

J-201 Resource Capacity Guidelines and Sample Application Analysis

J-201 Resource Capacity Guide

Introduction

This document has been prepared to help you understand the capacity and horsepower of the JACE-201E and JACE-201E-L products so that you can effectively plan and estimate projects.

The capacity of the standard JACE-201 is primarily limited by the horsepower of the processor (an IBM PowerPC 405EP processor running at 250 MHz) and the amount of memory (64MB SDRAM & 64 MB Serial Flash). In general terms, the J-201 has about 60-70% of the processor power of a JACE 4, and about 30% of the memory available for your application.

The JACE-201E-L is a lite version having a reduced capacity limited by license. Typically the license will limit the application before memory or processor capacity limits become effective. Different components that make up a station are allocated a score called a Resource Count. This measurement has no direct relationship with memory or processor capacity, but is a measure of usage of integration and control logic. A tool called a Resource Estimator is available in the AX Workbench that can calculate Resource Count without having to create a station. The JACE-201E-L limits the station capacity in two ways

- integration drivers are limited to 200 points each
- total station Resource Count is limited to 450 kRU

The Workbench can show the Resource Manager view of a station which provides current status of both memory and processor resources, as well as the Resource Count.

Like all JACEs, there is no hard, pre-defined limit on the amount of points, devices, graphics, that you can create in your application. The hardware capacity is the limitation. Different application scenarios will consume resources in different ways.

This document provides some guidelines based on typical application configurations, which we have tested as part of the JACE-201 release process. It is provided for reference purposes only. As they say “your actual mileage may vary”.

J-201 Resource Capacity Guidelines and Sample Application Analysis

Note on using graphic image files with JACE 2.

Note: Only “jpg” and “gif” graphic files may be used in the J-201. Do not use “png” graphic files in J-201 applications. Internet Explorer (IE) does not support 8-bit alpha channels in PNG images. However, there is a special IE-only filter Tridium uses to fix this, but it requires knowing the size of the image. Determining the size of the image in turn requires loading the image from the flash memory into system memory. Therefore, for performance reasons, Niagara AX Framework caches the loaded images in system memory. Because of the lower amount of available system memory in J-201's, loading these images into cache is unacceptable.

J-201 Resource Capacity Guidelines and Sample Application Analysis

1 J-201 Specifications

1.1 Platform

IBM PowerPC 405EP 250 MHz processor
64MB SDRAM & 64 MB Serial Flash
Battery Backup
Real-time clock

1.2 Communications

2 Ethernet Ports – 10/100 Mbps (RJ-45 Connectors)
1 RS 232 Port (9 pin D-shell connector)
1 RS 485 non isolated port (3 Screw Connector on base board)

1.3 Optional Communications Cards

NPB-LON Optional 78 Kbps FTT10 A Lon Adapter
NPB-232 Optional RS-232 port adapter with 9 pin D- shell connector

1.4 Operating System

QNX RTOS
IBM J9 JVM Java Virtual Machine
Niagara^{AX}

1.5 Power Supply

There are 3 choices for powering the J-201:

1. NBP-PWR. This modular unit accepts 24 volts AC at 50/60Hz or 24/48 volts DC as an input. It is a Din rail mounted unit and supplies power to the J-201 and up to four IO-16 modules. The nominal power input ranges from about 6VA minimum to 20VA with fully loaded I/O.
2. WPM-xx. This unit is a wall plug module (wall wart) that has a cord with a “Barrel Connector” which plugs into the J-201. It can power the JACE -201 and up to four IO-16 Modules. There are several versions of this module with the only difference being the plug configuration for the various countries. Each can accept a range of input voltage of 90 to 264 volts AC; 50/60 Hz.
3. The IO-34 module has an integral power supply, which accepts 24 volt AC input and is capable of powering the IO-34, the J-201 and up to two additional IO-16 modules.

