

# R Markdown and Interactive Dashboards

## Publishing Outputs



## Introduction and R Markdown Basics

Learning Objectives

Infrastructure: RStudio.cloud

Components

Headers and Text

Links and Images

Math text

Tables

The Markdown Quick Reference

Your turn: embellish plain text

Your turn: publish your report

Your turn: deploy your first dashboard

## The R Markdown Workflow

### Publishing Outputs

Output options

HTML

PDF

Presentations

Dashboards

Document templates

knitr options

Embedding code in chunks and inline

Other languages

Parameterization

Publishing documents

Your turn: Experiment with different document outputs

Your turn: Restructure from plain R Markdown to slides

# REVIEW QUIZ

- R Markdown is a language for creating \_\_\_\_\_ documents.
- Metadata for an R Markdown document is written at the top of the document in \_\_\_\_\_
- Name one or more types of information that we learned how to include in an R Markdown document.

*R Markdown is a system for  
creating structured  
computational documents*

**STAGE DOOR  
BAND AND CREW  
ONLY**

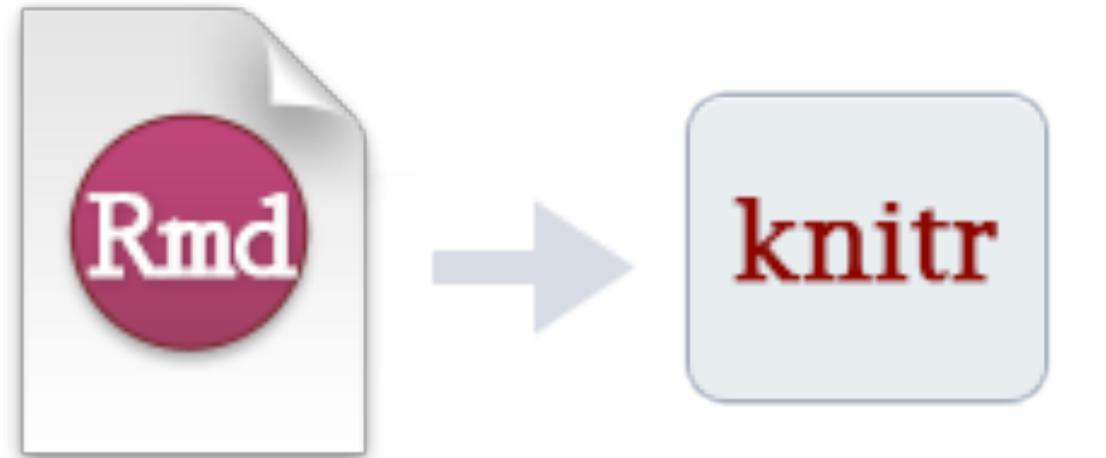
# R Markdown Relies On A Toolchain

Document



# R Markdown Relies On A Toolchain

Document



Package

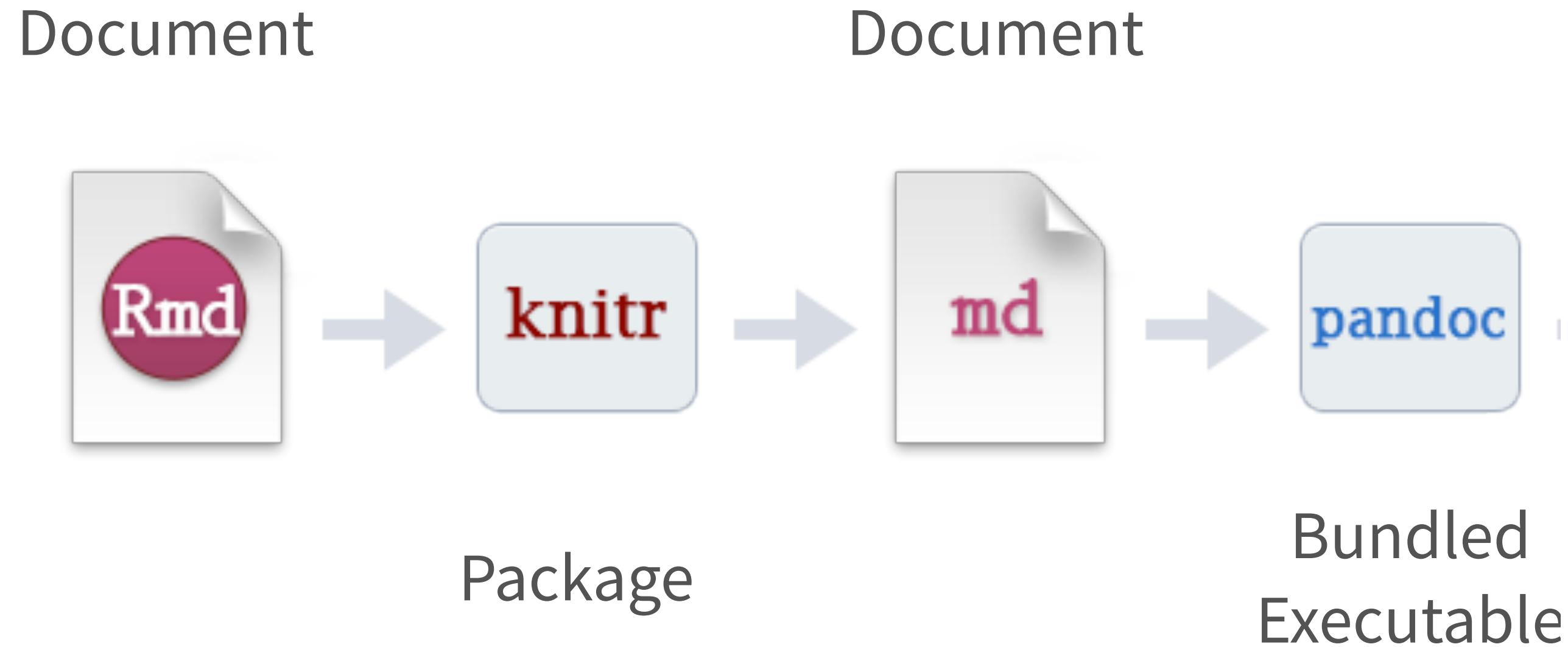
# R Markdown Relies On A Toolchain

Document

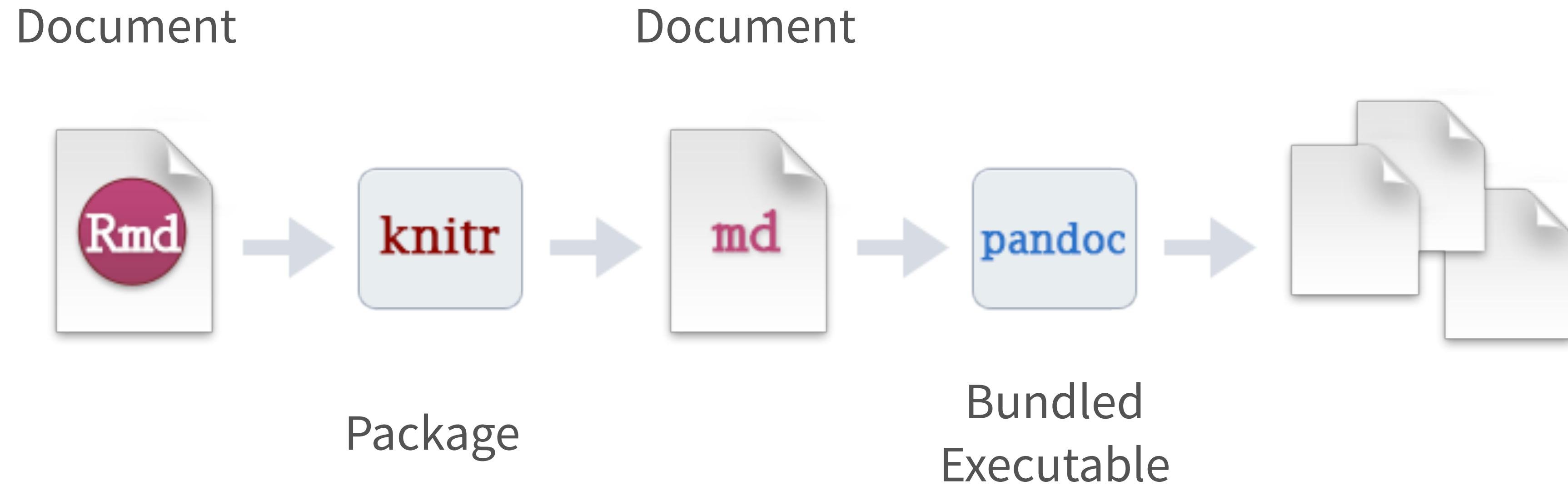


Package

# R Markdown Relies On A Toolchain



# R Markdown Relies On A Toolchain



*R Markdown can knit to many  
document types*



# We've Mostly Focused on HTML Output

Document



**knitr**

Document



**pandoc**

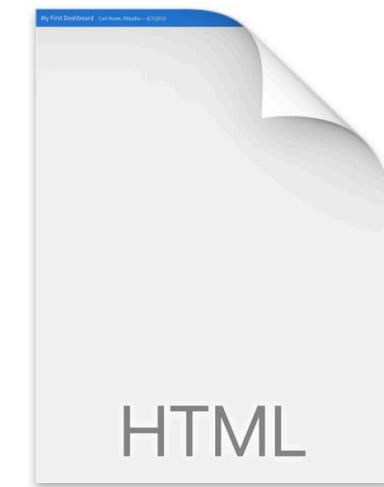
Reports



Slides



Dashboards



Web Sites



Package

Bundled Executable



And many many more....

# EXERCISE 21

(Don't be concerned that you missed a bunch of exercises.  
Each module has its own unique exercise numbers, but exercise  
numbers aren't consecutive between modules)

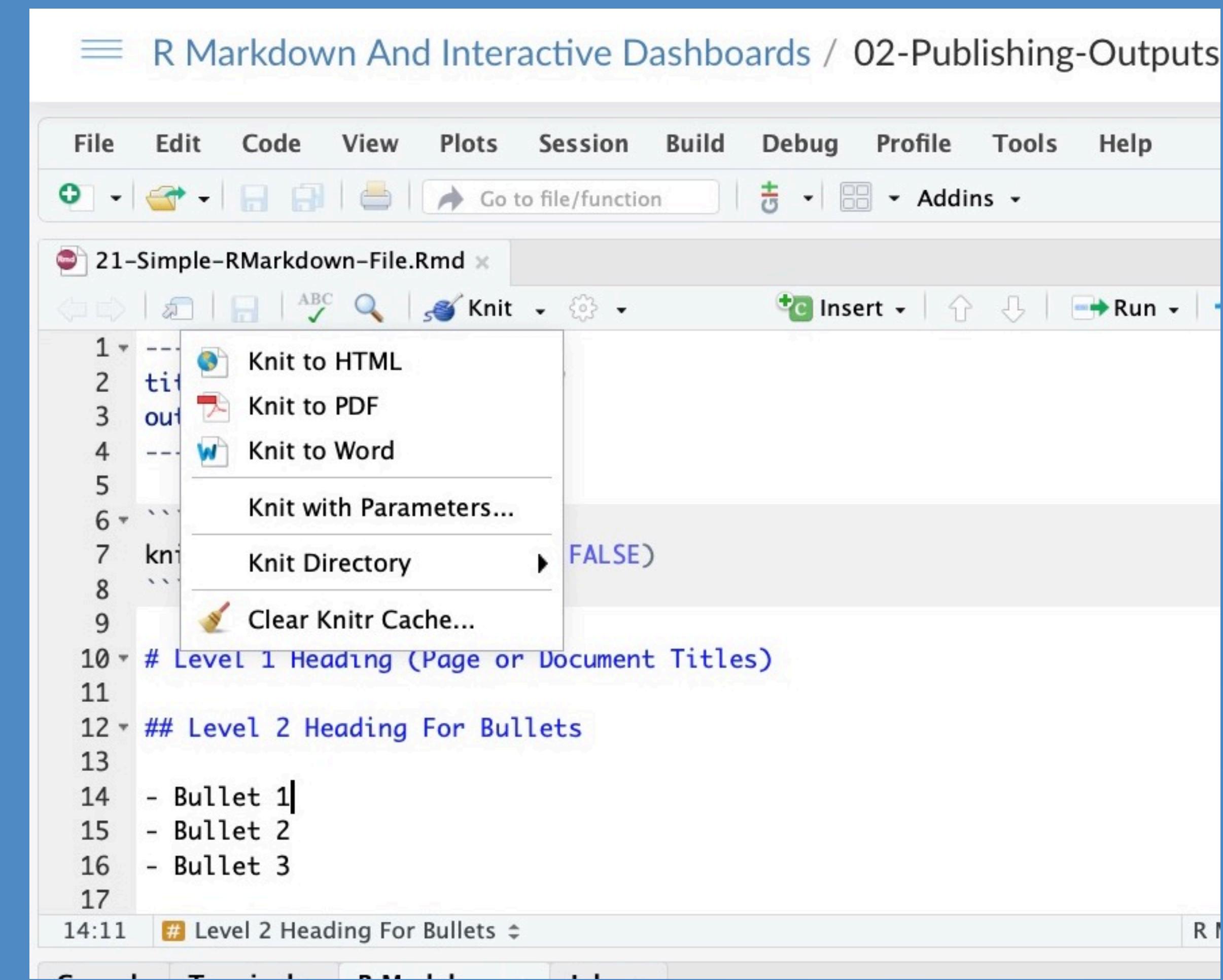
rstudio::conf

## Knit to Different Formats

1. Open project **02-Publishing-Outputs**
2. Click on **21-Simple-RMarkdown-File.Rmd** in the Files pane to open that file
3. Click on the arrow next to Knit, and select **Knit to HTML**
4. Now click on the arrow next to Knit and select **Knit to PDF**, and **Knit to Word** to view different outputs

