

Saia PCD® Supervisor

Guidance for Large Scale Systems



1. INTRODUCTION

When specifying Saia PCD® Supervisor for use with larger BEMS sites or multiple sites it is important to configure the system correctly, in order to provide optimum system performance. This document provides best practice guidance on assessing performance criteria, choosing the appropriate hardware (system architecture) and techniques for configuring Saia PCD® Supervisor in large scale systems.

What is a Large System?

There is no specific definition for what constitutes a large system. In simple terms a large system may be considered to be one that has a large number of points, e.g. in excess of 150,000. However, many other factors also need to be taken into consideration such as the number of:

- networks/sites (SBC or third party),
- communication drivers,
- PX pages,
- histories (including Niagara history extensions),
- alarms and alarm querying,
- analytics points,
- linked points,
- concurrent users.

Why is this important?

Ultimately Saia PCD® Supervisor is a processing engine and any requirement to move or process data within a system places a demand on the available processing power. Thus as the demand for data processing increases the capacity to process that data in a timely manner is reduced, which could eventually affect performance efficiency and result in a sub-optimal user experience.

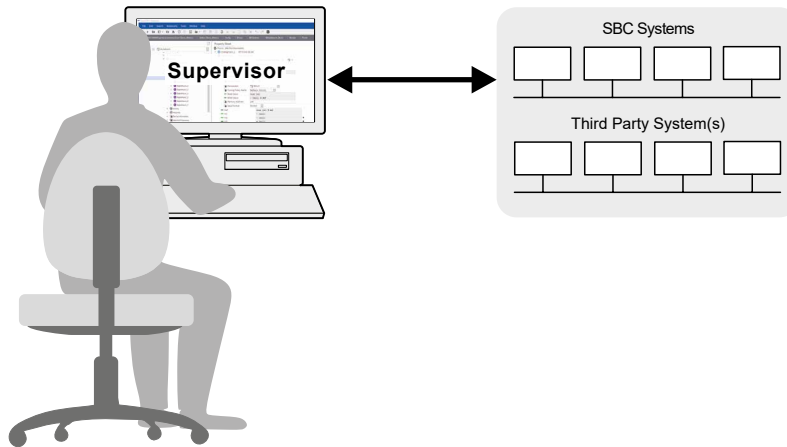
Typical symptoms of poor system performance include:

- slow response times (e.g. PX pages slow to display),
- point value/status slow to update,
- point read/write operations are slow,
- station keeps restarting (watchdog),
- station is slow to start or may not start at all,
- Saia PCD® Supervisor does not respond (memory errors appear in the console output).

To avoid these issues both Saia PCD® Supervisor and the BEMS (regardless of size) should always be configured using appropriate best practice. In addition, larger systems can be engineered to spread the processing overhead across multiple Saia PCD® Supervisor servers.

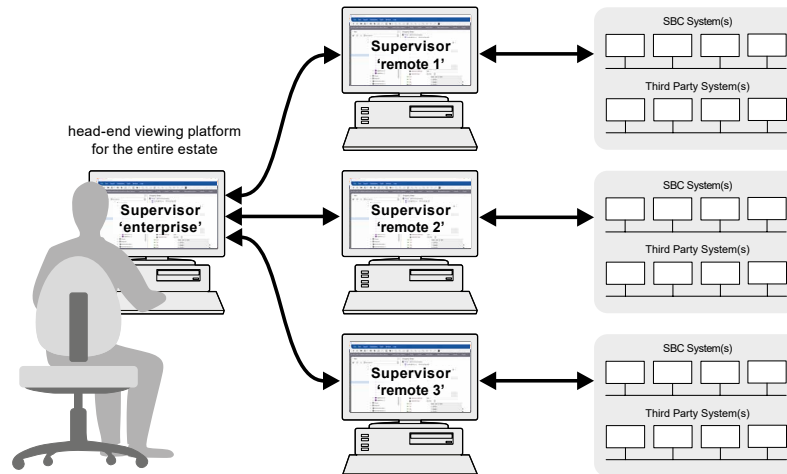
Large System Expansion - the basic principle

In typical small and medium sized systems a single instance of Saia PCD® Supervisor pulls in data from the required points and histories, and allows end users to monitor and interact with the system.



For larger systems, where the number of points (or other processing demands) suggest that greater processing power will be required, the system can be split between two or more instances of Saia PCD® Supervisor.

