



# Virage Developer Program Overview

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## 1 Introduction

This document provides an overview and introduction to the Virage Developer Program, our platform architecture, and development tools. Virage understands the technical motivations and needs of a development framework and open interfaces. Over the past 4 years and multiple release cycles, Virage open APIs and developer tools have formed the foundation of a rich ecosystem of product and system integration partners, now numbering over 50. Virage developer tools are mature, 5th generation interfaces that are fully documented, internationalized, and supported by a rich collection of source examples and technical notes. Virage developer tools include the VideoLogger, Virage Solution Server (and their respective SDKs), database plug-in tools, and ancillary products.

One aspect of Virage's business philosophy is to engender a thriving community of companies surrounding the applications of searchable video by delivering a top-notch set of tools and support for developers. Out of this stems a product design philosophy to deliver and support published interfaces that are clean and modular, and which allow third parties to enhance and integrate Virage products into diverse systems and application areas.

## 2 The Systems Problem

Digital video applications today have a complex nature, requiring integration of several significant technologies. Logging, encoding, streaming, databases, web servers, automation, and asset management applications all contribute to the complexities inherent in deployments of these solutions. When you combine these technologies with requirements to integrate and support legacy systems and work flows, the need for component flexibility becomes evident. Virage originally designed the VideoLogger application with an open, extensible architecture as a foremost consideration. Today, many third-parties have integrated the VideoLogger into a wide variety of environments using Virage developer tools. You can see descriptions of Virage development partners on the Partner pages of our web site: <http://www.virage.com/partners>. More recently, developers have embraced our total solution platform, and are developing additional tools and systems support for web-based video publishing applications.

In addition to our partners, Virage develops and supplies plug-ins that extend the VideoLogger. Our internal developers use the same published interfaces as third parties, resulting in a high level of support and commitment to these interfaces.

Figure 1 illustrates the open architecture of the Virage Rich-Media Applications Platform.

