USE OF AI FOR NON-EMERGENCY CALL DIVERSION IN PSAPS

Abstract

This paper examines Arlington County's approach to utilizing machine learning and AI to optimize non-emergency call handling, alleviate workload burdens on telecommunicators, and enhance overall operational efficiency.

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Introduction

The Arlington County Division of Public Safety Communications and Emergency Management operates as the primary PSAP, for Arlington County Virginia, with a staff of 53 full-time employees, including administrative personnel, the center processes both emergency and non-emergency calls. Arlington has a population of approximately 240,548 residents and is home to numerous government agencies, corporate entities, and critical infrastructure including Arlington National Cemetery, Joint-base Myer-Henderson Hall, and the Pentagon.

In 2022, the center processed 264,414 administrative calls and 78,552 emergency 9-1-1 calls. Notably, 70.3% of call volume was attributed to non-emergency calls, such as fire alarm reports and private property tow inquiries. This significant proportion of non-emergency calls led to an exploration of AI-driven solutions to optimize call management and free up resources for emergency response.

Upon researching calls for service created in the Computer-Aided Dispatch (CAD) system, the following observations were made:

- The center received, processed, and entered 24,097 fire alarm-related calls. (Virginia requires homeowners and businesses to notify the Fire Marshall when their alarm is out of service)
- The center received, processed, and entered 19,318 private property or repossession tows of vehicles. This figure does not include secondary calls from citizens attempting to locate their vehicles.
- Based on call processing times, three hours of each shift was dedicated to processing these call types.

For comparison, in the same year, the PSAP entered the following emergency calls:

- 839 Cardiac arrests
- 320 Structure fires
- 1,759 Trouble-breathing calls
- 2,732 Domestics

Methodology

Recognizing the need to improve the handling of towing and fire alarm-related calls, Arlington County pursued technology solutions to reduce the workload and free up staff for emergency responses. The following strategies were implemented:

1. **Outsourcing Non-Emergency Call Functions**: A vendor was contracted to manage private property tow notifications, ensuring compliance while reducing call center workload.
2. **Integration with AWS Services**: Amazon Web Services (AWS) AI solutions were leveraged to create a machine-learning-based call filtering system.
3. **Utterance Collection and Data Analysis**: AI-driven utterance collection was conducted over 30 days to categorize non-emergency call types and develop effective workflows.
4. **Workflow Implementation**: Automated responses were designed to guide callers to online reporting portals and resources without requiring telecommunicator intervention.

While implementing the towing solution, additional research was conducted on automating processes to divert non-emergency calls from the center. In the spring of 2023, AWS services were introduced into the PSAP, providing a force-multiplying solution utilizing machine learning and artificial intelligence to assist callers on the non-emergency line.

In order to ascertain the reasons people were calling the non-emergency line we entered into a data collection phase where we redirected, ported over, the non-emergency phone line to AWS. The AWS product would answer that line, greeting the caller with a message informing them that they had reached the Arlington County Emergency Communications Center Non-Emergency Line. It would then provide instructions to hang up and dial 9-1-1 if they had an emergency. The system then asked callers to state the reason for their call, in an attempt to collect an “utterance” that would be used later to direct callers into a workflow. The collected response or utterances was then placed in a “bucket” and after analyzing the utterances we were able to determine that similar utterances, ones with the same meaning or intent, should be linked together this process is how we trained the AI through machine learning that those utterances had the same meaning or intent.

During the utterance collection phase, the PSAP gained insight into why people were calling beyond towing and fire alarm issues. This data collection phase lasted approximately 30 days where we were able to identify why citizens were calling the non-emergency line and based on those reasons we began to develop workflows. The product would compare the collected utterance against a list of utterances that were associated with each workflow if a match was found it would attempt to divert the caller into that workflow where the AI would engage the caller offering to send them via an SMS message a link to where the information they were requesting could be found.

