LEVEL | 0

Building from the ground up

Systems Engineering Proposal to NOVEC

Northern Virginia Electric Cooperative (NOVEC)

The following is a description of an identified scope of efforts, timeline and deliverables to improve the current system NOVEC employs to share maintenance costs on utility poles that include 3rd party attachments.

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Introduction

Company Description

NOVEC is a locally based and locally owned electric distribution cooperative headquartered in Manassas, Virginia. NOVEC's long-term energy strategy is to deliver to its customers a locally controlled energy supply that is reliable, environmentally responsible, and competitively priced.

NOVEC's service territory encompasses 651 square miles with more than 6,790 miles of power lines. NOVEC provides reliable electric service to more than 150,000 homes and businesses located in Clarke, Fairfax, Fauquier, Loudoun, Prince William and Stafford counties, the City of Manassas Park and the Town of Clifton, all in the state of Virginia.

NOVEC maintains satellite offices strategically located throughout our service territory in Manassas, Gainesville, Leesburg, Minnieville, and Stafford.

Background

To distribute power over such a large geographic region, NOVEC maintains over 60,000 utility poles used to distribute power to Northern Virginia. Government regulations require NOVEC to allow dual-use of the existing infrastructure for authorized 3rd party venders.

- Per VA Code § 56-466.1 a public utility shall permit, upon reasonable terms and conditions and the payment of reasonable annual charges ... the attachment of any wire, cable, facility or apparatus to its poles or pedestals, or the placement of any wire, cable, facility or apparatus in conduit or duct space owned or controlled by it, by such telecommunications service provider or cable television system that is authorized by law, to construct and maintain the attachment, provided that the attachment does not interfere, obstruct or delay the service and operation of the public utility or create a safety hazard.

3rd party vendors utilize NOVEC's infrastructure to attach additional wires to support non-power providing infrastructure mainly used to provide telephone, internet and television services to customers who also receive electrical power.

Figure 1 - Utility Pole supporting Electrical Power Distribution, Cable and Telephone infrastructure.

Given this relationship, NOVEC is responsible to estimate and charge fees to 3rd parties to cover the additional costs incurred to successfully host the additional attachments. The fees are first approved by regulators and then distributed to the 3rd parties based on estimates that account for additional maintenance costs for services that include tree trimming, pole replacement/upgrade and storm repair.

Problem Statement

Dual-use of the utility poles with 3rd party vendors poses challenges for maintaining the infrastructure and cost sharing between NOVEC and vendors. NOVEC is the responsible party for maintaining the utility pole infrastructure. Maintenance, as defined by NOVEC, is three faceted and includes tree trimming, pole replacement/upgrades, and storm repair. In each of these areas technicians and subcontractors provided by NOVEC are required to handle the 3rd party attachments to complete each type of work order.

A system is desired to enable NOVEC to accurately determine the specific costs attributed to maintaining associated 3rd party attachments. The system will enable NOVEC to effectively share the additional cost incurred from 3rd party attachments. The objective is to improve cost sharing and tracking of 3rd party attachments that will ultimately improve service for the end customers.

Stakeholders

- NOVEC
- Northern VA Government
    - City
    - County
    - State
- Consumers
- Companies requesting 3rd Party Attachments
- Contractors performing tree trimming
- Contractors performing power line repair

Scope

Several options exist for improving the situation described in the problem statement. Options range from working to influence the local regulator policy through interacting with local, state, and federal laws regarding the government's role in regulating utility pole management to providing a detailed design solution for total process improvement at NOVEC. After revising the problem statement and dialogs with NOVEC, the GMU team will focus only on understanding internal process improvements that focus within the NOVEC division described above to capture details that will provide the basis for a gap analysis that will enable the GMU team to provide reports suggesting options for improvements in the current NOVEC system. Also, for maintenance considerations, NOVEC has scoped the group into only considering the tree trimming and pole replacement/upgrade aspects of their field maintenance.

The efforts detailed in this SOW will be completed by mid-December with no follow-on efforts from the current GMU team members.

Assumptions

1. NOVEC will provide access to the 3rd party cost data, Geographic Information System (GIS) data on utility poles
2. The information given by NOVEC is true to the best of their knowledge (i.e. any sample data given is representative data for the whole company.)

