The Marine Corps Marathon is one of the largest marathons in the United States. Their packet pickup location has recently changed and in an interest of ensuring runner satisfaction with the new location, they are looking into modeling the scenario. This paper contains specific details on the issue at hand, relevant resources, and our approach at handling the issue.

Marine Corps Marathon Packet Pickup

A traffic flow simulation

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Background

The Marine Corps Marathon is one of the largest marathons in the United States. It is held annually on the last Sunday in October. The race starts on the Virginia side of the Potomac River, crosses over to the streets of Washington DC, crossing over the Memorial Bridge to finish at the Marine Corps War Memorial. While the race, sometimes called the 'People's Marathon', promotes physical fitness, it also serves to encourage community goodwill and display the organizational skills of the United States Marine Corps.

Every year, about 30,000 registered runners participate in this event. Marathon participants pick up their runner packet at the Health and Fitness Expo, held on Friday and Saturday before the race. Hundreds of sponsors participate at the Expo where vendors sell athletic gears to attendees. The Expo provides funds, and experience for the runners. In prior years, packet pickup occurred at the DC Convention Center, and prior to that RFK Stadium. Beginning in 2016, packet pickup, and the Health and Fitness Expo, will be held in the Gaylord Convention Center at National Harbor.

Problem Description

The Marine Corps Marathon Office (MCMO) places a high priority on having every runner's experience, both at the race and at packet pickup. Because the new location has insufficient parking space, MCMO will provide shuttle buses between National Harbor and three Metro stations (i.e., Eisenhower, Van Dorn and Branch Avenue Metro stations). Runners may also take advantage of the new Metrobus service that provides service from Alexandria to National Harbor. Those who decline use of shuttle buses or Metrobus are free to arrive by other means of transportation such as; personal vehicles, taxi, Uber/Lyft. The participants' choice of transportation mode will affect the transit time for all runners.

Based on data collected on runner behavior during packet pickup, the MCMO assumes that participants will arrive for packet pick up at roughly the same time/day as they did in previous years, while using a variety of means to get to the Gaylord Convention Center. However, there is great uncertainty in how the participants will react to the change in transportation options for reaching the new location. There is great concern that difficulty in reaching the Gaylord may decrease the time runners spend at the Expo.

Since it is expected that the Gaylord Center will host packet pickup for the next ten years, the MCM organizers want to understand how to best handle these transportation, including traffic on roads, availability of parking and how participants choose among the transportation options. The problem statement calls for a need for a model to determine the impact of the shuttle bus on the system, and how we can determine the number of shuttle buses to accommodate the new location.

Relevant Literature

Using Traffic Modeling to Explore How Congestion Information Affects Traffic

Master's Thesis. (GMU Thesis)

Author: Smith, Jennifer L

http://mars.gmu.edu/handle/1920/10313?show=full

We are drawing suggestions from the conclusion of the paper, primarily the ability to use social media in order to develop alternate routes that can possibly avoid some of the expected traffic on the packet pickup days.

Median opening/closure techniques for special event traffic control
ITE Journal

Author: Metzger, David N.

http://search.proquest.com.mutex.gmu.edu/docview/224866336?accountid=14541

Given the number of participants expected at the MCM packet pickup and expo, MCM organizers should examine if there are alternative traffic flow suggestions that could reduce the shuttle bus traffic.

Exploring Engineering, An Introduction to Engineering and Design, Volume 2

Authors: George Wise, Philip Kosky, Robert T. Balmer, and William D. Keat

This book was used to assist in modeling the traffic patterns, determining the working maximum capacity of the different roads leading to National Harbor.

Initial approach

Given that the system involves many different entities such as busses, people, cars, etc., it is best to analyze the system using Discrete Event Simulation approach leveraging ExtendSim simulation tool, the same tool is being used by the project sponsor.

