

**METHOD AND SYSTEM FOR SECURE COMPUTER FILE MANAGEMENT
AND STORAGE HAVING HIGH LEVEL OF USABILITY**

5

FIELD OF THE INVENTION

The present invention relates to method and system of secure computer file management and storage for use in desktop and mobile computing environments applicable to desktop computers, laptops, smart phones and tablet computing devices. More particularly, said computer file management and storage provides strong cryptographical protection of user data with support of multimedia annotations, which permit easy file organization and efficient search of said protected data for accomplishing high level of usability.

20

BACKGROUND OF THE INVENTION

While cryptography has been widely used to protect personal and business data from unauthorized access, cryptographically protected files are hard for computers to search and users to handle, particularly when the contents, names, descriptions and attributes pertaining to the files are encrypted. Usability and security have been widely reckoned as compromising to each other.

30

For the sake of increased productivity and easier file handling, many users tend to overlook and even neglect data security and privacy. Unprotected data, both personal and corporate, has been the target of malicious codes and intruders.

The scale of financial and reputational damages incurred from security breaches has been escalating.

Existing practices address the problem with indexing and query using content related keywords and tags. Many users incorporate plaintext keywords as part of the file name of an encrypted file, or tag a file with short descriptions.

There are many limitations curtailing the use of file names, keywords and tags. File names pose limits on character types and length of name strings. In desktop, mobile smart phone and mobile tablet computing environments, keywords and tags are dependent of file types and operating systems. As an example, keywords entered as part of a file of the Portable Document Format (PDF) cannot be directly used in searches by native file browsers of major operating systems. In addition, tags cannot be added to a Windows folder containing a group of related files. Furthermore, adding keywords and tags to a large number of individual files is very time consuming, inconvenient and very often incomprehensible because of the limited contextual information keywords and tags can carry.

US7689547 has disclosed a method in which the hash values of keyword strings are used for search of encrypted data.

US2009/0300351 has described a means of using an encrypted index derived from keywords defined by the file owner.

US7484092 has disclosed a technique which relies on keywords and file names as indexing information for speeding up search of encrypted files.

30

While keyword indexing can speed up file search processing, there is a need for a secure computer filing and storage sys-

tem which readily allows users to handle their encrypted information with ease. The present invention provides method and system for searchable and secure computer file management and storage having high level of usability. Said computer
5 file management allows the attachment of detailed information of any multimedia format to individual files and groups of files of any format, for augmenting the information stored in said files, and for enhancing usability in terms of file search, readability, operating-system neutral and ease of ex-
10 porting the encrypted files to remote storage.

SUMMARY OF THE INVENTION

15 The present application provides method and system for secure computer file management and storage having high level of usability.

A method of secure computer file management and storage is
20 provided. In the method, a computer file of digital content is managed in a computing environment for accomplishing data security against unauthorized access, for ensuring efficient and ease of search by users of the computing environment, and for attaining high level of usability.

25 The method begins with associating at least one file-level multimedia note with the computer file for providing descriptive information, supplementing the content and enhancing ease of handling and search of the computer file. The method
30 further associates at least one group-level multimedia note with the computer file for providing descriptive information, supplementing the content and enhancing ease of handling and search of the computer file together with a plurality of oth-

er computer files grouped together by the users. The computer file, file-level and group-level multimedia notes are protected cryptographically against unauthorized access.

5 The users may comprise human individuals, computer tools and applications in communication and interfaced with the secure computer file management and storage. The computing environment may be any computer operating systems capable of executing the tasks and activities performed by the users, and the
10 computer operating systems may be installed and executing on any fixed and mobile devices including desktop computers, portable computers, tablet computers and mobile smart phones. The computer file may be of any formats supported by the computing environment, and said any formats comprise content-
15 specific and application-specific formats compliant to any open and proprietary standards. The cryptographically protected computer file may be assigned a file name different from its original file name such that deriving the original file name from the assigned file name is impossible. The assigned
20 file name may comprise at least one randomly generated alphanumeric string.

