Shiny + Docker

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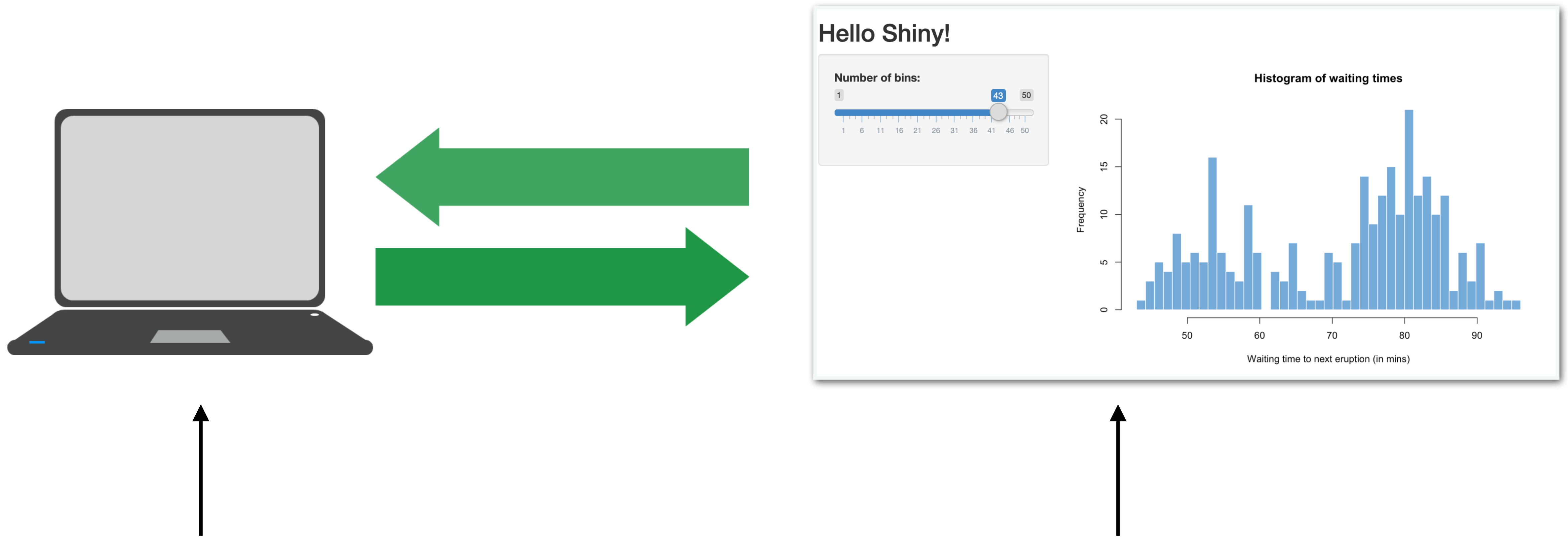
What is Shiny?

- R package from RStudio
- Web application framework for R
- R code → interactive web page
- No HTML/CSS/JavaScript knowledge required
- Great for sharing R analysis with someone scared of R

