Architecture and Redundancy Exam
Study Guide

Version 7.20
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About Us
Members of Educational Services' team of Instructional Designers have tertiary qualifications in Education, Educational Course Development and are also experienced instructors in their own right; some are also published authors. Currently, the team is supporting a range of over 70 courses in multiple languages and multiple software environments.

Authors
Alynda Brown, David Heath
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There are not many people who enjoy taking exams. In fact most people view impending exams with some degree of trepidation. There are, however, three things that help alleviate anxiety – preparation, preparation and preparation.

This Study Guide is designed to help prepare you for the exams in the CitectSCADA Certified Engineer stream. In this study guide you will see a list of suggested exercises, and a list of references for suggested reading.

The CSCE exams cover a very broad range of topics, so to enhance your chances of passing the exams it is advisable to take enough time to study the topics with which you are not yet familiar.

The best resource is the Educational Services Training courseware. Each of the exams is designed around the content in the Educational Services curriculum.

Of course you also need to be familiar with searching the CitectSCADA Help files and searching the CitectSCADA Knowledge base.

This Chapter Covers These Topics:

- Examination and Certification ............................................. 1-2
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Examination and Certification

There are a number of Authorised Examination Centres throughout the world. These centres are most likely to be your local Citect Office or Partner. A list of Examination Centres is located on the Educational Services website. Any Authorised Examination Centre must have been approved by Educational Services.

We are currently in the process of authorising our Citect offices so many of the Citect offices are in provisional status. If you do not find your local office listed on this page contact them directly as they may be a Provisional Examination Centre.

All examinations must be held under the supervision of an approved Examination Supervisor.
Registration

Registering for an Exam

Before anyone may sit for any of the Exams in the Certified Engineer program they must register via the Citect website.

To register for an exam through the website, this page needs to be filled out with the candidate's details. When the request is submitted an email will be sent to the Exam Coordinator in the Examination Centre that has been specified. The Exam Coordinator will contact the candidate regarding the details of the examination.

Go to the page http://www.citect.com/education and select the Exam Registration option from the left-side menu.

Complete the Exam Registration page with the appropriate information.

Why Register?

The registration process not only allows your local office to coordinate exams but is the first step in the exam process. When you register for the first time the Exam Coordinator in your region will arrange for your unique Student Login and Student Password. This Student Login and Password will be used in all of your Exams. We will also need an email address so that your exam results may be sent to you.

The Student Login follows this format

es_firstname_lastname

The Student Password is a computer generated random selection of characters.

The password will generally not be revealed to you, instead the Examination Supervisor will log in on your behalf at the examination centre

Exam Enrolment

The exam enrolment is created prior to the day of the exam. When the Exam coordinator registers the candidate to sit for a particular exam their Username is entered into the Enrolled User Group for that exam. The enrolment is disabled until the day of the exam.

The Day of the Exam

The Exams are supervised by Examination Supervisors. The exam may be held at the end of a training course or independently of any courses. When the candidate arrives at the Examination Centre they will need to identify themselves to the Exam Supervisor. If this is the candidate's first exam the Exam Supervisor will need to supply them with their Exam Username and Password. They will then be escorted to the Examination Room. The location of the testing room is most likely to be a Citect Training Room.
The Examination System

Open Book Exams

All exams are open book. The computers in the Examination room are loaded with an appropriate version of CitectSCADA for the exam being undertaken, the Knowledge Base and all PDF documents available on the distribution CD-ROM or DVD-ROM. However, no other material will be permitted in the Examination Room, for example, the Educational Services Training Manuals or the Study Guides.

The exams are supervised by the Exam Supervisor. Whilst candidates are allowed to refer to the online documentation and to create test projects on the installed CitectSCADA system, no speaking is allowed and no looking at another computer.

The examination procedure does not allow:

- Notes to be taken in or out of the examination room
- Screen shots or copies of examination questions to be taken from the examination room
- USB keys or any other removable media to be taken in or out of the examination room
- Photographs of any type
- Talking
- Collaboration with anyone
The Examination System (cont.)

The Examination system is hosted on the Citect UniverCiTe website and can be accessed from a web browser. The Examination Supervisor will have the page loaded prior to your arrival.

1. Login to the Examination System.
   i. Enter the student name and password at the login page.
   
   ![Login Page](image)

   The name and password follows this format.

   es_firstname_lastname
   password

   ii. Click GO.
iii. The Citect UniverCite will open at the Welcome page. All examinations and courses in which the candidate is currently enrolled will be listed.

You are enrolled in the following courses

**Citect Programming v7.0 Examination**
- No Grade
  - The Citect Programming Examination has been designed to test your knowledge of Citect.

**CitectSCADA Configuration v7.0 Examination**
- No Grade
  - The CitectSCADA Configuration Examination has been designed to test your knowledge of CitectSCADA.

**Customization and Design v7.0 Examination**
- No Grade
  - The Customization and Design v7.0 Examination has been designed to test your knowledge of CitectSCADA.

**Examination Instructions**
- No Grade
  - You should read these instructions before completing your first Examination.

**Networking and Architecture v7.0 Examination**
- No Grade
  - The Networking and Architecture Examination has been designed to test your knowledge of CitectSCADA.
A course has been provided to introduce new candidates to the examination system. If this is a new candidate they should complete this course before proceeding.

1. Complete the Examination Instructions course.
   i. Once the candidate has logged into the examination system all courses and examinations in which they are enrolled are listed. If this is a first time candidate they should complete the Examination Instructions course. Click the Examination Instructions title to enter the course.
   
   **Examination Instructions**
   
   You should read these instructions before completing your first Examination.
   
   ii. Click the Start --> link to open the course.
   
   **Course for New Candidates**
   
   You should read these instructions before completing your first Examination.
   
   iii. The title page of the Course will open. Click the Next --> link to begin the course.
   
   iv. Follow the links through the pages to view examples of all the question types that are used throughout the examination system.
Exam Questions

**Single Answer**
Read the question and select your response from the list of options. Select the radio button beside your choice.

1. How many people live on the moon?

   **Select the correct answer**
   
   A. 0
   B. 1
   C. 50
   D. 100

**Multiple Answers**
These questions are expecting at least one response, possibly as many as four. Tick boxes are provided for you to select as many or as few responses as you think appropriate.

In order to score the marks for these questions, you much select *exactly* the correct set of responses; there are no partial marks for partially correct responses.

2. Which planets in our solar system have no moons?

   **Select all that apply**
   
   A. [ ] Venus
   B. [ ] Jupiter
   C. [ ] Mercury
   D. [ ] Pluto
The Examination

Once a candidate has completed the Examination Instructions course they are ready to begin their first examination.

1  Open the Examination.
   i.  Return to the Welcome page and open the examination by clicking the link.

CitectSCADA Configuration v7.0 Examination  No Grade
The CitectSCADA Configuration Examination has been designed to test your knowledge of CitectSCADA.

   ii.  The introduction page will give the title of the examination and the passmark. Click the Start --> link to open the Title Page.

CitectSCADA Configuration v7.0 Examination - Session 1
The CitectSCADA Configuration Examination has been designed to test your knowledge of CitectSCADA.
Passmark:  75.00%

   iii.  The next page is the title page of the examination. Click the Next --> link to continue.

Welcome to the CitectSCADA Configuration Examination.
Click "Next" to read the Examination Instructions.
The Examination (cont.)

iv. This page is for the candidate to enter the information that is needed to print and send their certificate. The certificate will be created using the exact spelling of the candidate name entered on this page. Click the Next --> link to continue.

It is critically important that this page is correctly completed and properly submitted as it is the only cross-check we have to ensure the examination was conducted under suitable conditions.

Those exams received by the Chief Examiner without this information may be declared null and the candidate required to re-sit the exam.

CitectSCADA Configuration v7.0 Examination - Session 1

Your Examination Details

Please fill in your details below:

NB: This won’t contribute to your course grade.

[Question 1 To 2 of 2]

1. Name of your examiner:
   First name, Last name:

2. Your address:
   [This is the address you would like any certificates sent to. Please give either a Citect office or a company or home address.]

Submit

It is critically important that this page is correctly completed and properly submitted as it is the only cross-check we have to ensure the examination was conducted under suitable conditions.
v. The **Examination Instructions** provide the candidate with important information regarding the type of questions that they will see.

**Examination Instructions**

Please read the following instructions before you proceed to the Examination.

**Examination Questions**

The Examination is randomised and may include any of the following types of questions:

- Multiple choice (Select ONE correct answer.)
- Multiple select (Select ALL correct answers. One, two, three or all answers may be correct. You will only receive points if you select ALL of the correct responses.)
- True or false (Select whether the statement is "true" or "false").
- Yes or no (Select "yes" or "no" in response to a question.)
- Fill in the blank (Type the correct answer into the space provided. If two spaces are provided the answer will be two words.)

vi. The Examination Sections provides information on the content of each section and the controls that are contained within each section. It is important that the candidate is familiar with these controls.

**Examination Sections**

This Examination is divided into sections. Each section has its own "Start" button, timer and "Submit" button.

To begin each section click the "Start" button. This will take you to questions for that section. (Do not click "next" to start a section as this will take you to the beginning of the next section.)

Answer all questions in the section then click the "Submit" button when you are sure of your answers. Once you have clicked "Submit" your answers cannot be changed.

Section 1: The Citect Environment
Section 2a: Managing projects
Section 2b: Managing projects
Section 3a: Setting Up Communications
Section 3b: Setting Up Communications
Section 4a: Graphics
Section 4b: Graphics
Section 5: Commands and Controls
Section 6: Genies and Super Genies
Section 7: Devices
Section 8: Events
Section 9a: Alarms
Section 9b: Alarms
Section 10: Trends
Section 11: Process Analyst
Section 12: Navigation
Section 13: Reports
Section 14: Security
Starting the Examination (cont.)

vii. The instructions page provides information regarding the time limits and how to submit each section. Once the section has been submitted they may not re-enter that section. The time allocated increases with the difficulty of the questions. Regardless of the difficulty or the number of the questions each section is given a minimum of 5 minutes. Extra time has been provided in this system due to the needs of candidates who do not not speak English as their primary language.

Time Limits

Each section in the Examination is timed. Your time for a section starts once you have clicked on the "Start" button for that section. A timer will then appear in the top right-hand corner of your screen. If your time expires you will be awarded points for the questions you have answered correctly but will not be able to go back and answer the other questions in that section.

Answer all questions in the section then click the "Submit" button when you are sure of your answers. Once you have clicked "Submit" your answers cannot be changed.

viii. The instructions page also provides information regarding how to finalise the examination and upload their marks. When the candidate has finished reading this page click the Next --> link to continue.

When you have finished

When you reach the end of the Examination, click the link "Click to Complete Course & Upload Marks". This will record your marks for all sections in the Examination.

Now start the Examination
Click "Next" to go to Section 1 of the Examination.
Exam Sections

Each Exam Section covers a specific Topic. These topics are listed when the exam is entered but before the exam starts.

**Examination Sections**

This Examination is divided into sections. Each section has its own "Start" button, timer and "Submit" button.

To begin each section click the "Start" button. This will take you to questions for that section. (Do not click "Next" to start a section as this will take you to the beginning of the next section.)

Answer all questions in the section then click the "Submit" button when you are sure of your answers. Once you have clicked "Submit" your answers cannot be changed.

<table>
<thead>
<tr>
<th>Topics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1: The Citect Environment</td>
<td></td>
</tr>
<tr>
<td>Section 2A: Managing projects</td>
<td></td>
</tr>
<tr>
<td>Section 2B: Managing projects</td>
<td></td>
</tr>
<tr>
<td>Section 3A: Setting Up Communications</td>
<td></td>
</tr>
<tr>
<td>Section 3B: Setting Up Communications</td>
<td></td>
</tr>
<tr>
<td>Section 4A: Graphics</td>
<td></td>
</tr>
<tr>
<td>Section 4B: Graphics</td>
<td></td>
</tr>
<tr>
<td>Section 5: Commands and Controls</td>
<td></td>
</tr>
<tr>
<td>Section 6: Genies and Super Genies</td>
<td></td>
</tr>
<tr>
<td>Section 7: Devices</td>
<td></td>
</tr>
<tr>
<td>Section 8: Events</td>
<td></td>
</tr>
<tr>
<td>Section 9A: Alarms</td>
<td></td>
</tr>
<tr>
<td>Section 9B: Alarms</td>
<td></td>
</tr>
<tr>
<td>Section 10: Trends</td>
<td></td>
</tr>
<tr>
<td>Section 11: Process Analyst</td>
<td></td>
</tr>
<tr>
<td>Section 12: Navigation</td>
<td></td>
</tr>
<tr>
<td>Section 13: Reports</td>
<td></td>
</tr>
<tr>
<td>Section 14: Security</td>
<td></td>
</tr>
</tbody>
</table>

Each section contains a pool of questions. The candidate is given a random selection from this pool. Not all questions are of the same difficulty. Therefore different sections have different values assigned to the questions. However, all questions in each section have the same value. The Section information at the beginning of each section indicates the value of the questions.

**CitectSCADA Configuration v7.0 Examination - Session 1**

Answer all questions in this section then click the "Submit" button.

Each question in this section is worth 3 marks. The maximum number of marks for this section is 6 marks.

You are allowed to attempt this section 1 times.

This section is timed. You will have 5 minutes from the time that you press the "Start" button to complete this section.

Press the "Start" button to begin.
Exam Sections (cont.)

Entering the Section

The Section Information page has a Start button that must be clicked to enter the section. The candidate should **NOT** press the Next --> link as this will not enter the section. Instead it will take them to the beginning of the following section.

Press the "Start" button to begin.

Start

Section Time

All Sections allow a certain maximum amount of time in which to complete your work. Each section of the examination corresponds to chapters in the courses and is timed independently.

The available time is fixed for each exam and is also subdivided into allotments for each section of the exam. The system will not "bank" time - at the end of a section, any spare time is lost.

The Introduction page of each section provides the candidate with the time available for that section.

The CitectSCADA Configuration v7.0 Examination - Session 1

Section 1: The Citect Environment

Answer all questions in this section then click the "Submit" button.

Each question in this section is worth 3 marks. The maximum number of marks for this section is 6 marks.

You are allowed to attempt this section 1 times.

This section is timed. You will have 5 Minutes from the time that you press the "Start" button to complete this section.

Press the "Start" button to begin.

Start

The candidate is able to control when they start each section. The section timer starts when the candidate clicks the Start button.

This time is indicated by an onscreen counter/clock in the top right hand corner of the screen.

0:00:05:2
Exam Sections (cont.)

Completing a Section

When the candidate clicks **Submit**, the section is graded and the section results are displayed. This is the reason why it is not possible to return to a section.

Total Score: 100.00% OR 6.00 / 6.00
Working through the Exam

Exam Sections
Having confirmed your details, you are then presented with the exam sections you will encounter. Each of these sections is separately timed and questions in each section, although having equal value, may have different value to questions in other sections.

Typically, there are easy questions worth few marks and hard questions worth more marks. This is your last opportunity to decide you're attempting the wrong exam!

Examination Sections
This Examination is divided into sections. Each section has its own "Start" button, timer and "Submit" button.

To begin each section click the "Start" button. This will take you to questions for that section. (Do not click 'Next' to start a section as this will take you to the beginning of the next section.)

Answer all questions in the section then click the "Submit" button when you are sure of your answers. Once you have clicked "Submit" your answers cannot be changed.

Section 1: The Citect Environment
Section 2A: Managing projects
Section 3B: Managing projects
Section 3A: Setting Up Communications
Section 3B: Setting Up Communications
Section 4A: Graphics
Section 4B: Graphics
Section 5: Commands and Controls
Section 6: Genies and Super Genies
Section 7: Devices
Section 8: Events
Section 9A: Alarms
Section 9B: Alarms
Section 10: Trends
Section 11: Process Analyst
Section 12: Navigation
Section 13: Reports
Section 14: Security

Once you click the Start button (not shown in the graphic) timing commences for the first section.

Inside a section
You will be given the name of the section and advised the value of each section and the total number of marks available in the section. The timer in the top-right corner of the screen commences a count-down.

Click submit at the bottom of the screen to complete the section. You will be warned if there are un-completed questions and the section will not close.

Section 1: The Citect Environment

Answer all questions in this section then click the "Submit" button.

Each question in this section is worth 3 marks. The maximum number of marks for this section is 6 marks.
Submitting an Exam

Once the examination has been completed the candidate needs to submit their examination. This is done by clicking the **Click to Complete Course & upload Marks** link.

The examination completion is confirmed and the candidate may view their results by clicking the **Grades** link on the left side menu.

The page will display their overall result. The full section detail may be viewed by clicking the module name.

<table>
<thead>
<tr>
<th>Module</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>CITECTSCADA CONFIGURATION v7.0 EXAMINATION</td>
<td>99.09 / 100.00</td>
</tr>
<tr>
<td>Total Grade</td>
<td>89.09 / 100.00</td>
</tr>
</tbody>
</table>

End of Examination

You have now completed the Examination.

You should now do the following:

1. Click on the link "Click Here to Upload Your Marks". This will record your marks for all sections in the Examination.
2. You will then be able to check your grades.
Submitting an Exam (cont.)

**Detailed Results**

The full section detail allows the candidate to view the results for each section so that they can see which sections they may need to review.

