SIMULINK AND OPC IN REAL TIME SIMULATION

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Abstract

OPC (Open Process Control) is a standard data exchange technology in industry. This paper shows two ways of data exchange accessing between SIMULINK and a user program via OPC. The second objective is real-time simulation ensuring.

1   Introduction

A problem arises by introduction training of new employees to an industrial technology. Training on a real plant is usually inaccessible and hence companies use trainers. A similar situation predominates in educational sphere because access to a real plane is difficult. Assuming that, a user graphical interface for process monitoring and control is available. The interface should use a standard data exchange protocol. OPC is a standard data exchange technology in industry therefore its using is assumed. A real plant substitute is needful on the other communication side. SIMULINK is a powerful tool for modeling and simulating of complex dynamical systems hence it can serve as substitute of a real plant. Paper sphere of interest is the communication between SIMULINK and user programs together with real-time simulation ensuring.

2   OPC (Open Process Control)

OPC is a series of seven specifications defined by the OPC Foundation for supporting open connectivity in industrial automation. It is based on server – client architecture. Figure 1 illustrates the structure of OPC communication.
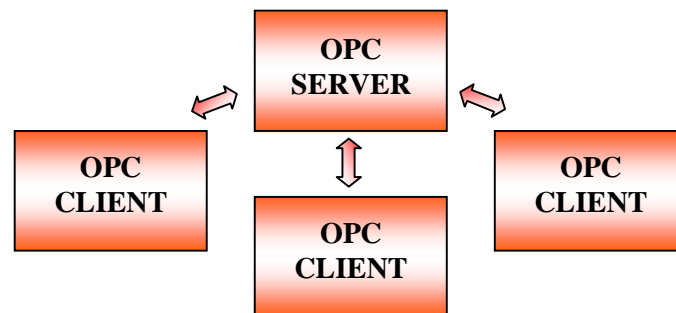

Figure 1: OPC client – server architecture

An OPC Server is identified by a unique server ID. The server ID is unique to the computer on which the server is located. Most OPC servers provide a hierarchical name space, where server items are arranged in a tree-like structure. The fully qualified item ID of a server item is simply the path to that leaf node, with a server-dependent separator. OPC clients connect to items provided by OPC server. Complex information about OPC is available on OPC foundation website [1], information in reduced form is on MathWorks website [3].

3   Solution

Two problem approaches are described in this paper. First solution makes use of OPC toolbox and the second one is based on DDE (Dynamic Data Exchange) technology. The selection of a suitable solution is on a reader.

3.1   OPC toolbox using

MATLAB OPC toolbox ensures pseudo real-time simulation and OPC communication and so it represents a direct solution. The problem can be that most of readers have to buy its license. The OPC toolbox allows working as OPC Client only. A user program acts as OPC client also hence an OPC

server is necessary, as figure 1 shows. A suitable OPC server is offered by MERZ [2]. It is called "MERZ OPC server value keeper" and it can be driven as demo version. The demo version works one hour as full version and it has to be restarted at the expiration. More information and the program are available on MERZ website [2].

An example of OPC toolbox using couldn't be added because we don't have the license. This part is based only on available information from website [3]. OPC server configuration is identical with OPC server configuration in chapter 3.2.2 therefore the OPC server configuration file from chapter 3.2.3 can be used with adapted example which is described in the same chapter.

3.2 DDE using

An alternative to OPC toolbox makes use of DDE technology. This technology is outdated but it is standard supported in MATLAB.

3.2.1 DDE architecture

Applications communicate with each other by establishing a DDE conversation. The application that initiates the conversation is called the client and the application that responds to the client application is called the server. The communication schema is outlined on figure 2. For more information see MathWorks website [3] or MATLAB help [4].

