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How to Scale a Shiny Dashboard

Damian Rodziewicz
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28 July 2020 | RStudio Webinar

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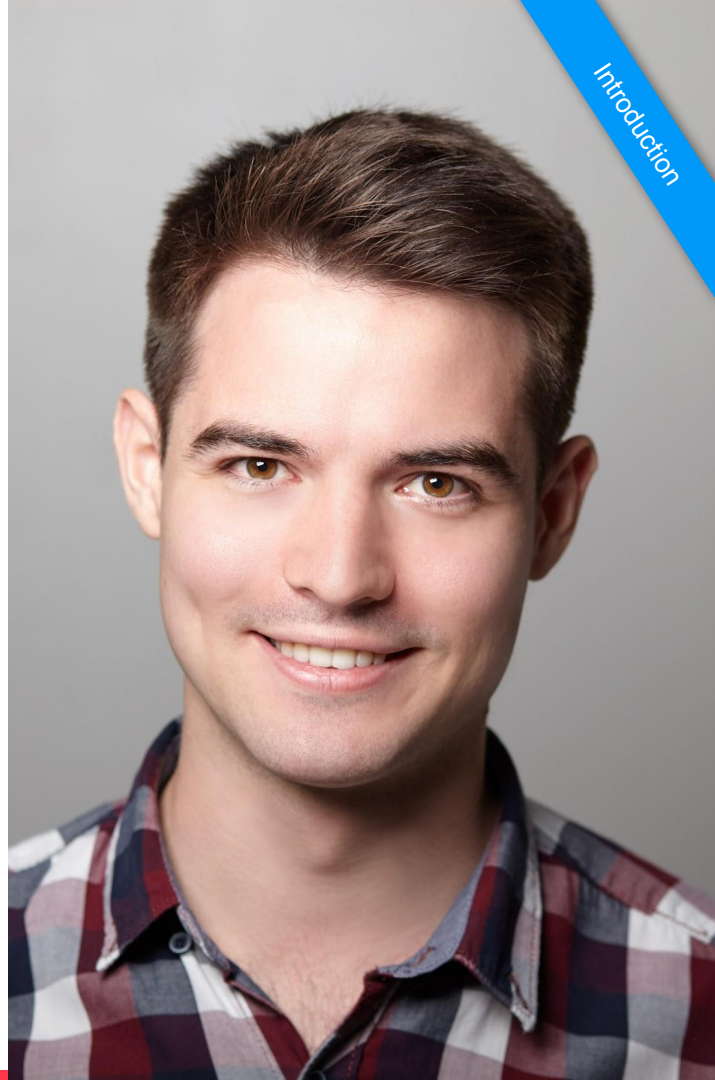
Hello



Damian Rodziewicz

VP of the Board & Co-Founder @ Appsilon

Passionate about Data Analysis and Programming

Previously worked at
Accenture, UBS, Microsoft, Domino Data Lab

Technology maniac

Loves psychology

Agenda

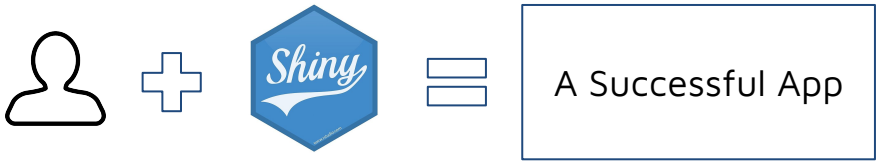
- Introduction
- Scaling
  - Leveraging Frontend
  - Extracting Computations
  - Architecture / Infrastructure

Introduction

You (or your Team)

Introduction

Introduction



Introduction

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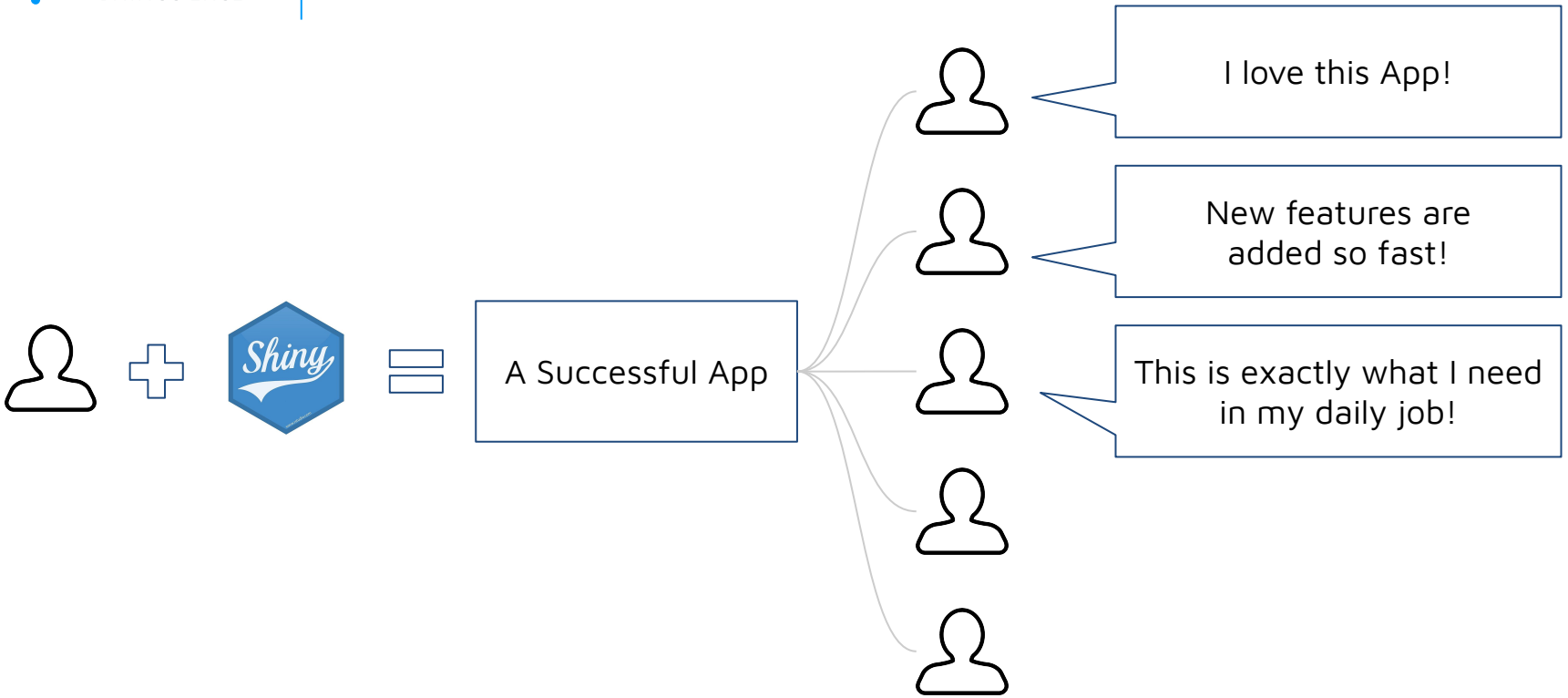

