CCA
Common Component Architecture

A Simple CCA Component Application

CCA Forum Tutorial Working Group
http://www.cca-forum.org/tutorials/

Module Overview

- What the example does: the math.
- From math to components: the architecture.
- The making of components: inheritance and ports.
- Framework-component interactions.
- Putting it all together: the Ccafeine ways.
- The application in action.

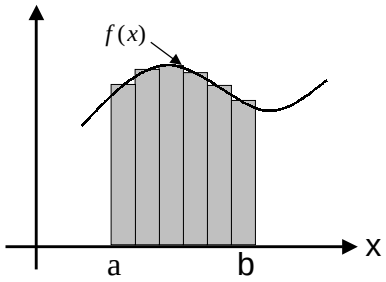
Goals

To show how CCA components are used to build an application to numerically integrate a continuous function using two different integration techniques.

The Math: Integrator (1)

The midpoint numerical integrator

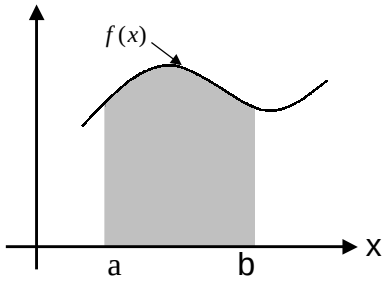
$$\int_a^b f(x)dx \approx \frac{b-a}{n}\sum_{j=1}^{n} f\left(\frac{x_{j-1}+x_j}{2}\right)$$



The Math: Integrator (2)

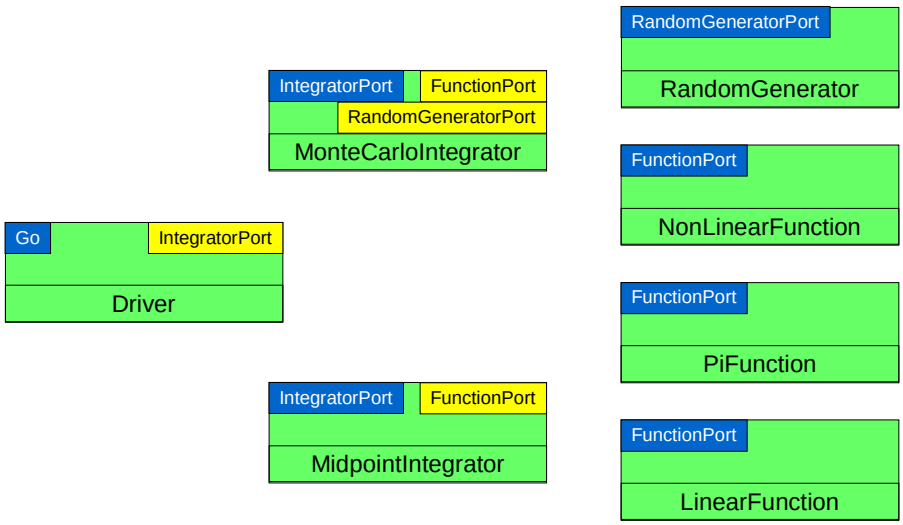
The Monte Carlo integrator

$$\int_a^b f(x)dx \approx \frac{1}{b-a}\left(\frac{1}{N}\sum_{i=1}^{N} f(x_n)\right)$$

