

Cloud-Enabled SDK Creates Infinite Digital Media Possibilities

Create a more connected digital media user experience for your customers

Deliver all the services demanded by today's consumers

In recent years, media, mobile, and cloud options have multiplied at an amazing pace and continue to do so today. Fortunately, PacketVideo's market-leading Twonky SDK makes it easy for our customers [Communications Service Providers (CSPs) and Consumer Electronics (CE) companies] to bring together all the services demanded by today's consumers. By doing so, CEs and CSPs can create a better and more connected digital media user experience for their media-hungry customers.

The latest release of **Twonky 8**, PacketVideo's carrier-grade SDK platform found in millions of products and services offered by the world's leading CSP and CE companies since Twonky's introduction 10 years ago, takes another major and innovative step forward as it moves into the cloud.

With cloud-enabled capability, PacketVideo's platform for media connectedness provides a number of important benefits for our CE and CSP customers to leverage:

- Respond to consumer demand for cloud services
- Create new revenue streams beyond device sales
- Unify media service offerings across multiple product lines
- Leverage the popularity of third-party over-the-top (OTT) and personal cloud services

For CSPs, Twonky 8 enables the infrastructure necessary to be your consumer's trusted media hub

Cloud technology trends

Technology, media, and consumer demands are all growing and changing at incredible speed. The increasing dominance of mobile devices, digital, and consumer-created media combined with the dramatic growth in multi-device households, represents an unprecedented challenge for companies providing related devices and services. The following trends set the stage for a revolution in cloud technologies.

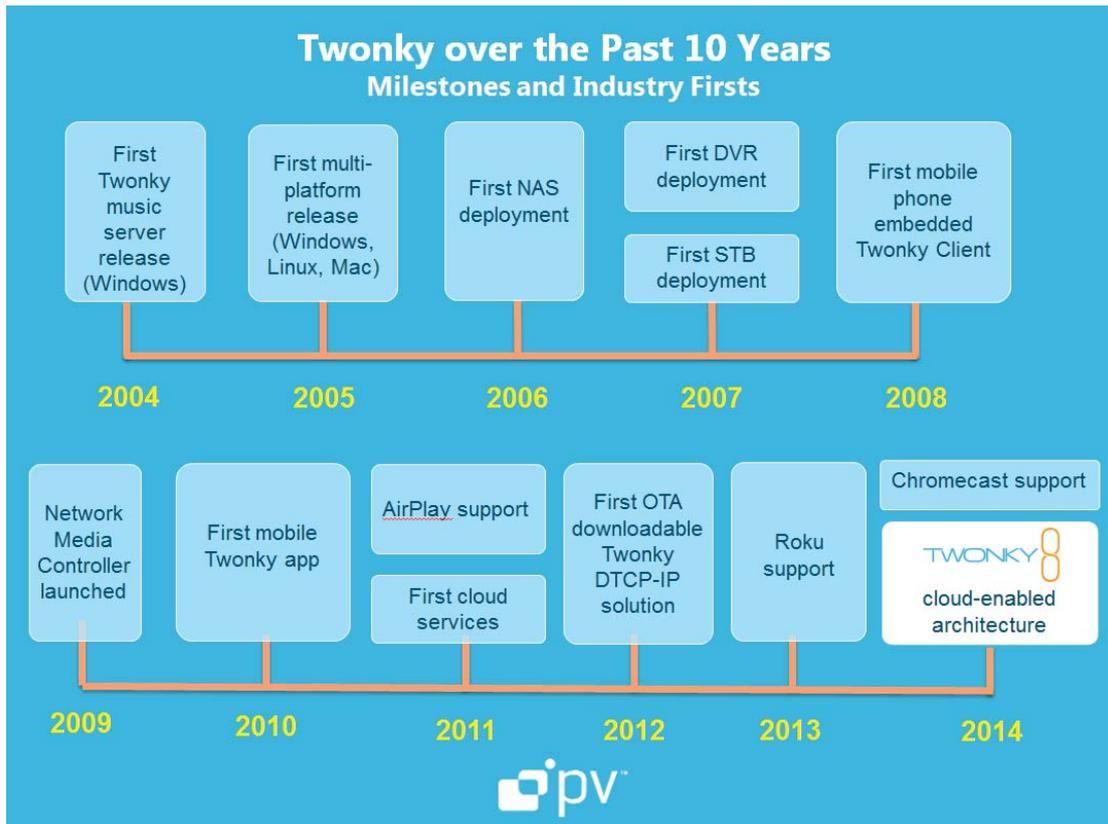
Mobile is on the verge of dominance

- Mobile is 25% of global web usage¹
- Mobile apps account for more than half of all digital media time²
- 22% of online video is viewed on mobile³

