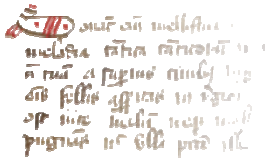

Historisch
Kulturwissenschaftliche
Informationsverarbeitung

Characterisation

Digital Preservation Planning: Principles, Examples and the Future with Planets.

July 29th, 2008

Manfred Thaller
Universität zu* Köln
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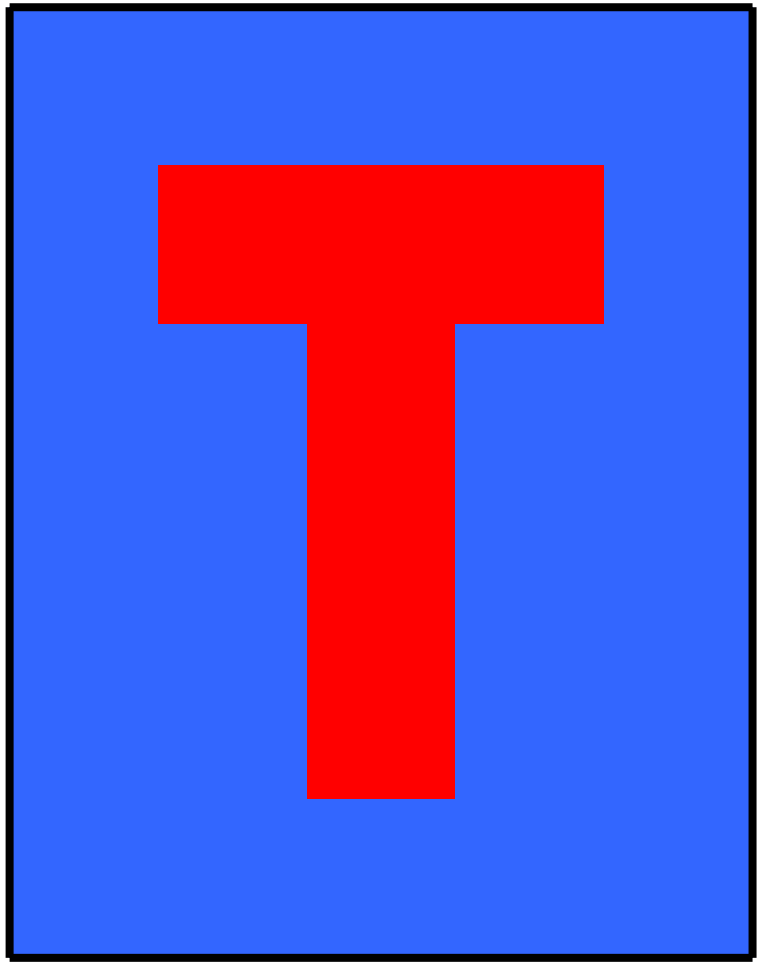
* University at, ***NOT*** of Cologne

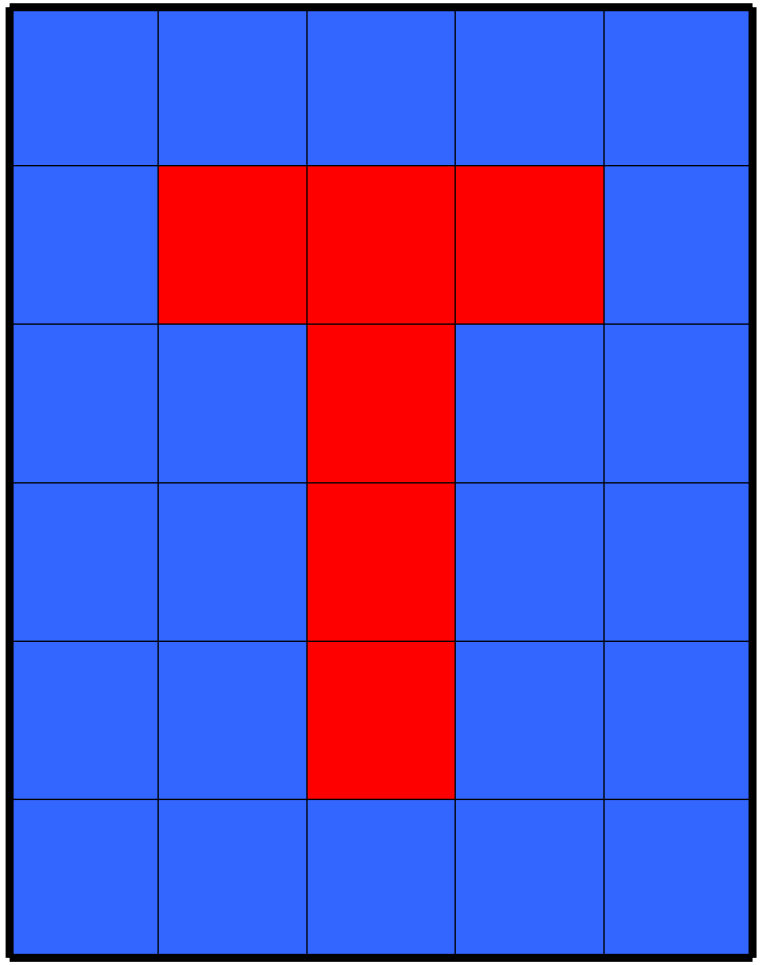
I – What is (in) a format?

An image



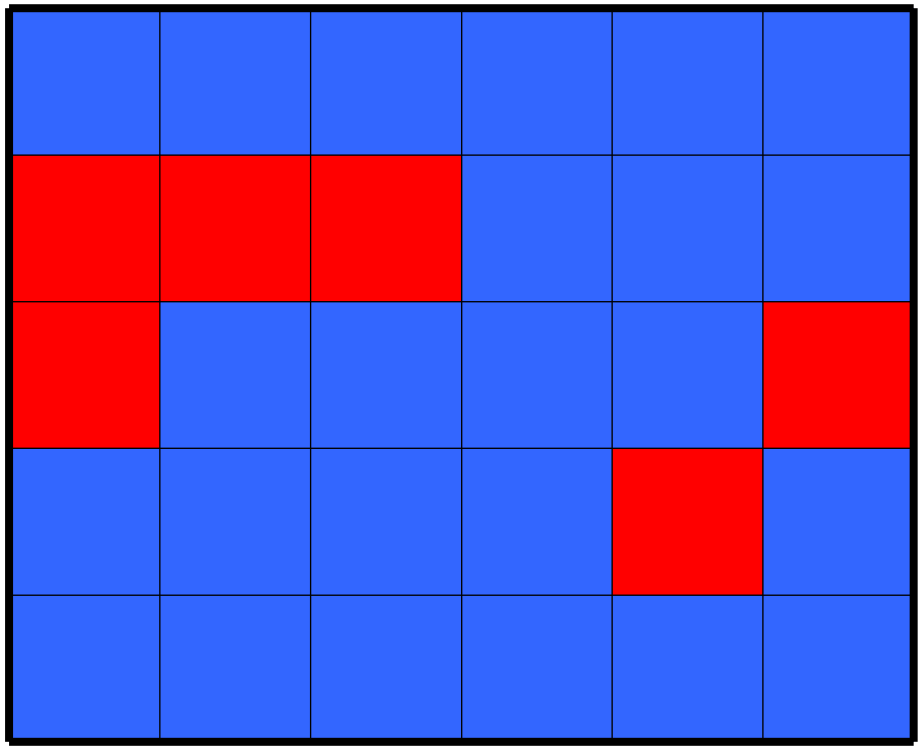
An image

6 rows
5 columns



An image

5 rows
6 columns



An image

1 == blue
0 == red

1	1	1	1	1
1	0	0	0	1
1	1	0	1	1
1	1	0	1	1
1	1	0	1	1
1	1	1	1	1

An image

1 == green
0 == yellow

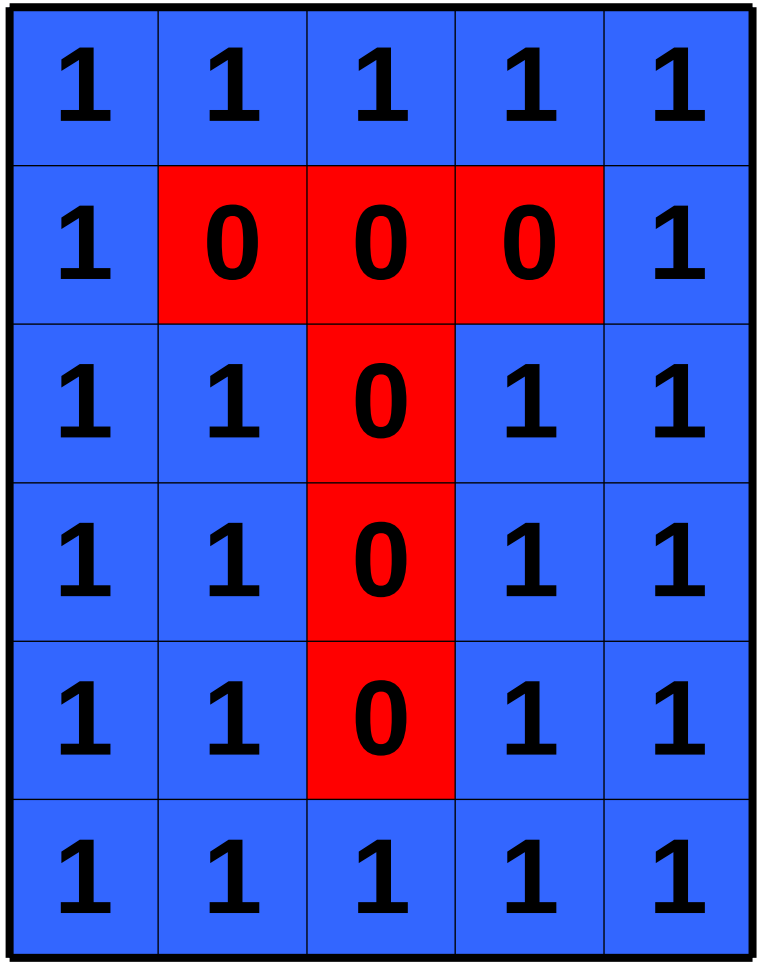
1	1	1	1	1
1	0	0	0	1
1	1	0	1	1
1	1	0	1	1
1	1	0	1	1
1	1	1	1	1

An image

Store:

1,1,1,1,1,1,
0,0,0,1,1,1,
0,1,1,1,1,0,
1,1,1,1,0,1,
1,1,1,1,1,1

Uncompressed



An image

Store:

6,1,3,0,3,1,
1,0,4,1,1,0,
4,1,1,0,7,1

(Compressed)
Run Length
Encoded

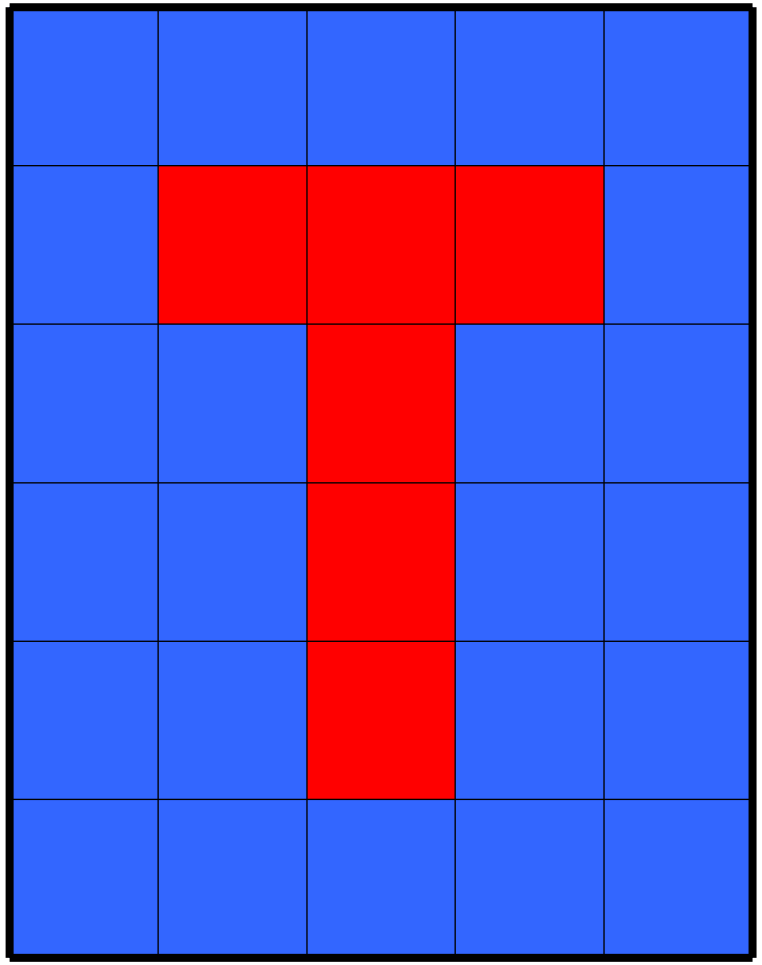
1	1	1	1	1
1	0	0	0	1
1	1	0	1	1
1	1	0	1	1
1	1	0	1	1
1	1	1	1	1