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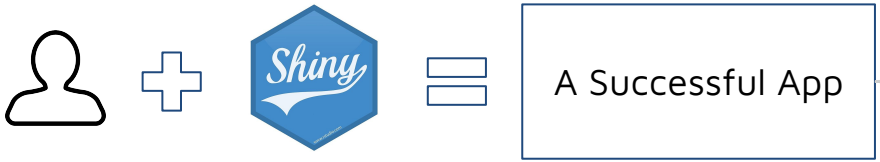

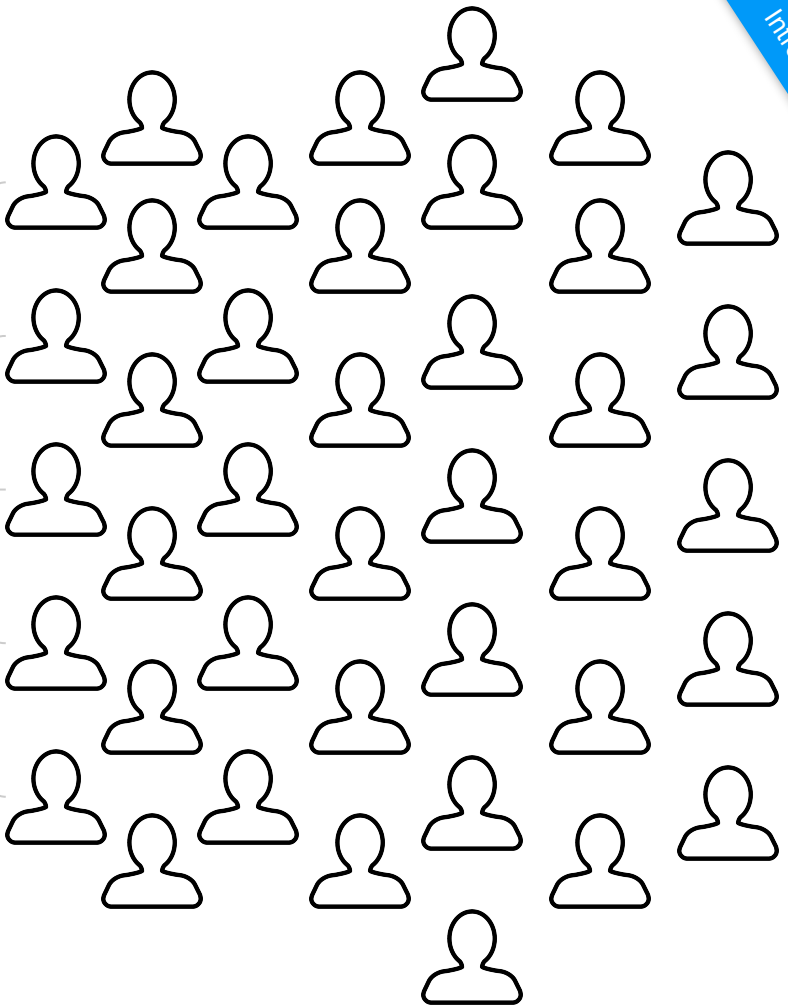

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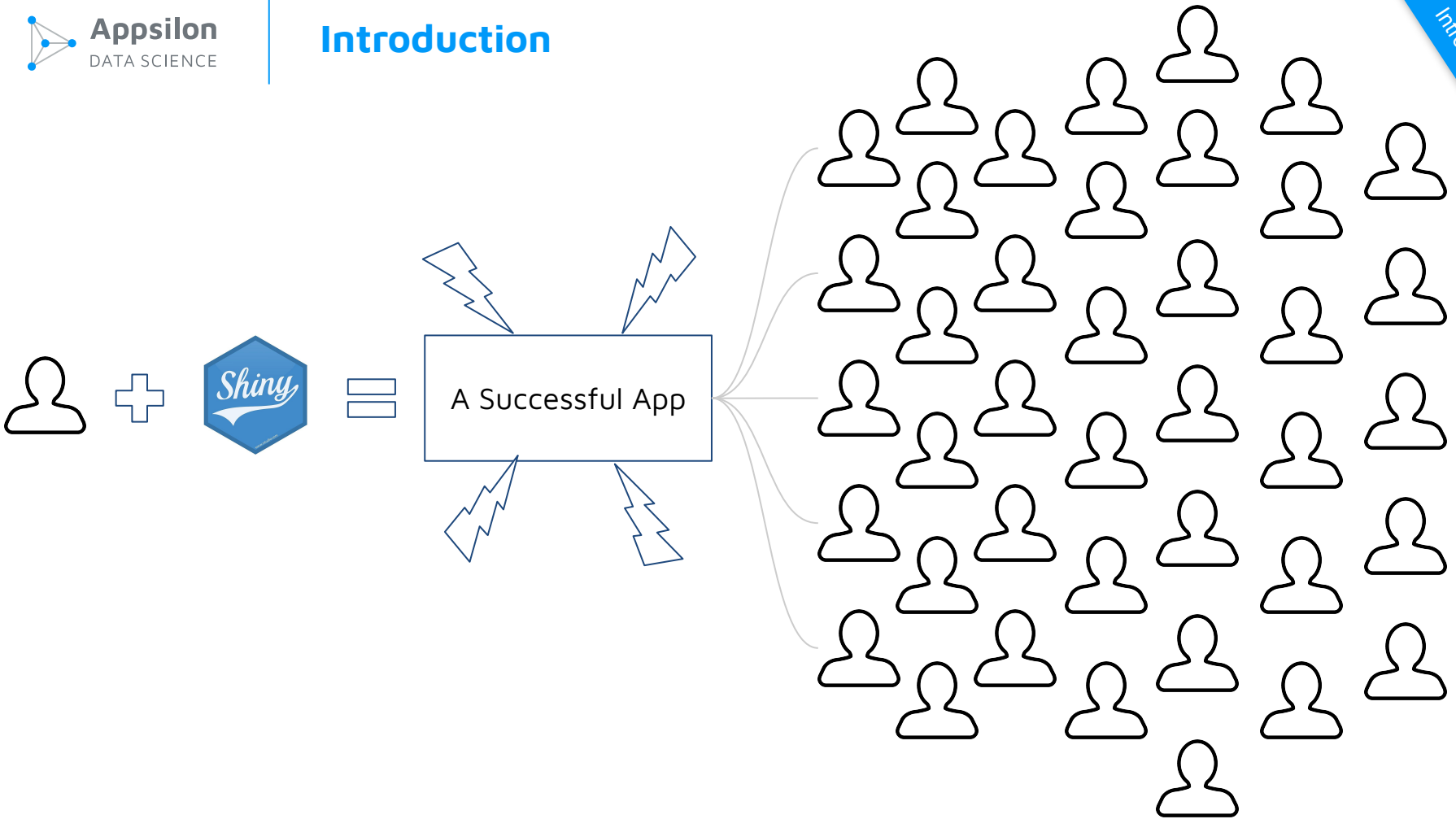

