Integrated Use of R and CDMS using Shiny

ITMD Workshop

Toppenish, WA

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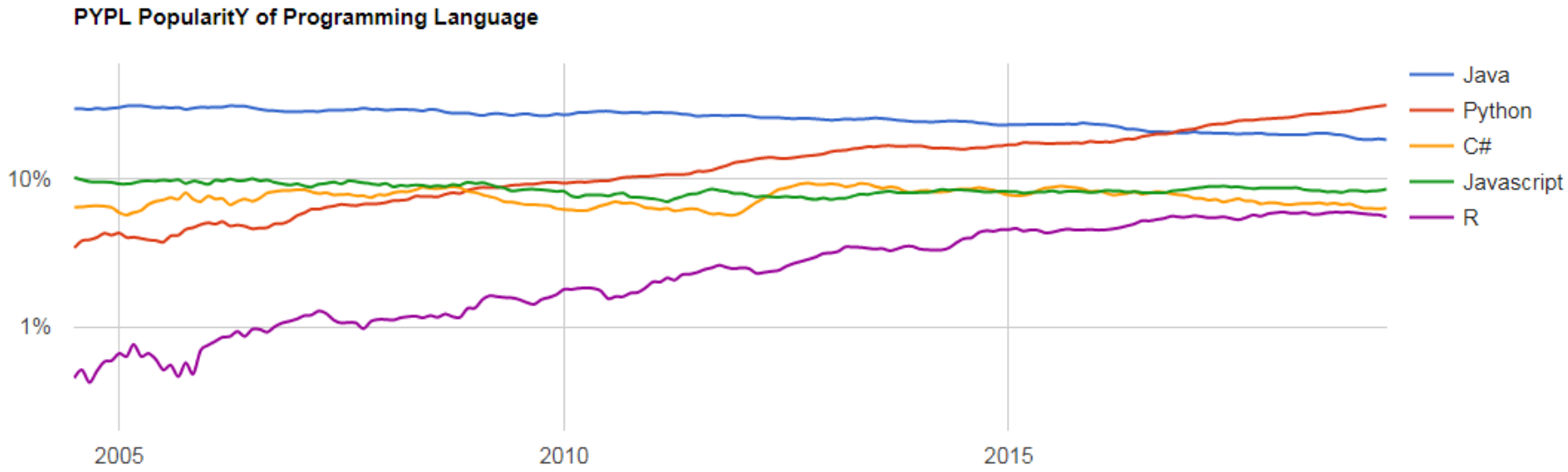
Presentation Overview

- Introduction to R, Shiny, and R Studio
- NPT Dataflow and R Packages
- Shiny Tutorial
- Production Shiny Examples

Introduction to R

- Free software environment for statistical computing and

April 2019 PYPL Index



9	Swift	3.06 %	-0.6 %
10	Matlab	2.13 %	-0.1 %

- R books available for purchase or free online
- Huge R Community
  - Stack Overflow, Twitter, R Studio Community

https://www.r-project.org/

Introduction to R Studio

- An Integrated Development Environment (IDE) that allows you to interact with R more readily
  - Open Source
  - Syntax highlighting, code completion and smart indentation (multiple languages)
  - Execute code directly
  - Plotting, history and version control built-in
  - Integrated R help and debugging
  - Similar to Microsoft Visual Studio
- “Our goal is to empower users to be more productive with R.”
- Employs many of the most respected R programmers and package developers

https://www.rstudio.com/

Introduction to Shiny

- An R Package developed by Joe Cheng (R Studio Team)
  - Creates interactive web applications
    - translates R code into languages necessary for client-sides and server-sides to communicate (e.g., JavaScript, HTML, CSS)
  - Requires ***zero*** programming or web development knowledge
    - proficiency in R is helpful; but not required!
  - Imbed all the statistical and data visualization tools available in R
  - Directly links data scientist with decision makers

https://shiny.rstudio.com/

Introduction to Shiny

- Easily make use of JavaScript libraries (e.g., leaflet, d3, plotly)
- Customize applications by imbedding other languages directly in the R code (e.g., java, html, Python, CSS)
- Application Deployment
  - Cloud based options (free and multiple paid tiers)
  - On-premise (open source)
  - On-premise (commercial)