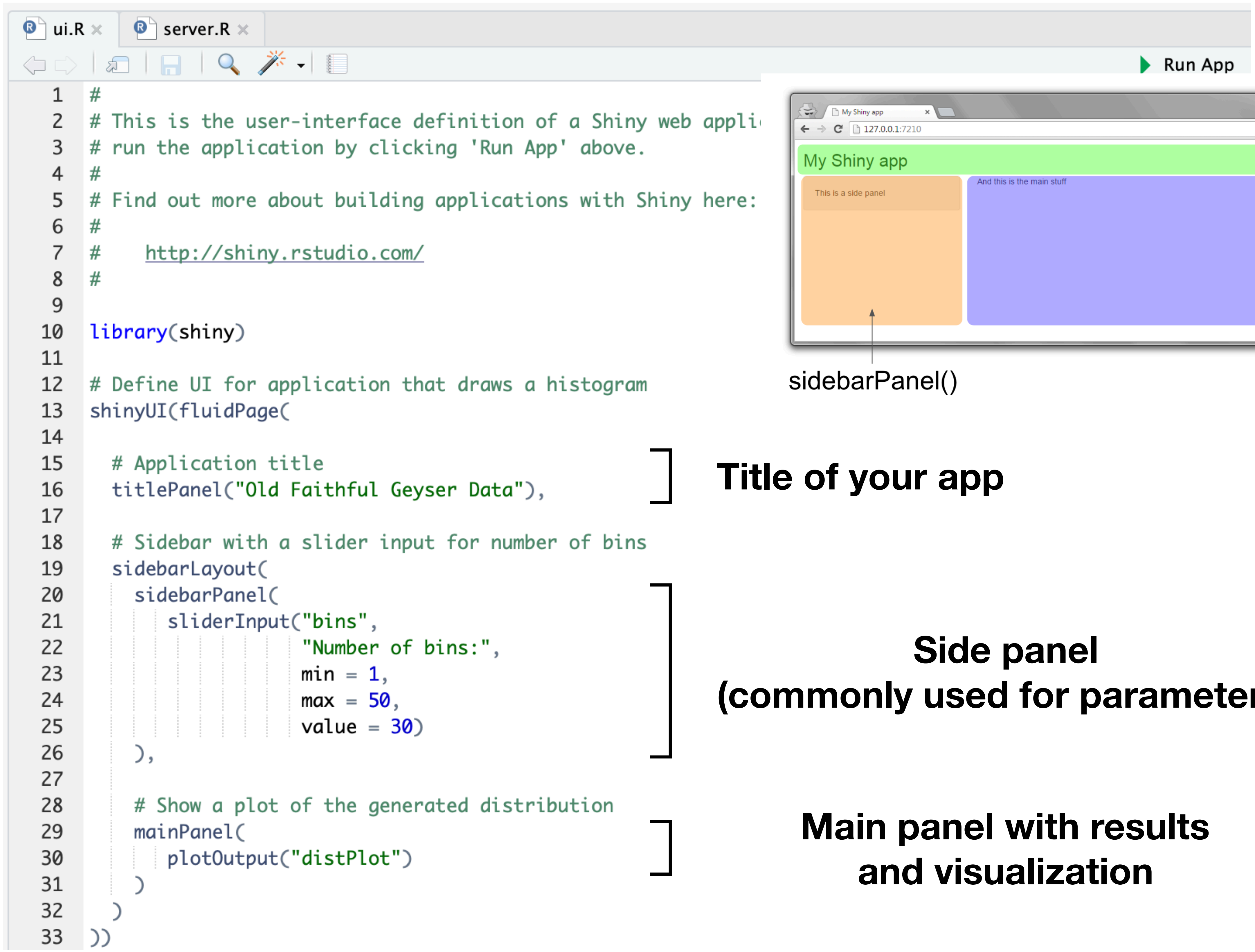
What is a Shiny App?