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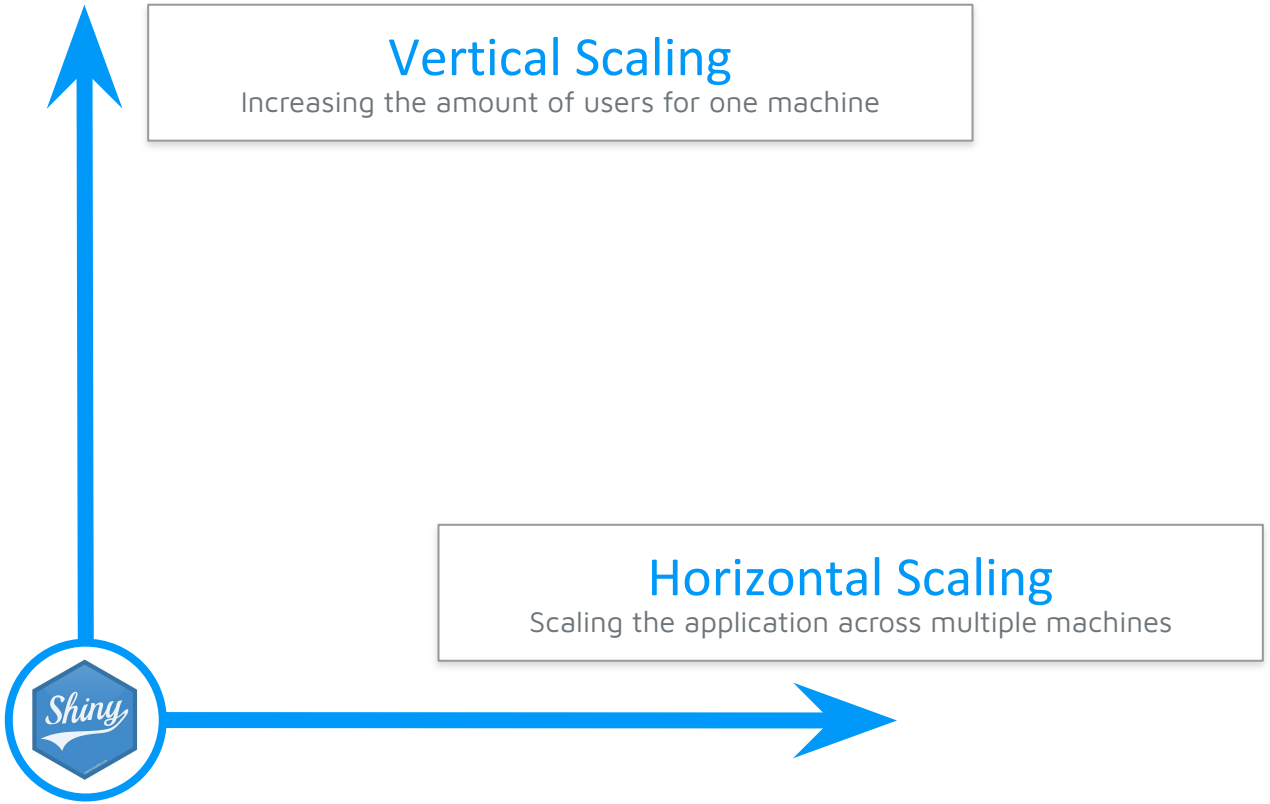
Scalable Application



Scalable Application

Leverage Frontend

Use Javascript to handle fast user interactions that do not change data

Extract Computations

Handle resource intensive operations away from the application

Set Architecture

Prepare application to be used by many users

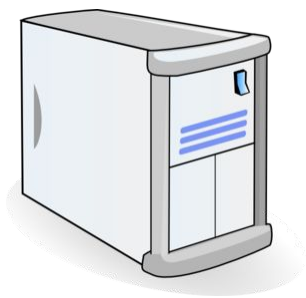
Make Shiny Layer Thin

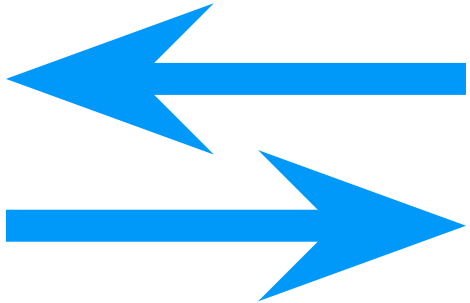
Shiny is a thin layer between the data and the interface

