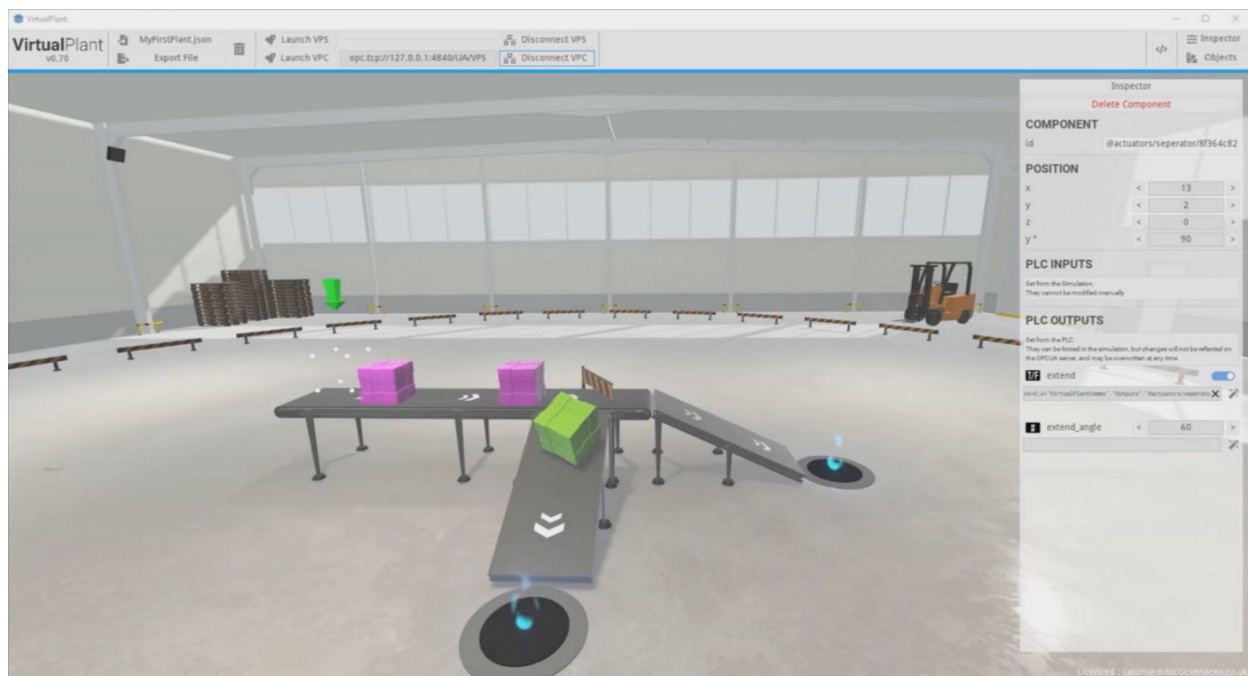


# VirtualPlant — a 3D Factory Simulator - Calumk - Medium

Calum Knott :: 2021/6/5

Thanks to a little time working-from-home at the start of 2021, I decided to embark on a small prototype of a 3D factory simulator.

I had used commercial simulation software before such as [CIROS](#), Siemens NX, and [Factory.io](#). All of them are great software- much broader in scope than this little project — but since all of these are paid software, and I like the challenge of writing software from scratch, i figured i would see what i can come up with myself...