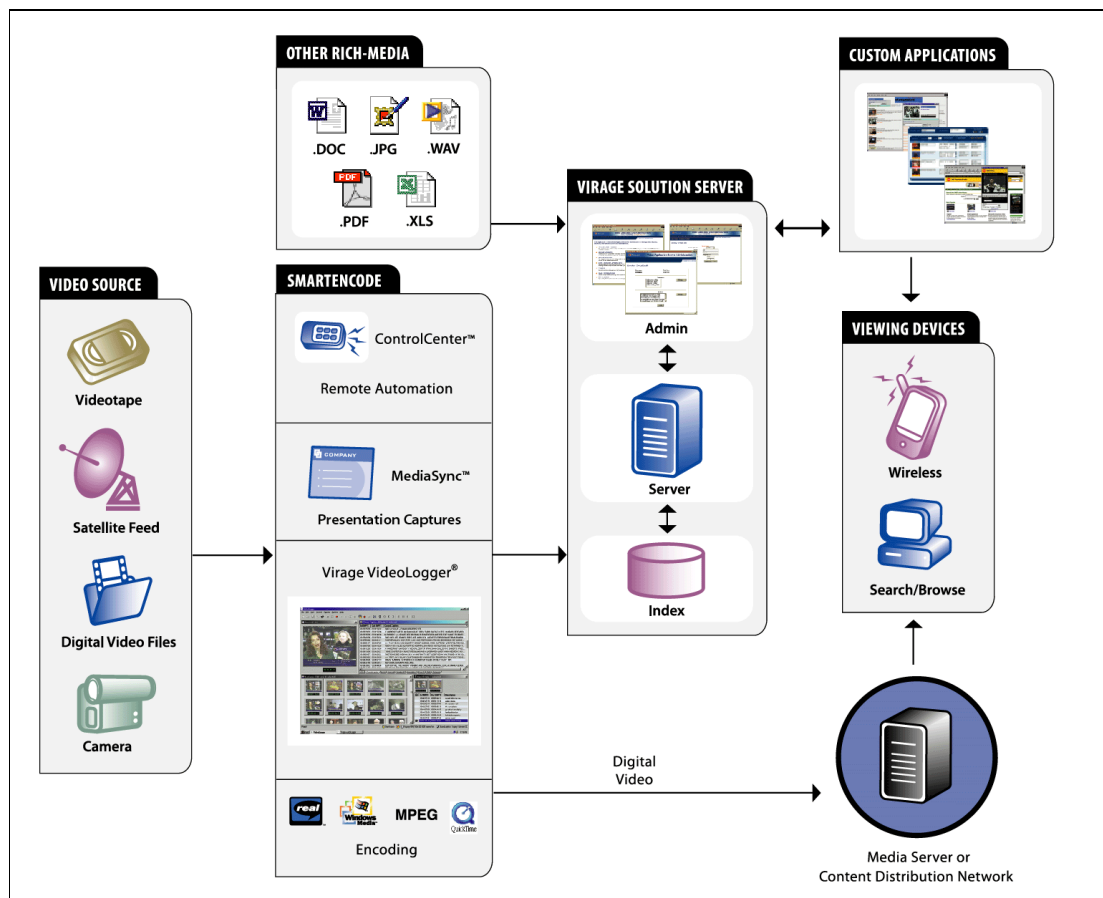


Figure 1

## 3 Developer Tools

There are a variety of concepts, products, and toolkits that contribute to the overall development platform that Virage provides.

### 3.1 Virage Data Model

The data model used to expose the metadata to back-end storage mechanisms (such as databases) is critical to searching, browsing, and otherwise exploiting the information. The VideoLogger software watches, listens, reads, and allows annotation of video. As metadata is squeezed out of the video signal, it is placed into a data model that is based on the concept of time-based *tracks* of data (Figure 2). The Virage data model, known as “VDF” (Video Description Format), has emerged as a defacto metadata standard and container format for video and multimedia content. The amount of video metadata (both inside and outside the firewall) represented by VDF exceeds all other metadata formats by orders of magnitude. Over 55 developers support the VDF format, and VDF is easily transformed to/from data containers such as XML and other proprietary formats and data models.

Virage metadata is perhaps the most flexible video metadata format and container in use today. Virtually every asset management system vendor supports VDF import and export, allowing VDF data flows to/from central repositories, and to/from the Virage Solution Server for highly scalable publishing to the Internet or WANs. The VDF data model is rich and flexible, with a highly dynamic track registration mechanism that accommodates new types of metadata and video analysis on the fly. Track data types can be images, text, weighted text, and binary. Some of the out-of-the-box metadata tracks include:

- ❑ **Keyframes:** intelligent or periodic keyframing
- ❑ **Closed-Caption / Teletext:** textual transcript data extracted from the VBI or side band signals
- ❑ **Speech-to-Text:** A keyword spotting algorithm is employed to provide speaker-independent keyword spotting when the audio signal contains speech. The vocabulary is large, and provides a robust text index into the video, which is especially useful when CC-text is not available. Several international language versions are available.
- ❑ **Audio Classification Track:** The audio classification engine categorizes the audio track into predefined classes (like speech, music, noise, silence, user-defined).
- ❑ **Speaker Identification Track:** The audio engine can discern the identity hundreds of speakers organized in libraries.
- ❑ **Clip Track:** A series of user-defined video segments with annotations specific to each segment.
- ❑ **Face ID Track:** A text-based track that reports who's face was recognized when.
- ❑ **On-Screen Text:** A text-based track that contains recognized text in the form of graphic overlays or other text appearing in the video.
- ❑ **Annotation Track:** A text-based track similar to the CC-text track that is available to application developers using the VideoLogger SDK. Developers can use this track to embed any collateral text-based metadata into the VDF that may be present in certain application scenarios.

