

App Design Summary:

App should allow connection to Micro:Bit via Bluetooth and access stored data.

Process of recording data:

- Connect to bit
- Retrieve Data
- Initiate connection process
- Wait for update in data
- Tell how many columns and what labels to use
- Not sure of data type, either floats or integers
- Possibly work with multiple Micro:Bits

Users:

- Any age
- Middle and High School teachers and students
- Students might be using the application
- No login needed

User Main Goal:

- View live data being collected from Micro:Bit

Device Type:

- Desktop

Other Notes:

- Many teachers want to do data collection
- Previous version of the app would stream in data and display it on the graph.

People are currently connecting Micro:Bit to sensors to collect data.

Overview of System:

A sensor will be connected to a Micro:bit device. The Micro:bit will then record the data and send it off to a web application via a bluetooth connection. There will be no server required, just a Micro:bit with any sensors attached, and a client device to access the data.

Stakeholders/Users:

Onion Model - as an annotated table -			
Kit	System	Containing System	Wider Environment
Application (webpage)	Bill Siever	High school teachers	App developers
HighCharts Library	High school teachers	Middle school teachers	UX specialist
Bill Sievers Micro:bit data fetch library	Middle school teachers	High school students	Bill Siever
Micro:bit Hardware	High school students	Middle school students	Dr. Pastel
	Middle school students		

Description of Stakeholders				
Name	Role	Layer(s) in OM	Type	Experience
Dr. Pastel	Professor of user interface classes	Wider Environment	Secondary	Advanced Beginners
Bill Seiver	Scientist for which the application is developed for	Wider Environment, System	Primary	Expert Performer
Tyler Budd Parker Kirwin Roger Lind Noah Reinke Josh Reynolds Michael Zitta	App Developers in the user interface class	Wider Environment	Secondary	Advanced Beginners
Yogi Koteru	UX Specialist in the user interface class	Wider Environment	Secondary	Advanced Beginners
High school teachers	The intended users of the application	Containing System, System	Primary	Novices
Middle school teachers	The intended users of the application	Containing System, System	Primary	Novices

High school students	The intended users of the application	Containing System, System	Secondary	Novices
Middle school students	The intended users of the application	Containing System, System	Secondary	Novices

Personas [need 4]:

- Persona 1 - Project Owner
 - Dr. Bill Siever
 - Doctorate in Computer Science
 - Developing Bluetooth Web API
 - Well versed in UI and Web protocols
 - Bill wants to be able to expand the standard graphing system developed by Microsoft to enable live recording of Bluetooth data over multiple Micro:bits and see the live results of a Micro:bit data recording, as well as export CSVs of selected Micro:bits. He intends to use the Micro:bit to its full potential, enabling multiple different third-party modules to record different sets of data.
- Persona 2 - High School Teacher
 - Mrs. Jane Smith
 - Has 10+ experience working with high school students
 - Teaches chemistry and AP chemistry
 - Not very “tech-savvy”
 - Jane wants to be able to use Micro:bits to record pH levels over time in her experiments for class demonstrations. She intends to show her students how to use the UI, and how to hook up multiple Micro:bits to the computer, and record the data over time. She want’s to export any/all data to a spreadsheet for grading purposes.
- Persona 3 - High School Student
 - John Johnson
 - Sophomore in high school
 - ~3.2 GPA
 - Excels in subjects like social studies and english
 - Has difficulty with science and math from time-to-time
 - John is assigned to work on a physics project for school. He needs to record the acceleration of a model car he built at a specific distance. The Micro:bit he is given will be attached to the car. He is to record the data, take notes about the live results, and export the data to a spreadsheet for further calculations/analysis. He only goes to the very popular websites (Youtube, Google, Facebook, etc.) and doesn’t have much experience with any complicated protocols like bluetooth.

- Persona 4 - Middle School Teacher
 - Mrs. Mary Smith
 - Has 2 years of experience teaching middle school science
 - Has experience with general engineering
 - Mary is teaching her 7th grade students what temperatures water changes its state (solid, liquid, gas). Her students won't be using the app, but she will. She will hand out 10 Micro:bits to her students who will work in groups for their experiments. Mary needs to connect all 10 Micro:bits to her computer, and analyze all the live data coming through.

