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Hard Real-time CORBA

PCT Testing

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Universidad Politécnica de Madrid
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SCILabs Ingenieros

Summary Sheet

IST Project 2001-37652
HRTC
Hard Real-time CORBA

PCT Testing

Abstract:

The present document describes the experiments performed on the PCT. The PCT has been built following the design document (deliverable D4.2.).

For every experiment a short introduction, an implementation schema, the procedure for the test, a description of the experiment and the results obtained are presented. Previously there is an introduction describing the PCT and the equipment used.

The identification of this deliverable is D4.6.

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1 Introduction

Process: The process is the neutralization of acetic acid (0.1M) with sodium hydroxide (0.1M). The process has two control loops: one controls the pH and another one controls the temperature.

Before the description of the process it is important to stress that neither the type of process nor the quality of the control achieved is important for the matter of this project. As stated in previous documents the purpose of the PCT is:

"The main objective of the distributed process control testbed is to identify (mainly hard real time) requirements for distributed control systems and perform experiments in conditions of systems heterogeneity and legacy integration. Experiments will be done using conventional IIOP and the new real-time protocol. "

The main effort in this workpackage has been devoted to that objective while minimizing the effort dedicated to get a good control of the process.

The process has two feeds, the first one is the acid which is the one to be neutralized. This is set to a fixed flow and concentration and any variation is a disturbance to the process. The second one is the base feed, this feed is set by the pH control loop. This loop has the pHmeter a controller (PI) and the base pump as the actuator.

There is a small reactor for the neutralization process and its output stream goes to a product tank through a weir.

This is the process with its main control loop, there is an additional loop for temperature control. This loop has no special relevance for the process but it is needed for the experiments to be taken. This loop has a temperature transmitter (pt100) a controller (PI) and pump as actuator. This pump is fed by hot water coming from a heater.

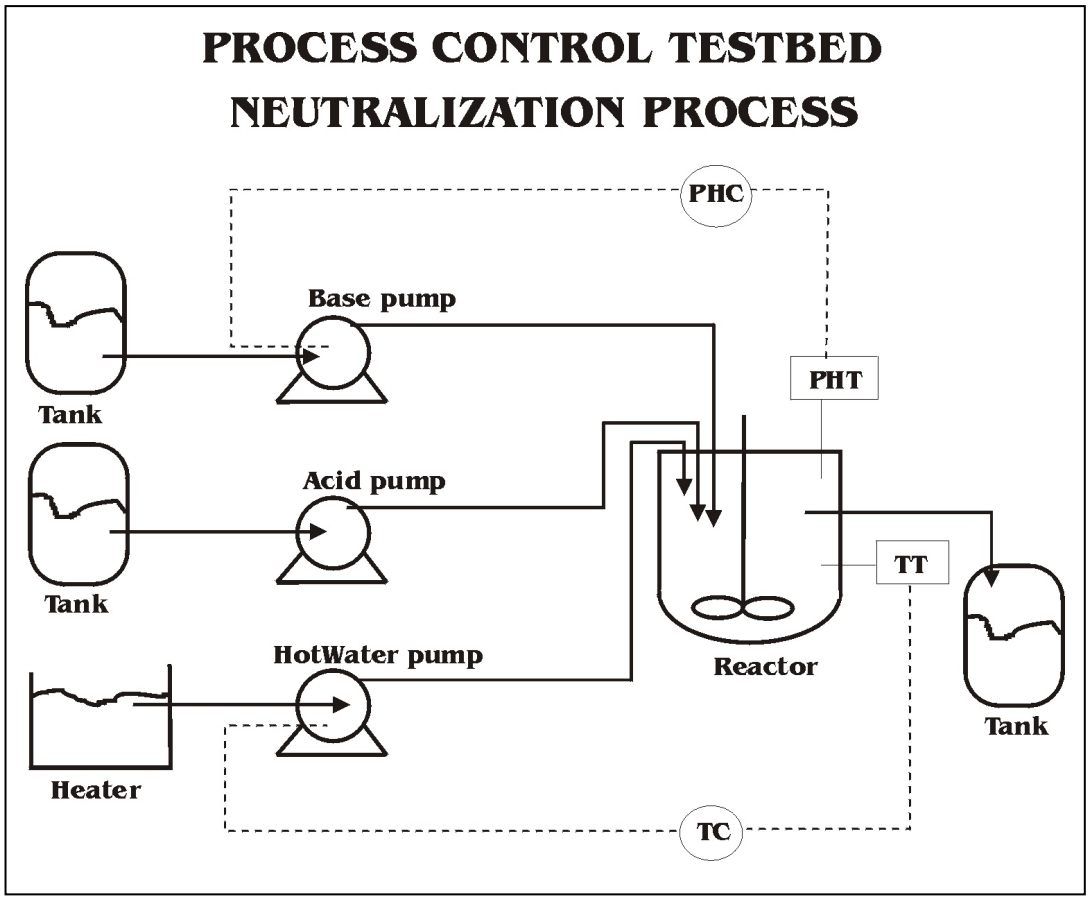


Figure 1: Process control set up

A list describing the equipment used and its purpose is presented in order to understand easily the coming schemas

1.1. Equipment

Item number	Item	Purpose
H005.1	TTTech Monitoring node	CORBA sensor wrapper
H005.2	TTTech Monitoring node	CORBA actuator wrapper
H005.3	TTTech Monitoring node	CORBA controller
H005.4	TTTech Monitoring node	CORBA Database bridge
H005.5	TTTech Monitoring node	Ethernet/TTP Bridge
H007.1	PC	CORBA sensor wrapper
H007.2	PC	CORBA actuator wrapper

Item number	Item	Purpose
H007.3	PC	CORBA controller
H007.4	PC	Human Machine Interface (HMI)
H007.5	PC	HMI for the TTP/C
H007.6	PC	Database
H007.7	PC	Database for the TTP/C
H007.8	PC	CORBA TPS wrapper
H007.9	PC	Process simulation
H008	pHmeter	PH measure and transmission
H010.1	Acid pump	Feed the acid to the process
H010.2	Base pump	Feed the base to the process
H010.3	Tempering water pump	Feed the water to the process
H012	Honeywell TPS	Legacy distributed control system
H013	Temperature sensor + transmitter	(PT100) measure and transmission
H014	Heating module	Heat the water for T control
H016.1-3	DAQ	Handling pumps and measurements
H016.4	RTD module	T signal conditioning
H016.5	AI-04 module	Signal isolation to connect PCI to connector 2345
H017.1	Tank	Base tank
H017.2	Tank	Acid tank
H017.3	Tank	Product tank
H017.4	Reactor	Neutralization reactor

2 Experiment 4.1- CCS loops

An analysis and evaluation of the tests and the overall package is in Deliverable D4.7. PCT documentation & evaluation!!

The purpose is to demonstrate the use of CORBA components for the implementation of control loops.

2.1 Experiment 4.1.a Ethernet Control loop

Description

In this experiment the main loop (pH control loop) is set up using an Ethernet network and Linux PCs as CORBA agents. All the components that participate in the loop are CORBA agents, directly like the controllers or wrapped like the sensors. Besides the loop elements and the process , there are two more nodes: the HMI to govern and monitor the process and the Database to record the time values obtained.

Figure 2 shows a detailed schema of the HW implementation of this experiment.

The steps followed to perform this experiment and defined in the next list:

Steps
1 Linux RTAI Installation in PCs H007.1,2,3,4 y 6
2 DAQ Cards drivers installation in H016.1
3 Process Set up
4 Reading from pHmeter H008
5 Handling pumps H010.1 y 2
6 Run the process (without CORBA nor control)

7 CORBA installation in PCs H007.1,2,3,4 y 6
8 Reading and signal transmission using CORBA. Open loop.
9 Implementation of the CORBA controller and close the loop.
10 Development and implementation of the Database
11 Development and implementation of the HMI.
12 CORBA control loop performance; recording in Database and monitoring in the HMI.

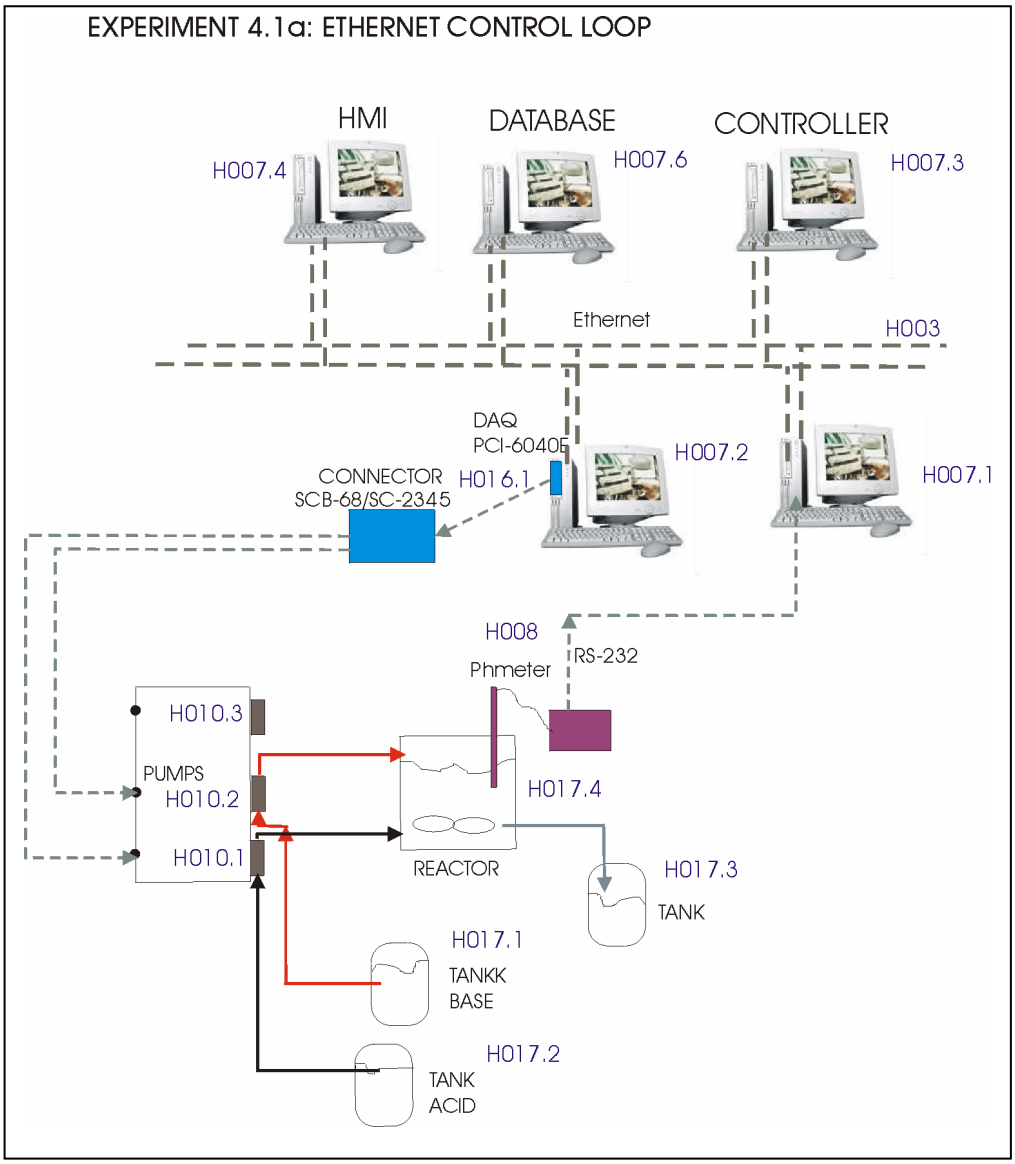


Figure 2: Experiment 4.1a Non-HRTP implementation. Ethernet control loop

Next figure shows the software implementation of the experiment:

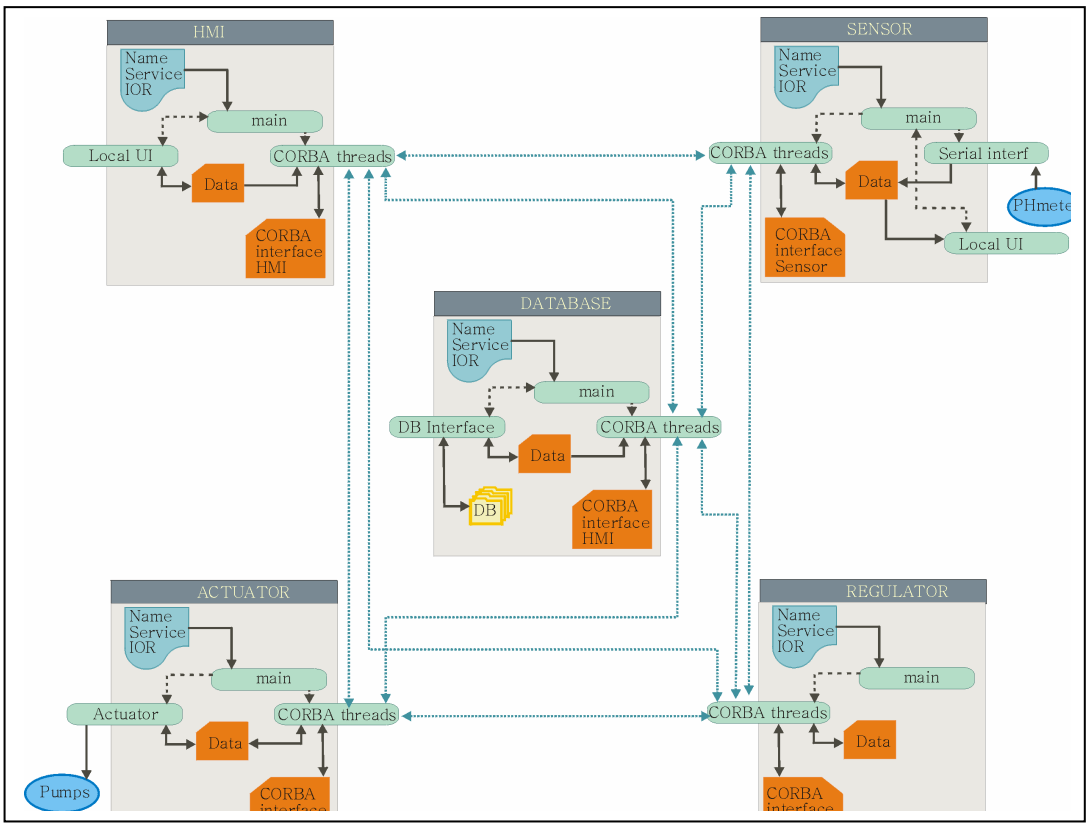


Figure 3: Software implementation of the CORBA Control Loop.

Test & results

The experiment has been conducted in two stages, the first one was to start the process only (without control). The pumps were manually controlled and the sensor values were monitored. The second stage was to run the process with the control loop closed (automatic mode). Different disturbances were applied to the process both regulatory (changes in the acid feed stream conditions) and servo (changes in the setpoint of the controller). Throughout all the testing the most important variables were recorded into the database, including value and time. All the PCs were synchronized using NTP, so we could compare all the different time tags from different sources.

Figure 4 shows the signal measurements of the control loop.

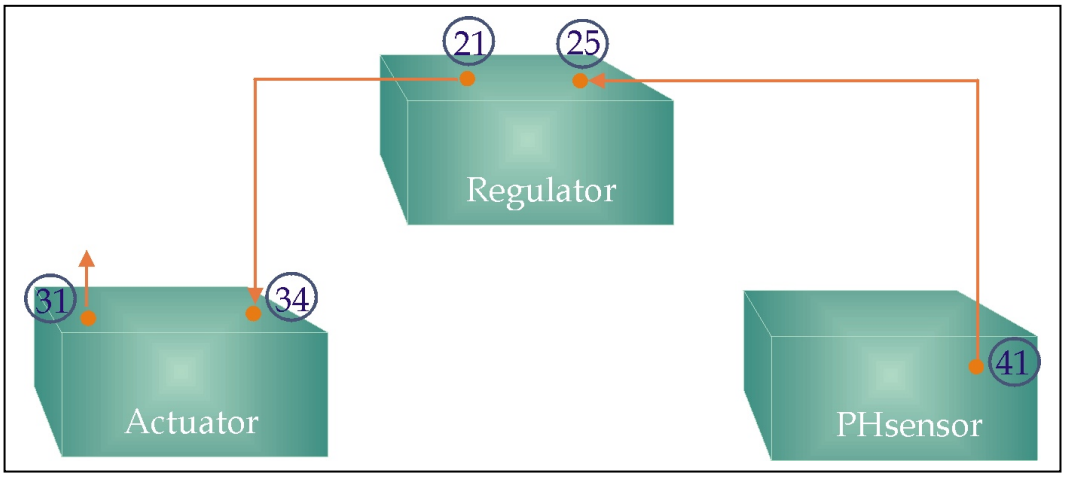


Figure 4: Signal measurements description

Signal 41: The pH sensor sends the requested data.
Signal 25: Reception of the pH value from the sensor in the controller.
Signal 21: The controller sends the computed control action to the actuator
Signal 34: Reception of the control action (base flow) from the controller in the actuator.
Signal 31: This signal is send after the actuator has written the control action in the driver of the DAQ card.

These signals are the same for all the experiments conducted in the PCT.

The experiment of the Corba Control loop has been performed under two network topologies. The first one is using an standard Ethernet Hub where collisions are not avoided. The second one is using an standard Ethernet Switch which splits up the collision domains. Following are the results for both network configurations.

Hubbed Ethernet.

The control loop elements where attached to a Hub which was connected to the Internet. The HMI and the Database where outside the Hub network.

Next is a sample of the measured signals. The complete data regarding this test is in Annex A.

	Signal ID	Seconds	Microseconds
108	41	1065703135	246963
109	25	1065703135	248795
110	21	1065703135	249308
111	34	1065703135	253538
112	31	1065703135	253603
113	41	1065703135	351947
114	41	1065703135	356965
115	25	1065703135	358704
116	21	1065703135	359215
117	34	1065703135	363668
118	31	1065703135	363727
119	41	1065703135	466980
120	25	1065703135	468805
121	21	1065703135	469353
122	34	1065703135	472568
123	31	1065703135	472630
124	41	1065703135	577080
125	25	1065703135	578902
126	21	1065703135	579465
127	34	1065703135	583633
128	31	1065703135	583690
129	41	1065703135	686998
130	25	1065703135	688840
131	21	1065703135	689355
132	34	1065703135	693462
133	31	1065703135	693521

The statistics of this test (for all the data), **time is in milliseconds:**

	Signal 25 - 41	Signal 34-21	Signal 41-41
Mean	1,822	3,564	9,979
Asymmetry coef.	0,695	1,125	-2,325
Standard deviation	0,055	0,385	0,317
Average deviation	0,048	0,290	0,124

It shows how a network with a Hub and no external traffic behaves quite well for process control. The complete loop timing around 10 milliseconds is acceptable. And the data dispersion is quite low.

Switched Ethernet. (Non real time)

The control loop elements where attached to a Switch which was connected to the Internet. The HMI and the Database where connected to the Switch as well.

Next is a sample of the measured signals. The complete data regarding this test is in Annex B.

	Signal ID	Seconds	Microseconds
564	41	1065711786	248424
565	25	1065711786	249330
566	21	1065711786	249514
567	34	1065711786	251316
568	31	1065711786	251375
569	41	1065711786	358418
570	25	1065711786	359324
571	21	1065711786	359503
572	34	1065711786	361309
573	31	1065711786	361371
574	41	1065711786	469803
575	25	1065711786	470709
576	21	1065711786	470952
577	34	1065711786	472733
578	31	1065711786	472792
579	41	1065711786	578454
580	25	1065711786	579369
581	21	1065711786	579570
582	34	1065711786	581361
583	31	1065711786	581419

The statistics of this test (for all the data), **time is in milliseconds:**

	Signal 25 - 41	Signal 34-21	Signal 41-41
Mean	0,946	1,821	10,009
Asymmetry coef.	5,425	1,444	0,093
Standard deviation	0,089	0,033	0,288
Average deviation	0,045	0,026	0,115

It shows how this network behaves well for process control. The numbers are quite similar to those obtained in the CCS Hub test because of the low collisions level in the previous test. This test presents a good timing response for the Ethernet for process control even with the Corba middleware overhead.

2.2 Experiment 4.1b. TTP/C Control loop

In this experiment the main loop (pH control loop) is set up using the TTP/C network and the TTTech Monitoring nodes as CORBA agents. All the components that participate in the loop are CORBA agents, directly like the controllers or wrapped like the sensors. Besides the loop elements and the process there are two more nodes: the HMI to govern and monitor the process and the Database to record the time values obtained., in this experiment these two nodes are PCs connected to the TTTech nodes via an Ethernet connection as they are not time critical.

Figure 5 hows a detailed schema of the HW implementation of this experiment.

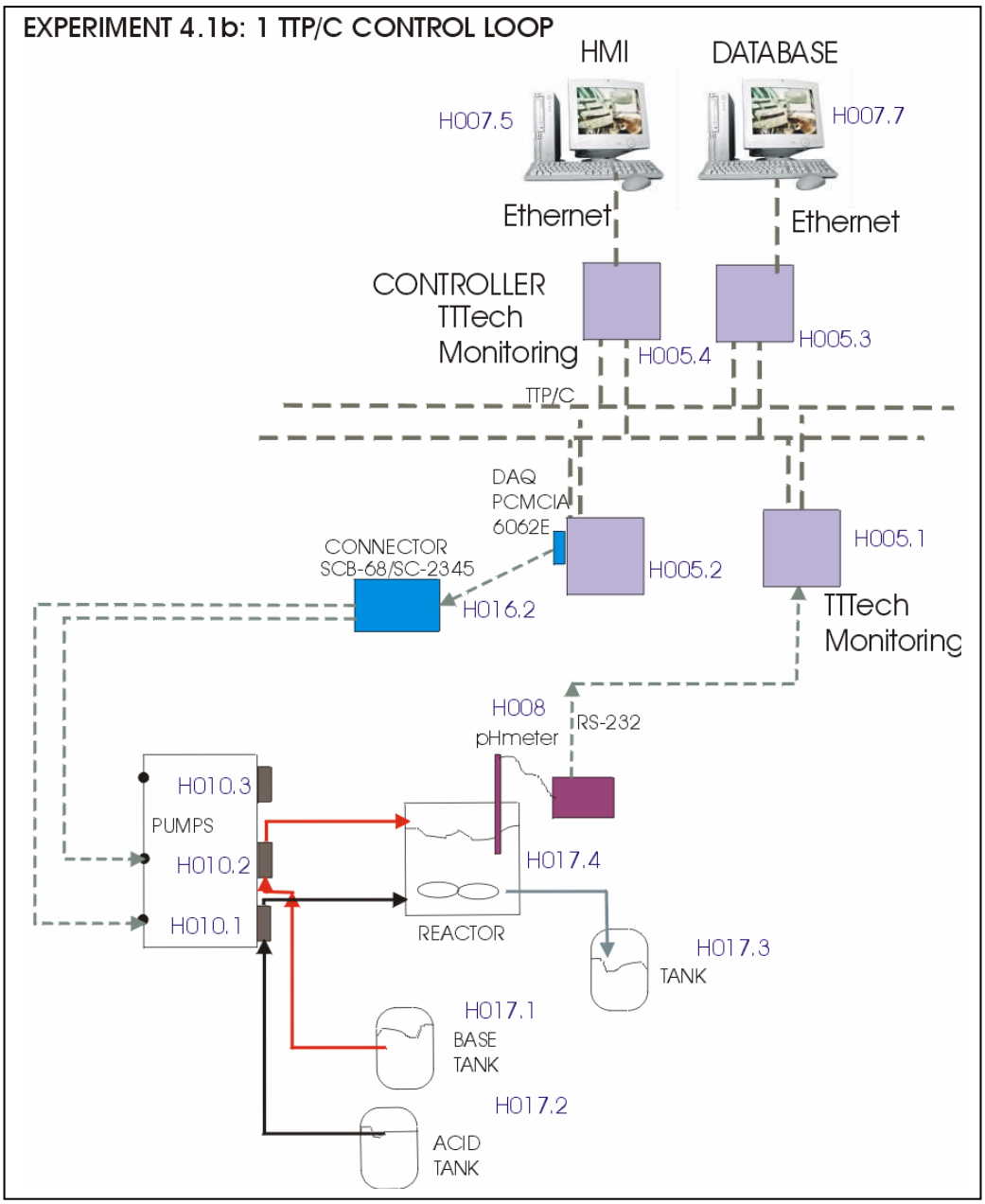


Figure 5: Experiment 4.1b. HRTP implementation. TTP/C control loop.