J-201 Resource Capacity Guidelines and Sample Application Analysis

2 Running System Resource Usage:

Niagara AX includes a comprehensive Resource Monitor, which you can access via WorkPlaceAX (the engineering tool). The tool provides you with a graphical view to monitor the resource parameters listed below to determine if the J-201 is running within the design criteria. To assure the most accurate data from the J-201 under evaluation, it is recommended that the JACE be rebooted before performing the following observations.

2.1 CPU Usage:

For proper operation, the application should be designed to keep the average CPU usage below 80%. This limit should not be exceeded when the station is running fully loaded with all field devices communicating, and all control functions implemented.

2.2 Heap Memory:

2.2.1 Heap Total: The Heap Total represents the amount of heap memory, which has been allocated to the station application. As the application becomes more complex, the amount of memory allocated to the heap will increase. The J-201 is configured for a maximum heap memory allocation of 14Mb. Unless the Heap Total has reached this 14Mb value, Heap Memory is not an issue. Once the Heap Total reaches this value, do not allow the Heap Used (see below) to reach a value higher than 75% of the Heap Total value.

2.2.2 Heap Used: The Heap Used represents the instantaneous amount of allocated heap memory currently being used by the running station. Periodically, garbage collection runs causing the Heap Used value to go to its minimum value. Garbage collection is a Java utility, which releases unused memory. Therefore, utilize the following method to determine Heap Used. Using Niagara Workbench, connect to the J-201 in question with the Station Manager. Right click on "Station" (next to the Fox), and select "Spy". Next, select "util", followed by "gc". Look at the "After GC" "used memory" value. The usedMemory value should not exceed 75% of the totalMemory value.

2.3 Memory Used

The Memory Used should not exceed 60Mb on a J-201. However, there are some tasks, which must be completed before evaluating this value. Make sure the J-201 station has been saved since the station was started. Also, make sure any HX pages included in the station application have been viewed utilizing a browser. Executing these tasks will cause the Memory Used to increase to its maximum value.

J-201 Resource Capacity Guidelines and Sample Application Analysis

3 Application Examples for Estimating Resource Usage

The following application examples have been developed at Tridium utilizing typical field bus scenarios, and a collection of controllers. Each example represents an application scenario where Tridium engineers have attempted to determine an acceptable configuration. These sample applications should be used as guidelines when estimating the capacity of the J-201. Your actual application characteristics may vary, depending on the field devices, protocol utilized, runtime size of application program, number of graphics, and other application-specific conditions.

The Lonworks examples below utilize a Invensys MNL-200 HVAC Controller. This controller has a total of 53 Lon properties (network variables and configuration parameters). Other Lonworks controllers may have many more Lon properties. Since each Lon property (whether it has an associated proxy extension or not) requires additional heap memory, the J-201 may not support as many controllers if they utilize a larger number of Lon properties.

J-201 Resource Capacity Guidelines and Sample Application Analysis

3.1 Example 1: J-201 with BACnet MSTP Only

This example represents a BACnet MS/TP application with no optional NDIO attached to the J-201. The BACnet controllers utilized were a combination of Alerton VAV-SD and Alerton VLC-1188 devices. The occupancy status of the devices was controlled by two (2) common schedule components. There were no PID loops utilized in the Jace because all control was accomplished by the BACnet devices. Eight Program components were utilized for monitoring high/low values of Sine Wave components executing on 1 second intervals.

