Getting NMEA 0183 data into marine vessel conning display: A practical solution

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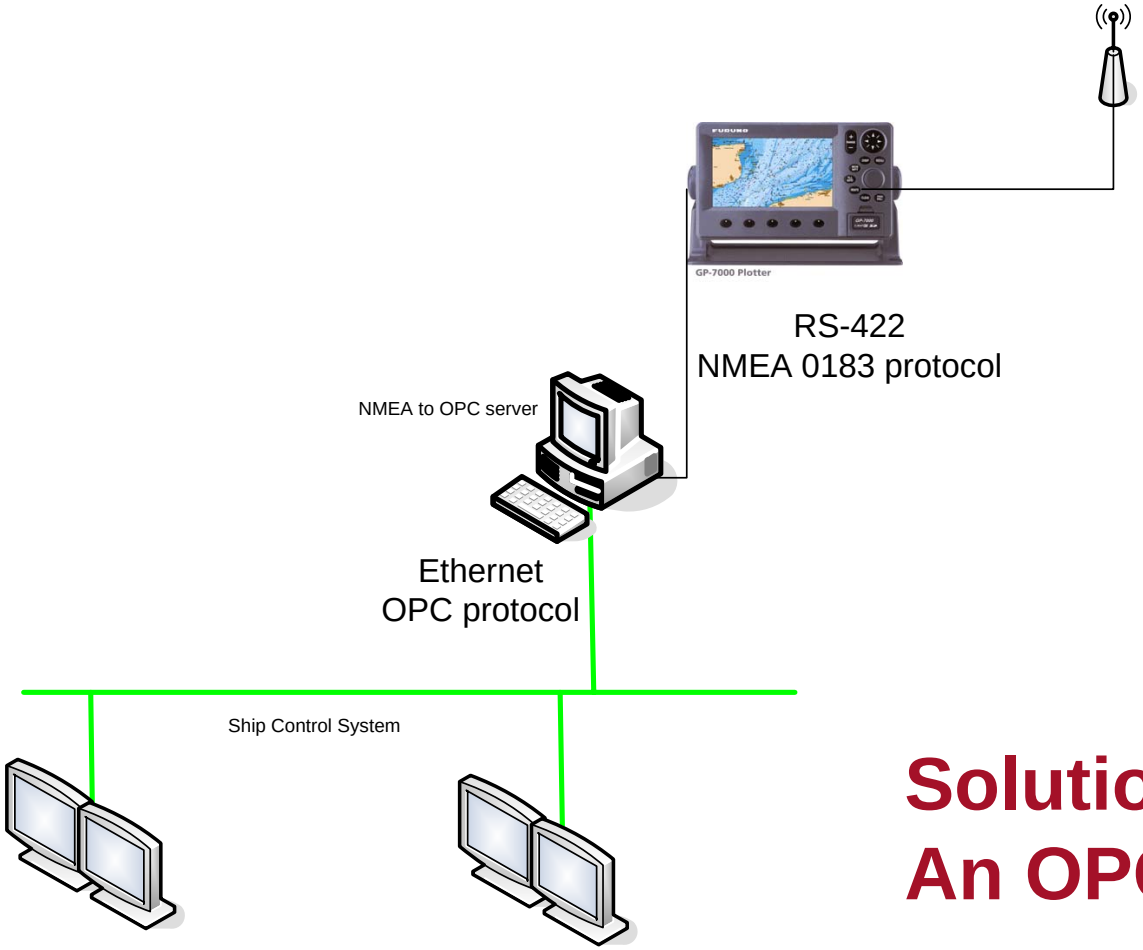
Challenge:
How to get GPS data into the Ship Control and Monitoring system



Solution:
An OPC server

Links

Below is a list of resources and technical information that forms the basis for this data acquisition model

http://www.automationworld.com/view-1947 A NMEA to OPC Case story (From the real world)

http://www.nmea.org/ Official site for the NMEA organisation

http://vancouver-webpages.com/peter/ Peter Bennets GPS / NMEA page

http://www.kh-gps.de/nmea-faq.htm Klaus H. Hirschelmann GPS site

http://gpsinformation.net/ GPS information website

http://www.sailsoft.nl Sailsoft: A nice GPS simulator

http://www.kernelpro.com Software for virtual COM port

http://www.kepware.com/ User configurable OPC server

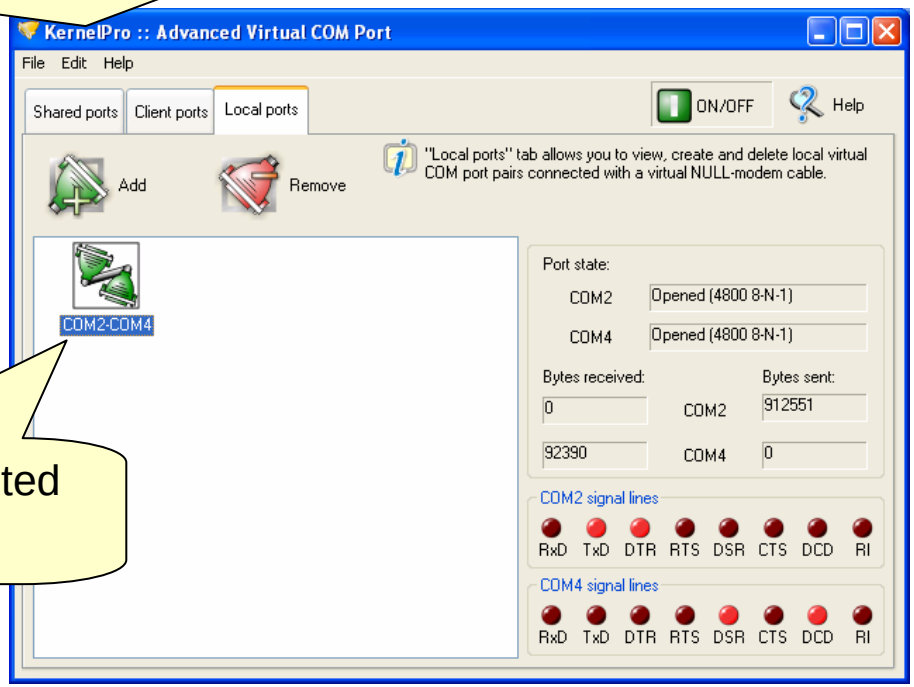
http://www.opcfoundation.org/ Official site for the OPC Foundation

http://www.interfacebus.com/Design_Connector_RS422.html Information about EIA/TIA 422 (Ex RS422)

http://www.kep.com/ Demo SCADA software for creating the conning display

Preparing the PC

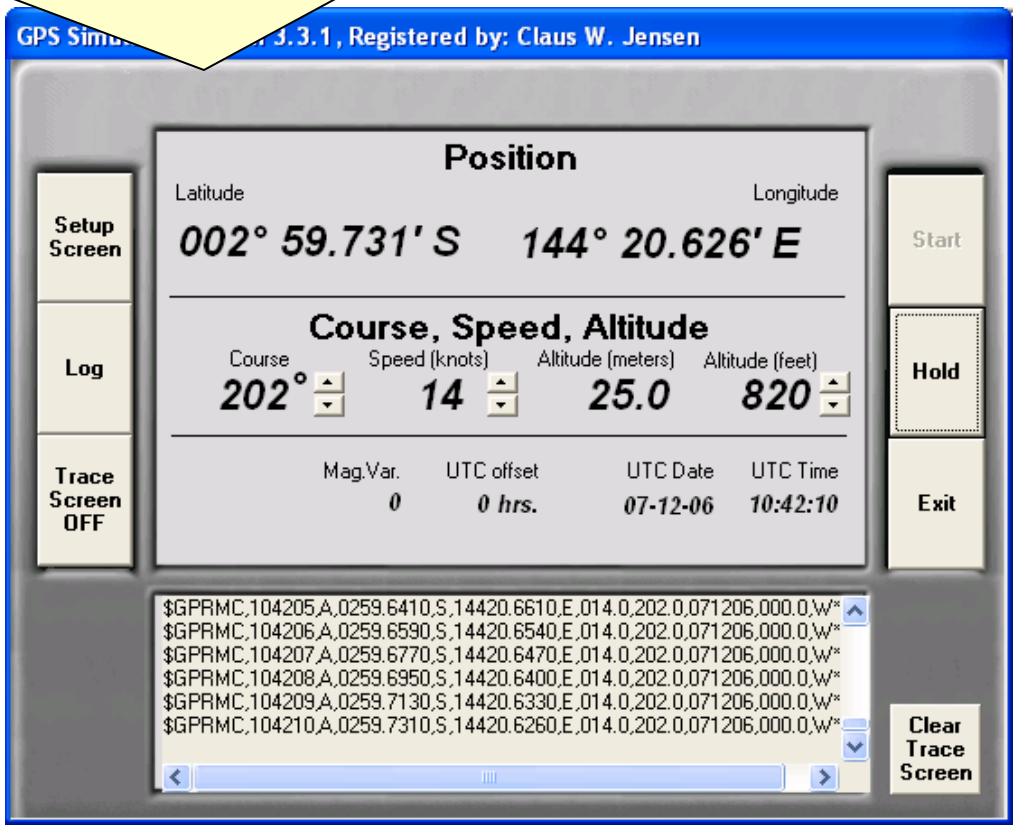
Download KernelPro and create virtual COM ports on your PC.
At Kernelpro's webpage you can download demo software, giving your PC virtual com ports, which are useful for testing software.
Download, install and configure 2 interconnected virtual ports.
Port 2 and 4 are used in the following example.
http://www.kernelpro.com/



Port 2 and 4 are connected to each other

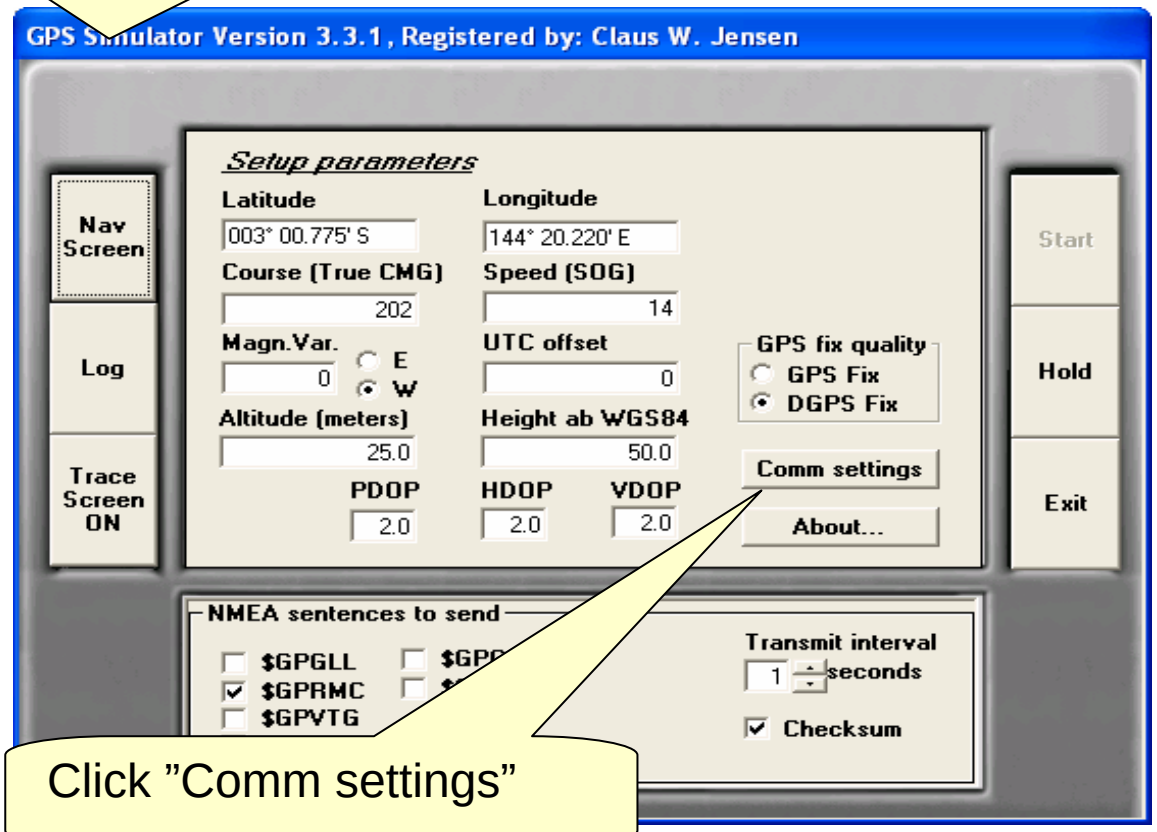
Download Sailsoft GPS Simulator

On Sailsoft you can download a very nice GPS simulator.
The demo version is stopping after 50 NMEA sentences.
License fee is only 15 EUR. (december 2006).
http://www.sailsoft.nl



Setup GPS simulator

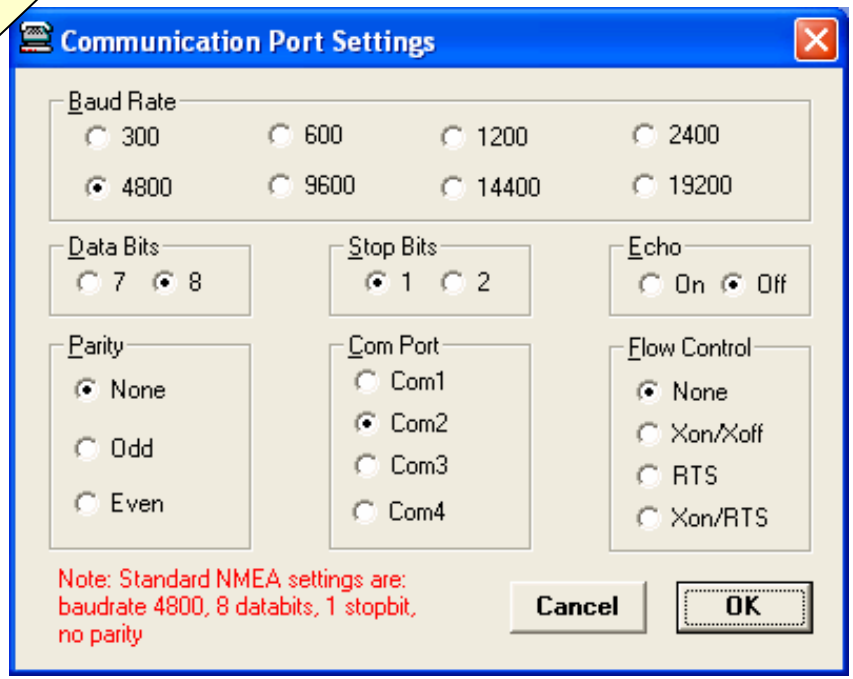
Setup screen for the GPS simulator



Click ”Comm settings”

