Help for Planning Plants with PCS 7 OPC DA

SIMATIC PCS 7 OPC DA

FAQ · March 2012
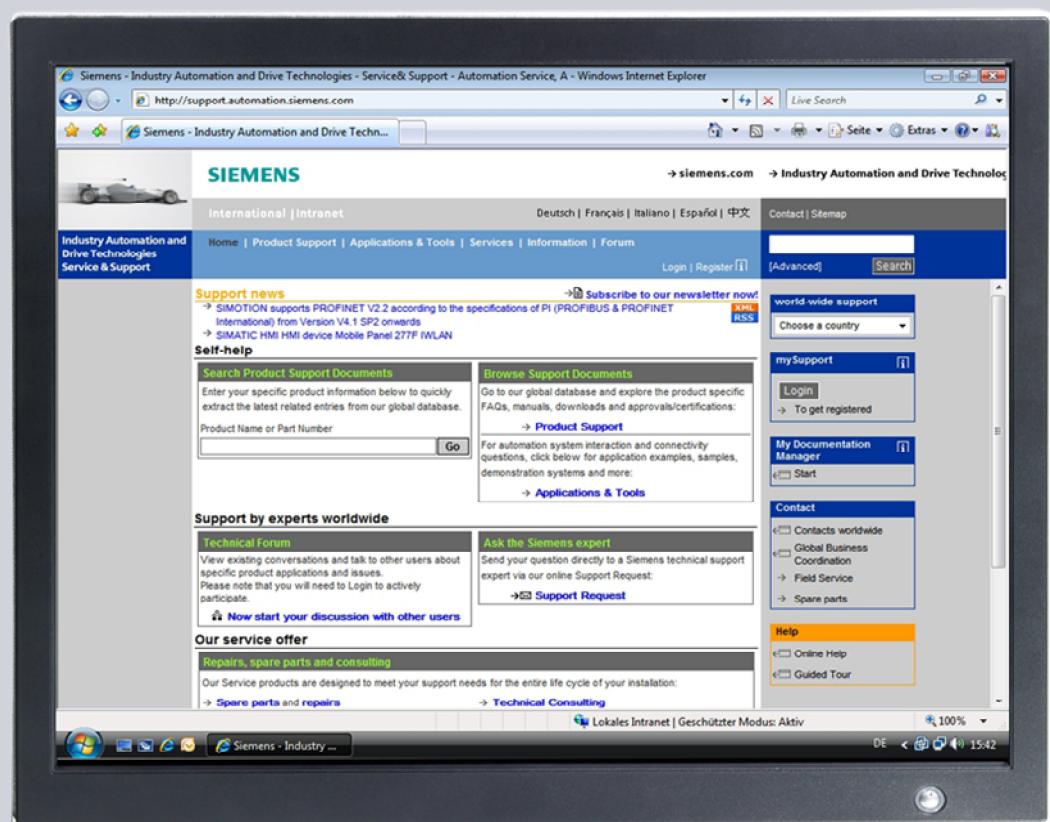
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Caution

The functions and solutions described in this article confine themselves predominantly to the realization of the automation task. Furthermore, please take into account that corresponding protective measures have to be taken in the context of Industrial Security when connecting your equipment to other parts of the plant, the enterprise network or the internet. Further information can be found in Entry ID: !50203404!.

http://support.automation.siemens.com/WW/view/de/50203404

Question

What is the performance of OPC DA in a PCS 7 standard configuration?

Answer

Observe the performance data listed in this document for a detailed answer to the above question.

Contents

1 Reason

OPC is the standard communication channel between a PCS 7 plant and a third-party system. Here, questions are often asked about the performance of the OPC DA server components of the PCS 7 system.

In this test description we have selected three PCS 7 configurations and examined them for their OPC DA performance.

WARNING	**The measured data applies only to the tested configurations under the given conditions.**
	Other configurations and conditions can lead to different measured values.

2 Goals

The documentation is designed to help you plan a PCS 7 plant in which OPC communication is to be used.
The focus here is on showing the OPC DA performance in the PCS 7 standard configurations

3 General Information on the Topic of OPC DA Performance in the PCS 7 Environment

In the PCS 7 environment, the WinCC OPC DA server components can be used on an OS Single Station, an OS Server or an OS Client.

The PCS 7 OPC DA server components can be used on an Open PCS 7 Station. We recommend using the Open PCS 7 OPC server components, because these are completely system tested and released.

The performance of an OPC DA server depends on the parameters below:

- Computer hardware used

- PCS 7 configuration

- Network performance

- PCS 7 configuration

- How the OPC client logs on the OPC tags

- OPC client used

- Implementation of other components that put a load on the OPC computer hardware

Due to the multiple possible configuration options it is impossible to give a generally valid statement about performance.

4 Explanation of Performance Measurements

PCS 7 V7.1 SP2 was used for the measurements featured in this FAQ response. A detailed description of the hardware and software used is available in the relevant chapters.

