

**DECISION MODEL FOR SELECTING
THE BEST TELECOMMUNICATION
SWITCHGEAR FOR FAA AIR TRAFFIC CONTROL
CENTERS**

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Abstract

Lockheed Martin is engaged in a competitive bid for modification and overhaul of the FAA ground based telecommunications system. Lockheed Martin is competing against two other major prime contractors for this award. The two other teams are MCI-World COM and Harris Electronic Systems. Lockheed Martin has teamed with AT&T on the order. A major component of the procurement involves the selection of telecom switches, the FAA has indicated a desire for the provider to utilize commercial off the shelf products for use by others and for easy expandability. The equipment will be used to link FAA facilities through a network of connecting backbone fiber, completing local area networks (LAN) and wide area networks (WAN).

The Lockheed Martin Team must determine which switch solution will best meet the needs of the FAA and at the same time offers the best value. The FAA Selection Committee has assigned a significant weighted score to the proposal section involving the switch solution. The company receiving a superior grade in this area will be in a strong position to be awarded the overall contract.

Background

The Federal Aviation Administration (FAA) has issued a Request For Proposal (RFP) to upgrade the telecommunications equipment which links the twenty-two major air traffic control centers in North America. The network of circuits provides the means for center-to-center ground communications and acts as a back up for air-to-air communications. The system is primarily used for mission critical commercial air traffic control across North America. The equipment upgrade involves the installation of new state of the art switches, which support voice, data and video. This new technology enables the FAA to streamline their communication needs by routing these services through one network as compared to the existing technology, which has independent voice, data, and video networks. In the past eighteen months the existing equipment has had unacceptable failure and availability rates that have affected the overall performance of the system. Through this procurement the FAA anticipates increasing its reliability/availability to 99.99999% (five nine's) for ground based telecommunications traffic.

In order for the prime contractor to be deemed compliant for the switch solution, the FAA has listed a set of minimum evaluation qualifications/criteria, which is discussed in the "Vendor Selection" section of this report. The FAA will conduct an extremely rigid set of testing procedures on the switch solution that will be conducted jointly between the contractor and the

FAA prior to installation. Also, a key part of the proposal response involves the method that such equipment will be transitioned into service and the approach to be used for a “zero loss of service” during transition (zero down time while switching circuits from old equipment to new equipment).

The RFP states the FAA will evaluate responses based on:

- Equipment specification compliance
- A transition plan that offers the least risk to the FAA
- A delivery schedule consistent with the urgency surrounding the current state of the existing equipment
- A response that provides the best value.

Opportunity

The opportunity that Lockheed Martin is presented with is to select a vendor that is totally compliant with all facets of the FAA specification for the switch solution. The Team will use a software tool to aid in the decision. The software chosen is ExpertChoice, and utilizes the Analytical Hierarchy Process (AHP) to make educated and weighted decisions.

Four suppliers have been pre-qualified based on manufacturing data and financial strength (corporate position). The vendors are as follows: Lucent Technologies, Cisco Systems, Alcatel, and Marconi/Fore. The four suppliers are well known in the communication industry, and at the time of pre-qualification considered equally formidable. This opinion/rating makes the use of the software model that much more important in that there is a foundation for the decision to be made without bias. Lockheed Martin will hold a bidders meeting to answer questions about the specification and to assure a thorough understanding of the requirements.

