FORENSICS @ NIST #NISTForensics

National Software Reference Library

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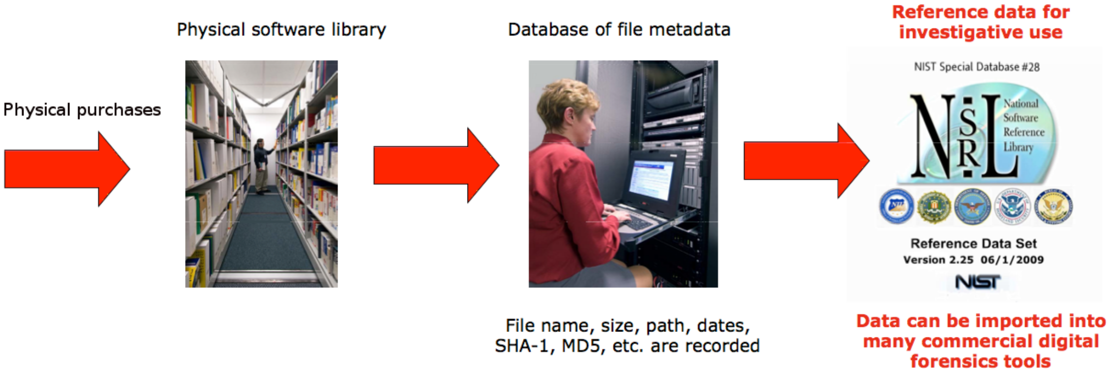
nsrl@nist.gov www.nsrl.nist.gov

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

NSRL Core



Physical purchases

Physical software library

Database of file metadata

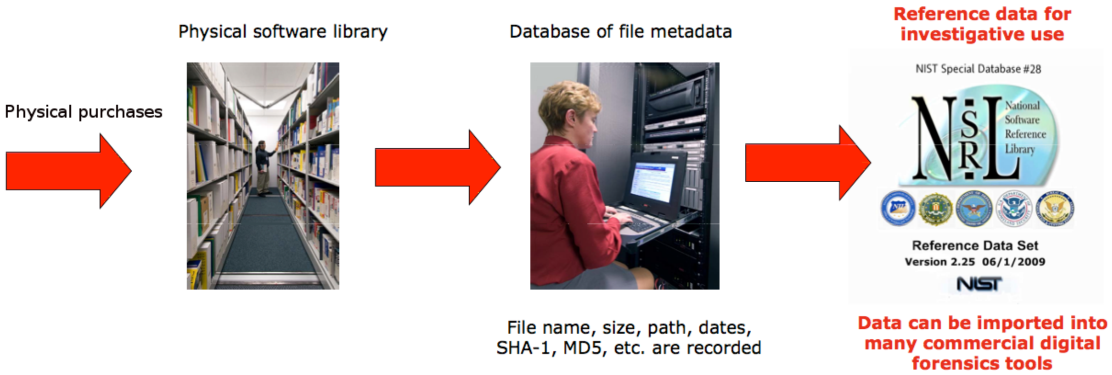
File name, size, path, dates, SHA-1, MD5, etc. are recorded

Reference data for investigative use

NIST Special Database #28
NSRL
National Software Reference Library
Reference Data Set
Version 2.25 06/1/2009
NIST

Data can be imported into many commercial digital forensics tools

NSRL Core



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All published data is traceable to original media.

