A CHANNEL DEPENDENT AUTHORIZATION METHOD FOR PAY-PER-VIEW AND IMPULSE PAY-PER-VIEW SERVICES

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ABSTRACT

Authorization of pay services by channel number has until now been adequate because only one service is contained within each channel. Pay-per-view and impulse pay-per-view services require channel sharing, thereby placing greater demands on authorization control systems and increasing the complexity and cost of addressable set-top terminals. An improved authorization method is described and it is shown how, by introducing the concept of authorization by code number, dependence on the tuned channel can be eliminated. The equipment required to support this method is described and a pay-per-view example is given.

INTRODUCTION

Conventional pay TV authorization systems are characterized by a control computer located at the CATV office or headend, an access limiting device called a service encoder and a large number of addressable set-top terminals. The control computer maintains subscriber files which describe what services (channels) are authorized in each set-top terminal, and transmits the file contents by addressing each terminal to load its authorization table. This table consists of a simple memory wherein a single bit per available channel is set or clear to specify whether or not that channel is authorized. Services are assigned to a specific channel (i.e., HBO may be on channel 18). Changes to the authorization memory are usually initiated by the subscriber, who telephones the CATV office to request an upgrade or downgrade. A customer service representative (CSR) modifies the subscriber file (usually through a billing system) which results in the transmission of new information to the set-top terminal, thus changing the content of its table. This method is adequate because each channel is used for only one subscription service.

A pay-per-view (PPV) channel contains more than one service, with each program offering broadcast in a scheduled time slot. PPV services may be further broken down into shorter periods such as preview, purchasable and non-purchasable intervals and, with back to back events, a pre-purchase interval for the following program. In addition, it may be desirable for all terminals to be authorized for interstitials such as coming attractions, promotional fills and a program guide. The state of the channel authorization table may change several times through the duration of a program. While the bit per channel memory described above is clearly not adequate, two solutions are evident: 1) increase the data transmission to the rate necessary to address all terminals in a fraction of a second, 2) increase the authorization memory size to hold the time features of the program. Both of these solutions are impractical due to either bandwidth/technology or cost constraints. It is the purpose of this paper to present an alternative method using code control, thereby avoiding the negative aspects of the obvious solutions.

CODE CONTROL

The conventional addressable set-top terminal contains a memory wherein individual bits correspond to channel numbers. The selected channel number addresses the memory to read out the associated bit. If set, the bit throws a switch to enable viewing the program (usually by permitting the descrambler circuitry to operate). This is illustrated in Figure 1. The information provided for descramble timing and control is carried in-band (normally audio carrier modulation) and decoded by other circuitry (not shown). The addressable controller maintains a cross reference list which equates each service to its channel number.

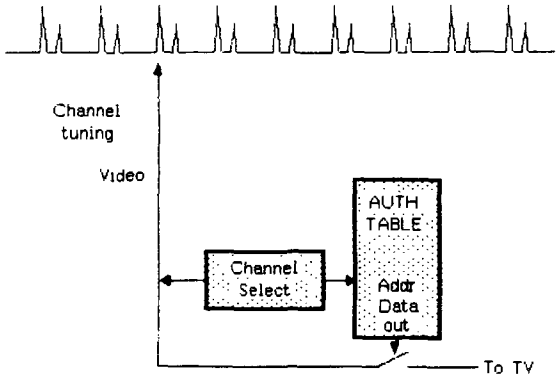

Figure 1 Authorization by channel

A code controlled terminal looks very similar as shown in Figure 2. In this case, however, the channel number is not used. Instead, each secured service has appended to it, a number called a "service code", which is carried in-band along with the existing descramble timing information. The service code addresses the memory to read out the authorization bit which, if set, throws the authorization switch as before. The addressable controller maintains a list equating each service to its assigned service code. The advantages of this approach will now be discussed.