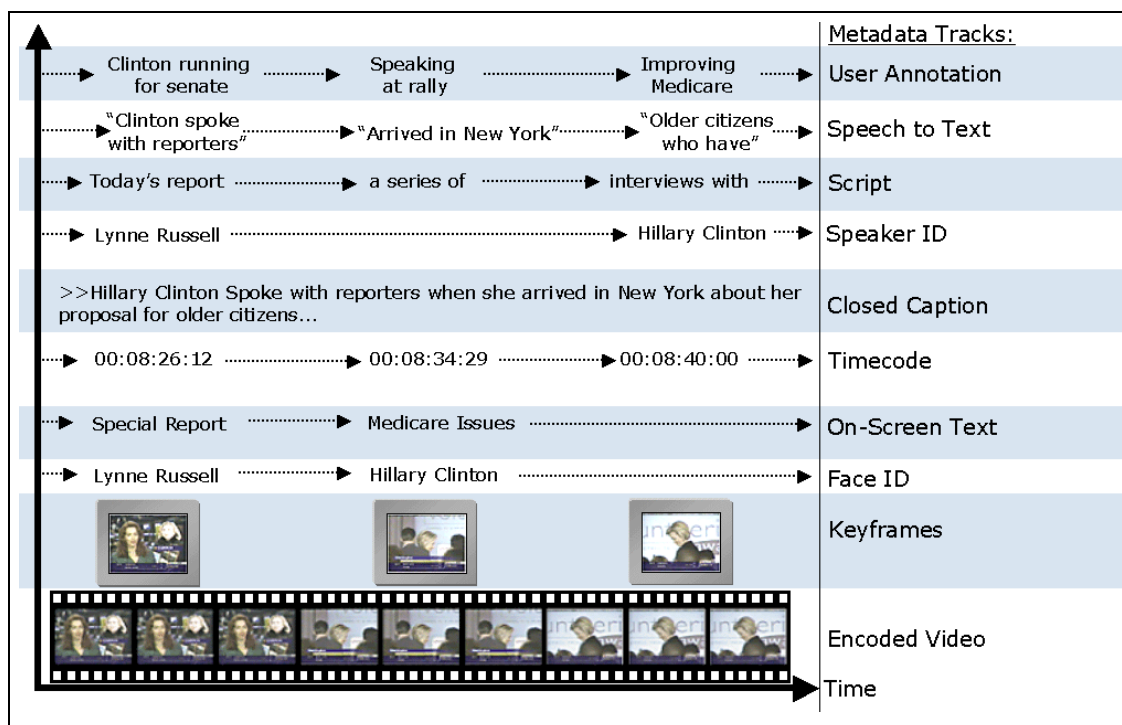


Figure 2

## 3.2 SmartEncode

The VideoLogger's SmartEncode™ process simultaneously indexes and encodes source video content into multiple digital video formats in a single pass, and provides a rich metadata index using media analysis modules. This is the key transformation to prepare video for use in asset management and web publishing scenarios, making sure that metadata is carefully synchronized with the streaming video.

For the developer and system integrator, the VideoLogger has a large degree of flexibility and customization potential in its 'out-of-the-box' form, without writing any code. The available configuration options usually address a significant portion of system integration activities. Some key points of flexibility and customization include:

- ❑ Schema design and use flexibility
- ❑ User interface flexibility (clip marking modes, shortcuts and function key assignments)
- ❑ V-LAN control of analog sources, or RS-422 "slave-mode" operation with broadcast equipment
- ❑ Dictionaries for customized vocabularies, speaker identification, keyword filtering, etc.
- ❑ Out-of-the-box support for a variety of digital ingest formats, and a variety of encoding systems
- ❑ Time code support for a several methodologies, including house-time feeds

In addition, the VideoLogger supports a wide range of media analysis plug-ins that can be configured, enabled, and disabled at run-time to optimize the analysis on for a given video session. Each of these modules has dedicated configuration and preference setting, accessible through the user interface or the Remote Control API of the SDK.

## 3.3 VideoLogger SDK

The VideoLogger application contains a rich group of APIs and plug-in interfaces for extensibility and customization by developers. The *VideoLogger Software Development Kit* (SDK) exposes these interfaces to developers, and features a number of powerful interfaces for automation, customization, video encoding development, and real-time database connections. The SDK is packaged as a dynamically linkable library of "C" entry points that provide access to the metadata and extensibility features of the VideoLogger. These interfaces are described below. Plug-in interfaces to the VideoLogger are supported for Win32 application development environments, while the VDF and Remote Control APIs are additionally supported on Solaris.

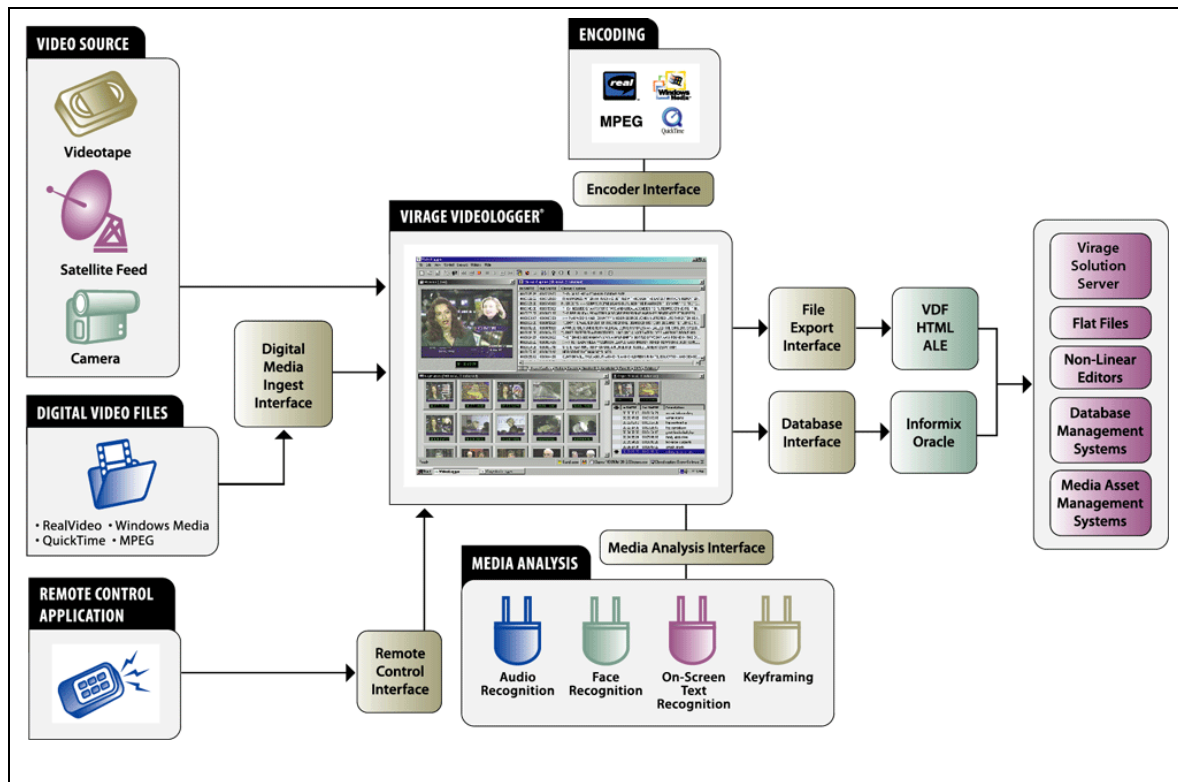


Figure 3

The VideoLogger SDK includes the following interfaces:

- ☐ VDF API for parsing and manipulating VDF metadata, including file I/O. You can transform VDF metadata into other data models, as well as manipulate and enhance VDF constructs such as text tracks.
- ☐ Remote control API to allow one or more VideoLoggers to be controlled by a remote process. You can drive VideoLoggers with scheduling applications, automation systems, and also augment metadata capture with external, collateral data sources.
- ☐ A Media Analysis plug-in interface to incorporate signal analysis algorithms that can extract meaningful metadata from the video and audio signals. This interface also can leverage metadata tracks published by other plug-ins to perform higher-level semantic analysis on metadata.
- ☐ A database plug-in interface to transform VDF metadata into external data models in database systems and media asset management systems
- ☐ File Export interfaces to map VDF into any file format
- ☐ Video encoder control interfaces to allow support of any encoding system
- ☐ Time code interface
- ☐ Digital Media Ingest interface for extending the formats and capabilities for digital ingest

All Virage platform products and SDKs are fully internationalized, and offer extensive support for character set encoding, localized messaging, and locale support.