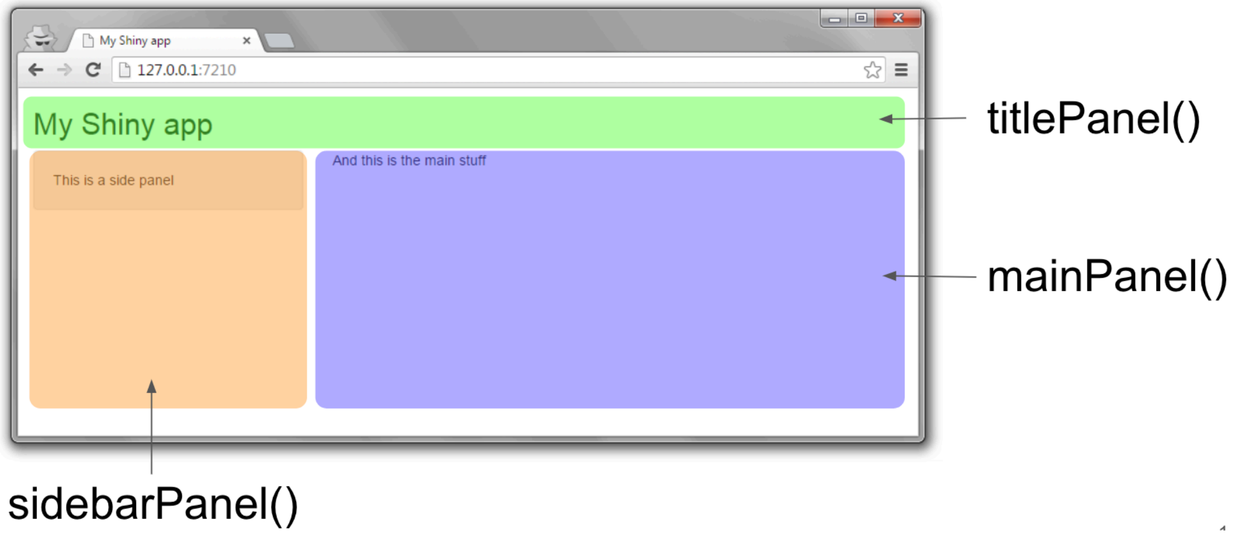
Computer running R

Web page

ui.R



```
#
# This is the user-interface definition of a Shiny web appli
# run the application by clicking 'Run App' above.
#
# Find out more about building applications with Shiny here:
#
#    http://shiny.rstudio.com/
#

library(shiny)

# Define UI for application that draws a histogram
shinyUI(fluidPage(

  # Application title
  titlePanel("Old Faithful Geyser Data"),

  # Sidebar with a slider input for number of bins
  sidebarLayout(
    sidebarPanel(
       sliderInput("bins",
                   "Number of bins:",
                   min = 1,
                   max = 50,
                   value = 30)
    ),

    # Show a plot of the generated distribution
    mainPanel(
       plotOutput("distPlot")
    )
  )
))
```