WARNING: you may need to disable your browser pop-up blocker to see the result

3m 00s



## YAML\* Header Data About Your Document (Metadata)

\*YAML: Yet Another Markdown Language

- Different values in the document type will create different outputs
- Various Document output types may require you to add more parameters and sub-parameters in the YAML header

```
---
```

```
title: "My First R Markdown Document"
author: "Carl Howe, RStudio"
date: "8/26/2019"
output: html_document
---
```

# Incomplete Document Type Map

| YAML Output String      | Additional Packages Required | Output Type  | Output Document Extension |
|-------------------------|------------------------------|--------------|---------------------------|
| html_document           | None                         | Report       | HTML                      |
| pdf_document            | None                         | Report       | PDF                       |
| word_document           | None                         | Report       | .DOCX File                |
| ioslides_presentation   | None                         | Presentation | HTML                      |
| xaringan::moon_reader   | xaringan                     | Presentation | HTML                      |
| powerpoint_presentation | None                         | Presentation | .PPTX File                |
| flex_dashboard          | flexdashboard                | Dashboard    | HTML                      |

And there are many more: <https://rmarkdown.rstudio.com/lesson-9.html>

# Select Your Output File Type Using YAML Statements

```
---
```

```
title: "Simple Markdown File"
output: html_document
```

```
---
```

```
---
```

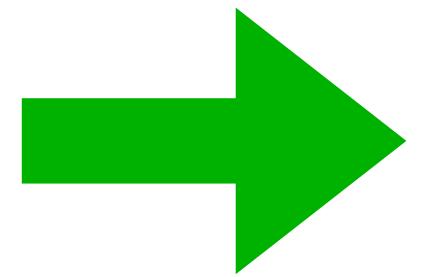
```
title: "Simple Markdown File"
output: pdf_document
```

```
---
```

```
---
```

```
title: "Simple Markdown File"
output: word_document
```

```
---
```



Simple Markdown File

Level 1 Heading (Page or Document Titles)

Level 2 Heading For Bullets

- Bullet 1
- Bullet 2
- Bullet 3

Level 2 Table Output

Here's a Level 2 table

```
summary(cars)
```

| speed         | dist           |
|---------------|----------------|
| Min. : 4.0    | Min. : 2.00    |
| 1st Qu.: 12.0 | 1st Qu.: 26.00 |
| Median : 15.0 | Median : 36.00 |
| Mean : 15.4   | Mean : 42.98   |
| 3rd Qu.: 19.0 | 3rd Qu.: 56.00 |
| Max. : 25.0   | Max. : 120.00  |

Level 2: An Equation

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

A Level 2 Plot

Here's a Level 2 plot



Simple Markdown File

Level 1 Heading (Page or Document Titles)

Level 2 Heading For Bullets

- Bullet 1
- Bullet 2
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Level 2 Table Output

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Simple Markdown File

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| Max. : 25.0   | Max. : 120.00  |

Level 2: An Equation

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

A Level 2 Plot

Here's a Level 2 plot

1

Level 3 Heading (Subheads or Tab Titles)

This just illustrates how level 3 subsections are rendered

# Select Your Output Format Using YAML Statements

```
---
```

```
title: "Simple Markdown File"
output: html_document
```

```
---
```

```
---
```

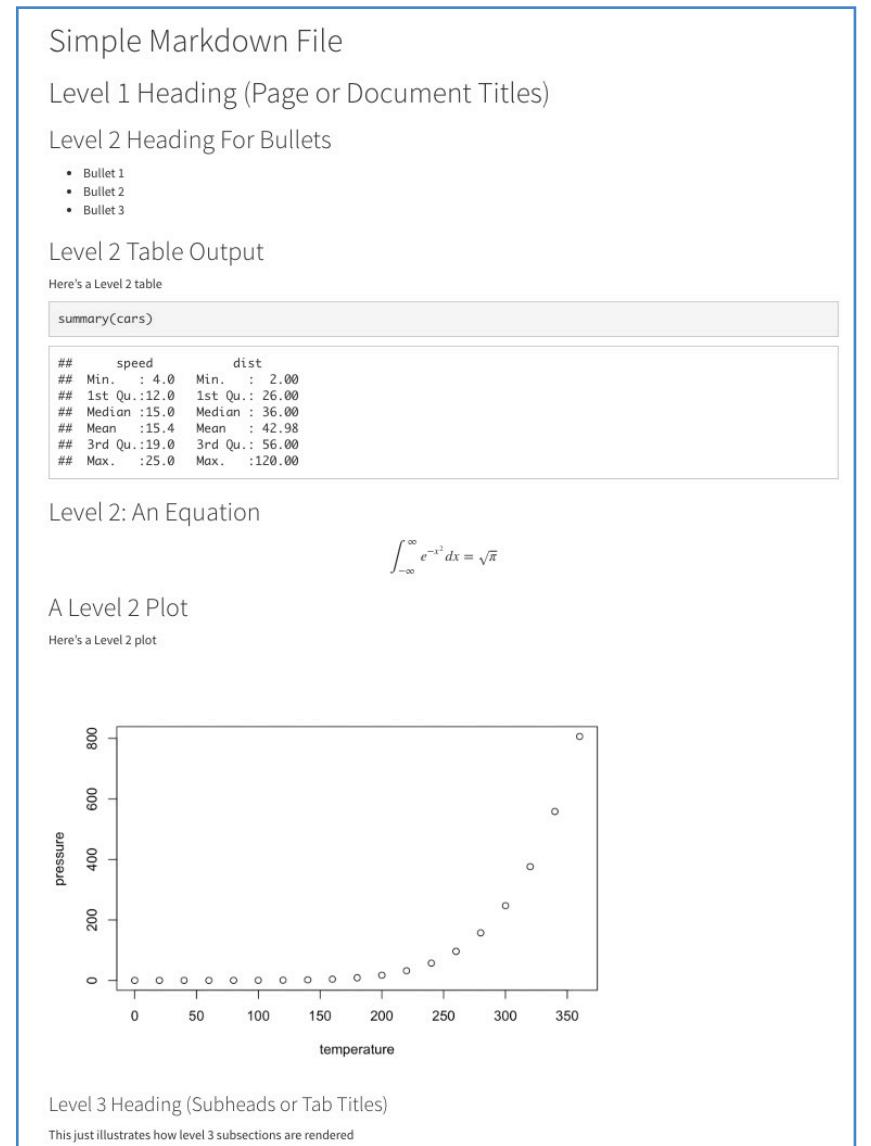
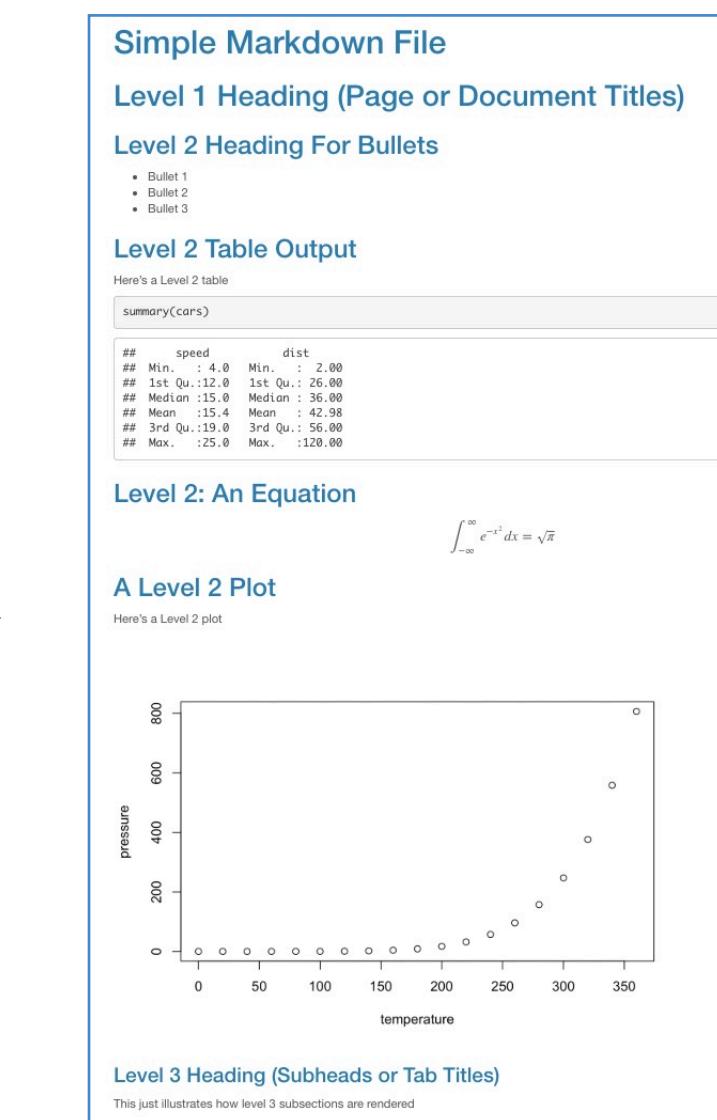
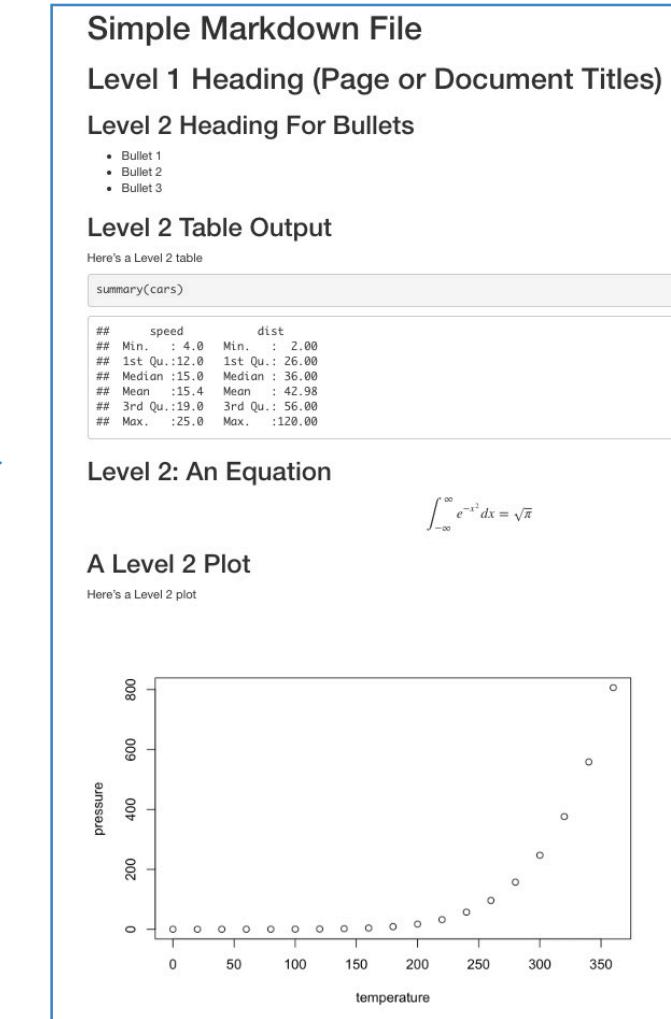
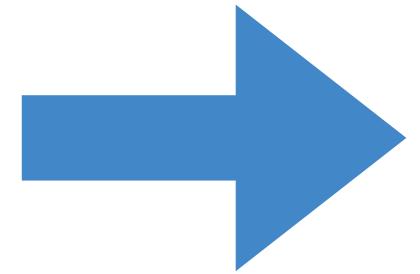
```
title: "Simple Markdown File"
output:
  html_document:
    theme: cosmo
```

```
---
```

```
---
```

```
title: "Simple Markdown File"
output:
  html_document:
    theme: cerulean
```

```
---
```



# Some `html_document` Themes

## Default `html_document` themes

- default
- cerulean
- journal
- flatly
- darkly
- readable
- spacelab
- united
- cosmo
- lumen
- paper
- sandstone
- simplex
- yeti

## Packages offering more document themes

`tufte::tufte_html`

`prettydoc::html_pretty`

# YAML Parameters

- We went from

```
---
```

```
title: "Simple Markdown File"
```

```
output: html_document
```

```
---
```

To

```
---
```

```
title: "Simple Markdown File"
```

```
output:
```

```
  html_document:
```

```
    theme: cerulean
```

```
---
```

Look what changed:

- We put **html\_document** on its own line under **output** and indented it 2 spaces.
- We added a colon to the end of **html\_document** when we added the **theme** parameter
- We indented **theme** another 2 spaces

# Your Turn

When we added themes, we went from

```
---
```

```
title: "Simple Markdown File"
```

```
output: html_document
```

```
---
```

To

```
---
```

```
title: "Simple Markdown File"
```

```
output:
```

```
  html_document:
```

```
    theme: cerulean
```

```
---
```

In your groups, discuss:

1. Why is `output: html_document` now split across two lines?
2. What you think the indentation indicates?
3. Why is there no colon at the end of `cerulean`?



