

holly5

IVR Virtualization

Transforming the Value of IVR

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Introduction to IVR Virtualization

Introduction

Holly5 IVR Virtualization goes beyond the multi-application and multi-tenancy offerings of other IVR products to provide superior flexibility, greater responsiveness to evolving business and commercial requirements whilst maximizing the utilization of the IVR investment.

After many years of IVR investment, enterprises are often left with a range of IVR systems spread across many business units and multiple vendors, often with under-performing legacy technologies. These factors lead to wasted capacity, inflexibility in resource allocation, difficulty in meeting new regulatory requirements, and competing demands on operational and application teams.

Holly5 IVR Virtualization is a unique offering that allows IVR managers to harmonize IVR services to a common next-generation infrastructure based on open standards, Voice over IP and state of the art automation.

Call automation on IVR plays a core role in most enterprise self-service strategies as a means of maintaining or improving customer service levels while also reducing service cost. IVR solutions utilizing touchtone and speech recognition can provide excellent self-service and can be blended effectively with agent services.

“Holly’s IVR Virtualization offers all the advantages of shared infrastructure and the advantages of a dedicated IVR.”

IVR Virtualization

Virtualization is an established computing technique that has been widely adopted in IT data centers as a means of improving operational efficiency and substantially reducing costs.

Virtualization refers to separating the physical characteristics of computing resources from the way in which other systems interact with those resources. Virtualization is achieved through aggregation, disaggregation or the combination of both.

Aggregation is the virtualization technique that makes multiple physical resources appear as a single logical resource. **Disaggregation** is the mirror virtualization technique that makes a single resource appear as multiple logical resources.

Holly5 Virtual IVRs, created through 5 years of Research & Development, are a fundamental advance on traditional IVR and multi-tenanted IVR products. Virtualization improves infrastructure utilization, particularly for multi-service environments. IVR Virtualization reduces capital and operational expenditure yet provides access to leading IVR performance and functionality with support for open standards.

Holly5 delivers both virtual aggregation and virtual disaggregation, allowing an organization to deploy a single physical IVR infrastructure across multiple sites and provision onto that infrastructure many Virtual IVRs, each of which performs as if it were an independent, dedicated IVR.

Holly5 Virtual IVRs offer all the functionality of a dedicated IVR but with the advantage that they can span a widely distributed foundation IVR with that foundation shared across dozens or even hundreds of Virtual IVRs each executing a separate service. All Virtual IVRs thus share common hardware and software infrastructure, operational resources and port capacity. Through Holly’s unique technology, IVR Virtualization offers all the advantages of shared infrastructure plus the advantages of dedicated IVRs.

Holly5: Comprehensive IVR Suite



- » **Unique Virtual IVR functions for responsiveness, efficient operations and lowest cost of ownership**
- » **Leading VoiceXML performance & density**
- » **Inbound and outbound services share capacity**
- » **Web services architecture for applications**
- » **Blend self-service and agent interaction**
- » **High-density, highly scalable architecture**
- » **Distributed, redundant, high-availability architecture**
- » **Advanced speech technology**
- » **Real-time, in-depth, centralized reporting**
- » **Native Voice over IP plus TDM interoperability**
- » **On-premise, internally hosted & externally hosted options**

IVR Virtualization Explored

Despite the widespread use of virtualization in general computing, this powerful technique is a new feature in a standard IVR product. Holly5 combines both virtual aggregation and virtual disaggregation techniques to offer a powerful call automation infrastructure.

Aggregation: Holly5 Foundation IVR

Holly5 scales from a single box IVR system to a widely distributed, massively scalable architecture. No matter the scale, a Holly5 architecture operates as a single Foundation IVR using virtual aggregation techniques to make the distributed physical infrastructure operate and appear to behave as a single manageable system.