Approach / Task Description

Through initial discussions with NOVEC we have refined the problem statement and propose to conduct a gap analysis for NOVEC focused on current business processes and cost estimation methods associated with 3rd party attachments. This analysis

will consist of the team members conducting field studies and interviews with NOVEC personnel to determine what the current processes are. Based on these studies, analysis will be performed to help NOVEC better understand where their processes are good and bad and help them in understanding the solution space for their current problem. This analysis will be presented to NOVEC as a part of the final deliverable.

Based on the results of this fieldwork and analysis, the GMU team will develop a target architecture designed to improve the tracking of 3rd party installations and associated maintenance cost.

The team's approach for development of this architecture is as follows:

- The GMU team will conduct a series of interviews with maintenance, administrative management and subcontract personnel to fully understand current processes for 3rd party installations and maintenance costs.
- The GMU team will observe activities associated with maintenance of 3rd party attachments including; tree-trimming and routine maintenance (as scoped by NOVEC). Routine maintenance means any maintenance done to a pole to keep it operational and not performed due to adverse effects of weather. (i.e. regular wear and tear on a pole, fixing/maintaining equipment on the pole, etc.)
- The GMU team will analyze current IT Architecture and associated GIS and Survey databases. These databases are key to understanding how information flows from the field back to the home office. These databases will provide critical information for NOVEC to track costs. Understanding how they work and interact with one another is crucial for any architecture we will propose for NOVEC.

Based upon gap analysis findings the GMU team will; draft a requirements document defining the specification for a future system.

Using the requirements document the GMU team will; develop an architecture for NOVEC that addresses the problem statement. This architecture will define current processes and develop new processes (or process steps) that are required to understand and capture maintenance costs of 3rd party attachments to their poles. This architecture will assist NOVEC with capturing the cost associated with maintaining these 3rd party attachments as well as

Using the developed architecture, the GMU team will prototype Use Cases involving stakeholder interaction to verify and validate the proposed architecture with NOVEC.

The GMU team will also develop a rough order of magnitude (ROM) estimate for the cost of the proposed architecture. The ROM is an estimation of the level of effort and cost to complete a proposed architecture. Given NOVEC has an existing IT

Architecture, the GMU Team expects to identify potential enhancements that will address the problem statement The ROM should have an accuracy of +/- 50% based on expert knowledge and experience of the GMU team.

Deliverables

The team will deliver several documents to NOVEC as a part of this project. These documents will include: A gap analysis report; a requirements document; an architecture model; and a cost estimation model.

Gap Analysis Report

The gap analysis report will document the solution space of the problem for NOVEC. It will contain the findings of the team from its field and infrastructure surveys. These surveys will be informally conducted interviews with NOVEC subject matter experts. The assumption the team makes is that their contact at NOVEC, Mr. Bryan Barfield, will allow them to speak with the correct person(s) in order to gain knowledge from first hand users. These surveys will provide the team with an honest picture of how NOVEC's current processes work. This will allow the team to understand where there are differences between the processes as they are stated and understood at higher management levels and how they are actually implemented at the working levels. The analysis will document current processes associated with 3rd party billing. It will explain to NOVEC where there are potential areas to operate more efficiently and effectively. It will be a baseline document from which the other documents are derived from.

System Capabilities Document

The system capabilities document will document the capabilities, in the form of requirements, to provide a solution for NOVEC. The goal of this document is to provide NOVEC a set of verifiable requirements allowing them to solicit RFIs from outside companies to develop the proposed architecture. We plan on doing verification and validation by way of interviews with NOVEC personnel. This will allow them an open forum with us to communicate their thoughts on our requirements. This will enfranchise them in this project and allow us to refine our product to make it useful for NOVEC. This document will be worked in conjunction with NOVEC for their buy-in and editing to ensure that it will meet their future needs.

