CSC 83060 DATA VISUALIZATION – FINAL REPORT

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ABSTRACT. The Visual Analytics Science and Technology (VAST) Challenge is an annual contest that aims in advancing the field of visual analytics through competition. The VAST Challenge is designed to help researchers understand how their software would be used in a novel analytic task and determine if their data transformations, visualizations, and interactions would be beneficial for particular analytic tasks. VAST Challenge problems provide researchers with realistic tasks and data sets for evaluating their software, as well as an opportunity to advance the field by solving more complex problems.[1] This is our take on the first mini challenge of VAST 2014.

1. INTRODUCTION – THE KRONOS INCIDENT

The Tethys-based GAStech has been operating a natural gas production site in the island country of Kronos for twenty years. During this period of time it has produced remarkable profits and developed strong relationships with the government of Kronos. However, GAStech has not been as successful in demonstrating environmental stewardship. [2]

On January 20th, 2014, a corporate meeting is held to celebrate the new-found fortune because of the initial public offering of the company. However, a series of rare events occur that lead to the disappearance of several employees. An organization known as the Protectors of Kronos (POK) is suspected in the disappearance, but things may not be what they seem.

As analysts, we were assigned with several tasks in order to analyze the evolution of the social organization over time and highlight the important events surrounding the disappearance.

2. MINI CHALLENGE 1

Mini-Challenge 1 focuses on the disappearance itself. As analysts we are given various data on the history of Kronos and the employees of GASTech and we are being counted on to bring law enforcement up to date on the current organization of the POK and how that organization has changed over time, as well as to characterize the events surrounding the disappearance. The full dataset is described in detail in section 3.

We are asked to provide a visual representation of the structure of the Protectors of Kronos network, identify the leaders, understand the extended network of the organization, the way their structure changed over time and if there are potential connections between the POK and GASTech.

Moreover we are asked to describe the timeline of events of January 20-21, 2014. Finally, we want to identify at least two possible explanations why the GAStech employees may be missing and provide evidence to support each of these explanations.

3. The Dataset – Possible Use

The dataset can be downloaded from many places over the internet, for example at [3]. Below we list its contents and explain what we thought each element could be useful in.

Dataset

- *Map of Kronos.*
  The image doesn't provide any useful information for the investigation. Kronos is an island in the Mediterranean, and it seems to be north of Crete. The map shows the general location of two cities important in the history of this scenario, Abila and Elodis.
- *Descriptions of Kronos and Tethys.*
  The FACTBOOK files support us with some details about the two countries that we investigate. Some of these data points may be useful in forming hypotheses, others might help us answer questions that arise about the countries.
- *Chart describing the local GAStech organization.*
  This helps us visualize where everyone sits in the company structure.
- *Spreadsheet of GAStech employee records.*
  This file provides us with detailed background on all the employees.
- *Email headers from two weeks of internal GAStech company email.*
  This file contains information that we can use to create hypotheses about who might be involved in the kidnapping, through looking at the relations between people through their emails.
- *Resumes and short biographies of many, but not all, of the GAStech employees.*
  Some of these documents show where certain employees originated from in Tethys, while other employees are from Kronos.
- *Historical reports and descriptions of the countries involved.*
  We get two historical documents, the 10 year report and the 5 year report. The 10 year report is a thesis published 10 years ago describing the social

movement that ultimately became the more radical POK. The 5 year report is an updated review of the POK.

- *Relevant current and historical news reports from multiple domestic and translated foreign sources.*
  These ~900 text files contain the bulk of the information about the reporting during the kidnapping. The information ranges from 1995-2014, so it should be important in constructing the timeline.

4. Our Take

4.1. **Structure of the Protectors of Kronos.**

The POK evolved over the years from an environmental concerns organization to a terrorist group. In the beginning, Henk Brodogi and Carmine Osvaldo were the leaders and members include Yanick Cato, Loreto Katell, Ale Loreto Hanne, Jeroen Karel and Valentine Mines.

Currently, there are two leaders. The sector under Silvia Marek and Eilan Karel before (who died in jail), whose membership include Lucio Jakab, Lorenzo Di Stefano, and Jirair Rocha. Mandor Vann heads a more violent direction for POK and his folowers include Hennie Osvaldo, Inga Ferro, Ruscella Mies Haber, Loreto Bodrogi, and Cornelia Lais.