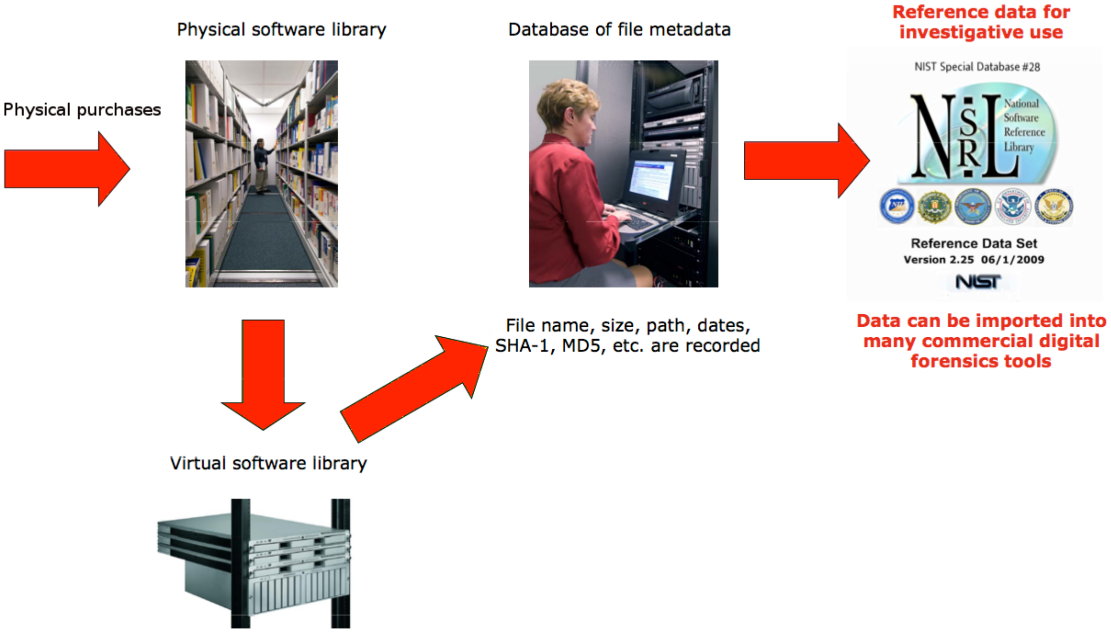
Collects metadata about files which can be used to uniquely identify files and their provenance.

Metadata is used during investigations to automatically

- Eliminate known files
- Target files of interest

Supported by the U.S. Department of Homeland Security, federal, state, and local law enforcement.

NSRL Core + Storage



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Virtual software library

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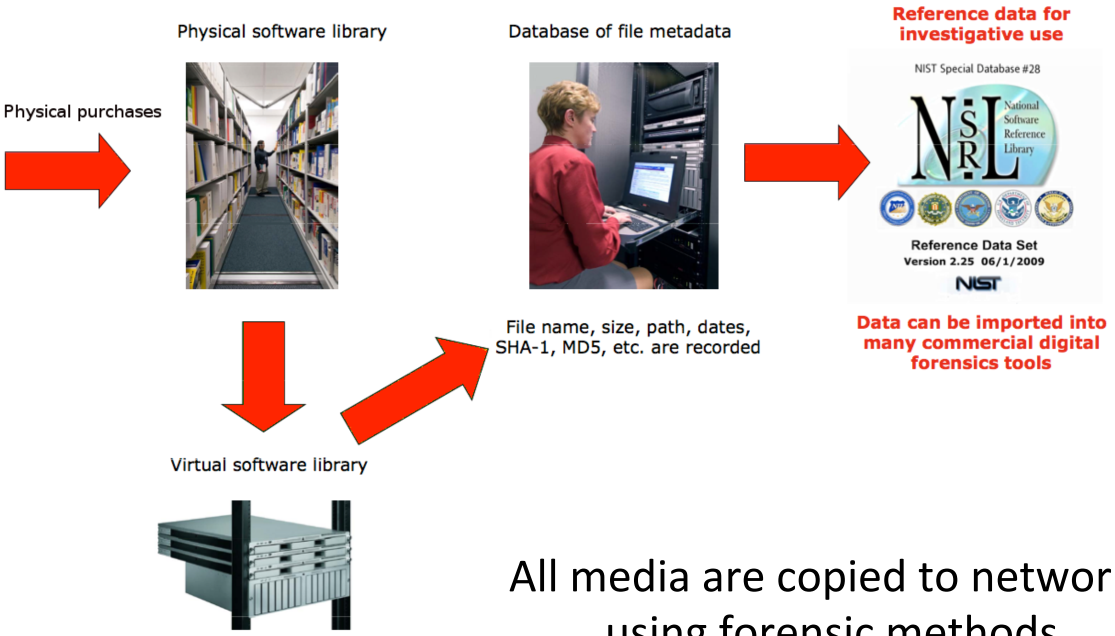
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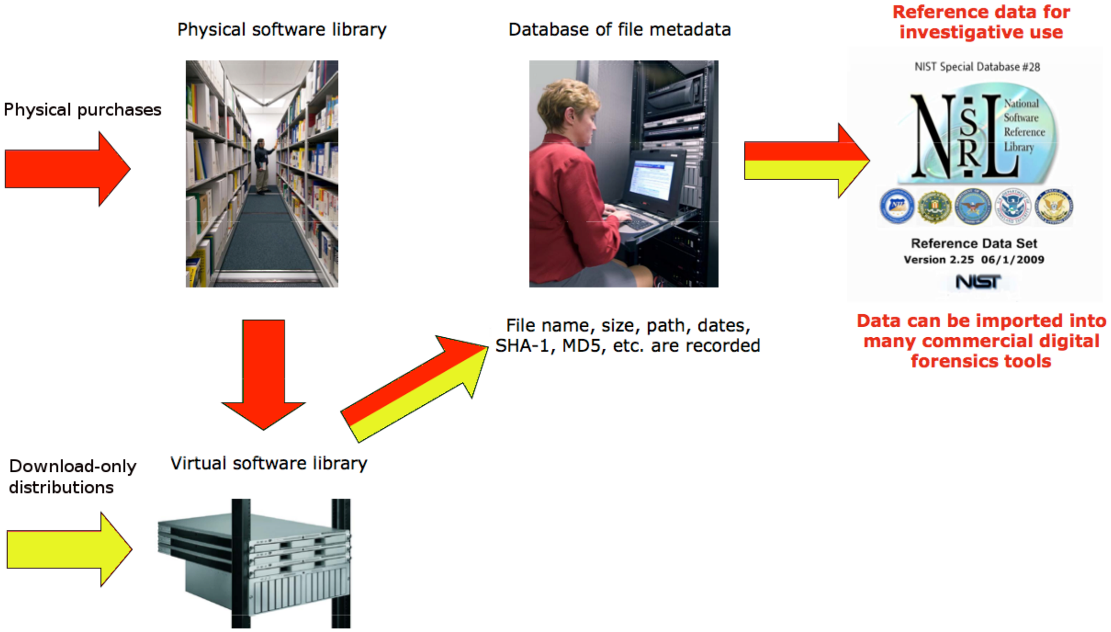
All media are copied to network storage
using forensic methods.
Repeatable processes can be performed.
Media degradation can be managed.
Easy to incorporate new algorithms.
Easy to extend metadata collection
and measurement.

