

Overview of Quarto

AUTHOR

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Current Research:



Title: Assessment and Monitoring of Virginia Water Quality Best Management Practices

Goals & Scope:

- Construct a mobile water quality monitoring station
- Telecommunication of data collected at each station

Equipment:

- CR1000 & CR1000x
- Cell210 4g LTE Cellular Module
- RF401A: 900 MHz Spread-Spectrum Radio
- YSI (Exo 3 and 2)
- CS655 Soil Moisture Probe
- spectro::lyser V3 nitrogen UV-Vis probe (SPV3)

Current Issue:

- Integrating SPV3 (modbus serial communication) into telecommunication network (pakbus)```

- Physical limitations of CR1000(x) prevent RF radio and cellular module from being on the same serial port
- Limitations of modbus output format over HTP / IP communication

Potential Solution:

- Set up File Transfer Protocol (FTP) between SPV3 and CR1000(x) to sidestep communication limitations between modbus and pakbus
 - Retrieve data pushed to data retrieval site
 - Develop R-script to clean and analyze raw data from FTP then embed the outputs into final website for viewing

Project Motivation:

Utilizing R for analysis of data and export results to html format that can be embedded in a website. Leading to an investigation into Quarto as a potential solution to this.

General:

What is Quarto?

- Opensource platform to easily publish and convey scientific data and accompanying code
 - Equivalent to a more robust version of R-markdown

Benefits Some Benefits of Quarto

- **Compatible with multiple languages through integration of respective engines**
 - *R (knitr)*
 - Python (Jupyter)
 - JavaScript (Observable)
- **Numerous output types**
 - *html*
 - .pdf
 - .docx
 - .ppxt
 - And other formats supported by other languages (ie .ipynb)

- **Integrate code from different languages/ projects into a single output document/format that is easily interpreted**

- Useful for large projects/tutorials using multiple platforms
- Easy to follow workflows

- **Easily publish data**

- Directly in R-studio through quarto
- *Export html to git or directly embed into a site*

For more info: <https://quarto.org>

Setup:

1. Download [Quarto Installer](#)

2. Open R studio

1. File

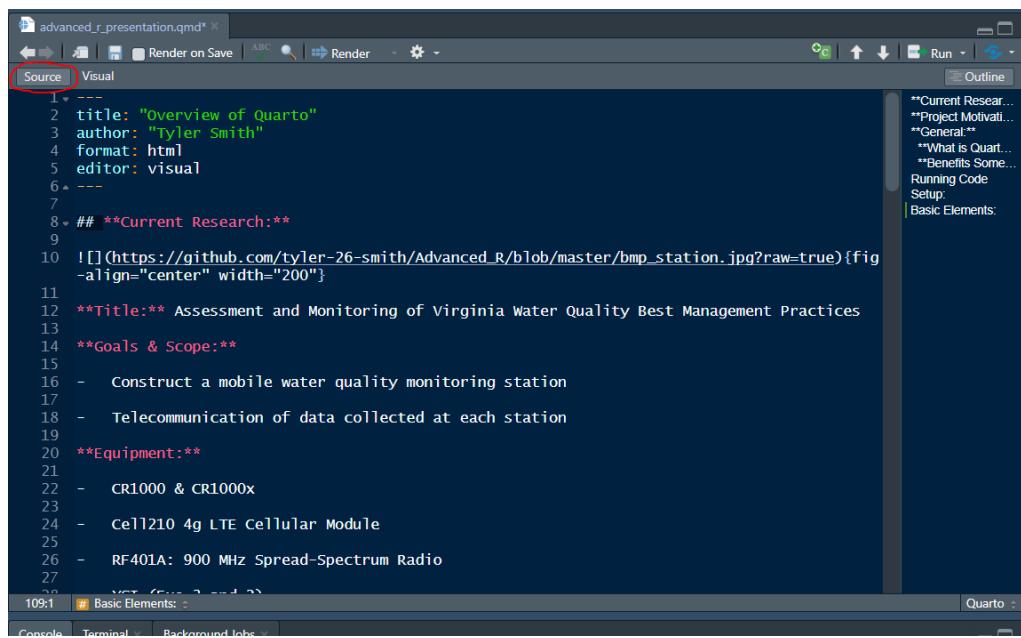
1. New File

1. Quarto Document / Presentation

Note: Quarto files use a .qmd file type similar to a mark down .rmd

Basic Elements:

1. Source Document



The screenshot shows the RStudio interface with a Quarto source document titled "advanced_r_presentation.qmd". The "Source" tab is selected, indicated by a red circle. The code in the editor is as follows:

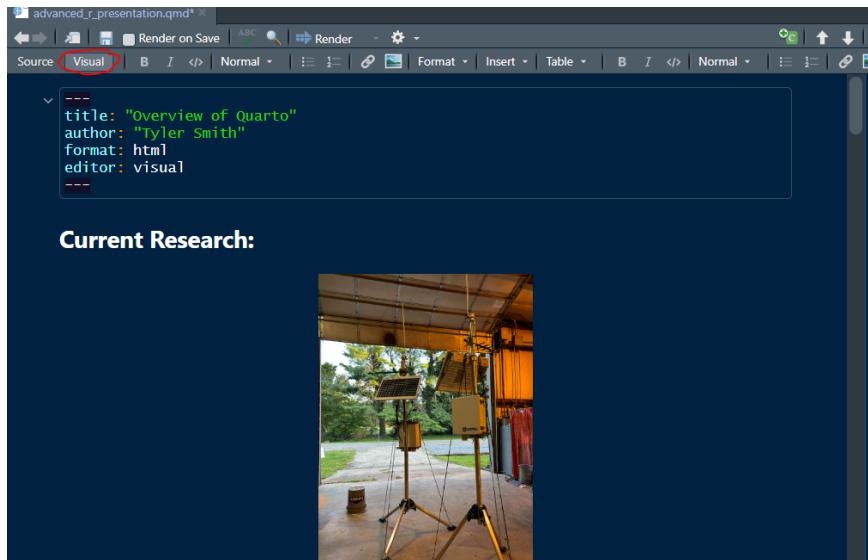
```
1 * ---  
2 title: "Overview of Quarto"  
3 author: "Tyler Smith"  
4 format: html  
5 editor: visual  
6 * ---  
7  
8 ## **Current Research:**  
9  
10 {fig  
-align="center" width="200"}  
11  
12 **Title:** Assessment and Monitoring of Virginia Water Quality Best Management Practices  
13  
14 **Goals & Scope:**  
15  
16 - Construct a mobile water quality monitoring station  
17  
18 - Telecommunication of data collected at each station  
19  
20 **Equipment:**  
21  
22 - CR1000 & CR1000x  
23  
24 - Cell1210 4g LTE Cellular Module  
25  
26 - RF401A: 900 MHz Spread-Spectrum Radio  
27  
28  
109:1 # Basic Elements: 1
```

The right sidebar shows a tree view of the document structure, including sections like "Current Research", "Project Motivation", "General", "What is Quarto?", "Benefits Some...", "Running Code", "Setup", and "Basic Elements".

- The source document is where you develop and run code. Code can then be populated into the visual document.

- Contains markdown and code cells similar to a markdown document
- Markdown code utilizes a latex format

2. Visual Document



The screenshot shows a Quarto Visual document titled "advanced_r_presentation.qmd". The top bar includes standard file operations like "Render on Save" and "Render". Below the bar, there's a toolbar with buttons for Source, Visual, Bold, Italic, and Normal. The main area is split into two panes: "Source" on the left and "Visual" on the right. The Source pane contains the following YAML front matter:

```
---
title: "Overview of Quarto"
author: "Tyler Smith"
format: html
editor: visual
---
```

The Visual pane displays the text "Current Research:" followed by an image of a scientific equipment setup, likely a weather station, mounted on a tripod and connected to a data logger.

- The visual document acts similar to a Google doc. Here you can edit the document as if it were any other word document software.
 - Headings / Subheadings
 - Text font, bold, italicizing, bullets...
 - Inserting pictures, tables, equations, links...
 - etc
- Visual document and source document are linked to one another, any changes made in one will populate in the other.

3. Render

Title: Assessment and Monitoring of Virginia Water Quality Best Management Practices

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Basic Elements:

```
R 4.3.1 ~ /blogdown/blogdown/ 
> #| include: false
>
> library(tidyverse)
-- Attaching core tidyverse packages --
✓ dplyr    1.1.2   ✓ readr    2.1.4
✓ forcats  1.0.0   ✓ stringr  1.5.0
✓ ggplot2  3.4.2   ✓ tibble   3.2.1
✓ lubridate 1.9.2   ✓ tidyverse 1.3.0
✓ purrr   1.0.1   — Conflicts —
sQ —
```

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- Render populates the content of the Source and Visual documents into a single output document

4. Output Format

```
---
title: "Overview of Quarto"
author: "Tyler Smith"
format:
  html: default
  pdf: default
editor: visual
---
```

- At the top of the source or visual document there is a “format:” option here is where you specify the output of the final document.
- The output can be specified to a single format or multiple formats
- Output can be set to “Preview in viewer” in the settings (by render) to prevent documents external to R-Studio from being opened

5. Adding Elements (via source or visual)

- Elements include:
 - Headings
 - List
 - Tables
 - Images

- Equations
- Citations
- Links
- *Code Blocks*
- etc.

