BUILDING A COMPREHENSIVE OPEN-SOURCE WEB PLATFORM FOR R SHINY APPS

AGENDA

1. Application - Building a Country Intelligence Dashboard

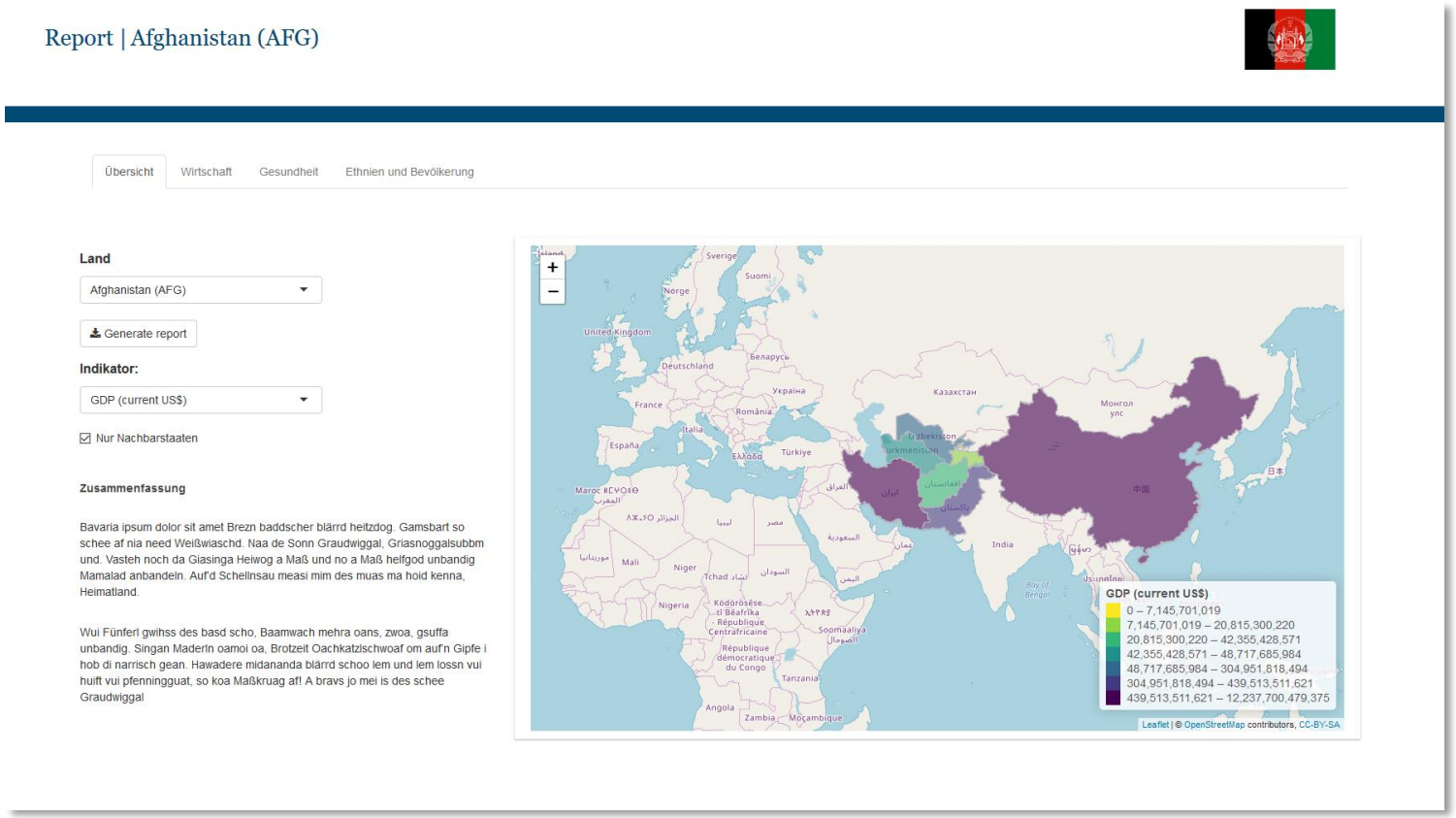
- Open-Source data from the World Bank
- GADM Geo-Information
- Combining Information in R

