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Discovery of Electronically Stored Information

ECBA conference
Tallinn
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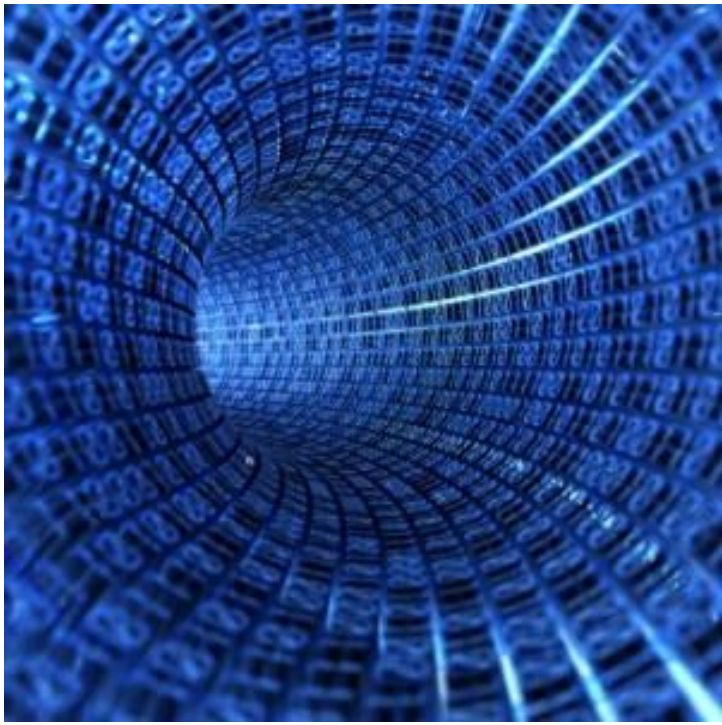