Scalable Application

server.R

ui.R





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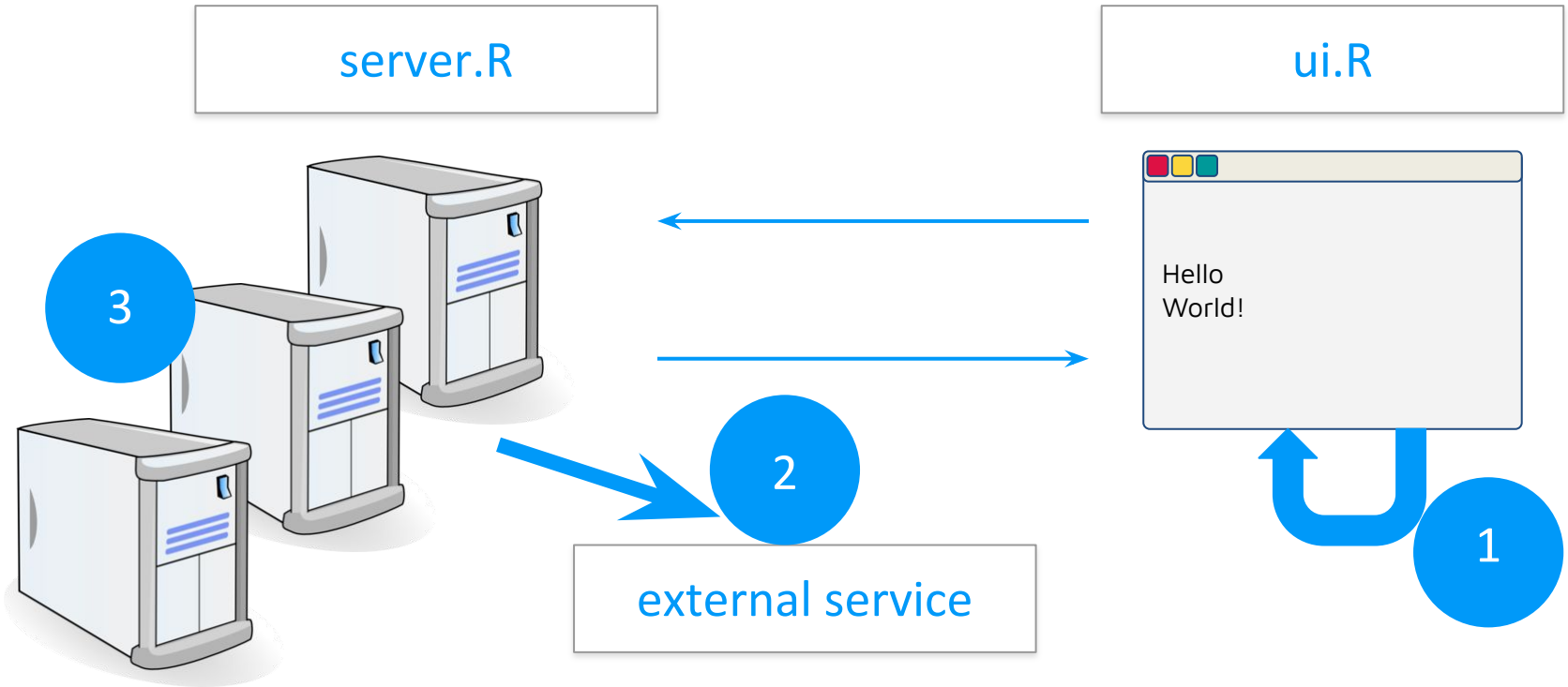
Scalable Application



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Leverage Frontend

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Using the power of the browser

Leverage frontend

1. Render inputs in *ui.R* and only update them in *server.R*

```
ui <- fluidPage(
  uiOutput("render_input"),
  actionButton("click_button", label = "")
)

server <- function(input, output, session) {

  output$render_input <- renderUI({
    numericInput(
      "render_input",
      label = "I will be updated using reactivity",
      value = if(is.null(input$click_button)) 0 else
input$click_button,
      min = 0,
      max = 10
    )
  })
}
```

```
ui <- fluidPage(
numericInput(
    "update_input",
    label = "I will be updated using updateInput",
    value = 0,
    min = 0,
    max = 10
  ),
  actionButton("click_button", label = "")
)

server <- function(input, output, session) {

  observeEvent(input$click_button, {
    updateNumericInput(
      session,
      "update_input",
      value = input$click_button
    )
  })
}
```

Using the power of the browser

1. Render inputs in *ui.R* and only update them in *server.R*
2. Run inline JavaScript code with {shinyjs} package

```
ui <- fluidPage(
  actionButton("click_button", label = "")
)

server <- function(input, output, session) {

  observeEvent(input$click_button, {
    shinyjs::runjs("$('#js_update > i').toggleClass('fa-arrow-up');")
  })
}
```

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Using the power of the browser

Leverage frontend

1. Render inputs in *ui.R* and only update them in *server.R*
2. Run inline JavaScript code with {shinyjs} package
3. Set all actions in JavaScript without *server.R* part

```
ui <- fluidPage(
  actionButton(
    "click_button",
    label = "I will update icons!",
    onclick = "$('#js_update > i').toggleClass('fa-arrow-up');"
  )
)
```

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Extract Computations: Remote API

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Plumber

Extract computations

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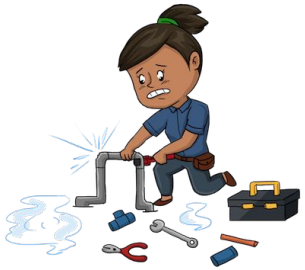
Loading Data Into Shiny



Extract computations

LOAD ONLY WHAT IS NEEDED

The entire dataset is rarely needed in the application. Usually the first user action within the app is to filter/select a subset of data. First, select – then load.

USE EFFICIENT DATA LIBRARIES

Manipulate data with package like {fst}, {data.table}, {arrow}. These packages will often improve app performance.

BUILD REST API

Wrap data extraction logic into a simple API with {plumber} by adding special comments.

DEPLOY EASILY

Use RStudio Connect or Docker to host your API.

RStudio Connect

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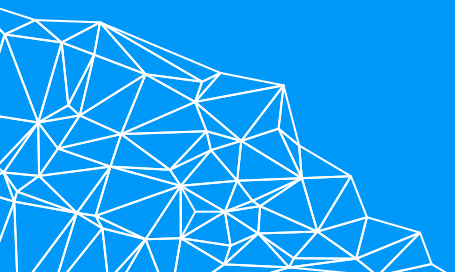
Extract Computations: Using a Database



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Using a database - why?

Extract computations

Pseudocode:

```
ui <- fluidPage(...)

data <- readRDS("./1gb_file.rds")

server <- function(input, output, session) {
  output$search_result <- … data %>% filter(value > input$query_value))
}

shinyApp(ui = ui, server = server)
```

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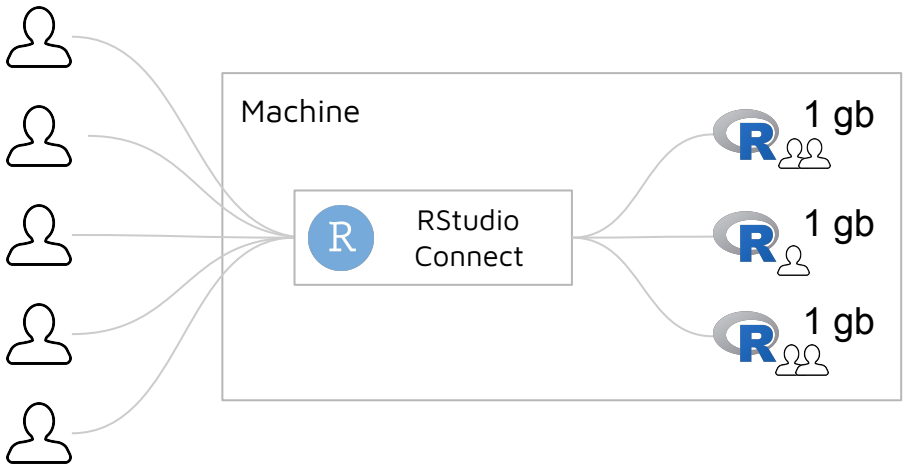
Using a database - why?