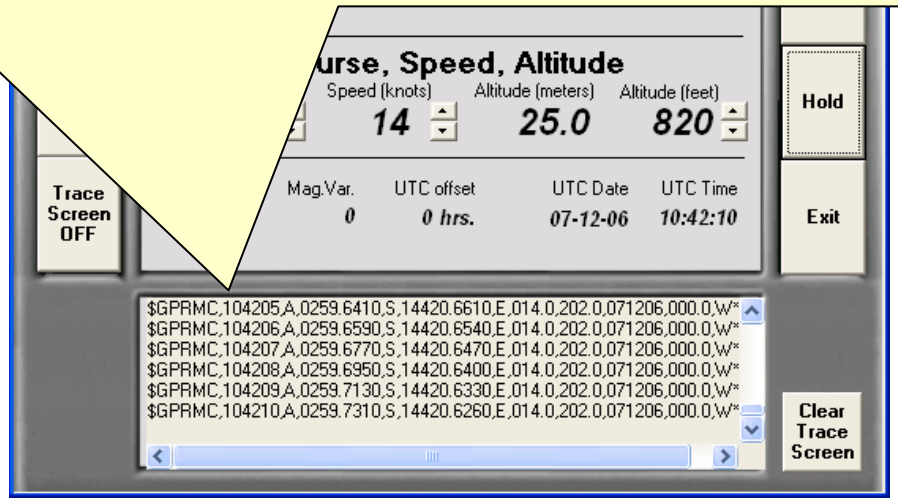
Communication setup for the GPS simulator

The shown communication setup is standard for GPS using NMEA 0183
Notice that the simulator will transmit on com port 2, which is the one we virtual have connected to com port 4



NMEA 0183 sentences

Begin with analyzing the NMEA sentence,
In the NMEA 0183 everything is sent as ASCII characters (1byte pr. character) and the sentence transmission is terminated by <CR><LF>
Define your OPC tag names, and find number of bytes and point of start in the sentence

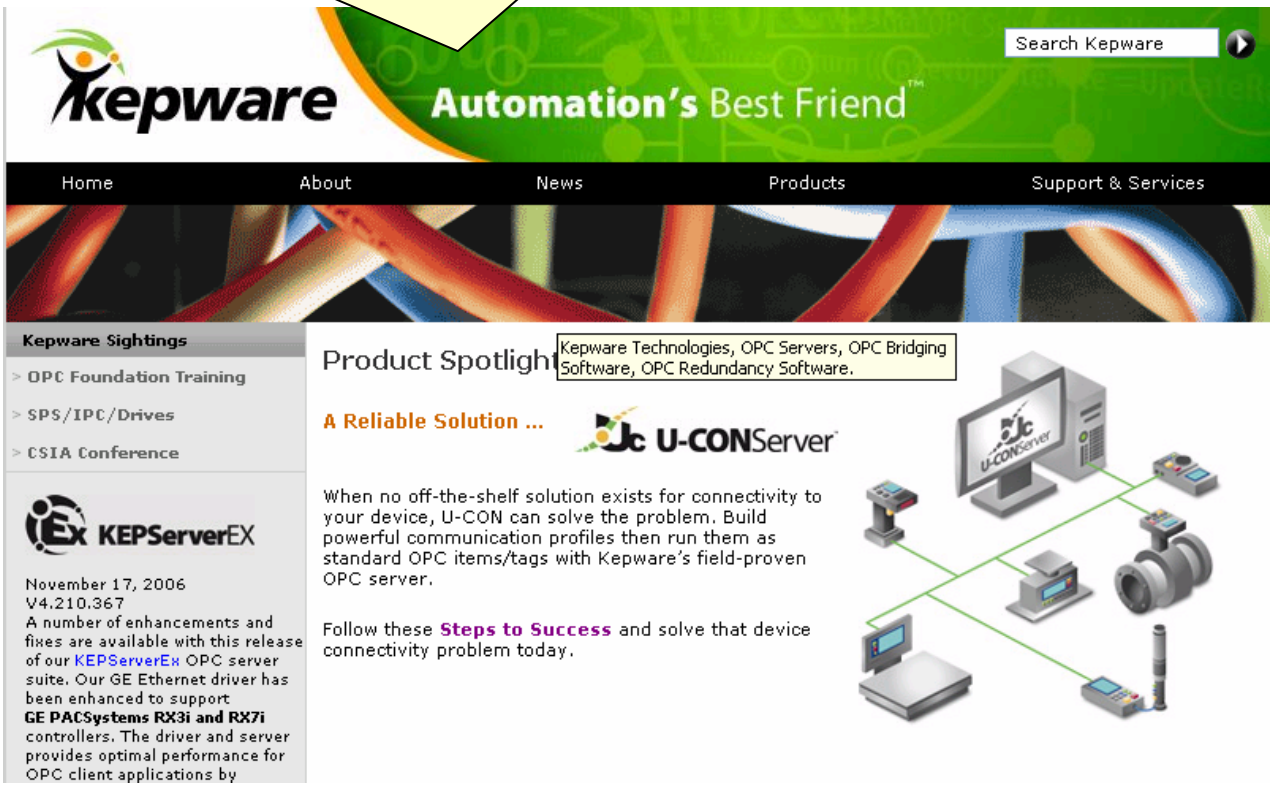


$GPRMC,112424,A,0345.3250,S,14402.8950,E,014.0,202.0,071206,000.0,W*7F

Example: ”Course”
5 bytes, starts at place 48

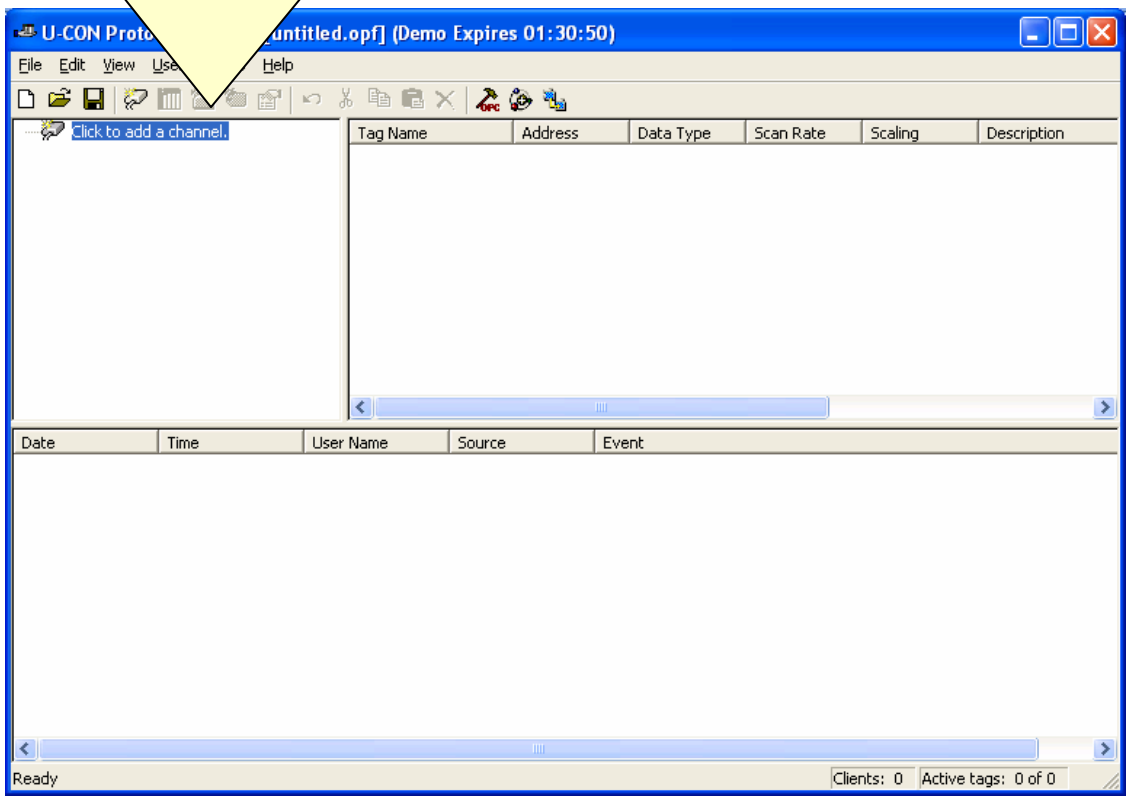
Download Kepware's UCON server.

At Kepware's website you can download an evaluation package of their U-CONServer, which is a user configurable OPC server, which can be configured to read and write data from or to nearly any communicating device.

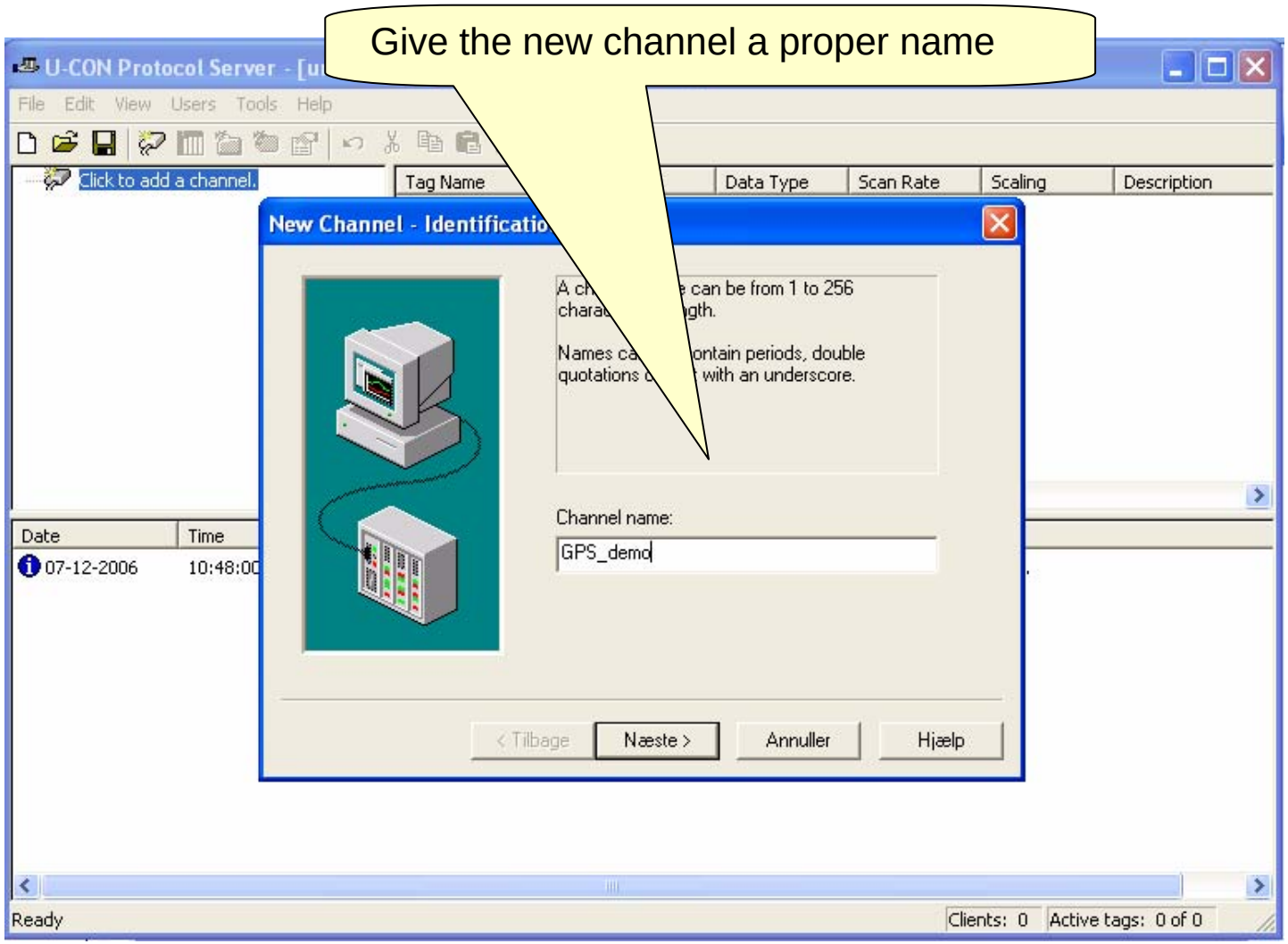


Install OPC server

Install, and run the UCONServer from Kepware.
Click on “Click to add a channel”

