ABSTRACT: The VidyoWorks software platform enables you to embed point-to-point and interactive multi-point video, audio, and collaboration inside your own applications, workflows, and custom web portals. This delivers the right communications modality where and when it’s needed, without forcing users to toggle between your application and a standalone communication client.
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Introduction

VidyoWorks™ is a software platform and development environment that enables enterprises, web developers, and service providers to integrate or embed high quality visual communications into their applications. VidyoWorks changes the economics and usage models for visual communications and has been embraced by application developers across business, consumer, and vertical markets connecting millions of people.

The Vidyo architecture was designed, from inception, to have native customization capabilities. Instead of building the Vidyo branded portfolio of products first, then bolting on APIs as an afterthought, the Vidyo architecture was conceived as a development platform that could be extended into a myriad of applications and markets. Vidyo’s own enterprise video communication and collaboration portfolio, VidyoConferencing™, is built upon the VidyoWorks platform. This means that all of the capabilities found within the VidyoConferencing product portfolio can be replicated within a third party custom application. This platform-first approach also means that the VidyoWorks platform makes custom development and integration a significantly simpler process than is customary with other communications applications.
VidyoWorks™ offers a variety of tools to build Vidyo enabled applications. Developers can perform a variety of customizations ranging from cosmetic skinning and branding changes to the user interface to deep integrations into a new or existing application or workflow.

The diagram below shows the VidyoWorks architecture. The VidyoWorks architecture is made up of several components:

![Diagram of VidyoWorks architecture]

**Vidyo Core Technology and VidyoWorks™ SDK**

The Vidyo core technology is the base level set of technologies that make up a videoconferencing platform. This includes client technologies such as the video and audio capture, encoding, decoding, rendering, and transport elements. It also includes the server components that provide point-to-point and multipoint calling, firewall transversal, and dynamic network adaptation. Vidyo core technology is an ensemble of technologies and is accessible through the VidyoWorks SDK.

The VidyoWorks SDK is an ensemble of all of the necessary technology and components that make up a videoconferencing system and is built on top of the Vidyo core technology. The VidyoWorks SDK is used by organizations that want to build their own conferencing infrastructure and solution using Vidyo technology. It is not assembled into simplified API, but rather provides low-level access to the software libraries that make up the Vidyo Core Technology.
Development with the VidyoWorks™ SDK requires the developer to assemble the “raw” components into a working videoconferencing platform.

The framework builds on top of the VidyoWorks SDK by assembling many of the low level VidyoWorks SDK methods into a higher level interface. By abstracting the complexity of the VidyoWorks SDK, the framework logically combines lower level methods in a manner that are ideal for videoconferencing applications. This leads to a streamlined set of commands that are made available to the VidyoWorks APIs. The result is a set of VidyoWorks APIs that are very powerful but significantly less complex.

**VidyoWorks APIs**
The VidyoWorks APIs (Application Programming Interface) are built on top of the VidyoConferencing Framework and are ideal for rapidly building Vidyo enabled applications. The VidyoWorks APIs are used by organizations that want to Vidyo enable their workflow application, web portal or business process, and wants to leverage Vidyo’s off-the-shelf infrastructure products to provide all of the back end communication services. In other words, they want to focus on what it is that they do best and leave the heavy lifting on the communications side to the experts. The VidyoWorks API set provides the necessary tools to manipulate or customize both client and server components of the Vidyo architecture. The VidyoWorks API set is made up of very powerful but simple methods, which lead to rapid development of custom applications or Vidyo enabled web portals without any special skills or expertise in communications.
VidyoWorks™ SDK

The VidyoWorks SDK is a complete and comprehensive software development kit for enabling your application or device with telepresence quality video, voice and content sharing capabilities. The VidyoWorks SDK allows for the development of new products based on Vidyo’s patented dynamic adaptation, video routing and Scalable Video Coding (SVC) technologies.

