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- 54 **A data link device.**
- 57 There is provided a method of operating a data link device. Data is received from at least one data source. The received data is compressed into a message block. Independently of whether a request to pull the received data is received from a node in a communications network, the message block comprising the compressed data is autonomously pushed to the node.

## **A DATA LINK DEVICE**

### Technical Field

- 5 The present invention relates to a data link device, a method of operating the data link device and a node in communication with the data link device in a communications network.

### Background

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The demand for data has increased dramatically over the last few decades and the need for data to be transmitted and received in real-time continues to grow. The volume of data being transferred across network infrastructures also continues to grow.

- 15 An example of an application in which real-time data is valuable is in the remote monitoring of a network infrastructure such as those in the energy sector, the logistics and transport sectors, and many other sectors. For example, obtaining real-time data can be valuable in monitoring the transport of energy through a high voltage transmission line or an oil or gas pipeline and in monitoring the transport of urgent care supplies (such as medicine, transplant organs and other examples where current status, location, condition or similar are useful). The transfer of real-time data is also valuable for online products and services and in the internet of Things (IoT) amongst others.
- 20

- 25 However, the dramatic rise in demand for real-time data through applications such as these means that the network infrastructure that carries the data is excessively burdened. In fact, the increasing demand for use of the network infrastructures can exceed the rate of growth in the capacity of the network infrastructures. This can cause problems that affect the network operator as well as the end users.

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- From a network operator perspective, the burden on the network infrastructure can result in insufficient network coverage in certain areas, large costs for network infrastructure expansion, a risk of satellite collisions through the need for an increase in the number of satellites in certain orbits, an increased risk of interference through the need for more base stations, inefficient use of the network infrastructure, and similar.

From an end user perspective, the burden on the network infrastructure can result in a reduction in the lifetime of Universal Mobile Telecommunications System Subscriber Identify Module (USIM) cards due to an increase in read/write cycles needed, an

- 5 increase in the power consumption and reduction in the lifetime of the data transmission device due to the need for continuous restarts, local issues within the network of the network operator such as cell or satellite congestion and delay of data to the end user, poor performance of the IoT service, delayed communications, degradation of service quality and even service outages.

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- Existing techniques for obtaining data in a network infrastructure involve a node requesting data from a plurality of data link devices, waiting for a response and then receiving data from each data link device one at a time. However, data sent through the current network infrastructures by this method is sent too slowly and delays are experienced due to network congestion and limited network capacity. Also, network operators only have a finite network capacity to handle the ever increasing data traffic and the end user is limited in their ability to cope with the limitations and data delays through current machine to machine (M2M) network infrastructures.

- 15 20 There is therefore a need for a means that enables data to be sent faster in a communications network and that increases the capacity of the network.

### Summary

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It is an object of the invention to obviate or eliminate at least some of the above disadvantages mentioned above and provide an improved communications network enabling higher speed transmissions and providing more available bandwidth for transmissions.

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According to an aspect of the invention, there is provided a method of operating a data link device. The method of operating the data link device comprises receiving data from at least one data source, compressing the received data into a message block and, independently of whether a request to pull the received data is received from a

node in a communications network, autonomously pushing the message block comprising the compressed data to the node.

In some embodiments, the method may further comprise autonomously pushing  
5 message blocks comprising compressed data received from the at least one data source to at least one node in the communications network at set time intervals independently of whether a request to pull the received data is received from the at least one node.

10 In some embodiments, the method may further comprise scheduling the autonomous pushing of the message block such that pushing of the message block occurs in the same time slot as pushing of a message block by at least one other data link device.

In some embodiments, scheduling the autonomous pushing of the message block may  
15 be based on timing information received from a Global Positioning System (GPS) satellite.

In some embodiments, the message block comprising the compressed data may be autonomously pushed directly to the node.  
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In some embodiments, the method may further comprise, prior to autonomously pushing the message block comprising the compressed data to the node, encrypting the compressed data.

25 In some embodiments, the method may further comprise at least temporarily storing the compressed data.

In some embodiments, one or more of the following may be selectable and/or customisable by a user: the at least one data source, the received data, the type of  
30 data received, a scheduling time for the autonomous pushing of the message block, the node to which the message block is pushed.

In some embodiments, the method may further comprise: receiving a request from a node in the communications network to pull data; compressing the requested data into

a message block; and transmitting the message block comprising the compressed data to the node.

In some embodiments, the received data may be compressed by a set percentage.

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In some embodiments, the received data may be compressed by at least 50%, at least 60% or at least 70%.

10 In some embodiments, the received data may be compressed by no more than 90% or no more than 80%.

In some embodiments, the received data may be compressed by 79%.

15 In some embodiments, the message block may further comprise information identifying the data link device, information identifying the data source, information identifying the type of data comprised in the message block and/or information for decoding the data comprised in the message block.

20 According to another aspect of the invention, there is provided a method of operating a node. The method of operating the node comprises receiving a message block autonomously pushed from at least one data link device, the message block comprising compressed data, and decompressing the compressed data comprised in the message block.

25 In some embodiments, the compressed data may be encrypted and the method may further comprise decrypting the compressed data.

30 In some embodiments, the method may further comprise: transmitting to at least one data link device a request to pull data; and receiving the requested data compressed into a message block.

In some embodiments, the method may further comprise formatting the decompressed data for use by a user.

According to an aspect of the invention, there is provided a data link device. The data link device comprise a receiver operable to receive data from at least one data source and a processor operable to compress the received data into a message block and, independently of whether a request to pull the received data is received from a node in

- 5 a communications network, autonomously push the message block comprising the compressed data to the node.

In some embodiments, the link device may further comprise a power management unit operable to manage power to the data link device.

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In some embodiments, the receiver may be provided in a first layer of the data link device, the processor may be provided in a second layer of the data link device and the power management unit may be provided in a third layer of the data link device, wherein the first, second and third layers of the data link device may be separate layers, each independently controllable by a user.

In some embodiments, the data link device may further comprise a storage unit operable to at least temporarily store the compressed data.

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In some embodiments, the processor may further be operable to autonomously push message blocks comprising compressed data received from the at least one data source to at least one node in the communications network at set time intervals independently of whether a request to pull the received data is received from the at least one node.

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In some embodiments, the processor may further be operable to schedule the autonomous pushing of the message block such that pushing of the message block occurs in the same time slot as pushing of a message block by at least one other data link device.

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In some embodiments, the processor may be operable to schedule the autonomous pushing of the message block based on timing information received from a Global Positioning System (GPS) satellite.

In some embodiments, the processor may further be operable to, prior to autonomously pushing the message block comprising the compressed data to the node, encrypt the compressed data.

- 5 In some embodiments, the receiver may further be operable to receive a request from a node in the communications network to pull data, the processor may be operable to compress the requested data into a message block and the data link device may further comprise a transmitter operable to transmit the message block comprising the compressed data to the node.

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In some embodiments, the processor may be operable to compress the received data by a set percentage.

15 In some embodiments, the processor may be operable to compress the received data by at least 50%, at least 60% or at least 70%.

In some embodiments, the processor may be operable to compress the received data by no more than 90% or no more than 80%.

20 In some embodiments, the processor may be operable to compress the received data by 79%.

According to an aspect of the invention, there is provided a node. The node comprises a receiver operable to receive a message block autonomously pushed from at least 25 one data link device, the message block comprising compressed data and a processor operable to decompress the compressed data comprised in the message block.

30 In some embodiments, the node may further comprise a transmitter operable to transmit to at least one data link device a request to pull data, wherein the receiver may be further operable to receive the requested data compressed into a message block.

In some embodiments, the compressed data may be encrypted and the processor may further be operable to decrypt the compressed data.

In some embodiments, the processor may further be operable to format the decompressed data for use by a user.

According to another aspect of the invention, there is provided a communications network comprising at least one of the data link devices and at least one of the nodes according to the invention.

According to another aspect of the invention, there is provided a computer program product, comprising a carrier containing instructions for causing a processor to perform the method.

In this way, the invention provides an improved communications network by enabling data to be transmitted faster in the network and increasing the capacity of the network. The invention significantly reduces the overhead of data through a high lossless compression to "artificially" extend the network capacity and use less bandwidth.

#### Brief description of the drawings

For a better understanding of the present invention, and to show how it may be put into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a block diagram illustrating a communications network in accordance with the invention;

Figure 2 is a block diagram illustrating a data link device in accordance with the invention;

Figure 3 is a block diagram illustrating an example of a data link device configuration according to the invention;

Figure 4 is a block diagram illustrating an example interface of the processor to other components of the data link device in accordance with the invention;

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Figure 5 is a block diagram illustrating a node in accordance with the invention;

Figure 6 is a block diagram illustrating an example of a node configuration in accordance with the invention;

- 5     Figure 7 is a flow chart illustrating a method of operating a data link device in accordance with the invention;

Figure 8 is a flow chart illustrating another method of operating a data link device in accordance with the invention;

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Figure 9 is a flow chart illustrating a method of operating a node in accordance with the invention;

15     Figure 10 is a flow chart illustrating another method of operating a node in accordance with the invention;

Figure 11 illustrates an example signalling diagram of the signals between the data link device and the node in the communications network in accordance with the invention;

20     Figure 12 is a flow chart illustrating an example method performed by a data link device of the invention;

Figure 13 is a flow chart illustrating another example method performed by a data link device of the invention;

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Figure 14 is a block diagram of an example power management unit of a data link device of the invention;

30     Figure 15 is a block diagram of an example status monitoring unit of a data link device of the invention; and

Figures 16a and 16b are example timing diagrams showing the difference in timing of data transmission to at least one node from data link devices according to the invention and data link devices according to current techniques.

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Detailed Description

**Figure 1** illustrates a communications network 100 in accordance with the invention.

- 5 The communications network comprises a data link device 102 and at least one node 104 (which for the purpose of illustration are shown here as nodes 104a, 104b and 104c).

10 The communications network may be, for example, a telecommunications network, a computer network, a satellite network or any other communications network. Some examples of a communications network include a terrestrial mobile network, a wide area network (WAN), a local area network (LAN), a virtual private network (VPN), an Ethernet, a Personal Area Network (PAN), a Machine to Machine (M2M) network, a Vehicle to Vehicle (V2V) network, a Vehicle to Infrastructure (V2I) network, a Single 15 Burst Data (SBD) network, an IEEE standard network, any other wireless device data sharing network, wireless or Digital Short Range Communications (DSRC) networks (such as a Vehicle to Vehicle (V2V) network, a Vehicle to Infrastructure (V2I) network, or similar), or the like. The node 102 may be, for example, a server, a base station, a database (such as a base station controller, a Home Location Register, a support node 20 or the like), an internet node, an access point, a node in any of the networks mentioned above or any other node. The datalink device 102 and the node 104 communicate to transfer data.

25 The communications network 100 also comprises one or more data sources 106 such as a sensor, a user input device and/or any other data source. The sensor may be a temperature sensor, a speed sensor, an air pressure sensor, or any other sensor. The user input device may be a mobile device such as a tablet, a smartphone, a handheld scanner or any other user input device. The data source 106 may communicate with the data link device 102 wirelessly or through a wired connection.

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**Figure 2** is a block diagram illustrating a data link device 102 in accordance with the invention. The data link device 102 comprises a receiver 200 operable to receive data from at least one data source 106 and a processor 202 operable to process the received data in accordance with the invention. The data link device 102 may also 35 comprises a storage unit 204 operable to store data.

