

# UNINTENDED INFORMATION LEAKAGE THROUGH METADATA

(AT THE DUTCH GOVERNMENT)

BY AUKE ZWAAN

# INTENTIONS

1. DOING SCIENCE
2. SINCERELY WORRIED ABOUT THE CURRENT STATE OF SECURITY
3. RAISING AWARENESS
4. HAVING FUN :-)

WHAT'S NOT THE GOAL?

HARMING ANY OF THE ORGANIZATIONS RESEARCHED

# DISCLAIMER

FOR CLARITY, INFORMATION IN THIS PRESENTATION CAN BE:

- **REDACTED**
- **ADDED**
- **MODIFIED**

# WHAT IS METADATA?

# WHAT IS METADATA?

“DATA ABOUT DATA”

# EXAMPLE: MUSIC



ALBUM

## The Stranger (30th Anniversary Legacy Edition)

By Billy Joel

1977 • 21 songs, 1 hr 46 min

PAUSE

SAVE



#	TITLE		
1	+ Movin' Out (Anthony's Song)	3:31	
2	+ The Stranger	5:11	
3	+ Just The Way You Are	4:51	

# EXAMPLE: MUSIC



BILLY JOEL THE STRANGER ALBUM

## The Stranger (30th Anniversary Legacy Edition)

By Billy Joel

1977 21 songs 1 hr 46 min

LEGACY EDITION

PAUSE SAVE ...

#	TITLE	Duration
1	Movin' Out (Anthony's Song)	3:31
2	The Stranger	5:11
3	Just The Way You Are	4:51





## ***Metadata businessplan.docx***

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<b>Author</b>	Elliot Alderson
<b>Last Modified By</b>	Dade Murphy
<b>Revision Number</b>	47
<b>Software</b>	Microsoft Word 2016
<b>Total Edit Time</b>	7.0 hours
<b>Create Date</b>	2015-01-05 14:07:15
<b>Modify Date</b>	2017-03-28 12:58:53

etc.



## *Metadata rfm.docx*

---

<b>Author</b>	Domain Admin CdL
<b>Software</b>	Windows XP SP1
<b>Create Date</b>	2017-25-06 13:33:37

# RESEARCH QUESTION

*WHAT TYPES OF METADATA DOES THE DUTCH GOVERNMENT  
LEAK THROUGH PUBLIC DOCUMENTS,*

*...AND*

*HOW COULD THIS INFORMATION BE USED IN THE  
RECONNAISSANCE PHASE OF A CYBER ATTACK?*

# WHAT IS “THE DUTCH GOVERNMENT”?

OPEN STATE FOUNDATION:

[HTTPS://PULSE.OPENSTATE.EU/HTTPS/DOMAINS/](https://pulse.openstate.eu/https/domains/)

- 1 650 DOMAINS

# STEPS IN THE METADATA ANALYSIS

1. HARVEST URLS OF PUBLIC DOCUMENTS FROM THE DOMAINS
2. DOWNLOAD THE DOCUMENTS
3. PARSE THE METADATA
4. ANALYZE AND VISUALIZE THE METADATA

# HARVESTING DATA

FOR ANALYSIS, ALL (OR AT LEAST A REASONABLE NUMBER OF) PUBLIC DOCUMENTS ARE REQUIRED. WHERE ARE THEY?

# HARVESTING DATA

FOR ANALYSIS, ALL (OR AT LEAST A REASONABLE NUMBER OF) PUBLIC DOCUMENTS ARE REQUIRED. WHERE ARE THEY?

...LET'S USE **GOOGLE!**



site:brabant.nl filetype:pdf



Alle

Afbeeldingen

Nieuws

Shopping

Maps

Meer

Instellingen

Tools

Ongeveer 39.100 resultaten (0,41 seconden)

<sup>[PDF]</sup> [Reactienota Notitie Reikwijdte en Detailniveau Gebiedsontwikkeling ...](#)

[www.brabant.nl/reactienotagol](http://www.brabant.nl/reactienotagol) ▼

15 sep. 2015 - Page 1. Reactienota Notitie Reikwijdte en Detailniveau. Gebiedsontwikkeling Oostelijke Langstraat. Page 2. Vastgesteld door GS op 15 ...

<sup>[PDF]</sup> [Onderzoek borging externe veiligheid in Brabantse ...](#)

[www.brabant.nl/EVinbestemmingsplannen](http://www.brabant.nl/EVinbestemmingsplannen) ▼

Page 1. Onderzoek borging externe veiligheid in. Brabantse bestemmingsplannen. Interbestuurlijk toezicht omgevingsrecht. Page 2. Onderzoek borging ...

<sup>[PDF]</sup> [Weerijs.psd](#)

[www.brabant.nl/vondstenweerijs](http://www.brabant.nl/vondstenweerijs) ▼

Page 1. |. |. ||| - |. |. Sporen van de eerste Rijsbergernaren aangetroffen. ||. ||| - - - |||. | tijdens herinrichting Weerijs. |||||. || De bodem kan worden ...

<sup>[PDF]</sup> [De geluidbelasting rondom de vliegbasis Woensdrecht voor het jaar ...](#)

[www.brabant.nl/~media/A1F19D0E9CDC42A9ACEE44A3F108A157.pdf](http://www.brabant.nl/~media/A1F19D0E9CDC42A9ACEE44A3F108A157.pdf)

23 mei 2011 - Page 1. NLR-CR-2011-210. De geluidbelasting rondom de vliegbasis. Woensdrecht voor het jaar 2010. R. de Jong. Nationaal Lucht- en ...





Ik ben geen robot



reCAPTCHA  
Privacy - Voorwaarden

Verzenden

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### Over deze pagina

Onze systemen hebben ongebruikelijk verkeer van uw computernetwerk vastgesteld. Op deze pagina wordt gecontroleerd of de verzoeken daadwerkelijk door u worden verzonden en niet door een robot. [Waarom gebeurt dit?](#)

IP-adres: 145.100.103.43

Tijd: 2017-06-29T08:45:46Z

URL: [https://www.google.nl/search?](https://www.google.nl/search?q=hack+the+planet!+hack+the+planet!&aq=chrome..69i57j69i60j0i4.2056j0j7&sourceid=chrome&ie=UTF-8)

[q=hack+the+planet!+hack+the+planet!&aq=chrome..69i57j69i60j0i4.2056j0j7&sourceid=chrome&ie=UTF-8](https://www.google.nl/search?q=hack+the+planet!+hack+the+planet!&aq=chrome..69i57j69i60j0i4.2056j0j7&sourceid=chrome&ie=UTF-8)

# ACTIVE VS. PASSIVE SCANNING

**PASSIVE SCANNING:** USING GOOGLE/BING “DORKS” AND GETTING THE FILE LOCATIONS “PASSIVELY”

# ACTIVE VS. PASSIVE SCANNING

**PASSIVE SCANNING:** USING GOOGLE/BING “DORKS” AND GETTING THE FILE LOCATIONS “PASSIVELY”

**ACTIVE SCANNING:** SCRAPING THE ENTIRE DOMAIN THROUGH A SCRIPT (BY FOLLOWING ALL INTERNAL LINKS)

# LIMITATIONS ON ACTIVE/PASSIVE SCANNING

## PASSIVE

- MOST IMPORTANT: **ROBOT DETECTION**
- NEXT, MAX. 1000 SEARCH RESULTS (BING) ← EVEN MANUALLY

# LIMITATIONS ON ACTIVE/PASSIVE SCANNING

## PASSIVE

- MOST IMPORTANT: **ROBOT DETECTION**
- NEXT, MAX. 1000 SEARCH RESULTS (BING) ← EVEN MANUALLY

## ACTIVE

- MORE WORKLOAD ON THE SERVERS, NOT STEALTHY
- “BACKLINKS” CANNOT BE FOUND  
(I.E. INCOMING LINKS FROM OTHER WEBSITES)

# PRIOR WORK/EXISTING TOOLS

- **FOCA**
  - (WINDOWS-ONLY, NO COMMAND-LINE MODE BUT ONLY GUI, CLOSED SOURCE)
- **METAGOOFIL**
  - (OUT OF SUPPORT FOR YEARS, NO LONGER WORKING)
- **GOOLAG SCANNER**
  - (OUT OF SUPPORT FOR YEARS, NO LONGER WORKING)
- **MALTEGO**
  - (STRICT LIMITATIONS ON NUMBER OF ENTITIES, NOT USABLE. ALSO, CLOSED SOURCE. CAN COST HUNDREDS TO THOUSANDS OF US DOLLARS)

# THE WAY TO GO: ACTIVE SCANNING

- SCRAPY (PYTHON)

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- SCRAPY (PYTHON)
- FOLLOW ALL INTERNAL LINKS AND FIND THE LOCATIONS OF PUBLIC DOCUMENTS



# THE WAY TO GO: ACTIVE SCANNING

- SCRAPY (PYTHON)
- FOLLOW ALL INTERNAL LINKS AND FIND THE LOCATIONS OF PUBLIC DOCUMENTS
- TOOK DAYS TO COMPLETE

# “EDUCATING” THE SCRAPER

USE OF A BLACKLIST TO PREVENT IT FROM LOOPING IN:

- CALENDARS
- BADLY DESIGNED INTERNAL SEARCH ENGINES
- API DOCUMENTATION PAGES
- THOUSANDS OF PAGES OF LEGISLATION
- ETC.

