



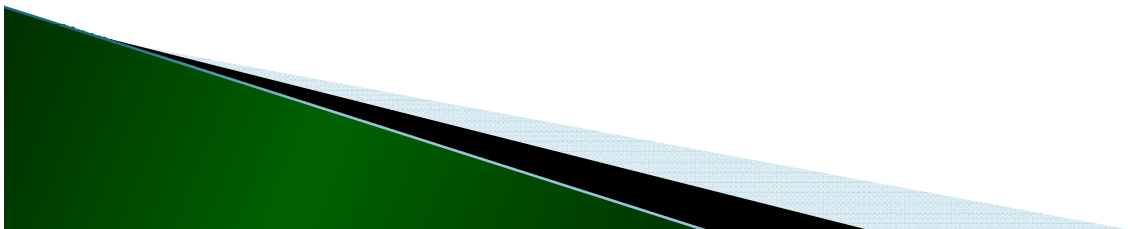
Air Force Operations Center Scheduling

Team AFOCS Proposal

February 17, 2011

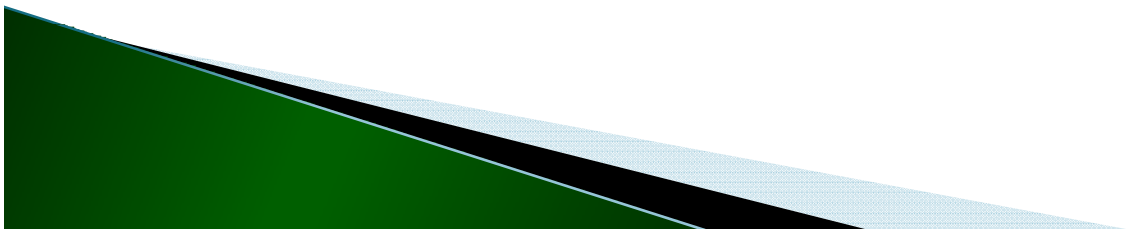
Outline

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 - Functional Requirements
- ▶ Technical Approach
- ▶ Expected Results
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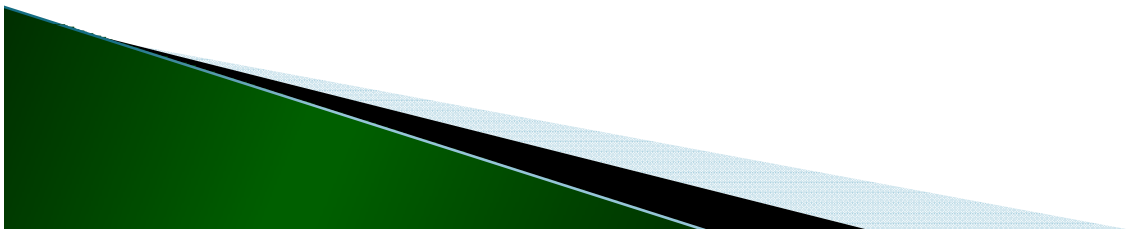
Problem Definition [1]

- ▶ U.S. Air Force operations require staffing numerous operation centers with trained and certified personnel.
- ▶ Scheduling the staffing of these operation centers is a time consuming manual process.
- ▶ The current scheduling process requires constant re-work due to unforeseen unavailability of resources.
- ▶ Scheduling includes not only staffing the operation centers, but also scheduling the training events, training resources, and trainers necessary to maintain current certification.



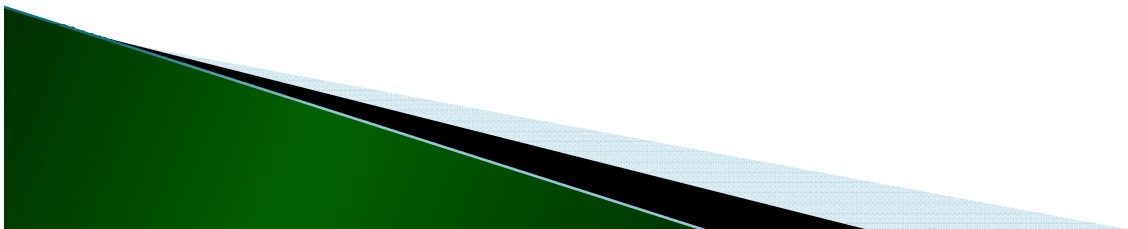
Problem Definition [2]

- ▶ Each of the 15 op centers require two functional positions: Crew Commander (CDR) and Deputy Crew Commander (DEP).
- ▶ The shifts are 24 hours long (7 a.m. to 7 a.m.).
- ▶ Shifts are referred to as “Alerts.”