The data link device 102 optionally comprises a power management unit (not shown) operable to manage power to the data link device 102 from a power source such as a battery, an external electric supply, or any other power source.

- 5 102 may have a built-in Global Position System (GPS). The data link device 102 may be housed in a housing. The housing may be made from a non-metallic material and may comprise a removable top for maintenance and a bottom flange for mounting.

In an example, the data link device 102 comprises a plurality of layers. The receiver

- 10 200 is provided in a first layer of the data link device 102, the processor 202 is provided in a second layer of the data link device 102 and the power management unit is provided in a third layer of the data link device 102. The first, second and third layers of the data link device are separate layers, each independently controllable by a user.

- 15 **Figure 3** is a block diagram illustrating an example of a data link device 102 configuration comprising a plurality of layers. In this example, the data link device 102 comprises a communications layer 300, a processor layer 302, a power management layer 304 and a power source 306.

- 20 The communications layer 300 may be a medium or long-range communications layer. For example, the communications layer 300 may comprise a medium or long-range transceiver such as a radio transceiver, a Global System for Mobile communication (GSM) transceiver, a satellite transceiver, any other transceiver or any combination of transceivers. The receiver 200 of the data link device 102 shown in Figure 2 is located  
25 in the communications layer 300.

- The processor 202 of the data link device 102 shown in Figure 2 is located in the processor layer 302. The processor layer 302 may be adapted to communicate data to a node 104 in the communications network 100 via, Bluetooth, WiFi or any other  
30 communications techniques. The processor layer 302 may be operable to initialise the communications layer 300 to connect to data sources (for example, sensors, user input devices, or other data sources). The processor layer 302 is also operable to control data operations such as data collection, data thread, data parsing, data truncation or any other data operations.

The power management unit of the data link device 102 is located in the power management layer 304, which is operable to manage power to the data link device 102 from a power source such as a battery, an external electric supply, or any other power source. The power management layer 304 may have a plurality of functions including

- 5 providing a multiple voltage power supply to the data link device 102, logging power source data, charging the power source (for example, where the power source is a battery pack), providing fault protection and reporting, monitoring and providing status updates such as power, battery charge, voltage, current status, and the like.
- 10 The communications layer 300, processor layer 302 and power management layer 304 are in the form of printed circuit boards and may be stacked on top of one another, for example, using stacking connectors. The printed circuit boards may communicate through microcontrollers.
- 15 **Figure 4** is a block diagram illustrating an example interface 400 of the processor 202 of the data link device 102 to other components of the data link device 102. In this example, the interface 400 interfaces the processor 202 of the data link device 102 to the storage unit 204, a debug connection 402, a general-purpose input/output (GPIO) 404, a long range wireless connection 406, a short range wireless connection 408 and
- 20 a global positioning system (GPS) connection 410. However, it will be understood that other components may be present instead of or as well as the illustrated components.

In this example, the processor 202 is illustrated as the central control point for the modular-connected components. Each of the modular connected components (204,

- 25 402, 404, 406, 408, 410) can be added or removed depending on the intended use of the datalink device 102. The processor 202 can have a controller area network (CAN) bus, serial and Ethernet buses, or any other bus to connect to external devices.

The storage unit 204 may be a non-volatile memory storage for the data and control

- 30 capability of the datalink device 102. The debug connection 402 may be an access channel for troubleshooting or updating the datalink device 102. The general-purpose input/output (GPIO) 404 may be an interface for allowing the datalink device 102 to connect to data sources. In this way, when additional digital control lines are needed for a system integrator, the digital control lines are available on a chip of the data link
- 35 device 102 thus avoiding the need to build additional circuitry. For example, a chip

using an audio codec has 8 GPIO pins, which are unused by default. Some system integrators (e.g. laptop manufacturers) use the first GPIO (GPIO0) on the audio chip to turn on an amplifier for the internal speakers of the laptop and an external headphone jack. In the data link device 102, the GPIO 404 can be used to connect the main processor 202 to a communications components and other components.

The long range wireless connection 406 may be a modular connected component. The long range wireless connection 406 may comprise a Global System for Mobile Communications (GSM) module for use in, for example, an M2M network within a mobile telecommunications network or in an Iridium Short Burst Data (SBD) service of a satellite network or a combination thereof (which may both be present on a single circuit board). The short range wireless connection 408 may be a modular connected component and may comprise any short-range communications means (such as short-range digital communications (SRDC), Bluetooth, WiFi, Radio IP or similar).

The global positioning system (GPS) connection 410 comprises any navigation and positioning means. Other examples of a navigation and positioning component that can be included in combination with the GPS component or instead of the GPS component may include a Precise Positioning (PPP) component, an Inertial Reference Unit (IRU), a gyro or other dead reckoning means, any satellite positioning system, or any other navigation and positioning component or combination thereof.

**Figure 5** is a block diagram illustrating a node 104 in accordance with the invention. The node 104 comprises a receiver 500 operable to receive data from a data link device 102 and a processor 502 operable to process the received data. The node 104 may also comprise a storage unit 504 operable to store data. The node 104 may also comprise a transmitter (not shown) operable to transmit to at least one data link device a request to pull data.

**Figure 6** is a block diagram illustrating an example of a node 104 configuration. In the example, the node 104 comprises a network connection 600 to connect to the communications network 100, a data decompression unit 602 operable to decompress data, a data categorisation unit 604 to categorise data, a data processing unit 606 operable to process data received from data sources (such as sensors or any other data sources) and a configuration unit 608 operable to configure settings for the node

104. The node 104 in this example also comprises a storage unit 504 operable to store data and a data display 610 operable to display data to an end user.

The operation of the data link device 102 and the node 104 will now be described with

5 reference to Figures 7 to 13.

**Figure 7** is a flow chart illustrating a method 700 of operating the data link device 102 in accordance with the invention.

10 With reference to Figures 2 and 7, at block 702, the receiver 200 of the data link device 102 receives data from at least one data source 106.

At block 704, the processor 202 of the data link device 102 compresses the received data into a message block. In one example, the processor 202 of the data link device

15 102 compresses the received data by a set percentage. For example, the received data may be compressed by at least 50%, at least 60% or at least 70%. In some examples, the received data is compressed by no more than 90% or no more than 80%. In another example, the received data is compressed by 79%.

20 The message block may further comprise information identifying the data link device 102, information identifying the data source 106, information identifying the type of data comprised in the message block, information for decoding the data comprised in the message block or any other information or combination of information.

25 Optionally, at block 706, the processor 202 of the data link device 102 encrypts the compressed data prior to autonomously pushing the message block comprising the compressed data to a node 104. The processor 202 of the data link device 102 may encrypt the compressed data through brevity code or any other encryption mechanism. By encrypting the compressed data, the invention provides a level of security and  
30 privacy with transmitting the data.

At block 708, the processor 202 of the data link device 102 autonomously pushes the message block comprising the compressed data to one or more nodes 104 in the communications network 100 independently of whether a request to pull the received

35 data is received from the one or more nodes 104.

In an example, the processor 202 of the data link device 102 autonomously pushes message blocks comprising compressed data received from the at least one data source to at least one node 104 in the communications network 100 at set time

- 5 intervals independently of whether a request to pull the received data is received from the at least one node 104. The processor 202 of the data link device 102 may schedule the autonomous pushing of the message block such that pushing of the message block occurs in the same time slot as pushing of a message block by at least one other data link device. In one example, scheduling the autonomous pushing of the  
10 message block is based on timing information received from a Global Positioning System (GPS) satellite. The message block comprising the compressed data may be autonomously pushed directly to the node 104 or indirectly to the node 104 (for example, via another node in the communications network 100).

- 15 The storage unit 204 may at least temporarily store the compressed data. In this way, the risk of lost data (for example, during power outages) is reduced.

The data link device 102 is customisable by a user. For example, one or more of the following may be selectable and/or customisable by a user of the data link device 102:

- 20 the data sources 106, the received data, the type of data received, a scheduling time for the autonomous pushing of the message block, the node 104 to which the message block is pushed.

**Figure 8** is a flow chart illustrating another method of operating a data link device 102

- 25 in accordance with the invention. The method illustrated in Figure 8 includes blocks 802, 804, 806 and 808, which correspond to blocks 702, 704, 706 and 708 respectively (as described earlier with reference Figure 7). The method illustrated in Figure 8 also includes blocks 810, 812 and 814.

- 30 With reference to Figures 2 and 8, at block 810, the receiver 200 of the data link device 102 receives a request from a node 104 in the communications network 100 to pull data. At block 812, the processor 202 of the data link device 102 compresses the requested data into a message block. At block 814, a transmitter of the data link device 102 transmits the message block comprising the compressed data to the node.

**Figure 9** is a flow chart illustrating a method 900 of operating a node 104 in accordance with the invention.

With reference to Figures 5 and 9, at block 902, the receiver 500 of the node 104 receives a message block autonomously pushed from at least one data link device 102. The received message block comprises compressed data. The compressed data may be encrypted. If the compressed data is encrypted, the method may optionally comprise (at block 904), the processor 502 of the node 104 decrypting the compressed data.

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At block 906, the processor 502 of the node 104 decompresses the compressed data comprised in the message block. Optionally, at block 506, the processor 502 of the node 104 formats the decompressed data for use by a user.

15 The storage unit 504 of the node 104 may at least temporarily store the compressed data or the decompressed data.

**Figure 10** is a flow chart illustrating another method 1000 of operating a node 104 in accordance with the invention. The method illustrated in Figure 10 includes blocks 20 1002, 1004 and 1006 which correspond to blocks 902, 904, and 906 respectively (as described earlier with reference Figure 9). The method illustrated in Figure 10 also includes blocks 1008, 1010 and 1012.

With reference to Figures 5 and 10, at block 1008, a transmitter of the node 104 transmits to at least one data link device 102 a request to pull data. At block 1010, the receiver 500 of the node 104 receives the requested data compressed into a message block. Optionally, at block 1012, the processor 502 of the node 104 formats the data for use by a user.

30 **Figure 11** illustrates an example signalling diagram of the signals between the data link device 102 and the node 104 in the communications network 100 in accordance with the invention.

With reference to Figure 11, the receiver 200 of the data link device 102 receives data 35 from at least one data source (signal 1100 of Figure 11). The processor 202 of the

data link device 102 autonomously pushes a message block comprising the data in a compressed form to the node 104 independently of whether a request to pull the received data is received from the node 104 and the receiver 500 of the node 104 receives the message block (signal 1102 of Figure 11).

5

Optionally, a transmitter of the node 104 transmits to the data link device 102 a request to pull data and the receiver 200 of the data link device 102 receives the request (signal 1104 of Figure 11). The processor 202 of the data link device 102 pulls the data from a data source 106 (signal 1106 of Figure 11) and a transmitter of the data link device 102 transmits a message block comprising the data in a compressed form to the node 104 (signal 1108 of Figure 11).

**Figure 12** is a flow chart illustrating an example method performed by a data link 102 device of the invention.

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At block 1200, the process is started. For example, the process may be started from an internal trigger, an external trigger or an internal timer. At block 1201, a configuration setting procedure is performed in which a preparation method for packing the data is determined. In this example, an INI configuration file is parsed.

