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WHITE PAPER

BENEFITS OF MIGRATING IVR SERVICES TO SIP/RTP AS A PRELUDE TO NEW MEDIA SERVICE DELIVERY

CONTENTS

EXECUTIVE SUMMARY

All communications service providers including mobile operators are making increasing use of packet-switched technology such as an MPLS core, soft switch, and soft IVR as they transition to NGN and IMS architectures. In particular, the use of a soft IVR means that many existing media services can be migrated to more efficient SIP/RTP technology to produce costs savings and more flexible solutions.

Media based services, such as self-service IVR systems, Ring Back Tone servers, service announcements, or call centres, are resource intensive and require highly scalable architectures. By adopting a distributed architecture and a platform that combines modules for handling both PSTN-based and IP-based resources an orderly migration to a full NGN solution can be achieved with no disruption to the customer base and negligible business risk.

And of course media solutions that are pre-integrated with other service delivery platform capabilities produce further efficiencies as well as a compelling opportunity for next generation service innovation.

MEDIA SERVICES ARCHITECTURE

A common feature of both PSTN and NGN communications networks is the separation of transmission facilities into signalling and bearer networks. This allows a generalization of the IVR or media application architecture into central control functions and distributed media functions.

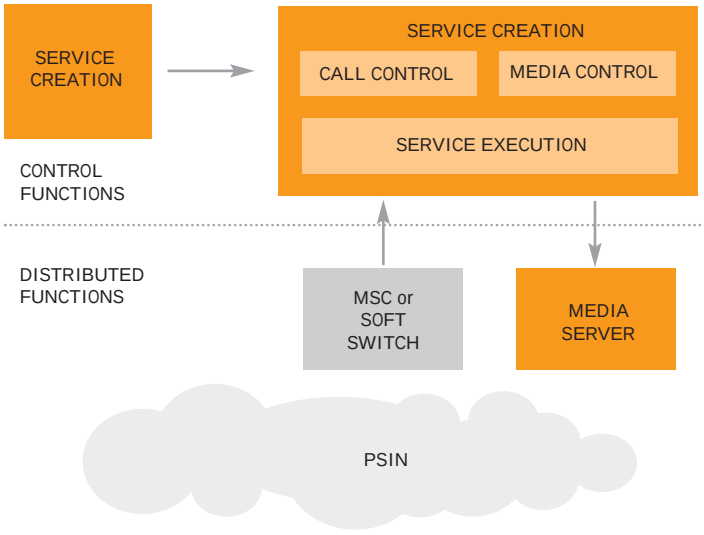


FIGURE 2
MULTI-SITE DISTRIBUTED MEDIA FOR AN SS7 NETWORK

Using componentized software principles it is possible to distribute functional modules to any location so an optimal distribution takes a number of factors into account including type of traffic handled, integration with other systems, and ease of management.

THE DISTRIBUTED MEDIA ADVANTAGE

Each Voice circuit in PSTN requires a 64Kbps channel over T1/E1 links and requires committed resources for any call. Hence placing media servers as close as possible to the ingress point, such as the MSC handling the call, minimizes the use of voice trunks between switching centres.

If all media servers were centralized then every IVR call would be carried to the primary site in order to Play Announcements and Collect User Information (the PACUI commands shown above) or play a Ring Back Tone.

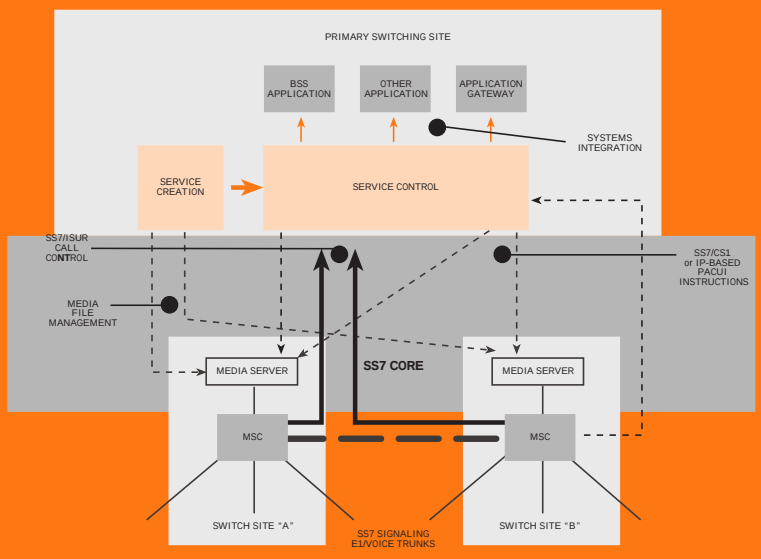
Example 1: If a remote switching site supports a population of 500K subscribers with on average 0.1 Busy Hour Call Attempts (BHCA) per subscriber to the IVR, and an average call hold time of 30 seconds, then we need:

500,000 x 0.1 x 30 / 3,600 = 417 voice circuits

These circuits must be dedicated between the switch and the media server location for IVR activities. Of course this also means that 417 IVR ports are required for this service.