# YAML Indentation Defines Relationships

```
---
```

```
title: "Simple Markdown File"
```

```
output:
```

```
    html_document:
```

```
        theme: cerulean
```

```
---
```

1. `title` and `output` are top level parameters.
2. `html_document`'s indentation under `output` indicates it is a parameter of `html_document`.
3. `theme`'s indentation under `html_document` indicates it is a sub-parameter of `html_document`

# Using Parameters In YAML

- We're now going to use `html_document` parameters to explore tables of contents
- We'll modify the following YAML code to see what happens

```
---
```

```
title: "Simple Markdown File"
output:
  html_document:
    theme: cerulean
    number_sections: true
    toc: true
    toc_depth: 3
    toc_float: false
---
```

# EXERCISE 22

rstudio::conf

## Create A Table of Contents

1. Click on **22-Simple-RMarkdown-File.Rmd** in the Files pane to open that file
2. Experiment with different values for the parameters for **html\_document**
3. Once you have a feel for how the table of contents works, replace

`toc_float: false`

with

`toc_float:  
collapse: true  
smooth_scroll: true`

4. Prepare to explain what those new sub-parameters do

```
---
```

```
title: "Simple Markdown File"
```

```
output:
```

```
  html_document:
```

```
    theme: cerulean
```

```
    number_sections: true
```

```
    toc: true
```

```
    toc_depth: 3
```

```
    toc_float: false
```

```
---
```



# So What Did These Parameters Do?

•

```
---
```

```
title: "Simple Markdown File"
output:
  html_document:
    theme: cerulean
    number_sections: true
    toc: true
    toc_depth: 3
    toc_float:
      collapse: true
      smooth_scroll: true
---
```

## Create A Presentation

1. Click on **23-ioslides-presentation.Rmd** in the Files pane to open that file
2. Change the YAML header to look like the one to the right.
3. Knit and step through the result in your preview pane (or launch in your browser)

```
---
```

```
title: "ioslides Presentation"
```

```
output:
```

```
  ioslides_presentation:
```

```
    widescreen: true
```

```
---
```

3m 00s

# Document Type Drives R Markdown Symbol Interpretations

| R Markdown Symbol | Alternate Symbol | Document Meaning | Presentation Meaning |
|-------------------|------------------|------------------|----------------------|
| #                 | ==               | Header 1         | New Section          |
| ##                | ----             | Header 2         | New Slide            |
| ###               |                  | Header 3         | Slide Subhead        |

## Try A Different Presentation Framework

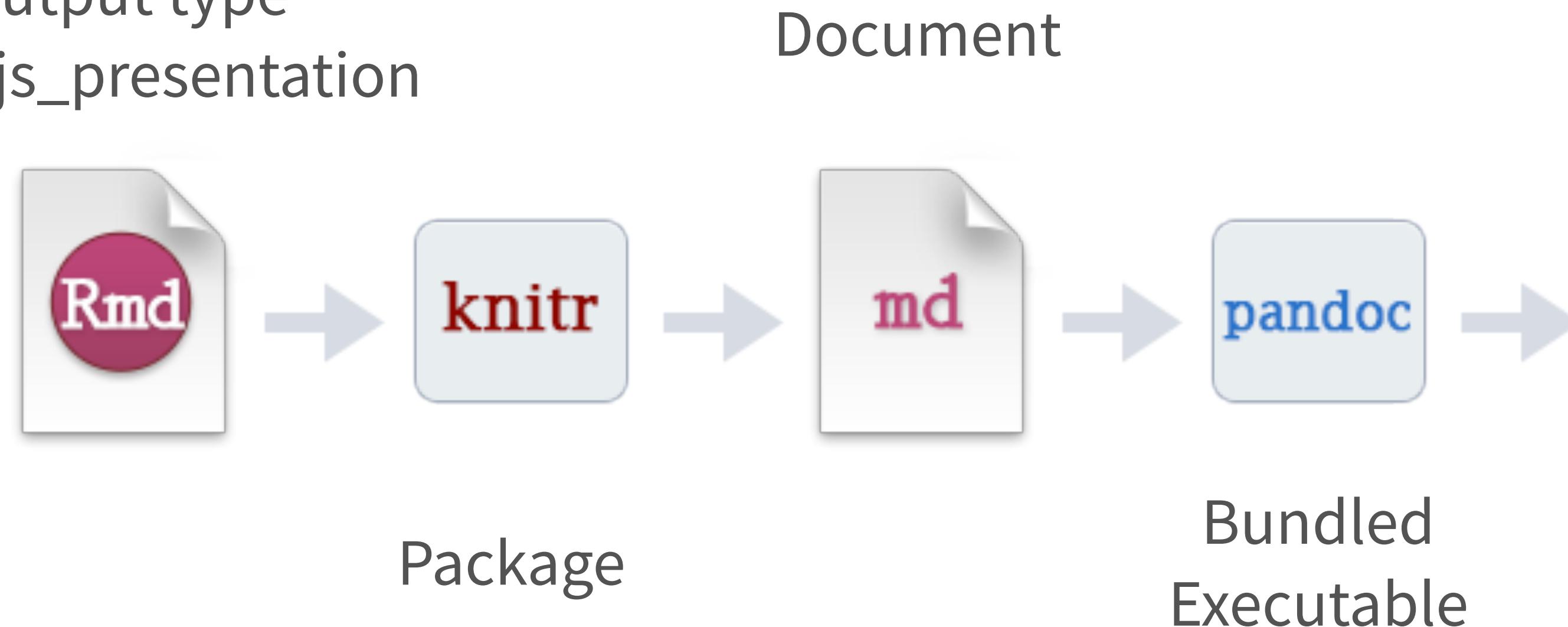
1. Click on **23-revealjs-presentation.Rmd** in the Files pane
2. Knit and step through the result in your preview pane (or launch in your browser)
3. What has changed from our prior HTML presentation?

3m 00s

# How Could You Use This Presentation Without RStudio.Cloud?

- HTML Presentations are

Output type  
revealjs\_presentation



23-revealjs-Presentation.html

*HTML-based R Markdown  
documents can be shared  
using the publish button in  
the RStudio IDE*

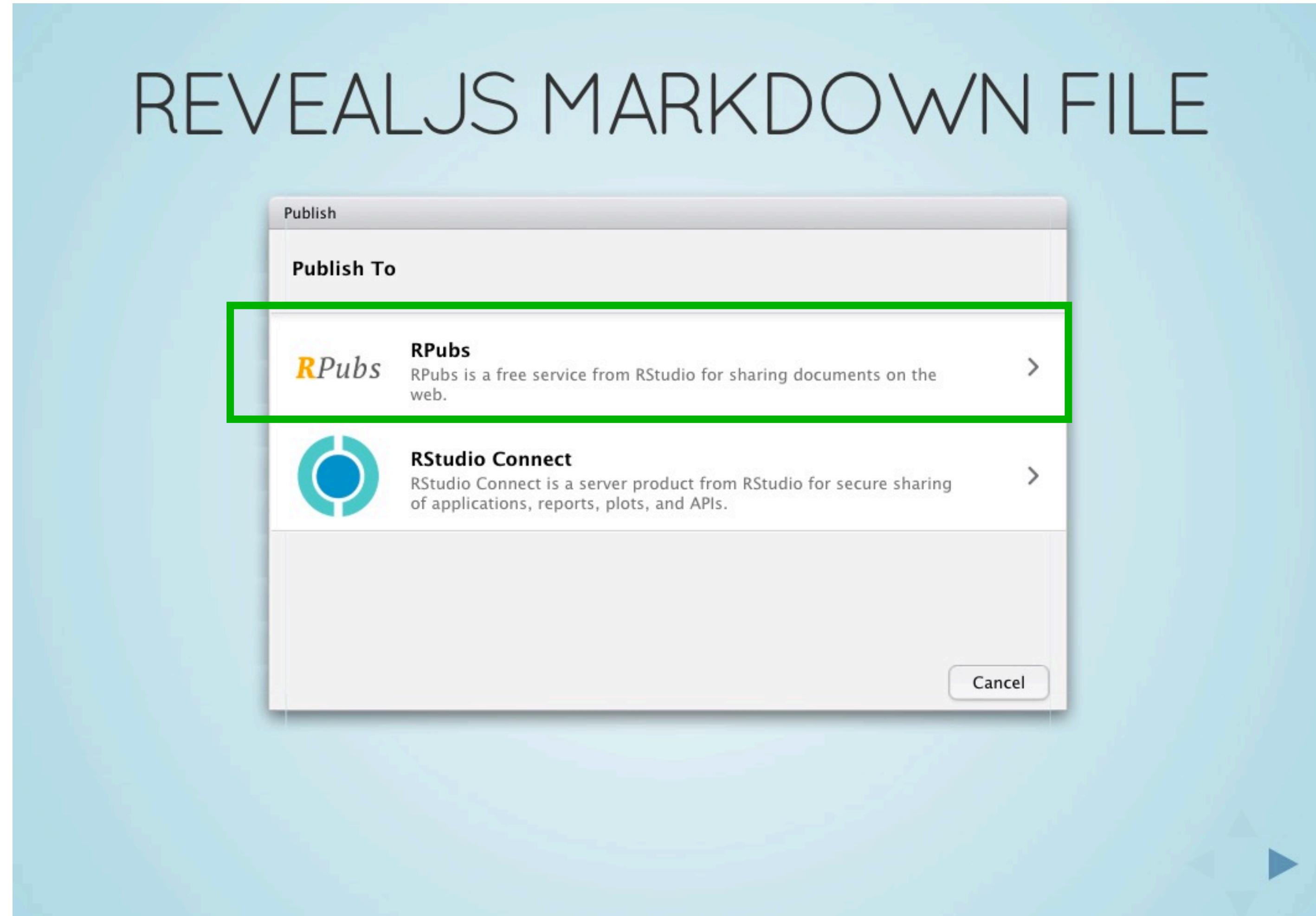
# Let's Publish Our Slides Together

1. Knit **23-revealjs-presentation.Rmd** and click the Publish button at the top.



# Let's Publish Our Slides Together

## 2. Click on RPubs

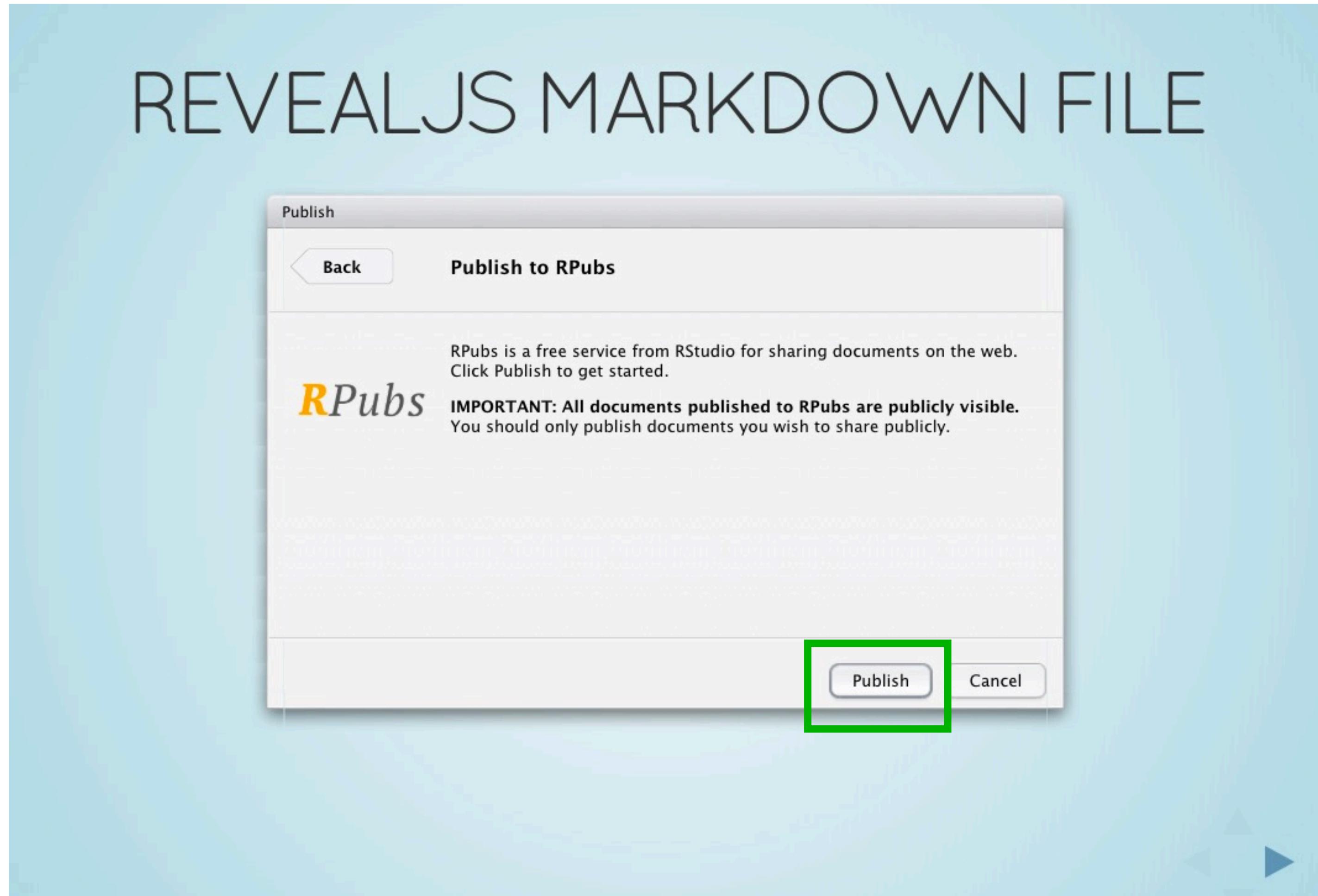


Github repo: [rstd.io/conf20-rmd-dash](https://rstd.io/conf20-rmd-dash)

rstudio.cloud workspace: [rstd.io/RMAID](https://rstd.io/RMAID)