The steps followed to perform this experiment and defined in the next list:

Steps
1 Linux RTAI installation in TTTechs H005.1,2,3 y 4
2 DAQ card driver installation in H016.2
3 Reading from pHmeter H008
4 Handling pumps H010.1 y 2
5 Run the process (without CORBA nor control)
6 CORBA installation in RTAI Linux TTTechs H005.1,2,3 y 4
7 Reading and signal transmission using CORBA (open loop)
8 CORBA controller implementation and close the loop.
9 Database implementation in H007.5
10 HMI implementation in H007.7
11 Communication between TTTech – Database and HMI
12 CORBA Control loop performance , recording in the Database and monitoring in the HMI.

3 Experiment 4.2.- Integration of legacy systems.

The purpose of this experiment is to demonstrate the integration of legacy systems in a CCS.

A commercial Honeywell TPS distributed control system (TDC 3000) is wrapped to become another CORBA node in the system . This experiment intends to check how easily an existing control system can be integrated within a CORBA control system. Limitations from the commercial DCS and from CORBA are identified in the experiment.

Description

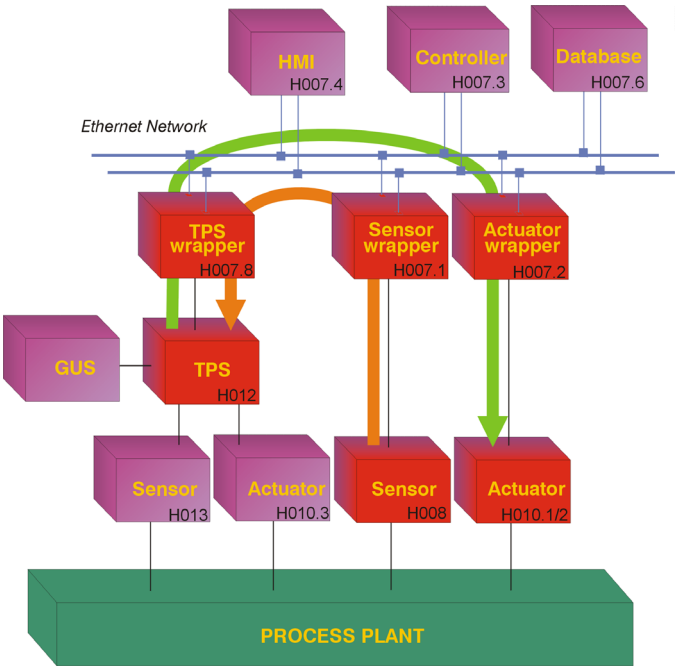
In this experiment mesurements are not the thrust. Whether it can or cannot be done, how can it be done and the problems encountered in the way are the results.

As stated in document D4.2 *PCT Design*, the proposed test are:

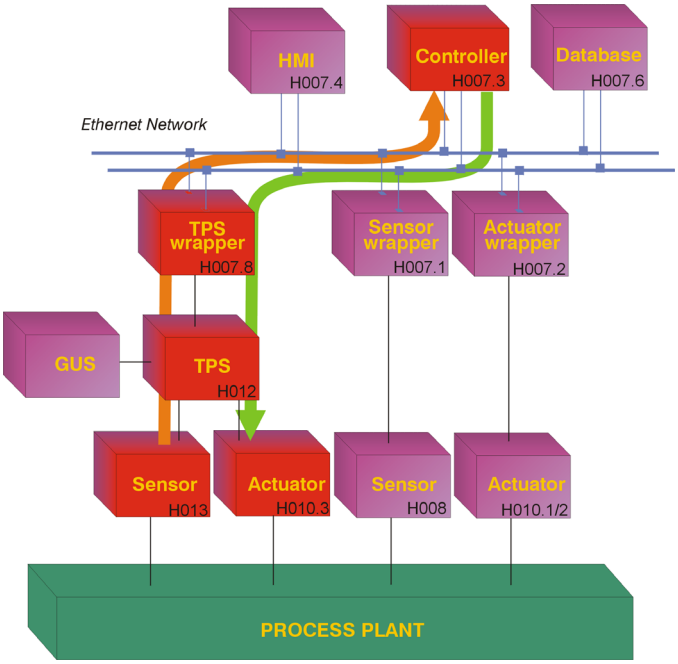
1. Limitations of the connection

   The available interfacing capabilities of the legacy system are examined, selecting the best one to communicate with the wrapper.

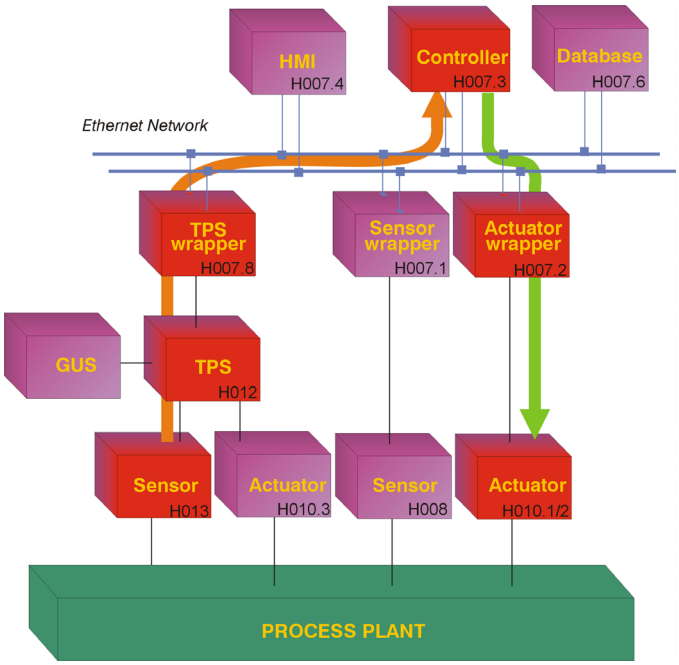
2. Use of the TPS controller with CCS sensor and actuator



3. Use of CCS controller with TPS sensor and actuator



4. Use of TPS sensor with CCS controller and actuator



The steps followed to perform this experiment and defined in the next list:

Steps
1 Linux RTAI installation in PC H007.8
2 CORBA installation in PC H007.8
3 Set up of additional process equipment
4 Configuration, installation and operation of temperature sensor (H013) and tempering pump (H010.3) from TPS
5 Development, installation and operation of the Modbus interface
6 Use of the TPS controller with CCS sensor and actuator
7 Use of CCS controller with TPS sensor and actuator
8 Use of TPS sensor with CCS controller and actuator

Figure 6 hows a detailed schema of the implementation of this experiment.

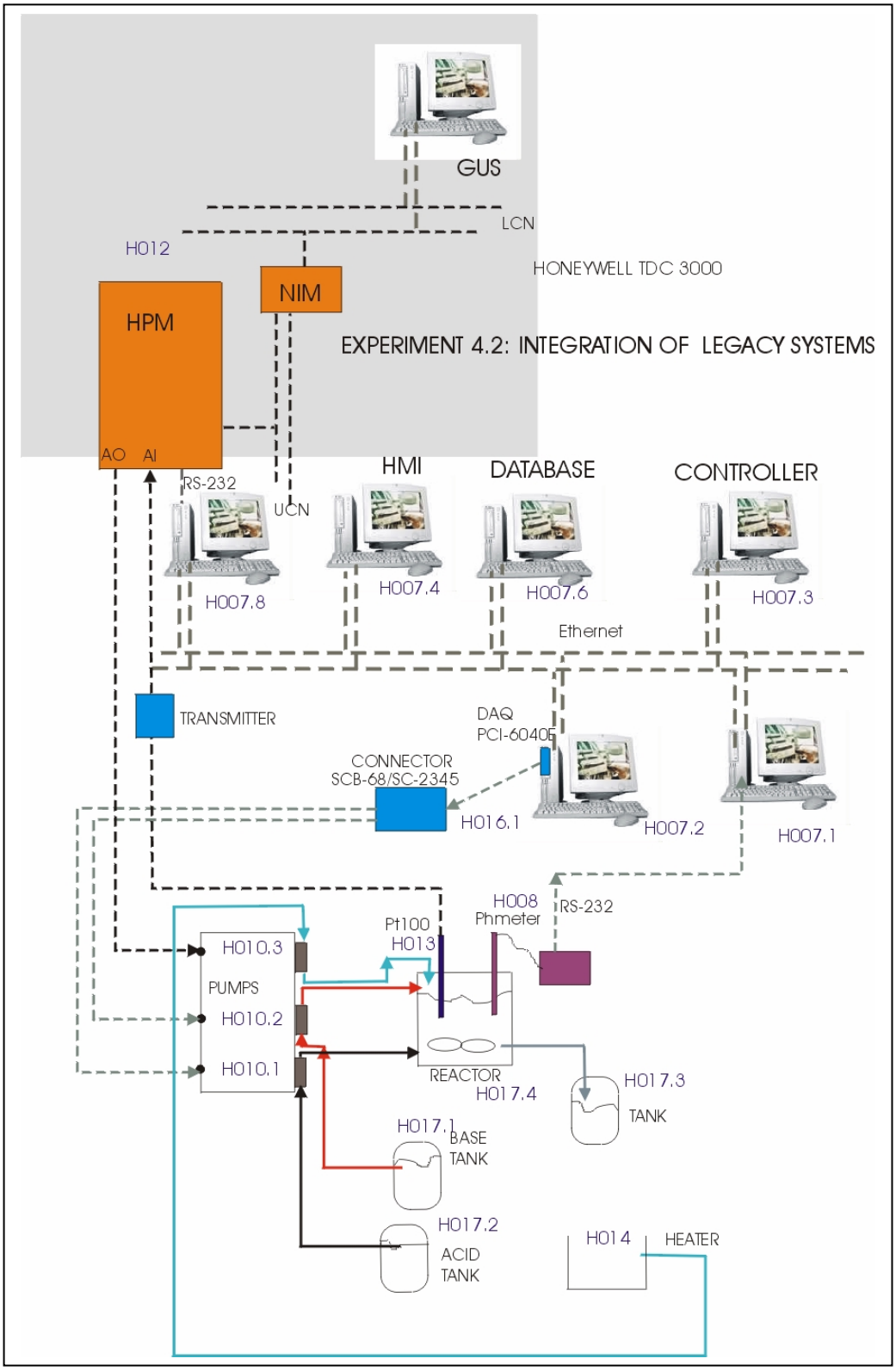


Figure 6: Integration of legacy systems setup.

Next figure shows the software implementation of this experiment:

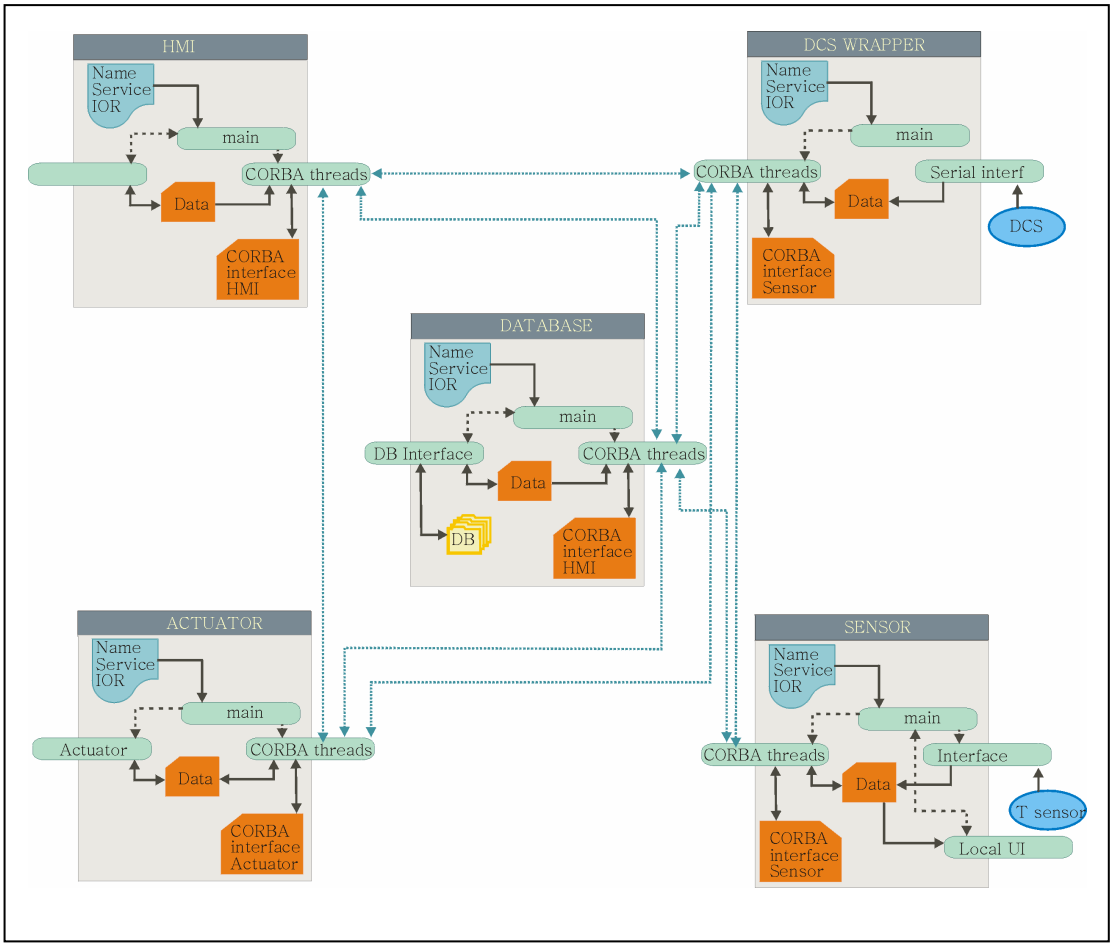
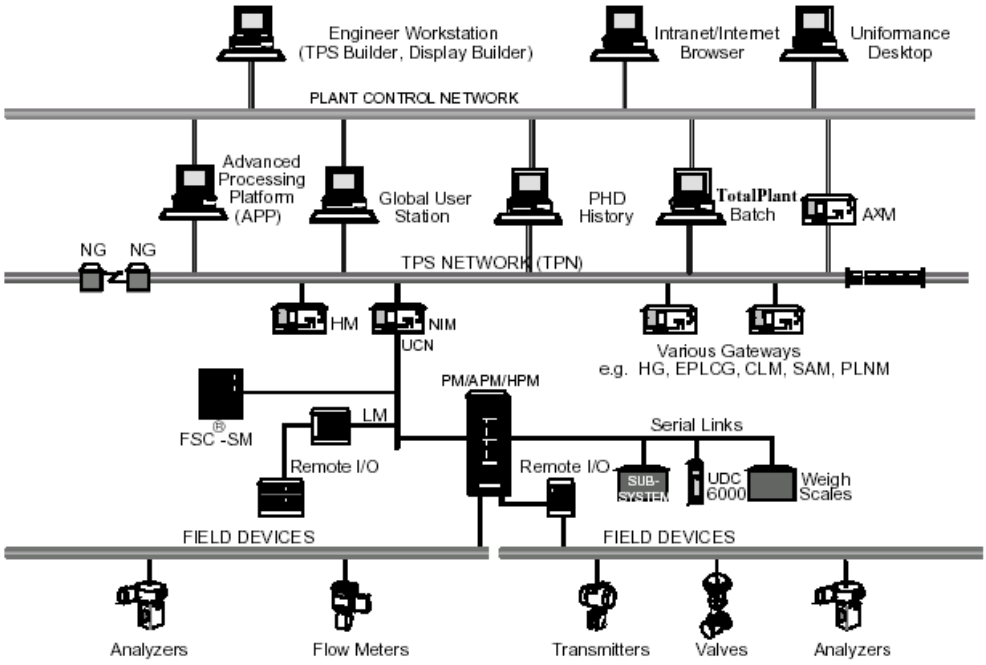


Figure 7: Software implementation of the legacy systems integration under CORBA.

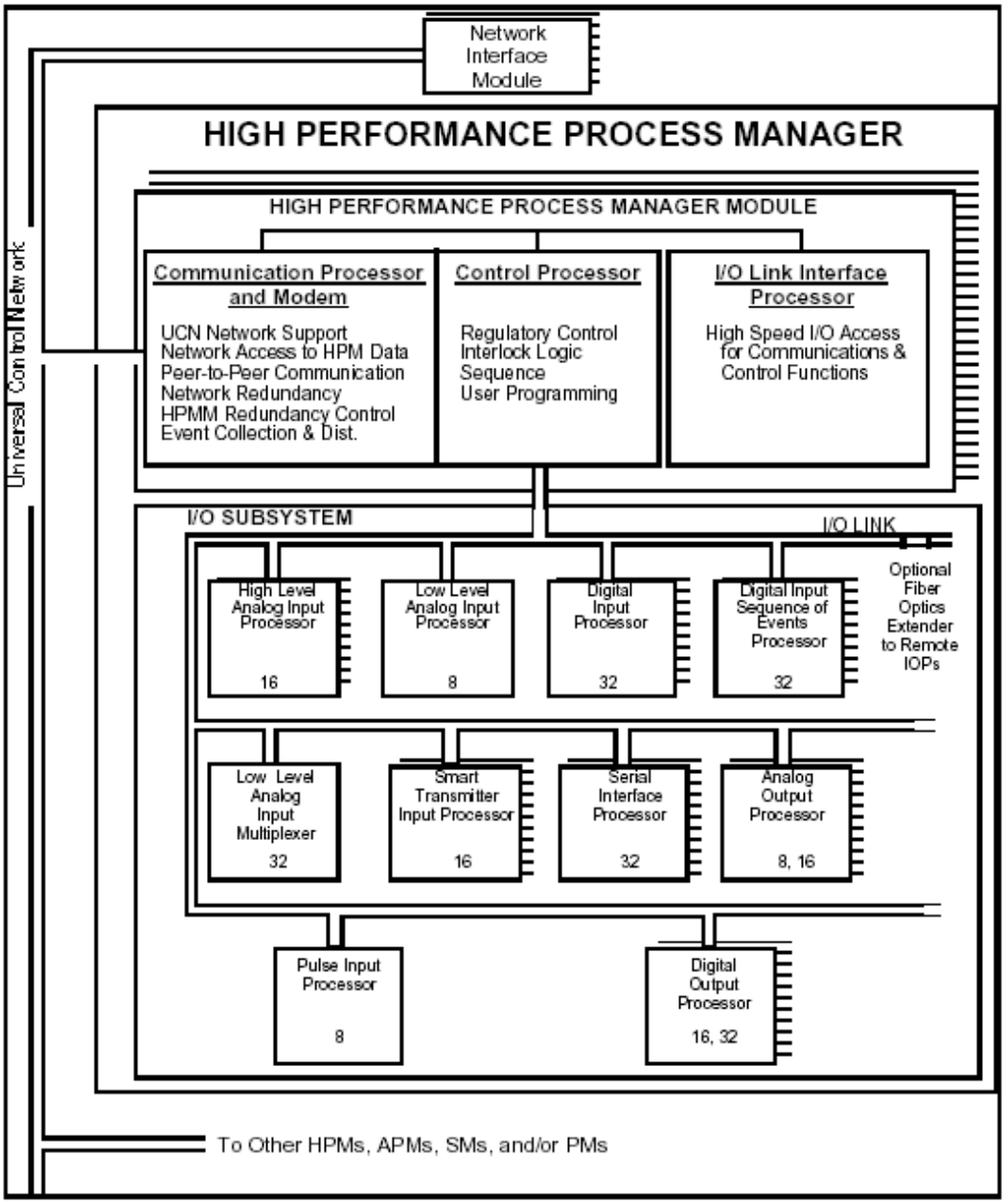
Test & results

1. Limitations of the connection

With the available hardware, to integrate the TPS in the CCS the system can be wrapped (with a PC) via the serial interface or via the GUS. The serial interface has the advantage of directly accessing the controller (HPM) like sensors or actuators do. Other routes to access the controller (PLNM, APP) are mostly equivalent to the GUS, and always have to go through the NIM, introducing latency in the communication. Actually, connections of PLCs and other instruments use the serial interface.



In the HPM is where the control algorithms are executed and where the input/output cables of the field instruments are connected (I/O subsystem). From here, via NIM, data is sent to the TPS network, were the GUS and HM are the nodes for monitoring and database.



So, it is clear that the serial interface is the fastest way for integrating the TPS in a CCS if it is intended to communicate at control level. (If the interest is only recording historic data, other vias are more convenient).

The serial interface uses Array Points (memory positions) where input/output data from/to the subsystem connected by the serial interface are stored. For input data (to the HPM), once there are accesible to other control points like virtual inputs.

The serial interface of the TPS is primarily intended as an input device and has been designed to import large quantities of data (flags, numerics, strings). Although data are scanned as fast as possible (up to 19.2 kbaud) at the I/O Processor level, they are mapped from here to the controller (array points) at one of the three rates: ¼ second, ½ second or 1 second). This is the most important limitation for communication even if it is probably enough for typical process plant control applications.

The scanning rates also imply a limit for the number of array points with SI connections:

- 80 at 1 second scan period
- 40 at ½ second scan period
- 20 at ¼ second scan period

Write requests preempts read (input) requests. The number of consecutive write data requests is limited to 16, after which, one array point read request is issued. We have not been able to confirm it but it is said that up to 30 write requests per second can be serviced before read response is significantly affected under certain conditions (no ladder logic running). Further, constant writes to the serial interface (for example, a logic output) can overload the system and degrade performance.

In conclusion, the integration of the TPS in a CCS system is possible but constrained in capacity and scan period. Additionally, there is uncertainty in the temporal behaviour.

2. Use of the TPS controller with CCS sensor and actuator

A PIDERFB (PID with External Reset Feedback) is the only HPM regulatory control algorithm which provides general I/O connections allowing output connection to general I/O point parameters like those of the Serial Interface points, and providing input connections for preventing reset windup. This is the one used in the test.

The corresponding TPS points has to be configured in the wrapper, mapping to the CCS sensor and actuators.

3. Use of CCS controller with TPS sensor and actuator

In this case, a CL program is used to transfer input and output data inside the HPM. This could also been used in the previous case.

4. Use of TPS sensor with CCS controller and actuator

From the point of view of the TPS integration, this is actually a subcase of the previous one. Only the write part of the CL program is used.