An image

dimensions

photogrammetric interpretation

compression



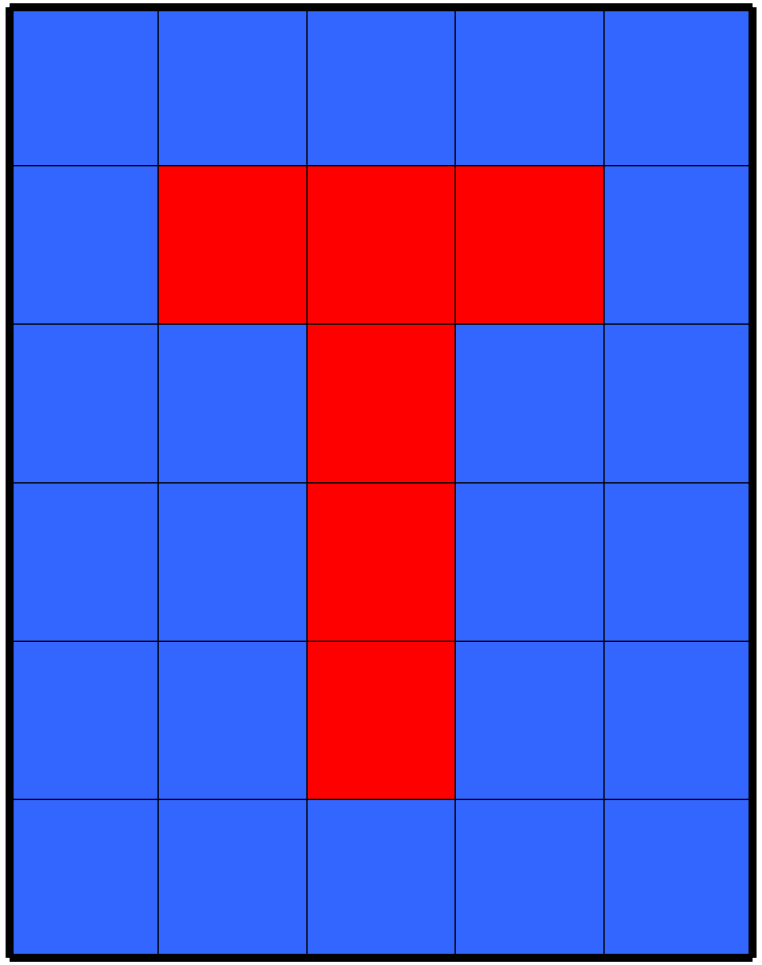
An image

<basic information>

<rendering information>

<storage information>

<data>



File format

<basic information>
What to do?
<rendering information>
How to do it?
<storage information>
How to move it from persistent to deployed form?
<data>
What to deploy?

File format

<basic information>

What to do?

<rendering information>

How to do it?

<storage information>

How to move it from persistent to deployed form?

<data>

What to deploy?

File format

<basic information>
Mandatory
<rendering information>
Useful
<storage information>
Historical

<data>
Mandatory

File format

A deterministic specification how the properties of a digital object can reversibly be converted into a linear bytestream (bitstream).

II – Why would we want to know?

III – Which format to choose?

Recommended formats: text

High confidence	Medium confidence	Low confidence
❖ Plain text (encoding: ISO8859-1 - 9, UTF-8, UTF-16 with BOM) ❖ XML (includes XSD/XSL/XHTML, etc.; with included or accessible schema and character encoding explicitly specified) ❖ PDF/A-1 (ISO 19005-1)	❖ Cascading Style Sheets (*.css) ❖ DTD (*.dtd) ❖ PDF (*.pdf) (embedded fonts) ❖ Rich Text Format 1.x (*.rtf) ❖ HTML 4.x (include a DOCTYPE declaration) ❖ SGML (*.sgml) ❖ Open Office (*.sxw/*.odt) ❖ Office Open XML (*.docx)	❖PDF (*.pdf) (encrypted) ❖ Microsoft Word (*.doc) ❖ WordPerfect (*.wpd) ❖ DVI (*.dvi) ❖ All other text formats not listed here

http://www.fcla.edu/digitalArchive/pdfs/recFormats.pdf

Recommended formats: bitmap / raster image

High confidence	Medium confidence	Low confidence
❖TIFF (uncompressed) ❖ PNG (*.png)	❖ BMP (*.bmp) ❖ JPEG/JFIF (*.jpg) ❖JPEG2000 (prefer lossless or uncompressed) (*.jp2) ❖TIFF (compressed) ❖GIF (*.gif)	❖MrSID (*.sid) ❖TIFF (in Planar format) ❖FlashPix (*.fpx) ❖PhotoShop (*.psd) ❖All other raster image formats not listed here

http://www.fcla.edu/digitalArchive/pdfs/recFormats.pdf

Recommended formats: vector graphics

High confidence	Medium confidence	Low confidence
❖SVG 1.1 (no Java binding) (*.svg)	❖Computer Graphic Metafile (CGM, WebCGM) (*.cgm)	❖Encapsulated Postscript (EPS) ❖Macromedia Flash (*.swf) ❖All other vector image formats not listed here

http://www.fcla.edu/digitalArchive/pdfs/recFormats.pdf

Recommended formats: audio

High confidence	Medium confidence	Low confidence
❖AIFF (PCM) (*.aif, *.aiff) ❖ WAV (PCM) (*.wav)	❖SUN Audio (uncompressed) (*.au) ❖Standard MIDI (*.mid, *.midi) ❖Ogg Vorbis (*.ogg) ❖Free Lossless Audio Codec (*.flac) ❖ Advance Audio Coding (*.mp4, *.m4a, *.aac) ❖ MP3 (MPEG-1/2, Layer 3)(*.mp3)	❖AIFC (compressed) (*.aifc) ❖ NeXT SND (*.snd) ❖ RealNetworks 'Real Audio, (*.ra, *.rm, *.ram) ❖ Windows Media Audio ❖(*.wma) ❖WAV (compressed) (*.wav) ❖All other audio formats not listed here

http://www.fcla.edu/digitalArchive/pdfs/recFormats.pdf

Recommended formats: video

High confidence	Medium confidence	Low confidence
❖Motion JPEG 2000 (ISO/IEC 15444-4) (*.mj2) ❖ AVI (uncompressed) (*.avi) ❖QuickTime Movie (uncompressed)(*.mov) ❖Motion JPEG (*.avi, *.mov)	❖Ogg Theora (*.ogg) ❖MPEG-1, MPEG-2 (*.mpg, *.mpeg) ❖MPEG-4(*.mp4)	❖AVI (compressed) (*.avi) ❖QuickTime Movie (compressed) (*.mov) ❖RealNetworks 'Real Video, (*.rv) ❖Windows Media Video (*.wmv) ❖All other video formats not listed here

http://www.fcla.edu/digitalArchive/pdfs/recFormats.pdf

Recommended formats: "data base"

High confidence	Medium confidence	Low confidence
❖Delimited Text (*.txt, *.csv) ❖SQL DDL	❖DBF (*.dbf) ❖OpenOffice *.sxc/*.ods) ❖Office Open XML *.xlsx)	❖Excel (*.xls) ❖All other spreadsheet/ database formats not listed here

http://www.fcla.edu/digitalArchive/pdfs/recFormats.pdf

Recommended formats: 3D ("virtual reality")

High confidence	Medium confidence	Low confidence
❖X3D (*.x3d)	❖VRML (*.wrl, *.vrml) ❖U3D (Universal 3D file format)	❖All other virtual reality ❖formats not listed here

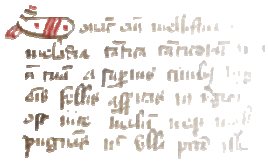
http://www.fcla.edu/digitalArchive/pdfs/recFormats.pdf

Doctoral thesis on robustness of file formats:

Volker Heydegger, University at Cologne.

herrmanv@uni-koeln.de

IV – How to we identify a format?



Historisch

Kulturwissenschaftliche

Informationsverarbeitung

What kind of file is this?

Two ways to identify a file:

(a)By extension.

„Each file ending with *.doc is a MS Word document“

What kind of file is this?

Two ways to identify a file:

(b) By internal characteristics („magic number", „signature").

A TIFF file begins with …
Bytes 0-1: The byte order used within the file. Legal values are:
"II" (4949.H) / "MM" (4D4D.H)
Bytes 2-3 An arbitrary but carefully chosen number (42) that further identifies the file as a
TIFF file.

File format registries - URLs

PRONOM:
http://www.nationalarchives.gov.uk/pronom/
(does not only rely on extensions)

Global Digital Format Registry:
http://hul.harvard.edu/gdfr
(predominantly project description)

FileExt:
http://filext.com
(predominantly links to software)

V – What's a file characteristic, than?

Technical metadata ➔

A high proportion of the preservation metadata will be in narrative format and will require manual entry by Library staff. A significant subset of the data however, relating to technical file characteristics, can be automatically extracted from the digital object by reading the file header details. This successful extraction of preservation metadata has been proved in a previous National Library proof of concept project. The automated capture of this information will significantly reduce the amount of manual data entry required from Library staff.

➔ file characteristics.

Why automate?

1 million objects: use one second for each.

== 16666.7 minutes == 277.8 hours

== 11.57 working days of a computer

== 34.7 8-hour days for a Human
== 7 working weeks

Why automate?

1 million objects: use five minutes for each.

== 416 666.7 hours

== 52 803.4 8-hour days for a Human
== way too much for anything

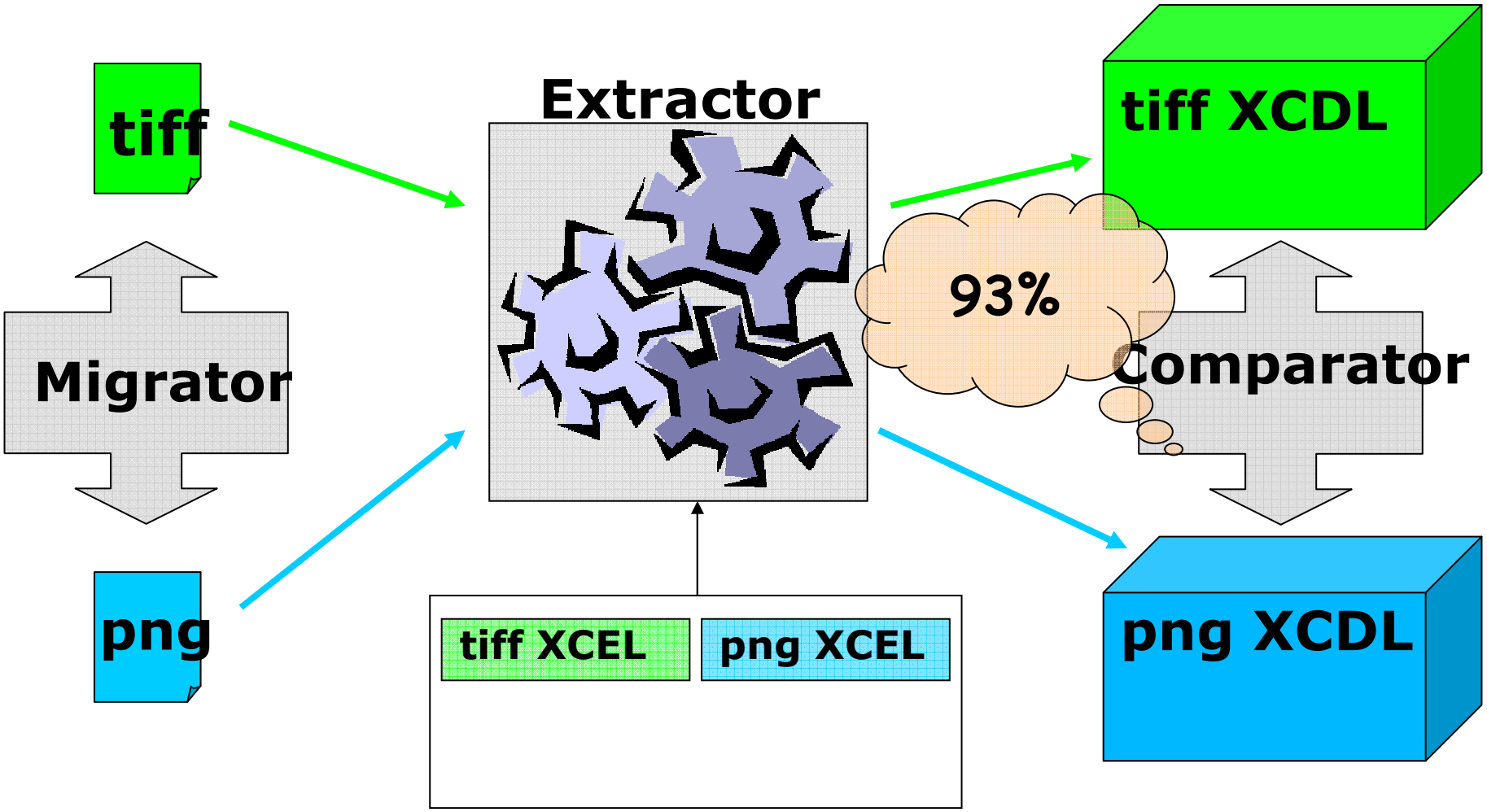
Formats in PLANETS: File characteristics

Based on two formal languages:

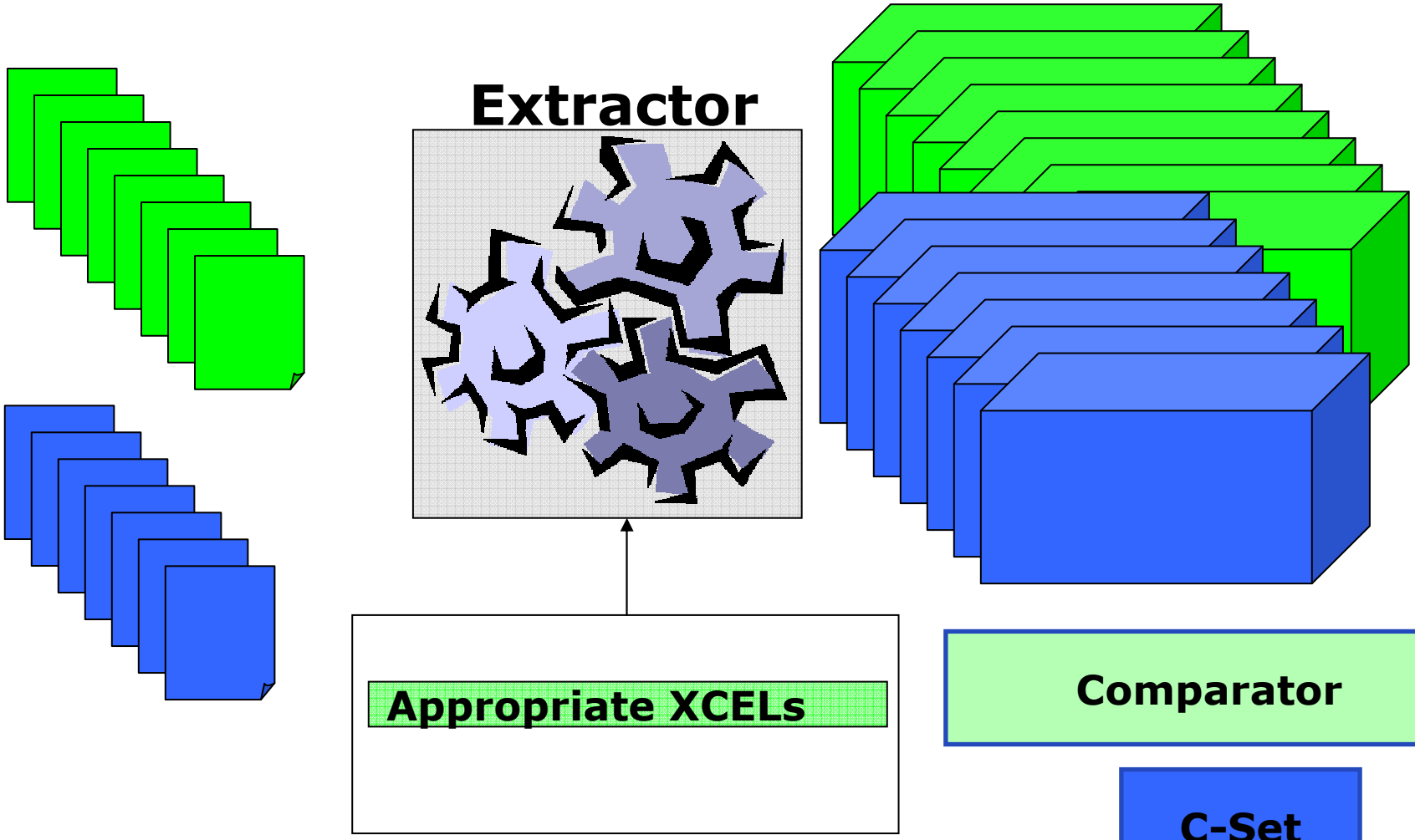
(1)eXtensible Characterisation Extraction Language (= XCEL)

(2)eXtensible Characterisation Description Language (= XCDL)

The comparator



The comparator



Why data?

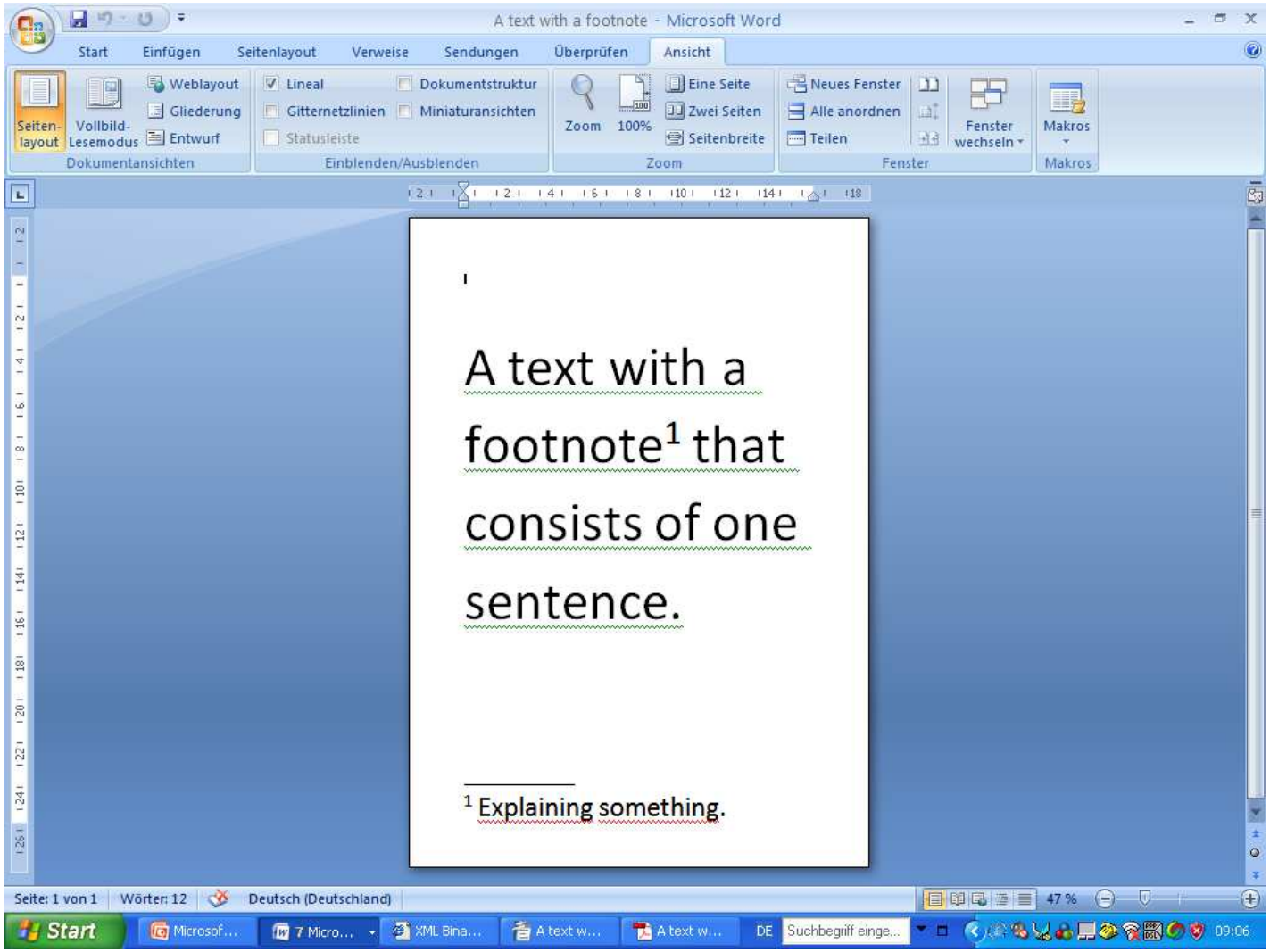
 ► Photoshop ► 

 ► Photoshop ► 

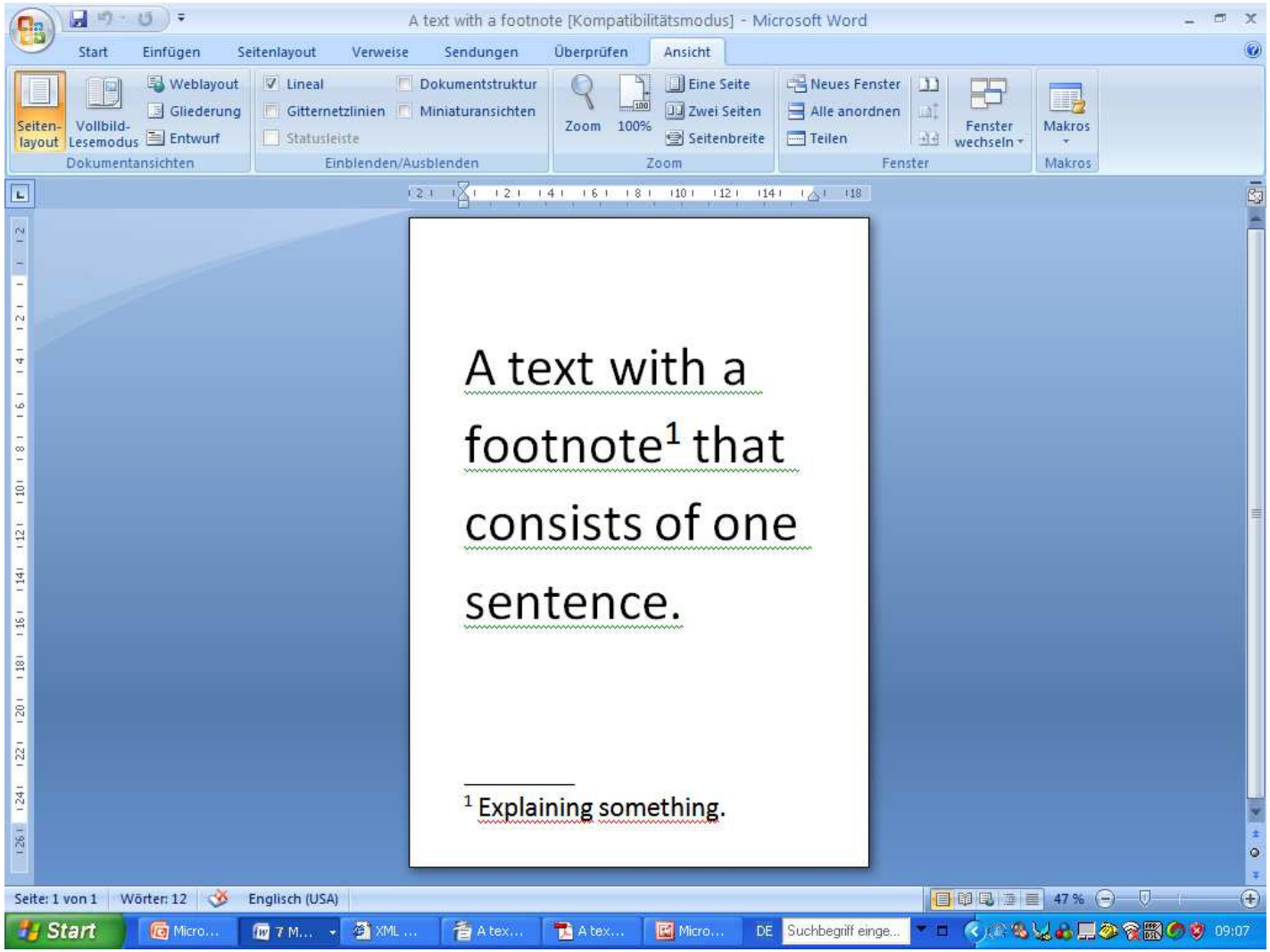
Becomes discoverable only from the actual data …

V – What is not in a file format?

