

# Visual Analytics Project - Team Eywa

Devasthali, Kimaya; Eagapati, Indrani; Makthala, Prathik



# Agenda

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- Data Exploration
- Visualization
- Other Interesting Insights
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# Introduction

- GAStech's relocation into a new and modern premises in Abila, Kronos.
- High energy efficiency standards alongside HVAC system calibration issues.
- Strategic positioning of expensive but limited hazium sensors.
- Proximity cards are being used as part of a security upgrade.
- "Rosie" an automatic robotic mail system that has built-in prox card detecting capabilities is introduced.



# Dataset

## Dataset – VAST 2016 Challenge Dataset

- Building layout and map of the new GASTech Offices and its employee data.
- Data from Proximity Sensors and HVAC (heating,ventilation and air conditioning)sensor readings.
- Maps of the HVAC sensor zones proximity sensor zones.
- Hazium readings from four sensors.
- Proximity sensor readings from Rosie



DATASET

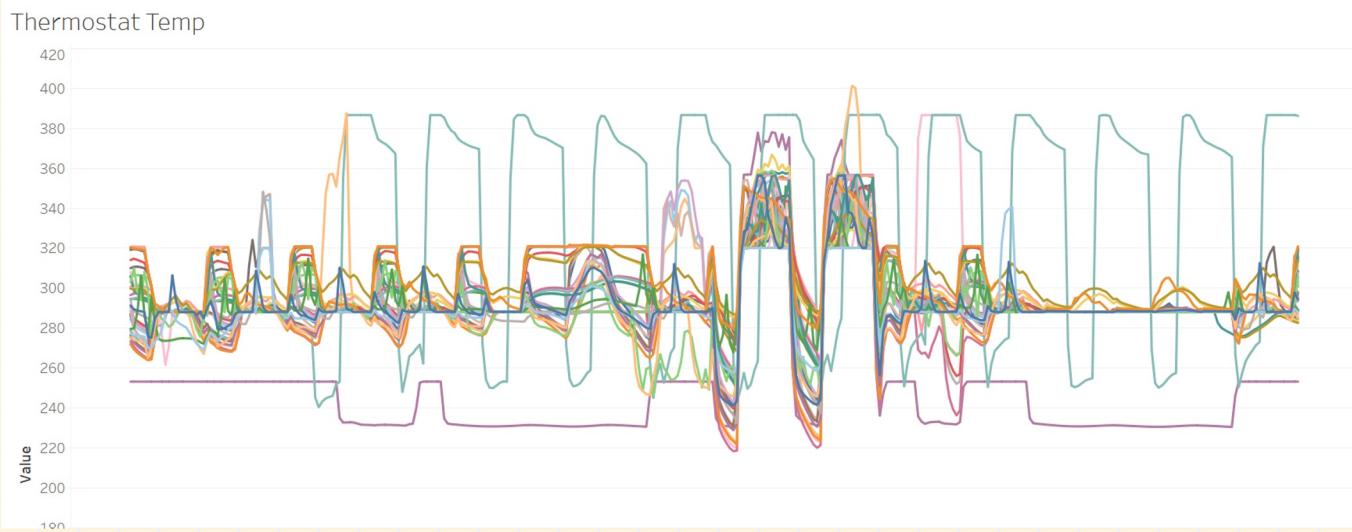
# Problem Description

- Goal: Study data to analyze potential suspicious activity.
- Study and Visualize data to gain insights on possible correlations and anomalies.
- Questions to Ponder:
  - What are the typical patterns observed in the sensors – prox cards and HVAC?
  - Have there been any unusual events?
  - Have there been any suspicious activities?
  - Any relationships observed in Building, HVAC and Employee proximity data?



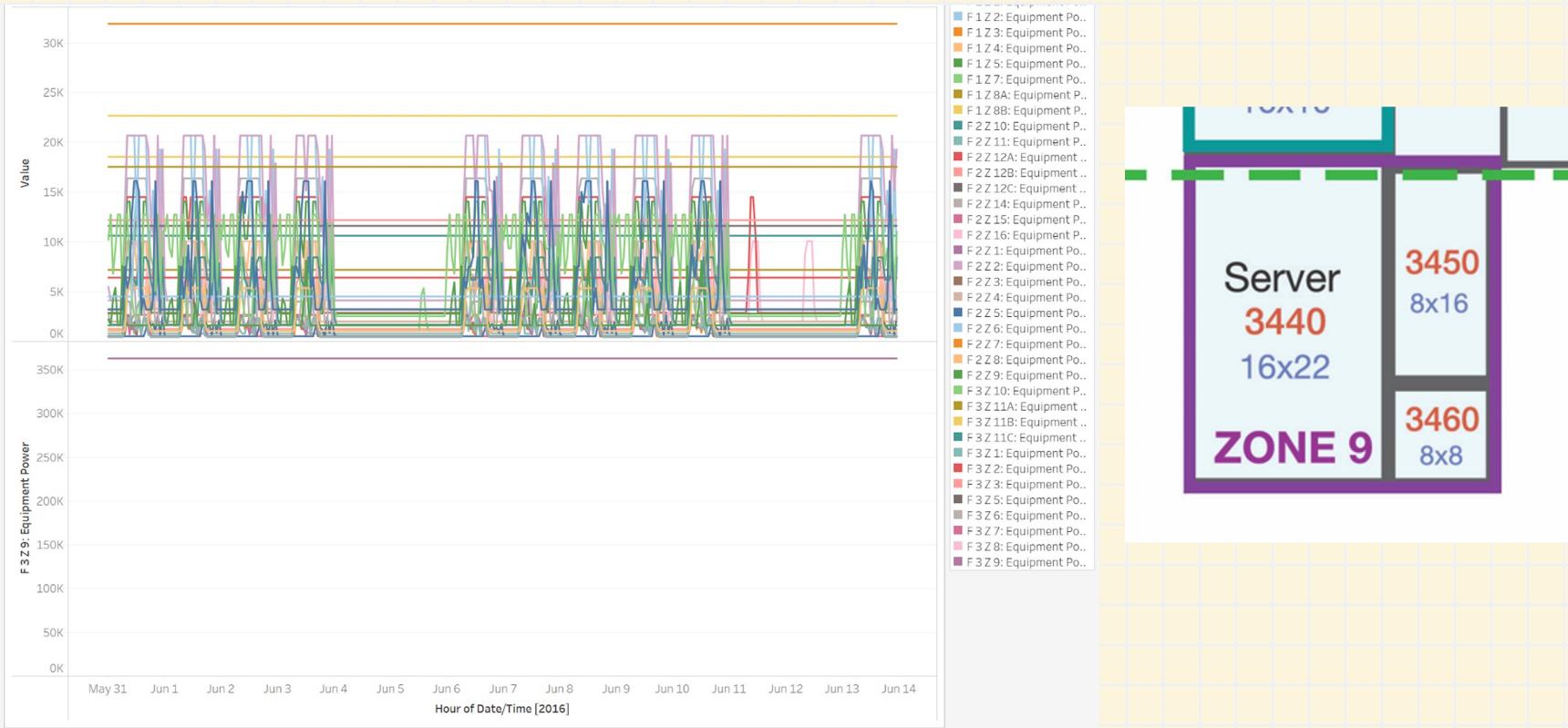
# Data Exploration

- Data includes sensor and HVAC data from the building.
- Insights like Power consumption, Heat, Gas Concentration, Air & Water flow readings etc.
- Power consumption is an important factor.
- Hazium Readings for 4 zones with Hazium sensors. Can be compared to CO2 readings.
- Other readings could also give some interesting insights.



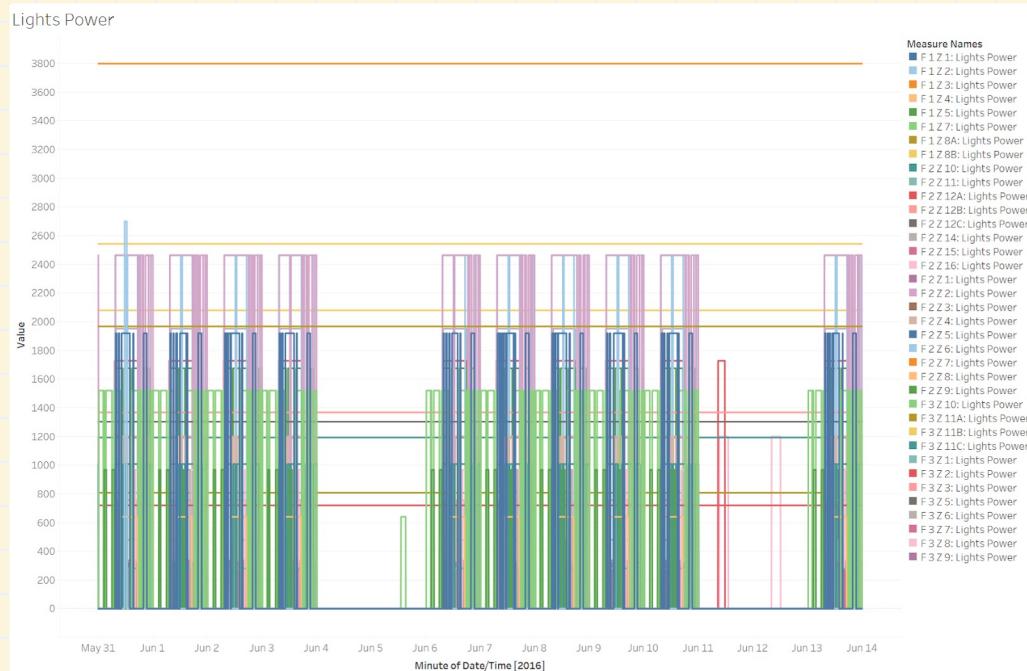
# Visualization - Equipment Power

Equipments Power Consumption by Zone – F 3 Z 9 has 10x higher consumption.