2. Technologies - Picking up the Pieces

- R Shiny
- Docker
- Shinyproxy
- Keycloak

PART 1 – COUNTRY INTELLIGENCE DASHBOARD

INTRODUCTION – COUNTRY INTELLIGENCE DASHBOARD



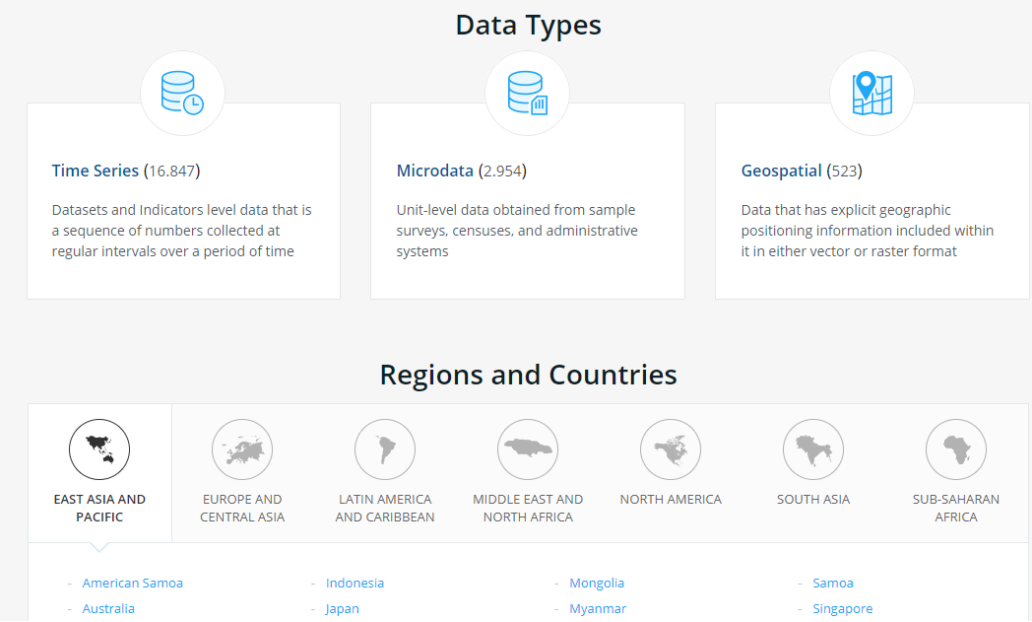
- Interactive Dashboard combining
  - World Bank Indicators
  - Geo Information

