Secure Packager and Encoder Key Exchange (SPEKE)

Open API Specification for Encoders, Transcoders, Packagers, and DRM Platforms

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Agenda

- Key Terms
- SPEKE (Secure Packager Encoder Key Exchange)
- Advantages
- SPEKE Architecture

What is the SPEKE API?

The **S**ecure **P**ackager and **E**ncoder **K**ey **E**xchange (SPEKE) is an open API specification which defines the standard for communication between encryptors and digital rights management (DRM) platforms.

Key Terms

Encryptor
- Encoders, transcoders, packagers

CPIX
- Content Protection Information Exchange format (DASH-IF)

SystemID or **schemeId**
- Unique ID for the underlying DRM vendor:
  - Microsoft PlayReady: `9a04f079-9840-4286-ab92-e65be0885f95`
  - Google Widevine: `edef8ba9-79d6-4ace-a3c8-27dcd51d21ed`
- Registered at: https://dashif.org/identifiers/protection/

Key ID (KID)
- Identifier that points to the underlying Key similar to a hash table

PSSH
- Protection System Specific Header, as part of CENC (Common Encryption)
- Contains a reference to the KeyID, SystemID and custom data for that DRM vendor Stored as an MP4 box in fMP4
- Stored as base64 encoding for MP4 box in DASH MPD

Why do we need to use DRMs?

Protect and control access to content

- Monetize content by maintaining control and fulfillment

Market coverage

- Content producers protect Premium video content
- Sporting events example: FIFA WorldCup 2018

Playback Complexity

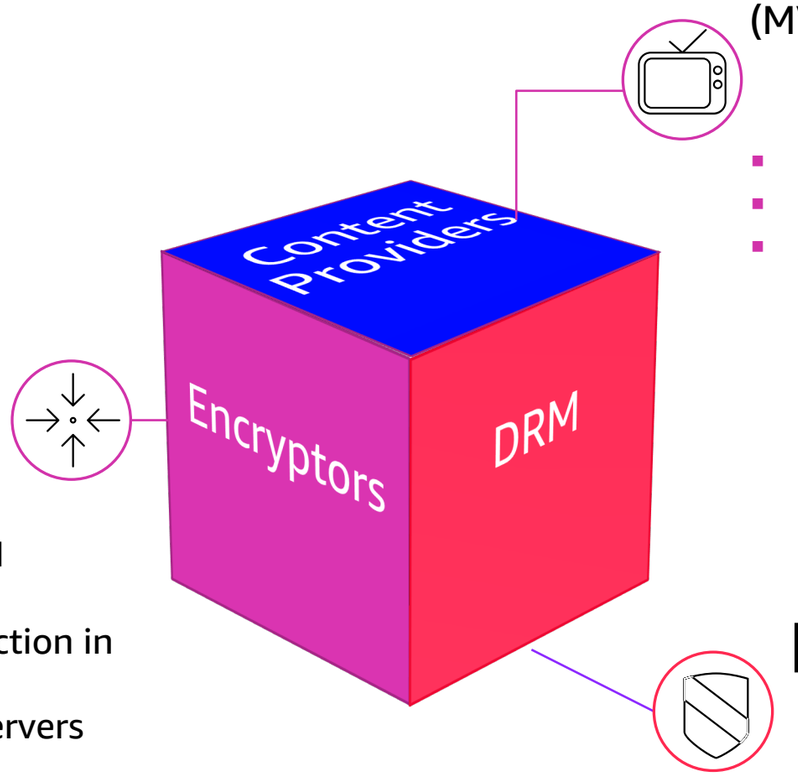
- Consumers watch content on various devices which all have specific Container/DRM requirements
- The DASH container offers Multi-DRM protected using Widevine and PlayReady
- Apple HLS is protected using Apple Fairplay
- Playback on Web Browsers, Multiscreen devices and Set-top boxes

SPEKE – Democratization of the video workflow

Content Providers

(MVPDS and Content distributors)

- Lowers barrier of DRM solution provider adoption
- Opportunity cost savings with quicker integration
- Ability to expand audience/device coverage



Encryptors

(Encoders, Transcoders and Packagers)

- Robust and lighter application
- Saves time, effort and cost of custom DRM API integration (4 weeks per custom integration)
- Savings in testing time and effort (~17% reduction in testing effort)
- Ability to test DRM workflow with reference servers

DRM Solution Providers

- Lowers barrier to adoption
- Custom integration cost and time savings
- Ability to establish proven workflows

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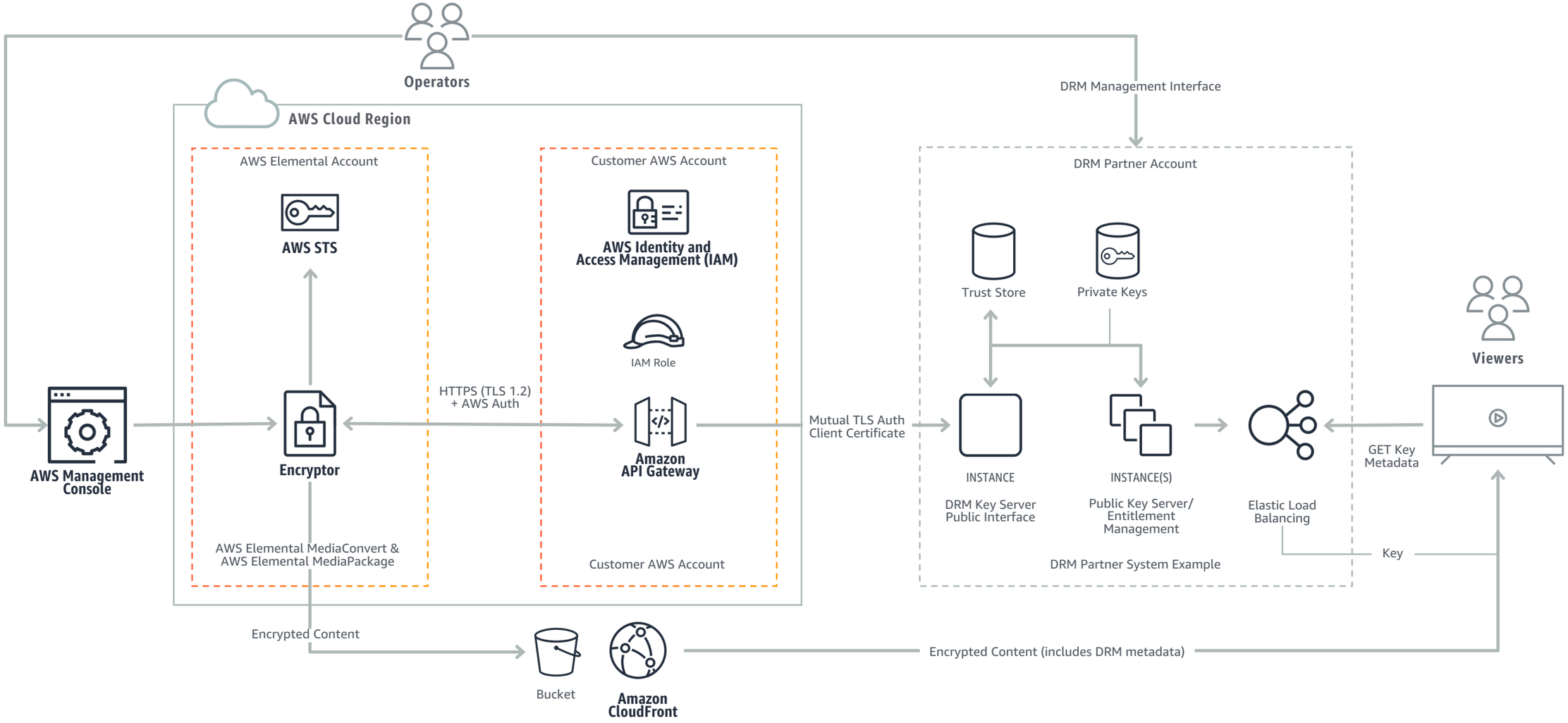
The SPEKE Ecosystem

Several DRM Solution providers have implemented SPEKE

SPEKE also enables customers to develop their own key management solution

SPEKE System Diagram



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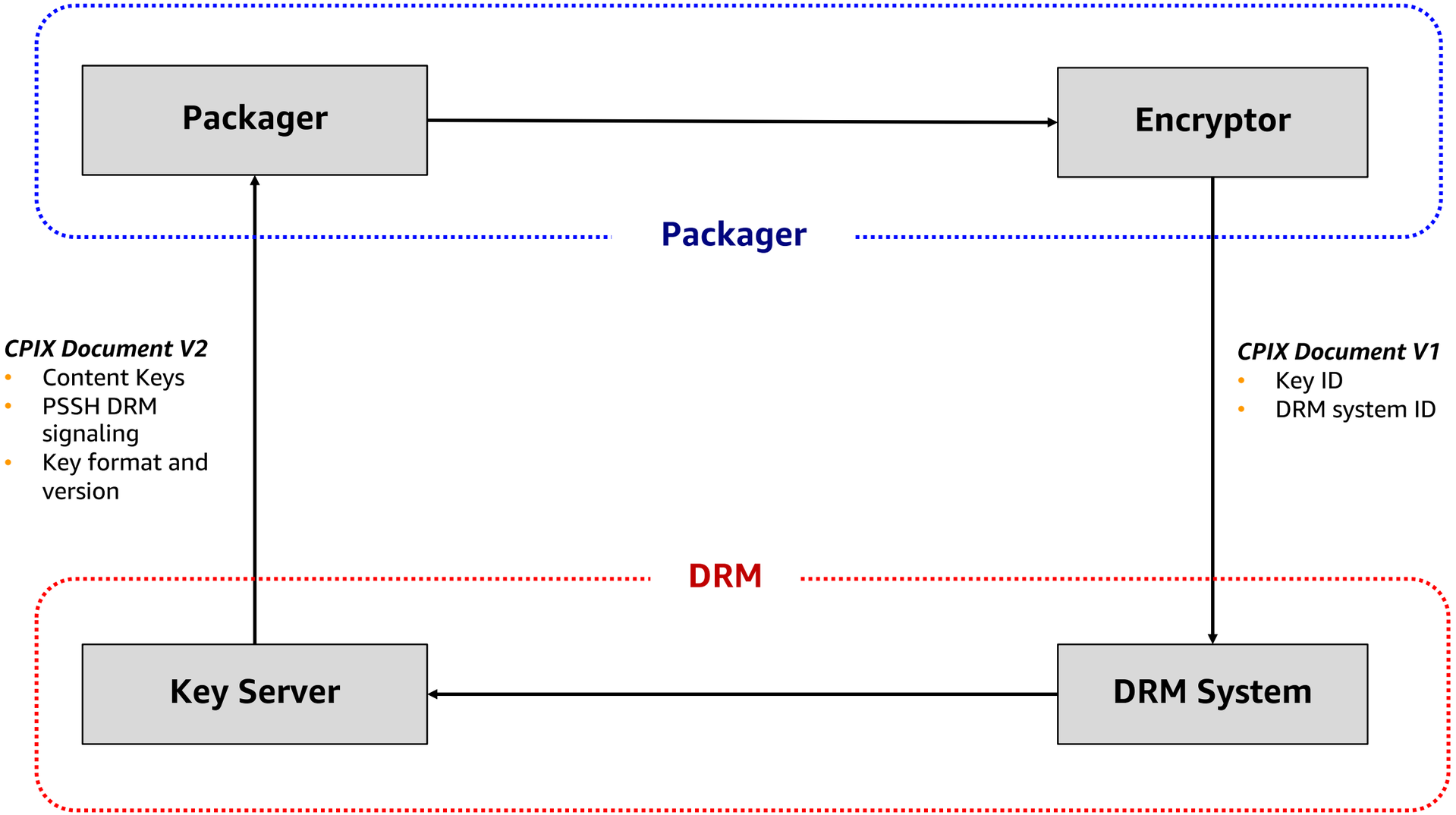
SPEKE – CPIX Based Encryptor Consumer Model



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SPEKE Request Sample – XML POST Over HTTP

```
<cpix:CPIX id="abc123" xmlns:cpix="urn:dashif:org:cpix" xmlns:pskc="urn:ietf:params:xml:ns:keyprov:pskc"
 xmlns:speke="urn:aws:amazon:com:speke">
<cpix:ContentKeyList>
  <cpix:ContentKey kid="98ee5596-cd3e-a20d-163a-e382420c6eff" explicitIV="OFj2IjCsPJFfMAxmQxLGPw==" ></cpix:ContentKey>
</cpix:ContentKeyList>
<cpix:DRMSystemList>
<!-- Common encryption (Widevine)-->
  <cpix:DRMSystem kid="98ee5596-cd3e-a20d-163a-e382420c6eff" systemId="edef8ba9-79d6-4ace-a3c8-27dcd51d21ed">
    <cpix:PSSH></cpix:PSSH>
  </cpix:DRMSystem>
<!-- Common encryption / MSS (Playready)-->
  <cpix:DRMSystem kid="98ee5596-cd3e-a20d-163a-e382420c6eff" systemId="9a04f079-9840-4286-ab92-e65be0885f95">
    <speke:ProtectionHeader></speke:ProtectionHeader>
    <cpix:PSSH></cpix:PSSH>
  </cpix:DRMSystem>
</cpix:DRMSystemList>
<cpix:ContentKeyPeriodList>
  <cpix:ContentKeyPeriod id="keyPeriod_0909829f-40ff-4625-90fa-75da3e53278f" index="1" />
</cpix:ContentKeyPeriodList>..... .....</cpix:CPIX>
```

GET Key

KeyID

SystemID 1

KeyID

SystemID 2

GET PSSH

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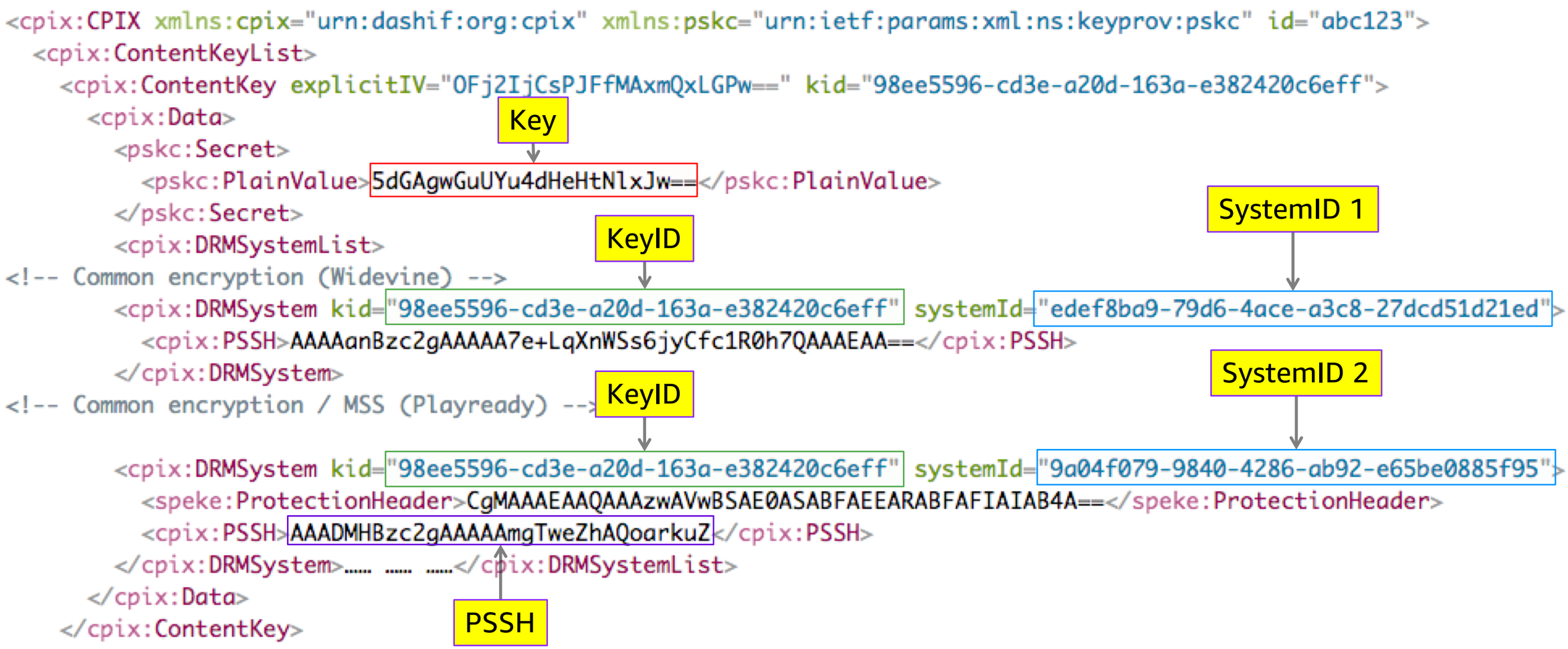
SPEKE Response Sample – XML Over HTTP




```
<cpix:CPIX xmlns:cpix="urn:dashif:org:cpix" xmlns:pskc="urn:ietf:params:xml:ns:keyprov:pskc" id="abc123">
  <cpix:ContentKeyList>
    <cpix:ContentKey explicitIV="OFj2IjCsPJFfMAxmQxLGPw==" kid="98ee5596-cd3e-a20d-163a-e382420c6eff">
      <cpix:Data>
        <pskc:Secret>
          <pskc:PlainValue>5dGAgwGuUYu4dHeHtNlxJw==</pskc:PlainValue>
        </pskc:Secret>
        <cpix:DRMSystemList>
<!-- Common encryption (Widevine) -->
        <cpix:DRMSystem kid="98ee5596-cd3e-a20d-163a-e382420c6eff" systemId="edef8ba9-79d6-4ace-a3c8-27dcd51d21ed">
          <cpix:PSSH>AAAAanBzc2gAAAAA7e+LqXnWSs6jyCfc1R0h7QAAAEAA==</cpix:PSSH>
        </cpix:DRMSystem>
<!-- Common encryption / MSS (Playready) -->
        <cpix:DRMSystem kid="98ee5596-cd3e-a20d-163a-e382420c6eff" systemId="9a04f079-9840-4286-ab92-e65be0885f95">
          <speke:ProtectionHeader>CgMAAAEAAQAAAzwAVwBSAE0ASABBFAEEARABFAFIAIAB4A==</speke:ProtectionHeader>
          <cpix:PSSH>AAADMHBzc2gAAAAAmgTweZhAQoarkuZ</cpix:PSSH>
        </cpix:DRMSystem>..... ..... .....</cpix:DRMSystemList>
      </cpix:Data>
    </cpix:ContentKey>
  </cpix:ContentKeyList>
</cpix:CPIX>
```

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How Do I Get Started with SPEKE?

- SPEKE API Documentation: https://docs.aws.amazon.com/speke/latest/documentation/what-is-speke.html
- SPEKE reference server: https://github.com/awslabs/speke-reference-server

SPEKE Reference Server

- Open source reference key server in GitHub AWS Labs project area
- Foundational example of a custom SPEKE key server
- Available today for use and customization
- Provides pre-built CloudFormation templates and code for a turnkey installation
- Integrates API Gateway, Lambda, S3, CloudFront, Secrets Manager for key generation
  - Uses secret IV per stream (content ID)
  - Uses key derivation to produce encryption/decryption keys
- Supports HLS, HLS-Sample, and DASH
- Participate at https://github.com/awslabs/speke-reference-server
- Fork the project and build your own key server
- Submit issues, questions, pull requests with improvements

Additional Resources:

- DASH-IF Implementation Guidelines: Content Protection Information Exchange Format (CPIX): http://dashif.org/wp-content/uploads/2016/11/DASH-IF-CPIX-v2-0.pdf
- Google Widevine: https://storage.googleapis.com/wvdocs/Widevine_DRM_Encryption_API.pdf
- Microsoft PlayReady: https://docs.microsoft.com/en-us/playready/
- Apple FairPlay Streaming: https://developer.apple.com/streaming/fps/

FAQ

- Can SPEKE be used for VOD and Live workflows?
- Is SPEKE extensible to new DRM systems?
- The encryptor creates the KID. Can the KID be overwritten?
- Can we integrate our own homegrown Key Management Server with SPEKE?
- How do you secure the communication channel for key exchange?

Thank you.

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