# Visualization - Light Power

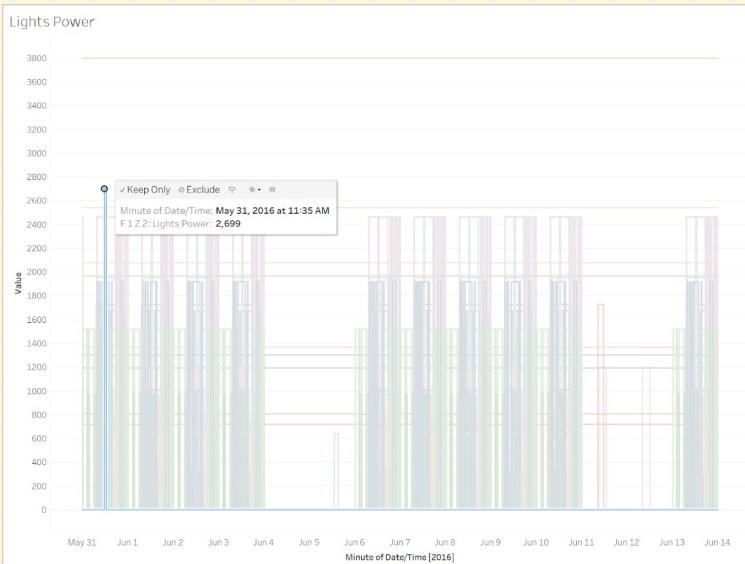
## Light Power Consumption by Zone



The trends of F1 Z1: Lights Power, F1 Z2: Lights Power, F1 Z3: Lights Power, F1 Z4: Lights Power, F1 Z5: Lights Power, F1 Z7: Lights Power, F1 Z8A: Lights Power, F1 Z8B: Lights Power, F2 Z10: Lights Power, F2 Z11: Lights Power, F2 Z12A: Lights Power, F2 Z12B: Lights Power, F2 Z12C: Lights Power, F2 Z14: Lights Power, F2 Z15: Lights Power, F2 Z16: Lights Power, F2 Z21: Lights Power, F2 Z22: Lights Power, F2 Z23: Lights Power, F2 Z24: Lights Power, F2 Z25: Lights Power, F2 Z26: Lights Power, F2 Z27: Lights Power, F2 Z28: Lights Power, F2 Z29: Lights Power, F3 Z10: Lights Power, F3 Z11A: Lights Power, F3 Z11B: Lights Power, F3 Z11C: Lights Power, F3 Z1: Lights Power, F3 Z2: Lights Power, F3 Z3: Lights Power, F3 Z5: Lights Power, F3 Z6: Lights Power, F3 Z7: Lights Power, F3 Z8: Lights Power and F3 Z7: Lights Power for Date/Time Minute. Color shows details about F1 Z1: Lights Power, F1 Z2: Lights Power, F1 Z3: Lights Power, F1 Z4: Lights Power, F1 Z5: Lights Power, F1 Z7: Lights Power, F1 Z8A: Lights Power, F1 Z8B: Lights Power, F2 Z10: Lights Power, F2 Z11: Lights Power, F2 Z12A: Lights Power, F2 Z12B: Lights Power, F2 Z12C: Lights Power, F2 Z14: Lights Power, F2 Z15: Lights Power, F2 Z16: Lights Power, F2 Z21: Lights Power, F2 Z22: Lights Power, F2 Z23: Lights Power, F2 Z24: Lights Power, F2 Z25: Lights Power, F2 Z26: Lights Power, F2 Z27: Lights Power, F2 Z28: Lights Power, F2 Z29: Lights Power, F3 Z10: Lights Power, F3 Z11A: Lights Power, F3 Z11B: Lights Power, F3 Z11C: Lights Power, F3 Z1: Lights Power, F3 Z2: Lights Power, F3 Z3: Lights Power, F3 Z5: Lights Power, F3 Z6: Lights Power, F3 Z7: Lights Power, F3 Z8: Lights Power and F3 Z9: Lights Power.