# RESULTS OF THE DATA HARVESTING

- FOUND **461,356** PUBLIC DOCUMENTS ON **671** DOMAINS
  - ON AVERAGE, **685** DOCUMENTS PER DOMAIN

# INTERESTING METADATA: FILE LOCATIONS

```
$ grep -hir 'C:\\'
Title : C:\Users\ [redacted] \document\ [redacted] -Central [redacted] tthijs.pdf
Title : C:\Users\ [redacted] -3\Docu [redacted] 8_3Dmod [redacted]
Title : C:\Users\ [redacted] \document\ [redacted] -Central [redacted] tthijs.pdf
Title : C:\Users\ [redacted] -3\Docu [redacted] 8_3Dmod [redacted]
Title : C:\Users\ [redacted] \an van [redacted] Cloud\J [redacted] en Steenbergem\Inschrijving Exploitatie\Boxenplan\Vergunningaanvraag + damwanden\Aanvullende v
Title : C:\Users\ [redacted] -3\Docu [redacted] 8_3Dmod [redacted]
Title : C:\Users\ [redacted] -3\Docu [redacted] 8_3Dmod [redacted]
Title : C:\proj\ [redacted] 5-50U0 [redacted]
Title : C:\Users\ [redacted] \an van [redacted] Cloud\J [redacted] en Steenbergem\Ins [redacted] g Exploitatie\Boxenplan\Vergunningaanvraag + damwanden\Aanvullende v
Title : C:\Users\ [redacted] evel\ [redacted] 0240_VO [redacted] _MACHINELOADS - S [redacted] E010 - Aanvraag verbreding oprit.pdf
Creator : C:\Users\ [redacted] evel\ [redacted] 0240_VO [redacted] _MACHINELOADS - S [redacted] E010 - Aanvraag verbreding oprit.pdf
Title : C:\Users\ [redacted] ezooije [redacted] s\16-01 [redacted] ES vd HEIJDEN _Be [redacted] Sheet - B10 - BEWARING - Plattegrond, gevelaanzichten en 3D-impressie.pdf
Creator : C:\Users\ [redacted] ezooije [redacted] s\16-01 [redacted] ES vd HEIJDEN _Be [redacted] Sheet - B10 - BEWARING - Plattegrond, gevelaanzichten en 3D-impressie.pdf
Title : C:\Users\ [redacted] ezooije [redacted] s\16-01 [redacted] ES vd HEIJDEN _Be [redacted] Sheet - BE31 - BEWARING - Doorsnede B-B en details.pdf
Creator : C:\Users\ [redacted] ezooije [redacted] s\16-01 [redacted] ES vd HEIJDEN _Be [redacted] Sheet - BE31 - BEWARING - Doorsnede B-B en details.pdf
Title : C:\proj\ [redacted] 5.23U1 [redacted]
Title : C:\Users\ [redacted] \document\ [redacted] -Central [redacted] tthijs.pdf
Title : C:\Users\ [redacted] ezooije [redacted] s\16-01 [redacted] ES vd HEIJDEN _Be [redacted] Sheet - BE30 - BEWARING - Doorsnede A-A en details.pdf
Creator : C:\Users\ [redacted] ezooije [redacted] s\16-01 [redacted] ES vd HEIJDEN _Be [redacted] Sheet - BE30 - BEWARING - Doorsnede A-A en details.pdf
Title : C:\Users\ [redacted] \a\FILES [redacted] EN 2015\ [redacted] nvraag omgevingsv [redacted] g\60004-102.pdf
Title : C:\Users\ [redacted] -3\Docu [redacted] 8_3Dmod [redacted]
Title : C:\Users\ [redacted] \document\ [redacted] -Central [redacted] tthijs.pdf
Title : C:\Monte [redacted] \lanten [redacted] in Brab [redacted] erdeloo)\Steenber [redacted] dmeldsysteem\ACAD tekeningen\37010-1 LAYOUT BMI Nassaul
Title : C:\Users\ [redacted] \uments\ [redacted] jecten\S [redacted] _verbouwing wonin [redacted] GROND (1)
Title : C:\Users\ [redacted] \uments\ [redacted] jecten\S [redacted] _verbouwing wonin [redacted] (1)
Title : C:\Users\ [redacted] \uments\ [redacted] BA Jan 2 [redacted] eet - BA 2 - Blad [redacted]
Title : C:\Monte [redacted] \lanten [redacted] in Brab [redacted] erdeloo)\Steenber [redacted] dmeldsysteem\ACAD tekeningen\37010-1 LAYOUT BMI Nassaul
Title : C:\Users\ [redacted] \document\ [redacted] o-WABO A [redacted] g Constructief_Ma [redacted] df
Title : C:\Users\ [redacted] \uments\ [redacted] jecten\S [redacted] _verbouwing wonin [redacted] 1 (1)
Title : C:\Users\ [redacted] evel\ [redacted] 0240_VO [redacted] _MACHINELOADS - Sh [redacted] 100 - Plattegrond, gevels en doorsnede.pdf
Title : C:\Users\ [redacted] \der\Des [redacted] stekenin [redacted] d 2012 A3 landsca [redacted]
```

# INTERESTING METADATA: FILE LOCATIONS

```
$ grep -hir '\.local'  
Manifest Reference File Path : \\[REDACTED].local\[REDACTED]  
Ingredients File Path : \\[REDACTED].local\[REDACTED]  
Tag dlc Doc Id Url : http://[REDACTED].local/Werkgroepen/[REDACTED]  
Tag dlc Doc Id Url : http://[REDACTED].local/Werkgroepen/[REDACTED]
```

```
$ grep -hir 'smb:'  
Dest Url : smb://[REDACTED].[REDACTED].local/samenwerken/DOC_Acrobat/  
Dest Url : smb://[REDACTED].[REDACTED].local/samenwerken/DOC_Acrobat/  
Dest Url : smb://[REDACTED].[REDACTED].local/samenwerken/DOC_Acrobat/
```

# VISUALIZING FILEPATHS

WHAT TO DO WITH THESE FILEPATHS?