Table 4-1

Measuring point	Meaning
OPC DA tags [s] of AS1	Logged-on OPC tags by means of the Matrikon OPC Explorer
OPC Data Change Rate [s] of the AS1 of the OPC client	Values calculated by Matrikon OPC client
Data Change Rate AS1 [s]	Through configuration of a sine value in the AS
OPC Data Change Rate [s] of the AS2 of the OPC client	Values calculated by Matrikon OPC client
OPC DA tags [s] of AS2	Logged-on OPC tags by means of the Matrikon OPC Explorer
Data Change Rate AS2 [s]	Through configuration of a sine value in the AS
Change of screen opening time [%] over 5 measurements. Percentage with reference to measurement 1.	Value measured with stopwatch
Reaction time of OS channel (OS1 - AS1) [ms], worst case	Value measured with OS script
Reaction time of OS channel (OS1 - AS2) [ms], worst case	Value measured with OS script
Total processor load of OS1 (average on screen change in 10s cycle)	Value measured with MS Performance Monitor
Network load of terminal bus	Value measured with MS Performance Monitor

Channel Diagnosis	
Tags in 1s cycle AS1	Counter in the OS Channel Diagnosis
Cycle overload 1s AS1	Counter in the OS Channel Diagnosis
Requests 1s AS1	Counter in the OS Channel Diagnosis
Tags in 2s cycle AS1	Counter in the OS Channel Diagnosis
Cycle overload 2s AS1	Counter in the OS Channel Diagnosis
Requests 2s AS1	Counter in the OS Channel Diagnosis
Tags in 60min cycle AS1	Counter in the OS Channel Diagnosis
Cycle overload 60min AS1	Counter in the OS Channel Diagnosis
Requests 60min AS1	Counter in the OS Channel Diagnosis
Read Response Time AS1, worst case [ms]	Counter in the OS Channel Diagnosis
Cycle Create Response AS1, worst case [ms]	Counter in the OS Channel Diagnosis
Tags in 1s cycle AS2	Counter in the OS Channel Diagnosis
Cycle overload 1s AS2	Counter in the OS Channel Diagnosis
Requests 1s AS2	Counter in the OS Channel Diagnosis
Tags in 2s cycle AS2	Counter in the OS Channel Diagnosis
Cycle overload 2s AS2	Counter in the OS Channel Diagnosis
Requests 2s AS2	Counter in the OS Channel Diagnosis
Tags in 60min cycle AS2	Counter in the OS Channel Diagnosis
Cycle overload 60min AS2	Counter in the OS Channel Diagnosis
Requests 60min AS2	Counter in the OS Channel Diagnosis
Read Response Time AS2, worst case [ms]	Counter in the OS Channel Diagnosis
Cycle Create Response AS2, worst case [ms]	Counter in the OS Channel Diagnosis
Request Queue Size AS1	Counter in the OS Channel Diagnosis
Request Queue Size AS2	Counter in the OS Channel Diagnosis
Own Cycles AS1	Counter in the OS Channel Diagnosis
Own Cycles AS2	Counter in the OS Channel Diagnosis

Key	green = OK	yellow = limit	red = overload

5 PCS 7 Test Configuration 1

Configuration 1 is an OS server system for operating and monitoring. An OS client is not in operation. This configuration corresponds to an OS Single Station, but is operated with a Microsoft Server 2003 R2 operating system.

The PCS 7 functions below were executed during the OPC test:

- 2.5 telegrams / s through AS-AS communication

- 10 alarms / s were triggered

- 1000 OS tags / s were archived

Figure 5-1
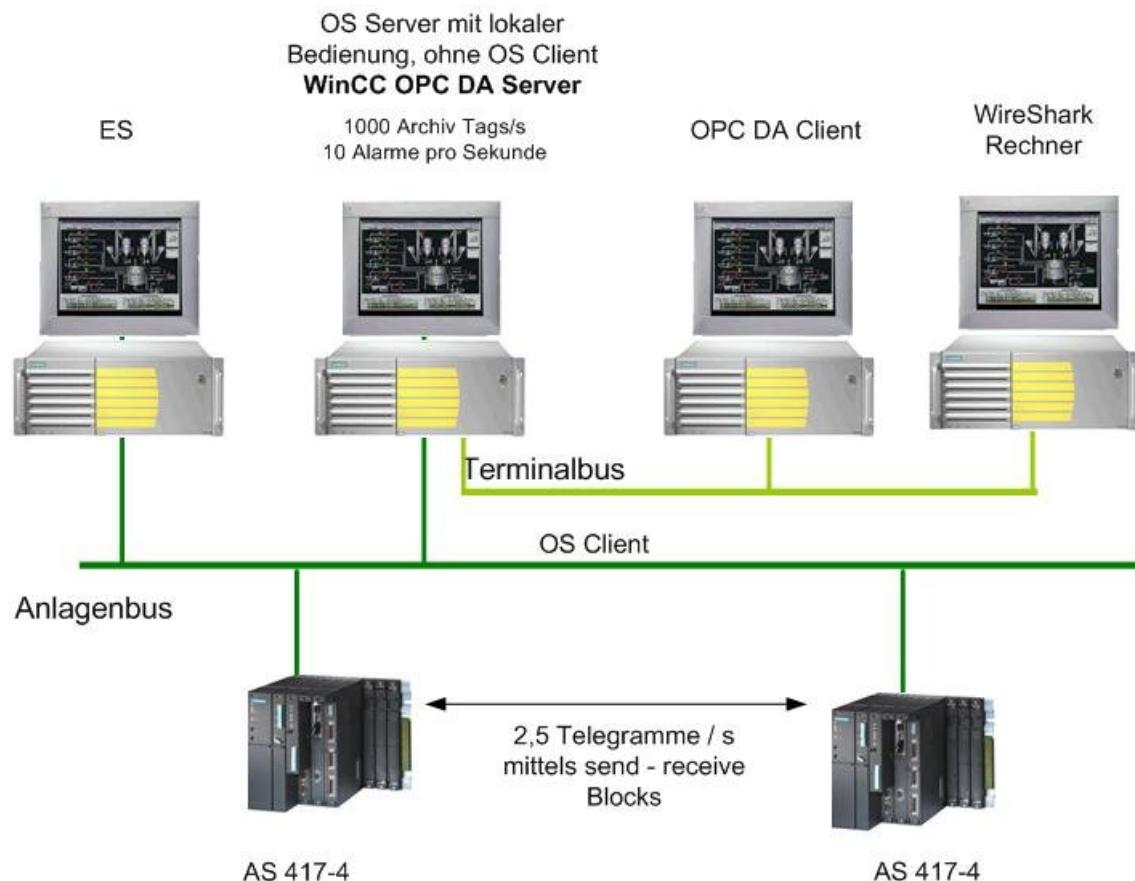
5.1   Conditions

Table 5-1

Computer	Computer hardware	Computer name
ES	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	ES50
OS server	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	SV50A
OPC client	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	SV50B
Wireshark computer	SIMATIC IPC 427C, Dual Core U9300, 1.2 GHz, 956GB RAM	CL50
Network components	**Network hardware plant bus**	**Network hardware terminal bus**
Switch	SCALANCE X208	SCALANCE X208
ES	SIMATIC Miniport CP1623 PCIe Adapter	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC
OS	SIMATIC Miniport CP1623 PCIe Adapter	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC
OPC client	SIMATIC Miniport CP1623 PCIe Adapter	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC
Wireshark computer	Intel® 82574L Gigabit Network Adapter	Intel® 82574L Gigabit Network Adapter
Plant bus = 100 Mbps		
Terminal bus = 100 Mbps		
Alarm logging / Tag logging		
Archive tags	Approx. 500 tags / s from AS1 + 500 tags / s from AS2	Archive tags
Message incidence	Approx. 10 messages / s	Message incidence
PCS 7 version		
V7.1 SP2		
OPC client components		
OPC DA client = Matrikon OPC Explorer V5.0		
OPC A&E client = OPC Event Sample Client (ICONICS)		
Process screens		
Most process screens have 36 process symbols.		
Screens with 100 process symbols are used for the screen opening time test.		
General information		
The reaction of the AS-OS connection is determined with a cyclic GetTagWait command.		
Maintenance		
Diagnostics screens were created.		
Automation systems		
AS1	CPU 417-4 V4.1	
AS2	CPU 417-4 V4.1	

5.2 Measurement Series

Table 5-2

Configuration	Measurement																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
OPC DA tags [s] of AS1	0	250	500	750	1000	2000	3000	5000	7000	10000	13000	15000	20000	25000	30000	30000	40000
OPC Data Change Rate [s] of the AS1 of the OPC client	0	250	500	750	1000	2000	3000	5000	7000	10000	13000	14000	14000	14000	14000	14000	14000
Data Change Rate AS1 [s]	0	250	500	750	1000	2000	3000	5000	7000	10000	13000	15000	20000	25000	30000	30000	40000
OPC DA tags [s] of AS2	0	250	500	750	1000	2000	3000	5000	7000	10000	13000	15000	20000	25000	0	30000	40000
OPC Data Change Rate [s] of the AS2 of the OPC client	0	250	500	750	1000	2000	3000	5000	7000	10000	13000	14000	14000	14000	0	14000	14000
Data Change Rate AS2 [s]	0	250	500	750	1000	2000	3000	5000	7000	10000	11050	15000	20000	25000	0	30000	40000
Change of screen opening time as a percentage over 5 measurements.	0,0	3,4	4,8	6,9	7,6	8,3	9,7	16,6	16,6	16,6	19,3	36,6	48,3	58,6	63,4	65,5	n.a.
Reaction time of OS channel (OS1 - AS1) [ms], worst case	47	40	40	60	62	47	78	94	109	185	219	980	1500	1734	2953	3516	n.a.
Reaction time of OS channel (OS1 - AS2) [ms], worst case	31	40	40	60	62	32	79	83	94	160	469	780	1700	1875	1578	3750	n.a.
Total processor load of OS1 (average on screen change in 5s cycle, Average Value Performance)	7%	12%	13%	12%	13%	12%	13%	17%	23%	28%	30%	31%	33%	33%	32%	33%	32%
Network load of terminal bus	0,02 %	0,22 %	0,42 %	0,62 %	0,81%	1%	2%	3%	5%	6%	9%	9%	10%	10%	5%	10%	9%