Devices

BACnet MSTP HVAC Controller	Alerton VAV-SD and VLC-1188
Number of devices	20
Total number of BACnet variables	252 per device
Number of BACnet variable monitored by Jace	69 per device
Histories	4 per device
Alarms	2 per device
Graphics	1 per device
Real Time values displayed	14 per graphic
Real Time graphical animations	6 per graphic

Station Characteristics

Overview/Floor Plan Graphics	2
Real Time values displayed	20 per graphic
Real Time graphical animations	0 per graphic
Number of graphic image jpg/gif files in Jace	73
Schedules	2
Non-Device histories	0
Non-Device alarms	0
Program objects	8
PID loop objects	0
Total number of graphics	22
Total number of histories	84
Total number of alarms	40

Memory Resource Utilization Information

heap.free	3 MB
heap.total	14 MB
heap.used	10 MB
mem.total	64 MB
mem.usage	55 MB
component.count	4801

JACE 2 Lite used in this application

BACnet points limit of 200 will limit the application to	2 BACnet devices
--	------------------

J-201 Resource Capacity Guidelines and Sample Application Analysis

3.2 Example 2: J-201 with Lonworks Only

This example represents a Lonworks application with no optional NDIO attached to the J-201. The Lonworks controllers utilized were the Invensys MNL-200 devices. The occupancy status of the devices was controlled by two (2) common schedule components. There were no PID loops utilized in the Jace because all control was accomplished by the Lonworks devices. Eight Program components were utilized for monitoring high/low values of Sine Wave components executing on 1 second intervals.

Devices

Lonworks MNL200 HVAC Controller	Invensys MNL-200 HVAC Controller
Number of devices	20
Total number of Lonworks variables	53 per device
Number of Lonworks variables monitored by Jace	24 per device
Histories	5 per device (500 records each)
Alarms	2 per device
Graphics	1 per device
Real Time values displayed	14 per graphic
Real Time graphical animations	6 per graphic

Station Characteristics

Overview/Floor Plan Graphics	2
Real Time values displayed	20 per graphic
Real Time graphical animations	0 per graphic
Number of graphic image jpg/gif files in Jace	73
Schedules	2
Non-Device histories	0
Non-Device alarms	0
Program objects	8
PID loop objects	0
Total number of graphics	22
Total number of histories	102 (500 records each)
Total number of alarms	40

Resource Utilization Information

heap.free	3 MB
heap.total	14 MB
heap.used	10 MB
mem.total	64 MB
mem.usage	55 MB
component.count	2805

JACE 2 Lite used in this application

Lon points limit of 200 will limit the application to	8 Lon devices
---	---------------

J-201 Resource Capacity Guidelines and Sample Application Analysis

3.3 Example 3: J-201 with BACnet MSTP and Lonworks

This example represents a combination of BACnet MS/TP devices and Lonworks devices with no optional NDIO attached to the J-201. The BACnet controllers utilized were a combination of Alerton VAV-SD and Alerton VLC-1188 devices. The Lonworks controllers utilized were the Invensys MNL-200 devices. The occupancy status of the devices was controlled by two (2) common schedule components. There were no PID loops utilized in the Jace because all control was accomplished by the BACnet and Lonworks devices. Eight Program components were utilized for monitoring high/low values of Sine Wave components executing on 1 second intervals.

Devices

Lonworks MNL200 HVAC Controller	Invensys MNL-200 HVAC Controller
Number of devices	10
Total number of Lonworks variables	53 per device
Number of Lonworks variable monitored by Jace	23 per device
Histories	5 per device (500 records each)
Alarms	2 per device
BACnet MSTP HVAC Controller	Alerton VAV-SD and VLC-1188
Number of devices	9
Total number of BACnet variables	252 per device
Number of BACnet variable monitored by Jace	69 per device
Histories	4 per device (500 records each)
Alarms	2 per device
Device Graphics	1 per device
Real Time values displayed	15 per graphic
Real Time graphical animations	6 per graphic

Station Characteristics

Overview/Floor Plan Graphics	2
Real Time values displayed	20 per graphic
Real Time graphical animations	0 per graphic
Number of graphic image jpg/gif files in Jace	4
Schedules	2
Non-Device histories	0
Non-Device alarms	0
Program objects	8
PID loop objects	0
Total number of graphics	22
Total number of histories	86 (500 records each)
Total number of alarms	36

Resource Utilization Information

heap.free	3 MB
heap.total	14 MB
heap.used	10 MB
mem.total	64 MB
mem.usage	56 MB
component.count	2814

JACE 2 Lite used in this application

Resource will limit the application to	3 Lon + 2 BACnet devices
--	--------------------------

J-201 Resource Capacity Guidelines and Sample Application Analysis

3.4 Example 4: J-201 with BACnet MS/TP and 34 Point NDIO

This example represents a combination of BACnet MS/TP devices and the optional NDIO expansion utilizing the IO34 module connected to the J-201. The BACnet controllers utilized were a combination of Alerton VAV-SD and Alerton VLC-1188 devices. The occupancy status of the devices was controlled by four (4) common schedule components. There were eight (8) PID loops executing in the Jace every 0.5 seconds utilized as part of the NDIO control application to simulate control of external equipment. Eight Program components were utilized for monitoring high/low values of Sine Wave components executing on 1 second intervals.

Devices

BACnet MSTP HVAC Controller	Alerton VAV-SD and VLC-1188
Number of devices	15
Total number of BACnet variables	252 per device
Number of BACnet variable monitored by Jace	69 per device
Histories	4 per device
Alarms	2 per device
Graphics	1 per device
Real Time values displayed	15 per graphic
Real Time graphical animations	6 per graphic
NDIO IO34 Module	
Number of Analog Inputs Used	9
Number of Analog Outputs Used	8
Number of Contact Inputs Used	7
Number of Contact Outputs Used	10
PID loop objects	8

Station Characteristics

Overview/Floor Plan Graphics	2
Real Time values displayed	20 per graphic
Real Time graphical animations	0 per graphic
Number of graphic image jpg/gif files in Jace	4
Schedules	4
Program objects	8
Total number of graphics	24
Total number of histories	90
Total number of alarms	37

Resource Utilization Information

heap.free	4 MB
heap.total	14 MB
heap.used	10 MB
mem.total	64 MB
mem.usage	57 MB
component.count	3052

JACE 2 Lite used in this application

BACnet points limit of 200 will limit the application to	2 BACnet devices + 34 NDIO pts
--	--------------------------------

J-201 Resource Capacity Guidelines and Sample Application Analysis

3.5 Example 5: J-201 with Lonworks and 34 Point NDIO

This example represents a combination of Lonworks devices and the optional NDIO expansion utilizing the IO34 module connected to the J-201. The Lonworks controllers utilized were the Invensys MNL-200 devices. The occupancy status of the devices was controlled by four (4) common schedule components. There were eight (8) PID loops executing in the Jace every 0.5 seconds utilized as part of the NDIO control application to simulate control of external equipment. Eight Program components were utilized for monitoring high/low values of Sine Wave components executing on 1 second intervals.

Devices

Lonworks MNL200 HVAC Controller	Invensys MNL-200 HVAC Controller
Number of devices	15
Total number of Lonworks variables	53 per device
Number of Lonworks variable monitored by Jace	24 per device
Histories	5 per device (500 records each)
Alarms	2 per device
Graphics	1 per device
Real Time values displayed	15 per graphic
Real Time graphical animations	6 per graphic
NDIO IO34 Module	
Number of Analog Inputs Used	8
Number of Analog Outputs Used	8
Number of Contact Inputs Used	8
Number of Contact Outputs Used	10
PID loop objects	8

Station Characteristics

Overview/Floor Plan Graphics	2
Real Time values displayed	15 per graphic
Real Time graphical animations	15 per graphic
Number of graphic image jpg/gif files in Jace	4
Schedules	4
Program objects	8
Total number of graphics	22
Total number of histories	113
Total number of alarms	38

Resource Utilization Information

heap.free	4 MB
heap.total	14 MB
heap.used	10 MB
mem.total	64 MB
mem.usage	56 MB
component.count	2546

JACE 2 Lite used in this application

BACnet points limit of 200 will limit the application to	5 Lon devices + 34 NDIO
--	-------------------------