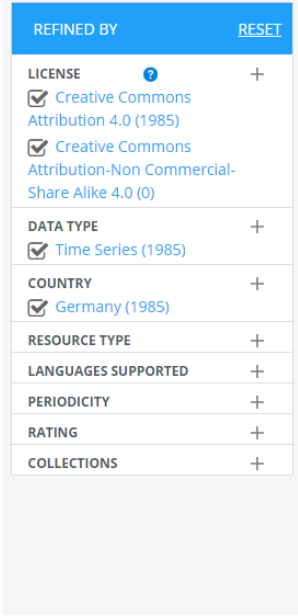
TECHNOLOGIES: R SHINY

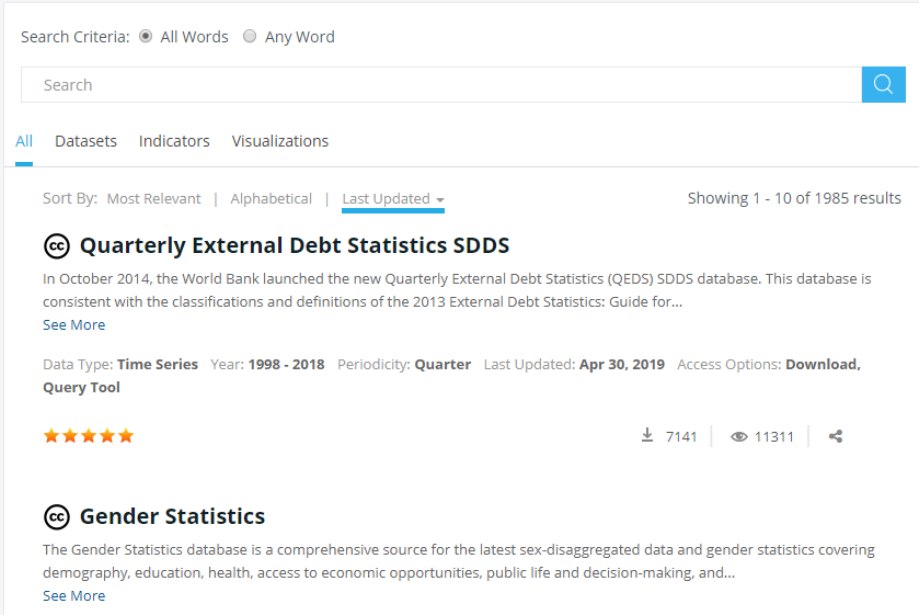
- **R** package for building interactive web apps
- Standalone app on webpage or in a dashboard
- Can be customized using CSS, htmlwidgets or JavaScript

APPLICATION: WORLD BANK DATA

- World Bank Data: Sources of funding and knowledge for developing countries
- Goal: reducing poverty, increasing shared prosperity, and promoting sustainable development
- Data: https://datacatalog.worldbank.org/







DEMONSTRATION

Report | Afghanistan (AFG)

Übersicht | Wirtschaft | Gesundheit | Ethnien und Bevölkerung

Land

Afghanistan (AFG)

Generate report

Indikator:

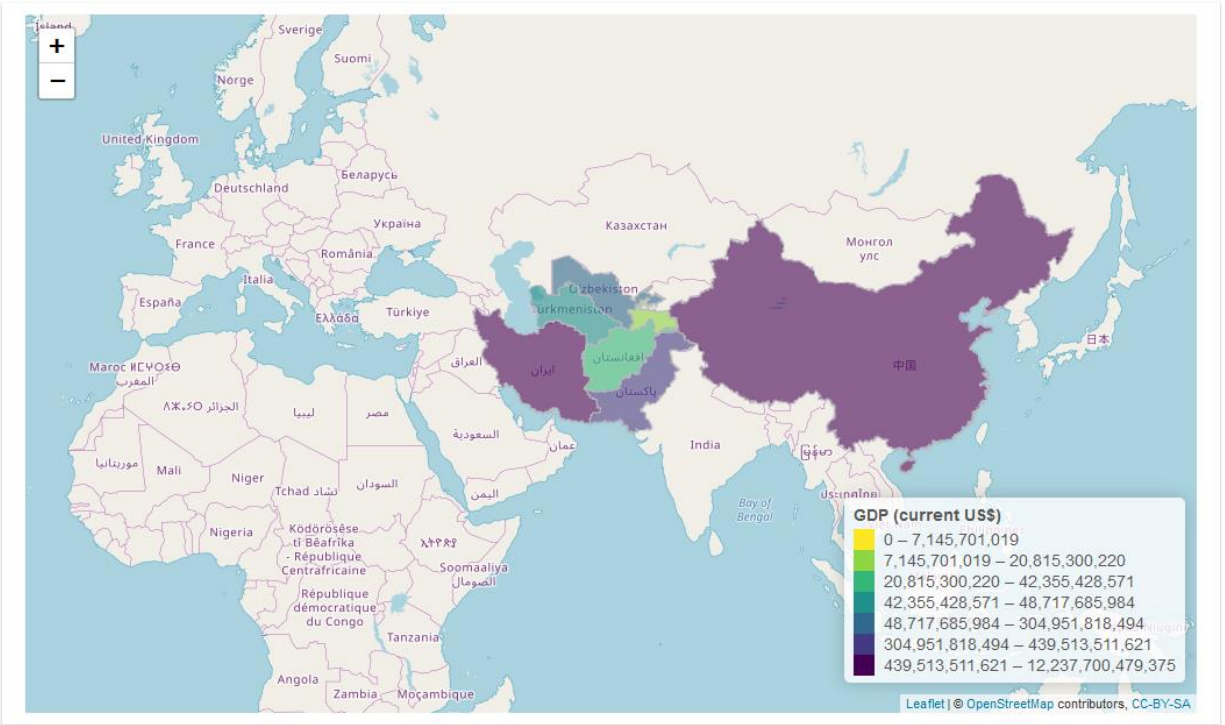
GDP (current US$)