Extract computations



5 users

3 gb

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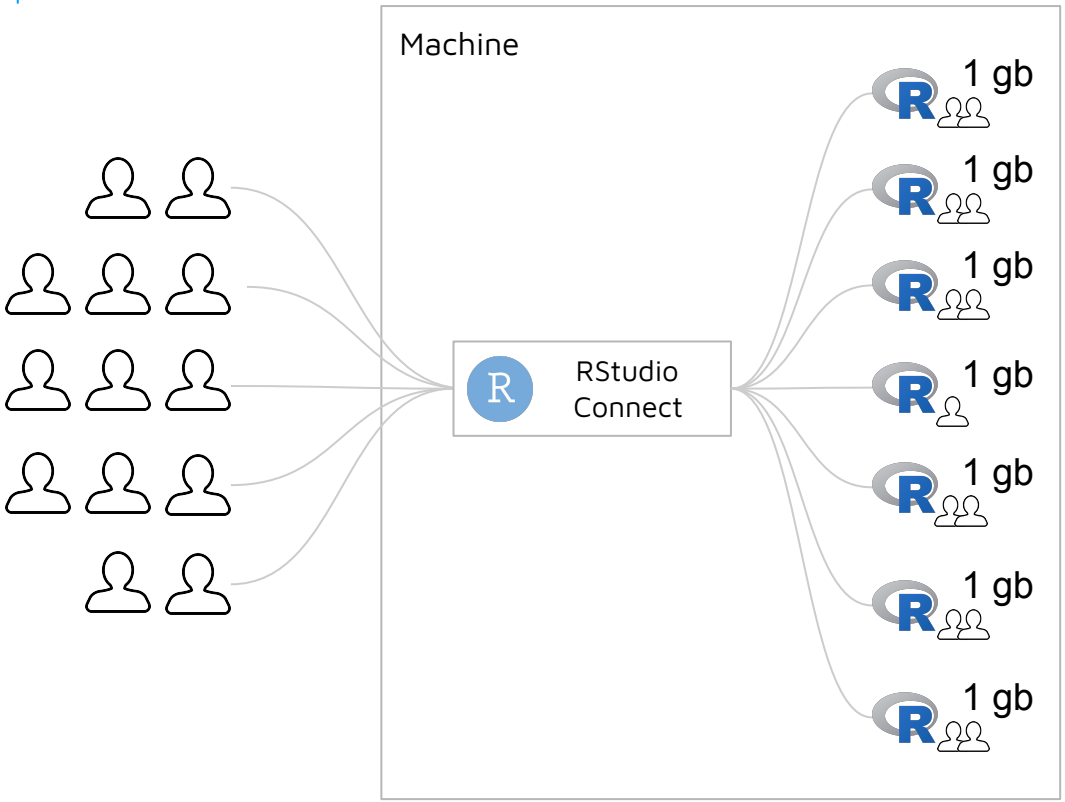
Using a database - why?



13 users

7 gb

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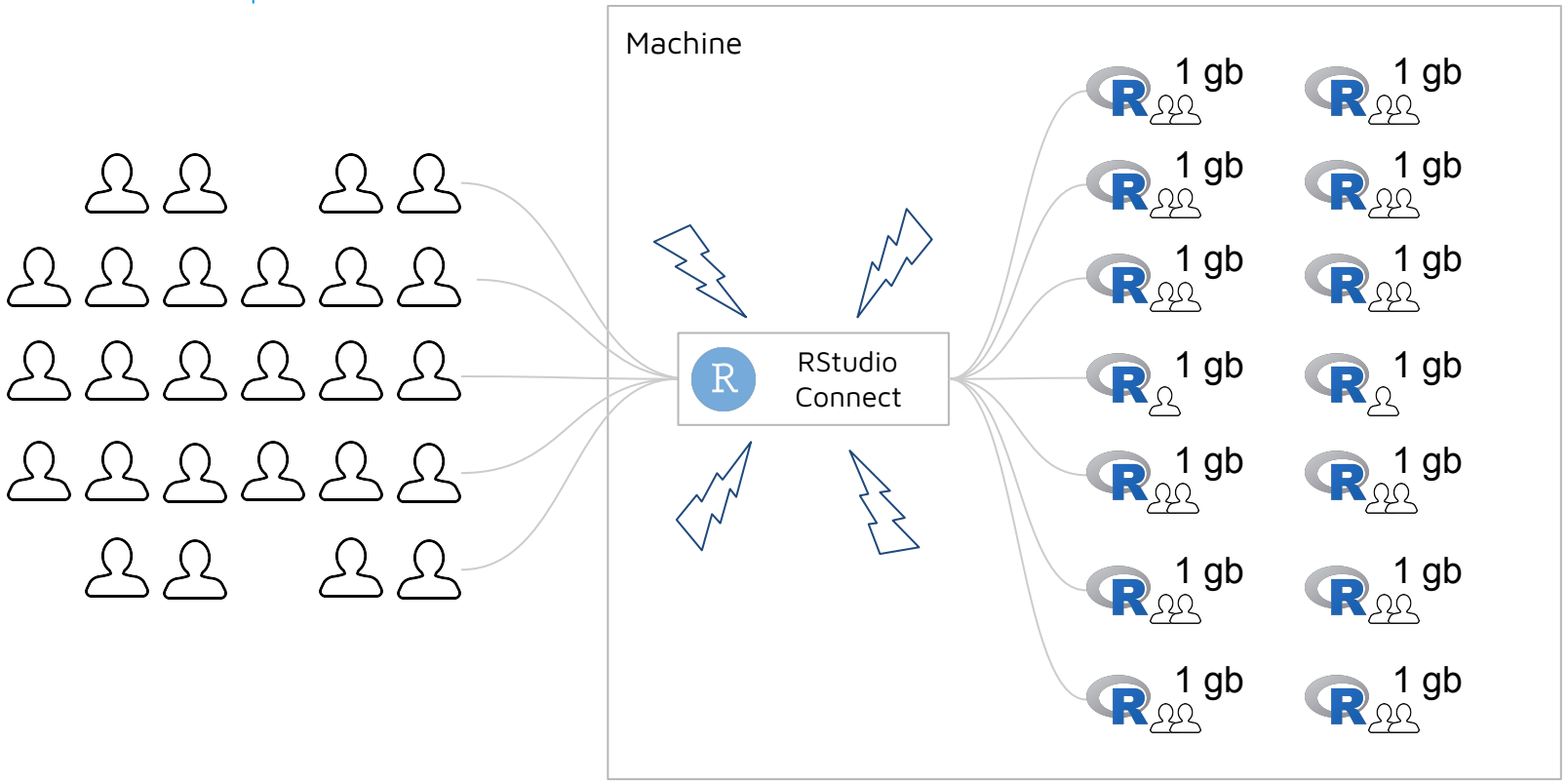
Using a database - why?

