CHEMCAD SUITE – OPC SERVER

OPC SERVER FEATURES

INTRODUCTION

Beginning in version 5.6, CHEMCAD is capable of setting up an OPC server which allows direct data transfer between any CHEMCAD simulation and any OPC client application.

OPC stands for "OLE for Process Control". OPC provides a standard method for different devices and applications to share data. Using OPC, Data can be shared between CHEMCAD simulations, SCADA systems, Data Historians, Distributed Control Systems (DCS), HMI's (Human-Machine Interfaces)

Some now consider "OPC" to mean "Openness, Productivity, Connectivity" because it is a foundation by which plant data can be shared and manipulated.

OPC enabled systems are classified as either OPC Servers or OPC Clients. OPC Servers are either applications or devices which provide data. OPC Clients are interfaces which use and manipulate this data. OPC Clients can connect to multiple OPC Servers at any given time and read and write data to all of them.

APPLICATIONS OF OPC:

Plant Perfomance Monitoring
- o Monitor specific unit performance (heat exchanger fouling, distillation column efficiency, etc)
- o Display performance directly to operation staff on any HMI/SCADA display
- o Inferential / Soft sensor: have values calculated in CHEMCAD (that are difficult, expensive, or impossible to directly measure in the plant) displayed for operation staff (stream compositions, fouling factors, etc)
- o Open or closed loop operation: use any PLC/DCS control loop interact directly with CHEMCAD variables

Real Time Optimization (RTO)
- o Use CHEMCAD's internal optimizer or any proprietary/third party optimizer to improve plant performance based on results of CHEMCAD simulations
- o Open or closed loop operation

Operator Training Systems (OTS)
- o Build CHEMCAD simulations which interact with any 3rd party HMI/SCADA/OTS interface as a rigorous, first principles-based simulated plant
- o Train on generic models or build CHEMCAD simulations that mimic your actual processes

OPC COMPLIANCE

Chemstations is a Member of the OPC Foundation, an organization devoted to maintaining the OPC standards. CHEMCAD is currently being tested for compliance to the OPC DA standards 2.05a and 3.0, and when testing is complete we will mark CHEMCAD as OPC certified.

ENABLING CHEMCAD AS AN OPC SERVER

To enable OPC within CHEMCAD, start CHEMCAD and go to the Misc. Settings option under the File menu. Put a checkmark at the option for "OPC Server". Once that is done, CHEMCAD will register an OPC server named "CHEMCAD.SimulationServer.1" on your machine.

Once you load a simulation, all of that simulations Stream properties and Unitop settings and variables are automatically published as tags to the OPC server's namespace.

Every value tag has a units tag associated with it showing the engineering units the value is reported in. The engineering units may be changed by changing the units within CHEMCAD (Format->Engineering Units).

READING AND WRITING VALUES TO CHEMCAD USING OPC

Using OPC, Values can be read or written to a simulation, and the simulation can be run. Both steady-state and dynamic simulations can be run in this way.

Values are updated to the OPC server whenever CHEMCAD completes a steady state run or dynamic time step. Additionally values may be read. In the case of a dynamic simulation, reading values between time steps will cause the program to extrapolate from the last converged results.

Values may be written at any time. If CHEMCAD is in the middle of executing a time step or steady-state simulation, the values will be held in a buffer until the simulation is converged and then will be written to CHEMCAD.

When values are written to a CHEMCAD stream, the stream is reflashed immediately, and all OPC tags for that stream are updated.

OPC SERVER OPERATIONS

In addition to reading and writing process data to CHEMCAD, it is useful to be able to send commands to CHEMCAD, for example to tell CHEMCAD to start or stop running a simulation.

This is done with a series of flags in the CHEMCAD group of the OPCServer. To use any of these flags write a 1 to flag. CHEMCAD will execute the desired command, and return a value indicating success or failure. A return of 0 indicates the command has completed successfully, a negative return indicates a problem of some kind.

The available commands in CHEMCAD 5.6 are:
- o **Run Steady State**- Runs a steady state simulation. When simulation finishes flag will be reset either to 0 (run converged) or to a negative number indicating the number of errors occurred during run. To view the error message text you must open the CHEMCAD interface directly
- o **Restore to initial state**-Returns a dynamic simulation to time 0. A return of 0 indicates success; a value of -1 indicates failure
- o **Run Dynamic**- Starts a dynamic simulation . A return of 0 indicates success; a value of -1 indicates failure
- o **Run Dynamic One Step**- Runs a single time step of a dynamic simulation. A return of 0 indicates success; a value of -1 indicates failure
- o **Set Initial State** –Sets the current process conditions as the time 0 conditions, overwriting the previous time 0 conditions. A return of 0 indicates success; a value of -1 indicates failure
- o **Stop Simulation**- Stops a dynamic simulation. A return of 0 indicates success; a value of -1 indicates failure