NSRL Expansion



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Download-only distributions

Virtual software library

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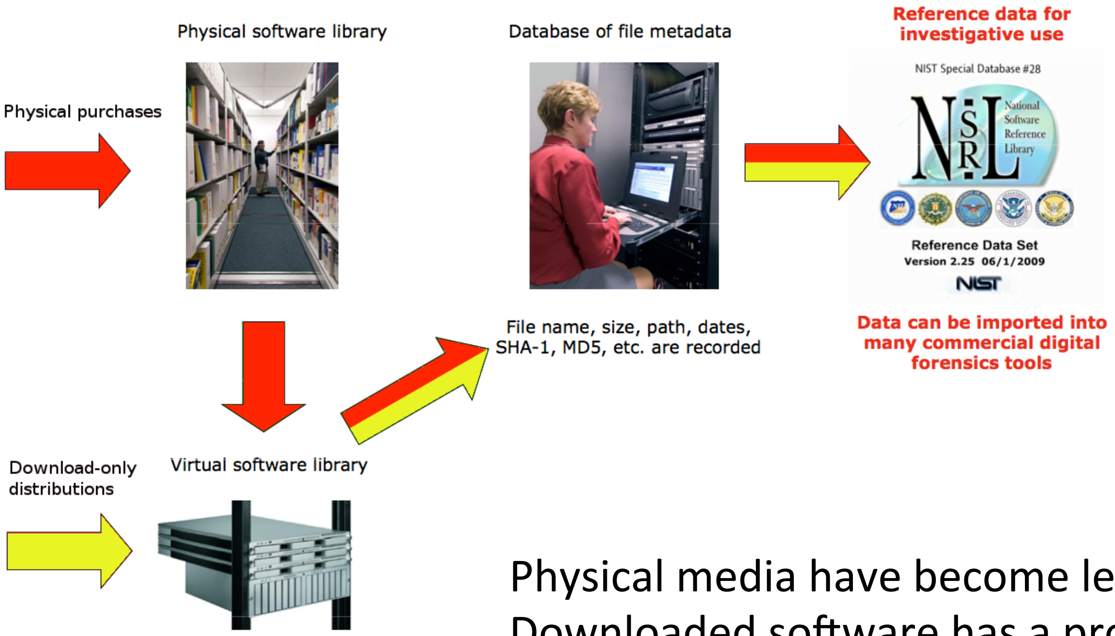
NSRL Expansion