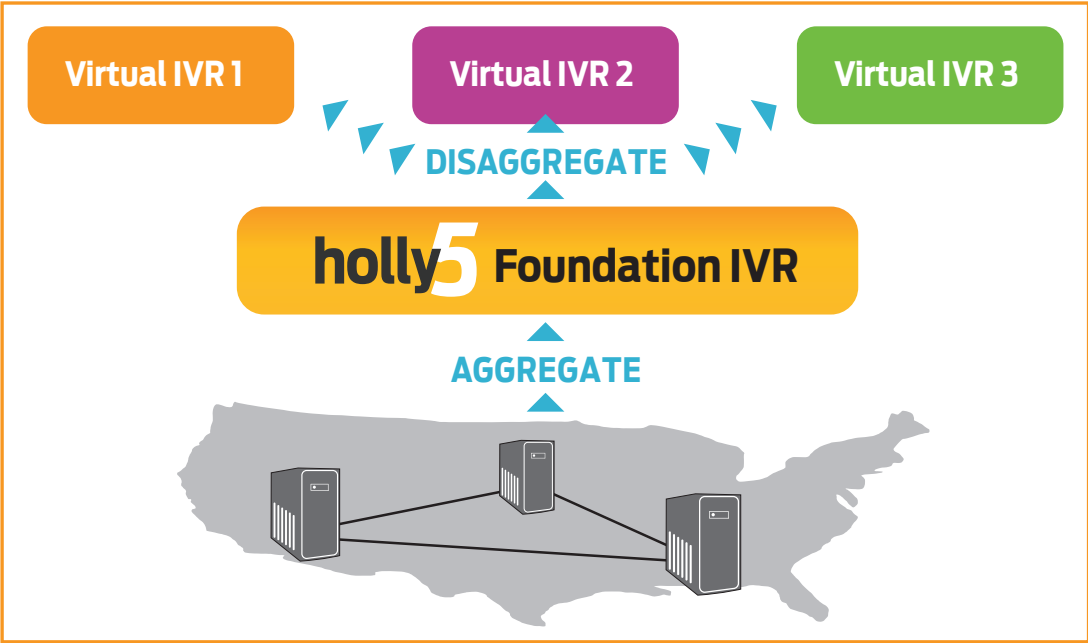
The figure below illustrates a distributed IVR solution with an IVR farm deployed across three sites in Eastern, Central and Western USA. Each site is potentially a multi-

server, multi-cluster installation to provide high levels of redundancy and available at each site.

Holly5 provides the virtual aggregation capabilities that allow this trans-national system to appear as a single virtual system which is referred to as the Holly5 Foundation IVR.

The key capabilities that unify the operations of this distributed farm are:

- Centralized management with a single point of control over all the system
- Ability for calls landing at different sites to be treated identically
- Ability for calls across all sites to managed under a unified capacity control system that mediates usage of system resources including ports and speech resources
- Infrastructure provided so that all logging, reporting and alarming is centralized and unified across all sites.



IVR Virtualization Explored

Disaggregation: Holly5 Virtual IVRs

Holly5 builds upon the unified Foundation IVR by using virtual disaggregation to partition and re-present the underlying resources as a set of Virtual IVRs.

A Virtual IVR looks, feels and operates much like a dedicated, stand-alone IVR which provides a model that is very familiar to owners and users of traditional IVR.

What is unique about Holly5 is that all the Virtual IVRs operate independently whilst still sharing the resources of the Foundation IVR but subject to the capacity grants, policies and permissions of the system operator.

Each Virtual IVR may be running a very different kind of application: speech or DTMF, dynamic or static, development or production, inbound or outbound, high volume or low volume and so on.

“Any Port, Any Service, Any Time”

Holly5 provides the port management and resource allocation features so that each call is allocated the required resources. Because Holly5 allocation is dynamic, there is no need to tie services or resources to ports so that any port at any site can handle any Virtual IVR at any time.

