Reactlog 2.0: Debugging the State of Shiny

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slides: bit.ly/rstudio-conf-2019-reactlog

rstudio::conf AUSTIN

Situation

- Built a Shiny application - 😄😄
- Add a new reactive feature to your application - 😄😄
- Reactive output does not update - 😞😐
- No errors in console - 😳😱⁉️

Debugging Reactive Code

- Debugging reactive code within a *working* Shiny application is **not a trivial task**
- Must know the reactive state:
  - Value
  - Dependencies / Invalidations
  - … over time!

Solution:
reactlog !!

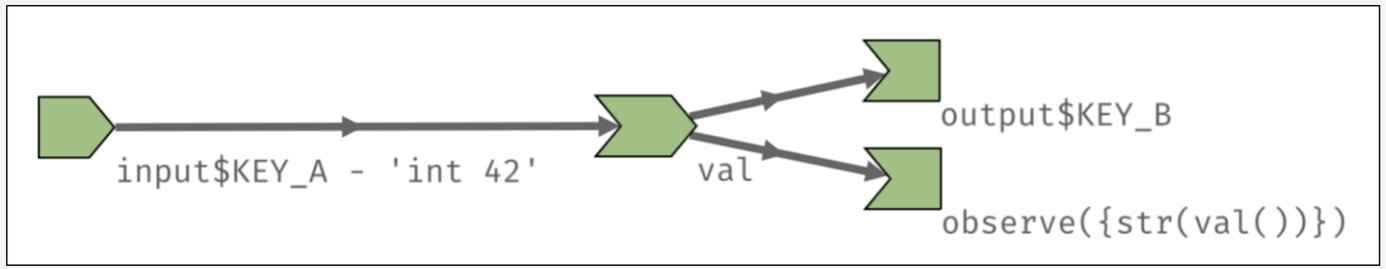
What is `reactlog`?

- `reactlog` - A snapshot of the history (**log**) of all **react**ive interactions within a shiny application

- (Review Reactive Programming)

Reactive Programming

- Reactive Programming -
  - Paradigm concerned about the propagation of change
- Three types of reactive elements




```
# Sources
input$KEY_A

# Conductors
val <- reactive({
  input$KEY_A + 1
})

# Endpoints
output$KEY_B <- renderPrint({
  val()
})

observe({
  str(val())
})
```

What is `reactlog`?

- `reactlog` - A snapshot of the history ("log") of all reactivity interactions within a shiny application

- (Review Reactive Programming)

- Traverse the reactive log forwards or backwards in time

- Search for defined reactive objects

- Filter to a reactive object's family tree (dependency tree)

- Built on cytoscape.js

Setup

- Install
  - ```
    devtools::install_github(
      "rstudio/reactlog"
    )
    ```
  - Will be a natural dependency of Shiny in v1.3.0
- Usage
  - ```
    # enable reactlog
    # before running your app!!
    options(shiny.reactlog = TRUE)