Reference Design Model

The reference design is a potential design solution that can be used to help NOVEC evaluate proposals for performance, utility and cost when soliciting RFIs (and

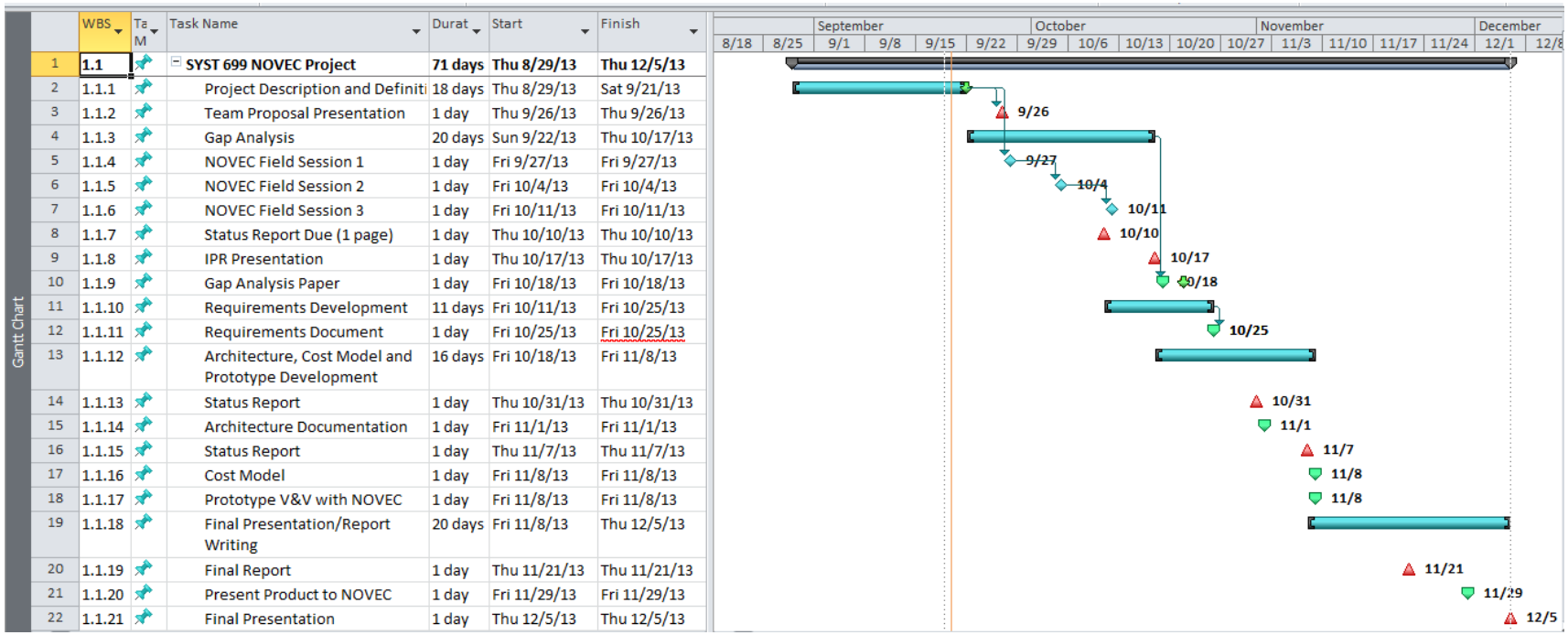
potentially a future RFP). This architecture will flow down from the requirements document. Once developed, we will work with NOVEC for verification and validation. To do this we will create common use cases and work through them with NOVEC. Documentation of the model will be provided in the final report.

Cost Estimation Model

The cost estimation model will provide NOVEC with a rough order of magnitude of the costs associated with implementing the proposed architecture. This model will output cost data. It will be V&V with NOVEC's support.

