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**Dissertation Planning**

*The underlying arguments that hold my PhD dissertation together.*

It’s too difficult to define or fully identify pervasive computing, or even demarcate it from other concepts. So we provide some characteristics instead, from multiple and overlapping perspectives.

Characteristics of Pervasive Computing

* The applications and services are dynamic and rich.
* Technology fades into the background. The user is not aware of the technology. She shouldn’t even be “using” any application and service. Rather, she should just live, and the technology should just make that happen effortlessly.
* The notion of a future where humans enter a virtual world is incorrect. Rather, our existing physical world will be enriched and augmented with artificial intelligence. There will be just one enhanced physical world.
* Computing should be everywhere. In particular, it should be essentially continuous in space-time.
* The Internet will be a key communications, storage, and computing platform. But it will be one of many.
* Communications should be seamless.
* Local (in space-time) interactions should propagate and result in global effects.
* System design should be inherently distributed.
* Fault-tolerance is built directly into the system. The user should not sense the slightest blip.
* The system should be scalable, in many respects.
* The cost should not only be effective, but it should also be elastic.
* The system should be energy efficient.

Background

We are very near what Mark Weiser and others have envisioned of a pervasive computing world. It is unclear whether we will slowly transition into it, or rather we will enter it quickly, when all the technology, social, political, and economic pieces finally fall into place. Many technologies, including key hardware and software systems are already available. But one stark unsolved problem is the lack of computer intelligence continuity in our physical space-time world. Recently, vastly superior mobile computing devices have yearned to fill the void, but unsatisfyingly fall short. These are ubiquitous machines, equipped with powerful sensors eager to capture, store, and share anything and everything in their space-time surroundings. However, mobile devices are limited to at most two to three units per person. Besides from being practically infeasible, giving every person more mobile devices does not solve the fundamental problem of filling the gaps. By default, humans cannot be everywhere all the time. Physical spaces are defined and designed to be used such that they are not at one hundred percent space-time utilization. Therefore, the problem remains unsolved.

Thesis Statement

Given existing science and technology trends, passive RFID is the unique solution that not only fills the void, but enables key pervasive computing systems to be designed and implemented. *In particular, we argue that large numbers of tags, that is, passive RFID tag multiplicity, allows us to design and deploy robust, distributed physical information systems to bring us into the pervasive computing future that has eluded us for far too long.*

To Be Shown

We will demonstrate that passive RFID tag multiplicity is the unique technology that fills the current gap of continuous computing in the physical world. We will show how other competing technologies are not as effective, and fail many of the characteristics of a truly pervasive system. This will largely be explored in the introductory sections. Next, we will show how passive RFID tag multiplicity does enable pervasive computing. We will offer tag-based information systems, and show how they satisfy the pervasive computing characteristics. We will study how tag multiplicity is a key ingredient in providing these qualities