    # run your shiny app
    shiny::runApp()

    # in your app...
    #   Mac: `cmd + F3`
    #   Windows: `ctrl + F3`
    # or...
    showReactLog()
    ```

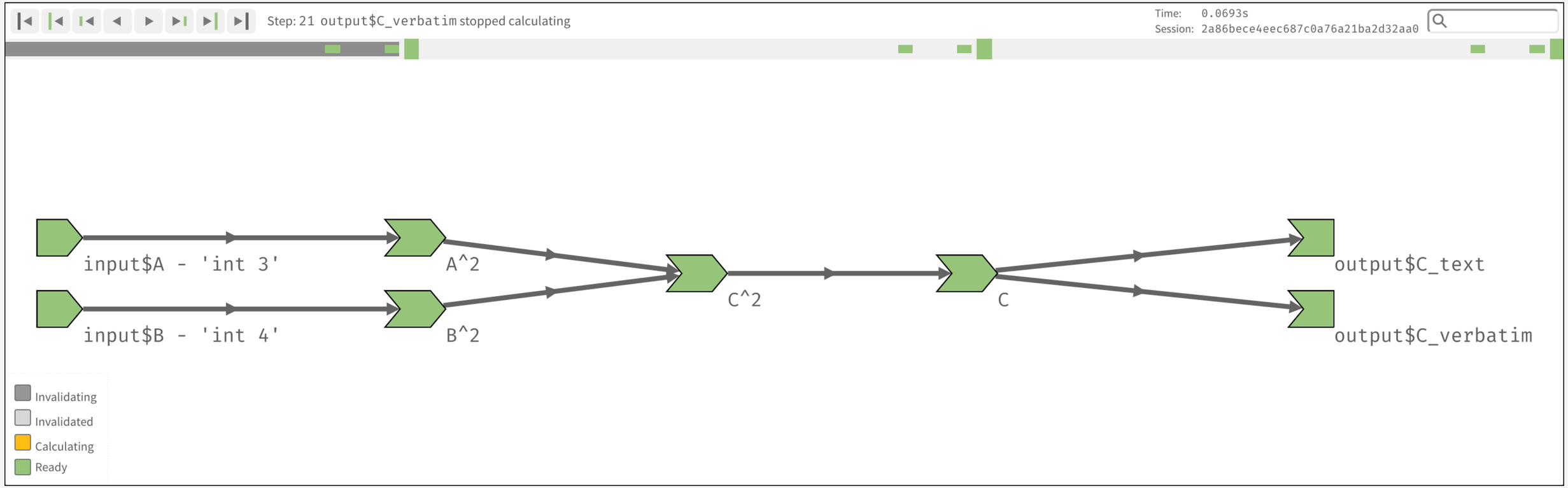
reActivity Being Recorded

- Reactivity
  - Define a reactive object
  - Start/Stop invalidating a reactive
  - Stop/Stop isolating reactive values
  - Add/Remove a reactive dependency
  - Freeze/Thaw a reactive value
- Values
  - Value changes
  - Start/Stop calculations
- Extra
  - User marked time points
  - Shiny is idle