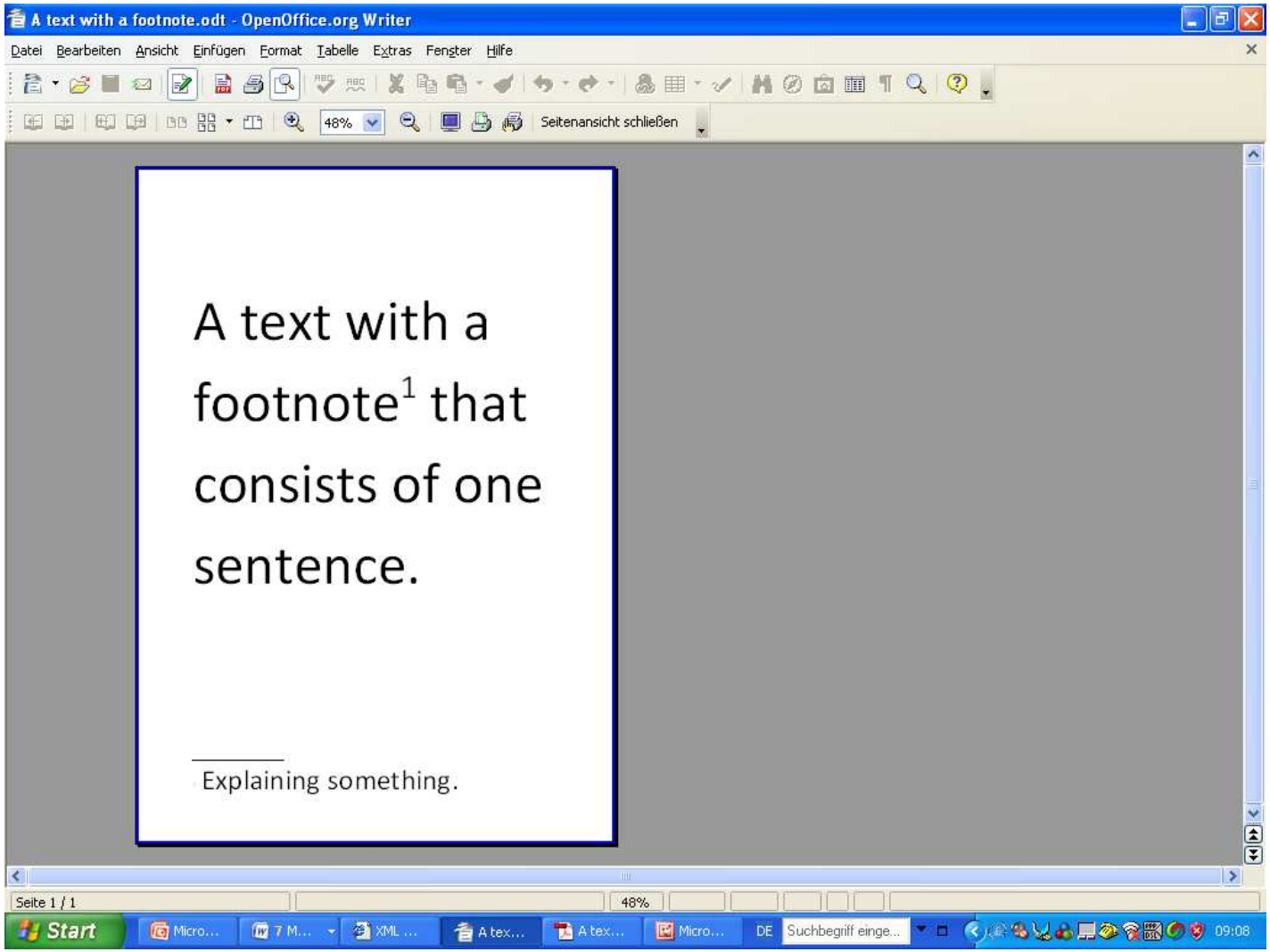
Testfile in Word 2007



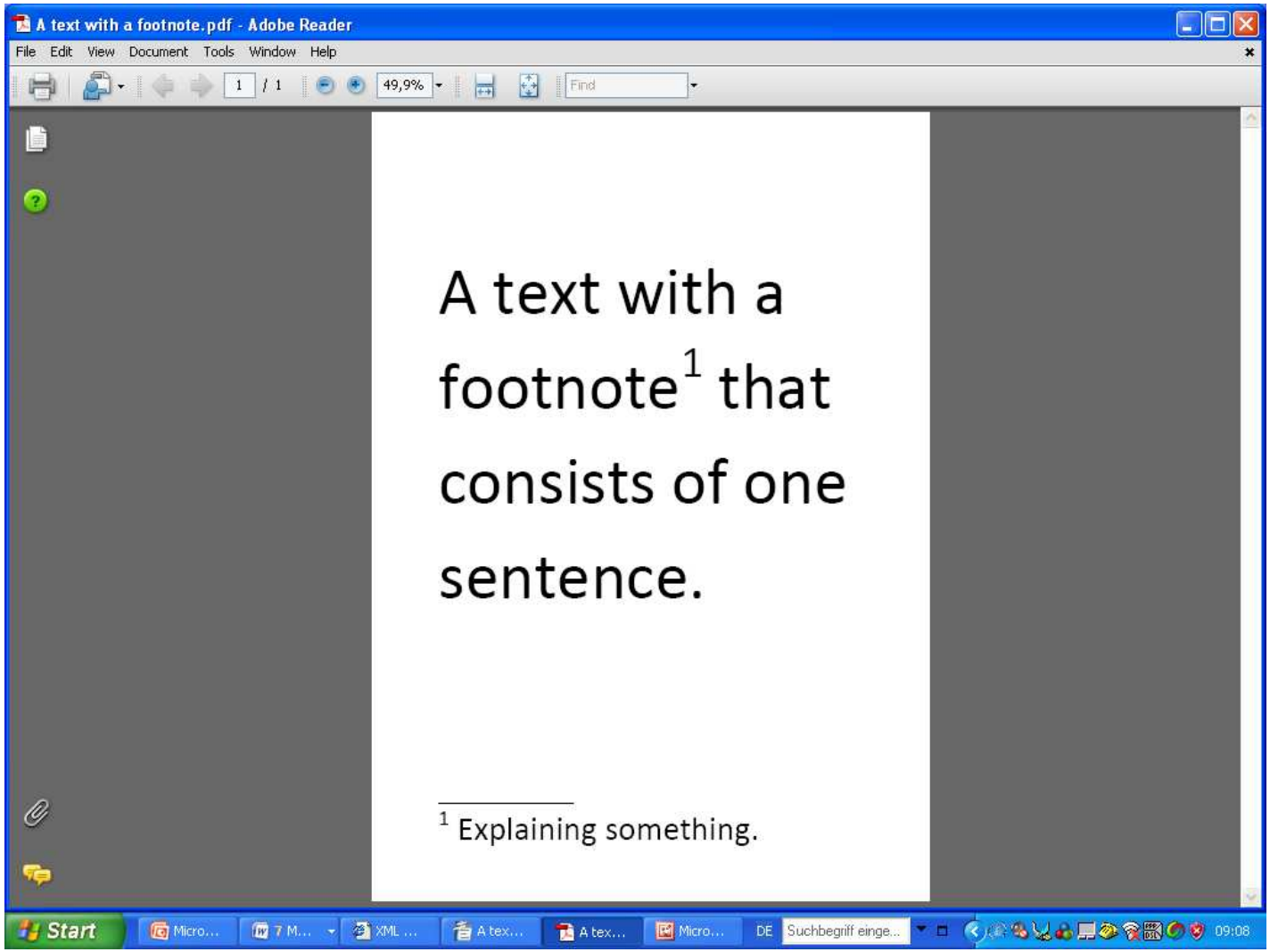
Testfile in Word 2003 (2007)



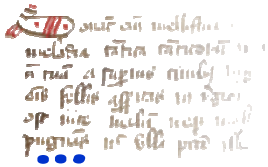
Testfile in Open Office ODT



Testfile in PDF



Measuring the pages ...