The leaders of POK are clearly summarized in the 5 and 10 years reports. Supporting evidence was extracted from the news articles that explicitly state the name of the leader along with timestamp.
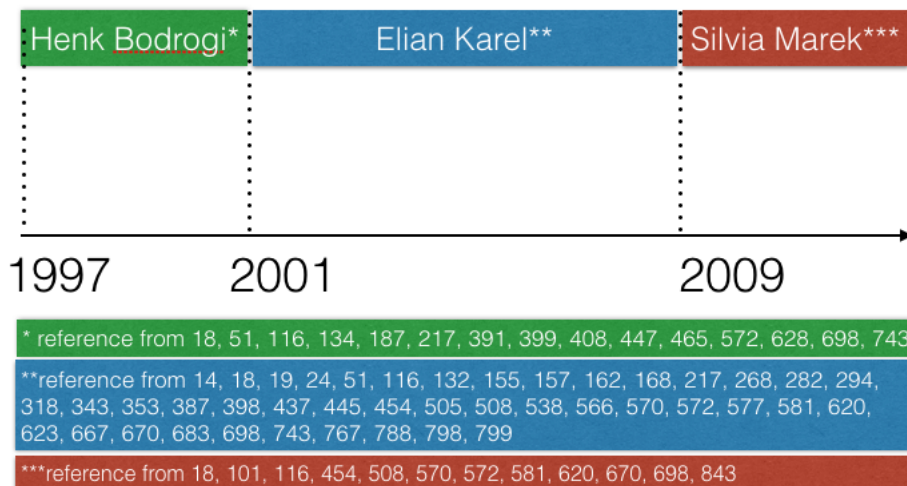

Figure 1. POK leaders timeline

Next, are wordclouds used to identify important words around the leaders of POK. In figure 2 below, we can see the most dominant words for the founder of POK, Henk Bodgrodi.

We can see among them:

- **Kronos** – where Henk was born.
- **GASTech** – the company that Henk fights.
- **Water** – the starting point of the environmental problem according to Henk.
- **Government** – Henk struggled to bring the attention of the government to the environmental problem.

FIGURE 2. Wordcloud regarding the founder of POK

The wordcloud that we see in figure 3 is for the second leader of POK, Elian Karel. We notice the strong presence of the word **police** that shows the violent turn that the organization took under his command, and the words **died** and **death** because Elian actually died while in jail.

Figure 3. Wordcloud regarding the second leader of POK

In figure 4 below, which is about the current leader, Silvia Marek, we notice that the name of Elian Karel is still strong since there were many articles related to ceremonies of his death and that she still can't fully control the organization because we can see **police** and **violence** being associated with her.

Figure 4. Wordcloud regarding the current leader of POK

4.2. **Timeline of events.**

In order to create a timeline in Tableau we employed the use of Gant bars to distinguish between events. In order to do this the difference between start and stop times, as a function of days needed to be calculated. The following calculation was performed to obtain a new variable called Duration:

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DATEDIFF('second',[Start],[Stop]))/86400
```

Once this was calculated it was added to the size of the Gant bar in order to obtain the appropriate length of each bar. Color was also added to distinguish between the types of events.
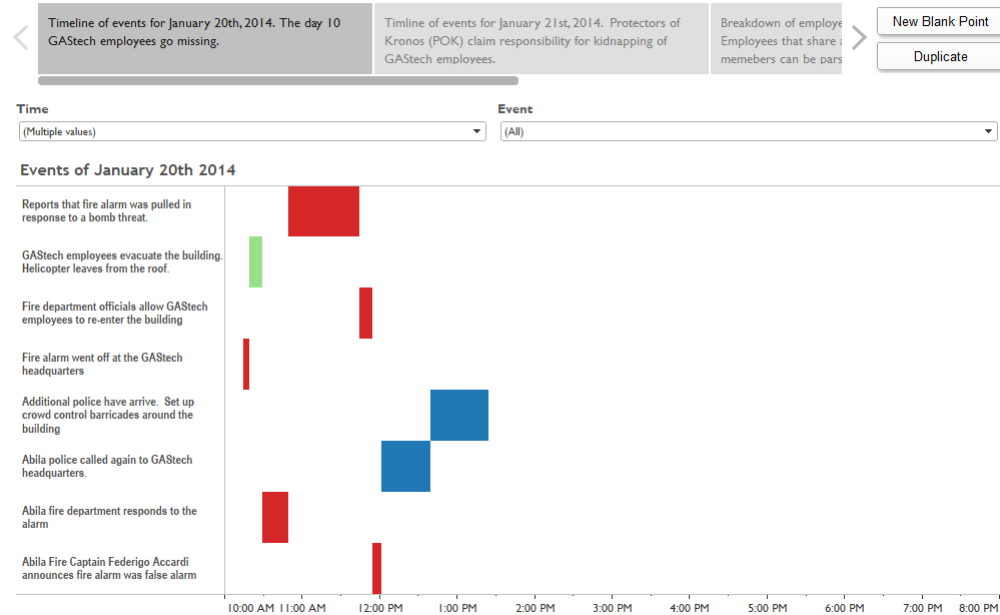
FIGURE 5. Blue indicates an event that involved the police, red was events in which the fire department was involved, green represented any event involving a GAStech employee, orange indicated government officials, and grey indicates the involvement of the POK.
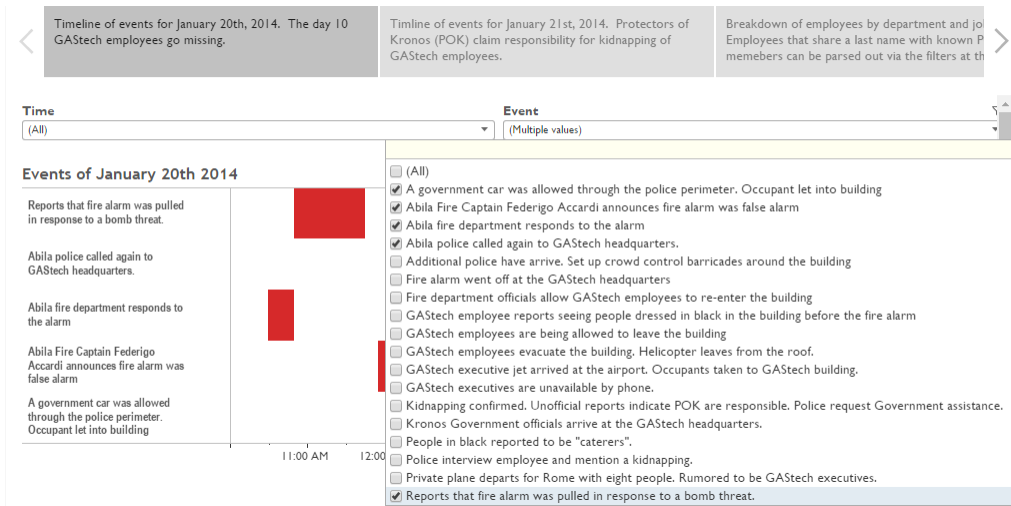
FIGURE 6. Each timeline included the use of filters to narrow down time periods or search for specific events. Users can select anywhere from one to all time periods.
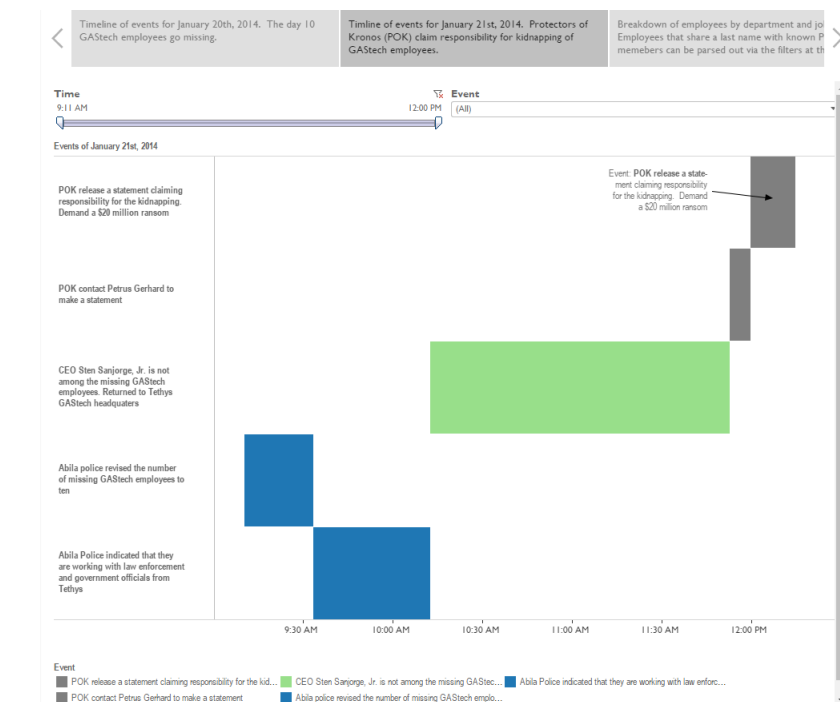

FIGURE 7. Similarly, users can select one event, a group of events, or all events that occurred.

January 20th

10:15 am | Reports that fire alarm is pulled in response to a bomb threat (Article 829)

10:20 am | GAStech employees evacuate the building. Helicoptor leaves from the roof with CEO Sanjorge (Article 763)

10:30 am | Abila fire department responds to the alarm (Article 70)

11:15 am | Sanjorge is at the reception, but other executives are missing. No information from GAStech or the police and fire department

11:55 pm | Abila Fire Captain Federigo Accardi annouces fire alarm was false (Article 78)

12:05 pm | Sanjorge leaves the reception in helicoptor and he exited the country in a private plane.

1:56 pm | GAStech-Tethys confirmed that the executives are missing (Article 522)