Some examples of these workflows are found on page 6. The caller can opt out of this process at several different points as illustrated in the example on page 7, if they opt out, they are then put into the non-emergency queue to be answered by a call-taker. Those calls that are successfully diverted and handled by the AI product are then terminated without having to transfer it to a call -taker.

First Use Case: Storm-Related Calls

The first practical application of AWS occurred during a severe weather event. Arlington experienced a derecho, leading to an overwhelming influx of calls about downed trees, power outages, and traffic light failures. Since Arlington County already had a robust online reporting page for such incidents, the first workflow was designed to direct these callers to the appropriate webpage instead of engaging a telecommunicator.

How the Workflow Operates: (diagram found on page 7)

- A caller on the non-emergency line is prompted for the reason for their call.
- AWS collects the utterances and checks them against the list of utterances provided for each workflow.
- If a match is found, AWS asks the caller if they are calling about a defined workflow issue, in this case, a “Storm.”
- If the caller's answer is “no,” they are transferred to a telecommunicator.
- If the caller’s answer is “yes,” they are advised that a link can be sent to them to report the issue online.
- If the caller agrees, an SMS message with a link to the reporting page is sent.
- Once this function is performed, they are re-engaged by the service and thanked for their call, which is then disconnected.

Use Case: Towing-Related Calls

Following the success of the storm-related workflow, AWS was leveraged in the handling of calls from individuals inquiring about towed vehicles. As previously mentioned, vehicle data and related tow information were made accessible through a public-facing portal. A workflow was created to send an SMS message with a link to the portal, allowing callers to locate their vehicles independently.

By leveraging AI and automation, Arlington County's PSAP has significantly reduced the burden of non-emergency calls, improved efficiency and allowing telecommunicators to focus on critical emergency incidents.

Key Findings

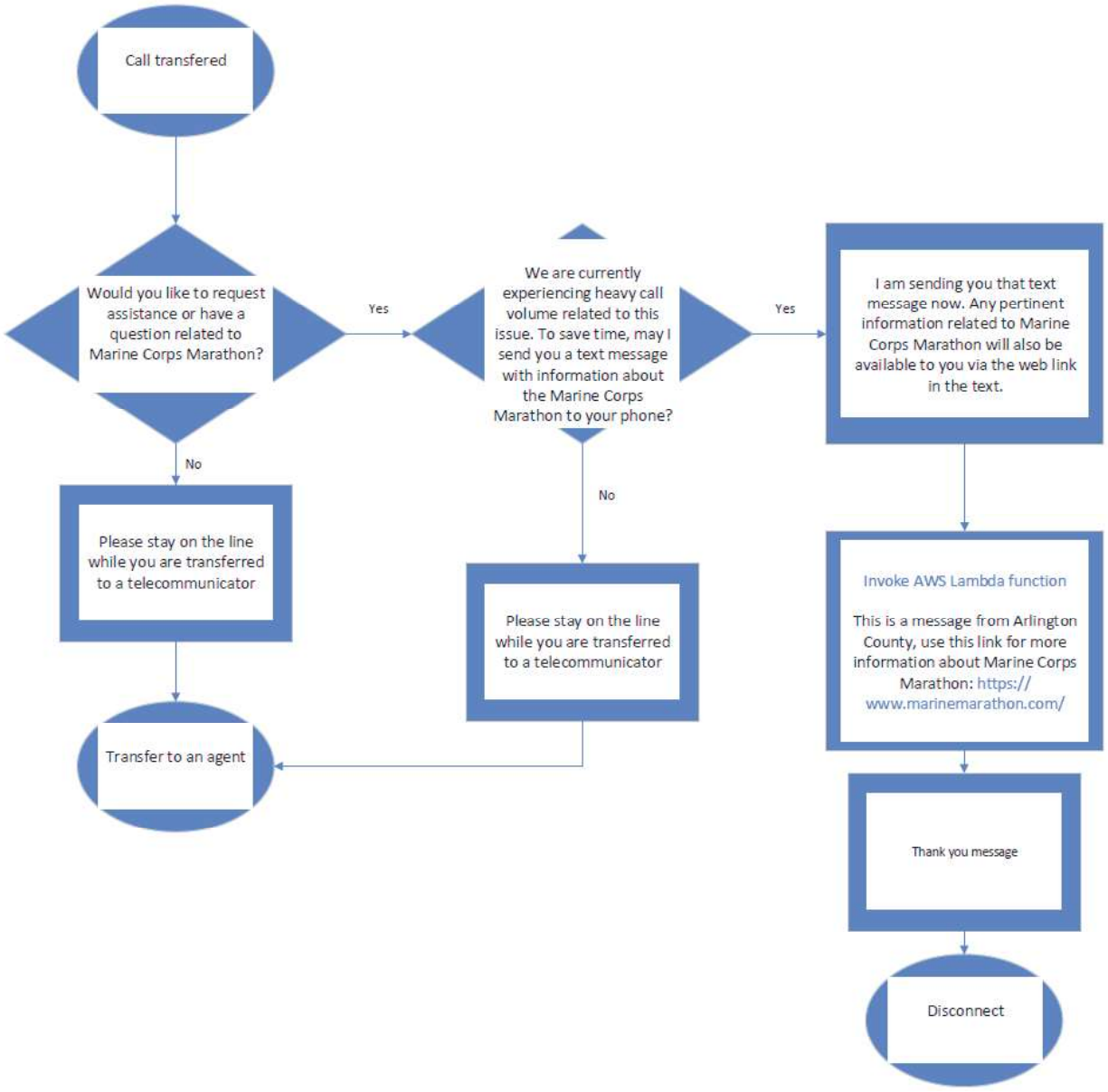
The adoption of AI-driven call diversion resulted in a significant reduction in administrative call volume:

- Between June and December 2023, non-emergency calls decreased by over 4,000 compared to the same period in 2022.
- A long-term comparison of the first six months of 2022 and 2024 showed a reduction of 22,167 administrative calls.
- From May 28, 2024, to February 15, 2025, 74,601 workflow interactions were documented, averaging 285 calls redirected per day, translating to a projected 103,928 diverted calls annually.
- Specific workflows for issues like towing, graffiti, and storm damage saw thousands of uses, with the towing workflow alone being utilized 9,536 times since its implementation in July 2024.

Workflow	Implementation Date	Uses (May 28, 2024 - Feb 15, 2025)
Towing	July 2024	9,536
Graffiti	August 2023	646
Storms	August 2023	888
Snow	August 2023	981
Marine Corps Marathon	September 2023	981
Campaign Signs	November 2024	37
Online Police Reports	December 2024	4,935
Red Light/Speed Camera	January 2025	85

Visual Data

Sample Workflow



ECaTS Data

Call Summary

Arlington Emergency Communication Center
1425 N. Courthouse Rd, 7th Floor
Arlington, VA 22201 County: Arlington

Year: 2022
Agency Affiliation Emergency Communications

Report Date:	02/18/2025 14:05:39
Report Date From:	01/01/2022
Report Date To:	06/30/2022
Period Group:	Month
Days Of Week:	All
Call Type:	Administrative
Abandoned Filters:	Exclude Abandoned
NSI Filters:	NSI Included in 911 Totals
Agency Affiliation:	All

		January 2022	February 2022	March 2022	April 2022	May 2022	June 2022	Total
Administrative	Inbound	13,865	15,565	16,913	14,205	14,852	12,814	88,214
	Abandoned	0	0	0	0	0	0	0
	Outbound	7,324	7,589	8,301	8,081	8,304	7,071	46,670
	Unparsed	0	0	0	0	0	1	1
	Total	21,189	23,154	25,214	22,286	23,156	19,886	134,885
	Avg Call Duration	112.3	144.8	146.8	138.4	137.1	106.7	132.1
	Total	21,189	23,154	25,214	22,286	23,156	19,886	134,885