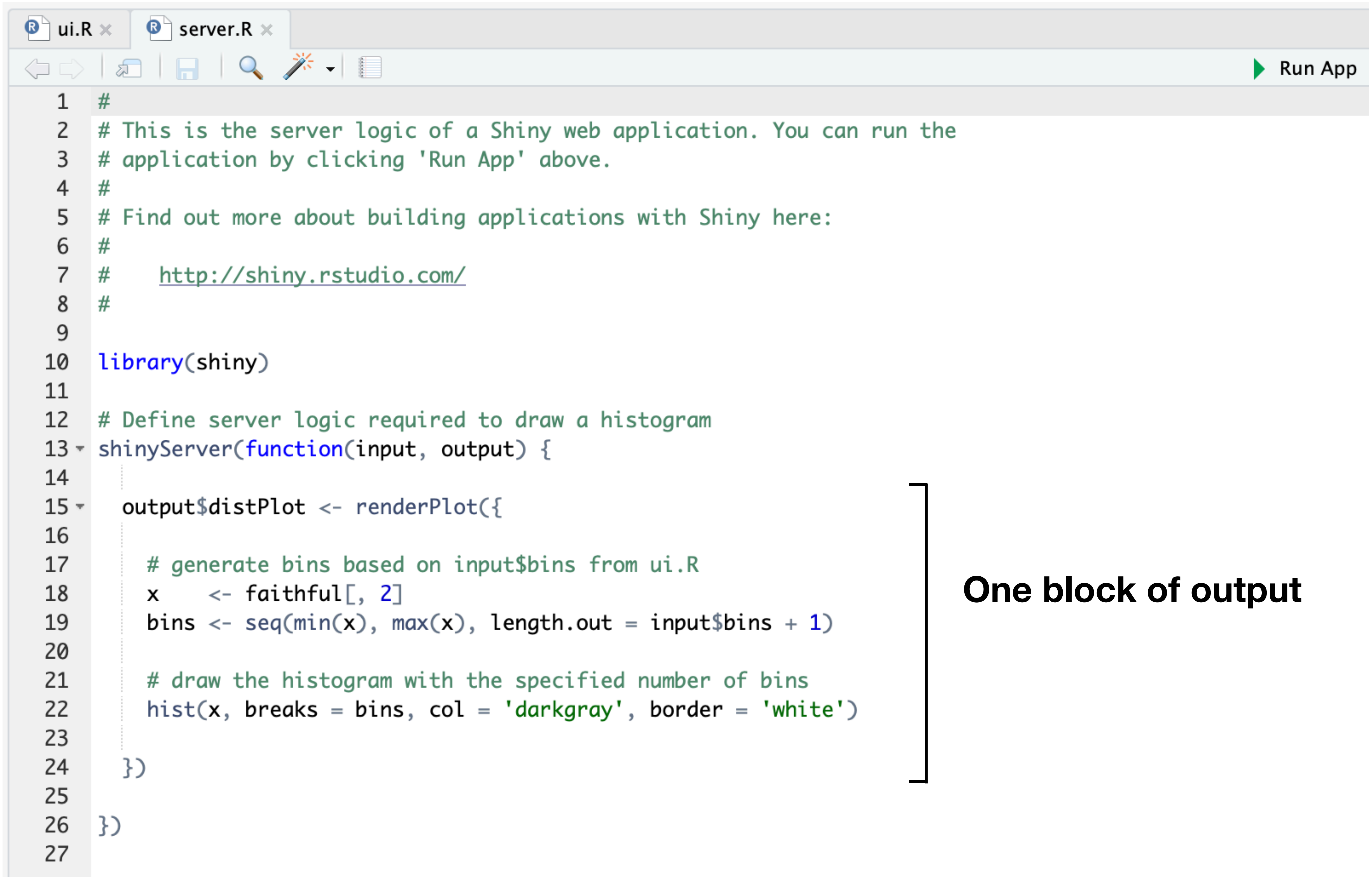


Title of your app

Side panel (commonly used for parameters)

Main panel with results and visualization

server.R

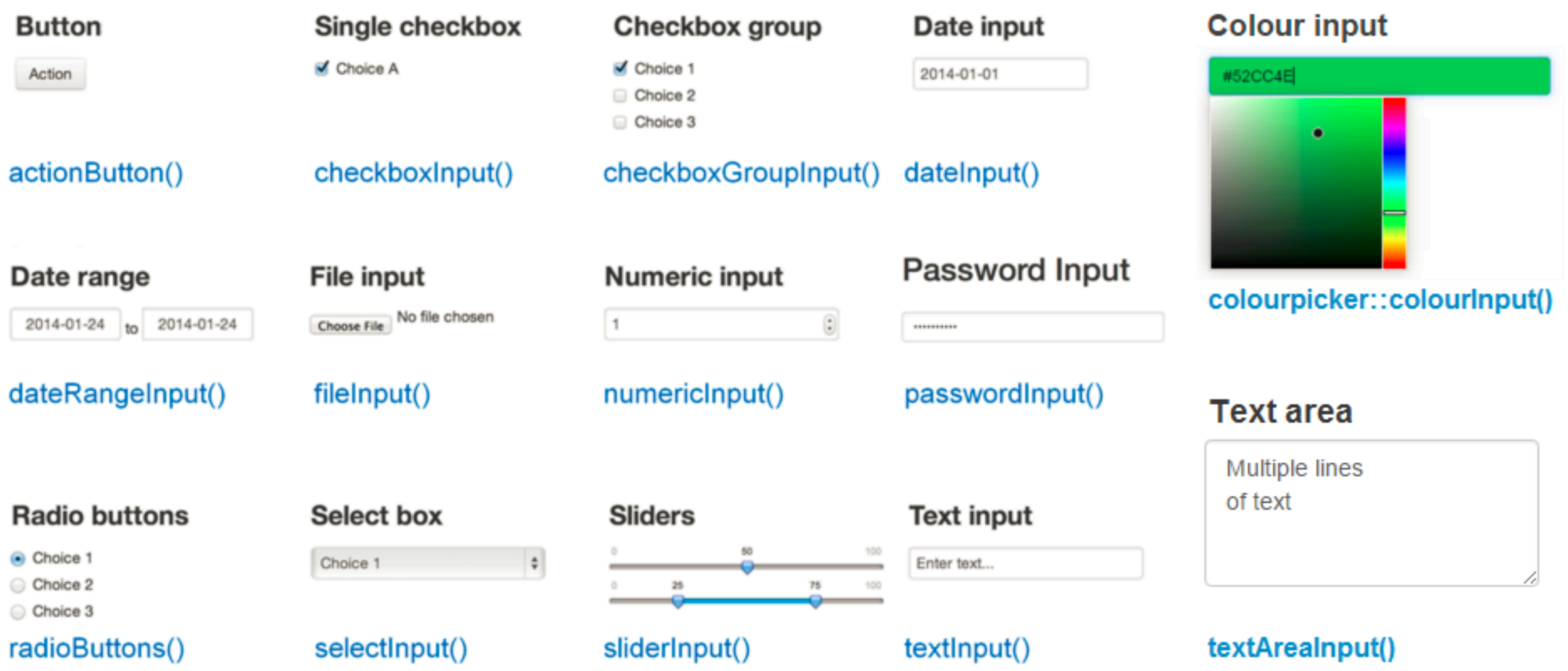


```r
#
# This is the server logic of a Shiny web application. You can run the
# application by clicking 'Run App' above.
#
# Find out more about building applications with Shiny here:
#
#    http://shiny.rstudio.com/
#

library(shiny)

# Define server logic required to draw a histogram
shinyServer(function(input, output) {

  output$distPlot <- renderPlot({

    # generate bins based on input$bins from ui.R
    x    <- faithful[, 2]
    bins <- seq(min(x), max(x), length.out = input$bins + 1)

    # draw the histogram with the specified number of bins
    hist(x, breaks = bins, col = 'darkgray', border = 'white')

  })

})
```