Figure 2: DDE communication architecture

3.2.2 Problem solution

MATLAB can appear as server or client by DDE communication. Using of MATLAB as DDE server can seem as a direct solution because DDE client – OPC server solution is available. Opposite is true. MATLAB has to be driven in automation mode for DDE server creating in this case. There are problems with real time simulations, data accessing etc. by working in automation mode.
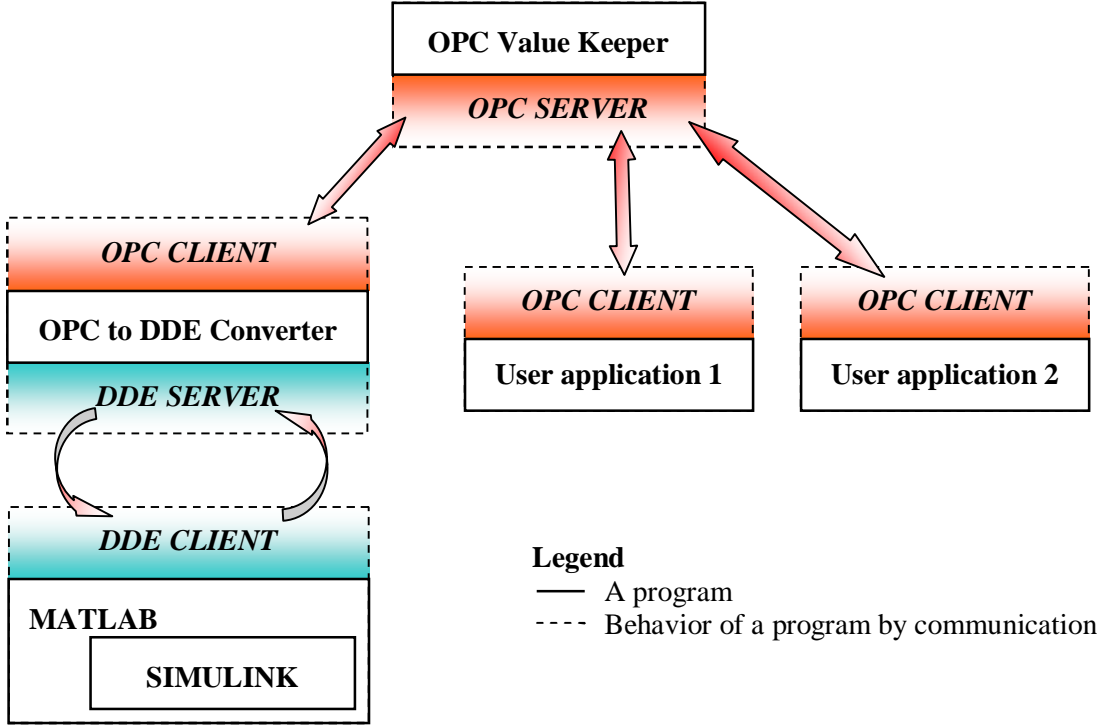

Figure 3: Schema of communication between SIMULINK and user programs by using DDE

Driving MATLAB as DDE client is a more suitable solution. Programs providing DDE server – OPC client conversion are offered, e.g. "MERZ OPC to DDE converter". But our goal is to exchange data between SIMULINK and a user program, so it is necessary to use an OPC server. OPC server offered by MERZ is convenient and it is mentioned in chapter 3.1. "MERZ OPC to DDE converter" and "MERZ OPC server value keeper" are available as demo version on MERZ website [2] where products information is published also. Demo versions work one hour as full versions and they have to be restarted at the expiration. Real-time simulation can be ensured by real-time toolbox in this case. A general schema of suggested solution shows figure 3.

DDE functions of MATLAB are accessible from SIMULINK by S-Functions. A DDE communication SIMULINK library is included on the CD.

3.2.3 Example

There is published an example of using DDE by OPC communication on the CD. The communication is established between SIMULINK model – OPC server – SIMULINK model via OPC in this example on the ground of simplification. A sinus function is output of the SIMULINK model and it serves as data source of OPC server. These data represent also an input of the SIMULINK model and they are taken from the OPC server. The SIMULINK model example is shown on figure 4.
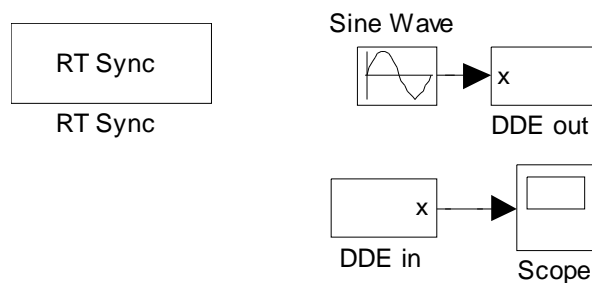
Figure 4: Example of communication via OPC by DDE using

Real-time simulation is assured by Real-time toolbox hence it has to be installed. "MERZ OPC Server Value Keeper" (version 2.01.06.01) was used as OPC Server. "MERZ OPC to DDE converter" (version 2.03.04.06) was used as OPC client and it assures OPC to DDE conversion simultaneously. Their configuration files for this example are included on the CD. Both programs are available on MERZ website [2].

References
[1] OPC Foundation. *OPC specification* [online]. Available on www <http://www.opcfoundation.org>
[2] MERZ. *MERZ products and documentations* [online]. Available on www <http://www.kontron-czech.com/Merz.html>
[3] The MathWorks. *MATLAB documentation* [online]. Available on www <http://www.mathworks.com/access/helpdesk/help/helpdesk.html>
[4] The MathWorks. *MATLAB HELP* [CD, DVD]

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