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Call Summary

Arlington Emergency Communication Center
1425 N. Courthouse Rd, 7th Floor
Arlington, VA 22201 County: Arlington

Year: 2024
Agency Affiliation Emergency Communications

Report Date:	02/18/2025 14:07:18
Report Date From:	01/01/2024
Report Date To:	06/30/2024
Period Group:	Month
Days Of Week:	All
Call Type:	Administrative
Abandoned Filters:	Exclude Abandoned
NSI Filters:	NSI Included in 911 Totals
Agency Affiliation:	All

		January 2024	February 2024	March 2024	April 2024	May 2024	June 2024	Total
Administrative	Inbound	12,753	12,117	12,672	12,567	13,342	12,070	75,521
	Abandoned	0	0	0	0	0	0	0
	Outbound	6,052	5,509	6,002	6,116	6,817	6,701	37,197
	Unparsed	0	0	0	0	0	0	0
	Total	18,805	17,626	18,674	18,683	20,159	18,771	112,718
	Avg Call Duration	124.3	138.0	126.2	135.0	115.5	121.5	126.5
	Total	18,805	17,626	18,674	18,683	20,159	18,771	112,718

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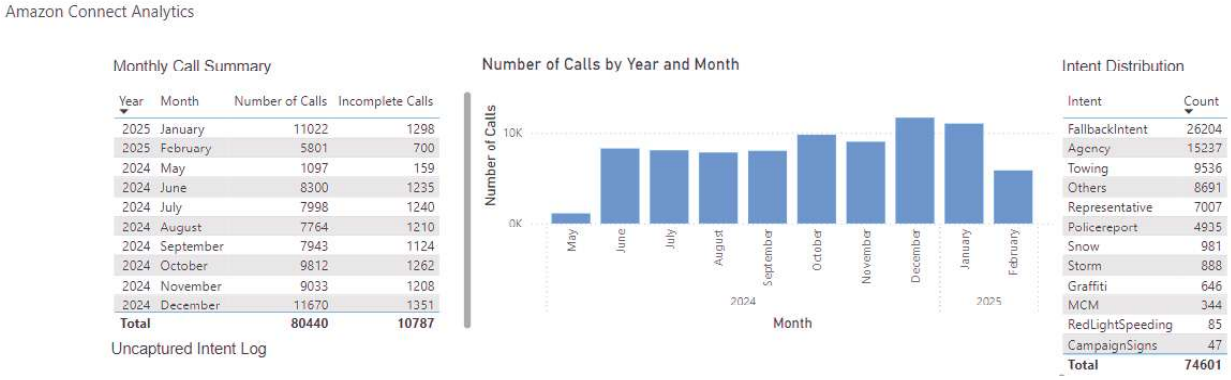
Amazon Connect Analytics drilled down from Redshift Data and put into a Dashboard.



Conclusion

The implementation of AI-driven call diversion has demonstrated a substantial impact on optimizing call center operations in Arlington County. By leveraging machine learning and automation, the PSAP successfully reduced non-emergency call burdens, allowing telecommunicators to focus on critical emergency responses. The reduction of over 22,000 calls in six months underscores the potential for AI to enhance public safety communication systems nationwide.

As we have continued to advance our understanding of the potential for more advanced solutions, the vendor has also continued to advance the abilities of their product. An example of these advancements is found in the creation of a bot. This bot will have the ability to use natural language processing skills and interact with the caller in their native language. The bot will have its access confined to a local knowledge base. That knowledge base will be made up of existing public facing webpages and resources provide by Arlington County. It will also contain information such as FAQs from different departments. The bot will have the ability to scrape those pages and share information with the caller without the intervention of a call-taker. As we are currently in the process of launching this bot, future papers documenting its effectiveness will follow.