Debugging Shiny Apps with reactlog

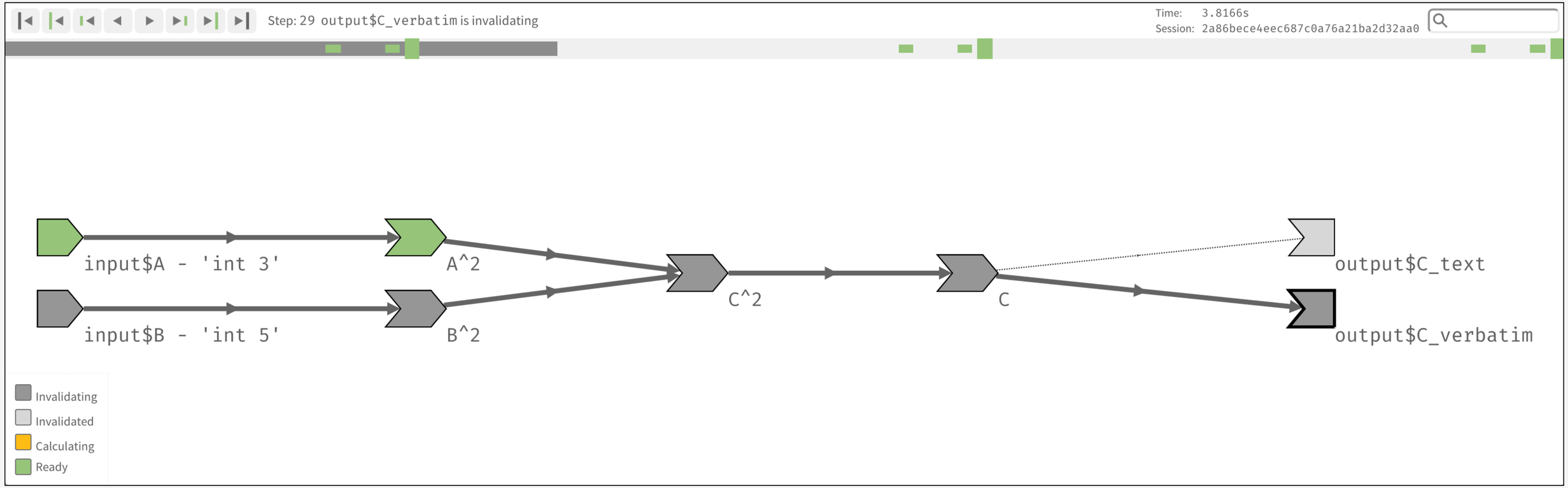
(Working) Pythagoras

- **Demo:** http://bit.ly/rstudio-conf2019-reactlog-demo



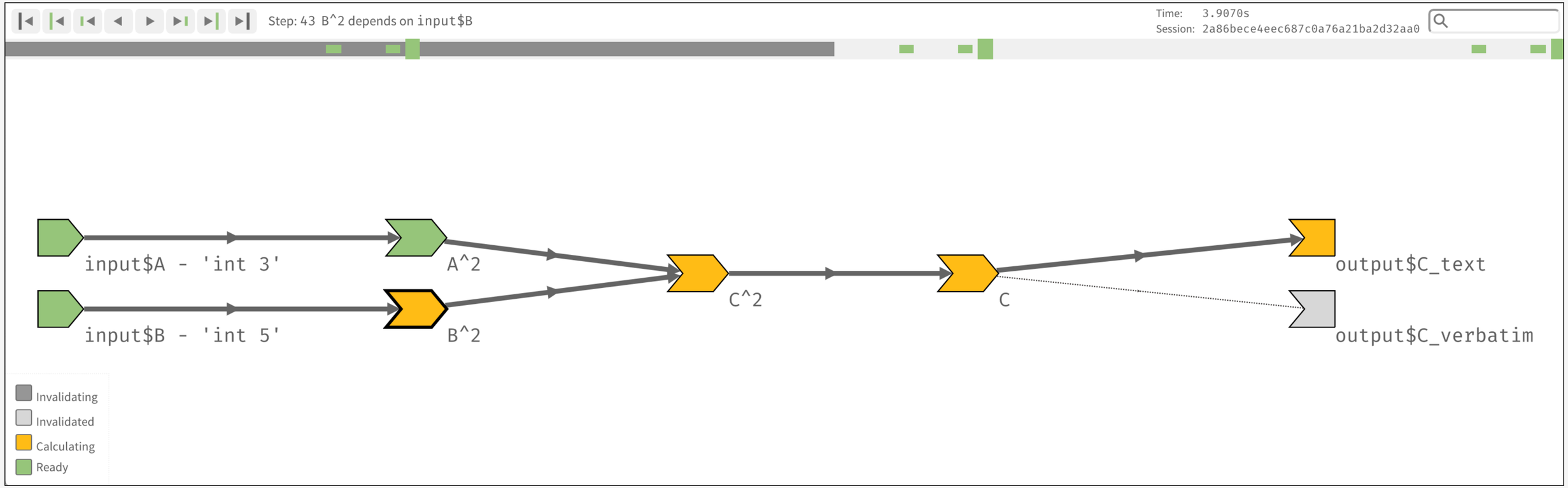
(Working) Pythagoras

- Changed Value of `input$B` to `5`
- All downstream dependencies are invalidated