☑ Nur Nachbarstaaten

Zusammenfassung

Bavaria ipsum dolor sit amet Brezn baddscher blärrd heitzdog. Gamsbart so schee af nia need Weißwiaschd. Naa de Sonn Graudwiggal, Griasnoggalsubbm und. Vasteh noch da Giasinga Heiwog a Maß und no a Maß helfgod unbandig Mamalad anbandeln. Auf'd Schellnsau measi mim des muas ma hoid kenna, Heimatland.

Wui Fünferl gwihss des basd scho, Baamwach mehra oans, zwoa, gsuffa unbandig. Singan Maderln oamoi oa, Brotzeit Oachkatzlschwoaf om auf'n Gipfe i hob di narrisch gean. Hawadere midananda blärrd schoo lem und lem lossn vui huift vui pfenningguat, so koa Maßkruag af! A bravs jo mei is des schee Graudwiggal



APPLICATION: GADM

- High resolution geo-information of administrative areas of all countries
- Includes many levels and subdivisions
- Data stored as polygons
- Freely available for non-commercial use @ https://gadm.org/data.html

````
```{r}
library(rgdal)
library(tidyverse)
path = "data/gadm36_levels.gpkg"
```

## Get information on layers

```{r}
(layers <- ogrListLayers(path) )
```

 [1] "level0" "level1" "level2" "level3" "level4" "level5"
 attr(,"driver")
 [1] "GPKG"
 attr(,"nlayers")
 [1] 6

## Read the first layer

```{r}
data0 <- readOGR(path, layers[1])
```
````

````
## Content

```{r}
str(data0@data,1)
```

 'data.frame':   256 obs. of  2 variables:
  $ GID_0 : Factor w/ 256 levels "ABW","AFG","AGO",..: 1 2 3 4 5 6 7
  $ NAME_0: Factor w/ 256 levels "Å…land","Afghanistan",..: 14 2 8 9

```{r}
str(data0@polygons[[1]]@Polygons[[1]],2)
```

 Formal class 'Polygon' [package "sp"] with 5 slots
   ..@ labpt  : num [1:2] -70 12.5
   ..@ area   : num 0.0151
   ..@ hole   : logi FALSE
   ..@ ringDir: int 1
   ..@ coords : num [1:2161, 1:2] -70 -70 -70 -70 -70 ...
````