2:00 pm | A government car was allowed through the police perimeter. Occupant let into building (Article 289)

3:40 pm | GAStech employee reports seeing people dressed in black in the building before the alarm (Article 381)

6:10 pm | Sanjorge's plane had arrived in Tethys a few hours ago, refueled, and starts back to Kronos with 6 GAStech officials (Article 441)

7:35 pm | A news conference is held by a representative from Abila police. "Several GAStech employees appear to be missing. Anyone seeing unusual activity is asked to contact the Abila police". 14 employees are missing (Article 776)

10:00 pm | Tethys federal law enforcement and ministry of foreign affairs staff arrive at the Abila airport and are seen going into the Abila police headquarters (Article 637)

January 21st

9:11 am | Abila police revised the number of missing people to ten. Names of the missing have not been released (Article 583)

10:00 am | GAStech company news conference. The CEO, Sanjorge, is not missing and has returned to Tethys. "Our hearts go out to the families of the kidnapped. We are working for a speedy and safe resolution to this crisis."

12:45 pm | The Protectors of Kronos released a statement claiming responsibility for the kidnapping of key GAStech officials. POK demands a $20M ransom in order to obtain the release of the kidnapped individuals (Article 261)

4.3. **Trying to find the traitors within GASTech.**

To illustrate the distribution of employees within GAStech, we created a categorical tree map. Each GAStech department is illustrated by a color and within each color we can see the number and name of each employee in that Department.
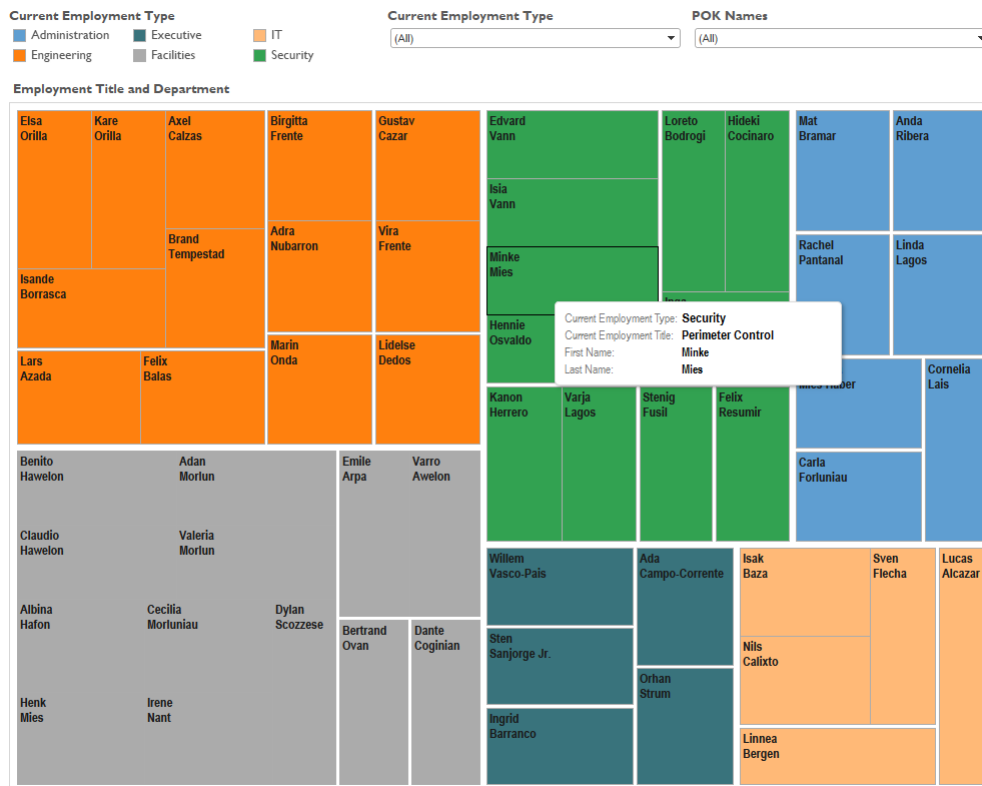