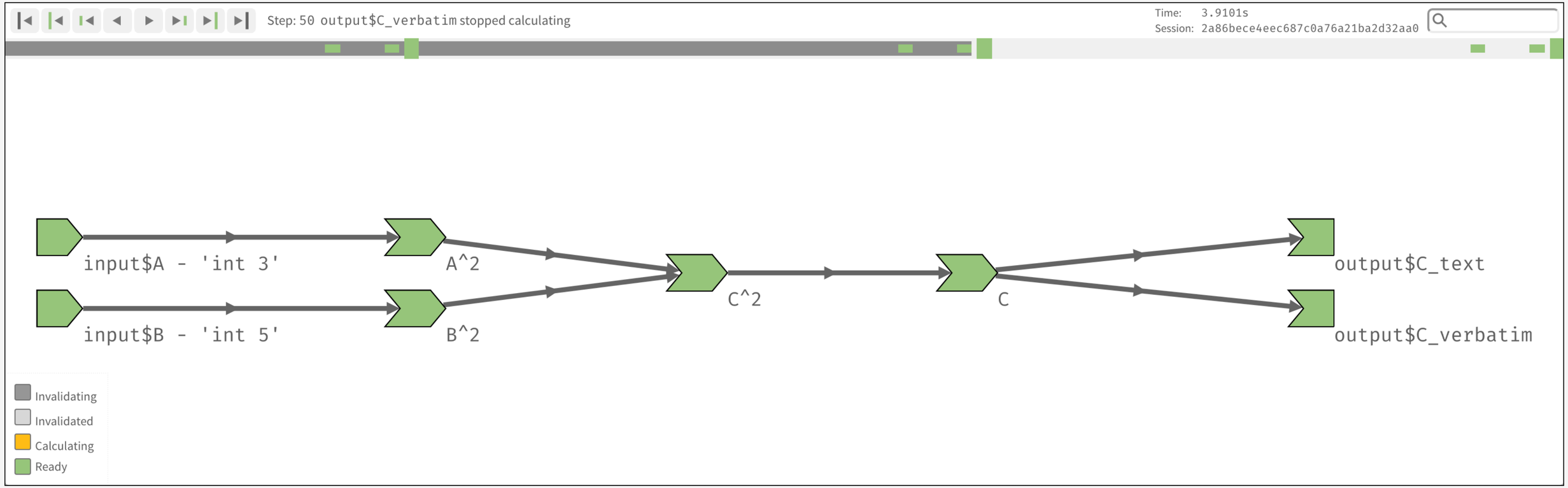
(Working) Pythagoras

- All visible output values are re-calculated



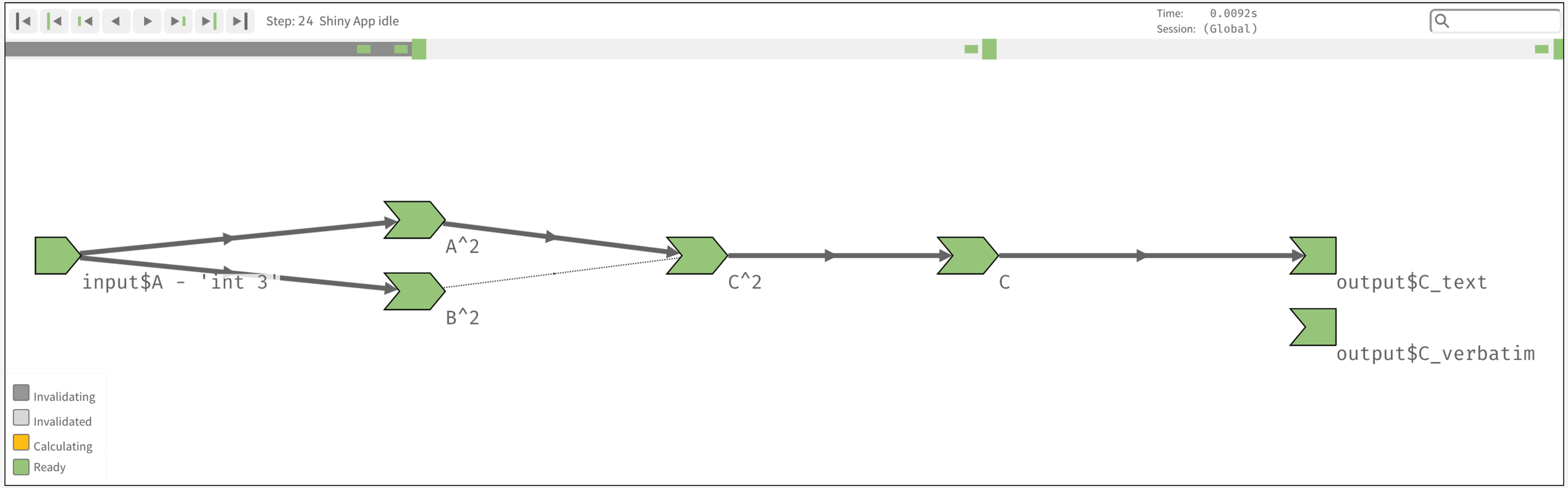
(Working) Pythagoras

- Back to steady state (Shiny is idle)



