



## Advanced Menu Usage and System Architecture: Impacts on User Behavior

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## Challenges of Home Network Complexity

Like most operators today, Buckeye has been looking for an enhanced user interface to improve subscriber interactions and support advanced guide features. The traditional user interface employing a grid programming guide has been around the industry for a long time now. This interface also includes many traditional guide features including folder access to Video on Demand and DVR content. The ability to customize this interface from the perspective of the operator or end user is sparse, usually limited to color scheme changes. Additionally, this platform has had relatively few interface enhancements over the past few years. However, there are enhancements planned for that user interface.

Subscribers are becoming accustomed to a broader range of enhanced user interfaces for access to programming and other content. This is the case to some extent with our current subscribers, but more particularly our next generation subscribers. The next generation subscriber will be looking for something other than a traditional grid guide and likely, something they can customize to some degree.

Our initial transition to a new user interface has been with the ARRIS Whole Home Solutions (WHS) system which offers a new system architecture and a different guide paradigm. The system architecture has a central gateway unit that provides content to several attached IP STBs. This new guide interface allows subscribers to choose their programming guide preference from a traditional grid guide or an enhanced rotational X and Y axis guide that provides an improved look and feel. The ARRIS WHS system also offers the opportunity to gain visibility in aggregate as to how subscribers are viewing and accessing content, providing valuable network, programming and marketing information that was ideal for this study.

## Study Background and Setup

With Buckeye's deployment of the ARRIS WHS system into existing hubs and nodes that also have substantial deployment of traditional single tuner set top boxes (STBs) and dual tuner DVR STBs, an environment exists that allows direct comparison of user activity on the different platforms.

The older STBs have a fairly standard grid-based guide interface as seen in Figure 1.



Figure 1: Grid Guide Menu Example

The standalone STBs are a mix of single tuner and dual tuner STBs that also provide Digital Video Recording services (DVR) with accompanying menus, such as Figure 2.



Figure 2: Grid Guide DVR Menu Example

The WHS system allows subscribers to choose their programming guide preference from a traditional grid guide or an enhanced rotational X and Y axis guide that provides a more web-like look and feel. The user is presented with a series of icons or cards that can be used to select different activities. Within a card, the user sees a range of choices appropriate to that activity presented vertically. Examples can be seen in Figures 4 and 5.



Figure 3: WHS Moxi Main Menu

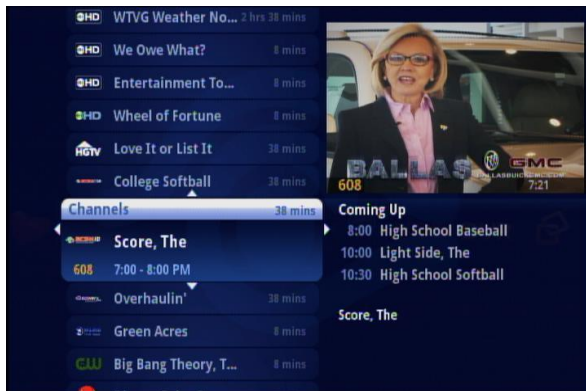


Figure 4: WHS Live TV UI Example

## Study Methodology

To monitor the channel change behavior of the subscribers, this study took advantage of several logging facilities within the Buckeye network. The anonymized logging facility of the switched digital video (SDV) system played an important part. The SDV system records all channel changes for all STBs in the system. This data allowed the users of all three types of devices to be compared directly through their channel change choices.

Within the ARRIS WHS system, extensive logs also allowed the study of user behavior with anonymized data. The scheduling and viewing of DVR recordings were also available for analysis, though this could not be compared to the wider population of older STBs.

Video on Demand use was also examined through the system’s centralized usage logs. Since all VOD views for all subscribers are tracked, this facility allowed user behavior to be compared between the different types of STBs.

