# Test Results for String Search Tool: X-Ways Version Forensic

**Text formatted like this (Bold, Italics and Green) should be removed and replaced. These are instructions to the report writer. You should begin with a cover page and an introductory section and maybe a table of contents.**

# How to Read This Report

This report is organized into the following sections:   
**Of course, you can reorganize sections, but then you should update this list.**

1. **Tested Tool Description.** The tool name, version, and vendor information are listed.
2. **Testing Organization.** Contact information and approvals.
3. **Results Summary.** This section identifies any significant anomalies observed in the test runs. This section provides a narrative of key findings identifying where the tool meets expectations and provides a summary of any ways the tool did not meet expectations. The section also provides any observations of interest about the tool or about testing the tool including any observed limitations or organization imposed restrictions on tool use.
4. **Test Environment & Selected Cases.** Description of hardware, software and support environment (e.g., version of Federated Testing used, device firmware version, etc) used in tool testing and a list identifying the applicable test cases selected from the Federated Testing String Search Test Suite.
5. **Test Result Details by Case.** Automatically generated test results that identify anomalies.

# Test Results for String Search Tool: X-Ways Version Forensic

# Tested Tool Description

Tool Name: X-Ways   
Tool Version: Forensic   
Vendor: ***Insert vendor name and contact information.***

# Testing Organization

***The following items in this section may be included or omitted as per organization's policy for tool test reports.***   
Organization conducting test: ***Insert Organization name.***   
Contact: ***Insert contact name.***   
Report date: ***Insert date.***   
Authored by: ***Insert author name.***   
Reviewed by: ***Insert name of reviewer.***   
Reviewed by date: ***Insert date.***   
Approved: ***Insert name of approving official.***   
Approved by date: ***Insert date.***   
  
This test report was generated using CFTT's Federated Testing Forensic Tool Testing Environment, see [Federated Testing Home Page](http://www.cftt.nist.gov/federated-testing.html).

# Results Summary

**Provide a narrative of key findings -- did the tool meet expectations. If not provide a summary of how the tool did not meet expectations. Provide any observations of interest about the tool or about testing the tool including any observed limitations or organization imposed restrictions on tool use.**

# Test Environment & Selected Cases

This section describes test hardware, software, test data sets and test cases.

## Test Hardware and Software

### Hardware

***List and describe any hardware used during testing in sufficient detail to repeat the tests.***

### Software

***List and describe any additional software used during testing in sufficient detail to repeat the tests.***

### Test Data Sets

String search test data set package Version 1.1 was used. The package can be downloaded from either the CFTT web site (www.cftt.nist.gov then select String Searching) or the CFReDS web site (www.cfreds.nist.gov). The package includes two dd files with known content. One of the dd test images contains target strings within FAT, ExFAT and NTFS file systems (Windows), the other dd test image contains target strings from HFS+ journaled, case insensitive (OSXJ), HFS+ journaled, case sensitive (OSXC), ext4 file system and APFS (Apple file system) (UNIX-like).

In general, each target string is encoded in ASCII and located in an active file and a recoverable deleted file in each partition of the test image. The Windows dd image also has a block of unallocated storage that contains the target strings without a file system. Some of the target strings are also encoded in Unicode UTF-8, UTF-16BE and UTF-16LE with a byte-order-mark. Test case FT-SS-09 is organized to test specific situations such as formatted strings, strings spanning file fragments, Unicode UTF-16 without a byte-order-mark, Unicode text with and without combining characters (diacritic marks), Unicode text with and without ligatures ("fi" as two characters and as one character) and strings located in inaccessible areas. Each instance of a target string also has a unique associated string ID located immediately after the target string. The string ID helps identify the specific string matched by the search tool.

## Test Case Descriptions

The following table gives a brief description of available test cases in the data sets. Not all test cases are used for all data sets.   
**You can delete the row in the table for any cases not used.**

|  |  |
| --- | --- |
| **Case** | **Case Description** |
| FT-SS-01 | Search ASCII |
| FT-SS-02 | Search Ignore Case |
| FT-SS-03 | Search for Words |
| FT-SS-04 | Search Logical AND |
| FT-SS-05 | Search Logical OR |
| FT-SS-06 | Search Logical NOT |
| FT-SS-07-CJK-char | Search Unicode Chinese/Japanese ideograms (Asian) |
| FT-SS-07-CJK-hangul | Search Unicode CJK Korean Hangul (Asian) |
| FT-SS-07-CJK-kana | Search Unicode CJK Japanese phonetic Kana (Asian) |
| FT-SS-07-Cyrillic | Search Unicode Cyrillic (Russian) |
| FT-SS-07-Latin | Search Unicode Latin (French & German) |
| FT-SS-07-NoBOM | Search Unicode 16 without a byte-order-mark |
| FT-SS-07-Norm | Normalized Search of Unicode text with diacritic marks (NFC & NFD) and ligatures (NFKC & NFKD) |
| FT-SS-07-RTL | Search Unicode RTL (Arabic) |
| FT-SS-08-Email | Search Tool-defined Queries -- Email Address |
| FT-SS-08-Phone | Search Tool-defined Queries -- Telephone Number |
| FT-SS-08-SS | Search Tool-defined Queries -- Social Security |
| FT-SS-09-Doc | Search Formatted Document Text |
| FT-SS-09-Frag | Search Fragmented File |
| FT-SS-09-Lost | Search Inaccessible (lost) Areas |
| FT-SS-09-MFT | Search File in MFT |
| FT-SS-09-Meta | Search file name substring in Meta-data |
| FT-SS-09-Stem | Search for matches to word stem |
| FT-SS-10-Hex | Search Hexadecimal Character Match |
| FT-SS-10-Regex | Search Pattern Character Match |

Some test cases are for specific features, e.g., logical conditions (**and**, **or**, **not**), built in searches (email, telephone numbers), etc. Three test cases, FT-SS-09-Frag, FT-SS-09-Lost & FT-SS-09-MFT, are only applied to the Windows data set.