20

At block 1202, a multi-threaded process is started for collecting threads of data from an external source. This may include a poll thread process 1204 and/or one or more call thread processes 1206 such as those described later with reference to Figure 13. At block 1208, a zeroMQ accumulation process is started in which data threads received from the external sources are checked and monitored. For example, all are checked and monitored if there is data being sent or ready to be sent from those sources.

At block 1210, it is checked whether new data is received. If not, the process proceeds back to block 1208 where the received data threads are monitored. If it is determined that new data is received, the process proceeds to block 1212, where accumulated data is processed. The processing of the data may include assembling the data in a format such as a block assembly. At block 1214, it is checked whether the block assembly is complete. If not, the process from block 1208 to 1212 is continued. Once it is determined at block 1214 that the block assembly is complete, it is checked

whether the blocks are ready for accumulation. If not, the process from block 1208 to 1214 is continued. Once it is determined at block 1216 that the blocks are ready for accumulation, the process proceeds to block 1218.

- 5 At block 1218, the block is set in a data packet and the process for sending (or transmitting) the data thread is started. At block 1220, the data thread is sent (or transmitted) in accordance with a send thread such as that described with reference to Figure 13. At block 1222, a clean-up procedure is started in which the process is reset for another data packet.

10

**Figure 13** is a flow chart illustrating another example method performed by a data link device 102 of the invention.

The Epoll thread 1300 is a process label that acts as a data thread registry. At block 1302, all Epoll processes are started and the thread is initialised. At block 1304, process descriptors are registered with Epoll and a thread registry process is started. At block 1306, it is checked whether new data is present such as checking a thread routed to an external data source for collecting new data. Once new data is detected, the process proceeds to block 1308 where the data is processed. The data that is processed may be data that is received from a particular thread. At block 1310, the data is publicized by means of zeroMQ. For example, the presence of data may be publicized from the data source to the zeroMQ, which then proceeds to block 1306 to check for more data.

25 The Call thread 1312 is a process label that acts as a data routing for gathering a data thread. At block 1314, a Call process is started and a thread is initialised. At block 1316, it is checked whether new data is present such as checking for new data from a data source in a particular thread. Once new data is detected, the process proceeds to block 1318 where the data is received by means of the thread and is processed. At 30 block 1320, the data is publicized by means of the zeroMQ and a zeroMQ accumulation process may be started such as that in block 1208 of Figure 12.

The Send thread 1322 is a process label that acts as a data send process. At block 1324, a complete data packet block is built for output (i.e. sending). At block 1326, the 35 data is compressed using the compression method described herein or any other

compression method and optionally encoded (or encrypted). At block 1328, the compressed (and optionally encrypted) data is sent via a communications means. At block 1330, a clean-up process is performed, which resets the process.

- 5 As discussed earlier, the data link device 102 may comprise a power management unit operable to monitor power to the data link device 102.

**Figure 14** is a block diagram of an example power management unit of a data link device 102 of the invention.

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In the power management unit of Figure 14, an input Regulator 1400 regulates an incoming voltage from a power adaptor to protect the power management system. A voltage selector 1402 allows selection of output voltages based. One or more output regulators 1404 provide programmable voltage outputs. In this example, four programmable voltage outputs are provided.

15

A battery management system (BMS) 1406 controls properties of the battery for the data link device 102 such as managing the battery charge and discharge, protecting the battery against over voltage, protecting the datalink device circuits from under and over voltage, while balancing charging of the battery when a rechargeable multi-cell battery configuration is used.

20

A local processor 1408 controls the power management system. This may include scheduling an optimal charge for a particular battery, for example, based on its chemical composition and other characteristics. The local processor 1408 allows for scheduled (push) or on-demand (pull) remote monitoring of the power management and BMS systems.

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A system measurements component 1410 measures internal characteristics such as the system voltage, battery temperature, current and other internal characteristics.

The power management unit may monitor power to the data link device 102 through a microcontroller. The properties measured by the power management unit may include the input voltage, battery charge, output voltages or any other properties of the data

link device 102. The power management unit sends information on the measured properties to the processor 202 of the data link device 102 for processing.

The power management unit of the data link device 102 may be operable to learn an  
5 optimal amount and a rate of battery charge that will extend the life of a power source  
(for example, battery life) and may send pre-scheduled or on-demand notices or  
event warnings to a central server to notify the user of the current operating status of  
the data link device 102. The power management unit of the data link device 102  
may monitor the operating status of the data sources to which the data link device  
10 102 is connected.

In an example, the data link device 102 may comprise a status monitoring unit operable  
to monitor a status of the data link device 102.

15 **Figure 15** is a block diagram of an example status monitoring unit of a data link device  
102 of the invention.

The status monitoring unit comprises a power management unit 1500 (such as that  
described in Figure 14) for managing power to the datalink device. The status  
20 monitoring unit also comprises a data gathering component 1502 for gathering data.  
The gathered data may concern status, measurements, configuration for the power  
management unit 1500, or any other data. The data gathering component 1502  
sends a data log 1504 to a main processor 1510 of the status monitoring unit. For  
example, the data gathering component 1502 sends the stored data collected in the  
25 data gathering process to the main processor 1510. The main processor 1510 is the  
processor of the data link device 102 such as that described in Figure 4.

The status monitoring unit also comprises a request handling component 1506, which  
handles request received from the main processor 1510 such as requests for data  
30 about the power management unit 1500, configuration changes for the power  
management unit 1500 or any other requests. The status monitoring unit comprises  
a configuration settings component 1508 for determining which data to gather and  
send to the main processor 1510.

The status monitoring unit further comprises a data parsing component 1512, which prepares and formats data received by the main processor 1510 from the power management unit 1500 for sending to a node using either push or pull methods. The status monitoring unit also comprises a component 1514 for issuing a request for  
5 data from the power management unit 1500.

**Figures 16a and 16b** illustrate example timing diagrams showing the difference in timing of data transmission to at least one node 104 from data link devices 102 according to the invention (Figure 16a) and data link devices according to current  
10 techniques (Figure 16b). In other words, the illustration in Figures 16a and 16b shows a typical data sequence over time using two different methods of acquiring data from the datalink device by the node.

As shown in Figure 16a, the timing of data transmission to at least one node 104 from  
15 a data link device 102 according to the invention may be synchronised with other data link devices 102. In other words, the data link devices 102 of the invention may be scheduled to transmit data in a common time frame. The datalink devices 102 of the invention may transmit data autonomously using the push operation and according to a schedule (for example, scheduling through a trigger from a data source input to the  
20 datalink device or through internal configuration settings).

It can be seen from Figures 16a and 16b that time savings are achieved through compressing and pushing the data in accordance with the invention rather than waiting for a node to request data to be pulled as in the current techniques. The method  
25 according to the invention ensures data is received faster by the node. This is in contrast to current techniques that use a pull operation where the device only sends data when polled by a node.

Therefore, the invention advantageously provides an improved communications  
30 network enabling higher speed transmissions, increasing the capacity of the network and providing more available bandwidth for transmissions.

The invention is applicable to many technology sectors. For example, the invention can be used in telematics where large amounts of real-time data may be required for  
35 tracking the GPS position of a vehicle or aircraft and sending the tracked GPS

position to either a data server for traffic flow management. The invention can also be used in logistics where large amounts of real-time information may need to be transmitted between devices to affect communication between networks of vehicles.

- The invention can also be used in smart phones, for example, to send data (such as  
5 sensor data, machine to machine specific data, or any other data) through a communications means including the Universal Mobile Telecommunications System (UMTS), the General Packet Radio Service (GPRS), the Short Message Service (SMS), the Multimedia Messaging Service (MMS) or any other communications means during communications.

10

Although example applications have been provided here, it will be understood that the invention is not limited to those applications and other applications are possible.

It should be noted that the above-mentioned embodiments illustrate rather than limit  
15 the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. The word “comprising” does not exclude the presence of elements or steps other than those listed in a claim, “a” or “an” does not exclude a plurality, and a single processor or other unit may fulfil the functions of several units recited in the claims. Any reference signs in  
20 the claims shall not be construed so as to limit their scope.

## CONCLUSIES

1. Werkwijze voor het gebruiken van een gegevensverbindingssinrichting, waarbij de werkwijze omvat:

- 5            • het ontvangen van gegevens uit ten minste één gegevensbron;  
              • het comprimeren van de ontvangen gegevens tot een berichtenblok; en  
              • het, onafhankelijk van het feit of er al of niet een verzoek tot het pullen van de ontvangen gegevens is ontvangen vanuit een knoop van een communicatienetwerk, autonoom naar de knoop pushen van het berichtenblok  
10            dat de gecomprimeerde gegevens omvat.

2. Werkwijze volgens conclusie 1, bovendien omvattende:

15            het op autonome wijze pushen van berichtenblokken die daarin gecomprimeerde gegevens omvatten die ontvangen zijn uit de ten minste ene gegevensbron, en dit naar ten minste één knoop van het communicatienetwerk en op vastgestelde tijdsintervallen, onafhankelijk van het feit of er al of niet een verzoek tot het pullen van de ontvangen gegevens is ontvangen vanuit de ten minste ene knoop.

20            3. Werkwijze volgens conclusie 1 of conclusie 2, bovendien omvattende:

25            het plannen van het autonoom pushen van het berichtenblok, op een zodanige wijze dat het pushen van het berichtenblok plaatsvindt binnen hetzelfde tijdvenster als het pushen van een berichtenblok door ten minste één andere gegevensverbindingssinrichting.

30            4. Werkwijze volgens conclusie 3, waarbij het plannen van het autonoom pushen van het berichtenblok is gebaseerd op timinginformatie die ontvangen wordt vanuit een Global Positioning System (gps)-satelliet.

5. Werkwijze volgens één der voorgaande conclusies, waarbij het berichtenblok dat de gecomprimeerde gegevens omvat, op autonome wijze rechtstreeks naar de knoop gepusht wordt.

6. Werkwijze volgens één der voorgaande conclusies, bovendien omvattende:  
het, voorafgaand aan het op autonome wijze naar de knoop pushen van het  
berichtenblok dat de gecomprimeerde gegevens omvat, versleutelen van de  
5 gecomprimeerde gegevens.
7. Werkwijze volgens één der voorgaande conclusies, bovendien omvattende:  
het ten minste tijdelijk opslaan van de gecomprimeerde gegevens.
- 10 8. Werkwijze volgens één der voorgaande conclusies, waarbij één of meerdere van de  
volgende geselecteerd kunnen worden en/of aangepast kunnen worden door een  
gebruiker: de ten minste ene gegevensbron, de ontvangen gegevens, het type van de  
ontvangen gegevens, een geplande tijd voor het op autonome wijze pushen van het  
berichtenblok, de knoop waar het berichtenblok naartoe gepusht wordt.
- 15 9. Werkwijze volgens één der voorgaande conclusies, bovendien omvattende:  
het ontvangen van een verzoek vanuit een knoop van het communicatienetwerk om  
gegevens te pullen;  
het comprimeren van de gevraagde gegevens tot een berichtenblok; en  
20 het naar de knoop versturen van het berichtenblok dat de gecomprimeerde gegevens  
omvat.
10. Werkwijze volgens één der voorgaande conclusies, waarbij de ontvangen gegevens  
gecomprimeerd zijn met een welbepaald percentage.
- 25 11. Werkwijze volgens conclusie 10, waarbij de ontvangen gegevens gecomprimeerd zijn  
met ten minste 50%, ten minste 60%, of ten minste 70%.
12. Werkwijze volgens conclusie 10 of conclusie 11, waarbij de ontvangen gegevens  
30 gecomprimeerd zijn met niet meer dan 90% of met niet meer dan 80%.