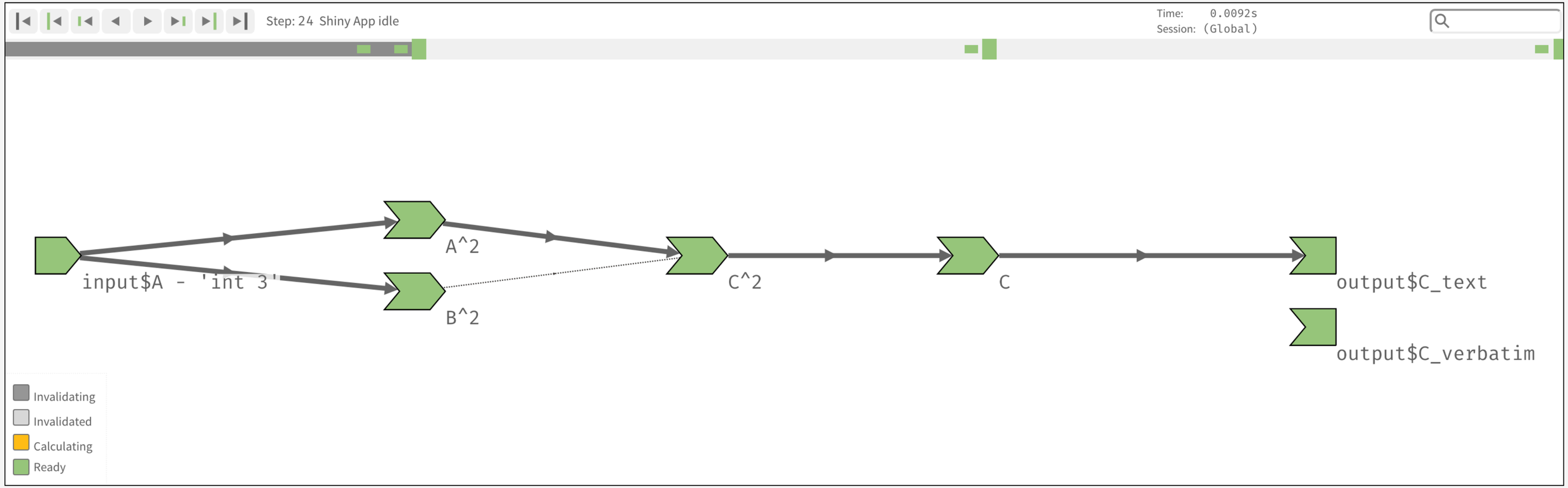
Broken Pythagoras

- **Demo:** http://bit.ly/rstudio-conf2019-reactlog-demo



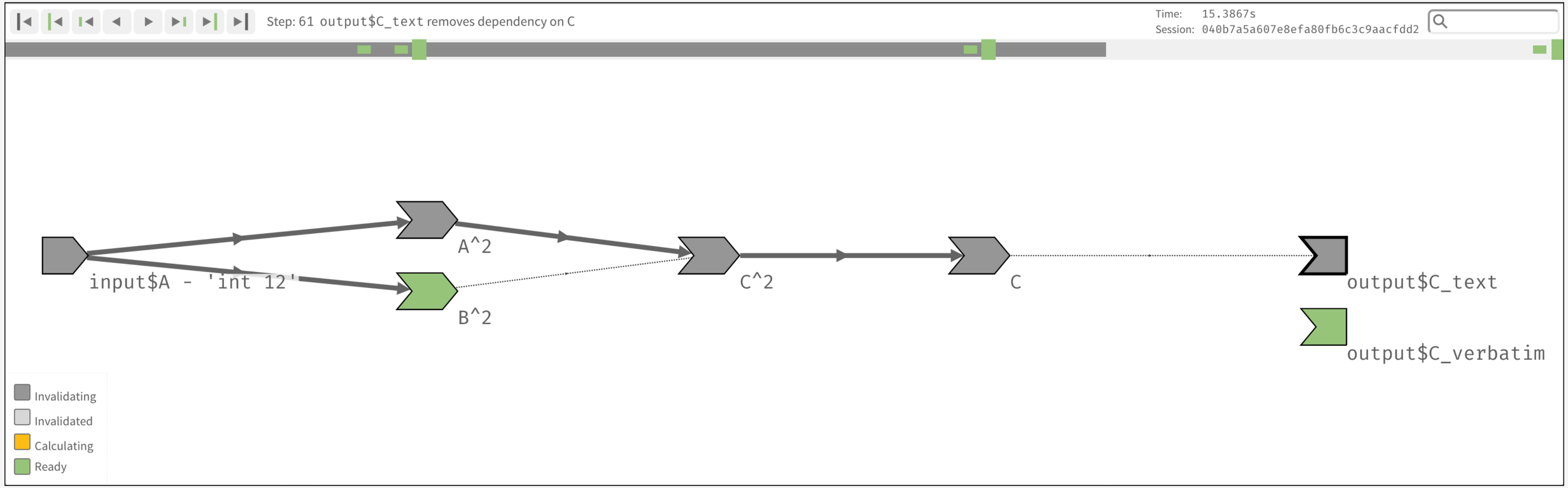
Broken Pythagoras

- **Problem:** `input$A` **is used to calculate** `B^2`