**If a test case applies to a feature that is not supported by the tested tool, the case should be omitted and listed here.**

# Test Result Details by Case (per Data Set)

This section presents test results grouped by function.

A string search tool may implement more than one search algorithm (also known as a search engine) for searching text. The two most common search engines are *indexed search* and *live search*. An indexed search reads all the acquired data once before doing any searching and builds an index to all words found. Each query can be looked up quickly in the index. A Live search reads all the acquired data for each query.

This section presents test results by test image (windows file systems, unix-like file systems or both). For each test image, there is a result table for each search engine tested. Each table shows results by test case of the number of expected search hits, the number of actual search hits and the number of strings missed (i.e., expected hits minus actual hits) for allocated files, deleted files and unallocated space.

The following search engines were tested: Other\_Physical, Indexed and Live.

## Results for Data Set: Windows

This section provides results for the Windows data set.

### Results for Other\_Physical Search of Windows Data Set

The table columns contain the following information:

* **Case** The test case identifier.
* **Expected String** The expected strings that should be reported by the search.
* **Active Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in an active file.
* **Deleted Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in a deleted file.
* **Unallocated Space** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in unallocated space.
* **Expected** The number of instances of the expected string found in the group (i.e., Active files, Deleted files or Unallocated space).
* **Hits** The number of times the expected string was found in the group.
* **Misses** The number of times the expected string was missed (not found) in the group.

Notes: If the row identifies a test case, then the results are a summary for all the strings that should be found.

In the Expected String column for test case FT-SS-09-DOC each string is labeled to indicate features of the expected string. The labels include the file type (.doc, .docx or .html), the encoding of the string in the .doc file and if the string has embedded formatting, labeled as Formatted, e.g., the string crossbow has the substring cross formatted as bold and underlined, i.e., **cross**bow.

| **Case** | **Expected String** | **Active Files** | | | **Deleted Files** | | | **Unalloc Space** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** |
| FT-SS-01 |  | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-02 |  | 15 | 15 | 0 | 15 | 15 | 0 | 5 | 5 | 0 |
|  | WOLF | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | Wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-03 |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | WOLF | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | Wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-04 |  | 3 | 3 | 0 | 3 | 3 | 0 | 0 | 0 | 0 |
|  | tiger | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 0 | 1 |
| FT-SS-05 |  | 6 | 6 | 0 | 6 | 6 | 0 | 2 | 2 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-06 |  | 12 | 0 | 12 | 12 | 0 | 12 | 0 | 0 | 0 |
|  | fox | 15 | 0 | 15 | 15 | 0 | 15 | 5 | 0 | 5 |
| FT-SS-07-CJK-char |  | 18 | 18 | 0 | 18 | 18 | 0 | 6 | 6 | 0 |
|  | 中国 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 東京 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-CJK-hangul |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 서울 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-CJK-kana |  | 18 | 18 | 0 | 18 | 18 | 0 | 6 | 6 | 0 |
|  | スバル | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | みつびし | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-Cyrillic |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | Сибирь | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-Latin |  | 18 | 18 | 0 | 18 | 18 | 0 | 6 | 6 | 0 |
|  | garçon | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | Schönheit | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-NoBOM |  | 39 | 39 | 0 | 39 | 39 | 0 | 13 | 13 | 0 |
|  | Россия | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | فلافل | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 中國 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | QuarterHorse | 12 | 12 | 0 | 12 | 12 | 0 | 4 | 4 | 0 |
| FT-SS-07-Norm |  | 75 | 75 | 0 | 75 | 75 | 0 | 25 | 25 | 0 |
|  | mañana (NFD) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | infinity (No Ligature) | 12 | 12 | 0 | 12 | 12 | 0 | 4 | 4 | 0 |
|  | Mäuse (NFD) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | inﬁnity (Ligature) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | Mäuse (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | libertà (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | libertà (NFD) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | mañana (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-RTL |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | الكسكس | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-09-Doc |  | 16 | 13 | 3 | 0 | 0 | 0 | 16 | 13 | 3 |
|  | longbow .html | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | shotgun Formatted .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | revolver .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | peroxide .docx | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | nitroglycerin Formatted .docx | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | rifle .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | crossbow Formatted .html | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | flintlock Formatted .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| FT-SS-09-Frag |  | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Washington | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | California | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FT-SS-09-Lost |  | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 |
|  | SecretKey | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | disconnected | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| FT-SS-09-MFT |  | 4 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 0 |
|  | bear | 4 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 0 |
| FT-SS-09-Meta |  | 6 | 6 | 0 | 6 | 6 | 0 | 2 | 2 | 0 |
|  | cañón | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | thunderbird | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-10-Hex |  | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | tiger | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-10-Regex |  | 6 | 6 | 0 | 6 | 6 | 0 | 2 | 2 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |

### Meta-Data results for Other\_Physical Search of Windows Data Set

The following table presents search results for strings located in file system meta-data. The **Case** column identifies the test case, the **String** column identifies the search string, the **Partition** column identifies the partition (file system) where the string is located and the **Seen** column records if the search tool reported at least one instance of the string (yes or no) in meta-data.