13. Werkwijze volgens conclusie 10, waarbij de ontvangen gegevens gecomprimeerd zijn met 79%.
14. Werkwijze volgens één der voorgaande conclusies, waarbij het berichtenblok bovendien informatie omvat die de gegevensverbindingssinrichting identificeert, informatie die de gegevensbron identificeert, informatie die het type gecomprimeerde gegevens in het berichtenblok identificeert, en/of informatie voor het decoderen van de gegevens die gecomprimeerd zijn in het berichtenblok.
  - 5 15. Werkwijze voor het gebruiken van een knoop, waarbij de werkwijze omvat:  
het ontvangen van een berichtenblok dat op autonome wijze gepusht werd vanuit ten minste één gegevensverbindingssinrichting, waarbij het berichtenblok gecomprimeerde gegevens omvat; en  
het decomprimeren van de gecomprimeerde gegevens die aanwezig zijn in het berichtenblok.
    - 10 16. Werkwijze volgens conclusie 15, waarbij de gecomprimeerde gegevens versleuteld zijn, en waarbij de werkwijze bovendien het ontsleutelen omvat van de gecomprimeerde gegevens.
    - 15 17. Werkwijze volgens conclusie 15 of conclusie 16, bovendien omvattende:  
het naar ten minste één gegevensverbindingssinrichting versturen van een verzoek om gegevens te pullen; en  
het ontvangen van de gevraagde gegevens die tot een berichtenblok gecomprimeerd zijn.
  - 20 18. Werkwijze volgens conclusie 15, 16, of 17, bovendien omvattende:  
het formatteren van de gedecomprimeerde gegevens zodat deze door een gebruiker gebruikt kunnen worden.
  - 25 19. Gegevensverbindingssinrichting, omvattende:

een ontvanger die werkzaam is om gegevens te ontvangen vanuit ten minste één gegevensbron; en

een processor die werkzaam is om de ontvangen gegevens de comprimeren tot een berichtenblok, en het, onafhankelijk van het feit of er al of niet vanuit een knoop van een communicatienetwerk een verzoek is ontvangen om de ontvangen gegevens te pullen, op autonome wijze naar de knoop pushen van het berichtenblok waarin de gecomprimeerde gegevens vervat zitten.

5 20. Gegevensverbindingssinrichting volgens conclusie 19, bovendien omvattende:

10 een voedingsbeheerseenheid die werkzaam is om de voeding van de gegevensverbindingssinrichting te beheren.

15 21. Gegevensverbindingssinrichting volgens conclusie 20, waarbij de ontvanger is voorzien

20 in een eerste laag van de gegevensverbindingssinrichting, waarbij de processor is voorzien in een tweede laag van de gegevensverbindingssinrichting, en de voedingsbeheerseenheid is voorzien in een derde laag van de gegevensverbindingssinrichting, waarbij de eerste, tweede, en derde lagen van de gegevensverbindingssinrichting verschillende lagen zijn die elk op onafhankelijke wijze gecontroleerd kunnen worden door een gebruiker.

25 22. Gegevensverbindingssinrichting volgens één der conclusies 19, 20, of 21, bovendien

omvattende:

een opslageenheid die werkzaam is om ten minste tijdelijk de gecomprimeerde gegevens op te slaan.

25 23. Knoop, omvattende:

een ontvanger die werkzaam is om een berichtenblok te ontvangen dat op autonome wijze vanuit ten minste één gegevensverbindingssinrichting gepusht werd, waarbij het berichtenblok gecomprimeerde gegevens omvat; en

een processor die werkzaam is om de gecomprimeerde gegevens die vervat zitten in een berichtenblok te decomprimeren.

24. Knoop volgens conclusie 23, bovendien omvattende:

5        een transmitter die werkzaam is om naar ten minste één gegevensverbindingseinrichting een verzoek te versturen om gegevens te pullen, waarbij de ontvanger bovendien werkzaam is om de gevraagde gegevens te ontvangen die gecomprimeerd zijn tot een berichtenblok.

10      25. Communicatienetwerk, omvattende:

ten minste één gegevensverbindingseinrichting volgens één der conclusies 19 tot en met 22; en

ten minste één knoop volgens één der conclusies 23 tot en met 24.

15      26. Computerprogrammaproduct, een drager omvattende die instructies omvat die ervoor zorgen dat een processor een werkwijze volgens één der conclusies 1 tot en met 18 uitvoert.

