**Requirements Engineering and Architecture Design In-class Activity**

You will conduct various requirements engineering and architecture design activities for the product described below. This is intended to be primarily an in-class activity although it is certainly permissible to work on it outside of class. The objective is to provide a concrete example to practice applying lecture material. As time permits, you may be asked to share your work for class discussion. Document your work using the worksheet template below that will be submitted to the appropriate drop box as we go along. You will be graded on the quality and appropriate quantity (effort) of work.

Note: This is a sophisticated and complex system. As an architect think strategically; take a system view, and think large scale.

**Case Study: Internet TV**

Say good bye to traditional broadcast and cable network channel content providers, distributed exclusively on subscription cable and satellite networks, and over the air broadcast networks. The future of the TV experience will be Internet based content interaction and distribution based on flexible purchase options including on demand pay as you go (iTunes), bundled and unbundled subscriptions (e.g., ESPN only), and free content with advertising.

The system to support this emerging content distribution market will include an in-home device supported by backend content providers, web servers, and Internet service providers. The in-home device will be available in several configurations supported by a software product line. The software may be integrated within the TV itself or it may be embedded in a set top box. It may also be acquired as a software only package to run on a lap top computer that uses the TV as a monitor. The first two packaging options will include a wireless keyboard that serves as a combination TV remote/application keyboard. A minimalist wireless universal remote control device is another option. In addition to a high speed Internet connection, the in-home device will also have the ability to connect to an in-home wireless network for access to any home network connected device such as a network storage device. The in-house device is NOT a replacement for a general purpose computer. It is specifically targeted at high definition (HD) quality multi-media consumer entertainment and social networking.

The following list contains a non-exclusive list of scenarios that will be supported. The software architecture will need to support the addition of new scenarios in future devices based on consumer demand and technology availability.

- **Web browsing** – access to any web site application and content. There should be no system constraint on what sites are accessible, and what data content are exchanged bidirectionally. There should be no loss in visual content fidelity.

- **Access home system based content** – The system should be able to access (CRUD) content stored on a home storage device. Typically, that will include multi-media files such as music, photos, and videos.
Access to streaming traditional TV channel content – a software “tuner” is available to access digital channel streams with options to time delay viewing.

Apps – the in-home devices should have the ability to download, save, and run mobile device apps on multiple mobile device platform virtual machines.
Worksheet Template

1. **Elicitation** (10 points)
   - **Interview questions** – Read through the system synopsis. What requirements questions do you have? Document 5-6 questions and use them to interview the customer (instructor) as necessary to elicit requirements for one major product feature. Interview one other potential user to elicit requirements. Document several (5-10) significant functional and non-functional requirements.

2. **Vision and Scope** (10 points)
   - **Identify stakeholders** - identify and briefly profile key stakeholders. They should include direct users as well as represent indirect business interests.
   - **Problem and vision statement** - formulate a problem statement and a vision statement of the solution
   - **System Boundary** - determine the system boundary and represent as a system context diagram.
   - **Profile users** - identify and name the primary user roles. For one of the primary users identified above, describe that user’s goals for using the system. Profile that user using the following table.

<table>
<thead>
<tr>
<th>User Role</th>
<th>Name, brief description of the role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context of Use</td>
<td>E.g., frequency of use, environment, etc.</td>
</tr>
<tr>
<td>Abilities</td>
<td>E.g., education, technology skill, etc.</td>
</tr>
<tr>
<td>Personal Information</td>
<td>E.g., age, gender, etc.</td>
</tr>
</tbody>
</table>

3. **Use case modeling** (15 points)
   - Develop use case model for the system represented by a use case diagram.
   - Detail one significant use case.
   - 1) Model the detailed use case using stereotype classes 2) refine by adding responsibilities and attributes; 3) develop an interaction diagram 4) what did you learn about the requirements?

4. **Document ASR's** (10 points)
   - Document some (minimum of five) architecturally significant requirements. Why are they architecturally significant?

5. **Quality attributes and tactics** (10 points)
   - Create a QA utility tree for this system. Assign priorities.
   - Write a tabular scenario for the highest priority QA.
   - What design tactics do you think would be appropriate to support the scenario?

6. **First order software architecture design** (10 points)
Create a high level module view of a software architecture design. Explain your design rationale.

7. **Design refinement** (20 points)

One of the core system requirements for the Internet TV system is the ability to read incoming real time streams of encoded broadcast video for user viewing on displays. All of the following computational steps are required to process incoming video for display:

- Digital rights management validation
- Variable length decoding
- Inverse quantization
- Inverse discrete cosine transformation
- Motion compensation
- Frame rendering

Two quality attribute requirements must be satisfied by the architecture design.

- Streaming video shall play in real time without visible interruption 99% of the time.
- It shall be possible to add or update encoded video file formats and relevant associated computational algorithms as new video content providers are supported.

Choose an architectural pattern(s) to support streaming video requirements. Represent the architecture in a component and connector view.

- What design tactics would you apply to achieve the quality requirements?
- What is the rationale for the decisions you made?