|  |  |  |  |
| --- | --- | --- | --- |
| **Case** | **String** | **Partition** | **Seen** |
| FT-SS-09-Meta |  |  |  |
|  | thunderbird | ntfs | Yes |
|  | cañón | fat32 | Yes |
|  | cañón | exfat | Yes |
|  | cañón | ntfs | Yes |

### Comments on Other\_Physical Search of Windows Data Set

The following table presents any comments recorded during testing for a test case.

| **Case** | **Comments** |
| --- | --- |
| FT-SS-06 | Page Fault |
| FT-SS-07-Latin | UTF-16 encoded strings are reported twice. |
| FT-SS-07-NoBOM | Hits on the string "QuarterHorse" encoded as UTF-16 are reported twice. |
| FT-SS-07-Norm | Searches do not use Unicode normalization on the search string. Strings normalized as NFC are reported twice. |
| FT-SS-09-Frag | Not finding the string "Washington" is the real expected result because the string is split across two file fragments and should be missed in a sector by sector physical search. |

### Results for Indexed Search of Windows Data Set

The table columns contain the following information:

* **Case** The test case identifier.
* **Expected String** The expected strings that should be reported by the search.
* **Active Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in an active file.
* **Deleted Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in a deleted file.
* **Unallocated Space** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in unallocated space.
* **Expected** The number of instances of the expected string found in the group (i.e., Active files, Deleted files or Unallocated space).
* **Hits** The number of times the expected string was found in the group.
* **Misses** The number of times the expected string was missed (not found) in the group.

Notes: If the row identifies a test case, then the results are a summary for all the strings that should be found.

In the Expected String column for test case FT-SS-09-DOC each string is labeled to indicate features of the expected string. The labels include the file type (.doc, .docx or .html), the encoding of the string in the .doc file and if the string has embedded formatting, labeled as Formatted, e.g., the string crossbow has the substring cross formatted as bold and underlined, i.e., **cross**bow.

| **Case** | **Expected String** | **Active Files** | | | **Deleted Files** | | | **Unalloc Space** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** |
| FT-SS-01 |  | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-02 |  | 15 | 15 | 0 | 15 | 15 | 0 | 5 | 5 | 0 |
|  | WOLF | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | Wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-03 |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | WOLF | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | Wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-04 |  | 3 | 3 | 0 | 3 | 3 | 0 | 0 | 0 | 0 |
|  | tiger | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 0 | 1 |
| FT-SS-05 |  | 6 | 6 | 0 | 6 | 6 | 0 | 2 | 2 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-06 |  | 12 | 12 | 0 | 12 | 12 | 0 | 0 | 0 | 0 |
|  | fox | 15 | 12 | 3 | 15 | 12 | 3 | 5 | 0 | 5 |
| FT-SS-07-CJK-char |  | 18 | 18 | 0 | 18 | 18 | 0 | 6 | 6 | 0 |
|  | 中国 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 東京 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-CJK-hangul |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 서울 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-CJK-kana |  | 18 | 9 | 9 | 18 | 9 | 9 | 6 | 3 | 3 |
|  | スバル | 9 | 0 | 9 | 9 | 0 | 9 | 3 | 0 | 3 |
|  | みつびし | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-Cyrillic |  | 9 | 6 | 3 | 9 | 6 | 3 | 3 | 2 | 1 |
|  | Сибирь | 9 | 6 | 3 | 9 | 6 | 3 | 3 | 2 | 1 |
| FT-SS-07-Latin |  | 18 | 15 | 3 | 18 | 15 | 3 | 6 | 5 | 1 |
|  | garçon | 9 | 6 | 3 | 9 | 6 | 3 | 3 | 2 | 1 |
|  | Schönheit | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-NoBOM |  | 39 | 27 | 12 | 39 | 27 | 12 | 13 | 9 | 4 |
|  | Россия | 9 | 6 | 3 | 9 | 6 | 3 | 3 | 2 | 1 |
|  | فلافل | 9 | 6 | 3 | 9 | 6 | 3 | 3 | 2 | 1 |
|  | 中國 | 9 | 3 | 6 | 9 | 3 | 6 | 3 | 1 | 2 |
|  | QuarterHorse | 12 | 12 | 0 | 12 | 12 | 0 | 4 | 4 | 0 |
| FT-SS-07-Norm |  | 75 | 39 | 36 | 75 | 39 | 36 | 25 | 13 | 12 |
|  | mañana (NFD) | 9 | 0 | 9 | 9 | 0 | 9 | 3 | 0 | 3 |
|  | libertà (NFD) | 9 | 0 | 9 | 9 | 0 | 9 | 3 | 0 | 3 |
|  | Mäuse (NFD) | 9 | 0 | 9 | 9 | 0 | 9 | 3 | 0 | 3 |
|  | inﬁnity (Ligature) | 9 | 0 | 9 | 9 | 0 | 9 | 3 | 0 | 3 |
|  | Mäuse (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | infinity (No Ligature) | 12 | 12 | 0 | 12 | 12 | 0 | 4 | 4 | 0 |
|  | mañana (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | libertà (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-RTL |  | 9 | 6 | 3 | 9 | 6 | 3 | 3 | 2 | 1 |
|  | الكسكس | 9 | 6 | 3 | 9 | 6 | 3 | 3 | 2 | 1 |
| FT-SS-09-Doc |  | 16 | 15 | 1 | 0 | 0 | 0 | 16 | 13 | 3 |
|  | longbow .html | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | shotgun Formatted .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | revolver .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | peroxide .docx | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | nitroglycerin Formatted .docx | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | rifle .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | crossbow Formatted .html | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | flintlock Formatted .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| FT-SS-09-Frag |  | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Washington | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | California | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FT-SS-09-Lost |  | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 |
|  | SecretKey | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | disconnected | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| FT-SS-09-MFT |  | 4 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 0 |
|  | bear | 4 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 0 |
| FT-SS-09-Meta |  | 6 | 5 | 1 | 6 | 5 | 1 | 2 | 2 | 0 |
|  | cañón | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 0 |
|  | thunderbird | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-10-Hex |  | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | tiger | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |

### Meta-Data results for Indexed Search of Windows Data Set

The following table presents search results for strings located in file system meta-data. The **Case** column identifies the test case, the **String** column identifies the search string, the **Partition** column identifies the partition (file system) where the string is located and the **Seen** column records if the search tool reported at least one instance of the string (yes or no) in meta-data.

| **Case** | **String** | **Partition** | **Seen** |
| --- | --- | --- | --- |
| FT-SS-09-Meta |  |  |  |
|  | thunderbird | ntfs | Yes |
|  | cañón | fat32 | No |
|  | cañón | exfat | No |
|  | cañón | ntfs | Yes |

### Comments on Indexed Search of Windows Data Set

The following table presents any comments recorded during testing for a test case.

| **Case** | **Comments** |
| --- | --- |
| FT-SS-02 | Hits on strings "WOLF", "Wolf" and "wolf" were reported twice. |
| FT-SS-07-CJK-char | The search was run more than once after re indexing and the results were inconsistent. Sometimes all strings were found, other times no strings were found and sometimes only the UTF-8 strings were found. |
| FT-SS-07-CJK-kana | Building an index was a problem. There were two possible options that could be selected: Japanese or Unicode Multi-lingual Plane. Selecting "Japanese" failed to produce an index and returned a "non-hex char" error. The other option worked once for "みつびし", but then would not yield any hits after re indexing later. No hits were returned for "スバル". |
| FT-SS-07-Latin | UTF-16 hits were reported twice. |
| FT-SS-07-RTL | No UTF-16-BE hits were reported. |
| FT-SS-09-MFT | Also listed in $MFT. |
| FT-SS-09-Meta | String IDs 2641 & 2645 in NTFS were probably matched, but the "Search Hits" did not show any context around the string hit. (Therefore the string ID of the hit was not visible.) |

### Results for Live Search of Windows Data Set

The table columns contain the following information:

* **Case** The test case identifier.
* **Expected String** The expected strings that should be reported by the search.
* **Active Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in an active file.
* **Deleted Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in a deleted file.
* **Unallocated Space** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in unallocated space.
* **Expected** The number of instances of the expected string found in the group (i.e., Active files, Deleted files or Unallocated space).
* **Hits** The number of times the expected string was found in the group.
* **Misses** The number of times the expected string was missed (not found) in the group.

Notes: If the row identifies a test case, then the results are a summary for all the strings that should be found.

In the Expected String column for test case FT-SS-09-DOC each string is labeled to indicate features of the expected string. The labels include the file type (.doc, .docx or .html), the encoding of the string in the .doc file and if the string has embedded formatting, labeled as Formatted, e.g., the string crossbow has the substring cross formatted as bold and underlined, i.e., **cross**bow.

| **Case** | **Expected String** | **Active Files** | | | **Deleted Files** | | | **Unalloc Space** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** |
| FT-SS-01 |  | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-02 |  | 15 | 15 | 0 | 15 | 15 | 0 | 5 | 5 | 0 |
|  | WOLF | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | Wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-03 |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | WOLF | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | Wolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-04 |  | 3 | 3 | 0 | 3 | 3 | 0 | 0 | 0 | 0 |
|  | tiger | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 0 | 1 |
| FT-SS-05 |  | 6 | 6 | 0 | 6 | 6 | 0 | 2 | 2 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-06 |  | 12 | 12 | 0 | 12 | 12 | 0 | 0 | 0 | 0 |
|  | fox | 15 | 12 | 3 | 15 | 12 | 3 | 5 | 0 | 5 |
| FT-SS-07-CJK-char |  | 18 | 18 | 0 | 18 | 18 | 0 | 6 | 6 | 0 |
|  | 中国 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 東京 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-CJK-hangul |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 서울 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-CJK-kana |  | 18 | 18 | 0 | 18 | 18 | 0 | 6 | 6 | 0 |
|  | スバル | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | みつびし | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-Cyrillic |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | Сибирь | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-Latin |  | 18 | 18 | 0 | 18 | 18 | 0 | 6 | 6 | 0 |
|  | garçon | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | Schönheit | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-NoBOM |  | 39 | 39 | 0 | 39 | 39 | 0 | 13 | 13 | 0 |
|  | Россия | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | فلافل | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | 中國 | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | QuarterHorse | 12 | 12 | 0 | 12 | 12 | 0 | 4 | 4 | 0 |
| FT-SS-07-Norm |  | 75 | 75 | 0 | 75 | 75 | 0 | 25 | 25 | 0 |
|  | mañana (NFD) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | infinity (No Ligature) | 12 | 12 | 0 | 12 | 12 | 0 | 4 | 4 | 0 |
|  | Mäuse (NFD) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | inﬁnity (Ligature) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | Mäuse (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | libertà (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | libertà (NFD) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | mañana (NFC) | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-07-RTL |  | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
|  | الكسكس | 9 | 9 | 0 | 9 | 9 | 0 | 3 | 3 | 0 |
| FT-SS-09-Doc |  | 16 | 15 | 1 | 0 | 0 | 0 | 16 | 13 | 3 |
|  | longbow .html | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | shotgun Formatted .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | revolver .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | peroxide .docx | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | nitroglycerin Formatted .docx | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | rifle .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | crossbow Formatted .html | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 1 |
|  | flintlock Formatted .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| FT-SS-09-Frag |  | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | Washington | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | California | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FT-SS-09-Lost |  | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 |
|  | SecretKey | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
|  | disconnected | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| FT-SS-09-MFT |  | 4 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 0 |
|  | bear | 4 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 0 |
| FT-SS-09-Meta |  | 6 | 6 | 0 | 6 | 6 | 0 | 2 | 2 | 0 |
|  | cañón | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | thunderbird | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-10-Hex |  | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | tiger | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
| FT-SS-10-Regex |  | 6 | 6 | 0 | 6 | 6 | 0 | 2 | 2 | 0 |
|  | DireWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |
|  | WereWolf | 3 | 3 | 0 | 3 | 3 | 0 | 1 | 1 | 0 |