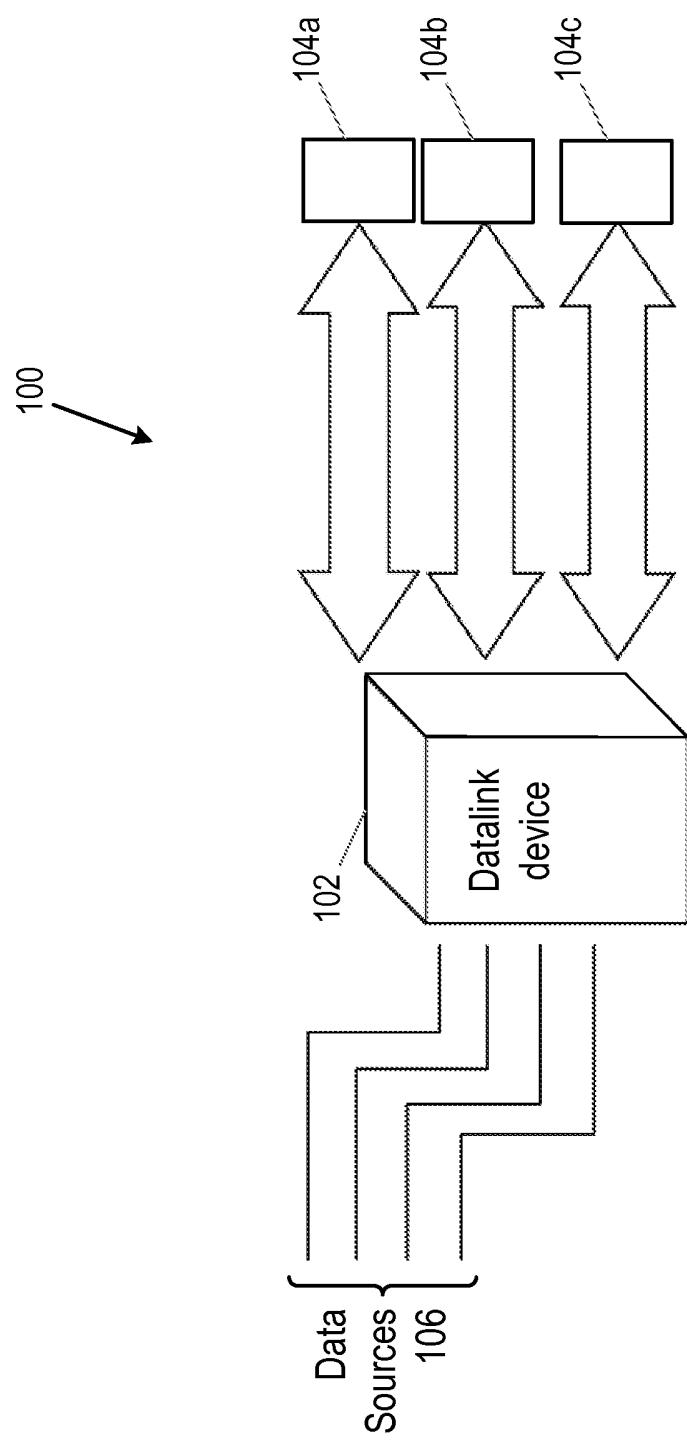


Figure 1

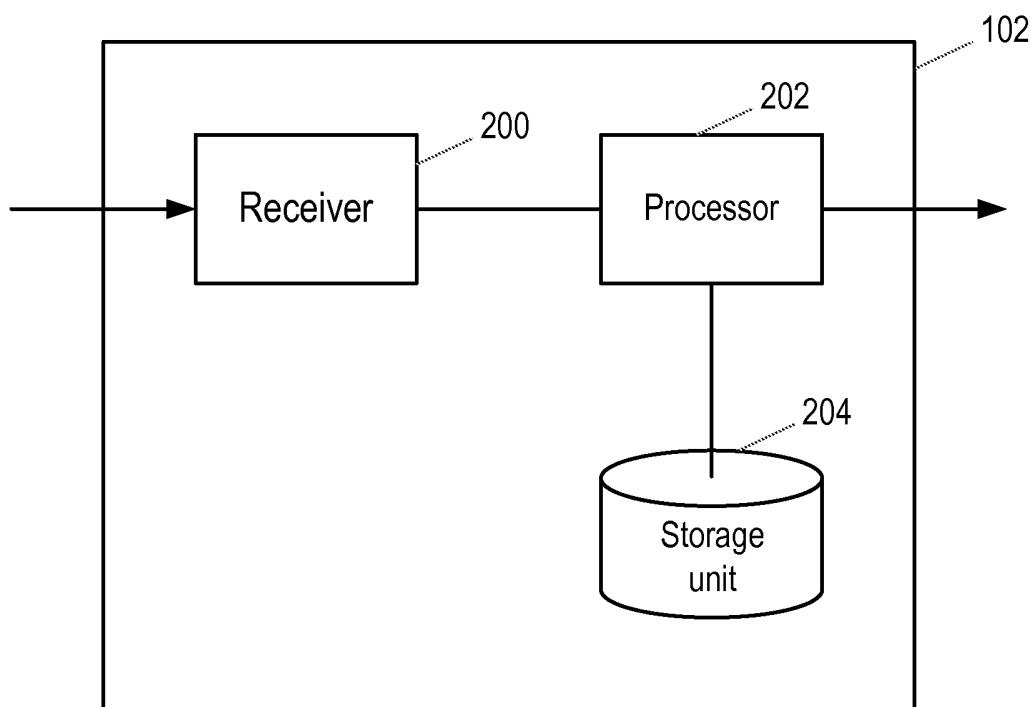


Figure 2

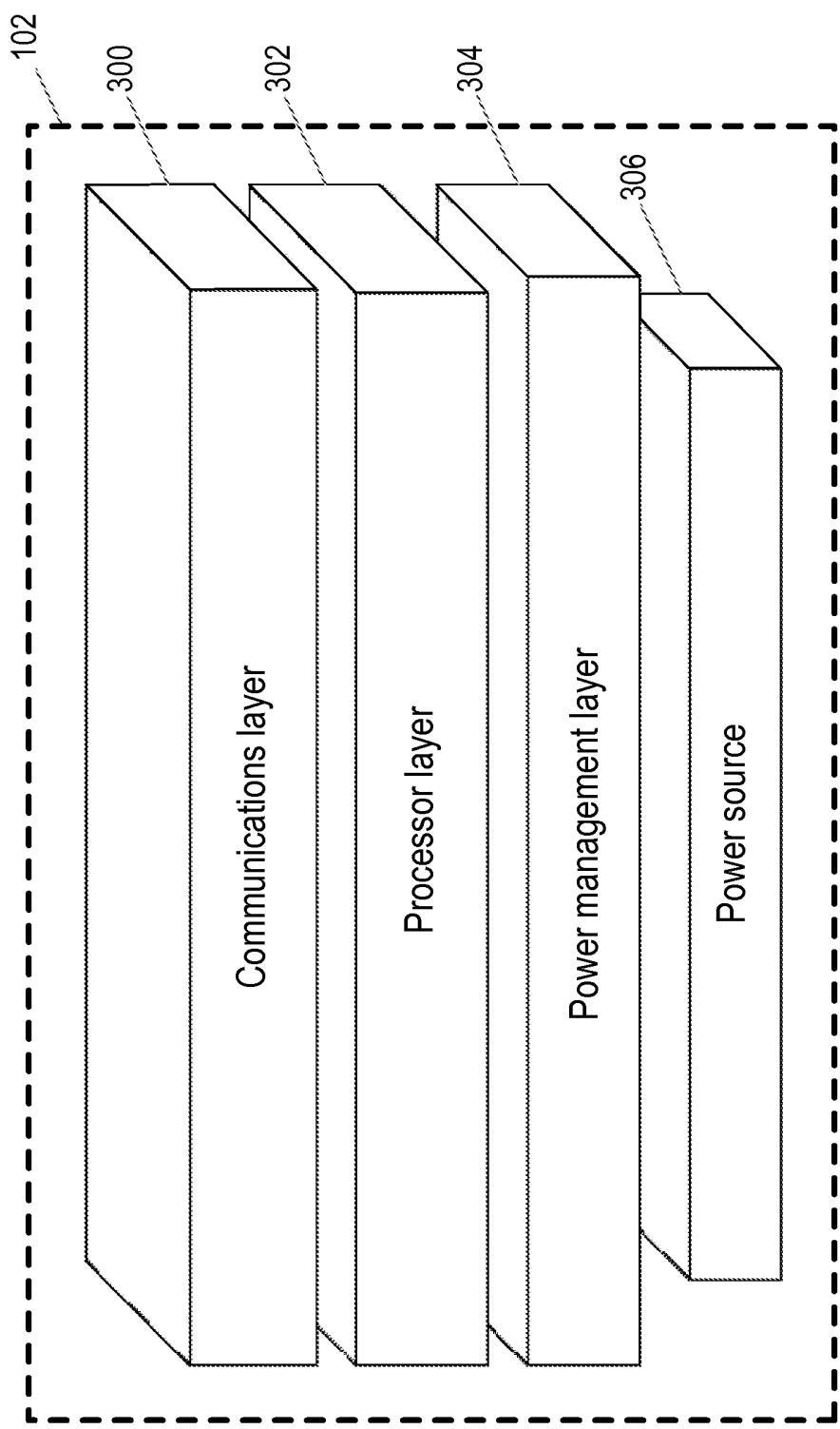


Figure 3

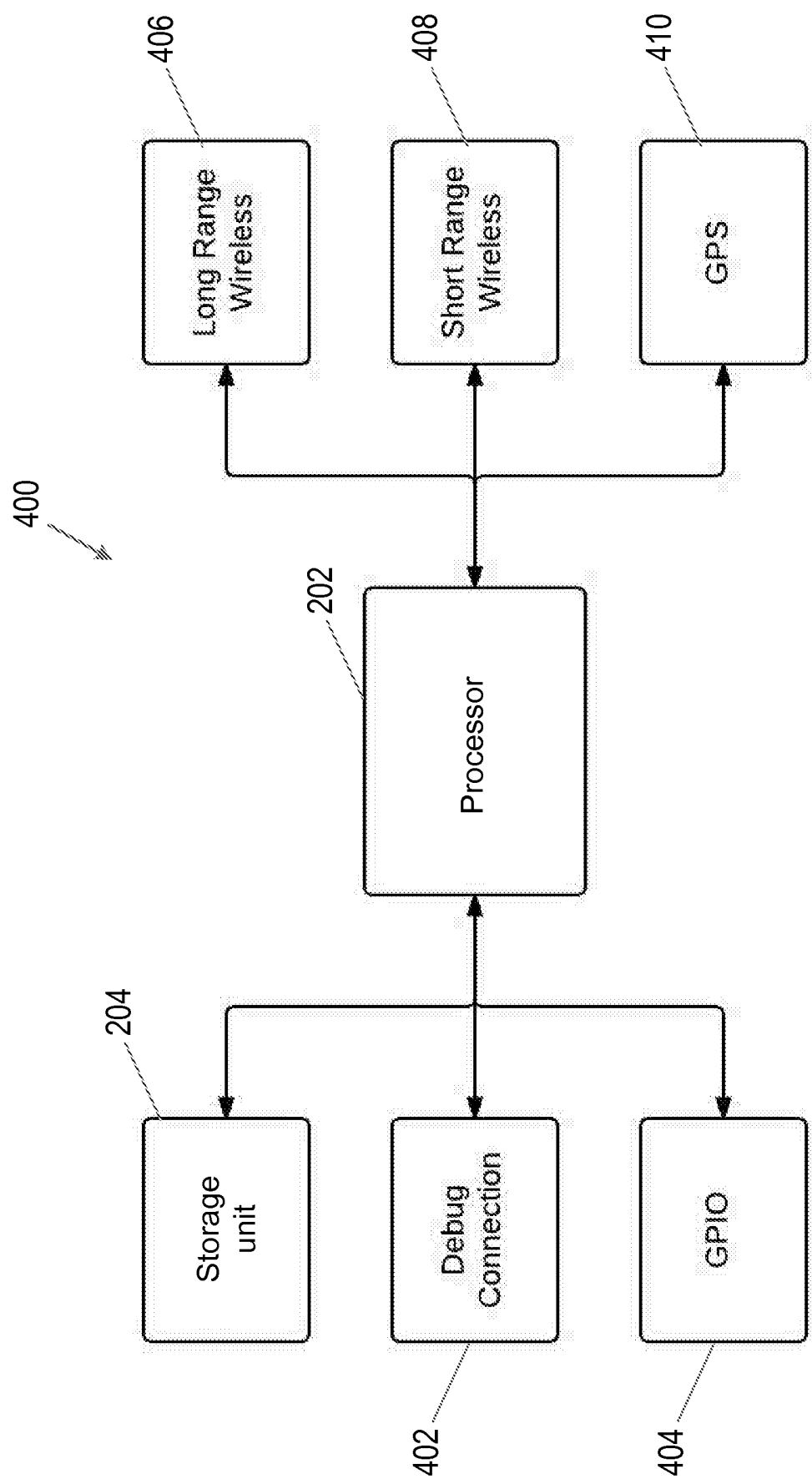


Figure 4

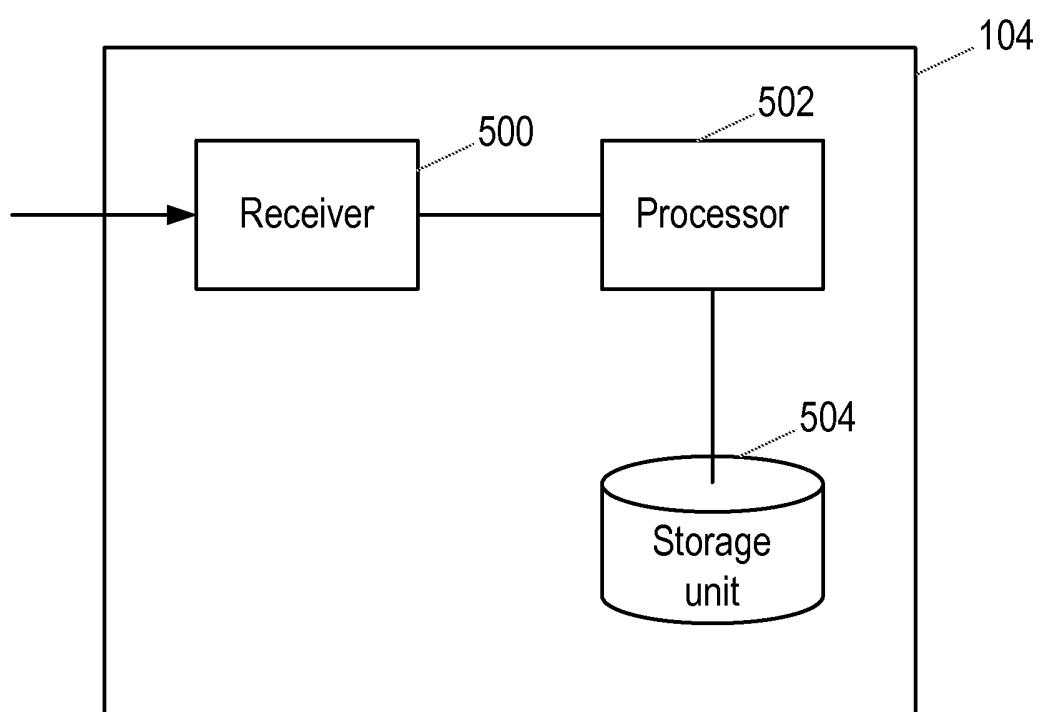


Figure 5

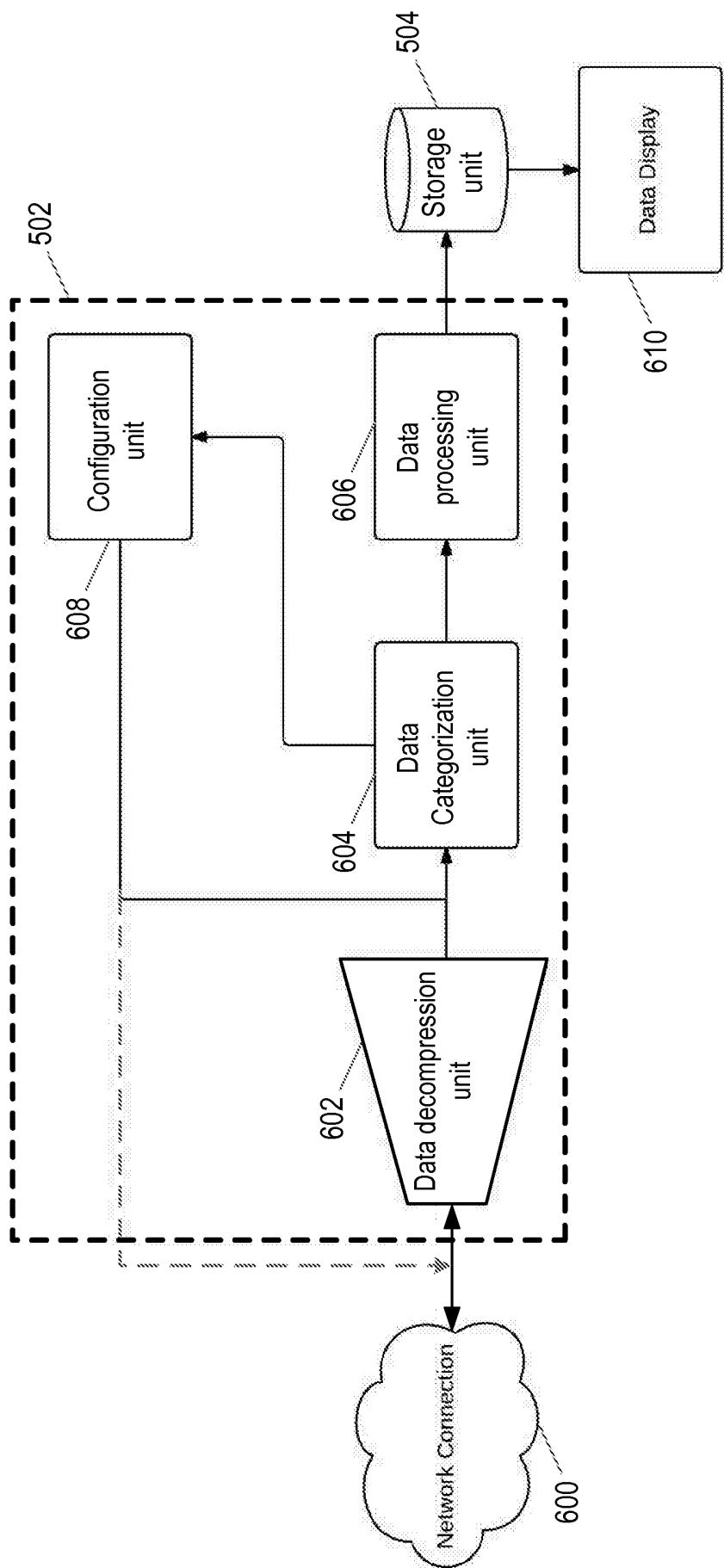


Figure 6

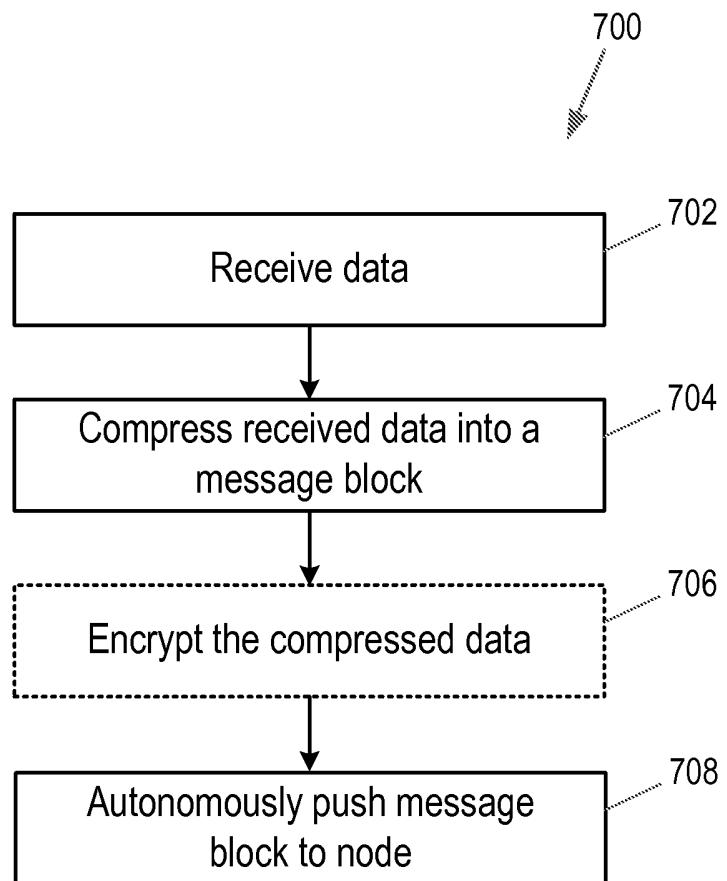


Figure 7