CHEMCAD OPC NAMESPACE

An OPC Namespace defines and organizes all the available commands and data. OPC namespaces are divided into groups, and each group has items within it. Items are sometimes referred to as tags. The groups in CHEMCAD's OPC Namespace are organized as follows:
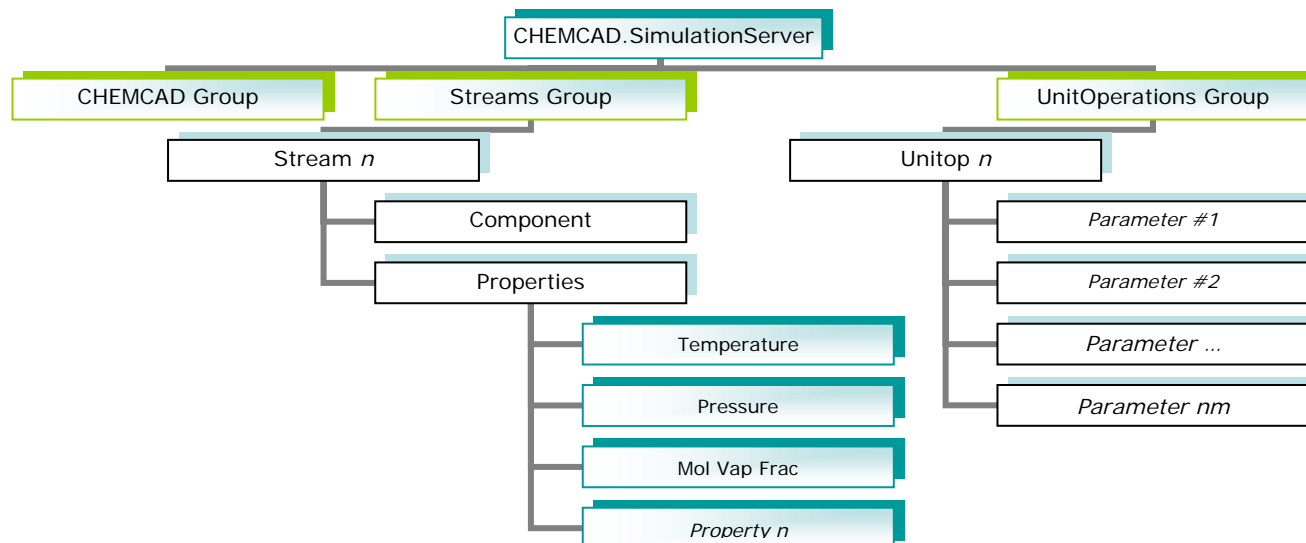
Note: most of the data items in a simulation have engineering units associated with them. In these cases we usually define set out 2 separate tags, one containing the data value, the other containing the units string. All units strings are read only from OPC. The units string are governed by the settings inside the simulation

CHEMCAD.SimulationServer- The OPC Server Name. By convention this name is followed by a version number, e.g. "CHEMCAD.SimulationServer.1" to indicate the OPC Server version. This is the server name the OPC clients will connect to.
- o **CHEMCAD**- This group contains any information which is not dependent on streams or unitops and all run commands
- o **Streams**- This group contains a series of subgroups, one for each stream on the flowsheet numbered by stream ID number
  - o Stream n-This group contains all data pertaining to this stream. Some of the data items in the group are writable by OPC, and writing any of them will update the rest of the OPC data for example in the Properties subgroup.
    - ▪ Tags:
      - Enthalpy Units/Enthalpy Value- The value of that stream's enthalpy, and the Units string this value is in (read only)
      - Mole Vap Fraction-The stream's mole vapor fraction. (read only)
      - Temperature Units/Value-The stream's temperature and units (read/write)
      - Stream name-A string displaying the stream label (read only)
      - Pressure Units/Value- The stream's Pressure and units (read/write)
      - Total Flowrate Units/Value- the streams total flowrate and units (read/write)
      - Components-A subgroup containing data on the stream composition. All tags in this group are read only.
        - o Tags:
          - ▪ Flow Units- A string showing the component flow units
          - ▪ 1-n {component name}-each components flowrate is listed in order of the component list, using the units shown in the Flow Units tag.
      - Properties-A subgroup containing the streams calculated properties. All tags in this subgroup are read only.
- o **Unit Operations**- This group contains a series of subgroups: one for each unitop on the flowsheet, numbered by unitop ID.
  - o Unit n-this group contains all data pertaining to this unitop. Most of the data items are read/write, allowing you to make changes within that unitop.
    - ▪ Tags:
      - ID- the integer ID number for this unit (read only)
      - Label-a string displaying the unitop label (read only)
      - TYPE- a string indicating the type of unitop this is (HTXR, SCDS, etc) (read only)
      - Parameter 1-n:Each data item in a unitop gets its own subgroup showing the parameter name. The Values are all read/write, the units strings are read only.