The original file name and attributes of the computer file, together with the names, storage locations, time stamps and
25 other attributes of the cryptographically protected computer file, the file-level multimedia notes and the group-level multimedia notes are cross-referenced, and the cross-reference information is cryptographically protected and stored in suitable means including computer registers, files
30 and database records.

The file-level and group-level multimedia notes support sub-notes of any multimedia formats including text, audio, image and video. Each of the non-text multimedia sub-notes of the file-level and group-level multimedia notes comprises at least one multimedia file of any non-text format. The text sub-notes of the file-level and group level multimedia notes comprise a combination of contents created by users, information extracted from file attributes of the computer file and information generated automatically based upon time, date, location and any information deemed suitable. The text sub-notes may support hyperlinks which point to any of the file-level and group-level multimedia notes, and external locations including directories and folders in the computing environment, website addresses and Internet Protocol addresses. The text sub-notes may further support the use of all available character sets, font sizes, font types, font colours, bookmarks, highlights and other features typically performed by document editors, and the text sub-notes have no limitation in the number of characters used.

20

The text and non-text information in the file-level and group-level multimedia notes can be searched and compared against search criteria specified by the users, and the search results deemed sufficiently close and related to the search criteria are outputted to the computing environment in data files or interfaced to applicable computer applications. The text information searched comprises user created content, extracted file attributes, automatically generated information, said original file name, bookmarks, hyperlinks, font characteristics, highlights, note subjects and categories. The search of non-text information comprises techniques employed for image and facial recognition applicable to files

30

comprising image and video data, speech recognition and voice recognition applicable to files comprising audio data. The search results comprise names, attributes and content of the identified files and the associated file-level and group-level multimedia notes. A dedicated graphical user interface may be used to create, edit, browse and search the file-level multimedia notes and group-level multimedia notes, and display the search results based upon the user-specified search criteria.

10

The cryptographically protected computer file, file-level and group-level multimedia notes are stored in permanent memory, whereas temporarily decrypted files, associated multimedia notes, and other non-permanent data may be stored in volatile memory which erases its stored data upon removal of power supply.

15

A system for secure computer file management and storage is provided. The system comprises a computer application which is executed in a computing environment for managing computer files to accomplish data security against unauthorized access, ensure efficient and ease of search by users, and attain high level of usability. Each of the computer files is associated with at least one file-level multimedia note for providing descriptive information, supplementing the content and enhancing ease of handling and search of the computer file. Furthermore, each of the computer files is associated with at least one group-level multimedia note for providing descriptive information, supplementing the content and enhancing ease of handling and search of the computer file and a plurality of other computer files grouped together by the users. The computer files, the file-level and group-level

20

25

30

multimedia notes are cryptographically protected against unauthorized access.

The file-level and group-level multimedia notes support sub-
5 notes of any multimedia formats including text, audio, image
and voice formats, with text sub-notes comprising a combination
of contents created by users, information extracted from
file attributes of the computer files and information generated
10 automatically based upon time, date, location and any
information deemed suitable. The text sub-notes further support
hyperlinks, bookmarks, highlights and all the available
font sizes, font types, font colours and character sets,
whereas non-text multimedia sub-notes comprise multimedia
files of any non-text format.

15 The text and non-text information in the file-level and
group-level multimedia notes are searchable against user-
specified criteria, which comprise text segments, file names,
hyperlinks, font characteristics, highlights and bookmarks,
20 and the search criteria further comprising parameters associated
with image, speech and voice recognition. The computer
application may comprise a dedicated graphical user interface
for users to create, edit, browse and search the file-level
multimedia notes and group-level multimedia notes, and display
25 search results based upon the user-specified search criteria.

The cryptographically protected computer files, file-level
and group-level multimedia notes are stored in permanent
30 memory, and other non-permanent data may be stored in volatile
memory which erases its stored data upon removal of power
supply.

BRIEF DESCRIPTION

5 Embodiments according to the present invention will now be described with reference to the following figures, in which like reference numerals denote like elements.