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

Cut out page from rendering surface.

Scale to common dimensions: 371 +/- 1 x 521 +/- 1

Measure

1. The leftmost and lowest completely black pixel in the letter "A" starting the first line of the main text.
2. The leftmost and highest completely black pixel in the letter "E" starting the first line of the text in the footnote.
3. The geometrical centre of the period at the end of the main sentence.
4. The geometrical centre of the period at the end of the footnote text.

Measuring Word 2003

A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

(i) = 45 / 134;

(ii) = 57 / 470;

(iii) = 215 / 322 ;

(iv) = 254 / 483

Measuring Word 2007

Historisch
Kulturwissenschaftliche
Informationsverarbeitung

A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

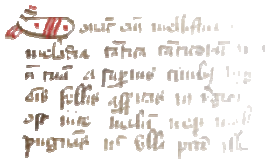
(i) = 45 / 134;

(ii) = 57 / 470;

(iii) = 215 / 322 ;

(iv) = 254 / 483

Open Office ODT



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

(i) = 44 / 132;

(ii) = **52** / 469;

(iii) = 214 / 320 ;

(iv) = **247** / 482

A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

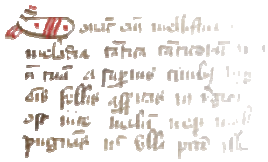
(i) = 45 / 130;

(ii) = 59 / 467;

(iii) = 215 / 317 ;

(iv) = 254 / 480

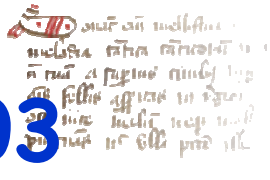
Summary I



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

The comparison of the four renderings of the example pages described above seem to indicate clearly, that a migration from the Word family of formats to PDF is a *better* way to preserve the content of the document, than a migration to the Open Office format.

Measuring Word 2003



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

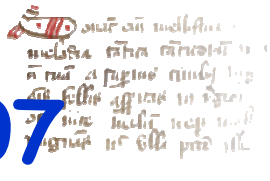
Relationship tagged explicitly.

Text / footnote separation clear.

Rendering / layout not (totally) predicatble.

Footnote indicator unpredictable.

Measuring Word 2007



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

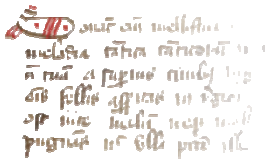
Relationship tagged explicitly.

Text / footnote separation extremely clear.

Rendering / layout pretty predictable.

Footnote indicator not predictable.

Open Office ODT



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

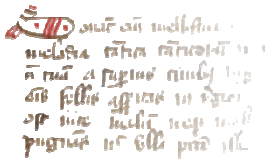
Relationship tagged explicitly.

Text / footnote separation extremely clear.

Rendering / layout a little bit predictable.

Footnote indicator predictable.

PDF



A text with a footnote[1] that consists of one sentence.

[1] Explaining something.

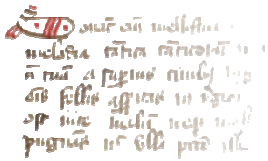
Relationship expressed by layout.

Text / footnote separation missing.

Rendering / layout very much predictable.

Footnote indicator predictable.

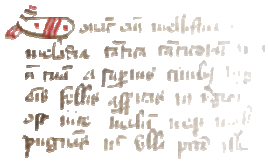
Summary II



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

The comparison of the four internal structures of the example pages described above seem to indicate clearly, that a migration from the Word family of formats to PDF is a *worse* way to preserve the content of the document, than a migration to the Open Office format.

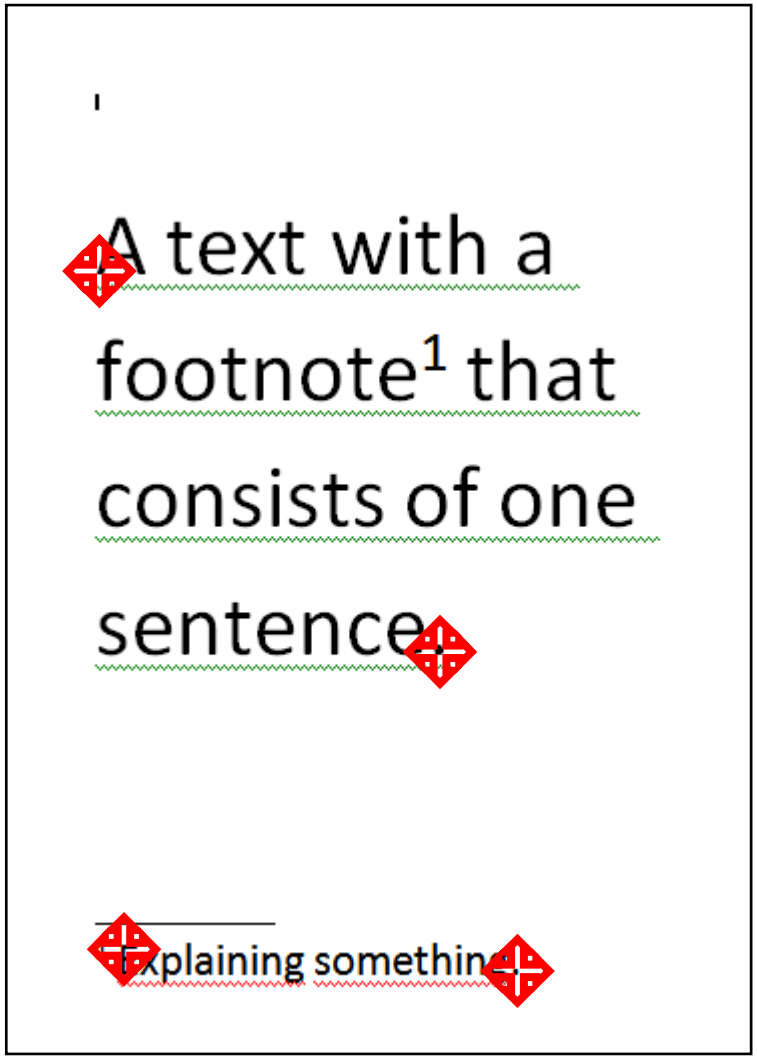
Small technical note



Historisch
Kulturwissenschaftliche
Informationsverarbeitung

Do not forget, that the whole movement started by SGML, carried into the WWW by HTML, transferred to content by the TEI and started XML as a basic empowering technology ...
... assumes that rendering is NOT particularly relevant.

Proposal




```
<significantPoints>
  <point x="45" y="134" />
  <point x="57" y="470" />
  <point x="215" y="322" />
  <point x="254" y="483" />
</significantPoints>
```