



# Efficient versioning for Film and Series thanks to IMF

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mesclado

- Thank you to all SMPTE Members
- My 3 wishes for SMPTE as a Governor:
  - More value: Virtual sections, etc.
  - More attractive: membership cost
  - More local: splitting the Region (EMEA and Latin America / Central America)



## A team of architects & IT consultants for the media industry



### Passions

- ✓ Video
- ✓ Marketing
- ✓ Startup



### Focus



- ✓ Business
- ✓ Operations
- ✓ Technology



### Team

- ✓ Independent Consultant based in France

### Projects

- ✓ Tenders for Media Systems Evolution
- ✓ “Video Entrepreneur”: Do it yourself Video Marcom at zero budget





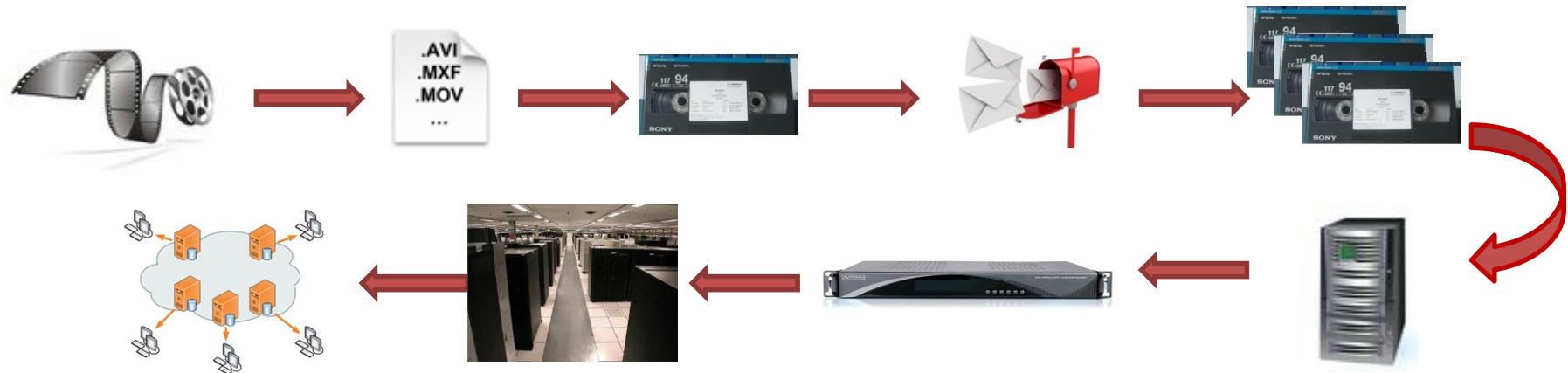
# **Interoperable Master Format (IMF): More efficient operations**

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- History
  - Need to find a replacement for delivery of tapes for program masters.
  - Migration to file-based program exchange involves various proprietary formats
  - Content localization requirements (audio, multi platform versioning)
  - Dealing with the increased number of Video/Digital Media distribution platforms hence requiring multiple formats (SD/HD/UHD, HDR/SDR, 2D/S3D, etc.)



- Example: Tape masters VOD delivery  
→ Costs, delays



- IMF business case
  - Build on DCP success: secure file-based exchanges
  - Need to re-use finished media content several times and for a long period
  - TV Broadcast market needs ready-to-use content
  - More cost effective by minimizing interoperability issues between systems with a standardized Master file format
  - Motivated by the 6 Hollywood majors to move to file-based masters exchange
  - ➔ Interoperable Master Format (IMF)



- Options for Master Delivery: 2 types of masters
  - Edit Master
  - Delivery Master
- Only IMF (and AS-02) handles multi-versioning