The behaviour in all the experiments, under the cited constrainsts, is satisfactory for process control, but only one sensor , one actuator and one controller are used simultaneoulsy.

4 Experiment 4.3. Asynchronous events management (Sequence of events-SOE)

Description

The steps to be followed to perform this experiment and defined in the next list:

Steps
1 Linux RTAI installation in TTTechs H005.5
2 DAQ card H016.2 drivers installation in H005.5
3 CORBA installation in H005.5
5 DAQ card digital output connection to all the nodes: PCs through parallel port and TTTechs through serial port
6 Events generation software in H005.5
7 Events detection software in PCs and TTTechs nodes.
8 Test: Regenerate the correct sequence of events.

Figure 8 hows a detailed schema of the implementation of this experiment.

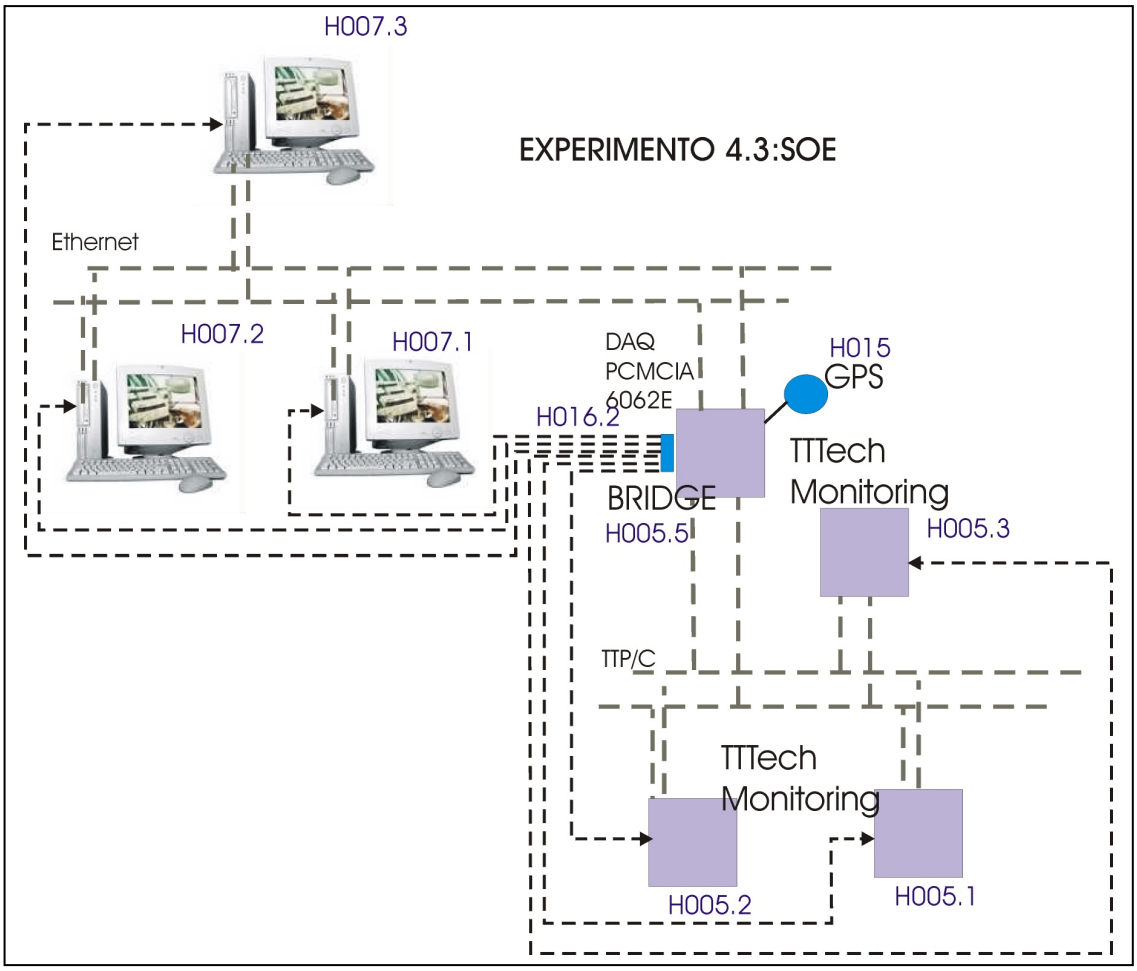


Figure 8: Experiment 4.3. Asynchronoous events management implementation.

5 Experiment 4.4 Distributed simulation

This experiment has been cancelled as it was informed in the progress reports Q3 and Q4. The reason is that the DMSO from the US no longer provides a public distribution implementing the framework HLA (High Level Architecture) which the standard adopted by the OMG for distributed simulation and was going to be used for this experiment.

6 Experiment 4.5.- Interaction of simulation agents with control agents

The purpose of this experiment is to test and identify requirements for the use of simulation objects on a CCS.

Description

The use of models and simulation for control is being increasingly used and thus it is important to test how these models and simulation can be used (and integrated) in a CORBA control system.

The steps followed to perform this experiment and defined in the next list:

Steps
1 Linux RTAI installation in PC H007.9
2 CORBA installation in PC H007.9
3 Process model development using the modeling environment ABACUSS
4 Wrapping of the ABACUSS model with CORBA.
5 Test: Operators training using the simulated plant (process+control) with the developed HMI.
6 Test: Simulated plant running with the actual controller.

Figure 9 hows a detailed schema of the implementation of this experiment.

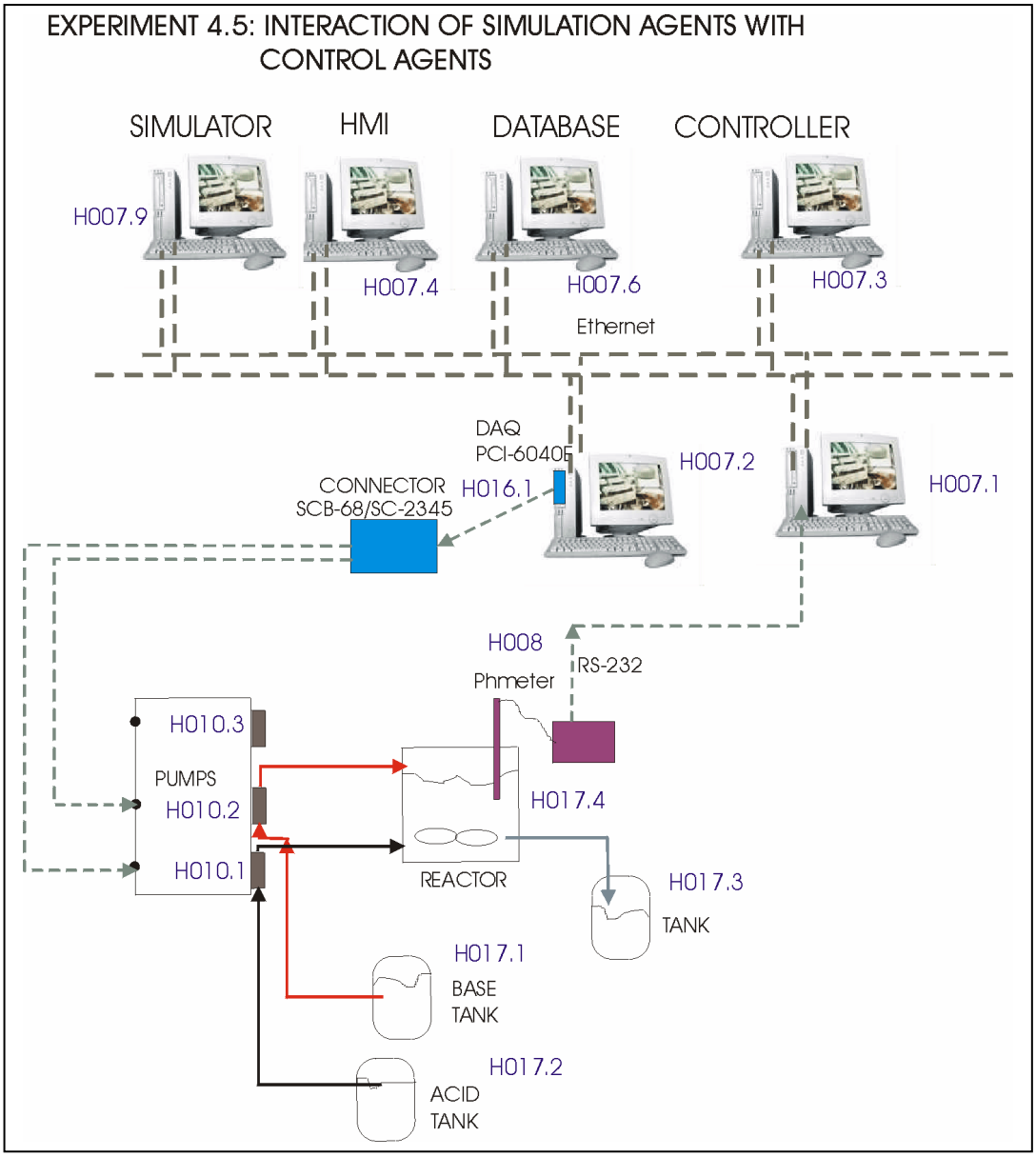


Figure 9: Experiment 4.5. Interaction between simulation and control objects.

Next figure shows the software implementation of this test:

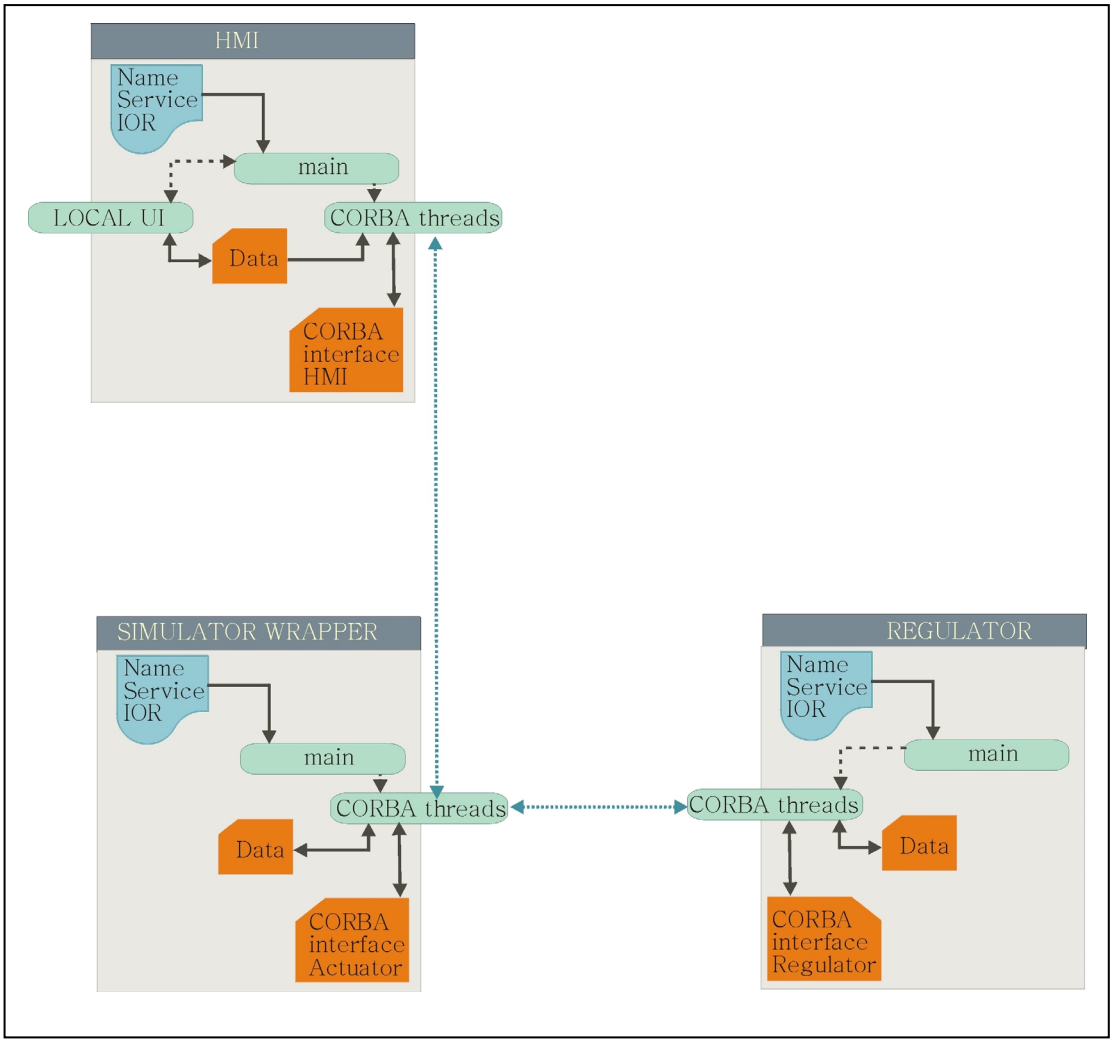


Figure 10: Software implementation of the simulation and control interaction experiment.

Test & results

The experiment is composed of two tests.

Operators training (interaction between the simulation and the HMI nodes). In this case the process and the control system are simulated. The HMI sends and receives data from the simulator. The time of execution of the simulation is slowed down to resemble the actual time of the process.

Hardware in the loop (interaction between the simulation and the actual controller). In this test the system simulated is the process plant with the sensors and actuators. The pH controller is left out of the model. The real

pH controller implemented in a separate CORBA node is used to control the simulated plant.

For this test no measurements have been recorded. The reason is that the performed tests are off-line tests and so timing properties are of no relevance. CORBA is very well prepared for this type of interaction where the middleware is fundamental. Another thing is to use CORBA with a real time simulator, but in this case we come up with the problems that a (hard) real time simulator has to be build.

7 Experiment 4.6. Intensive data traffic.

The purpose of this experiment is to check capacity limits of the system when the number of control elements increases.

Description

Figure 11 shows a detailed schema of the implementation of this experiment.

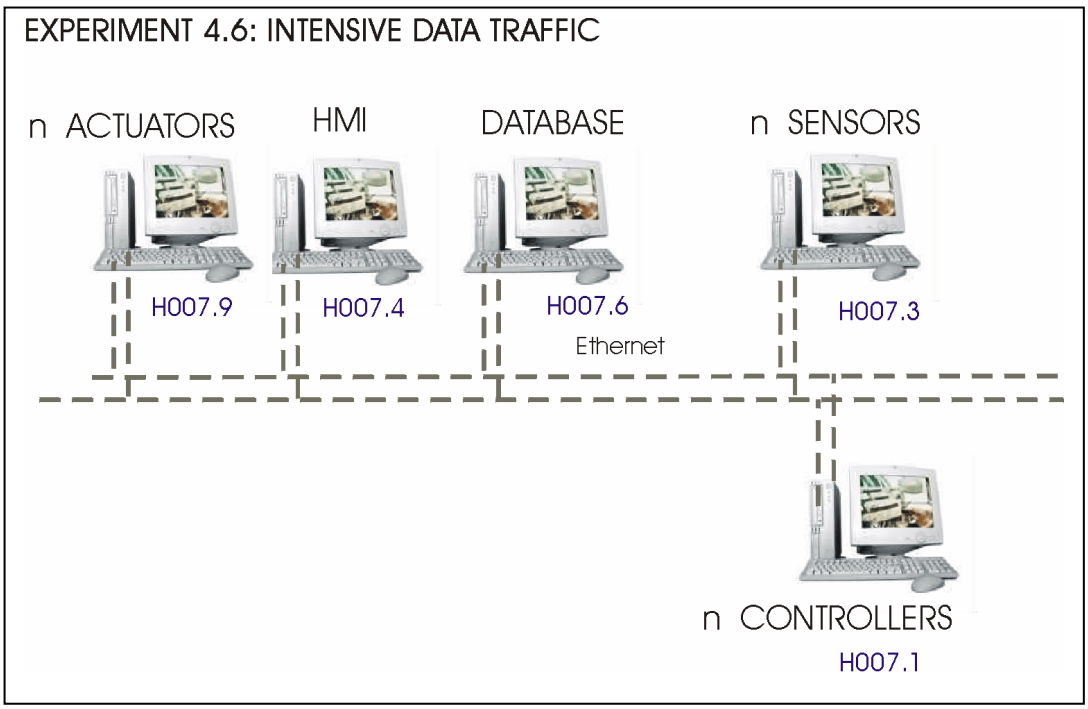


Figure 11: Expeirment 4.6. Loop performance under intensive data traffic.

The steps followed to perform this experiment and defined in the next list:

Steps
1 Development and implementation of virtual sensors in H007.3
2 Development and implementation of virtual actuators in H007.9
3 Development of virtual controllers in H007.1
4 Network performance with multiple devices transmitting signals.
5. Control loop performance degradation under intensive data traffic.

Next figure shows the software implementation of this test:

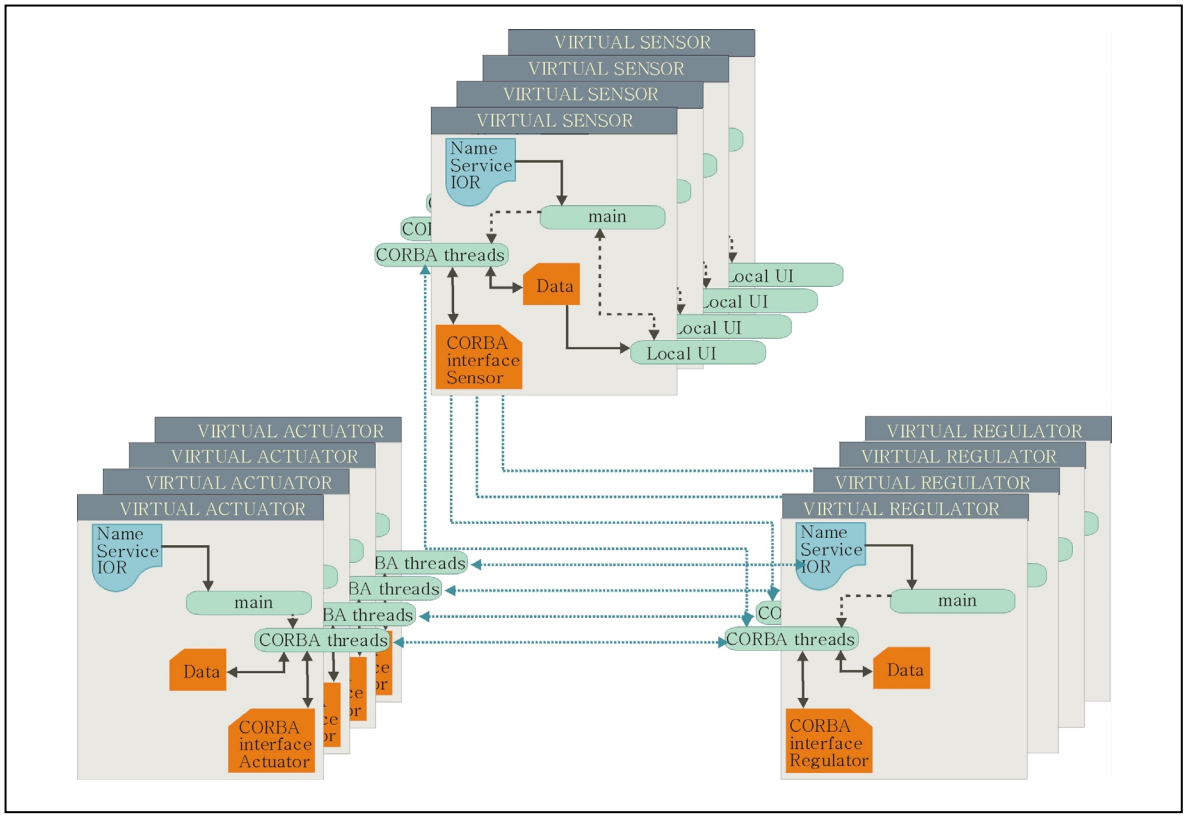


Figure 12: Software implementation of the intensive data traffic experiment.

Tests & results

The test has been performed with a hubbed network and a switched network. The network has been heavily loaded and the influence in the main control loop has been measured.

Hubbed Ethernet.

In the first case two different cases has been tested, the first one is multiple virtual objects exchanging information. The second one has been passing huge amount of information in between PCs in the network. Next is a sample of the results (main control loop timing) for the second case. Results for the first case (it is less representeative as the network was not very loaded with the virtual objects) as well as the complete data for the second case are presented in Annex C.

	Signal ID	Seconds	Microseconds
376	41	1065706037	676118
377	25	1065706037	677999
378	21	1065706037	678180
379	34	1065706037	681532
380	31	1065706037	681595
381	41	1065706037	786294
382	25	1065706037	788305
383	21	1065706037	788491
384	34	1065706037	793034
385	31	1065706037	793129
386	41	1065706037	897748
387	25	1065706037	903049
388	21	1065706037	903232
389	34	1065706037	908314
390	31	1065706037	908378
391	41	1065706038	6756
392	25	1065706038	8551
393	21	1065706038	8731
394	34	1065706038	12382
395	31	1065706038	12444
396	41	1065706038	116475
397	25	1065706038	118876
398	21	1065706038	119111
399	34	1065706038	129410
400	31	1065706038	129503

The statistics of this test (for all the data), **time is in milliseconds:**

	Signal 25 - 41	Signal 34-21	Signal 41-41
Mean	3,105	5,405	14,3274167
Asymmetry coef.	3,095	2,920	3,28596057
Standard deviation	2,788	3,138	13,315641
Average deviation	1,684	2,053	7,29289444

It can be shown that the time interval between nodes increase regarding the CCS loop and that the data dispersion is quite great. This implies that this network configuration is not suitable for process control.

Switched Ethernet. (Non real time)

A sample of the results obtained for the switched Ethernet are displayed next, the complete data set can be found in Annex D.

	Signal ID	Seconds	Microseconds
56	41	1065712132	998340
57	25	1065712132	999236
58	21	1065712132	999471
59	34	1065712133	1359
60	31	1065712133	1418
61	41	1065712133	108204
62	25	1065712133	109096
63	21	1065712133	109279
64	34	1065712133	111170
65	31	1065712133	111229
66	41	1065712133	218232
67	25	1065712133	219125
68	21	1065712133	219308
69	34	1065712133	221202
70	31	1065712133	221259
71	41	1065712133	328209
72	25	1065712133	329090
73	21	1065712133	329273
74	34	1065712133	331157
75	31	1065712133	331215
76	41	1065712133	438234
77	25	1065712133	439132
78	21	1065712133	439312
79	34	1065712133	441199
80	31	1065712133	441255

The statistics of this test (for all the data), **time is in milliseconds:**

	Signal 25 - 41	Signal 34-21	Signal 41-41
Mean	0,923	1,911	9,986
Asymmetry coef.	6,302	2,169	-0,456
Standard deviation	0,116	0,030	0,497
Average deviation	0,046	0,019	0,225

These figures are more or less te same as those obtained in the CCS loop. There is some influence in the data dispersion (signal 41-41 standard dev. goes from 0.28 to 0.49 but in any case are low numbers), but the results shows that the switched ethernet is still suitable.

8 Experiment 4.7.-Concurrency test.

The purpose of this experiment is to identify concurrency issues in CCS.

Description

The steps followed to perform this experiment and defined in the next list:

Steps
1 Test: Multiple CORBA agents accessing a the pH sensor.