As mentioned earlier, an additional difference between the older STBs and the WHS system is that the WHS system uses a Gateway with 6 shared tuners to support up to 6 IP STBs. Any DVR recordings are also shared across the household. Because the Gateway provides a WHS household’s only interface into the SDV and VOD systems, the logs from those systems reflect the overall usage for that entire household. To allow a more direct comparison between the stand-alone STB usage and the WHS usage, internal logs from the WHS were used to gain visibility into how the users were interacting with the individual IP STBs.

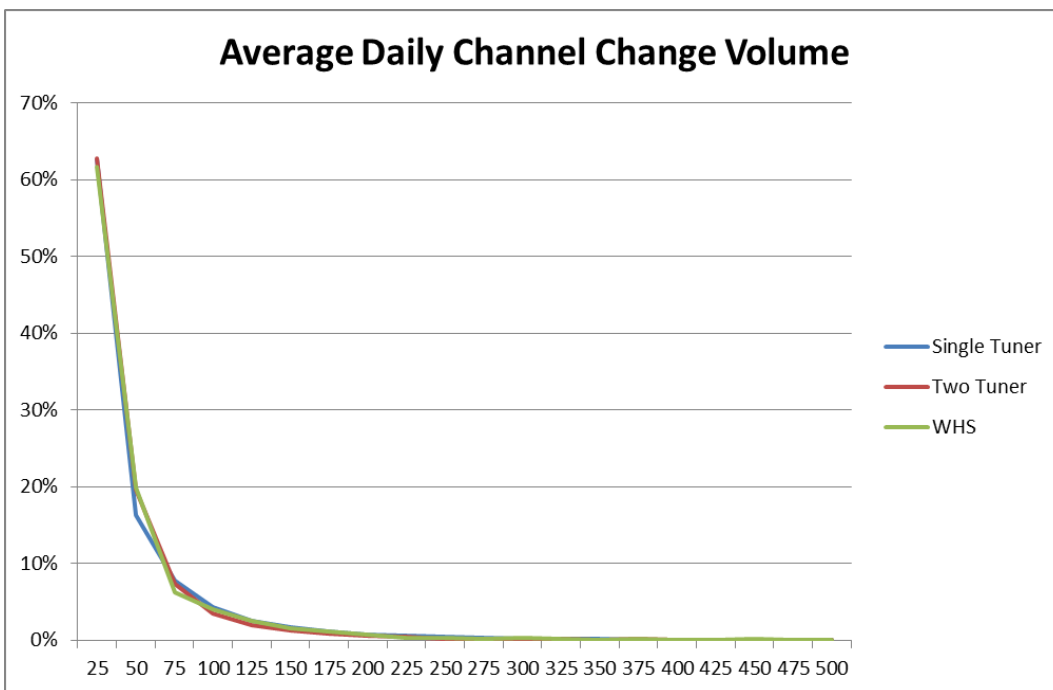


Figure 5: Daily Channel Change Volume Averaged Across One Week

## Results

Overall, the results showed the greatest differences in user behavior between DVR households and non-DVR households, and smaller differences that may be due to

varying user responses to the different menu types or possibly to the WHS whole-home service architecture.

## Channel Change Discussion

Looking at channel change findings, subscriber households using WHS had about the same number of channel change operations per household as a single tuner or dual tuner STB. The average number of operations per day was 37 for a WHS system and a single tuner STB, and 35 for a dual tuner STB. Figure 5 compares histograms of the average daily channel change performance of the three groups of STBs. The three groups of STBs have very similar distributions of channel change habits.

Finding that WHS households taken as a single unit are very close to single STB behavior was surprising, since a single WHS household has on average 2.6 IP STBs.

