

A File Transfer System

Field of the Invention

- 5 The present invention relates to a file transfer system for transferring a file over a network.

Background of the Invention

- 10 It is known to share a file between a source and a destination across a network by wirelessly connecting a destination device to a source device and transferring the file to the destination device using any suitable file transfer protocol. Should the connection between the
- 15 source and destination devices be lost, the file transfer operation can be re-commenced by reconnecting the destination device to the source device since a partially complete file is stored at the destination device.
- 20 It is also known to transfer files using a BitTorrent file sharing protocol wherein a destination device potentially connects to multiple source devices with each source device transferring a different piece of the desired file to the destination device. As with the above direct
- 25 connection arrangement, if a connection is lost between the destination device and all of the source devices, the file transfer process can be continued by reconnecting to one or more of the source devices.
- 30 However, with each of the above known file transfer arrangements, the partially complete file is required to be present on a destination device in order to continue and complete the file transfer operation.

Summary of the Invention

In accordance with a first aspect of the present

invention, there is provided a file transfer system for transferring a file from a source to a destination, the file having a plurality of file pieces, the system comprising:

5 a source memory arranged to store data indicative of a file desired to be transferred to a destination;

 a source network interface arranged to facilitate transfer of data indicative of pieces of the file to and from the source memory;

10 a plurality of destination memories, each destination memory having an associated destination network interface arranged to facilitate transfer of data indicative of pieces of the file to and from the destination memory when the source network interface is in networked communication
15 with the destination network interface;

 the system being arranged such that when a source network interface is in networked communication with a destination network interface, at least one file piece is transferred from the source memory associated with the
20 source network interface to the destination memory associated with the destination network interface if the file piece has not already been transferred to any destination memory; and

 the system being arranged to retrieve the file pieces
25 stored in the destination memories, and to combine the retrieved file pieces together to recreate the desired file at the destination.

In one embodiment, the system comprises a source device
30 comprising the source memory and the source network interface.

In one embodiment, the source device is movable such that by moving the source device the source network interface
35 is connectable in networked communication with any of the plurality of destination network interfaces.

In one embodiment, the system comprises a plurality of source devices, and the respective source network interfaces of the source devices together form a source network. In one arrangement, the source network is an ad
5 hoc network which may be a wireless ad hoc network.

In one embodiment, each source device has an associated file desired to be transferred to a destination, and the system may be arranged to copy the files to all other
10 source devices on the source network such that each source memory includes all files associated with the source devices. The files may be transferred between the source devices using a BitTorrent type protocol, and with this arrangement each source device may comprise a source peer
15 and at least one source device may comprise a source tracker arranged to maintain a record of the files present on the source devices. The source tracker may be incorporated into a source peer.

20 In one embodiment, the system comprises a plurality of source networks, each source network comprising at least one source device.

The system may be arranged such that each source device
25 has an associated unique identifier, which may be a unique IP address.

The or each source network interface may comprise a source wireless network interface which may comprise a source
30 wireless access point. The or each destination network interface may comprise a destination wireless network interface which may comprise a destination wireless access point.

35 In one arrangement, the respective destination network interfaces together form a destination network. In one arrangement, the destination network is a fixed network.

In one embodiment, the source network interfaces are movable such that by moving the source network interfaces the source network interfaces are connectable in networked communication with any of the plurality of destination
5 network interfaces.

The system may be arranged such that when a network communication is established between a source network interface and a destination network interface, the source
10 network and the destination network do not merge.

In one embodiment, each destination network interface is of predetermined type and the system is arranged such that all destination network interfaces of the same type have
15 the same associated identifier, which may be the same IP address.

In one embodiment, each source device is associated with a mode of transport in a mass transport system and the
20 destination network interfaces are associated with stop/terminals in the mass transport system.

In one arrangement, the modes of transport comprise trains, buses and/or ferries.
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In one embodiment, each source device is associated with a carriage of a train, and at least some destination network interfaces are associated with a train station. At least one of the destination network interfaces may be
30 associated with a train depot.

In one arrangement, each destination memory has an associated plurality of destination network interfaces. In an embodiment wherein the source devices are disposed
35 on a train carriage and the destination memories are associated with train stations and/or train depots, the

plurality of destination network interfaces may be distributed along the station and/or depot in order to ensure establishment of a network communication between a source network interface and a destination network interface when the train arrives at the station or depot.

