1. INTRODUCTION

Networking at homes continue to get complex over time requiring users to configure and manage them. Perhaps the most common among home devices today are wireless Access Points (APs) that are supplied by a number of diverse vendors — Linksys, Netgear, DLink, TrendNet, Belkin, to name a few. In fact, wireless APs increasingly serve as the true gateway for the Internet inside a home. A plethora of WiFi-capable devices access Internet-based services through them, e.g., laptops, tablets and other handhelds, game controllers (XBox, Wii), media streaming devices (Apple TV, Google TV, Roku), and many more. Given its central role in these home networks, the performance and experience of users in the home depend centrally on efficient and dynamic configuration of these APs. In this paper, we argue for a simple vendor-neutral API that should be implemented by home wireless APs to enable a cloud-based management service that enables coordination, provides better performance, and reduces the burden on users.

A cloud-based management service and a vendor-neutral API: In many dense urban environments, a large number of APs and their associated clients are in range and cause interference to each other. For example, each home AP in our deployment had 20 - 60 neighboring SSIDs. These environments are further challenged by many other wireless devices and appliances, e.g., Bluetooth headsets, analog cordless handsets, wireless security cameras, and even microwave ovens, that can also operate in the same spectrum and cause further interference. Individual home users neither have the sophistication nor the patience to frequently tune their wireless APs into some efficient configuration parameters to mitigate the impact of interference.

In our proposed service, called COAP (Coordination framework for Open APs), participating wireless APs are configured to securely connect to a cloud-based controller (Figure 1, left). The controller provides all necessary management service that can be operated by a third-party (potentially distinct from the individual ISPs). In the context of large apartment building, we envision that the apartment management contract with a single controller service (e.g.,通过 a fixed annual fee) and all RF management of home APs. We believe this approach is especially important in home environments where each wireless = x" line indicate the WiFi links that are potentially interfered when a neighboring Microwave Oven is active.
APs serve users in the usual manner and also provide our controller service with various measurements that demonstrate the
improved performance. To demonstrate the benefits of a cloud-based controller service, we have been operating a preliminary
version in two large apartment buildings in downtown Madison, WI. In both these apartments, we have given away free
WiFi APs (total of 21) to residents which have been augmented for management by our own controller service. The
A majority of observed APs (nearly 60% out of nearly 300) never changed their channel of operation
2. COAP FRAMEWORK AND API
To enable COAP’s usage in home settings, we propose an open API as described in Table 1. The minimum requirement for
any COAP-compliant AP is to support just the basic API, that allows the controller to set the operating channel and transmit
power levels. This basic functionality allows for a minimal level of control of these APs from the cloud service. Beyond this
basic API, a number of advanced functionalities can be optionally supported depending on the AP vendor’s preferences. We
split this optional API into two parts — those that collect anonymous wireless usage statistics, and those that leverage some
information about the traffic patterns. For example, the controller can use the traffic context to anticipate future wireless usage
at an AP. It is possible that an AP vendor request explicit user permission if it wants to use the traffic context part of the optional
API. The implementation of each API can be made independently by each vendor as long as the response type and
format is standardized. We have been developing a specific controller service that leverages these API functions to provide a
more efficient service in our initial deployments. We will continue to refine our controller implementation as well as our API
specifications as we continue to learn from our deployments. The COAP framework and API is being used as an integral part
of the management plane of the MobilityFirst Internet architecture (http://mobilityfirst.winlab.rutgers.edu/).

3. REFERENCES
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