What defines a Virtual IVR is that is provisioned with independent facilities for:

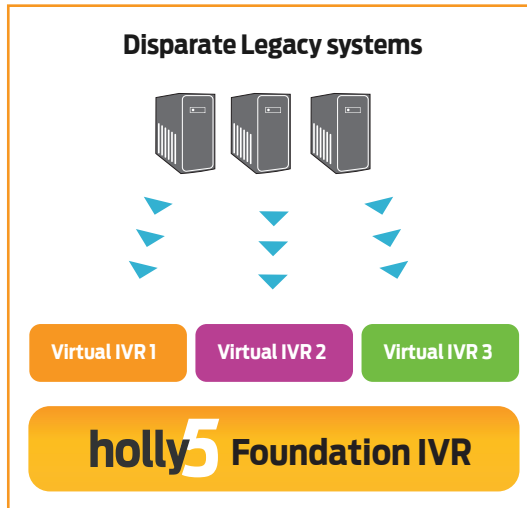
- Inbound and/or outbound call services
- Application independence with Certified VoiceXML support
- Choice of speech resource or touchtone
- Independent and flexible port capacity management
- Independent configuration of over 100 properties
- Resource allocation and monitoring for sociability
- Secure web portal for reporting and management.

Benefits of IVR Virtualization

Holly5 Virtualization is the ideal means of providing a consolidated IVR solution for Internal Hosting of enterprise-wide call automation services.

Consolidate and Harmonize

Holly5 offers all the advantages of consolidated and shared infrastructure but addresses the common objections to centralization. Each Virtual IVR offers state-of-the-art automation capability without sacrificing ownership of the customer experience, independence in application deployment or management self-service.



- Lowest cost of ownership through central management of a widely distributed and shared infrastructure with consolidation of people, skills and business processes.
- Each business unit can own one or many Virtual IVRs with self-service for independent management of applications, capacity, configuration and reporting.
- Optimize infrastructure utilization by sharing IVR hardware and software investments across a diversity of applications and business units. Unlike traditional IVRs, with Holly5 Virtual IVRs all resources are available for any service at any time.

- Holly5 Virtual IVRs avoid the conflicts created by traditional IVR solutions when services share infrastructure and compete for the control of system behaviors and resources.
- Holly5 operators can apportion the capacity and cost of shared IVR infrastructure across business units with rapid response to changing requirements.

Increase Responsiveness

Self-Management Simplifies Ownership: Holly5 Virtual IVRs can be self-managed by their business unit owners without day-to-day involvement of central operators. Each Virtual IVR has a dedicated Web Portal with central operators able to selectively delegate ownership, management rights and configuration rights to each owner.

Holly5 enforces strict isolation and security constraints. A Virtual IVR user cannot view the customer data, call records or configuration of another Virtual IVR. Similarly, changes to the configuration or behavior of each Virtual IVR are isolated.

Dynamic & Ready-To-Go: It takes less than a minute to provision a new Virtual IVR and seconds to resize or reconfigure it. This provides the Virtual IVR owners with greatly improved responsiveness to changing business requirements over traditional IVR systems. Furthermore, these processes do not affect live calls or the behavior of other Virtual IVRs.

Benefits of Virtualization

Lower Costs

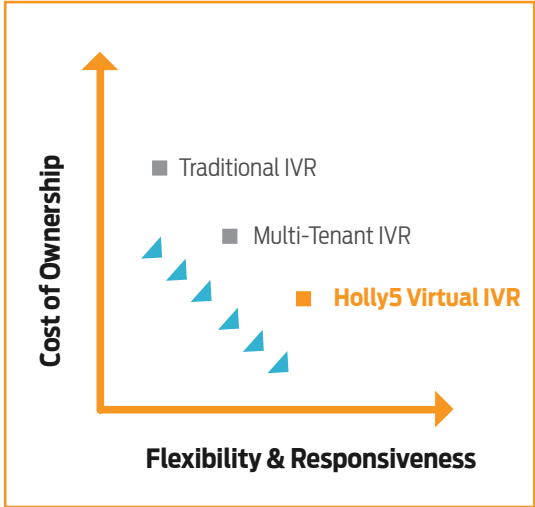
Improved Manageability: A single smaller operations team can supervise a nationally or globally distributed infrastructure from Holly5's central management console. Holly5 supports dynamic configuration, live provisioning and web-based process control.

