Technical Workshop

Topic: TwinCAT Database Server

Step by step introduction for hands on with TwinCAT Database Server.

1. Foreword

There are two possibilities to configure the TwinCAT Database Server - on the one hand out of the PLC Control and on the other hand with TwinCAT Database Server XML Configuration File Editor. Today we discuss a small example for the configuration with XML Editor, but there is also an instruction for the second way for testing yourself.

2. DataBaseServer Configuration with XML Editor

Open the Editor under Start -> All Programs -> TwinCAT System -> TwinCAT DataBase Server -> XML Configuration File Editor



Beckhoff Automation GmbH Eiserstraße 5 33415 Verl Germany Postfach 1142

33398 Verl

Telefon: +49 (0) 52 46/9 63-0Fax Zentrale:-149Fax Vertrieb:-198Fax Anlagentechnik:-379Fax Service:-479E-Mail: info@beckhoff.dewww.beckhoff.de

Geschäftsführer: Dipl. Phys. Hans Beckhoff Arnold Beckhoff Registergericht: Gütersloh HRB 1803 Ust.-ld.-Nr.: DE 126787444 Finanzamt Wiedenbrück St.-Nr. 347/5819/0027 Kreissparkasse Verl BLZ 478 535 20 Kto.Nr. 4 000 766 SWIFT: WELADED1WDB IBAN: DE114785352 00004000766

At first you have to add a new database. Right click on Database as it is shown in the picture or by the symbols in the tool bar.



In the next step you must configure your database. Not everybody has got the great databases on his system, that's why we choose the ASCII database.

You can find the declaration of all different database types, which we support, in the Information System.

http://infosys.beckhoff.com/content/1031/tcdbserver/html/tcdbserver_dbdeclaration.htm

Beckhoff Automation GmbH Eiserstraße 5 33415 Verl Germany	
Postfach 11 42 33398 Verl	

Telefon: +49 (0) 52 46/9 63-0Fax Zentrale:-149Fax Vertrieb:-198Fax Anlagentechnik:-379Fax Service:-479E-Mail: info@beckhoff.dewww.beckhoff.de

Geschäftsführer: Dipl. Phys. Hans Beckhoff Arnold Beckhoff Registergericht: Gütersloh HRB 1803 Ust.-Id.-Nr.: DE 126787444 Finanzamt Wiedenbrück St.-Nr. 347/5819/0027 Kreissparkasse Verl BLZ 478 535 20 Kto.Nr. 4 000 766 SWIFT: WELADED1WDB IBAN: DE114785352 00004000766



Choose the DBType ASCII. If you only will log alphanumeric data types and Boolean choose "Double" for DBValueType. Otherwise select "Bytes" for the log of structures and strings too.

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		ODBC_InterBase	·
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For an ASCII database you must indicate only the database URL, like it is shown in the next picture. You still need the Database ID (DBID) later on and also the AdsID which you can see on the next page.

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Add an AdsDevice and insert your AdsNetID, also your AdsPort. If you use the local system, you don't need to type your NetID.

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If you create a configuration for a remote system, you have the possibility to choose your target in the table on the right side. Now you can insert a Symbolgroup with variables from your PLC project.

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Before you configure your Symbolgroup, you have to "Build" your PLC project. Open TwinCAT PLC Control with PLCVariableSample.pro file and then Project -> Build. This is important for the generation of the tpy file. You can search for variables about the "Import Symbols" button in the Database Editor.

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For example you choose the first five variables of the Symbolcollection. You can change the LogMode for each variable, like it is shown in the next picture. You have to set the AdsID and the DBID, which you know from the sides before.

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	Sym	GnoID D	irection		0	vcletime	3 1	AdsID	DBID	532140			
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Group 1 (Symbols:5)		DBName	Symbolname	Type		IGroup	IOffset	BitSize	LoaM	ode			
		DIMM1	MAIN.DIMM1	REAL	-	16448	0	32	cvcle	-			
		DIMM2	MAIN.DIMM2	REAL	-	16448	4	32	cvcle	-			
		DIMM3	MAIN DIMM3	REAL	-	16448	8	32	cycle	-			
		DIMM4	MAIN DIMM4	REAL	-	16448	12	32	cycle	-			
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TwinCAT Database Server Configurator File Item View Language Help 🛅 📂 📂 🛃 💁 🎁 🧶 🛅 📭 🗙 🚱 🖏 👘 🕨 🌆 Configuration Explorer ч× Symbolgroup 1 4 0 E Configuration Symbolgroup 1 🖻 🕕 Databases DBID SymGrpID Direction AdsID Cycletime 间 DB 1 ("ASCII") ADSDevices 30000 1 🔹 Symbols: 5 ADS_to_DB_APPEND 1 ms 1 🔹 1 🙆 Device 1 ("local" : 801) ADS to DB APPEND ADS to DB UPDATE DBName ADS to DB RINGBUFFER DB to ADS DIMM1 MAIN.DIMMT REAL Symbolgroups Group 1 (Symbols:5) IGroup **IOffset** BitSize LogMode cycle 💌 -. REAL 16448 0 32 DIMM2 MAIN.DIMM2 REAL 🔻 16448 4 32 cycle 💌 DIMM3 MAIN DIMM3 REAL 🔻 16448 8 32 cycle 🔻 MAIN.DIMM4 32 cycle 🔻 DIMM4 REAL • 16448 12 -DIMM5 MAIN.DIMM5 LREAL 16448 16 64 cycle ---* Message List **д х** Timestamp Message (1) 09.04.2013 13:27:13 Import Symbols: 5 Symbols imported (i) 09.04.2013 13:18:13 (i) 09.04.2013 13:16:30 Add SymbolGroup "Group:1" to XML Configurationfile. Add AdsDevice "AdsID:1" to XML Configurationfile. 09.04.2013 13:12:45 Add Database "DBID:1" to XML Configurationfile. Import Symbols ... Done Manual Impersonate

