21st SEAPAVAA CONFERENCE

IMAGINING AN AV ARCHIVE OF THE FUTURE

CULTURAL CENTER OF THE PHILIPPINES

MANILA, PHILIPPINES

3-8 APRIL 2017

Piql Services – Long-term Digital Preservation

SEAPAVAA2017 Manila, Philippines

About Piql

- Global provider of solutions for preservation of valuable data
- Driven by making our digital heritage accessible for future generations
- Background as the leading provider of digital film printers to the motion picture industry
- Unique know-how of transferring images and data to film
- Started in 2002, with headquarters in Drammen, Norway

Origins

piql

Motion picture industry

Cinevator®

Science project

Fraunhofer

Bundesamt für Bevölkerungsschutz und Katastrophenhilfe

FILMOTEC SPECIAL FILMS

HARMAN technology Ltd

Riksarkivet

norner

ELEMENTI LOGIC

eurostars

INNOVATION NORWAY

The Research Council of Norway

technicolor

Google's Vint Cerf warns of 'Digital Dark Age'

Vint Cerf, «the father of the internet».

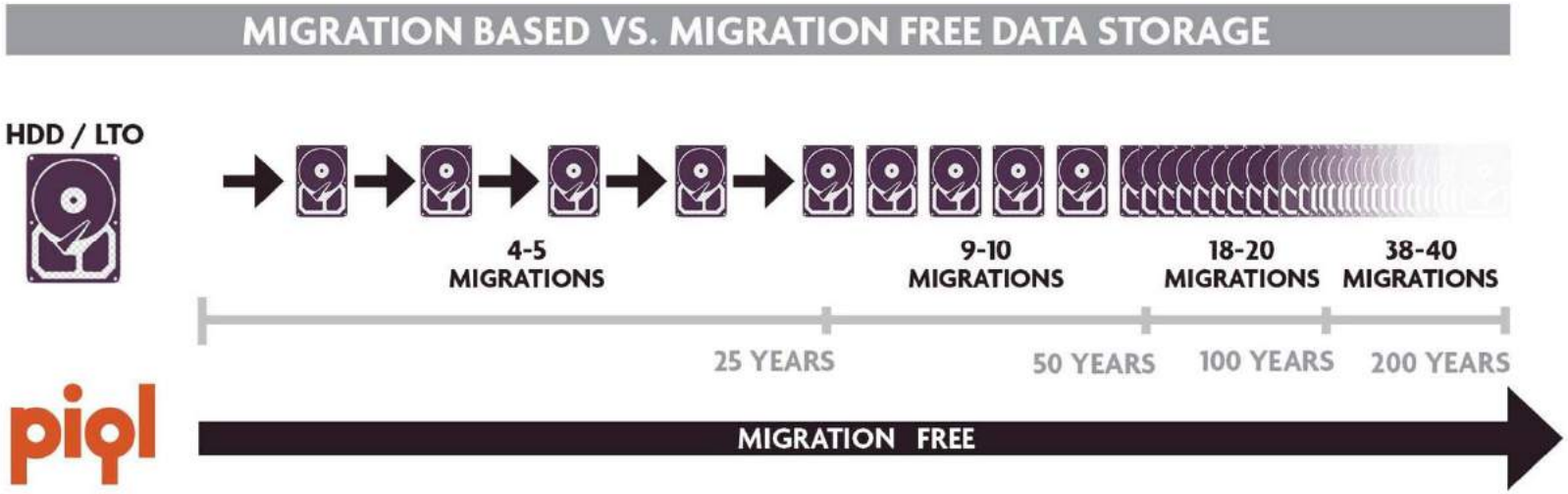
- Fears that all hardware and software eventually will become obsolete
- Our digital memory risks being lost in the wake of an accelerating digital revolution

> ***Even if we accumulate vast archives of digital content, we may not actually know what it is.***

Currently a Google Vice President, Vint Cerf fears that future generations will have little or no record of the 21st Century as we enter what he describes as a "Digital Dark Age". Old formats of documents that we've created or presentations may not be readable by the latest version of the software because backwards compatibility is not always guaranteed.