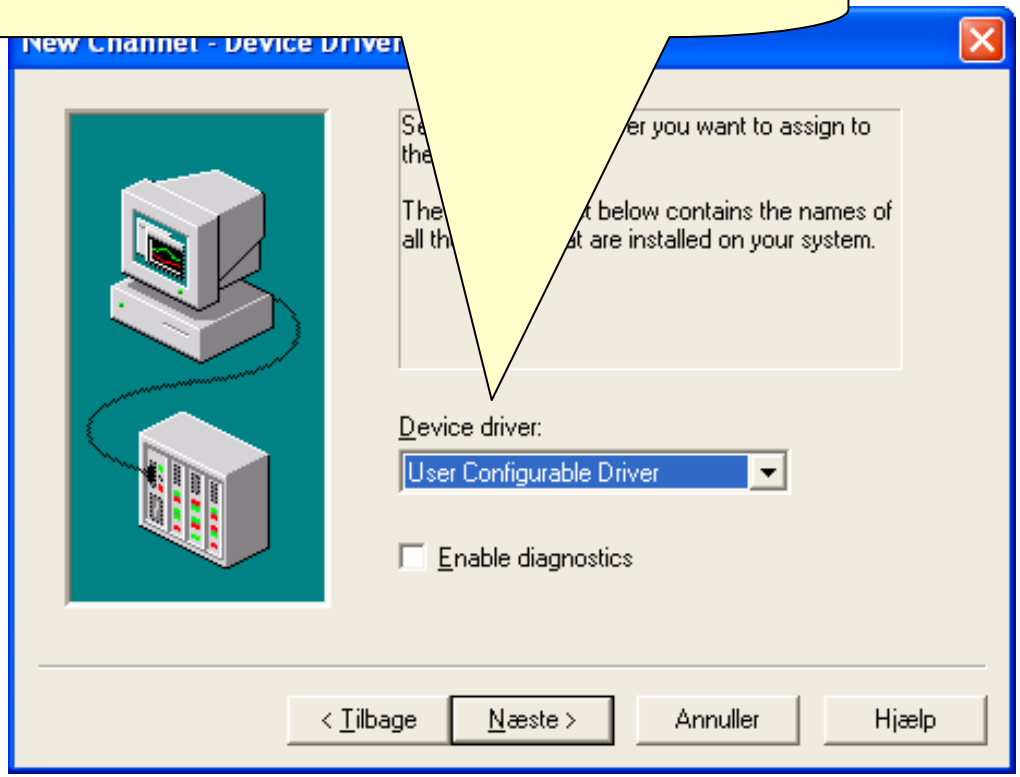


Create a communication channel



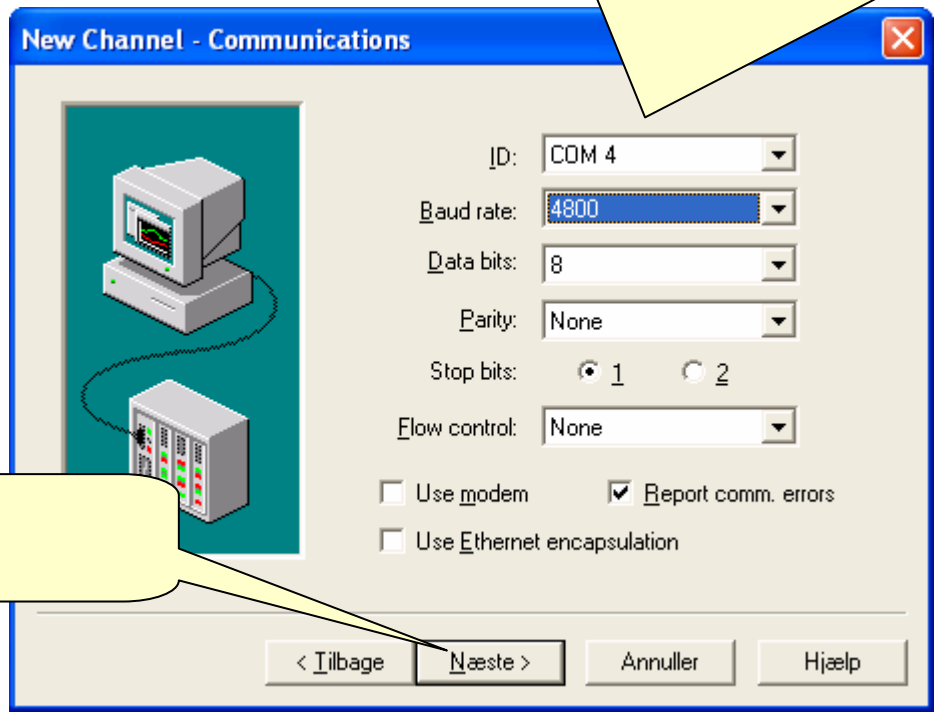
Define your own driver

Select “User Configurable Driver”



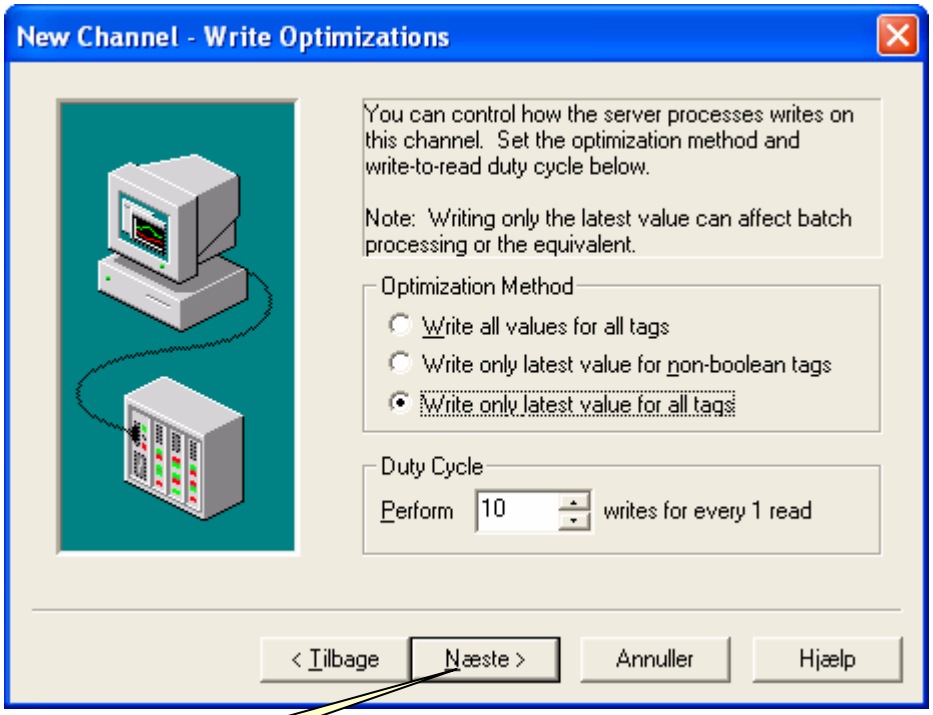
Set communication settings for your driver

1.
Select the same Communication Port Settings as the simulator.
Remember also to set the com port to the same as which is virtual connected to the GPS simulator



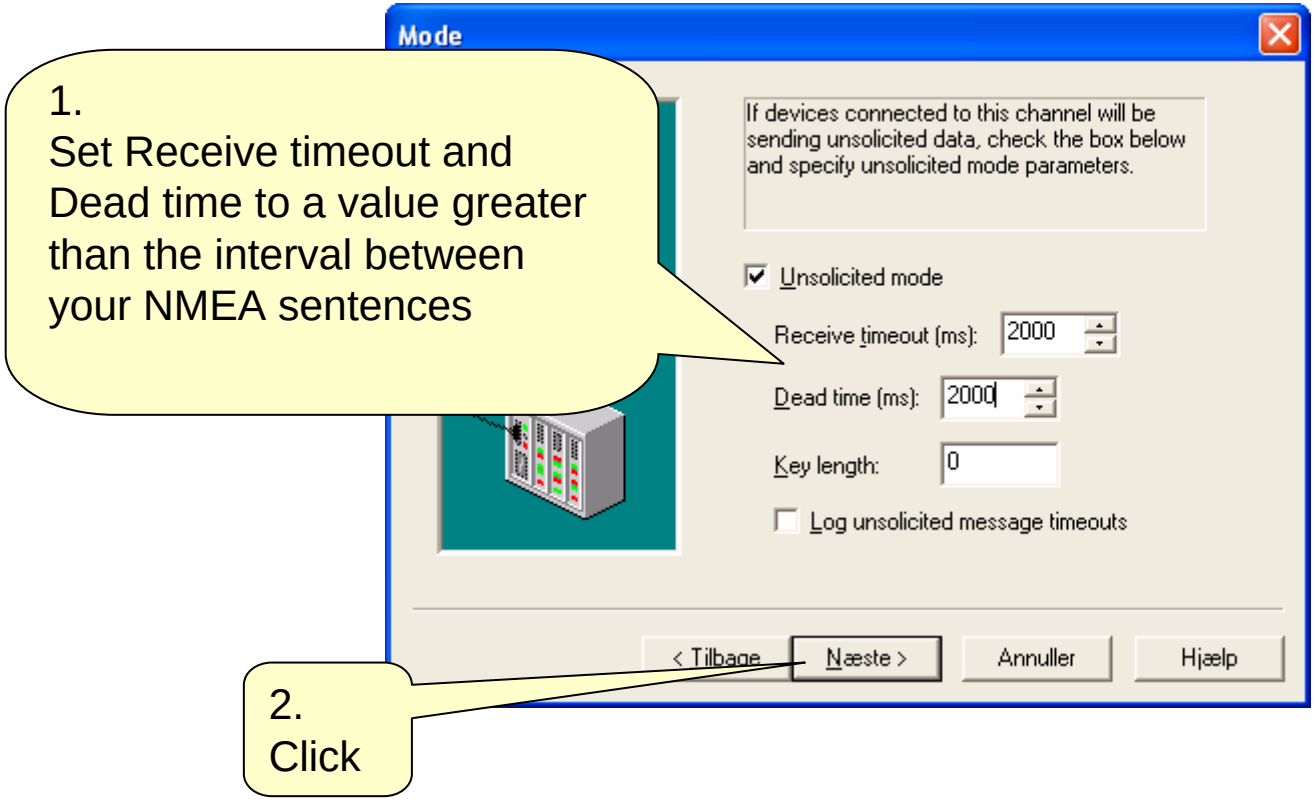
2.
Click

NMEA 0183 is a single talker, multi listener protocol

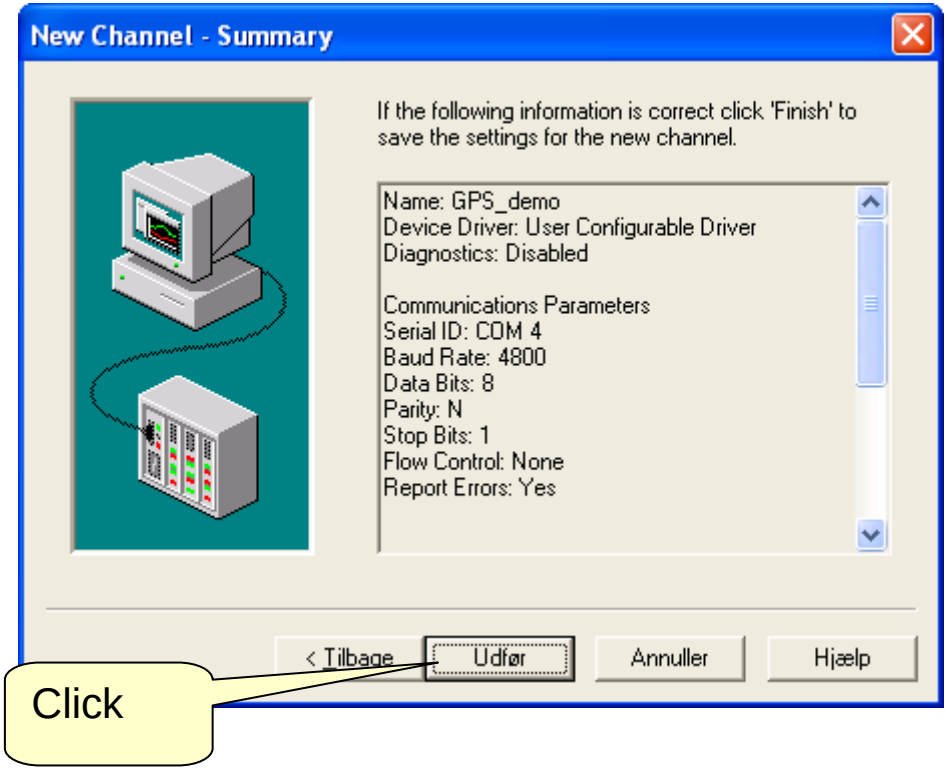


Click

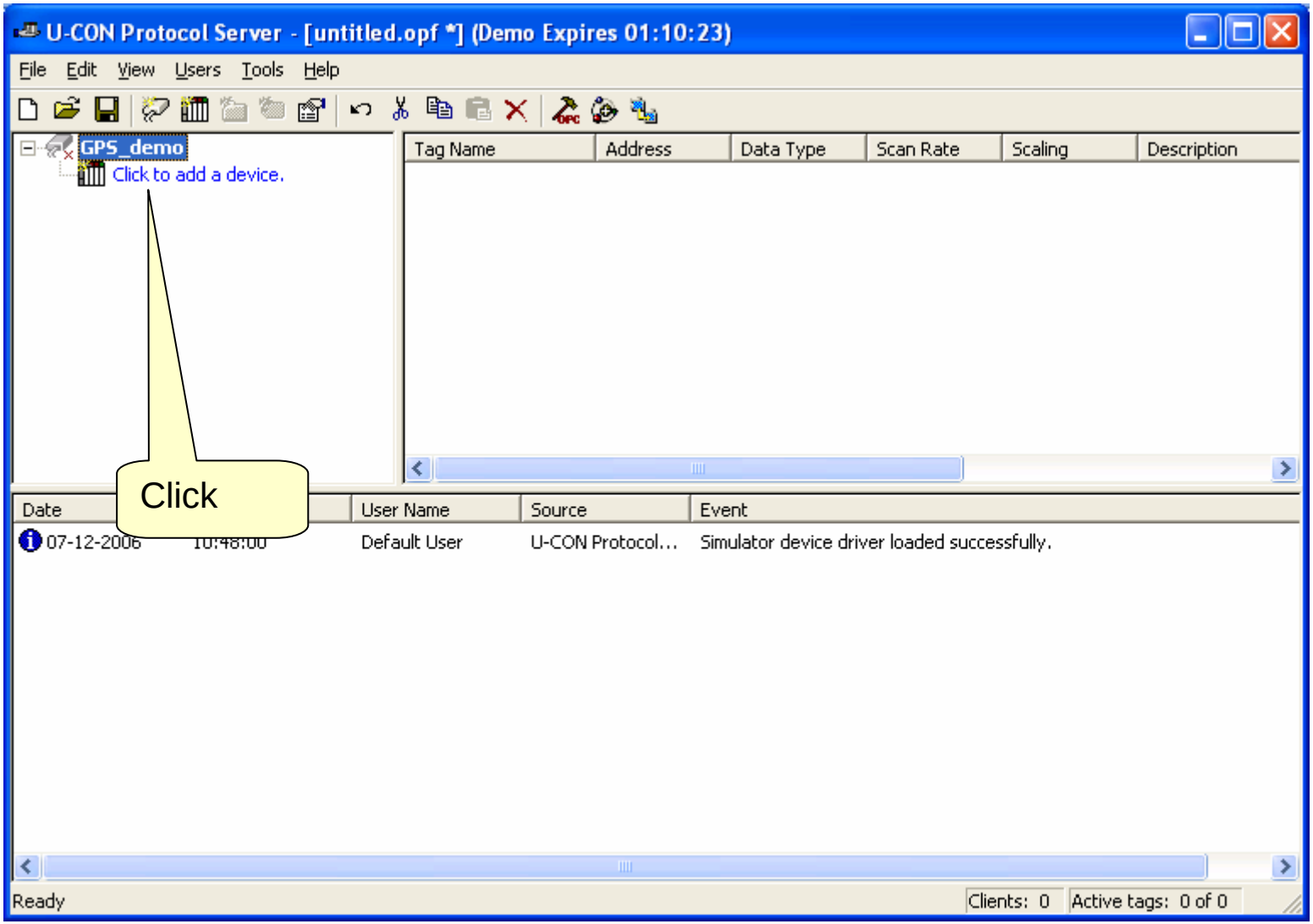
Unsolicited? Yes, NMEA 0183 is transmitting on time basis without request