Beckhoff Automation GmbH	Telefon: +49(0) 52 46/9 63-0	Geschäftsführer:	Kreissparkasse Verl	Deutsche Bank
Eiserstraße 5	Fax Zentrale: -149	Dipl. Phys. Hans Beckhoff	BLZ 478 535 20	BLZ 480 700 43
33415 Verl	Fax Vertrieb: -198	Arnold Beckhoff	Kto.Nr. 4 000 766	Kto.Nr. 371701400
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You have the possibility to choose the communication direction. In this case ADS_to_DB_APPEND is selected.

ADS_to_DB_APPEND:

This option appends the new data entries to the old in the database.

ADS_to_DB_UPDATE:

This option updates the available entries in the database.

ADS_to_DB_RINGBUFFER:

With this write mode you can limit the count or the age of datasets at databasetables.

DB_to_ADS:

This communication direction describes the reading of values from the database into the PLC.

If the Database Server should be used without the PLC (only logging from PLC variables), the option AutoStart must be set. So the Database Server immediately starts creating the connections to the declared database and ADS-devices after a TwinCAT start. Therefore you have to create a Bootproject from PLCVariableSample.pro. Finally you have to save your DB configuration in the Editor under C:\TwinCAT\Boot.

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Configuration Explorer	д х	Configuration	4 ۵
Configuration		Configuration	
DB 1 ("ASCII") ADSDevices 		StartUp Manual (Standard StartUp for using all function blocks of the PLC Lib.) AutoStart (Starts the cyclic read or write of the symbolizious after TwinCAT restart.)	
Group 1 (Symbols:5)			
		Creating Errorlogfile (creates a text file where all occured errors will be stored)	\TcDBSrvErrorLog.txt
		Impersonate User (impersonate user logins for network connections)	
		Password	
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09.04.2013 13:18:13 Add Symb 09.04.2013 13:16:30 Add Aden	olaroup "Gro Jevice "Adell	Dup: I to XML Configurationfile.	
(i) 09.04.2013 13:12:45 Add Data	base "DBID:	1" to XML Configurationfile.	
Import Symbols Done		AutoStart LogMode Imper	sonate

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Eiserstraße 5	Fax Zentrale:	-149	Dipl. Phys. Hans Beckhoff	BLZ 478 535 20	BLZ 480 700 43
33415 Verl	Fax Vertrieb:	-198	Arnold Beckhoff	Kto.Nr. 4 000 766	Kto.Nr. 371701400
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4. Configuration test

Go to PLC Control and start the PLC, after that create a Bootproject and make a TwinCAT restart. Look for the test database "TestDB" under C:\TwinCAT\TcDatabaseSrv\Samples.

This was a small introduction for the Beckhoff Database Server. Have fun with it. Questions? Then write me an email! For professionals follows a small instruction for the configuration of the Database Server from the PLC.

5. DataBaseServer Configuration from the PLC

Task:

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Create a Microsoft SQL Compact database from the PLC Control, add a database connection and insert a new table in your database. Finally use the write function block with the ring buffer mode "RingBuffer_Count" to write 100 times a variable into the table of your database.

At first insert a R_TRIG function block to start your program with a rising edge. After that create a state machine for the call of your database function blocks, like it is shown in the picture below.