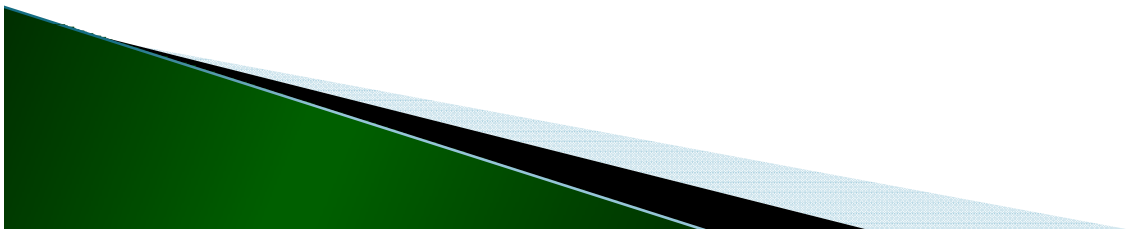
Problem Definition [3]

- ▶ The USAF group consists of three squadrons.
- ▶ Each squadron is responsible for staffing five op centers, one of which is the Squadron Command Post (SCP).



Problem Definition [4]

- ▶ Personnel are categorized according to their functional roles. The four functional roles are:
 1. Crew member
 2. Instructor (INST)
 3. Evaluator (EVAL)
 4. Flight Commander (FLT CDR)
- ▶ Personnel are categorized as either the Commander or Deputy for each alert.



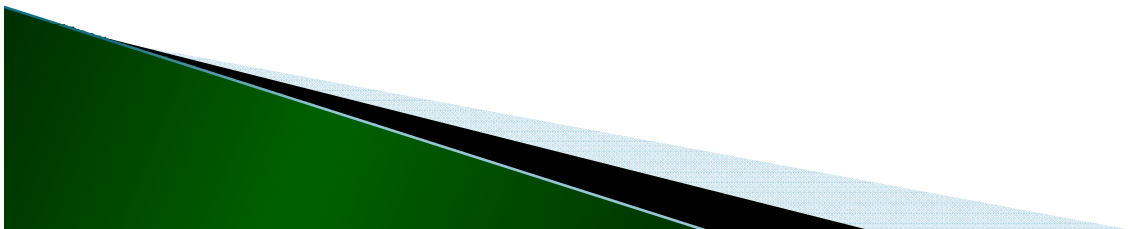
Problem Definition [5]

- ▶ The monthly training events are:
 - TR
 - T1
 - T3
 - T4

Training Event	Frequency	Type	Duration (hrs)	Trainer	Comments
TR	Monthly	Simulator	4	INST – 2 ea	
T1	Monthly	Classroom	8	INST – 2 ea	
T3	Monthly	Classroom	4	INST – 2 ea	Often paired with T4
T4	Monthly	Classroom	4	INST – 2 ea	Often paired with T3
Annual Evaluation	Annually	Simulator	4	EVAL – 3 ea	

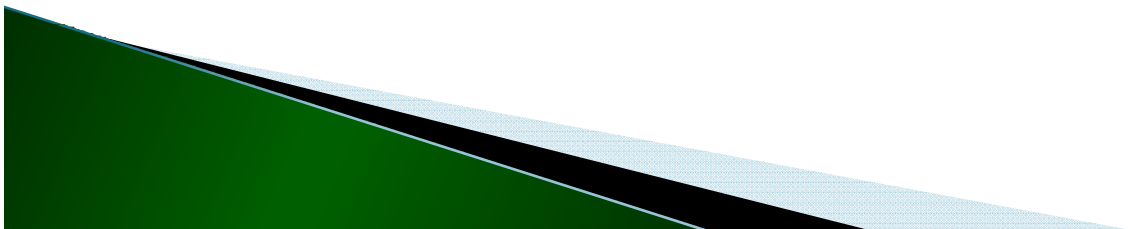
Statement of Need

- ▶ Develop an optimization algorithm for automatic scheduling of operations centers to improve efficiency and performance of the existing scheduling process.
- ▶ Algorithm must be dynamic to handle daily changes and produce a re-optimized solution while still adhering to all the scheduling conditions.