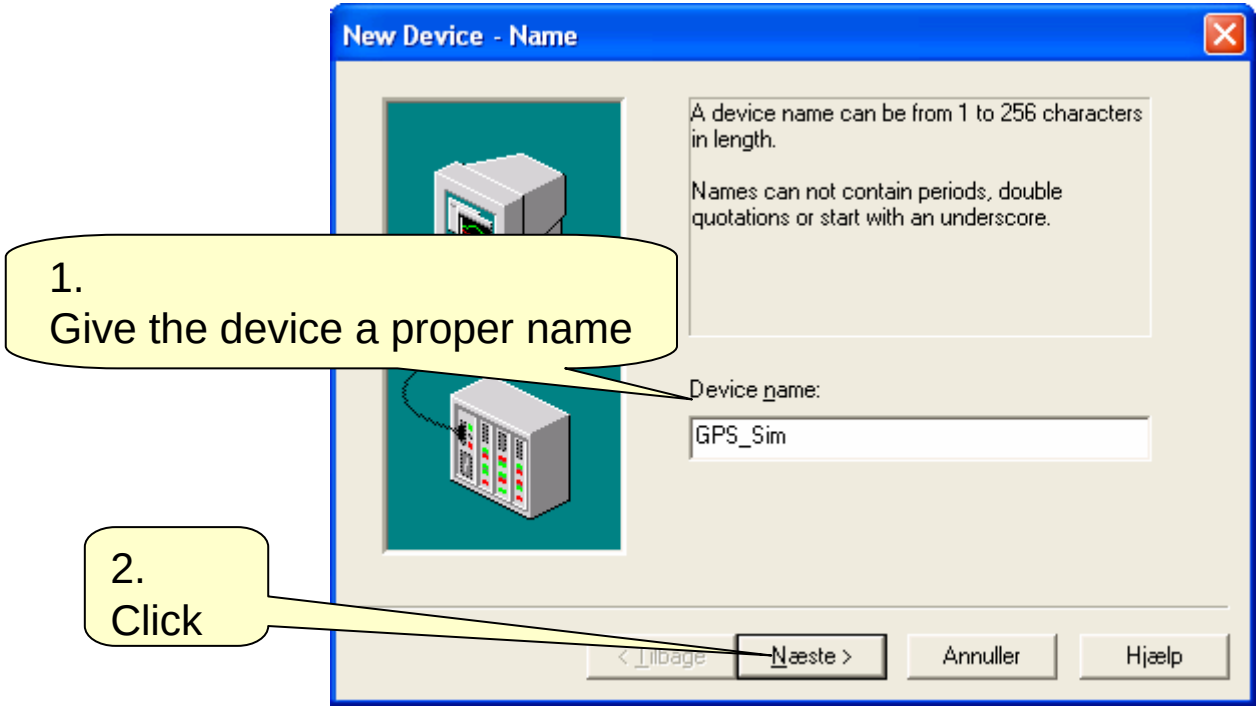
OK! Driver configured



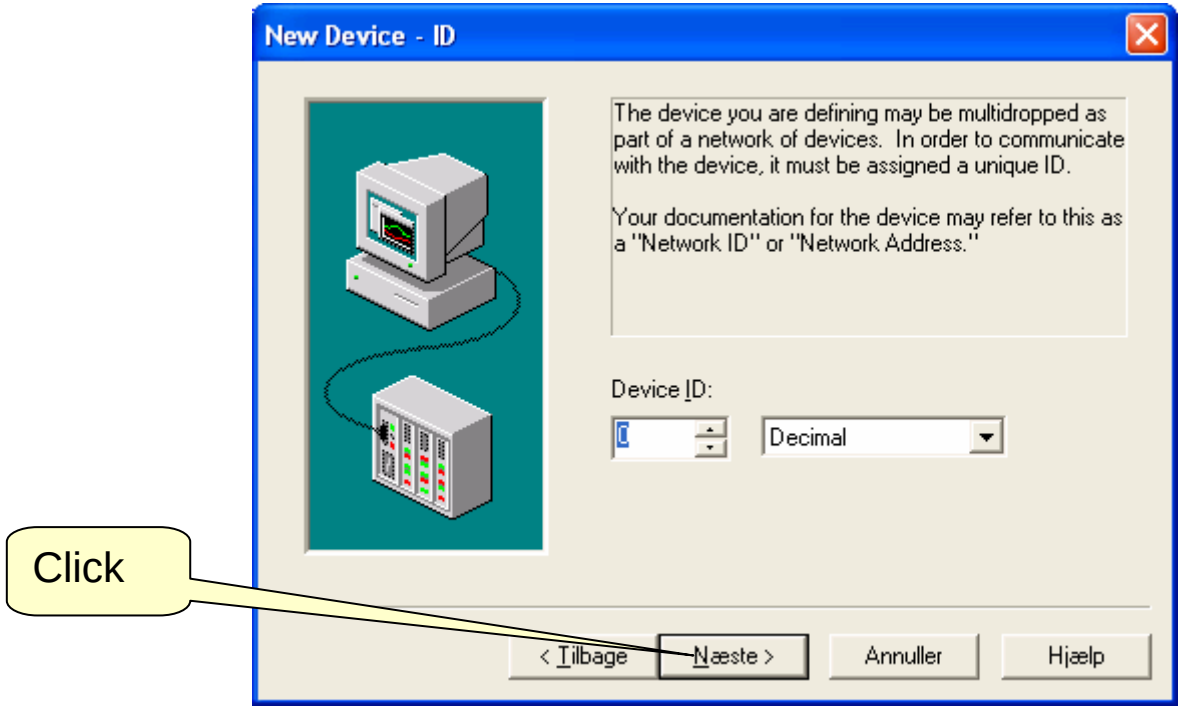
Add a device to the ”GPS_demo” channel



The device must have a unique name

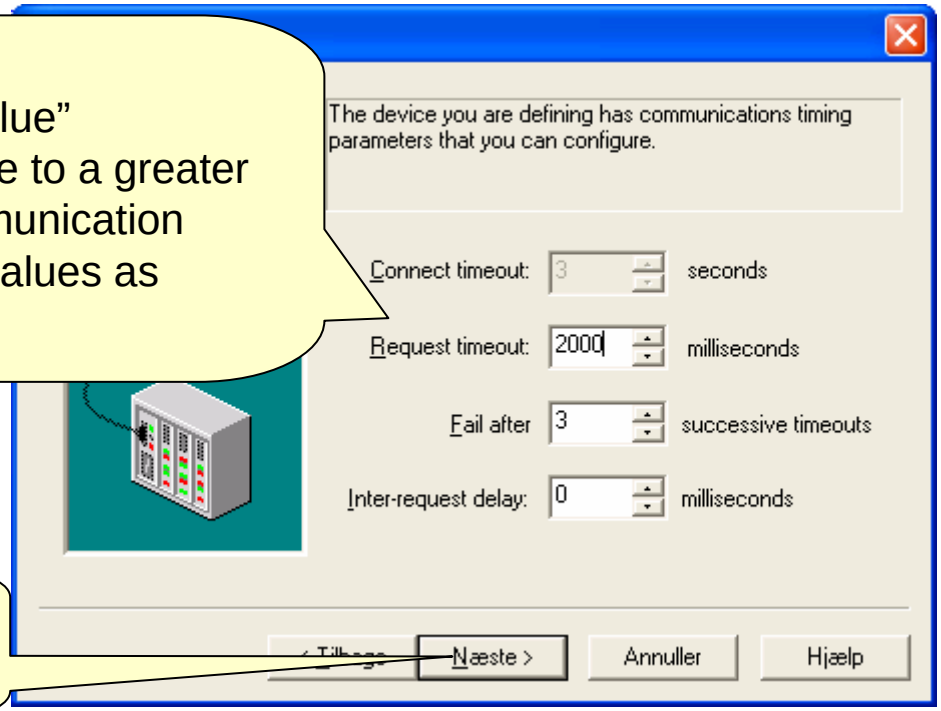


Since this is not a bus communication protocol, Device ID is not needed for NMEA 0183



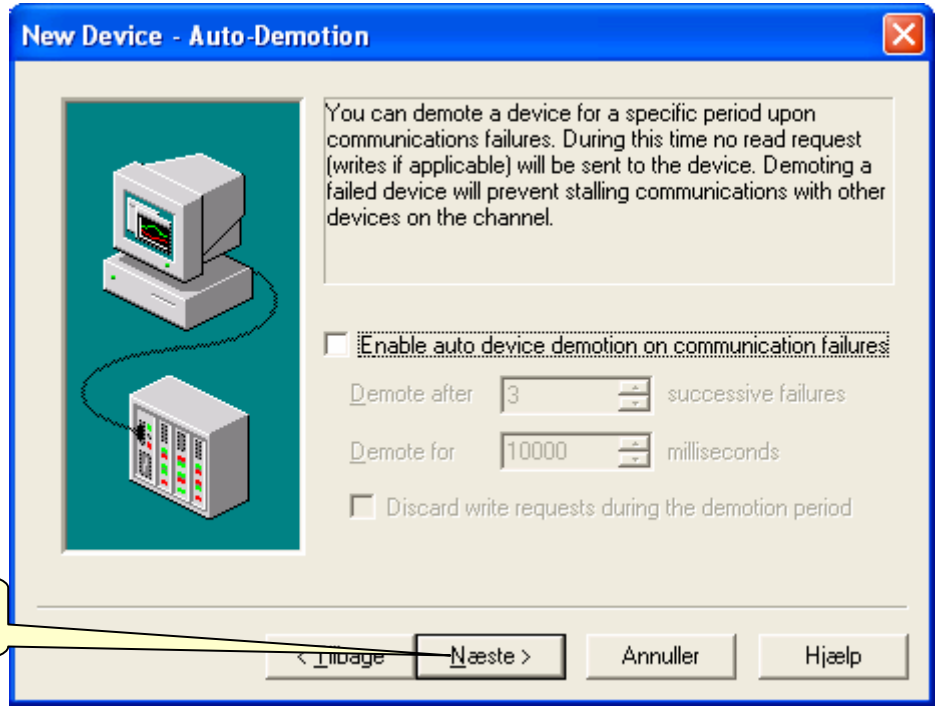
Request timeout

1.
“Request timeout value”
Set the timeout value to a greater value than the communication rate, and the other values as shown.



2.
Click

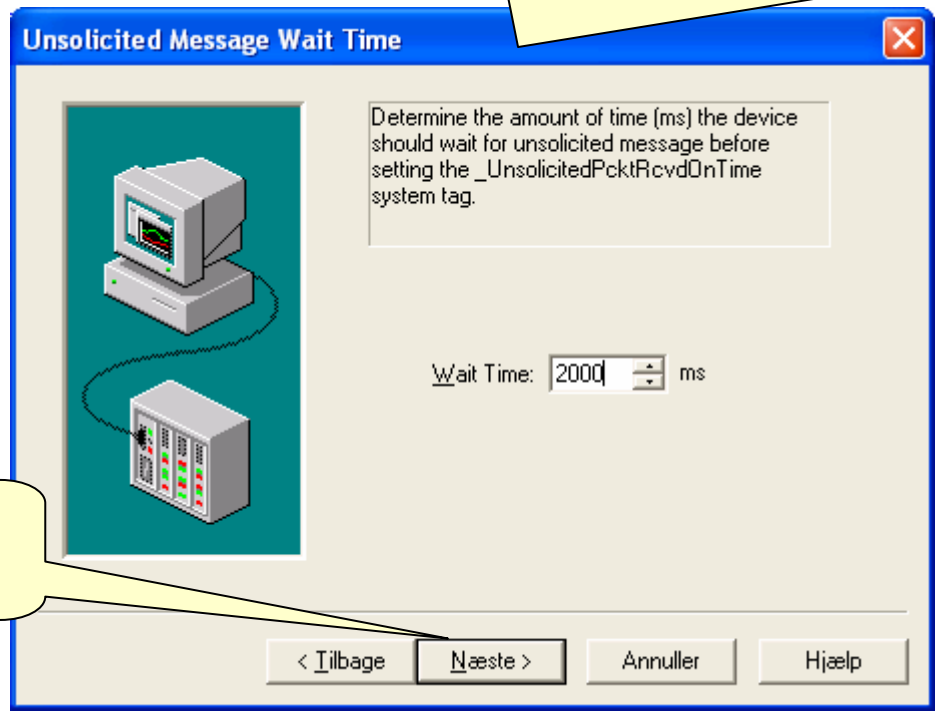
No device demotion needed!



Click

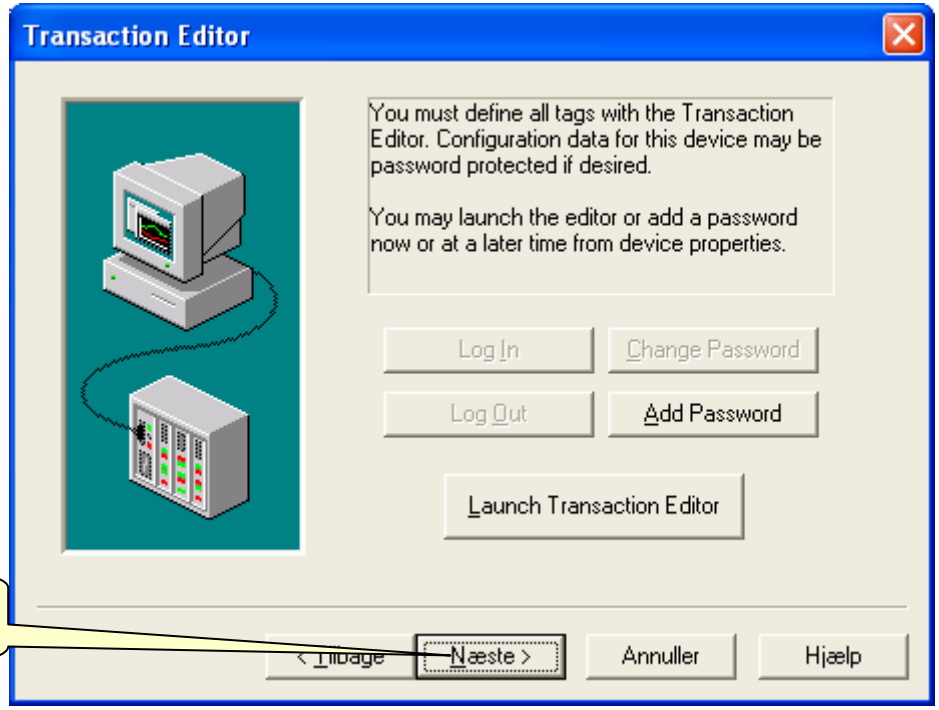
Unsolicted Message Wait Time

1.
Set the timeout value to a greater value than the communication rate.
The tag "_UnsolicitedPcktRcvdOnTime" which is visible from an OPC client, will be set to "1" if no sentence is received within the "Wait Time"!



