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Sponsor: LtCol Thomas Kline - U.S. Marine Corps Forces Pacific

## Objectives

Create a homegrown logistics simulation based on executable, sustainable, and real-world constraints. Be able to simulate concepts such as running out of fuel, water, ammunition, or medical supplies, critical cargo shipments needed to fix a downed transport aircraft, enemy engagement, medivacs, etc.

## Tasks Completed

- Port Agent:
  - **Orders dynamically** to try and keep classes of supply above reorder line.
  - **Models High-Intensity Conflict (HIC)**, Low-Intensity Conflict, and HIC_Factor. Users can say when HIC starts and how long it endures at which ports, and the HIC_Factor multiplies consumption from the standard consumption rates, which you can interpret as low-intensity conflict.
  - **Transport-Loading Priority:** Ports now prioritize Ships at seaports, Aircraft at airports, over trucks and helicopters at either. This way there is no delay in loading priority transports.
- Transport Agent:
  - **Load time** varies by user input: can differentiate between LO/LO, RO/RO, C-17, etc. Then final check does how much total volume loaded vs. how much total volume capacity of transport; and calculates the percentage of user input total load time from that ratio.
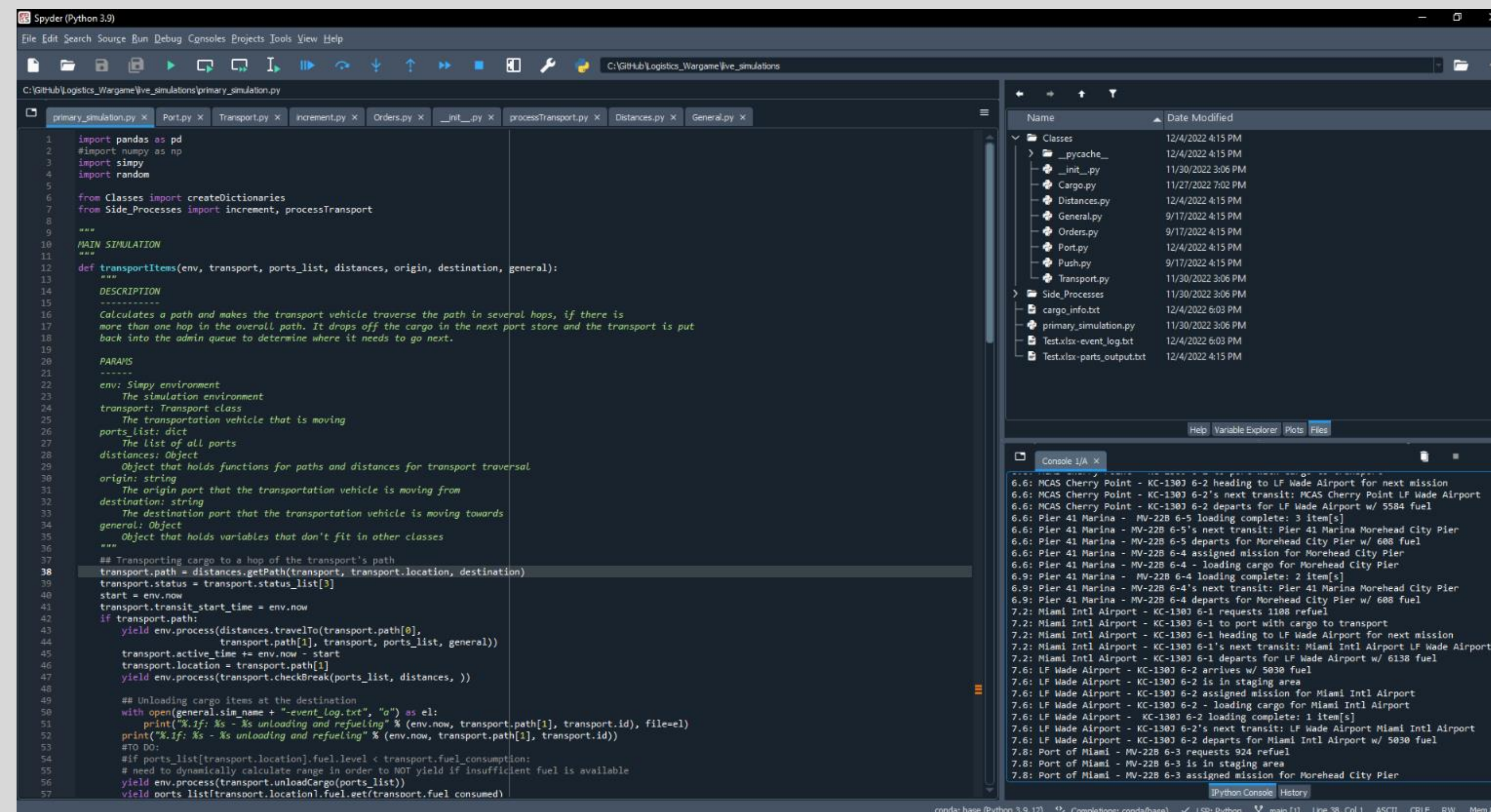
## Documentation