# Let's Publish Our Slides Together

## 3. Click Publish

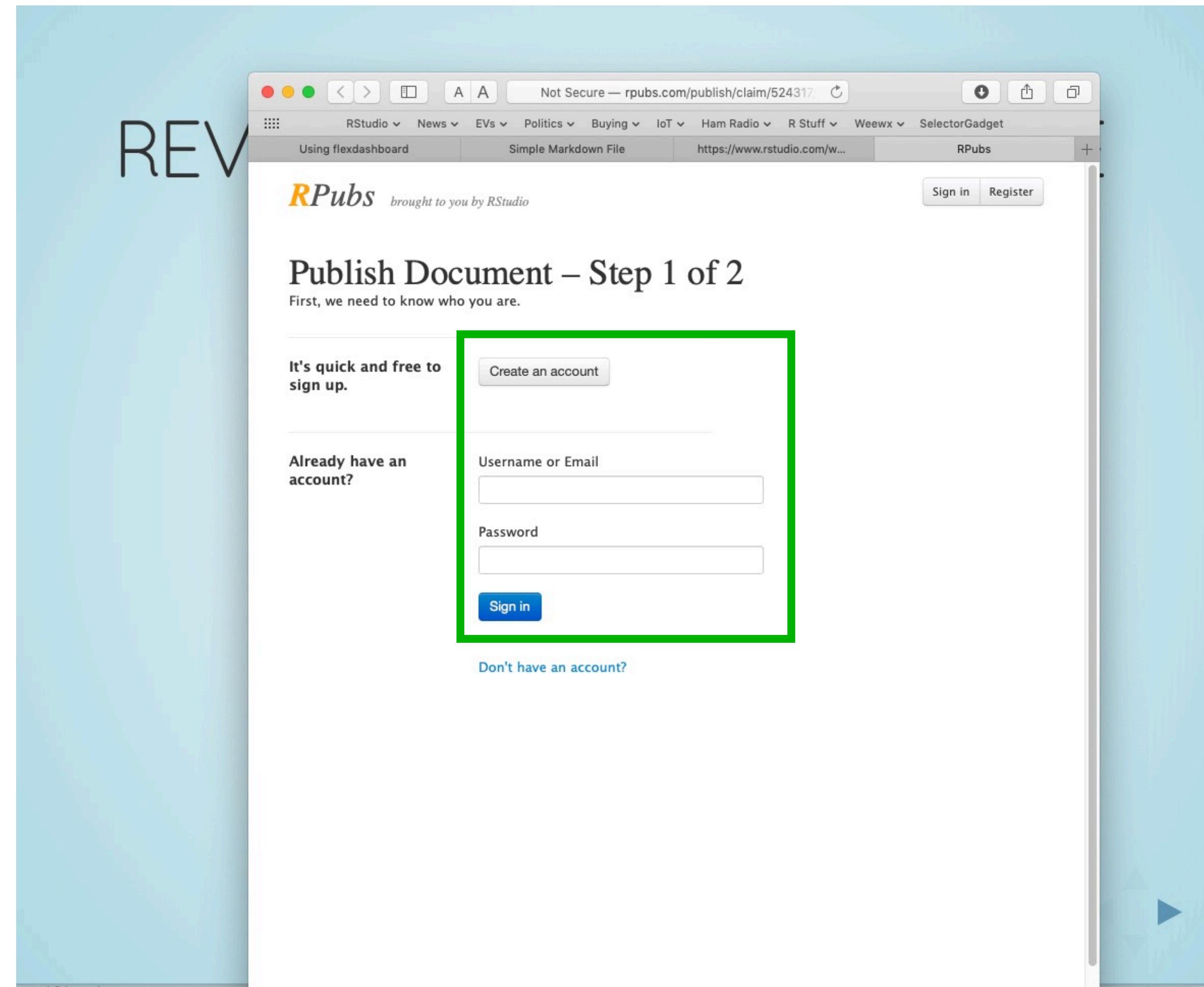


[Github repo: rstd.io/conf20-rmd-dash](#)

[rstudio.cloud workspace: rstd.io/RMAID](#)

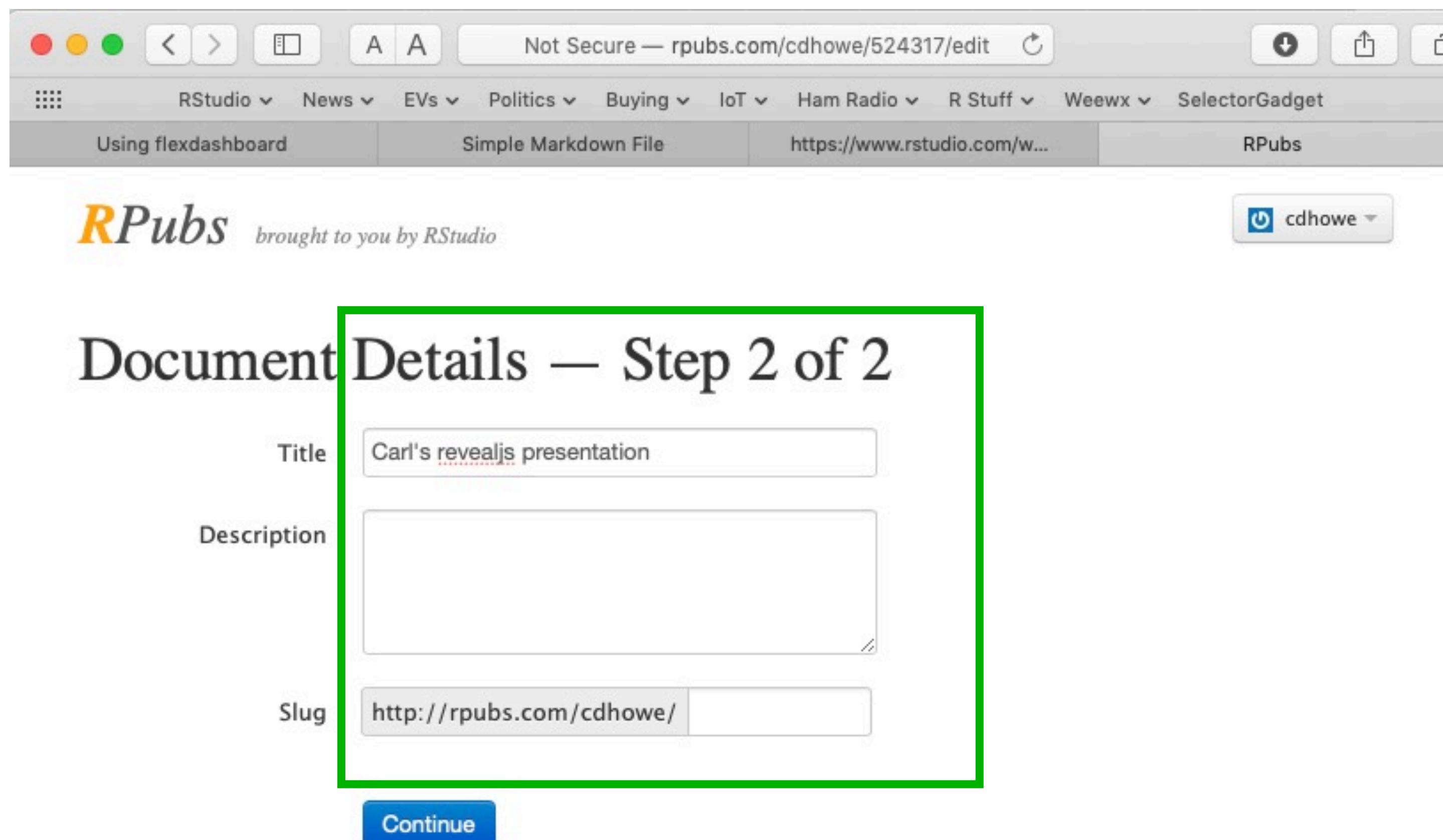
# Let's Publish Our Slides Together

4. Create an account on RPubs if you don't already have one. If you do, log in.



# Let's Publish Our Slides Together

## 5. Enter your document details



The screenshot shows a web browser window for RPubs. The title bar reads "Not Secure — rpubs.com/cdhowe/524317/edit". The main content is titled "Document Details — Step 2 of 2". It contains three input fields: "Title" with the value "Carl's revealjs presentation", "Description" (empty), and "Slug" with the value "http://rpubs.com/cdhowe/". A green box highlights these three fields. At the bottom is a blue "Continue" button.

RPubs brought to you by RStudio

cdhowe

Document Details — Step 2 of 2

Title: Carl's revealjs presentation

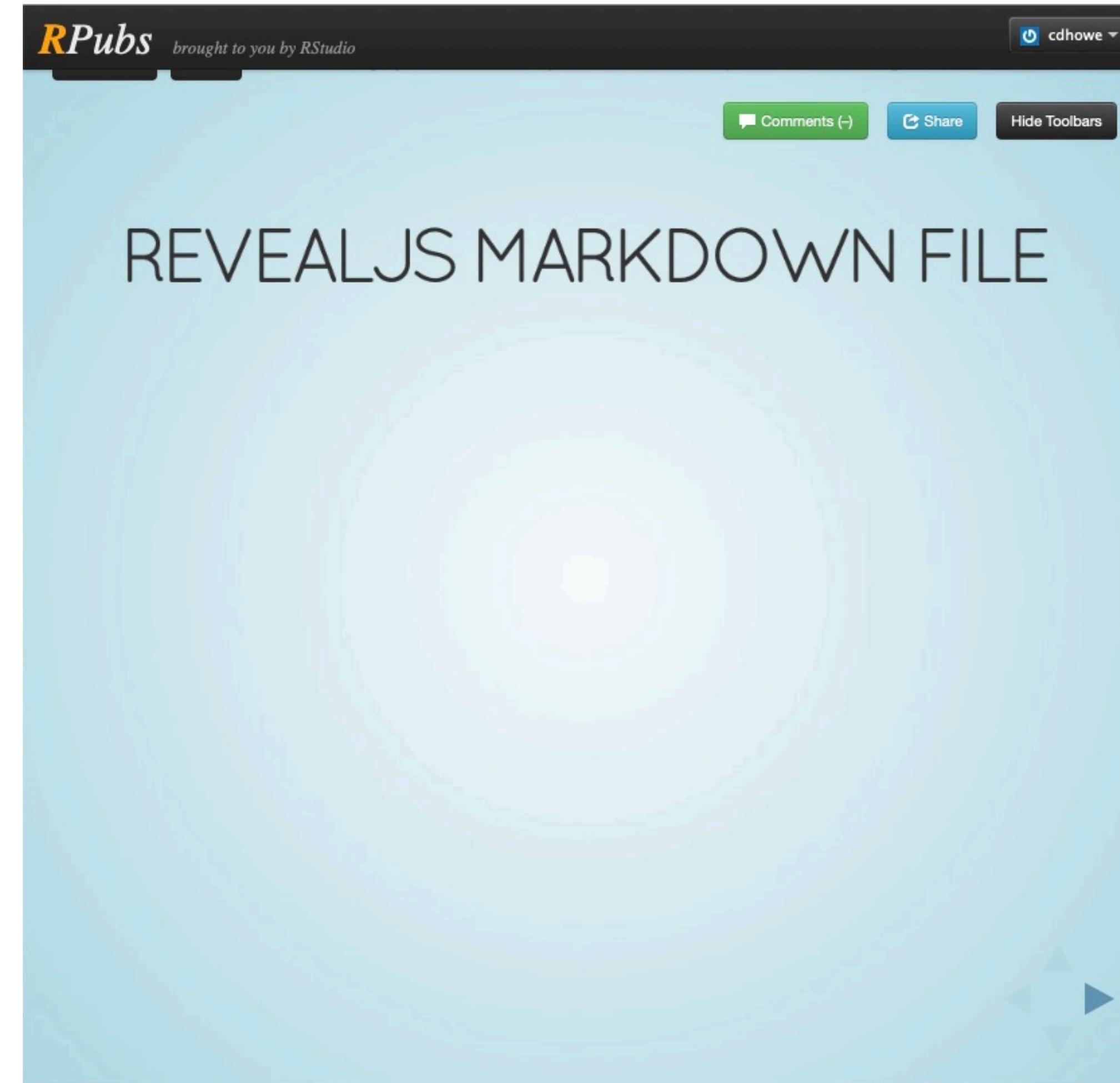
Description:

Slug: http://rpubs.com/cdhowe/

Continue

# Let's Publish Our Slides Together

6. Our document is now published and live



[Github repo: rstd.io/conf20-rmd-dash](#)

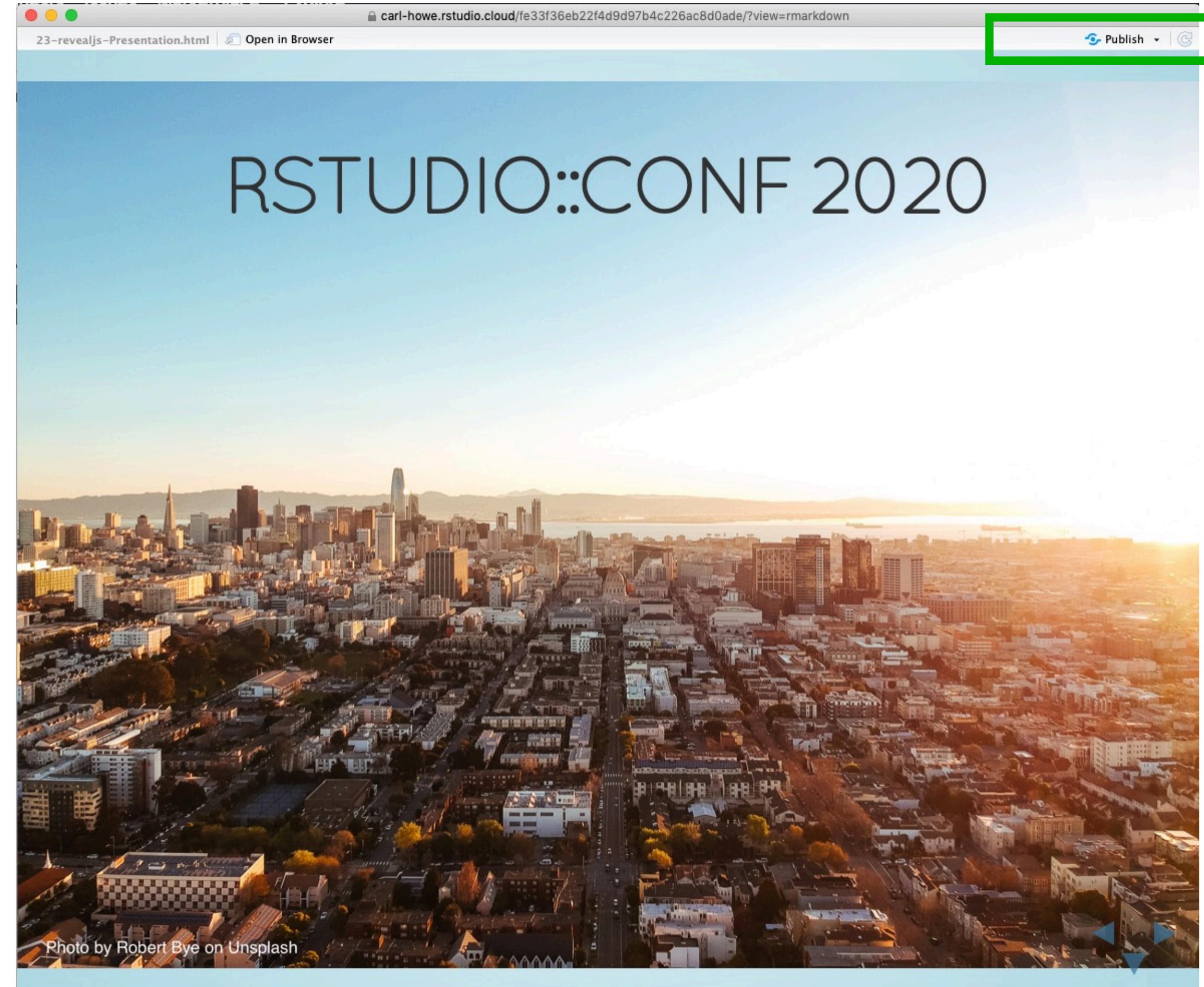
[rstudio.cloud workspace: rstd.io/RMAID](#)

# Publish Can Share HTML Docs And Shiny Apps

- [RPubs.com](#) will be our destination for HTML documents
- [shinyapps.io](#) will be our destination for Shiny apps
- We will also use an RStudio Connect server that can handle both types of output.
- We'll discuss the differences between the two types of documents and interactivity in our next module.

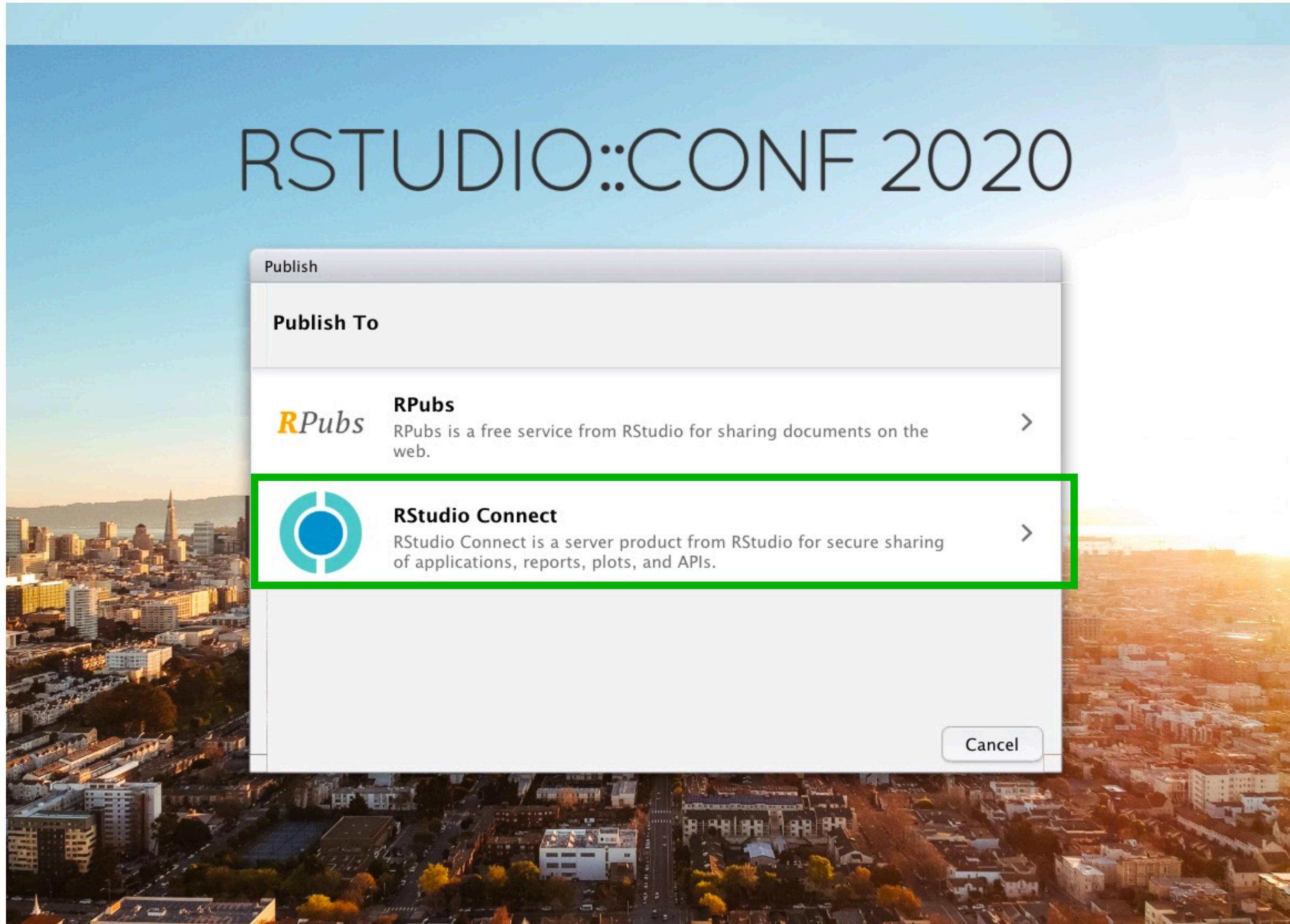
# Publishing on RStudio Connect

1. Knit **23-revealjs-presentation.Rmd** and click the Publish button at the top.



# Publishing on RStudio Connect

## 2. Click on RStudio Connect

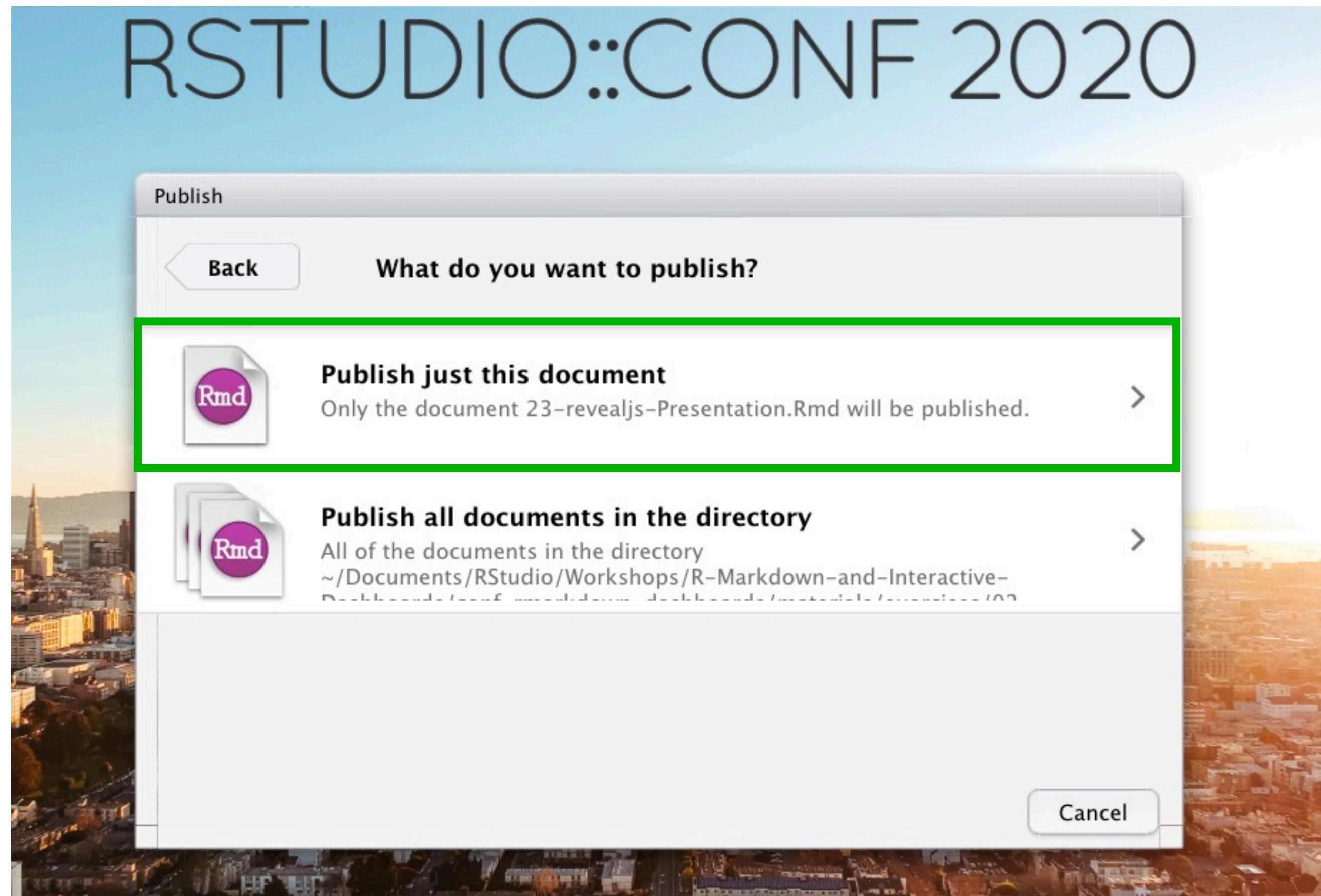


[Github repo: rstd.io/conf20-rmd-dash](#)

[rstudio.cloud workspace: rstd.io/RMAID](#)