Z:\KARST\JAPANESE-PUZZLES

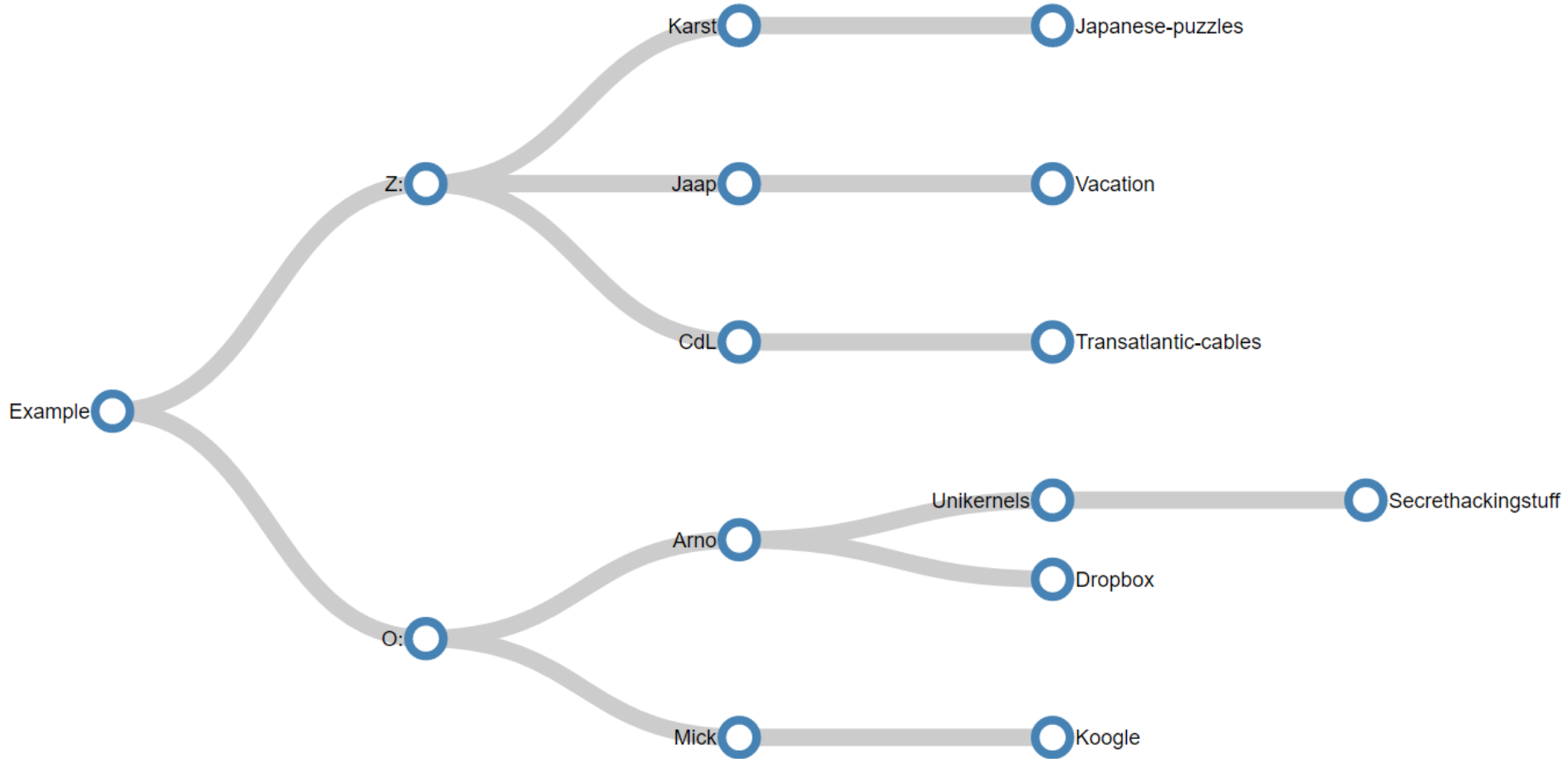
Z:\JAAP\VACATION

O:\ARNO\UNIKERNELS\SECRETHACKINGSTUFF

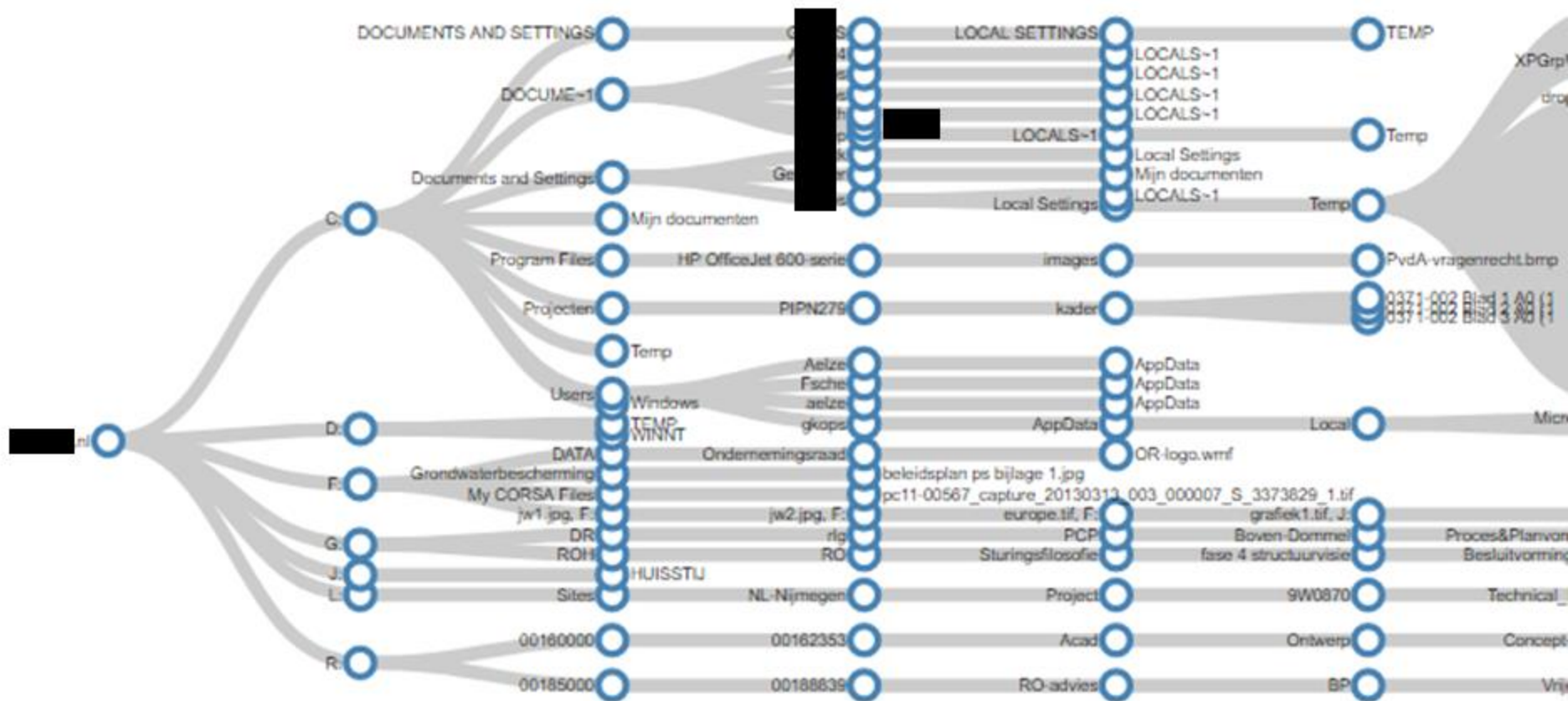
O:\ARNO\DROPOBOX

Z:\CDL\TRANSATLANTIC-CABLES

O:\MICK\KOOOGLE



# EXAMPLE: FILEPATHS OF A DOMAIN



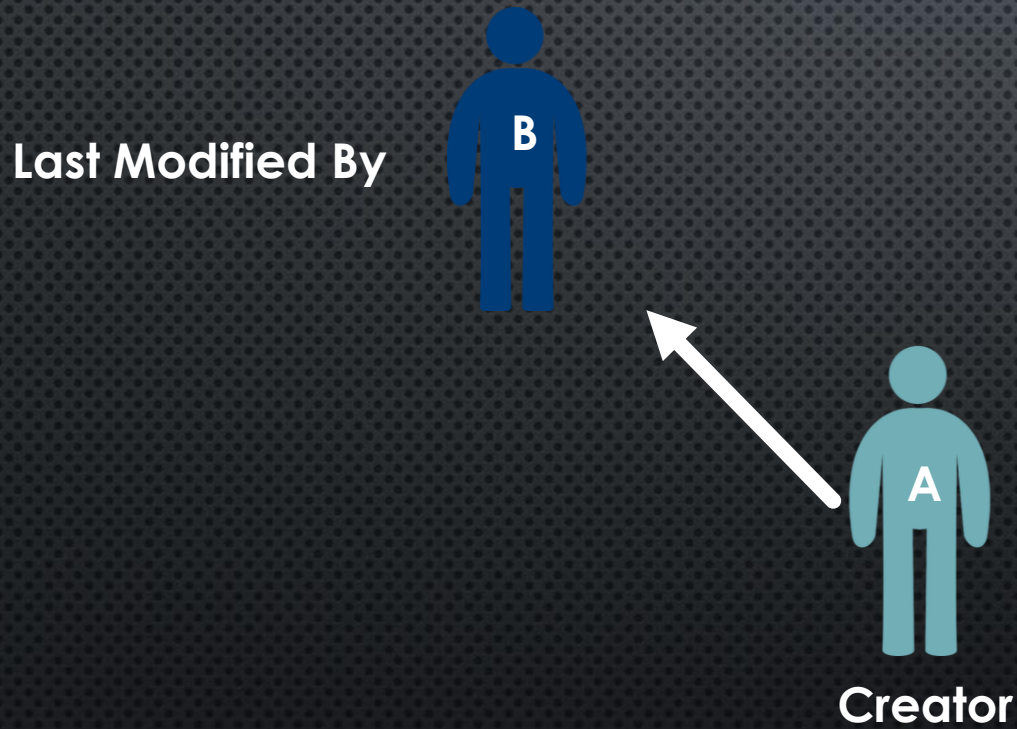


