
An Expert System for Network Router Configuration

Conclusion and References

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1. Conclusion

Results

The system is able to produce a simple configuration script based on a short interview with the user. And the interview questions can be extended by adding new python modules and new rules to the Knowledge-base.

Discussion

Of the top five common issues in software projects, two definitely plagued this project. Insufficient end-user involvement and an inaccurate estimate of needed resources.

The lack of native support for backward-chaining in the knowledge base, CLIPS, presented some challenges. For the small scale of rules in this project, however, the simulation of backward-chaining was effective. However, this simulation has not been tested on a large-scale knowledge base. A major problem in this project was acquiring Subject Matter Experts (SME) to add facts to the knowledge-base. The knowledge-base was developed from OpenWRT How-Tos and Recipes but it is unclear how well those How-Tos include practical knowledge or heuristics[10]. In the meantime, a never-ending cycle of research ate all development time. Too much time was spent on researching networking scenarios and ways to maintain a knowledge base. Time should have been spent integrating CLIPS and the web framework.

This has been a learning experience on what is manageable for one individual and the author would like to thank his committee for encouraging him to down-size from his original, unmanageable, proposal.

Throughout this project there has been a struggle to reconcile the theoretical with the practical. At one point, the system architecture was developed by using Data Flow diagrams. UML diagrams were presented afterwards but these Object-oriented artifacts were incompatible with the Data Flow artifacts which were derived from functional decomposition. Software engineering document templates from IEEE were closely followed for the Vision and SRS documents but many parts of the Software Description Document template had to be re-worked.

The WRSPM reference model was a big risk for this project since it is very new concept. However, never has developing requirements been easier. With the WRSPM reference model, the World and Machine entities inform and, more importantly, provide constraints on requirement and specification development.

2. Future Work

This is just a first step in enabling users a better experience with their routers. The quality of the knowledge base will directly reflect the quality of this software product. However, knowledge representation is hard and indeed, the main disadvantage of Expert Systems is quality of the Knowledge-base. One approach to alleviate the difficulty developing the knowledge-base is Business Domain Development (BDD). Software testing packages such as Cucumber, Lettuce, and Behave, allow non-technical domain experts, or subject matter experts (SME), write test cases for software. This allows the SMEs to define software test cases in natural language text. BDD then is analogous to writing a unique scenario for a fixed software engine to carry out, just like a knowledge-base is written for an inference engine. BDD should then be considered to allow SMEs to develop knowledge-bases as natural language text files.

3. Source Code

Source code versioning for this project was managed with a local git repository. The source code may also be browsed publicly online at github.com at <http://github.com/mkpz/erc>

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