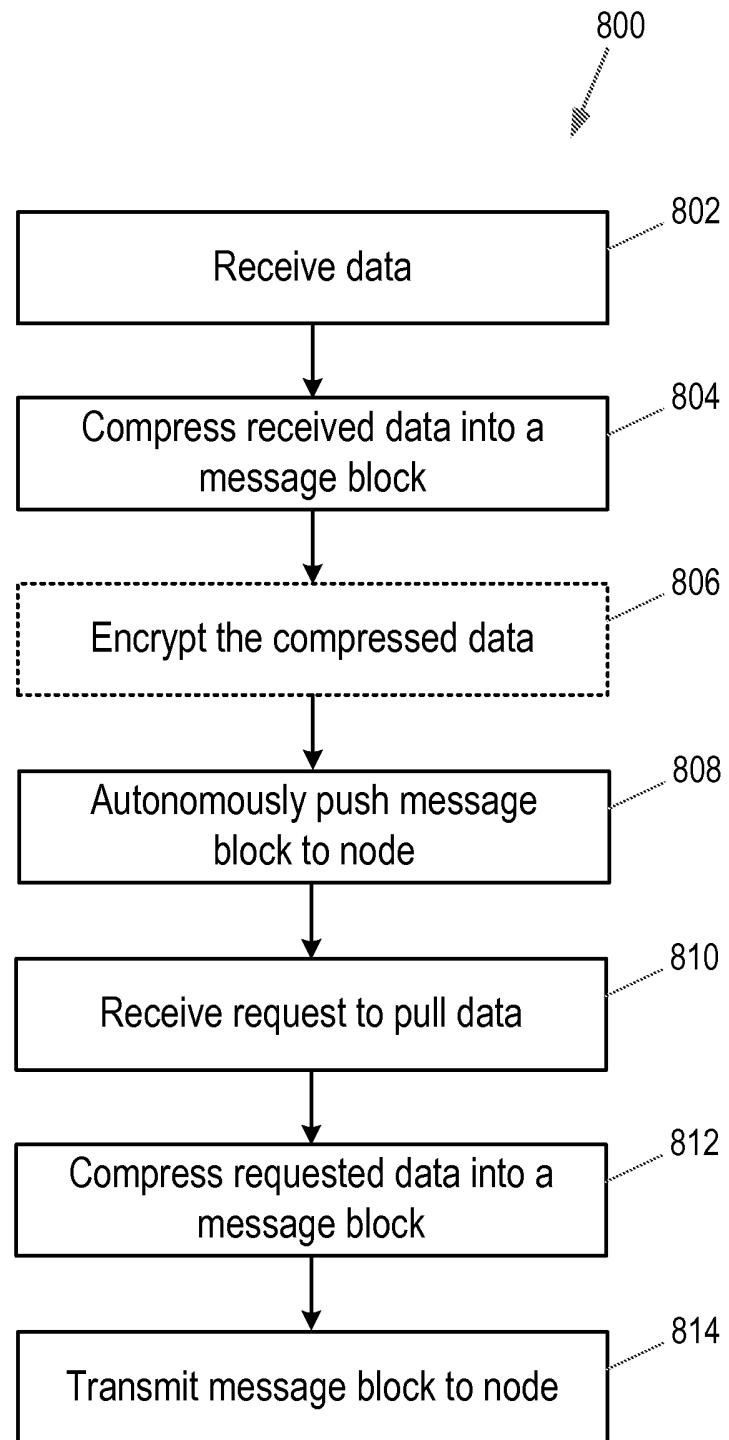


Figure 8

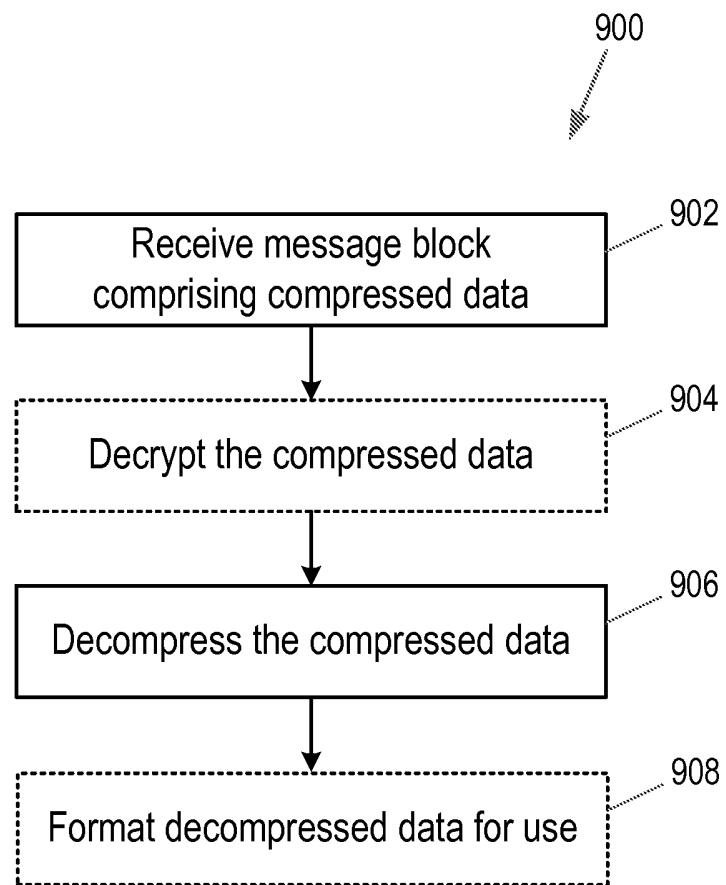


Figure 9

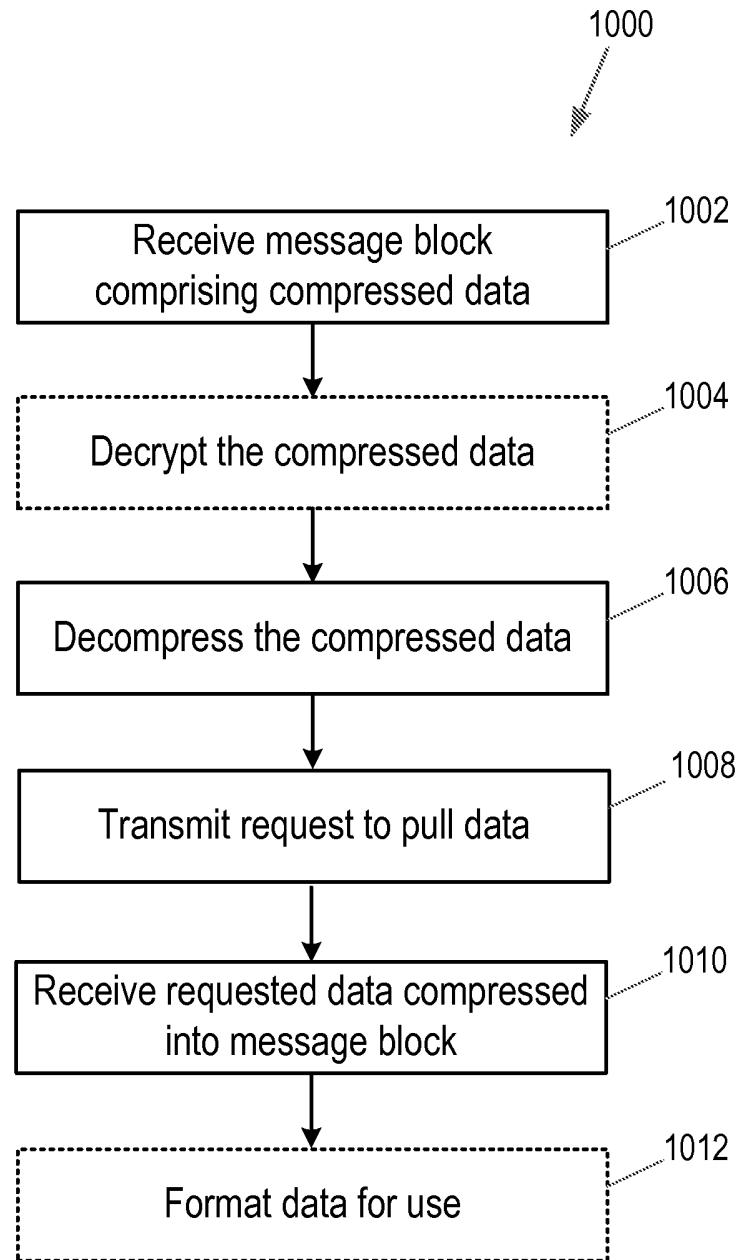
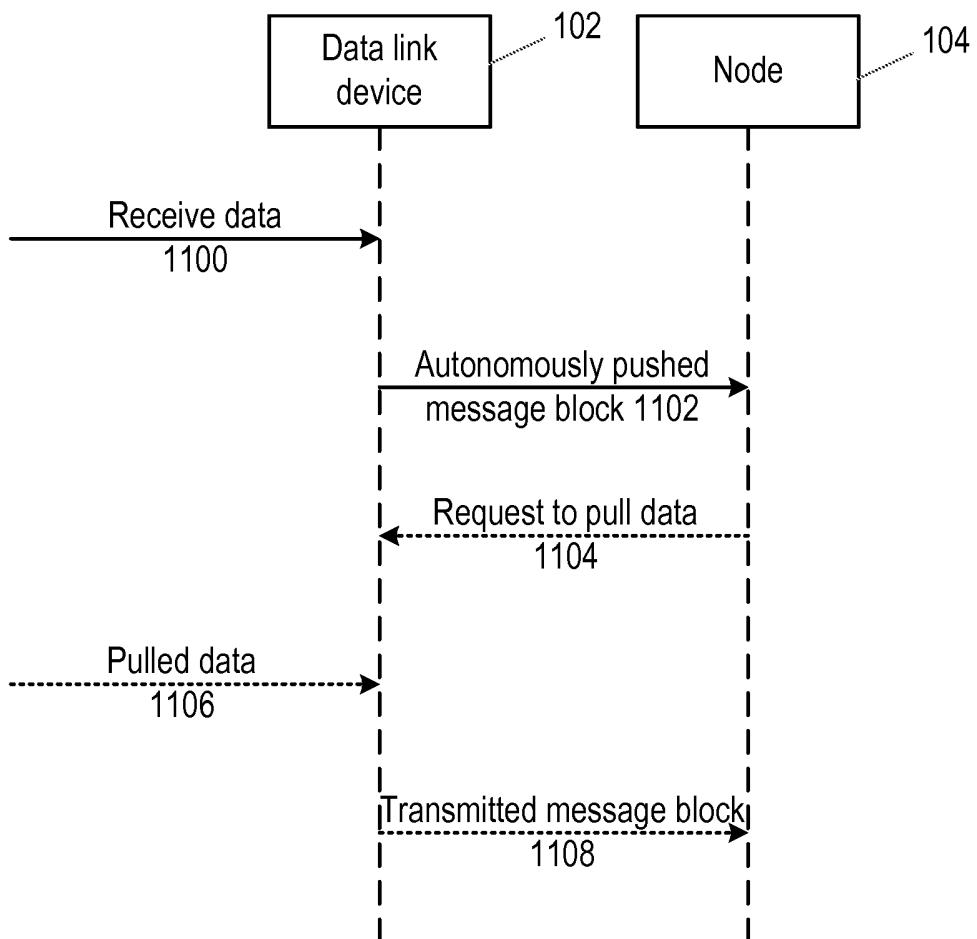