Statement of Work

- ▶ Completely understand the existing scheduling process
- ▶ Research on similar problems (i.e literature review)
- ▶ Establish connection and dialogue with the client to extract client's needs and requirements
- ▶ Develop an optimization algorithm to improve efficiency and performance of the existing scheduling process
- ▶ Build a model to test and demonstrate the capabilities of the algorithm
- ▶ Compare the existing and new process with the developed algorithm



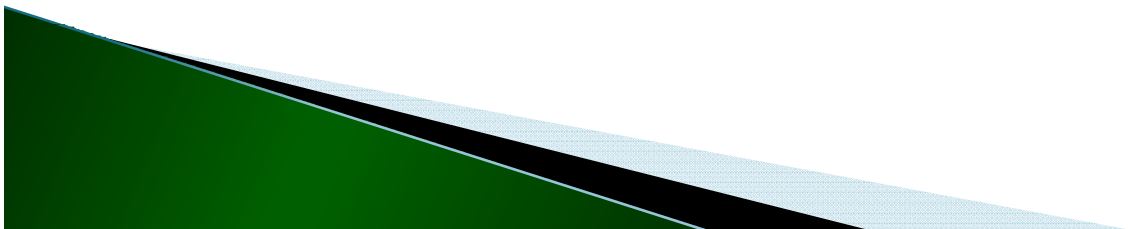
Scope [1]

▶ In Scope

- The emphasis of this project will be to develop an optimization algorithm to improve efficiency and performance of the existing scheduling process. The AFOCS team will test and analyze the optimization algorithm.

▶ Out of Scope

- The AFOCS team will not be responsible for implementing code to merge the algorithm with the current system.



Scope [2]

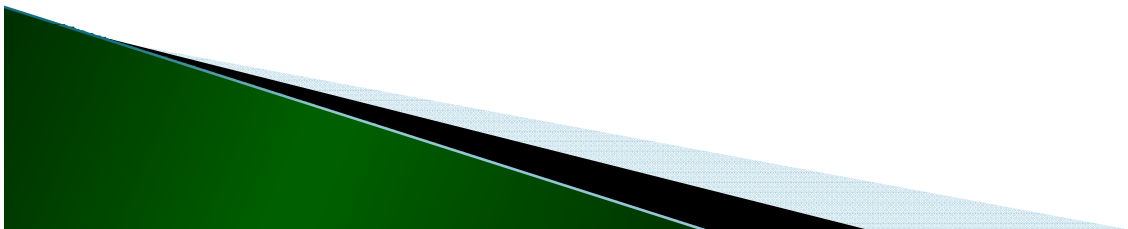
► Assumptions

- Project sponsors will be available to answer questions and clarify business rules for scheduling resources
- The AFOCS team will have access to the AIMMS software platform for developing the optimization algorithm
- The optimization algorithm has two functions:
 - Produce a set schedule of resources for a given input calendar month
 - Re-optimize the schedule due to unforeseen unavailability of resources
- The optimization algorithm has the appropriate data for input

Preliminary Requirements [1]

▶ Project Requirements

- Develop an optimization algorithm/model
- Compare performance of different algorithms/approaches
- Develop a Requirements Document
- Develop an Architecture diagram using a data model to show the different pieces of data and how the pieces flow together.
- Prepare a Systems Engineering Management Plan (SEMP)
- Develop a Test and Evaluation Master Plan (TEMP)



