qFlow
Project Plan Document

Document Version: 1.0
1. AUTHORS

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2. VERSION HISTORY

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qFlow – Project Definition Document
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4. **INTRODUCTION**

The problem this project seeks to address is the problem of optimizing stochastic flow charts. Many systems can be modeled as networks of interconnected queues, from emergency rooms to communication in computer networks. It is, however, nontrivial to find optimal configurations for these systems, given factors such as cost and throughput. This project seeks to solve this optimization problem in a way that can be applied to many different fields.

The goal of this document is to establish a detailed description of the plan to be followed during the development of qFlow. It includes a statement of work detailing the scope of the project, work requirements for each phase, acceptance criteria and a rough schedule.

5. **STATEMENT OF WORK**

The scope of this project includes creating a model to simulate stochastic flow systems with an easy to use and intuitive interface which can easily show how the systems behave over a long period of time. The scope also includes a genetic algorithm to optimize these flow systems.

The models to be simulated will consist of a set of nodes, connections, and resource pools. Each node contains a set of queues and represents a state in the system. One of the nodes will act as an entry node, where clients will enter the system at a specified rate. Each client will randomly be assigned a priority. Each edge contains a vector of weights, each with a probability. The elements of these vectors correspond to transition probabilities for clients of each probability.

6. **WORK REQUIREMENTS**

**Kickoff:**
- Setup development environment for each team member.
- Each developer will require development tools such as Visual Studio.
- Prepare documentation, such as this one.

**Design Phase:**
- Work out object oriented class structure for the simulation.
- Model chromosome for the genetic algorithm.
- Split work between the team members in an organized way.

**Implementation Phase:**
- Build the stochastic flow model simulation, front-end and back-end.
- Apply genetic algorithms to the models for optimization.
- Fix bugs.

**Training Phase:**
- Documentation.
- Demoing the project.

**Handoff/Closure:**
- Final packaging/Submission.
7. **SCHEDULE/MILESTONES**

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**Important Deadlines:**

- **March 2nd, 2018:** Flow Model/Simulation
- **March 9th, 2018:** Genetic Algorithm Optimization
- **March 23rd, 2018:** Presentable Demo

8. **ACCEPTANCE CRITERIA**

The goal is to be able to model reasonably complex systems, simulate them to an acceptable degree of accuracy, and optimize these models using genetic algorithms. The final decision over acceptance of the project will be made by Dr. Rahimi.

9. **RESOURCE REQUIREMENTS**

Each member of the group will require a working development environment, including a working computer with Visual Studio. The only other real requirement would be data to verify correctness of the simulations and optimizations.

10. **RISKS**

The largest risk of this project is being unable to get the project to a workable state before the deadline. We will attempt to mitigate this risk through planning, as in this document.

11. **ROLES AND RESPONSIBILITIES**

Although no section of the project will be exclusive to any one member, each member will assume the following major roles:

- **Nicholas Lasswell:** Simulation of the stochastic flow charts
- **Nicholas Pennington:** Front-end
- **Michael Smith:** Genetic Algorithm
Date: 1/26/18
Approved by: Shahrzad Rahimi
Approver Signature:
Mentor Name:
Mentor Signature: