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Preparation Strategies and Resources for the CLD Exam

or…

I Passed the CLD, and So Can You

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U.S. DEPARTMENT OF ENERGY | NNSA

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Outline

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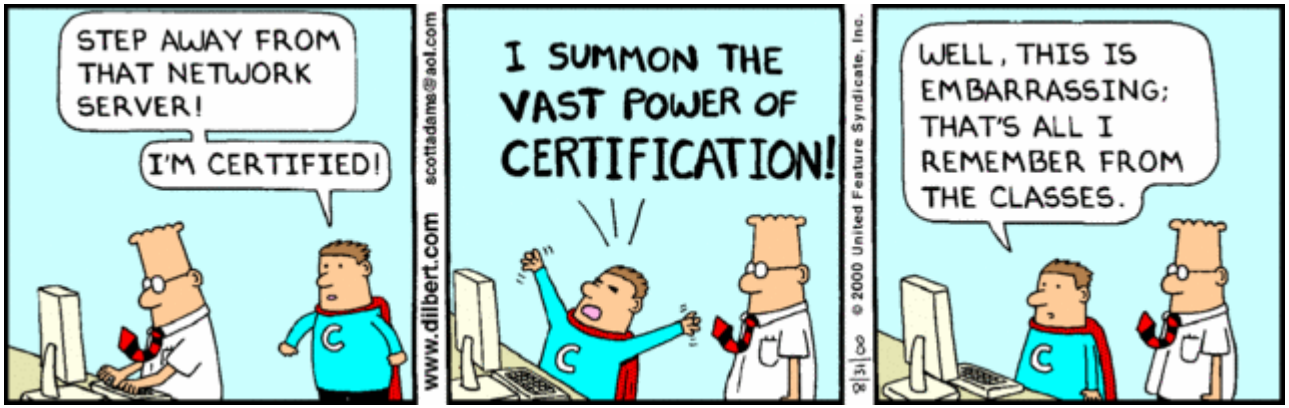
- Certified LabVIEW Developer (CLD) exam format
- Scoring
- Preparation resources
- Sample exams
- Things to practice / strategies


STEP AWAY FROM THAT NETWORK SERVER!
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I SUMMON THE VAST POWER OF CERTIFICATION!
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WELL, THIS IS EMBARRASSING; THAT'S ALL I REMEMBER FROM THE CLASSES.

NI LabVIEW Certifications

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- Certified LabVIEW Associate Developer (CLAD)
  - "Indicates a broad working knowledge of the LabVIEW environment, a basic understanding of coding and documentation best practices, and the ability to understand and interpret existing code."
  - Format: 1-hour, multiple choice-exam, taken at *Pearson-VUE Learning Center*.
- Certified LabVIEW Developer (CLD)
  - "... the ability to design and develop functional programs while minimizing development time and ensuring maintainability".
  - Format: 4-hour exam in which you build a complete LabVIEW application from a set of specifications. Proctored. Must be scheduled through NI. Exam is graded by a pair of NI engineers.
  - Prerequisite: must be a CLAD.
- Certified LabVIEW Architect (CLA)
  - "...the highest skill level … can develop a framework for an application to be executed by a team of developers if given a set of high-level requirements."
  - Format: 4-hour exam. "Short answer and practical development exam", similar to CLD.
  - Prerequisite: must be a CLD.
- Certifications are valid for ~~two~~ three years; recertification ~~requires~~ may involve a 1-hour multiple-choice exam or earning points by performing certain activities.

CLD Exam Format

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- Proctored, next one will be in May.
- BYOC.
- You'll be provided with:
  - USB stick with a pre-built front panel template,
  - A document describing requirements and functional specifications for your application.
  - 4 hours.
- The exam is not easy, primarily because of time pressure.
  - The specifications can be involved, and there's little time to waste following blind alleys.
  - You must meet high standards for code style and documentation.

CLD Exam: Scoring

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- To pass, need ~~30~~ 28 points out of 40 possible.
  - Functionality: 15 points
  - Style : 15 points
  - Documentation: 10 points.
- Implications:
  - Downside: A perfectly functional application that is messily written and poorly documented may easily fail.
  - Upside: A neatly written, well documented application does not need to be completely functional.

Scoring: Functionality (15 points)

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- Does the application run?
- Does the application meet its requirements?
- UI must be responsive & application must not “peg” the CPU.
- Application must handle error conditions.
- What to do if you can’t get your application to work?
  - Documentation! Try to isolate the bug. Leave notes for the graders.

Scoring: Style (15 points)

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- What constitutes good style?
  - See exam preparation guide, or LabVIEW style checklist.
- Good style:
  - Repeated code should be placed in subVIs,
  - Appropriate data types and data structures,
  - No deeply-nested structures,
  - Minimal use of sequence structures,
  - Define typedefs for clusters and enumerated controls,
  - Neatness.
- LabVIEW VI Analyzer Toolkit
  - “provides tests that check VIs interactively or programmatically for style, efficiency, and other aspects of LabVIEW programming”.
  - You may or may not have this toolkit. The examiners will have it.
- You won’t have a lot of time to clean up your code later.

Scoring: Documentation (10 points)

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- Front panel window:
  - Tip strips for controls & indicators,
  - Informative labels,
  - Operating instructions where appropriate,
  - Sensibly grouped and named clusters.
- Block diagram:
  - Label constants and wires,
  - Document programming structures (loops, case structures, etc.),
  - Describe operation of non-obvious algorithms.
- VI properties:
  - Describe the purpose of the VI/subVI,
  - Describe inputs and outputs (terminals).
- Document as you write; you won't have time to go back & do it later.

CLD Preparation Resources from NI

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- “Preparation E-kit for the CLD Exam”
  - https://lumen.ni.com/nicif/us/ekitcldexmprp/content.xhtml
  - Preparation guide– 13-page pdf,
  - Four sample exams,
  - A series of videos,
  - CLD success package – a series of 17 short exercises.

Other Resources

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- Forums:
  - NI forums
    - forums.ni.com → “Special interest boards” → “Certification”.
  - LAVA forums
    - lavag.org → “LabVIEW (by category)” → “Certification and training”
- NI LabVIEW Core I-III courses
  - “…users with active SSP [Standard Service Program] contracts can access online training 24 hours a day, every day, via their ni.com user profiles”.
- Help → LabVIEW Help → search for “LabVIEW Style Checklist”

Sample Exams

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- NI-provided sample exams:
  - Boiler controller: straightforward, state-machine,
  - Sprinkler controller: good example of a “sequencer” application,
  - Car wash controller: another “sequencer” problem,
  - ATM machine: slightly trickier.
- Note: NI-published exam solutions are real exams, not NI-authored “perfect solutions”. They’re imperfect.
- Make up your own problems:
  - Burglar alarm,
  - Microwave oven,
  - Programmable thermostat.

Learning from the Sample Exams

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- Take them, and give yourself the full four hours.
- Take notes on how you're spending your time as you work through the exam.
- Practice good coding style and documenting as-you-go.
- Take the same exam repeatedly, trying different approaches to architecture.

