

# Specification, Detection, and Notification of RFID Events with Cascadia

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## 1. Introduction

The Cascadia system [5] greatly simplifies the development of pervasive RFID applications in spite of the inherent uncertainty in RFID data. It provides applications with an infrastructure for specifying, extracting and managing meaningful high-level events from raw RFID data. Cascadia allows end users to specify events using a web-based tool with an intuitive visual language based on direct manipulation. It also extracts specified events from the data in spite of the unreliability of RFID technology and the inherent ambiguity in event extraction. We demonstrate Cascadia's workings with a map-based interface that displays streams of RFID events and with a digital diary application that automatically populates a calendar with events in which the user participated. We use RFID traces collected in our building-wide RFID deployment, the *RFID Ecosystem* [1].

## 2. System Description

Cascadia comprises five components (see Figure 1(a)):

1. **RFID Input:** In this demonstration we replay raw RFID traces from the RFID Ecosystem as input.
2. **Particle Filter:** A particle filter that processes raw RFID data, producing a smoothed stream of probabilistic location estimates for each RFID tag.
3. **PEEX:** A Probabilistic Event EXtractor which continuously extracts user-specified higher-level events.
4. **Event Manager:** A component with an API that exposes services for event specification, subscription, notification, and querying.
5. **Scenic:** A web-based tool that allows end users to specify events with an intuitive visual language based on direct manipulation.

## 3. Demonstration Content

Our demonstration consists of two web-based interfaces built using Cascadia: a Google maps-based [3] interface and a digital diary which uses Google calendar<sup>1</sup> [2]. Figure 1(b)

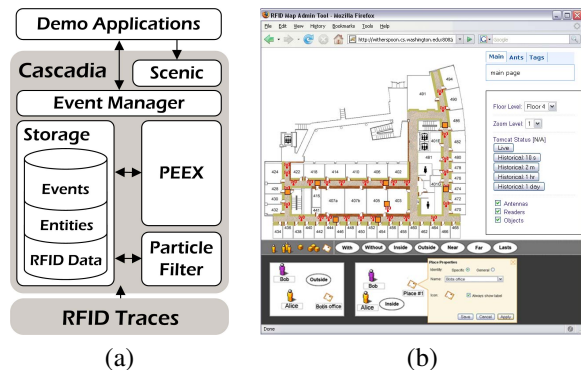


Figure 1. (a) System architecture. (b) Map interface.

shows the map-based visualization of when and where RFID tags move and events occur in the replayed input trace. The digital diary demonstrates Cascadia's performance over the entire input trace by posting descriptions of the detected events to a Google calendar; users may also view the detected events in tabular form as they occur. The demonstration also allows users to specify new events or modify predefined events with Scenic (shown in Figure 1(b)). The PeexL translation of all Scenic event specifications will also be shown. Finally, users can set probability thresholds, events of interest, and other parameters with a configuration interface. Overall, our demonstration illustrates how Cascadia facilitates the specification, detection, and management of RFID events by developers and end users.

## References

- [1] The RFID Ecosystem Project. <http://rfid.cs.washington.edu/>, 2008.
- [2] Google. Google Calendar APIs and Tools. <http://code.google.com/apis/calendar>, 2008.
- [3] Google. Google Maps API. <http://code.google.com/apis/maps/>, 2008.
- [4] Khoussainova, N. et al. A Demonstration of Cascadia Through a Digital Diary Application. In *SIGMOD*, 2008.
- [5] Welbourne, E. et al. Cascadia: A System for Specifying, Detecting, and Managing RFID Events. In *MobiSys*, 2008.

<sup>1</sup>This portion of the demonstration appears elsewhere [4]