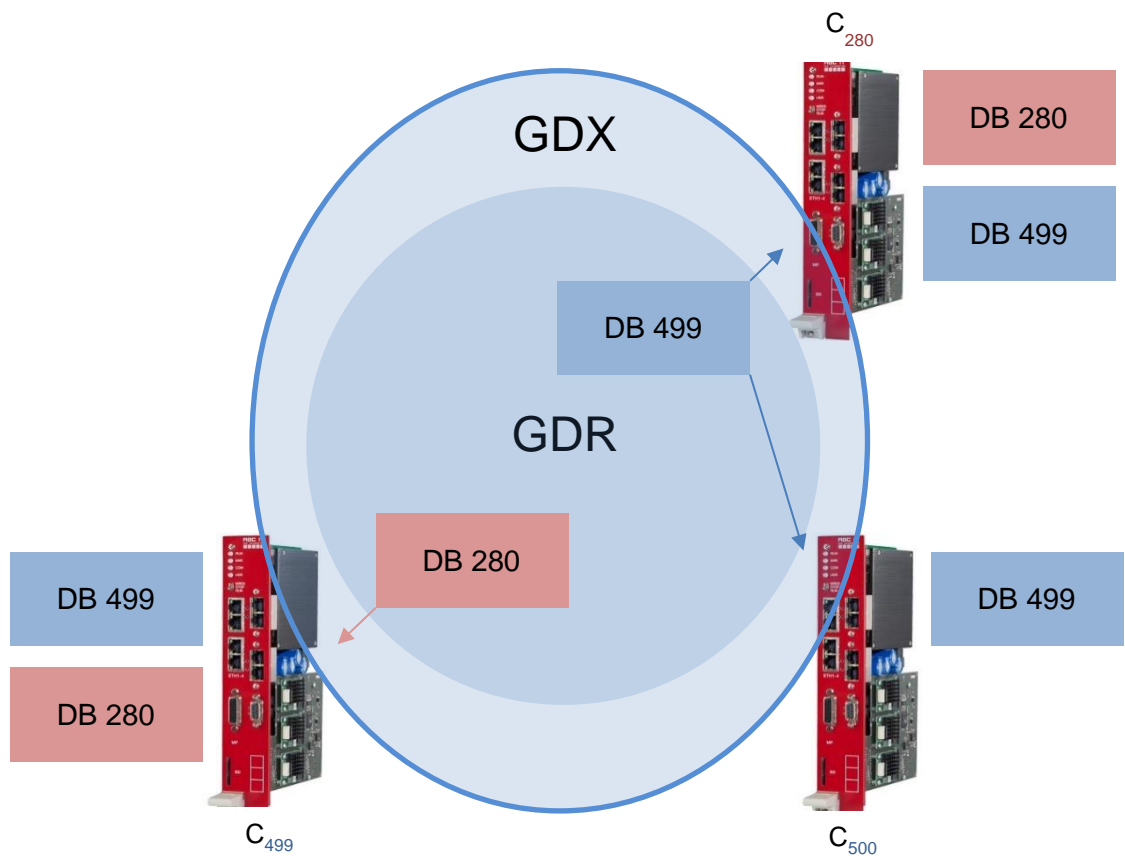
4.5 GDXUPDI:100

The update interval defines the time interval in milliseconds, in which a test for date change is running through. If a date change is detected, the new data will be placed in the *GDR*.

5. Global Data Xchange GDX

5.1 Controller – controller communication

The ABC X-CPU-6 m57 is a GDX controller and is able to exchange data with all other GDX controllers.



Controller-controller communication

With a typified data source, the communication between the controllers is easy to create and maintain.

