Delivering High-Resolution JPEG2000 Images and Documents over the Internet

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About LuraTech

LuraTech provides software, services and outstanding support for document conversion with the objective of widely automated preparation of these documents for long-term archiving and processing in ERP and other systems.

- Founded 1995 in Berlin
- US-Subsidiary founded 1999
- UK-Subsidiary founded in 2010
- Core business is document conversion & compression, incorporating LuraWave JP2 technology.

Member of: PDF/A Competence Center, DIN, ISO, IEC, JPEG Group, AWV, VOI voice of information

Image Compression Options

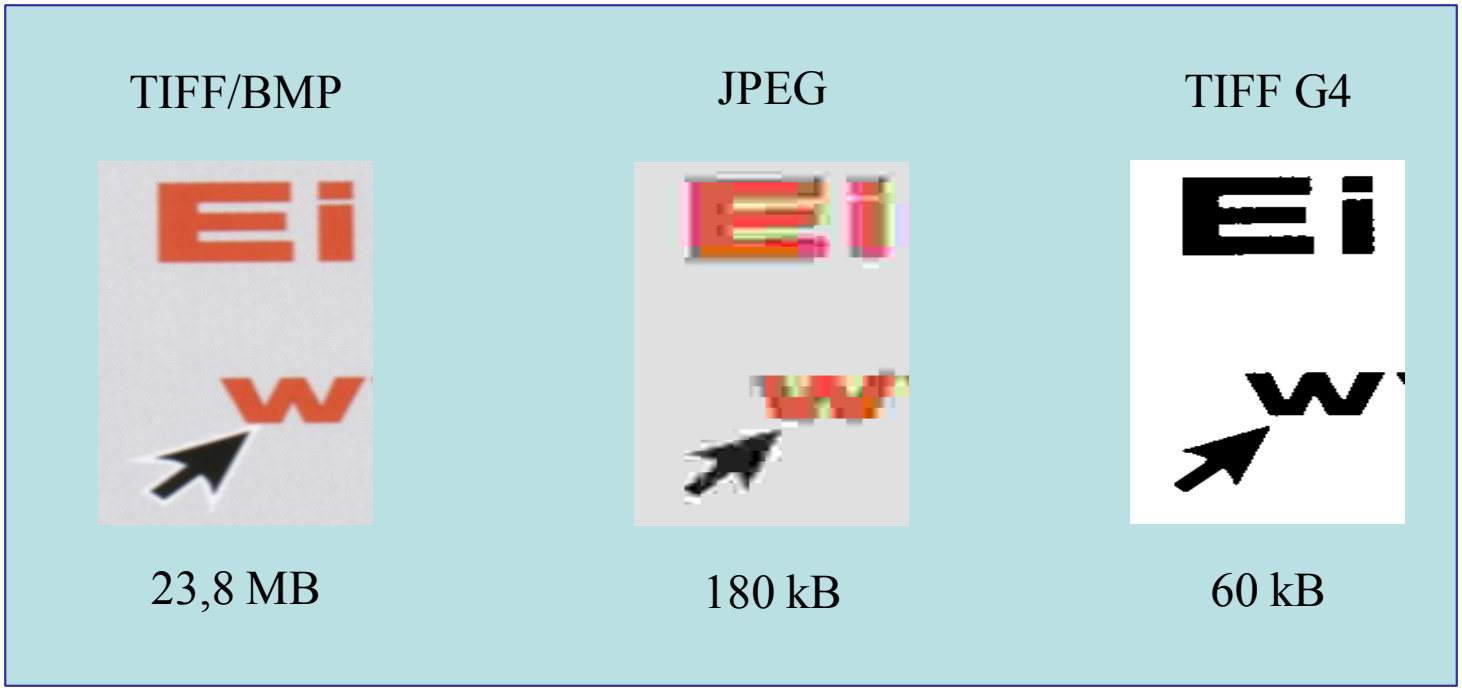
- For the Internet, Image Compression is a must-have
  - Images need to appear quickly
  - Only portions of an image may be of interest