FIGURE 8. Scrolling over an employees name will also tell the user what their specific title is. Here we can see that Minke Mies work in the Security department as Perimeter Control.

A set was created to only include the employees who shared a last name with known POK members whether past or present. This set was called POK Names and was added as a filter for the treemap. Users can filter on Employment Type and/or whether an employee shares a last name with a POK member. Figure 9 illustrates the use of the POK Names filter, which only shows employment information for employees with a POK last name. This was useful in developing a preliminary theory for the kidnapping.
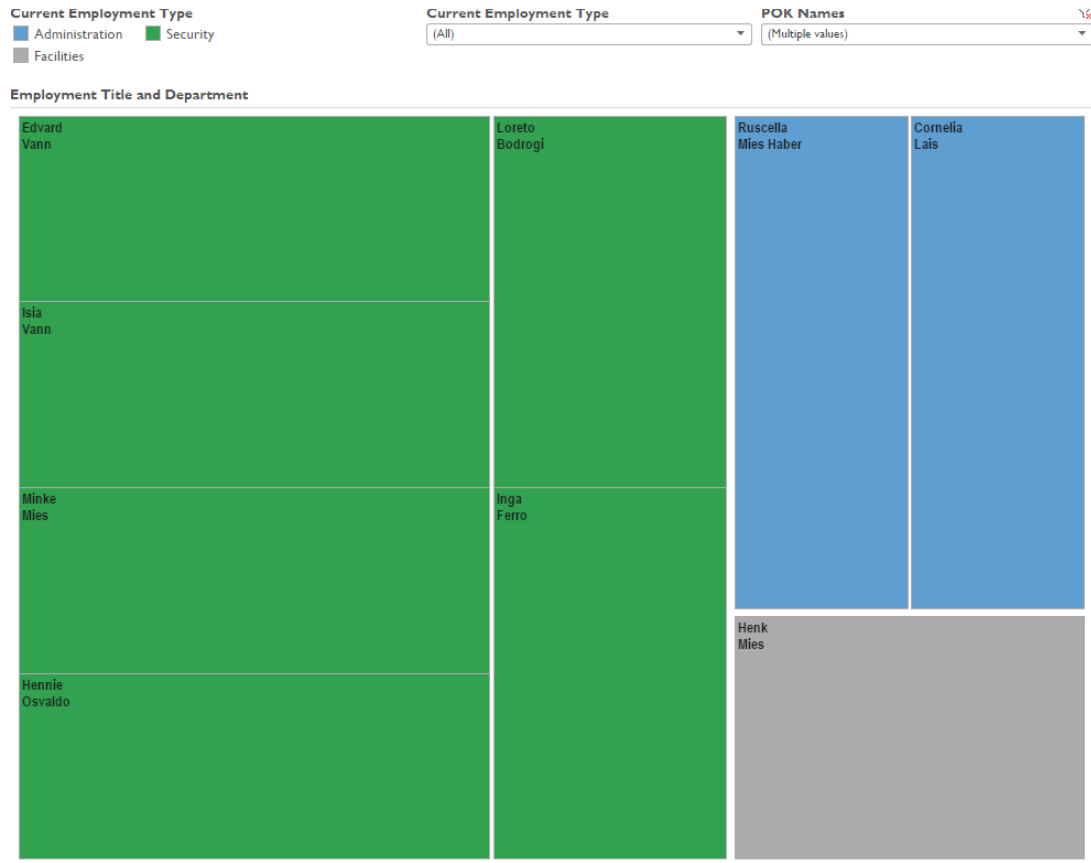
FIGURE 9. We see that these employees mainly work in the Security department, with one working in Facilities, and two working in Administration.

Lollipop charts were created to illustrate the number and subject of emails sent by possible POK members. A set was created called suspicious emails, which only contained emails with a subject that seemed related to the events of January 20th and 21st ans it can be seen in figure 10. This set along with POK names were added as a filter to the chart. Employee names were extracted from their employee emails using a combination of calculations.

`LEFT([From_@],FIND([From_@],'@')-1)` was used to find the @ symbol and keep all characters that occur before it. Then, `REPLACE([From_no@], ".", " ")` was used to replace the decimal point in the name with a space. To make the lollipop chart, two charts were created on the same dashboard, a bar chart and a point chart (see below). The axes were then combined and synchronized in order to have each chart overlap. This allowed for the visual of the bar and the point or circle to be on one visual. Filters were also added so users can select only those

