
Designing Software for Consumers to Easily Set Up a Secure Home Network

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Abstract

Home networking continues to expand into a collection of computers and networked devices that are becoming more complex to setup and manage. Research indicated that new techniques were needed to help people set up a secure home network. The techniques should satisfy the expectations of advanced users, without requiring technical knowledge on the part of novice users. A central design theme influenced the software solution: If a networking expert was advising a user on how to set up, configure, and secure a home network, what would this person tell the user to do?

In this case study, insights about creating a new home networking program to solve the challenges are discussed. Results indicated animations, good default settings and a network map increased the user success rate for network setup.

Keywords

Home network, digital home, personas, network configuration, network devices, animation, graphical user interface

ACM Classification Keywords

H5.2 Information Interfaces and Presentation—User-Centered Design.

Introduction

People are experiencing a proliferation of networked devices in the home as more homes become connected to the broadband Internet [11]. This has led to a collection of computers and networked devices (for example, print servers, wireless cameras, range extenders, and so on) that are becoming more complex, difficult to set up, configure, secure, and support [2] [6]. Correct home network setup (for example router and wireless cameras) has become critical for participation in today's connected home. The challenge of managing the home network has been compared to the work of Information Technology (IT) professionals in the enterprise without the benefit of help desks and problem tickets [8].

Linksys products have always appealed to early adopters, and the product brand is highly regarded in the marketplace. However, these products often use specific networking terminology that some novices are unfamiliar with. We needed a home networking solution that could help people set up a secure home network, without requiring a high degree of technical knowledge. However, the solution should not be "dumbed down" for advanced users. The solution should enhance communication and simplify the family life, not add complexity or frustration [3]. We wanted to avoid the "educate the user about home networking" mentality. Our desire was to make home networking a pleasant experience that reinforces the Linksys brand as the best in the industry, and easiest to use.

With limited time and budget, the challenge for the Linksys team was to first focus on setting up the router. A large project restriction was to not change any

existing hardware and firmware on routers, Internet cameras, and print servers.

This project, called EasyLink Advisor [7], is a case study to design software to meet users' needs in secure home network setup and to reduce technical support calls.

Understanding Consumers

Research

The first task was to truly understand who our customers are, their wants, needs, and desires related to home networking. Over a cumulative seven week period, research was triangulated [5], by the following:

- Ethnographic style observations in retail stores (figure 1)
 - Being a fellow customer
 - Being a Linksys representative (wearing a Linksys shirt)
- Users drawing their home networks
- Field interviews and observations [1]
 - Retail returns counter
 - Retail sales persons
 - In-Home network set up
- Content analysis
 - Technical support calls
 - Web forums
 - Internal documents and reports
 - Prior Linksys usability studies
- Heuristic analysis of existing installation tools [9]



Figure 1. Networking Products Aisle in a Retail Store

Field studies for this project revealed that creating a secure home network requires either technical knowledge, or a relationship with a technical person (a friend or neighbor) to help set up the router. It isn't hard to set up a network, but specific domain knowledge is needed to be successful.

Content analysis of call statistics and prior usability studies in Linksys indicated that most of the problems users face can be addressed during initial setup and configuration. Additionally, results from customer support indicate most consumers do not employ wireless security; this opens them up to the possibility of several Internet related dangers or network attacks. The dangers range from credit card numbers being stolen, to home networks being accessed, to illegal activities being conducted from a hijacked network. Consumers are not aware of the risks, especially in high-density housing.

User Personas

User personas were an integral part of the development process [4]. Personas were created from the research data to help the design and engineering teams understand our users. Four personas were created to represent extreme differences in technical knowledge and attitudes towards networking. For example, the "Traveling Thomas, The Neighborhood Know-It-All" persona (figure 2) was a compilation of the data that indicated networking details are needed. Listening to technical support calls revealed that some novice users did not care to know about networking details. The "Juggling Janice, The Soccer Mom" persona was compiled to represent novices whose mental model is "I just want stuff to work".



Figure 2. Two User Personas

In some homes, multiple users wanted the ability to manage the network so that if the "network administrator" was out of town, problems could still be resolved [6].

The solution had to be simple enough for the Juggling Janice persona to use, and technically sophisticated enough for the Traveling Thomas persona to enjoy and recommend to others.

Design Themes

Four design themes evolved from the data and personas to guide the direction of the software design.

1. Advice From an Expert

The first design theme was, “if a networking person was there instructing the user on cabling, configuration, and securing a home network, what would this person advise the user to do?” The networking person would follow some best practices, including:

- a) Evaluate the current Internet connection
- b) Guide the consumer on how to cable the router
- c) Explain how to enable wireless security
- d) Give advice on related tasks like adding wireless computers to the network

This is roughly the setup model we created in EasyLink Advisor.