# VISUALIZING SOCIAL NETWORKS

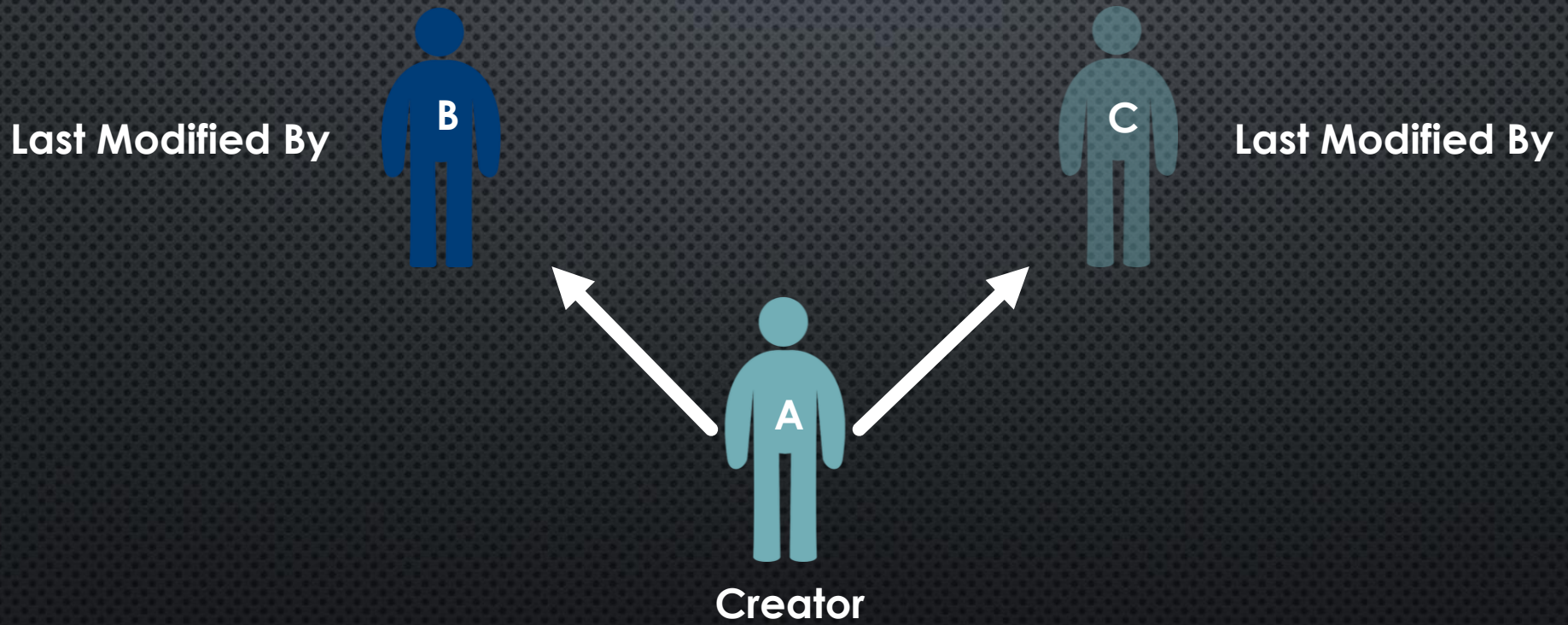
INTERESTING METADATA IN MICROSOFT OFFICE FILES:

- CREATOR
- AUTHOR
- LAST MODIFIED BY

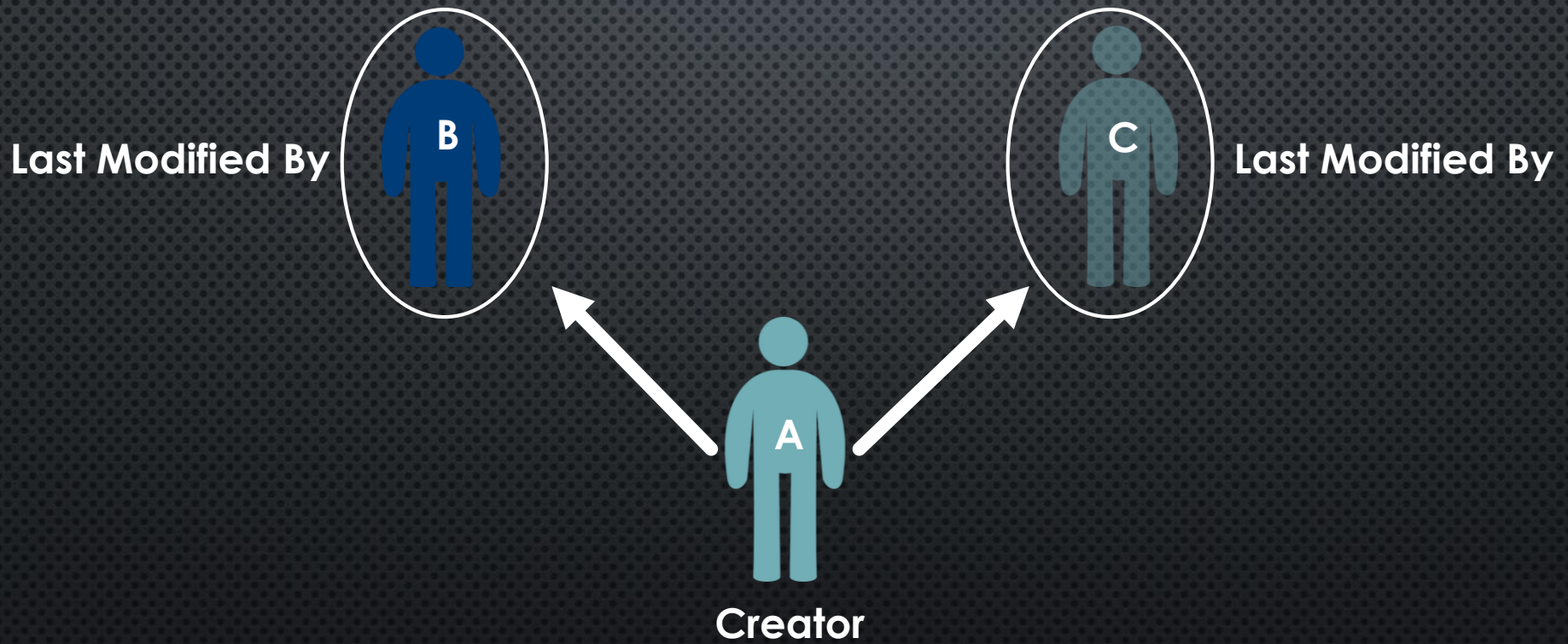
# VISUALIZING SOCIAL NETWORKS: EDIT NETWORK



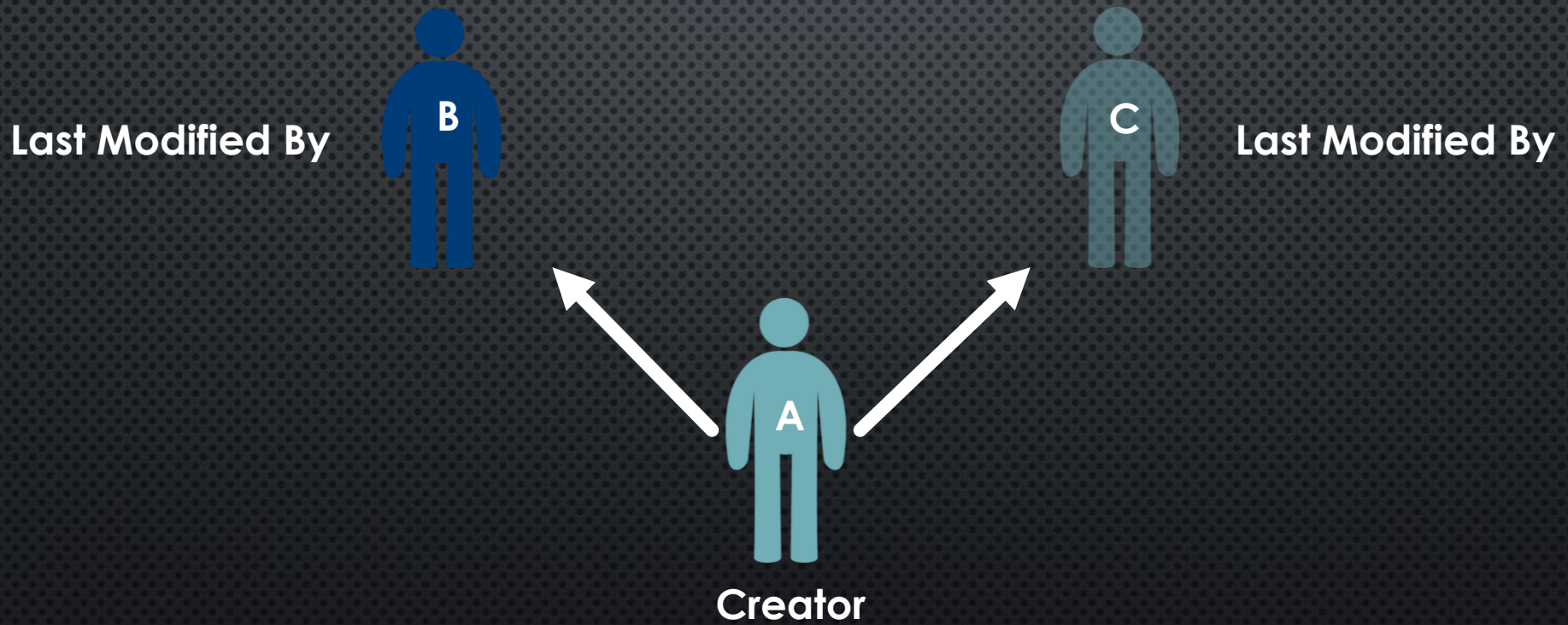
# VISUALIZING SOCIAL NETWORKS: EDIT NETWORK