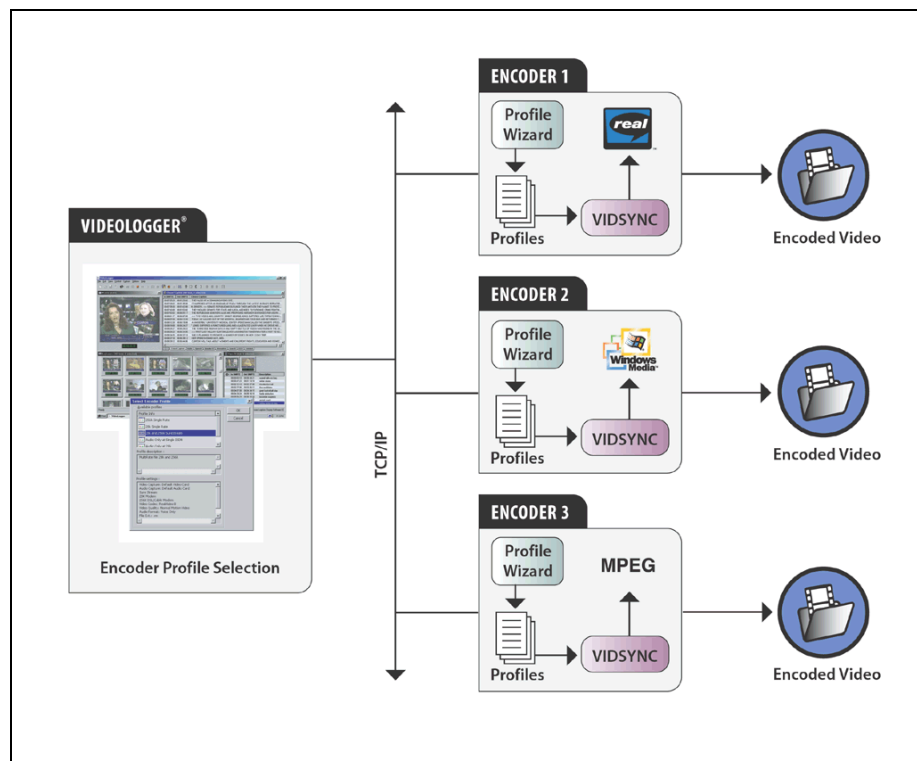


Figure 4

## 4 Virage Solution Server

The Virage Solution Server and the Virage SmartEncode process provide an end-to-end solution for indexing and publishing searchable video on the Internet. The solution server uses metadata generated by the VideoLogger to enable web-based searching and browsing of the indexed video. The system is a persistent, multi-threaded application server that dynamically generates HTML pages based on queries to the video metadata index. Query results let users quickly locate and view a video segment at exactly the point of interest. The server platform is optimized for high-performance, full-text search, easy customization of HTML templates, and integration with leading video streaming technologies. A corresponding SDK provides an extensible platform that enables integration into existing Web production and publishing environments

### 4.1 Solution Server SDK

The Virage Solution Server has a developer's kit that enhances your ability to customize and extend the environment beyond the template customizations already discussed. The developer's kit includes tools and documentation that expose the XML server protocols and Perl application logic, allowing you to tightly integrate other modules and application within the overall system. A Perl Application Framework provides enormous leverage in developing custom application extensions, including a full registration and configuration interface that tightly integrates your extensions into the Solution Server operations.