Notes from Scientist Meetings:

- Would you want the live data to continuously populate the graph or would a refresh/update button suffice?
(up to us. Pause button, Play button to add everything new)
- Would the data be collected indefinitely or would it only be collected within a specified amount of time (Start/Stop button)
(Auto start when mirco:bit is selected)
- Do you care what framework we use?
(whatever works well)
- What meeting schedule would the customer want? Weekly, biweekly, etc
(unsure, weekly meetings most likely not necessary. Most likely biweekly)
- What format is the data coming in as (arrays, files, individual pairs, etc)
(2 different ways to access data, raw csv file, publish/subscribe model, event based. CSV updates on demand)
- If there are multiple micro:bit should the download button create a csv for each one or combine it all into one file?
(probably would be easier to do separate files, select different micro:bits and then download for selected one)

Nominal use scenarios/cases:

Generic Usecase:

A user of the app will connect (x) amount of Micro:bits to their computers through the UI. Once all the Micro:bits are connected, the user can start recording data on each device. The user will be able to see the data on a graph in the UI. The user will be able to pause/resume/stop the recording, and export the data to a CSV file.

Usecase for Persona 2:

Mrs. Jane Smith prepares for her experiment by launching the Micro:bit visualizer web application. She walks her students through connecting the Micro:bits to the web bluetooth. Mrs.

Jane Smith, on the UI, clicks on the connect Micro:bit button. She then proceeds through the described connection steps. When done connecting the Micro:bits Mrs. Jane Smith shows her students how to zoom and pan on the graph. She also shows them how to play/pause/stop the live streamed data.

Mrs. Jane Smith then resumes normal teacher duties while her students connect up the Micro:bits for live streaming of pH data. Mrs. Jane Smith is able to see the data in real time on the graph. Once her class experiments conclude, she ends the streaming and downloads the csv data for grading.

Usecase for Persona 3:

John Johnson launches the Micro:bit visualization web application. He connects the Micro:bit to the app via the web bluetooth by following the connection steps. Once connected he straps the Micro:bit to his model car and starts streaming the data to the web application. When he sees the graph begin to populate with value points he pushes his model car to grab data based on acceleration for his physics project. When the car comes to a stop, he stops the data stream and downloads the csv to later do further calculations on his data.

Error use case:

Error Usecase for Persona 4:

Mrs. Mary Smith launches the Micro:bit visualization web application intending to connect several Micro:bits. Mrs. Mary Smith begins to connect to the Micro:bits. After following the connection steps she starts the bluetooth connection on Micro:bit 001 but selects the connection to be established to Micro:bit 003. After a failed connection, the Micro:bit visualization web application tells her that she may have made an error in the Micro:bit selection stage and to go back and confirm that she's connecting to the correct Micro:bit. Mrs. Mary Smith learns of the mistake she made and realized she wasn't establishing a connection with the correct Micro:bit. She fixes her mistake and is able to proceed through the connections error free. Mrs. Mary Smith is now able to proceed with her water temperature experiment knowing all her Micro:bits are connected properly.

Simplified Hierarchical Task Analysis:

Upper level views:

- Connect a Micro:bit view

 - * Micro:bit selection

- Download Micro:bit data view

 - * Micro:bit selection

 - * Download Micro:bit data

- Graph view

 - * Select Micro:bit data stream

 - * Pause Micro:bit data stream

 - * Resume Micro:bit data stream

 - * Navigate on graph

 - * Select graph type

Lower level views:

Micro:bit selection

Select

* Choose Micro:bit

Connect

* Start bluetooth

Remove

* End bluetooth

* Delete

Download Micro:bit data

Select

* Choose Micro:bit

Download

Select Micro:bit data stream

Select

* Choose Micro:bit

Toggle

* Turn on (visual) multiple Micro:bit simultaneously

* Turn off (visual) multiple Micro:bit simultaneously

Pause Micro:bit data stream

Pause

* Turn off (visual) Micro:bit data stream

Resume Micro:bit data stream

Resume

* Turn on (visual) Micro:bit data stream

Navigate on graph

Move

* Mouse controls

Zoom

* Mouse wheel controls

Select graph type

Line graph

Database Schema:

There is no need for a database in this application. We may, however, consider using a javascript data store to hold some essential information. The key, value pairs that we may put into the data store are keys that associate our Micro:bit name with the csv file. An example key, value pair would be: [microbit_001, 001.csv], where microbit_001 is associated with the 001.csv file that is available for download.