Black/white:
- TIFF FAX G4

Color:
- TIFF
- TIFF LZW
- JPEG
- PDF

Disadvantages of File Formats

- Lossless TIFF is too large to handle
- Lossy JPEG doesn't preserve the text
- FAX G4 discards colour information



Document Compression Challenges

Documents contain different components

- Text
- Pictures
- Graphics / Logos
- Various colour depth (colour/black & white)

High compression using standard JPEG:

➢Text not legible

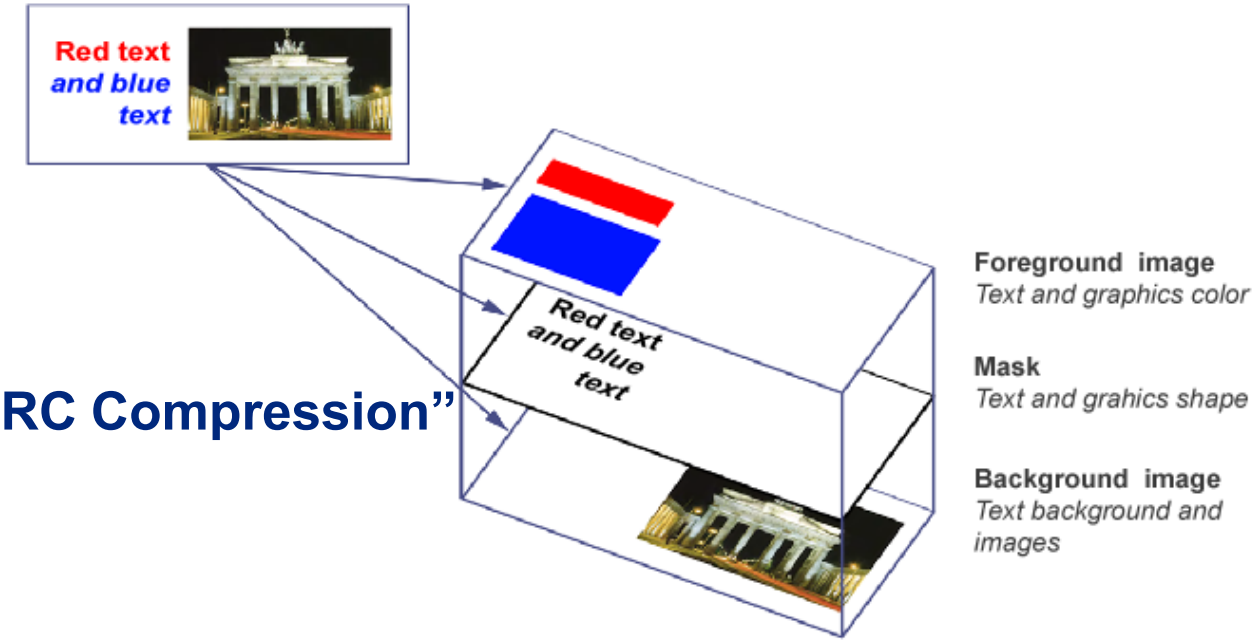
Archiving with Fax G4:

➢Loss of colour

LuraTech Multi-Raster Content Compression

Separate document into 3 independently coded layers:

1. **Colour images (JPEG 2000)**
2. **Bitonal Text (JBIG or FAX G4)**
3. **Coloured text mask (JPEG 2000)**



"MRC Compression"

Internet Documents: JPEG 2000 Benefits

- File format very powerful
  - Use one original copy
  - Display many different layers
  - Generate new images on the fly
- Wavelet based encoding benefits
  - Highly compressed images are “fuzzy” rather than blocky (as with jpeg)
  - More appealing to the human eye

JPEG v JPEG2000 Image Display

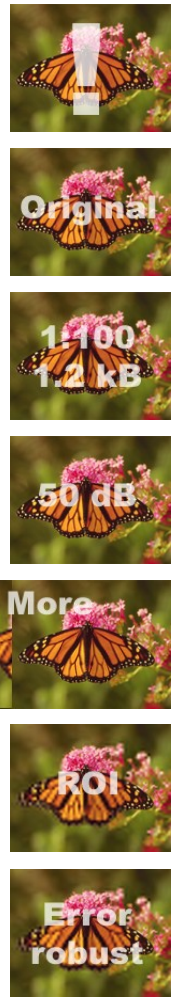
- Images are significantly smaller
- Less memory space and quicker transfer & download times
- Highly suited to the Internet, but most browsers don't support JP2