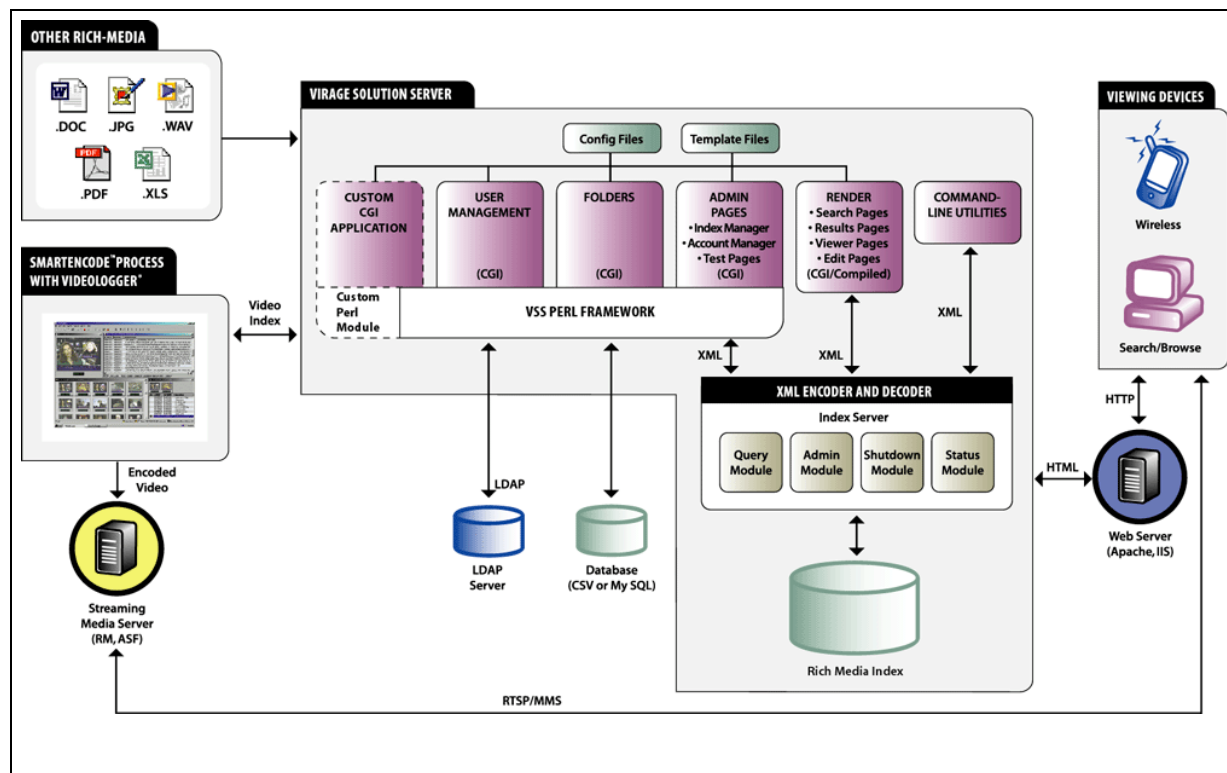


Figure 5

Virage designed the Solution Server to be customized. Developers can solve video publishing problems using the SDK with any of the following approaches:

- ☐ Use schemas and account management features to meet the specific requirements of your application with no programming
- ☐ Exploit the Virage Template Language for complete customization of interfaces and integration with existing web site pages and features
- ☐ Construct custom CGI-bin and/or command-line applications that communicate directly with the Virage Solution Server via XML over HTTP
- ☐ Construct scripts and modules that invoke the existing suite of command-line utilities that come with the system

## 4.2 Database Plug-ins

Virage supports both Oracle and Informix database servers with plug-in products for the VideoLogger. These plug-ins transform VDF metadata from the VideoLogger into a table structure within the database, and can operate in real-time. The plug-ins preserve user security, transaction integrity, and offer a great deal of application schema flexibility. The plug-ins ship with complete documentation of the database schema to allow application development using a variety of DBMS development tools.

## 5 ControlCenter

The ControlCenter™ is a companion product to the VideoLogger that allows remote scheduling, control, and automation of SmartEncode™ processes. Browser-based administration capabilities allow you to operate, maintain, and monitor multiple VideoLoggers with maximum efficiency. The ControlCenter is primarily designed for large-scale deployments of VideoLogger running in a remote location with little to no user attendance.