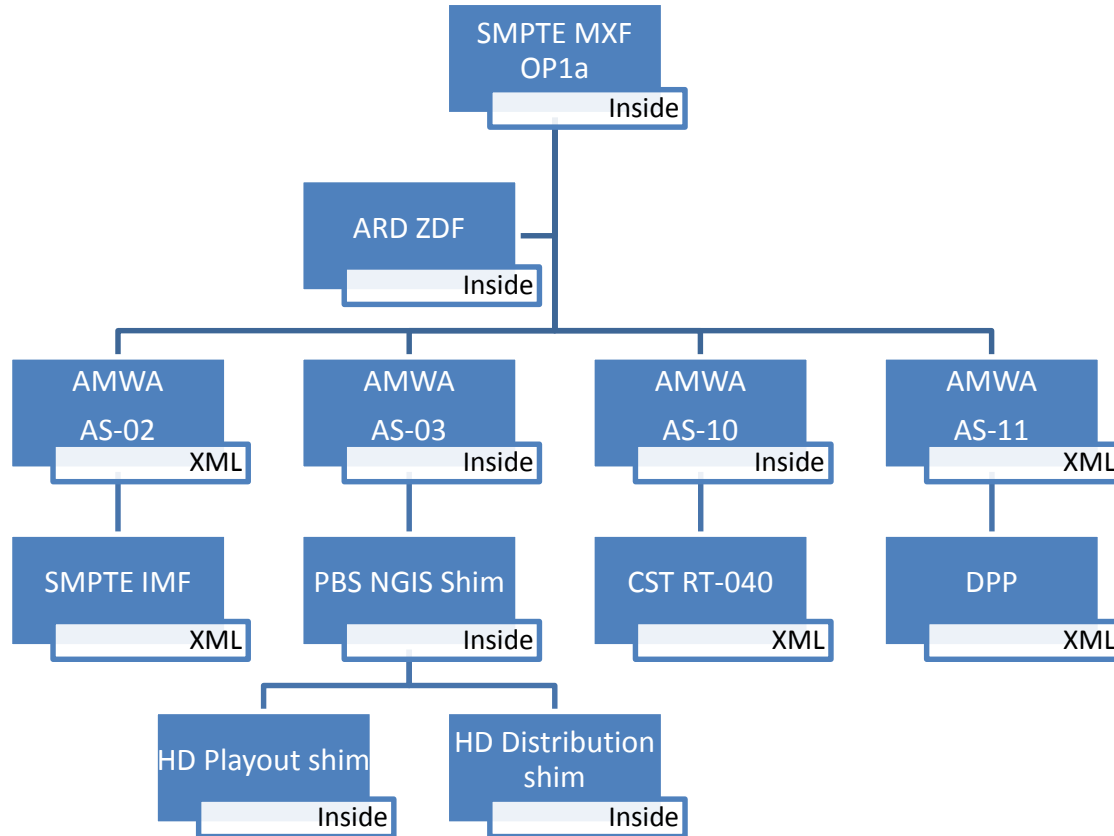
	Edit Master	Delivery Master
Open	IMF	AS-02, AS-03, AS-10, AS-11 DPP, ARD ZDF
Proprietary codec	ProRes	ProRes
Open and complex	DPX	MXF Op1a

Examples of wrapping formats



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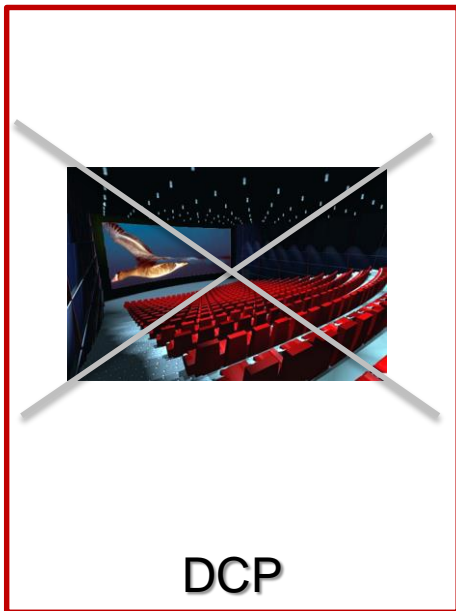


*Examples of wrapping formats*

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- Scope: everything but D-Cinema
- ➔ Goal: facilitate distribution and lower costs



- Standardization
  - By SMPTE: 35PM-50 WG on IMF
  - Involvement of most major players in the media market (Studios, manufacturers, right-holders, OTT platforms, etc.), mostly American companies with global footprints



- Goal: standardized exchange format:
  - Delivering a package rather than a single master
  - Everybody can easily re-purpose parts of a package (different versions of the same content, different languages, subtitles, audio description, etc.) to provide the requested version (TV subtitled in English, VOD dubbed in French, etc.)