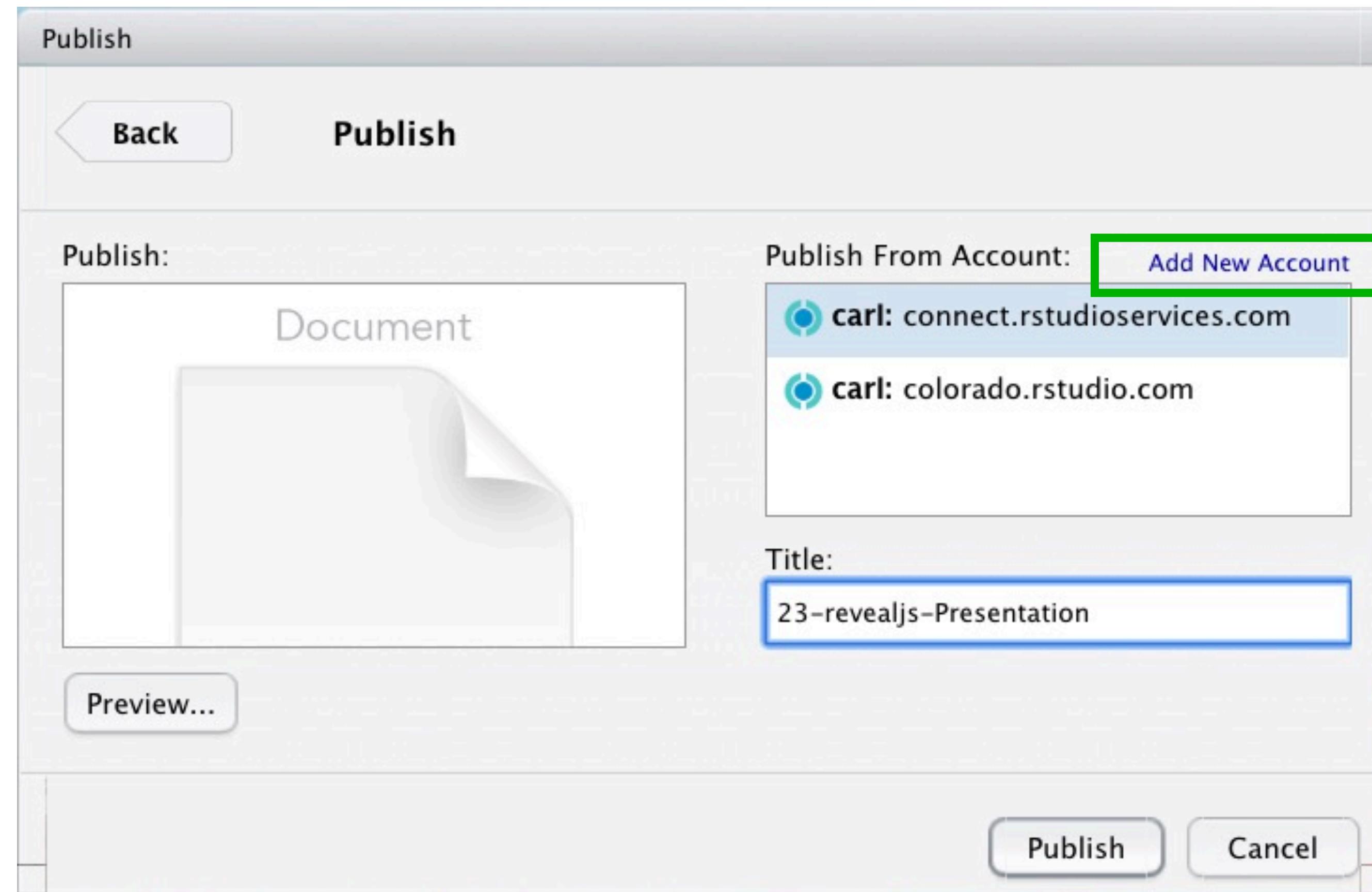
# Publishing on RStudio Connect

3. Click on Publish just this document



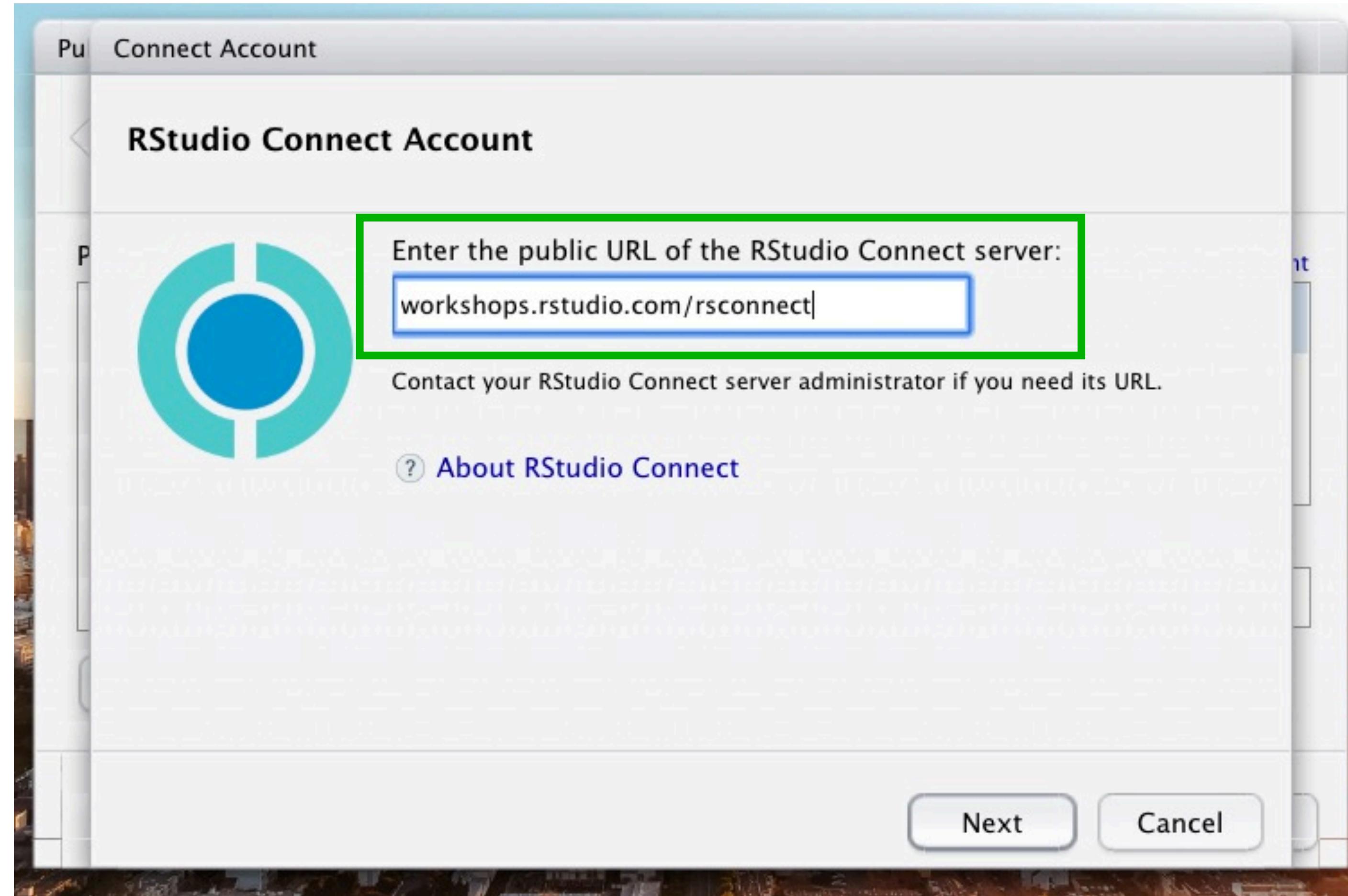
# Publishing on RStudio Connect

## 4. Click on Add New Account



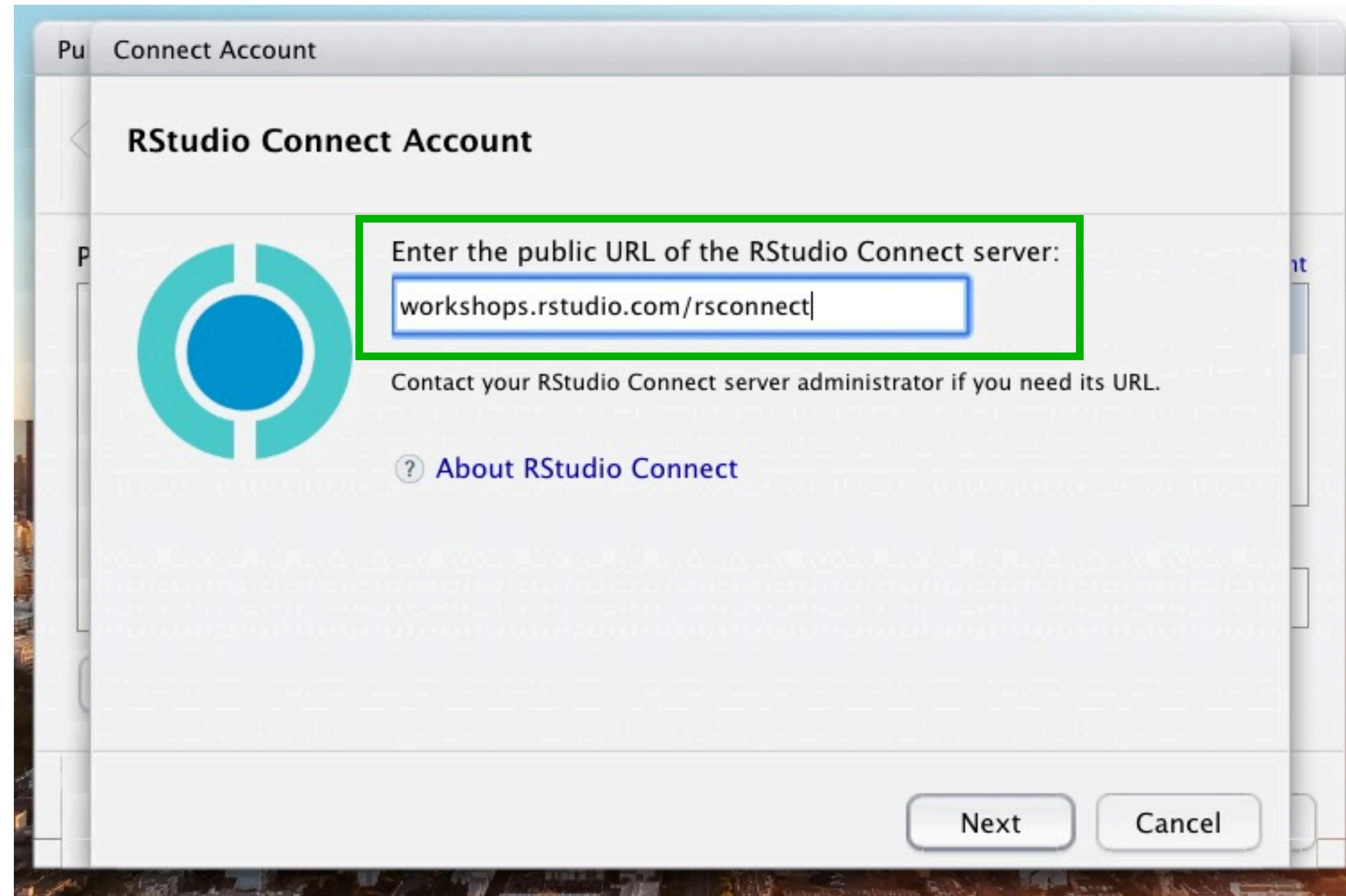
# Publishing on RStudio Connect

5. Enter "workshops.rstudio.com/rsconnect" as the Connect URL



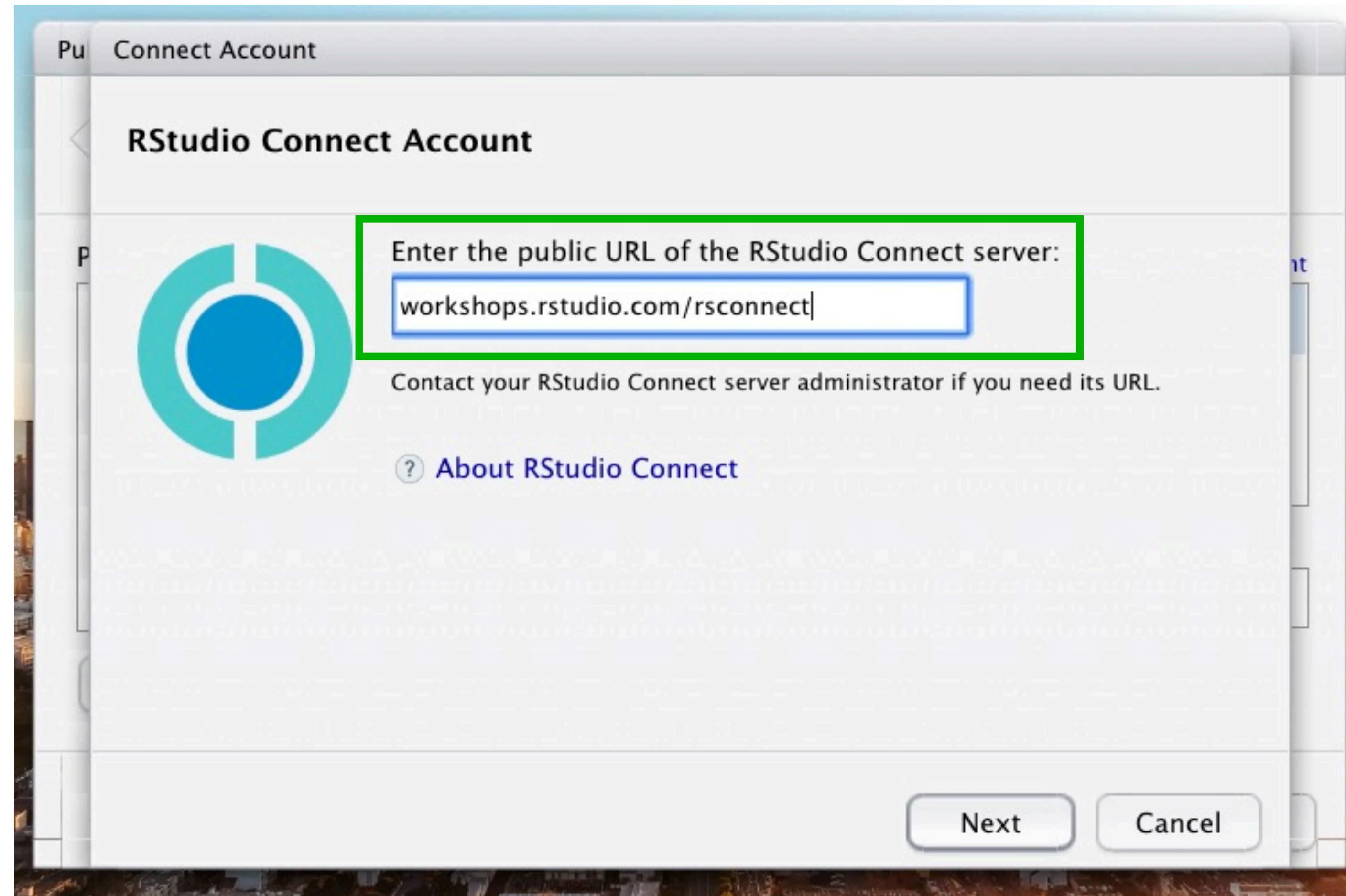
# Publishing on RStudio Connect

5. Enter "workshops.rstudio.com/rsconnect" as the Connect URL



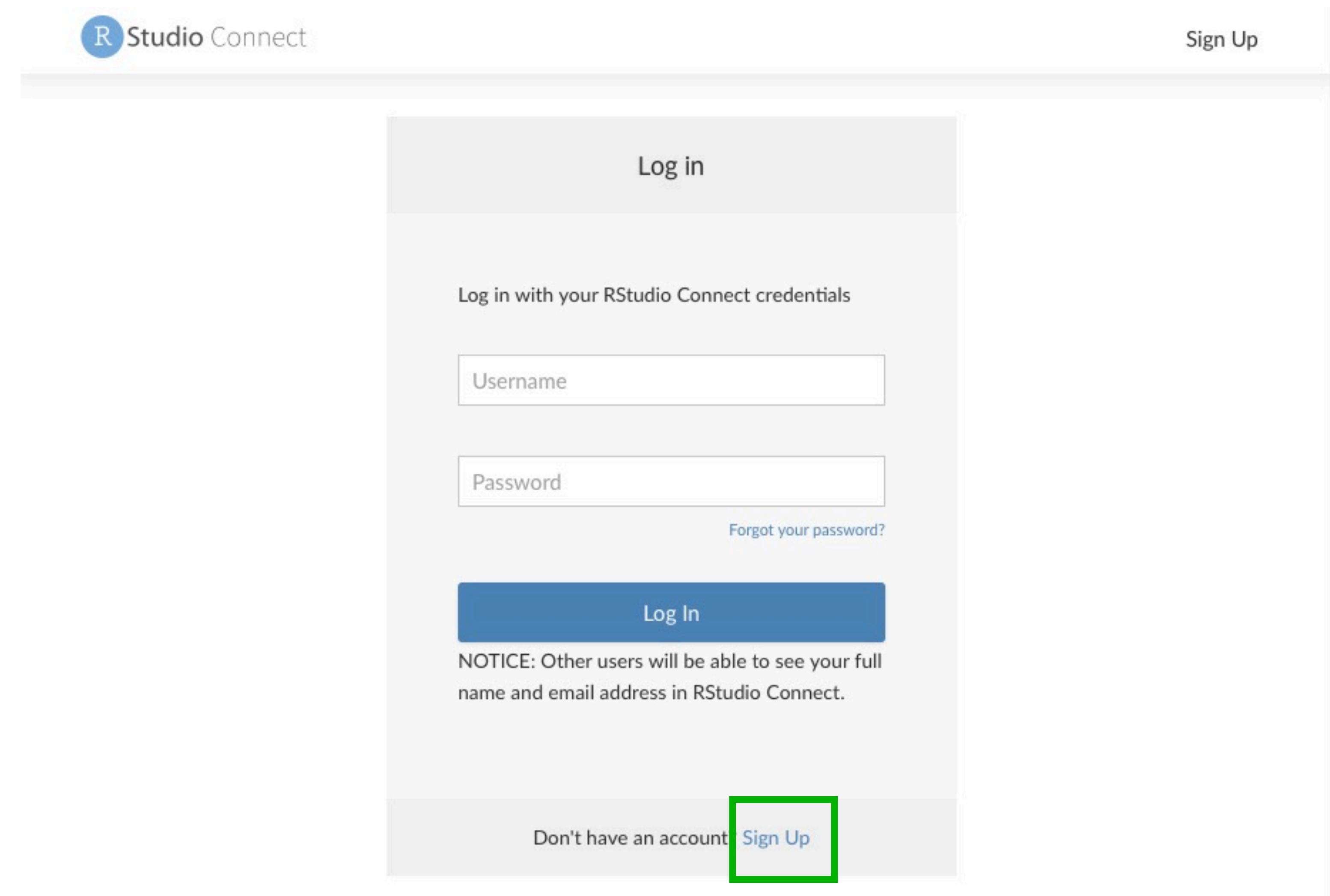
# Publishing on RStudio Connect

6. Enter "workshops.rstudio.com/rsconnect" as the Connect URL



# First Time only: Register for your account

7. Click on Sign Up



# First Time only: Register for your account

8. Fill in your details (not mine)

Sign Up

Username

First Name

Last Name

Email

Password

Password (Again)

[Sign Up](#)

NOTICE: Other users will be able to see your full name and email address in RStudio Connect.

Already have an account? [Log In](#)

# First Time only: Register for your account

9-10. Confirm your signup by clicking on the email link sent, and then clicking on Connect