## Goals :

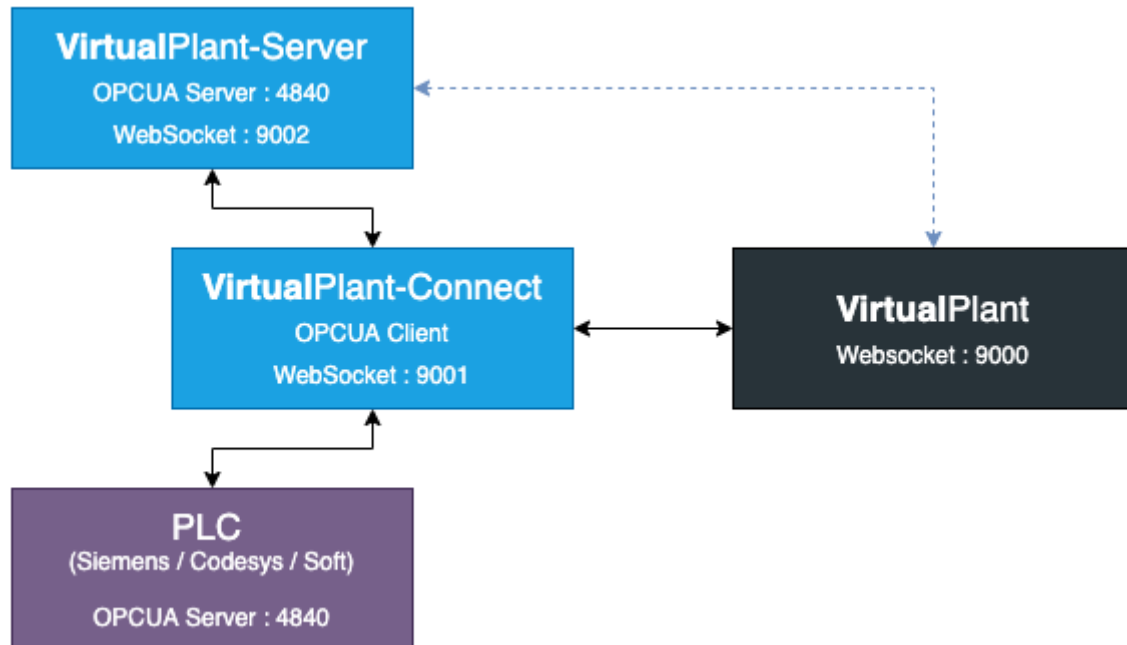
I set myself a few goals to achieve

- Any Physical or Soft PLC with OPCUA should be able to communicate with the virtual environment
- The environment should be physics based
- The environment should be flexible enough to be expandable to multiple use cases

## Tech Stack :

- The engine of choice was [Godot](#). I chose Godot as I had used it a year or so earlier, and it was completely cross-platform, and open-source allowing me to develop on both my mac and windows systems. VirtualPlant will build and run on Windows/Linux/Mac — and is to my knowledge the only Factory simulator to do so.

- The communication to PLC's would be handled by [node-opcua](#). I chose to abstract this to a second language as (1) I had used node-opcua previously (2) Theoretically, the abstraction means future communication drivers can be written without the need to edit the program itself.
- Godot communicates with the drivers via WebSockets
- (Basic) 3D work was completed in blender.



Communication Structure

## Initial Prototypes

Some early test work, getting the physics to behave nicely, and testing a very simple OPCUA driver, which I eventually re-wrote

A little extra eye candy later, and things stopped looking quite so primary-school

## Feature Creep

One shortcoming of this project, is since the end-goal was to “have fun and make something useful” I didn’t really know where to stop.

Once basic conveyors, sensors and gates were implemented, I simply kept going.

I added Robot Arms, With full IK, and a vacuum gripper, so that you can pick place and control the position from your PLC program

I added Liquid Handling (In a limited capacity, including colour mixing

And Finally, I added it all together.

Robots, and Liquid and Boxes full of liquid.

So after a week or so's work, I'm fairly pleased with the software.

It works pretty well, has an integrated OPCUA Server and Client, and could be a useful teaching tool. Unfortunately, as time moves on, I am unable to keep up development of this software — So it will probably sit in limbo for a while, until i work out a good use case.

If anyone has any suggestions, please let me know :)

For now, documentation and more information is available at <https://virtualplant.didacticservices.co.uk/#/>

Please contact me if you would like to give it a try.

TLDR; — I made a Factory simulator