Extract computations



26 users

14 gb

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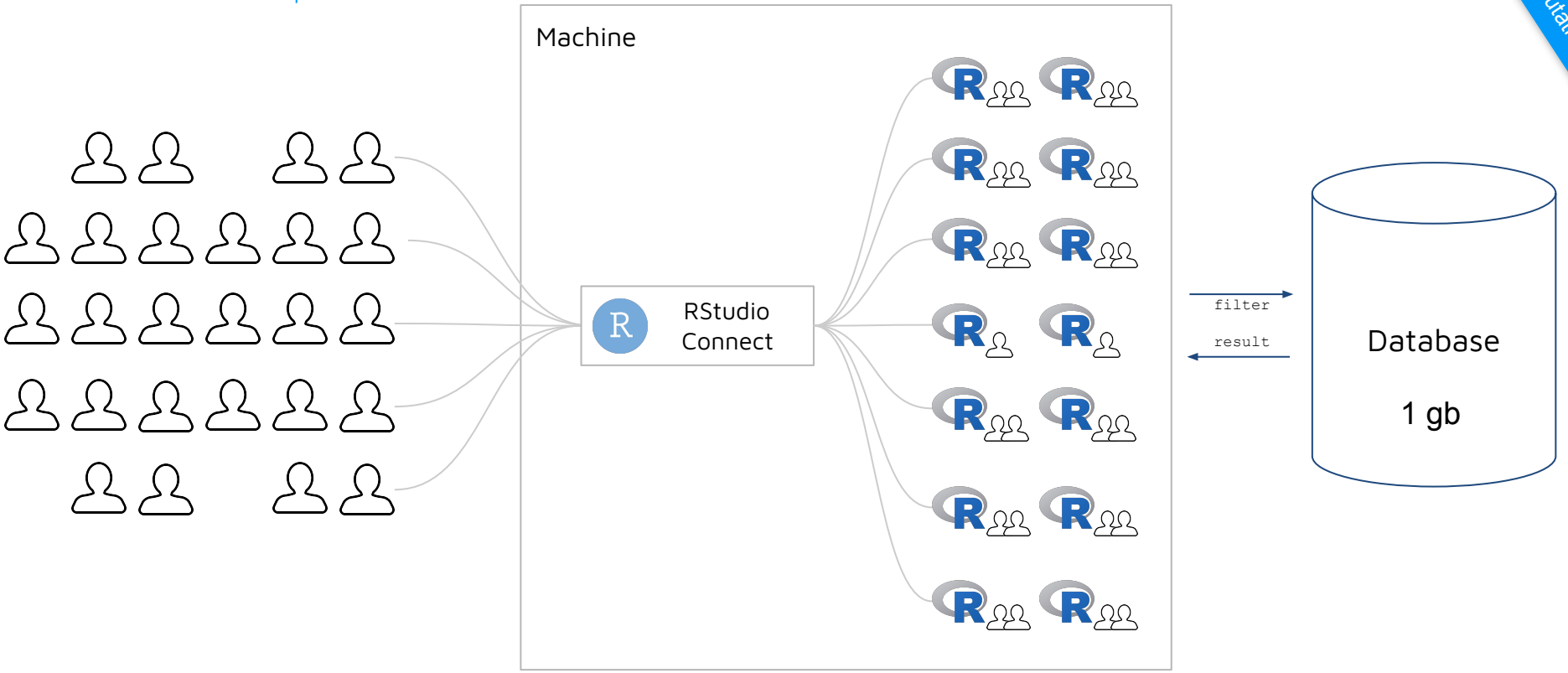
Using a database - the result

Extract computations



26 users

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Set Architecture

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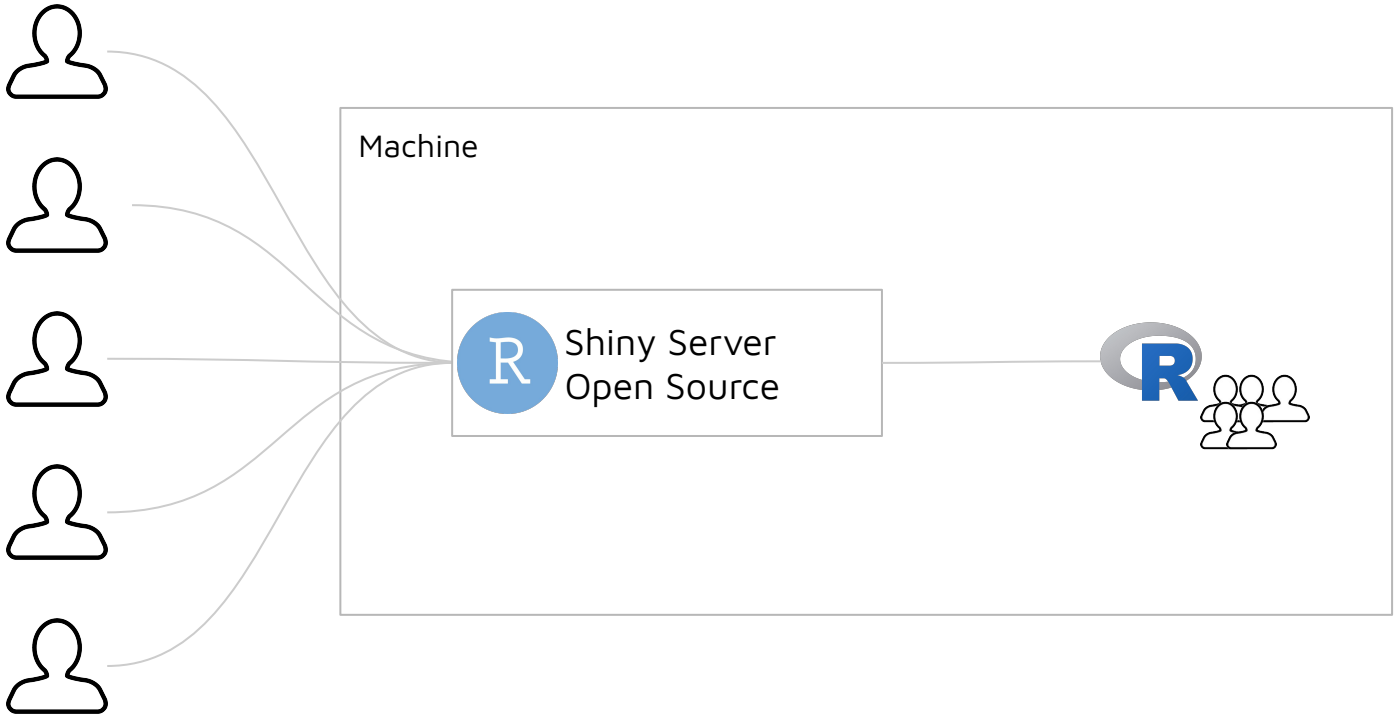
Shiny Server Open Source