Vendor Evaluation

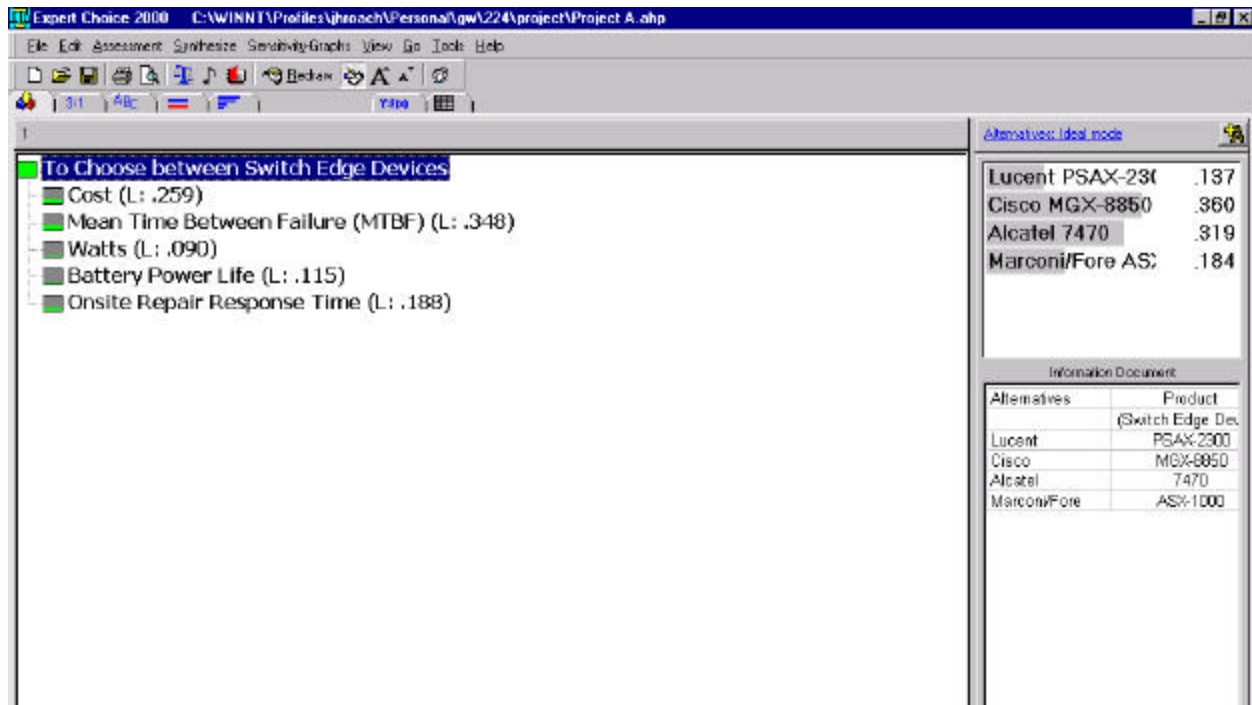
The criteria that will be used to evaluate each of the four suppliers will be:

- 1) Mean Time Between Failures (MTBF): The time between failures of the equipment measured in hours.
- 2) Cost: Actual cost of the switch including all base warranty and extended warranty costs, sustaining engineering costs and technology refresh/upgrades.
- 3) Watts: The amount of energy in watts that the hardware will generate. Higher wattage requires significant space and cooling requirements.
- 4) Battery Power Life: Equipment that can function for a specified time (in hours) in battery mode after the loss of primary power (AC).
- 5) On-Site Repair Response Time: The time from when an emergency call is placed to the supplier to the time that a supplier representative is on-site.

"Mean Time Between Failure", "Watts", "On-Site Repair Response Time", "Cost", and "Battery Power Life", are the five items that will be the criteria that the prospective suppliers will be judged upon. The sequence of importance, as determined by the Lockheed Martin Team after reviewing the specification and its knowledge of the FAA, is as follows: "Mean Time Between Failures", "Cost", "On-Site Repair Response Time", "Battery Power Life", and "Watts". The hierarchy was organized into ExpertChoice at the goal level by, preference and intensity, by the Lockheed Martin Team.

Selection

The overall selection process will primarily depend upon the results generated through the use of the AHP model using ExpertChoice. Upon the selection by the AHP model and the Team, Lockheed Martin personnel will make a formal recommendation to senior management in which the results will be presented for a decision. The AHP model provides a framework to aid in evaluating the complex decision scenario. The framework will ensure a better understanding of the problem, criteria and ultimately assist the Team in determining the final selection. The data was accumulated as part of a Lockheed Martin's request to each of the pre-qualified vendor. The evaluations of the suppliers with respect to the tools used in the model were established by the criteria contained in the FAA specification and Lockheed Martin analysis from other similar



Results and Analyses

Based on the rankings discussed above the graphical pairwise comparison function in ExpertChoice produced results for the five primary objectives. The result enabled the team to determine priorities for the stated criteria. The team as measures of intensity relative to each other agreed upon the stated weights.