APPLICATION: INTERACTIVE MAPS WITH R SHINY

- Join geo information from GADM with WDI Data

ENTITY_TEXT_ID_ADM0	VALUE_FLOAT	INDICATOR_NAME	YEAR	geometry
Afghanistan (AFG)	9.843842e+09	GDP (current US$)	2007	list(list(c(68.5775909433334, 68.5595665, 68.532562256, 68.498...
Afghanistan (AFG)	1.019053e+10	GDP (current US$)	2008	list(list(c(68.5775909433334, 68.5595665, 68.532562256, 68.498...
Afghanistan (AFG)	1.248694e+10	GDP (current US$)	2009	list(list(c(68.5775909433334, 68.5595665, 68.532562256, 68.498...
Afghanistan (AFG)	2.061610e+10	GDP (current US$)	2014	list(list(c(68.5775909433334, 68.5595665, 68.532562256, 68.498...
Afghanistan (AFG)	1.946902e+10	GDP (current US$)	2016	list(list(c(68.5775909433334, 68.5595665, 68.532562256, 68.498...
Afghanistan (AFG)	2.081530e+10	GDP (current US$)	2017	list(list(c(68.5775909433334, 68.5595665, 68.532562256, 68.498...
Albania (ALB)	1.924242e+09	GDP (current US$)	1984	list(list(c(20.0438248940821, 20.0781005250001, 20.105264026...
Albania (ALB)	1.965385e+09	GDP (current US$)	1985	list(list(c(20.0438248940821, 20.0781005250001, 20.105264026...
Albania (ALB)	2.156625e+09	GDP (current US$)	1987	list(list(c(20.0438248940821, 20.0781005250001, 20.105264026...
Albania (ALB)	2.335125e+09	GDP (current US$)	1989	list(list(c(20.0438248940821, 20.0781005250001, 20.105264026...
Albania (ALB)	7.094526e+08	GDP (current US$)	1992	list(list(c(20.0438248940821, 20.0781005250001, 20.105264026...
Albania (ALB)	1.985674e+09	GDP (current US$)	1994	list(list(c(20.0438248940821, 20.0781005250001, 20.105264026...
Albania (ALB)	2.424499e+09	GDP (current US$)	1995	list(list(c(20.0438248940821, 20.0781005250001, 20.105264026...

APPLICATION: INTERACTIVE MAPS WITH R SHINY

- Join geo information from GADM with WDI Data
- Define colours, labels and popup when hovering over text

```
statesDF <- reactive({
  statesDF <- inner_join(states, data(), by = c("GID_0"))
})

pal <- reactive({
  pal <- colorNumeric("viridis", domain = statesDF()$Value, n = 5)
})

labs <- reactive({
  labs <- as.list(statesDF()$ENTITY_TEXT_ID_ADM0)
})

popup <- reactive({
  popup <- paste0("<strong>", statesDF()$ENTITY_TEXT_ID_ADM0, "</strong>",
                  "<br><strong>", input$indicator, ":</strong>",
                  "<br><strong>", formatFigure(statesDF()$Value),"</strong>")
})
```

APPLICATION: INTERACTIVE MAPS WITH R SHINY

- Define leafletPlot: R plot for JavaScript based library for interactive maps
- Pass all arguments including polygon values
- More info on https://rstudio.github.io/leaflet/

```
output$leafletPlot <- renderLeaflet({
  leaflet(statesDF()) %>%
    addTiles() %>%
    flyTo(lonSelection(), latSelection(), zoom = 3) %>%
    addPolygons(color = "#BDBDC3", weight = 1, smoothFactor = 0.5,
                opacity = 1, fillOpacity = 0.6,
                fillColor = ~pal()(Value),
                highlightOptions = highlightOptions(color = "white", weight = 2,
                                                    bringToFront = TRUE),
                layerId = ~GID_0, popup = popup(),
                label = lapply(labs(), HTML)) %>%
    addLegend("bottomright", pal = pal(), values = ~Value,
              title = input$indicator,
              opacity = 1
    )
})
```