Jan Balatka, Deloitte Czech Republic, Analytic & Forensic Technology unit

Agenda

Introduction

eDiscovery investigation

- Collection
- Pre-processing
- Processing
- Review

Example projects

Key takeaways

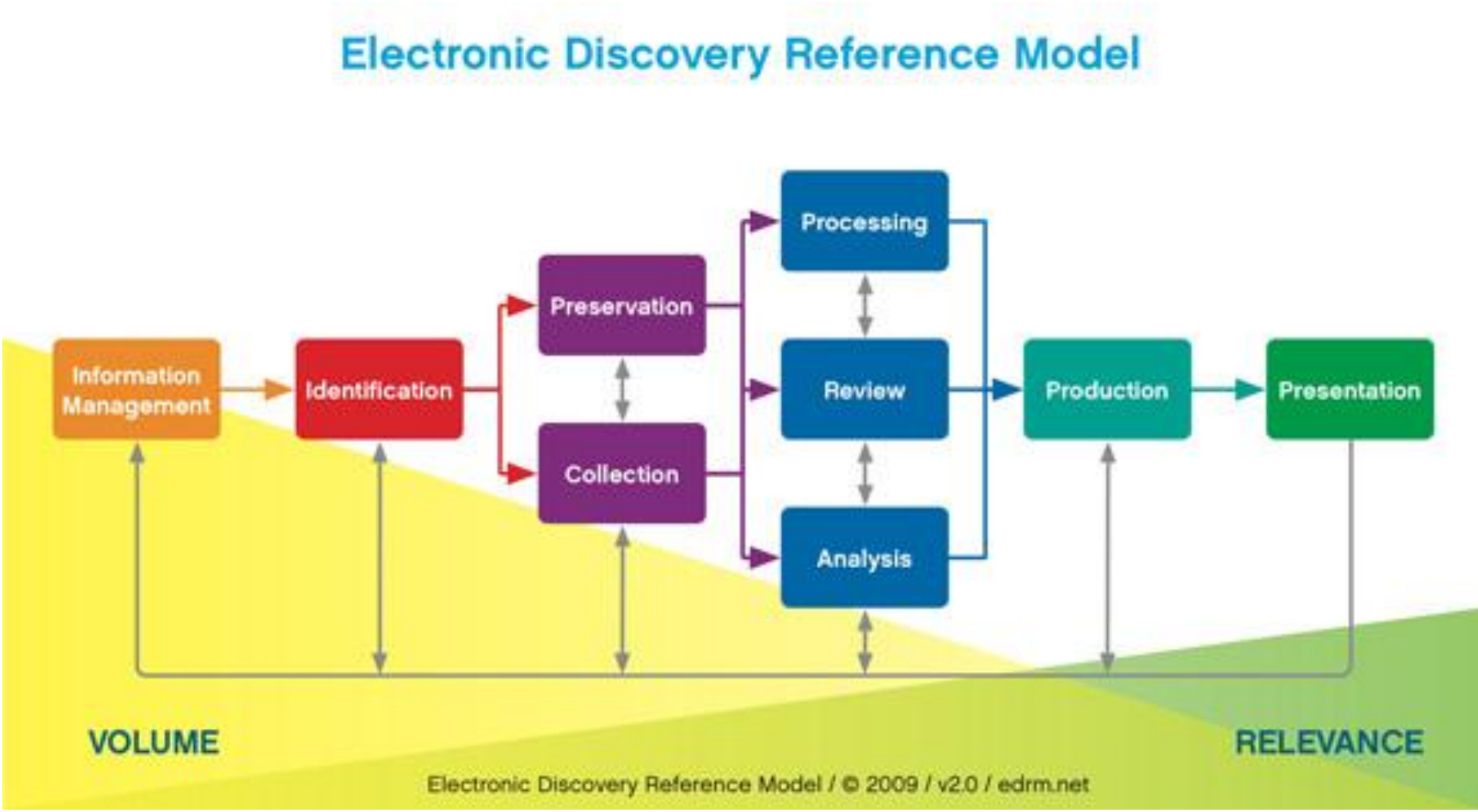
Introduction

Digital world

- **More than 95% of the digital universe is unstructured data**
- **Enterprises have some liability for 80% of information in the digital universe at some point of its digital life**
- **90% of the data in the world today has been created in the last two years**

Source: IDC, IBM

eDiscovery reference model



eDiscovery investigation

eDiscovery investigation

- We will focus on the following phases:
  - Collection
  - Pre-processing
  - Processing
  - Review
- Common **drivers**
  - Regulatory – FCPA (Foreign Corrupt Practices Act)...
  - Fraud/incident investigations
- This presentation focuses on **unstructured data**

Collection phase

Basics of Collection phase

- **Collecting data in a forensically sound manner**
  - **Complete and accurate data acquisition**
  - **No changes to the original evidence**
  - **Documentation**
- Proven methodology and experienced staff essential
- Special software and hardware equipment needed
- Planning and logistics important, often work under time pressure
- Information identification – custodians, media, periods, priorities...

Storage types

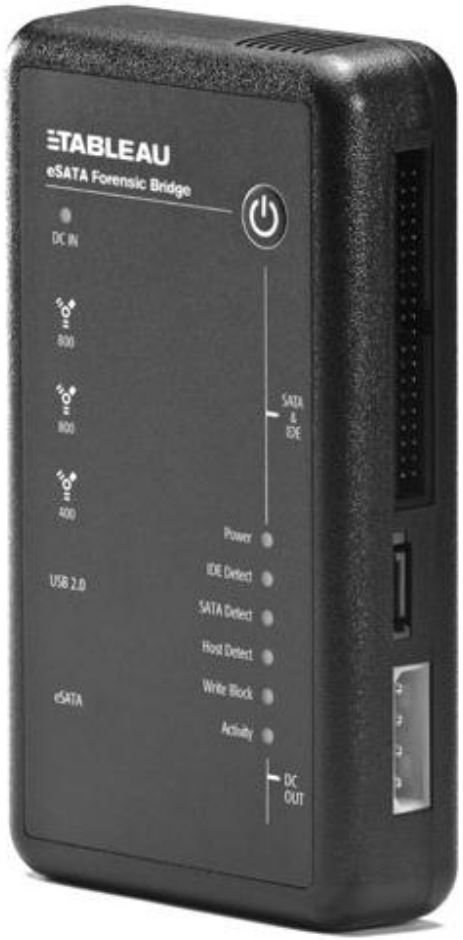
- Custodian (user) computers – desktops, notebooks
- Server computers – server mailboxes, home folders, shared folders, e-rooms
- CDs, DVDs
- External hard disk drives
- Flash drives, memory cards
- Tape backups
- Hard copy documents
- Handheld devices
- Other (cloud...)