The VidyoWorks SDK packages the Vidyo Core Technology into a set of tools that can be used to build specialized custom platforms based on Vidyo Core Technology. The VidyoWorks SDK is designed for very low-level integration and provides the greatest degree of customizability. However, it does require significantly more effort and expertise for development projects as it lacks the VidyoConferencing Framework.

VidyoWorks SDK Highlights

- Modular architecture
- Hardware support for x86 and ARM
- OS independent: Windows, Linux, Mac OS X, iOS, Android
- API’s are object oriented, ANSI C (C89, C99)
- Thread-safe
- Multi-core optimized
- Well defined high level interfaces for video, voice and data applications
- Advanced plugin interfaces for deep customization
- Secure and scalable
VidyoWorks™ APIs

The most common entry point into the VidyoWorks architecture is via the VidyoWorks APIs. The APIs provide a significant level of integration and customizability without requiring extensive knowledge of video compression, media transport, session management, and other aspects of video communication normally required when working with the VidyoWorks SDK. Instead, the API approach leverages Vidyo’s off-the-self infrastructure that handles all of the heavy lifting on the communications side, enabling the developer to focus on the user experience and workflow. In short, the VidyoWorks APIs allow application developers to rapidly build custom applications with embedded videoconferencing without the need to become experts in videoconferencing and communication.

The VidyoWorks APIs provide the easiest and most rapid path for developing custom applications with readily available and lower cost development expertise. They are built on top of the VidyoConferencing™ Framework, and are the same APIs that Vidyo’s own products are based upon. Using the VidyoWorks APIs provides a high level of customizability while still leveraging all of the benefits of the VidyoConferencing architecture and intellectual property.

Components of VidyoWorks APIs

The VidyoWorks APIs are organized into four main areas. Each of these four areas has a set of APIs that provide associated functionality. Each of the four areas provides different capabilities and use different technologies for integration. These include:

- **VidyoWorks Server API** – Provides customization and integration with all of the Vidyo infrastructure components
- **VidyoWorks Client API** – Provides customization of the in call video client
- **VidyoRoom Remote Control API** – Integrates VidyoRoom systems into third party control and automation systems or custom control apps
- **VidyoDesktop Plug-in API** – Provides a mechanism for adding functionality to the existing VidyoDesktop client

Each of these areas is explained in the sections below.

VidyoWorks™ Server API

The VidyoWorks Server APIs provide programmatic access to the line of Vidyo server products. These include the VidyoPortal™, VidyoRouter™, VidyoGateway™, and VidyoReplay™. In order to use the VidyoWorks Server APIs, a working Vidyo deployment must be in place. At a minimum, the deployment must include a VidyoPortal and VidyoRouter as these are required with any Vidyo deployment. Therefore, any custom application developed using the VidyoWorks Server API must have the associated Vidyo product. For example, if the custom application needs to interact with SIP or H.323 devices the VidyoGateway is required to provide this functionality. If streaming and recording of conferences is needed, the VidyoReplay must be part of the deployment.

The APIs available for the servers are web services based APIs. The API methods are implemented using SOAP over HTTP/HTTPS. One of the advantages of utilizing Vidyo’s
How does Vidyo’s dynamic adaptation work?
Dynamic adaptation works by leveraging the video encoded using scalable video coding. By leveraging H.264 SVC (UCIF Mode 2s), the VidyoRouter can manage both temporal and spatial video layers. This allows the VidyoRouter to dynamically adjust both frame rate (temporal scalability) and resolution (spatial scalability) of the video stream without needing to transcode the video. Having both temporal and spatial scalability provides two dimensions for adaptability delivering unprecedented precision. Combining this adaptability with Vidyo’s intelligent algorithms results in superior video quality over the widest range of network conditions. This capability can be extended to any future scalable codec such as H.265 SHVC or VP9.

VidyoPortal™
The VidyoPortal is the central management and signaling server within the Vidyo architecture. It is a required component of the VidyoWorks™ API platform and is the central interface to the system. The VidyoPortal exposes a set of web services APIs that allow third parties to develop their own custom portals using Vidyo’s technology. These services are exposed via SOAP/WSDL interfaces. All VidyoWorks Server API calls are issued through the VidyoPortal providing a single point for managing the entire Vidyo infrastructure.