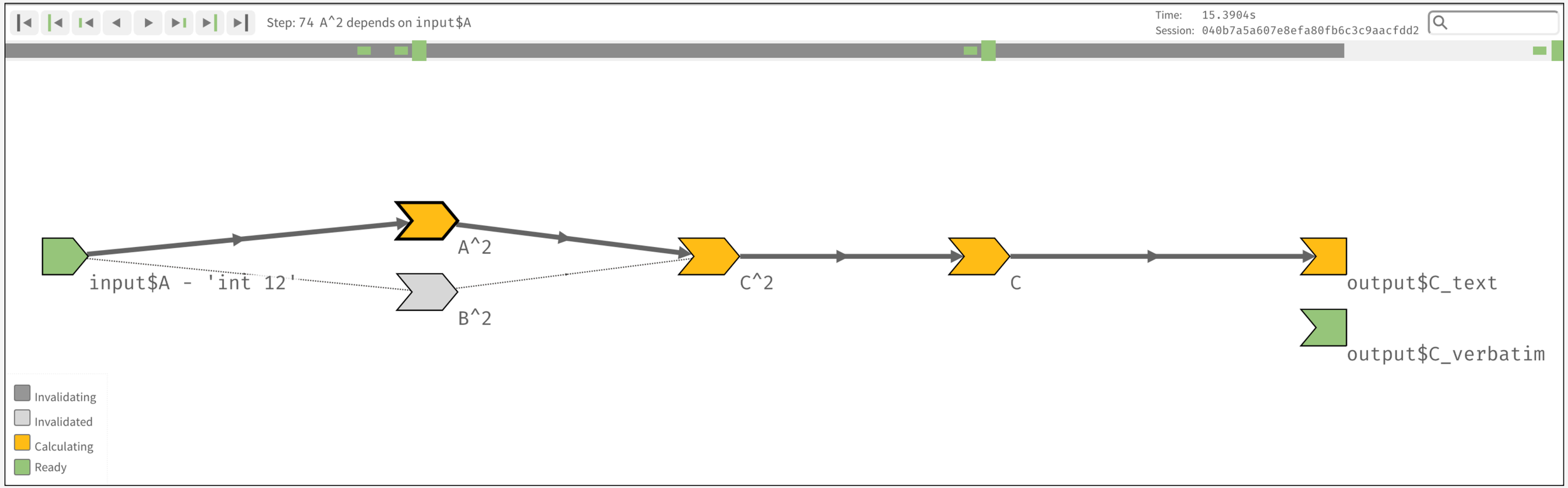
Broken Pythagoras

- Problem: `C_verbatim` is **never** invalidated



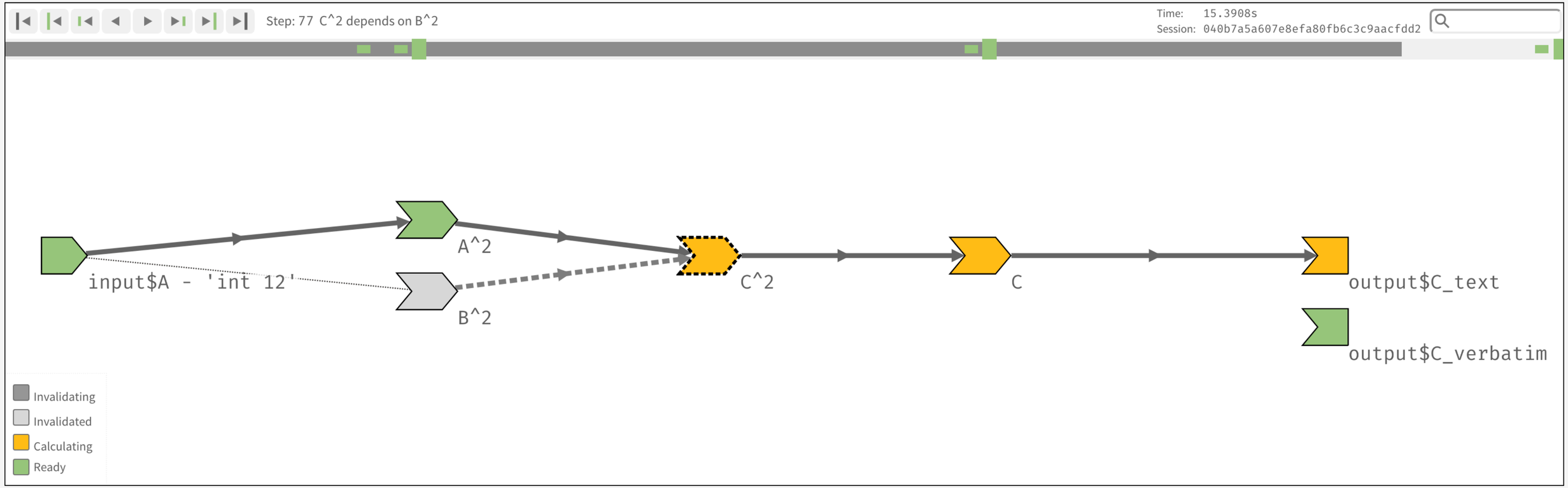
Broken Pythagoras

- Calculation looks correct… so far