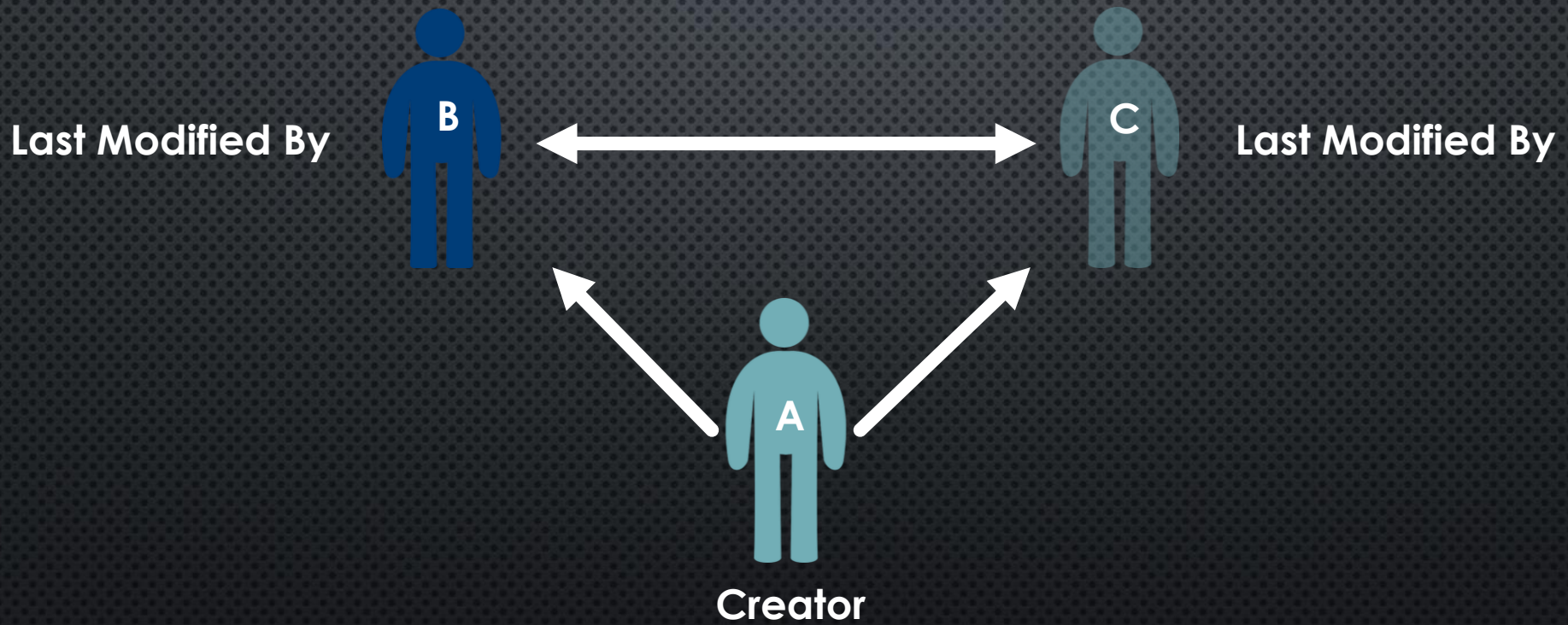
# VISUALIZING SOCIAL NETWORKS: EDIT NETWORK



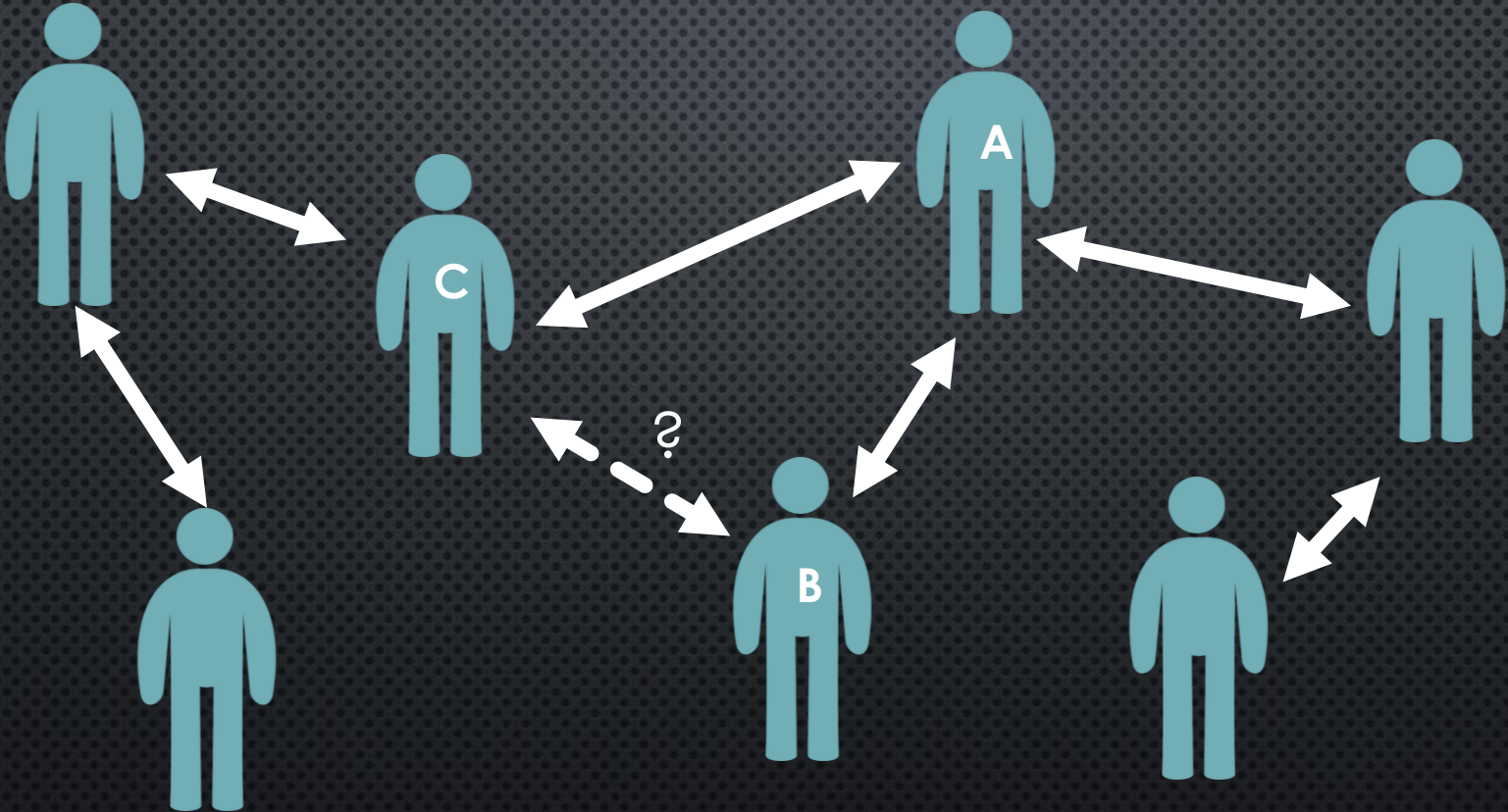
# VISUALIZING SOCIAL NETWORKS: TRIADIC CLOSURE



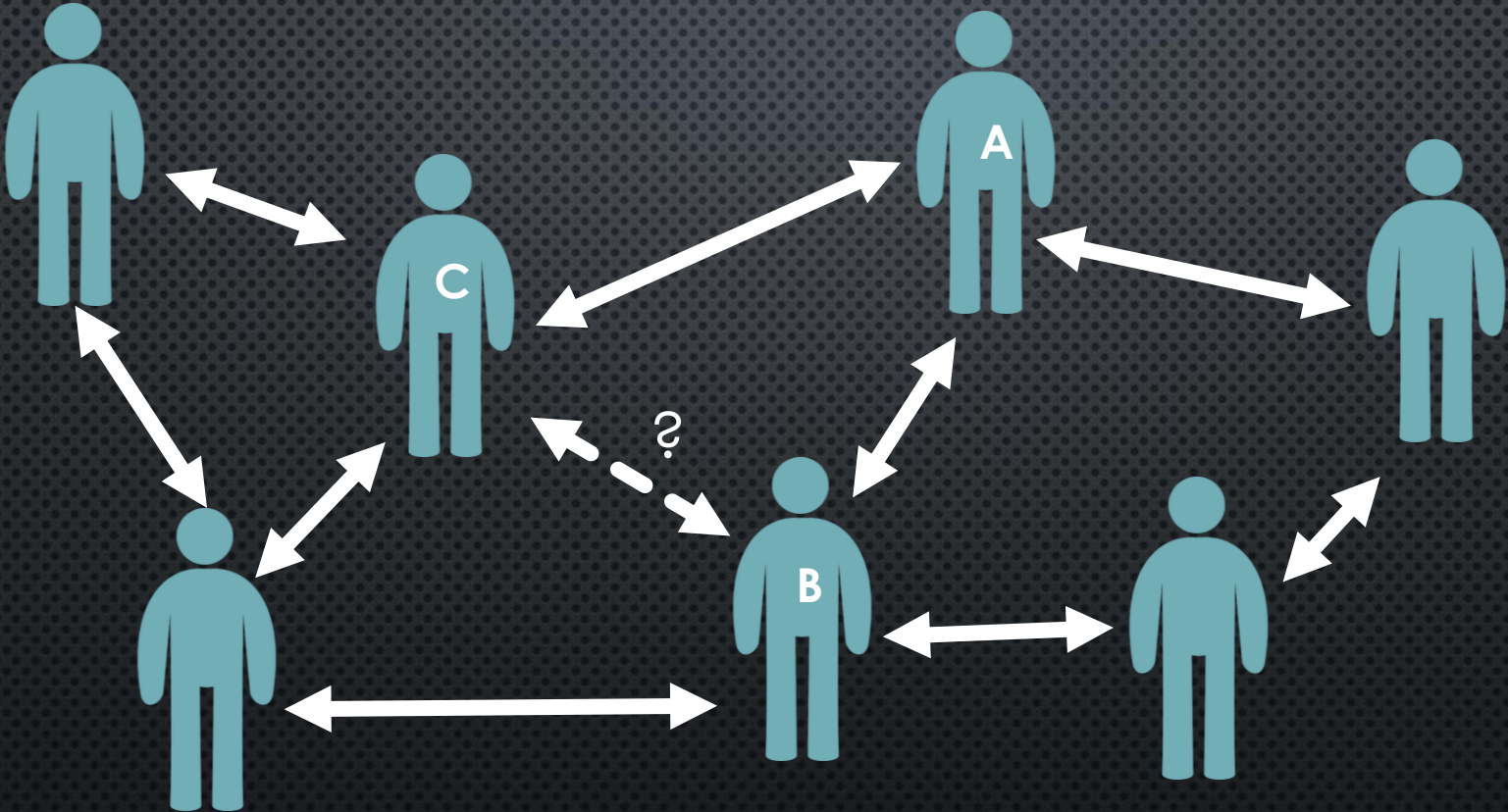
# VISUALIZING SOCIAL NETWORKS: TRIADIC CLOSURE