One block of output

Add different types of inputs

Inputs are what gives users a way to interact with a Shiny app. Shiny provides many input functions to support many kinds of interactions that the user could have with an app. For example, `textInput()` is used to let the user enter text, `numericInput()` lets the user select a number, `dateInput()` is for selecting a date, `selectInput()` is for creating a select box (aka a dropdown menu).

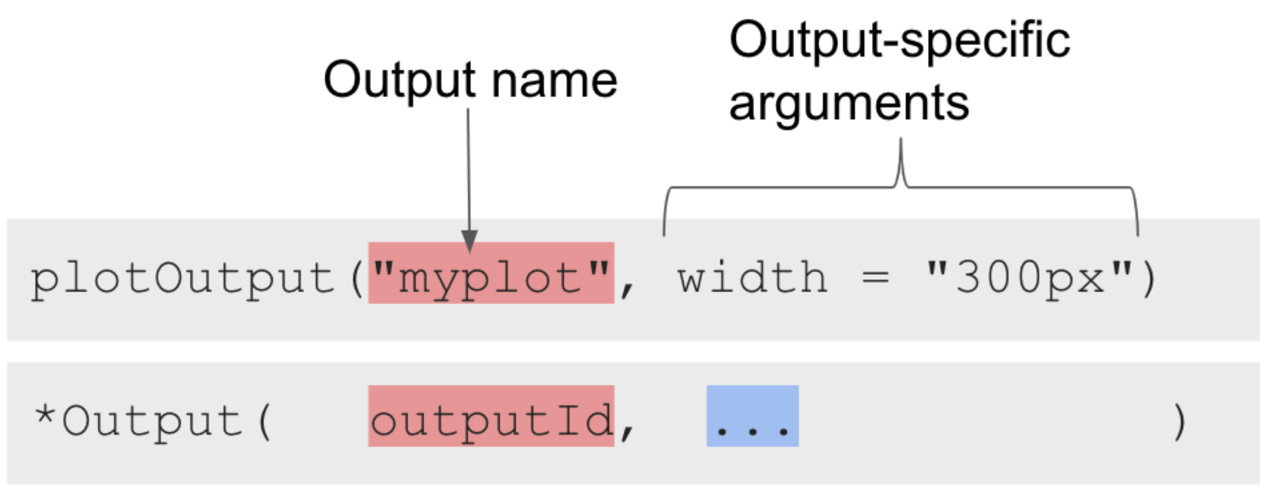


All input functions have the same first two arguments: `inputId` and `label`. The `inputId` will be the name that Shiny will use to refer to this input when you want to retrieve its current value so it should be unique.

Outputs

- Plots, tables, text - anything that R creates and users see
- Initialize as empty placeholder space until object is created

Function	Outputs
plotOutput()	plot
tableOutput()	table
uiOutput()	Shiny UI element
textOutput()	text



```
plotOutput("myplot", width = "300px")
*Output(   outputId,  ...             )
```

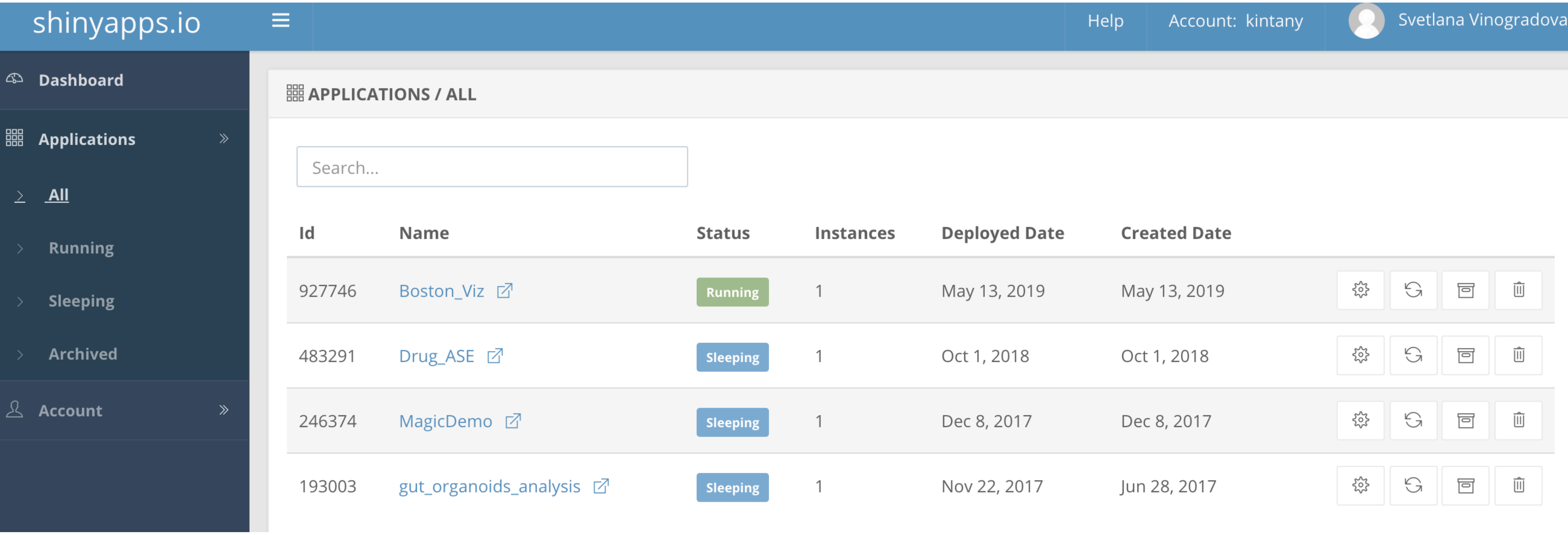
Publishing your Shiny App

Log in at https://www.shinyapps.io (you need to create an account first)

Go to Account > Tokens > Add Token > Show Secret > Copy

In R studio, button "Publish", copy to the window > Publish

https://kintany.shinyapps.io/Boston_Viz/



Id	Name	Status	Instances	Deployed Date	Created Date
927746	Boston_Viz	Running	1	May 13, 2019	May 13, 2019
483291	Drug_ASE	Sleeping	1	Oct 1, 2018	Oct 1, 2018
246374	MagicDemo	Sleeping	1	Dec 8, 2017	Dec 8, 2017
193003	gut_organoids_analysis	Sleeping	1	Nov 22, 2017	Jun 28, 2017

Resources

- Shiny official tutorial http://shiny.rstudio.com/tutorial
- Shiny cheatsheet http://shiny.rstudio.com/images/shiny-cheatsheet.pdf
- Lots of short useful topics http://shiny.rstudio.com/articles
- Shiny in Rmarkdown http://rmarkdown.rstudio.com/authoring_shiny.html
- Get help from https://groups.google.com/forum/#!forum/shiny-discuss

  or http://stackoverflow.com/questions/tagged/shiny

Docker

Using Docker allows you to

- increase the performance of your app
- scale it,
- reduce its costs,
- make it reproducible,
- run it on wherever you want

