

VOICE APPLICATIONS ON BT'S DERIVED SERVICES NETWORK

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ABSTRACT

BT provides and supports advanced voice services via its Derived Services Network (DSN) which overlays the normal telephone network. This paper examines the latest network features to support independent service providers and its own managed voice services, showing how they can be combined in a powerful way to serve high call volume applications such as telemedia advertising.

Keywords: *Customer Access Manager, Mid-Call Diversion, Premium Rate Service, Remote Download, Remote Update, Service Management, Telemedia, Televote*

1. INTRODUCTION

It is not surprising that the largest commercial area for the application of voice processing techniques is associated with services connected via the telephone network, when one considers that virtually any one of hundreds of million phones world-wide is a potential terminal. If one also considers that the use of the phone is an everyday occurrence it is evident that many initial psychological barriers are broken down compared to other voice processing systems. In the UK, the vast majority of voice processing business is associated with premium rate services, where the telecommunications operator shares a premium rate call charge with the independent service provider who rents the network access. BT's Premium rate services are provided by a specialist overlay network call the Derived Services Network.

When the premium rate service market sector started in the UK, the services tended to centre around 'chat lines' and frivolous services. The voice technology and network demands for such services were minimal, requiring conference bridges and some speech compression techniques for passive announcements. As technology such as speaker independent speech recognition and database interaction become more mature the market developed in the areas of automated information services.

To maximise the revenue generated by the investment in Interactive Voice Response (IVR) equipment and telephone lines, simultaneous multiple voice services need to be supported on the same group of common access lines. Each service is selected by passing the last 2 or 3 digits of the dialled telephone number to the voice equipment as a service

address. Thus on a group of a hundred lines with 2 address digits signalled, the equipment must be able to dynamically cope with anything from 100 different services concurrently active to 100 calls simultaneously accessing one service.

2. MID-CALL DIVERSION

As the Premium Rate Service market developed, the entertainment and sporting voice services reached saturation levels and new applications now concentrate on interactive information services. These services tend to give voice access to on-line databases for applications ranging from restaurant guides to airline flight details. The objectives of such services are not only to give people ready access to the information which will aid them in their choice of purchase, but to allow them to make their purchase there and then, from potentially one of a number of different vendors. To achieve this, Mid-Call Diversion has been introduced as a network feature. This allows service providers' voice response units (VRUs) to be able to answer calls, capture the caller's choices and then 'recall' the network and out-dial in MF on their 'direct inward dialling' premium rate lines. Although similar in concept to a PABX transfer function, it differs in that when the third party answers the VRU is cleared by the network, leaving the caller and third party connected. While awaiting an answer from the third party, the VRU has the opportunity for playing a holding message or retrieving the call, (see fig. 1).

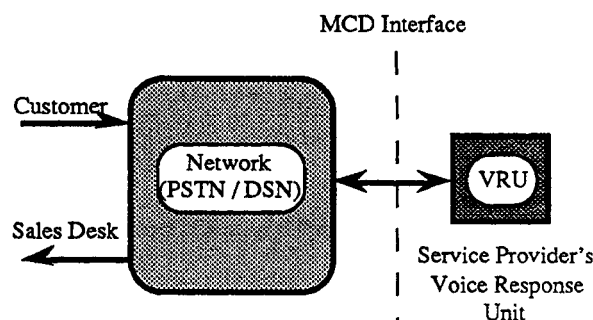


Fig. 1, Mid-Call Diversion Scenario

Enhancements to the MCD feature have been planned to allow the VRU to receive more call progress information via MF (TouchTone) signalling to indicate busy condition, number unobtainable, call delivered (ringing), etc. thus

allowing the service provider to produce voice applications that offer a wide range of service options.

A typical MCD application may give information to a potential customer on a range of products. After making a selection, the VRU connects the caller to the appropriate supplier to place the order. When delivered successfully the VRU can drop out of the connection to process the next call. If the application detects that the call has not been answered by the third party, the customer can be retrieved and a message taking facility could be invoked.

3. MANAGEMENT OF VOICE SERVICE TRAFFIC VIA CUSTOMER ACCESS MANAGER

The nature of traffic patterns to premium rate voice services is very transient, depending on the advertising campaigns used to promote the service, e.g. publication dates of magazines and the use of radio or television produce large traffic peaks. Maximising the calls answered benefits both the service provider and the network provider through increased revenue, as well as the callers who are less likely to find the service busy.

Service providers have a fairly constant number of lines from the network, with several number ranges which correspond to dialled digits being forwarded to the VRUs. In addition they often have VRUs of differing capabilities. To efficiently manage traffic patterns, numbers need to be dynamically allocated against groups of lines so as to provide answering capacity where needed.