Example – HDD imaging

- Imaging a notebook hard disk drive using a hardware write-blocker and EnCase Forensic software suite
- Obtaining a bit-by-bit copy (exact replica) of entire hard disk drive data, including unallocated space
- Storing image files within an encrypted container

Collection methods

- Using **hardware forensic write-blockers**



- Using **standalone forensic duplicators**

Collection methods

- Using custom **live Linux distributions**
- Making a **“live image”** – using the subject computer, with OS booted – least desirable but sometimes only practical
  - RAID
  - Servers that cannot be turned off due to operational reasons
- Using other software tools
- Using third party service providers
  - Hard copy documents – scanning and OCRing
  - Tape backups

Handheld devices

- Special tools required

Legal issues

- Although there is a EU directive on data privacy protection the actual data privacy rules are different in EU member countries
- Legal consultations required
- Prior consent of custodians often required. This can lead to evidence being lost due to actions by custodians, but in practice the risk is mitigated by the following:
  - Custodians formally asked to retain all relevant data
  - Possibility to detect mass deletions and detect use of anti-forensics tools
  - Recovery of deleted items
  - Email communication distributed among multiple custodians
  - Personal backups

Pre-processing phase

Introduction

- **Objectives**
  - **Reduce volume of data – include only relevant data for further processing** (email, Office files...)
  - **Recover deleted data**
  - **Preserve the data and metadata**
- Inclusive/exclusive approach

Pre-processing steps

- **Recovering folders**
  - FAT partitions – searches unallocated space for signatures of a deleted folder, can rebuild files and folders that were within that deleted folder
  - NTFS partitions – searches unallocated space for MFT records and scans current MFT for files without parent folders, can recover the identified files
- **File signature analysis** – comparing file extensions with file headers
- **Expanding compound files** such as archives – based on file extensions and/or signatures
- **Filtering only relevant data** based on file extensions and/or signatures and other criteria
- **Exporting the resulting set of files**

Decryption

- Accessing corporate user computers with **full volume encryption** using appropriate credentials
- Encrypted files can be handled on an individual basis
  - Getting harder as the applications use stronger encryption methods (Office Word and Excel 97-2003 versus 2007)
  - Password is the weakest link
  - Distributed processing, GPU acceleration, use of indexed words

Digging deeper

- Recovery of deleted partitions
- Carving data from unallocated space
- Timeline analysis (e.g. mass deletion detection, detection of gaps in email)
- Exploring Windows artifacts
  - Identification of wiping software
  - Recycle bin files
  - Attached external storage device history
  - Web browsing history
  - Prefetch analysis
  - Recent document history, file browsing history
  - Encrypted files