There is only one step as the configuration needed to perform this experiment is the same as in other previous ones.

Figure 12 shows a detailed schema of the implementation of this experiment.

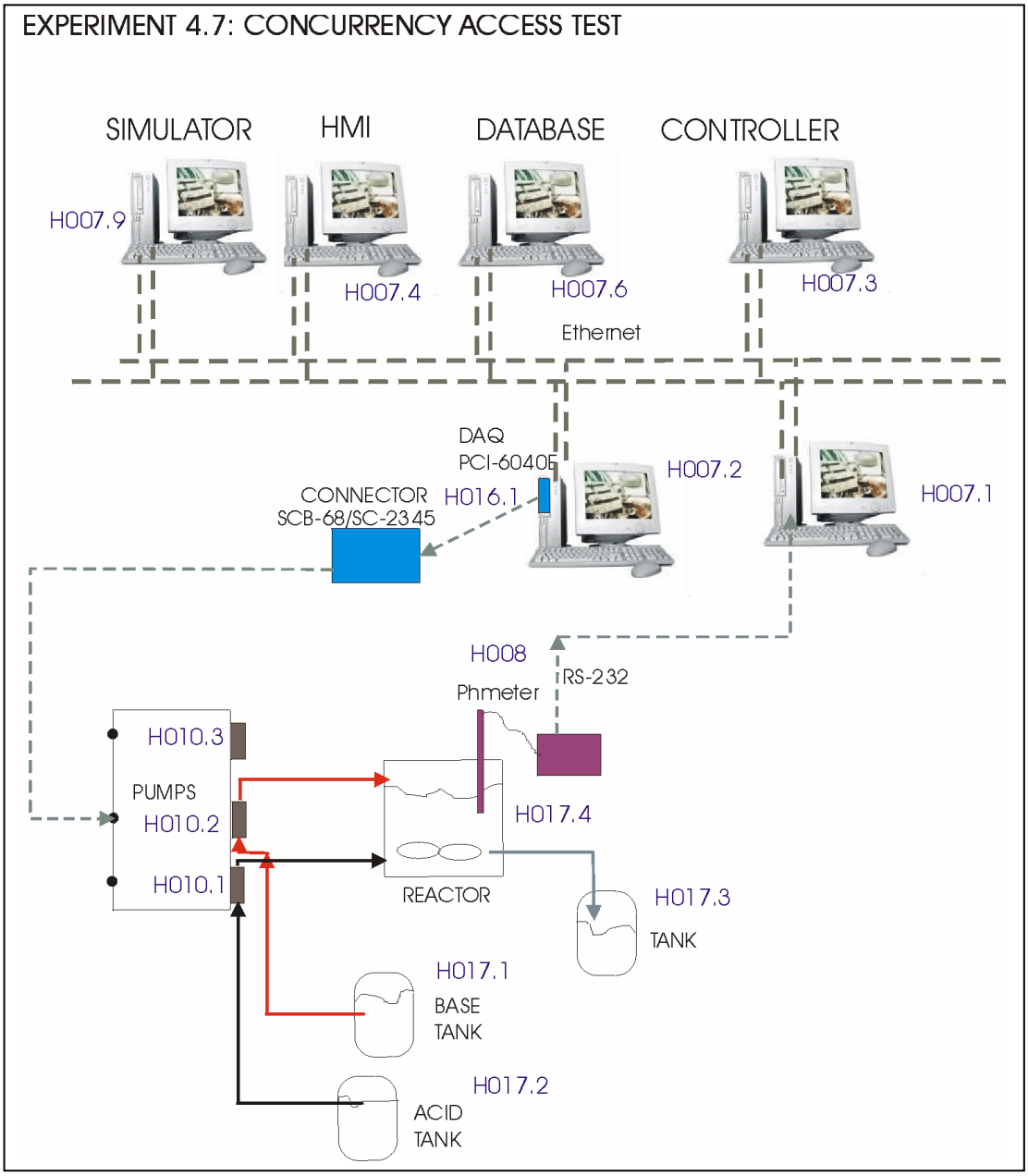


Figure 13: Experiment 4.7. Concurrency access test implementation.

Tests & results

The test has been performed with a hubbed network and a switched network. In this case virtual objects are trying to access to the actual pH sensor node. The behaviour of the main control loop under this circumstances has been measured for both topologies.

Hubbed Ethernet.

A sample of the results obtained for the switched Ethernet are displayed next, the complete data set can be found in Annex E.

	Signal ID	Seconds	Microseconds
109	41	1065711080	288570
110	25	1065711080	297062
111	21	1065711080	297244
112	34	1065711080	305963
113	31	1065711080	306022
114	41	1065711080	398748
115	25	1065711080	407187
116	21	1065711080	407365
117	34	1065711080	415998
118	31	1065711080	416058
119	41	1065711080	511002
120	25	1065711080	516736
121	21	1065711080	516915
122	34	1065711080	562932
123	31	1065711080	562990
124	41	1065711080	618755
125	25	1065711080	621642
126	21	1065711080	621820
127	34	1065711080	625141
128	31	1065711080	625201
129	41	1065711080	728985
130	25	1065711080	737310
131	21	1065711080	737512
132	34	1065711080	746313
133	31	1065711080	746375

The statistics of this test (for all the data), **time is in milliseconds:**

	Signal 25 - 41	Signal 34-21	Signal 41-41
Mean	8,317	8,751	16,2063
Asymmetry coef.	-1,794	4,800	0,67498201
Standard deviation	1,415	11,307	6,74669895
Average deviation	0,874	5,684	5,9427

These results are even worse than those obtained with Traffic Intensive test. The loop timing is highly increased and the data show high variability. CORBA has proved that can handle multiple requests at a really fast rate. In this test (as in the switched Ethernet case) around 10 virtual objects where constantly requesting the pH at the maximum rate available.

Switched Ethernet. (Non real time)

A sample of the results obtained for the switched Ethernet are displayed next, the complete data set can be found in Annex F

	Signal ID	Seconds	Microseconds
248	41	1065711652	518047
249	25	1065711652	519165
250	21	1065711652	519371
251	34	1065711652	521290
252	31	1065711652	521351
253	41	1065711652	588865
254	41	1065711652	632128
255	25	1065711652	633163
256	21	1065711652	633393
257	34	1065711652	635453
258	31	1065711652	635512
259	41	1065711652	741846
260	25	1065711652	743226
261	21	1065711652	743407
262	34	1065711652	745290
263	31	1065711652	745352
264	41	1065711652	850535
265	25	1065711652	851803
266	21	1065711652	851984
267	34	1065711652	853912
268	31	1065711652	853972
269	41	1065711652	959862

270	25	1065711652	960922
271	21	1065711652	961102
272	34	1065711652	963014
273	31	1065711652	963074

The statistics of this test (for all the data), **time is in milliseconds:**

	Signal 25 - 41	**Signal 34-21**	**Signal 41-41**
Mean	1,194	1,883	11,760
Asymmetry coef.	1,967	1,318	2,717
Standard deviation	0,165	0,035	5,388
Average deviation	0,121	0,027	3,083

The results show that the concurrency access affects the switched ethernet in a significant manner. Although results are quite good it can be noted that the timing is slightly increased and specially that the variability of the loop is quite high.

Next table summarizes the results of the performed tests.
(CCS: control loop, TI: traffic intensive, CA: concurrent access)

	HUB								
	CCS			TI			CA		
	41-25	34-21	41-41	41-25	34-21	41-41	41-25	34-21	41-41
Mean	1,822	3,564	9,979	3,105	5,405	14,3274167	8,317	8,751	16,2063
Asymmetry coef.	0,695	1,125	-2,325	3,095	2,920	3,28596057	-1,794	4,800	0,67498201
Standard deviation	0,055	0,385	0,317	2,788	3,138	13,315641	1,415	11,307	6,74669895
Average deviation	0,048	0,290	0,124	1,684	2,053	7,29289444	0,874	5,684	5,9427

	SWITCH								
	CCS			TI			CA		
	41-25	34-21	41-41	41-25	34-21	41-41	41-25	34-21	41-41
Mean	0,946	1,821	10,009	0,923	1,911	9,986	1,194	1,883	11,760
Asymmetry coef.	5,425	1,444	0,093	6,302	2,169	-0,456	1,967	1,318	2,717
Standard deviation	0,089	0,033	0,288	0,116	0,030	0,497	0,165	0,035	5,388
Average deviation	0,045	0,026	0,115	0,046	0,019	0,225	0,121	0,027	3,083

9 Experiment 4.8. Network bridging.

The purpose of this epxeriment is to identify requirements and limits for the use of several (possibly heterogeneous) segments in a CCS network.

Description

The steps followed to perform this experiment and defined in the next list:

Steps
Network merging

Figure 13 shows a detailed schema of the implementation of this experiment.

A bridge connects the two network segments (the ethernet and the TTP/C networks).

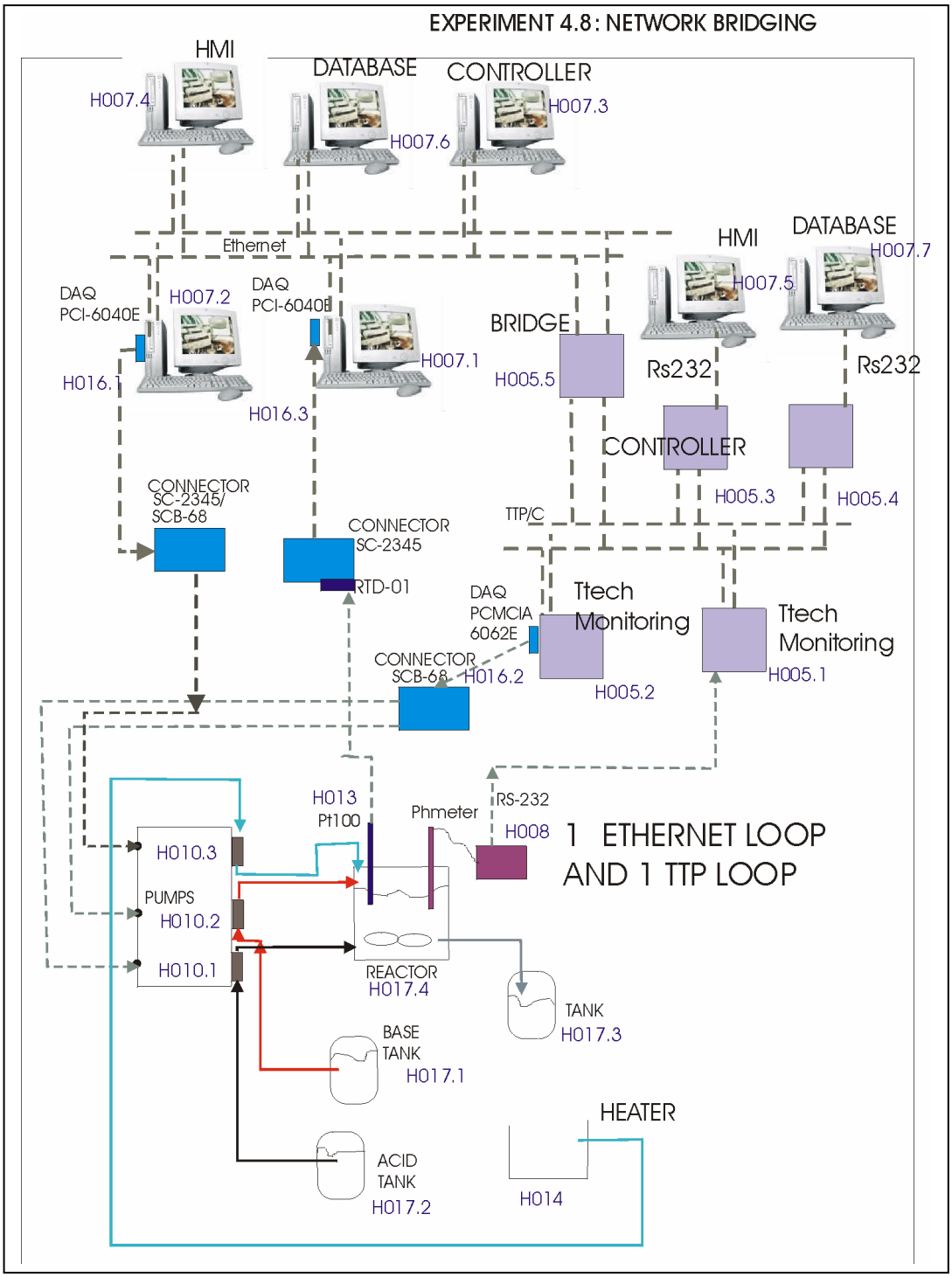


Figure 14: Experiment 4.8. network bridging implementation. One ethernet and one TTP control loop.

10 Annexes

List of Annexes
Annex A: CCS loop Hub test data
Annex B: CCS loop Switch test data
Annex C: Traffic intensive Hub test data
Annex D: Traffic intensive Switch test data
Annex E: Concurrent access Hub test data
Annex F: Concurrent access Switch test data

Annex A: CCS Loop Hub tests.

Test ID	Signal ID	Seconds	Microsecs	Signal 41-25 msecs	Signal 21-34 msecs	Signal 41-41 msecs
1	41	1065702998	140853			
2	41	1065702999	150251			
3	41	1065703000	161365			
4	41	1065703000	305987			
5	25	1065703000	307803	1,816		
6	21	1065703000	308128			
7	34	1065703000	312759			
8	31	1065703000	312936			
9	41	1065703000	415467			
10	25	1065703000	417244	1,777		
11	21	1065703000	417449			
12	34	1065703000	420641		3,192	
13	31	1065703000	420724			
14	41	1065703000	525462			
15	25	1065703000	527232	1,77		
16	21	1065703000	527424			
17	34	1065703000	531205		3,781	
18	31	1065703000	531276			
19	41	1065703000	635529			
20	25	1065703000	637398	1,869		
21	21	1065703000	637602			
22	34	1065703000	640980		3,378	
23	31	1065703000	641047			
24	41	1065703000	745604			
25	25	1065703000	747383	1,779		
26	21	1065703000	747611			
27	34	1065703000	750748		3,137	
28	31	1065703000	750808			
29	41	1065703000	855488			
30	25	1065703000	857268	1,78		
31	21	1065703000	857455			
32	34	1065703000	860589		3,134	
33	31	1065703000	860648			
34	41	1065703000	965500			
35	25	1065703000	967286	1,786		
36	21	1065703000	967465			
37	34	1065703000	970980		3,515	
38	31	1065703000	971039			
39	41	1065703001	75559			
40	25	1065703001	77495	1,936		
41	21	1065703001	77696			
42	34	1065703001	81194		3,498	

43	31	1065703001	81257				
44	41	1065703001	182466				
45	41	1065703001	185515				
46	25	1065703001	187185		1,67		
47	21	1065703001	187369				
48	34	1065703001	190914			3,545	
49	31	1065703001	190975				
50	41	1065703001	295523				
51	25	1065703001	297326		1,803		
52	21	1065703001	297502				
53	34	1065703001	300932			3,43	
54	31	1065703001	300991				
55	41	1065703001	405535				
56	25	1065703001	407299		1,764		
57	21	1065703001	407482				
58	34	1065703001	410852			3,37	
59	31	1065703001	410912				
60	41	1065703001	515669				
61	25	1065703001	517474		1,805		
62	21	1065703001	517705				
63	34	1065703001	520786			3,081	
64	31	1065703001	520844				
65	41	1065703001	625556				9,887
66	25	1065703001	627341		1,785		
67	21	1065703001	627538				
68	34	1065703001	630724			3,186	
69	31	1065703001	630783				
70	41	1065703001	735561				10,005
71	25	1065703001	737335		1,774		
72	21	1065703001	737522				
73	34	1065703001	740974			3,452	
74	31	1065703001	741033				
75	41	1065703001	845568				10,007
76	25	1065703001	847350		1,782		
77	21	1065703001	847528				
78	34	1065703001	850956			3,428	
79	31	1065703001	851014				
80	41	1065703001	955706				10,138
81	25	1065703001	957534		1,828		
82	21	1065703001	957765				
83	34	1065703001	961246			3,481	
84	31	1065703001	961306				
85	41	1065703002	65594				
86	25	1065703002	67374		1,78		
87	21	1065703002	67555				
88	34	1065703002	71028			3,473	
89	31	1065703002	71086				
90	41	1065703002	175607				10,013
91	25	1065703002	177413		1,806		
92	21	1065703002	177604				

93	34	1065703002	181045			3,441	
94	31	1065703002	181104				
95	41	1065703002	280549				
96	41	1065703002	285621				
97	25	1065703002	287319		1,698		
98	21	1065703002	287519				
99	34	1065703002	291274			3,755	
100	31	1065703002	291333				
101	41	1065703002	395618				9,997
102	25	1065703002	397403		1,785		
103	21	1065703002	397590				
104	34	1065703002	401805			4,215	
105	31	1065703002	401863				
106	41	1065703002	505627				10,009
107	25	1065703002	507401		1,774		
108	21	1065703002	507583				
109	34	1065703002	511261			3,678	
110	31	1065703002	511320				
111	41	1065703002	615636				10,009
112	25	1065703002	617426		1,79		
113	21	1065703002	617613				
114	34	1065703002	620695			3,082	
115	31	1065703002	620754				
116	41	1065703002	725643				10,007
117	25	1065703002	727416		1,773		
118	21	1065703002	727593				
119	34	1065703002	731005			3,412	
120	31	1065703002	731064				
121	41	1065703002	835758				10,115
122	25	1065703002	837548		1,79		
123	21	1065703002	837777				
124	34	1065703002	841017			3,24	
125	31	1065703002	841075				
126	41	1065703002	945666				9,908
127	25	1065703002	947462		1,796		
128	21	1065703002	947639				
129	34	1065703002	950969			3,33	
130	31	1065703002	951029				
131	41	1065703003	55680				
132	25	1065703003	57628		1,948		
133	21	1065703003	57814				
134	34	1065703003	60975			3,161	
135	31	1065703003	61034				
136	41	1065703003	165812				10,132
137	25	1065703003	167605		1,793		
138	21	1065703003	167835				
139	34	1065703003	171428			3,593	
140	31	1065703003	171487				
141	41	1065703003	275699				9,887
142	25	1065703003	277495		1,796		

143	21	1065703003	277690			
144	34	1065703003	281137		3,447	
145	31	1065703003	281196			
146	41	1065703003	385697			9,998
147	25	1065703003	387473	1,776		
148	21	1065703003	387651			
149	34	1065703003	391189		3,538	
150	31	1065703003	391249			
151	41	1065703003	403946			
152	41	1065703003	495719			
153	25	1065703003	497504	1,785		
154	21	1065703003	497694			
155	34	1065703003	501130		3,436	
156	31	1065703003	501187			
157	41	1065703003	605736			10,017
158	25	1065703003	607514	1,778		
159	21	1065703003	607691			
160	34	1065703003	610976		3,285	
161	31	1065703003	611034			
162	41	1065703003	715734			9,998
163	25	1065703003	717522	1,788		
164	21	1065703003	717709			
165	34	1065703003	721012		3,303	
166	31	1065703003	721070			
167	41	1065703003	825740			10,006
168	25	1065703003	827611	1,871		
169	21	1065703003	827790			
170	34	1065703003	831140		3,35	
171	31	1065703003	831199			
172	41	1065703003	935771			10,031
173	25	1065703003	937582	1,811		
174	21	1065703003	937769			
175	34	1065703003	940899		3,13	
176	31	1065703003	940958			
177	41	1065703004	45872			
178	25	1065703004	47668	1,796		
179	21	1065703004	47897			
180	34	1065703004	50971		3,074	
181	31	1065703004	51028			
182	41	1065703004	155777			9,905
183	25	1065703004	157585	1,808		
184	21	1065703004	157775			
185	34	1065703004	161206		3,431	
186	31	1065703004	161265			
187	41	1065703004	265773			9,996
188	25	1065703004	267545	1,772		
189	21	1065703004	267722			
190	34	1065703004	270886		3,164	
191	31	1065703004	270945			
192	41	1065703004	360205			

193	41	1065703004	377174				
194	25	1065703004	378884		1,71		
195	21	1065703004	379130				
196	34	1065703004	382467			3,337	
197	31	1065703004	382534				
198	41	1065703004	485806				8,632
199	25	1065703004	487590		1,784		
200	21	1065703004	487786				
201	34	1065703004	490870			3,084	
202	31	1065703004	490933				
203	41	1065703004	595825				10,019
204	25	1065703004	597610		1,785		
205	21	1065703004	597788				
206	34	1065703004	600846			3,058	
207	31	1065703004	600904				
208	41	1065703004	705878				10,053
209	25	1065703004	707738		1,86		
210	21	1065703004	707944				
211	34	1065703004	711447			3,503	
212	31	1065703004	711512				
213	41	1065703004	815838				9,96
214	25	1065703004	817624		1,786		
215	21	1065703004	817802				
216	34	1065703004	821184			3,382	
217	31	1065703004	821244				
218	41	1065703004	925848				10,01
219	25	1065703004	927659		1,811		
220	21	1065703004	927836				
221	34	1065703004	931166			3,33	
222	31	1065703004	931229				
223	41	1065703005	35859				
224	25	1065703005	37939		2,08		
225	21	1065703005	38117				
226	34	1065703005	41470			3,353	
227	31	1065703005	41527				
228	41	1065703005	145864				10,005
229	25	1065703005	147654		1,79		
230	21	1065703005	147835				
231	34	1065703005	151502			3,667	
232	31	1065703005	151562				
233	41	1065703005	255993				10,129
234	25	1065703005	257790		1,797		
235	21	1065703005	258022				
236	34	1065703005	261372			3,35	
237	31	1065703005	261438				
238	41	1065703005	365881				9,888
239	25	1065703005	367651		1,77		
240	21	1065703005	367830				
241	41	1065703005	371212				
242	34	1065703005	371959				

243	31	1065703005	372021				
244	41	1065703005	475927				8,276
245	25	1065703005	477630		1,703		
246	21	1065703005	477812				
247	34	1065703005	481290			3,478	
248	31	1065703005	481351				
249	41	1065703005	585895				9,968
250	25	1065703005	587701		1,806		
251	21	1065703005	587880				
252	34	1065703005	591103			3,223	
253	31	1065703005	591161				
254	20	1065703005	627177				
255	41	1065703005	695915				
256	25	1065703005	697842		1,927		
257	21	1065703005	698041				
258	34	1065703005	701459			3,418	
259	31	1065703005	701518				
260	41	1065703005	806079				10,164
261	25	1065703005	807938		1,859		
262	21	1065703005	808117				
263	34	1065703005	811515			3,398	
264	31	1065703005	811576				
265	41	1065703005	915942				9,863
266	25	1065703005	917743		1,801		
267	21	1065703005	917920				
268	34	1065703005	921227			3,307	
269	31	1065703005	921287				
270	41	1065703006	25940				
271	25	1065703006	27726		1,786		
272	21	1065703006	27903				
273	34	1065703006	31402			3,499	
274	31	1065703006	31460				
275	41	1065703006	135958				10,018
276	25	1065703006	137763		1,805		
277	21	1065703006	137943				
278	34	1065703006	141434			3,491	
279	31	1065703006	141493				
280	41	1065703006	245953				9,995
281	25	1065703006	247622		1,669		
282	21	1065703006	247800				
283	34	1065703006	251280			3,48	
284	31	1065703006	251338				
285	41	1065703006	355964				10,011
286	25	1065703006	357764		1,8		
287	21	1065703006	357942				
288	34	1065703006	361221			3,279	
289	31	1065703006	361278				
290	41	1065703006	380254				
291	41	1065703006	466094				
292	25	1065703006	467946		1,852		