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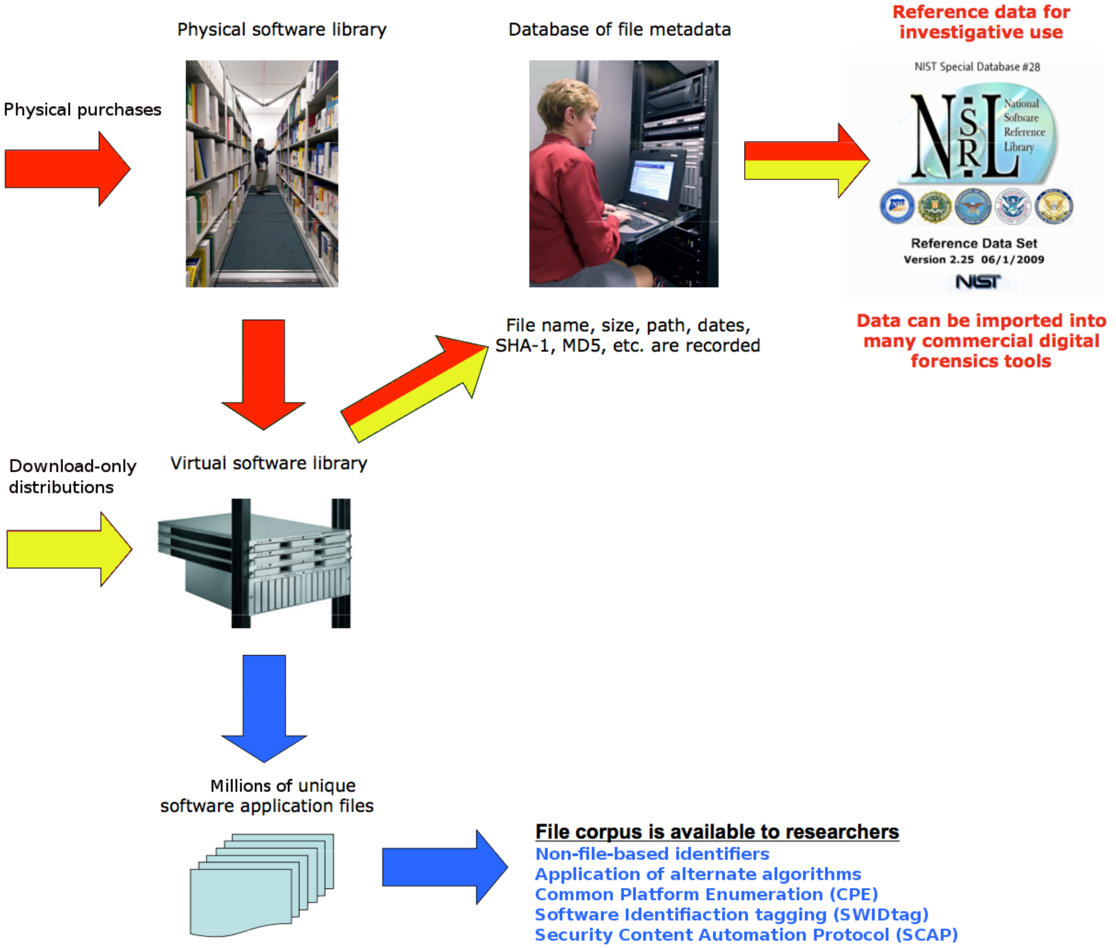
Download-only distributions

Virtual software library

Physical media have become less popular.
Downloaded software has a provenance.
Expansion into acquiring downloads enables

- Greater coverage of popular software
- Ability to add mobile apps
- Route for collaboration with other collections