The system may further comprise a central device, which may comprise a central peer, in networked communication with the destination network interfaces and arranged to retrieve the file pieces stored in the destination memories, and to combine the retrieved file pieces together to recreate the or each file.

The system may be arranged such that file pieces are transferred between the source network and one or more destination memories using a BitTorrent type protocol, and with this arrangement each destination memory may have an associated destination peer. The system may further comprise a destination tracker connected to the destination network, the destination tracker arranged to maintain a record of the files present on the source devices. The destination tracker may be incorporated into a destination peer or the central peer.

In one embodiment, at least some of the source devices have an associated camera arranged to produce still and/or video images and to store in the or each respective source memory image files indicative of the images. In an embodiment wherein the source devices are disposed on a train carriage, the images may be indicative of inside the train carriage.

The or each camera may be arranged to produce images only when the train is between stations.

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In accordance with a second aspect of the present invention, there is provided a method of transferring a

file from a source to a destination, the file having a plurality of file pieces, the method comprising:

storing data indicative of a file desired to be transferred to a destination in a source memory;

5 providing a source network interface arranged to facilitate transfer of data indicative of pieces of the file to and from the source memory;

providing a plurality of destination memories;

10 providing each destination memory with an associated destination network interface arranged to facilitate transfer of data indicative of pieces of the file to and from the destination memory when the source network interface is in networked communication with the destination network interface;

15 connecting a source network interface in networked communication with a destination network interface,

transferring at least one file piece from the source memory associated with the source network interface to the destination memory associated with the destination network interface if the file piece has not already been
20 transferred to any destination memory;

retrieving the file pieces stored in the destination memories; and

25 combining the retrieved file pieces together to recreate the desired file at the destination.

Brief Description of the Drawings

30 The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram illustrating operation of an example file transfer system according to an embodiment of the present invention;

35 Figure 2 is a block diagram of a file transfer system in accordance with an embodiment of the present invention with a roving network of the system shown at a first

location;

Figure 3 is a schematic block diagram of the file transfer system as shown in Figure 2 with the roving network shown in at a second location;

5 Figure 4 is a schematic block diagram of a roving network according to an embodiment of the present invention;

Figure 5 shows a carriage settings table used by the file transfer system shown in Figures 2 and 3;

10 Figure 6 shows a station settings table used by the file transfer system shown in Figures 2 and 3;

Figure 7 is a flow diagram illustrating a file transfer process occurring at the roving network in an embodiment of the present invention; and

15 Figure 8 is a flow diagram illustrating operation of an example file transfer operation occurring between the roving network and a fixed network.

Description of an Embodiment of the Invention

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Referring to Figure 1 of the drawings, there is shown a file transfer system 10 for transferring a file from a source device to a destination device.

25 The file transfer system 10 is represented in terms of a fixed network 12 referred to as a "hive" and one or more ad hoc roving networks 14 each referred to as a "swarm".

30 In this example, the hive 12 comprises a plurality of worker peers 16, and a plurality of wireless access points 18, each wireless access point 18 being associated with a worker peer 16. The hive 12 also includes a worker tracker 20, and at least one queen peer 22.

35 The worker peers 16, the worker tracker 20 and the queen peers 22 connect together in a networked relationship, in this example through a Wide Area Network (WAN) such as the

Internet 23.

Each swarm 14 comprises a plurality of ad hoc peers 24, a wireless access point 26, and an ad hoc tracker 28. The
5 ad hoc peers 24 are connected together through an ad hoc network 30.

When a swarm 14 is in close enough proximity to the hive 12, a wireless link is established between the swarm 14
10 and the hive 12 and, whilst the communication link exists, pieces of a file desired to be transferred from the swarm to the hive are downloaded to a worker peer 16 in the hive 12. When the connection is lost and a subsequent
15 connection is made between the swarm and the hive, further file pieces are transferred from the swarm to the same or a different worker peer 16 of the hive.

After receipt of all file pieces by the hive, a queen peer 22 downloads the completed file pieces and the queen peer
20 22 joins the file pieces together to recreate the original file.

