Intelligent Fault Reporting System
Project Proposal

For
EMSD

CONDITIONS OF PROPOSAL

All information contained in this proposal is confidential and shall not be disclosed to any other persons/parties except those employees of EMSD involved in the evaluation process.

This proposal is valid for 90 days from the date of issue.
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1. Executive Summary

EMSD (Electrical and Mechanical Services Department) is one of HK government departments responsible for inspection and enforcement of operation and safety of many electricity and gas installations; railways and trams; lifts and escalators; amusement rides; working platforms on building sites, and many other diverse areas.

Among EMSD’s daily operations, there were many parties which would call EMSD hotline and file fault report for maintenance or other purpose from various location. Currently EMSD was using human agents to serve 20,000 calls per year, sometimes during rush hours such as when natural disasters occurred (like typhoon), it would be hard for the human agents to handle the overwhelming calls in time.

Fano wants to leverage the ASR (Automatic Speech Recognition) and NLP (Natural Language Processing) technology and offer Fano Voicebot to integrate with EMSD’s IVRS system, then EMSD users could just call the frequent dial-in phone numbers to report such fault in a more efficient way, and after the Voicebot process, all the extracted key information would be passed to EMSD CRM and kept accordingly.

2. About Fano

Fano Labs Limited is a Hong Kong-based technology start-up which specialized in speech recognition and natural language processing and related Artificial Intelligence solutions. It is a spin-off from University of Hong Kong and operates both in Hong Kong and Mainland China. Founded in 2015 by Dr. Miles Wen, Honorary Assistant Professor at the University of Hong Kong (HKU) and former Fulbright Scholar at University of California, Berkeley, and Prof. Victor O.K. Li, BBS; ScD (MIT), Chair Professor of Information Engineering at HKU. Fano Labs is backed by Horizons Ventures, the private investment arm of Li Ka-shing, and Hong Kong Science & Technology Park.

Fano Labs is the winner of the Grand Award in the Smart Business stream of the Hong Kong ICT Awards 2018, the most prestigious award in Hong Kong’s ICT industry and won the Multilingual Artificial Intelligence Customer Service System in the 18th Asia Pacific Information and Communications Technology Alliance (APICTA), seen as the Oscars of the ICT in Asia Pacific region. Fano Labs is one of the strongest companies in speech recognition and natural language processing technologies, especially for Chinese dialects recognition, processing and analysis.
With very strong local R&D (10+ PhD holders), plus engineering, project and support teams, Fano Labs will offer best-in-class solutions and services for EMSDs who are looking for best and most innovative AI solutions in ASR and NLP.

3. Solution and Implementation

Fano’s proposed solution include the following architecture including the proposed technologies and functions:

**ASR (Automatic Speech Recognition)**
First when EMSD users call the hotline, upon IVRS answers and initiates MRCP request to Fano MRCP server, then voice streaming pipe will be established between the IVRS and Fano MRCP server, and Fano ASR engine will transcribe the input voice into text.

**NLP (Natural Language Processing)**
Fano ASR engine then output the transcribed text to Fano NLP engine (AccoBot) to analyze against predefined business rules (or other predefined set of classification
categories). AccoBot NLP platform will return with the related response to MRCP server and instruct IVRS to give caller the proper response. Based on the nature of the call, AccoBot determines the proper fault type and location, index the content with extracted information and store them in EMSD provided CRM and its own storage.

**Preliminary Call Flow**

The following is a high-level call flow description of the proposed Voicebot, which is similar as the current flow handled by human agent. The actual dialog design will be completed as a part of the design phase of the project, following the agreement on specific project requirements, and may vary in form from the diagram below.

![Call Flow Diagram]

4. **Project Plan**

Fano Labs will deliver the services with the following project methodology:

a. **Project team formation**
   - Line up all project team members
   - Kickoff meeting and subsequent regular/ad-hoc meetings
   - Oversee the project progress and monitor the performance of the services
   - Make sure the implementation is on schedule and perform as designed

b. **Collect and analyze user requirement**
   - Understand and collect the rules and use cases under each scope
   - Understand user requirement and extract business rules

c. **Data collection and ASR and NLP model tuning**
   - Collect existing data from EMSD under each scope
o Summarize the data quality and characteristics and propose data generation from Fano if no live data available

d. Voice User Interface Design
   o Design detailed call flows and dialogue design
   o Pass the call flow design to EMSD to implement into the existing IVRS and integrate with backend system
   o Tuning a balanced and optimized design by pilot testing from partial to full development.

e. Environment setup
   o Setup testing, staging and production environments

j. System integration
   o Perform the integration of all hardware and software and network

k. System Integration Test

l. User Acceptance Test
   o Provide support and work with EMSD
   o Bug fixing
### 5. Roles and Responsibilities