Placing IVR port capacity adjacent to the serving MSC saves 417 inter-switch voice trunks, or 14 x E1 links. And high media usage, e.g. popular Ring Back Tone services, means even higher savings using such a distributed media plane.

FIGURE 2
MULTI-SITE DISTRIBUTED MEDIA FOR AN SS7 NETWORK



WHY NOT DISTRIBUTE THE SERVICE CONTROL?

Having justified a distributed media plane so that it avoids the carriage of IVR media traffic to a central site the question arises as to why we should not treat the signalling plane in the same way and distribute the Service Control Function (SCF).

It can be noted that whilst a distributed SCF may have benefits in certain scenarios, there are a number of major trade-offs that must be considered in relation to media service delivery.

- Signalling traffic requires significantly less bandwidth than media traffic
- Signalling is likely to be centrally managed anyway for other reasons, such as prepaid charging
- Most IVR services require access to subscriber data or other centrally managed applications, so some type of transaction traffic must be directed to the primary site to complete the IVR service
- The advantages in using SS7 for routing, load-sharing and failure handling across large geographies are well proven as part of the core network
- The point-to-point integration (or even EAI bus) used for IVR application integration is not standardized or conducive to multi-site routing and operational management
- Since the primary site is likely to be the seat of management, including service development and testing, a central SCF simplifies operations and hence reduces the overall solution costs

There are many variables involved when it comes to signalling traffic calculations so no precise figures can be provided here. However, it is should be noted that the SS7/ISUP traffic between the MSC and SCF for IVR call handling is relatively simple and lightweight, as is the PACUI traffic from SCF to media servers. In addition, all signalling traffic can share point-to-point SS7 links.

IVR applications vary, and traffic from the SCF to back-end subscriber databases or integrated applications depends on the IVR service. It is reasonable to conclude that any traffic/bandwidth savings that might arise by distributing SCF do not compensate for the added complexity, costs, and risks associated with a distributed SCF architecture.

Unless there are other reasons not related to media delivery the suggested architecture in *Figure 2* is highly recommended for optimal media delivery outcomes, including multi-regional IVR solutions for mobile operators.

Inter-site bandwidth can easily demonstrate **90% savings** (and often much more) for a distributed IVR service.

NGN, IMS AND IVR TERMINOLOGY

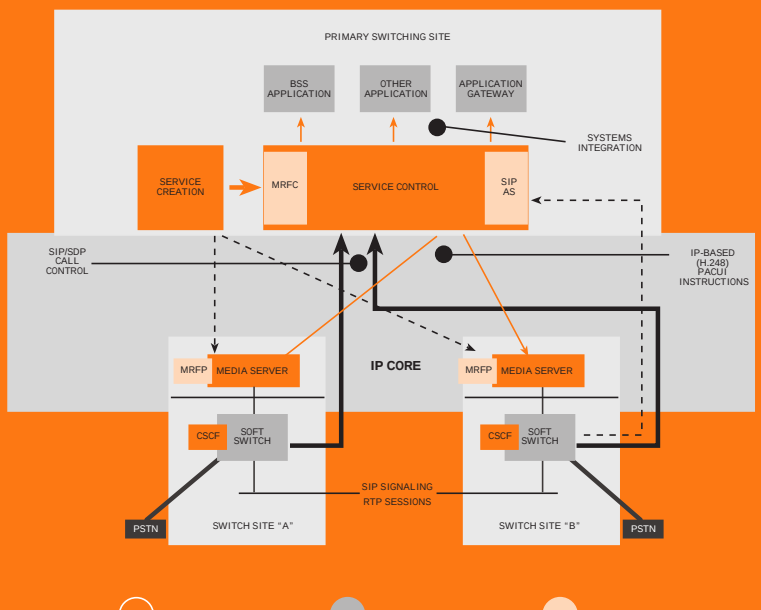
Now we turn our attention to the migration of IVR services to NGN and discover that this transition to IP networking does not change the distributed architecture principles.

For NGN we substitute SIP for SS7/ISUP in the signalling plane, and RTP sessions for E1/Voice bearers across the media plane.

In functional terms, the Specialized Resource Function (SRF) or Intelligent Peripheral (IP) that provided basic IVR facilities for the SSP or SCP in the IN architecture is replaced in IMS by the Media Resource Function (MRF). Similarly, the SCF becomes the SIP Application Server (SIP/AS).