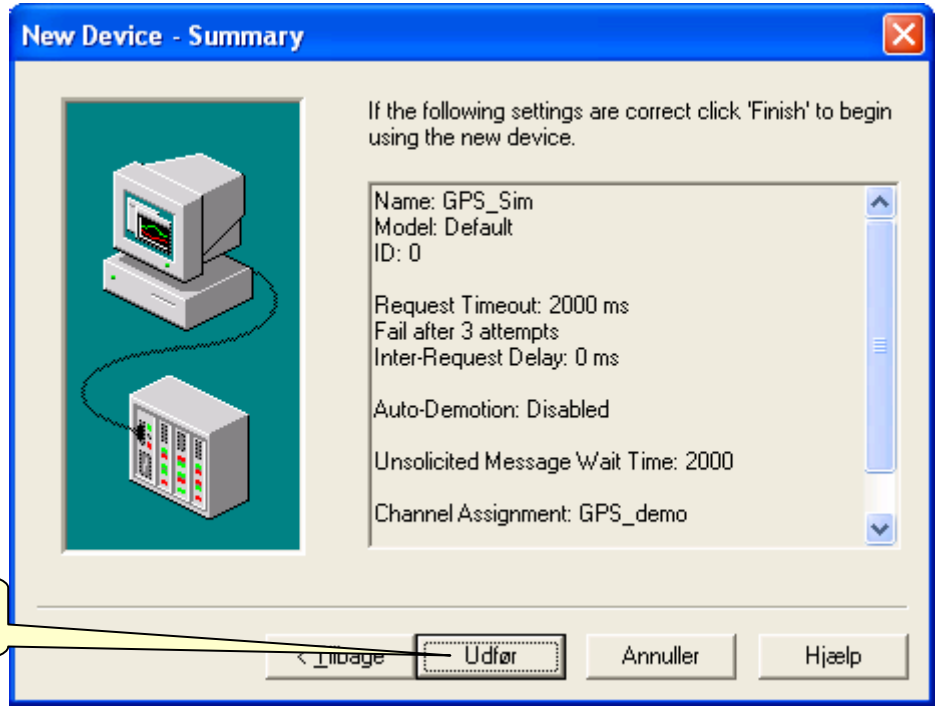
2.
Click

Wait to launch the Transaction Editor



Click

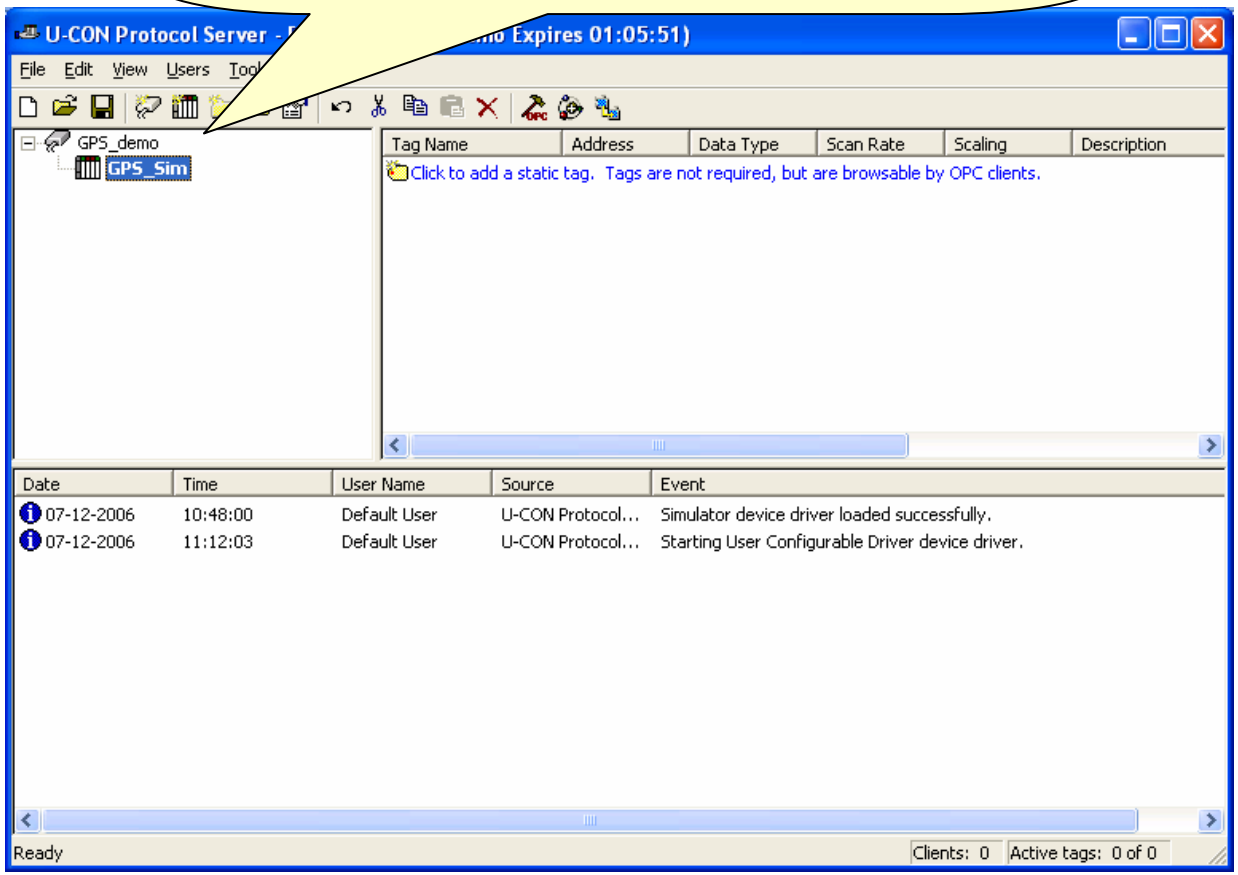
The device “GPS_Sim” is configured, and now the OPC tags need to be defined



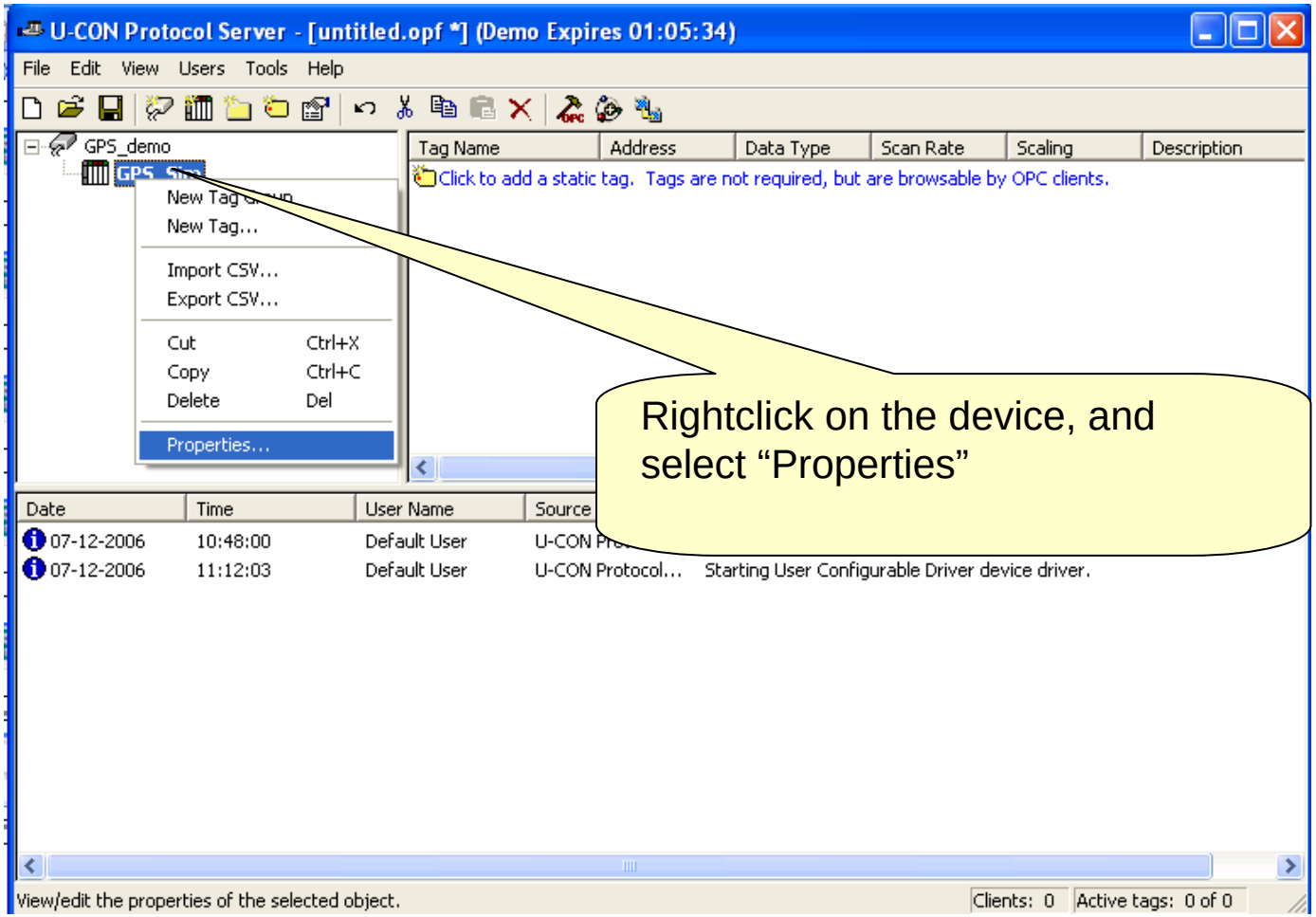
Click

Channel and device in the OPC server

Channel "GPS_demo" with the device "GPS_Sim" should look like this

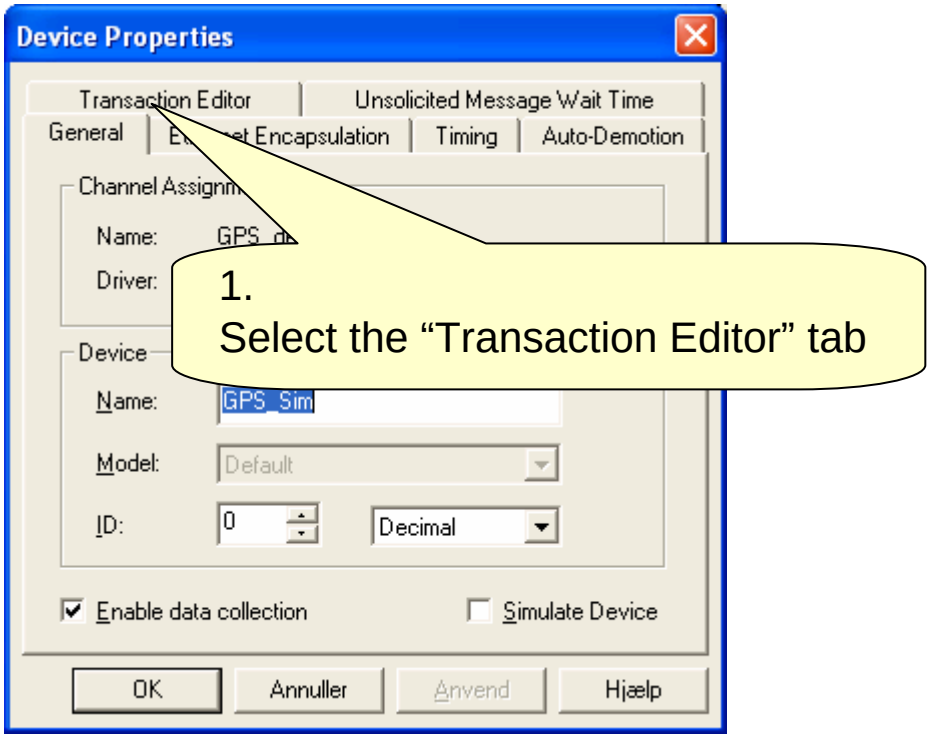


Device properties

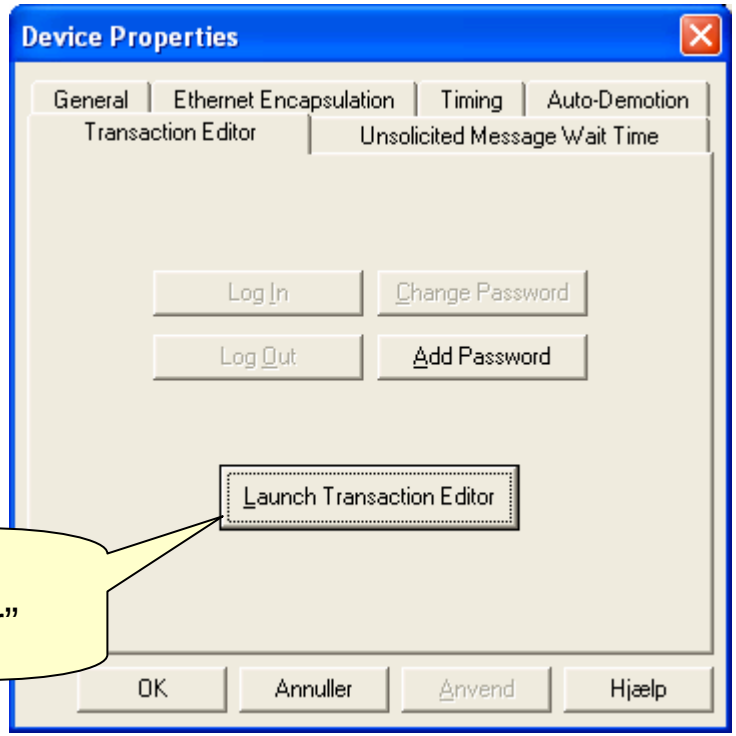


Rightclick on the device, and select “Properties”