VidyoRouter™
The VidyoRouter is a core component of the Vidyo architecture. It is responsible for routing all audio and video transmitted during a call. The
VidyoRouter is also responsible for performing dynamic adjustment of video quality based upon network conditions, endpoint capabilities, and user viewing preferences. In short, the VidyoRouter™ dynamically manages the media portion of a videoconference.

While the VidyoRouter is the heart of the Vidyo infrastructure, the VidyoPortal™ manages it. For this reason, commands are not issued directly to the VidyoRouter via API. Instead, commands issued to the VidyoPortal are translated into call setup commands to the VidyoRouter(s) involved in the call. Once the VidyoRouter has been deployed, configured, and registered to the VidyoPortal there is little need to interact with it directly. Therefore, there are no web services APIs for the VidyoRouter.

VidyoGateway™
The VidyoGateway allows the VidyoConferencing infrastructure to connect to traditional H.323 and SIP devices. The VidyoGateway can be integrated with SIP based IP PBXs, such as a Mitel or ShoreTel SIP based phone system. The VidyoGateway seamlessly integrates into the network providing the end user with an easy experience regardless of whether they are calling a Vidyo device or traditional H.323/SIP device.

Conceptually, one can think of the VidyoGateway as a back to back user agent, with IVR services, that translates between Vidyo and H.323, SIP, and other future protocols. For the purposes of call setup engaging the VidyoGateway is simply a matter of placing a call and does not require any additional steps. Therefore, from an API perspective the VidyoGateway can be engaged in a call using the same call setup commands that are used for Vidyo endpoints. The VidyoGateway is part of the Vidyo infrastructure and is managed by the VidyoPortal. Commands issued to the VidyoPortal are translated into call setup commands to the VidyoGateway(s) involved in the call. Once deployed there is little need to interact with the VidyoGateway directly.
**VidyoReplay™**
The VidyoReplay™ enables recording and streaming of the audio, video, and content that is shared during the conference. It can be used to record sessions for on-demand playback or extend the conference to a live webcast for non-interactive audiences to view the conference. With integrated content catalog, viewers can easily search and access recordings and live webcasts. Content owners can manage their own recordings easily through web interface. The VidyoPortal™ manages VidyoReplay. For this reason, commands are not issued directly to the VidyoReplay via API. Instead, the VidyoReplay API calls are issued to the VidyoPortal.

**VidyoPortal™ Super API**
The VidyoPortal Super API provides access to the functions associated with Super User access to the VidyoPortal. This includes tenant management, database management, Inter-Portal Communications management, VidyoRouter management, and policy configuration. The VidyoPortal Super API is ideal for service providers that need to manage multiple instances, or tenants of a single instance of the VidyoPortal. By using this API, powerful management systems can be developed to globally manage multiple VidyoPortals without the need to interact with each VidyoPortal individually.

**VidyoPortal™ Admin API**
The VidyoPortal Admin API provides access to the functions associated with administrator access to the VidyoPortal within a single tenant. This includes user account management, user group policy management, virtual meeting room management, record/webcast control, and content management. The VidyoPortal Admin API is ideal for management of Vidyo users on the VidyoPortal as well as managing live conferences within virtual meeting rooms as an administrator level user.

**VidyoPortal™ User API**
The VidyoPortal User API provides access to the functions associated with user access to the VidyoPortal. This includes user account preference settings, speed dial selections, searching the directory, logging in and out, placing calls, meeting room control, webcast controls, recording controls, and content management. The VidyoPortal User API is used when developing a custom application that will be exposed to an end user. With this API the end user workflow can be completely customized for the target application.

**VidyoPortal™ Guest API**
The VidyoPortal Guest API provides access to the functions associated with guest access to the VidyoPortal. This API is ideal for very basic integration to leverage guest links within the VidyoPortal system. Use this API if the custom application needs to simply provide a URL that participants can click to join a call without the need of presence, directories, or point-to-point calling.