In fact, IMS further divides the MRF into the Media Resource Function Controller (MRFC) in the signalling plane and the Media Resource Function Processor (MRFP) in the media plane then

FIGURE 3
MULTI-SITE
DISTRIBUTED MEDIA
FOR NGN IMS



stipulates the use of H.248 as the control protocol between these in an effort to define standard components and interfaces.

For practical reasons the media server capabilities, including both MRFC and MRFP, are almost always provided by a single vendor and the use of H.248 is not widely accepted. Indeed most vendors have simply evolved their existing IVR architecture into IP-based multimedia solutions.

CO-EXISTENCE AND MIGRATION

The first step in a full migration to an NGN architecture is co-existence. This may take one of 2 main forms:

> Side-by-side deployments

> Hybrid (dual support) components

Supporting side-by-side deployments of similar components may prove costly if the migration takes longer than expected, especially if different vendors are involved. As well as any functional duplication, the management of different systems may add complexity and increase the cost of service maintenance.

Hybrid solutions like those from Amdocs that support IVR and media services over either SS7 or IP networks leverage a layered architecture where multiple protocols can be comfortably handled together under a common service execution platform. Using this approach the migration can proceed in situ from the existing IVR services to new IP-based "soft IVR" services at a pace based solely on business and operational readiness.

INCENTIVES TO MIGRATE TO SIP/RTP

The lure of NGN solutions is **lower costs**. Up front costs are reduced due to the commoditization and standardization of components, but most savings come about through the lower transmission costs involved when using IP-based solutions to deliver services to the end user.

Example 2: Take a typical IVR slice of 240 ports, meaning we need to be able to concurrently handle 240 user sessions for announcements and/or Dual Tone Multi-Frequency (DTMF) user interaction, like pressing menu options. The 240 port bandwidth required using E1/Voice is about 16Mbps whilst for RTP using G729A or G726 it is about 4.8Mbps.

In other words, RTP media servers can offer a **70% saving** on bandwidth between the switch and the media servers.

The bandwidth saving comes on top of the savings achieved by media plane distribution, and the generally lower costs of an IP core over the traditional SS7/E1 core.

Finally, there is one additional area of cost saving that arises in solutions such as those offered by Amdocs. When using SIP/RTP media servers a **higher port density** (meaning more concurrent calls) can be handled on a given hardware server than if the same platform was serving identical media services using SS7/E1 technology.

All of this adds up to a much improved **price/performance** to deliver on the benefits of NGN.

MORE PERSPECTIVE ON SAVINGS WITH RING BACK TONES

The good news on price/performance advantages gets even better in the face of large scale media solutions.

Consider some popular services, such as the Personal Ring Back Tone (or Caller Tone) service. This is a media resource intensive service and can have extremely high scalability.

A subscriber using this has all incoming calls connected to a media server to play an alternate caller tone, such as a favourite song or jingle. Here is how the savings with SIP/RTP media are magnified on such a service.

Example 3: Taking the switching site population of 500K subscribers used in Example 1, we will assume that 40% of subscribers register for the Caller Tone service, and generally there is 1 incoming call per subscriber during busy hour. If the average network ring time is 15 seconds then we can calculate the number of media ports as follows:

500,000 x 40% x 1 x 15 / 3,600 = 833 ports

This means that whereas for a standard IVR service the mobile operator may require approximately 1 media port for every 1,000 subscribers, when using Caller Tone services the ratio may be closer to 1 media port for every 500 subscribers, or even less.

Hence the savings realized through higher port density, lower media bandwidth requirements, and IP-based network infrastructure, are magnified with Caller Tone services. With a future that promises more media-based services for the end user as part of the shift to a more open, Internet style, services regime underpinned by the IMS architecture, the time to think about NGN migration is now.

POWER AND FLEXIBILITY IN A SERVICE PLATFORM

So far the focus in this paper has been on the technical merits of migrating media based services, such as a standard IVR found in every mobile network, to a solution using IP-based services, such as those specified by IMS. It has been demonstrated that such a transition offers significant cost savings. It has also been shown that by adopting proven architectures and using component based solutions such a transition can be made simple and low risk.

But when we consider service delivery with multimedia services, we must also consider how media resources can be reused as building blocks to construct more sophisticated and marketable services for subscribers, and how various services, both within and external to the operator's environment, can be aggregated and used in innovative ways to create competitive value added services.

We start with a closer look at the Amdocs system core.