<table>
<thead>
<tr>
<th>Section 1: Introduction</th>
<th>5.00 / 5.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic Total</td>
<td>6.00 / 6.00</td>
</tr>
<tr>
<td>Section 2A: Variables</td>
<td></td>
</tr>
<tr>
<td>Section 2A: Variables Drag and Drop</td>
<td>7.00 / 7.00</td>
</tr>
<tr>
<td>Topic Total</td>
<td>7.00 / 7.00</td>
</tr>
<tr>
<td>Section 2B: Variables</td>
<td></td>
</tr>
<tr>
<td>Section 2B: Variables</td>
<td>15.00 / 18.00</td>
</tr>
<tr>
<td>Topic Total</td>
<td>16.00 / 18.00</td>
</tr>
<tr>
<td>Section 3A: Simple Functions</td>
<td></td>
</tr>
<tr>
<td>Section 3A: Simple Functions drag and drop</td>
<td>4.97 / 7.00</td>
</tr>
<tr>
<td>Topic Total</td>
<td>4.97 / 7.00</td>
</tr>
</tbody>
</table>

**Passing Grade**

The pass mark for all exams is 75%.

Once all of the exams have been passed (or the upgrade exam for an existing CSCE), the Examination Administrator will be advised automatically. The certificate will be mailed within a few days.
Completing the Exam

Uploading Your Marks

After submitting the final exam section, a screen will be presented inviting you to upload your marks.

Once done, you are advised that your final grade may be seen via the Grades link on the left-side menu. The exam is completed.
Successful Completion

Certificates

If the candidate has been successful in all the required examinations they will be given CitectSCADA Certified Professional (CSCP) or CitectSCADA Certified Engineer (CSCE) status. Unlike the course certificates, a CSCP or CSCE qualification is one that implies attainment of a level of expertise. In order to separate the two types of certificate given by Citect, any accreditation that implies the attainment of expertise is represented by the word **PASSED** on the certificate. The certificates may be sent either directly to the candidate or to the Examination Centre.
Overview

You can configure a CitectSCADA monitoring and control system to suit any industrial application. CitectSCADA has been designed with flexibility in mind, so you can design a system to suit your exact requirements.

CitectSCADA suits both small and large applications. Since CitectSCADA has a flexible architecture it will keep pace with your plant and information requirements as they change and expand.

Whilst reliability is a key feature of computer hardware breakdowns do occur. It is for this reason that Redundancy is designed into CitectSCADA and can be implemented without changing the project configuration.

This Chapter Covers These Topics:

- CitectSCADA Architecture ...................................................2-2
- On-line Changes .................................................................2-5
- Clustered Control System ......................................................2-9
- Redundancy .........................................................................2-11
- Web Client ...........................................................................2-12
- System Security ...................................................................2-13
As well as being a client, any computer in a CitectSCADA system may act as an Alarm, Report, Trend or I/O server. Clearly in a larger environment, server tasks will be dedicated to individual servers, but small sites could reasonably configure a single computer to handle all server and client functionality.

The diagram shows each of the duties assigned to individual computers, but CitectSCADA permits all of these to be configured on a single computer.

📖 **Note:**

Windows XP supports a maximum of 10 inbound client connections. More than one of these might be used by a single remote computer, for instance a client and a file share would each consume a connection.

A Windows server product must be used if more than 10 connections are required.
CitectSCADA Architecture (cont.)

When configuring CitectSCADA the following rules apply:

- Each Cluster must have a unique name.
- Each Server component must belong to one Cluster.
- Each Server component must have a unique name within the Cluster.
- Each Cluster contains only one pair of Alarm Servers. Those Servers, which are redundant to each other, must reside on different computers.
- Each Cluster contains only one pair of Report Servers. As with the Alarm Servers, those redundant Servers must reside on different computers.
- Each Cluster contains only one pair of Trend Servers. Again, those redundant Servers must reside on different computers.
- Each Cluster can contain an unlimited number of I/O Servers (up to the limit of 16,383 I/O Devices). It is possible to have more than one I/O Server on the same computer as long as they are in different Clusters.

The diagram below is an example of a CitectSCADA system running with two Clusters across three machines. All Server and Client components have been deployed in accordance with the clustering rules.
CitectSCADA Architecture (cont.)

Use these suggested exercises to increase your understanding of the topic.

- Set up a project that is networked across several computers.
- Configure an I/O Server
- Configure a Citect cluster with different computers taking the I/O, Trend, Alarm and Report Server roles.
- Configure a Global Client to connect to two separate Citect clusters.
- Create a new tag and extension to a graphics page. Test that the on-line changes system will correctly propagate the update.

