# Applicant Questionnaire: Software Developer

## Instructions

For some of our positions, we refer to portfolios or code samples when determining if interested people will fit with our team. We have found that some people's previous experience doesn't lend itself towards the creation of an online presence, so we have prepared a brief questionnaire.

Please answer the following questions to the best of your abilities.

Complete and email your response to [sshivi@clearpath.ai](mailto:sshivi@clearpath.ai). Good luck.

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| **Applicant Name:** | **Sourabh Arora** |

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| **Describe your experience with containers and orchestration frameworks. How were they used to deploy systems, large or small? This can be for a personal projects or work for previous employers.** |
| Response:  I have worked on Docker based container environment to do development for ROS based cleaning robot application at Avidbots. To set it up, basically pulling the docker image and setting up the container. Then linking it with IDE to do development effort. To deploy it on the robot I had to create a build on Jenkins. Once the build is successful, I could test it out on robot. |

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| **Describe a problem you solved using a deployment automation tools. How did you test your solution?** |
| Response:  I have used bash scripts to pull the docker image that contains:   * Ubuntu operating system, its dependencies * ROS distribution and its dependencies * ROS packages and its libraries   That also includes catkin workspace containing autonomy and slam repos along with ROS Grid flow. Of any missing dependencies I have used *rosdep init* and *rosdep install* before catkin build to test it on local environment.  To test it on robot I have mostly pushed my code to Jenkins that runs a build and ultimately test it on robot. Console log of Jenkins usually provides an information for the cause of an error, and this is a starting point to see what fails in Jenkins if all the rosdep condition are satisfied in local environment and everything is running fine on simulator environment. |

## Team Project:

Please focus on a recent project you completed as part of a larger team

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| **Please describe your contributions to the project. What components were you personally responsible for, and what were their interfaces to the other components? How did those interfaces get defined?** |
| Response:  At Thales Group - Train Autonomous Platform, I have developed components for Cross Comparing the Data from Instances, Pre Processing the data for latitudinal and longitudinal velocity, hit counts for validating the data, data starvation etc. Those were independent classes interacting with each other via Interface class to interact with other components. Based on the features required, I had in process to load all the components in the Factory class to collect stationary data.  At Survalent, Fault location class in the FLISR application was bringing in the data form spatially distributed geographical data of electrical devices from distribution transformer level downstream to feeder level, where electrical calculation was done to evaluate the voltage, current etc to see the fault and isolate the area of fault  At Avidbots – One of the first task I got was to merge the existing parallel development branch for GUI redevelopment interface to new pre-release branch which eventually became a master branch. It involved me navigating through different ros nodes and interacting with different teams for resolving merge conflicts. |

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| **What tools did you use? Why?** |
| Response:  Polyspace for AUTOSAR and MISRA compliance for the code structure and Doxygen for document generation.  Unit test using GTest  MSSQL having ODBC connection for SQL queries on the database side.  Docker based development environment. Docker images already included all the dependencies for the ros packages, with ansible, terraform etc. |

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| **What steps did you take to future-proof your solution? Were there areas where you (and the team) chose specifically not to future-proof? What was the reasoning in each case? Is there an example where this strategy paid off?** |
| Response:  I have done Unit testing for the code coverage and then the component is going through performance test that includes stress test to future proof the code. |

## Individual Project

Please focus on a project completed individually (or mostly individually). Side projects, open source contributions, stuff for school, and stuff for previous employers are all valid.

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| **What was the project? What was the motivation and what did you accomplish? How did it turn out differently from your plan going in?** |
| Response:  At Avidbots – The new development effort I worked on individually is to re-develop the sub module of Light Sub System for the cleaning Neo2 robot. It included first working on a spike to purpose the design document of the Light Subs system, which I purposed to follow Factory Method design pattern.  I started with first supporting the change with using the existing Neo 2 robots to support backward compatibility. The same approach is been used to replicate it for other sub systems like cleaning , drive sub systems etc.  The motivation for this redevelopment effort for new sub module on the Autonomy stack is for quicker launch of new products, for example a small cleaning robot with each light on different PCB board provided by the Firmware team. We would have a modular approach to support each light interface using a single light manager object to update left light, right lights, brake light etc. |

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| **What is something that you know now that could have helped you with this project if you had known it at the time? Please focus on technical knowledge rather than personal development (e.g. time management).** |
| Response:  I think more than learning, it was more of adapting to new development style at my role at Avidbots working on ROS based application.  Working at Survalent and Thales Group, I had mostly worked on single threaded application with at most using shared mutex for read threads. Also, as per the code compliance requirement of the development team, was suggested avoid using smart pointers and use raw pointers.  While at Avidbots, apart from Sensor Safety which required AUTOSAR compliance, all the sub system interface required working on threaded application and using smart pointers. |

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| **What tools did you use?** |
| Response:  rqt\_reconfigure with flatland plugin on docker based development environment on local machine |

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| **How did you test and validate your solution?** |
| Response:  I tested and validated the solution using G-Test (unit testing) and also, on sim by publishing and subscribing on ROS. |

## Lightning Round

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| **What is the most interesting tool or language you have done meaningful work in? What did you like or dislike about it? If given the opportunity, how might you improve the tool or language based on your experience?** |
| Response:  Most of my experience comes doing development in C/C++. While using C++ gives lots of freedom to developers for optimizing the code to improve performance with speed and efficiency on various operating system. But as a developer the cons I can think of is that user have to be careful in terms of manual memory management, memory leaks.  Recently, I had started using Python, which is resource intensive but does away with memory leak scenarios and comparatively simple syntax. |

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| **What is your favorite robot, real or fictional, and in one sentence, why?** |
| Response:  Best fictional robot is Ironman that does everything and the reason why I started getting interested in robotics. In reality, I have worked more on cleaning robot running on ROS and ABB robots integrating with PLC for material handling applications. |

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| **What are your salary expectations for this role?** |
| Response:  Around CAD 105,000 per annum and negotiable depending upon the salary range for the job. |