293	21	1065703006	468176			
294	34	1065703006	471671		3,495	
295	31	1065703006	471729			
296	41	1065703006	575993			9,899
297	25	1065703006	577775	1,782		
298	21	1065703006	577957			
299	34	1065703006	581481		3,524	
300	31	1065703006	581540			
301	41	1065703006	685993			10
302	25	1065703006	687758			
303	21	1065703006	687938			
304	34	1065703006	691206			
305	31	1065703006	691266			
306	41	1065703006	796004			10,011
307	25	1065703006	797794			
308	21	1065703006	797973			
309	34	1065703006	801443			
310	31	1065703006	801502			
311	41	1065703006	906126			10,122
312	25	1065703006	907950			
313	21	1065703006	908181			
314	34	1065703006	911420			
315	31	1065703006	911480			
316	41	1065703007	16028			
317	25	1065703007	17939			
318	21	1065703007	18117			
319	34	1065703007	21608			
320	31	1065703007	21665			
321	41	1065703007	126037			10,009
322	25	1065703007	127833			
323	21	1065703007	128014			
324	34	1065703007	131590			
325	31	1065703007	131649			
326	41	1065703007	236040			10,003
327	25	1065703007	237828			
328	21	1065703007	238007			
329	34	1065703007	241522			
330	31	1065703007	241580			
331	41	1065703007	346066			10,026
332	25	1065703007	347865			
333	21	1065703007	348069			
334	34	1065703007	351662			
335	31	1065703007	351720			
336	41	1065703007	390305			
337	41	1065703007	456060			
338	25	1065703007	457690			
339	21	1065703007	457868			
340	34	1065703007	461481			
341	31	1065703007	461540			
342	41	1065703007	566064			

343	25	1065703007	567928
344	21	1065703007	568110
345	34	1065703007	571277
346	31	1065703007	571335
347	41	1065703007	676198
348	25	1065703007	677997
349	21	1065703007	678233
350	34	1065703007	681591
351	31	1065703007	681649
352	41	1065703007	786083
353	25	1065703007	787879
354	21	1065703007	788057
355	34	1065703007	791668
356	31	1065703007	791727
357	41	1065703007	896095
358	25	1065703007	897917
359	21	1065703007	898095
360	34	1065703007	901347
361	31	1065703007	901406
362	41	1065703008	6110
363	25	1065703008	7897
364	21	1065703008	8076
365	34	1065703008	11556
366	31	1065703008	11614
367	41	1065703008	116245
368	25	1065703008	118052
369	21	1065703008	118285
370	34	1065703008	121717
371	31	1065703008	121778
372	41	1065703008	226176
373	25	1065703008	228035
374	21	1065703008	228242
375	34	1065703008	231811
376	31	1065703008	231877
377	41	1065703008	336137
378	25	1065703008	337923
379	21	1065703008	338101
380	34	1065703008	341548
381	31	1065703008	341607
382	41	1065703008	400316
383	41	1065703008	446138
384	25	1065703008	447922
385	21	1065703008	448101
386	34	1065703008	451400
387	31	1065703008	451460
388	41	1065703008	556154
389	25	1065703008	557804
390	21	1065703008	557988
391	34	1065703008	561677
392	31	1065703008	561735

393	41	1065703008	666180		
394	25	1065703008	667967		
395	21	1065703008	668148		
396	34	1065703008	671335		
397	31	1065703008	671394		
398	41	1065703008	776174		
399	25	1065703008	777967		
400	21	1065703008	778146		
401	34	1065703008	781409		
402	31	1065703008	781468		
403	41	1065703008	886304		
404	25	1065703008	888105		
405	21	1065703008	888335		
406	34	1065703008	891768		
407	31	1065703008	891830		
408	41	1065703008	996217		
409	25	1065703008	998011		
410	21	1065703008	998208		
411	34	1065703009	1521		
412	31	1065703009	1578		
413	41	1065703009	106235		
414	25	1065703009	108157		
415	21	1065703009	108340		
416	34	1065703009	111796		
417	31	1065703009	111856		
418	41	1065703009	216209		
419	25	1065703009	217994		
420	21	1065703009	218173		
421	34	1065703009	221631		
422	31	1065703009	221691		
423	41	1065703009	326340		10,131
424	25	1065703009	328796		
425	21	1065703009	329026		
426	34	1065703009	332662		
427	31	1065703009	332720		
428	41	1065703009	410443		
429	41	1065703009	436226		
430	25	1065703009	437924		
431	21	1065703009	438104		
432	34	1065703009	441556		
433	31	1065703009	441615		
434	41	1065703009	546238		10,012
435	25	1065703009	548018		
436	21	1065703009	548201		
437	34	1065703009	551729		
438	31	1065703009	551790		
439	41	1065703009	656253		10,015
440	25	1065703009	658028		
441	21	1065703009	658209		
442	34	1065703009	661694		

443	31	1065703009	661755		
444	41	1065703009	766251		9,998
445	25	1065703009	768047		
446	21	1065703009	768226		
447	34	1065703009	771791		
448	31	1065703009	771851		
449	41	1065703009	876267		
450	25	1065703009	878060		
451	21	1065703009	878240		
452	34	1065703009	881464		
453	31	1065703009	881524		
454	41	1065703009	986278		
455	25	1065703009	988048		
456	21	1065703009	988227		
457	34	1065703009	991776		
458	31	1065703009	991835		
459	41	1065703010	96288		
460	25	1065703010	98151		
461	21	1065703010	98328		
462	34	1065703010	101602		
463	31	1065703010	101660		
464	41	1065703010	206397		
465	25	1065703010	208197		
466	21	1065703010	208430		
467	34	1065703010	211844		
468	31	1065703010	211910		
469	41	1065703010	316300		
470	25	1065703010	318079		
471	21	1065703010	318259		
472	34	1065703010	321560		
473	31	1065703010	321618		
474	41	1065703010	420398		
475	41	1065703010	426307		
476	25	1065703010	427978		
477	21	1065703010	428158		
478	34	1065703010	431958		
479	31	1065703010	432021		
480	41	1065703010	536450		
481	25	1065703010	538272		
482	21	1065703010	538501		
483	34	1065703010	541730		
484	31	1065703010	541789		
485	41	1065703010	646335		
486	25	1065703010	648119		
487	21	1065703010	648319		
488	34	1065703010	651517		
489	31	1065703010	651576		
490	41	1065703010	756339		
491	25	1065703010	757978		
492	21	1065703010	758158		

493	34	1065703010	764083			
494	31	1065703010	764142			
495	41	1065703010	866352			
496	25	1065703010	868242			
497	21	1065703010	868425			
498	34	1065703010	871591			
499	31	1065703010	871651			
500	41	1065703010	976365			
501	25	1065703010	978172			
502	21	1065703010	978352			
503	34	1065703010	981807			
504	31	1065703010	981864			
505	41	1065703011	86426			
506	25	1065703011	88345		1,919	
507	21	1065703011	88551			
508	34	1065703011	91883			3,332
509	31	1065703011	91949			
510	41	1065703011	196414			
511	25	1065703011	198269		1,855	
512	21	1065703011	198468			
513	34	1065703011	202035			3,567
514	31	1065703011	202096			
515	41	1065703011	306389			
516	25	1065703011	308172		1,783	
517	21	1065703011	308352			
518	34	1065703011	311851			3,499
519	31	1065703011	311909			
520	41	1065703011	416513			
521	25	1065703011	418348		1,835	
522	21	1065703011	418581			
523	34	1065703011	421978			3,397
524	31	1065703011	422037			
525	41	1065703011	430430			
526	41	1065703011	526411			
527	25	1065703011	528046		1,635	
528	21	1065703011	528229			
529	34	1065703011	531934			3,705
530	31	1065703011	531994			
531	41	1065703011	636421			
532	25	1065703011	638200		1,779	
533	21	1065703011	638380			
534	34	1065703011	641986			3,606
535	31	1065703011	642044			
536	41	1065703011	746422			
537	25	1065703011	748205		1,783	
538	21	1065703011	748384			
539	34	1065703011	751828			3,444
540	31	1065703011	751886			
541	41	1065703011	856544			
542	25	1065703011	858494		1,95	

543	21	1065703011	858725		
544	34	1065703011	861999		3,274
545	31	1065703011	862057		
546	41	1065703011	966450		
547	25	1065703011	968268	1,818	
548	21	1065703011	968448		
549	34	1065703011	971919		3,471
550	31	1065703011	971978		
551	41	1065703012	76456		
552	25	1065703012	78250	1,794	
553	21	1065703012	78429		
554	34	1065703012	81861		3,432
555	31	1065703012	81919		
556	41	1065703012	186792		
557	25	1065703012	188679	1,887	
558	21	1065703012	188940		
559	34	1065703012	192391		3,451
560	31	1065703012	192459		
561	41	1065703012	296499		
562	25	1065703012	298299	1,8	
563	21	1065703012	298502		
564	34	1065703012	301883		3,381
565	31	1065703012	301943		
566	41	1065703012	406481		
567	25	1065703012	408266	1,785	
568	21	1065703012	408446		
569	34	1065703012	412206		3,76
570	31	1065703012	412266		
571	41	1065703012	441459		
572	41	1065703012	516496		
573	25	1065703012	518276	1,78	
574	21	1065703012	518459		
575	34	1065703012	521875		3,416
576	31	1065703012	521933		
577	41	1065703012	626658		
578	25	1065703012	628529	1,871	
579	21	1065703012	628758		
580	34	1065703012	632226		3,468
581	31	1065703012	632293		
582	41	1065703012	736513		
583	25	1065703012	738291	1,778	
584	21	1065703012	738471		
585	34	1065703012	741847		3,376
586	31	1065703012	741907		
587	41	1065703012	846519		
588	25	1065703012	848318	1,799	
589	21	1065703012	848497		
590	34	1065703012	852070		3,573
591	31	1065703012	852129		
592	41	1065703012	956535		

593	25	1065703012	958341		1,806	
594	21	1065703012	958520			
595	34	1065703012	962216			3,696
596	31	1065703012	962274			
597	41	1065703013	66648			
598	25	1065703013	68602			
599	21	1065703013	68833			
600	34	1065703013	72203			
601	31	1065703013	72261			
602	41	1065703013	176553			
603	25	1065703013	178361			
604	21	1065703013	178541			
605	34	1065703013	181998			
606	31	1065703013	182058			
607	41	1065703013	286554			
608	25	1065703013	288546			
609	21	1065703013	288725			
610	34	1065703013	292290			
611	31	1065703013	292347			
612	41	1065703013	396568			
613	25	1065703013	398351			
614	21	1065703013	398531			
615	34	1065703013	402103			
616	31	1065703013	402162			
617	41	1065703013	450492			
618	41	1065703013	506576			
619	25	1065703013	508351			
620	21	1065703013	508535			
621	34	1065703013	511962			
622	31	1065703013	512020			
623	41	1065703013	616604			
624	25	1065703013	618404			
625	21	1065703013	618586			
626	34	1065703013	622082			
627	31	1065703013	622140			
628	41	1065703013	726596			
629	25	1065703013	728381			
630	21	1065703013	728561			
631	34	1065703013	732113			
632	31	1065703013	732171			
633	41	1065703013	836722			
634	25	1065703013	838804			
635	21	1065703013	839035			
636	34	1065703013	842577			
637	31	1065703013	842636			
638	41	1065703013	946632			
639	25	1065703013	948469			
640	21	1065703013	948649			
641	34	1065703013	952035			
642	31	1065703013	952094			

643	41	1065703014	56633
644	25	1065703014	58405
645	21	1065703014	58584
646	34	1065703014	62003
647	31	1065703014	62061
648	41	1065703014	166634
649	25	1065703014	168456
650	21	1065703014	168638
651	34	1065703014	171811
652	31	1065703014	171870
653	41	1065703014	276760
654	25	1065703014	278603
655	21	1065703014	278834
656	34	1065703014	282323
657	31	1065703014	282381
658	41	1065703014	386646
659	25	1065703014	388412
660	21	1065703014	388592
661	34	1065703014	392002
662	31	1065703014	392061
663	41	1065703014	460534
664	41	1065703014	496663
665	25	1065703014	498420
666	21	1065703014	498601
667	34	1065703014	502058
668	31	1065703014	502119
669	41	1065703014	606674
670	25	1065703014	608498
671	21	1065703014	608678
672	34	1065703014	611982
673	31	1065703014	612041
674	41	1065703014	716677
675	25	1065703014	718543
676	21	1065703014	718722
677	34	1065703014	722585
678	31	1065703014	722645
679	41	1065703014	826686
680	25	1065703014	828440
681	21	1065703014	828619
682	34	1065703014	832190
683	31	1065703014	832249
684	41	1065703014	936707
685	25	1065703014	938540
686	21	1065703014	938720
687	34	1065703014	942590
688	31	1065703014	942650
689	41	1065703015	46855
690	25	1065703015	48845
691	21	1065703015	49075
692	34	1065703015	52331

693	31	1065703015	52389
694	41	1065703015	156722
695	25	1065703015	158496
696	21	1065703015	158679
697	34	1065703015	162487
698	31	1065703015	162545
699	41	1065703015	266723
700	25	1065703015	268523
701	21	1065703015	268702
702	34	1065703015	272103
703	31	1065703015	272167
704	41	1065703015	376735
705	25	1065703015	378437
706	21	1065703015	378617
707	34	1065703015	381987
708	31	1065703015	382047
709	41	1065703015	470551
710	41	1065703015	486860
711	25	1065703015	488591
712	21	1065703015	488822
713	34	1065703015	492110
714	31	1065703015	492173
715	41	1065703016	481093
716	41	1065703017	491802
717	41	1065703018	500715

Annex B: CCS Switched Loop

Test ID	Signal ID	Seconds	Microsecs	Signal 41-25 msecs	Signal 21-34 msecs	Signal 41-41 msecs
1	41	1065711763	839007			
2	41	1065711764	842913			
3	41	1065711765	852834			
4	41	1065711766	862950			
5	41	1065711767	872996			
6	41	1065711768	883133			
7	41	1065711769	893076			
8	41	1065711770	903178			
9	41	1065711771	914171			
10	41	1065711772	923140			
11	41	1065711773	933103			
12	41	1065711774	367758			
13	25	1065711774	368853			
14	21	1065711774	369154			
15	34	1065711774	371812			
16	31	1065711774	371987			
17	41	1065711774	477424			
18	25	1065711774	478329			
19	21	1065711774	478536			
20	34	1065711774	480389			
21	31	1065711774	480470			
22	41	1065711774	587430			
23	25	1065711774	588334			
24	21	1065711774	588516			
25	34	1065711774	590376			
26	31	1065711774	590445			
27	41	1065711774	697415			
28	25	1065711774	698308			
29	21	1065711774	698487			
30	34	1065711774	700321			
31	31	1065711774	700379			
32	41	1065711774	807438			
33	25	1065711774	808338			
34	21	1065711774	808519			
35	34	1065711774	810486			
36	31	1065711774	810542			
37	41	1065711774	917431			
38	25	1065711774	918340			
39	21	1065711774	918518			
40	34	1065711774	920337			
41	31	1065711774	920394			

42	41	1065711774	953439
43	41	1065711775	27612
44	25	1065711775	28514
45	21	1065711775	28745
46	34	1065711775	30581
47	31	1065711775	30637
48	41	1065711775	137459
49	25	1065711775	138352
50	21	1065711775	138533
51	34	1065711775	140353
52	31	1065711775	140409
53	41	1065711775	247479
54	25	1065711775	248366
55	21	1065711775	248550
56	34	1065711775	250375
57	31	1065711775	250432
58	41	1065711775	357486
59	25	1065711775	358369
60	21	1065711775	358550
61	34	1065711775	360517
62	31	1065711775	360574
63	41	1065711775	467642
64	25	1065711775	468563
65	21	1065711775	468795
66	34	1065711775	470585
67	31	1065711775	470642
68	41	1065711775	577503
69	25	1065711775	578406
70	21	1065711775	578603
71	34	1065711775	580402
72	31	1065711775	580460
73	41	1065711775	687512
74	25	1065711775	688408
75	21	1065711775	688589
76	34	1065711775	690489
77	31	1065711775	690548
78	41	1065711775	797511
79	25	1065711775	798406
80	21	1065711775	798586
81	34	1065711775	800408
82	31	1065711775	800465
83	41	1065711775	907531
84	25	1065711775	908440
85	21	1065711775	908617
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88	41	1065711775	963104
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90	25	1065711776	18562
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92	34	1065711776	20602				
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95	25	1065711776	128441	0,891			
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97	34	1065711776	130457		1,836		
98	31	1065711776	130524				
99	41	1065711776	237706			10,156	
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127	34	1065711776	790480		1,806		
128	31	1065711776	790538				
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241	31	1065711779	211015			

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274	21	1065711779	979193			
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278	41	1065711780	87882			
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605	41	1065711787	128488				
606	25	1065711787	129385				
607	21	1065711787	129565				
608	34	1065711787	131416				
609	31	1065711787	131477				
610	41	1065711787	238507				
611	25	1065711787	239397				
612	21	1065711787	239594				
613	34	1065711787	241404				
614	31	1065711787	241461				
615	41	1065711787	348671				10,164
616	25	1065711787	349572	0,901			
617	21	1065711787	349806				
618	34	1065711787	351619		1,813		
619	31	1065711787	351677				
620	41	1065711787	458513				9,842
621	25	1065711787	459411	0,898			
622	21	1065711787	459591				
623	34	1065711787	461414		1,823		
624	31	1065711787	461472				
625	41	1065711787	568534				
626	25	1065711787	569476				
627	21	1065711787	569661				
628	34	1065711787	571491				
629	31	1065711787	571549				
630	41	1065711787	678530				
631	25	1065711787	679421	0,891			
632	21	1065711787	679601				
633	34	1065711787	681415		1,814		
634	31	1065711787	681475				
635	41	1065711787	788724				10,194
636	25	1065711787	789759				
637	21	1065711787	789981				
638	34	1065711787	791993				
639	31	1065711787	792059				
640	41	1065711787	906471				
641	25	1065711787	907420	0,949			

642	21	1065711787	907680			
643	34	1065711787	909535		1,855	
644	31	1065711787	909595			
645	41	1065711788	8566			
646	25	1065711788	9605	1,039		
647	21	1065711788	9786			
648	34	1065711788	11639		1,853	
649	31	1065711788	11699			
650	41	1065711788	83494			
651	41	1065711788	118593			
652	25	1065711788	119474	0,881		
653	21	1065711788	119677			
654	34	1065711788	121526		1,849	
655	31	1065711788	121587			
656	41	1065711788	228661			
657	25	1065711788	229589			
658	21	1065711788	229774			
659	34	1065711788	231600			
660	31	1065711788	231658			
661	41	1065711788	338603			
662	25	1065711788	339526			
663	21	1065711788	339707			
664	34	1065711788	341543			
665	31	1065711788	341602			
666	41	1065711788	448600			
667	25	1065711788	449488			
668	21	1065711788	449669			
669	34	1065711788	451494			
670	31	1065711788	451552			
671	41	1065711788	558783			10,183
672	25	1065711788	559712	0,929		
673	21	1065711788	559944			
674	34	1065711788	561790		1,846	
675	31	1065711788	561847			
676	41	1065711788	668618			9,835
677	25	1065711788	669549	0,931		
678	21	1065711788	669733			
679	34	1065711788	671568		1,835	
680	31	1065711788	671628			
681	41	1065711788	778633			10,015
682	25	1065711788	779528			
683	21	1065711788	779710			
684	34	1065711788	781572			
685	31	1065711788	781630			
686	41	1065711788	888633			10
687	25	1065711788	889557			
688	21	1065711788	889736			
689	34	1065711788	891572			
690	31	1065711788	891631			
691	41	1065711788	998801			

692	25	1065711789	6105	
693	21	1065711789	6336	
694	34	1065711789	8257	
695	31	1065711789	8316	
696	41	1065711789	93619	
697	41	1065711789	108655	
698	25	1065711789	109521	
699	21	1065711789	109702	
700	34	1065711789	111565	
701	31	1065711789	111625	
702	41	1065711789	218667	10,012
703	25	1065711789	219562	
704	21	1065711789	219740	
705	34	1065711789	221560	
706	31	1065711789	221617	
707	41	1065711789	328684	10,017
708	25	1065711789	329582	
709	21	1065711789	329764	
710	34	1065711789	331588	
711	31	1065711789	331647	
712	41	1065711789	438690	
713	25	1065711789	439584	
714	21	1065711789	439764	
715	34	1065711789	441584	
716	31	1065711789	441642	
717	41	1065711789	548724	
718	25	1065711789	549649	
719	21	1065711789	549832	
720	34	1065711789	551662	
721	31	1065711789	551720	
722	41	1065711789	658706	
723	25	1065711789	659593	
724	21	1065711789	659772	
725	34	1065711789	661592	
726	31	1065711789	661650	
727	41	1065711789	768853	
728	25	1065711789	769775	
729	21	1065711789	770006	
730	34	1065711789	771835	
731	31	1065711789	771892	
732	41	1065711789	878733	
733	25	1065711789	879676	
734	21	1065711789	879860	
735	34	1065711789	881691	
736	31	1065711789	881749	
737	41	1065711789	988724	
738	25	1065711789	989757	
739	21	1065711789	989938	
740	34	1065711789	991792	
741	31	1065711789	991848	

742	41	1065711790	98742
743	25	1065711790	99651
744	21	1065711790	99830
745	34	1065711790	101658
746	31	1065711790	101719
747	41	1065711790	105865
748	41	1065711790	208907
749	25	1065711790	209833
750	21	1065711790	210064
751	34	1065711790	211922
752	31	1065711790	211981
753	41	1065711790	318771
754	25	1065711790	319674
755	21	1065711790	319859
756	34	1065711790	321679
757	31	1065711790	321736
758	41	1065711790	428775
759	25	1065711790	429684
760	21	1065711790	429865
761	34	1065711790	431696
762	31	1065711790	431755
763	41	1065711790	538783
764	25	1065711790	539855
765	21	1065711790	540035
766	34	1065711790	541897
767	31	1065711790	541954
768	41	1065711790	648791
769	25	1065711790	649706
770	21	1065711790	649889
771	34	1065711790	651718

Annex C: Traffic Intensive Hub test data

Test ID	Signal ID	Seconds	Microsecs	Signal 41-25 msecs	Signal 21-34 msecs
1	41	1065706026	687914		
2	41	1065706027	653398		
3	41	1065706028	684329		
4	41	1065706028	684931		
5	25	1065706028	697123		
6	21	1065706028	697420		
7	34	1065706028	723919		
8	31	1065706028	724101		
9	41	1065706028	823210		
10	25	1065706028	825353		
11	21	1065706028	825566		
12	34	1065706028	830360		
13	31	1065706028	830472		
14	41	1065706028	935384		
15	25	1065706028	938039		
16	21	1065706028	938221		
17	34	1065706028	947652		
18	31	1065706028	947723		
19	41	1065706029	114807		
20	25	1065706029	116606	1,799	
21	21	1065706029	116791		
22	34	1065706029	121891		
23	31	1065706029	121984		
24	41	1065706029	228589		
25	25	1065706029	242454	13,865	
26	21	1065706029	242635		
27	34	1065706029	246191		
28	31	1065706029	246253		
29	41	1065706029	375131		
30	25	1065706029	389756	14,625	
31	21	1065706029	389935		
32	34	1065706029	431449		
33	41	1065706029	564432		
34	41	1065706029	688981		
35	31	1065706029	431539		
36	25	1065706029	725182		
37	21	1065706029	725414		
38	34	1065706029	866736		
39	41	1065706029	867998		
40	31	1065706029	866830		