The following QR code leads to a YouTube video going over documentation for the Fairy Dust Fighter Project
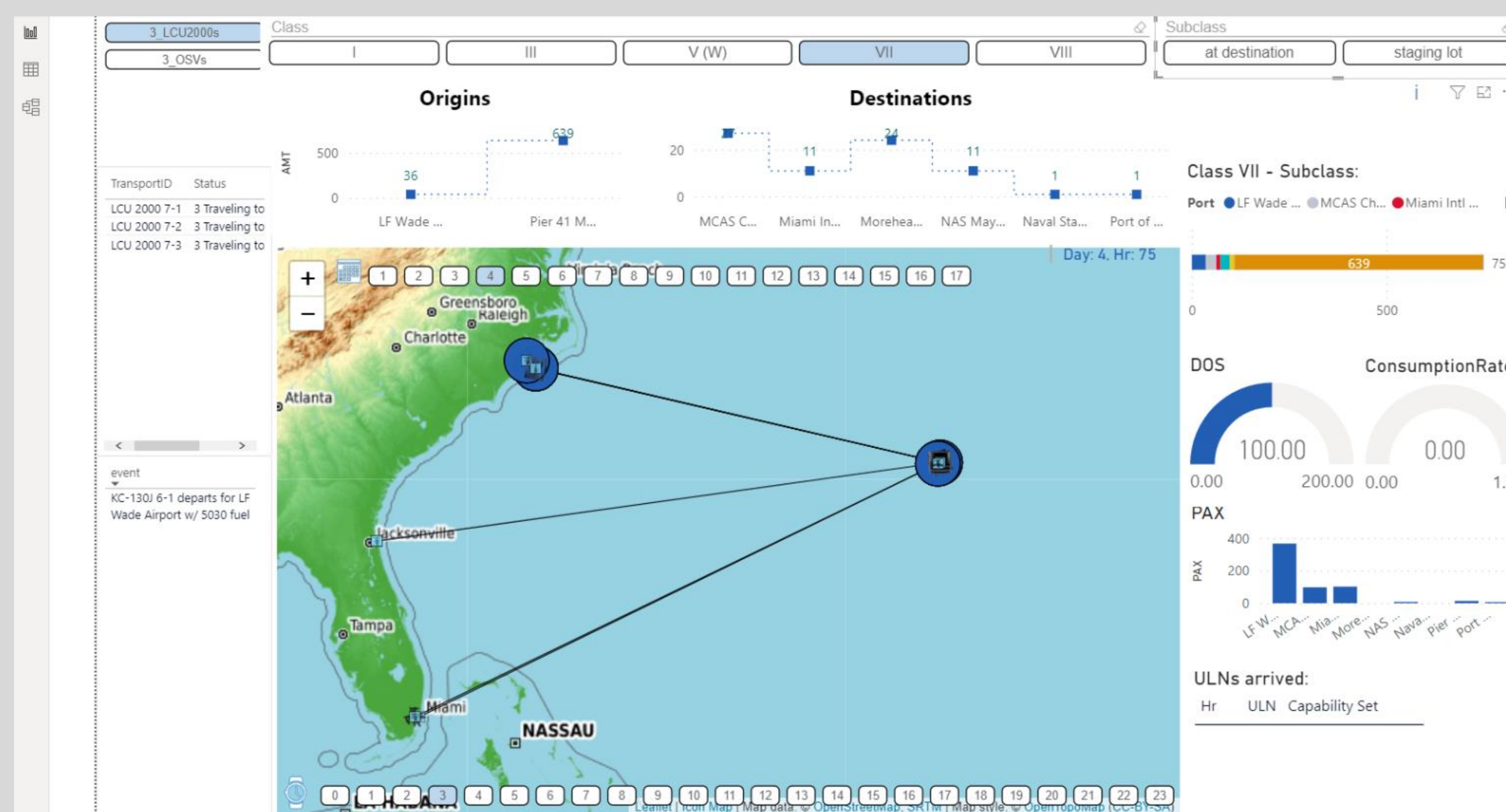
## Project Demonstration

### Python



Fairy Dust Fighter runs on MCEN, stores code in DoD's GitLab, and runs on apps in the Software Center

### PowerBI



Power BI animates Fairy Dust Fighter and allows user-created reports, charts, and graphs