Maximized Resource Utilization: Holly5 has unique capabilities that enable operators to optimize utilization of IVR capacity, equipment and software licenses. With every IVR port capable of handling any call for any service at any time, operators can dedicate or pool capacity to meet customer requirements.

Leading Density: By achieving leading port density for a VoiceXML Compliant platform, Holly5 reduces hardware expenditure, equipment space, power usage and operational overheads.

Standard Hardware: Holly5 is a software-only solution deployed on standard x86/Linux and Solaris equipment ranging from basic servers to blade servers and high-availability mid-range equipment. In contrast to proprietary solutions, this standard hardware is competitively priced, more easily sourced, improves supportability, and provides consistency with other IT systems.

Centralized and Dynamic: Holly5 configuration and management of all Virtual IVRs is centralized and available through a secure, easy-to-use web portal. Remote management through the Holly Management System is simpler and cheaper with dynamic configuration improving responsiveness to both changing business and technical conditions.



Self-Service Diversity

Holly5 has comprehensive coverage for call automation application from basic touchtone through to advanced multi-lingual and natural language conversations.

Many Applications, Many Virtual IVRs

With certified compliance for open standards and support for all leading speech products, Holly gives enterprises the confidence to put a wide range of services for multiple owners onto a shared infrastructure.

Virtual IVRs provide greater flexibility and responsiveness in multi-application environments with the value increasing with each additional service deployed.

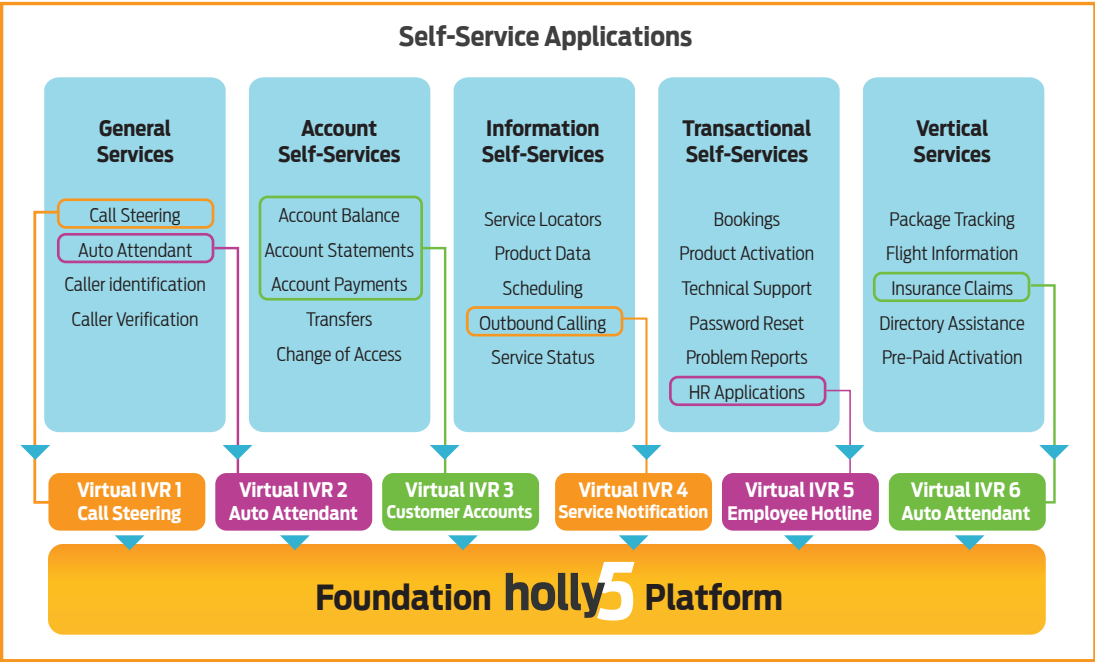
With Virtual IVRs, each service operates in isolation with independent capacity allocation, configuration, monitoring and reporting. Services can be provisioned and updated in seconds without interruption or impact to other existing services.