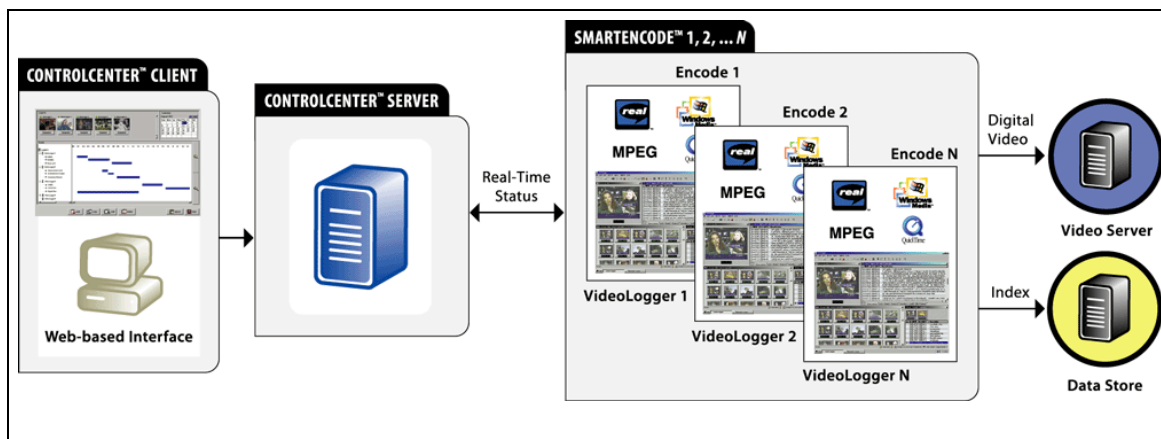


Figure 6

The ControlCenter views the world as a collection of VideoLogger resources and a collection of events that act on those resources to define a logging session. Each VideoLogger resource in turn has one or more encoding resources available that it can access and configure for each logging session. Each event allows for triggers at critical times to allow integration with arbitrary equipment and processes associated with each logging session. Each trigger consists of a system call to a script or executable process located on the VideoLogger workstation. The ControlCenter integration features, combined with the VideoLogger SDK, provide a powerful and comprehensive platform for accommodating customer work flows and data flows.

## 6 MediaSync

Virage MediaSync is a powerful component of the SmartEncode process for capturing, indexing, and synchronizing Microsoft PowerPoint presentation materials with video. MediaSync consists of two components: the MediaSync application and a MediaSync plug-in to the VideoLogger. The diagram below illustrates the end-to-end workflow for capturing a presentation and delivering it to end-users. Because MediaSync gathers all the presentation metadata and timing automatically, a fully synchronized on-demand playback is available immediately after the presentation is complete, with no manual intervention or authoring step required.

The MediaSync application runs on the presentation computer and captures the PowerPoint content. It extracts all the text on the slides (including speaker notes), captures slide images, and time-stamps each slide flip as it occurs. Slide titles are understood and form a table of contents for the viewer. This information is sent in real time to the MediaSync plug-in running on a VideoLogger ingest station where it is merged into the video of the presentation. All of the PowerPoint information becomes part of the VDF.

MediaSync applications represent a rich opportunity for system integration and customization. All PowerPoint metadata is accessible through the VDF API, while the presentation and playback synchronization are all easily customized with the Solution Server SDK interfaces and templates.