In the following large system example, each 'remote' Saia PCD® Supervisor handles a proportion of the site(s) points, alarms and histories, etc. Essential data is then pulled into an overall 'enterprise' Saia PCD® Supervisor that provides essential 'top level' information to the end users:



There are many different ways to split up a large installation. You should aim to configure each 'remote' Saia PCD® Supervisor station to have a near equal share of the processing overhead. For example, by allocating each PC to a separate floor or building, or dividing up the number of points or LANs. Remember to take account of any slower connections to remote sites or slower network media.

When designing a large scale system a few basic principles should be followed:

- Reduce the need for inter-Saia PCD® Supervisor communications by ensuring each Saia PCD® Supervisor manages as much of it's own discreet part of the overall system as possible.
- Consider how users will navigate the overall system and ensure that labels of stations, networks, sites, etc. are unique across the entire installation to avoid any confusion, e.g. when any alarms or histories are aggregated at a higher level.
- Aggregate as much data as possible within each Saia PCD® Supervisor before it is passed 'up to the enterprise station, e.g. by performing any analytics within the same Saia PCD® Supervisor that is collecting controller histories.

2. BEST ENGINEERING PRACTICE FOR ALL SYSTEMS

Whether you are engineering a large, medium or small system there are a number of important factors that must be considered to ensure that the system works as efficiently as possible. These include:

- PC Specification
- SBC System Communication
- Alarm Handling
- History / Plot Setup
- Point Usage

The following sections provide some best practice advice to get the best performance from any size system.

2.1. PC specification

When choosing a PC to run Saia PCD® Supervisor it must always meet the minimum specification as set out in the SBC Data Sheet (34-001). In addition, to provide the best possible performance, we recommend that:

- **A solid state drive (SSD) is used**
The speed of disk access provides the greatest overall benefit to PC performance.
- **As much RAM as possible is installed**
Aside from speed of disk access, memory size provides the next biggest increase to performance.
- **The PC is dedicated to running Saia PCD® Supervisor**
Using the PC to run other software applications at the same time will reduce system resources available to Saia PCD® Supervisor. If you intend using SQL Server alongside Saia PCD® Supervisor then you must check that the PC specification is suitable for both applications.

2.1.1. Saia PCD® Supervisor memory allocation

Saia PCD® Supervisor requires an allocation of RAM – this is known as the NRE (Niagara Runtime Environment) or JAVA heap size. With larger sites it may be necessary to increase the default value, to ensure that the software and station run smoothly. As a general rule it is recommended that you allocate 50% of the available RAM to Saia PCD® Supervisor. For example, on a PC with 64 GB RAM you should allocate 32 GB for Saia PCD® Supervisor, leaving 32 GB for the Windows™ operating system.

Refer to the Saia PCD® Supervisor Configuration Manual (27-651) for further details.

2.2. SBC system communication

- **Be aware of the communication drivers types and bandwidth limitations**
The speed of different network types (e.g. Ethernet, LON, BACnet) will have an effect on performance.

2.3. Alarm handling

- **Keep the number of alarms as low as possible**

Saia PCD® Supervisor has an alarm database that can accommodate up to 250,000 alarm records. Once that limit is reached the oldest alarm records will be deleted to make way for newer alarms. You should, therefore, always aim to process only alarms that are useful. Nuisance alarms should, wherever possible, be prevented from occurring in the first instance by good system commissioning. Where this is not possible make use of the alarm filter 'dump' option to prevent unwanted alarms from being added to the alarm database.

- **Alarm delivery**

It is preferable to have alarms delivered over IP to Saia PCD® Supervisor to reduce traffic on the Local Network.

- **Alarm console configuration**

By default alarm consoles are configured to show all alarms. This can result in a large amount of data being processed, making the console slow to load and increasing network traffic. Setting the default to a small time frame (e.g. 'last week') will make the initial loading quicker.

2.4. History / Plot setup

- **Set a limit on the history database size**

By default the history database is set to be unlimited. As a result, unless a process has been put in place to archive records that are no longer required, the available storage space will become an issue. Also, the more records that there are in the database, the longer it will take for any services to query or analyse history data, e.g. analytics and charts. Be aware that if a limit is set, then an appropriate backup/archive scheme must be implemented to avoid older records being overwritten once it is full.