NSRL Expansion + Corpus



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Download-only distributions

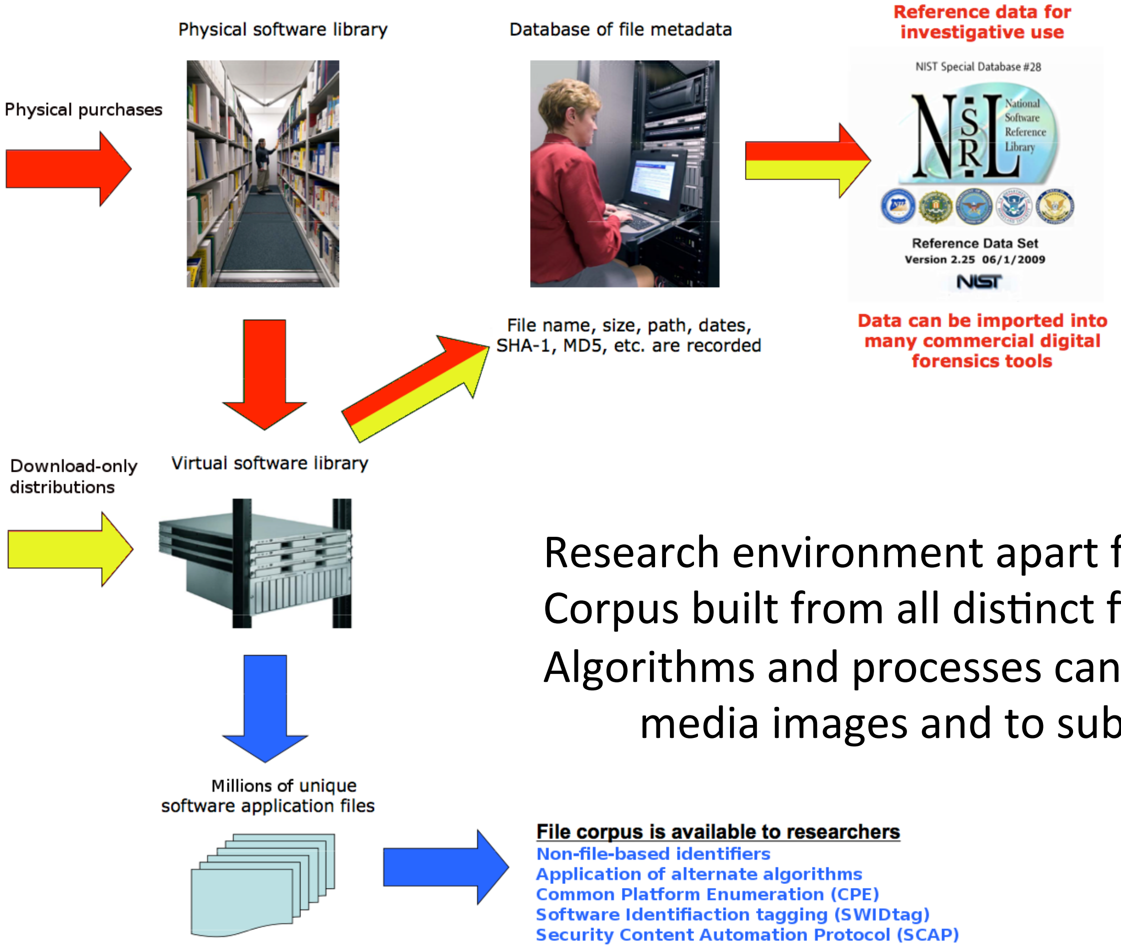
Virtual software library

Millions of unique software application files

File corpus is available to researchers

Non-file-based identifiers
Application of alternate algorithms
Common Platform Enumeration (CPE)
Software Identifiaction tagging (SWIDtag)
Security Content Automation Protocol (SCAP)