41	25	1065706029	869896		
42	21	1065706029	870113		
43	34	1065706029	873925		
44	31	1065706029	873984		
45	41	1065706030	3594		
46	25	1065706030	6728	3,134	
47	21	1065706030	6924		
48	34	1065706030	12102		5,178
49	31	1065706030	12165		
50	41	1065706030	117270		
51	25	1065706030	119743	2,473	
52	21	1065706030	119928		
53	34	1065706030	124434		4,506
54	31	1065706030	124523		
55	41	1065706030	226285		
56	25	1065706030	228546	2,261	
57	21	1065706030	228725		
58	34	1065706030	233520		4,795
59	31	1065706030	233582		
60	41	1065706030	335571		
61	25	1065706030	339478	3,907	
62	21	1065706030	339660		
63	34	1065706030	346222		6,562
64	31	1065706030	346316		
65	41	1065706030	445888		
66	25	1065706030	448029	2,141	
67	21	1065706030	448210		
68	34	1065706030	452338		4,128
69	31	1065706030	452401		
70	41	1065706030	556254		
71	25	1065706030	558555	2,301	
72	21	1065706030	558734		
73	34	1065706030	562919		4,185
74	31	1065706030	563020		
75	41	1065706030	665506		
76	25	1065706030	667259		
77	21	1065706030	667440		
78	34	1065706030	671059		
79	31	1065706030	671122		
80	41	1065706030	776165		
81	25	1065706030	779661		
82	21	1065706030	779894		
83	34	1065706030	785307		
84	31	1065706030	785401		
85	41	1065706030	885736		
86	25	1065706030	887530	1,794	
87	21	1065706030	887714		
88	34	1065706030	891893		4,179
89	31	1065706030	891955		
90	41	1065706030	995535		

91	25	1065706030	997132	1,597	
92	21	1065706030	997314		
93	34	1065706031	1715		
94	31	1065706031	1777		
95	41	1065706031	105989		
96	25	1065706031	108525	2,536	
97	21	1065706031	108759		
98	34	1065706031	116544		7,785
99	31	1065706031	116637		
100	41	1065706031	268829		
101	25	1065706031	272003	3,174	
102	21	1065706031	272186		
103	34	1065706031	276558		4,372
104	31	1065706031	276652		
105	41	1065706031	376378		
106	25	1065706031	378231	1,853	
107	21	1065706031	378411		
108	34	1065706031	382064		3,653
109	31	1065706031	382127		
110	41	1065706031	485570		
111	25	1065706031	487170	1,6	
112	21	1065706031	487352		
113	34	1065706031	491018		3,666
114	31	1065706031	491078		
115	41	1065706031	595812		
116	25	1065706031	597929	2,117	
117	21	1065706031	598110		
118	34	1065706031	601788		3,678
119	31	1065706031	601882		
120	41	1065706031	705772		
121	25	1065706031	707480	1,708	
122	21	1065706031	707665		
123	34	1065706031	711066		3,401
124	31	1065706031	711128		
125	41	1065706031	816121		
126	25	1065706031	817849	1,728	
127	21	1065706031	818045		
128	34	1065706031	822261		4,216
129	31	1065706031	822354		
130	41	1065706031	983391		
131	25	1065706031	985262	1,871	
132	21	1065706031	985498		
133	34	1065706031	989133		3,635
134	31	1065706031	989195		
135	41	1065706032	95794		
136	25	1065706032	98173	2,379	
137	21	1065706032	98357		
138	34	1065706032	103335		4,978
139	31	1065706032	103429		
140	41	1065706032	206913		

141	25	1065706032	208564
142	21	1065706032	208745
143	34	1065706032	213022
144	31	1065706032	213085
145	41	1065706032	323086
146	25	1065706032	324574
147	21	1065706032	324755
148	34	1065706032	339239
149	31	1065706032	339331
150	41	1065706032	426120
151	25	1065706032	432045
152	21	1065706032	432261
153	41	1065706032	440258
154	34	1065706032	441253
155	31	1065706032	441318
156	41	1065706032	558953
157	25	1065706032	568560
158	21	1065706032	568746
159	34	1065706032	572118
160	31	1065706032	572212
161	41	1065706032	675817
162	25	1065706032	688725
163	21	1065706032	688915
164	34	1065706032	696098
165	31	1065706032	696159
166	41	1065706032	798306
167	25	1065706032	804936
168	21	1065706032	805298
169	34	1065706032	813841
170	31	1065706032	813936
171	41	1065706032	982525
172	25	1065706032	986957
173	21	1065706032	987154
174	34	1065706032	993368
175	31	1065706032	993433
176	41	1065706033	152576
177	25	1065706033	154247
178	21	1065706033	154508
179	34	1065706033	158231
180	31	1065706033	158325
181	41	1065706033	257188
182	25	1065706033	263914
183	21	1065706033	264099
184	34	1065706033	268691
185	31	1065706033	268754
186	41	1065706033	496878
187	25	1065706033	515210
188	41	1065706033	522321
189	21	1065706033	515390
190	34	1065706033	628068

191	31	1065706033	628162
192	41	1065706033	632901
193	25	1065706033	636730
194	21	1065706033	636945
195	34	1065706033	640543
196	31	1065706033	640604
197	41	1065706033	745887
198	25	1065706033	747607
199	21	1065706033	747804
200	34	1065706033	752062
201	31	1065706033	752125
202	41	1065706033	855849
203	25	1065706033	857548
204	21	1065706033	857759
205	34	1065706033	861251
206	31	1065706033	861343
207	41	1065706033	966013
208	25	1065706033	967887
209	21	1065706033	968069
210	34	1065706033	973431
211	31	1065706033	973495
212	41	1065706034	82875
213	25	1065706034	84474
214	21	1065706034	84655
215	34	1065706034	88616
216	31	1065706034	88710
217	41	1065706034	185911
218	25	1065706034	187874
219	21	1065706034	188055
220	34	1065706034	192340
221	31	1065706034	192406
222	41	1065706034	295823
223	25	1065706034	297469
224	21	1065706034	297649
225	34	1065706034	301246
226	31	1065706034	301340
227	41	1065706034	406363
228	25	1065706034	408174
229	21	1065706034	408407
230	34	1065706034	412366
231	31	1065706034	412430
232	41	1065706034	458999
233	41	1065706034	529832
234	25	1065706034	531450
235	21	1065706034	531632
236	34	1065706034	536274
237	31	1065706034	536368
238	41	1065706034	635901
239	25	1065706034	637618
240	21	1065706034	637829

241	34	1065706034	641440
242	31	1065706034	641509
243	41	1065706034	746055
244	25	1065706034	748530
245	21	1065706034	748725
246	34	1065706034	754356
247	31	1065706034	754419
248	41	1065706034	856030
249	25	1065706034	857719
250	21	1065706034	857948
251	34	1065706034	861819
252	31	1065706034	861911
253	41	1065706034	966424
254	25	1065706034	968098
255	21	1065706034	968280
256	34	1065706034	986893
257	31	1065706034	986956
258	41	1065706035	76016
259	25	1065706035	78282
260	21	1065706035	78463
261	34	1065706035	83209
262	31	1065706035	83298
263	41	1065706035	186696
264	25	1065706035	189211
265	21	1065706035	189411
266	34	1065706035	194926
267	31	1065706035	194990
268	41	1065706035	296156
269	25	1065706035	299115
270	21	1065706035	299295
271	34	1065706035	304046
272	31	1065706035	304138
273	41	1065706035	405916
274	25	1065706035	407538
275	21	1065706035	407719
276	34	1065706035	411153
277	31	1065706035	411215
278	41	1065706035	468675
279	41	1065706035	515933
280	25	1065706035	517557
281	21	1065706035	517741
282	34	1065706035	521236
283	31	1065706035	521306
284	41	1065706035	626318
285	25	1065706035	628172
286	21	1065706035	628406
287	34	1065706035	633352
288	31	1065706035	633438
289	41	1065706035	736084
290	25	1065706035	738388

291	21	1065706035	738585
292	34	1065706035	743837
293	31	1065706035	743902
294	41	1065706035	845960
295	25	1065706035	847580
296	21	1065706035	847762
297	34	1065706035	851527
298	31	1065706035	851618
299	41	1065706035	955966
300	25	1065706035	957579
301	21	1065706035	957762
302	34	1065706035	961296
303	31	1065706035	961358
304	41	1065706036	66177
305	25	1065706036	68956
306	21	1065706036	69188
307	34	1065706036	72818
308	31	1065706036	72911
309	41	1065706036	250118
310	25	1065706036	251721
311	21	1065706036	251904
312	34	1065706036	255360
313	31	1065706036	255424
314	41	1065706036	356006
315	25	1065706036	357610
316	21	1065706036	357791
317	34	1065706036	362241
318	31	1065706036	362334
319	41	1065706036	466042
320	25	1065706036	468395
321	21	1065706036	468577
322	34	1065706036	472873
323	31	1065706036	472936
324	41	1065706036	505350
325	41	1065706036	576303
326	25	1065706036	577971
327	21	1065706036	578152
328	34	1065706036	581762
329	31	1065706036	581855
330	41	1065706036	686209
331	25	1065706036	689321
332	21	1065706036	689506
333	34	1065706036	700410
334	31	1065706036	700472
335	41	1065706036	796229
336	25	1065706036	797985
337	21	1065706036	798168
338	34	1065706036	803048
339	31	1065706036	803140
340	41	1065706036	906419

341	25	1065706036	908128		
342	21	1065706036	908361		
343	34	1065706036	913621		
344	31	1065706036	913698		
345	41	1065706037	16304		
346	25	1065706037	18370		
347	21	1065706037	18552		
348	34	1065706037	26731		
349	31	1065706037	26824		
350	41	1065706037	126621		
351	25	1065706037	131291		
352	21	1065706037	131473		
353	34	1065706037	139483		
354	31	1065706037	139548		
355	41	1065706037	236827		
356	25	1065706037	239087	2,26	
357	21	1065706037	239269		
358	34	1065706037	243486		4,217
359	31	1065706037	243547		
360	41	1065706037	346186		
361	25	1065706037	347792	1,606	
362	21	1065706037	348024		
363	34	1065706037	351520		3,496
364	31	1065706037	351612		
365	41	1065706037	456368		
366	25	1065706037	457985	1,617	
367	21	1065706037	458245		
368	34	1065706037	461659		3,414
369	31	1065706037	461723		
370	41	1065706037	538273		
371	41	1065706037	566342		
372	25	1065706037	573780		
373	21	1065706037	573984		
374	34	1065706037	579991		
375	31	1065706037	580084		
376	41	1065706037	676118		
377	25	1065706037	677999	1,881	
378	21	1065706037	678180		
379	34	1065706037	681532		3,352
380	31	1065706037	681595		
381	41	1065706037	786294		
382	25	1065706037	788305	2,011	
383	21	1065706037	788491		
384	34	1065706037	793034		4,543
385	31	1065706037	793129		
386	41	1065706037	897748		
387	25	1065706037	903049	5,301	
388	21	1065706037	903232		
389	34	1065706037	908314		5,082
390	31	1065706037	908378		

391	41	1065706038	6756		
392	25	1065706038	8551	1,795	
393	21	1065706038	8731		
394	34	1065706038	12382		3,651
395	31	1065706038	12444		
396	41	1065706038	116475		
397	25	1065706038	118876	2,401	
398	21	1065706038	119111		
399	34	1065706038	129410		10,299
400	31	1065706038	129503		
401	41	1065706038	228458		
402	25	1065706038	235025	6,567	
403	21	1065706038	235206		
404	34	1065706038	238746		3,54
405	31	1065706038	238809		
406	41	1065706038	387918		
407	25	1065706038	389519	1,601	
408	21	1065706038	389701		
409	34	1065706038	393363		3,662
410	31	1065706038	393458		
411	41	1065706038	496976		
412	41	1065706038	498722		
413	25	1065706038	498828		
414	21	1065706038	499062		
415	34	1065706038	512965		
416	31	1065706038	513029		
417	41	1065706038	606406		
418	25	1065706038	608307	1,901	
419	21	1065706038	608518		
420	34	1065706038	616727		8,209
421	31	1065706038	616818		
422	41	1065706038	748917		
423	25	1065706038	750706	1,789	
424	21	1065706038	750904		
425	34	1065706038	754273		3,369
426	31	1065706038	754338		
427	41	1065706038	856456		
428	25	1065706038	860704	4,248	
429	21	1065706038	860900		
430	34	1065706038	872567		11,667
431	31	1065706038	872662		
432	41	1065706038	966903		
433	25	1065706038	971900	4,997	
434	21	1065706038	972082		
435	34	1065706039	2620		
436	31	1065706039	2684		
437	41	1065706039	81006		
438	25	1065706039	83700	2,694	
439	21	1065706039	83881		
440	34	1065706039	89135		5,254

441	31	1065706039	89229		
442	41	1065706039	186386		
443	25	1065706039	188163		
444	21	1065706039	188345		
445	34	1065706039	192777		
446	31	1065706039	192840		
447	41	1065706039	296382		
448	25	1065706039	298023	1,641	
449	21	1065706039	298255		
450	34	1065706039	301791		3,536
451	31	1065706039	301884		
452	41	1065706039	409481		
453	25	1065706039	413727	4,246	
454	21	1065706039	413925		
455	34	1065706039	418520		4,595
456	31	1065706039	418583		
457	41	1065706039	508726		
458	41	1065706039	517165		
459	25	1065706039	519700		
460	21	1065706039	519882		
461	34	1065706039	536494		
462	31	1065706039	536589		
463	41	1065706039	715422		
464	25	1065706039	718251	2,829	
465	21	1065706039	718511		
466	34	1065706039	721987		3,476
467	31	1065706039	722050		
468	41	1065706039	828326		
469	25	1065706039	836248	7,922	
470	21	1065706039	836449		
471	34	1065706039	848731		12,282
472	31	1065706039	848824		
473	41	1065706039	947918		
474	25	1065706039	960859	12,941	
475	21	1065706039	961041		
476	34	1065706040	14725		
477	31	1065706040	14789		
478	41	1065706040	69840		
479	25	1065706040	71439	1,599	
480	21	1065706040	71620		
481	34	1065706040	75220		3,6
482	31	1065706040	75310		
483	41	1065706040	176571		
484	25	1065706040	180887	4,316	
485	21	1065706040	181067		
486	34	1065706040	184979		3,912
487	31	1065706040	185041		
488	41	1065706040	287400		
489	25	1065706040	290016	2,616	
490	21	1065706040	290197		

491	34	1065706040	302542		12,345
492	31	1065706040	302635		
493	41	1065706040	397333		
494	25	1065706040	399356	2,023	
495	21	1065706040	399555		
496	34	1065706040	408668		9,113
497	31	1065706040	408730		
498	41	1065706040	519009		
499	41	1065706040	590276		
500	25	1065706040	591954		
501	21	1065706040	592213		
502	34	1065706040	596620		
503	31	1065706040	596715		
504	41	1065706040	697215		
505	25	1065706040	699313	2,098	
506	21	1065706040	699497		
507	34	1065706040	705437		5,94
508	31	1065706040	705499		
509	41	1065706040	807641		
510	25	1065706040	809946	2,305	
511	21	1065706040	810142		
512	34	1065706040	830901		20,759
513	31	1065706040	830994		
514	41	1065706040	916674		
515	25	1065706040	918654	1,98	
516	21	1065706040	918838		
517	34	1065706040	922856		4,018
518	31	1065706040	922918		
519	41	1065706041	27728		
520	25	1065706041	32450	4,722	
521	21	1065706041	32677		
522	34	1065706041	40064		7,387
523	31	1065706041	40156		
524	41	1065706041	136616		
525	25	1065706041	138835	2,219	
526	21	1065706041	139019		
527	34	1065706041	142801		3,782
528	31	1065706041	142864		
529	41	1065706041	246700		
530	25	1065706041	249820	3,12	
531	21	1065706041	250009		
532	34	1065706041	255124		5,115
533	31	1065706041	255185		
534	41	1065706041	366954		
535	25	1065706041	368601	1,647	
536	21	1065706041	368783		
537	34	1065706041	372484		3,701
538	31	1065706041	372578		
539	41	1065706041	476514		
540	25	1065706041	478186	1,672	

541	21	1065706041	478376		
542	34	1065706041	486277		7,901
543	31	1065706041	486339		
544	41	1065706041	528842		
545	41	1065706041	587465		
546	25	1065706041	589229		
547	21	1065706041	589410		
548	34	1065706041	596223		
549	31	1065706041	596315		
550	41	1065706041	703162		
551	25	1065706041	705130	1,968	
552	21	1065706041	705323		
553	34	1065706041	709872		4,549
554	31	1065706041	709936		
555	41	1065706041	845482		
556	25	1065706041	847192	1,71	
557	21	1065706041	847425		
558	34	1065706041	851982		4,557
559	31	1065706041	852076		
560	41	1065706041	956481		
561	25	1065706041	958122	1,641	
562	21	1065706041	958313		
563	34	1065706041	961783		3,47
564	31	1065706041	961845		
565	41	1065706042	66577		
566	25	1065706042	68432	1,855	
567	21	1065706042	68611		
568	34	1065706042	74066		5,455
569	31	1065706042	74168		
570	41	1065706042	177348		
571	25	1065706042	235365		
572	21	1065706042	235598		
573	34	1065706042	240616		
574	31	1065706042	240678		
575	41	1065706042	336939		
576	25	1065706042	339747	2,808	
577	21	1065706042	339931		
578	34	1065706042	344627		4,696
579	31	1065706042	344722		
580	41	1065706042	446519		
581	25	1065706042	448128	1,609	
582	21	1065706042	448317		
583	34	1065706042	451962		3,645
584	31	1065706042	452024		
585	41	1065706042	538773		
586	41	1065706042	556697		
587	25	1065706042	558896		
588	21	1065706042	559103		
589	34	1065706042	565920		
590	31	1065706042	566015		

591	41	1065706042	666889		
592	25	1065706042	668542	1,653	
593	21	1065706042	668731		
594	34	1065706042	672245		3,514
595	31	1065706042	672309		
596	41	1065706042	776557		
597	25	1065706042	778192	1,635	
598	21	1065706042	778376		
599	34	1065706042	782208		3,832
600	31	1065706042	782302		
601	41	1065706042	886805		
602	25	1065706042	888801		
603	21	1065706042	888992		
604	34	1065706042	895058		
605	31	1065706042	895122		
606	41	1065706042	997883		
607	25	1065706043	14566		
608	21	1065706043	14797		
609	34	1065706043	18734		
610	31	1065706043	18797		
611	41	1065706043	117323		
612	25	1065706043	119442		
613	21	1065706043	119631		
614	34	1065706043	126052		
615	31	1065706043	126141		
616	41	1065706043	226588		
617	25	1065706043	228203		
618	21	1065706043	228386		
619	34	1065706043	231927		
620	31	1065706043	231992		
621	41	1065706043	338748		
622	25	1065706043	340715		
623	21	1065706043	340906		
624	34	1065706043	383513		
625	31	1065706043	383608		
626	41	1065706043	446854		
627	25	1065706043	515815		
628	21	1065706043	516062		
629	34	1065706043	519705		
630	31	1065706043	519767		
631	41	1065706043	553229		
632	41	1065706043	627175		
633	25	1065706043	628817		
634	21	1065706043	629008		
635	34	1065706043	632813		
636	31	1065706043	632903		
637	41	1065706043	737001		
638	25	1065706043	738880		
639	21	1065706043	739063		
640	34	1065706043	742831		

641	31	1065706043	742894
642	41	1065706043	846800
643	25	1065706043	850610
644	21	1065706043	850801
645	34	1065706043	855602
646	31	1065706043	855695
647	41	1065706043	957194
648	25	1065706043	959161
649	21	1065706043	959346
650	34	1065706043	963028
651	31	1065706043	963092
652	41	1065706044	66724
653	25	1065706044	68582
654	21	1065706044	68769
655	34	1065706044	73238
656	31	1065706044	73335
657	41	1065706044	176769
658	25	1065706044	179044
659	21	1065706044	179225
660	34	1065706044	183981
661	31	1065706044	184046
662	41	1065706044	287135
663	25	1065706044	290192
664	21	1065706044	290424
665	34	1065706044	294126
666	31	1065706044	294219
667	41	1065706044	422149
668	25	1065706044	424299
669	21	1065706044	424480
670	34	1065706044	427856
671	41	1065706044	532088
672	31	1065706044	427920
673	25	1065706044	533967
674	21	1065706044	534158
675	34	1065706044	541849
676	31	1065706044	541940
677	41	1065706044	558847
678	41	1065706044	637502
679	25	1065706044	640523
680	21	1065706044	640759
681	34	1065706044	644489
682	31	1065706044	644560
683	41	1065706044	746902
684	25	1065706044	749680
685	21	1065706044	749873
686	34	1065706044	754230
687	31	1065706044	754291
688	41	1065706044	857024
689	25	1065706044	860590
690	21	1065706044	860784

691	34	1065706044	873748
692	31	1065706044	873843
693	41	1065706044	966736
694	25	1065706044	968345
695	21	1065706044	968534
696	34	1065706044	972020
697	31	1065706044	972082
698	41	1065706045	77544
699	25	1065706045	85109
700	21	1065706045	85290
701	34	1065706045	99382
702	31	1065706045	99477
703	41	1065706045	187064
704	25	1065706045	190236
705	21	1065706045	190413
706	34	1065706045	252842
707	31	1065706045	252907
708	41	1065706045	305654
709	25	1065706045	307572
710	21	1065706045	307752
711	34	1065706045	312561
712	31	1065706045	312656
713	41	1065706045	417451
714	25	1065706045	419233
715	21	1065706045	419423
716	34	1065706045	424159
717	31	1065706045	424223
718	41	1065706045	541627
719	25	1065706045	543576
720	21	1065706045	543809
721	34	1065706045	550567
722	31	1065706045	550662
723	41	1065706045	568837
724	41	1065706045	647040
725	25	1065706045	649223

Annex D: Traffic Intensive Switch test data.