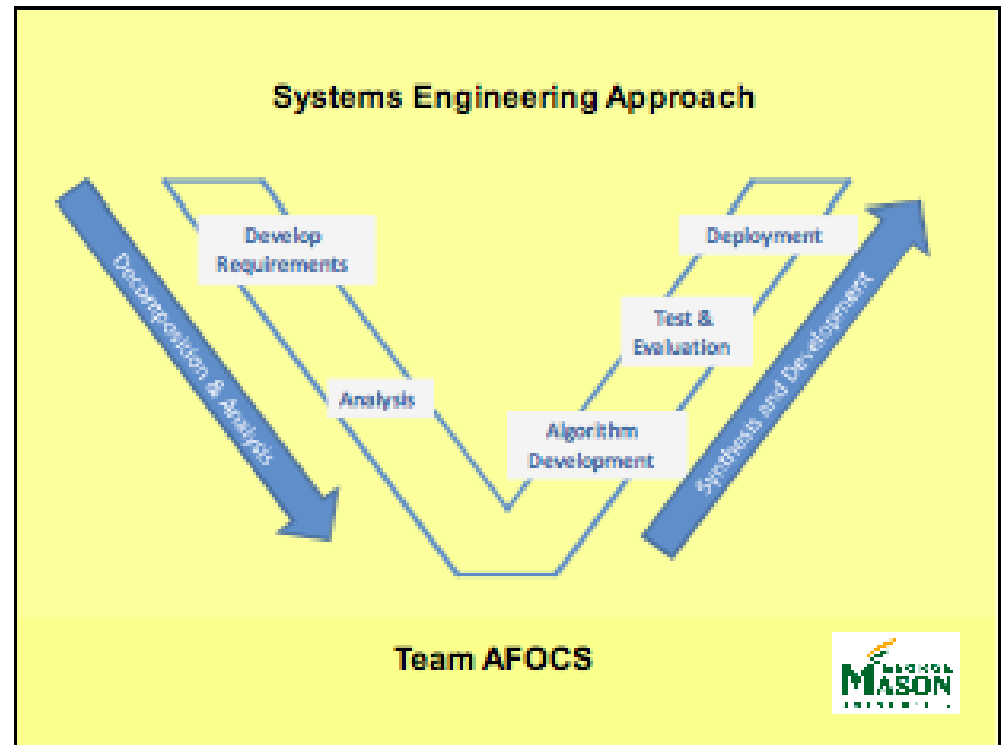
Preliminary Requirements [2]

▶ Functional Requirements

- Schedule 15 op centers plus one standby crew.
- Schedule monthly and annual required training.
- Maximize crew integrity.
- Schedule one or two instructors (INST) for each monthly training event.
- Schedule three evaluators (EVAL) for each annual evaluation.
- Rebuild the schedule anytime during the calendar month due to an unforeseen absence of an individual.
- Minimize rescheduled events due to an unforeseen absence of an individual.

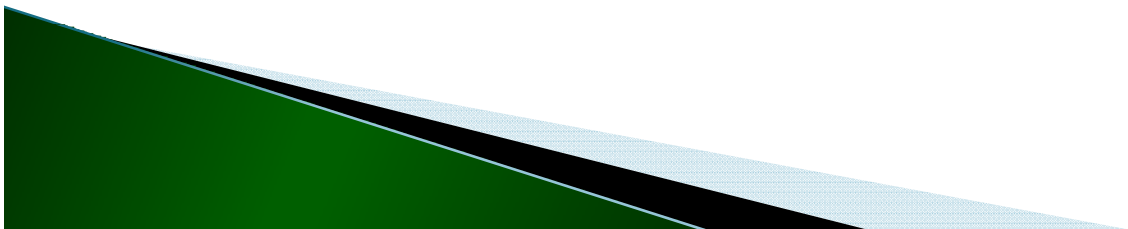
Technical Approach

- ▶ The project will be completed in five overlapping phases. The phases are:
 - Requirements Development
 - Analysis
 - Algorithm Development
 - Test and Evaluation
 - Delivery