Functionality: Architectures

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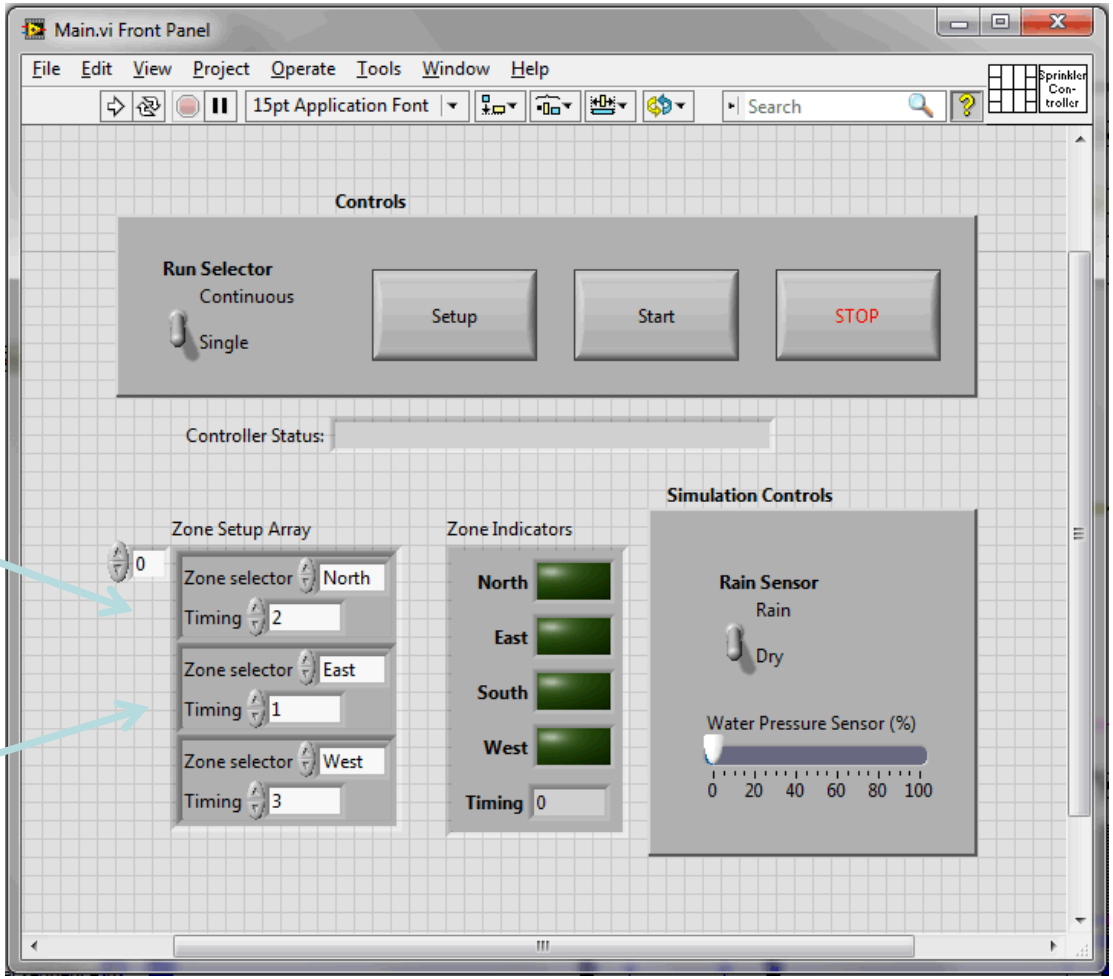
- State machine,
  - Single loop, poll controls, store state information in shift registers.
  - This simple architecture can be used to solve all of the practice exams.
- Queue-driven state machine,
  - Event structure in independent loop to handle UI,
- Multiple producer/consumer loops with queue-based communication,
  - Very flexible architecture, but can be time-consuming to set up.
- Actor framework:
  - Don’t do it!

Sequencer: Sprinkler Controller

A sequence of events is stored in an array:

Sequence is user-editable. Can be read from/ written to a file.



Things to Practice

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- Certain types of operations occur over and over in the practice exams:
  - Event timer
    - Implement using a functional global.
    - Can you make it pauseable? Multiple timers? Etc…
  - I/O to simple ASCII, tab or comma-delimited files.
  - Event sequencer (queue, or array):
    - Your program should be able to step through a sequence of preprogrammed events.
  - Handling of date/time data
    - Conversion of ASCII data to/from timestamp and/or time/date clusters.
- Exercises in the “CLD Success package” are very helpful!
  - Exercises touch on all these points, and have solutions.

Dealing With Time Pressure

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- Efficient coding practices:
  - Use appropriate architecture.
  - Document as you go.
  - Write clean code.
  - Learn to use “Quick Drop”:
    - <Ctrl>-<Spacebar> then start typing the name of the vi.
- Plan ahead:
  - Design your application on paper before you start writing code.

Plan Before You Code

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- My observation: with the practice exams and with the real exam, I found that I could take 30-45 minutes to design the application (with pencil & paper) and complete the exam on time.
- It's tough to force yourself to take time to plan; your instinct is to start coding.
- Planning ahead helps you avoid making critical design errors, such as choosing an architecture that's unsuitable for meeting some part of the specification.

Things You Don’t Need to Know

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- The CLD exam tests your knowledge of the core language.
- There are a lot of things the exam doesn’t cover:
  - Data acquisition (DAQmx),
  - Instrument control (VISA, etc.),
  - Object-oriented LabVIEW,
  - Network-dependent operations,
  - RT or FPGA programming,
  - NI motion/vision or other add-ons.

Conclusions

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- The CLD exam is difficult because of time pressure + specific standards for style & documentation.
- Practice will help you:
  - Be efficient in your use of time,
  - Develop the habits of good documentation and coding style.
- There's a lot you don't have to know to pass the CLD exam.