The invention is particularly applicable to a mass transport system comprising a plurality of definable
25 stops/terminals wherein it is desired to transfer files from modes of transport in the mass transport system through the stops to a destination in communication with the stops.

30 In an example implementation, the hive is associated with stations/depots of a transport system and each swarm is associated with a mode of transport on the transport system, such as a train, bus or ferry on the transport system.

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In the following detailed example of a file transfer system 31, the hive is associated with a plurality of

stations/depots in a rail transport system, and the swarms are associated with trains in the transport system. However, while the present invention is described in the following example in relation to a system for transferring
5 a file from a train through a train station to a destination, it will be understood that the invention has broader application to any arrangement wherein a file is desired to be transferred from a source to a destination and the source is connectable to any one of multiple
10 network interfaces in communication with the destination.

A file desired to be transferred from a swarm to the hive is located on a source device, in this example located on a carriage 32 of a train 34, to a destination device, in
15 this example a central device referred to as a central peer 36 remotely disposed relative to the source device 32 and associated with train stations/depots, as shown in Figures 2 and 3.

20 The destination device is in networked communication with a plurality of station devices referred to in this example as station peers 38, each station peer being located at a station 40 at which the train 34 may stop during a journey. In this example, the station peers 38 and the
25 central peer 36 form part of a fixed inter-station network 42.

In this example, each station 40 is provided with a local station network 44 having a plurality of station wireless
30 access points 46 which may be distributed along a station platform so as to ensure that a connection will be possible between at least one carriage 32 of a train 34 and the local station network 44 when the train arrives at the station 40.

35 Each station 40 also includes a station memory 48 for storing file pieces downloaded from the carriages as

discussed in more detail below. The station memory 48 is shown separate to the station peer 38, although it will be understood that the station memory may as an alternative be incorporated into the station peer 38.

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The system 31 also includes a station tracker 72 connected to the fixed network 42, the station tracker 72 being arranged to maintain a record of all files on the carriage memories 64.

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It will be appreciated that although Figures 2 and 3 show 3 stations 40 forming part of a train journey, at least one of the stations may be a train depot.

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Referring to Figure 4, each source device is a network enabled device referred to in this example as a carriage peer 60 and the carriage peers 60a, 60b, 60c together form a roving network which is capable of connecting to the fixed network 42 when the train 34 is at located at a station 40a, 40b, 40c.

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The roving network in this example is in the form of an ad hoc network whereby the carriage peers 60 connect directly to each other to form the network. Each carriage peer has a unique IP address so that each carriage peer is distinguishable from other carriage peers in the same and other ad hoc networks associated with the system.

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In the present example, each of the carriage peers 60a, 60b, 60c is capable of wirelessly connecting to a station peer 38a, 38b, 38c when the train 34 stops at a station 30a, 40b, 40c and transferring at least part of a file from the carriage peer 40a, 40b, 40c to a station peer 38a, 38b, 38c associated with the station.

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In the present example, the files to be transferred from the carriages 32 to the station peers 38 and ultimately to

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the central peer 36 are video files created at each carriage 32 using a camera 62a, 62b, 62c. The created video files are stored in respective memories 64a, 64b, 64c provided on the carriages 32a, 32b, 32c. The carriage
5 memories 64 are shown separate to the carriage peers 40, although it will be understood that each carriage memory 64 may as an alternative be incorporated into a carriage peer 40.

10 Each carriage 32a, 32b, 32c also includes a carriage wireless access point 66a, 66b, 66c under control of a respective carriage peer 40a, 40b, 40c for facilitating wireless transfer of data and files to and from the carriage peer 40a, 40b, 40c.

15 The carriage peers 40 are arranged such that video files produced by the respective cameras 62 and stored in the respective memories 64 are copied to the other memories 64 so that each memory 64 has a copy of all video files. In
20 this example, this occurs using a BitTorrent type protocol wherein a carriage tracker 68 located on one of the carriages maintains a record of the files present on each memory 64, in this example in the form of meta files, and each of the carriage peers 40 connects to the carriage
25 tracker 68 in order to derive information indicative of the other carriage peers 40 and of the video files stored on the memories 64 associated with the other carriage peers 40.

30 While in the present example a carriage tracker 68 is provided to maintain a record of the files present on each memory 64, other arrangements are possible. For example, a carriage peer 40 may be configured so as to also function as a carriage tracker.