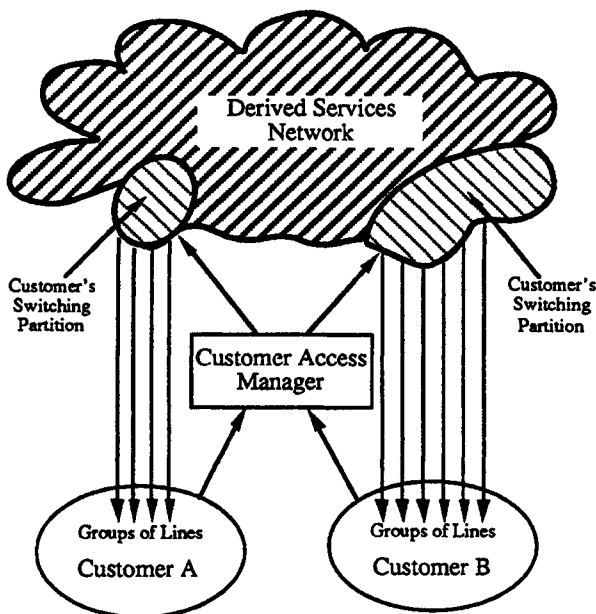


Fig. 2, Customer Access Manager

To achieve this, a specialist service management feature called the Customer Access Manager has been developed to allow the service provider direct control over a switching partition within the network (see fig. 2). Access is via a PC with a modem, and authorisation is validated by the entry of a personal identification number into a small, stand-alone encryption card. This card returns a *passcode* which is only valid for 60 seconds, and is used to validate the log-in process. The service provider can create new switching configurations and commit them into a calendar for automatic implementation, planned to correspond with the publicity campaigns or take immediate effect. In addition, calls can be directed to broadcast ports which provide many-to-one connections and can be used for *live feed* and non *start-at-beginning* voice applications, further increasing the flexibility of the service management capability.

4. MANAGED RECORDED INFORMATION SERVICE PLATFORM

In addition to providing lines direct to independent service providers, BT offers a managed voice facility called the Managed Recorded Information Services platform. This platform is distributed around the UK at Recorded Announcement Centres which are co-located with the Derived Services Network nodes. The platform is managed from a National Announcement Centre which is co-located with the Network Management Centre. The platform's capabilities can be divided into two main areas: mass answering for very high traffic, and a basic managed voice platform for medium traffic handling capabilities.

5. BASIC MANAGED VOICE PLATFORM

The medium volume traffic platform consists of a specialised switching stage known as the Auxiliary Switch together with a number of VRUs (see fig. 3). The Auxiliary Switch provides a local flexibility point to allow the management of traffic across different types of VRUs and enable services to be seamlessly moved between equipment for maintenance purposes.

The Auxiliary Switch also provides common customer statistics independent of the type of VRU. The VRUs consists of 30 channel units connected to an Auxiliary Switch via 2Mbit/sec links and networked together via an Ethernet LAN, providing a flexible machine capacity of between 30 to 480 lines. The standard VRU cluster configuration is 120 lines. Direct inward dialled digits are used to share 100 different services on this cluster of VRUs. The mix of traffic profiles of the services shared on each of the clusters is optimised to ensure the best call completion rates.

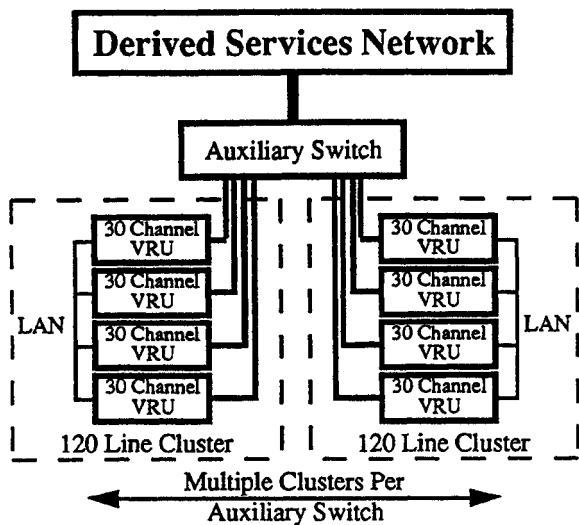


Fig. 3, Medium Volume Traffic, Managed Voice Equipment Configuration in a Recorded Announcement Centre

The service structures available are made up from generic building blocks with such functions as play-to-line, record-from-line, yes/no-decision-branching and simple menu choice using speaker independent recognition. These building blocks can be simply and quickly configured to meet the service provider's requirements. Although these building block functions provide very simple caller dialogues, overall they are complex due to the underlying remote service management, security layers and administration control.

Access to the remote service management features is via a dial-up link. BT's Remote Update service enables the audio content of the service to be changed at will, either by any MF telephone or by a specialist phone with tape deck interfaces which allow studio recorded tapes to be transferred. Where the service has captured audio data from callers, the information can be accessed via BT's Remote Download facility. This allows the recorded caller entries to be reviewed, deleted and down loaded individually or in 42 minute blocks to a tape recorder for later transcription.