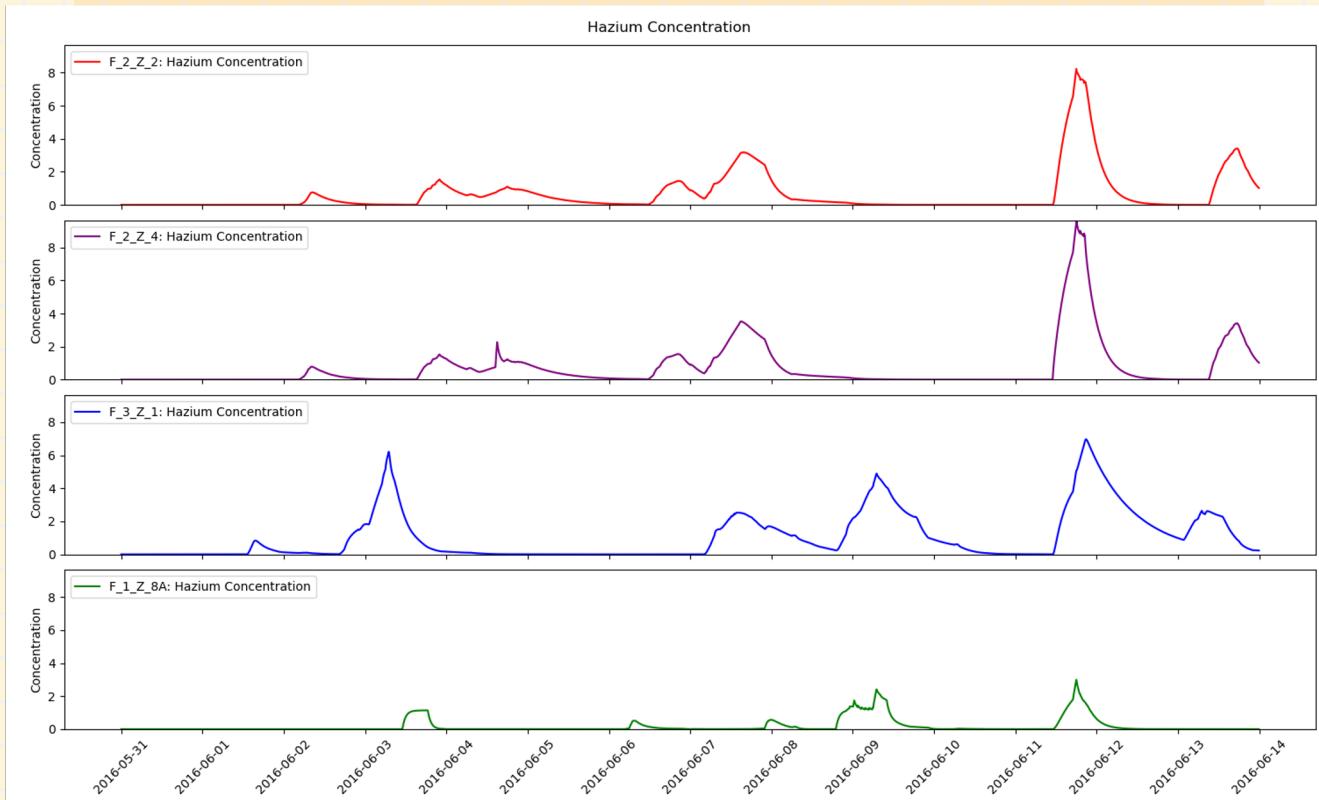
# Visualization - Light Power

## Light Power Consumption by Zone



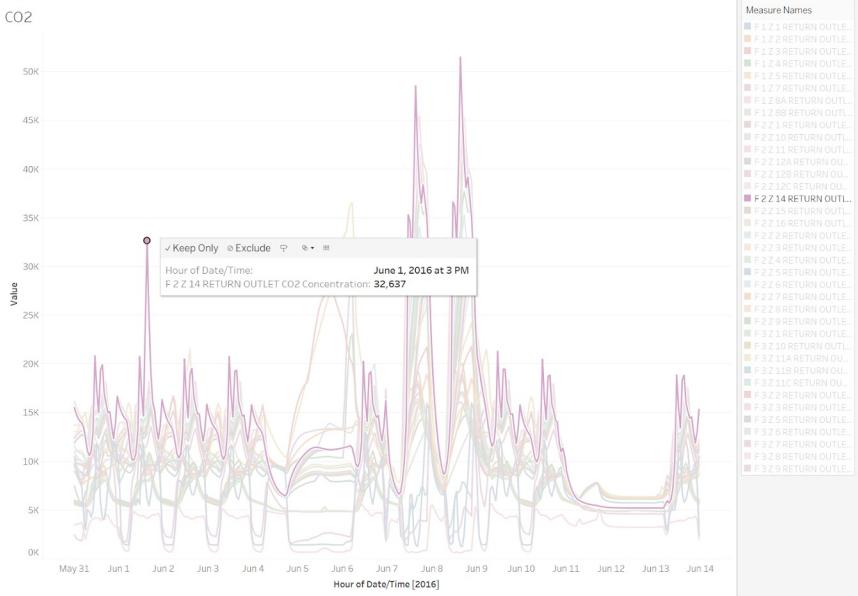
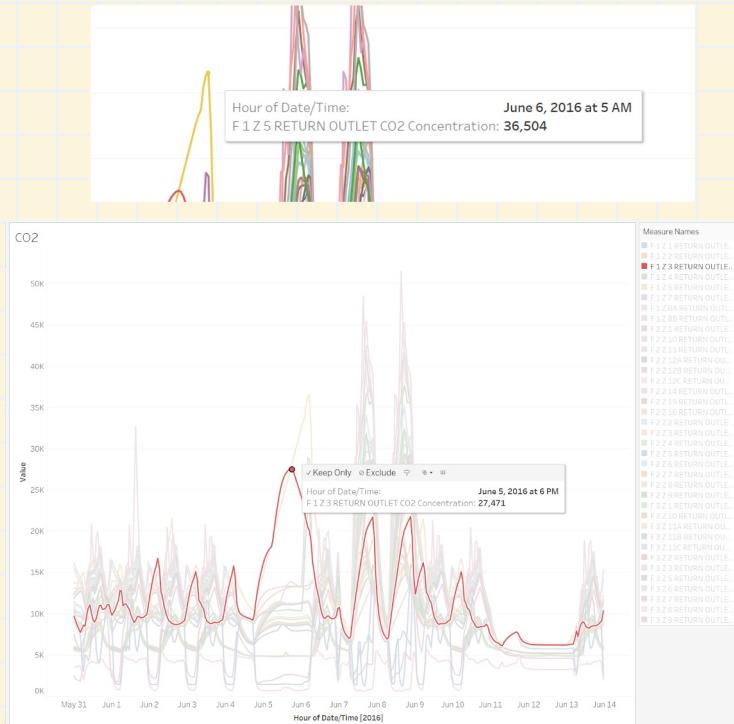
# Visualization - Hazium Data