10 FIG. 1 illustrates a searchable and secure computer file management and storage system managing a plurality of computer files by means of at least one shared group-level multimedia note, and each of said computer files being further associated with at least one file-level multimedia note,

15 FIG. 2 illustrates a secure cross-reference register linking the essential information pertaining to an encrypted computer file managed in the system of FIG. 1,

20 FIG. 3 shows a process flow executed by said secure file management system of FIG. 1 to protect a computer file cryptographically,

25 FIG. 4 shows an embodiment of an interactive computer application for users to perform note editing, browsing, and searching of cryptographically protected data managed in the system of FIG. 1, and

30 FIG. 5 shows a process flow for searching through cryptographically protected computer files managed by the system of FIG. 1.

DETAILED DESCRIPTION

5 The present invention may be understood more readily by reference to the following detailed description of certain embodiments of the invention.

FIG. 1 illustrates a searchable and secure computer file management and storage system 100 (hereinafter referred to as "secure file management system") managing a plurality of computer files of digital content 110 for accomplishing data security against unauthorized access while maintaining high level of usability in terms of file management, handling and information search. Said secure file management system 100 associates said computer files 110 collectively with at least one group-level multimedia note 130. Each of said computer files 110 is further associated with at least one file-level multimedia note 120.

20 Said secure file management system 100 executes in a computer environment comprising any computer operating system capable of executing all the required computing tasks and related user-specific and application-specific computing activities.

25 Said computing environment executes on any fixed and mobile user devices including desktop computers, portable computers, tablet computers and mobile smart phones. Said computer operating system includes but not limited to Windows, Linux, Mac, Unix, Android and iOS.

30 Said file-level multimedia note 120 comprises a plurality of text sub-notes 122 and non-text multimedia sub-notes 124, each of which serves to provide descriptive information, sup-

plement the content of its associated computer file 110, as well as facilitate file search. Said group-level multimedia note 130 comprises a plurality of text sub-notes 132 and non-text multimedia sub-notes 134, which serve to provide descriptive information, supplement the content of said computer files 110 grouped together by said users, as well as facilitate file search.

Without loss of generality, users comprise human individuals and computer applications in communication and interfaced with the secure file management system 100.

Said computer files 110 can be of any formats as long as they are supported in said computing environment in which said secure file management system 100 executes. Said any formats include all content-specific and application-specific formats compliant to open and proprietary standards.

Said file-level multimedia notes 120 and group-level multimedia notes 130 support sub-notes of any multimedia formats including text, audio, image and video.

Said text sub-notes 122 & 132 comprise contents created by users, information extracted from file attributes of said computer files 110 and information generated automatically based upon time, date, location and any information deemed suitable. Furthermore, said text sub-notes 122 & 132 support hyperlinks which point to any of said file-level and group-level multimedia notes 120 & 130, and external locations including directories and folders of said computing environment, website addresses and Internet Protocol addresses accessible from web browsers and related computer applications.

In addition, said text sub-notes 122 & 132 support the use of all available character sets, font sizes and types, font colours, bookmarks, highlights and other features performed by typical document editors. Besides, there is no limitation in the number of characters used.

Each of said non-text multimedia sub-notes 124 & 134 of file-level and group-level multimedia notes 120 & 130 comprises at least one multimedia file of any non-text format.

10

All text sub-notes 122 & 132 and non-text multimedia sub-notes 124 & 134 can be created, edited, browsed (140) and searched (150) by said users.

15 Said computer files 110, file-level multimedia notes 120 and group-level multimedia notes 130 are protected cryptographically before they are transferred to permanent memory, such as computer hard disks, for storage.

20 As an illustration, a movie file is protected cryptographically by said secure file management system 100 of the present invention. In order to accomplish high level of security and usability, the user may enter text description about the movie in the text sub-note 122 of said file-level multimedia note 120. Information about the plot and reviews of the movie may be recorded in said text sub-note. The user may attach photographic image files of the actors and an audio file carrying an interview of the lead actors as the non-text multimedia sub-note 124 of said file-level multimedia note 120.

25 30 The user may group this movie file with other movies produced by the same director using a group-level multimedia note 130. The user may enter the biographical data of the director as

the text sub-note 132, and attach photographic image files of the director as non-text multimedia sub-notes 134 of said group-level multimedia note 130.