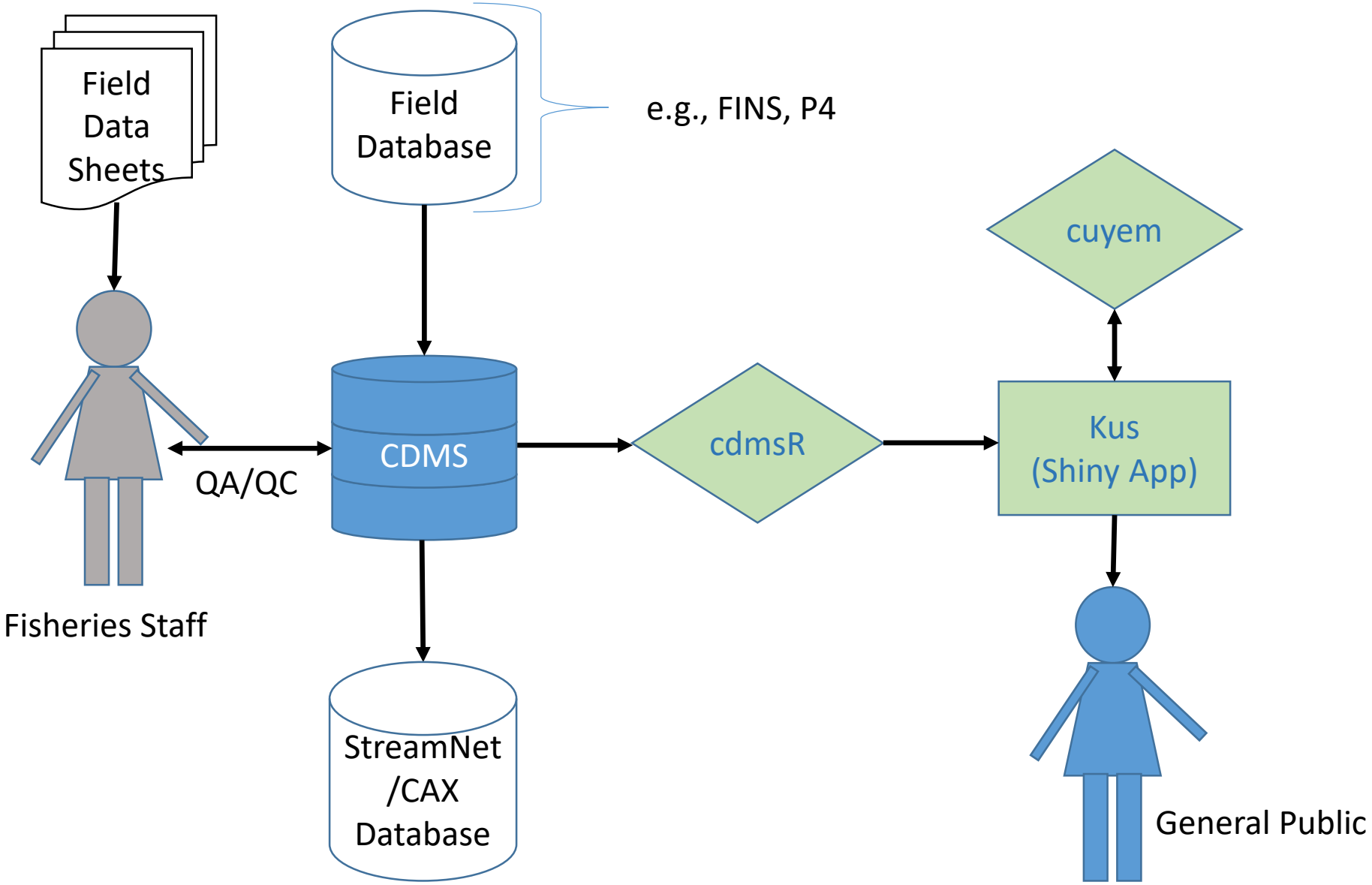
https://shiny.rstudio.com/

Introduction to Shiny

- Reactive programming model
  - link client-side outputs to either static or dynamic user defined inputs
- Requires two distinct parts:
    - ui.R (front-end code)
      - layout, select boxes, radio buttons, figures, tables
    - server.R (back-end code)
      - dbase connections, data transformations/summaries, figure and table creation

https://shiny.rstudio.com/

NPT Dataflow and R Packages



NPT R Packages and Tools

- cdmsR
  - access data stored in CDMS through existing API endpoints
- cuyem (fish)
  - group of functions for estimating fish metrics and indicators
  - consistent methodology and provides precision estimates
- kus (water)
  - connects across CDMS datasets and/or external data
  - data summaries and visualizations
  - public access

Shiny Tutorial

- To R Studio!!

Shiny Production Examples

- PitPH
  - assist in hydrosystem operational planning by estimating the probability a smolt will pass through the powerhouse at variable spill levels
  - https://nptfisheries.shinyapps.io/pitph2/
- PITtracker
  - tracks PIT tag observations of Chinook and Bull Trout in the Imnaha River to assist in weir management
  - https://nptfisheries.shinyapps.io/PITtrackR/
- Kus
  - Interface for tribal members and employees to access fisheries information
  - https://nptfisheries.shinyapps.io/kus-data/

Questions?