FiDO: A Community-based CDN for Challenged Network Environments

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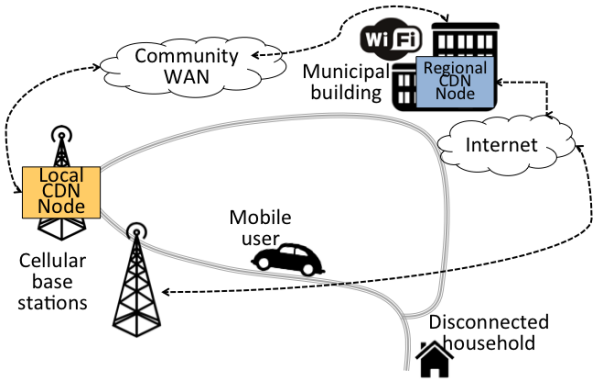

Figure 1: Overview of FiDO usage scenario.

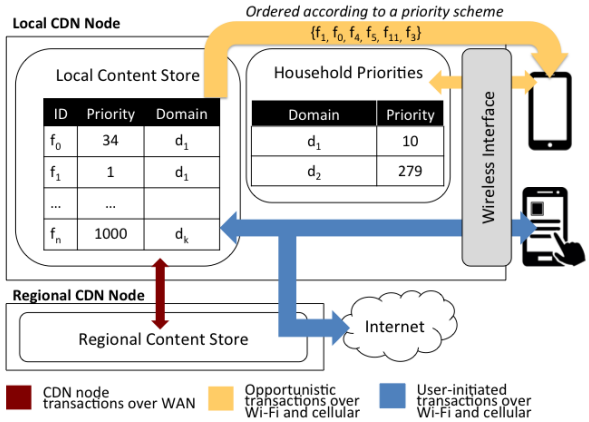

Figure 2: Data flow diagram associated with FiDO's local content delivery nodes.

ABSTRACT

Tribal lands, particularly in rural areas of the United States, continue to lack access to the Internet. According to the FCC, only 15% of people living in these areas have access to the Internet [1]. Inspired by previous observations of community content similarity in tribal networks [3, 2], we propose FiDO (Files Delivered Opportunistically), a community-based content delivery system that takes advantage of user mobility, opportunistic connectivity, and collaborative filtering to provide relevant Web content to disconnected households via proactive downloads during visits by household members to connected locations. FiDO allows users' mobile devices to browse Web content on behalf of their households by leveraging Web browsing patterns generated by individuals in the greater community. Web content browsed by community members is stored at content delivery nodes; when users' mobile devices make opportunistic contact with the nodes, the most relevant content is pushed to the mobile device based on the user's household preferences and according to the frequency with which community members browse particular content objects (see Figure 2).

We perform a data analysis to determine the feasibility of using collaborative-based filtering at various scopes of community to browse the Web on behalf of households. We evaluate the performance of the FiDO system with a trace-driven simulation approach using Web traces collected from a community-operated wireless ISP that serves 13 Native American reservations in Southern California. Our simulation compares the performance of four different content prioritization schemes that use varying degrees of historic household Web browsing preferences and community Web browsing preferences to predict the daily information needs of disconnected households. Using basic information about household Web browsing preferences and collaborative filtering by the surrounding reservation community, we are able to opportunistically provide households with an average of 37.1%–60.8% of their daily expected content, even when opportunistic connectivity available to a household is limited to an average of 0.2 kbps throughout the day (2.2 MB).

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1. REFERENCES

[1] Federal Communications Commission. Native Nations. https://www.fcc.gov/general/native-nations, Sept. 2016.

[2] M. Vigil, E. Belding, and M. Rantanen. Repurposing FM: Radio Nowhere to OSNs Everywhere. In *ACM CSCW 2016*, pages 1260–1272, San Francisco, CA, USA, Feb. 2016.

[3] M. Vigil, M. Rantanen, and E. Belding. A First Look at Tribal Web Traffic. In *WWW 2015*, pages 1155–1165, Florence, Italy, May 2015.