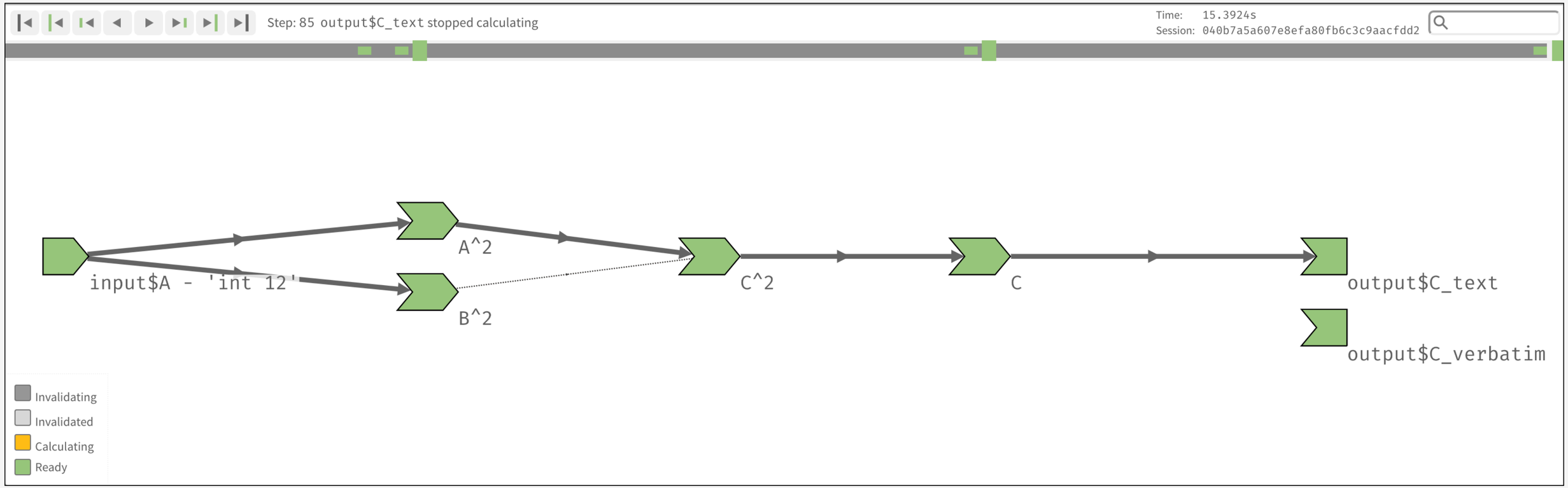
Broken Pythagoras

- **Problem: Unwanted `isolate()` call in `C^2` to `B^2`**



Broken Pythagoras

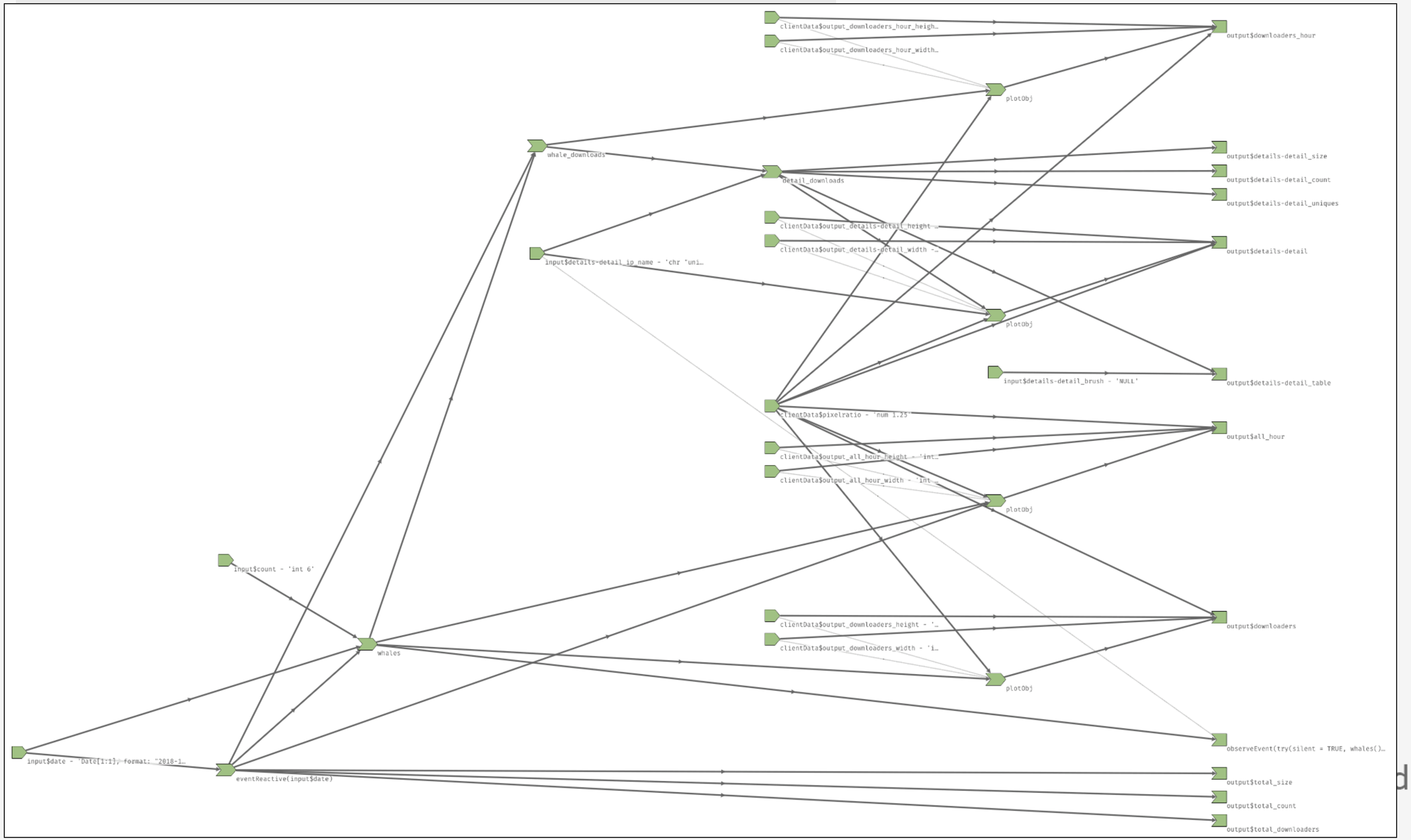
- Back to steady state (Shiny is idle)