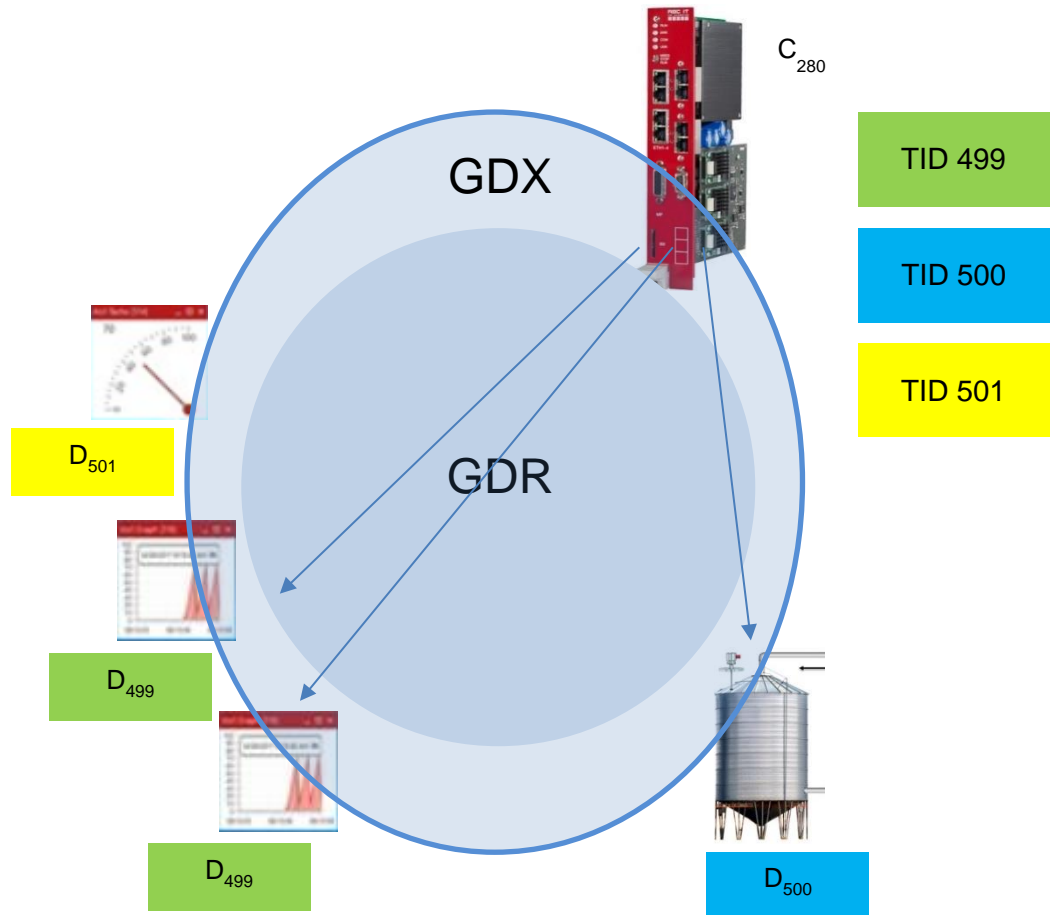
Sender and receiver work with identical objects.

Adresse	Name	Typ	Anfangswert	Kommentar
0.0		STRUCT		
+0.0	LifeCount	DWORD	DW#16#0	
+4.0	Data	ARRAY[0..99]		
*1.0		BYTE		
=104.0		END_STRUCT		

Typified data source under STEP7

5.2 Controller – device communication

The ABC X-CPU-6 m57 is a GDX controller and is able to exchange data with all GDX devices.



Controller-device communication

A GDX device can be a C ++ / C # / Java / ... program, a hardware IO, a complete visualization or a measurement PC in telecontrol.

Devices become unique by assigning a device ID *GDXDID*. If several devices are parameterized with the same *GDXDID*, they will receive identical data objects.

For visualizations, this means a non-license dependent multiple execution is possible in the GDX network.

Schnittstelle		Inhalt von: 'Umgebung\Schnittstelle\STAT\D'				
Name	Datentyp	Anfangswert	Ausschlussoperand	Abbruchoperand	Kommentar	
Object	DInt	L#514	<input type="checkbox"/>	<input type="checkbox"/>	Object Tacho	
SeqNo	DWord	DW#16#0	<input type="checkbox"/>	<input type="checkbox"/>		
Value	Real	0.000000...	<input type="checkbox"/>	<input type="checkbox"/>		
Min	Real	0.000000...	<input type="checkbox"/>	<input type="checkbox"/>		
Max	Real	1.000000...	<input type="checkbox"/>	<input type="checkbox"/>		
Desc	String[32]	'Tacho'	<input type="checkbox"/>	<input type="checkbox"/>		

```

FB600 : Titel:
Kommentar:

[ ] Netzwerk 1: Type Object
    L   L#514
    T   #D.Object          #D.Object      -- Object Tacho

[ ] Netzwerk 2: Sequence Number
    L   #D.SeqNo          #D.SeqNo
    L   1
    +D
    T   #D.SeqNo          #D.SeqNo

[ ] Netzwerk 3: Value
    L   #Value            #Value
    T   #D.Value          #D.Value

[ ] Netzwerk 4: Automatic
    U   #Automatic        #Automatic
    SPB L800

[ ] Netzwerk 5: Minimum
    L   #Min              #Min
    T   #D.Min            #D.Min

[ ] Netzwerk 6: Maximum
    L   #Max              #Max
    T   #D.Max            #D.Max

[ ] Netzwerk 7: Description
    CALL "BLKMOV"          SFC20          -- Copy Variables
    SRCBLK :=#Desc        #Desc
    RET_VAL:=#t_int       #t_int
    DSTBLK :=#D.Desc      #D.Desc

[ ] Netzwerk 8: Peripherie/Port Address
    L800: NOP 0
    L   DINO
    SLD 3
    T   #o                #o

[ ] Netzwerk 9: Aktuelle Instanz entspricht dem GDX-Objekt
    L   54
    L   16
    T   P&D [#o]         #o

[ ] Netzwerk 10: Error
    L   0
  
```

GDX-Device Tacho definition under STEP7

The data object *Tacho* with the type ID *GDXTID* 514 is transferred to the GDR with the *GDXDID* 600. All devices with the ID 600 will receive this data.