Wetherall – Simple Scaling for RFID-based Pervasive Computing Systems
- Passive RFID tag called WISP, with variety of sensors. Capable of harvesting power from readers.
- Previous implementations small scale. Want to scale up to building level using RFID ecosystem at University of Washington. Whole building has RFID readers. http://rfid.cs.washington.edu/
- Multiple pervasive applications co-existing is difficult.
- Searching for individual tags in the building is difficult. (Note: In our vision, we do not care about individual tags.)
- Centralized design that they presently have is difficult to scale.
- Propose "simple scaling". Transform to an Internet-like architecture.
- Embedded tags are in control. They decide which application to run, and what data to communicate. Readers provide power and connectivity.
- Even tags are at the lowest layer, then can communicate with higher layers. A tag can control a remote reader, since the tag's closest reader has a connection to the remote reader. (Note: This is like cross-layer design, and remote procedure call design. This is probably why they call it "Internet architecture".)
- They say this tag-reader control dynamic is very important. It is crucial to scaling. (Note: Our approach/vision is slightly different. We believe a lot of the intelligence/control will stay at the lower layers, when information is passed between neighboring tags, as readers move past them. For them, it seems most of the intelligence/control is at the higher layers, where readers are connected to a smart network. Contrast this with a third approach, which is what industry currently uses. In this approach, the tags are really dumb. Readers scan them. Middleware filters out the noise. This produces practical supply chain signals and other business-oriented signals that are moved up into the business/database systems.)
- They view tags as end hosts and readers as routers, in the Internet model. (Note: Again, our vision is that intelligence can remain at the tags, and do not necessarily have to be moved up to readers. This has the benefit of locality. That is, tags are more versatile since they are cheap, passive, and replaceable. Therefore, we want to distribute intelligence among these tags. It is a more distributed and flexible model.)
- Since want to model as Internet, can use that research, and apply it to RFID. (Note: In summary, it seems their vision is more conservative. And probably can be quite successful. But our ideas are more radical. We can sell our ideas from this perspective.)

Sundaram – Building a Home with Pervasive Memory
- Physical objects have no memory. Physical markers (dents, stains, etc.) provide us with history of objects.
- Cannot query an object about its activity. Cannot “Google” an object.
- Propose objects that know their histories of use. (Note: This self-knowledge of physical objects isn’t particularly new at all. I suppose the vision hasn’t been realized yet. But the concept isn’t earth-shattering.)
- Objects allow for decentralized querying. (Note: This however, is newer. But again, ideas like Internet of Things and semantic web of objects have been around for a while now.)
- In NSF project, have begun this idea of semantically tagging objects. Also embedded sensors.
- House with memory requires multi-disciplinary approach. Powering embedded sensors difficult. Embedded sensors have limited storage. E.g. Gen 2 tags typically have 1024 bits. (Note: Not true anymore. TegoChip has 32 kB of memory. It is a passive, UHF tag. Very much Gen 2! It has been announced for over a year now.)
- Need to store information in environment. Need redundant storage. Need good error correcting codes. (Note: This is very similar to what we have been studying. We have been coding for a variety of failures. But we are also considering security aspects too.)
- High density of objects will create significant electromagnetic interference. (Note: I don’t necessarily agree. Our vision is that tags will be everywhere yes. But they will be passive tags. Active devices (for interrogation) will be pervasive as well. But they will not be constantly scanning for tags necessarily. I believe asynchronous algorithms and systems will be more than adequate. They will be not real-time, but very close to it. So I believe in general, reader-collision issues (multiple readers interfering with each other) won’t be a huge issue. One reader scanning multiple tags has been well-studied and very good algorithms exist and are already

standardized. So I'm not sure why the author here is mention this.)
- Significant privacy issues. (Note: Totally agree. Nobody has really convincingly cracked the RFID security nut yet. There have been significant strides in research. But nothing substantial in real-world practical applications.)
(Note: So this vision is focused very much on the memory of individual objects, supported by tags. The authors see a future where we can query these tags as well, to know what these tags are doing. But that vision is limited. In our work, we are imagining that the dynamics and interactions between tags are important as well. Furthermore, it's not just about tags documenting their tagged objects. But it's more. It's about documenting the physical world, as well as the higher layer semantics of that world.)

Kinget – Energy Harvesting Active Networked Tags (EnHANTs)
- EnHANTs are small devices attached to arbitrary physical objects.
- Society transitioning from barcodes to RFID.
- Envision eventually transition from RFID to EnHANTs.
- EnHANTs do energy harvesting (ambient light, motion, temperature gradients, etc.). They network. They are adaptive energy constraints. They are small and flexible.
- Have a cross-layer research program to realize this vision.
- Applications include: lost item and disaster recovery, emergency alerts, space-time proximity information.
- Talk about some networking challenges.
(Note: This vision is not very novel at all. Many of ideas are being worked on by many groups, and have been for a while. Their research is of course significant. But I would not call what was proposed very visionary. Many of the ideas combine stuff like embedded sensors, small devices, DTNs, wireless ad-hoc networking. So again, the research is good and necessary. But it doesn't push the boundaries as a vision.)