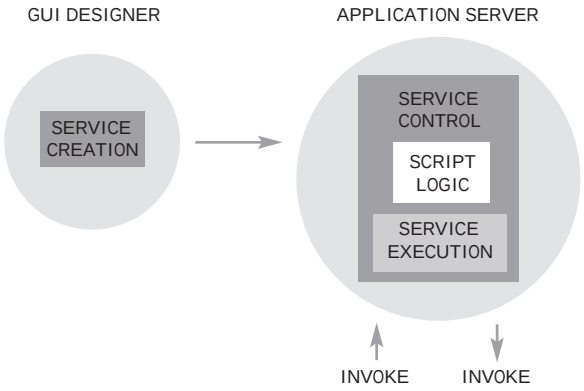


FIGURE 4
GENERAL PURPOSE SERVICE DESIGN AND EXECUTION

The core technology involves 2 main components:

- **Service Creation** that provides a GUI design, debug, and deployment environment for any service and can use over 300 Service Independent Building Blocks (SIBs) – inbuilt, pre-tested service functions
- **Application Server** which runs the designed "script" on a extremely scalable, high performance engine, with access to the service delivery eco-system

A service instance executes a script that is invoked by an external trigger such as a network transaction. The "invoke" request is a set of Attribute Value Pairs (AVP) so that the engine is entirely independent of any protocol. This means that it easy to support common services even across many protocols. Each script may in turn invoke other on-platform or off-platform applications to enrich the service logic.

SERVICE DELIVERY ECO-SYSTEM

A full discussion on service delivery and control is beyond the scope of this paper but by now we should recognize that an IVR, or Ring Back Tone server, are just examples of media-based applications. As the old "stove-piped" view of services gives way to the service delivery eco-system based on horizontal layers, component architecture, standard interfaces, and open access, we can now position media services in the context of end-to-end service delivery.

Media service delivery becomes part of the overall service capability mix, leveraging the Amdocs core system technology for flexible service design and execution, and integrating with other eco-system elements such as Online Charging Systems (OCS) for access to subscriber account details, Diameter for charging, and SOAP to invoke Web Services or applications within, or external to, the operator.

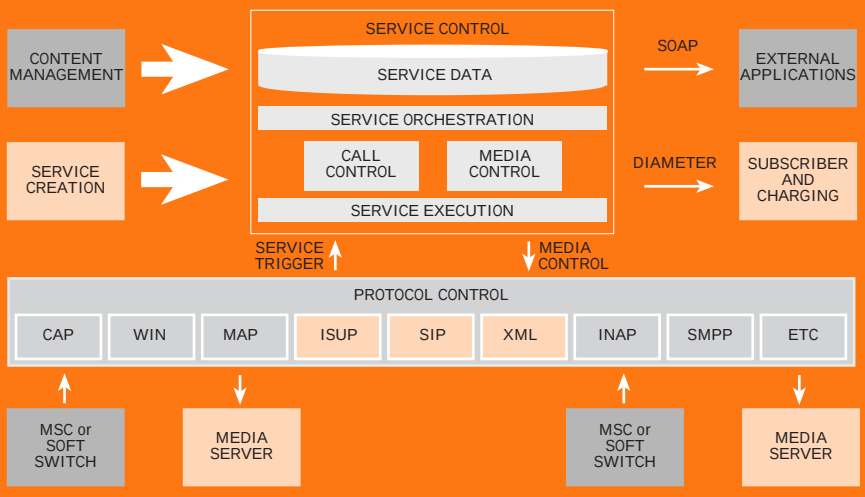


FIGURE 5
MEDIA-BASED
SERVICE DELIVERY ECO-SYSTEM

Benefits gained by shifting to NGN technology for media services such as IVR and RBT are then inherited by any subsequent media applications.

New marketing initiatives can build on the strength of integrated Call Control and Media Control within this eco-system to create service variants that stimulate customer loyalty and open the way for new revenues. Examples of service evolution that are enabled include:

- **Video Ring Back** which evolves the popular Caller Tones (or RBT) service into a full multimedia play
- **Interactive Voice** and Video (IVV) which adds colour to familiar IVR services by adding video to audio instructions and speech as well as DTMF interaction
- **Mobile Blogging** where users can share media as a way of social networking
- **Mobile Advertising** to insert payed advertisements into subscriber Call or Message services which will widen revenue opportunities and offset declining usage charges
- **Targeted offers** using Business Intelligence and market segmentation tools to target individual subscribers for up-sell and cross-sell
- **Mobile Shopping** to deliver an online shopping experience to time challenged subscribers building loyalty and value

Such next generation services, and many others like these, expect to co-exist in a vibrant eco-system of multimedia interaction. The foundation is a next generation services platform based on a proven future-proof architecture.

CONCLUSION

Amdocs can support the present needs of mobile operators for services as common as IVR and RBT on the Amdocs Service Platform. However, by using this platform these services and many other integrated subscriber transactions can be seamlessly migrated into the NGN world.

The core Service Creation and Application Server technology provides a single platform that equally supports all protocols and orchestrates service delivery through open integration with resources in other systems. Multimedia based services are an inherent part of this service delivery eco-system making the promised benefits of the next generation of services in reach today

ABOUT THE AUTHOR

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