### Meta-Data results for Live Search of Windows Data Set

The following table presents search results for strings located in file system meta-data. The **Case** column identifies the test case, the **String** column identifies the search string, the **Partition** column identifies the partition (file system) where the string is located and the **Seen** column records if the search tool reported at least one instance of the string (yes or no) in meta-data.

| **Case** | **String** | **Partition** | **Seen** |
| --- | --- | --- | --- |
| FT-SS-09-Meta |  |  |  |
|  | thunderbird | ntfs | Yes |
|  | cañón | fat32 | Yes |
|  | cañón | exfat | Yes |
|  | cañón | ntfs | Yes |

### Comments on Live Search of Windows Data Set

The following table presents any comments recorded during testing for a test case.

| **Case** | **Comments** |
| --- | --- |
| FT-SS-06 | UTF-16 strings are reported twice. |
| FT-SS-07-Latin | UTF-16 strings are reported twice. |
| FT-SS-07-NoBOM | UTF-16 strings for "QuarterHorse" are reported twice. |
| FT-SS-07-Norm | UTF-16 strings normalized as NFC are reported twice. |
| FT-SS-09-Doc | UTF-16 strings are reported twice. |
| FT-SS-09-Lost | UTF-16 strings are reported twice. |

## Results for Data Set: UNIX

This section provides results for the UNIX data set.

### Results for Other\_Physical Search of UNIX Data Set

The table columns contain the following information:

* **Case** The test case identifier.
* **Expected String** The expected strings that should be reported by the search.
* **Active Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in an active file.
* **Deleted Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in a deleted file.
* **Unallocated Space** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in unallocated space.
* **Expected** The number of instances of the expected string found in the group (i.e., Active files, Deleted files or Unallocated space).
* **Hits** The number of times the expected string was found in the group.
* **Misses** The number of times the expected string was missed (not found) in the group.

Notes: If the row identifies a test case, then the results are a summary for all the strings that should be found.

In the Expected String column for test case FT-SS-09-DOC each string is labeled to indicate features of the expected string. The labels include the file type (.doc, .docx or .html), the encoding of the string in the .doc file and if the string has embedded formatting, labeled as Formatted, e.g., the string crossbow has the substring cross formatted as bold and underlined, i.e., **cross**bow.

| **Case** | **Expected String** | **Active Files** | | | **Deleted Files** | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** |
| FT-SS-01 |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-02 |  | 20 | 20 | 0 | 20 | 20 | 0 |
|  | WOLF | 4 | 4 | 0 | 4 | 4 | 0 |
|  | wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | Wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-03 |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | WOLF | 4 | 4 | 0 | 4 | 4 | 0 |
|  | wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | Wolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-04 |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | tiger | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-05 |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-06 |  | 16 | 0 | 16 | 16 | 0 | 16 |
|  | fox | 20 | 0 | 20 | 20 | 0 | 20 |
| FT-SS-07-CJK-char |  | 24 | 24 | 0 | 24 | 24 | 0 |
|  | 中国 | 12 | 12 | 0 | 12 | 12 | 0 |
|  | 東京 | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-CJK-hangul |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | 서울 | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-CJK-kana |  | 24 | 24 | 0 | 24 | 24 | 0 |
|  | スバル | 12 | 12 | 0 | 12 | 12 | 0 |
|  | みつびし | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-Cyrillic |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | Сибирь | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-Latin |  | 24 | 24 | 0 | 24 | 24 | 0 |
|  | garçon | 12 | 12 | 0 | 12 | 12 | 0 |
|  | Schönheit | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-NoBOM |  | 52 | 52 | 0 | 52 | 52 | 0 |
|  | Россия | 12 | 12 | 0 | 12 | 12 | 0 |
|  | فلافل | 12 | 12 | 0 | 12 | 12 | 0 |
|  | 中國 | 12 | 12 | 0 | 12 | 12 | 0 |
|  | QuarterHorse | 16 | 16 | 0 | 16 | 16 | 0 |
| FT-SS-07-Norm |  | 100 | 100 | 0 | 100 | 100 | 0 |
|  | mañana (NFD) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | infinity (No Ligature) | 16 | 16 | 0 | 16 | 16 | 0 |
|  | Mäuse (NFD) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | inﬁnity (Ligature) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | Mäuse (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | libertà (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | libertà (NFD) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | mañana (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-RTL |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | الكسكس | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-09-Doc |  | 16 | 14 | 2 | 0 | 0 | 0 |
|  | longbow .html | 2 | 2 | 0 | 0 | 0 | 0 |
|  | shotgun Formatted .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | revolver .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | peroxide .docx | 2 | 1 | 1 | 0 | 0 | 0 |
|  | nitroglycerin Formatted .docx | 2 | 1 | 1 | 0 | 0 | 0 |
|  | rifle .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | crossbow Formatted .html | 2 | 2 | 0 | 0 | 0 | 0 |
|  | flintlock Formatted .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 |
| FT-SS-09-Meta |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | cañón | 4 | 4 | 0 | 4 | 4 | 0 |
|  | thunderbird | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-10-Hex |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | tiger | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-10-Regex |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |

### Meta-Data results for Other\_Physical Search of UNIX Data Set

The following table presents search results for strings located in file system meta-data. The **Case** column identifies the test case, the **String** column identifies the search string, the **Partition** column identifies the partition (file system) where the string is located and the **Seen** column records if the search tool reported at least one instance of the string (yes or no) in meta-data.

| **Case** | **String** | **Partition** | **Seen** |
| --- | --- | --- | --- |
| FT-SS-07-CJK-char |  |  |  |
|  | 中国 | osxj | Yes |
|  | 中国 | osxc | Yes |
|  | 中国 | apfs | Yes |
|  | 東京 | osxj | Yes |
|  | 東京 | osxc | Yes |
|  | 東京 | apfs | Yes |
| FT-SS-07-Cyrillic |  |  |  |
|  | Сибирь | osxj | Yes |
|  | Сибирь | osxc | Yes |
|  | Сибирь | apfs | Yes |
| FT-SS-07-NoBOM |  |  |  |
|  | فلافل | osxj | Yes |
|  | فلافل | osxc | Yes |
|  | فلافل | apfs | Yes |
|  | Россия | osxj | Yes |
|  | Россия | osxc | Yes |
|  | Россия | apfs | Yes |
|  | 中國 | osxj | Yes |
|  | 中國 | osxc | Yes |
|  | 中國 | apfs | Yes |
| FT-SS-07-RTL |  |  |  |
|  | الكسكس | osxj | Yes |
|  | الكسكس | osxc | Yes |
|  | الكسكس | apfs | Yes |
| FT-SS-09-Meta |  |  |  |
|  | thunderbird | osxj | Yes |
|  | thunderbird | osxc | Yes |
|  | thunderbird | apfs | Yes |
|  | thunderbird | ext4 | Yes |
|  | cañón | ext4 | Yes |

### Comments on Other\_Physical Search of UNIX Data Set

The following table presents any comments recorded during testing for a test case.

| **Case** | **Comments** |
| --- | --- |
| FT-SS-06 | Tool crashes. page protection fault. |
| FT-SS-07-Latin | UTF-16 encoded strings are reported twice. |
| FT-SS-07-NoBOM | UTF-16 strings for "QuarterHorse" are reported twice. |
| FT-SS-07-Norm | Searches do not use Unicode normalization on the search string. Strings normalized as NFC are reported twice. |
| FT-SS-09-Doc | UTF-16 strings are reported twice. |

### Results for Indexed Search of UNIX Data Set

The table columns contain the following information:

* **Case** The test case identifier.
* **Expected String** The expected strings that should be reported by the search.
* **Active Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in an active file.
* **Deleted Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in a deleted file.
* **Unallocated Space** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in unallocated space.
* **Expected** The number of instances of the expected string found in the group (i.e., Active files, Deleted files or Unallocated space).
* **Hits** The number of times the expected string was found in the group.
* **Misses** The number of times the expected string was missed (not found) in the group.

Notes: If the row identifies a test case, then the results are a summary for all the strings that should be found.

In the Expected String column for test case FT-SS-09-DOC each string is labeled to indicate features of the expected string. The labels include the file type (.doc, .docx or .html), the encoding of the string in the .doc file and if the string has embedded formatting, labeled as Formatted, e.g., the string crossbow has the substring cross formatted as bold and underlined, i.e., **cross**bow.

| **Case** | **Expected String** | **Active Files** | | | **Deleted Files** | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** |
| FT-SS-01 |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-02 |  | 20 | 20 | 0 | 20 | 20 | 0 |
|  | WOLF | 4 | 4 | 0 | 4 | 4 | 0 |
|  | wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | Wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-03 |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | WOLF | 4 | 4 | 0 | 4 | 4 | 0 |
|  | wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | Wolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-04 |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | tiger | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-05 |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-06 |  | 16 | 0 | 16 | 16 | 0 | 16 |
|  | fox | 20 | 0 | 20 | 20 | 0 | 20 |
| FT-SS-07-CJK-char |  | 24 | 8 | 16 | 24 | 8 | 16 |
|  | 中国 | 12 | 4 | 8 | 12 | 4 | 8 |
|  | 東京 | 12 | 4 | 8 | 12 | 4 | 8 |
| FT-SS-07-CJK-hangul |  | 12 | 0 | 12 | 12 | 0 | 12 |
|  | 서울 | 12 | 0 | 12 | 12 | 0 | 12 |
| FT-SS-07-CJK-kana |  | 24 | 0 | 24 | 24 | 0 | 24 |
|  | スバル | 12 | 0 | 12 | 12 | 0 | 12 |
|  | みつびし | 12 | 0 | 12 | 12 | 0 | 12 |
| FT-SS-07-Cyrillic |  | 12 | 8 | 4 | 12 | 8 | 4 |
|  | Сибирь | 12 | 8 | 4 | 12 | 8 | 4 |
| FT-SS-07-Latin |  | 24 | 20 | 4 | 24 | 20 | 4 |
|  | garçon | 12 | 8 | 4 | 12 | 8 | 4 |
|  | Schönheit | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-NoBOM |  | 52 | 36 | 16 | 52 | 36 | 16 |
|  | Россия | 12 | 8 | 4 | 12 | 8 | 4 |
|  | فلافل | 12 | 8 | 4 | 12 | 8 | 4 |
|  | 中國 | 12 | 4 | 8 | 12 | 4 | 8 |
|  | QuarterHorse | 16 | 16 | 0 | 16 | 16 | 0 |
| FT-SS-07-Norm |  | 100 | 45 | 55 | 100 | 45 | 55 |
|  | mañana (NFD) | 12 | 0 | 12 | 12 | 0 | 12 |
|  | libertà (NFD) | 12 | 0 | 12 | 12 | 0 | 12 |
|  | Mäuse (NFD) | 12 | 0 | 12 | 12 | 0 | 12 |
|  | inﬁnity (Ligature) | 12 | 0 | 12 | 12 | 0 | 12 |
|  | Mäuse (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | infinity (No Ligature) | 16 | 13 | 3 | 16 | 13 | 3 |
|  | mañana (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | libertà (NFC) | 12 | 8 | 4 | 12 | 8 | 4 |
| FT-SS-07-RTL |  | 12 | 8 | 4 | 12 | 8 | 4 |
|  | الكسكس | 12 | 8 | 4 | 12 | 8 | 4 |
| FT-SS-09-Doc |  | 16 | 15 | 1 | 0 | 0 | 0 |
|  | longbow .html | 2 | 2 | 0 | 0 | 0 | 0 |
|  | shotgun Formatted .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | revolver .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | peroxide .docx | 2 | 2 | 0 | 0 | 0 | 0 |
|  | nitroglycerin Formatted .docx | 2 | 2 | 0 | 0 | 0 | 0 |
|  | rifle .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | crossbow Formatted .html | 2 | 1 | 1 | 0 | 0 | 0 |
|  | flintlock Formatted .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 |
| FT-SS-09-Meta |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | cañón | 4 | 4 | 0 | 4 | 4 | 0 |
|  | thunderbird | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-10-Hex |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | tiger | 4 | 4 | 0 | 4 | 4 | 0 |