NSRL Expansion + Corpus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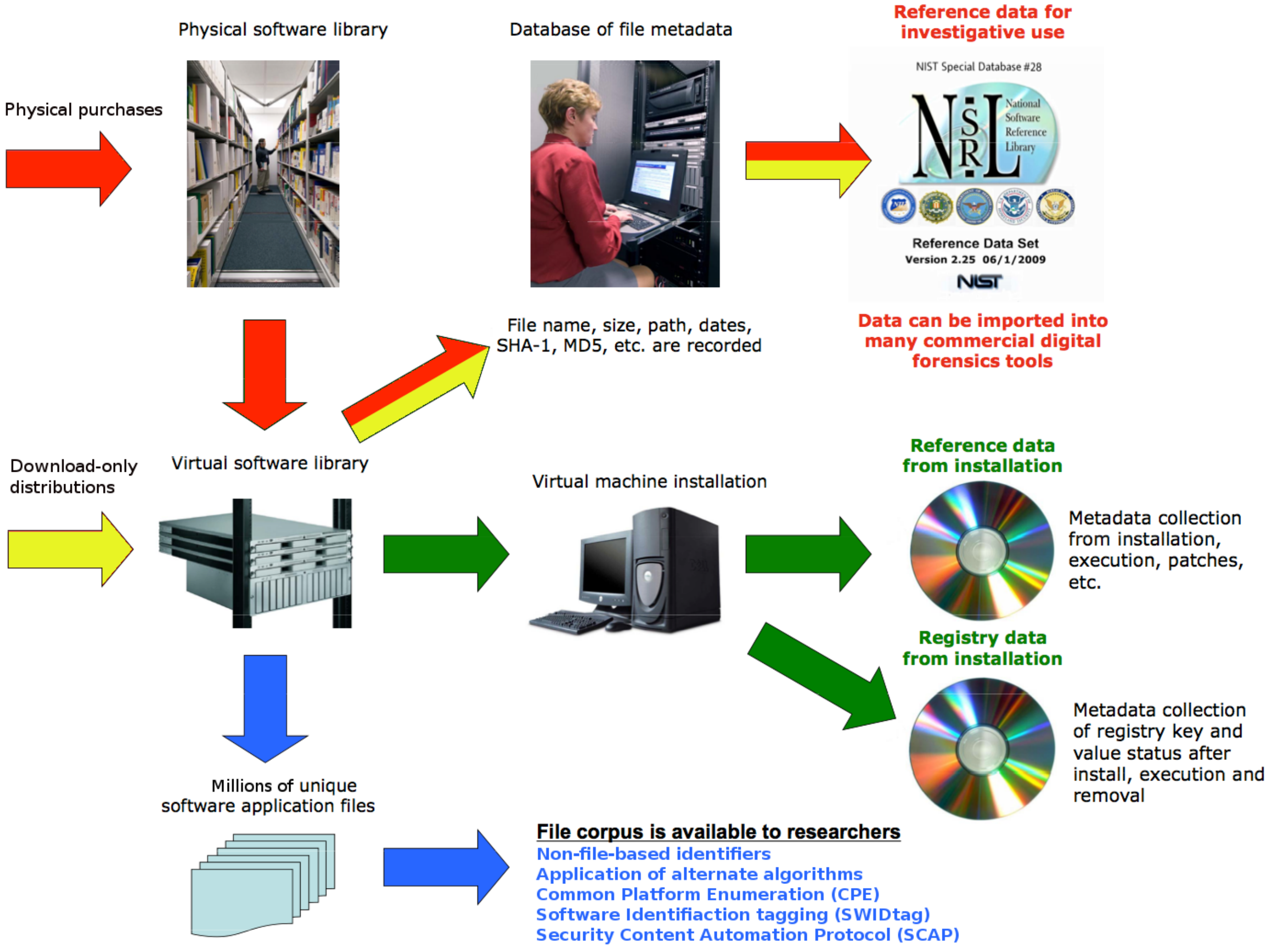
Research environment apart from core.
Corpus built from all distinct files from media.
Algorithms and processes can be applied to media images and to subsets of files.

NSRL Expansion + Corpus

Alternate algorithm examples:

- SHA-256, SHA-512, SHA-3
- ssdeep, sdhash
- fiwalk, bulk_extractor
- Memory carving
- Manifest processing
- Block or sector processing

NSRL Next Generation



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Download-only distributions

Virtual software library

Virtual machine installation

Reference data from installation

Metadata collection from installation, execution, patches, etc.

Registry data from installation

Metadata collection of registry key and value status after install, execution and removal

Millions of unique software application files

File corpus is available to researchers

- Non-file-based identifiers
- Application of alternate algorithms
- Common Platform Enumeration (CPE)
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NSRL Next Generation

NSRL uses virtual machine (VM) technology to investigate the forensics of the software life cycle.