Set architecture



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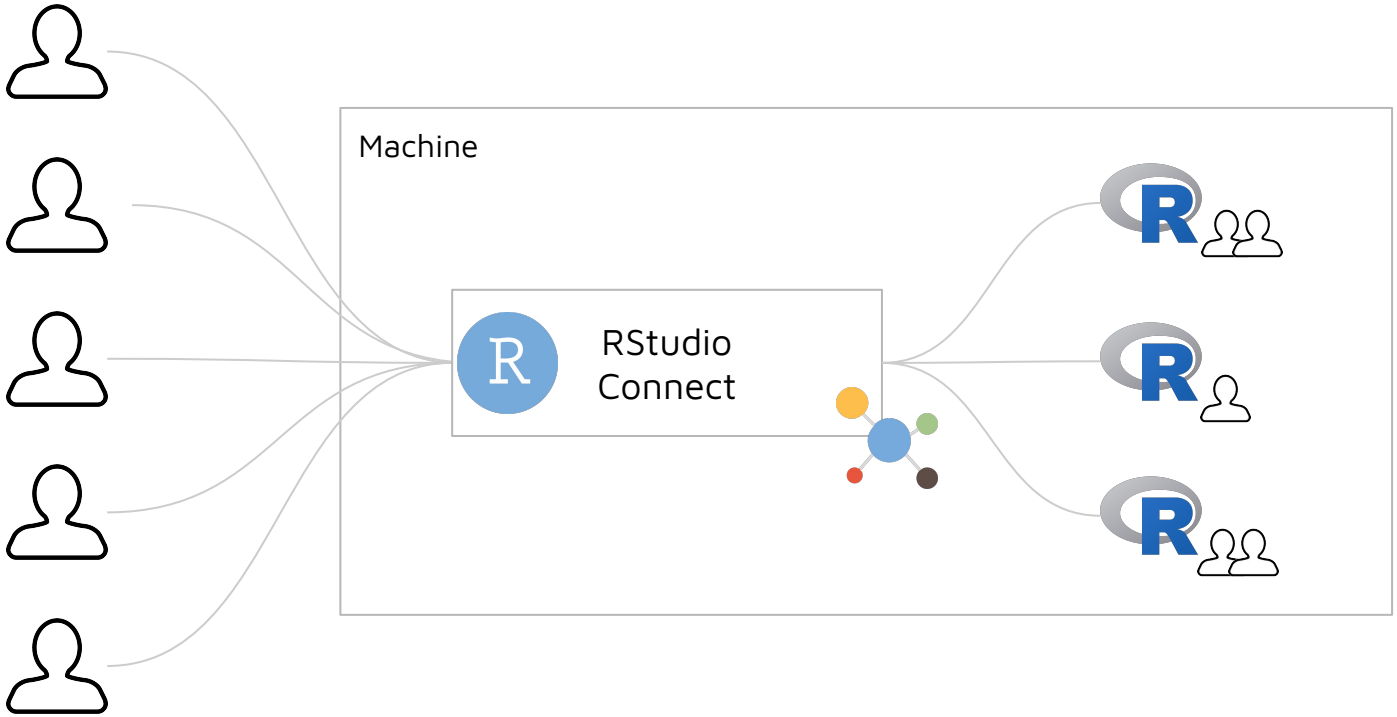
RStudio Connect

Set architecture



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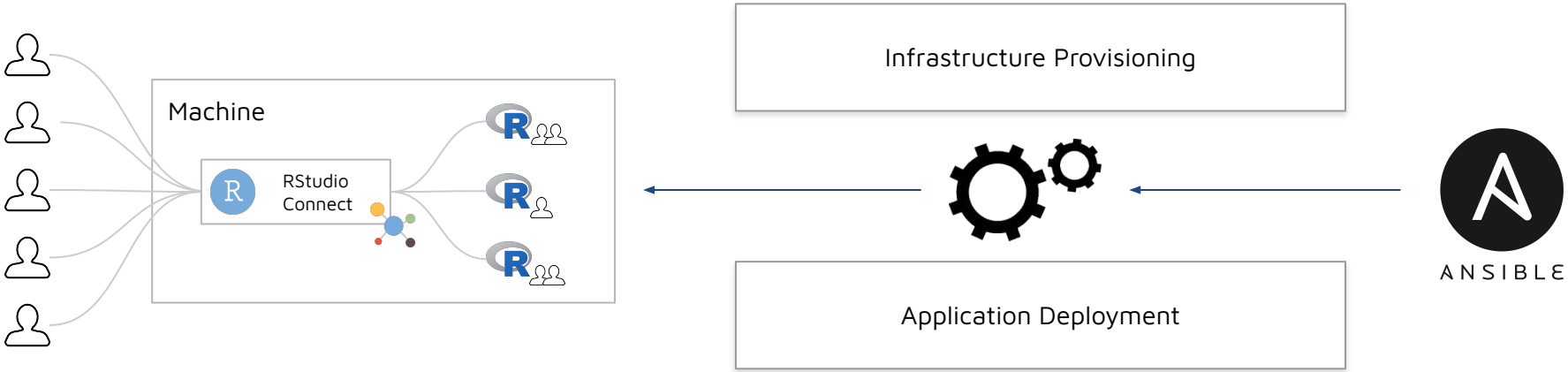
RStudio Connect - provisioning