5 FIG. 2 illustrates a secure cross-reference register 200 linking the essential information pertaining to any of the computer files 110 stored in the secure file management system 100. Said register 200 comprises first sub-register 220
10 storing the name and other attributes of the original computer file, which is the unprotected version of said computer file 110. Said cross-reference register 200 further comprises second sub-register 230 which stores the name, the location of storage, time stamps and other attributes of the cryptographically protected computer file 110. Said protected com-
15 puter file 110 is assigned a file name different from its original file name such that deriving the original file name from the assigned file name is impossible. Said assigned file name may comprise at least one randomly generated alphanumeric string.

20

Upon completing the process of protecting said original computer file cryptographically, said secure file management system 100 prompts the user to erase said original computer file. Alternatively, said secure file management system 100
25 performs erasure of the original file automatically. The algorithm used to erase the original file may comprise zeroization and overwriting of said original and unprotected file with randomized data such that said original computer file is not recoverable.

30

Said cross-reference register 200 further comprises third sub-register 240 which stores the identifier, the location of

storage, time stamps and other attributes of the file-level multimedia note 120 associated with said computer file 110. Said register 200 further comprises fourth sub-register 240 which stores the identifier, the location of storage, time
5 stamps and other attributes of the group-level multimedia note 120 associated with said computer file together with other computer files grouped by the users.

The information stored in said cross-reference register 200
10 is cryptographically protected and written to store in permanent computer memory as files, database records or any suitable means and formats.

FIG. 3 shows the process flow 300 executed by said secure
15 file management system 100 to secure an unprotected computer file. The process begins with step 310 in which the user selects a computer file of any format, followed by steps 320 & 330 in which the user creates a text sub-note 122 and inserts a non-text multimedia sub-note 124 respectively to form the
20 file-level multimedia note 120 associated with said unprotected computer file. Next, the user selects an existing group-level multimedia note 130 to associate with said unprotected computer file in step 340, after which the user can edit the text and non-text multimedia sub-notes 132 & 134 of
25 said selected group-level multimedia note 130. Alternatively, the user creates a new group-level multimedia note 130 in step 350. Next in step 360, said secure file management system 100 encrypts the unprotected computer file, said file-level and group-level multimedia notes 120 & 130 with either
30 the same cryptographic key or using one key for protecting said unprotected computer file and another key for encrypting said multimedia notes 120 & 130. Next, process 300 advances

to step 370 in which said secure file management system 100 writes the names and other file attributes of said unprotected computer file, generated file name of the encrypted computer file 110, file-level multimedia notes and group level multimedia notes 120 & 130 in said cross-reference register 200, which is securely stored in protected file or database formats.

Said cryptographic encryption key can be of any type provided that it is sufficiently strong against attacks. For instance, the public cryptographic key of an asymmetric cryptography key pair may be used to encrypt said unprotected computer file and multimedia notes 120 & 130, whereas the private key of said key pair is used to decrypt the encrypted files and notes. The secret private key can be protected in a dedicated file, database or external storage using passwords and additional authentication factors including one-time-passwords and biometric verification techniques.

FIG. 4 shows an embodiment of an interactive computer application 400 comprising a graphical user interface for users to perform note creation, editing, browsing, and searching of cryptographically protected data filed in said secure file management system 100.

Said computer application 400 comprises a search engine which accepts user-specified search criteria 470. The text and non-text information in said file-level and group-level multimedia notes 120 & 130 can be searched and compared against said user-entered search criteria 470. Search results that are sufficiently close to said search criteria 470 are outputted to the graphical user interface for display, written to dedi-

cated files or interfaced to other computer applications which initiate the search.

Searchable text information comprises any text content of
5 said file-level and group-level multimedia notes 120 & 130.
Said searchable text information includes user created contents, information extracted from file attributes of said computer files 110, information generated automatically based upon time, date and location, and original file name of said
10 computer file 110. Said searchable text information further comprises note subjects, note categories, bookmarks, hyperlinks, highlights and font characteristics used in said file-level and group-level multimedia notes 120 & 130.