The screenshot shows two pages from the RStudio Connect interface. The top part is titled "Awaiting Confirmation" and includes a message about confirming the account via email, a "Resend Confirmation Email" button, and a user profile icon. The bottom part is titled "Connect to R" and asks to confirm package connection, with a "Connect" button highlighted by a green box.

R Studio Connect

Awaiting Confirmation

You need to confirm your account before proceeding. You should have received an email with a link that will allow you to confirm your account.

It may take a few minutes for the email to arrive; you might also need to check your Spam or Junk folder.

Resend Confirmation Email

CH

Connect to R

Confirm package connection.

You're almost done configuring R to publish content to RStudio Connect. Click the Connect button below to link your RStudio Connect account (`carlhowe`) to the `rsconnect` R package.

If you didn't reach this screen by initiating an account link from the RStudio IDE or in R via `rsconnect::connectUser`, click Cancel.

Cancel

Connect

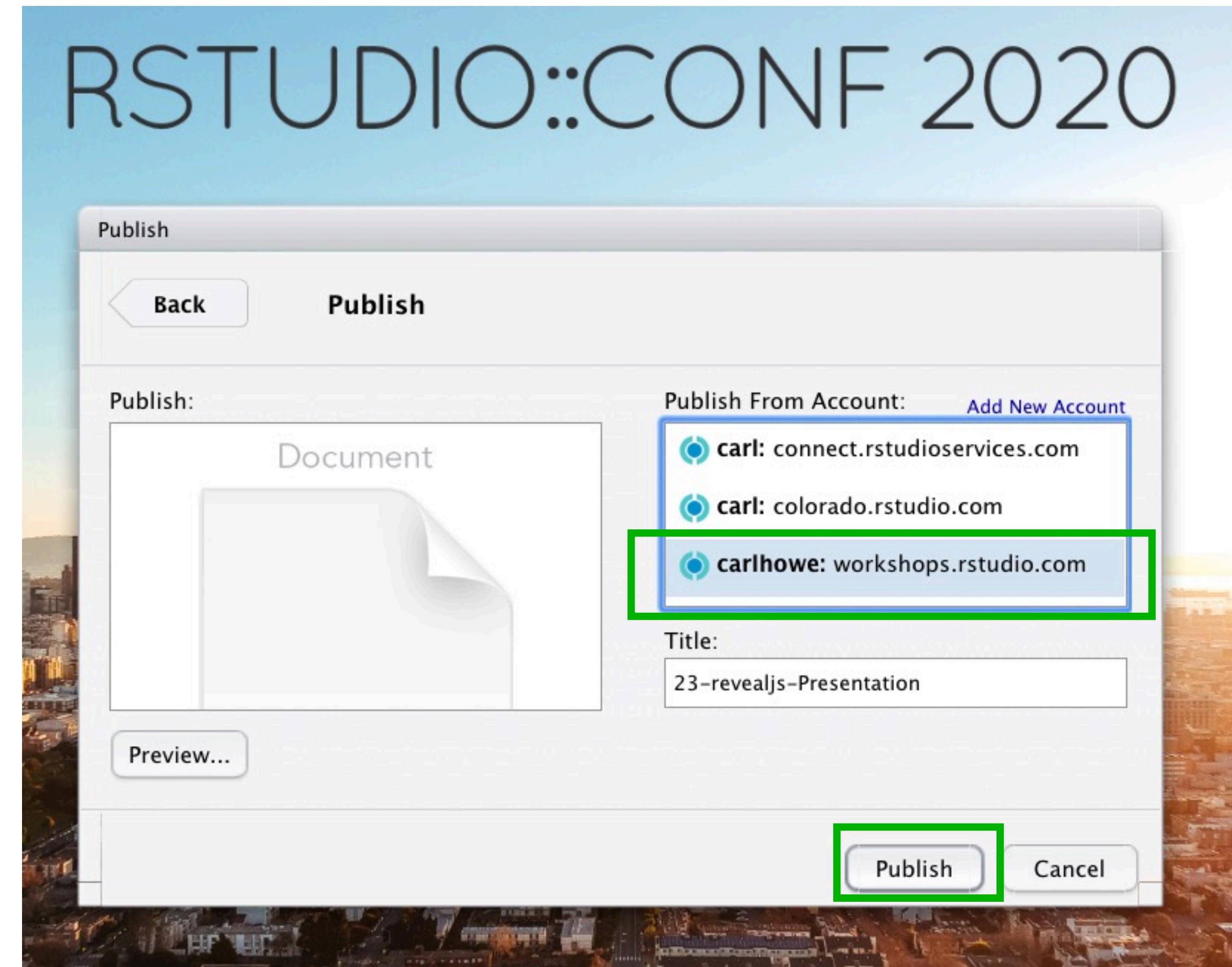
# First Time only: Register for your account