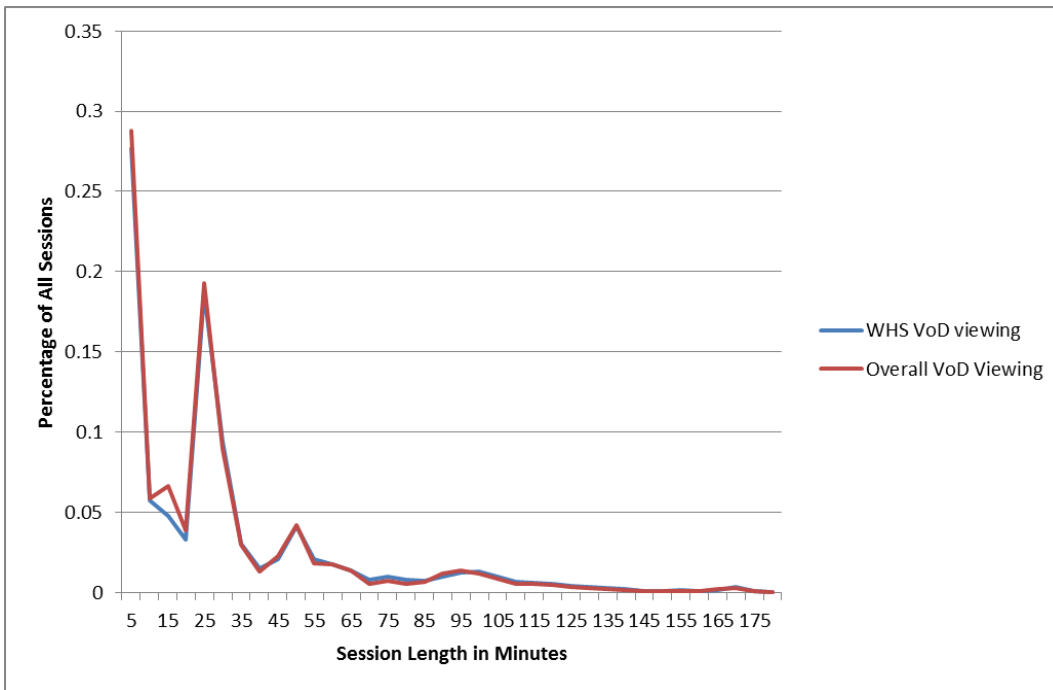


Figure 6: VOD Session Length Comparison

Checking for simultaneous operation of IP STBs during the week did show that even though the average number of STBs deployed per system was 2.6, only 1.5 IP STBs, on average, were active at any one time. This figure does not include channel changes that are driven by recordings. Overall, this suggests that users require fewer channel



changes to find the programming they want. Since the dual tuner STBs can provide DVR functionality as can the WHS, it also suggests that at least part of the difference is due to the advanced menu structure of the WHS user interface as opposed to the presence of DVR functionality alone.

A related finding was that many subscribers using the WHS still used the grid-based guide occasionally, though as the time the user had spent with the WHS system increased, the use of the grid guide version decreased.

## VOD Discussion

Video On Demand (VOD) statistics were also studied to see if the different menus and system architectures were correlated with any VOD behavior changes. Overall, as seen in Figure 6, the users of the advanced menu system behaved similarly to other users. WHS users considered as a household were slightly more likely to view at least one VOD asset, 32%, versus 31% of dual tuner units and 26% of single tuner STBs. But since there are multiple STBs in the subscriber's residence, this suggests that the total VOD purchases per household may be close to the same or slightly less than households with the older technology. Again even though the household average was 2.6 IP STBs, an average of 1.45 STBs per household were actually used for orders. The total consumption, shown in Figure 7 was also quite similar.