Hazium Data - Data Spikes on 3rd, 7th, 8th and 12th June



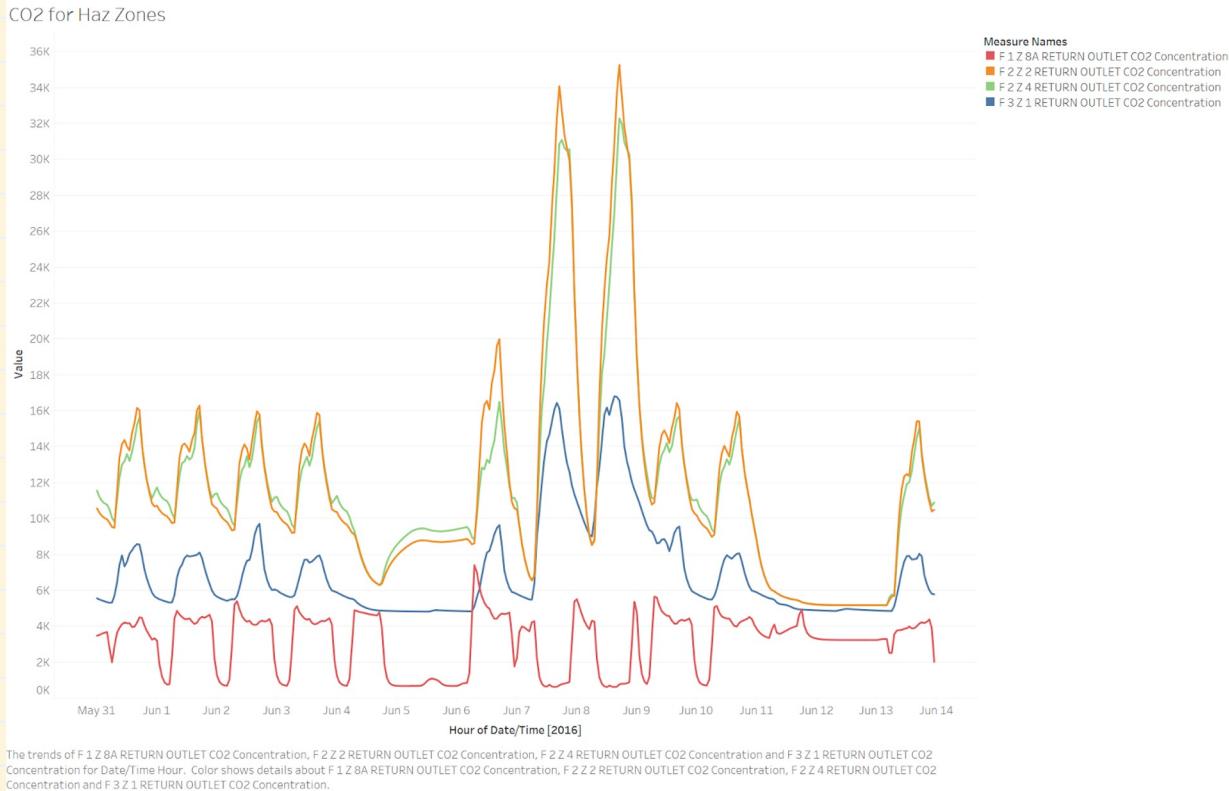
# Visualization - CO2

CO2 Readings by Zone - Depicting unusual spikes.



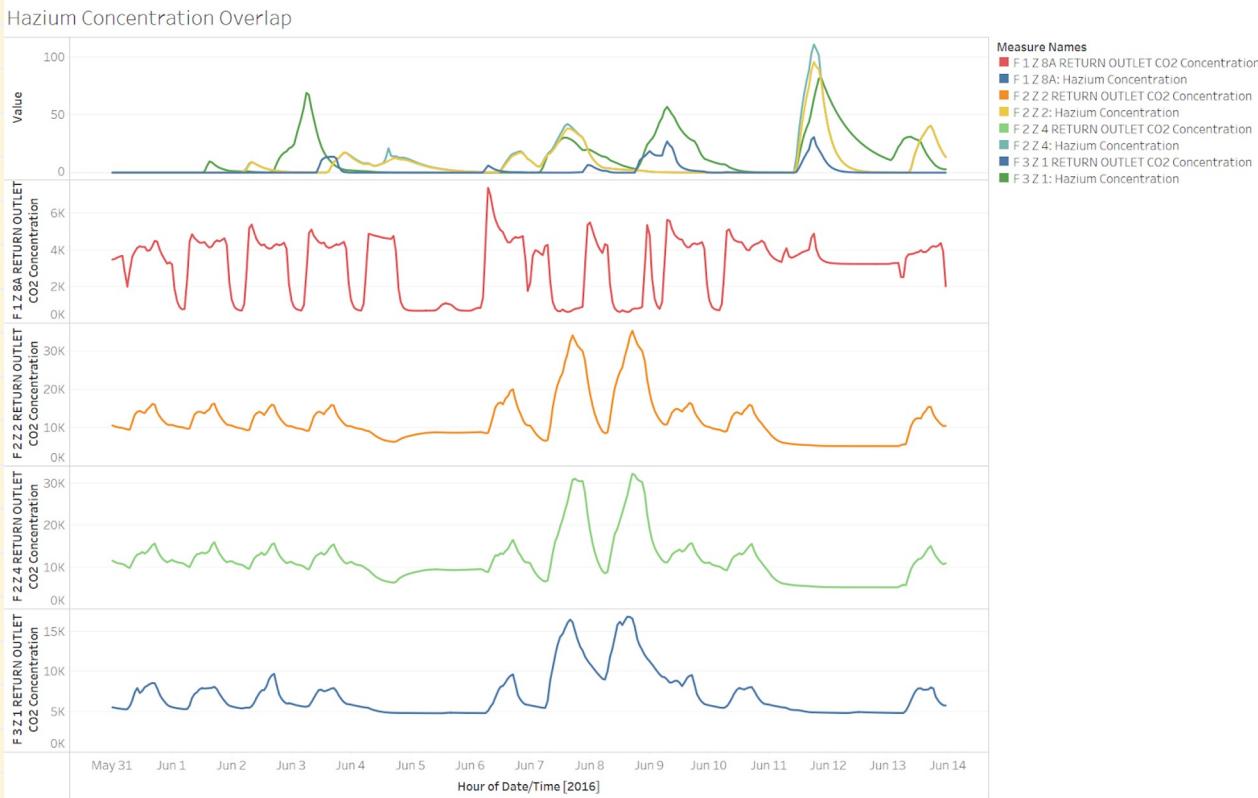
# Visualization - CO2

CO2 Readings for Hazium Zones – Similar spikes.