11. Finally connect  
your account to  
RStudio.cloud



# Back to publishing: Select your Connect account

12. Select your Connect account and click Publish

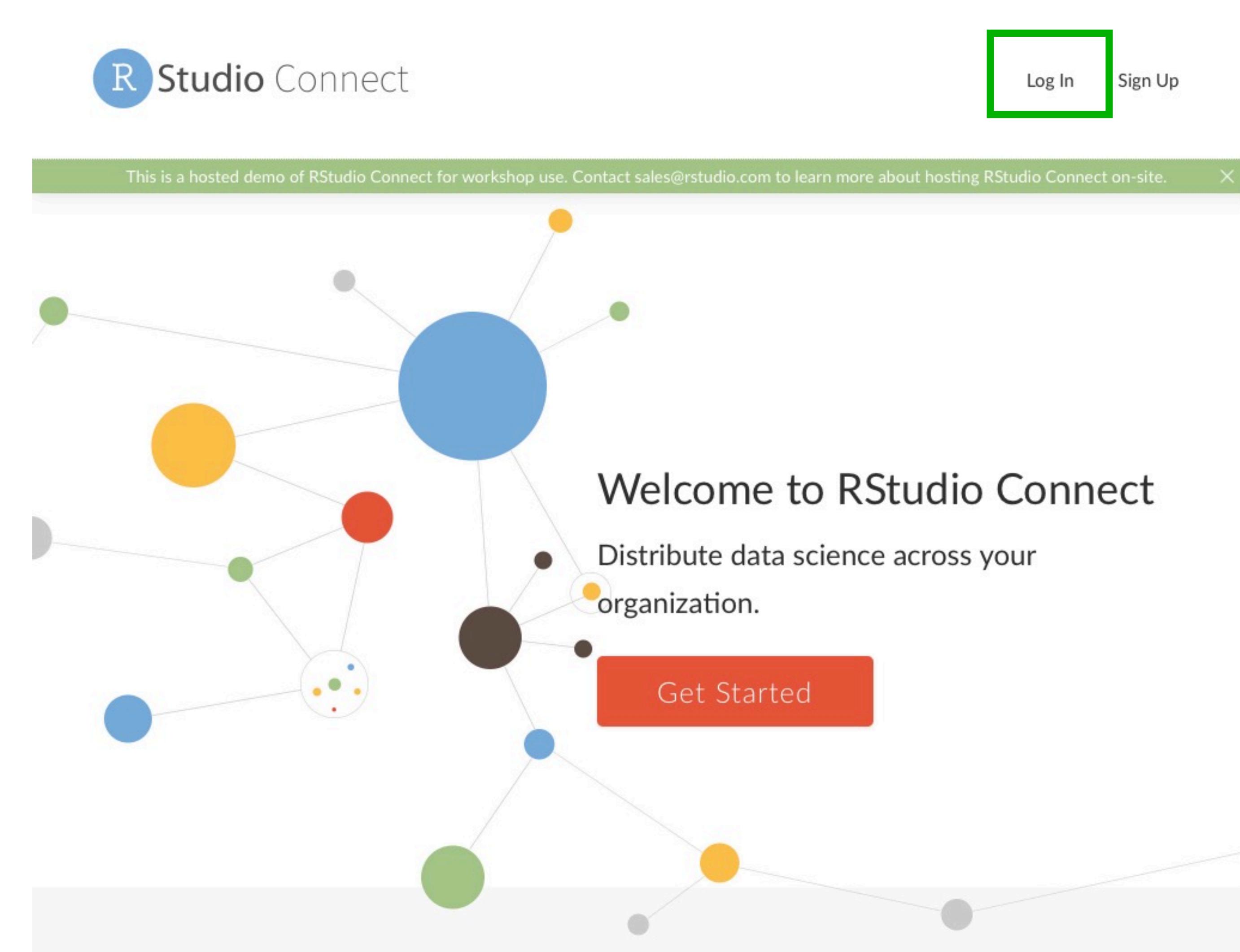


# *Viewing published outputs on RStudio Connect*



# Browse to [workshops.rstudio.com/rsconnect](https://workshops.rstudio.com/rsconnect)

Log in with the account you created when you published your content



# Browse to [workshops.rstudio.com/rsconnect](https://workshops.rstudio.com/rsconnect)

Log in with the account you created when you published your content

Log in

Log in with your RStudio Connect credentials

Username

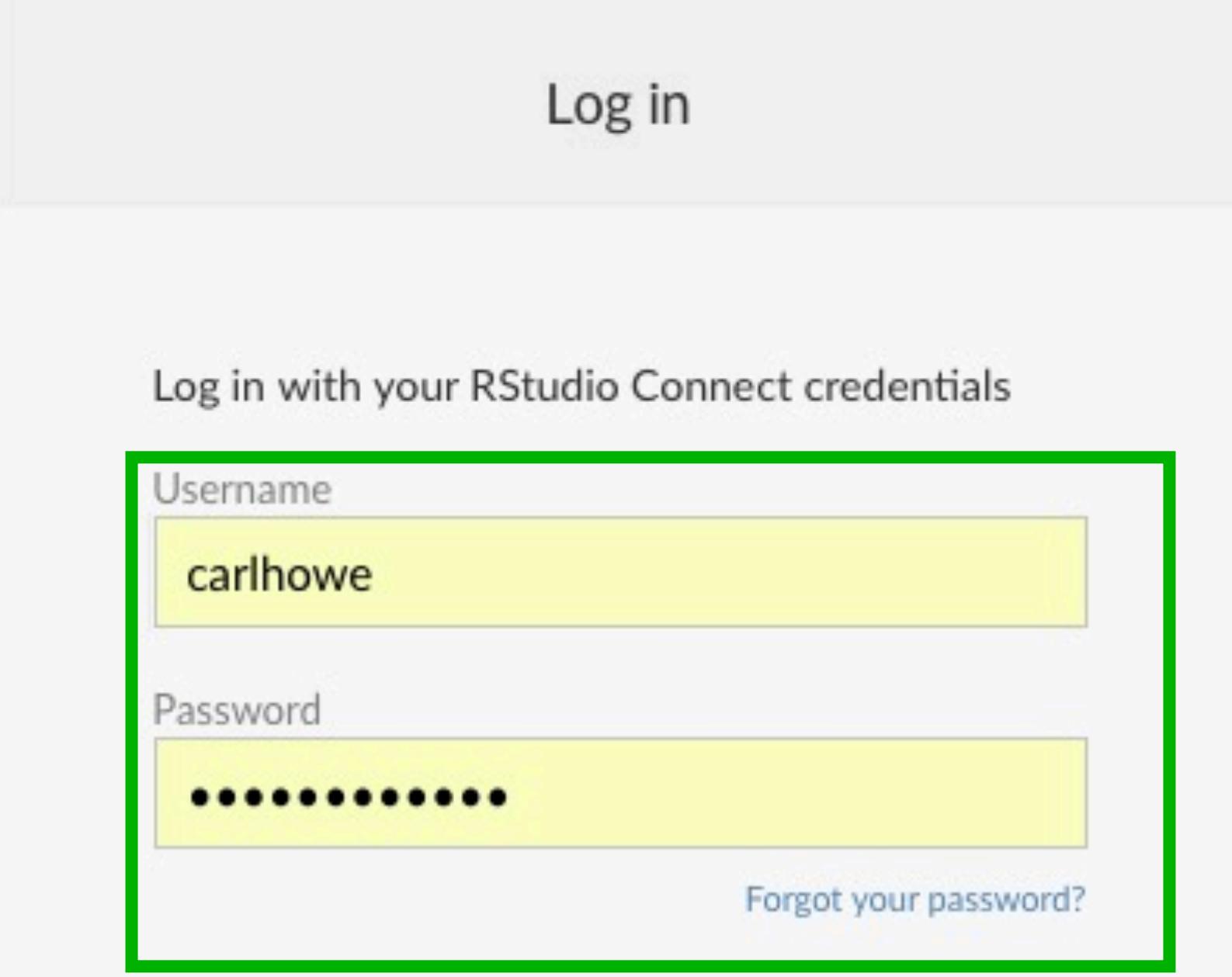
Password

[Forgot your password?](#)

[Log In](#)

NOTICE: Other users will be able to see your full name and email address in RStudio Connect.

[Don't have an account? Sign Up](#)



# You now see the most recent content published

View published documents and click Options

R Studio Connect

Content

Please remember this is only a preview of RStudio Connect. This server will be decommissioned after rstudio::conf 2020. Contact [sales@rstudio.com](mailto:sales@rstudio.com) to learn more about hosting RStudio Connect on-site.

23-revealjs-Presentation

carlhowe

Type: Document Deployed: Today at 10:38 AM

01-My-First-Dashboard

carlhowe

Type: Document Deployed: Today at 10:21 AM

# You now see the most recent content published

Select Yours to ignore documents published by others

R Studio Connect

Content

Please remember this is only a preview of RStudio Connect. This server will be decommissioned after sales@rstudio.com to learn more about hosting RStudio Connect on-site.

23-revealjs-Presentation  
carlhowe  
Type: Document Deployed: Today at 10:38 AM

01-My-First-Dashboard  
carlhowe  
Type: Document Deployed: Today at 10:21 AM

23-revealjs-Presentation  
carlhowe  
Type: Document Deployed: Today at 9:36 AM

03-Links-and-images  
carlhowe  
Type: Document Deployed: Yesterday at 1:34 PM

Options Publish ×  
Search for a name...

Owner  
 All  
 Yours

Content Type  
 All  
 Applications  
 Documents & Reports  
 Plots  
 Pins  
 APIs  
 TensorFlow Model APIs

Info  
You have created 4 documents. Learn how to deploy Shiny applications, plots, pins, APIs and TensorFlow Model APIs.  
There are 3 applications, 9 documents and 1 API published to this server.

# Now you'll only see your documents

Select just your documents

The screenshot shows the 'Your Content' page in RStudio Connect. At the top right, there are 'Options' (grid, publish, close) and a search bar ('Search for a name...'). Below the search bar is a 'Reset all filters' button. On the right side, there are two filter sections: 'Owner' and 'Content Type'. The 'Owner' section has a radio button for 'All' (unchecked) and one for 'Yours' (checked and highlighted with a green box). The 'Content Type' section has a radio button for 'All' (checked), followed by options for 'Applications', 'Documents & Reports', 'Plots', 'Pins', 'APIs', and 'TensorFlow Model APIs'. There are two document cards listed: '23-revealjs-Presentation' by carlhowe (Type: Document, Deployed: Today at 10:38 AM) and '01-My-First-Dashboard' by carlhowe (Type: Document, Deployed: Today at 10:21 AM).

Your Content

Please remember this is only a preview of RStudio Connect. This server will be decommissioned after [sales@rstudio.com](mailto:sales@rstudio.com) to learn more about hosting RStudio Connect on-site.

Options Publish

Search for a name...

[Reset all filters](#)

**Owner**

All

Yours

**Content Type**

All

Applications

Documents & Reports

Plots

Pins

APIs

TensorFlow Model APIs

Info

23-revealjs-Presentation  
carlhowe  
Type: Document Deployed: Today at 10:38 AM

01-My-First-Dashboard  
carlhowe  
Type: Document Deployed: Today at 10:21 AM

## Try A Powerpoint Presentation

1. Click on **23-Powerpoint-presentation.Rmd** in the Files pane
2. Knit the result
3. Unfortunately, rstudio.cloud has no way to view Powerpoint
4. Feel free to download and view your Powerpoint output if you have that software
5. Please note: Powerpoint documents can use .pptx files for formatting, but they must have very specific slide masters.
6. Also, Powerpoint documents aren't easily published unless you use a service such as Office 365

3m 00s

## Knit A Flex Dashboard

1. Click on **24-Simple-Flexdashboard.Rmd** in the Files panel
2. Knit the result
3. Try to figure out how our header types match the output

3<sub>m</sub> 00<sub>s</sub>

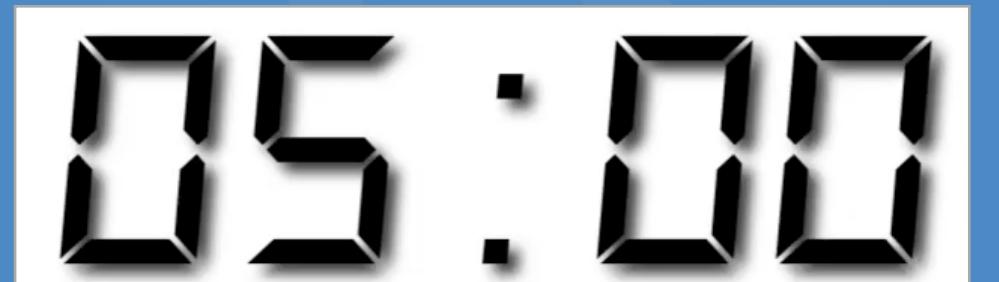
## Knit a Tufte Handout Using Templates

1. `install.packages('tufte')`
2. `library(tufte)`
3. Use New File > R Markdown > From Template
4. Choose the Tufte Handout (HTML or PDF) template
5. Save the file as "tufte.Rmd"
6. Knit the result

3<sub>m</sub> 00<sub>s</sub>

## Knit a Xaringan Slide Deck Using Templates

1. `install.packages('xaringan')`
2. `library(xaringan)`
3. Use New File > R Markdown > From Template
4. Choose the **ninja presentation** template
5. Save the file as "xaringan.Rmd"
6. Knit the result
7. Publish the result to Connect
8. View the presentation on Connect



# EXERCISE 27

## Load package `rticles` and Knit a Royal Society Open Science Article

1. `install.packages('rticles')`
2. `library(rticles)`
3. Use New File > R Markdown > From Template
4. Choose the Journal of Open Source Software template
5. Knit the result

3<sub>m</sub> 00<sub>s</sub>

*R Markdown similar to that  
for reports and slides can also  
generate dashboards.*

# Document Type Drives R Markdown Symbol Interpretations

| R Markdown Symbol | Alternate Symbol | Document Meaning | Presentation Meaning | Dashboard Meaning  |
|-------------------|------------------|------------------|----------------------|--------------------|
| #                 | ==               | Header 1         | New Section          | Top level page     |
| ##                | ----             | Header 2         | New Slide            | New layout section |
| ###               |                  | Header 3         | Slide Subhead        | Layout subsection  |

We'll discuss layouts more when we get to Flexdashboards

## Knit a FlexDashboard

1. Open 28-Simple-Flexdashboard.Rmd
2. Knit the result
3. Publish it to Connect

3<sub>m</sub> 00<sub>s</sub>

# Summary

## R Markdown

- Is a system for creating structured computational documents
- Can knit to many document types
- Can be shared using the publish button in the RStudio IDE
- Used for reports and slides can also generate dashboards.