Despite the logical separation, Holly5 allows any call to any port of the foundation platform to be handled by any Virtual IVR. This allows the central operator to maximize the utilization of the resources by redistributing capacity rights according to changing call volume and business requirements.

Off-the-Shelf Applications

VoiceXML, with its portability and power, has created a market of off-the-shelf applications for general enterprise deployment and for specific verticals. There are ready-to-go solutions for most of the applications in the figure above.

Off-the-shelf applications and Virtual IVRs are a powerful combination. An enterprise can source, configure and deploy applications more rapidly than is possible with other delivery models. Each Virtual IVR can be running an application created by a different supplier with the configuration to optimize the performance and success of that service.



Self-Service Diversity

Delegated Ownership

Holly5 allows the central operator to delegate capacity, management, reporting and other self-service facilities to business unit owners of Virtual IVRs. The Holly Management System provides each Virtual IVR with a web portal providing the following capabilities:

- Self-management of service updates, configuration and call handling subject to the permissions and control rights delegated by the system operator;
- Sophisticated, real-time reporting for business owners, developers and designers with over 45 views on call data;
- Security for their customer data and call records;
- Control of the system resources including port capacity and speech recognition subject to the permissions granted by the system operator.

Operational Isolation

Once created each Virtual IVR can be managed independently. This is a key advantage over traditional IVR systems in which changes to services often conflict and require coordination and assessment of cross-impact.

For example, when deploying a new speech service, the industry best-practice is to validate and enhance the application through a pilot process with analysis of call outcomes and caller behaviors. The pilot program results in a series of tuning recommendations for changes to prompts, grammars and call-flow with the objective of improving the caller experience and automation rates.

Holly5 supports the ability to selectively activate call recording for a single application through its Virtual IVR, plus the ability to control speech recognition logging, utterance capture and other monitoring facilities that are valuable in pilot phase. Contrast this with standard IVR platforms in which these features are controlled at a machine level and therefore activating them for one service can affect all services on that machine at the expense of independence and performance.

Virtual IVR – 7 Key Features

Holly5 Virtual IVR combine the advantages of shared infrastructure with the advantages of a dedicated IVR. Each Holly5 Virtual IVR has the 7 key features of an independent IVR with provisioning, applications, speech automation, capacity management, configuration, resources and reporting.

Inbound & Outbound Provisioning

A Holly5 Virtual IVR is provisioned instantly with a one-click operation. Once created, a Virtual IVR may be managed independently or assigned to a Group for common configuration and management. All integration of telephony, CTI, speech and other services is provided by the Holly5 Foundation IVR so those facilities can be assigned immediately to the new IVR with minimal overhead.

Each Holly5 Virtual IVR can be provisioned to provide inbound or outbound call services – or both. Virtual IVRs have independent inbound/outbound number ranges, can have differentiated CTI treatment plus a suite of advanced call processing features.

Outbound facilities include VoIP-Centric call progress detection with active detection of fax, modem, answering machines and network signaling.

Application Independence

Each Holly5 Virtual IVR can operate one or many applications all on a platform that is independently-certified as VoiceXML Compliant.

The VoiceXML standard brings the web services architecture to IVR solutions. Organizations are increasingly harmonizing their contact center and web channels on common back-end solutions with shared development teams for substantial cost savings and faster service delivery.

Holly supports a wide variety of VoiceXML development tools including Vicorp, VoiceObjects, VoxGen, IBM Speech Tools, Nuance dialog products and many more. Standard development environments include Eclipse, J2EE and Microsoft .Net.

Advanced Speech Automation

Any Holly5 Virtual IVR can host applications from the most basic prompting and touchtone applications through to advanced speech conversations with multi-lingual and natural language input in over 45 languages.

Holly5 dynamically allocates speech resources as calls require it, delivering savings in licenses and hardware.