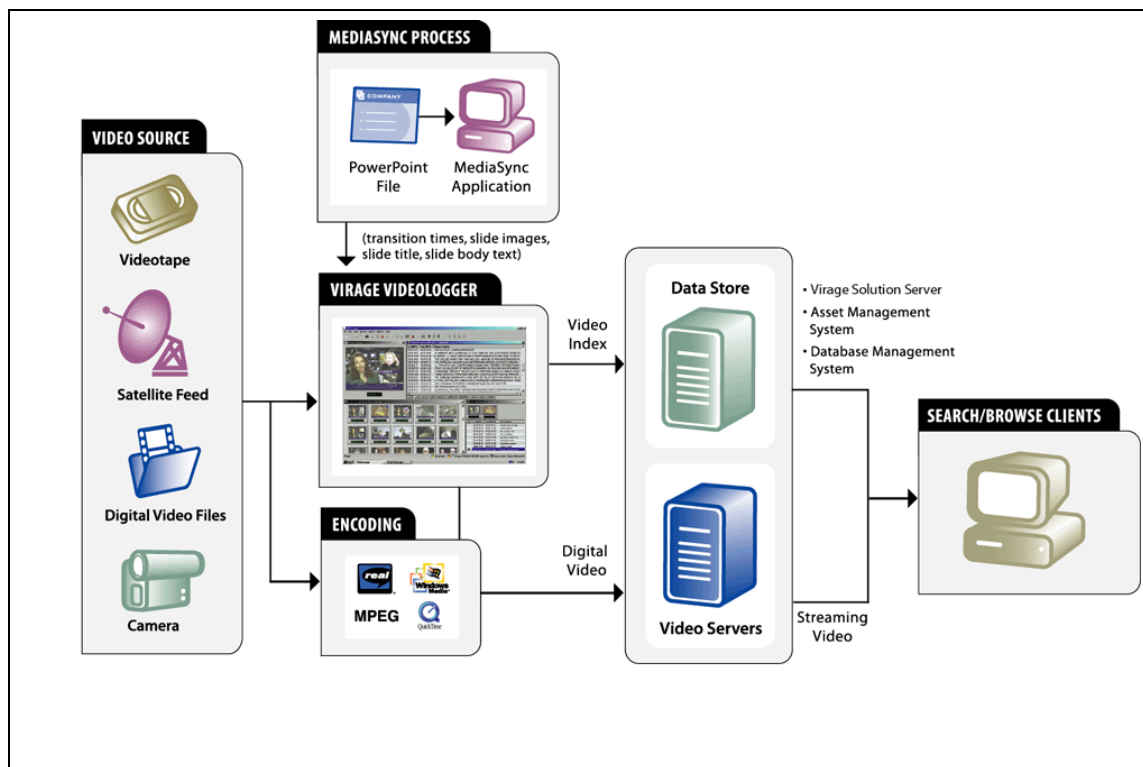


Figure 7

## 7 Virage Developer Program

The Virage Developer Program is a formal relationship between Virage and various development organizations in a range of product and service areas. The program currently has 50+ members, including asset management system vendors, video encoding and serving technology vendors, automation equipment vendors, and media-centric system integrators. Visit the Virage web site for an up-to-date description of these companies (<http://www.virage.com/partners>). The goal of the developer program is to foster product integration and expertise relating to searchable video solutions. It is open to potential partners that meet certain criteria relating to leveraging sales of Virage products. The program and its benefits are not available to end-users, although the developer tools described in this paper are licensable products.

In addition, Virage offers a Reseller program which is a separate, but highly complementary, program that allows you to integrate and completely source a solution for your customers.

### 7.1 Developer Program Structure

The Virage Developer Program consists of access to developer tools and other specific benefits of being a program member. These benefits include the following:

- ☐ Access to Virage products and developer tools, including updates and new releases.
- ☐ Developer Support & Newsletters

- ☐ Password access to the Developer Web Site containing papers, preview documentation, sample code and other 'goodies', sample test data, and other resources for the developer
- ☐ Solution Design Assistance: a free service offered to developers to design and implement integration solutions, from conceptual understanding to helping you write code
- ☐ Preferred consideration as beta sites
- ☐ Developer events (Virage Developer Forums) held periodically
- ☐ Co-Marketing activities: press, articles, lead generation, trade shows
- ☐ Co-Selling activities: sales force education, seminars, joint calls and presentations

Program membership includes no-cost development license for internal development purposes to most Virage developer tools the benefits described above. The only cost is an annual maintenance fee to cover the product updates and support features. The no-cost licenses are for VideoLogger and its SDK, Media Analysis plug-ins including Speech and Audio Analysis, Face Identification, On-Screen Text Identification, and more, the Virage Solution Server and its SDK, Oracle database plug-in, ControlCenter, and MediaSync.

Contact Chuck Fuller, Developer Relations ([chuck@virage.com](mailto:chuck@virage.com)), for more information on this program and potential membership.