15 Search of non-text information comprises techniques employed for image and facial recognition applicable to files storing image and video data, speech recognition and voice recognition applicable to files storing audio data.

20 Search results comprise original file names and attributes of said computer files 110 identified in a search, together with the respective file-level and group-level multimedia notes 120 & 130 associated with said identified files.

25 Said computer application 400 may display said search results as a file list in an appropriate area 480 of its graphical user interface. Users may select any of said identified files from said file list 480 to view its associated multimedia notes. The lists of file-level and group level multimedia
30 notes 120 & 130 associated with any of the listed identified files are respectively displayed as file-level note list 440 and group-level note list 410. The content of said text sub-

notes 122 & 132 of said group-level and file-level multimedia notes are displayed respectively in text-note editors 450 & 420. Said text-note editors 450 & 420 carry the functionalities of common document editors supporting the use of available font types, styles, sizes, colours, bookmarks and hyperlinks. Bookmarks allow quick access when users activate dedicated function buttons provided in the graphical user interface. Hyperlinks provide a convenient means for users to navigate to any of said file-level and group-level multimedia notes 120 & 130, and external locations including directories and folders of said computing environment, website addresses and Internet Protocol addresses accessible from web browsers and related computer applications. Non-text multimedia subnotes of said file-level and group-level multimedia notes 120 & 130 are displayed respectively in multimedia note areas 460 & 430. Users may select and play any of said displayed multimedia notes in areas 460 & 430 by means of appropriate computer applications launched external to said secure file management system 100. Alternatively, said displayed multimedia notes may be viewed directly in the graphical user interface by means of appropriate computer applications pre-integrated with said secure file management system 100. Content of any listed file identified 480 by said computer application 400 may be selected to display in an appropriate area 490 in the graphical interface.

Said search results may also be outputted to said computing environment in data files or interfaced to other applicable computer applications.

30

Creation of the file-level multimedia note 120 can be accomplished with user selecting a computer file, followed by ac-

tivating a dedicated function button on said graphical user interface to launch said text note editor 450 for the user to enter the text information as text sub-note 122. Users can further add multimedia files from file folders, cameras and
5 any other sources as non-text multimedia sub-notes 124.

Creation of the group-level multimedia note 130 can be accomplished with user selecting a computer file, followed by activating a dedicated function button on said graphical user
10 interface to launch said text note editor 420 for the user to enter the text information as text sub-note 132. Users can further add multimedia files from file folders, cameras and any other sources as non-text multimedia sub-notes 134.

15 FIG. 5 shows a process flow 500 for searching through cryptographically protected files in said secure file management system 100 to identify files which sufficiently match user-specified search criteria entered in said interactive computer application 400. The process begins with users entering
20 search criteria in step 510, which comprises text segments associated with said file-level and group-level multimedia notes 120 & 130, note subjects, note categories, bookmarks, hyperlinks and highlights. Search criteria further comprises non-text information including image, audio and video samples
25 for use by the search engine of said secure file management system 100 to identify the intended objects, persons, spoken texts or speakers. In the next step 520, the search engine temporarily decrypts all the protected file-level and group-level multimedia notes 120 & 130 and searches through all the
30 sub-notes 122, 124, 132 & 134 in step 530. The contents of said file-level and group-level multimedia notes 120 & 130 can be indexed and stored in a secure database. Indexing may

involve the process of scanning the original content, discarding content that carries little contextual information, and retaining the remaining content for scanning in searches. Indexed content, if available, is used to complement and speed up searches in step 522. Next, the process advances to step 540 in which computer files 110 associated with multimedia notes 120 & 130 which have contents sufficiently close to said search criteria are identified and listed in appropriate area of said graphical user interface 480. Moreover, the associated file-level and group-level multimedia notes 120 & 130 are displayed in appropriate areas of said graphical user interface 410, 420, 430, 440, 450 & 460. Should the search (530) fail to identify any computer file, all prior search results displayed are cleared in step 550.