Mobile is enhancing, not replacing, other screens

- 84% of mobile device owners use mobile devices while watching TV⁴
- Social media interaction boosts ad retention and purchase intent⁵
- Millennials do 34% of their TV watching online⁶

The confluence of mobile and media dominance gives rise to the need for a new, complete cloud solution that will support current usage of mobile and media while remaining open to new innovations.



regardless of the device, brand or platform used. By becoming the “go-to” source for all your subscribers’ media consumption needs, your consumers will be able to access media content and services from their array of consumer devices—and enjoy it the way they want to.

Twonky 8 Moves into the Cloud

In today’s fast-paced media universe, consumers want seamless access and ability to enjoy their premium and personal media content—using any device, anytime, anywhere. They don’t want to be bothered with the back-end details of where or how their desired media can be played. They just want effortless, secure, and synchronized access, with user-friendly interfaces and effective interactivity across devices and with content providers to boot. Bottom line, consumers want to be able to play the media they’ve stored in the home or cloud using their smart phone or tablet, whether they’re at home or on the go.

The Twonky SDK from PacketVideo effectively does this for our CE and CSP customers.

As Twonky 8 moves into the cloud, it continues to provide all the tools and capabilities that our customers around the world have relied on over the past decade for successful device and digital media discovery, management, and consumption across

the cloud, mobile, and connected home. But now, with cloud capabilities, it does so much more.

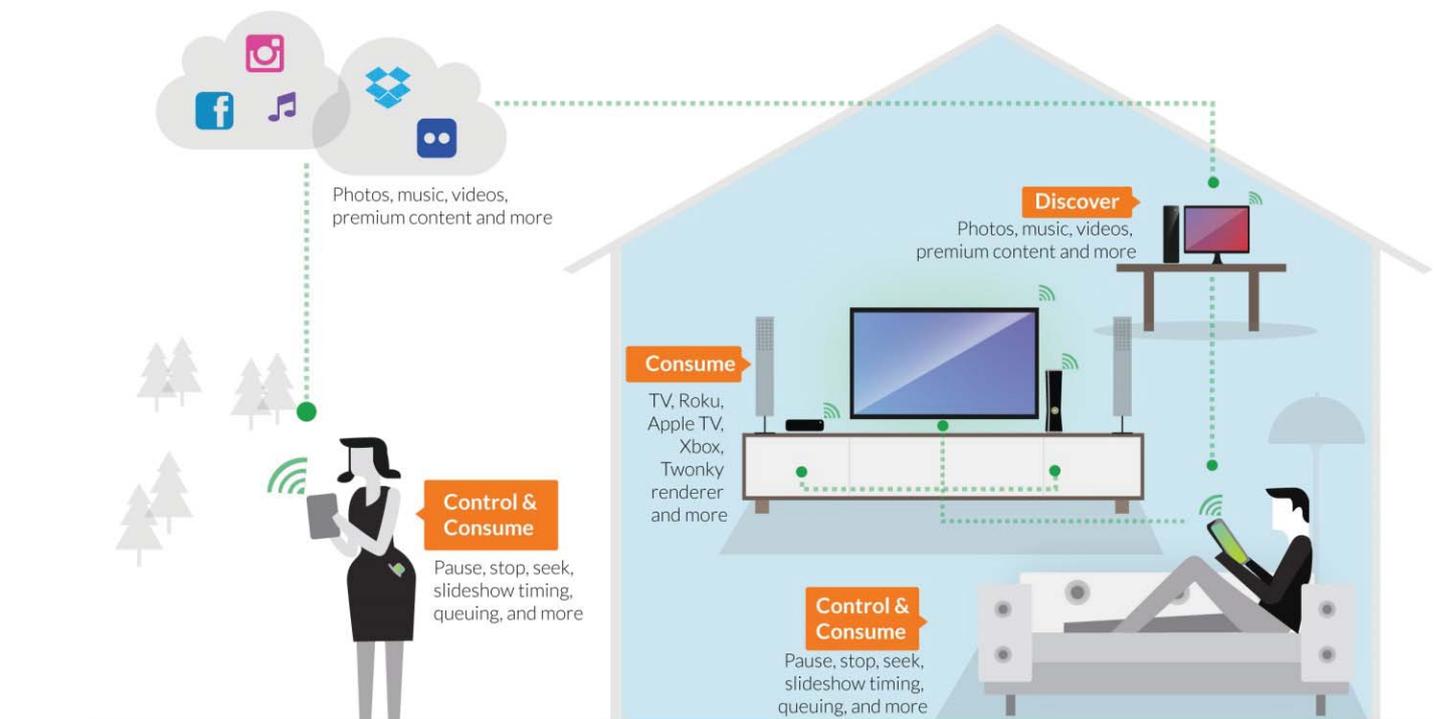
Twonky has a rich history of standing above the rest for its built-in support for large-scale cloud, mobile, and connected home solutions that work across all media types, platforms, and devices.

