Claims

1. A method for sending and receiving file via e-mail among a plurality of e-mail clients via a server and a plurality of slice stores comprising:

creating an e-mail on a first of said plurality of e-mail clients;

slicing file in said created e-mail to form a plurality of slices using a secret matrix;

transmitting each of said plurality of slices to various ones of said plurality of slice stores;

generating a proxy attachment containing information of said sliced file;

replacing said file in said e-mail with said proxy attachment;

generating an attachment information wherein said attachment information comprises: an attachment ID; said secret matrix, e-mail address of said plurality of e-mail clients, and a session key;

transmitting said~~an~~ attachment information to said server; ~~and~~

transmitting said e-mail to a plurality of recipients from said plurality of e-mail clients, wherein a file size of said proxy attachment is smaller than a file size of said file;

receiving a request from one of said plurality of e-mail clients to retrieve said file, wherein said request includes said attachment ID, *a*, and a list of slice IDs, $S = \{S_1, S_2, \ldots, S_n\}$;

in response to receiving said request to retrieve said file, said server performs the following steps:

retrieving said attachment information according to said request;

generating a list of download information based on the retrieved attachment information;

transmitting said list of download information to said one of said plurality of e-mail clients;

receiving a request from one of said plurality of e-mail clients to retrieve said secret matrix;

in response to receiving said request from said one of said plurality of e-mail clients to retrieve said secret matrix, said server performs the following steps:

determining said one of said plurality of e-mail clients server has obtained a minimum number of slices required for combining said slices; and

transmitting said secret matrix in response to said determination that said one of said plurality of e-mail clients server has obtained a minimum number of slices required for combining said slices.

~~2. The method according to claim 1 further comprising generating said attachment information wherein said attachment information comprises: an attachment ID; said secret matrix, e-mail address of said plurality of e-mail clients, and a session key.~~

23. The method according to claim 1 wherein in response to receiving said attachment information from said first of said plurality of e-mail clients, said server performs the following steps:

creating a new file entry in a persistent storage of said server.

34. The method according to claim 23 further comprising storing said attachment information in said new file entry in said persistent storage of said server.

45. The method according to claim 1 further comprising:

determining said file size of said file is above a predetermined file size.

56. The method according to claim 1 wherein said proxy attachment comprises an attachment ID, *a*; IDs of each of said plurality of slices, $S = \{S_1, S_2, \ldots, S_n\}$ where S is said plurality of slices and n is the number of slices said file has been sliced into; a minimum number of slices, m, needed to re-combine the file where $m<n$; a checksum for each of said plurality of slices; e-mail address of each of said plurality of e-mail clients, $R = \{r_1, r_2, r_3, \ldots r_i\}$, wherein R is the set of recipient e-mail address, $r_1, r_2, r_3, \ldots r_i$ are the e-mail address of each of said recipient; a session key for authentication; and server ID, α, containing an IP address of said server.

~~7. The method according to claim 6 wherein in response to receiving said e-mail by a one of said plurality of e-mail clients used by one of said plurality of recipients, said one of said plurality of e-mail clients performs the following step:~~

~~transmitting a request to said server for retrieving said file, wherein said request includes said attachment ID, a, and a list of slice IDs, $S = \{S_1, S_2, \ldots, S_n\}$.~~

~~8. The method according to claim 5 wherein in response to receiving said request for retrieving said file, said server performs the following steps:~~

~~retrieving said attachment information according to said request;~~

~~generating a list of download information based on the retrieved attachment information; and~~

~~transmitting said list of download information to said one of said plurality of e-mail clients.~~

6~~9~~. The method according to claim 1~~8~~ wherein said list of download information comprises:

$D(a,s_i)=\{I_{i,r}\}$, where *a* is the attachment ID, s_i is the slice ID, $I_{i,r}$ is the IP address of recipient, *r*, having i^{th} slice, and $i=\{1,2,3...,n\}$ is the number of slices available for download.

7~~10~~. The method according to claim 1~~8~~ wherein in response to receiving said download information from said server, said one of said plurality of e-mail clients performs the following step:

retrieving said plurality of slices based on said list of download information.

8~~11~~. The method according to claim 7~~10~~ wherein said step of retrieving said plurality of slices comprises:

scanning said list of download information;

removing download information from said list of download information which has already been retrieved;

selecting a subset of download information;

determining if each of said download information in said selected subset of download information has more than one IP address; and

re-ordering said IP addresses in response to determining that each of said download information remaining in said list of download information has more than one IP address.