Temporarily decrypted information is contained within the secure environment of said secure file management system 100 against unauthorized access. In one embodiment of implementing said secure environment, all temporarily decrypted files and multimedia notes, and all other non-permanent data are stored in volatile memory which loses all its stored data upon removal of power supply.

In summary, the present invention provides a method and system for searchable and secure file management and storage having high level of usability. Computer files 110 in a desktop, portable or mobile environment are associated with file-level and group-level notes 120 & 130 of text and non-text multimedia formats. The multimedia notes 120 & 130 serve to augment the content and enhance ease of handling and search of the computer files 110. All computer files and multimedia notes are cryptographically protected against unauthorized

access. Text sub-notes 122 & 132 support a plurality of searchable features including font characteristics, bookmarks, hyperlinks and highlights. Non-text multimedia sub-notes 124 & 134 comprise files of any multimedia formats. A
5 computer application 400 with dedicated graphical interface may be used for users to create, edit, browse and search said file-level and group-level multimedia notes 120 & 130, and display search results based upon user-specified search criteria, which comprise text segments associated with note sub-
10 jects, note categories, bookmarks, hyperlinks, text highlights and text content of said file-level and group-level multimedia notes 120 & 130. Search criteria further comprises non-text information including image, audio and video samples for use to identify the intended objects, persons, spoken
15 texts or speakers.

Although the above description contains much specificity, these should not be construed as limiting the scope of the embodiments but merely providing illustration of the foreseeable
20 able embodiments. Especially the above stated advantages of the embodiments should not be construed as limiting the scope of the embodiments but merely to explain possible achievements if the described embodiments are put into practise. Thus, the scope of the embodiments should be determined by
25 the claims and their equivalents, rather than by the examples given.

CLAIMS

1. A method of secure computer file management and storage,
wherein
5 a computer file of digital content is managed in a
computing environment for accomplishing data security
against unauthorized access, for ensuring efficient and
ease of search by users of said computing environment,
and for attaining high level of usability, and
10 the method comprising the steps of
 associating at least one file-level multimedia note
with said computer file for providing descriptive infor-
mation, supplementing the content and enhancing ease of
handling and search of said computer file, and
15 associating at least one group-level multimedia
note with said computer file for providing descriptive
information, supplementing the content and enhancing
ease of handling and search of said computer file to-
gether with a plurality of other computer files grouped
20 together by said users, and
 protecting cryptographically said computer file,
said file-level and group-level multimedia notes against
unauthorized access.
- 25 2. The method of claim 1, wherein
 said users comprising human individuals, computer
tools and applications in communication and interfaced
with said secure computer file management and storage.
- 30 3. The method of claims 1 or 2, wherein
 said computing environment being any computer oper-
ating systems capable of executing the tasks and activi-

ties performed by said users, and said computer operating systems being installed and executing on any fixed and mobile devices including desktop computers, portable computers, tablet computers and mobile smart phones.

5

4. The method of claim 1, wherein

said computer file is of any formats supported by said computing environment, and said any formats comprising content-specific and application-specific formats compliant to any open and proprietary standards.

10

5. The method of claim 1, wherein

said cryptographically protected computer file being assigned a file name different from its original file name such that deriving the original file name from the assigned file name is impossible.

15

6. The method of claim 5, wherein

said assigned file name comprising at least one randomly generated alphanumeric string.

20

7. The method of claims 1 or 5, wherein

the original file name and attributes of said computer file, together with the names, storage locations, time stamps and other attributes of said cryptographically protected computer file, said file-level multimedia notes and said group-level multimedia notes being cross-referenced, and the cross-reference information being cryptographically protected and stored in suitable means including computer registers, files and database records.