emails that seemed suspicious or they could select specific email subjects. Date and each possible POK Name could also be selected. A wildcard filter was added to search for the recipients of each email. This is represented in the To search box. Typing in a name of an employee will show only those emails which were sent to that employee.
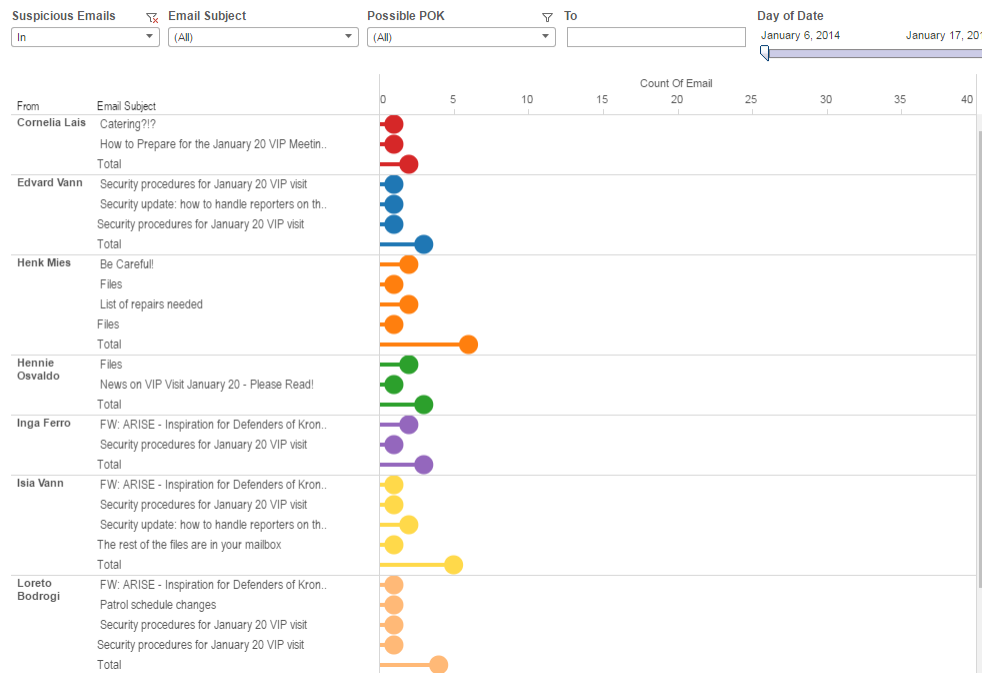

FIGURE 10. Email count from suspicious employees.

5. CONCLUSIONS

We ended up with some theories. One possibility is an obvious one and that is that GAStech executives are truly kidnapped by the POK and are being held for ransom. Maybe they are in a bad financial situation. POK members likely gained access to GAStech by gaining employment and carried out the kidnapping from the inside

Another reason of the kidnapping might be the revenge from Vann family that belong in POK towards GAStech. Jualianna Vann died because of the pollution that was caused by GASTech in 1998 and the government did not act to change the environmental policies of the company.

Two more, less plausible motives could be:

(1) Bring the attention of people to the GASTech pollution issue.

(2) There is an unknown power (the Asterian Peoples Army maybe) at play that is behind all this mess and POK is just being framed for the wrong reasons.

REFERENCES

[1] http://vacommunity.org/VAST+Challenge+2015
[2] http://www.vacommunity.org/VAST+Challenge+2014
[3] http://www.vacommunity.org/VAST+Challenge+2014%3A+Mini-Challenge+1