- **Set up History Service correctly**

Choose a suitable collection interval to avoid large numbers of plots downloading at the same time, or preferably make use of alarms to trigger data collection only when necessary.

- **Keep the overall number of histories as low as possible**

Try to avoid having histories that have no real value in monitoring system behaviour.

- **Avoid using too many Niagara history extensions**

Each history extension will trigger a continuous background refresh for the associated point. Large numbers of extensions will generate a significant amount of network traffic.

2.5. Point usage

- **Keep the number of points as low as possible**

Having points that are not used in system monitoring waste system resources and add to the licensable point count. Always make use of the Easy Database Manager to assist with the removal of unwanted/unused points.

- **Avoid having a large number of points on PX pages**

Opening multiple pages containing large numbers of points will create additional network traffic.

- **Avoid excessive use of Niagara point linking and analytics**

Linking a point in Niagara will trigger continuous background refresh for that point. Large numbers of linked and analytic points will have a significant impact on network traffic and processing resources.

3. CONFIGURING AN EXPANDED SYSTEM

Install Saia PCD® Supervisor on each remote PC and the enterprise PC and ensure that they are licensed correctly.

Commissioning a large system must then be accomplished by following these steps:

- Set up each Saia PCD® Supervisor remote station
- Add the remote stations to the enterprise station
- Make PX pages on remote stations visible on the enterprise station
- Add required points from remote stations to the enterprise station (optional)
- Configure remote stations to send alarms to the enterprise station
- Add required histories from remote stations to the enterprise station
- Create new PX pages on the enterprise station (optional)
- Set up system database service to create a Hierachy view
- Set up a single-sign-on (SSO) scheme (optional)

A brief description of each step is provided below. For full details of specific procedures please refer to the Saia PCD® Supervisor Configuration Manual or Niagara Help.

3.1. Set up each Saia PCD® Supervisor remote station

Refer to the Saia PCD® Supervisor Configuration Manual for full details of building a site and configuring the station, e.g. adding users, creating PX pages, setting up analytics, etc.

3.1.1. SBC Site Naming

It is important when setting up histories that each history has a unique ID (ord). By default, when adding SBC sites, Saia PCD® Supervisor names each site in the format SITE00001, SITE00002, etc., creating the possibility of duplicate history ords. It is recommended, therefore, to rename all SBC sites to have a unique site name – this must be changed before adding histories. In the Nav tree, right-click on the site (under SBC Systems) and select **Rename**.

3.2. Add the remote stations to the enterprise station

- On the enterprise PC, discover or add the remote Saia PCD® Supervisor stations under the **Niagara Network**.
- In the **New** dialogue box enter the **Username** and **Password** for the remote station and set **Virtuals Enabled** to true.
- In **Certificate Management** go to the **Allowed Hosts** tab and approve each of the remote stations.
- On each remote PC, go to **Certificate Management**, select the **Allowed Hosts** tab and approve the enterprise station.

3.3. Make PX pages on remote stations visible on the enterprise station

By default, PX pages on the remote stations are not viewable on the enterprise PC. If users of the enterprise station will require access to any PX pages you will need to follow this step on each remote station:

- In the **Niagara Network** property sheet, under **Virtual Policies**, set Import **Virtual Px Files On Demand** to true.

Note: This process provides a link to the PX page in the Nav tree – the PX page contents/points are not duplicated on the enterprise station.

3.4. Add required points from remote stations to the enterprise station (optional)

- On the enterprise station, discover or add any points from the remote stations that are required for PX pages or analytics on the enterprise station.

Note: Take care to only add important/relevant points to the enterprise station.

3.5. Configure remote stations to send alarms to the enterprise station

- On each remote station go to the **Alarm Service** wiresheet, add a **Station Recipient** and configure it to send alarms to the enterprise station.
- Link the **Station Recipient** to the required alarm class(es).

Note: Take care to only send important/relevant alarms to the enterprise station.

3.6. Add required histories from remote stations to the enterprise station

Any histories linked to points on PX pages on the remote station(s) will need to be discovered and added to the enterprise station.