Project Plan

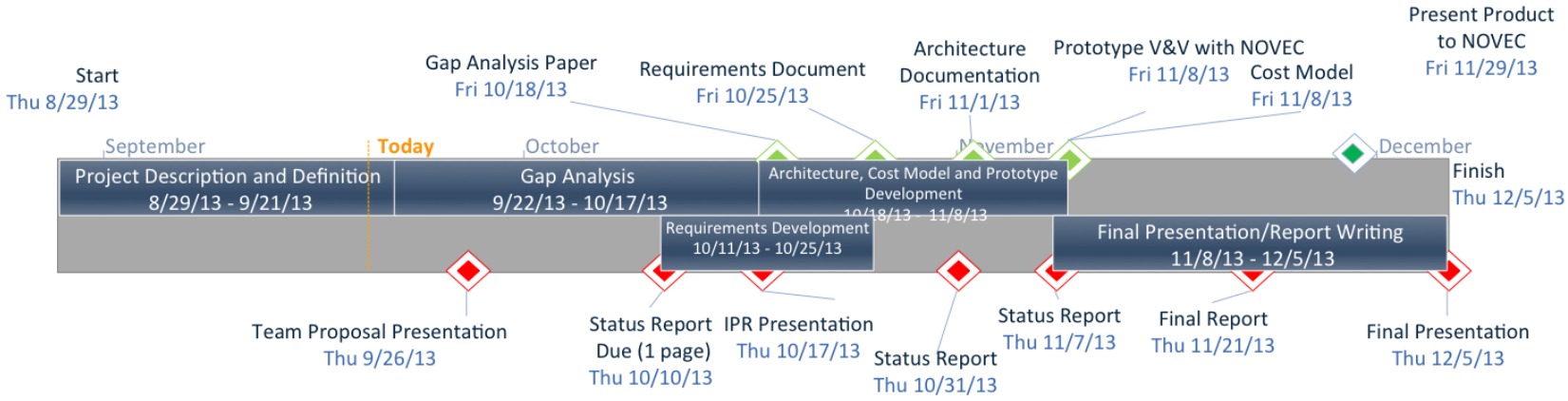
Below is a detailed project plan outlining the flow of events showing how each effort will tie into and support future work and deliverables. The plan is subject to updates throughout the effort and is meant to provide a backdrop to align the interactions between the GMU team, NOVEC, and classroom activities.



Gantt Chart

	WBS	Ta M	Task Name	Durat	Start	Finish
1	1.1		**SYST 699 NOVEC Project**	**71 days**	**Thu 8/29/13**	**Thu 12/5/13**
2	1.1.1		Project Description and Definiti	18 days	Thu 8/29/13	Sat 9/21/13
3	1.1.2		Team Proposal Presentation	1 day	Thu 9/26/13	Thu 9/26/13
4	1.1.3		Gap Analysis	20 days	Sun 9/22/13	Thu 10/17/13
5	1.1.4		NOVEC Field Session 1	1 day	Fri 9/27/13	Fri 9/27/13
6	1.1.5		NOVEC Field Session 2	1 day	Fri 10/4/13	Fri 10/4/13
7	1.1.6		NOVEC Field Session 3	1 day	Fri 10/11/13	Fri 10/11/13
8	1.1.7		Status Report Due (1 page)	1 day	Thu 10/10/13	Thu 10/10/13
9	1.1.8		IPR Presentation	1 day	Thu 10/17/13	Thu 10/17/13
10	1.1.9		Gap Analysis Paper	1 day	Fri 10/18/13	Fri 10/18/13
11	1.1.10		Requirements Development	11 days	Fri 10/11/13	Fri 10/25/13
12	1.1.11		Requirements Document	1 day	Fri 10/25/13	Fri 10/25/13
13	1.1.12		Architecture, Cost Model and Prototype Development	16 days	Fri 10/18/13	Fri 11/8/13
14	1.1.13		Status Report	1 day	Thu 10/31/13	Thu 10/31/13
15	1.1.14		Architecture Documentation	1 day	Fri 11/1/13	Fri 11/1/13
16	1.1.15		Status Report	1 day	Thu 11/7/13	Thu 11/7/13
17	1.1.16		Cost Model	1 day	Fri 11/8/13	Fri 11/8/13
18	1.1.17		Prototype V&V with NOVEC	1 day	Fri 11/8/13	Fri 11/8/13
19	1.1.18		Final Presentation/Report Writing	20 days	Fri 11/8/13	Thu 12/5/13
20	1.1.19		Final Report	1 day	Thu 11/21/13	Thu 11/21/13
21	1.1.20		Present Product to NOVEC	1 day	Fri 11/29/13	Fri 11/29/13
22	1.1.21		Final Presentation	1 day	Thu 12/5/13	Thu 12/5/13

Another way to view the project schedule in one timeline is shown below. Deliverables for both NOVEC and GMU class are included in this view to depict the synergy each deliverable will provide. The view enables stakeholders to get a quick overview of what inputs are required to help achieve a deliverable and to ensure deliverables are reviewed for potential feedback in a timely manner.



Definitions

Term	Definition
3rd Party Attachments	any attachment by a cable television system or provider of telecommunications service to a pole, duct, conduit, right-of-way or similar facility owned or controlled by a public utility (in this case NOVEC).
Utility Pole	A pole (typically made of wood) used to support overhead power lines and various other public utilities, such as cable, fiber-optic cable, and related equipment such as transformers and streetlights.