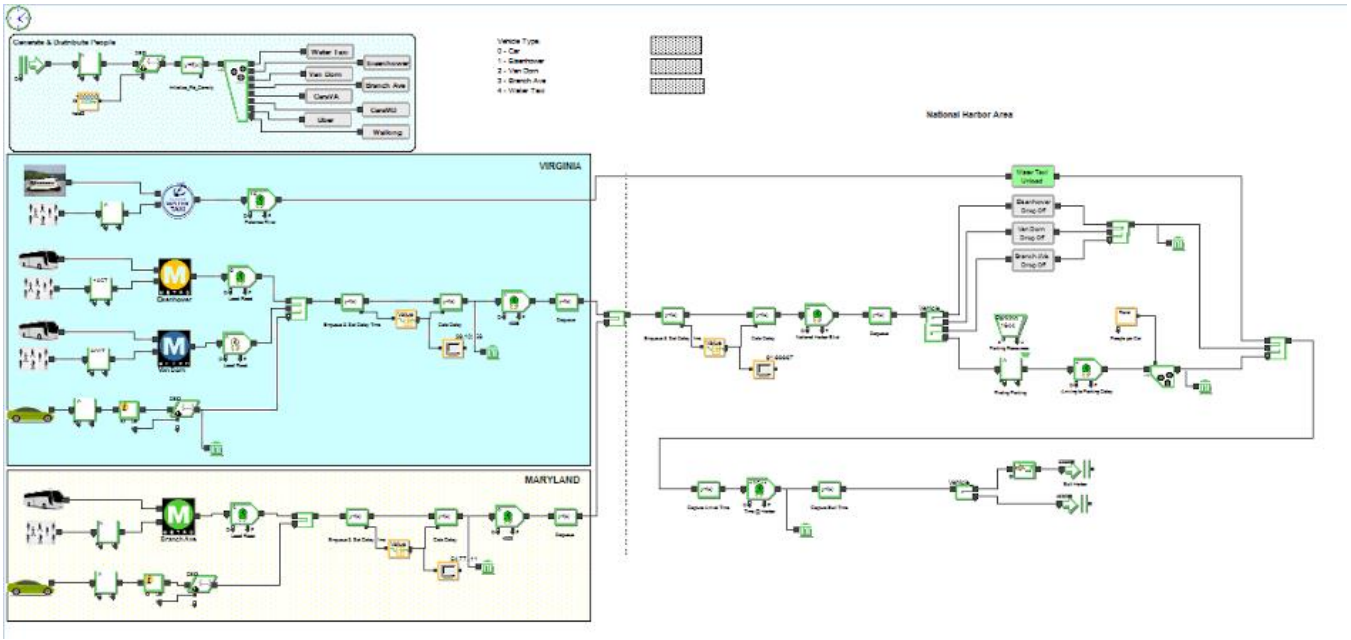
One of the greatest difficulties of this project is the data collection aspect of it. The system is dealing with major traffic routes from two states, through the DC beltway region - already well known for its traffic issues. In addition, much of the information related to the individual packet pickup either was not collected in previous years, or not yet available to us. We have spoken to our sponsor/client about this, and he has assured us that they are going to be doing frequent surveys this year to acquire some of that information.

Once the data collection portion is done, we will be able to use it to validate our existing model on the traffic / packet pickup process. Once the model is validated, we have a few steps to take:

1. Discover the different impacts that each variable has on the model (bus number, bus routes, water taxi availability, general traffic flow during the day, etc.)
2. Use estimates for how the new casino will have an impact on the existing model
3. Acquire model output data for the model with the casino information added
4. Attempt to determine an optimal solution given the casino estimates.

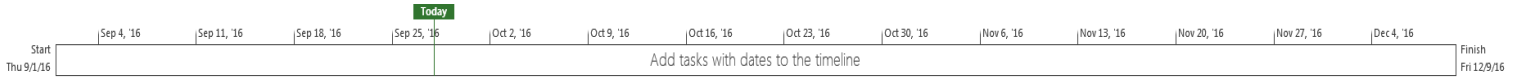
Unfortunately, 3 & 4 are determined on step 2, which is only an estimate and we cannot validate. However, if our model is valid, once proper data is found (or a more reliable estimate is made), the model could be used independent of us for internal Marine Corps Marathon testing.

Current Model



Resource Management

TIMELINE



GANTT CHART

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		Team organization	3 days	Thu 9/1/16	Sat 9/3/16		
2		Meet with Customer	1 day	Wed 9/7/16	Wed 9/7/16		
3		Build Problem Definition	6 days	Thu 9/1/16	Thu 9/8/16		All
4		Gather requirments	9 days	Thu 9/1/16	Tue 9/13/16		All
5		Gather data	9 days	Thu 9/1/16	Tue 9/13/16		Ricky
6		**Model development**	**32 days**	**Fri 9/9/16**	**Mon 10/24/16**		
7		Analyze input data	3 days	Fri 9/9/16	Tue 9/13/16		All
8		Develop Model and incorporate data	6 days	Tue 9/13/16	Tue 9/20/16		Nghia
9		Verify and validate model	16 days	Wed 9/21/16	Wed 10/12/16		All
10		Execute what if analysis	3 days	Thu 10/13/16	Mon 10/17/16		Nghia
11		Analyze simulation results	6 days	Mon 10/17/16	Mon 10/24/16		All
12		**Draft Proposal**	**9 days**	**Fri 9/16/16**	**Wed 9/28/16**		
13		Problem definition	2 days	Fri 9/16/16	Sun 9/18/16		Ricky, Mumtahina,Elsh
14		Initial Approach	9 days	Sun 9/18/16	Wed 9/28/16		Ricky
15		Model development					Nghia
16		Literature research	8 days	Sun 9/18/16	Tue 9/27/16		Ricky,Nghia
17		Background	3 days	Sun 9/18/16	Tue 9/20/16		Elshaday
18		Resource Allocation	2 days	Tue 9/27/16	Wed 9/28/16		Mumtahina
19		Schedule	9 days	Sun 9/18/16	Wed 9/28/16		Mumtahina
20		Meet with Professor	1 day	Thu 9/29/16	Thu 9/29/16		All
21		Prepare report	19 days	Fri 9/30/16	Wed 10/26/1		All
22		Start drafting presentation	17 days	Sun 10/9/16	Mon 10/31/16		All
23		Dry run presentation	7 days	Mon 10/31/1	Tue 11/8/16		All
24		Meet with Professor	1 day	Thu 11/3/16	Thu 11/3/16		All
25		Prepare final presentation	13 days	Mon 11/14/16	Wed 11/30/16		All
26		Last minute corrections	5 days	Thu 12/1/16	Wed 12/7/16		All