Step 1: Install Docker

If you don't have Docker installed, visit docker.com and install the Community Edition. If you are not sure if you have Docker installed, try running:

```
docker --version
```

More help can be found here: https://docs.docker.com/get-started/ For example, try running a test image:

```
docker run hello-world
```

Step 2: Create a directory and copy your ShinyApp

Create a directory where you store all necessary files. In this folder, we will add our source code and further configuration files.

The file structure will look like the following:

```
Docker_ShinyApp
└── Boston_Viz
    ├── server.R
    ├── ui.R
    └── data
```

Step 3: Create a Dockerfile

The Dockerfile is the blueprint of any Docker image. It tells Docker what to install and in which order.

As a basis for the Dockerfile, I use a modified copy from the official Shiny-Docker image:

```
FROM r-base:latest

MAINTAINER Svetlana Vinogradova "kintany@gmail.com"

# Install dependencies and Download and install shiny server
RUN apt-get update && apt-get install -y -t unstable \
    sudo \
    gdebi-core \
    make \
    git \
    gcc \
    zlib1g-dev \
    libcurl4-gnutls-dev \
    libcairo2-dev/unstable \
    libxt-dev && \
    R -e "install.packages(c('shiny', 'rmarkdown', 'DT'), repos='https://cran.rstudio.com/')" && \
        R -e "install.packages(c('dplyr','magnittr','ggplot2','shinythemes', 'remotes','lubridate'))"  && \
      R -e "remotes::install_github('thomasp85/shinyFiles')" && \
    rm -rf /var/lib/apt/lists/*

EXPOSE 3838

COPY shiny-server.sh /usr/bin/shiny-server.sh
COPY Boston_Viz/ /srv/shiny-server/Boston_Viz/

CMD ["/usr/bin/shiny-server.sh"]
RUN ["chmod", "+x", "/usr/bin/shiny-server.sh"]
```

Step 4: Add configuration files for your ShinyApp

Download or create shiny-server.sh (*Adapted from* rocker-org)

```
Rscript -e ".libPaths('/usr/lib/R/library/'); shiny::runApp('/srv/shiny-server/Boston_Viz/', launch.browser =
F, port = 3838, host = '0.0.0.0')"
```

In the end, this directory should have the following structure:

```
Docker_ShinyApp
├── Dockerfile
├── shiny-server.sh
└── Boston_Viz
    ├── server.R
    ├── ui.R
    └── data
```

Step 5: Build the docker image

Building the Docker Image is straightforward. Make sure you are in the `Docker_ShinyApp` directory with the Terminal and type in:

```
docker build -t My_ShinyApp .
```

You can name the Docker Image whatever you like.

This process might take a couple of minutes as Docker will download the dedicated R and ShinyApp version, as well as all dependencies and packages.

Step 6: Publish your Docker

You can follow the instructions here: https://docs.docker.com/docker-hub/repos/

To push a repository to the Docker Hub, you must name your local image using your Docker Hub username, and the repository name that you created through Docker Hub on the web.

You can add multiple images to a repository, by adding a specific `:<tag>` to it (for example `docs/base:testing`). If it's not specified, the tag defaults to `latest`.

You can name your local images either when you build it, using

`docker build -t <hub-user>/<repo-name>[:<tag>]`, by re-tagging an existing local image

`docker tag <existing-image> <hub-user>/<repo-name>[:<tag>]`, or by using

`docker commit <existing-container> <hub-user>/<repo-name>[:<tag>]` to commit changes.

Now you can push this repository to the registry designated by its name or tag.

```
$ docker push <hub-user>/<repo-name>:<tag>
```

The image is then uploaded and available for use by your teammates and/or the community.

Step 6: Run the docker image with your ShinyApp

When this process is done, you can run your ShinyApp in Docker 🎉

```
docker run --rm -p 3838:3838 My_ShinyApp
```

Now, you can open the app with any browser by visiting `http://0.0.0.0:3838`