# APPLYING THE CLUSTERING COEFFICIENT (1/2)



# APPLYING THE CLUSTERING COEFFICIENT (2/2)

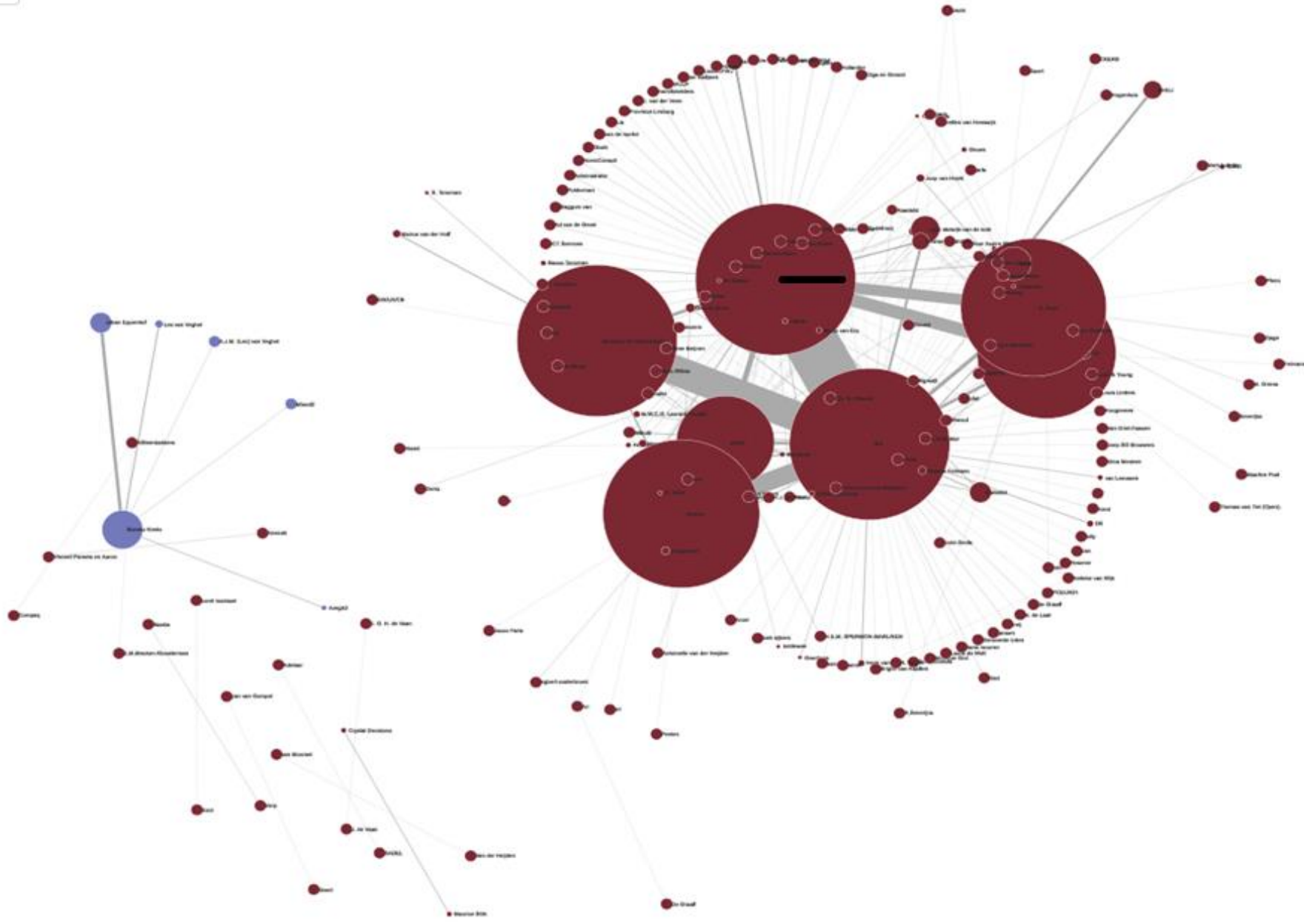




# Visualizations

People working together on documents

nl ▾



# VULNERABILITIES: CVES AND CPES

Microsoft® Word 2016  
Microsoft® Office Word 2007  
Adobe Acrobat 11.0.0

# VULNERABILITIES: CVES AND CPES

Microsoft® Word 2016  
Microsoft® Office Word 2007  
Adobe Acrobat 11.0.0



cpe:/a:microsoft:word:2016  
cpe:/a:microsoft:word:2007  
cpe:/a:adobe:acrobat:11.0.0

# VULNERABILITIES: CVES AND CPES

Microsoft® Word 2016  
Microsoft® Office Word 2007  
Adobe Acrobat 11.0.0



cpe:/a:microsoft:word:2016  
cpe:/a:microsoft:word:2007  
cpe:/a:adobe:acrobat:11.0.0



**CVE-2017-8509**  
**CVE-2017-0281**  
**CVE-2017-0254**  
**CVE-2017-0254**  
**CVE-2015-5094**  
**CVE-2015-5090**  
[...]  
**CVE-2015-5089**  
**CVE-2015-5088**  
**CVE-2014-8450**  
**CVE-2014-1761**  
**CVE-2014-0260**

# Vulnerabilities

Some metadata tags contain information on software or hardware used. This information can be used to get insight into potential vulnerabilities at the domain that produced the reviewed documents. On this page, an overview of these software and hardware versions can be found. To get the information, the [Creator Tool](#) tags were searched through.

Below, you find an overview for the information on **potential** vulnerabilities for each domain is shown per year.

*Note that CVEs may appear multiple times for a single domain. This is because, in those cases, the domain has more than one matching CPE.*

## 2017

CVE ID	CPE string	CVSS score	Description
CVE-2017-8509	cpe:/a:microsoft:word:2016	9.3	A remote code execution vulnerability exists in Microsoft Office when the software fails to properly
CVE-2017-0281	cpe:/a:microsoft:word:2016	9.3	Microsoft Office 2007 SP3, Office 2010 SP2, Office 2013 SP1, Office 2016, Office Online Server 2016
CVE-2017-0254	cpe:/a:microsoft:word:2016	9.3	Microsoft Word 2007, Office 2010 SP2, Word 2010 SP2, Office Compatibility Pack SP3, Office for Mac
CVE-2017-0254	cpe:/a:microsoft:word:2007	9.3	Microsoft Word 2007, Office 2010 SP2, Word 2010 SP2, Office Compatibility Pack SP3, Office for Mac
CVE-2017-0053	cpe:/a:microsoft:word:2016	9.3	Microsoft Office 2010 SP2, Office Compatibility Pack SP3, Word 2007 SP3, Word 2010 SP2, Word 2013 S
CVE-2017-0029	cpe:/a:microsoft:word:2016	4.3	Microsoft Office 2010 SP2, Word 2010 SP2, Word 2013 RT SP1, and Word 2016 allow remote attackers to

# ENRICHING THE DATA: FINDING EMAIL ADDRESSES

HOW CAN WE DERIVE EMAIL ADDRESSES FROM THE USER LIST?

## Email address syntaxes

One source of email addresses includes data breaches. In this analysis, the [Anti Public](#) data breach was used to check for email addresses. In the output below, the occurrences of users from brabant.nl are listed.

<b>Email syntax</b>	<b>Number of occurrences</b>
<code>{f}{last}</code>	100
<code>{f}{prefix}{last}</code>	29
<code>{first}{prefix}{last}</code>	13

## Email address syntaxes

One source of email addresses includes data breaches. from brabant.nl are listed.

