## Plantalytics Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
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<tbody>
<tr>
<td>Katy Brimm</td>
<td>Team Lead</td>
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<tr>
<td>Steven Ngo</td>
<td>Hardware Code Captain</td>
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<tr>
<td>Matt Fraser</td>
<td>Back End Code Captain</td>
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<tr>
<td>Michael Limb</td>
<td>Iteration Planner</td>
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<tr>
<td>Eric Turley</td>
<td>Release Manager</td>
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<tr>
<td>Scott Ewing</td>
<td>Verification &amp; Validation Manager</td>
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<tr>
<td>Kelly Ledford</td>
<td>Task Master</td>
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<tr>
<td>Sapphire Becker</td>
<td>Front End Code Captain</td>
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Sponsor Team

Troy Brown (CTO)
Ben Nahir (CEO)
Doug Beyers (CMO)
Brad Scardino (COO)
What They Wanted

● Goal:
  ○ “Real time, high density environmental monitoring in vineyards.”

● Proposed tech:
  ○ Sensors to collect data on temperature, humidity, and leaf wetness
  ○ Time series database
  ○ Web application with data analysis
  ○ Incorporates Google Maps’ API

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Where We Ended Up

- **Back-End**
  - Cassandra Cluster
  - Python Backend
  - API

- **Frontend**
  - Wordpres
  - App pages

- **End User**
  - Mobile & PC

- **Vineyard**
  - Nodes
  - Hub
From Local Vineyards to Our Databases
Farm Fresh Data

We plant our nodes just before the start of the season for premium data.
Node to Hub

Nodes receive data from multiple sensors. They can have any number of sensors; currently there are three:

- Temperature
- Humidity
- Leaf-Wetness

They construct JSON payloads over LoRaWAN, encrypt them using AES-128, and send them to the hub every 10 seconds.

Upon payload receipt via MQTT, the hub decrypts it, confirms its node ID, then stores it in a batching area.
Hub to Cloud

The hub collects the batch of the latest node data every five minutes. This is only the most recent receipt from each node during this five minute interval.

It then sends this batch to the backend API along with its issued API key.

If necessary, an API key can be reissued.
Storage - It’s Where Your Data Goes…

- Data Submission
  - Hub → Backend → Database

- Cassandra Database Cluster
  - Scalability
  - Resiliency

- Data Alerts
  - Missing Data → Email Report
Actual Model: Data Request

DASHBOARD
- Request “Real Time” Environmental Data For User’s Vineyard
- Visualize Vineyard Data

BACKEND
- Authenticate Request, Query For Location And Environmental Data.
- Format JSON response

CASSY
- Fetch User’s Environmental Data

Error
- Not Found!!
Front-end: Original Requirements

- Account Management
- Dashboard
- Map
- Additional Information
Front-end: Learning Experiences

- Mapping tools can be expensive.
- Chrome’s Developer Tools are great for testing web apps on multiple screen sizes!
Front-end: What We Use

- Maps: Leaflet - an open-source JavaScript library for mobile-friendly interactive maps
- Overlay: Leaflet.idw - A small Leaflet plugin to generate an IDW interpolated map
- jQuery-UI - a curated set of user interface interactions, effects, widgets, and themes built on top of the jQuery JavaScript Library.
Application Demo
Workflow

1. Tasks from iteration plan into “New Tasks”
2. New Tasks reviewed, details added, broken into subtasks
3. Moved to Backlog when finalized
4. Tasks picked up by team members, branched
5. When complete, create Pull Request
6. New team member reviews, tests.
7. Merged when approved

Sip it!
Testing

1. Combination of automated testing and manual testing
2. Every pull request has included acceptance criteria
3. Back-end relied on extensive unit testing
   a. 135 automated tests
   b. 95% code coverage of 2786 lines of back-end code
4. Front-end user interface relied more heavily on manual testing
5. All team members participated in testing
The Best Laid Plans: Our Original Schedule

Schedule: Day 1 - MVP
Total time: ~ 9 weeks

May 2nd - June 5th
- Documentation Creation
  - Weeks 1 - 4
- Architectural Design
  - Weeks 3 - 5
- Iteration Planning
  - Week 5

Today - MVP
- Implementation
  - Weeks 6 & 7
- Testing / V & V
  - Weeks 7 & 8
- Polishing
  - Week 9

MVP: July 1st
Of Mice and Men: Our Original Schedule

Schedule: Post MVP
Total time: ~ 8 weeks

Iteration 2: July
- Documentation & Design
  - Weeks 1 & 2
- Implementation
  - Week 3
- Testing / V & V
  - Week 4

Iteration 3: August
- Documentation & Design
  - Weeks 1 & 2
- Implementation
  - Week 3
- Testing / V & V
  - Week 4

End Date: August 29th
Often go Awry: Adjusting the Goal Line

- Original demo date: July 1st
  - Modified due to Vineyard availability

- Adjusted Hardware installation date: July 7th
- Adjusted Software demo date: July 11th
  - Again modified, this time due to hardware manufacturing
Our Actual Schedule

**Iteration 1: May 2nd - July 11th**
- 10 weeks

- Hub sends data to the database
- Database populated with pseudo data
- Dashboard page
  - Basic login
  - Logout
- Validation of login verified against data in database
- Heatmap overlay using pseudo data from our three “sensors”

**Iteration 2: July 12th - August 29th**
- 9 weeks

- Nodes gather data
- Nodes send data to the Hub
- Hub communicates with the database
- Fleshed out:
  - User login & logout
  - Update / change user password
  - Overlayed map menu
- Email notifications:
  - Aids in changing user passwords
  - Hub error notification

*All data used is generated, as a live demo has still not occurred*
Overcoming Obstacles

We experienced several delays in getting working, completed hardware.

This led to our hardware team getting behind in their development schedule, while everyone else was able to continue working with our generated data.

We received our final hardware (still not 100% functional) just a few weeks ago.

In spite of these problems, we were able to put more people on the job, and complete our planned development.

GO TEAM!
Onwards and Upwards

Demo dates: tentative for some point in the future.
The demo will be independent of our (completed!) Capstone project.
Now the sponsors have the control!
Questions?