PART 2 – PICKING UP THE PIECES IN OPEN SOURCE

CREATING A COMPREHENSIVE APPLICATION

Goal: Serve multiple R Shiny applications in an enterprise context

including

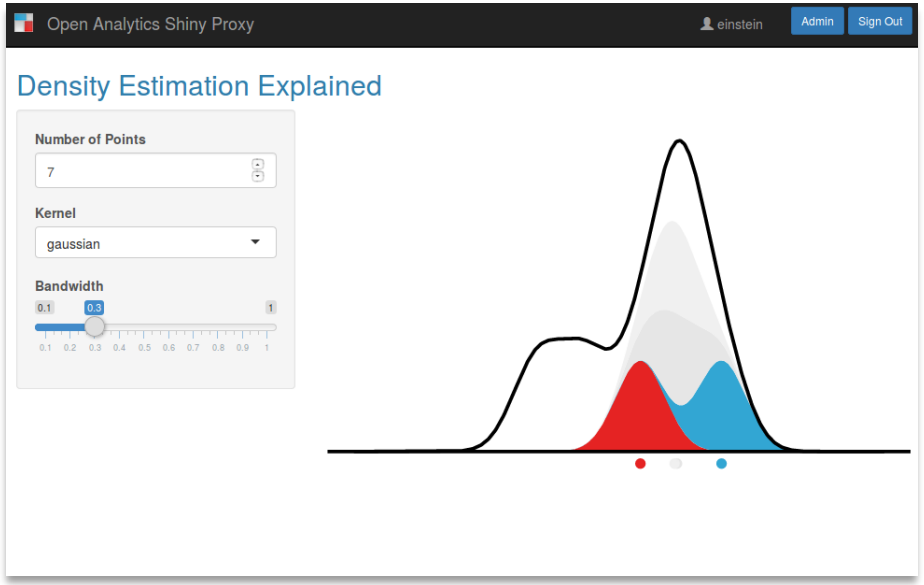
- An authentication system
- Possibility to scale application to a large number of users
- Ways to make applications portable

Solution:

- Shinyproxy & R Shiny app in Docker
- Keycloak for authentication
- NGINX for traffic routing

TECHNOLOGIES: SHINYPROXY

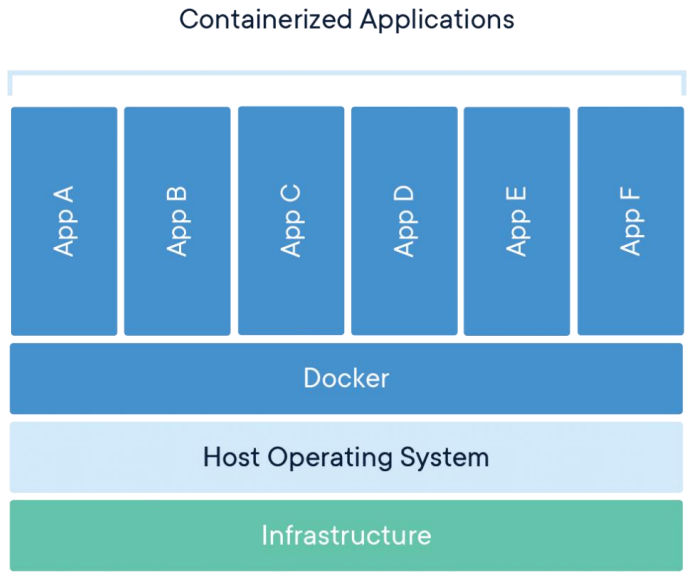
- Deploy multiple Shiny Applications in one place
- Need for enterprise features yet open source
- All benefits by Docker-based technology
- Built-in functionalities for LDAP or SSO authentication and authorization
- More info on https://www.shinyproxy.io/