Email syntax	Number of occurrences
<code>{f}{last}</code>	100
<code>{f}{prefix}{last}</code>	29
<code>{first}{prefix}{last}</code>	13

X

## Phishing Targets

The targets below are potential future acquaintances due to the concept of [Triadic Closure](#).

This means they are likely to get to know each other at some point in the future. That makes the ("User 1", "User 2") good source/target pairs for phishing attack information).

██████.nl ▾

User 1	User 2	Average clustering coefficient
██████	de B	1.0
██████	Ho	1.0
██████	van ████████ (en).	1.0
██████	ke v	1.0
██████	Com	1.0
██████	Stav	1.0
██████	ewee	1.0
██████	oeth	1.0
██████ e van ████████	██████	1.0



## Email address syntaxes

One source of email addresses includes data breaches. from brabant.nl are listed.

Email syntax	Number of occurrences
<code>{f}{Last}</code>	100
<code>{f}{prefix}{Last}</code>	29
<code>{first}{prefix}{Last}</code>	13

X

## Modifiers

Below, you find a list of all unique modifiers (i.e. values of the `Last Modified By` metadata tags) for [https://\[redacted\].nl](https://[redacted].nl)

- A [redacted] (LinkedIn, [redacted].nl, Bing)
- A [redacted] (LinkedIn, [redacted], Bing)
- A [redacted] (LinkedIn, [redacted], Bing)
- A [redacted] (LinkedIn, [redacted], Bing)
- A [redacted] (LinkedIn, [redacted], Bing)
- A [redacted] (LinkedIn, [redacted], Bing)
- A [redacted] (LinkedIn, [redacted], Bing)
- A [redacted] (LinkedIn, [redacted], Bing)
- B [redacted] (LinkedIn, [redacted], Bing)
- C [redacted] (LinkedIn, [redacted], Bing)
- D [redacted] (LinkedIn, [redacted], Bing)
- D [redacted] (LinkedIn, [redacted], Bing)
- E [redacted] (LinkedIn, [redacted], Bing)
- G [redacted] (LinkedIn, [redacted], Bing)
- G [redacted] (LinkedIn, [redacted], Bing)
- G [redacted] (LinkedIn, [redacted], Bing)
- G [redacted] (LinkedIn, [redacted], Bing)
- H [redacted] (LinkedIn, [redacted], Bing)
- H [redacted] (LinkedIn, [redacted], Bing)

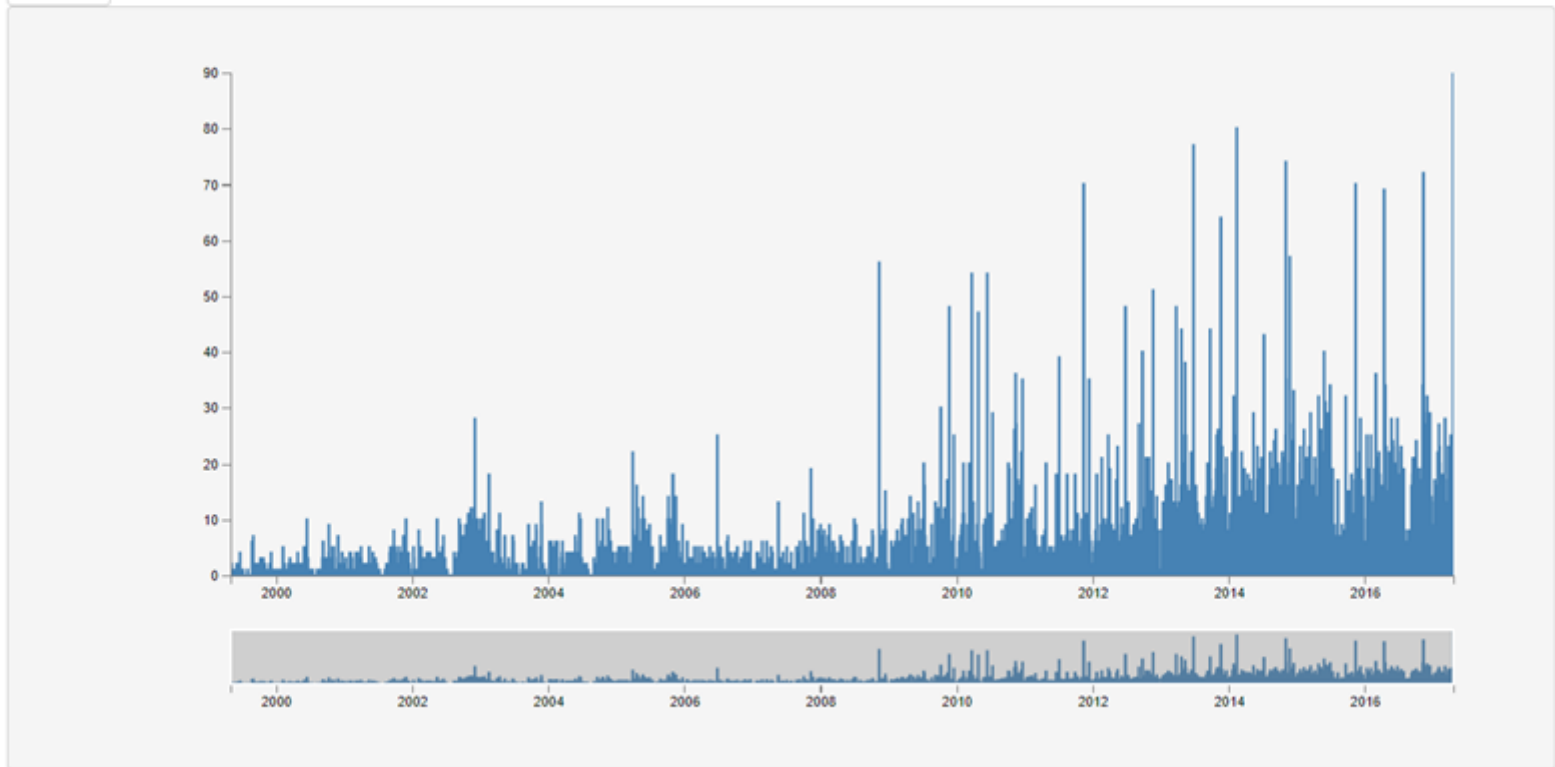
# Timelines

## Creation and modification statistics

This page shows an overview of when files were created. Please note that only files with a date format of "yyyy-mm-dd" are taken into account here.

nl ▾

create ▾



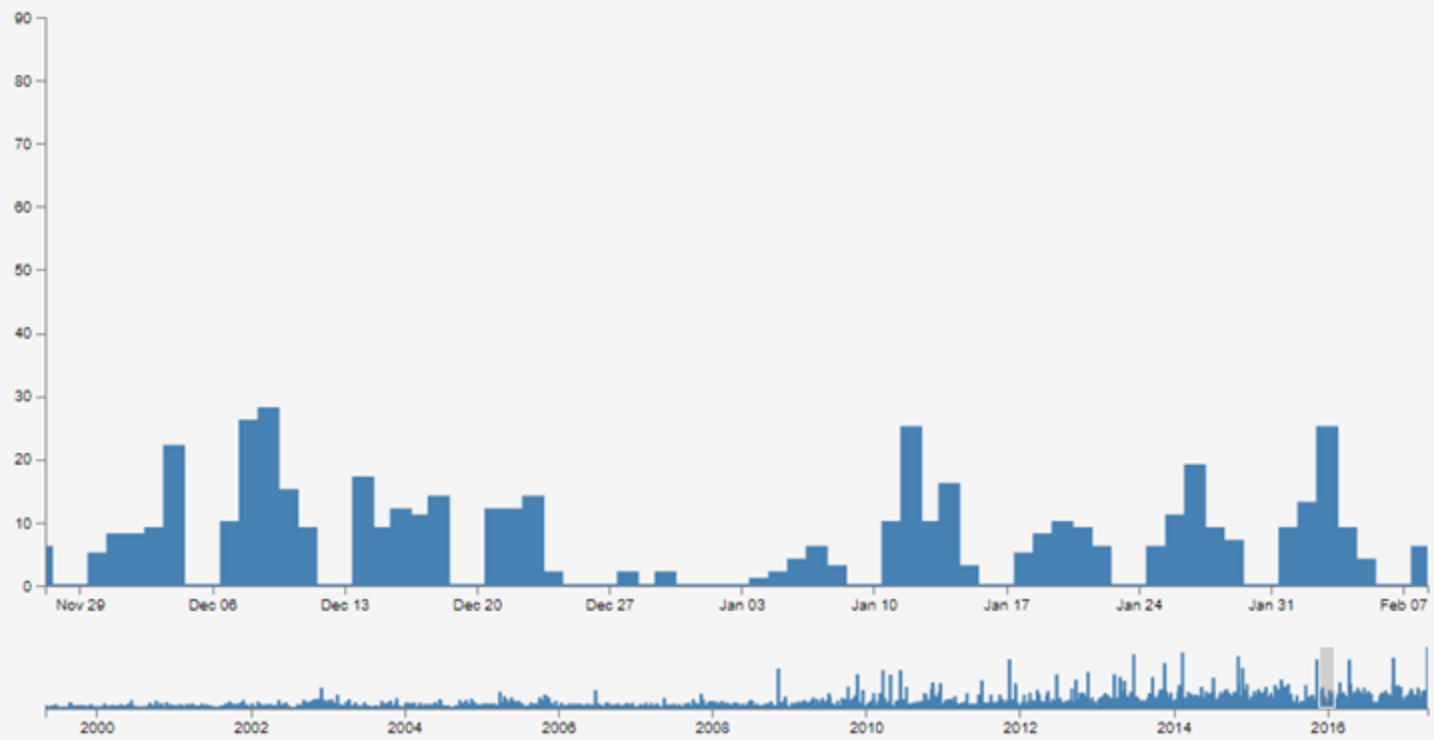
# Timelines

## Creation and modification statistics

This page shows an overview of when files were created. Please note that only files with a date format of "yyyy-mm-dddd" are taken into account here.