0001	PROGR	AM MAIN				
0002	VAR					
0003	3 fbDBCreate		: FB_DBCreate;			
0004	4 fbDBConAdd		: FB_DBConnecti	onAdd;		
0005	15 fbDBTableCreate		: FB_DBTableCre	eate;		
0006	16 fbDBWrite		: FB_DBWrite;			
0007						
0008	stat	e	: INT := 0;			
0009	R_E	Edge	: R_TRIG;			
0010	bE>	ecute	: BOOL;			
0011	END_VA	AR				
	<					
0001	(* Take i	care for the test	with FB_DBCreate that	t the database do not exist-	-> for a second run delet	e the DB*)
0002	R_Edge	(CLK := bExec	ute);			
0003	FR_Ed	ge.Q THEN				
0004	stat	e := 1;				
0005	END_IF					
0006						
0007	CASE st	ate OF				
0008	0:	(* idle state *)				
0009	2					
0010	1:	(" Create a Da	atabase")			
0011	11. Ale the ED DDC					
0012		(Is the LD_D	DCreate busy ()			
0013	, 2: (* Add e connaction to your Detebeco *)					
0015	· ·					
0016	21: (* Is the EB_DBConnectionAdd busy? *)					
0017	:					
0018	3: (* Create a table for vour Database *)					
0019	;					
0020	31: (* Is the FB_DBTableCreate busy? *)					
0021	;					
0022	4: (* Write cyclic values into your Database *)					
0023	;					
0024	41:	(* Is the FB_D	BWrite busy? *)			
0025	;					
0026	END_CA	ASE				
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Now declare all other variables that you need. Especially the structure of the table. You can find a description how to do this for Microsoft SQL Compact the Information System: http://infosys.beckhoff.com/english.php?content=content/1033/tcdbserver/html/TcDBServer_MobileDatabase.htm

An AutoID is generated in the "ID" column. The value in this column is always increased by 1. The "Timestamp" column stores the time at which the data record was saved. And the name of the variable is stored in the third column. Under "Value" you find the values of the variables.

You can take the remaining variables from the next picture.

0001 PROGRAM MAIN						
0002VA	R					
0003	fbDBCreate	: FB_DBCreate;				
0004	fbDBConAdd	: FB_DBConnectionAdd;				
0005	fbDBTableCreate	: FB_DBTableCreate;				
0006	fbDBWrite	: FB_DBWrite;				
0007						
0008	state	: INT := 0;				
0009	R_Edge	: R_TRIG;				
0010	bExecute : BOOL;					
0011						
0012	bError	: BOOL;				
0013	uErrlD	: UDINT;				
0014						
0015	uDblD	: UDINT;	(* Database ID *)			
0016	uAdsID	: UDINT := 1;	(* Set your ADS ID *)			
0017						
0018	(* Table structure: *)					
0019	tablestrc: ARRAY [03] OF ST_DBColumnCfg :=					
0020	(sColumnName := 'ID', sColumnProperty := 'IDENTITY(1,1)', eColumnType := EDBCOLUMN_BIGINT),					
0021	(sColumnName := 'Timestamp', eColumnType := EDBCOLUMN_DATETIME),					
0022	22 (sColumnName := 'Name', eColumnType := EDBCOLUMN_NTEXT),					
0023	23 (sColumnName := 'Value', eColumnType := eDBColumn_Integer);					
0024						
0025	ILogVariable	(INT)	(* Log variable *)			

The next steps.

Beckhoff Automation GmbH	Telefon: +49(0) 52 46/	963-0
Eiserstraße 5	Fax Zentrale:	-149
33415 Verl	Fax Vertrieb:	-198
Germany	Fax Anlagentechnik:	-379
	Fax Service:	-479
Postfach 11 42 33398 Verl	E-Mail: info@beckhoff.de www.beckhoff.de	

Geschäftsführer: Dipl. Phys. Hans Beckhoff Arnold Beckhoff Registergericht: Gütersloh HRB 1803 Ust.-Id.-Nr.: DE 126787444 Finanzamt Wiedenbrück St.-Nr. 347/5819/0027 Kreissparkasse Verl BLZ 478 535 20 Kto.Nr. 4 000 766 SWIFT: WELADED1WDB IBAN: DE114785352 00004000766

FB_DE	3Create:		
0007	CASE state OF		
0008	0: (*idle	state *)	
0009	;		
0010			
0011	1: (* Cre	ate a Database '	")
0012	fbDBCreat	e(sNetID	;= ,
0013		sPathName	:= 'C:\TwinCAT\TcDatabaseSrASamples',
0014		sDBName	:= 'DB_ITW',
0015		eDBType	:= eDBType_Mobile_Server,
0016		sSystemDB	;= ,
0017		sUserld	:=,
0018		sPassword	;= ,
0019		bExecute	:= TRUE,
0020		tTimeout	:= T#20s,
0021		bBusy	=> ,
0022		bError	=> bError,
0023		nErrID	=> uErrID);
0024	state := 11;		
0025			
0026	11:		
0027	fbDBCreat	e(bExecute := <mark>F</mark> 4	ALSE);
0028	IF NOT fbE)BCreate.bBusy	AND NOT fbDBCreate.bError THEN
0029	state :	:= 2;	
0030	END_IF		

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In state number one you have to insert the FB_DBCreate. The path of the database must be given to this function block. But you must provide that this database does not exist yet. Otherwise there is an error message. In state 11 you have to wait until the function block is not busy.