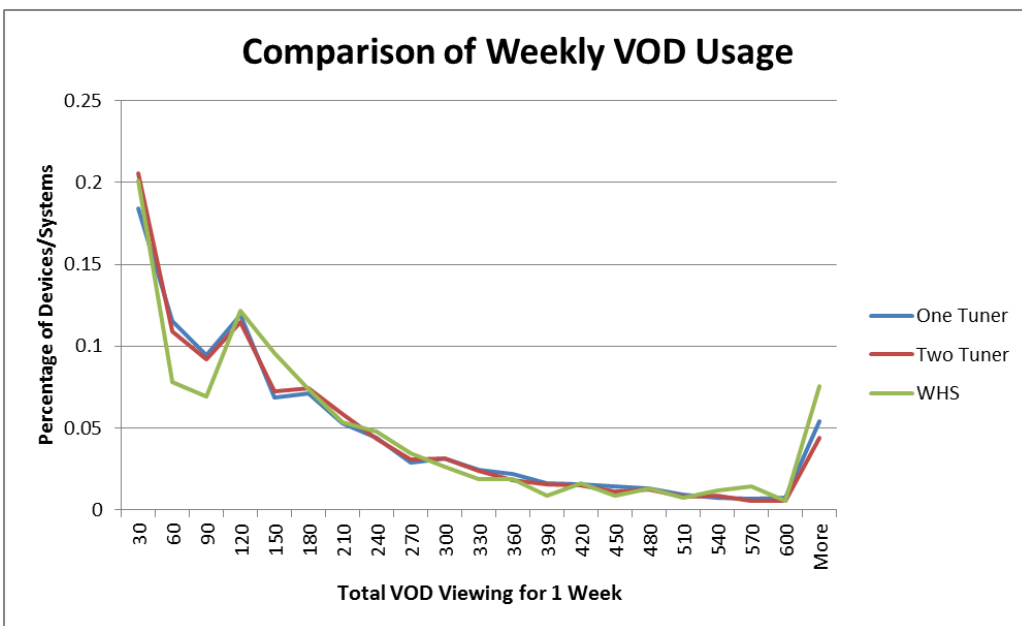


Figure 7: Comparison of VOD Usage



One interpretation of the weekly usage metrics is that about 10% of all subscribers order a 2-hour movie on VOD once a week. About 30% of all subscribers view substantially more content than that, with WHS subscribers leading in the high usage category at 36%.

## *DVR Discussion*

Comparing the single tuner boxes with the DVR capable systems does show that DVR capabilities tend to alter viewing habits. Since the WHS system has extensive DVR logs it was possible to examine how people with that system tend to use it.

DVR usage alters the channel change statistics in two ways. Recordings are scheduled around when programming is available – so some channel changes reflect the DVR engine seizing a tuner and selecting the channel directly. The viewing times are set by when the subscriber is available to view the content, and the subscriber may or may not also view live programming before or after they view the stored content.

By comparing when content was recorded (Figure 8) with when the recorded content was usually consumed (Figure 9), it can be seen that the timings of those activities is very similar. The bulk of recordings does occur slightly later in the evening than the bulk of the viewing sessions. Comparing the number of recording with the number of viewing sessions also highlights the fact that only about 70% of recording sessions are actually viewed. Overall, when considering that DVR systems tend to have fewer channel change operations than non-DVR units, it suggests that DVR users are using the DVR capabilities to more efficiently control their viewing time.