Source: https://www.shinyproxy.io/

TECHNOLOGIES: DOCKER

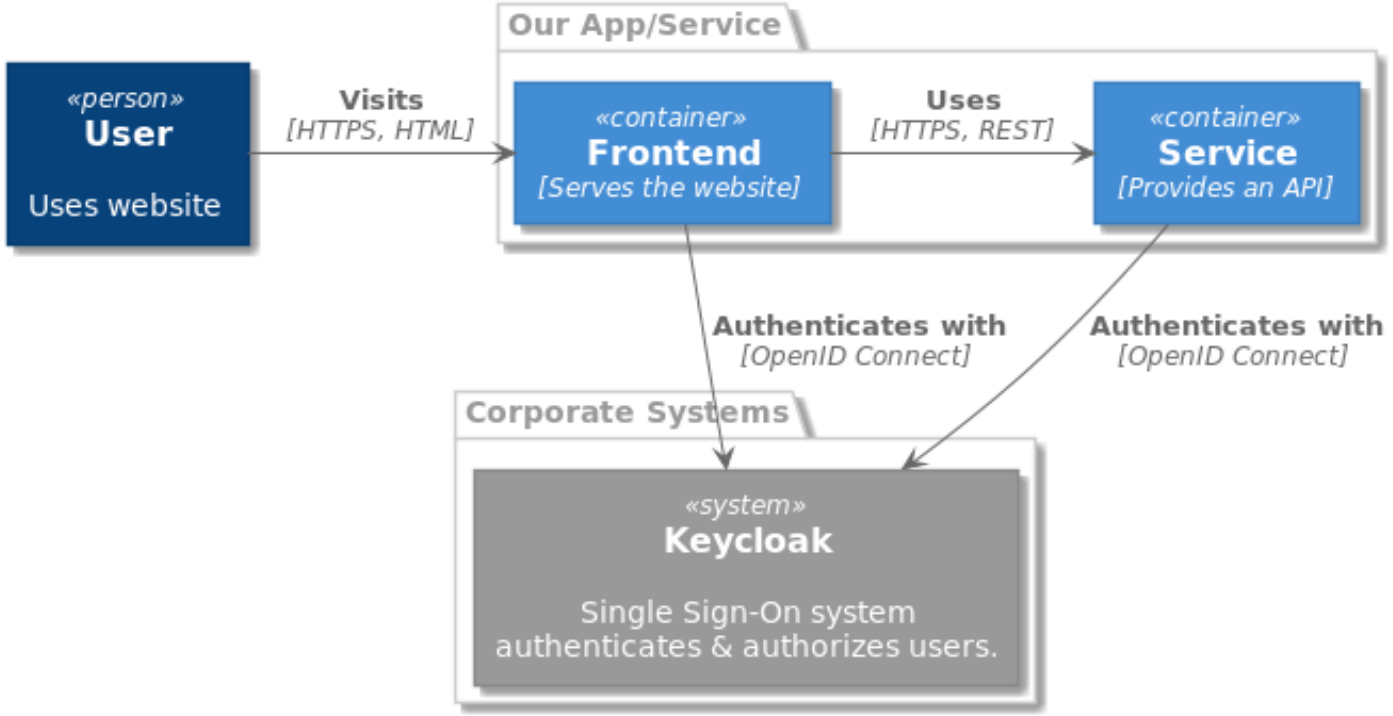
- A platform for distributed applications, similar to a Virtual Machine
- A docker container: is a lightweight way of virtualization



Source: https://www.docker.com/resources/what-container

TECHNOLOGIES: KEYCLOAK

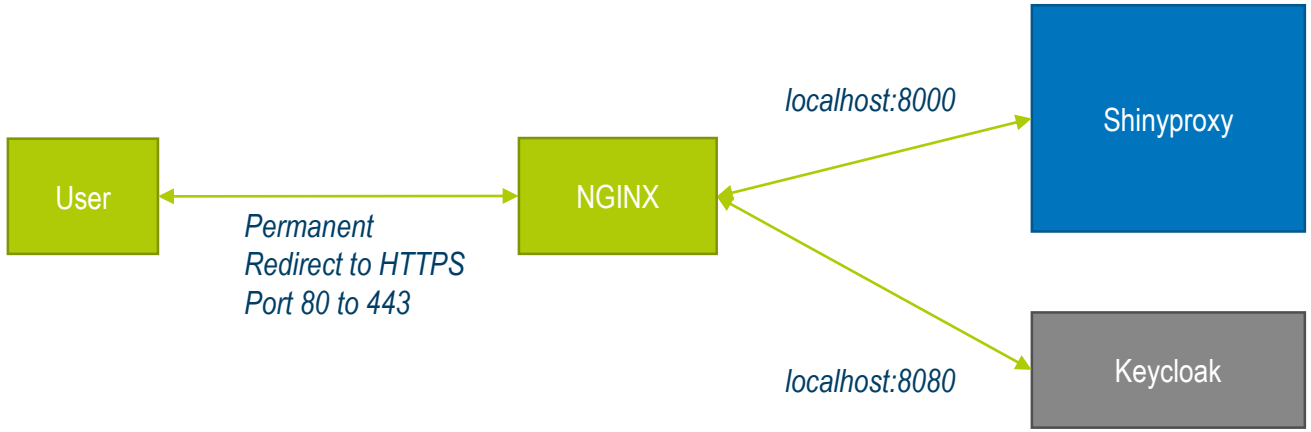
- Open source identity and access management solution
- More info on https://www.keycloak.org