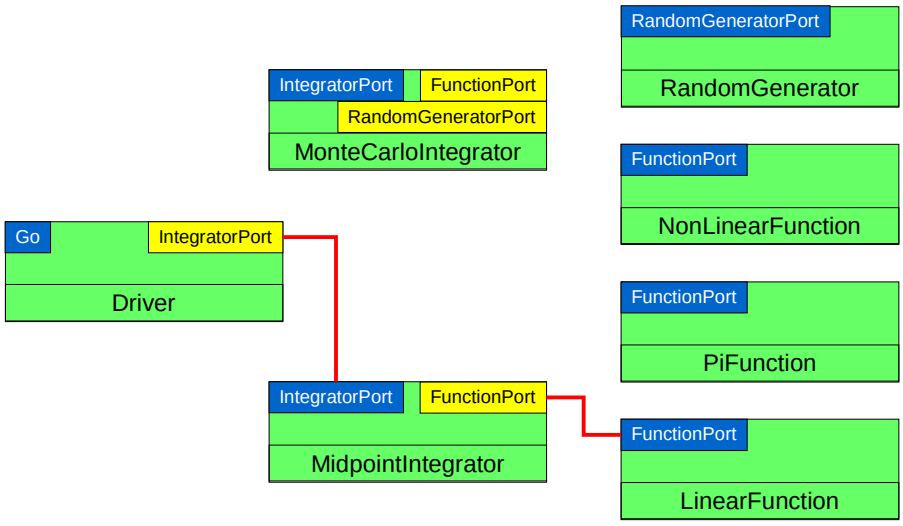


x_n Uniformally distributed in $[a,b]$

Example Architecture



Pluggability: Scenario 1



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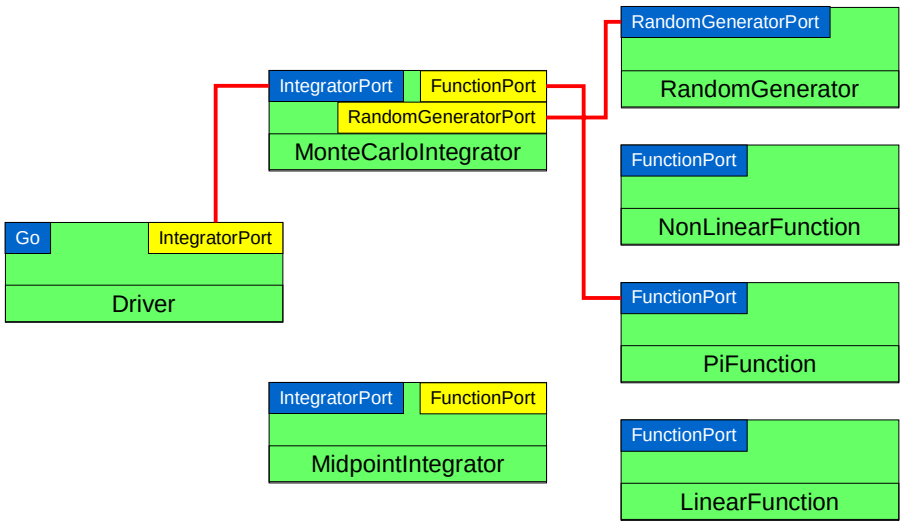
Pluggability: Scenario 1



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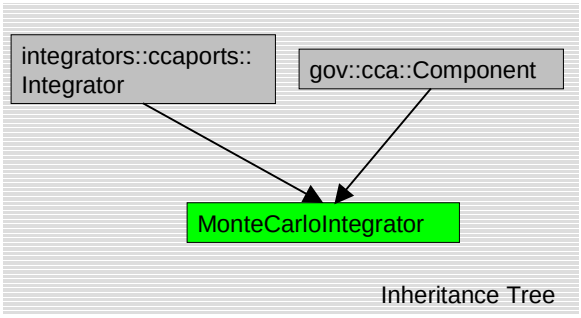
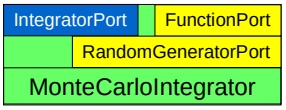
MonteCarloIntegrator in Details





Relevant files:
MonteCarloIntegrator_CCA.h
Integrator_CCA.h
Function_CCA.h
RandomGenerator_CCA.h

What makes it a component?
Inheritance from ***gov:cca::component***

Where does **IntegratorPort** come from?
Inheritance from ***integrators::ccaports::Integrator***

Notes

- Inheritance from ***gov::cca::Component*** furnishes the only method known to the framework: ***setServices()***
- "**Provides**" ports are interfaces that need to inherit from ***gov::cca::Port***
- A component need to have access to definitions of methods in the ports it "**Uses**" , hence the need to include ***Function_CCA.h*** and ***RandomGenerator_CCA.h***

