QuieSense: Distributed, Autonomous, Context-Awareness System for Wi-Fi Enabled Mobile Devices

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MOTIVATION

Every day, we spend about half a minute thinking about or changing the audio mode of our mobile phones. It may seem insignificant, but that amounts to about 34 years of time wasted per annum for a city of 100,000! Shouldn't we be using this time more productively? What if our mobile devices could sense and then adapt to the context of their local environments? Imagine if your smartphone was intelligent enough to know that it should not be ringing loudly when you are in an important meeting, or that it should not be in silent mode when you are trying to find where you have misplaced it.

INTRODUCTION

During the past half year, we have been building a fully-autonomous, three-part system that provides contextual awareness to mobile devices in a scalable, cost-effective, and secure way. When deployed, our system would automatically switch a user's phone to the appropriate audio mode, depending on the local context, without requiring any prior effort from the user. Alternatively, the user has the option to choose notifications instead of automatic mode switching when the surrounding context changes to one that requires a different ring mode. Our approach is completely agnostic to any personal information such as personal calendar or user behavior, and it requires neither GPS, nor internet, nor even network connection to the smartphone.

THE GENERAL IDEA

While the social context of a phone has both spatial and temporal dependence, the social context of an environment depends only on time. Thus, rather than focusing on the phone, we flipped the question and asked, could we create a smart environment that knows and broadcasts its social context locally to any listening device, and have the listener change its behavior accordingly. Reservation calendars already provide the social context of an environment, and smartphones can see the list of Wi-Fi networks in range without connecting to any network. Thus, by retrieving reservation data from a calendar and embedding it into the SSID itself, we can deliver contextual information to a phone even as it remains completely disconnected.

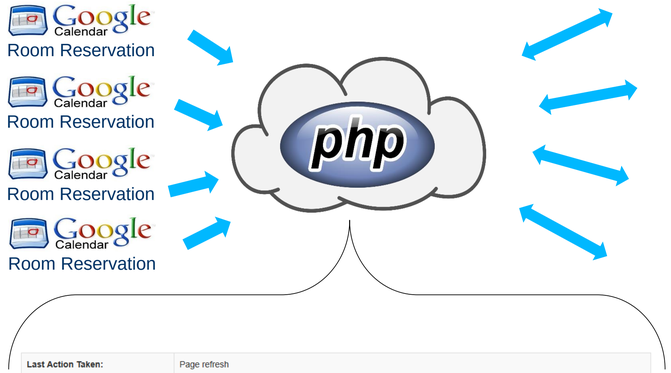
IMPLEMENTATION

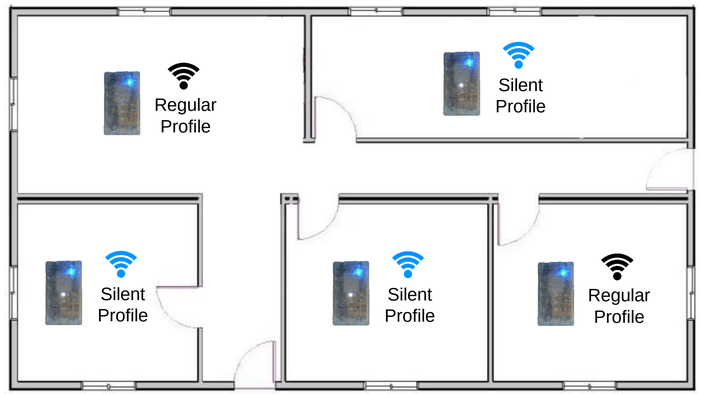
The QuieSense system consists of three custom-made software components and off-the shelf electronics:

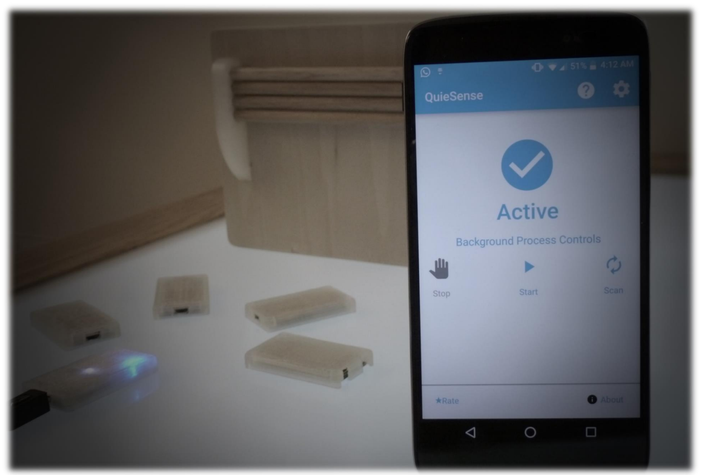
I. A custom-made server-side software that serves the following purposes:
   a) Retrieving reservation information from the Google calendars associated with each room and computing the SSIDs
   b) Establishing a communication with each WiFi module to provide it SSID and other control parameters,
   c) Provide a dashboard from which one could monitor and manually control each module, or update its firmware remotely.
   d) Provide a an interface for creating custom schedules to overrides a reservation schedule.

II. Embedded, custom-made firmware running on the ESP8266 Wi-Fi modules that periodically retrieves the SSID and the other control parameters from the server, and then broadcasts the retrieved SSID.

III. Android app that listens for the SSIDs "SilentProfile" and "RegularProfile" and controls the phone's ring mode accordingly. The app can also discern whether a user is simply passing by a particular transmitter or staying put, such as during a meeting.







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