35 In this example, the carriage peers 40, the carriage tracker 68, the station peers 38, the central peer 36 and

the station tracker 52 are implemented using suitable computing devices, such as personal computers.

Referring to Figure 5, a carriage settings table 80 is shown which includes a plurality of carriage fields 82 and associated user definable values 84. The purpose of the carriage settings table 80 is to record values usable by the system 10 to define specific features of operation of the roving network, and to facilitate modification of the values 82 by an authorised user. In the present example, the carriage settings table 80 defines values including a carriage address range to scan in order to locate and connect the carriage peers 40 to the ad hoc network, the IP addresses of the station peers, how often to attempt a connection to a station peer, the IP address of the depot, and the size of the file pieces to be transferred.

Referring to Figure 6, a station settings table 90 is shown which includes a plurality of station fields 92 and associated user definable values 94. The purpose of the station settings table 90 is to record values usable by the system 10 to define specific features of operation of the fixed network, and facilitate modification of the values 92 by an authorized user. In the present example, the station settings table 90 defines values including the station address range to scan in order to locate and connect the station peers to the fixed network, and the server type indicative of whether the server is a station peer, a depot peer or the central peer.

An example implementation will now be described with reference to the example shown in Figures 2 to 6.

An ad hoc network is established between all available carriage peers 40 by scanning the carriage IP address range defined in the carriage settings table 80, and a list of available carriage peers is created.

According to a predefined period of time defined in the carriage settings table 80, a check is periodically carried out to determine whether all carriage peers 40 specified in the carriage peers list are still present, and if no response is received from any of the carriage peers 40, the or each affected carriage peer is deleted from the carriage peer list.

According to a predefined period of time defined in the carriage settings table 80, a check is periodically carried out to determine whether a wireless communications link can be established between a carriage peer 40 and a station peer 38. If a connection is established, a file transfer protocol is initiated between the connected carriage peer and the station peer.

According to a predefined period of time defined in the carriage settings table 80, a check is periodically carried out to determine whether a wireless communications link can be established between a carriage peer 40 and a depot peer. If a connection is established, a file transfer protocol is initiated between the connected carriage peer and the depot peer.

The ad hoc network is arranged such that when a station peer is connected to the ad hoc network, the connected station peer always has the same IP address. Similarly, when a depot peer is connected to the ad hoc network, the connected depot peer always has the same IP address. In this way, the carriage peers 40 and the carriage tracker 68 are able to easily identify and communicate with a station peer 38.

It will be understood that the system may be arranged such that each of the station and depot peers also has an IP address associated with the fixed network and the fixed IP

address may be used as a backup by the carriage peers to establish a wireless connection between a carriage peer 40 and a station or depot peer if connection to the station depot peer using an IP address associated with the ad hoc network fails.

The ad hoc carriage network and the fixed station network are arranged such that, unlike a conventional ad hoc network, when a connection is made between a carriage peer and a station peer, the ad hoc network and the fixed network do not merge and instead remain separate except for the communications link between the carriage peer and the station peer.

Figure 7 shows a flow diagram illustrating steps of a file transfer process occurring at the ad hoc network in an embodiment of the present invention.

During operation, a train travels along a route including a plurality of stations 40a, 40b, 40c and between stations the cameras 62a, 62b, 62c gather video information from inside the respective carriages 32a, 32b, 32c and store corresponding video files in the respective memories 64a, 64b, 64c.

Each carriage peer 40 creates a meta file including information indicative of characteristics of the video file derived from the carriage camera 62 associated with the carriage peer 40 and the meta file is communicated to the carriage tracker 68 and from the carriage tracker 68 to the other carriage peers 40 associated with the ad hoc network 50. The meta file defines the name of the video file, the length of the video file, the IP address of the carriage peer 40, a start timestamp, an end timestamp, the number of pieces in the file, and a check reference SHA1 usable to determine whether a transferred meta data file includes an error. In this example, the meta file is of

the following format:

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d4:SHA120:ed3:leni[length of video File] e4:pleni
[pieces length] e2:IP15:[IP address of origin]
5 8:priorityi[0/1]e4:name[length of filename]:
[filename]5:start19:[dd/mm/yyyy hh:mm:ss start of
video file]3:end19:[dd/mm/yyyy hh:mm:ss end of video
file]3:pcs[Num pieces*20]:[SHA1 of pieces]
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10 Each carriage peer 40 sends a new connection request including a carriage peer identifier to each of the other carriage peers 40 having a SHA1 reference corresponding to a sought after file and the carriage peers 40 receiving the connection request communicate a reply indicating that

15 the connection request has been received. The requesting carriage peer 40 then sends a bitfield indicative of the file pieces which have not yet been transferred to the relevant other carriage peers 40, and the relevant other carriage peers send a bitfield to the requesting carriage

20 peer indicative of the file pieces possessed by the other carriage peers. Using this information, the requesting carriage peer then begins downloading missing file pieces from the other carriage peers. When downloading of a file piece is complete, a message is communicated from the

25 requesting carriage peer to the other carriage peers so that the carriage peers can maintain an up to date record of the locations of the file pieces. This continues until all carriage peers have all file pieces for all video files.

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Each carriage peer 40 is configured to attempt to commence file transfer with a station peer when the associated carriage arrives at a station or at a depot, and after every 3 seconds when the carriage peer 40 is connected to

35 a station peer 38.

Figure 8 shows a flow diagram 130 illustrating steps 132

to 148 of an example file transfer operation occurring between the ad hoc network and the fixed network.

When the train 14 arrives at a first station 40a, as shown
5 in Figure 2, a wireless communications link is established between a first station peer 38a at the first station 40a and one or more of the carriage peers 40a, 40b, 40c using the station wireless access points 26a and the carriage wireless access points 66a. The ad hoc network publishes
10 to the fixed network all meta data files that have not already been acknowledged by the fixed network, and the fixed network acknowledges the new meta data files if the calculated SHA1 for each of the meta data files matches the SHA1 included in the file. The first station peer 38a
15 then downloads from the carriage tracker 68 the new meta files indicative of the new files present on the memories 64 and forwards the new meta files to the station tracker 52. The new meta data files are then downloaded by the station peers 38 and the central peer 36, so that the
20 station peers 38 and the central peer 36 are cognisant of the files stored at each carriage 32. Each carriage then sends a bitfield to the first station peer 38a indicative of the file pieces which have not yet been transferred to any station peer. The first station peer 38a then checks
25 which pieces have not been completed and begins to download from one or more of the memories 64 pieces of the video files that have not already been downloaded and stores the downloaded file pieces in the first station memory 28a.

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When downloading of a file piece is complete, a message confirming this is communicated from the first station peer 38a connected to the ad hoc network to the other station peers and the central peer. When all file pieces
35 have been downloaded, a file complete message is sent to the ad hoc network to indicate that all file pieces have successfully been transferred to the fixed network.

When the train 14 leaves the station, the connection between the or each carriage peer 40a, 40b, 40c and the first station peer 38a is lost and consequently transfer of the file pieces from the carriage peer(s) 40a, 40b, 40c
5 to the first station peer 38a is interrupted.

When the train 14 arrives at a subsequent second station 40b, as shown in Figure 3, a similar process occurs whereby a wireless communications link is established
10 between the second station peer 38b at the second station 40a and one or more of the carriage peers 40a, 40b, 40c, and the second station peer 38b downloads from one or more of the memories 64 pieces of the video files that have not already been downloaded and stores the downloaded file
15 pieces in a second station memory 28b.

At an appropriate time, for example when the train is between stations or after completion of the train journey, the central peer 36 retrieves the file pieces downloaded
20 to the different station memories 28 and combines the file pieces in order to recreate the original video files stored in the carriage memories 64.

In this way, different pieces of a file are downloaded to
25 respective different station peers 38 as the train proceeds along a journey, and the separate pieces are subsequently combined together by the central peer 36 so as to recreate the original file.

30 Modifications and variations as would be apparent to a skilled addressee are deemed to be within the scope of the present invention.