Test ID	Signal ID	Seconds	Microsecs	Signal 41-25 msecs	Signal 21-34 msecs	Signal 41-41 msecs
1	41	1065712118	614626			
2	41	1065712119	624203			
3	41	1065712120	634247			
4	41	1065712121	644273			
5	41	1065712122	654308			
6	41	1065712123	664371			
7	41	1065712124	674341			
8	41	1065712125	684405			
9	41	1065712126	694456			
10	41	1065712127	704498			
11	41	1065712128	714525			
12	41	1065712129	724548			
13	41	1065712130	734430			
14	41	1065712131	744435			
15	41	1065712132	118476			
16	25	1065712132	119550			
17	21	1065712132	119849			
18	34	1065712132	122521			
19	31	1065712132	122695			
20	41	1065712132	228117			
21	25	1065712132	229009			
22	21	1065712132	229220			
23	34	1065712132	231122			
24	31	1065712132	231199			
25	41	1065712132	338117			
26	25	1065712132	339033			
27	21	1065712132	339228			
28	34	1065712132	341113			
29	31	1065712132	341182			
30	41	1065712132	448113			
31	25	1065712132	449006			
32	21	1065712132	449186			
33	34	1065712132	451080			
34	31	1065712132	451137			
35	41	1065712132	559557			
36	25	1065712132	560463	0,906		
37	21	1065712132	560708			
38	34	1065712132	562593			
39	31	1065712132	562649			

40	41	1065712132	668130			8,573
41	25	1065712132	669014	0,884		
42	21	1065712132	669197			
43	34	1065712132	671075		1,878	
44	31	1065712132	671130			
45	41	1065712132	754600			
46	41	1065712132	778143			
47	25	1065712132	779014	0,871		
48	21	1065712132	779193			
49	34	1065712132	781084		1,891	
50	31	1065712132	781141			
51	41	1065712132	888143			10
52	25	1065712132	889059	0,916		
53	21	1065712132	889237			
54	34	1065712132	891130		1,893	
55	31	1065712132	891187			
56	41	1065712132	998340			10,197
57	25	1065712132	999236	0,896		
58	21	1065712132	999471			
59	34	1065712133	1359			
60	31	1065712133	1418			
61	41	1065712133	108204			
62	25	1065712133	109096	0,892		
63	21	1065712133	109279			
64	34	1065712133	111170		1,891	
65	31	1065712133	111229			
66	41	1065712133	218232			10,028
67	25	1065712133	219125	0,893		
68	21	1065712133	219308			
69	34	1065712133	221202		1,894	
70	31	1065712133	221259			
71	41	1065712133	328209			9,977
72	25	1065712133	329090	0,881		
73	21	1065712133	329273			
74	34	1065712133	331157		1,884	
75	31	1065712133	331215			
76	41	1065712133	438234			10,025
77	25	1065712133	439132	0,898		
78	21	1065712133	439312			
79	34	1065712133	441199		1,887	
80	31	1065712133	441255			
81	41	1065712133	548230			9,996
82	25	1065712133	549115	0,885		
83	21	1065712133	549297			
84	34	1065712133	551189		1,892	
85	31	1065712133	551244			
86	41	1065712133	658394			10,164

87	25	1065712133	659437	1,043			
88	21	1065712133	659616				
89	34	1065712133	661495		1,879		
90	31	1065712133	661552				
91	41	1065712133	764522				
92	41	1065712133	768222				
93	25	1065712133	769066				
94	21	1065712133	769244				
95	34	1065712133	771114				
96	31	1065712133	771172				
97	41	1065712133	878372				10,15
98	25	1065712133	879281	0,909			
99	21	1065712133	879512				
100	34	1065712133	881420		1,908		
101	31	1065712133	881477				
102	41	1065712133	988235				9,863
103	25	1065712133	989301	1,066			
104	21	1065712133	989480				
105	34	1065712133	991407		1,927		
106	31	1065712133	991463				
107	41	1065712134	98270				
108	25	1065712134	99163	0,893			
109	21	1065712134	99341				
110	34	1065712134	101245		1,904		
111	31	1065712134	101302				
112	41	1065712134	209642				11,372
113	25	1065712134	210549	0,907			
114	21	1065712134	210793				
115	34	1065712134	212689		1,896		
116	31	1065712134	212745				
117	41	1065712134	318289				8,647
118	25	1065712134	319178	0,889			
119	21	1065712134	319374				
120	34	1065712134	321281		1,907		
121	31	1065712134	321340				
122	41	1065712134	428291				10,002
123	25	1065712134	429181	0,89			
124	21	1065712134	429360				
125	34	1065712134	431259		1,899		
126	31	1065712134	431319				
127	41	1065712134	538305				10,014
128	25	1065712134	539206	0,901			
129	21	1065712134	539386				
130	34	1065712134	541414		2,028		
131	31	1065712134	541471				
132	41	1065712134	648289				9,984
133	25	1065712134	649178	0,889			

134	21	1065712134	649355			
135	34	1065712134	651266		1,911	
136	31	1065712134	651325			
137	41	1065712134	758311			10,022
138	25	1065712134	759191	0,88		
139	21	1065712134	759368			
140	34	1065712134	761274		1,906	
141	31	1065712134	761333			
142	41	1065712134	774523			
143	41	1065712134	868310			
144	25	1065712134	869209			
145	21	1065712134	869388			
146	34	1065712134	871322			
147	31	1065712134	871380			
148	41	1065712134	978328			10,018
149	25	1065712134	979218	0,89		
150	21	1065712134	979397			
151	34	1065712134	981309		1,912	
152	31	1065712134	981368			
153	41	1065712135	88468			
154	25	1065712135	89376	0,908		
155	21	1065712135	89606			
156	34	1065712135	91492		1,886	
157	31	1065712135	91550			
158	41	1065712135	198359			9,891
159	25	1065712135	199265	0,906		
160	21	1065712135	199447			
161	34	1065712135	201353		1,906	
162	31	1065712135	201410			
163	41	1065712135	308354			9,995
164	25	1065712135	309246	0,892		
165	21	1065712135	309427			
166	34	1065712135	311329		1,902	
167	31	1065712135	311387			
168	41	1065712135	418375			10,021
169	25	1065712135	419273	0,898		
170	21	1065712135	419454			
171	34	1065712135	421361		1,907	
172	31	1065712135	421417			
173	41	1065712135	528511			10,136
174	25	1065712135	529423	0,912		
175	21	1065712135	529657			
176	34	1065712135	531604		1,947	
177	31	1065712135	531660			
178	41	1065712135	638390			9,879
179	25	1065712135	639277	0,887		
180	21	1065712135	639458			

181	34	1065712135	641368		1,91	
182	31	1065712135	641427			
183	41	1065712135	748386			9,996
184	25	1065712135	749275	0,889		
185	21	1065712135	749456			
186	34	1065712135	751356		1,9	
187	31	1065712135	751413			
188	41	1065712135	784596			
189	41	1065712135	858412			
190	25	1065712135	859319			
191	21	1065712135	859499			
192	34	1065712135	861401			
193	31	1065712135	861458			
194	41	1065712135	968407			9,995
195	25	1065712135	969437	1,03		
196	21	1065712135	969617			
197	34	1065712135	971634		2,017	
198	31	1065712135	971692			
199	41	1065712136	78429			
200	25	1065712136	79315	0,886		
201	21	1065712136	79495			
202	34	1065712136	81394		1,899	
203	31	1065712136	81452			
204	41	1065712136	188433			10,004
205	25	1065712136	189325	0,892		
206	21	1065712136	189503			
207	34	1065712136	191481		1,978	
208	31	1065712136	191545			
209	41	1065712136	298598			10,165
210	25	1065712136	299506	0,908		
211	21	1065712136	299739			
212	34	1065712136	301639		1,9	
213	31	1065712136	301698			
214	41	1065712136	408458			9,86
215	25	1065712136	409352	0,894		
216	21	1065712136	409534			
217	34	1065712136	411438		1,904	
218	31	1065712136	411496			
219	41	1065712136	518501			10,043
220	25	1065712136	519404	0,903		
221	21	1065712136	519586			
222	34	1065712136	521491		1,905	
223	31	1065712136	521547			
224	41	1065712136	628466			9,965
225	25	1065712136	629353	0,887		
226	21	1065712136	629532			
227	34	1065712136	631410		1,878	

228	31	1065712136	631469				
229	41	1065712136	738615				10,149
230	25	1065712136	739513	0,898			
231	21	1065712136	739742				
232	34	1065712136	741647		1,905		
233	31	1065712136	741706				
234	41	1065712136	794626				
235	41	1065712136	848483				
236	25	1065712136	849386	0,903			
237	21	1065712136	849566				
238	34	1065712136	851506		1,94		
239	31	1065712136	851563				
240	41	1065712136	958502				10,019
241	25	1065712136	960229	1,727			
242	21	1065712136	960408				
243	34	1065712136	962347		1,939		
244	31	1065712136	962404				
245	41	1065712137	68499				
246	25	1065712137	69381	0,882			
247	21	1065712137	69560				
248	34	1065712137	71516		1,956		
249	31	1065712137	71574				
250	41	1065712137	178584				10,085
251	25	1065712137	179482	0,898			
252	21	1065712137	179666				
253	34	1065712137	181571		1,905		
254	31	1065712137	181628				
255	41	1065712137	288525				9,941
256	25	1065712137	289545	1,02			
257	21	1065712137	289726				
258	34	1065712137	291639		1,913		
259	31	1065712137	291697				
260	41	1065712137	398544				10,019
261	25	1065712137	399429	0,885			
262	21	1065712137	399610				
263	34	1065712137	401518		1,908		
264	31	1065712137	401576				
265	41	1065712137	508688				10,144
266	25	1065712137	509594	0,906			
267	21	1065712137	509826				
268	34	1065712137	511741		1,915		
269	31	1065712137	511797				
270	41	1065712137	618565				
271	25	1065712137	619461	0,896			
272	21	1065712137	619644				
273	34	1065712137	621551		1,907		
274	31	1065712137	621609				

275	41	1065712137	728556
276	25	1065712137	729455
277	21	1065712137	729632
278	34	1065712137	731532
279	31	1065712137	731590
280	41	1065712137	804694
281	41	1065712137	838579
282	25	1065712137	839479
283	21	1065712137	839657
284	34	1065712137	841561
285	31	1065712137	841619
286	41	1065712137	948945
287	25	1065712137	949997
288	21	1065712137	950257
289	34	1065712137	952185
290	31	1065712137	952241
291	41	1065712138	58599
292	25	1065712138	59494
293	21	1065712138	59675
294	34	1065712138	61595
295	31	1065712138	61653
296	41	1065712138	168605
297	25	1065712138	169522
298	21	1065712138	169701
299	34	1065712138	171609
300	31	1065712138	171665
301	41	1065712138	278627
302	25	1065712138	279513
303	21	1065712138	279696
304	34	1065712138	281589
305	31	1065712138	281646
306	41	1065712138	388615
307	25	1065712138	389525
308	21	1065712138	389704
309	34	1065712138	391590
310	31	1065712138	391647
311	41	1065712138	498708
312	25	1065712138	499720
313	21	1065712138	499925
314	34	1065712138	501838
315	31	1065712138	501901
316	41	1065712138	608642
317	25	1065712138	609555
318	21	1065712138	609737
319	34	1065712138	611670
320	31	1065712138	611730
321	41	1065712138	718835

322	25	1065712138	719738
323	21	1065712138	719972
324	34	1065712138	721871
325	31	1065712138	721930
326	41	1065712138	814674
327	41	1065712138	828655
328	25	1065712138	829512
329	21	1065712138	829695
330	34	1065712138	831612
331	31	1065712138	831669
332	41	1065712138	938673
333	25	1065712138	939625
334	21	1065712138	939804
335	34	1065712138	941719
336	31	1065712138	941777
337	41	1065712139	48667
338	25	1065712139	49598
339	21	1065712139	49778
340	34	1065712139	51702
341	31	1065712139	51759
342	41	1065712139	158842
343	25	1065712139	159749
344	21	1065712139	159981
345	34	1065712139	161882
346	31	1065712139	161939
347	41	1065712139	268698
348	25	1065712139	269581
349	21	1065712139	269766
350	34	1065712139	271672
351	31	1065712139	271729
352	41	1065712139	378730
353	25	1065712139	379618
354	21	1065712139	379798
355	34	1065712139	381707
356	31	1065712139	381766
357	41	1065712139	488714
358	25	1065712139	489616
359	21	1065712139	489797
360	34	1065712139	491725
361	31	1065712139	491782
362	41	1065712139	598732
363	25	1065712139	599625
364	21	1065712139	599806
365	34	1065712139	601717
366	31	1065712139	601778
367	41	1065712139	708724
368	25	1065712139	709603

369	21	1065712139	709783		
370	34	1065712139	711687		
371	31	1065712139	711745		
372	41	1065712139	818745		
373	25	1065712139	819660		
374	21	1065712139	819840		
375	34	1065712139	821742		
376	31	1065712139	821800		
377	41	1065712139	824671		
378	41	1065712139	929800		
379	25	1065712139	930696		
380	21	1065712139	930942		
381	34	1065712139	932836		
382	31	1065712139	932894		
383	41	1065712140	38775		
384	25	1065712140	39778		
385	21	1065712140	39962		
386	34	1065712140	41908		
387	31	1065712140	41965		
388	41	1065712140	148769		
389	25	1065712140	149652		
390	21	1065712140	149831		
391	34	1065712140	151739		
392	31	1065712140	151796		
393	41	1065712140	258822		
394	25	1065712140	259738	0,916	
395	21	1065712140	259920		
396	34	1065712140	261830		1,91
397	31	1065712140	261888		
398	41	1065712140	368970		
399	25	1065712140	369883	0,913	
400	21	1065712140	370115		
401	34	1065712140	372027		1,912
402	31	1065712140	372084		
403	41	1065712140	478907		
404	25	1065712140	479829	0,922	
405	21	1065712140	480026		
406	34	1065712140	481925		1,899
407	31	1065712140	481982		
408	41	1065712140	588991		
409	25	1065712140	589907	0,916	
410	21	1065712140	590142		
411	34	1065712140	592043		1,901
412	31	1065712140	592103		
413	41	1065712140	698823		
414	25	1065712140	699703	0,88	
415	21	1065712140	699883		

416	34	1065712140	701803		1,92	
417	31	1065712140	701862			
418	41	1065712140	808820			9,997
419	25	1065712140	809727	0,907		
420	21	1065712140	809906			
421	34	1065712140	811818		1,912	
422	31	1065712140	811875			
423	41	1065712140	834725			
424	41	1065712140	918841			
425	25	1065712140	919717			
426	21	1065712140	919895			
427	34	1065712140	921803			
428	31	1065712140	921862			
429	41	1065712141	28839			
430	25	1065712141	29737	0,898		
431	21	1065712141	29914			
432	34	1065712141	31814		1,9	
433	31	1065712141	31871			
434	41	1065712141	138862			10,023
435	25	1065712141	139744	0,882		
436	21	1065712141	139922			
437	34	1065712141	141804		1,882	
438	31	1065712141	141862			
439	41	1065712141	248996			10,134
440	25	1065712141	249894	0,898		
441	21	1065712141	250127			
442	34	1065712141	252083		1,956	
443	31	1065712141	252147			
444	41	1065712141	358880			9,884
445	25	1065712141	359767	0,887		
446	21	1065712141	359952			
447	34	1065712141	361887		1,935	
448	31	1065712141	361948			
449	41	1065712141	468889			10,009
450	25	1065712141	469797	0,908		
451	21	1065712141	469989			
452	34	1065712141	471890		1,901	
453	31	1065712141	471951			
454	41	1065712141	580369			11,48
455	25	1065712141	581318	0,949		
456	21	1065712141	581565			
457	34	1065712141	583436		1,871	
458	31	1065712141	583497			
459	41	1065712141	688906			8,537
460	25	1065712141	689787			
461	21	1065712141	689982			
462	34	1065712141	691837			

463	31	1065712141	691895		
464	41	1065712141	798906		10
465	25	1065712141	799793		
466	21	1065712141	799970		
467	34	1065712141	801836		
468	31	1065712141	801892		
469	41	1065712141	844738		
470	41	1065712141	908914		
471	25	1065712141	909807		
472	21	1065712141	909995		
473	34	1065712141	911850		
474	31	1065712141	911909		
475	41	1065712142	18925		
476	25	1065712142	19940		
477	21	1065712142	20116		
478	34	1065712142	22068		
479	31	1065712142	22126		
480	41	1065712142	128937		
481	25	1065712142	129810		
482	21	1065712142	129998		
483	34	1065712142	131888		
484	31	1065712142	131946		
485	41	1065712142	238951		
486	25	1065712142	239817		
487	21	1065712142	240000		
488	34	1065712142	241928		
489	31	1065712142	241987		
490	41	1065712142	348957		
491	25	1065712142	349850		
492	21	1065712142	350040		
493	34	1065712142	352054		
494	31	1065712142	352112		
495	41	1065712142	459160		
496	25	1065712142	460136		
497	21	1065712142	460361		
498	34	1065712142	462307		
499	31	1065712142	462370		
500	41	1065712142	568981		

Annex E: Concurrent Access Hub Test data.

Test ID	Signal ID	Seconds	Microsecs	Signal 41-25 msecs	Signal 21-34 msecs	Signal 41-41 msecs
1	41	1065711012	484020			
2	41	1065711013	495380			
3	41	1065711014	498913			
4	41	1065711015	509028			
5	41	1065711016	518963			
6	41	1065711017	528983			
7	41	1065711018	539067			
8	41	1065711019	549056			
9	41	1065711020	559080			
10	41	1065711021	569155			
11	41	1065711022	579199			
12	41	1065711023	589191			
13	41	1065711024	599216			
14	41	1065711025	609270			
15	41	1065711026	619293			
16	41	1065711027	629319			
17	41	1065711028	639356			
18	41	1065711029	649378			
19	41	1065711030	659415			
20	41	1065711031	669424			
21	41	1065711032	679467			
22	41	1065711033	689634			
23	41	1065711034	699565			
24	41	1065711035	709552			
25	41	1065711036	719852			
26	41	1065711037	729636			
27	41	1065711038	739843			
28	41	1065711039	749738			
29	41	1065711040	759755			
30	41	1065711041	769813			
31	41	1065711042	779866			
32	41	1065711043	789842			
33	41	1065711044	799881			
34	41	1065711045	809896			
35	41	1065711046	819928			
36	41	1065711047	829969			
37	41	1065711048	839937			
38	41	1065711049	850032			
39	41	1065711050	859862			
40	41	1065711051	870044			
41	41	1065711052	880090			

42	41	1065711053	889952
43	41	1065711054	900617
44	41	1065711055	910300
45	41	1065711056	940974
46	41	1065711057	930253
47	41	1065711058	941582
48	41	1065711059	990150
49	41	1065711060	960772
50	41	1065711061	970363
51	41	1065711063	65956
52	41	1065711063	995510
53	41	1065711065	641
54	41	1065711066	18364
55	41	1065711067	20708
56	41	1065711068	170471
57	41	1065711069	40769
58	41	1065711070	50603
59	41	1065711071	64398
60	41	1065711072	70650
61	41	1065711073	220735
62	41	1065711074	90725
63	41	1065711075	102124
64	41	1065711076	110997
65	41	1065711077	120735
66	41	1065711078	131586
67	41	1065711079	141241
68	41	1065711079	332794
69	25	1065711079	341649
70	21	1065711079	341952
71	34	1065711079	349780
72	31	1065711079	349952
73	41	1065711079	449648
74	25	1065711079	457391
75	21	1065711079	457593
76	34	1065711079	462673
77	31	1065711079	462753
78	41	1065711079	571489
79	25	1065711079	580161
80	21	1065711079	580393
81	34	1065711079	585867
82	31	1065711079	585934
83	41	1065711079	688387
84	25	1065711079	697348
85	21	1065711079	697897
86	34	1065711079	700974
87	31	1065711079	701036
88	41	1065711079	808867
89	25	1065711079	817310
90	21	1065711079	817514
91	34	1065711079	822122

92	31	1065711079	822179				
93	41	1065711079	930978				
94	25	1065711079	939555				
95	21	1065711079	939732				
96	34	1065711079	977160				
97	31	1065711079	977220				
98	41	1065711080	48933				
99	25	1065711080	58349				
100	21	1065711080	58560				
101	34	1065711080	62662				
102	31	1065711080	62720				
103	41	1065711080	151165				
104	41	1065711080	168728				
105	25	1065711080	178317	9,589			
106	21	1065711080	178499				
107	34	1065711080	183907		5,408		
108	31	1065711080	183966				
109	41	1065711080	288570				
110	25	1065711080	297062	8,492			
111	21	1065711080	297244				
112	34	1065711080	305963		8,719		
113	31	1065711080	306022				
114	41	1065711080	398748				10,178
115	25	1065711080	407187	8,439			
116	21	1065711080	407365				
117	34	1065711080	415998		8,633		
118	31	1065711080	416058				
119	41	1065711080	511002				12,254
120	25	1065711080	516736	5,734			
121	21	1065711080	516915				
122	34	1065711080	562932				
123	31	1065711080	562990				
124	41	1065711080	618755				7,753
125	25	1065711080	621642	2,887			
126	21	1065711080	621820				
127	34	1065711080	625141		3,321		
128	31	1065711080	625201				
129	41	1065711080	728985				10,23
130	25	1065711080	737310	8,325			
131	21	1065711080	737512				
132	34	1065711080	746313		8,801		
133	31	1065711080	746375				
134	41	1065711080	849748				20,763
135	25	1065711080	858394	8,646			
136	21	1065711080	858626				
137	34	1065711080	863802		5,176		
138	31	1065711080	863864				
139	41	1065711080	968667				18,919
140	25	1065711080	977939	9,272			
141	21	1065711080	978119				

142	34	1065711080	982419		4,3	
143	31	1065711080	982479			
144	41	1065711081	88451			-980,216
145	25	1065711081	97987	9,536		
146	21	1065711081	98165			
147	34	1065711081	109264		11,099	
148	31	1065711081	109330			
149	41	1065711081	161046			
150	41	1065711081	208606			
151	25	1065711081	216836	8,23		
152	21	1065711081	217066			
153	34	1065711081	234447		17,381	
154	31	1065711081	234509			
155	41	1065711081	320000			11,394
156	25	1065711081	326548	6,548		
157	21	1065711081	326732			
158	34	1065711081	334004		7,272	
159	31	1065711081	334065			
160	41	1065711081	429580			9,58
161	25	1065711081	436873	7,293		
162	21	1065711081	437051			
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164	31	1065711081	443184			
165	41	1065711081	538545			8,965
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171	25	1065711081	656583			
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174	31	1065711081	674297			
175	41	1065711081	769930			21,386
176	25	1065711081	778793			
177	21	1065711081	778972			
178	34	1065711081	782815			
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180	41	1065711081	888514			18,584
181	25	1065711081	897660	9,146		
182	21	1065711081	897839			
183	34	1065711081	907178		9,339	
184	31	1065711081	907238			
185	41	1065711082	8763			
186	25	1065711082	17590	8,827		
187	21	1065711082	17819			
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189	31	1065711082	31794			
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191	25	1065711082	137634	9,065		

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195	41	1065711082	170970			
196	41	1065711082	249108			
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199	34	1065711082	261507			
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201	41	1065711082	358828			9,72
202	25	1065711082	364595			
203	21	1065711082	364777			
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207	25	1065711082	477203	8,502		
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212	25	1065711082	607000	8,167		
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215	31	1065711082	617676			
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217	25	1065711082	718450	9,408		
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219	34	1065711082	723007		4,377	
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222	25	1065711082	838324	8,329		
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225	31	1065711082	846706			
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232	25	1065711083	138045	9,121		
233	21	1065711083	138223			
234	34	1065711083	141838		3,615	
235	31	1065711083	141898			
236	41	1065711083	183721			
237	41	1065711083	254125			
238	25	1065711083	259669			
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253	25	1065711083	607432	8,401		
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263	25	1065711083	836399	7,469		
264	21	1065711083	836579			
265	34	1065711083	899522			
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267	41	1065711083	938742			9,812
268	25	1065711083	947971	9,229		
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276	31	1065711084	79955			
277	41	1065711084	180745			21,87
278	25	1065711084	191144	10,399		
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283	41	1065711084	318475			27,331
284	25	1065711084	326528	8,053		
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287	31	1065711084	330942			
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296	34	1065711084	560674		3,114		
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306	34	1065711084	781870		3,862		
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309	25	1065711084	898068	8,26			
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311	34	1065711084	902327		4,028		
312	31	1065711084	902388				
313	41	1065711085	16668				
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315	21	1065711085	25204				
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317	31	1065711085	32691				
318	41	1065711085	128840				12,172
319	25	1065711085	137754				
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321	34	1065711085	141753				
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326	21	1065711085	262554				
327	34	1065711085	266768				
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344	41	1065711085	709263	10,353
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356	21	1065711085	948407	
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359	41	1065711086	59029	
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361	21	1065711086	67979	
362	34	1065711086	72172	
363	31	1065711086	72237	
364	41	1065711086	179117	20,088
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368	31	1065711086	191659	
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377	21	1065711086	427925	
378	34	1065711086	431885	
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381	25	1065711086	548509	
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383	34	1065711086	553148	
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385	41	1065711086	659042	19,742
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387	21	1065711086	679809	
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389	31	1065711086	684370	
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396	25	1065711086	918150			
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402	21	1065711087	37947			
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422	25	1065711087	518218	9,295		
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457	41	1065711088	309322			10,782
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632	25	1065711092	671545		8,275	
633	21	1065711092	671722			
634	34	1065711092	675969			4,247
635	31	1065711092	676030			
636	41	1065711092	779462			
637	25	1065711092	787689			
638	21	1065711092	787866			
639	34	1065711092	791622			
640	31	1065711092	791683			
641	41	1065711092	889600			