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NSRL Next Generation Diskprinting

Mary Laamanen

Alex Nelson

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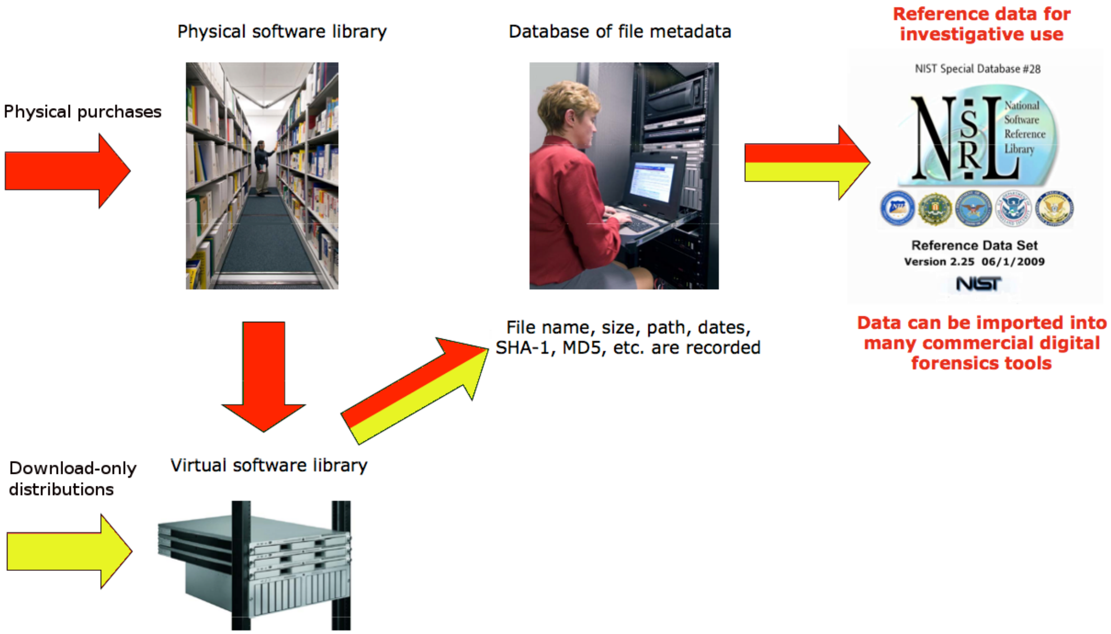
NSRL Expanded Core



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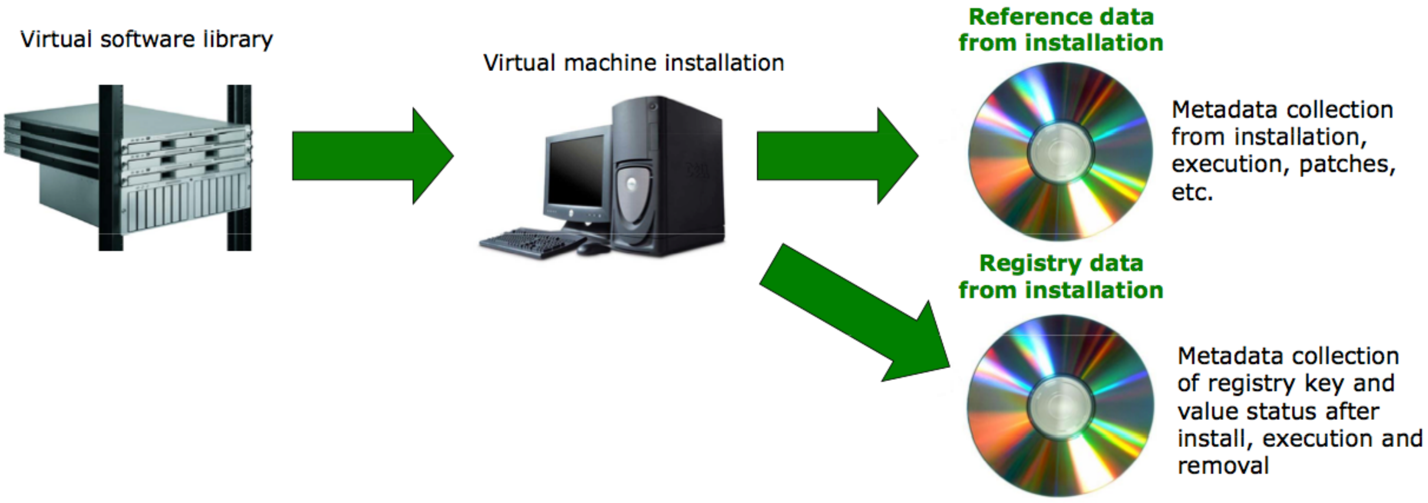
NSRL Diskprints



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Motivation

Gather data on the specific effects of individual software packages on a system over the software's lifetime.