Claims:

1. A file transfer system for transferring a file from a source to a destination, the file having a plurality of file pieces, the system comprising:
 - a source memory arranged to store data indicative of a file desired to be transferred to a destination;
 - a source network interface arranged to facilitate transfer of pieces of the file to and from the source memory;
 - a plurality of destination memories, each destination memory having an associated destination network interface arranged to facilitate transfer of file pieces to and from the destination memory when the source network interface is in networked communication with the destination network interface;
 - the system being arranged such that when a source network interface is in networked communication with a destination network interface, a file piece is transferred from the source memory associated with the source network interface to the destination memory associated with the destination network interface only if the file piece has not already been transferred to any destination memory, wherein each file piece is only transferred once to any destination memory; and
 - after all file pieces have been transferred to respective destination memories, the system being arranged to retrieve the file pieces stored in the destination memories, and to combine the retrieved file pieces together to recreate the desired file at the destination.
2. A system as claimed in claim 1, comprising a source device, the source device comprising the source memory and the source network interface.
3. A system as claimed in claim 2, wherein the source device is movable such that by moving the source device to

a location in close proximity to any one of a plurality of destination network interfaces, the source network interface is connectable in networked communication with any of the plurality of destination network interfaces.

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4. A system as claimed in claim 2 or claim 3, comprising a plurality of source devices, the respective source network interfaces of the source devices together forming a source network.

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5. A system as claimed in any one of claims 2 to 4, wherein the source network is an ad hoc network.

6. A system as claimed in claim 5, wherein the ad hoc network is a wireless ad hoc network.

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7. A system as claimed in any one of claims 2 to 6, wherein each source device has an associated file desired to be transferred to a destination, and the system may be arranged to copy the files to all other source devices on the source network such that each source memory includes all files associated with the source devices.

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8. A system as claimed in claim 7, wherein the files are transferred between the source devices using a BitTorrent protocol.

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9. A system as claimed in claim 8, wherein each source device comprises a source peer and at least one source device comprises a source tracker arranged to maintain a record of the files present on the source devices.

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10. A system as claimed in claim 9, wherein the source tracker is incorporated into a source peer.

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11. A system as claimed in any one of claims 2 to 10, wherein the system comprises a plurality of source

networks, each source network comprising at least one source device.

12. A system as claimed in any one of claims 2 to 11,
5 wherein the system is arranged such that each source device has an associated unique identifier.

13. A system as claimed in claim 12, wherein the unique identifier is a unique IP address.

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14. A system as claimed in any one of the preceding claims, wherein the or each source network interface comprises a source wireless network interface.

15 15. A system as claimed in any one of the preceding claims, wherein the or each destination network interface comprises a destination wireless network interface.

16. A system as claimed in any one of the preceding
20 claims, wherein the respective destination network interfaces together form a destination network.

17. A system as claimed in claim 16, wherein the destination network is a fixed network.

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18. A system as claimed in any one of the preceding claims, wherein the source network interfaces are movable such that by moving the source network interfaces the source network interfaces are connectable in networked
30 communication with any of the plurality of destination network interfaces.

19. A system as claimed in any one of the preceding claims, wherein the system is arranged such that when a
35 network communication is established between a source network interface and a destination network interface, the source network and the destination network do not merge.

20. A system as claimed in any one of the preceding claims, wherein each destination network interface is of predetermined type and the system is arranged such that all destination network interfaces of the same type have
5 the same associated identifier.

21. A system as claimed in claim 20, wherein said associated identifier is an IP address.

10 22. A system as claimed in any one of the preceding claims, wherein each source memory is associated with a mode of transport, and at least some destination network interfaces are associated with a stop or terminal in a transport system.

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23. A system as claimed in claim 22, wherein at least one of the destination network interfaces is associated with a train, bus or ferry stop or terminal.

20 24. A system as claimed in any one of the preceding claims, wherein each destination memory has an associated plurality of destination network interfaces.

25 25. A system as claimed in any one of the preceding claims, comprising a central device in networked communication with the destination network interfaces and arranged to retrieve the file pieces stored in the destination memories, and to combine the retrieved file pieces together to recreate the or each file.

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26. A system as claimed in any one of the preceding claims, wherein the system is arranged such that file pieces are transferred between the source network and one or more destination memories using a BitTorrent type
35 protocol.

27. A system as claimed in claim 26, wherein each destination memory has an associated destination peer.

28. A system as claimed in claim 27, comprising a
5 destination tracker connected to the destination network, the destination tracker arranged to maintain a record of the files present on the source memories.