Processing phase

Processing

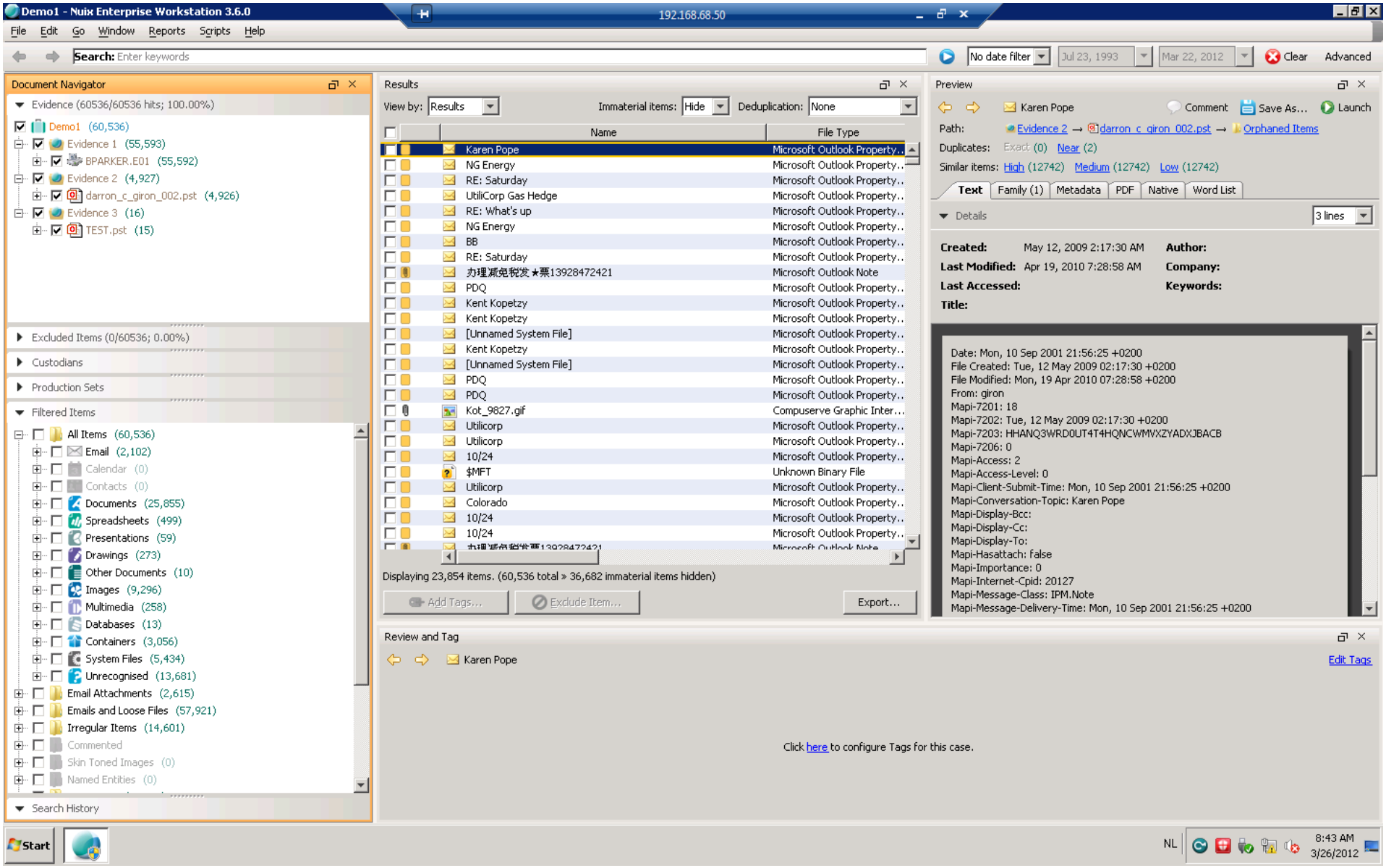
- **The processing platform extracts the text and metadata from the input data set so these can be uploaded to the review platform**
- Some **features** of a processing platform
  - Reliable and extensive support of input data file formats
  - Extraction of metadata
  - Processing of attached/embedded data
  - Speed, scalability
  - De-duplication
  - Filtering (date ranges, search terms)
  - Limited recovery of deleted items (e.g. PST containers)

De-duplication and De-NIST

- Global or per custodian
- **Significantly reduces the volume of data for further processing** (40-60% typical) but relevant information can be lost (ie. Due to lost context from the storage path)

- De-NIST excludes tens of thousands known files (based on hash value, usually executables)

Processing platform – an example (NUIX)

