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TAMPERE UNIVERSITY OF TECHNOLOGY

ASE-9476 Factory Information Systems

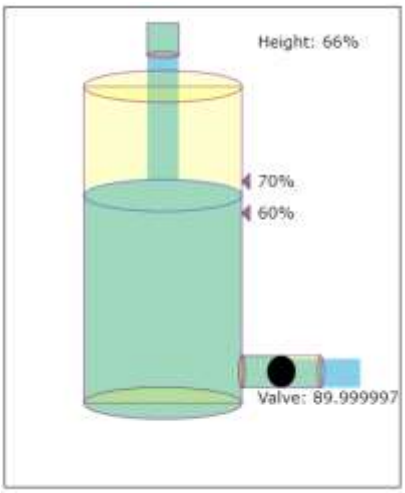
Assignment 2: OPC UA deployment

26th of March, 2018

Objectives

1. Understanding the features of the OPCUA
2. Experience the usage of Hypermedia in web applications

Work description



This Assignment targets the usage of the OPC UA protocol for communicating with a simulated water tank. The water tank, which contains the view and the model layers, is accessible via NPM[1] library. As show in the figure, the tank have continuous inlet flow that fills the tank, a drain to control the level of the tank using a valve. The tank is capable of publishing the level of the water instantaneously. This model then is controlled by an OPC UA server. The students are expected to build the OPC UA client that collects the data from the server and accordingly actuate the valve in the drain to keep the level within the desired levels (60% and 70%).

Steps

1. Create a directory in your drive named as OPC UA.
2. Download the server application from Moodle2 in the created folder. The file named as **app-server.js (DON'T CHANGE ANYTHING IN THE FILE)**
3. Open a terminal or command prompt in the created folder.
4. Type : npm install water-tank
5. Type: npm install node-opcua
6. Once the modules are downloaded, you will be able to run the server by typing node app-server.js.
7. Open the web browser and visit the link : http://localhost:3001/model
8. You should be now able to visualize the tank. At this moment the tank is empty and not filling.
9. Now you need to build your client to control the water level in the tank. The client should:
    a. Discover the server variables (**Level** for reading the water level in the tank, **Valve** fro reading the valve opening ratio) and methods (**setValve** to change the valve opening ratio, **startExperiment** to start filling the tank).
    b. Monitor the level value
    c. Keep the water level between 60% and 70%.

Additional Information and Supporting documents

1. How to configure your IP address in your PC
    a. Windows: https://www.youtube.com/watch?v=BR1Z0jDauJ4
    b. Mac: https://www.youtube.com/watch?v=-l3l1KvRlTo
    c. Linux: https://www.youtube.com/watch?v=rTECO83sK_o
2. How to open a TCP port in your PC
    a. Windows: https://www.youtube.com/watch?v=cbFiWeeMUDI

[1] https://www.npmjs.com/package/water-tank

   b. Mac: https://www.macworld.co.uk/how-to/mac-software/how-open-specific-ports-in-os-x-1010-firewall-3616405/
   c. Linux: https://www.youtube.com/watch?v=KGebpAPSeTs
3. OPC UA module on git: https://github.com/node-opcua/node-opcua
4. OPC UA Commander (Client for debugging): https://github.com/node-opcua/opcua-commander. This commander will help you to check the structure of the server.

Tools and equipment

- NodeJS
- Wireshark
- Text editor
- Web browser

Questions

1. Explain briefly what is the Address Space, what is its importance?
2. What is the difference between Object and ObjectType?
3. Mention the transport mechanisms for OPC UA. Tell in which situations you would use them.
4. Can new transport mechanisms be added in the future?
5. Mention tasks that you can perform with OPC UA services

Deliverables

Each group should submit the following by **1st of March, 2018 23:59**:

- Zip file containing all developed code/scripts (INCLUDING THE NODE-MODULE folder)
- Report in PDF format (10 pages Max) including the following point:
  1. Code description
  2. Challenges and limitations
  3. Answers to the question in this document (questions' section)

It is important to be reminded that each group needs to present the results in person. This will be managed after the submission of the report. Further information will be sent via Moodle regarding this issue.

Grading

This assignment is graded out of 10 points.

Additional Notes

1 extra point as a bonus for the following additional requirements:

1. Build an HTML interface for the application showing the tank level and the valve value. Also the interface should include charts for the historical data of both quantities.

It is important to mention that the bonus marks will be ignored if the main requirement is not achieved.