Post-  
production  
House A

Master

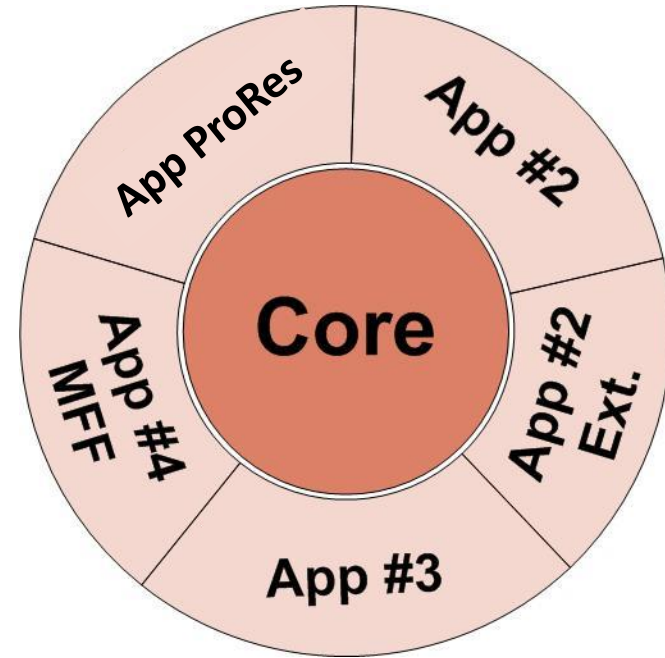


Labs and other  
productions  
houses

PART 1 - 12



- Two-level design: CORE and Applications
- Basic concepts of IMF:
  - Wrapping Essence Component
  - Composition (CPL) allowing multiple versions generation from the same content
  - Customer distribution parameters (OPL)
  - IMF Package (IMP)



*IMF Core vs Applications*

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- The Core
  - Main component of the standard
  - Regroups common elements of all IMF packages (IMP)
  - Defines data structures, media and data essence and other constraints guaranteeing interoperability

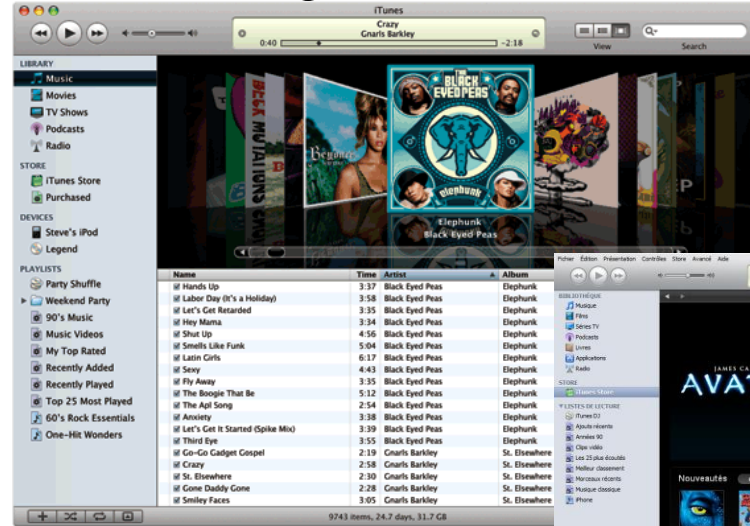


- The Core: components
  - Core Constraints (ST 2067-2)
    - Document referring to the other documents of the Core
    - Defines constraints on IMF applications: everything but image characteristics and codecs
    - Defines a structure rather than parameters
    - ➔ IMF 1.1 Revision in progress (e.g. reference to W3C IMSC1)



# Composition Play List or CPL (ST 2067-3)

- CPL: “broadcaster list” using MXF edit units



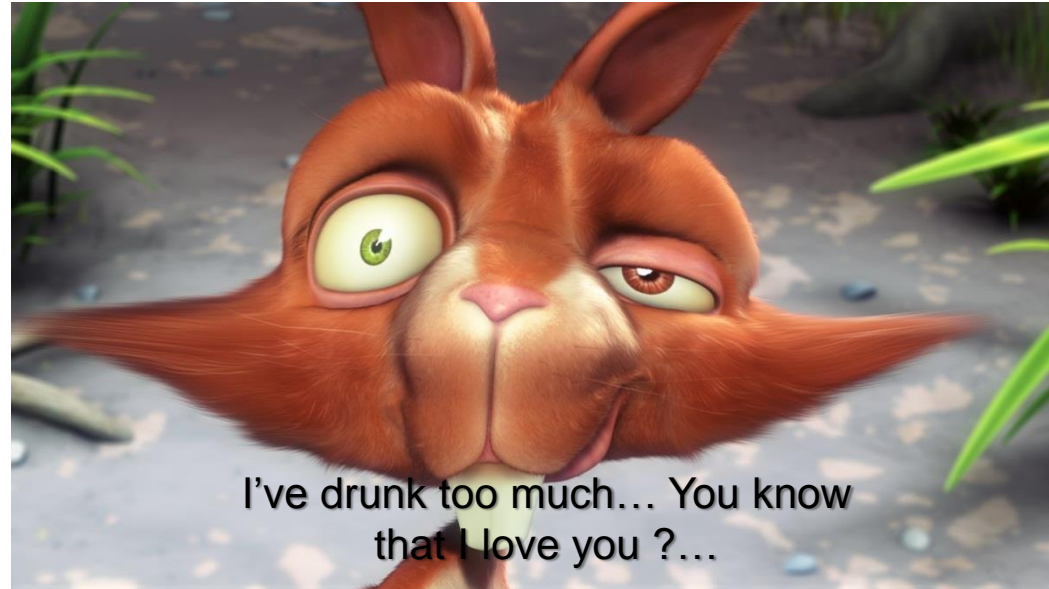
Note: the timeline uses the Edit Unit  
(e.g.: duration of a video frame or  
length of an audio sample)





# Composition Play List or CPL (ST 2067-3)

- CPL: Timed Text
  - Audio Description
  - English
  - French



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# Composition Play List or CPL (ST 2067-3)

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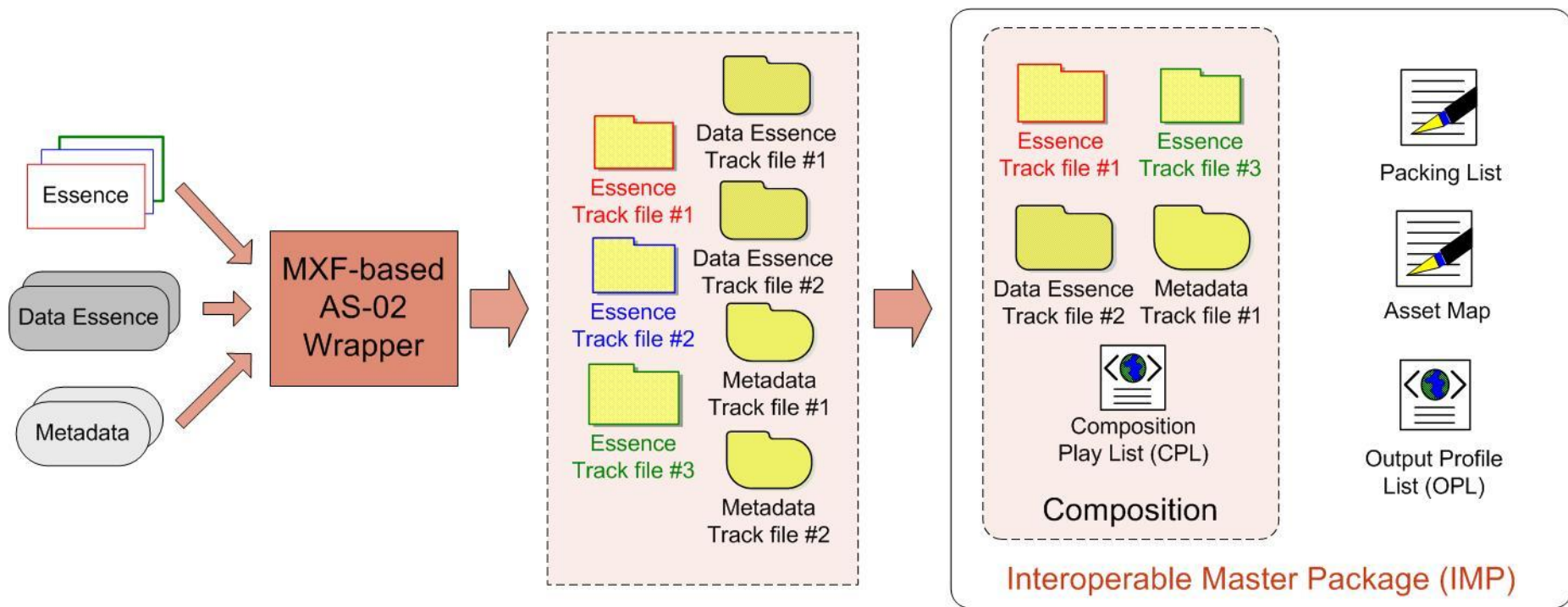
- The Core: components
  - Essence Component (ST 2067-5)
    - Defines generic container that wraps the media
    - MXF OP-1a wrapping (single track per container)



- The Core: components
  - Package structure
    - Each IMP (IMF Package) contains:
      - 1+ compositions (Composition PlayList i.e. CPL + media tracks)
      - 1 Asset Map (organization of media files for transport)
      - 1 Packing List (list of all the items within a package)
      - OPTIONAL: 1+ output profile list (OPL)



# Basic elements of a typical IMF Package



*Example of a chain creation of an Interoperable Master Package (IMP)*

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# Interoperable Master Format (IMF): More cost-effective

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# Film mastering and versioning

## CASE STUDY: Saving 26% on cost using IMF



### Background

IMF was born of the D-Cinema Package (DCP) standard success. IMF enables film distribution worldwide using a single package, each region receiving one or more versions of the content, aka “Compositions”. Several compositions can share common content, thus reducing distribution complexity. In 2006, the Hollywood studios began to consider a similar format for their masters.



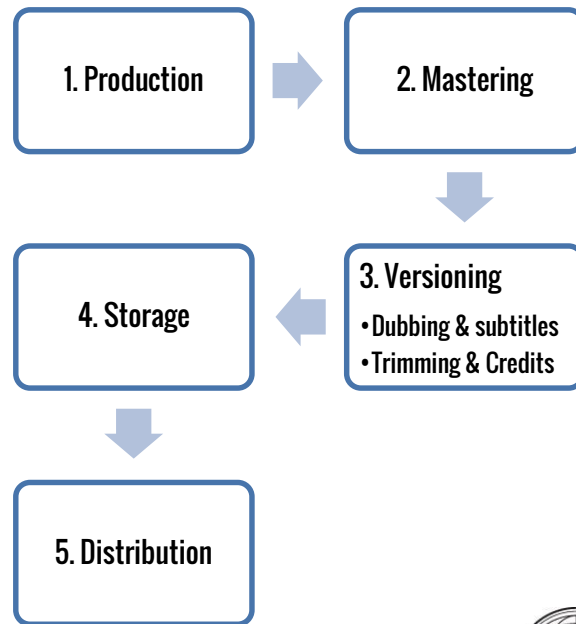
### Challenges

- Reducing interoperability issues
- Supporting latest video formats like UHD, HDR and VR
- Enhancing multi-versioning support whilst keeping infrastructure costs down



### Outcomes

- ✓ Automated versioning and delivery based on metadata
- ✓ Archiving masters
- ✓ Producing outputs in multiple delivery formats
- ✓ ...







### 1. Production

Case study:

- 1-hour documentary
- 2 versions: Original Version (OV) and International Version (IV)



### 2. Mastering

Without IMF	With IMF
<ul style="list-style-type: none"><li>• Using ProRes 422 to produce one MXF or Quicktime file per version</li><li>• File size: 60GB per version</li></ul>	<ul style="list-style-type: none"><li>• Using JPEG-2000 to produce the Interoperable Master Package (IMP) with higher quality images</li><li>• File size: 100GB for the package</li></ul>



### 3. Versioning

For versioning purposes, a proxy is created. The proxy is sent to a lab along with a subtitling or dubbing order.

**Dubbing and subtitling:** We order 5 subtitles and 5 extra audio languages (English, German, Italian, Spanish and Arabic).

Without IMF	With IMF
In both cases we receive 5 .stl files and 5 audio files	
5 new masters are produced for the dubbed versions (60GB each).	Supplemental packages are added to the original IMP with new audio and subtitles (~100GB total). New CPLs are created for each version.

#### Trimming & Credits:

We create 2 new versions for Arabic and German territories: 1<sup>st</sup> for censorship purposes (cutting scenes) and the 2<sup>nd</sup> for co-production contract (adding credits).

Without IMF	With IMF
2 new masters are produced. The old versions are purged.	The IMF package is updated: <ul style="list-style-type: none"><li>• German version: new CPL with extra credits (slate)</li><li>• Arabic version: new CPL with a removed scene</li></ul>

# Film mastering and versioning

## CASE STUDY: Saving 26% on cost using IMF



### 4. Storage

Without IMF	With IMF
We store the OV, IV, German and English versions. Other language versions are purged to save cost (60GB each).	We store the IMF package. All the versions are included in one single IMP (~100GB total).



### 5. Distribution

Without IMF	With IMF
When ordered, each master is used to produce the version delivered to the client. Spanish and Italian versions are purged after use to make savings on storage.	When ordered, the IMP is used to produce the version delivered to the client based on the CPL. All versions are kept within the IMF package.

3 years later, an order is received for dubbed Spanish and Italian versions.

Without IMF	With IMF
2 new masters are produced for the dubbed versions (60GB each).	The IMP is used to produce the version delivered to the client based on the existing CPL.

## Conclusions

### Total Cost of Ownership (4 years)

TCO without IMF	TCO with IMF
\$29 904	\$22 017

*These costs were computed according to a typical post-production rate card*

### More case studies

We have identified a total of 15 case studies, each of them offers more benefits.

### Cost Savings

Storage cost is very small compared to the costs of editing and producing new versions (subtitling or dubbing), so it is wise saving all versions.

### Storage Cost (per version, per year)

The cost of saving extra versions is marginal using IMF:

Cost without IMF	Cost with IMF
\$14.0	\$0.40



**Merci 😊**

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