Table 5-3

Channel Diagnosis	Measurement																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Tags in 1s cycle AS1	514	764	1014	1264	1514	2514	3514	5514	7514	10514	13514	15514	20514	25492	30262	30492	40498
Cycle overload 1s AS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Requests 1s AS1	9	10	12	14	17	26	38	55	77	106	134	173	210	238	282	285	377
Tags in 2s cycle AS1	100	500	244	100	388	244	100	244	100	100	100	100	100	144	30	0	27
Cycle overload 2s AS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Requests 2s AS1	2	7	4	3	6	4	3	4	2	2	3	2	3	2	2	0	1
Tags in 60min cycle AS1	0	100	36	0	72	36	0	36	0	0	0	0	0	36	0	0	0
Cycle overload 60min AS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Requests 60min AS1	0	2	1	0	1	1	0	1	0	0	0	0	0	1	0	0	0
Read Response Time AS1, worst case [ms]	6	6	11	7	16	12	102	111	119	123	138	174	182	114	108	117	125
Cycle Create Response AS1, worst case [ms]	27	n.a.	n.a.	n.a.	n.a.	92	n.a.	101	67	n.a.	n.a.	n.a.	94	n.a.	n.a.	n.a.	n.a.
Tags in 1s cycle AS2	541	764	1014	1264	1514	2514	3514	5514	7514	10514	13514	15514	20514	25755	614	30655	39855
Cycle overload 1s AS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Requests 1s AS2	8	10	12	15	17	26	36	55	83	101	135	157	234	242	15	287	465
Tags in 2s cycle AS2	100	100	100	500	212	100	100	100	100	100	100	100	100	0	3	144	0
Cycle overload 2s AS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Requests 2s AS2	2	2	2	7	3	2	2	2	2	2	2	2	2	0	1	2	0
Tags in 60min cycle AS2	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	36	0
Cycle overload 60min AS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Requests 60min AS2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Read Response Time AS2, worst case [ms]	22	6	16	7	37	77	110	99	98	168	162	122	209	153	7	129	117
Cycle Create Response AS2, worst case [ms]	27	29	35	n.a.	n.a.	100	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Request Queue Size AS1	0	0	0	0	0	0	0	0-4	0-4	0-10	10-23	42-52	80-100	105-115	n.a.	145-156	239-247
Request Queue Size AS2	0	0	0	0	0	0	0	0-3	0-4	0-10	13-23	15-25	100-117	112-123	n.a.	154-163	327-340
Own Cycles AS1	0	0	0	0	0	0	9	28	50	76	105	149	160	209	252	253	346
Own Cycles AS2	0	0	0	0	0	0	6	25	53	71	105	116	163	210	0	258	433

Table 5-4

Result	Measurement																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Total Tag Load AS1 / s	564	1014	1136	1314	1708	2636	3564	5636	7564	10564	13564	15564	20564	25564	30277	30492	40512
Total Tag Load AS2 / s	591	814	1064	1514	1620	2564	3564	5564	7564	10564	13564	15564	20564	25755	615,5	30727	39855
Total Tag Load WinCC channel / s	1155	1828	2200	2828	3328	5200	7128	11200	15128	21128	27128	31128	41128	51319	30893	61219	80367
Subscribed to OPC DA tags / s	0	500	1000	1500	2000	4000	6000	10000	14000	20000	26000	30000	40000	50000	30000	60000	80000
Updated OPC tags / s	0	500	1000	1500	2000	4000	6000	10000	14000	20000	26000	28000	28000	28000	14000	28000	28000

Notes

Measurement 12 to measurement 14 (30,000 – 50,000 logged-on OPC DA tags):
OS Runtime interface could not be used temporarily but stabilized itself after a few minutes.

Measurement 15 and measurement 16 (30,000 – 60,000 logged-on OPC tags):
OS Runtime interface could not be used temporarily. System stabilized itself only sporadically.

Measurement 17 (80,000 logged-on OPC DA tags):
OS Runtime interface could not be used. System did not stabilize itself completely. The OS had to be restarted.

6   PCS 7 Test Configuration 2

Configuration 2 is a setup with a redundant OS server, an Engineering System, an OS client, on which the WinCC OPC DA server installed by default is used and an OPC client computer. Two redundant automation systems were used.

The PCS 7 functions below were executed during the OPC test:

- 5 telegrams / s through AS-AS communication

- 10 alarms / s were triggered

- 1000 OS tags / s were archived

Figure 6-1
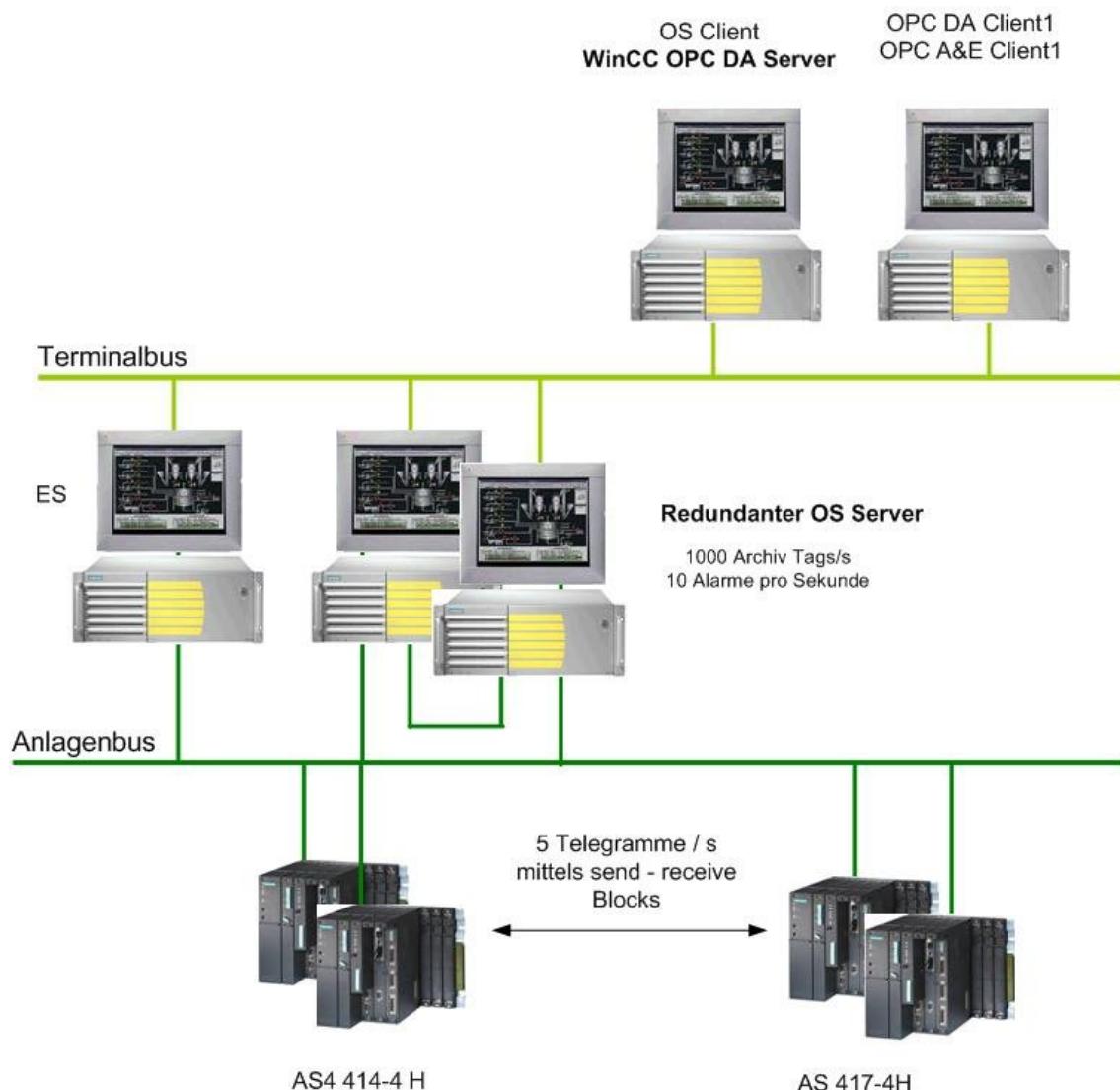
6.1   Conditions

Table 6-1

Computer	Computer hardware	Computer name
ES	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	ES50
SV50A	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	SV50A
SV50B	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	SV50B
OPC client	SIMATIC Rack PC IL43, 3.4 GHz, Intel Pentium 4, 3 GB RAM	MS05
Wireshark computer	Life Book E series, Intel Pentium 3, 847MHz, 512 MB RAM	LB32
OS client	SIMATIC IPC 427C, Dual Core U9300, 1.2 GHz, 956GB RAM	CL50

Network components	Network hardware plant bus	Computer name
Switch	SCALANCE X208	
ES	SIMATIC Miniport CP1623 PCIe Adapter	ES50
OS server	SIMATIC Miniport CP1623 PCIe Adapter	SV50A
OS server	SIMATIC Miniport CP1623 PCIe Adapter	SV50B
Wireshark computer	Intel® Pro/100 VE Ethernet Adapter	LB32
Plant bus = 100 Mbps		
Terminal bus = 100 Mbps		

Computer name	Network hardware terminal bus	
	SCALANCE X208	
ES50	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC	
SV50A	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC	
SV50B	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC	
CL50	Intel® 82574L Gigabit Network Adapter	

Alarm logging / Tag logging	
Archive tags	Approx. 500 tags / s from AS1 + 500 tags / s from AS2
Message incidence	Approx. 10 messages / s

PCS 7 version
V7.1 SP2

OPC client components
OPC DA client = Matrikon OPC Explorer V5.0
OPC A&E client = OPC Event Sample Client (ICONICS)

Process screens
Most process screens have 36 process symbols.
Screens with 100 process symbols are used for the screen opening time test.

General information
The reaction of the AS-OS connection is determined with a cyclic GetTagWait command.

Maintenance
Diagnostics screens were created.