### Meta-Data results for Indexed Search of UNIX Data Set

The following table presents search results for strings located in file system meta-data. The **Case** column identifies the test case, the **String** column identifies the search string, the **Partition** column identifies the partition (file system) where the string is located and the **Seen** column records if the search tool reported at least one instance of the string (yes or no) in meta-data.

| **Case** | **String** | **Partition** | **Seen** |
| --- | --- | --- | --- |
| FT-SS-07-CJK-char |  |  |  |
|  | 中国 | osxj | Yes |
|  | 中国 | osxc | Yes |
|  | 中国 | apfs | Yes |
|  | 東京 | osxj | Yes |
|  | 東京 | osxc | Yes |
|  | 東京 | apfs | Yes |
| FT-SS-07-Cyrillic |  |  |  |
|  | Сибирь | osxj | Yes |
|  | Сибирь | osxc | Yes |
|  | Сибирь | apfs | Yes |
| FT-SS-07-NoBOM |  |  |  |
|  | فلافل | osxj | Yes |
|  | فلافل | osxc | Yes |
|  | فلافل | apfs | Yes |
|  | Россия | osxj | Yes |
|  | Россия | osxc | Yes |
|  | Россия | apfs | Yes |
|  | 中國 | osxj | Yes |
|  | 中國 | osxc | Yes |
|  | 中國 | apfs | Yes |
| FT-SS-07-RTL |  |  |  |
|  | الكسكس | osxj | Yes |
|  | الكسكس | osxc | Yes |
|  | الكسكس | apfs | Yes |
| FT-SS-09-Meta |  |  |  |
|  | thunderbird | osxj | Yes |
|  | thunderbird | osxc | Yes |
|  | thunderbird | apfs | Yes |
|  | thunderbird | ext4 | Yes |
|  | cañón | ext4 | Yes |

### Comments on Indexed Search of UNIX Data Set

The following table presents any comments recorded during testing for a test case.

| **Case** | **Comments** |
| --- | --- |
| FT-SS-06 | Tool hangs & crashes. |
| FT-SS-07-CJK-hangul | Tool crashed. |
| FT-SS-07-CJK-kana | Failed to index; hung & crash. |
| FT-SS-07-Cyrillic | No hits on UTF-16-BE. |
| FT-SS-07-NoBOM | No UTF-16-BE returned for Arabic & Russian. No UTF-16 returned for Traditional Chinese. |

### Results for Live Search of UNIX Data Set

The table columns contain the following information:

* **Case** The test case identifier.
* **Expected String** The expected strings that should be reported by the search.
* **Active Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in an active file.
* **Deleted Files** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in a deleted file.
* **Unallocated Space** A group of three columns (**Expected, Hits and Misses**) giving the number of hits and misses when searching for the expected string in unallocated space.
* **Expected** The number of instances of the expected string found in the group (i.e., Active files, Deleted files or Unallocated space).
* **Hits** The number of times the expected string was found in the group.
* **Misses** The number of times the expected string was missed (not found) in the group.

Notes: If the row identifies a test case, then the results are a summary for all the strings that should be found.