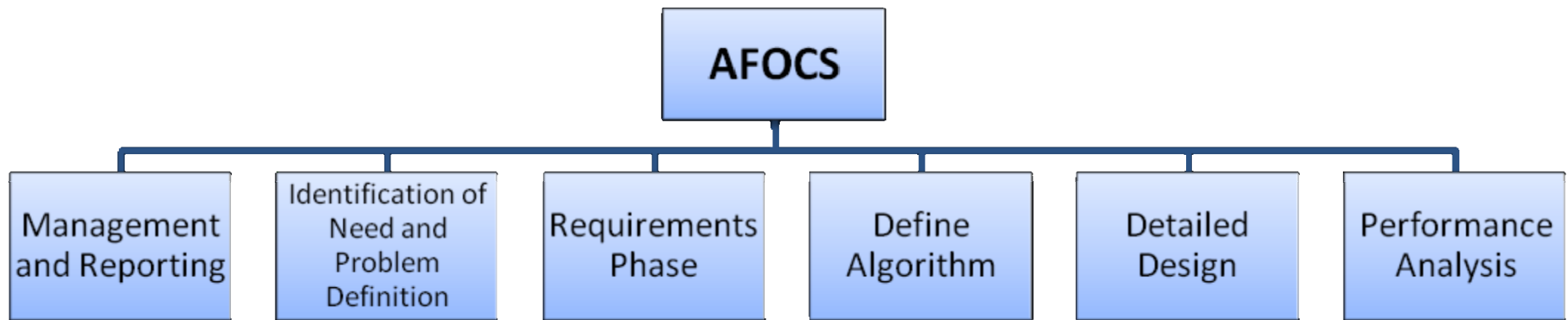


Expected Results

- ▶ Develop an efficient optimization algorithm that
 - Can automate the scheduling task
 - Will be dynamic to address the daily changes and produce a new optimized solution that still adheres to all the conditions for the schedule
- ▶ Find usable models and analyses from the literature review
 - Used to create the requirements document, the Systems Engineering Management Plan (SEMP) and Test & Evaluation Master Plan (TEMP)
- ▶ The final products produced will be the actual optimization model developed in AIMMS and associated documentation