Use the following references to assist your understanding of the topic.

- CitectSCADA Help Topic - Computer Role Configuration.
- CitectSCADA Help Topic - LAN Parameters.
- CitectSCADA Help Topic - Clustering.
- CitectSCADA Help Topic - Rules of Clustering.
- Knowledge Base Article Q3943: Implications for Citect and Microsoft Windows XP Service Pack 2.
On-line Changes

CitectSCADA Clients from Version 7.0 onwards don't require configuration updates or restarts when changes are made on the Server. When any Alarm, Trend or Variable Tag is added, removed or updated on the Server side, Clients will not require updates or restarts for them to adjust to the new configuration. Only the Server needs to be restarted or (effective from V7.20) reloaded.

- When a Trend, Alarm or I/O Server is restarted with an updated configuration, Clients currently running will adjust automatically to the changes without requiring restart.
- Rather than browsing the local trend database to provide a list of trends, a Trend Client will now ask the Trend Server for a list of trends.
- The Alarm Client has been changed to recognise when the Server connection has been changed or restored, check whether the alarm configuration is still the same, and flush its local cache if needed to ensure any data is correct.
- Reloading a Server will not interrupt the execution of the Clients; they will continue processing the existing Alarms or Trends until the reload is completed, when the new items will become available.

When a system has been configured so that Clients are able to be updated Online all changes take place on the Server. The Clients are able to update their information because they are linked to a central project or the COPY parameter has been used and the local project will update when changes are detected.
Online Changes (cont.)

How Online Changes Work (cont.)

When a change to the project is made on the Server, the Server must be reloaded. If the Server is providing more than one type of Server functionality, Multi-Process mode allows the user to reload that process only with the Runtime Manager.

Once the Server is reloaded, the changes are transferred to the Clients and are available online. During the reload operation, the existing complement of Alarms, Trends etc will continue to be available to Clients; once the reload is complete, the new items will automatically become available.
Online Changes (cont.)

Individual servers may be Restarted or Reloaded from the Runtime Manager, located in the System Tray.

Note:

There are a number of limits on exactly what will change without a reload based on the wider impact of the change. These limits are detailed in the CitectSCADA Help - Effects of Server Reload on Servers.

Restart vs. Reload

The startup of any server may be divided into two discrete stages. Firstly it must identify how it is to be configured and secondly, it must determine what it has to do. For an Alarm Server the first stage would include log file locations and other such information while the second stage would be to create the list of actual alarms with which it has to operate.

A Server Restart reinitialises both components while a Reload only attends to the list of things it must do. As an analogy, consider a band on stage. It could be assumed that getting the instruments ready on the stage and all the sound equipment performing properly would be the first stage described above, while the handwritten list of songs taped to the keyboard player's instrument is the second.

With that in mind, it is obvious that reinitialising the equipment is a very difficult task, while changing the list of songs is trivial to achieve mid-performance.
## On-line Changes (cont.)

### Suggested Exercises

Use these suggested exercises to increase your understanding of the topic.

- Enable the COPY parameter on client computers and make changes at the primary computer to determine how and when changes are propagated.
- Work with Server Reload and Restart to determine the differences and when each is required.

### Further Reading

Use the following references to assist your understanding of the topic.

- CitectSCADA Help Topic - Server Side Online Changes.
- CitectSCADA Help Topic - Client Side Online Changes.
- CitectSCADA Help Topic - ServerReload.
- CitectSCADA Help Topic - Running the System.
Clustered Control System

Combine Discrete Sites

A clustered system allows discrete sites being controlled by local operators to be viewed by a global Control Client. A typical cluster consists of a Primary and Standby Server providing Alarm, Trend, Report and I/O Servers support. The cluster may also have local CitectSCADA Clients and several other I/O Servers. A Citect Cluster is typically a plant or in the case of very large or distributed plants, a Cluster may be a section of a plant.

Each site is represented in the project with a separate Cluster, grouping its Primary and Standby Servers. Clients at each site are only interested in the local Cluster, whereas Clients at the central control room are able to view all Clusters.