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## How it Works

1. User sets up a scenario: nodes, transport, cargo, push & pull logistics options, etc
2. Simulation builds network libraries for navigation
3. Simulation instantiates nodes, transport, cargo and gives each appropriate attributes
4. Ports select, load, and service transports
5. Transport of cargo between nodes occur
6. Class of supply consumed over time; monte-carlo simulation runs
7. Output is given to Power BI for animation and analysis

## Next Steps

- Transition away from Excel input to Microsoft PowerApps
- Upgrade equipment for better computational power
- Upgrade from low-level AI to reinforcement learning
- Continue to improve optimization and logic for nodes, transport, cargo, etc
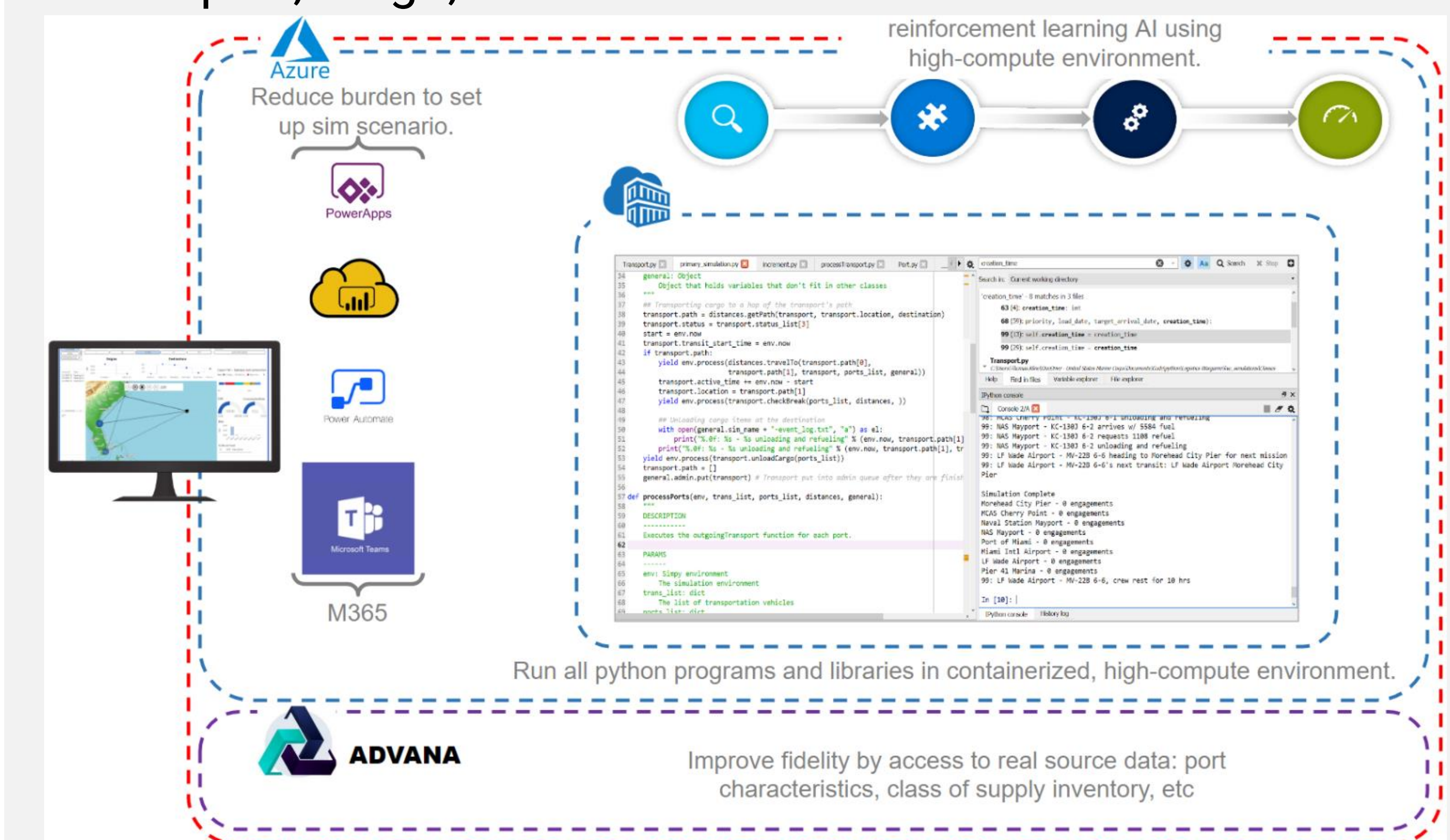


Fairy Dust Fighter needs access to real data, higher compute for improved AI-capability and improved user-experience

## Takeways

- Understanding the SimPy framework and how it is used to simulate real time events.
- Understanding how to use the GeoPy library to create/locate real life coordinates to work hand in hand with live simulations of combat and logistics.