Twonky 8 enables companies to build useful and reliable ways for consumers to have greater access and ability to enjoy premium and personal media content on any device or service—everything from smart TVs, DMAs, and HDMI dongles to popular OTT cloud services like Facebook and Flickr—in the home and on the go.

Twonky 8 includes complete support for everything needed to build enticing experiences leveraging cloud, media, and mobile.

- **Built for flexibility and speed:** A new cloud-enabled architecture accelerates deployment and updates to media services
- **With built-in popular services:** Twonky 8 features built-in support for popular online services (such as Dropbox, Facebook, Flickr)
- **Get the most out of every screen:** Stream and beam music, photos, and videos between smart phones, tablets, and TVs, regardless of the device manufacturer’s technology platform

Twonky 8 Adds New Cloud-Enabled Connectivity



- **Consolidated access to multiple services:** Users can easily access all of their preferred cloud services with a single login
- **Customize experiences:** Persona management capability allows each member of a household to create a custom media profile to access their personal content
- **Easy integration with popular media devices:** This includes Apple TV, Roku, Chromecast, and smart TVs, regardless of platform (iOS, Android, Linux, Mac OS, and QNX)
- **Prepared for the future:** PacketVideo's Twonky 8 comes with device adaptation technology to easily accommodate new devices and content sources as they enter the market
- **Cutting edge security measures:** Ensures protection of personal and premium content

All of these features come from a trusted company: PacketVideo. Our technology has been reliably used in millions of CE and CSP devices and services around the world for the past 16 years, with no product recalls tied to our technology. Unlike open source platforms or companies with limited "point solutions," PacketVideo's carrier-grade technology continues to lead the market with its innovative

and proven capabilities across the globe and will be around for the duration.

What is Twonky?

Twonky is the world's leading technology platform for media connectedness and is found today in millions of products and services offered by the world's leading CE and CSP companies (including seven of the top 10 global CSPs) since Twonky's introduction in 2004.

Built on the foundation of the Twonky Software Development Kit (SDK), Twonky has three major components: server, client, and cloud. (See the graphic on page 4 for a visual depiction of the various components and what devices and services they enable).

Following is an overview of each Twonky component:

Twonky SDK

The carrier-grade Twonky SDK contains core technology libraries wrapped in a robust and flexible set of APIs to enable rapid deployment of media solutions on consumer electronic and mobile devices. The SDK provides the media engine for Twonky's own media applications and serves as the foundation for our CE and CSP customers' own differentiated and branded media solutions.

Server

On the server side, Twonky enables users to discover, manage, and deliver photos, video, music, and premium content on whatever media player the user chooses. Twonky Server is highly flexible and optimized for speed, efficient utilization of precious system resources, and maximum compatibility with popular media devices.

Client

On the client side, Twonky enables a wide variety of media control and playback solutions. Twonky can power the media player in an STB or digital media adapter as well as a companion mobile application for smart control of connected media devices.

Cloud (NEW)

Twonky 8's cloud-enabled capability allows our CE and CSP customers to provide more connected cloud, mobile, and media solutions that bring together all the services their consumers demand, by unifying product lines and leveraging third party mobile devices and media services.

How PacketVideo's Twonky 8 Helps Consumer Electronics Companies

In this rapidly changing mobile and social world, it is not enough to simply keep up. To succeed and grow, companies need to get ahead. CE companies wanting to deliver and monetize cloud services to their customers will find that Twonky 8 can help achieve their objectives.

With help from Twonky 8, CEs can leverage the cloud to quickly build innovative devices and more easily deliver cloud services to:

- Strengthen current customer relationships, attract new customers
- Unify offerings across multiple product lines
- Provide companion cloud-based apps for your devices
- Use technology to introduce and update cloud services



In a rapidly changing media environment, CEs need to adapt quickly or risk being left behind. Twonky 8 provides the right path to success via the cloud, allowing CEs to build devices and cloud services with a proven carrier-grade platform that's flexible enough to accommodate shifting consumer needs.

PacketVideo offers the only solution in the marketplace with a downloadable DTCP-IP solution with over-the-air activation that meets strict DTLA compliance and robustness security rules. PacketVideo prides itself on ensuring that our technology will help our customers around the world keep up with today and tomorrow's technologies and any changing industry standards.

The Ways PacketVideo's Twonky 8 Helps CSPs

A cable company is no longer the consumer's sole access to entertainment via their TV set. Communications service providers, not to mention everything on the internet, must compete for consumers' attention today. Instead of fighting other channels, wireless carriers and cable operators can leverage them for advantage with help from PacketVideo's Twonky 8.

With Twonky 8's cloud-based capability, cable operators can extend the reach of their services beyond their STB ecosystem by leveraging the various consumer devices found in today's connected home.

Service providers can leverage Twonky 8's cloud-based capability to deliver OTT services to more of their customers' devices, thus expanding their reach into the home to provide more services.

By leveraging the cloud-enabled connection capabilities of Twonky 8, wireless operators and cable operators can expand their ability to:

- Leverage and capitalize on OTT and personal cloud services
- Expand footprint beyond the STB ecosystem to reach more consumers with new content
- Monetize cloud services by offering the content and options consumers want
- Become the go-to choice as a trusted media hub across devices and the cloud

Twonky 8 Meets Global Standards

Since its launch in 2004, PacketVideo's Twonky technology has been designed to meet every industry standard found around the globe, including DLNA, DTLA, and UPnP. PacketVideo makes it a priority to stay on top of emerging technologies and industry standards to ensure our CSP and CE customers' products and services work as intended, regardless of which manufacturer's technology or local industry standard is in use.

And with PacketVideo's deep experience in DRM and DTCP-IP, CSPs get the added benefit of robust media content protection and security.

Twonky 8's Device Adaptation Technology

Twonky 8's *device adaptation technology* can help "future proof" your services across all types of devices, such as smart phones, tablets, dongles, and smart TVs. Our broad platform support includes iOS, Android, Linux, Windows, Mac OS, and QNX. We support interoperability with popular media adapters such as Apple TV, Roku, Chromecast, and smart TVs.

With its new cloud-based service adaptation architecture, Twonky 8 enables rapid introduction and quick updating of new services for your consumers whenever needed. Your customers will appreciate this, along with Twonky 8's ability to provide single login across their OTT and personal cloud services. You and your customers will appreciate the out-of-the-box integration with popular cloud services such as Facebook, Dropbox, and Flickr.

Wireless carriers and cable operators not yet using Twonky 8 technology will need to spend precious time, money, and energy into building and testing a complex technology infrastructure for their current or future cloud services. More often than not, doing so is not one of their core competencies. A better alternative is to use Twonky 8, with its proven platform and impeccable track record of success for the world's leading CEs and CSPs for more than a decade. By making the choice, wireless carriers and cable operators can utilize Twonky 8 to rapidly accelerate the adoption and usage of on-demand services for their consumers. Not only with this help them to remain competitive in an increasingly tough global marketplace, it also offers CEs and CSPs an effective way to leverage and capitalize on growing global demand for easy access OTT and personal cloud services.

Twonky 8—Sample Use Cases

Twonky 8 helps CEs and CSPs expand their services by enabling the cloud. Outlined below is a sampling of specific use cases illustrating how Twonky 8 can help CEs and CSPs accelerate their development, deployment, and user engagement with cloud, media, and mobile content and services for their consumers to enjoy.

Use Case #1: Build a Branded CSP App

Imagine being able to easily offer an app where your customers can browse and stream their favorite media from anywhere, without having to develop that application from scratch. Instead, rely on Twonky's proven technology to instantly support popular consumer cloud services such as Dropbox, Facebook and Flickr, and enable your customers to login and manage content with a single sign on. Your app can include instant playback of content stored anywhere. PacketVideo's Twonky 8 includes support for DTCP-IP as well as intuitive user experiences.

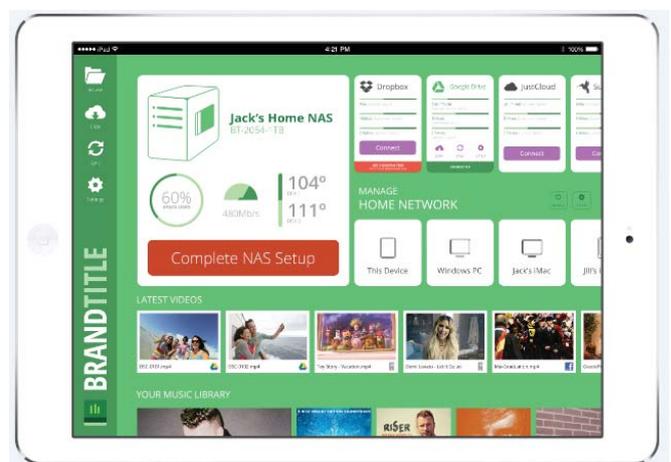


*Example of a CSP-branded application
Twonky 8 unifies your users' media along with your branded services in a simple, unified format*

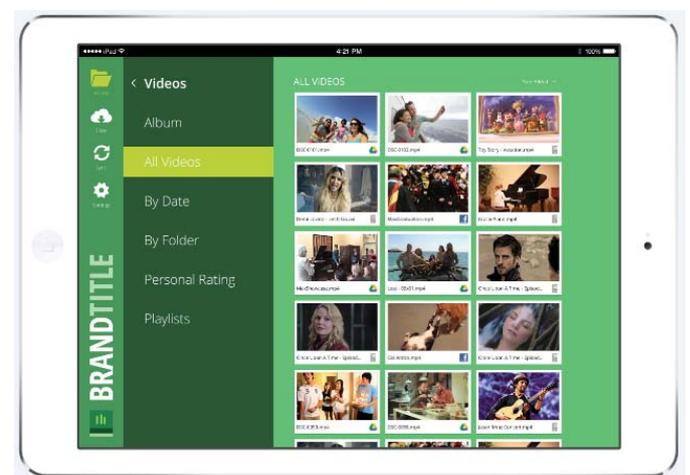
Use Case #2: Build a Companion App for CE Devices

App benefits for a consumer electronics device:

With Twonky 8, you can create a branded companion app that will accelerate CE device setup and give your customers convenient access to their local and online content with single sign on. With DTCP-IP security and remote access if/when needed, your customers can access their content (including premium content from licensed partners) stored locally or in the cloud to play when wanted or to beam to other devices, including smartphones, tablets, TVs, and gaming consoles. CE companies, meanwhile, can easily deliver new product release and update messages and can enjoy cross marketing opportunities with licensed content partners.



*Example: (your) branded consumer application on a CE device
Allows your consumers to easily find their content organized by services, content type and date, while the local media player provides playlist and queuing support*



*Example: (your) branded consumer app on a CE device
Twonky finds and catalogs media (photos, music, videos) for easy selection*

Use Case #3: Build a TV Client Such as an HDMI Dongle

Streaming media is already huge and beaming will only continue to become more popular. As consumers see how easy it can be to send media from one device to another, with or without the help of a “dongle” device, they will come to demand this capability as standard. Because of this, you need to be able to quickly support different beaming scenarios, including beaming and playing media (video, photos, music), from a variety of sources with your services or devices. Twonky 8 lays the groundwork for quickly building your own beaming solution. Doing so will in turn deepen consumer engagement and time spent with your services, across multiple devices.



Example of a CSP-branded TV application — ready for beaming

Twonky 8 allows your customers to discover, control, and consume media easily, with ability to beam the media from one device to another

Use Case #4: Create Single-Sign On for All Cloud Storage and Online Media

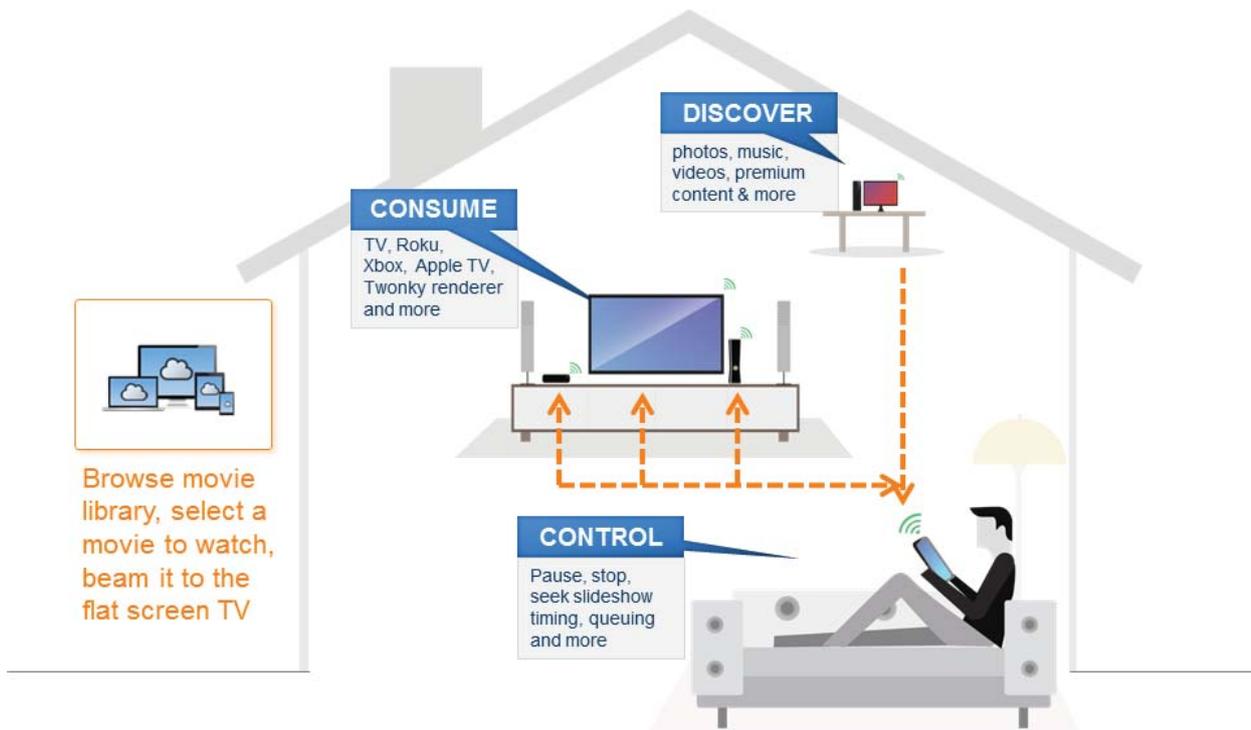
The cost of cloud storage is falling and its popularity is rising. Make it easy for your customers to find and access their content in the cloud anywhere, anytime, with just one simple sign-on. Improved access to services will increase the time consumers spend with them, and eliminate frustrations about being able to access online media from anywhere. Make the most of the cloud by integrating what’s offered in PacketVideo’s Twonky 8 SDK.



Example of a single-sign on for cloud storage and online media

Makes it easy for your consumers to find and catalog their media for selection

Different Beaming Scenarios



Get the Infinite Possibilities of Twonky 8 Working in Your Favor

With the new release of Twonky 8, CE and CSP companies (including wireless carriers and cable operators) now have the opportunity to move into the cloud.

- By doing so, CE device manufacturers can create new revenue streams that can go beyond device sales by delivering and monetizing cloud services to meet their customers' changing needs.

- Cable operators, meanwhile, can expand their footprint beyond the STB ecosystem, becoming a go-to choice as a trusted media hub.
- At the same time, service providers will find Twonky 8 provides a great way to deliver OTT services to more of their customers' devices, thus expanding their reach into the home to provide more services.

To learn more about these benefits, and to get the "The Twonky Advantage," email sales@pv.com or call us at +1-858-731-5300.



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APPENDIX

Twonky 8 Technical Specifications

New Features in PacketVideo’s Twonky 8

- Cloud-enabled Server and Client SDK architecture
- Out-of-the-box integration with popular cloud services such as Facebook, Dropbox, and Flickr
- Single-login support Built-in integration with popular media adapters such as Roku, Chromecast, Apple TV, and DLNA DMRs like Xbox 360/one and Smart TVs
- Device adaptation technology to future-proof your services across all types of devices
- Broad platform support including iOS, Android, and Linux

Standard Features

- Solutions designed to industry standards, including DLNA, DTLA, UPnP

- Digital Rights Management (DRM) and Digital Transmission Content Protection over IP (DTCP-IP)
- Twonky 8 applications for a wide variety of operating systems
 - ✓ Android: Android 4.0 or higher
 - ✓ iOS: iOS 6.0 or higher
 - ✓ Linux
- Twonky 8 SDK development environment
 - ✓ Android: Eclipse, ADT, ANT, or Gradle on Windows, Mac, or Linux with Android 4.2.2 SDK (API level 17) and Android SDK Tools v22 / Build tools v19
 - SDK includes Eclipse project for Sample Application
 - ✓ iOS: XCode 5.0 or higher with iOS SDK 7.0 or 7.1
 - ✓ Linux
- Cloud infrastructure
 - ✓ Robust, scalable PV-hosted infrastructure
 - ✓ PV customer-hosted deployment options

Twonky 8 Comparison Chart

	Open Source Alternative	Twonky Server
Out-of-the-box compliance with DLNA certification tools	 The version under test failed 3 DLNA and 2 UPnP test cases	 DLNA Refence server for trickmodes and DTCP
Comfortable media browsing based on rich metadata; also addressing large media libraries		
	Music <ul style="list-style-type: none"> • All Tracks • Album • Artist • Genre • Folder 	Music <ul style="list-style-type: none"> • All Tracks • Album • Artist • Artist Index • Artist / Album • By Folder • Composer • Genre • Genre / Album • Genre / Artist / Album • Rating • Playlists

 Not Supported
  Partial Support
  Full Support
  Full Support + Additional Formats

	Open Source Alternative	Twonky Server
	Pictures <ul style="list-style-type: none"> • All Photos • Camera • Date • Folder 	Pictures <ul style="list-style-type: none"> • Album • All Photos • By Date • By Folder • Keywords • Rating • Slideshows
	Video <ul style="list-style-type: none"> • All Videos • Folder 	Video <ul style="list-style-type: none"> • Album • All Videos • By Date • By Folder • Rating • Playlists • Title Index
Persistent views for fast start up after initial scan		
Support for user-defined navigation trees		
Navigation tree may be selected per client device		
Support for multiple user profiles with different access rights to the shared content		
Upload of media items from a client device to the server (e.g., backup media from a mobile device)		
Time-seek support allows client devices to start video playback at a certain time, (e.g., at the same time the user stopped watching it previously)		

 Not Supported

 Partial Support

 Full Support

  Full Support + Additional Formats

	Open Source Alternative	Twonky Server
Client adaptation to improve interoperability between server and client device and to provide better user experience	 Hardcoded for a limited number of devices. Including additional clients or updates to existing clients require a complete firmware update	 Flexible mechanism that allows adding new client devices at any time independent of firmware updates. Twonky Server provides more than 200 client device adaptations.
Server-side playlist handling to enable clients to create and manage playlists that are also visible to other connected devices		
Automatically generates Smart Playlists based on user behavior		 Highly Rated, Last Played, Most Played, Recently Added
Video subtitle support	 Limited to a few devices	
Support for Karaoke files (.cdg and .kar) in conjunction with MP3		
Aggregation of other media servers provides a single, comprehensive view of all media to ease searching and browsing		
To ease browsing the “duplicate removal” feature lists media items that are shared multiple times just once in the navigation tree.		
The transcoding interface enables software as well as hardware transcoding on the fly. Client adaptation makes sure that transcoding only takes place when really needed.		

 Not Supported

 Partial Support

 Full Support

  Full Support + Additional Formats

	Open Source Alternative	Twonky Server
Picture scaling	<p></p> <p>Memory footprint depends on original picture size (27MB for a 12MP photo). It is also significantly slower than Twonky (1400ms vs 900ms). Picture scaling is not combined with client adaptation, i.e., most client devices will get the original size and have to scale locally.</p>	<p></p> <p>The Twonky scaler has a constant memory footprint of 2MB, independent of original picture size. Automatic pre-scale of pictures depending on client needs (part of client adaptation), saving bandwidth and improving picture quality.</p>
Support for thumbnail generation	<p></p> <p>Devices like PS3 have to generate the thumbnails themselves which results in a poor/slow browsing experience</p>	<p></p> <p>Extraction of thumbnails from EXIF header and automatic creation if not available</p>
Support for streaming premium content through DTCP-IP	<p></p>	<p></p>
Anonymous reporting of usage data for media analytics like library size, media types, connected devices seen in the households, usage pattern	<p></p>	<p></p>
Built-in web-based control point to browse and control connected devices	<p></p>	<p></p>
In-built Remote UI Server to serve the same UI to every client device. Can be utilized for services like VoD and any kind of device control like scheduled recoding.	<p></p>	<p></p>
Web-based configuration UI allowing user to customize the service according to their preferences (e.g., to define media shares)	<p></p>	<p></p>

 Not Supported

 Partial Support

 Full Support

  Full Support + Additional Formats

	Open Source Alternative	Twonky Server
Configuration API allowing OEMs to tailor the server for their specific platform	 Simple configuration file with limited number of configuration options parameters:	 Run-time configuration though http based configuration API with large number of configuration options that allow tailoring the server to the platform.
Provision of Status Information like number of shared items, db status, file scan progress, connected clients, or active streaming sessions		
Non-DLNA front-ends to enable browser-based client applications		 RSS, JSON
DLNA Profile Support		 AAC_ADTS_320, PNG_LRG, MPEG_TS_JP_T
Supported media formats by file extension including non-DLNA formats		
Music	AAC, FLAC, M4A, MP3, MP4, OGG, PCM, WAV, WMA	AAC, FLAC, M4A, M4B, MP3, MP4, OGG, PCM, WAV, WMA, 3GP, MP2, AC3, MPA, MP1, AIF, ASF, DSD (DSF, DFF)
Picture	JPEG	JPEG, PNG, TIF, TIFF, BMP, GIF
Video	AVI, DIVX, M2TS, MKV, MOV, MP4, MPEG2, MPEG4, MPG, VOB, WMV, XVID	AVI, DIVX, M2TS, MKV, MOV, MP4, MPEG2, MPEG4, MPG, VOB, WMV, XVID MP1, SPTS, 3GP, VDR, MPE, DVR-MS, M1V, M4V, MPV, FLV,
Support for Playlists covering all media types	 Music-only	 Music playlists, picture slideshows, and video playlists

 Not Supported
  Partial Support
  Full Support
  Full Support + Additional Formats

	Open Source Alternative	Twonky Server
Interface to import third-party databases to enhance meta-data, e.g., from a PVR or EPG		
Professional services for integration and certification		

ENDNOTES

¹2014 Internet Trends, Kleiner Perkins Caulfield Byers. May 28, 2014.

²"Major Mobile Milestones in May: Apps Now Drive Half of All Time Spent on Digital." comScore, June 25, 2014.

³Ooyala Global Video Index, Q1 2014.

⁴Nielsen Connected Devices Report, Q3 2013, as referenced in Nielsen Digital Consumer Report. Nielsen. February 10, 2014.

⁵Millward Brown, referenced in 1.

⁶Verizon Digital Media Study 2014.