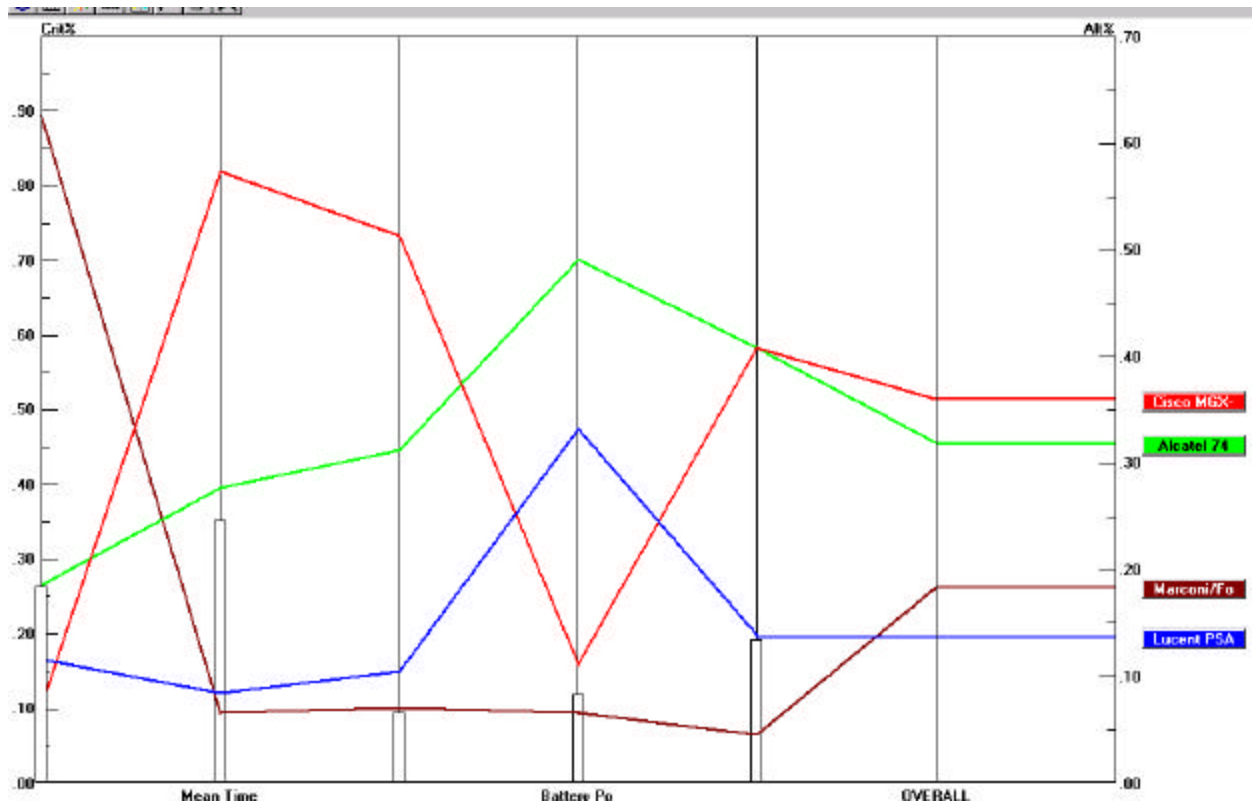
As shown, “Mean Time Between Failure” was given the largest preference. The FAA specification emphasizes reliability and air traffic control is obviously considered “mission critical”. The second most important factor or criteria is the cost of the equipment itself. The FAA has funding/budgetary issues, it can justify higher costs in this area but ultimately it must be in accordance with FAA appropriations. The remaining three categories were closely grouped but again, based on the FAA specification and industry/past experiences the ranks as shown were applied.