6. RECORDED INFORMATION DISTRIBUTION EQUIPMENT (RIDE)

For high volume mass answering services, a managed broadcast capability was developed using a specialised system called Recorded Information Distribution Equipment. For applications such as television show telephone responses (*televote*), it is not practical to switch all calls to a single node within the network. To overcome this, instead of taking the calls to the voice information, the voice information is simultaneously distributed around the country via a number of digital rings (see fig. 4). This voice information is fed onto the rings at the National Announcement Centre either by private wires from service providers or via proprietary VRUs running BT applications. These applications allow a simple

passive announcement with accessed by the Remote Update facility.

Voice information distributed around the rings can be of a continuous type where callers are connected into any part of the information (e.g. live feeds) or *start-at-the-beginning* type. *Start-at-the-beginning* services have start synchronisation information included into the ring signalling.

The Recorded Information Distribution Equipment is connected into the rings at regional Recorded Announcement Centres. It extracts the voice information and, in the case of the *start-at-the-beginning* services, buffers the information to allow each caller to hear the service from the beginning.

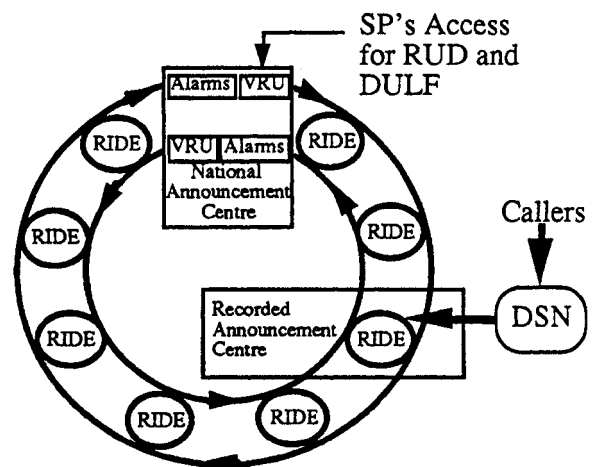


Fig. 4, Distribution of Voice Services for Mass Answering Applications

Service providers are offered BT's on-line statistics facility which provides immediate access to statistics on both Recorded Information Distribution Equipment and all equipment situated behind the Auxiliary Switches (see fig. 5).

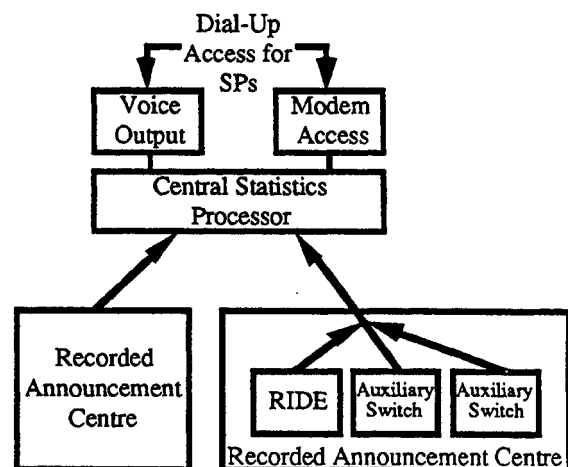


Fig. 5, On-line Statistics Facility

Each Recorded Announcement Centre sends back statistics for 15 minute periods containing information on call counts, hold times and the region where the call originated. *Televote* applications statistics are produced at 1 minute intervals. The statistics are collected centrally and processed to give consolidated information for a service as a whole. Service providers can retrieve the information by dial-up access to either a voice unit which reads out summaries on the statistics or via a modem access.

7. MASS MEDIA APPLICATION EXAMPLE

The following example demonstrates how these features within BT's network can be combined to provide a voice processing solution to the high calling rates associated with a tele-media campaign. A commercial radio station ran a competition for a major prize. Listeners were invited to phone in on a premium rate access number.

The Derived Services Network was used to proportionally shared calls between BT's network based managed recorded information service and the service provider's lines which had the CAM feature. The broadcast managed service was used, with the service provider recording a courtesy message via Remote Update. This message was repeatedly distributed via a digital ring to Recorded Information Distribution Equipment located around the country. These switches used the distributed message to play a courtesy announcement to

95% of the callers to inform them that they had been unsuccessful in being a finalist in the competition. With the switches being geographically distributed, network congestion was minimised.

The remaining 5% of calls were directed to a service provider who used BT's Customer Access Manager to open up all of his lines capacity to cater for the campaign. On one of the service provider's groups of lines a VRU selected a number of callers and used Mid-Call Diversion to divert them to the radio studio to appear on the air.

The campaign generated an enormous response the impact of which was controlled via BT's Network Management Centre. The campaign resulted in a little under half a million calls being answered in about 2 hours.

8. CONCLUSION

BT has developed its network capability to support automated speech applications and the management of voice services operated by independent service providers and also established a managed voice processing platform that has an enormous call answering capacity. When combining these features with its network management control and advanced call routing capabilities of the Derived Services Network it gives the service provider a powerful platform to support the most ambitious of automated voice service campaigns.