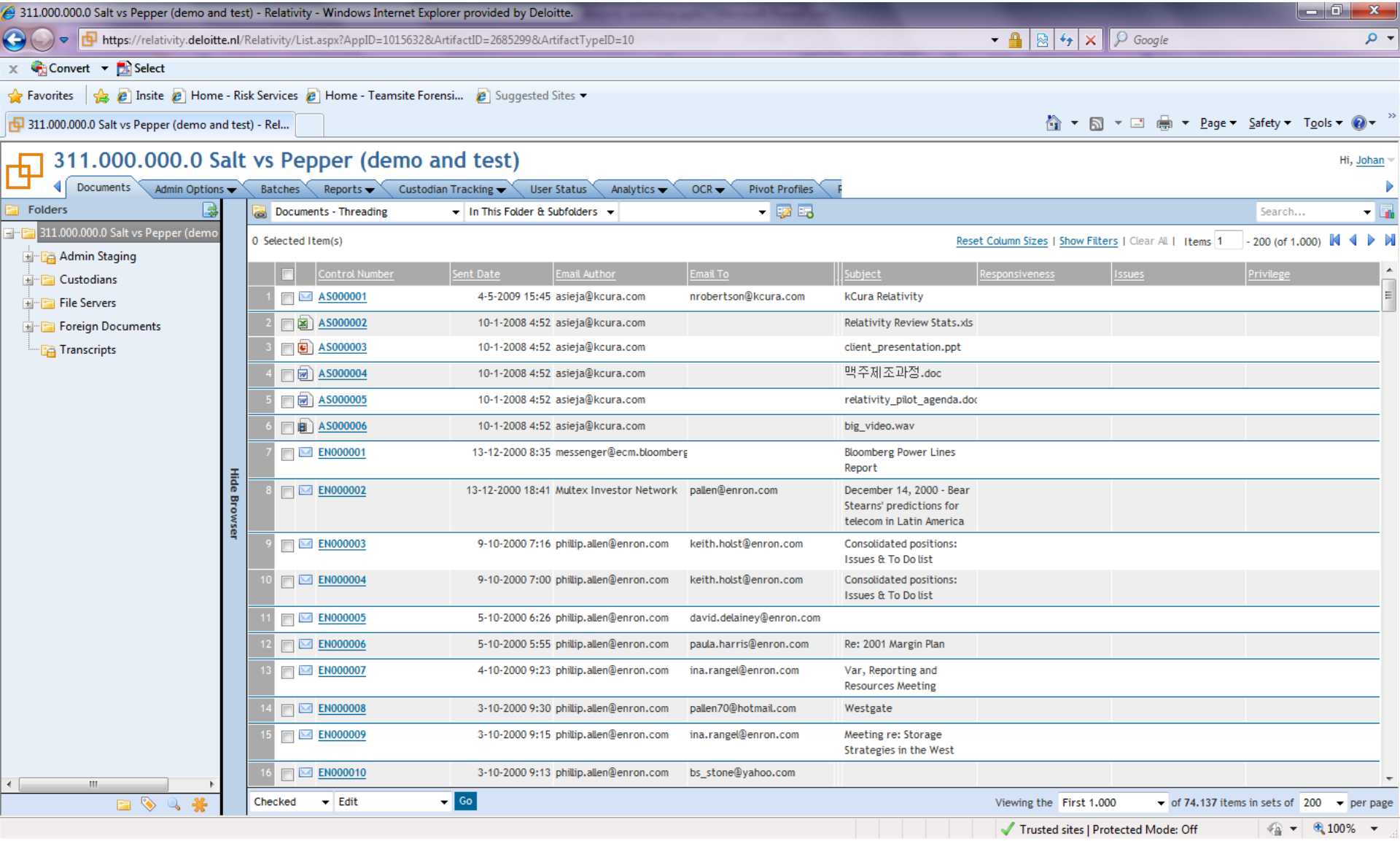


Review phase

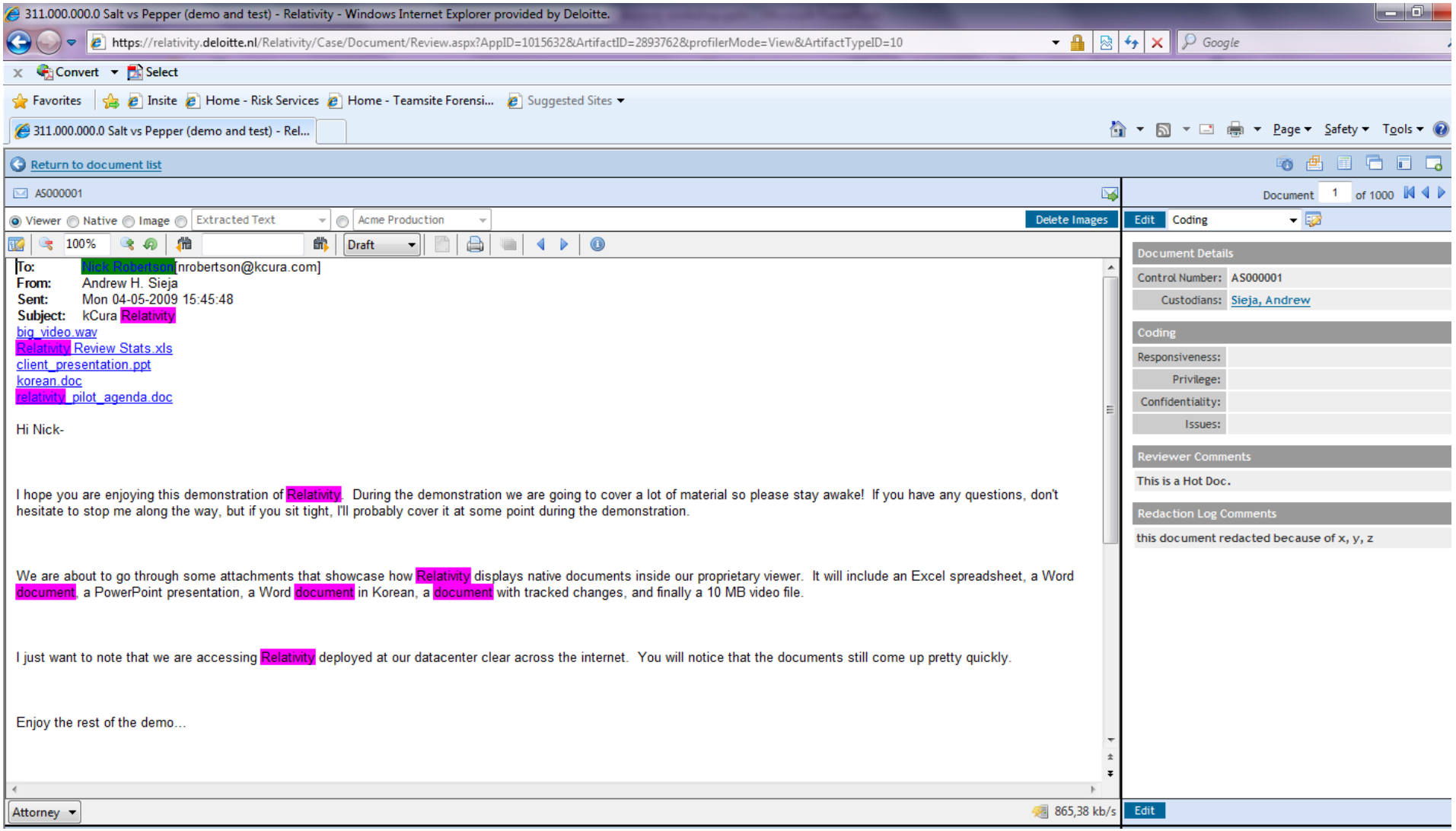
Review

- **The review platform makes information available for review, analysis and productions**
- Some **features** of a review platform
  - Document review – presentation, tagging...
  - Web-based access of multiple reviewers
  - Handling large volumes of data
  - Indexing, complex searches
  - Workflow capabilities
  - Productions
  - Object-level security
  - Advanced analytics (e.g. clustering, predictive coding)