- Cost - .259
- Mean Time Between Failure - .348

- Watts Required - .090
- Battery Power Life - .115
- On-Site Repair Response Time - .188

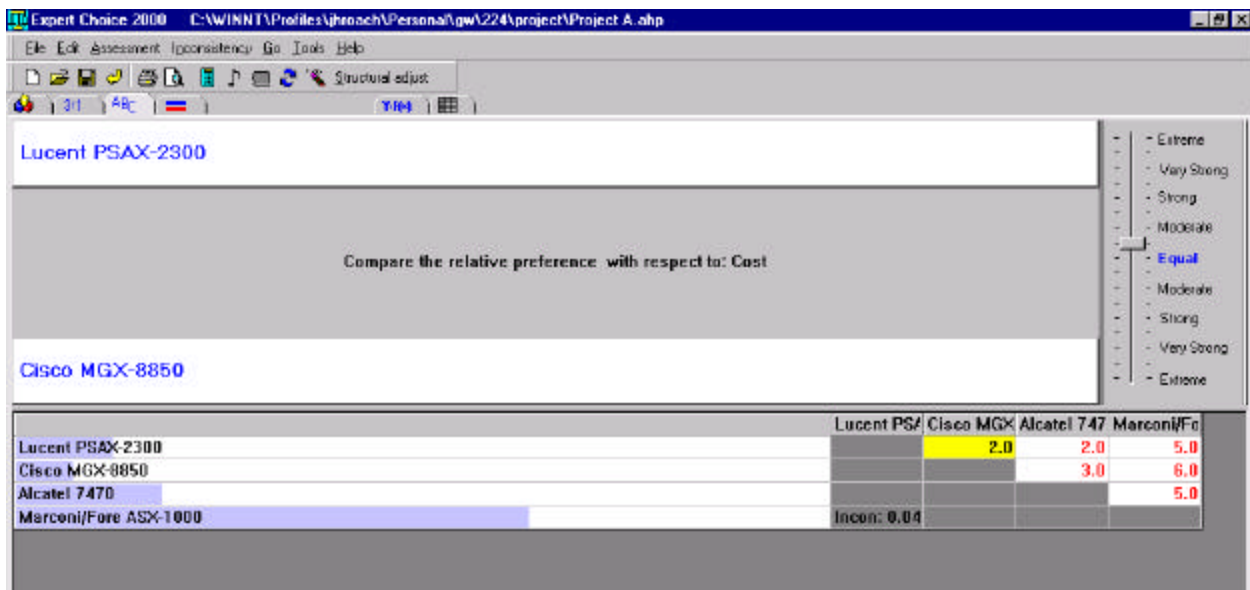
Sensitivity Analysis

Figure 1-a shows through a performance sensitivity analysis between the four alternatives, Cisco Systems measured strongest due to their reliability/MTBF ratings.