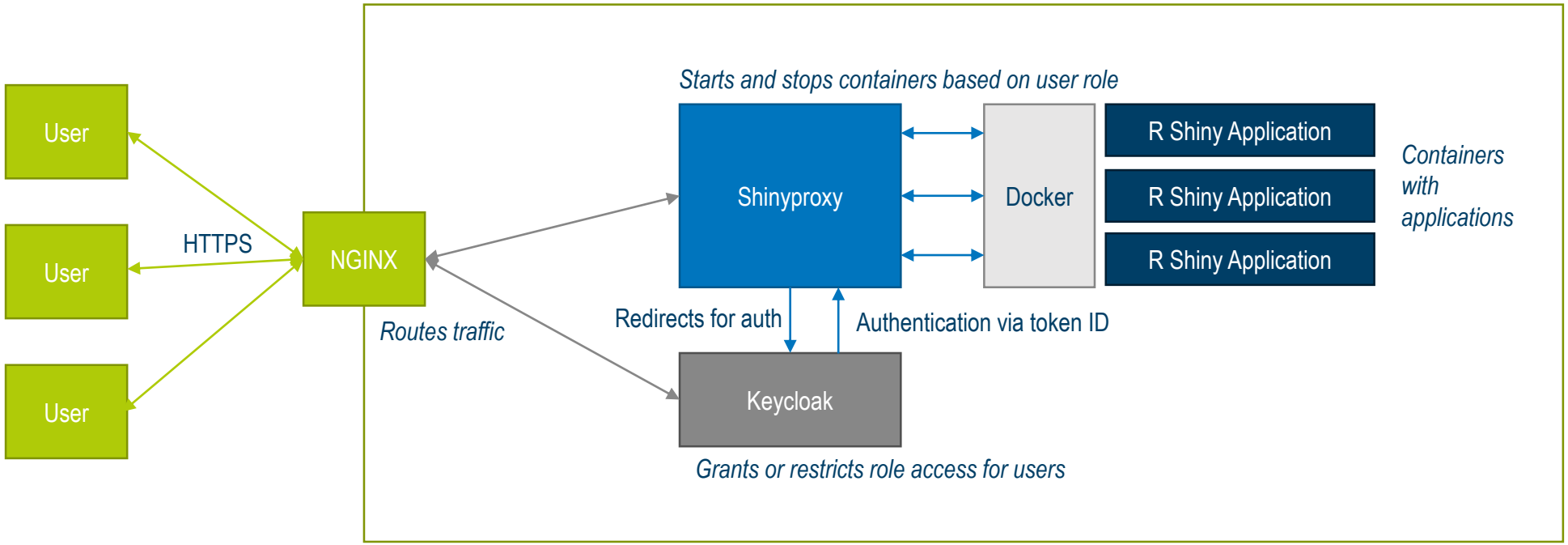
Source: https://blog.jdriven.com/2018/10/securing-spring-microservices-with-keycloak-part-2/

TECHNOLOGIES: NGINX

- Web server used as web proxy – manages SSL and routes traffic
- Two upstreams: Keycloak and Shinyproxy



APPLICATION: PICKING UP THE PIECES



DEMONSTRATION

THANKS FOR JOINING!

CYOSS
AN ESG GROUP COMPANY