912. The method according to claim 811 wherein said step of re-ordering said IP addresses comprises:

determining a download cost for said IP addresses in each of said download information in said selected subset of download information;

arranging said IP addresses in each of said download information according to lowest download cost to highest download cost.

1013. The method according to claim 912 wherein said step of determining said download cost comprises:

pinging each of said IP address to determine a download speed of each of the IP address.

1114. The method according to claim 1013 wherein said step of pinging is a simple Internet Control Message Protocol (ICMP) ping.

1215. The method according to claim 912 wherein said step of retrieving said file comprises:

retrieving each of said slices of said selected subset of download information from an IP address having a lowest download cost.

1316. The method according to claim 1215 further comprising:

monitoring for one of said slices in said subset of download information being retrieved; and

determining a validity of said slice being retrieved.

14~~17~~. The method according to claim 13~~16~~ wherein said step of determining said validity of said slice retrieved comprising:

calculating a checksum for said slice retrieved;

determining said checksum is valid based on a checksum in said proxy attachment; and

removing said retrieve slice in response to said slice being not valid.

15~~18~~. The method according to claim 13~~16~~ wherein said step of determining said validity of said slice retrieved comprising:

calculating a checksum for said slice retrieved;

determining said checksum is valid based on a checksum in said proxy attachment; and

updating said server on retrieval of said retrieve slice in response to said slice being valid.

16~~19~~. The method according to any one of claims 14~~17~~ and 15~~18~~ wherein said step of retrieving said file further comprises:

determining all slices of said subset of download information are retrieved

determining a total number of slices retrieved in response to said determination that all slices of said subset of download information are retrieved;

comparing said total number of slices with said *m* in said proxy attachment;

generating a request for said secret matrix in response to said total number of slices being equal to or more than said *m* in said proxy attachment; and

transmitting said request to said server.

~~20. The method according to claim 19 wherein in response to receiving said request for said secret matrix, said server performs the following steps:~~

~~retrieving said secret matrix associated to said request from a persistent storage of said server;~~

~~transmitting said secret matrix to said one of said plurality of e-mail clients.~~

~~21. The method according to claim 20 wherein in response to receiving said secret matrix from said server, said one of said plurality of e-mail clients performs the following step:~~

~~re-combining said slices based on said secret matrix to form said file.~~

1722. The method according to claim 811 wherein said step of retrieving said file further comprises:

retrieving said slices of said selected subset of download information from said at least one slice store in response to determining that only one IP address is available.

1823. The method according to claim 1723 further comprising:

monitoring for one of said slices in said subset of download information being retrieved; and

determining a validity of said slice being retrieved.

1924. The method according to claim 1823 wherein said step of determining said validity of said slice retrieved comprising:

calculating a checksum for said slice retrieved;

determining said checksum is valid based on a checksum in said proxy attachment; and

removing said retrieve slice in response to said slice being not valid.

2025. The method according to claim 1823 wherein said step of determining said validity of said slice retrieved comprising:

calculating a checksum for said slice retrieved;

determining said checksum is valid based on a checksum in said proxy attachment; and

updating said server on retrieval of said retrieve slice in response to said slice being valid.

2126. The method according to any one of claims 1924 and 2025 wherein said step of retrieving said file further comprises:

determining all slices of said subset of download information are retrieved;

determining a total number of slices retrieved in response to said determination that all slices of said subset of download information are retrieved;

comparing said total number of slices with said *m* in said proxy attachment;

generating a request for said secret matrix in response to said total number of slices being equal to or more than said *m* in said proxy attachment; and

transmitting said request to said server.

~~27. The method according to claim 26 wherein in response to receiving said request for said secret matrix, said server performs the following steps:~~

~~retrieving said secret matrix from said persistent storage;~~

~~transmitting said secret matrix to said one of said plurality of e-mail clients.~~

~~28. The method according to claim 27 wherein in response to receiving said secret matrix from said server, said one of said plurality of e-mail clients performs the following step:~~

~~re-combining said slices based on said secret matrix to form said file.~~

22. The method according to claim 5, wherein said step of determining said one of said plurality of e-mail clients has obtained a minimum number of slices required for combining said slices by said server comprises:

determining a number of slices retrieved by said one of said plurality of e-mail clients;

comparing said number of slices with said *m* in said attachment information;

retrieving said secret matrix from said attachment information in response to said number of slices being equal to or more than *m*.

22. The method according to claim 22 wherein in response to receiving said secret matrix from said server, said one of said plurality of e-mail clients performs the following step:

re-combining said slices based on said secret matrix to generate said file.