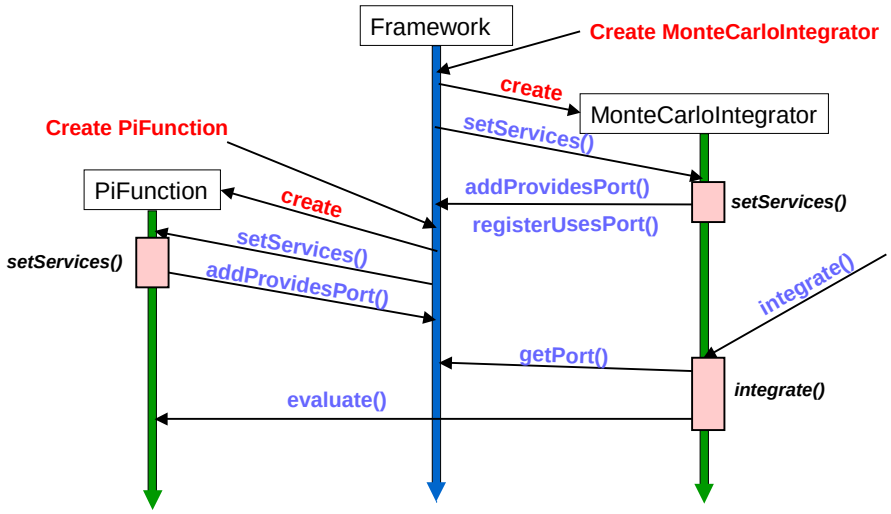
The Framework Role

- Framework-to-Component: ***setServices()***
  - Called after the component is constructed.
  - The component's chance to identify:
    - Ports it provides – ***addProvidesPort()***
    - Ports it uses – ***addUsesPort()***
  - Component should not acquire the port here – Reason: it may not be there yet !!!!.
  - Also used to "shutdown" the component.

Component-to-Framework

- Mainly through ***Services*** object passed through ***setServices().***
- ***createPortInfo()***:
  - portName, portType, portProperties.
- ***addProvidesPort()***, ***registerUsesPort()***:
  - Component "*pointer*", PortInfo
- ***getPort():***
  - Called by the using component.
  - Matching using portType (not name).
- ***releasePort(), removeProvidesPort()***:
  - When all is done.

When are calls made??



Notes

- Relevant code : MonteCarloIntegrator_CCA.cc
- ***getPort()*** is called immediately before the port is used.
- The framework only knows ***gov::cca::Port*** , hence the ***dynamic_cast<>.***
- Making a port call: it's just a regular ***virtual*** call***.***

Putting it all together

- Getting the application to do something:
  - Assembling the components into an app.
  - Launching the Application.
- App. assembly:
  - Framework need to be told what components to use, and where to find them.
  - Framework need to be told which ***uses*** port connects to which ***provides*** port.
- App execution: the ***GO*** port:
  - Special ***provides*** port used to launch the application (after connections are made).

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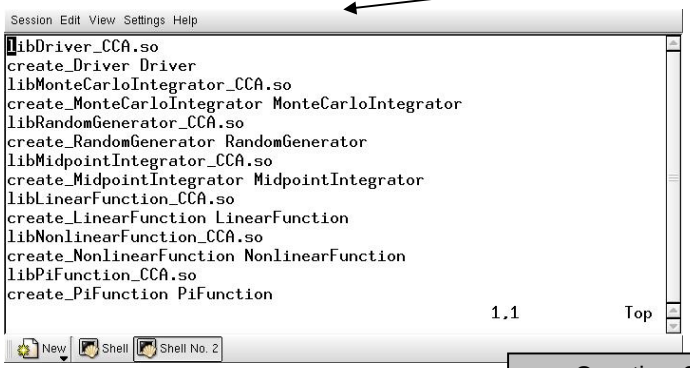
Oh Component , where art thou?.

Which components, and how to create them



Questions?. Ask Rob

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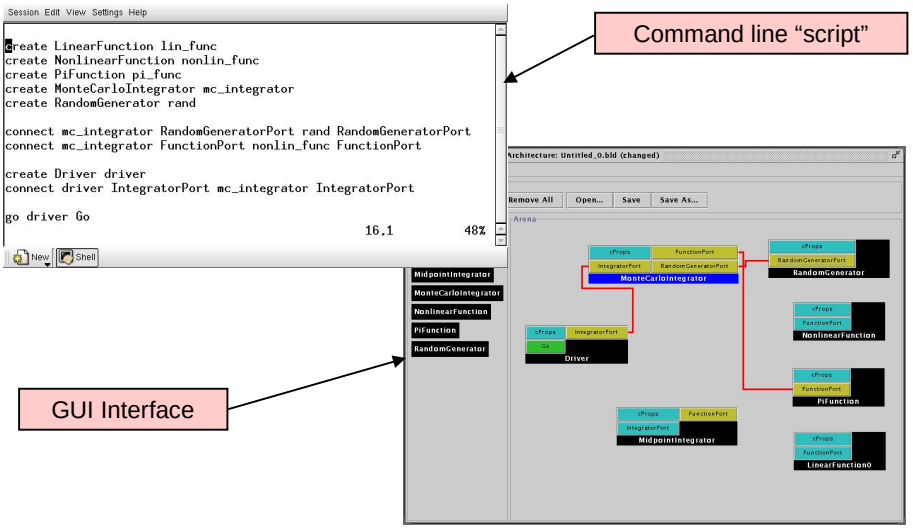
App. Assembly The Ccafeine way



And now, our feature presentation.