642	25	1065711092	897908		8,308	
643	21	1065711092	898084			
644	34	1065711092	902665			4,581
645	31	1065711092	902725			
646	41	1065711093	77			
647	25	1065711093	8630			
648	21	1065711093	8827			
649	34	1065711093	14350			
650	31	1065711093	14409			
651	41	1065711093	119587			
652	25	1065711093	128715			
653	21	1065711093	128939			
654	34	1065711093	175611			
655	31	1065711093	175676			
656	41	1065711093	239689			
657	25	1065711093	248364			
658	21	1065711093	248574			
659	34	1065711093	256062			
660	31	1065711093	256122			
661	41	1065711093	281545			
662	41	1065711093	359731			
663	25	1065711093	368443			
664	21	1065711093	368652			
665	34	1065711093	374865			
666	31	1065711093	374925			
667	41	1065711093	479843			
668	25	1065711093	488716			
669	21	1065711093	488950			
670	34	1065711093	510098			
671	31	1065711093	510157			
672	41	1065711093	599740			
673	25	1065711093	608675			
674	21	1065711093	608853			
675	34	1065711093	613323			
676	31	1065711093	613382			
677	41	1065711093	719557			
678	25	1065711093	728336			
679	21	1065711093	728513			
680	34	1065711093	750066			
681	31	1065711093	750126			
682	41	1065711093	829484			
683	25	1065711093	839274			
684	21	1065711093	839451			
685	34	1065711093	845677			
686	31	1065711093	845736			
687	41	1065711093	950927			
688	25	1065711093	958551			
689	21	1065711093	958755			
690	34	1065711093	966049			
691	31	1065711093	966108			

692	41	1065711094	70041
693	25	1065711094	78513
694	21	1065711094	78715
695	34	1065711094	84004
696	31	1065711094	84063
697	41	1065711094	189722
698	25	1065711094	199883
699	21	1065711094	200064
700	34	1065711094	203414
701	31	1065711094	203475
702	41	1065711094	291686
703	41	1065711094	309906
704	25	1065711094	318431
705	21	1065711094	318675
706	34	1065711094	322561
707	31	1065711094	322620
708	41	1065711094	432317
709	25	1065711094	440626
710	21	1065711094	440807
711	34	1065711094	449022
712	31	1065711094	449083
713	41	1065711094	549656
714	25	1065711094	558049
715	21	1065711094	558226
716	34	1065711094	570303
717	31	1065711094	570361
718	41	1065711094	661079
719	25	1065711094	669538
720	21	1065711094	669715
721	34	1065711094	674073
722	31	1065711094	674133
723	41	1065711094	779938
724	25	1065711094	788426
725	21	1065711094	788656
726	34	1065711094	792250
727	31	1065711094	792311
728	41	1065711094	900379
729	25	1065711094	908598
730	21	1065711094	908804
731	34	1065711094	913027
732	31	1065711094	913087
733	41	1065711095	19600
734	25	1065711095	28546
735	21	1065711095	28752
736	34	1065711095	33173
737	31	1065711095	33232
738	41	1065711095	139932
739	25	1065711095	148179
740	21	1065711095	148357
741	34	1065711095	288713

742	31	1065711095	288773
743	41	1065711095	290258
744	41	1065711095	301414
745	25	1065711095	304829
746	21	1065711095	305012
747	34	1065711095	310978
748	31	1065711095	311037
749	41	1065711095	409802
750	25	1065711095	419048
751	21	1065711095	419229
752	34	1065711095	422757
753	31	1065711095	422814
754	41	1065711095	529881
755	25	1065711095	538838
756	21	1065711095	539068
757	34	1065711095	543370
758	31	1065711095	543431
759	41	1065711095	649820
760	25	1065711095	658443
761	21	1065711095	658621
762	34	1065711095	662675
763	31	1065711095	662737
764	41	1065711095	759794
765	25	1065711095	768678
766	21	1065711095	768885
767	34	1065711095	772349
768	31	1065711095	772408
769	41	1065711095	880108
770	25	1065711095	889140
771	21	1065711095	889318
772	34	1065711095	892836
773	31	1065711095	892896
774	41	1065711096	581
775	25	1065711096	9309

Annex F: Concurrent Access Switch test data.

Test ID	Signal ID	Seconds	Microsecs	Signal 41-25 msecs	Signal 21-34 msecs	Signal 41-41 msecs
1	41	1065711539	461137			
2	41	1065711540	465849			
3	41	1065711541	475868			
4	41	1065711542	485858			
5	41	1065711543	495858			
6	41	1065711544	505822			
7	41	1065711545	515866			
8	41	1065711546	525963			
9	41	1065711547	535969			
10	41	1065711548	546023			
11	41	1065711549	556051			
12	41	1065711550	566034			
13	41	1065711551	576080			
14	41	1065711552	586178			
15	41	1065711553	596125			
16	41	1065711554	606166			
17	41	1065711555	616197			
18	41	1065711556	626225			
19	41	1065711557	636303			
20	41	1065711558	646410			
21	41	1065711559	656310			
22	41	1065711560	666370			
23	41	1065711561	676387			
24	41	1065711562	686496			
25	41	1065711563	696478			
26	41	1065711564	706490			
27	41	1065711565	716557			
28	41	1065711566	726563			
29	41	1065711567	736601			
30	41	1065711568	747721			
31	41	1065711569	756695			
32	41	1065711570	766650			
33	41	1065711571	776710			
34	41	1065711572	786764			
35	41	1065711573	796759			
36	41	1065711574	806814			
37	41	1065711575	816845			
38	41	1065711576	826850			
39	41	1065711577	836914			
40	41	1065711578	846930			
41	41	1065711579	856941			

42	41	1065711580	867033
43	41	1065711581	877028
44	41	1065711582	887077
45	41	1065711583	897206
46	41	1065711584	907119
47	41	1065711585	917147
48	41	1065711586	927420
49	41	1065711587	937226
50	41	1065711588	947250
51	41	1065711589	957295
52	41	1065711590	967293
53	41	1065711591	977210
54	41	1065711592	987282
55	41	1065711594	1828
56	41	1065711595	7419
57	41	1065711596	17466
58	41	1065711597	27313
59	41	1065711598	206589
60	41	1065711599	47413
61	41	1065711600	196527
62	41	1065711601	110479
63	41	1065711602	77520
64	41	1065711603	88268
65	41	1065711604	97600
66	41	1065711605	350379
67	41	1065711606	282772
68	41	1065711607	127705
69	41	1065711608	138439
70	41	1065711609	149999
71	41	1065711610	520022
72	41	1065711611	428380
73	41	1065711612	339084
74	41	1065711613	291118
75	41	1065711614	197988
76	41	1065711615	207991
77	41	1065711616	367940
78	41	1065711617	237203
79	41	1065711618	238468
80	41	1065711619	253597
81	41	1065711620	500090
82	41	1065711621	432204
83	41	1065711622	326703
84	41	1065711623	288897
85	41	1065711624	298456
86	41	1065711625	569229
87	41	1065711626	464395
88	41	1065711627	329222
89	41	1065711628	339168
90	41	1065711629	349609
91	41	1065711630	600435

92	41	1065711631	535431
93	41	1065711632	427727
94	41	1065711633	390361
95	41	1065711634	399088
96	41	1065711635	449486
97	41	1065711636	421486
98	41	1065711637	430136
99	41	1065711638	871153
100	41	1065711639	449466
101	41	1065711640	478640
102	41	1065711641	488686
103	41	1065711642	481896
104	41	1065711643	490301
105	41	1065711644	500789
106	41	1065711645	509870
107	41	1065711646	520724
108	41	1065711647	529712
109	41	1065711648	539451
110	41	1065711649	530998
111	25	1065711649	532260
112	21	1065711649	532567
113	34	1065711649	535302
114	31	1065711649	535474
115	41	1065711649	549228
116	41	1065711649	640857
117	25	1065711649	642040
118	21	1065711649	642247
119	34	1065711649	644208
120	31	1065711649	644290
121	41	1065711649	752023
122	25	1065711649	753192
123	21	1065711649	753423
124	34	1065711649	755348
125	31	1065711649	755420
126	41	1065711649	860070
127	25	1065711649	861317
128	21	1065711649	861499
129	34	1065711649	863469
130	31	1065711649	863527
131	41	1065711649	970825
132	25	1065711649	971915
133	21	1065711649	972094
134	34	1065711649	974014
135	31	1065711649	974074
136	41	1065711650	78178
137	25	1065711650	79526
138	21	1065711650	79706
139	34	1065711650	81612
140	31	1065711650	81670
141	41	1065711650	188538

142	25	1065711650	189638
143	21	1065711650	189870
144	34	1065711650	191747
145	31	1065711650	191804
146	41	1065711650	299073
147	25	1065711650	300375
148	21	1065711650	300572
149	34	1065711650	302460
150	31	1065711650	302518
151	41	1065711650	408286
152	25	1065711650	409331
153	21	1065711650	409514
154	34	1065711650	411368
155	31	1065711650	411426
156	41	1065711650	520304
157	25	1065711650	521313
158	21	1065711650	521493
159	34	1065711650	523357
160	31	1065711650	523419
161	41	1065711650	563099
162	41	1065711650	631959
163	25	1065711650	632949
164	21	1065711650	633131
165	34	1065711650	635053
166	31	1065711650	635111
167	41	1065711650	739513
168	25	1065711650	740799
169	21	1065711650	740978
170	34	1065711650	742881
171	31	1065711650	742943
172	41	1065711650	853027
173	25	1065711650	854343
174	21	1065711650	854521
175	34	1065711650	856380
176	31	1065711650	856439
177	41	1065711650	961481
178	25	1065711650	962534
179	21	1065711650	962768
180	34	1065711650	964655
181	31	1065711650	964714
182	41	1065711651	72550
183	25	1065711651	73551
184	21	1065711651	73733
185	34	1065711651	75659
186	31	1065711651	75721
187	41	1065711651	182402
188	25	1065711651	183435
189	21	1065711651	183613
190	34	1065711651	185511
191	31	1065711651	185578

192	41	1065711651	290190	
193	25	1065711651	291472	
194	21	1065711651	291666	
195	34	1065711651	293541	
196	31	1065711651	293603	
197	41	1065711651	402665	
198	25	1065711651	403689	
199	21	1065711651	403920	
200	34	1065711651	405835	
201	31	1065711651	405897	
202	41	1065711651	507738	
203	25	1065711651	508837	
204	21	1065711651	509024	
205	34	1065711651	510897	
206	31	1065711651	510959	
207	41	1065711651	585184	
208	41	1065711651	620808	
209	25	1065711651	621835	
210	21	1065711651	622018	
211	34	1065711651	623948	
212	31	1065711651	624006	
213	41	1065711651	731335	
214	25	1065711651	732365	
215	21	1065711651	732553	
216	34	1065711651	734433	
217	31	1065711651	734494	
218	41	1065711651	838847	
219	25	1065711651	840165	
220	21	1065711651	840342	
221	34	1065711651	842234	
222	31	1065711651	842293	
223	41	1065711651	947640	
224	25	1065711651	949014	
225	21	1065711651	949203	
226	34	1065711651	951052	
227	31	1065711651	951113	
228	41	1065711652	61527	
229	25	1065711652	62697	1,17
230	21	1065711652	62874	
231	34	1065711652	64787	
232	31	1065711652	64849	
233	41	1065711652	171106	
234	25	1065711652	172103	0,997
235	21	1065711652	172335	
236	34	1065711652	174279	
237	31	1065711652	174339	
238	41	1065711652	278023	
239	25	1065711652	279267	1,244
240	21	1065711652	279464	
241	34	1065711652	281327	

242	31	1065711652	281389				
243	41	1065711652	390507				
244	25	1065711652	391690	1,183			
245	21	1065711652	391882				
246	34	1065711652	393768		1,886		
247	31	1065711652	393828				
248	41	1065711652	518047				27,54
249	25	1065711652	519165	1,118			
250	21	1065711652	519371				
251	34	1065711652	521290		1,919		
252	31	1065711652	521351				
253	41	1065711652	588865				
254	41	1065711652	632128				
255	25	1065711652	633163	1,035			
256	21	1065711652	633393				
257	34	1065711652	635453		2,06		
258	31	1065711652	635512				
259	41	1065711652	741846				9,718
260	25	1065711652	743226	1,38			
261	21	1065711652	743407				
262	34	1065711652	745290		1,883		
263	31	1065711652	745352				
264	41	1065711652	850535				8,689
265	25	1065711652	851803	1,268			
266	21	1065711652	851984				
267	34	1065711652	853912		1,928		
268	31	1065711652	853972				
269	41	1065711652	959862				9,327
270	25	1065711652	960922	1,06			
271	21	1065711652	961102				
272	34	1065711652	963014		1,912		
273	31	1065711652	963074				
274	41	1065711653	69897				
275	25	1065711653	71266	1,369			
276	21	1065711653	71446				
277	34	1065711653	73328		1,882		
278	31	1065711653	73389				
279	41	1065711653	180393				10,496
280	25	1065711653	181441	1,048			
281	21	1065711653	181621				
282	34	1065711653	183500		1,879		
283	31	1065711653	183559				
284	41	1065711653	290956				10,563
285	25	1065711653	292009	1,053			
286	21	1065711653	292192				
287	34	1065711653	294139		1,947		
288	31	1065711653	294202				
289	41	1065711653	400335				
290	25	1065711653	401794	1,459			
291	21	1065711653	402028				

292	34	1065711653	403955		1,927	
293	31	1065711653	404014			
294	41	1065711653	508557			8,222
295	25	1065711653	509634	1,077		
296	21	1065711653	509831			
297	34	1065711653	511688		1,857	
298	31	1065711653	511749			
299	41	1065711653	590221			
300	41	1065711653	620622			
301	25	1065711653	621822			
302	21	1065711653	622003			
303	34	1065711653	623907			
304	31	1065711653	623966			
305	41	1065711653	728450			
306	25	1065711653	729563	1,113		
307	21	1065711653	729741			
308	34	1065711653	731654		1,913	
309	31	1065711653	731717			
310	41	1065711653	840123			11,673
311	25	1065711653	841215			
312	21	1065711653	841448			
313	34	1065711653	843323			
314	31	1065711653	843382			
315	41	1065711653	952061			
316	25	1065711653	953845	1,784		
317	21	1065711653	954025			
318	34	1065711653	955894		1,869	
319	31	1065711653	955953			
320	41	1065711654	60665			
321	25	1065711654	61769	1,104		
322	21	1065711654	61946			
323	34	1065711654	63931		1,985	
324	31	1065711654	63992			
325	41	1065711654	173446			12,781
326	25	1065711654	174716	1,27		
327	21	1065711654	174895			
328	34	1065711654	176764		1,869	
329	31	1065711654	176823			
330	41	1065711654	283987			10,541
331	25	1065711654	285150			
332	21	1065711654	285332			
333	34	1065711654	287190			
334	31	1065711654	287251			
335	41	1065711654	390447			
336	25	1065711654	391482	1,035		
337	21	1065711654	391661			
338	34	1065711654	393578		1,917	
339	31	1065711654	393637			
340	41	1065711654	498960			8,513
341	25	1065711654	500038	1,078		

342	21	1065711654	500216			
343	34	1065711654	502063		1,847	
344	31	1065711654	502124			
345	41	1065711654	604520			5,56
346	41	1065711654	631712			
347	25	1065711654	632752	1,04		
348	21	1065711654	633001			
349	34	1065711654	634930		1,929	
350	31	1065711654	634990			
351	41	1065711654	740774			9,062
352	25	1065711654	742106	1,332		
353	21	1065711654	742302			
354	34	1065711654	744179		1,877	
355	31	1065711654	744240			
356	41	1065711654	849167			8,393
357	25	1065711654	850191	1,024		
358	21	1065711654	850371			
359	34	1065711654	852273		1,902	
360	31	1065711654	852331			
361	41	1065711654	959861			10,694
362	25	1065711654	961028	1,167		
363	21	1065711654	961218			
364	34	1065711654	963120		1,902	
365	31	1065711654	963179			
366	41	1065711655	88404			
367	25	1065711655	89635	1,231		
368	21	1065711655	89859			
369	34	1065711655	91741		1,882	
370	31	1065711655	91802			
371	41	1065711655	200053			11,649
372	25	1065711655	201402	1,349		
373	21	1065711655	201583			
374	34	1065711655	203502		1,919	
375	31	1065711655	203562			
376	41	1065711655	310104			10,051
377	25	1065711655	311199	1,095		
378	21	1065711655	311382			
379	34	1065711655	313241		1,859	
380	31	1065711655	313304			
381	41	1065711655	419811			9,707
382	25	1065711655	420933	1,122		
383	21	1065711655	421113			
384	34	1065711655	423051		1,938	
385	31	1065711655	423110			
386	41	1065711655	529923			10,112
387	25	1065711655	531030	1,107		
388	21	1065711655	531208			
389	34	1065711655	533107		1,899	
390	31	1065711655	533168			
391	41	1065711655	609806			

392	41	1065711655	637870				
393	25	1065711655	638895				
394	21	1065711655	639076				
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37	41	1065711418	204523
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41	41	1065711422	82839
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46	41	1065711427	172284
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283	31	1065711434	832023			
284	41	1065711434	939832			11,262
285	25	1065711434	940923	1,091		
286	21	1065711434	941103			
287	34	1065711434	942950			
288	31	1065711434	943010			
289	41	1065711435	48435			
290	25	1065711435	49621	1,186		
291	21	1065711435	49811			
292	34	1065711435	51687		1,876	
293	31	1065711435	51747			
294	41	1065711435	178545			30,11
295	25	1065711435	179564	1,019		
296	21	1065711435	179787			
297	34	1065711435	181673		1,886	
298	31	1065711435	181733			
299	41	1065711435	212344			
300	41	1065711435	308501			
301	25	1065711435	309729			
302	21	1065711435	309917			
303	34	1065711435	311779			
304	31	1065711435	311836			
305	41	1065711435	418939			10,438
306	25	1065711435	420218	1,279		
307	21	1065711435	420409			
308	34	1065711435	422251		1,842	
309	31	1065711435	422311			
310	41	1065711435	529137			
311	25	1065711435	530196	1,059		
312	21	1065711435	530394			
313	34	1065711435	532247		1,853	
314	31	1065711435	532307			
315	41	1065711435	639511			10,374
316	25	1065711435	640859	1,348		
317	21	1065711435	641045			
318	34	1065711435	642897		1,852	
319	31	1065711435	642958			
320	41	1065711435	748533			9,022

321	25	1065711435	749593	1,06			
322	21	1065711435	749771				
323	34	1065711435	751619		1,848		
324	31	1065711435	751678				
325	41	1065711435	859807			11,274	
326	25	1065711435	860864	1,057			
327	21	1065711435	861050				
328	34	1065711435	862908		1,858		
329	31	1065711435	862969				
330	41	1065711435	971782			11,975	
331	25	1065711435	972911				
332	21	1065711435	973142				
333	34	1065711435	975036				
334	31	1065711435	975094				
335	41	1065711436	81790				
336	25	1065711436	83117				
337	21	1065711436	83307				
338	34	1065711436	85212				
339	31	1065711436	85281				
340	41	1065711436	191092			9,302	
341	25	1065711436	192105	1,013			
342	21	1065711436	192284				
343	34	1065711436	194175		1,891		
344	31	1065711436	194235				
345	41	1065711436	224017				
346	41	1065711436	300348				
347	25	1065711436	301517				
348	21	1065711436	301709				
349	34	1065711436	303591				
350	31	1065711436	303652				
351	41	1065711436	410026			9,678	
352	25	1065711436	411219	1,193			
353	21	1065711436	411450				
354	34	1065711436	413319		1,869		
355	31	1065711436	413378				
356	41	1065711436	520833			10,807	
357	25	1065711436	521981	1,148			
358	21	1065711436	522171				
359	34	1065711436	524027		1,856		
360	31	1065711436	524087				
361	41	1065711436	629537			8,704	
362	25	1065711436	630749	1,212			
363	21	1065711436	630928				
364	34	1065711436	632786		1,858		
365	31	1065711436	632846				
366	41	1065711436	738826			9,289	
367	25	1065711436	740755	1,929			
368	21	1065711436	740931				
369	34	1065711436	742809		1,878		
370	31	1065711436	742868				

371	41	1065711436	850033			11,207
372	25	1065711436	851088	1,055		
373	21	1065711436	851266			
374	34	1065711436	853121		1,855	
375	31	1065711436	853181			
376	41	1065711436	960302			10,269
377	25	1065711436	961389	1,087		
378	21	1065711436	961577			
379	34	1065711436	963426		1,849	
380	31	1065711436	963485			
381	41	1065711437	69580			
382	25	1065711437	70538	0,958		
383	21	1065711437	70719			
384	34	1065711437	72661		1,942	
385	31	1065711437	72722			
386	41	1065711437	179003			9,423
387	25	1065711437	180170	1,167		
388	21	1065711437	180400			
389	34	1065711437	182259		1,859	
390	31	1065711437	182318			
391	41	1065711437	238006			
392	41	1065711437	290277			
393	25	1065711437	291311	1,034		
394	21	1065711437	291495			
395	34	1065711437	293340		1,845	
396	31	1065711437	293398			
397	41	1065711437	401495			11,218
398	25	1065711437	402600	1,105		
399	21	1065711437	402789			
400	34	1065711437	404634		1,845	
401	31	1065711437	404694			
402	41	1065711437	510236			8,741
403	25	1065711437	511240	1,004		
404	21	1065711437	511421			
405	34	1065711437	513282		1,861	
406	31	1065711437	513341			
407	41	1065711437	621430			
408	25	1065711437	622935	1,505		
409	21	1065711437	623165			
410	34	1065711437	625027		1,862	
411	31	1065711437	625088			
412	41	1065711437	731094			9,664
413	25	1065711437	732168	1,074		
414	21	1065711437	732348			
415	34	1065711437	734200		1,852	
416	31	1065711437	734259			
417	41	1065711437	840549			9,455
418	25	1065711437	841921	1,372		
419	21	1065711437	842107			
420	34	1065711437	843979		1,872	

421	31	1065711437	844041		
422	41	1065711437	949064		8,515