25

30

8. The method of claim 1, wherein
said file-level and group-level multimedia notes
supporting sub-notes of any multimedia formats including
text, audio, image and video.
- 5
9. The method of claim 8, wherein
each of the non-text multimedia sub-notes of said
file-level and group-level multimedia notes comprising
at least one multimedia file of any non-text format.
- 10
10. The method of claim 8, wherein
the text sub-notes of said file-level and group
level multimedia notes comprising a combination of con-
tents created by users, information extracted from file
15 attributes of said computer file and information gener-
ated automatically based upon time, date, location and
any information deemed suitable.
11. The method of claim 10, wherein
20 said text sub-notes supporting hyperlinks which
point to any of said file-level and group-level multime-
dia notes, and external locations including directories
and folders in said computing environment, website ad-
dresses and Internet Protocol addresses.
- 25
12. The method of claims 8 or 10, wherein
said text sub-notes supporting the use of all
available character sets, font sizes, font types, font
colours, bookmarks, highlights and other features typi-
cally performed by document editors, and said text sub-
30 notes having no limitation in the number of characters
used.

13. The method of claims 1 or 2 wherein
the text and non-text information in said file-
level and group-level multimedia notes being searched
5 and compared against search criteria specified by said
users, and the search results deemed sufficiently close
and related to the search criteria being outputted to
said computing environment in data files or interfaced
to applicable computer applications.
10
14. The method of claims 5, 10, 11, 12 or 13, wherein
said text information searched comprising said user
created content, said extracted file attributes, said
automatically generated information, said original file
15 name, said bookmarks, hyperlinks, font characteristics,
highlights, note subjects and categories.
15. The method of claims 13 wherein
said search of non-text information comprising
20 techniques employed for image and facial recognition ap-
plicable to files storing image and video data, speech
recognition and voice recognition applicable to files
storing audio data.
- 25 16. The method of claim 13 wherein
said search results comprising names, attributes
and content of the identified files and said associated
file-level and group-level multimedia notes.
- 30 17. The method of claims 1, 10, 13, 14, 15 or 16 wherein
a dedicated graphical user interface being used to
create, edit, browse and search said file-level multime-

dia notes and group-level multimedia notes, and display said search results based upon said user-specified search criteria.

- 5 18. The method of claim 1, wherein
- said cryptographically protected computer file,
file-level and group-level multimedia notes being stored
in permanent memory, whereas temporarily decrypted
files, associated multimedia notes, and other non-
10 permanent data being stored in volatile memory which
erases its stored data upon removal of power supply.
19. A system for secure computer file management and storage
comprising
- 15 a computer application being executed in a compu-
ting environment for managing computer files to accom-
plish data security against unauthorized access, ensure
efficient and ease of search by users, and attain high
level of usability, wherein
- 20 each of said computer files being associated with
at least one file-level multimedia note for providing
descriptive information, supplementing the content and
enhancing ease of handling and search of said computer
file,
- 25 each of said computer files being associated with
at least one group-level multimedia note for providing
descriptive information, supplementing the content and
enhancing ease of handling and search of said computer
file and a plurality of other computer files grouped to-
30 gether by said users, and

said computer files, said file-level and group-level multimedia notes being cryptographically protected against unauthorized access.

5 20. The system of claim 19, wherein

said file-level and group-level multimedia notes supporting sub-notes of any multimedia formats including text, audio, image and voice formats, with

10 text sub-notes comprising a combination of contents created by users, information extracted from file attributes of said computer files and information generated automatically based upon time, date, location and any information deemed suitable, and said text sub-notes supporting hyperlinks, bookmarks, highlights and all the
15 available font sizes, font types, font colours and character sets, and

non-text multimedia sub-notes comprising multimedia files of any non-text format.

20 21. The system of claim 20, wherein

said text and non-text information in said file-level and group-level multimedia notes being searchable against user-specified criteria, which comprise text segments, file names, hyperlinks, font characteristics,
25 highlights and bookmarks, and said search criteria further comprising parameters associated with image, speech and voice recognition.

22. The system of claims 19, 20 or 21, wherein

30 said computer application comprising a dedicated graphical user interface for users to create, edit, browse and search said file-level multimedia notes and

group-level multimedia notes, and display search results based upon said user-specified search criteria.

23. The system of claim 19, wherein

5 said cryptographically protected computer files,
file-level and group-level multimedia notes being stored
in permanent memory, and other non-permanent data being
stored in volatile memory which erases its stored data
upon removal of power supply.

10