29. A system as claimed in claim 28, wherein the
10 destination tracker is incorporated into a destination peer or the central peer.

30. A system as claimed in any one of the preceding claims, wherein at least some of the source memories have
15 an associated camera arranged to produce still and/or video images and to store in the or each respective source memory image files indicative of the images.

31. A method of transferring a file from a source to a
20 destination, the file having a plurality of file pieces, the method comprising:

storing data indicative of a file desired to be transferred to a destination in a source memory;

providing a source network interface arranged to
25 facilitate transfer of pieces of the file to and from the source memory;

providing a plurality of destination memories;

providing each destination memory with an associated destination network interface arranged to facilitate
30 transfer of file pieces to and from the destination memory when the source network interface is in networked communication with the destination network interface;

connecting a source network interface in networked communication with a destination network interface,

35 transferring a file piece from the source memory associated with the source network interface to the destination memory associated with the destination network

interface only if the file piece has not already been transferred to any destination memory, wherein each file piece is only transferred once to any destination memory;

after all file pieces have been transferred to
5 respective destination memories,
retrieving the file pieces stored in the destination memories; and
combining the retrieved file pieces together to
recreate the desired file at the destination.

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32. A method as claimed in claim 31, comprising providing a source device, the source device comprising the source memory and the source network interface.

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33. A method as claimed in claim 32, comprising providing a movable source device such that by moving the source device to a location in close proximity to any destination network interface, the source network interface is connectable in networked communication with any of the
20 plurality of destination network interfaces.

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34. A method as claimed in claim 32 or claim 33, comprising providing a plurality of source devices, and forming a source network between the respective source network interfaces.

35. A method as claimed in any one of claims 32 to 34, wherein the source network is an ad hoc network.

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36. A method as claimed in claim 35, wherein the ad hoc network is a wireless ad hoc network.

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37. A method as claimed in any one of claims 32 to 36, wherein each source device has an associated file desired to be transferred to a destination, and the method comprises copying the files to all other source devices on

the source network such that each source memory includes all files associated with the source devices.

38. A method as claimed in claim 37, comprising
5 transferring the files between the source devices using a BitTorrent protocol.

39. A method as claimed in any one of claims 32 to 38,
wherein the method comprises providing a plurality of
10 source networks, each source network comprising at least one source device.

40. A method as claimed in any one of claims 32 to 39,
comprising associating each source device with a unique
15 identifier.

41. A method as claimed in claim 40, wherein the unique identifier is a unique IP address.

20 42. A method as claimed in any one of claims 31 to 41, comprising forming a destination network with the destination network interfaces.

43. A method as claimed in claim 42, wherein the
25 destination network is a fixed network.

44. A method as claimed in any one of claims 31 to 43,
comprising providing movable destination network
interfaces such that by moving the destination network
30 interfaces the source network interface is connectable in networked communication with any of the plurality of destination network interfaces.

45. A method as claimed in any one of claims 31 to 44,
35 comprising ensuring that the source network and the destination network do not merge when a network communication is established between a source network

interface and a destination network interface.

46. A method as claimed in any one of claims 31 to 45,
comprising providing each destination network interface
5 with the same associated identifier.

47. A method as claimed in claim 46, wherein said
associated identifier is an IP address.

10 48. A method as claimed in any one of claims 31 to 47,
comprising associating each source memory with a mode of
transport, and associating at least some destination
network interfaces with a stop or terminal in a transport
system.

15 49. A method as claimed in claim 48, wherein at least one
of the destination network interfaces is associated with a
train, bus or ferry stop or terminal.

20 50. A method as claimed in any one of the preceding
claims, wherein each destination memory has an associated
plurality of destination network interfaces.

51. A method as claimed in any one of claims 31 to 50,
25 comprising providing a central device in networked
communication with the destination network interfaces,
retrieving the file pieces stored in the destination
memories, and to combining the retrieved file pieces
together at the central device to recreate the or each
30 file.

52. A method as claimed in any one of claims 31 to 51,
comprising transferring file pieces between the source
network and one or more destination memories using a
35 BitTorrent type protocol.

53. A method as claimed in any one of claims 31 to 52,
comprising providing at least some of the source memories
with an associated camera arranged to produce still and/or
video images, and storing image files indicative of the
5 images in the or each respective source memory.