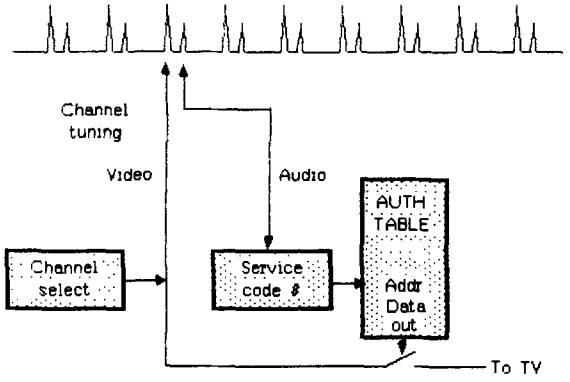

Figure 2 Authorization by service code

It is not necessary for the service code to be held constant, although it usually is for subscription services. Any encoded channel may be used for PPV services. An existing subscription service may be partitioned and sold separately, for example, by using one service code value from 12:00 midnight to 8:00 PM and another from 8:00 PM to midnight. By setting one service code value equivalent to "basic", all subscribers may be authorized for certain promotional information. A group of channels may be sold as a package by setting their service codes to the same value. The greatest benefit of this technique accrues with PPV services. Recall from the previous discussion the need to segment a PPV service into several time slots. A set of service code values may be used for this purpose, as shown in the PPV example in a later section.

As previously indicated, the service code is actually part of the descramble timing information carried in the TV signal. The value is inserted by the service encoder as directed by either front panel switches or remotely from the addressable control computer as shown in Figure 3. With the remote control feature, the addressable service encoder permits the addressable control computer to schedule and control services. The information sent to the set-top terminals via this path is not restricted to service codes. It should be service related, however, and may also contain the following:

- Service type (subscription or pay-per-view)
- Purchasable or not
- Morality rating
- Cost of purchasable service
- Encoding method
- Barker channel if unauthorized

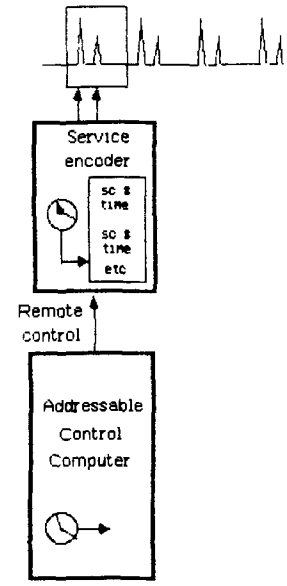

Figure 3 Remote controlled service encoder

Note that even this seemingly small amount of data may require significant transmission bandwidth at common program switchover times. Therefore, it is prudent to include a time controlled queue in the service encoder. Thus, the data for several time slots may be preloaded into the set of encoders for execution at pre-specified times, avoiding peak load bandwidth requirements. As a final point, it is evident that both the addressable control computer and the addressable service encoder need to understand time. The service encoders contain a battery backed real time clock which is periodically synchronized by the addressable control computer through a time message transmission.

PPV CONTROL

Armed with these new tools, a PPV control example will now be presented. In the following discussion, the program and interstitials are broken into time segments labelled S1 through S6 and service code values assigned C1, C2 and C3. A typical Hollywood film runs about one hour and 40 minutes. It is customary to run interstitials between films consisting of coming attractions, sales information, program guide, etc. For control purposes, these are included in the "program" schedule which is assumed to start at 7:40 PM and run two hours to end at 9:40 PM. It is also assumed that some part of the subscriber population is configured with store and forward set-top terminals, thereby permitting "impulse" purchase of the event. The "program" actually starts at the end of the previous event, which occurs at 7:40 PM. Assume further that there is a promotional barker channel to which unauthorized set-top terminals will tune when the subscriber attempts to tune a pay-per-view channel and is not already authorized. Refer to Figure 4. The first segment, S1 contains the program guide which runs for 15 minutes. During this time all subscribers are authorized to view a rolling list of services along with their associated cost and broadcast times. Blanket authorization may be accomplished either through use of a service code (C1) for which all subscribers have been previously authorized or by the clear mode (not scrambled). The system could have alternatively pre-authorized only a selected partition of subscribers, for example those who have impulse terminals. Segment 2 contains the "coming attractions", where scenes from the next program are shown to stimulate interest. The service code is set to C2 (the one actually used for the film) during this period to allow impulse purchase, however, the signal is sent using the clear mode, therefore all subscribers may view the picture. The program begins with segment 3 during which time the service code and mode are retained to provide a ten minute "preview", while allowing late comers the opportunity to purchase. A second advantage of the preview period is to allow more time for the system to respond to call in purchases from those subscribers without impulse terminals. The encoder is set to scramble during segment 4, while retaining the same