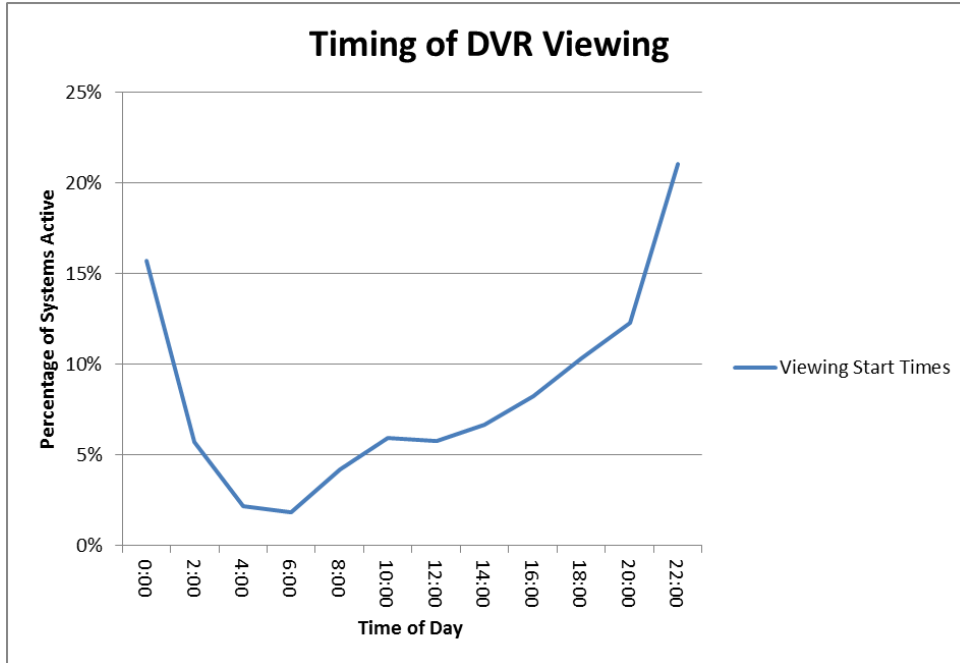


Figure 8: Timing of Recording Sessions

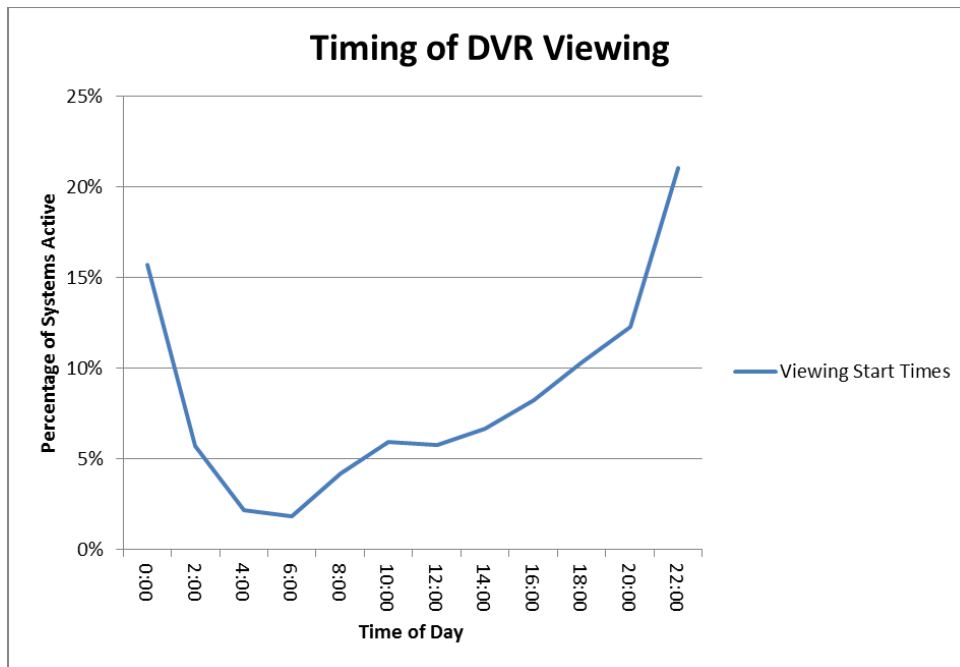


Figure 9: Timing of Viewing Sessions

## Conclusion

Operators and guide developers are placing significant focus in the area of the user interface. The push to enhance this experience for their subscribers as well as to augment product usage and broaden their own marketing data must continue to ensure that the operators' video products are accessible and attractive to the next generation of subscribers.

Looking at detailed usage logs offers insights into how subscribers are actually using a product, and can turn up unexpected insights, such as that a whole home DVR system tends to greatly reduce the actual network channel change traffic compared to the deployment of a similar number of stand-alone devices. This study also showed that subscribers will continue using familiar technologies, such as a grid guide, but will also gradually accept new user interfaces.

Further research into user behavior will undoubtedly turn up fresh insights allowing the operators to tune their networks to actual user behavior and provide a great user experience at the same time.

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