

The Advantages of Modular Design in Software Engineering

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INTRODUCTION

When deciding to develop software there are many factors one must consider before the actual programming begins. These factors include considering program functionality, what programming language to use, and what design technique to use when developing the software. Software engineers have a multitude of design techniques at their disposal. All of which have advantages and disadvantages over the other. While no technique is considered the absolute best, some are more advantageous based on the team using them and the project they are applied to. This poster is going to focus on one such design technique, modular programming.

Abstract

The purpose of this research poster is to discuss the benefits of using a modular approach to software engineering. Modular software design is done by breaking the larger code into smaller sections, think modules, that hold specific functions. Modular design is shown to improve the design process by allowing better re-usability, workload handling, and easier debugging processes.

OBJECTIVES

To analyze the benefits of using a modular design approach for software over other approaches.

METHODS

- Observe pros and cons of modular programming
- Look at what we can learn from real world examples of modular programming

Examples of Programs that Use a Modular Framework

Robot Development Kit (RDK)

- Went with a modular design for more flexibility and reusability. This makes the software easy to use for various people throughout the years for various robots and tweaked for specific preferences. The reusability also contributes to the ease of use for the development kit.

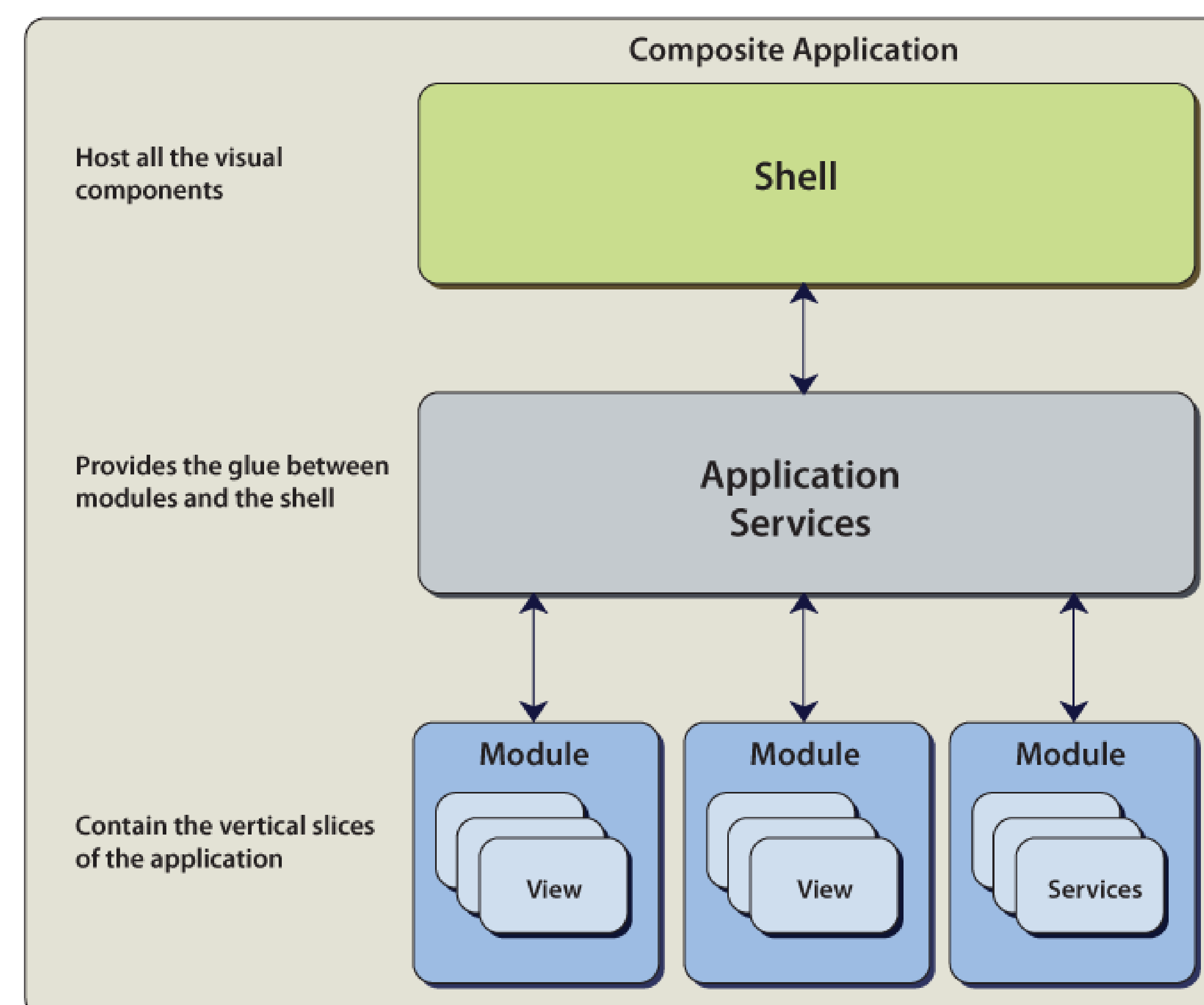


Figure 1. General diagram of modular program

Examples (CONT.)

AuTuMN

- AuTuMN is a program created to simulate response to tuberculosis. Since TB is a disease that affects people of varying risk groups differently and is more or less infectious based on the infected organ, a complex system must be used to analyze this data to appropriately treat TB. Using a modular system, this program is able to deal with these massive amounts of complex data in order to aid in treating patients around the world.

Modular Robotic System (MRS)

- The development of the MRS shows the benefits of being able to change out modules for a specific function. Because of various benefits and flaws of using different algorithms to provide different functions for the robots, a modular system allows flexibility in the design when considering which algorithms should be used.

Advantages	Disadvantages
Allow each module to be written separately without having to know code of other modules	Requires documentation to be thorough and well communicated
Faster development time due to parts being split up across team members and problems handled in chunks.	Designed to be used primarily for large systems; not effective unless used on a large scale
Modules allow for greater flexibility of the overall program	More effective when several people are sharing work
Individual modules are highly reusable, this Cuts down costs and reduces time taken on future projects	Increased Program complexity
Bugs are less frequent and easier to detect as they will exist in the module they originate from	
Shorter programs	

CONCLUSIONS

There is substantial evidence to suggest modular software design has more advantages than disadvantages and is a fairly good choice to consider when thinking of methods used to design software. There is not substantial evidence to suggest how much better, if at all, it is than other design techniques however. This is something that could be considered for future studies which would further help companies when designing software.

FUTURE WORK

There is not as much hard data driven evidence of the benefits of using a modular design approach over other types of approaches. One way to change this is potentially perform a field study to observe development teams that use various approaches to software design. In this type of study the design technique used would be a control variable and the response variables of productivity, cost, bugs that had to be handled, development speed and so forth. Given the reusable nature of modular programming this study would ideally follow the team through multiple projects to see how the reusability effects development.

References (Calibri, 40 points, bold)

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