FB_DBC	ConnectionAdd:					
0032	2:(*Add a con	nection to your Dat	abase	e*)		
0033	fbDBConAdd((sNetID	;= ,			
0034		eDBType	:= eD	BType_Mobile_Server,		
0035		eDBValueType	:= eD	BValue_Double,		
0036		sDBServer	:= ,			
0037		sDBProvider	;= ,			
0038		sDBUrl	:= 'C:'	,TwinCAT\TcDatabaseSr/\Sa	amples\DB_ITW.sdf	u ,
0039		sDBSystemDB	;= ,			
0040		sDBUserld	:= ,			
0041		sDBPassword	:= ,			
0042		sDBTable	:= 'IT'	W_Table',		
0043		bExecute	:= TP	IUE,		
0044		tTimeout	:= T #	20s,		
0045		bBusy	=>,			
0046		bError	=> bB	Error,		
0047		nErrID	=≻ uE	ErrID,		
0048		hDBID	=≻);			
0049	state := 21;		,			
0050						
0051	21:					
0052	fbDBConAdd	(bExecute:=FALSE	, hDBI	D=> uDbID);		
0053	IF NOT fbDBC	ConAdd.bBusy ANI	D NOT	fbDBConÁdd.bError THEN		
0054	state := 3;	-				
0055	END_IF					
Beckhot Eiserstra 33415 V Germany	ff Automation GmbH Be 5 Y Y	Telefon: +49 (0) 52 46/ Fax Zentrale: Fax Vertrieb: Fax Anlagentechnik: Fax Service:	963-0 -149 -198 -379 -479	Geschäftsführer: Dipl. Phys. Hans Beckhoff Arnold Beckhoff Registergericht: Gütersloh HRB 1803 UstIdNr.: DE 126787444	Kreissparkasse Verl BLZ 478 535 20 Kto.Nr. 4 000 766 SWIFT: WELADED1WDB IBAN: DE114785352 D0004000256	Deutsche Bank BLZ 480 700 43 Kto.Nr. 371701400 SWIFT: DEUTDE3B489 IBAN: DE9348070042
Postrach 1142 E-Mail: info@be 33398 Verl www.beckhoff.		www.beckhoff.de	.ue	StNr. 347/5819/0027	00004000766	0371701400



In this function block you have to set the DBType and the DBValueType (Bytes or Double). And you already have to give your table a name. The other settings for Microsoft SQL Compact databases are in the Information System: http://infosys.beckhoff.com/content/1033/tcdbserver/html/tcdbserver_dbdeclaration.htm



One of the inputs of this function block is "hDBID". You give over the value which you get from the FB_DBConnectionAdd. Furthermore you give over the size and the address of your table structure.

Beckhoff Automation GmbH Eiserstraße 5 33415 Verl Germany Postfach 1142

33398 Verl

Telefon: +49(0) 52 46/9 63-0Fax Zentrale:-149Fax Vertrieb:-198Fax Anlagentechnik:-379Fax Service:-479E-Mail: info@beckhoff.dewww.beckhoff.de

Geschäftsführer: Dipl. Phys. Hans Beckhoff Arnold Beckhoff Registergericht: Gütersloh HRB 1803 Ust.-Id.-Nr.: DE 126787444 Finanzamt Wiedenbrück St.-Nr. 347/5819/0027 Kreissparkasse Verl BLZ 478 535 20 Kto.Nr. 4 000 766 SWIFT: WELADED1WDB IBAN: DE114785352 00004000766

FB_DBWrite:



With the FB_DBWrite you can write the current values of the variable "iLogVariable" into the database all the time. But there will be stored only 100 values of the variable, if you set the nRingBufferCount to 100.

At the end of the program code you can see the variable which is increasing by1 every PLC cycle.

Important: If you test the sample program take care that the database does not exist!

Beckhoff Automation G Eiserstraße 5 33415 Verl Germany	imb
Postfach 1142 33398 Verl	

Telefon: +49 (0) 52 46/9 63-0Fax Zentrale: -149Fax Vertrieb: -198Fax Anlagentechnik: -379Fax Service: -479E-Mail: info@beckhoff.dewww.beckhoff.de

Geschäftsführer: Dipl. Phys. Hans Beckhoff Arnold Beckhoff Registergericht: Gütersloh HRB 1803 Ust.-Id.-Nr.: DE 126787444 Finanzamt Wiedenbrück St.-Nr. 347/5819/0027 Kreissparkasse Verl BLZ 478 535 20 Kto.Nr. 4 000 766 SWIFT: WELADED1WDB IBAN: DE114785352 00004000766