(Source: BBC News, www.bbc.com/news)

Two approaches



piql
”
The solution is to take an X-ray snapshot of the content and the application and the operating system together, with a description of the machine that it runs on, and preserve that for long periods of time.
And that digital snapshot will recreate the past in the future.
Vint Cerf, «father of the internet» and VP of Google

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Paris
Musée du Louvre
Le Centre Pompidou
Pont des Arts
Sainte Chapelle
Cathédrale Notre-Dame de Paris
Odéon Théâtre de l'Europe
Rue des Écoles
Rue Réaumur
Rue du Louvre
Rue Jacob
We have explicitly created such a digital snapshot

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Security issues

LTO

HDDs/SSDs

Cloud

Widely known security issues

piql

Challenges:	Bit-rot/obsolete formats[1]	Hardware[2]	Error rate[3]	Other error sources
Piql solution:	• Proven longevity • Forward error correction • Human readable format descriptions	• True WORM[4] • No moving parts that harm the medium	• True WORM • Proven longevity	• Offline and unalterable • Fully automated storage system (ISO 18911)

1) https://openclipart.org/detail/197002/mono%20file%20broken
2) http://de.wikipedia.org/wiki/Head-Crash
3) https://www.backblaze.com/blog/how-long-do-disk-drives-last/
4) Write Once Read Many

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The best of both worlds

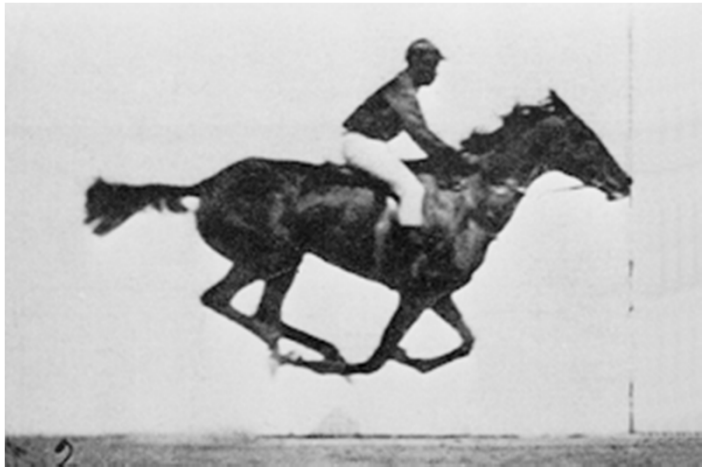
Best of film

- ✓ True WORM
- ✓ Offline
- ✓ Proven longevity
- ✓ Allows visual representation for future access

Best of digital

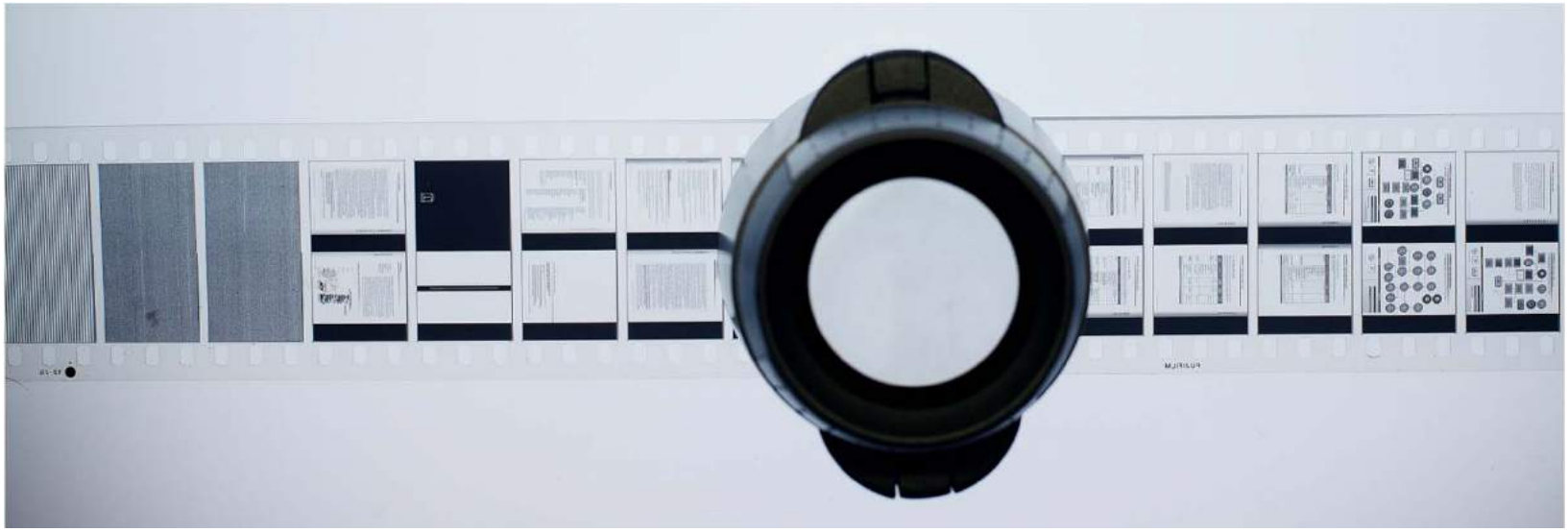
- ✓ Metadata access
- ✓ Metadata searchability
- ✓ Unified Unique Identifiers
- ✓ Secure access

