

CS 578 – Software Architectures

Fall 2013

Homework Assignment #1

Due: *Friday, October 4, 2013*

– *see course websites for submission details* –

Introduction

We will focus on selecting and designing a set of components, connectors, and architectural styles that satisfy the requirements and complete the challenges of the Next Generation Climate Architecture description provided to you in supplementary documentation.

This assignment aims to help you understand how to decompose the description of a desired system and its requirements into components and connectors, how to select and leverage appropriate architectural styles for the system, and how to compare and contrast the advantages and disadvantages of one architectural style over another.

Design Activity

To begin, you will take the next step in decomposing Figure 2 in the supplementary documentation, which is the Level 0, or “high level” functional description of the Next Generation Climate Architecture (NGCA). The architecture should be refined into sets of database components; connectors that describe their interactions; protocols that describe the control and message flow between the components; high level service components that describe how to manipulate, access, and transform climate models and remote sensing data to make them comparable. This activity will result in your production of a “Level 1” or refined architectural description of NGCA. Your design activity here can begin using any of the methods discussed in class (e.g., brainstorming; drawing from other domains, or by analogy; via literature searching, etc.) Please identify the design activity that you selected (you can use more than one).

Architectural Styles

You will select two architectural styles (e.g., layered, pipe and filter, etc.) as part of your design activity that will yield two possibly different architectural instances. Describe the style constraints e.g. types of components and connectors and constraints on which these elements can communicate with each other and the properties exhibited by each style selected. Explain which set of components and connectors from your design adhere to the style constraints of your selected styles. If you have decided to include a connector not typically associated with your selected architectural styles, please explain why you chose to deviate from your chosen styles.

Components and Connectors Induced by the Style

For each style selected in the previous activity, produce a diagram of your Level 1 NGCA architecture as defined by the style. Include the components, connectors, and associations between components and connectors in your diagram. Please ensure that your diagram is readable. Provide a description of each component and connector. Your description should name each component, explain the key functionalities of each component, and explain the set of connectors selected for the system. We recommend that you answer this question as a bulleted or numbered list or in the form of a table.

Requirements and Key Architectural Challenges

Select a subset of your components and connectors and describe how they satisfy two of the requirements of the NGCA system as specified in the supplementary document. Please avoid saying that all your components and connectors together satisfy the two requirements. Instead describe how the functionalities or properties of each component and/or connector work together to satisfy a particular requirement.

Select a subset of your components and connectors and describe how they deal with the two of the key architectural challenges of the NGCA system. Please avoid saying that all your components and

connectors together deal with the two architectural challenges. Instead, describe how the functionalities or properties of each component and/or connector work together to complete a particular challenge.

Use-case scenarios

For each of your styles selected and subsequent architectures derived, come up with a use-case scenario for the NGCA system then describe each component and connector involved in that use case scenario. Your use case should illustrate how the particular architectural style either does or does not address a key challenge, or a key requirement that you have previously selected. Each use case can be demonstrated graphically with a diagram and then text should also be provided to illustrate the use case.

Deliverables

Please limit your answers to 3 pages. Any diagrams you create are not included in the page limitation. Please include all your text and figures in a single PDF file named:

<lastname>_<firstname>_csci578_mattmann_fall2013_HW1.pdf.

For example, if your name is Joshua Garcia then the name of the file would be **Garcia_Joshua_csci578_mattmann_fall2013_HW1.pdf**.