Set architecture



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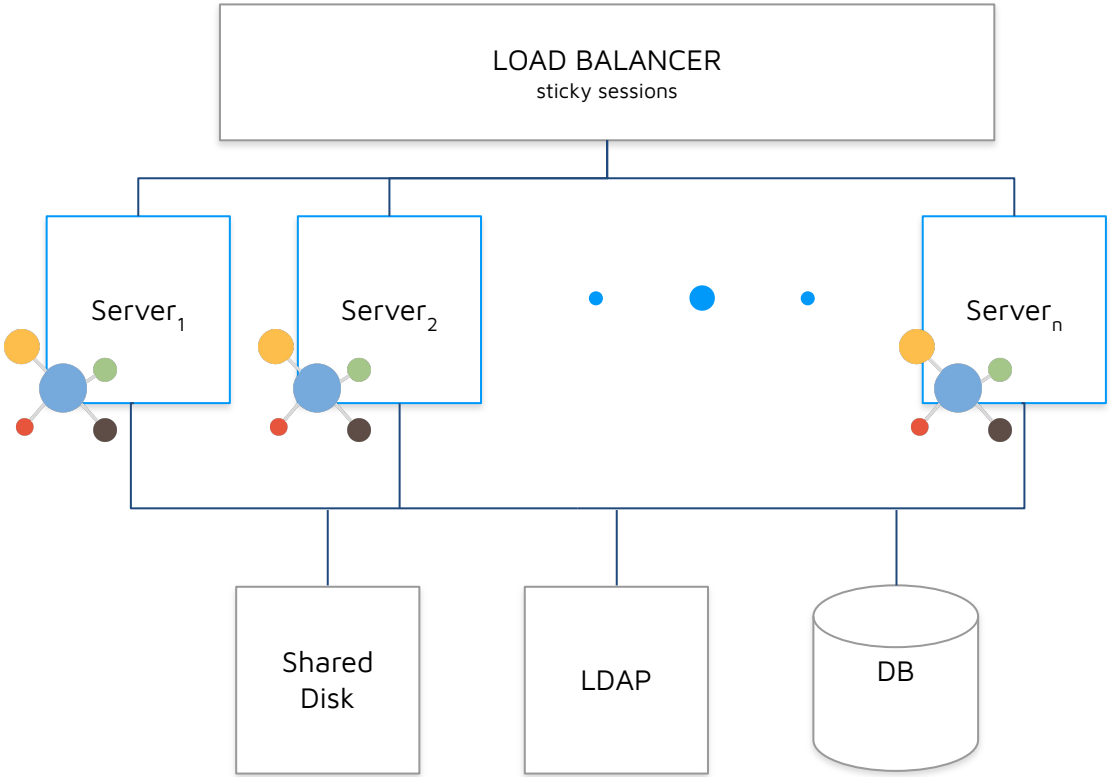
RStudio Connect - horizontal scaling

Set architecture



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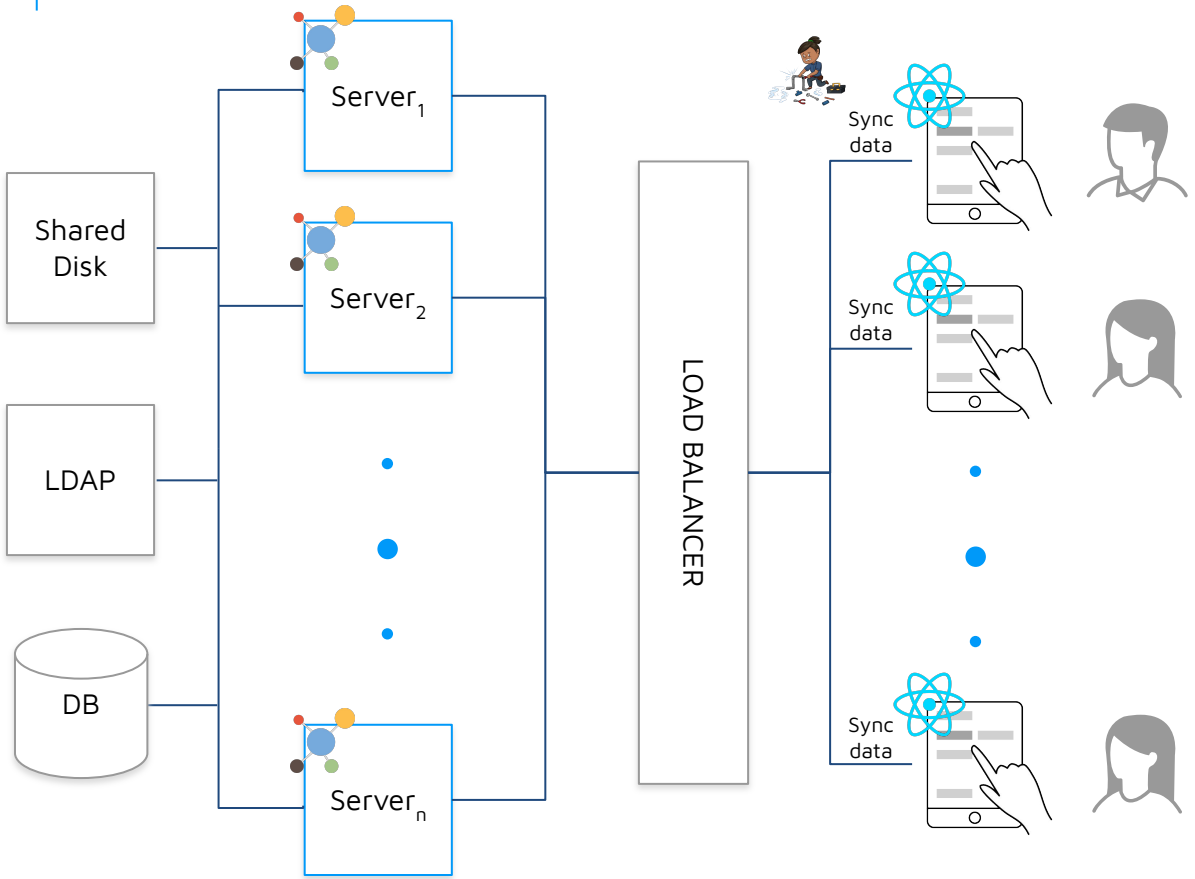
Architecture

Set architecture



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Thank you

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