The deployment of a control room scenario is fairly straightforward, as each site can be addressed independently within its own Cluster. The control room itself only needs Control Clients.
**Clustered Control System (cont.)**

<table>
<thead>
<tr>
<th>Suggested Exercises</th>
<th>Use these suggested exercises to increase your understanding of the topic.</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Create a complex 'Global' project which combines two other active projects.</td>
<td></td>
</tr>
<tr>
<td>✓ Compile the combined project and seek to understand what compile errors are generated and how they should best be addressed.</td>
<td></td>
</tr>
<tr>
<td>✓ Determine how to apply &quot;cluster context&quot; to Tags, Objects, Pages etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Further Reading</th>
<th>Use the following references to assist your understanding of the topic.</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ CitectSCADA Help Topic - <em>Cluster context rules.</em></td>
<td></td>
</tr>
<tr>
<td>✓ CitectSCADA Help Topic - <em>About cluster context.</em></td>
<td></td>
</tr>
<tr>
<td>✓ CitectSCADA Help Topic - <em>Clustered control system.</em></td>
<td></td>
</tr>
<tr>
<td>✓ Knowledge Base Article Q5238: Using tag names in pages and Cicode with multi-clusters.</td>
<td></td>
</tr>
</tbody>
</table>
Redundancy

Why Use Redundancy?
Many industrial plants cannot afford to have their CitectSCADA monitoring system fail at any time. Building redundancy into your system can prevent the loss of control and monitoring of your CitectSCADA system.

Suggested Exercises
Use these suggested exercises to increase your understanding of the topic.

- Create a project with a Primary and Standby I/O Server.
- Configure the Servers to also act as redundant Trend, Report and Alarm Servers.
- Add File Server Redundancy to the system.
- Configure a redundant Disk I/O Device.
- Disable the Primary Server and change some of the values on the Standby.
- Reconnect the Primary and watch what happens.

Further Reading
Use the following references to assist your understanding of the topic.

- CitectSCADA Help Topic - Building Redundancy into Your System.
- CitectSCADA Help Topic - Data Path Redundancy
- CitectSCADA Help Topic - Multiple Device Redundancy (Standby Data Paths)
- Knowledge Base Article Q2228: Configuring a Redundant Disk PLC.
- Knowledge Base Article Q3723: Trend Redundancy Backfilling.
- Knowledge Base Article Q1378: Using Citect with Redundant LANs.
Web Client

The CitectSCADA Web Client allows you to view a live CitectSCADA project within a Web browser. It provides easy access to CitectSCADA Runtime for LAN-connected users requiring read/write access to current production information.

The CitectSCADA Web Client Help has a procedural structure that is intended to guide you through the steps required to successfully set up a Web Client system.

To ensure a successful installation, it is recommended that you initially familiarise yourself with the System architecture, and then work your way through the following topics, as they logically guide you through the set up process.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation</td>
<td>Covers the hardware and software requirements, the process for installing the Web Server software, and an explanation of what gets installed.</td>
</tr>
<tr>
<td>Web Client user account types</td>
<td>Describes the different types of client accounts supported by the Web Server and their access rights.</td>
</tr>
<tr>
<td>Setting up Security</td>
<td>Describes how to prepare the Web Server for secure communication and how to set up client accounts.</td>
</tr>
<tr>
<td>Preparing a CitectSCADA project for deployment</td>
<td>Explains the adjustments that need to be made to a CitectSCADA project prior to deployment on the Web Server.</td>
</tr>
<tr>
<td>Configuring a deployment</td>
<td>Describes how to deploy a project on the Web Server, by identifying its source location and associated servers.</td>
</tr>
<tr>
<td>Implementing multiple language support</td>
<td>if required, there are several language options you can implement on the Web Server interface.</td>
</tr>
</tbody>
</table>

Frequently Asked Questions

If you have worked your way through the procedures outlined above and are still having problems, there is a Frequently Asked Questions section, within the CitectSCADA Help Using the Web Client topic, to help resolve some of the problems that may be encountered.

Suggested Exercises

Use these suggested exercises to increase your understanding of the topic.

- Set up a Web Server.
- Set up the Windows Security for the necessary Web Client Users.
- Deploy your Project.
- Connect using Internet Explorer.
- Attend a CitectSCADA Architecture and Redundancy Exam Study Guide where Web Client is examined in great detail.

Further Reading

Use the following references to assist your understanding of the topic.

- CitectSCADA Help Topic - CitectSCADA Web Client. All of it!
System Security

Aspects of Security

This section of the exam deals with a variety of security topics within the contexts of Server and User Authentication. Most of these topics have evolved as a direct response to the growing concerns about security in SCADA systems world-wide.

The Server User

Using the credentials provided, a Server User will be automatically logged in to the server processes on the current computer, giving any Cicode run from that Server, the privilege level of this Server User.