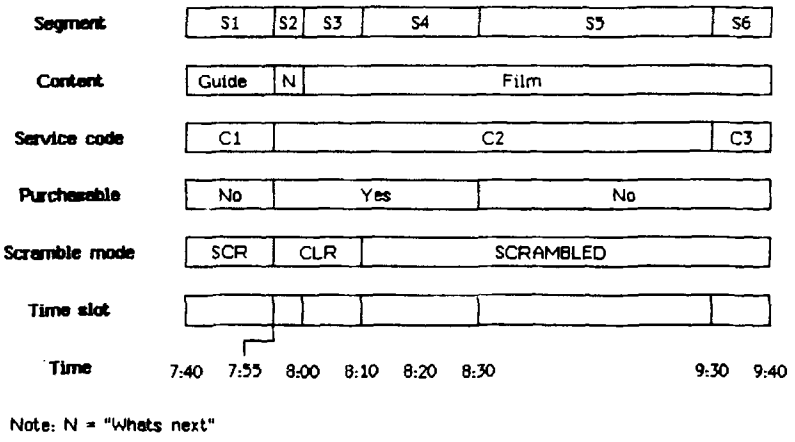

Figure 4 PPV control sequence

service code and purchasability attributes. During this segment, unauthorized subscribers will be able to view only the barker channel which should contain a rolling tutorial describing how to purchase the program. Segment 5 is included to terminate the ability to purchase the film. Set-top terminals may be outfitted with a display lamp which when lit, indicates a "purchasable event". This lamp will go off at segment 5 if the event has not already been purchased. This feature is a convenience to subscribers who may have tuned in late and, if they knew how much of the program has already elapsed, would probaby decide not to purchase it. Although segment 6 is not strictly necessary in this example, it is included for completeness. This segment is required to solve a somewhat elusive control problem which is described below.

Authorization by service code is not without disadvantages. A service code number may be used at any time on any channel, however, it must not be used for more than one program at any one time. Occasionally, due to service code value limitations or scheduling conficts, two or more programs on the same or different channels may be assigned the same service code. Under these conditions, subscribers authorized for one program would automatically be authorized for the others. Three global commands may be used to prevent this undesirable situation. The three commands are "set", "clear" and "copy" service code. During segment 5, the control computer issues a global "copy C2 to C3" command. All subscriber terminals which are authorized for C2 will now be authorized for C3 also. During segment 6 the service code is set to C3 after which the control computer issues the command "clear C2". This action occurs during the last few minutes of the program because it is unlikely that any terminals would be unpowered - thereby avoiding the downgrade of C2 - at this time. Since the command sequence is closely spaced, it is also unlikely that the terminals would hear the first command and not the second. The alternate service code, C3, may be any spare subscription code - not used for PPV - since it is only used for short, non-overlapping time intervals.

SUMMARY

A channel independent authorization method has been described. This method allows efficient pay-per-view control while avoiding the traditional bandwidth and cost intensive changes to conventional pay TV authorization systems. Programming capabilities include interstitials, program previews, impulse purchasing and global control of segmented authorization populations. This method should find interesting application as more cable system owners utilize pay-per-view programming as the next major CATV venture.