Automation systems	
AS4	CPU 414 -4H , V4.5
AS5	CPU 417-4HT14 , V4.5

6.2 Measurement Series

Table 6-2

Configuration	Measurement									
	1	2	3	4	5	6	7	8	9	10
OPC DA tags [s] of AS4	100	500	1000	2000	3000	3500	4000	5000	6000	10000
Data Change Rate AS4 [s] (measured by OPC Explorer)	100	500	1000	2000	3000	3500	4000	4000	4000	4000
OPC DA tags [s] of AS5	100	500	1000	2000	3000	3500	4000	5000	6000	10000
Data Change Rate AS5 [s] (measured by OPC Explorer)	100	500	1000	2000	3000	3500	4000	5000	5000	5000
Change of screen opening time on the master OS server as a percentage over 5 measurements.	0,00%	3,31%	2,65%	3,31%	6,62%	6,62%	6,95%	9,27%	15,89%	19,21%
Change of screen opening time on the OS client as a percentage over 5 measurements.	0,00%	0,00%	6,80%	2,67%	8,98%	9,22%	10,19%	11,17%	12,86%	15,29%
Reaction time of OS channel (OS1 - AS4) [ms], worst case	24	28	34	38	40	70	65	120	260	1150
Reaction time of OS channel (OS1 - AS5) [ms], worst case	22	25	32	38	40	70	65	120	260	1150
Total processor load of the master OS (SV50A, average on screen change in 10s cycle of the OS client)	4,40%	4,50%	5,90%	6,50%	7,50%	8,20%	8,30%	10,00%	12,00%	13,00%
Total processor load of the standby OS (SV50B) (empty screen opened)	2,30%	2,30%	2,30%	3,00%	3,30%	3,20%	3,10%	3,00%	3,00%	3,00%
Network load of the terminal bus master OS (SV50A, empty screen, no screen change on the OS client)	0,32%	0,32%	0,63%	0,70%	0,72%	0,74%	0,75%	0,79%	0,82%	0,85%
Total processor load of the terminal bus standby OS (SV50B) (empty screen)	0,32%	0,32%	0,32%	0,30%	0,32%	0,32%	0,32%	0,32%	0,32%	0,32%
Total processor load of the OS client when the process screen is updated with 100 POs (MonAnL) in the screen cycle	19,50%	20,00%	20,00%	20,00%	21,00%	22,00%	22,00%	24,00%	25,00%	26,00%
Total processor load of the OS client (CL50) on average without screen change, empty screen opened	2,30%	2,70%	4,00%	4,20%	5,30%	5,50%	5,80%	7,50%	7,80%	8,00%
Network load of terminal bus CL50	0,41%	0,76%	1,00%	1,00%	2,00%	2,50%	3,00%	4,00%	4,00%	5,00%

Table 6-3

Channel Diagnosis (without cyclic screen change)	Measurement									
	1	2	3	4	5	6	7	8	9	10
Tags in 1s cycle AS4	601	1001	1501	2501	3501	4001	4501	5501	6501	10501
Cycle overload 1s AS4	0	0	0	0	0	0	0	0	0	0
Requests 1s AS4	6	10	14	24	33	38	42	51	61	98
Tags in 2s cycle AS4	0	0	6	0	0	0	0	0	0	0
Cycle overload 2s AS4	0	0	0	0	0	0	0	0	0	0
Requests 2s AS4	0	0	1	0	0	0	0	0	0	0
Tags in 60min cycle AS4	0	0	0	0	0	0	0	0	0	0
Cycle overload 60min AS4	0	0	0	0	0	0	0	0	0	0
Requests 60min AS4	0	0	0	0	0	0	0	0	0	0
Read Response Time AS4, worst case [ms]	n.a.	51	96	109	143	105	118	120	125	116
Cycle Create Response AS4, worst case [ms]	n.a.	10	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Tags in 1s cycle AS5	627	1027	1527	2527	3527	4027	4527	5427	6527	10527
Cycle overload 1s AS5	0	0	0	0	0	38	0	0	0	0
Requests 1s AS5	6	10	15	24	33	0	42	51	61	98
Tags in 2s cycle AS5	0	4	6	6		0	400	0	0	0
Cycle overload 2s AS5	0	0	0	0	0	0	0	0	0	0
Requests 2s AS5	0	1	1	1	0	0	6	0	0	0
Tags in 60min cycle AS5	0	0	0	0	0	0	100	0	0	0
Cycle overload 60min AS5	0	0	0	0	0	0	0	0	0	0
Requests 60min AS5	0	0	0	0	0	0	2	0	0	0
Read Response Time AS5, worst case [ms]	n.a.	12	n.a.	n.a.	145	154	116	151	128	186
Cycle Create Response AS5, worst case [ms]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Request Queue Size AS4	0	0	0	0	0	0-2	0-2	0-4	4-8	37-40
Request Queue Size AS5	0	0	0	0	0	0	0-1	0-1	0-3	26-32
Own Cycles AS4	0	0	4	13	22	27	31	40	50	87
Own Cycles AS5	0	0	0	0	6	11	23	24	34	71

Table 6-4

| Result	Measurement									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Subscribed to OPC DA tag load / s	200	1000	2000	4000	6000	7000	8000	10000	12000	20000
Updated OPC tags / s	200	1000	2000	4000	6000	7000	8000	9000	9000	9000

7 PCS 7 Test Configuration 3

Configuration 3 is a setup with an OS server, an Engineering System, an OS client, an Open PCS 7 station, a Wireshark computer and an OPC client computer. Two redundant automation systems and two standard automation systems were used.

