2018 PTI Solutions Award Competition

Required Information

Each entry must include the following information:

1. Select your jurisdiction's **Population Category: _____D_____**

    A. 1-99,000

    B. 100,000-349,999

    C. 350,000-749,999

    D. Over 750,000

2. Select your **Technology Category: _____H_____**

    A. Telecommunications and Information Technology (I.T. management, operations and infrastructure) and Cybersecurity (awareness, planning, breach protocol, practices).

    B. Cybersecurity (awareness, planning, breach protocol, practices).

    C. Web Services, E-Government and Mobile Apps

    D. GIS (Geospatial Information Systems)

    E. Public Safety and Emergency Management, Community Resiliency

    F. Sustainability (energy, including energy assurance planning; environment, public works, transportation).

    G. Data and Performance Metrics

    H. Innovative Uses of New Technologies (for example: Unmanned Aerial Systems, Autonomous Vehicles, Virtual Reality, Artificial Intelligence, 3D printing, etc.)

3. Project Title that best describes your entry: **Geospatial Data and Voice-Enabled Artificial Intelligence**

4. Abstract (summary of your entry) of approximately 100-250 words, text only. Use multiple paragraphs where appropriate. PTI will publish this abstract on its website.

The Montgomery County, Maryland Department of Technology Services (DTS) Geographic Information Systems (GIS) team developed a voice-enabled, virtual, artificial intelligence assistant (using the Amazon Alexa device) which provides the County's annual fall leaf collection date(s) for the user's address. Once the Alexa user initiates a voice command (for example, by asking Alexa "When is my leaf collection,?") the Alexa device runs a query using a County developed web service, using the street address registered to the user's Amazon Alexa account (*note: alternatively, a user may also specify an address rather than assume the use of the default address*). The web service processes the query, and triggers Alexa to respond to the user's question with the designated leaf collection date(s) and time(s) for the specified address. A demo of "Alexa asks Montgomery County when is my leaf collection?" can be viewed on-line at https://youtu.be/vi8JPt_GSG0.

This is the County's first-ever implementation of such artificial intelligence / digital assistant technology. As such, the County envisions supplementing existing service delivery channels (i.e. web, mobile, 311) with this emerging technology to improve the provisioning and accessibility of County services and information for County residents and constituents.

Furthermore, over time, DTS-GIS plans to expand the use of the artificial intelligence technology to "voice enable" other County services, such as those related to Public Safety, Transportation, Procurement, Elections and others, and to use other hardware devices in addition to the Amazon Alexa.

5. Statement of the Problem. Describe the need, problem or issue that your technology solution addresses.

Prior to the implementation of this artificial intelligence solution, DTS-GIS, in partnership with the County's Department of Transportation (DOT), created a web-based Leaf Vacuum map viewer for citizens to find out the leaf vacuum schedule for the season (See Supplemental Materials – Figure 1 & Figure 2). Although this map viewer was highly effective, the County believed an opportunity existed to improve this service by exploring the use of artificial intelligence and digial assistants. The County sought to answer the question of whether or not it would be "easier" for a County resident to verbally ask an Alexa device about leaf collection than to go through the 'trouble' of powering up a PC, laptop or mobile device, bringing up the browser, and starting the map viewer.

It is becoming increasingly clear to the County that jurisdictions across the nation are starting to explore the use of artificial intelligence to enhance or economize services delivery to their constituents. The County believes that in the near future, County constituents will come to expect

this next generation of technology to be a part of the County services delivery portfolio. Therefore, DTS-GIS found it imperative to "get ahead" of the game and develop a working solution in order to test and validate the technology. One added benefit is that County residents with disabilities (for example, the visually impaired) would be able to command the Amazon Alexa device by voice and get the response on leaf collection date(s) and time(s) for their address, also by voice.

6. Response. Describe the solution or program you implemented.

DTS-GIS partnered with the County's DOT and Open Data program team to develop the Amazon Alexa solution. The DTS-GIS developer completed the project over the course of an estimated 6 weeks. The underlying technology platforms used to develop the solution include the Node JS programming language under the Model View Controller (MVC) development architecture. Important to note is that this architecture can be easily extended for multiple subsequent Alexa based artificial intelligence applications with limited changes.

DTS-GIS leveraged existing geocoding services for the purpose of translating the user's registered Amazon Alexa street address into an X, Y coordinate pair and locating the address point on the leaf collection polygon (zone) for the address. These geo-processing capabilities are based on Esri GIS technology. Prior to each leaf collection season, DOT sets the collection date(s) for each collection zone. This information is published on the County's dataMontgomery website (see Figure 3 - The architecture of the Alexa based citizen to County interaction paradigm).

A demo of "Alexa asks Montgomery County when is my leaf collection date?" can be viewed on-line at https://youtu.be/vi8JPt_GSG0. You'll hear the user's question "Alexa, when is my leaf collection?"and the answer from Alexa "Your leaves are scheduled to be picked up by November 25th." (see Figure 4 - A (young) County resident got her question "When is my leaf collection?" answered by the Amazon Alexa.)

The County obtained a dozen Amazon Alexa units at a very reasonable price due in part to Amazon's interest in expanding these capabilities to government services. Amazon provided access to the needed code set to the DTS-GIS development team. The backend GIS data and map services already existed and therefore no added cost was incurred for this program. Jurisdictions seeking to replicate this program "from scratch" may be expected to incur costs in the range of $10,000 to $25,000 depending on several factors including staff availability, labor costs, hardware, software licenses and other related items.

Note: please see supplemental materials, figures 1 through 4, for additional information about the Alexa solution.

7. Results. Describe the results you achieved, including examples of how your solution enhanced services, improved productivity or effectiveness, and accomplished greater efficiencies or cost savings. Include a summary of any performance metrics/analytics you may have produced.

Ironically (and unfortunately), DTS-GIS completed the development of this artificial intelligence solution subsequent to the County's 2017 leaf collection season. That said, the County fully intends to publicize and make available this technology to County residents in the fall of 2018, in advance of the 2018 leaf collection season.

Regardless, the County views this program as a great success, given the relatively low cost and moderate level of effort that was expended to develop the solution. As noted earlier, the County leveraged existing staff and geocoding services to develop the solution, and through an informal "partnership" with Amazon, acquired the Alexa devices at a modest cost and the Amazon code set at no cost.

Equally as important, the DTS-GIS, in partnership with DOT and the Open Data program, engaged with many County departments in the process of idenfying candidate County services for which to develop this artificial intelligence "skill." Through this process, DTS and County departments partnered to establish the beginnings of a developer "community of interest" that will be greatly beneficial moving forward for the purposes of expanding the use of this technology in the future.

The County's first foray into artificial intelligence is an example of a highly innovative yet low-cost solution that seeks to expand and simplify the delivery of services and information to County residents and constituents. With this new application, an owner of an Amazon Alexa device can simply and quickly obtain leaf collection information without using a computer, mobile device, or placing a phone call to the County's 311 call center. This solution enhances the user's experience of interacting with County's data and web services. In the future, a wealth of other County data and services (such as property tax payment, school enrollment, library card renewal, etc.) can also be provided via artificial intelligence technologies.

8. Key Participants. Identify team members and any partners (government agencies, other organizations, vendors) that participated in the development or implementation of your solution.

- Montgomery County Department of Technology Services
- Montgomery County Department of Transportation

9. Contact Information. Provide the name, title and contact information of the officials who will serve as a resource for additional information. List one contact person per line; do not use columns to present contacts. Provide E-mail addresses.

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