Review platform – an example (Relativity)



Review platform – an example (Relativity)



Search terms

- **Recall and precision – trade-off**
  - Recall – number of relevant documents retrieved by a search / total number of existing relevant documents
  - Precision – number of relevant documents retrieved by a search / total number of documents retrieved by that search
- **Early case assessment (ECA)**
  - Test the search terms for number of hits and relevancy of hits (on a sample), iteratively refine the search terms
- **Keep updating the search terms** based on the outcomes of the review and new facts identified during the engagement

Search terms

- Some terms are likely to generate **excessive number of search hits**
  - General terms such as “payment” or “invoice”, employee names, words that appear in email signatures, homonyms (words that have the same spelling but different meaning)...
  - Depending on the client needs, terms with large number of hits can be acceptable
- Account for **stemming** – either replace the variable part of word with a wildcard or list all the forms
- Include **misspellings**
- Search for terms with and without **accents** (emails)
- Include search terms in multiple **languages** when appropriate
- Use thesaurus – add **synonyms**
- Use **Boolean** and **other operators** (proximity searching, exact phrases)

Technology assisted review

- **Near de-duplication**
  - Groups content similar documents together
- **Email threading**
  - Entire thread visible, enables focusing only on unique or most inclusive items
- **Unsupervised machine learning – Clustering**
  - Creates clusters based upon patterns of words with relative weight
- **Supervised machine learning – Predictive coding**
  - The machine will “learn” how to score documents for relevance based on past coding made by humans
  - The machine then sends iterative statistically generated samples to the reviewer, improving the accuracy of relevance
  - Once the desired level of accuracy is achieved, the machine training is complete. The remaining population can be scored via the machine

Example projects

Project 1 – France, a pharmaceutical company

- Allegations: FCPA (Foreign Corrupt Practices Act) violations
- Joint effort of Deloitte Netherlands, Czech Republic and US, client based in US
- Extensive data collection at short notice
  - Five countries, 30 custodians
  - More than 8 TB raw data collected
- Setup of standalone processing and review platform
  - Custom NUIX and Relativity setup on the client's premises – "mobile" solution ready within several days

Project 1 – France, a pharmaceutical company

- Processing large volumes of data
  - Pre-processing reduced the amount of data for indexing by a factor of 10
  - Further reductions in data uploaded into the review platform by applying global de-duplication (as per the client's request) and individual date ranges per custodian

Project 1 – France, a pharmaceutical company

- Challenges of review
  - Client adding more reviewers at short notice to meet aggressive deadlines
  - Constant requests for review customizations brought surprising level of complexity
  - No ECA performed due to the time pressure – search terms could have been refined earlier
  - Used industry standard machine translation software, still some language pairs worked poorly (ie Bulgarian vs. English) – client added more reviewers
  - “Legal can’t see how complex can data processing be” – we are here to meet the client’s expectations

Project 2 – Germany, an industrial conglomerate

- Allegations: FCPA violations
- Largest forensic investigation ever completed by that time
- Processed the laptops, mailboxes, PDAs, home directories and external media of 5,000 employees on a global scale
- Several other work streams running in parallel
- We helped the client to reduce the initial assumption of $6 billion fine to $1 billion finally paid

Key takeaways

Key takeaways

- **Forensically sound data collection, processing and review support require proven methodology, specialist knowledge and tools**
- Pre-process the data by applying a well tested procedure – get more evidence later
- Perform Early Case Assessment whenever possible, refine search terms iteratively
- Continuous and thorough quality control is essential

Thank you!

Jan Balatka

Senior manager

Forensic & Dispute services – Analytic & Forensic Technology

Deloitte Advisory s.r.o., Karolinska 654/2, 18600 Praha 8, Czech Republic

mobile: +420 731 450 902, email: jbalatka@deloittece.com

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