Holly5 supports leading speech products from Nuance Communications, IBM, Telisma, Loquendo and LumenVox with support for open standards including W3C's SRGS and IETF MRCP.

Flexible Capacity

Each Holly5 Virtual IVR can be resized on demand to increase or reduce capacity – a capability not available for traditional dedicated IVRs. Virtual IVRs can share capacity in pooling arrangements, can be allocated dedicated capacity or can be sized with a combination of dedicated and pooled capacity.

Dynamic Configuration

Each Holly5 Virtual IVR has entirely independent configuration. Each Virtual IVR owner has separate control of call recording, logging depth, VoiceXML defaults and over 100 other configurable behaviors. This capability eliminates the biggest cause of conflict between co-resident services in traditional IVRs.

Virtual IVR – 7 Key Features

Sociability: Monitor & Protect Resources

A critical challenge of shared infrastructure is that Virtual IVRs play well together. Holly5 delivers unique IVR capabilities for monitoring resource usage by each Virtual IVR and for operators to ensure sociability. Key resources – including CPU, memory and speech engine usage – are monitored and protected. Holly5 also allows operators to impose policy restrictions on Virtual IVRs; for example, preventing use of speech recognition or restricting speech recognition usage to a specified product.

Comprehensive Real-time Reporting

Each Holly5 Virtual IVR has a dedicated reporting console that provides users with in-depth real-time reporting that spans business intelligence, technical inspection and speech analytics.

Over 45 reports cover call volumes, call outcomes, web performance, application responsiveness, resource usage and much more.

The Virtual IVR portal supports different levels of permission and rights for administrators, developers, and business reporters. Holly5 also includes a Developer Console for each Virtual IVR with real-time access to speech recognition logs.

IVR Virtualization without Sacrifice



Open Standards: VoiceXML + VoIP

Holly Connects is a leader in open standards IVR systems.

Holly5 supports the Web Services Model with native support for HTTP, Secure HTTP and XML.

Holly is Certified VoiceXML 2.0 Compliant. Defined by the World Wide Web Consortium (W3C), VoiceXML builds on the web model by providing a standard language for authoring IVR applications. Holly also supports the suite of W3C Recommendations in the VoiceXML family including SRGS, SISR, SSML and NLSML. Holly staff have led the development of many of these W3C standards.

Holly is also a Sponsor of the VoiceXML Forum and represented on its Board of Directors which is providing leadership in the standards setting process.

Holly provides native support for Voice over IP (VoIP) through implementation of key standards including the Session Initiation Protocol (SIP) and Real-time Transport Protocol (RTP). Holly is deployed with a wide range of VoIP products including Sonus, Cisco, Avaya, Nortel, Broadsoft, AudioCodes Asterisk and Nokia amongst many others.

VoiceXML and VoIP together provide Holly's customers with confidence that a Holly IVR investment has a long lifespan and that it is interoperable with a broad range of 3rd party products.

Leading Density & Performance

With leading density and performance, Holly5 can pack more ports into less space on a lower budget. The Holly5 Foundation IVR delivers the capacity to run 400 simultaneous VoiceXML calls on a standard dual-CPU server and the ability to rack-and-stack servers to meet large enterprise requirements.

Holly5 Virtual IVRs are engineered to leverage the full performance and density of the Foundation IVR so running Virtual IVRs has no effect on the platform density.

Scalability

Holly5 supports deployment to simple single-server configurations and scales to well beyond 10,000 ports. Holly's software-only solution supports independent scaling of components for call execution, logging and other functions to meet capacity requirements.

With the ability to dynamically provision new equipment and ports, customers can upsize their infrastructure as call demands dictate. Because Holly runs on standard equipment the lead time for scaling is greatly reduced.

Carrier-Grade Reliability

Holly5 was engineered for carrier-grade reliability and availability. It has been field-proven through deployment in large enterprise, telecommunications and hosted service providers on six continents.