**VidyoReplay™ API**
The VidyoReplay API provides access to the functions associated with VidyoReplay webcasting and recording functions. The VidyoReplay API is actually accessed through the VidyoPortal and is a subset of other VidyoPortal APIs. The VidyoReplay API does not interface directly with the VidyoReplay. The VidyoReplay API includes methods for recording control, webcast control, and content management. This API is needed when webcast or recording functionality is desired.
VidyoWorks™ Client API

The VidyoWorks Client API is a set of libraries that can be used to develop a custom video client. These client libraries provide the capability to embed a working videoconferencing endpoint into any new or existing application. Libraries are available for all major platforms including Windows, Mac, Linux, Android, iOS and a web based client.

Using the VidyoWorks Client API a developer has all of the necessary tools to focus on the core capabilities of the application under development while relying on Vidyo’s industry leading videoconferencing technology to deliver the highest possible video communications. The VidyoWorks Client API provides the following capabilities:

- Client initialization
- Call initiation and termination
- Call ringing
- Device management
- Layout control
- Self-view control
- Max bandwidth control
- Quality control
- Content sharing control
- Chat control
The Vidyo Client API library lets you build custom Vidyo-enabled applications.

**VidyoWorks™ Client API for Web**

The VidyoWorks Client API for Web is a browser plug-in that enables embedding of a videoconferencing application within a web page. The browser plug-in is the standard Vidyo client library wrapped inside a JavaScript container. This makes custom client development simple for web developers and allows video rendering and control using JavaScript from inside the browser. Rich sets of APIs manage the overall configuration and control of the pre-call and in-call state machine of the VidyoClient library.

For example, below is an implementation of a Vidyo-enabled contact center, where the financial institution can offer personal service to high-value clients:
VidyoRoom™ Remote Control API

The VidyoRoom HD-series and VidyoPanorama™ provide an API allowing third parties to augment VidyoRoom functionality with third-party control and automation systems and applications or build a custom control application. The VidyoRoom Remote Control API is particularly useful when enterprises have a variety of audiovisual equipment in a boardroom, auditorium or meeting room and want everything to be controlled through a common interface, such as a touchscreen. There are a variety of third party control and automation systems on the market for this type of integration. The VidyoRoom Remote Control API is available to allow these third party control systems to be integrated in a simple way that provides a rich set of functions.

The VidyoRoom Remote Control API provides bidirectional communication between the VidyoRoom system and the controlling entity. The API is offered as a TCP-based network interface or a local serial interface. The bidirectional interface carries commands from the controlling device to the VidyoRoom. In addition, the communication between the VidyoRoom and controlling device includes events, status updates, and requested information. This assures that any controlling device or software can deliver commands reliably and be able to obtain status from the VidyoRoom™ system.

The VidyoRoom Remote Control API was designed to be compatible with a variety of controllers. Some third-party devices are rather weak in processing power, therefore, a major design goal was to keep CPU and memory usage down to a minimum without sacrificing functionality. Controller device software development is typically based on event-action models that use basic communications schemes with their controlled...
device. As a result, the interface is simple, thin, and flat and is not based on XML or other elaborate message/data encoding schemes.

**VidyoRoom Control API Tools**
There are a variety of tools available to assist with providing control and automation of VidyoRoom systems. If using common third party control systems, such as AMX or Crestron, drivers are provided by Vidyo.

**VidyoDesktop™ Plug-in API**
The VidyoDesktop Plug-in API is used in situations where there is a need to add additional functionality to the existing VidyoDesktop application without developing an entirely new client. It offers a lightweight way of adding capability without rebuilding or changing the existing VidyoDesktop. The VidyoDesktop Plug-in API provides an interface for developers to add additional functions from the VidyoDesktop via an alternate menu accessed via right-click. From the right-click menu a third party application can be launched.

Third party plug-ins can be easily added to the existing VidyoDesktop client enhancing the capability beyond the standard feature set. Once the third party plug-in is developed, it is submitted to Vidyo for review and validation. Once the plug-in has been validated by Vidyo it is then assigned a certificate allowing it to be safely and securely used with VidyoDesktop.