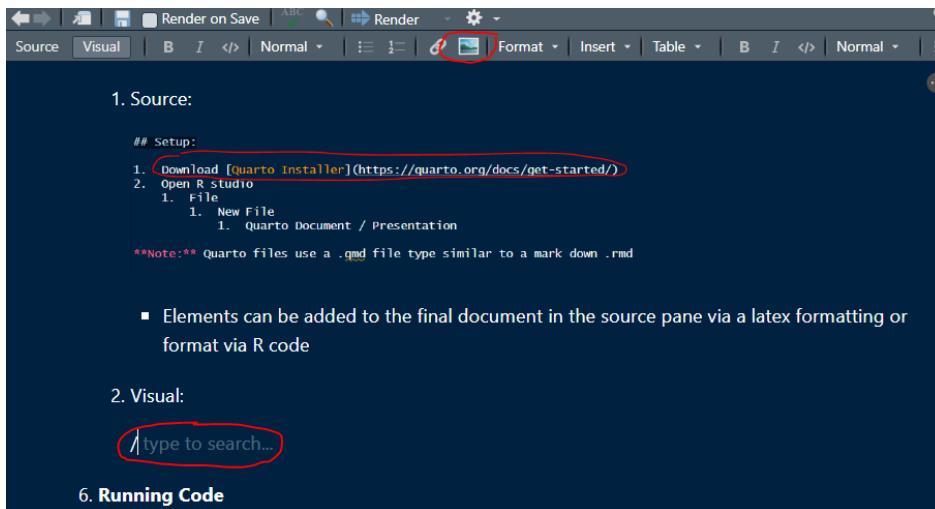
1. Source:

```
## Setup:
1. Download [Quarto Installer](https://quarto.org/docs/get-started/)
2. Open R studio
  1. File
    1. New File
      1. Quarto Document / Presentation

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```

- Elements can be added to the final document in the source pane via a latex formatting or format via R code

2. Visual:



- Elements can be added in the visual document either with keyboard shortcuts, clicking on widgets, or typing "/" followed by the respective element

6. Running Code

1. Insert R code block into visual document
2. add code
3. click "render" to output code to document:

First Code Example:

```
1 + 1
```

[1] 2

Note: Within the R code block you can add functionality ("executions") to the output with commands such as "#| echo: false", which will print only the output of the codeblock and prevent the raw source code from being printed. [Click here](#) for more examples of functions to edit output format.

Second Code Example:

```
[1] 4
```

Below is an attempt at adding code from another project:

```
#install.packages("RCurl")
library(RCurl)
```

```
Warning: package 'RCurl' was built under R version 4.3.2
```

```
url <- getURL("https://github.com/tyler-26-smith/Masters_Research/blob/main/data/fp1.1.csv")
ext1.1 <- read.csv(text = url)
```

```
test_func <- function(ext_df, xsecname, m_title){
  library(ggplot2)
  final_plot <- ggplot(data = ext_df, aes(x = Distance, y = Elevation)) +
    geom_line() +
    ylim(min_elev, max_elev) +
    geom_point(data = select_func(xsecname),
               aes(x = MEAS, y = Elev_m_pro,
                    size = tile_dry_g,
                    color = as.character(Name)), alpha = 0.5) +
    scale_color_manual(values = c("#1B9E77", "#D95F02", "#7570B3", "#E7298A", "#66A61E"),
                       name = "Tile ID") +
    scale_size(range = c(1, 11),
               limits = c(0, 650),
               breaks = c(0.001, 65, 130, 195, 260, 325, 390, 455, 520, 585, 650),
               labels = c("0", "0-65", "65-130", "130-195", "195-260", "260-325",
                         "325-390", "390-455", "455-520", "520-585", "585-650"),
               name = "Sediment Accumulated (g)") +
    ggtitle(m_title) +
    xlab("Stationing") +
    ylab("Elevation")
  return(final_plot)
}
```

```
#test_func(ext1.1, 1.1, "Cross Section 1.1")
```

7. Publishing:

1. Set up Quarto account (or link to github)
2. Open terminal

1. "quarto publish"
3. Provider: Quarto Pub
4. Publish with account: enter credentials
5. Re-authorize account (y/n): y
6. Authorize (y/n): y
7. Site Name: ""