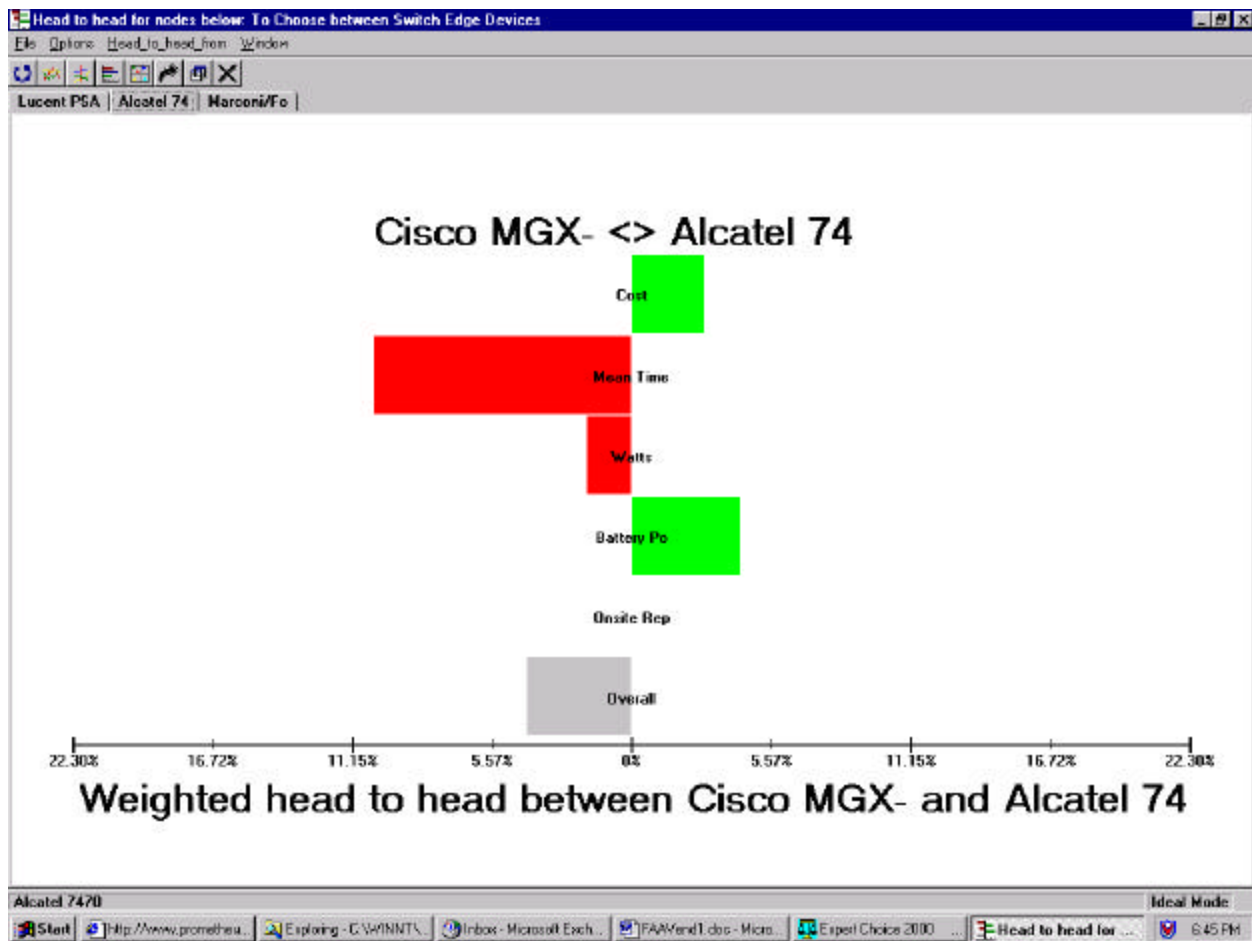


Cisco was weak in the area of Battery Power but was overshadowed by their performance on the two top measures. (It should be noted that if at a later date it is desired to change the priority of the criteria used, it could be done. Within ExpertChoice, there is the ability to move the intensity evaluation of the criteria, and see how the choices are more in relation to each other. This enables the model to be developed at an early stage and then changed if different opinions deem it necessary)

The team performing this analysis structured the complexity as a hierarchy and have derived the ratio scale measures through pairwise relative comparisons. This pairwise comparison was performed utilizing the five parameters mentioned earlier. The comparison incorporates redundancy thereby permitting us to derive accurate priorities. This redundancy is noted by the Icon box in the figure below. As shown, there is a comfortable level of accuracy in the pairwise comparison because the Icon is less than the value of 1. It is important to realize that decisions should not be changed in the comparison just because a value is greater than one. However, this is a good way to check for either errors or relative judgment.



An additional important tool used in the decision comparison is the head-to-head tool. This allows one to look at the attributes or criteria of two alternatives relative to just each other. The figure below shows the top two alternatives, Cisco and Alcatel. This figure illustrates that the Mean Time Between Failure is a major factor in driving the overall preference for Cisco switches.



Conclusion

Cisco was chosen by the working Team and was recommended to the Sr. Management Team. The data contained in this report will be distributed to the committee for discussion/final approval. The ExpertChoice model aided the team in reaching its conclusion. Cisco offers the best overall value to Lockheed Martin and the FAA. With “Best Value” being a key measure, the Lockheed Martin Team should receive a score that is consistent with being fully compliant. Cisco has agreed to work with the Lockheed Martin Team during the pre-award period and has agreed to continue to improve even further on the design of the chosen switch.