- Fully redundant architecture: Holly5 delivers redundancy at machine, cluster and site levels. It is engineered with no single point of failure and with failover handling between components that is automatic and instantaneous to maximize call handling.
- Resilient architecture: Holly5 is tolerant of network, hardware and software failures. Holly performs extensive and intensive product qualification processes to verify behavior in a wide range of abnormal conditions.

IVR Virtualization without Sacrifice

- Self-healing architecture: Holly5 has watch-dog processes that detect abnormal processes and perform automatic component restarts to maintain service ability.

Alarming: monitor and control platform alarming with feeds to SNMP, Syslog and a wide range of management tools.

Central Management

Holly5 is operated through the Holly Management System. HMS is the dashboard of Holly5 and it provides a web console that allows a distributed Holly system to be provisioned, monitored and configured as a single system.

Control Virtual IVRs:

Through HMS the central operator has full control over all Virtual IVRs on a shared Holly5 Foundation IVR. The operator has comprehensive administrator rights:

- Create and remove Virtual IVRs
- Configure Virtual IVRs
- Allocate and adjust capacity for Virtual IVRs including pooling of capacity
- Assign rights and permissions to Virtual IVR users
- Monitor usage of critical system resources by Virtual IVRs
- Report on call volumes for Virtual IVRs and groups of Virtual IVRs.

OA&M for the Holly5 Foundation IVR:

Through HMS the central operator also has full control and management for the Foundation IVR with central oversight of distributed equipment and call handling facilities.

Configuration: configure the infrastructure, with most capabilities being dynamically configurable.

Real-time Reporting: monitor performance and utilization of the entire Foundation IVR infrastructure.

Provisioning: remotely deploy and upgrade servers across the network without interruption to calls in progress.

Glossary

IETF: The Internet Engineering Task Force develops and promotes Internet standards. Key IETF standards relating to IVR include TCP/IP, SIP, RTP, HTTP and HTTPS.

MRCP: Media Resource Control Protocol is an IETF specification that defines a standard protocol for an IVR to employ the capabilities of speech recognition and text-to-speech servers. It is supported by all leading speech vendors.

RTP: The Real-time Transport Protocol is the IETF standard for delivering audio and other media over the Internet. Commonly used with SIP, RTP is natively supported by Holly5.

SIP: The Session Initiation Protocol is the IETF standard that is the leading Voice over IP Protocol along with RTP. SIP is natively supported by Holly5.

SISR: Speech Interpretation for Speech Recognition is a W3C standard for extracting meaning from spoken input to VoiceXML and SRGS systems. SISR is supported by Holly5 and by leading speech recognition vendors.

SRGS: Speech Recognition Grammar Specification is the W3C standard for declaring how speech recognizers should process spoken input by defining words and patterns of words. SRGS is supported by Holly5 and by leading speech recognition vendors. SRGS is a key module of the VoiceXML language.

SSML: Speech Synthesis Markup Language is a W3C standard for providing annotated input to text-to-speech (or speech synthesis) products. SSML is supported by Holly5 and by leading text-to-speech vendors. SSML is a key module of the VoiceXML language.

Virtualization: A standard computing technique in which physical characteristics of computing resources are separated from the way in which other systems interact with those resources.

Virtual Aggregation: The virtualization technique that makes multiple physical resources appear as a single logical resource.

Virtual Disaggregation: The virtualization technique that makes a single resource appear to function as multiple logical resources.

Virtual IVR: Unique technology from Holly Connects for provisioning multiple IVR solutions through both virtual aggregation of distributed physical resources and disaggregation into Virtual IVRs.

VoiceXML: A W3C standard for authoring interactive dialog applications with speech and/or touchtone input and prompt and text-to-speech output. VoiceXML is based on XML and brings the web model of deployment to IVR solutions.

VoiceXML Forum: The industry organization formed to promote the VoiceXML standard through marketing, education and certification.

W3C: The World Wide Web Consortium develops the interoperable standards that are the basis of the Web. The W3C Voice Browser Working Group develops the IVR-related standards including VoiceXML, SRGS, SISR, SSML and CCXML.

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