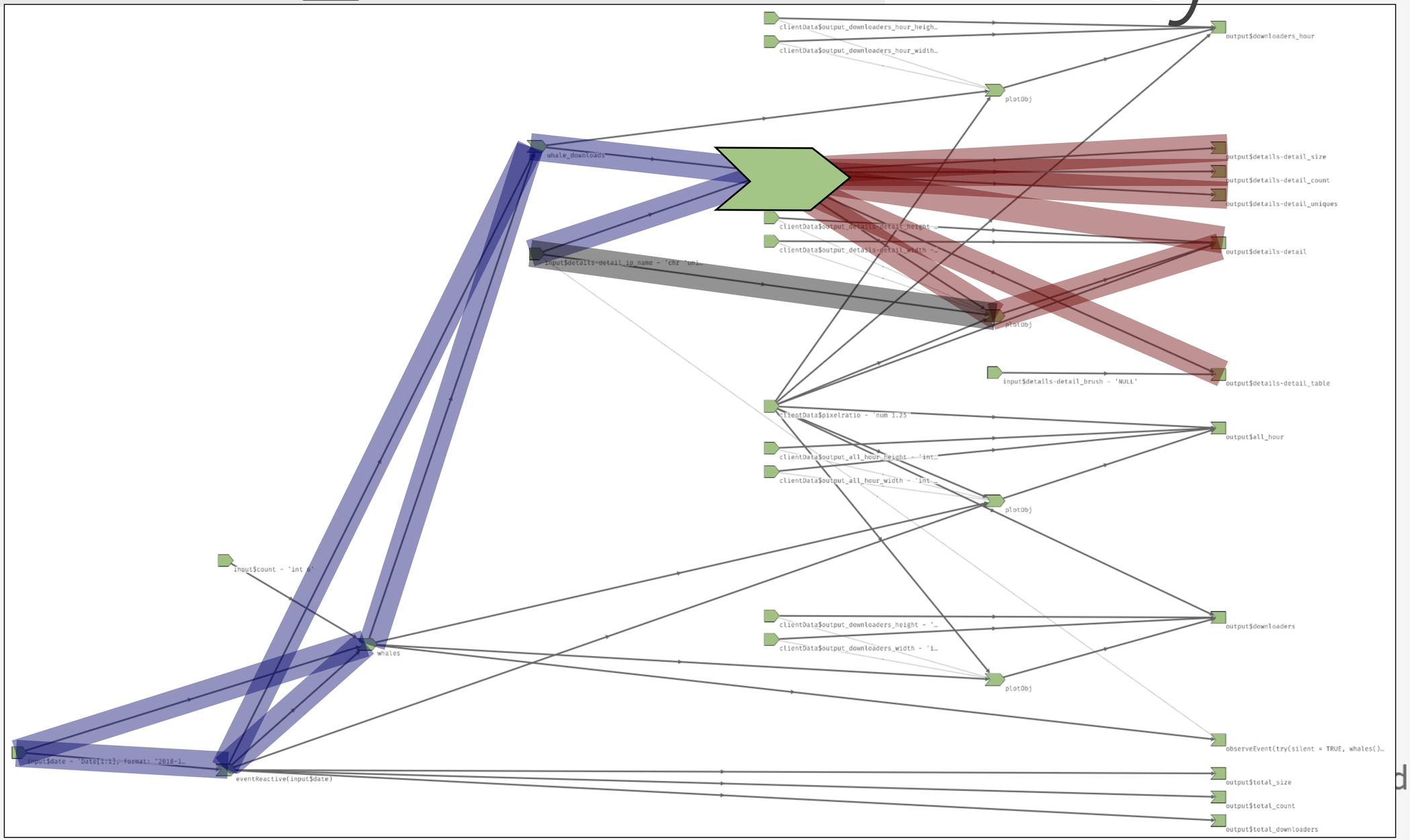
Searching within `reactlog`

- `cranwhales`: github.com/rstudio/cranwhales
- Run app:
  - ```
    options(shiny.reactlog = TRUE)
    shiny::runGitHub("rstudio/cranwhales", ref = "sync")
    ```
- Very dense application!
- Using the search bar in the top right,
  search for `"detail_downloads"` to filter the graph
    ```

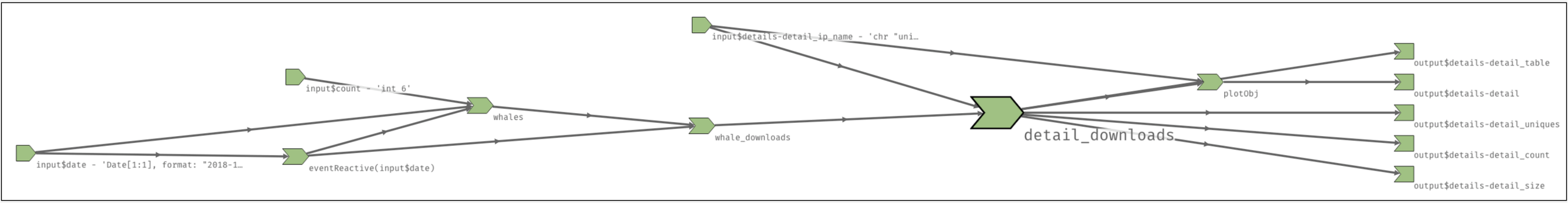
cranwhales is **dense!**



detail_downloads family tree



`detail_downloads` family tree



Things to Remember

- Shiny outputs that are not visible are not calculated. …This is on purpose!
  (Effective Reactive Programming - Joe Cheng @ Shiny DevCon 2016 “Part 1”@46:34)

- If new reactive objects are being created for every user interaction,
  you may have coded an “anti-solution”
  (Shiny DevCon 2016 “Part 1”@17:00)
  - Will cause reactlog graph to become **very** large
  - Maybe use a reactive() vs an observe()?

- `reactlog` is **NOT** a *performance* debugger. `reactlog` is a *reactivity* debugger
  - Use profvis for *performance analysis*

- Do not keep `options(show.reactlog = TRUE)` when deploying to production.

Future Ideas

- Visually differentiate separate user sessions
- Display the value of an endpoint (`output`) or conductor (`reactive()`)
- Add expandable / collapsable groups for a set of reactive objects
  - Ex: `renderPlot` is made of 5+ reactive objects...
    really only one reactive component for a user
- Remove reactive objects from the `reactlog` graph that have been garbage collected
- Combine `reactlog` and `profvis` to analyze a Shiny application's performance and reactive state simultaneously

Questions?

- **`reactlog`:** github.com/rstudio/reactlog
  - `options(shiny.reactlog = TRUE); shiny::runApp()`
- **Shiny reactivity:** shiny.rstudio.com/articles/#reactivity
- **Slides:** bit.ly/rstudio-conf-2019-reactlog (GitHub)