# Visualization - Hazium Data

## Hazium Data - Compared to CO<sub>2</sub>



# Other Interesting Insights



Other data that shows unusual readings on the 7th and 8th June.



# Employee Pattern - Visualization

Graph showing the prox card data for each employee by date and hour.

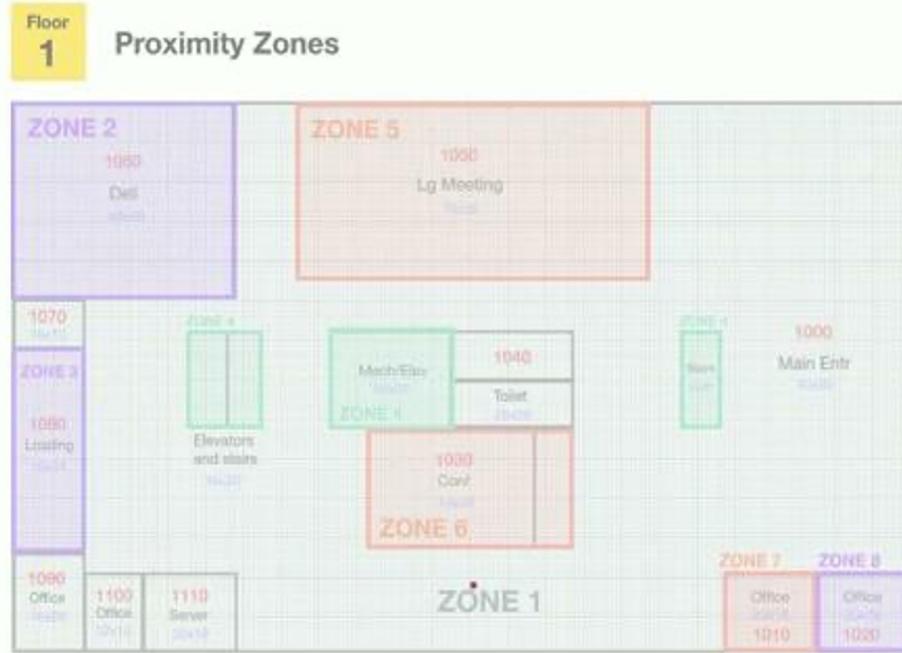


# Employee Pattern - Analysis

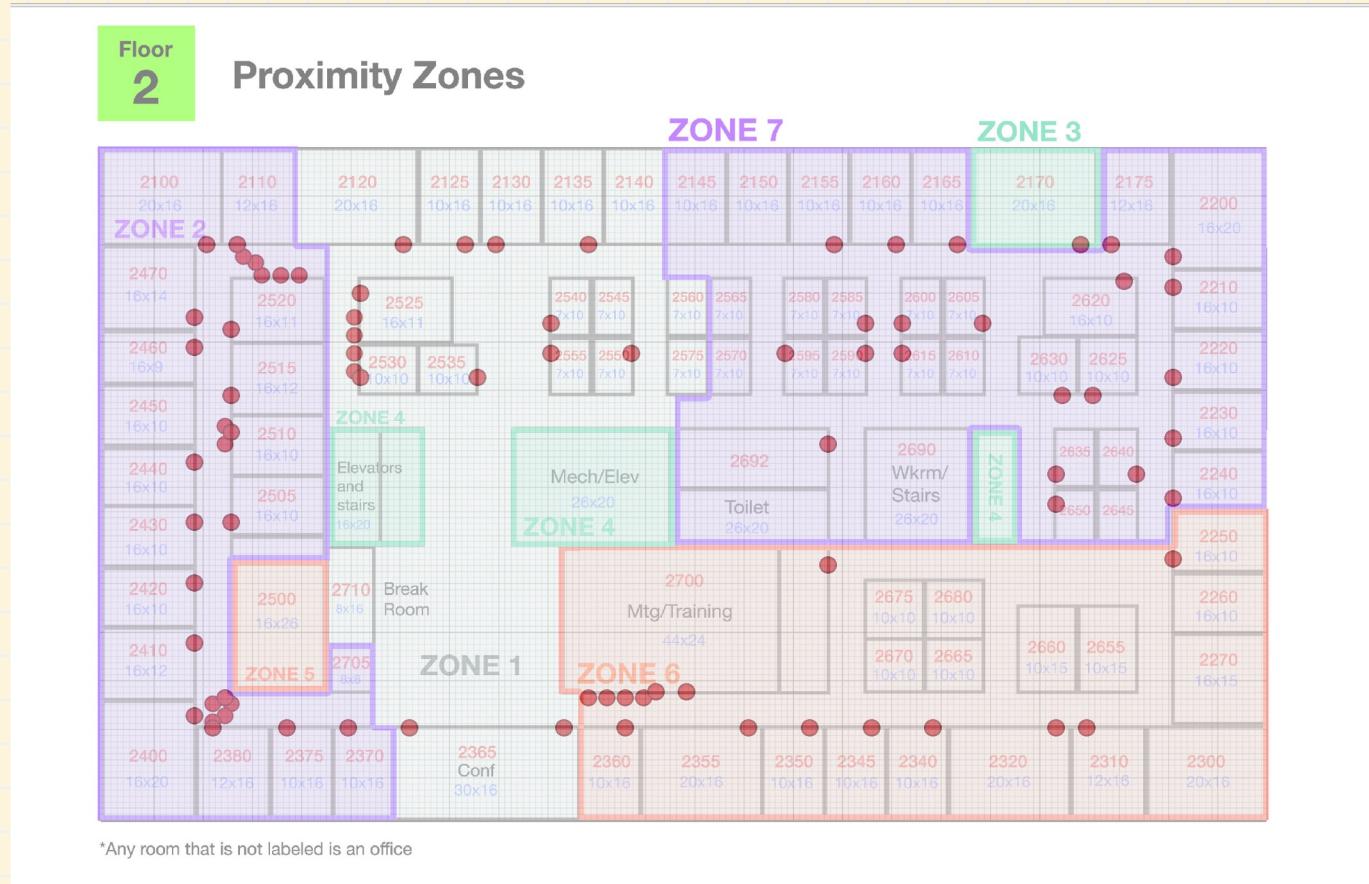
- Typically employees work from around 8 AM till 5 PM on weekdays.
- Some employees mostly from IT department work in the later shift starting at 4 PM.
- Very few employees from Facilities work throughout the night starting from midnight.