Transaction Editor

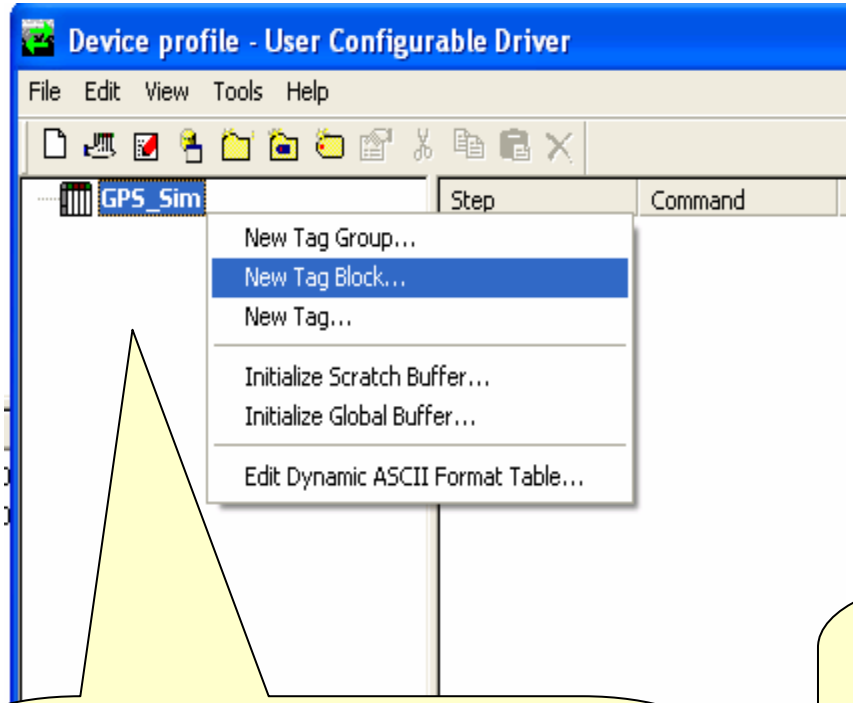


1.
Select the “Transaction Editor” tab

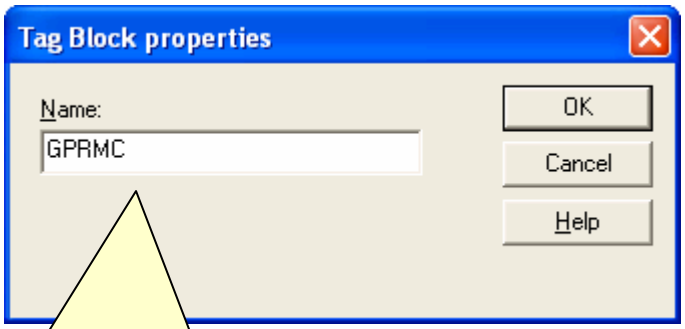


2.
Launch the “Transaction Editor”

Tag Block

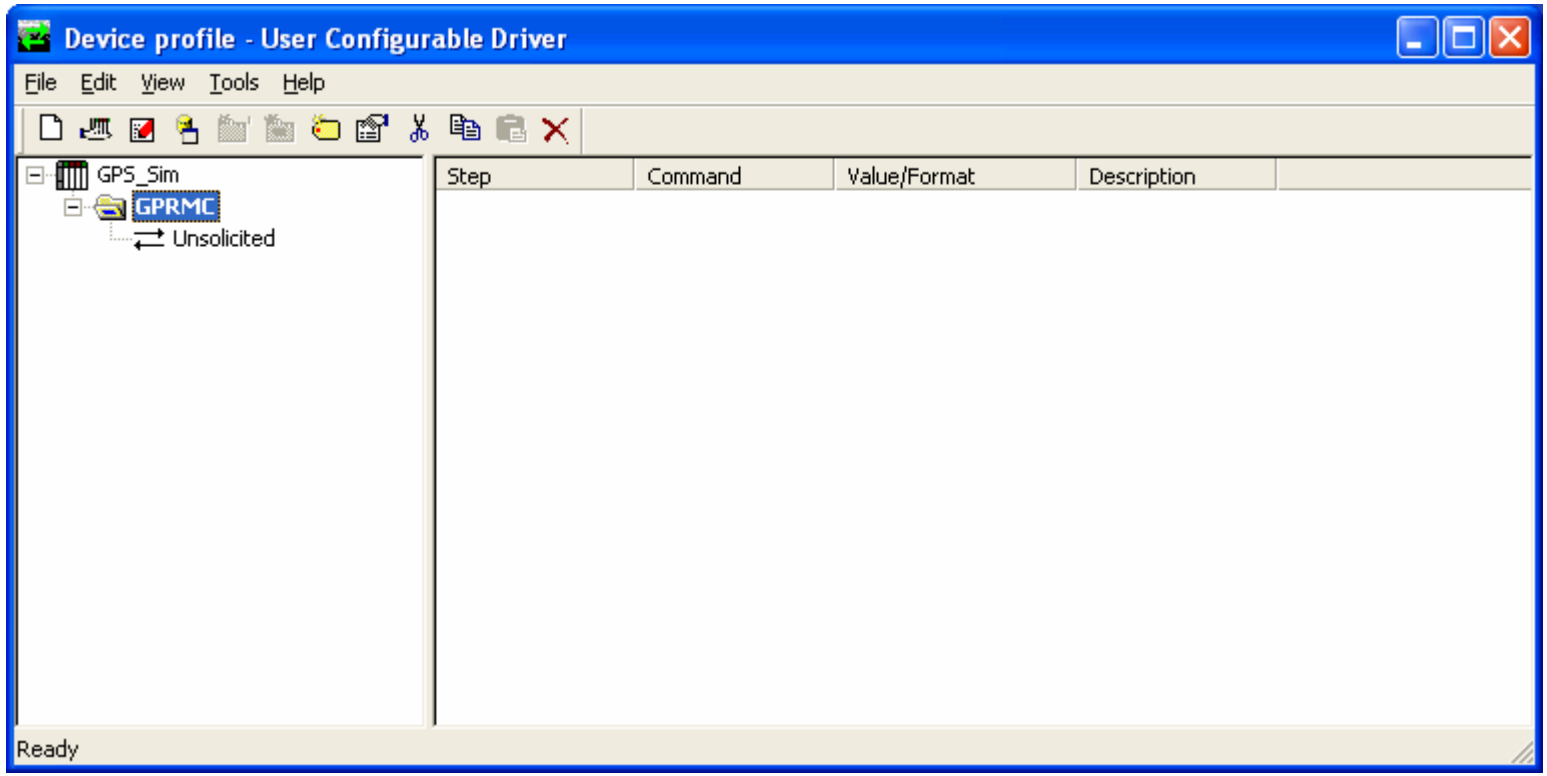


1.
Rightclick on the device "GPS_Sim", and select "New Tag Block"

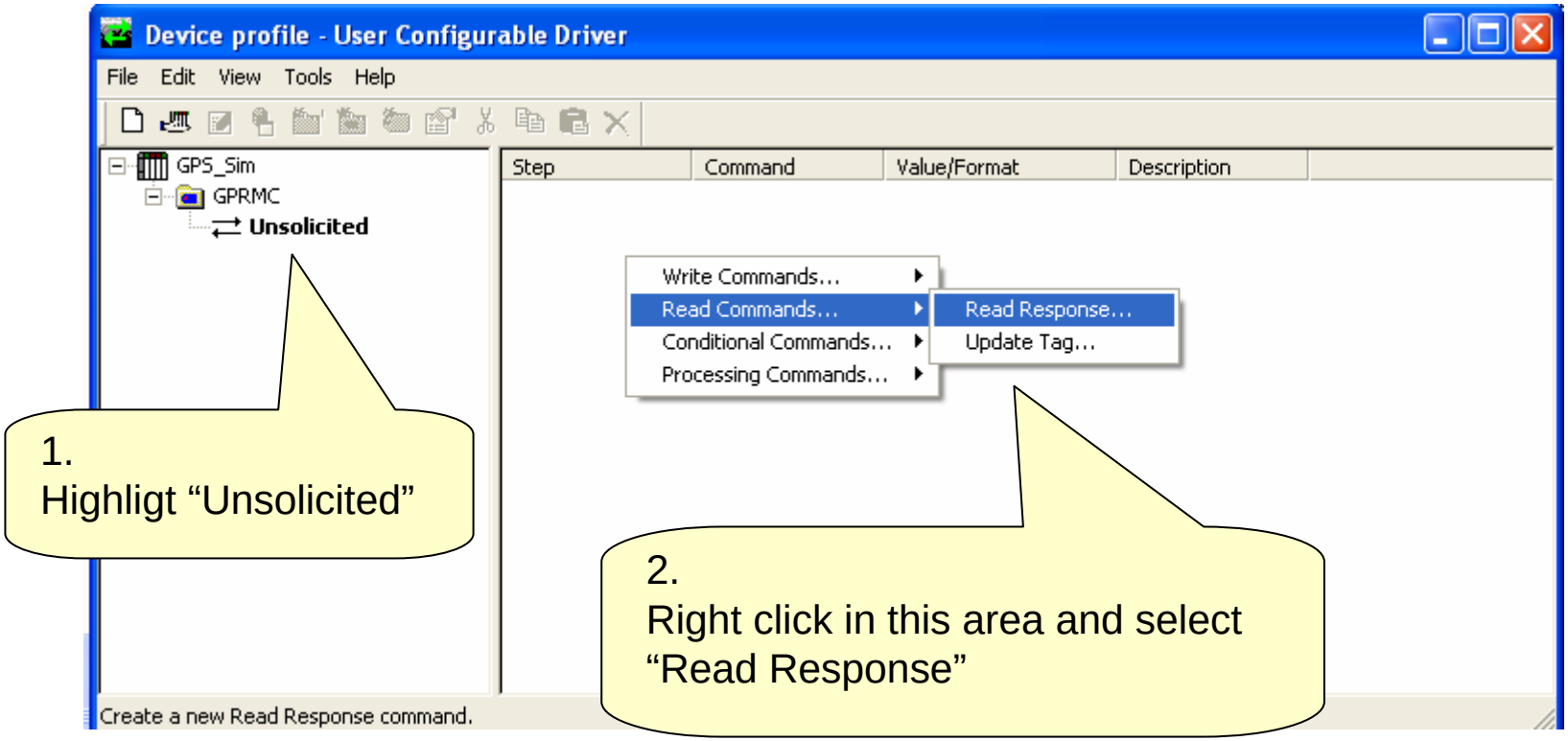


2.
Give the Tag Block a proper name. Since the GPS simulator is set up for NMEA sentences of type RMC, I will call the block "GPRMC" because the definition of the single tags, is closely related to the data order in the specific sentence type