2. Multi-Coding of Instructions

To address the explicit instructions needed by novices, and avoid offending expert users, the software presented complete instructional screen titles so advanced users can scan them. For novices, detailed text instructions, illustrations, and Flash animations contained the same content, but are presented in multiple ways (figure 3).

3. Good Default Settings

A typical router has about 90 settings. People usually keep the defaults, which may not be the best or most appropriate settings. A key objective was to evaluate the initial conditions and use those conditions to customize the router settings for the user. Security was enabled using the most widely compatible protocol.



Figure 3. Flash Animations in a Network Setup Wizard

4. Visualization of the Network

After working in the enterprise space in Cisco, we knew network maps aided in rapid understanding of network topology. In the home, visualization of the network became beneficial in a different way. A network map aided the person who set up the network because it supplies a visual inventory of the network, including computers and devices. This also allowed other household members to be the “network administrator” as needed.

Design Themes Applied

Product Cabling and Setup

With cabling and setup being the most critical step for users, we followed the first three themes to guide the user on how to securely set up the product. Context sensitive wizards illustrated the process. Each screen was designed so that an advanced user could glance at it and know what to do, while a novice user would be shown explicitly what to do.

Flash animations were used to illustrate the cabling steps. The novice could play each animation as many times as needed to get the cabling correct. The advanced user only needed to look at the static frame and not play the animations (figure 3).

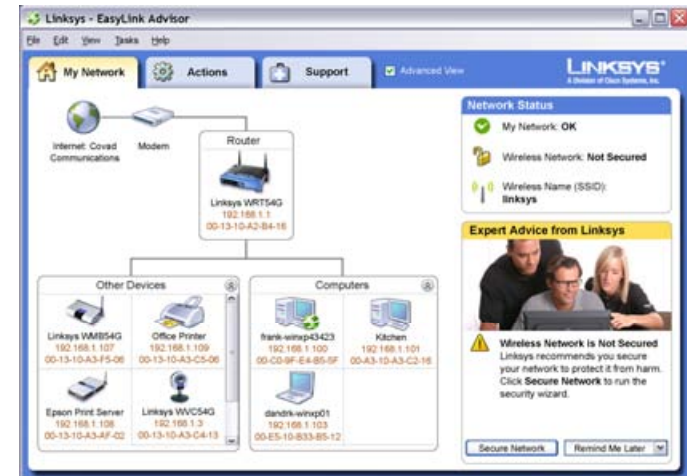


Figure 5. Network Map with Advanced View on



Figure 4. Expert Advice Notification

Expert Advice

Expert advice reinforces the notion that a networking person is there, helping the user optimize the network. Expert advice is a frame that provides context sensitive best practices and advice based on the person's specific environment (figure 4). For example, if the user installs EasyLink Advisor on a router that is already set up but doesn't have wireless security turned on, expert advice unobtrusively asks the user if he or she wants to automatically secure the network.

Network Map

Following the second and fourth design themes, a network map becomes the primary focal point once the network is up and running. The network map becomes a centralized location to see devices, their relationships, status, and expert advice. The standard view is simplified for novices while advanced users can quickly see network details (figure 5).

Preliminary Results

To test and validate the design, we conducted three rounds of usability studies and a pilot test in the retail channel.

The first release of the software focused on router setup and configuration. Again, the physical products remain unchanged. Working as a total solution, the animations, good default settings, and context-sensitive features increased the success rate for user setup.

Usability studies indicated that the setup animations with an initial static image were a good compromise for the novice and expert users. As we were only concerned with mimicry (not learning), the animations

didn't hinder the advanced users (because they didn't invoke the animations), but were used frequently by novices. "Wow" and "cool" reactions were observed in the usability studies which contributed to increased user satisfaction.

A lesson learned with the Flash animations is that every step must be shown visually. It was interesting that users didn't plug in the power adapter to the wall outlet if the adapter was not shown in the animation.

The network map (see figure 5) provided another insight to users' mental models. It took five major revisions to get it right and provide flexibility for devices that come and go. In earlier versions, we tried to maximize screen real estate by removing the gray lines that connect devices. The absence of the lines confused and even angered some users. People expected to see devices (even wireless devices) connected by lines.

A pilot test was conducted with over 1,000 units sold into the retail channel. The pilot test indicated a 46% reduction in calls to technical support, thus our design goals were met.

As EasyLink Advisor penetrates the marketplace over the next few months, we'll better understand if we succeeded in the additional goal of enhancing communications and simplifying life for home network setup and monitoring.

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