Arpa	Emile	Facilities	1070
Awelon	Varro	Facilities	1070

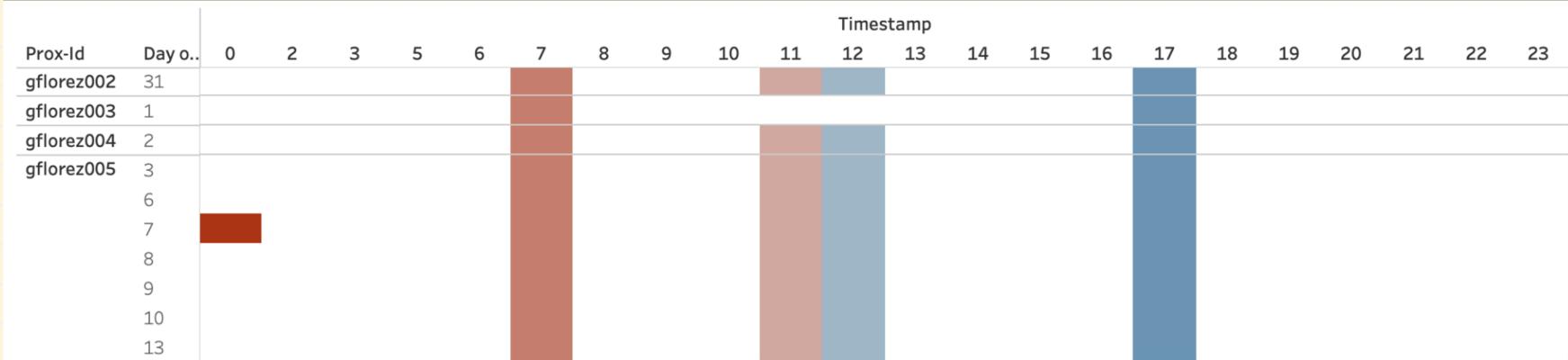
# Visualization - Varro Awelon's



# Visualization - Data from Rozie



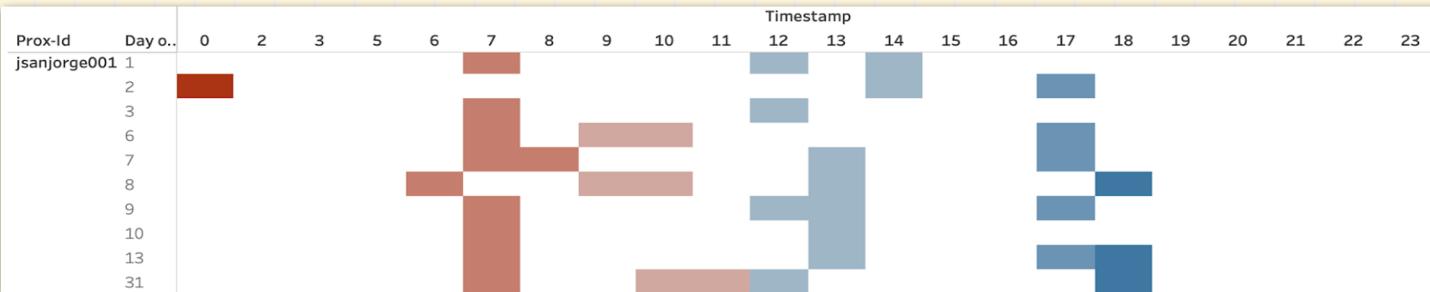
# Anomalies



Employees are issued back-up prox cards if they misplace the original. Geneviere Florez has been issued 4 backup cards which indicates their carelessness or can be an anomaly that should be looked into. There is an unusual mid-night activity on 7th june as well.