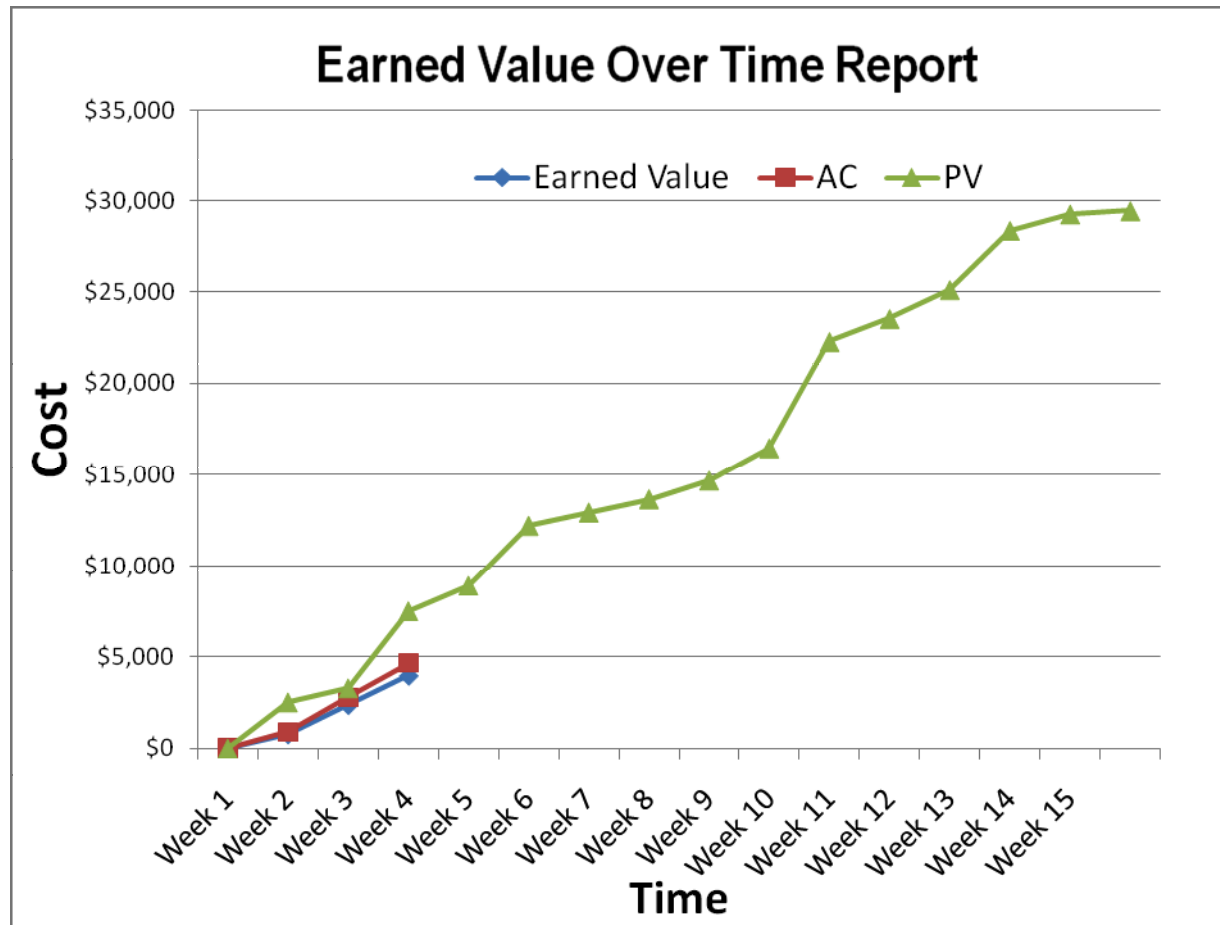


Initial Project Plan [1]



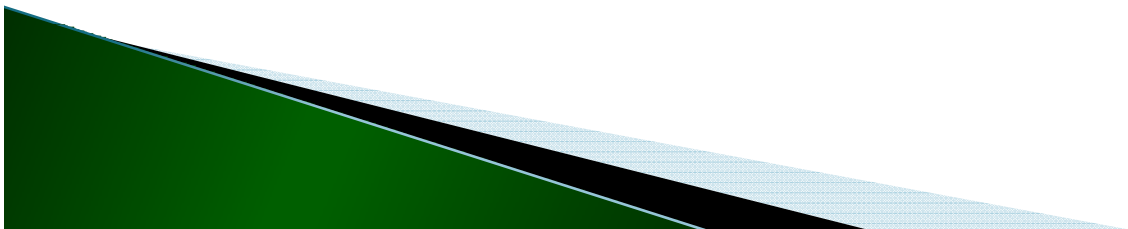
Level 1 Work Breakdown Schedule

Initial Project Plan [2]

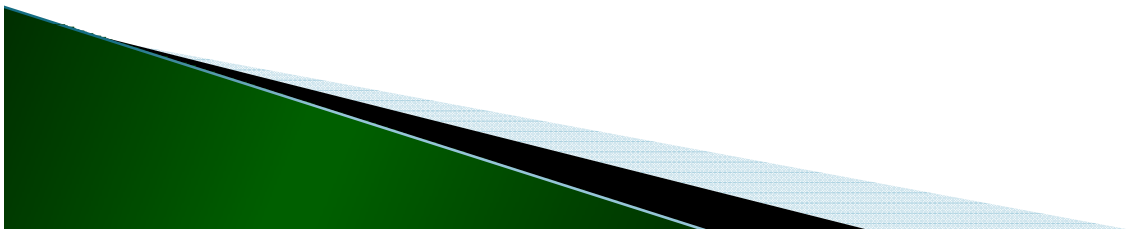


AFOCS EVM

Questions?