JPEG

JPEG 2000

LuraWave.jp2 Features

- **Improved image quality**
- **Compression options**
  - Lossless
  - Lossy by fixed size
  - Lossy by fixed quality (PSNR)
- **Preview progression & image scaling**
  - 5 different progression types
- **Region of Interest (ROI)**
  - Arbitrarily shaped
- **Error resilience**



Improved Image Quality

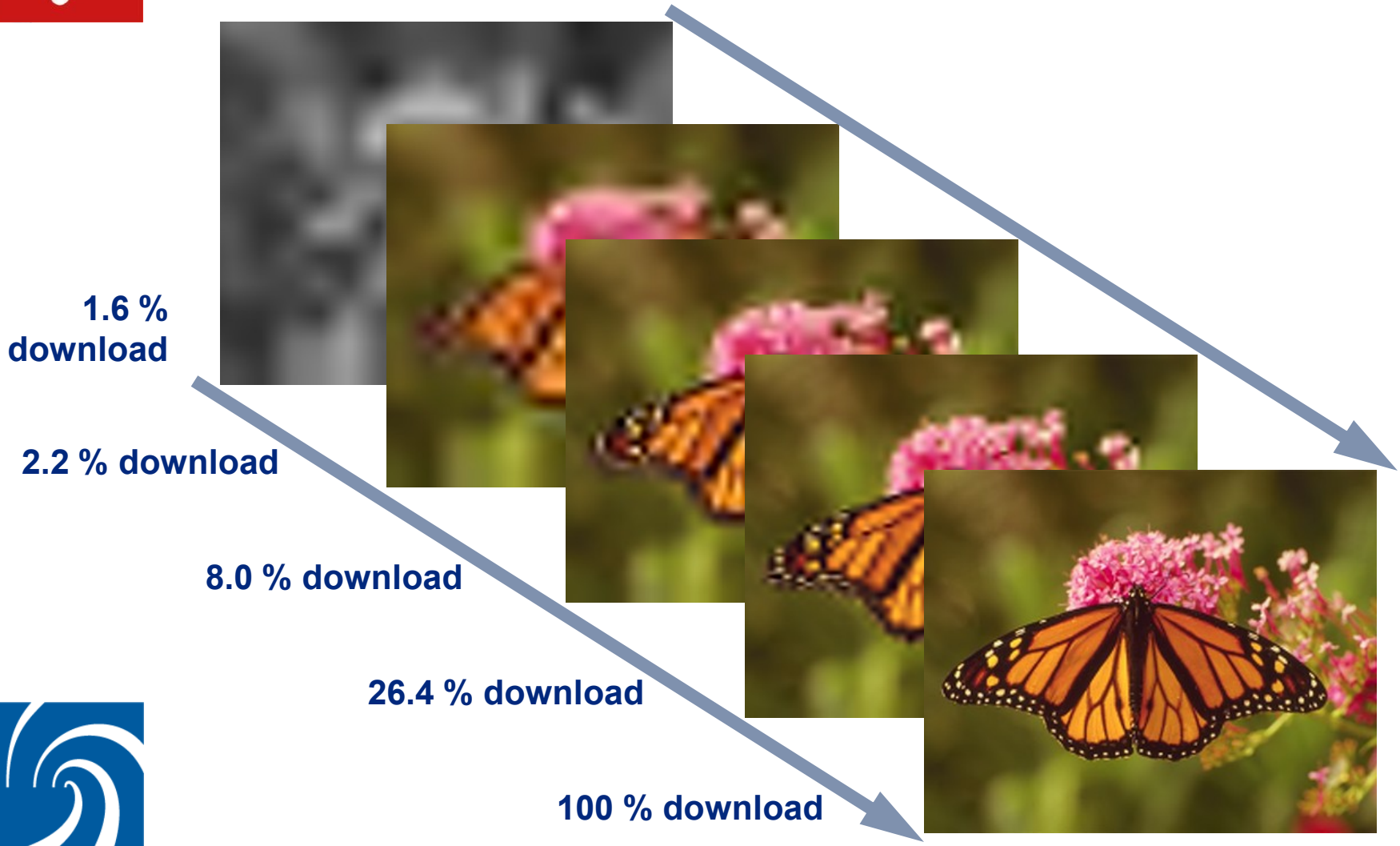
JPEG 1:126

JPEG2000 1:126

Three Different Types of Compression

- **Lossless**
  - No quality loss with up to 3:1 compression
- **Lossy by fixed size**
  - Good image quality with up to 100:1 compression
- **Lossy by fixed quality**
  - Excellent image quality with a compression of up to 80:1 compression

Previews

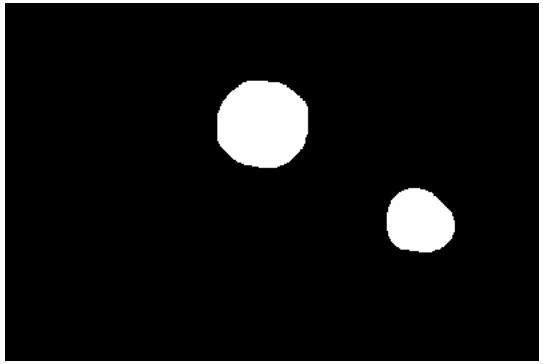

1.6 % download
2.2 % download
8.0 % download
26.4 % download
100 % download

Regions of Interest

← Original

+

ROI mask →



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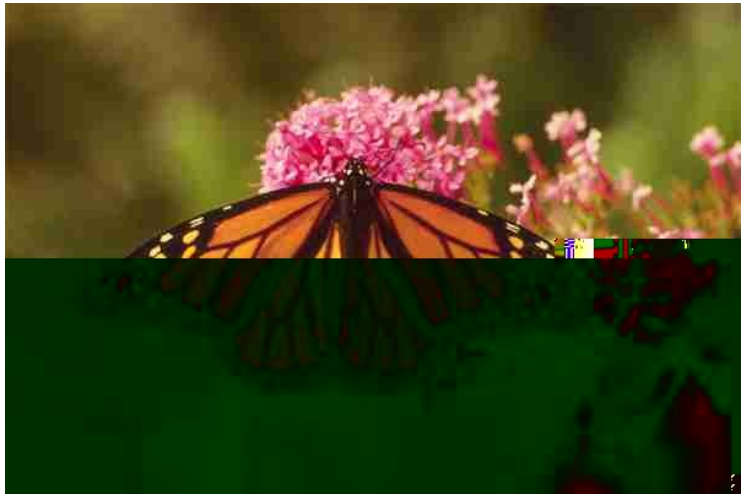
Error Resilience

Compression 1:52 = 13.4 kB

Embedded error: 16 Bytes set to zero in the middle of the files



JPEG
PSNR = 15.7 dB

JPEG2000
PSNR = 46.5 dB

Example LuraWave JP2 Applications

- **Image data bases**
- **Image transfers over the Internet**
  - Using the LuraTech Image Content Server (ICS)
- **Scanned images**
- **Patient x-rays**
- **Images stored on CD**
- **Digital photography**
- **Palm pilot applications**

LuraTech Image Content Server

- Series of toolkits produced by LuraTech
  - Customer implements & hosts
  - Creates a JP2 image store
  - JPEG images delivered to a standard web browser
  - No additional end-user plug-ins required

ICS Features

- Interactive viewing capabilities
  - e.g. panning, zooming, animated page turns
- Intelligent image caching
  - Provides instantaneous client-end viewing
- Supports associated image metadata
  - e.g. XML, GML, MES, ALTO etc.
- “On-the-fly” single-source JP2 conversion to JPG
  - Eliminates the requirement for derivative files
- Open architecture allows for customisation

ICS Implementations

- National Library Netherlands
  - Koninklijke Bibliotheek - http://kranten.kb.nl
- Harvard University
  - University library system
- California Digital Library
  - School teacher resource
- Lexis-Nexis
  - Displaying of maps

Thank-you for your attention!

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