In the Expected String column for test case FT-SS-09-DOC each string is labeled to indicate features of the expected string. The labels include the file type (.doc, .docx or .html), the encoding of the string in the .doc file and if the string has embedded formatting, labeled as Formatted, e.g., the string crossbow has the substring cross formatted as bold and underlined, i.e., **cross**bow.

| **Case** | **Expected String** | **Active Files** | | | **Deleted Files** | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Expected** | **Hits** | **Misses** | **Expected** | **Hits** | **Misses** |
| FT-SS-01 |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-02 |  | 20 | 20 | 0 | 20 | 20 | 0 |
|  | WOLF | 4 | 4 | 0 | 4 | 4 | 0 |
|  | wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | Wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-03 |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | WOLF | 4 | 4 | 0 | 4 | 4 | 0 |
|  | wolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | Wolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-04 |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | tiger | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-05 |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-06 |  | 16 | 16 | 0 | 16 | 16 | 0 |
|  | fox | 20 | 16 | 4 | 20 | 16 | 4 |
| FT-SS-07-CJK-char |  | 24 | 24 | 0 | 24 | 24 | 0 |
|  | 中国 | 12 | 12 | 0 | 12 | 12 | 0 |
|  | 東京 | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-CJK-hangul |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | 서울 | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-CJK-kana |  | 24 | 24 | 0 | 24 | 24 | 0 |
|  | スバル | 12 | 12 | 0 | 12 | 12 | 0 |
|  | みつびし | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-Cyrillic |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | Сибирь | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-Latin |  | 24 | 24 | 0 | 24 | 24 | 0 |
|  | garçon | 12 | 12 | 0 | 12 | 12 | 0 |
|  | Schönheit | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-NoBOM |  | 52 | 52 | 0 | 52 | 52 | 0 |
|  | Россия | 12 | 12 | 0 | 12 | 12 | 0 |
|  | فلافل | 12 | 12 | 0 | 12 | 12 | 0 |
|  | 中國 | 12 | 12 | 0 | 12 | 12 | 0 |
|  | QuarterHorse | 16 | 16 | 0 | 16 | 16 | 0 |
| FT-SS-07-Norm |  | 100 | 100 | 0 | 100 | 100 | 0 |
|  | mañana (NFD) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | infinity (No Ligature) | 16 | 16 | 0 | 16 | 16 | 0 |
|  | Mäuse (NFD) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | inﬁnity (Ligature) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | Mäuse (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | libertà (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | libertà (NFD) | 12 | 12 | 0 | 12 | 12 | 0 |
|  | mañana (NFC) | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-07-RTL |  | 12 | 12 | 0 | 12 | 12 | 0 |
|  | الكسكس | 12 | 12 | 0 | 12 | 12 | 0 |
| FT-SS-09-Doc |  | 16 | 15 | 1 | 0 | 0 | 0 |
|  | longbow .html | 2 | 2 | 0 | 0 | 0 | 0 |
|  | shotgun Formatted .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | revolver .doc UTF-16 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | peroxide .docx | 2 | 2 | 0 | 0 | 0 | 0 |
|  | nitroglycerin Formatted .docx | 2 | 2 | 0 | 0 | 0 | 0 |
|  | rifle .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 |
|  | crossbow Formatted .html | 2 | 1 | 1 | 0 | 0 | 0 |
|  | flintlock Formatted .doc UTF-8 | 2 | 2 | 0 | 0 | 0 | 0 |
| FT-SS-09-Meta |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | cañón | 4 | 4 | 0 | 4 | 4 | 0 |
|  | thunderbird | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-10-Hex |  | 4 | 4 | 0 | 4 | 4 | 0 |
|  | tiger | 4 | 4 | 0 | 4 | 4 | 0 |
| FT-SS-10-Regex |  | 8 | 8 | 0 | 8 | 8 | 0 |
|  | DireWolf | 4 | 4 | 0 | 4 | 4 | 0 |
|  | WereWolf | 4 | 4 | 0 | 4 | 4 | 0 |

### Meta-Data results for Live Search of UNIX Data Set

The following table presents search results for strings located in file system meta-data. The **Case** column identifies the test case, the **String** column identifies the search string, the **Partition** column identifies the partition (file system) where the string is located and the **Seen** column records if the search tool reported at least one instance of the string (yes or no) in meta-data.

| **Case** | **String** | **Partition** | **Seen** |
| --- | --- | --- | --- |
| FT-SS-07-CJK-char |  |  |  |
|  | 中国 | osxj | Yes |
|  | 中国 | osxc | Yes |
|  | 中国 | apfs | Yes |
|  | 東京 | osxj | Yes |
|  | 東京 | osxc | Yes |
|  | 東京 | apfs | Yes |
| FT-SS-07-Cyrillic |  |  |  |
|  | Сибирь | osxj | Yes |
|  | Сибирь | osxc | Yes |
|  | Сибирь | apfs | Yes |
| FT-SS-07-NoBOM |  |  |  |
|  | فلافل | osxj | Yes |
|  | فلافل | osxc | Yes |
|  | فلافل | apfs | Yes |
|  | Россия | osxj | Yes |
|  | Россия | osxc | Yes |
|  | Россия | apfs | Yes |
|  | 中國 | osxj | Yes |
|  | 中國 | osxc | Yes |
|  | 中國 | apfs | Yes |
| FT-SS-07-RTL |  |  |  |
|  | الكسكس | osxj | Yes |
|  | الكسكس | osxc | Yes |
|  | الكسكس | apfs | Yes |
| FT-SS-09-Meta |  |  |  |
|  | thunderbird | osxj | Yes |
|  | thunderbird | osxc | Yes |
|  | thunderbird | apfs | Yes |
|  | thunderbird | ext4 | Yes |
|  | cañón | ext4 | Yes |

### Comments on Live Search of UNIX Data Set

The following table presents any comments recorded during testing for a test case.

| **Case** | **Comments** |
| --- | --- |
| FT-SS-07-Latin | Hits on strings encoded UTF-16 are reported twice. |
| FT-SS-07-NoBOM | UTF-16 hits for "QuarterHorse" are reported twice. |
| FT-SS-07-Norm | No Unicode normalization. Strings normalized as NFC and without a ligature encoded as UTF-16 are reported twice. Some strings are not found unless searched for alone without any other strings included in the search. |

END of REPORT