<table>
<thead>
<tr>
<th>Phase</th>
<th>Fano’s role and responsibilities</th>
<th>EMSD’s role and responsibilities</th>
</tr>
</thead>
</table>
| Project management | • Develop and maintain the project plan to encompass all key activities, deliverables, and milestones for the Project  
                  • Manage project risks, issues, changes and deliverables in coordination with EMSD project manager  
                  • Facilitate regular meeting with EMSD project manager  
                  • Generate status reports regarding milestones specified, and manage the formal closure of this Project in coordination with EMSD project manager | • Provide a single point of contact for all project management related activities  
                  • Manage and coordinate all aspects of all phases in accordance with the project plan  
                  • Coordinate activities associated with the IVRS system vendor  
                  • Keep track of official notices from Fano regarding project status via e-mail, as well as all internal communication of these updates |
| Design         | • Conduct requirements review and analysis with EMSD  
                  • Summarize and consolidate overall system requirements for the Project, into functional requirement documentation  
                  • Define and confirm, together with EMSD, the scope of fault reporting classifier  
                  • Design and plan the Project and network configuration for production deployment in EMSD’s architecture  
                  • Provide specific requirement for text data generation in Traditional Chinese with Cantonese style and commonly used English  
                  • Propose Voice User Interface Design(VUI) plan | • Provide detailed business requirements, along with all relevant documents and information  
                  • Provide comprehensive and timely review and approval of the system design and functional requirement documentation prior to project implementation  
                  • Confirm the fault reporting classification scope,  
                  • Provide IVRS integration interface and API and related details,  
                  • Confirm and sign-off the system design documentation  
                  • Provide real audio data sample if available, or otherwise provide sample scripts and real scenario description to confirm the data generation requirement to make sure the data to be generated to be as close to real data  
                  • Generate data and provide the data to Fano for training of the ASR model  
                  • Approve and confirm the VUI Design |
| Implementation  | • Label audio data generated by EMSD  
                  • Offer detailed call flows, dialogue design and all the voice prompting scripts  
                  • Generate sample calls  
                  • Organize focus groups for testing the VUI  
                  • Build ASR model for the Voicebot  
                  • Configure no more than 10 category types, | • Confirm schedules and dependencies for implementing and testing the Project  
                  • Manage of all site activities relating to development, installation and testing of the Project  
                  • Development of the front-end application  
                  • Integrate Fano solution with front-end application via the API provided by Fano  
                  • Review periodical checkpoint and offer prompt reported issues feedback  
                  • Implement the call flow in existing IVRS  
                  • Provide relevant documentation, learning |
<table>
<thead>
<tr>
<th>Phase</th>
<th>Fano’s role and responsibilities</th>
<th>EMSD’s role and responsibilities</th>
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<tbody>
<tr>
<td></td>
<td>• Provide the APIs for EMSD to integrate with back-end application to show the Voicebot transcript, fault reporting category, location.</td>
<td>• Provide API access and documentation for any customized integration</td>
</tr>
<tr>
<td>Testing</td>
<td>• Provide any necessary fixes based on EMSD testing,</td>
<td>• Facilitate all site-related activities required during the testing phase</td>
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<td>• Install testing or UAT environment and production environment,</td>
<td>• Oversee a controlled deployment of the UAT, according to schedules defined in the project plan</td>
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<td>• Monitor the user acceptance testing of the project, and fine tune the project to improve its performance,</td>
<td>• Approve and coordinate any changes to the project with recommendation from Fano</td>
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<td></td>
<td>• Generate performance report based on the production environment</td>
<td>• Coordinate with its end user to provide an onsite environment for operation training.</td>
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<td></td>
<td>• Analysis of the application data</td>
<td></td>
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<td></td>
<td>Offer training to key users and provide standard training materials</td>
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<td></td>
<td>• Leverage data analysis on focus group’s testing results to fine tune the call flow design and VUI</td>
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<tr>
<td>Model training</td>
<td>• Based on audio data provided by EMSD, conduct ASR model tuning</td>
<td>• Provide at least 25 sets of audio data per fault type category</td>
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<tr>
<td>service</td>
<td></td>
<td>• Provide or generate at least 100 hours of audio data in 8kHz 8bit format to train the ASR model</td>
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6. Assumptions
• EMSD is responsible to provide and setup all infrastructure and hardware for the Applications.
• EMSD needs to provide detailed description of Cloud / infrastructure environment
• Fano will install its ASR and NLP solution (Fano Voicebot) into EMSD’s current environment without changing the solution’s current database structure
• Fano will integrate with EMSD IVRS which is compliant with MRCP
• Fano will provide API for the CRM integration
• EMSD is responsible for the front-end application development and back-end integration
• Audio files are stored in standard format, not proprietary format
• The ASR Language model supports Cantonese mixed with English words
• Training will be conducted in “train-the-trainer” approach.
• EMSD needs to provide at least 25 sets of audio data per fault reporting category
- EMSD needs to provide/generate at least 100 hours of audio data to train the ASR model
- EMSD needs to ensure their existing IVR vendor will work closely with Fano for Voicebot integration
- IVR call flow enhancement will be handled by EMSD IVR vendor, and all the associated work (e.g. voice prompt recording)

7. Hardware Requirement

<table>
<thead>
<tr>
<th>Server</th>
<th>Quantity</th>
<th>GPU</th>
<th>vCPU</th>
<th>Memory</th>
<th>Hard Disk</th>
<th>OS</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>1</td>
<td>N/A</td>
<td>24</td>
<td>256 GB</td>
<td>3*1TB Raid5</td>
<td>CentOS /Windows</td>
<td>Intel® Xeon® Silver 4123 Processor (8 cores)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Intel® Xeon® Silver 4215 Processor (16 cores)</td>
</tr>
<tr>
<td>Training Server</td>
<td>1</td>
<td>NVIDIA Tesla P100</td>
<td>8</td>
<td>16 GB</td>
<td>200 GB</td>
<td>CentOS /Windows</td>
<td>NVIDIA Tesla P100, Intel® Xeon® Silver 4215 Processor(8 cores)</td>
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