…using the only medium that has proved to last



- 1878:
- The first motion picture ever made.
- «The horse in motion»

Reinventing the use of trusted technology



Trustworthy Digital Storage Medium - PiqlFilm

Silver halides coated on polyester base – B/W film

- Invention over 100 years old, behavior and lifetime well documented and understood - open technology – no patents
- True WORM* storage medium – write once read many
- True offline medium - no power usage – hacking proof
- Documented lifetime of 500 years - tested using ISO 18901, 18936 and 18924
- Chemically stable & secure medium with proven longevity of hundreds of years

The lifetime solves many of the trust/authenticity issues caused by digital archiving

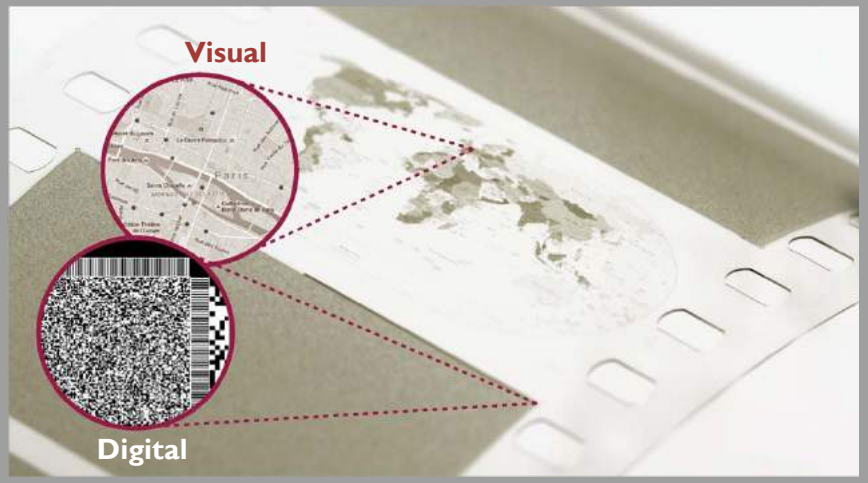
*WORM: Write-Once, Read-Many

Content Section

Visual and digital information stored on same medium.

A combination of both is called hybrid format

Data and metadata files are included here



Choose the storage format that suits you...

piql

Digital

We store your data as computer readable binary codes (1 and 0).

For maximum data integrity

Visual

We store your data as human readable text or images.

For immediate data access

Hybrid

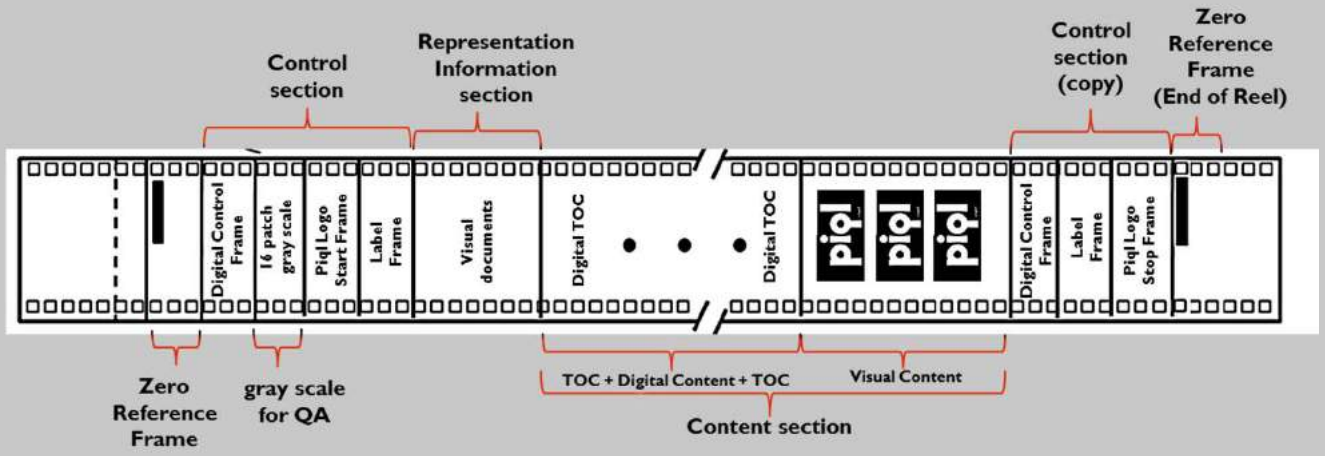
We store your data in digital format alongside human readable text or images.

For double accessibility

Reel Format

The Reel format is divided into 3 sections:

- **Control section** (administrative and technical metadata: how to decode the content),
- **Representation Information section** (structural and semantic information that facilitates the proper rendering, understanding, and interpretation of a digital object's content)
- **Content section** (where the data and metadata are written, includes digital Table of Content).



Technology **“Bits on Film”**

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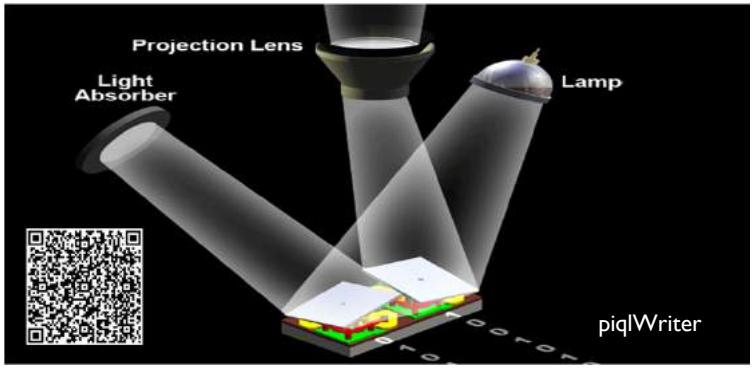
Data written as high-density QR codes

- Encode binary data to 2D barcode.
- Project the barcode on 35mm perforated film through a DMD from Texas Instruments.
- *Link to **video***

Open platform for data reading

- Image capturing (Scanning)
- Decoding software (open source)
- *Link to **video** of Piql system*

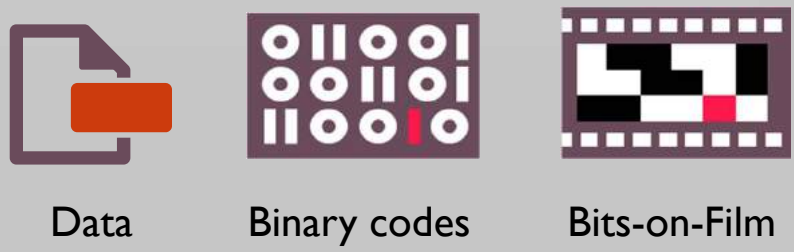


We have digitized the film

We write digital bits and bytes onto film

piqlFilm – nano-film with tested longevity of a minimum of 500 years

piqlBox – created by a new polymer material tested to last more than 500 years



Data Binary codes Bits-on-Film

Self-contained medium

A self-contained storage medium. The *reel format* has been designed to contain metadata, written in human readable format, explaining in details how to recover the information in the future.

Film is an unalterable, secure and offline medium.

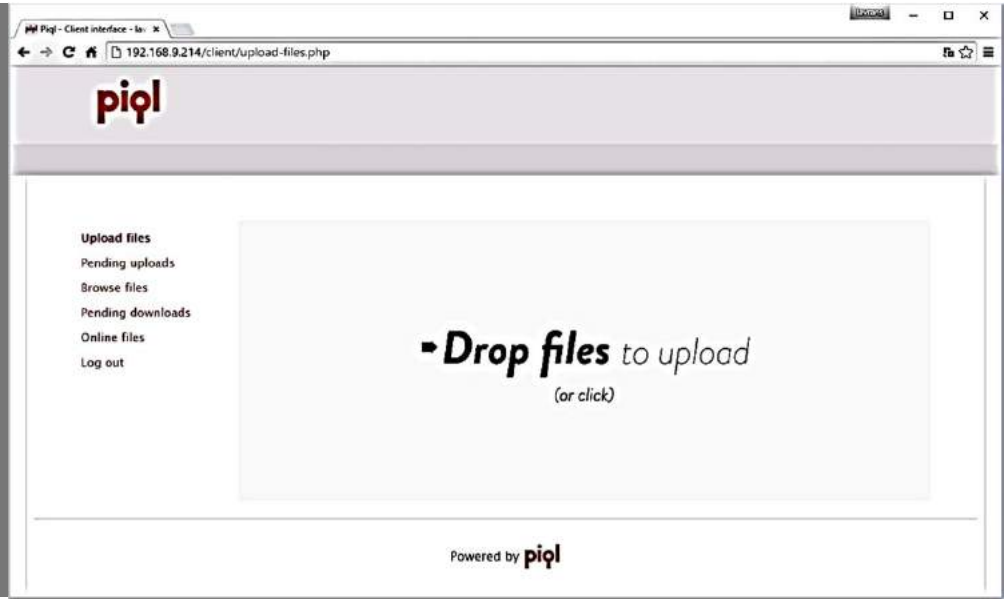
Integrated with the IT Environment

Ingest

- Secured Web/SFTP/File Share
- Custom API
- File format normalization
- Flexible metadata ingestion

Access:

- Online Search
- Download through WEB, SFTP, custom API or physical HDD



Storage

- PiqlBox: Unique storage container - lifetime of 500 years
- Label on storage container - lifetime of 500 years
- Support for manual and automated storage systems
- Integrated with fully automated storage: piqlVault

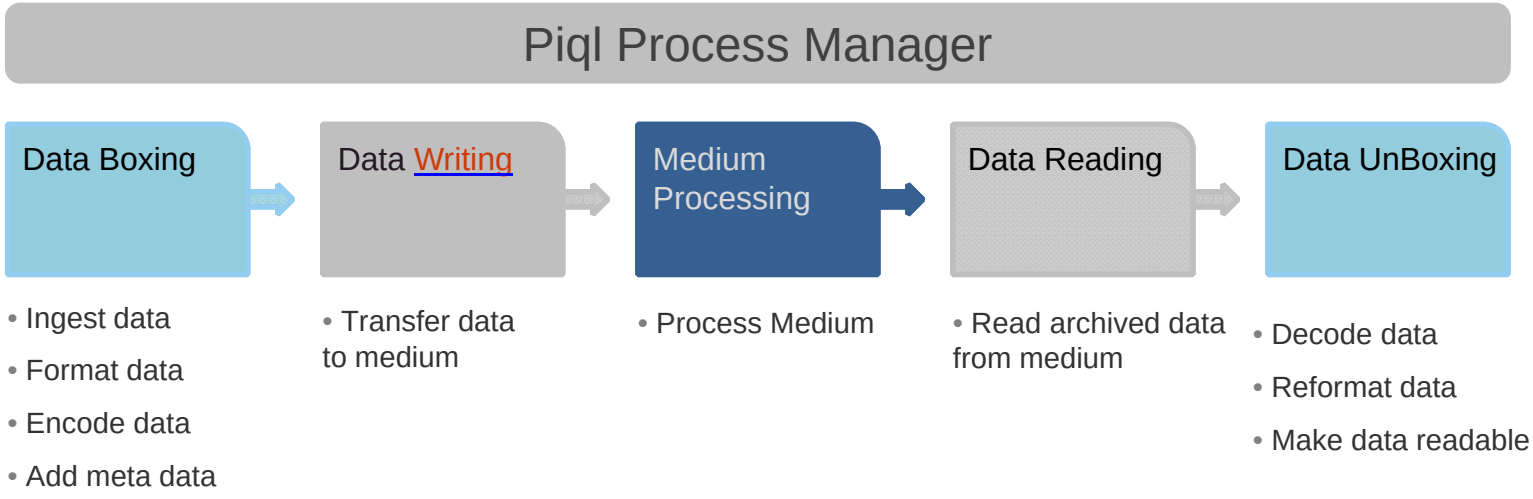
piqlVault

Automatic storage & retrieval concept developed and adapted for long-term preservation of data on film (in piqlBox)

- ✓ Extreme Space Utilization
- ✓ Ergonomic Working Environment
- ✓ Free Scaling Expansions

All source codes are **open** to ensure
future access

PIQL System Workflow



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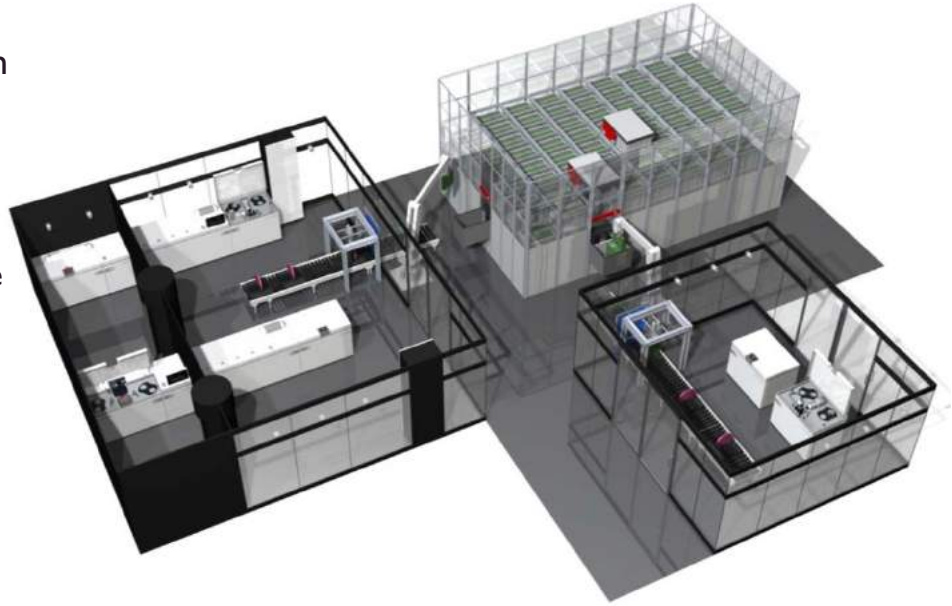
Piql System

Enabled by our unique technology -

- We use our patented **turnkey solution** with all equipment and processes to:
  - Write the data onto the storage medium
  - Recover the original files
  - Automated storage solution
  - Storage medium and packaging with unique properties

- Piql Preservation Services uses an OAIS (Open Archival Informaation System) compliant turnkey solutions to provite data owners with a secure, accessible, and migration-free solution for digital preservation.



Combining the preservation qualities of film with the user-friendliness of digital technologies

piql

Ultra-secure data storage

UNALTERABLE
By using a true WORM medium, we make it impossible to modify or delete recorded data.

SECURE
We safeguard your data from cyberattacks, logical threats as well EMP and physical threats

Long-term digital preservation

MIGRATION-FREE
Avoid the risk of data loss, save time and get a predictable long-term cost.

FUTURE-PROOF
Data retrieval is possible independent of technology obsolescence

PERMANENT
Our film and box are tested to keep your data for 500 years.

Common

FLEXIBLE
We can store data both in digital and visual format

SEARCHABLE
Your data is fully searchable, so you'll always find what you need.

Piql for Audio & Visual

- Piql removes the need to continously migrate audio-files to new storage mediums, which until now has been the only way to store audio for the long-term.
- By being a true WORM*, the piqlFilm guarantees the authenticity of the stored audio files.

- Piql can offer a more cost efficient long-term solution than todays standard of analog black/white color separation film for preservation.
- By using a physical storage medium, Piql Services keeps the visual files ‘alive’ without any need of electricity, and thus minimizes storage cost.

The Piql Services offers a solution where audio (digital) & visual data can be stored together.

Piql for Audio & Visual

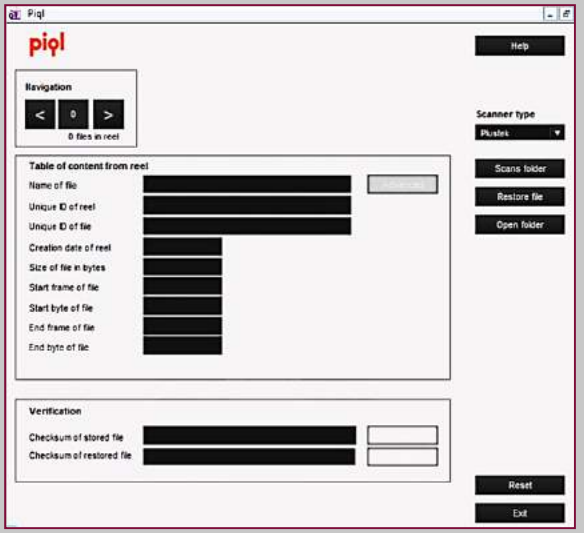
The Piql repository assesses potential preservation formats against the following criteria:

- The full specification of the format must be openly available.
- No patent, intellectual property rights or other rights attach to the format.
- The format is widely endorsed and/or adopted (audio files should be no compression, video files should be lossless)
    - Audio recommendation: Uncompressed WAVE
    - Video recommendation: MotionJPEG2000 lossless, FFV1 lossless

- Regeneration of data (video link)…sometime in the future!

4 Ways to demonstrate Piql Technology

- Live demonstration in Drammen
- Real time remote video demonstration
- Automatic simulation through Client Interface
- Proof of Concept – Restoring digital data frames using client's files and Piql decoding software



DELIVERED IN Q3 2016

ČESKÝ ROZHLAS CZECH RADIO | Audiovisual content in Czech Republic

piql

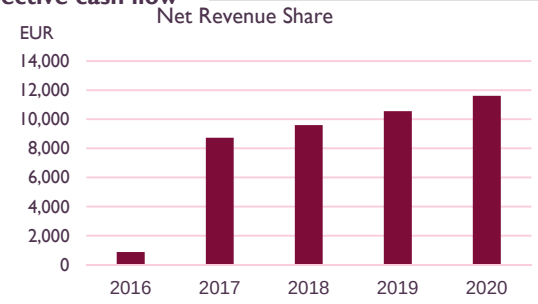
Background

- Bonton, Piql Partner in Czech Republic has signed a commercial agreement with Radio Czech.
- The job consist of 1 TB of historical information labelled as the "Golden Treasure" of Czech Republic and relates to cultural heritage and include sound recordings from the WWII and the Soviet invasion in 1968.
- Total archive consist of 300 000 hours of sound, 16 million documents and 10 million pages of musical records.

Business Opportunity

- The contract is for preserving 1 TB with 5857 WAVE files.
- The business case is based on the assumption that production of the pilot will lead to subsequent jobs of 10 TB next year and then an increase of 10% year by year to preserve major parts of the total archive.

Prospective cash flow



Future projects

- The job qualifies the Piql solution as a way of preserving audiovisual content and will open the opportunity to the preserve the majority of the Czech Radio archive.
- The Czech Radio project is a great reference for similar projects

DELIVERED IN Q4 2016

| Preservation of sound within motion picture

piql

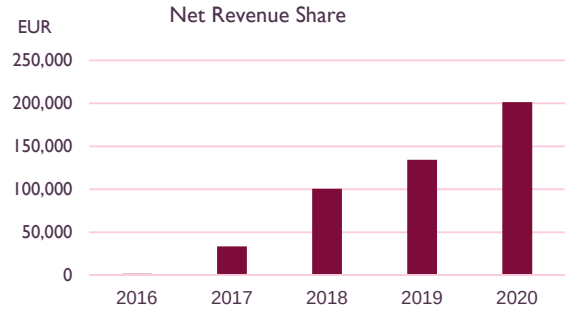
Background

- Piql has completed a Pilot of 0,5 TB with a major film studio, preserving the sound master tracks from the one of their successful blockbusters.
- The sound material includes all the original sounds tracks in English as well as 7 parallel master tracks in WAVE format.

Business Opportunity

- It is a pilot run.
- One movie contains original sound material in need of preservation equivalent to 0,5-1,5 TB.
- The film studio has a total of 713 movies (2016) with significant value to be preserved for the future.
- The total business opportunity is estimated to be 1 PB of data of sound material.

Prospective cash flow



Future projects

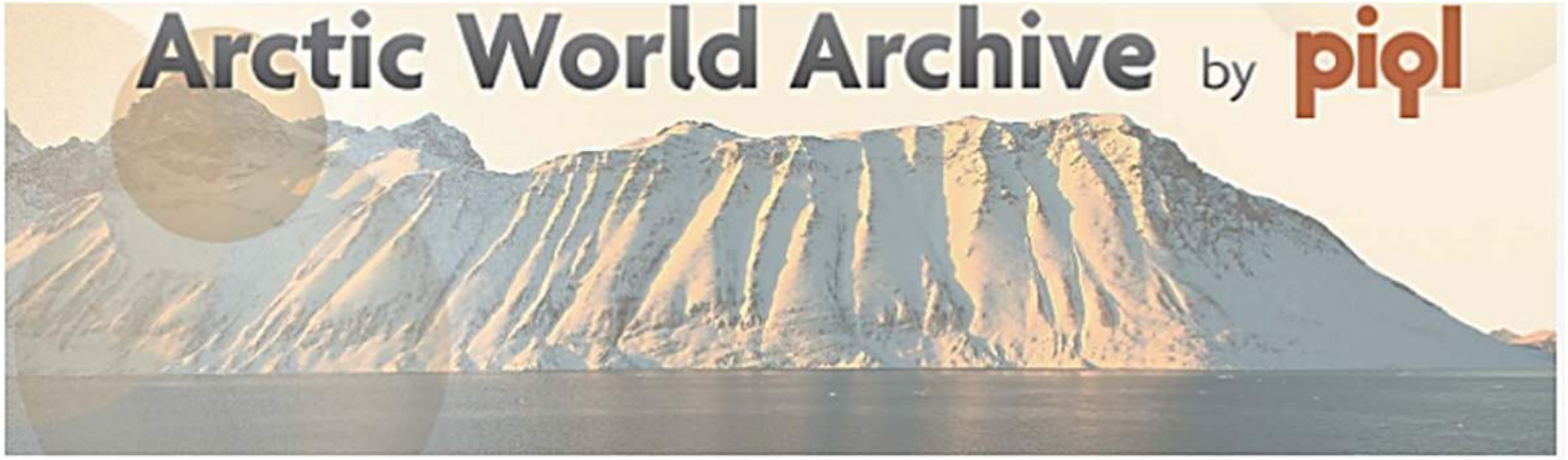
- For the visual material the film studio use best practice of traditional analog black/white color separation for preservation. Piql can offer a more cost efficient long-term solution for protecting the master copies.
- Delivery and market acceptance by this film studio, will open doors to other film studios in as well.

Arctic World Archive by Piql

Deep inside arctic mountains with permafrost and ideal climatic conditions, on an archipelago declared demilitarized by 42 nations; the safest place on the planet for a "digital embassy". Like what the Global Seed Vault is doing for plants, the Arctic World Archive is now doing for the worlds digital heritage.

The Arctic World Archive at Svalbard, is the ultimate vault for storing this preserved information. It is for any country, authority, organisation or individual in need of ultra-secure storage of their valuable information with guaranteed access in the future.

The first deposits are being made by National Archive of Brazil in March 2017.



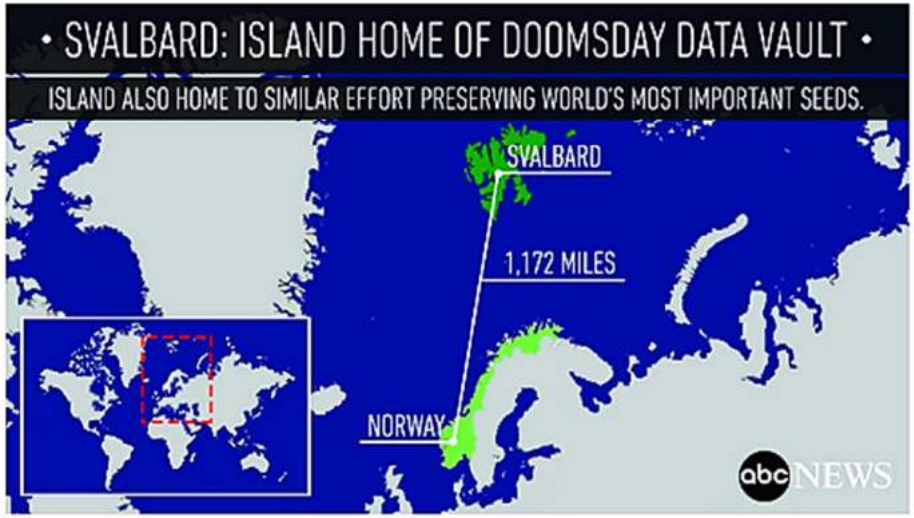
The inauguration of Piql's digital vault "Arctic World Archive" took place on March 27th in Mine no. 3 in Longyearbyen, on the arctic island of Svalbard.

The opening is receiving massive media attention from all over the world, from media channels such as TIME Magazine, ABC News, AOL.com, The Sun and NRK, just to name a few. We have talked to CNN, Al Jazeera and BBC, and the World Economic Forum has made a video clip about Piql's digital vault.

piql

Archive, is housed in a mine on the island of Svalbard — a small archipelago well north of its owner, Norway.

Piql says that it has already received data from Brazil, Mexico and Norway, which it will be able to preserve for hundreds of years and protect from nuclear and electronic attack.



The vault was officially opened on March 27th with the directors of the

"We can be reasonably confident that no military attack will happen," sid Pål Berg from a Norwegian coal mining firm called SNSK.

Currently, only the countries of Mexico and Brazil have opted to store their national archive, along with Norway's own Song og Fjordane County Council.

"There is a special feeling that I should save my nation's memory on the Arctic island," Eric Cardoso from Mexico's National Archives said.

Bjerkstrand said that the archive would protect these historical resources and other forms of "the globe's most valuable data from future catastrophes, war and cyberattack as well as future technological obsolescence."

Arctic World Archive

Why Piql technology?

- ✓ a permanent storage solution (i.e. no need to migrate)
- ✓ guaranteed access to data in the future independent of specific technology.
  - All information on how to access and interpret the data is included in human readable text on the preservation medium
  - All that is needed in the future is a light source, a magnifying glass, a camera and a computer

Thank you!

Website: www. Piql.com

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