This user has nothing to do with the Runtime Manager or any processes related to it, only Cicode tasks.

Note:

The Server User configuration screen is only available when the Computer Setup Wizard is configured for Multi-Process.

There are three options for the Server user.

<table>
<thead>
<tr>
<th>Default Server User</th>
<th>All Cicode will be run on the Server as if it is owned by a user with full access to all areas and all privileges - this is an internally defined 'virtual' user.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Any Cicode function requiring a Privilege level on the server will fail to run.</td>
</tr>
<tr>
<td>Specific User</td>
<td>The user must be either a known user in the current project or a valid Windows user connected to the project via the Windows groups feature described in Assign Windows Groups to Roles.</td>
</tr>
</tbody>
</table>
System Security (cont.)

Windows Integrated Security uses Role based security definitions that focus on the Areas and Permissions of a Job Type rather than the identity of any one person.

Roles act as templates that define the Areas and Permissions for users who are included in a linked Windows Group.
System Security (cont.)

When a Windows user is logged on to a runtime system with the associated privileges and areas of the role to which the user belongs, there are times when a higher level authorisation is required for the user to perform certain actions. An example of this is in the Pharmaceutical Industry in the United States where FDA guidelines on electronic records and electronic signatures are defined in Title 21 CFR Part 11 of the Code of Federal Regulations. One of the requirements in this code is that electronic signatures must be countersigned by more than one person.

In order to comply with regulations such as these CitectSCADA has developed **Multi Signature Support**. The **MultiSignatureForm** function can be displayed through a Cicode form to allow countersigning of an operation by another user who has the required level of privilege.

The **MultiSignatureForm** function displays a form that allows up to four users to have their credentials verified in order to approve an operation. The usernames can be native CitectSCADA or Windows Integrated Security users.

For further information about the **MultiSignatureForm** function, see *CitectSCADA Help - MultiSignatureForm*.

Techniques used to create CitectSCADA forms using Cicode are covered in the *CitectSCADA Customisation and Design Course*. 

![Signature Verification](image)

**Further Training:**

Techniques used to create CitectSCADA forms using Cicode are covered in the *CitectSCADA Customisation and Design Course*. 

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**High Level Authorisation** 

**System Security (cont.)**
## System Security (cont.)

**Suggested Exercises**

Use these suggested exercises to increase your understanding of the topic.

- Create CitectSCADA Roles linked to Windows groups.
- Configure an object on a page to use multi-signature support.
- Configure a Server User using the various options to determine the effect of each.

**Further Reading**

Use the following references to assist your understanding of the topic.

- CitectSCADA Help Topic - *Adding Roles*.
- CitectSCADA Help Topic - *Adding groups and users in Windows security*.
- CitectSCADA Help Topic - *Roles*.
- CitectSCADA Help Topic - *Multi-Signature Support*.
Chapter 3: Navigating the Knowledge Base

Overview

Introduction

The Knowledge Base contains three navigational tools to help you quickly find relevant information:

- Contents - so you can always find the start and also lists the Latest Articles.
- Index - Lists all articles in numeric order
- Search - the quickest way to find relevant articles. It allows you to query all of the text in the entire Citect Knowledge Base.

This Chapter Covers These Topics:

- Searching................................................................................3-2
# Searching

| Search Queries | Learning about effective queries will help you to locate relevant articles. The simplest query consists of just one word. For example, to find articles about alarm pages, you could enter the word alarm. This query would return a list of all articles that contain the word 'alarm'. If the query word is common, a large number of articles will be displayed, and you may need to further narrow your search. |
| Enter Multiple Words | To narrow your search, enter more than one word. For example, to find articles about alarm pages, you could enter the words alarm page. This query would return all articles that contain both the words 'alarm' and 'page'. Some search engines require the keyword AND to be used for this kind of search - it is not necessary here. |
| Operators | Customise your queries with the NEAR, NOT and OR keyword operators. For example, the query alarms page not hardware, would exclude an article about the "hardware alarms page". |
| Literal Phrases | Put quotation marks around keywords if you want to search for a literal expression. For example, searching for "alarm page" would find articles that contain that exact phrase. This can be quite useful if you need to use a keyword in your search. For example, "exclusive or" contains the keyword OR, and would cause an error without the quotes. |
| Wild Cards | Use wild cards (* and ?) where you are uncertain about the form of a word. For example, if you are uncertain about whether to search for "alarms", "alarm", or "alarming", search instead for alarm*. The ? is similar, but works only for one character. |