■■■■.nl ▾

create ▾



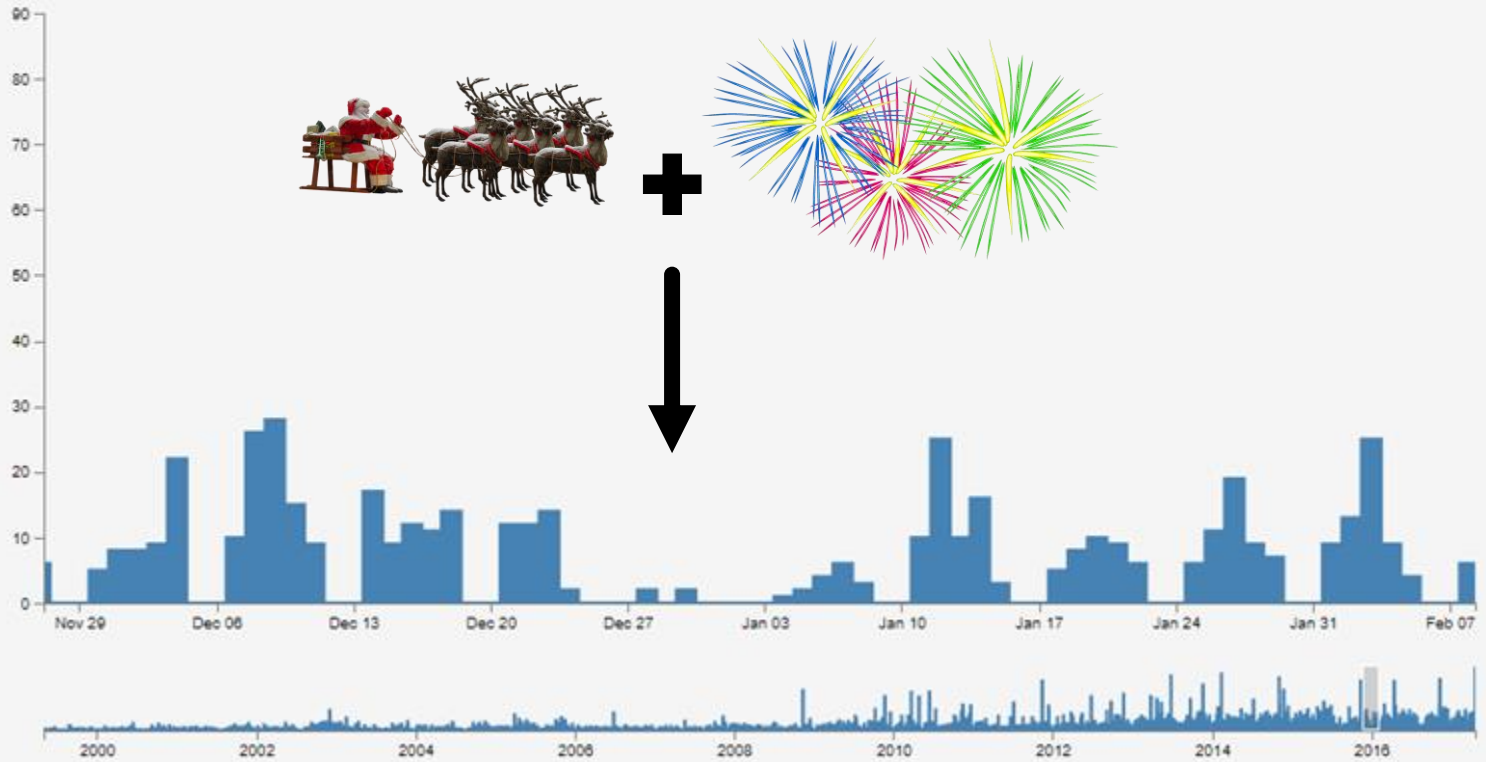
# Timelines

## Creation and modification statistics

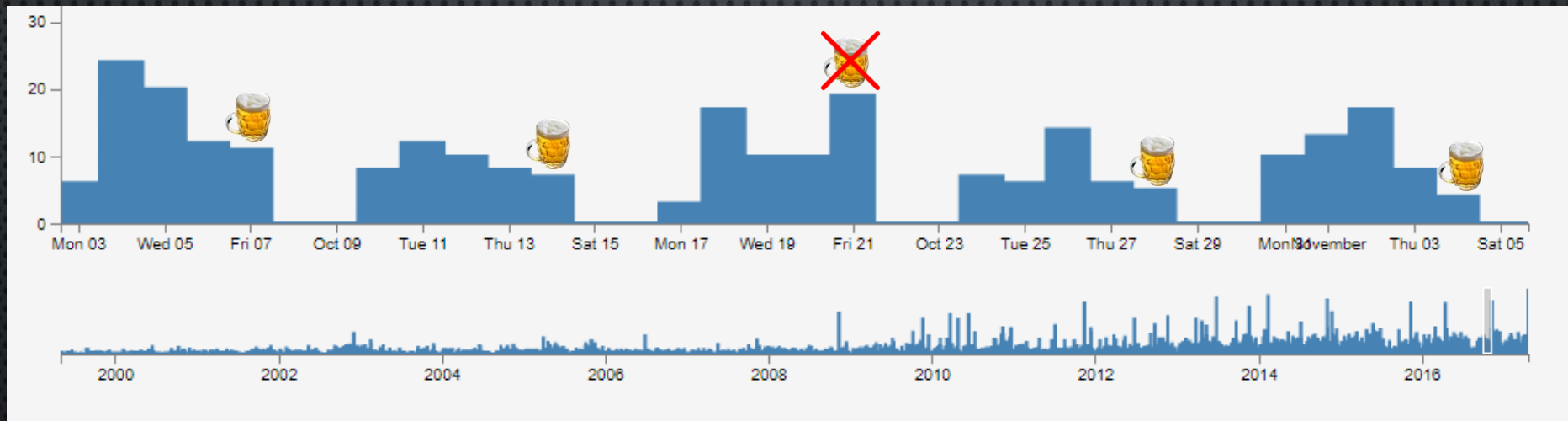
This page shows an overview of when files were created. Please note that only files with a date format of "yyyy-mm-dddd" are taken into account here.

nl ▾

create ▾



# WEEKLY PATTERNS



# CONCLUSIONS

- THE DUTCH GOVERNMENT LEAKS METADATA THROUGH PUBLIC DOCUMENTS ON ALMOST ALL DOMAINS
- THIS INFORMATION TURNS OUT TO BE A **VALUABLE SOURCE OF INFORMATION** FOR A HACKER
- IT IS **NOT** AN ATTACK TOOL **ON ITS OWN**, BUT IT DOES PROVIDE INSIGHT INTO AN ORGANIZATION'S INNER WORKINGS (FILESYSTEMS, USERS, SOFTWARE, TIMELINES, ETC.)
- CVEs CAN BE FOUND FOR DOMAINS, BUT **CONVERTING SOFTWARE VERSIONS** FOUND IN METADATA **TO VALID CPEs** TURNS OUT TO BE **HARD** (RESULTING IN FALSE POSITIVES)

# CONCLUSIONS

- THE MOST INTERESTING INFORMATION IN THE METADATA IS ABOUT **PEOPLE, USERS AND SOCIAL NETWORKS;**
  - THIS INFORMATION **SEEMS VALID,**
  - IS PRESENT IN **ALMOST ALL DOCUMENTS,**
  - ...AND GIVES **MOST INFORMATION ABOUT POTENTIAL ATTACK PATHS**  
(INFECTION SPREADING)

# FUTURE WORK

- GET EVEN FURTHER:
  - LINK TO PEOPLE'S **SOCIAL MEDIA** ACCOUNTS AND HARVEST MORE INFORMATION (INTERESTS, FRIENDS, PERSONALITIES)
- LOOK FOR *.DOCM* FILES:
  - INDICATES THE ORGANIZATION USES OFFICE **MACROS**
- MAKE THE SCRAPER SMARTER (TO AVOID DISTURBANCE)
- ADD OFFENSIVE FEATURES TO THE DASHBOARD



**PLEASE ASK QUESTIONS!**

*FEEL FREE TO DROP BY FOR A LIVE DEMO*