Provide digital forensic investigators with new reference data.

Extend the NSRL research environment for use by forensic researchers to develop new tools and techniques.

Systems and Software

All software is part of the NSRL library

- Provides Traceability

Operating System

- Focus on versions of Microsoft Windows

Software applications

- Chosen based on recommendations

Virtual Machine Advantages

VM state can be captured at any time

- VM may be paused / suspended

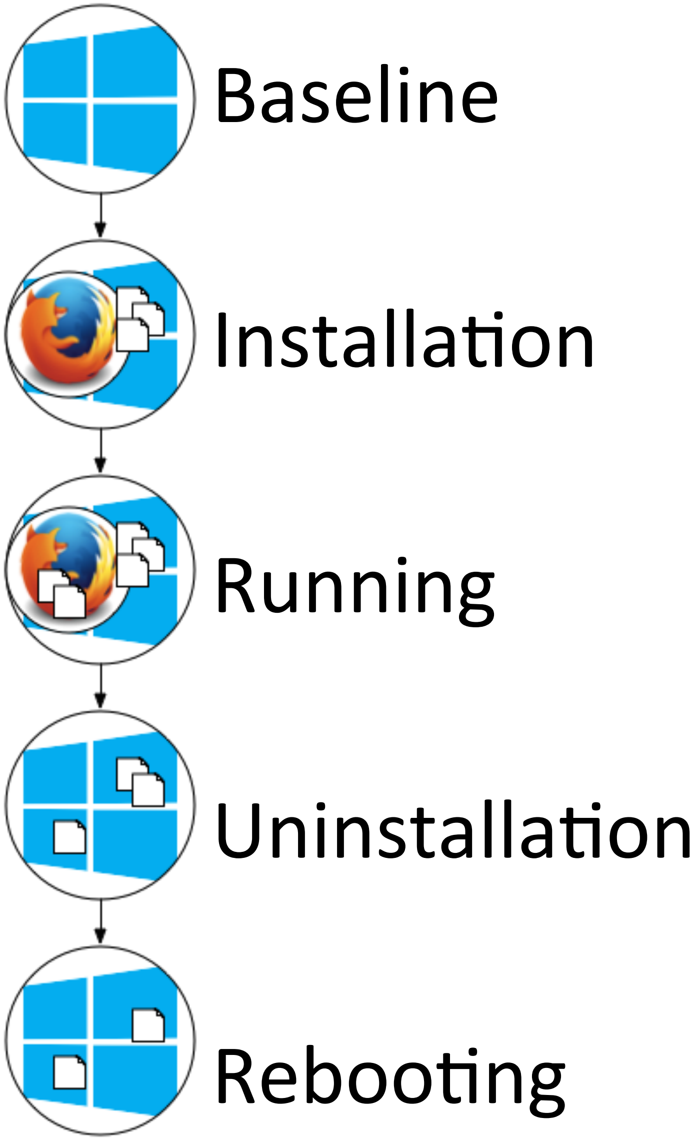
VM is preserved as a set of files

- Hard drive, RAM contents, etc

Can be copied off for external processing

Saved for future reference

Artifacts


Baseline

Installation

Running

Uninstallation

Rebooting

Captured Data

Filesystem (file hashes, MAC times, etc)

- Executables
- Libraries
- etc.

Configuration information

- Windows Registry

Memory mapping information

- System RAM

Network communication

- pcap files

Snapshot Metadata

Snapshot Id – Unique Id

Application Lifecycle State – Record the application lifecycle stage

Snapshot Notes – Record all user actions taken when generating the snapshot including unexpected behavior

Processing Workflow

What do we do with all this data?

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NSRL Next Generation – Diskprinting

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2 Prometheus Computing
3 University of California, Santa Cruz

CENTER FOR RESEARCH IN STORAGE SYSTEMS

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