The PCS 7 functions below were executed during the OPC test:

- 5 telegrams / s through AS-AS communication between AS1 and AS2

- 5 telegrams / s through AS-AS communication between AS4 and AS5

- 10 alarms / s were triggered

- 1000 OS tags / s were archived

Figure 7-1
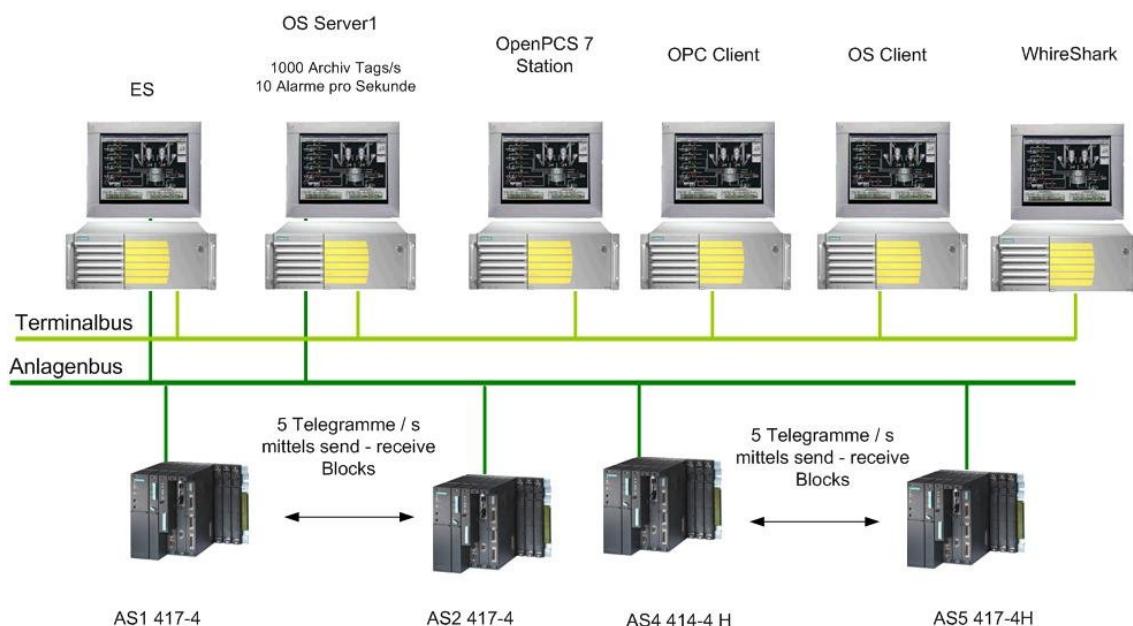
7.1 Conditions

Table 7-1

Computer	Computer hardware	Computer name
ES	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	ES50
SV50A	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	SV50A
SV50B	SIMATIC IPC 547C,Core 2 Duo, E8400 , 3.0 GHz, 3.43 GB RAM	SV50B
OPC client	SIMATIC Rack PC IL43, 3.4 GHz, Intel Pentium 4, 3 GB RAM	MS05
Wireshark computer	Life Book E series, Intel Pentium 3, 847MHz, 512 MB RAM	LB32
OS client	SIMATIC IPC 427C, Dual Core U9300, 1.2 GHz, 956GB RAM	CL50

Network components	Network hardware plant bus	Computer name
Switch	SCALANCE X208	
ES	SIMATIC Miniport CP1623 PCIe Adapter	ES50
OS server	SIMATIC Miniport CP1623 PCIe Adapter	SV50A
OS server	SIMATIC Miniport CP1623 PCIe Adapter	SV50B
Wireshark computer	Intel® Pro/100 VE Ethernet Adapter	LB32
Plant bus = 100 Mbps		
Terminal bus = 100 Mbps		

Computer name	Network hardware terminal bus
	SCALANCE X208
ES50	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC
SV50A	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC
SV50B	Realtek RTL 8168C(P) PCI-E Gigabit Ethernet NIC
CL50	Intel® 82574L Gigabit Network Adapter

Alarm logging / Tag logging	
Archive tags	Approx. 500 tags / s from AS1 + 500 tags / s from AS2
Message incidence	10 messages / s

PCS 7 version
V7.1 SP2

OPC client components
OPC DA client = Matrikon OPC Explorer V5.0
OPC A&E client = OPC Event Sample Client (ICONICS)

Process screens
Screens with 100 process symbols are used for the screen opening time test.

General information
The reaction of the AS-OS connection is determined with a cyclic GetTagWait command.

Maintenance
Diagnostics screens were created.

Automation systems	
AS4	CPU 414 -4H , V4.5
AS5	CPU 417-4HT14 , V4.5
AS1	CPU 417-4 V4.1
AS2	CPU 417-4 V4.1