3.7. Create new PX pages on the enterprise station (optional)

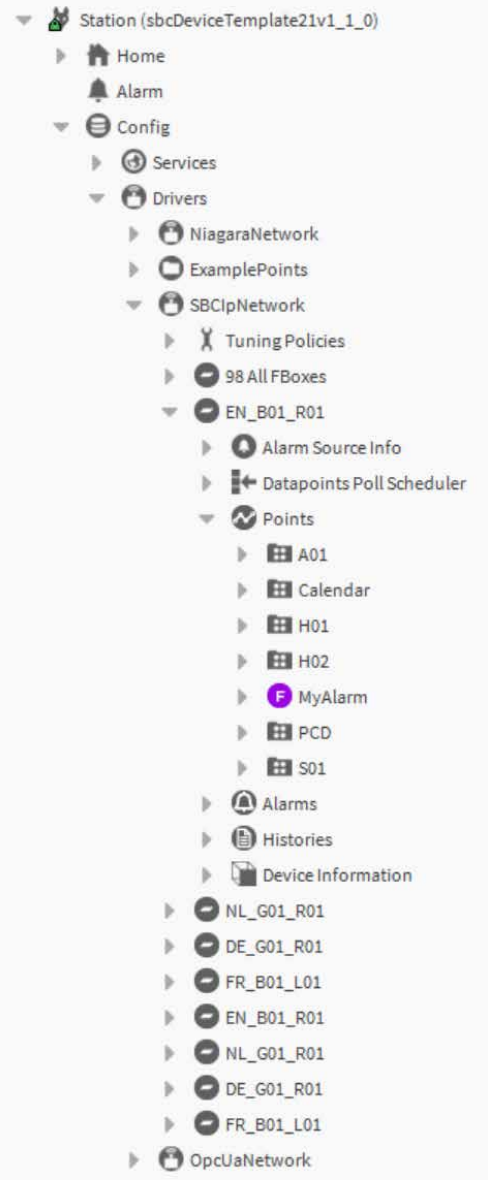
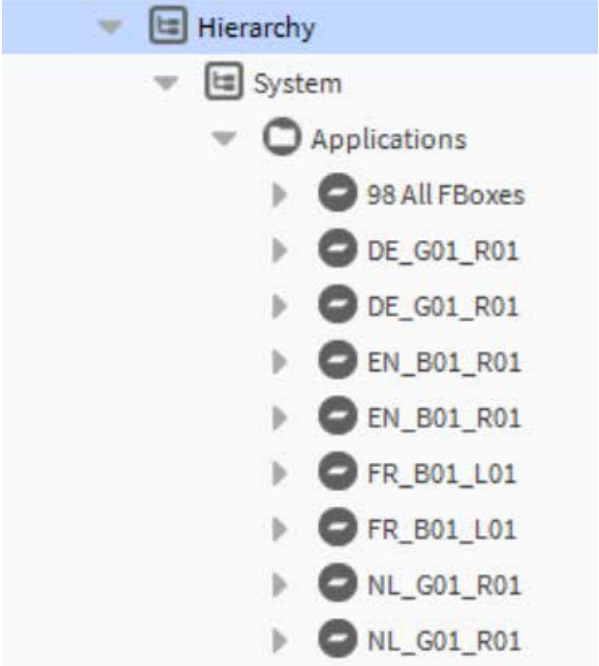
- Create overview PX pages as required for any points that you added in step 3.4.

Note: If required, Niagara alarms, histories and analytics can also be configured.

CONFIGURING AN EXPANDED SYSTEM

3.8. Set up system database service to create a hierarchy view

Setting up a Hierarchy can greatly simplify the navigation around the system by reducing the folder levels, and consequently the number of mouse clicks, to drill down through the network:

Standard view example:	Hierarchy view example:
	

3.9. Set up a SINGLE-SIGN-ON (SSO) scheme (optional)

It is recommended that an SSO scheme is implemented allowing users to login once on the enterprise Saia PCD® Supervisor and also be able to access data on the remote stations as well as navigate to the remote stations when needed. Such a scheme also improves system security and simplifies the management of users.

For further details on setting up SSO refer to the Niagara Help.