Backup Slides

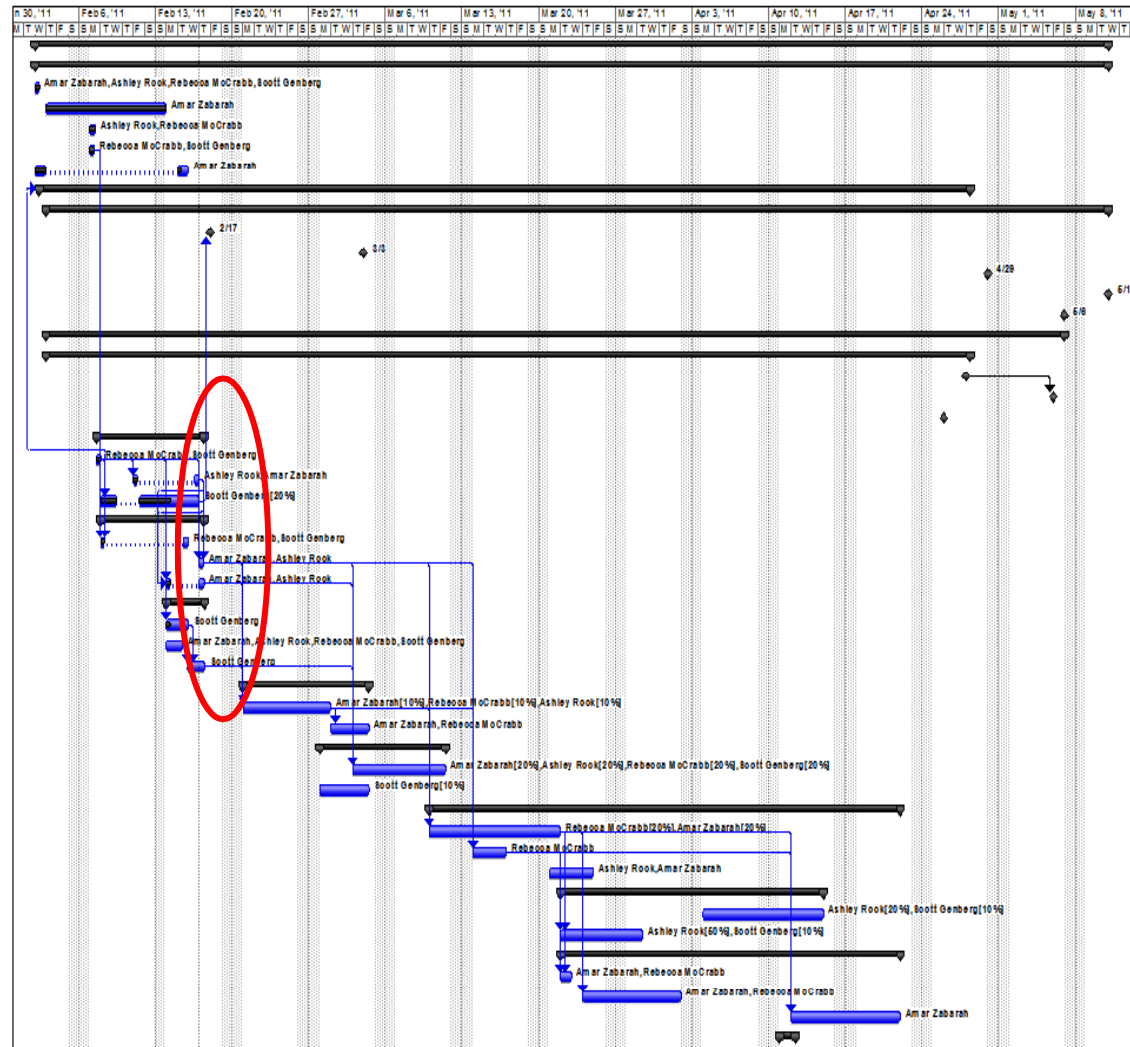


Initial Project Plan [3]