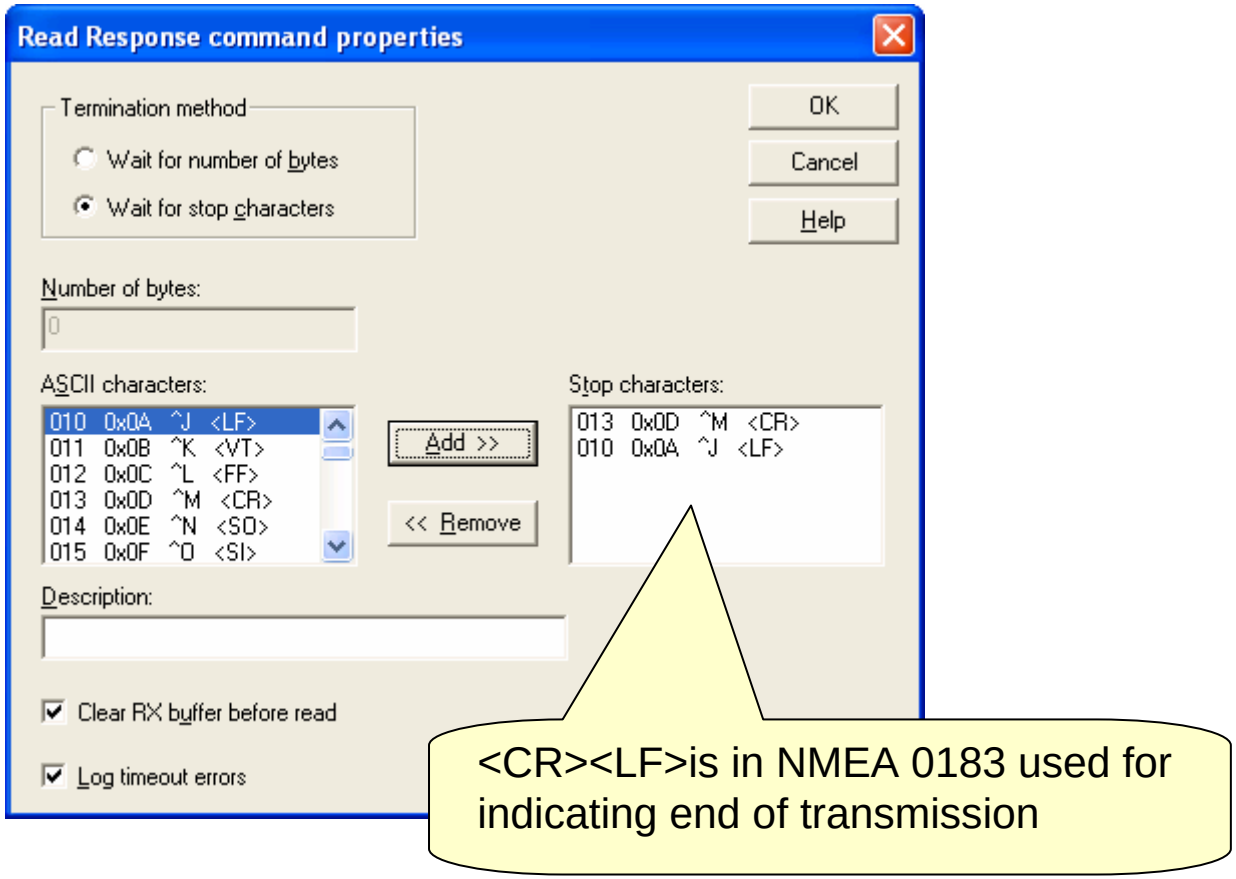
Tag Block defined



Unsolicited - read commands

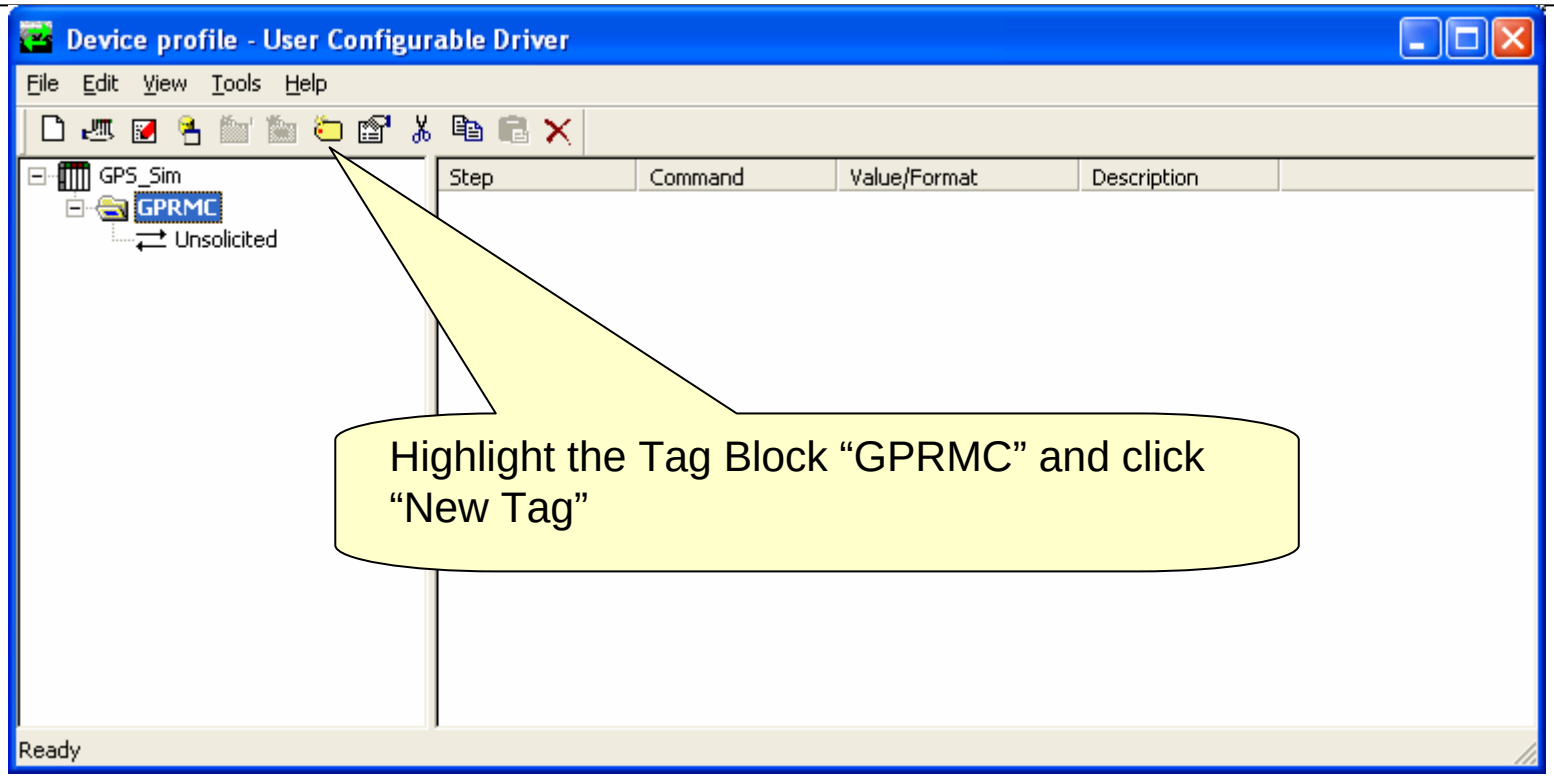


<Carriage return>
<Line feed>



<CR><LF>is in NMEA 0183 used for indicating end of transmission

New Tag



Highlight the Tag Block “GPRMC” and click “New Tag”

Defining tags from NMEA sentences

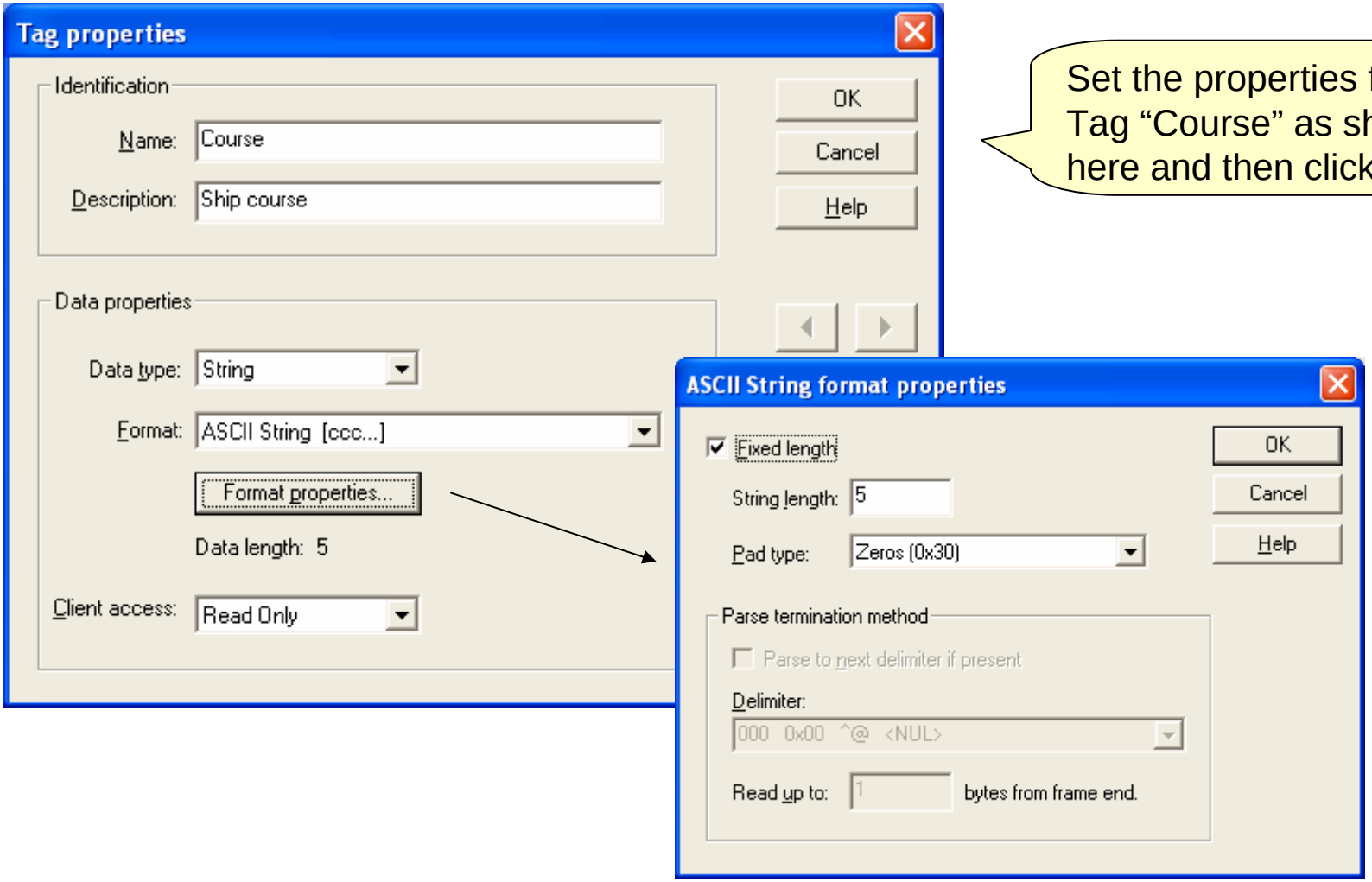
NMEA 0183 RMC sentence

$GPRMC,112424,A,0345.3250,S,14402.8950,E,014.0,202.0,071206,000.0,W*7F

Course
5 bytes starts at place 48

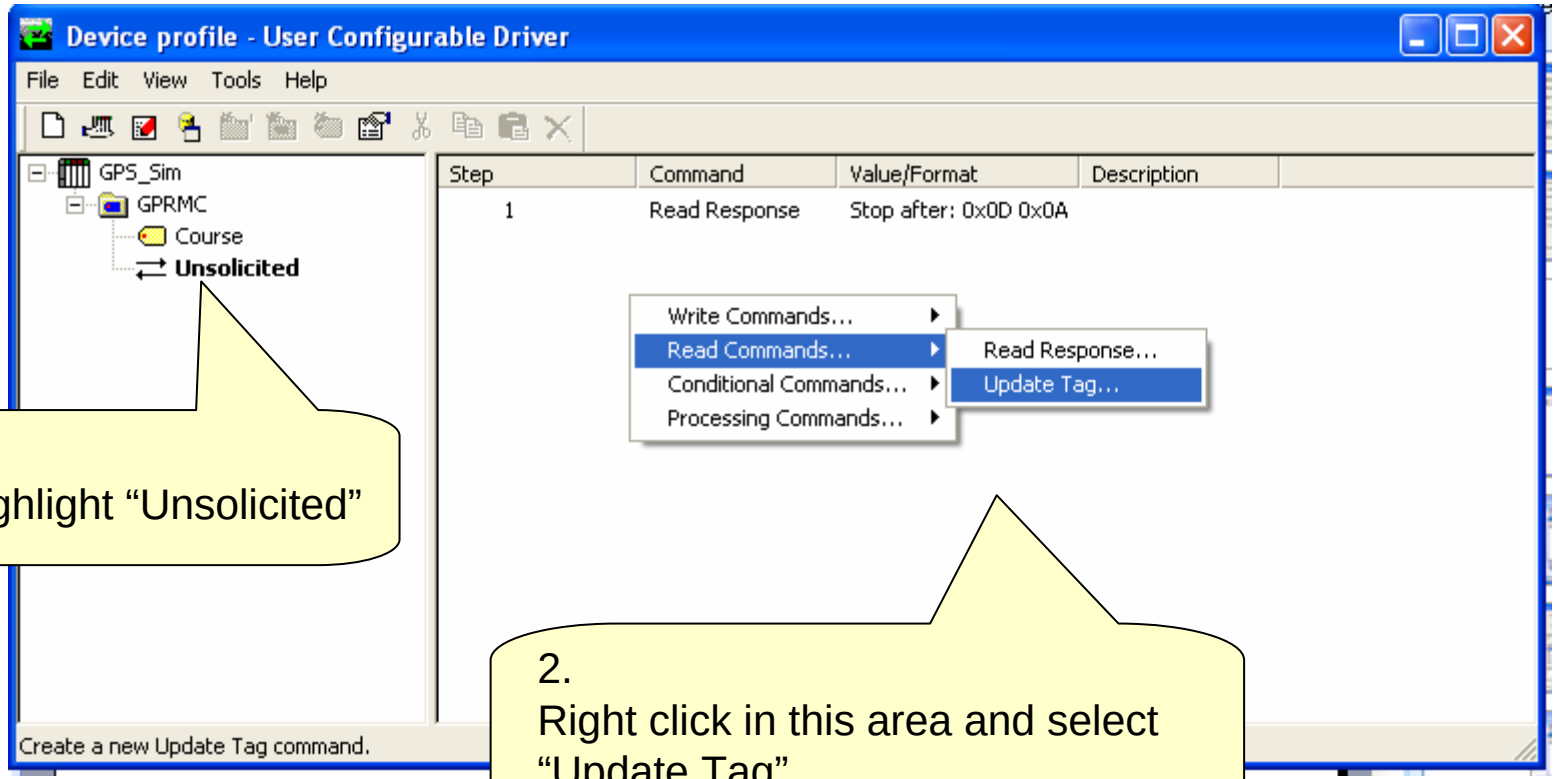
The Tag “Course” is a string consisting of 5 bytes which starts at byte 48

Defining the tag named ”Course”



Set the properties for the Tag “Course” as shown here and then click “OK”