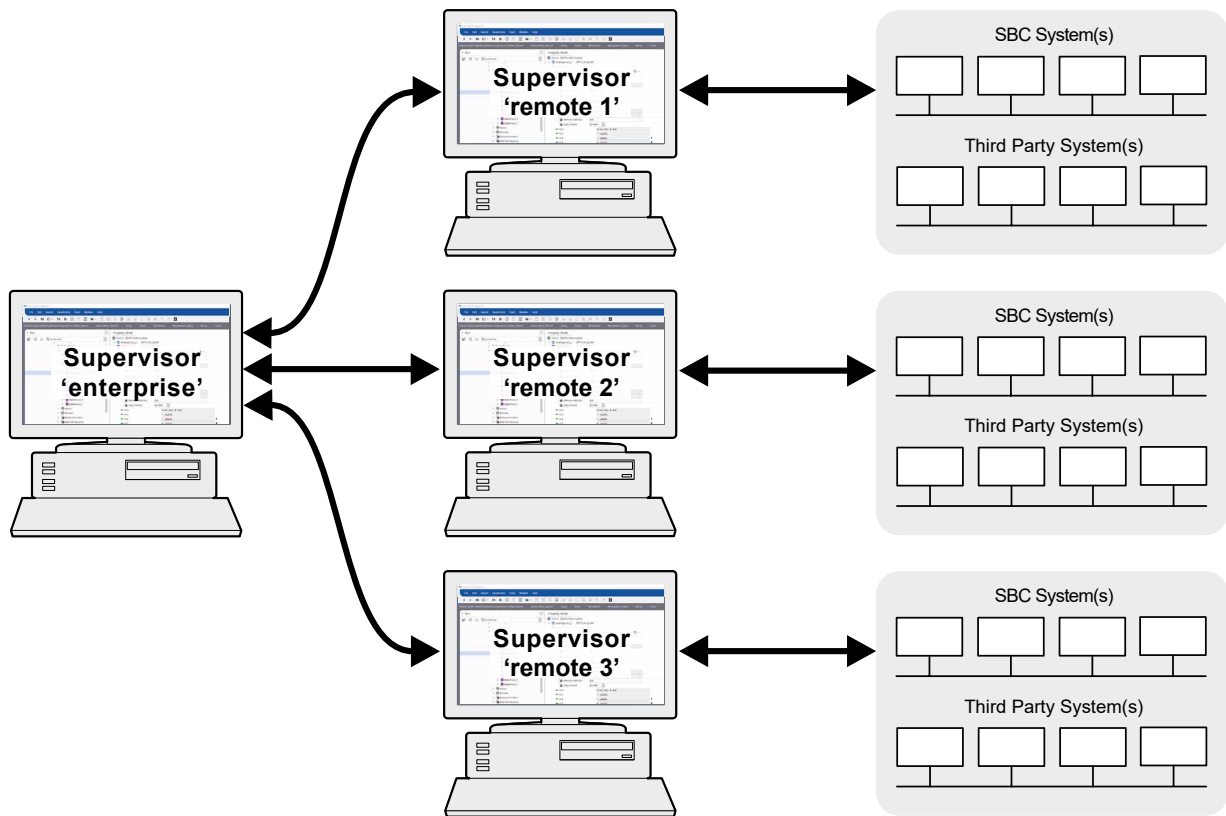
4. EXAMPLE OF A LARGE SCALE SYSTEM

The following example is a requirement for a large system that is capable of delivering:

- 1 million + points
- 210 k plots*
- 3000 time schedules
- 10800 alarms per day*

*using the standard Niagara database

The diagram below demonstrates the recommended topology and settings used to meet this requirement. This was replicated in our laboratories using simulated Saia PCD controllers and networks. The figures provided here are for guidance only and do not constitute a guarantee of satisfactory performance in all cases.



Enterprise station	Each remote station
configured with: <ul style="list-style-type: none"> ● SSO ● overview PX pages ● high-level analytics ● hierarchy viewer for ease of navigation to individual systems using System DB Service ● alarms from remote Saia PCD® Supervisor stations ● key histories imported from remote stations 	configured with: <ul style="list-style-type: none"> ● 5 sites per Saia PCD® Supervisor ● 2 LANs per site ● 100 participants per LAN ● 350 k points (70 k points per site) ● 70 k plots* (14 k plots per site) - daily execution ● 1000 time schedules (200 schedules per site) - daily execution ● 1000 time sync operations - daily execution ● 3600 alarms per day* ● 1 PX page containing 100 points

*using the standard Niagara database

Note: Although tested using simulated only SBC systems, this configuration could accommodate other third party networks, e.g. PCD3.M6860, PCD3.M6893 and BACnet, without affecting the overall system performance.



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