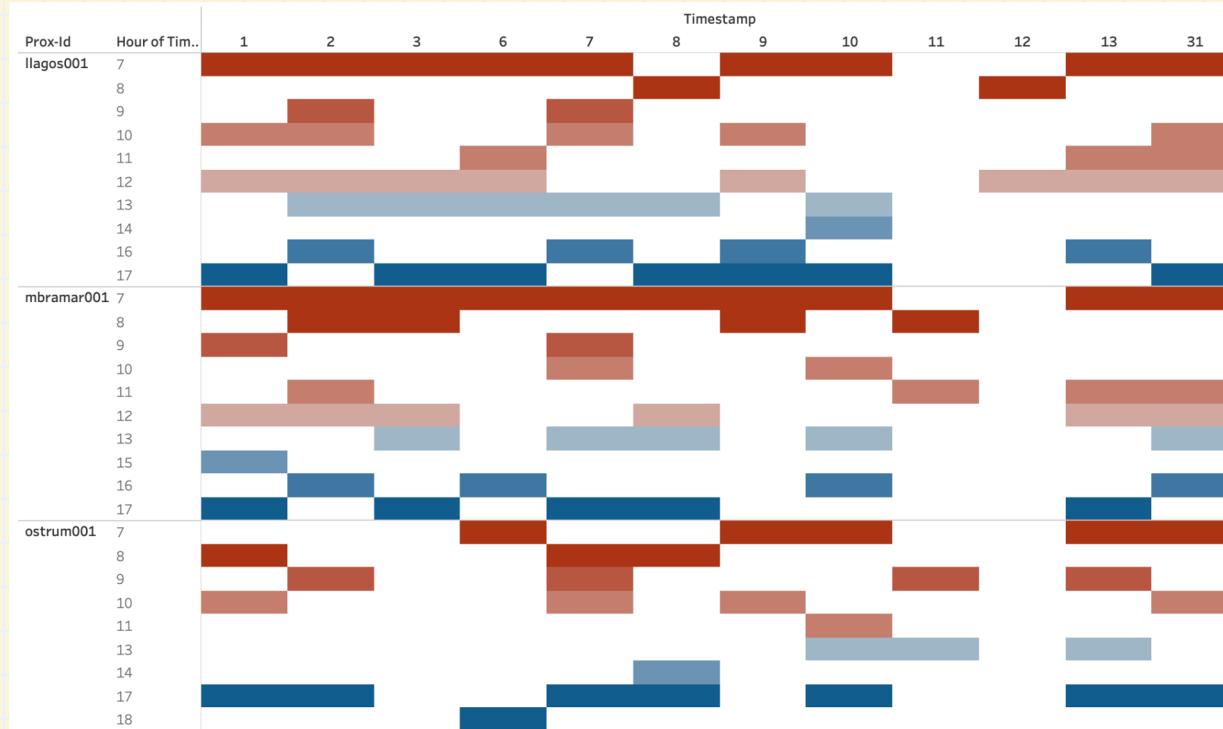
# Anomalies

Executive Sten Sanjorge Jr., on premises at the unusual time of 12:00 AM who typically works from 7 AM to 5PM.

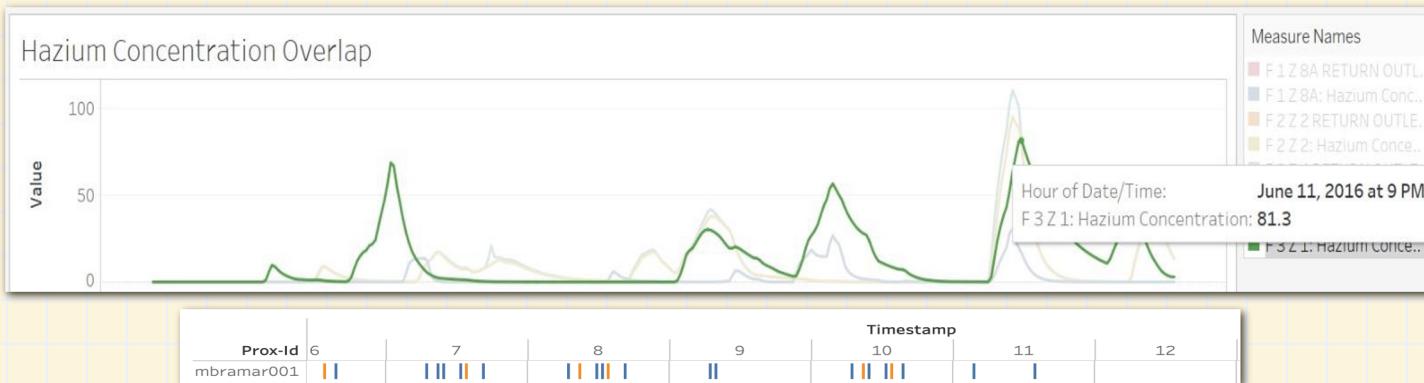


# Anomalies - Proximity Sensors

Employees Mat Bramar, Linda Lagos, and Orhan Strum have unusual weekend activity in the office.



# Observed Relationship between Prox Card Data and Hazium Data



A record high of Hazium concentration was observed on 11th June which is a Saturday after a few hours of Mat Bramar and Orhan Strum's departure from the office. A weekend activity in the office is not usual and aligned with this high concentration of hazium, this activity should be further investigated.

# Conclusion:

- Analyzing the provided data has yielded valuable insights into employee patterns and identification of anomalies within the employee patterns.
- Addressing these anomalies can lead to increased security and avoid breaches further.

# Future Scope:

- Employing clustering techniques to club the similar patterns of the employee movement together.
- The coordinates of fixed proximity sensors could help in further investigation.