Unsolicited- Update Tag

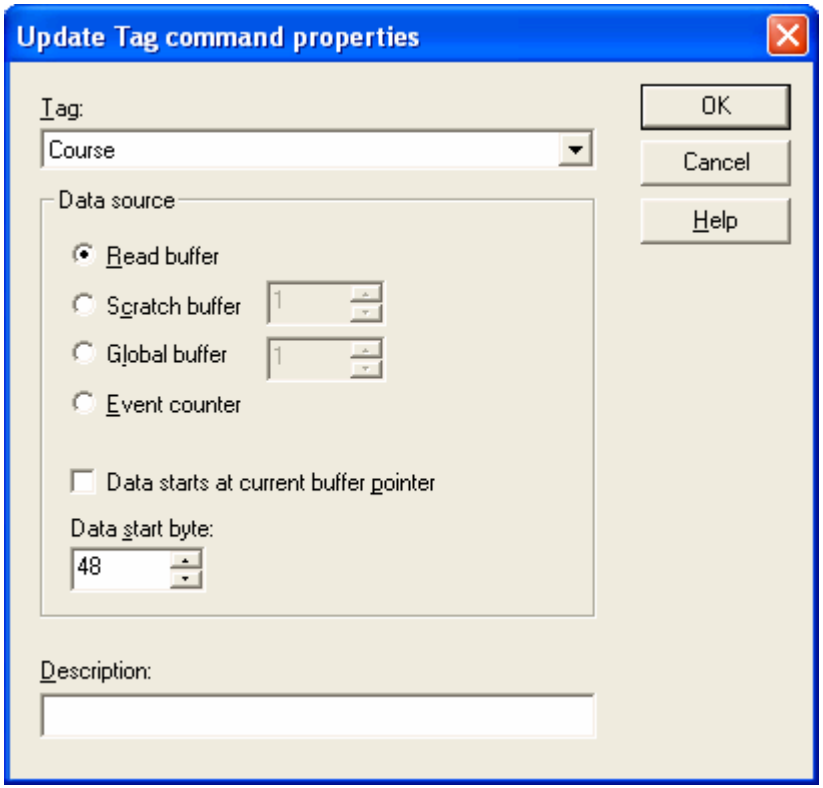


1.
Highlight “Unsolicited”

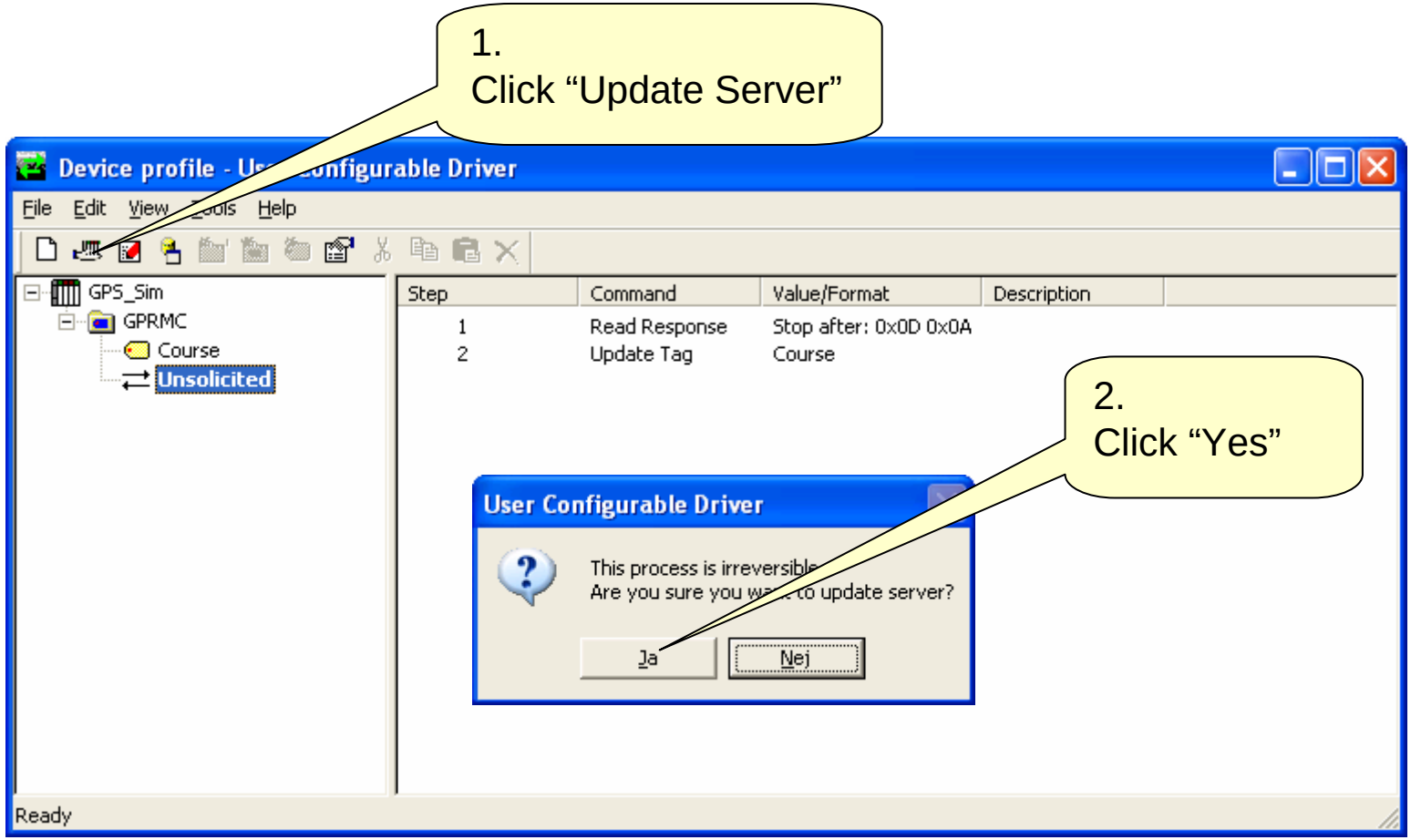
2.
Right click in this area and select “Update Tag”

”Course” Tag

Name: Course
Data start byte: 48

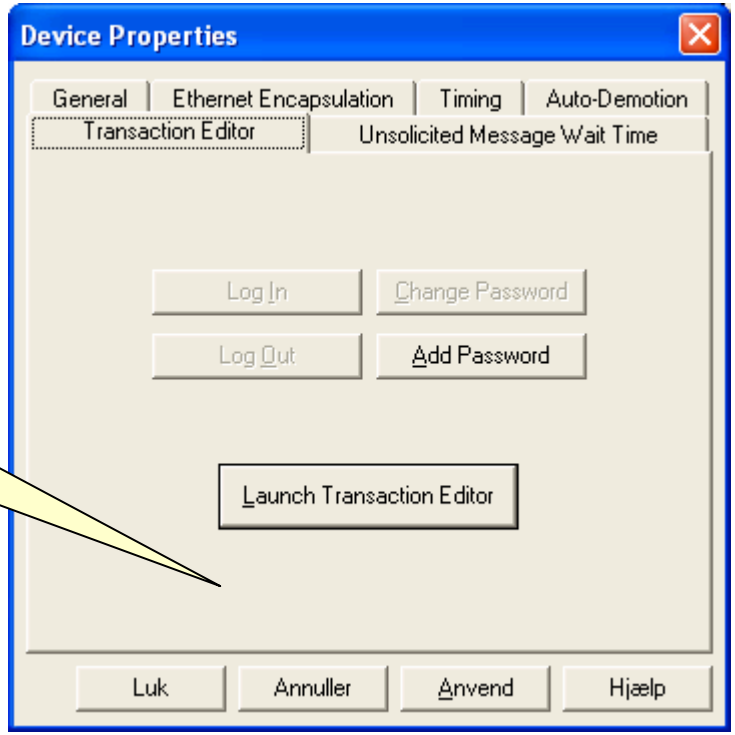


Update OPC server

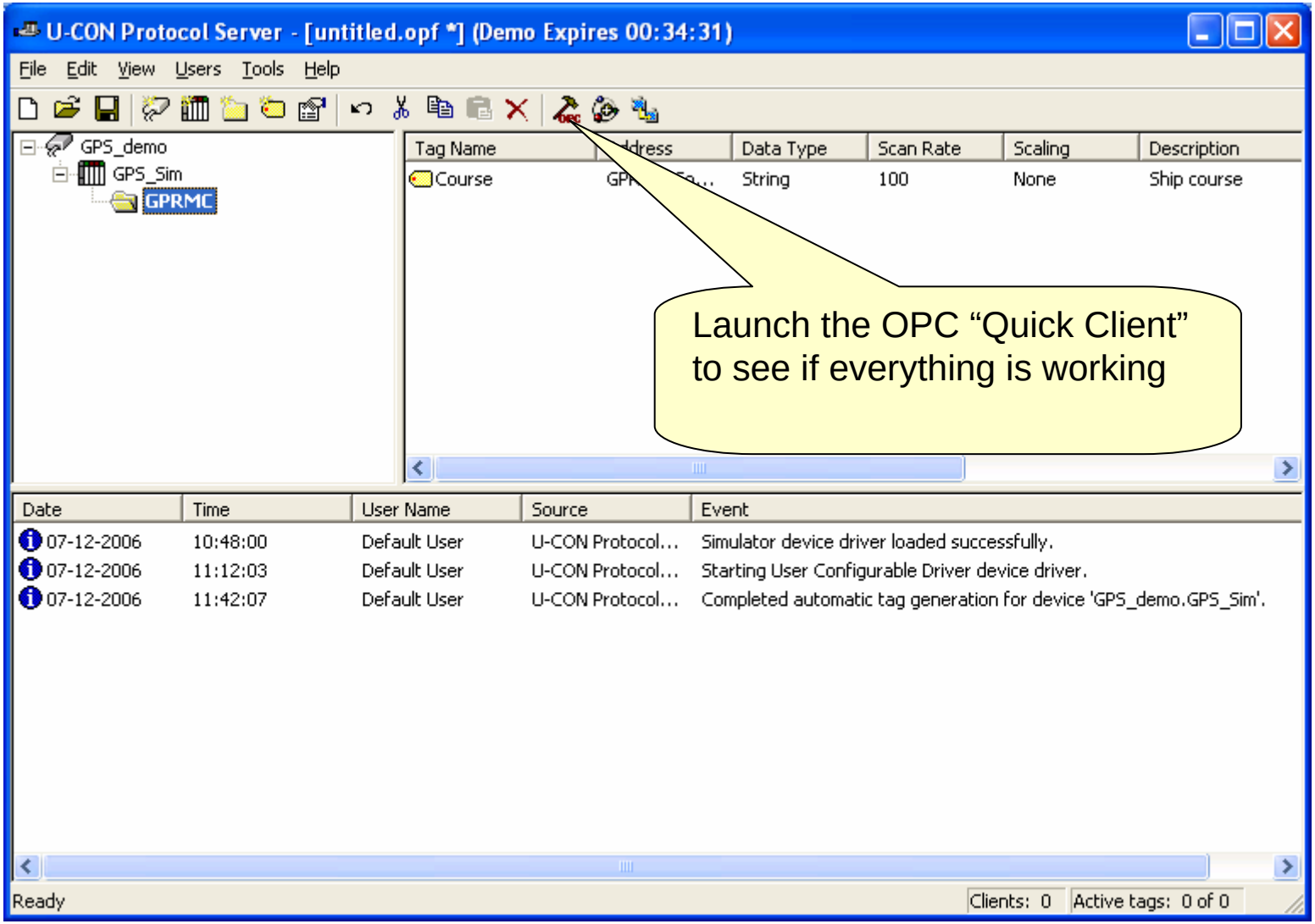


Apply and close

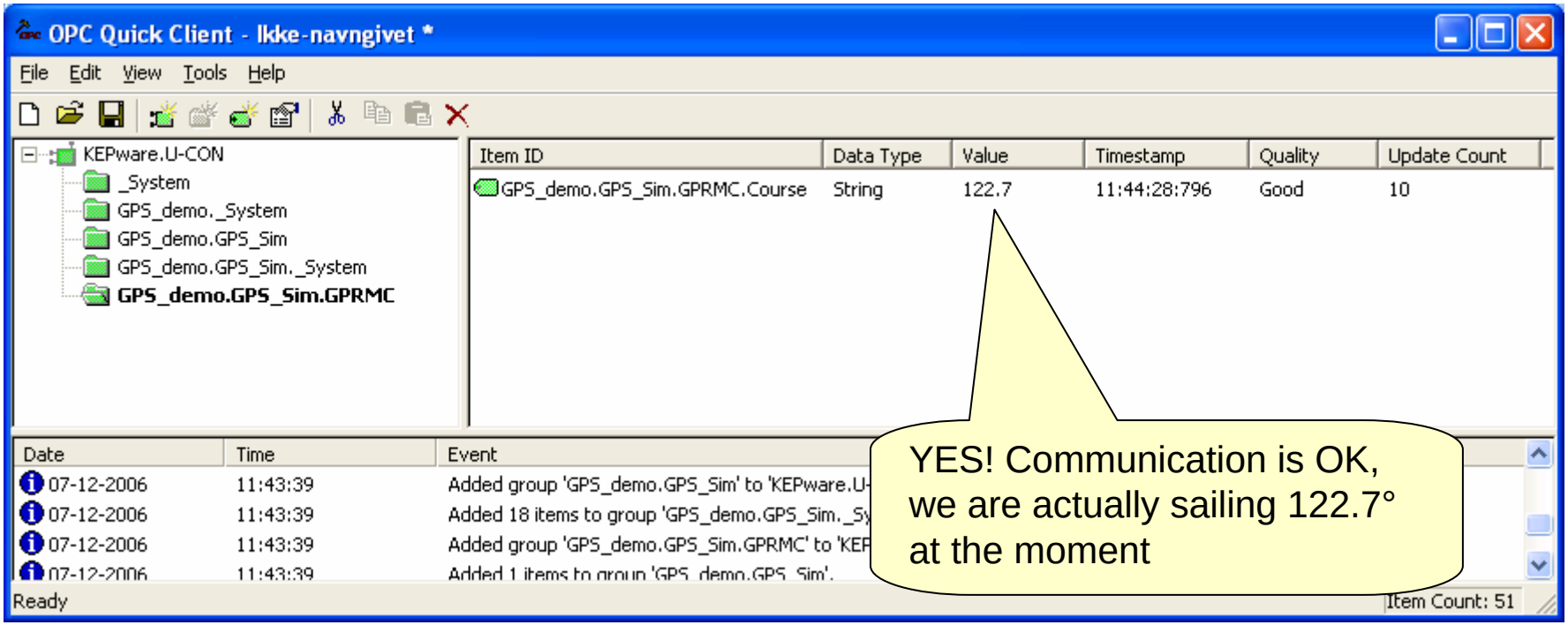
Click “Apply” and “Close”



Launch "Quick Client"



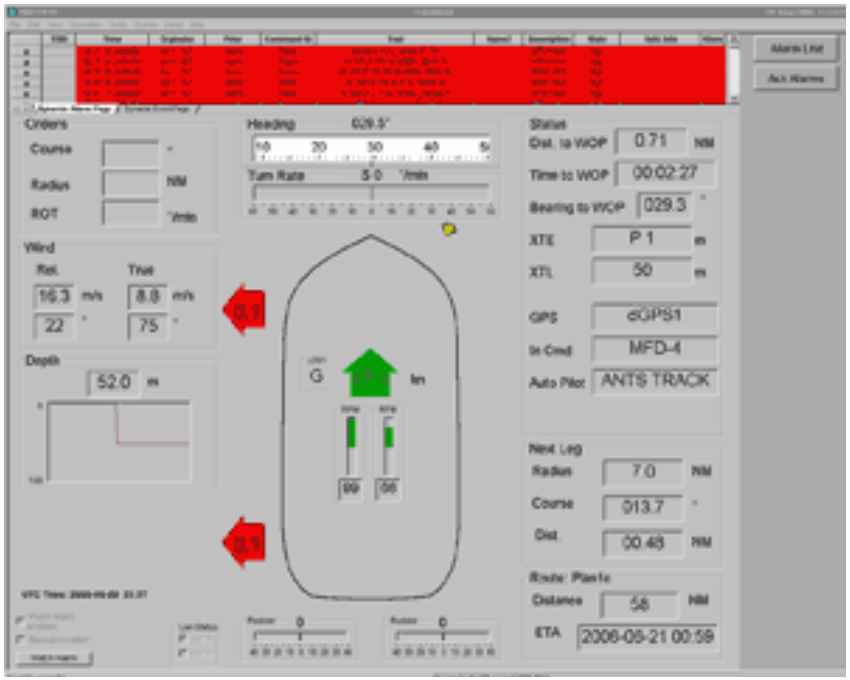
Confirm Simulator value with "Quick Client" output



YES! Communication is OK, we are actually sailing 122.7° at the moment

Conning display

- Final step is creating the ships conning display in the SCADA software, and animating the objects by connecting them to the OPC tags defined in the Kepware OPC server



Source: www.kongsberg.com