7.2 Measurement Series

Table 7-2

Configuration	Measurement				
	1	**2**	**3**	**4**	**5**
OPC DA tags [s] of AS1	1000	2000	3000	5000	14000
OPC Data Change Rate [s] of the AS1 of the OPC client	1000	2000	3000	5000	13500
OPC DA tags [s] of AS2	1000	2000	3000	5000	14000
OPC Data Change Rate [s] of the AS2 of the OPC client	1000	2000	3000	5000	13500
OPC DA tags [s] of AS4	1000	2000	3000	5000	5000
OPC Data Change Rate [s] of the AS4 of the OPC client	1000	2000	3000	4500	4500
OPC DA tags [s] of AS5	1000	2000	3000	5000	5000
OPC Data Change Rate [s] of the AS5 of the OPC client	1000	2000	3000	5000	5000
Reaction time of OS channel (SV50A - AS1) [ms], worst case	10	10	16	20	96
Reaction time of OS channel (SV50A - AS2) [ms], worst case	12	14	16	21	115
Reaction time of OS channel (SV50A - AS4) [ms], worst case	26	35	50	85	73
Reaction time of OS channel (SV50A - AS5) [ms], worst case	28	33	50	85	69
Change of screen opening time on the OS client as a percentage over 5 measurements.	0,00%	0,00%	0,00%	0,45%	6,74%
Total processor load of the SV50A without screen change	6,10%	7,60%	11,00%	16%	27%
Total processor load of the Open PCS 7 station without screen change	2,70%	3,30%	3,50%	5,00%	10%
Network load of the terminal bus on the OS server	0,40%	0,46%	0,60%	0,68%	1%
Network load of the terminal bus on the Open PCS 7 station	1,00%	3,00%	4,00%	8,00%	14%

Table 7-3

Channel Diagnosis	Measurement				
	1	2	3	4	5
Tags in 1s cycle AS1	1501	2501	3501	5501	14501
Cycle overload 1s AS1	0	0	0	0	0
Requests 1s AS1	14	24	33	51	135
Tags in 1s cycle AS2	1500	2500	3500	5500	14400
Cycle overload 1s AS2	0	0	0	0	0
Requests 1s AS2	14	24	33	51	134
Tags in 1s cycle AS4	1501	2501	3501	5401	5401
Cycle overload 1s AS4	0	0	0	0	0
Requests 1s AS4	14	24	33	51	51
Tags in 1s cycle AS5	1527	2527	3527	5527	5527
Cycle overload 1s AS5	0	0	0	0	0
Requests 1s AS5	15	24	33	52	52
Request Queue Size AS1	0	0	0	0 - 1	0 - 12
Request Queue Size AS2	0	0	0	0 - 1	0 - 12
Request Queue Size AS4	0	0	0	0 - 3	0 - 3
Request Queue Size AS5	0	0	0	0 - 1	0 - 1
Own Cycles AS1	0	0	2	20	103
Own Cycles AS2	0	0	3	20	103
Own Cycles AS4	0	9	18	36	35
Own Cycles AS5	0	0	2	21	28

Table 7-4

Result	Measurement				
	1	2	3	4	5
Subscribed to OPC DA tags / s	4000	8000	12000	20000	38000
Updated OPC tags / s on the OPC client	4000	8000	12000	19500	36500

8 Evaluation of Measuring Results

The measured values obtained are with reference exclusively to the specified PCS 7 configurations under the specified conditions. The results might be completely different under different conditions.

8.1 Basis of the Evaluation

1. The statements are valid only for the specified conditions.

2. The processor load of the OS server and the OPC server computer is on average not higher than 15% under the specified conditions.

3. The Request Queue Size of the WinCC channel diagnostics is permanently zero.

4. All the tags requested by the OPC server are also updated in the requested cycle on the OPC client computer.

5. The screen opening times do not deteriorate more than 30% of the value of the reference measurement (Measurement 1).

6. The configurations are not operated in the limit zone so that there are enough resources available for coping with any events that occur acyclically.

7. The values given here are with reference to OPC tags that actually change in the second cycle. More OPC tags can be subscribed to if they do not change correspondingly frequently or if the OPC tags are subscribed to in a slower cycle.

8.2 Configuration 1

AS 1 and AS 2 cannot provide more than approx. 14,000 OPC tags / s. The increased screen opening time becomes unacceptable between 13,000 and 15,000 OPC tags / s.
The total processor load of OS1 becomes unacceptable between 3,000 and 5,000 OPC tags per AS.
A queue (Counter Request Queue Size) forms in the AS-OS channel between 3,000 and 5,000 OPC tags per AS.
In the test, the operator control and monitoring capability was no longer given as from 30,000 logged-on OPC DA tags whose value changes in the second cycle.

Conclusion

In Configuration 1, 6,000 OPC DA tags / s can be subscribed to by the OPC client and updated by the OPC server.

8.3 Configuration 2

Even if there are hardly any OPC tags logged on, the OS client machine still has a high load with the updating of a process screen with 100 process objects. A queue (Counter Request Queue Size) forms in the AS-OS channel as from 3,000 OPC DA tags.

Conclusion

In Configuration 2, 6,000 OPC DA tags / s can be subscribed to by the OPC client and updated by the OPC server if there is no operation and monitoring activity on the OS client. With this configuration it is recommended to use high-performance hardware for the OS client.

8.4 Configuration 3

The total processor load of the OS server becomes unacceptably high at a total OPC DA load of approx. 20,000 OPC DA tags / s. AS 4 can update a maximum of 4,500 OPC DA tags / s.
A queue (Counter Request Queue Size) forms in the AS-OS channel between 3,000 and 5,000 OPC DA tags / s.

Conclusion

In Configuration 3, 12,000 OPC DA tags / s can be subscribed to by the OPC client and updated by the OPC server.