AFOCS_Project Plan						
ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	Air Force Operations Center Scheduling Project	568 hrs?	Wed 2/2/11	Tue 5/10/11		
2	Management and Reporting	568 hrs	Wed 2/2/11	Tue 5/10/11		
3	Kick-Off Telecon	2 hrs	Wed 2/2/11	Wed 2/2/11		Amar Zabarah, Ashley
4	Determine Project Plan and Work Breakdown Structure	4 hrs	Thu 2/3/11	Thu 2/3/11		Amar Zabarah
5	Define Group Responsibilities	4 hrs	Mon 2/7/11	Mon 2/7/11		Ashley Rock, Rebecca
6	Kick Off Meeting	2 hrs	Mon 2/7/11	Mon 2/7/11		Rebecca McCrabb, Scott
7	EV/M Review	16 hrs	Wed 2/2/11	Tue 2/15/11		Amar Zabarah
8	Meetings/Telecon (Biweekly)	496 hrs	Wed 2/2/11	Thu 4/28/11	35	
16	Deliverables	560 hrs	Thu 2/3/11	Tue 5/10/11		
17	Proposal	32 hrs	Fri 2/11/11	Thu 2/17/11	37	Scott Genberg[20%]
18	Interim Progress Report I	72 hrs	Mon 2/21/11	Thu 3/3/11		Amar Zabarah[10%],
19	Interim Progress Report II	72 hrs	Tue 4/19/11	Fri 4/29/11		Amar Zabarah[10%],
20	Optimization algorithm(s)	72 hrs	Thu 4/28/11	Tue 5/10/11		Rebecca McCrabb[25%]
21	Website	72 hrs	Tue 4/26/11	Fri 5/6/11		Amar Zabarah[25%]
22	Presentation that communicates results	544 hrs	Thu 2/3/11	Fri 5/6/11		
23	Status Report (Biweekly)	490 hrs	Thu 2/3/11	Thu 4/28/11		
31	Dry Run	4 hrs	Thu 4/28/11	Thu 4/28/11		
32	Final Presentation	8 hrs	Fri 5/6/11	Fri 5/6/11	31	
33	Final Technical Report	72 hrs	Tue 4/26/11	Fri 5/6/11		
34	Identification of Need and Problem Definition	69 hrs	Mon 2/7/11	Thu 2/17/11		
35	Extract Information from Stakeholders	2 hrs	Mon 2/7/11	Mon 2/7/11		Rebecca McCrabb, Scott
36	Review Preceding Documentation	4 hrs	Fri 2/11/11	Wed 2/16/11	35	Ashley Rock, Amar Za
37	Document Problem Definition	48 hrs	Tue 2/8/11	Wed 2/16/11	35	Scott Genberg[20%]
38	Encompass Boundary and Scope	67 hrs	Tue 2/8/11	Thu 2/17/11		
39	Define Objectives	4 hrs	Tue 2/8/11	Tue 2/15/11	6,35	Rebecca McCrabb, Scott
40	Define Assumptions	2 hrs	Thu 2/17/11	Thu 2/17/11	35,36,37	Amar Zabarah, Ashley
41	Define Constraints	4 hrs	Mon 2/14/11	Thu 2/17/11	35,36,37	Amar Zabarah, Ashley
42	Requirements Phase	27.9 hrs	Mon 2/14/11	Thu 2/17/11		
43	Identify Initial Requirements (originating)	16 hrs	Mon 2/14/11	Tue 2/15/11	35	Scott Genberg
44	Determine Derived Requirements	12 hrs	Mon 2/14/11	Tue 2/15/11		Amar Zabarah, Ashley
45	Document Preliminary Requirements	12 hrs	Tue 2/15/11	Thu 2/17/11	43,44	Scott Genberg
46	Define Algorithm	76 hrs	Mon 2/21/11	Fri 3/4/11		
47	Methodology	48 hrs	Mon 2/21/11	Mon 2/28/11	40,41,45	Amar Zabarah[10%],
48	Techniques	28 hrs	Tue 3/1/11	Fri 3/4/11	47	Amar Zabarah, Rebec
49	Detailed Design	76 hrs	Mon 2/28/11	Fri 3/11/11		
50	Concept of Operations (CONOPS)	52 hrs	Thu 3/3/11	Fri 3/11/11	40,41,45	Amar Zabarah[20%],
51	Determine and Document Final Mission Requirements	36 hrs	Mon 2/28/11	Fri 3/4/11		Scott Genberg[10%]
52	Performance Analysis	248 hrs?	Thu 3/10/11	Thu 4/21/11		
53	Modeling and Simulation	64 hrs	Thu 3/10/11	Mon 3/21/11	40,47	Rebecca McCrabb[20%]
54	Construct Code/Algorithm	24 hrs	Mon 3/14/11	Wed 3/16/11	40,47	Rebecca McCrabb
55	Validation Plan	32 hrs	Mon 3/21/11	Thu 3/24/11		Ashley Rock, Amar Za
56	Define Functional/Physical Architecture	144 hrs	Tue 3/22/11	Thu 4/14/11		
57	Define Operational Architecture	72 hrs	Mon 4/4/11	Thu 4/14/11		Ashley Rock[20%], Scott
58	Requirements Traceability	44 hrs	Tue 3/22/11	Tue 3/29/11	53,54	Ashley Rock[50%], Scott
59	Analysis	184 hrs?	Tue 3/22/11	Thu 4/21/11		
60	Evaluate Algorithm	8 hrs?	Tue 3/22/11	Tue 3/22/11	53,54	Amar Zabarah, Rebec
61	Testing	56 hrs	Thu 3/24/11	Fri 4/1/11	53	Amar Zabarah, Rebec
62	Decision Analysis	64 hrs	Tue 4/12/11	Thu 4/21/11	53,54	Amar Zabarah
63	Cost Analysis (Maybe)	10 hrs	Mon 4/11/11	Tue 4/12/11		

AFOCS Project Schedule

Initial Project Plan [4]



AFOCS Project Schedule