VidyoDesktop plug-in API extends the capabilities of VidyoDesktop client
Case Studies

HealthSpot™

In America, the drive to maintain a healthy society is being challenged by population growth, rising healthcare costs, a lack of access to medical facilities and a shortage of physicians that is expected to exceed 100,000 in the coming years. Among the innovators tackling this challenge is HealthSpot™, with a breakthrough telehealth solution that brings healthcare providers and patients together in a remarkable new way with help from Vidyo.

HealthSpot developed the HealthSpot™ Station, an enclosed walk-in kiosk that enables patient access to medical diagnostics and treatment from board-certified doctors via high definition video conferencing and interactive diagnostic tools. Inside the HealthSpot Station, the patient experiences a comfortable, private environment with touch-screen access to HD video conferencing powered by Vidyo, for face-to-face interaction with a doctor who may be working from the office, home or anywhere. Kiosks can be conveniently located at neighborhood pharmacies, drug stores, grocery stores, schools, community centers or shopping malls.

mobitoki

Poland needed to comply with EU legal requirements to make public services available to deaf and hard-of-hearing citizens in their national sign language. It was estimated that approximately 40,000 sites could benefit from sign language services, but the entire country had only 150 official sign language interpreters. Polish communication service provider, mobitoki, came up with an idea to help the Polish government meet its mandate. They proposed implementing a videoconferencing-based sign language interpretation service, built on the VidyoWorks APIs.

Mobitoki’s Vidyo-based toktutok service uses a call center in which several sign language interpreters are always available. Any public service in Poland can use an endpoint, typically a desktop PC or laptop computer, equipped with a webcam – to establish on-demand links to the call center via VidyoConferencing™. This way, sign language interpreters can virtually join conversations between deaf citizens and their medical providers, municipal officials or other public service providers.
Rounds

The Vidyo-integrated Rounds solution is platform-agnostic, combining shared entertainment with multi-party HD video conferencing, mass scaling capabilities, and the market's best video quality. The integration allows Rounds to offer a next-level video experience that brings real life social interactions back online - an exciting addition to the social communication market.

The addition of Vidyo’s high-quality visual communication platform, VidyoWorks™, based on Scalable Video Coding (SVC) technology, is expected to take the Rounds platform to the next level, expanding the reach, fidelity and capabilities of the Rounds application. Users can look forward to experiencing reliable, high-quality video communications that can be accessed via any IP network and from any device.

ETIAM

ETIAM-Connect, which is a leading edge image and clinical data-sharing solution, aims to support telemedicine and the delivery of clinical care in remote settings. Through integration of the VidyoWorks™ platform, ETIAM-Connect will now include HD video conferencing capabilities to provide quicker, more efficient patient care. Currently, ETIAM-Connect is used to automate trauma transfers, referring physician access, multidisciplinary team communication, eHealth patient services and remote access.

The VidyoWorks platform offers a high quality (HD) videoconferencing solution for medical professionals. When video quality and reliability are prerequisites for an accurate patient/physician remote dialog, it’s important to rely on error resiliency and low latency rate matching thus enabling natural, affordable, high-quality video to work over the Internet, LTE and 4G networks.
Conclusion

The VidyoWorks™ software platform enables anyone to embed point-to-point and multipoint video, audio, and collaboration inside one’s own applications, workflows and custom web portals. An unparalleled quality of user experience can be achieved with the core foundation built on top of Vidyo’s leading VidyoConferencing™ architecture and a custom user interface and workflow designed to suit the exact needs of the user community. With VidyoWorks, high quality, scalable video communication is finally achievable in the context of any application, business process or workflow.
Resources
Find more information about the VidyoWorks™ platform and the Vidyo products described in this paper by using the links listed below.

Vidyo

- Vidyo web site: [http://www.vidyo.com](http://www.vidyo.com)
- Vidyo Support Center: [http://www.vidyo.com/services-support/technical-support/](http://www.vidyo.com/services-support/technical-support/)