Figure 10



**Figure 11**

12/16

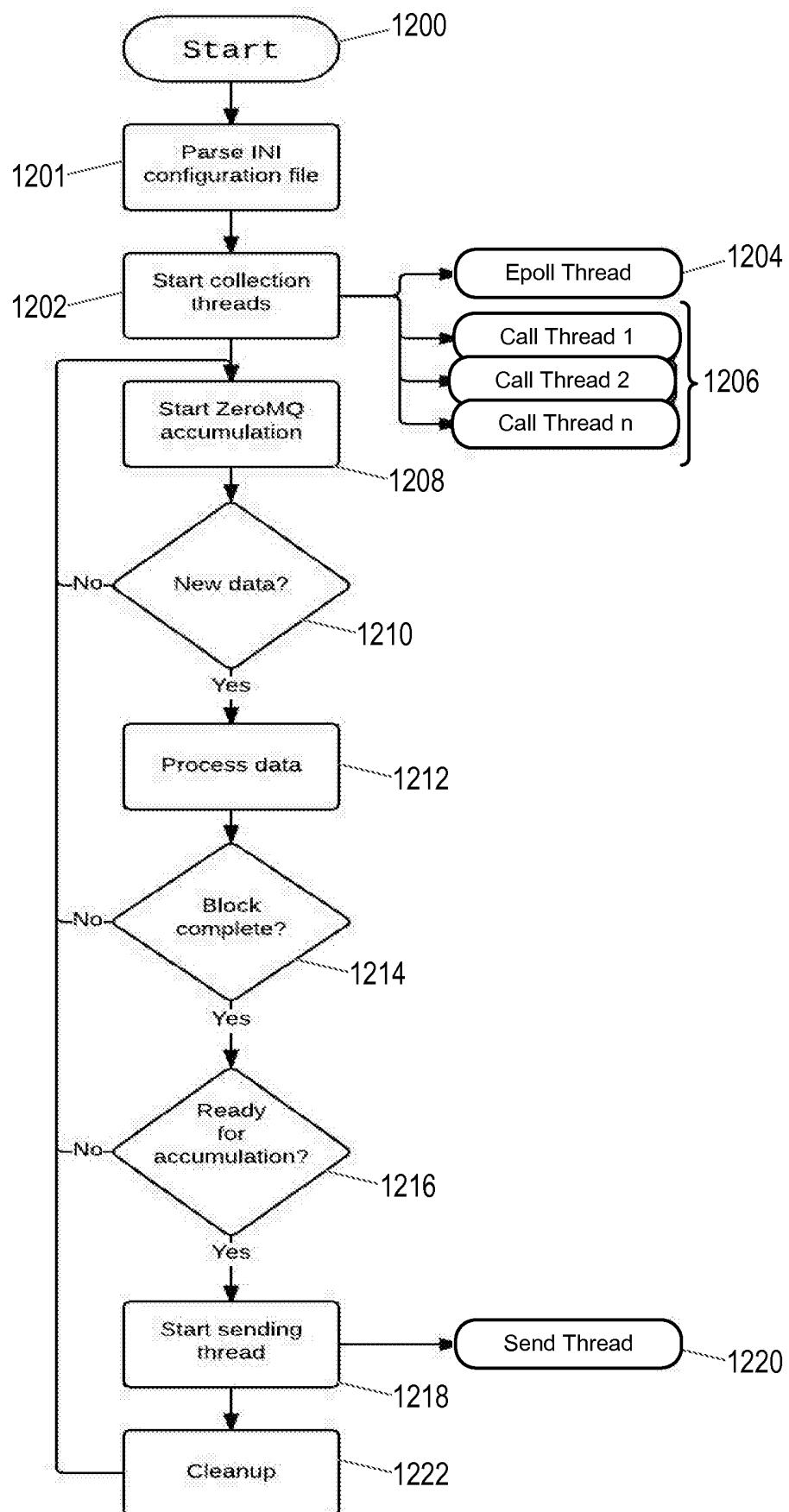


Figure 12

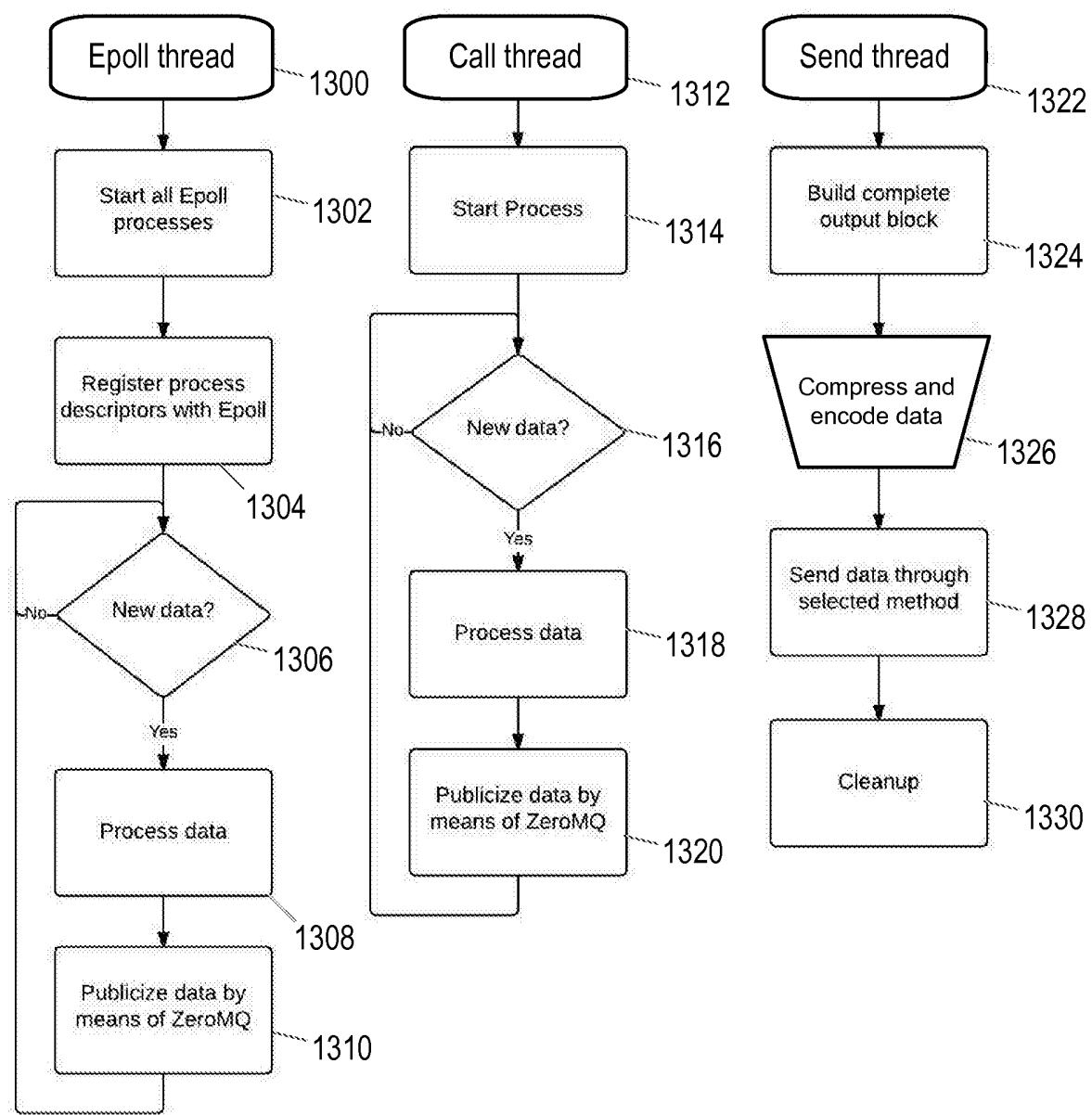


Figure 13

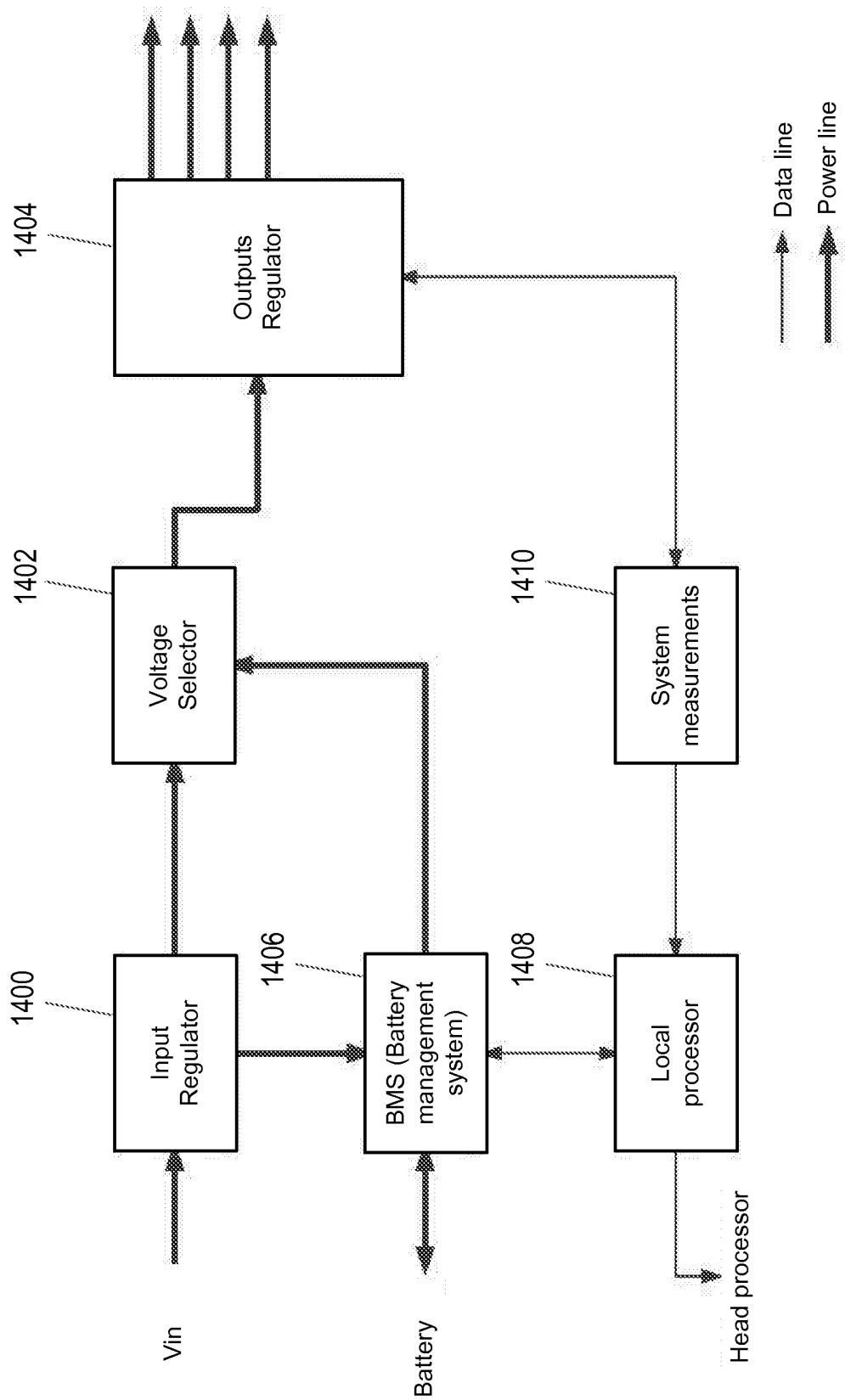


Figure 14

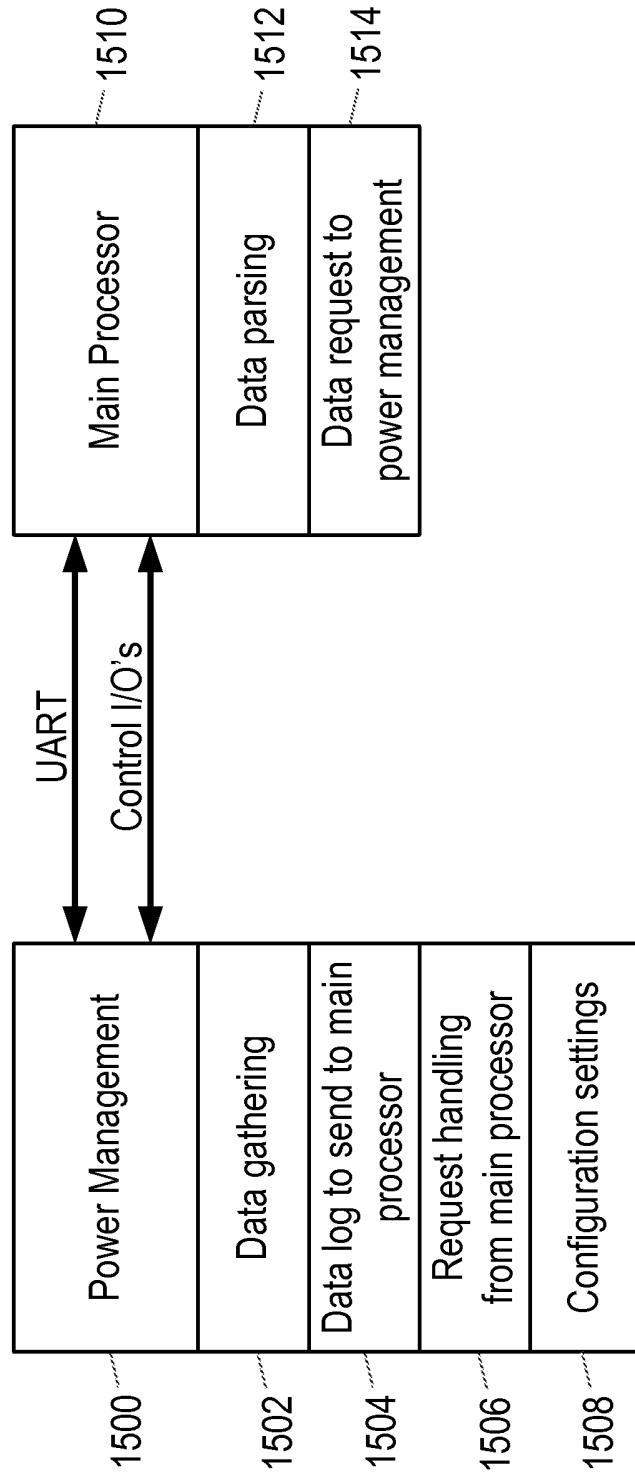


Figure 15

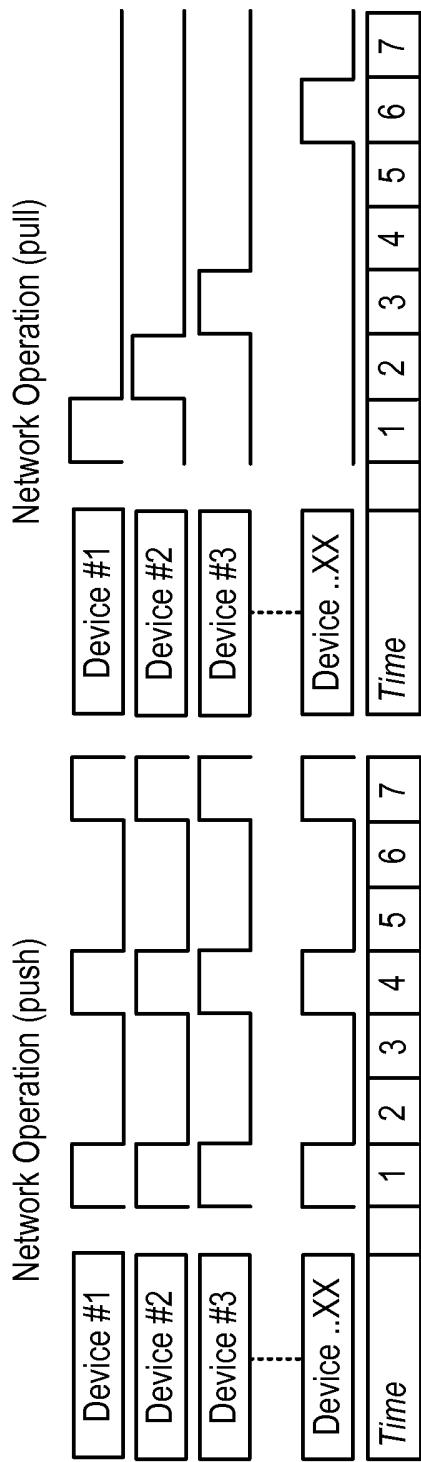


Figure 16a

Figure 16b

**ABSTRACT****A DATA LINK DEVICE**

- 5 There is provided a method of operating a data link device. Data is received from at least one data source. The received data is compressed into a message block. Independently of whether a request to pull the received data is received from a node in a communications network, the message block comprising the compressed data is autonomously pushed to the node.

10

*Figure 7 to accompany the abstract.*



Rijksondernemend  
Nederland

OCTROOIAANVRAAG NR.  
NO 139555  
NL 2016189

### ONDERZOEKSRAPPORT

BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK

#### RELEVANTE LITERATUUR

Categorie <sup>1</sup>	Literatuur met, voor zover nodig, aanduiding van speciaal van belang zijnde tekstgedeelten of figuren.	Van belang voor conclusie(s) nr:	Classificatie (IPC)
	EENHEID VAN UITVINDING ONTBREEKT zie aanvullingsblad B ----- X US 2008/046616 A1 (VERZUNOV SERGEY [RU] ET AL) 21 februari 2008 (2008-02-21) * samenvatting * * alinea [0032], [0077] * * alinea [0103] - alinea [0104] * * alinea [0109], [0110] * * alinea [0122] - alinea [0130]; figuur 5 * ----- Y US 2015/215952 A1 (HINMAN BRIAN [US] ET AL) 30 juli 2015 (2015-07-30) * alinea [0041], [0042] * ----- Y WO 01/43390 A2 (MARKPORT LTD [IE]; CORRIGAN LOUIS [IE]; DOYLE JOHN [IE]; HARTE ROBERT) 14 juni 2001 (2001-06-14) * bladzijde 4, regel 26 - bladzijde 5, regel 5 * * bladzijde 9, regel 6 - regel 15 * -----	1,5,6, 9-19, 23-26 2-4,7,8, 22	INV. H04L29/06 H04L29/08 H04W4/00
		2-4,7,22	Onderzochte gebieden van de techniek
		8	H04L H04W
	Indien gewijzigde conclusies zijn ingediend, heeft dit rapport betrekking op de conclusies ingediend op:		
	Plaats van onderzoek: 's-Gravenhage	Datum waarop het onderzoek werd voltooid: 16 november 2016	Bevoegd ambtenaar: Konrad, Markus
	<b>CATEGORIE VAN DE VERMELDE LITERATUUR</b>		
1	X: de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur Y: de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht A: niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft B: niet-schriftelijke stand van de techniek P: tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur	T: na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bewarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding E: eerder octrooiaanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven D: in de octrooiaanvraag vermeld L: om andere redenen vermelde literatuur &: lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie	

**GEBREK AAN EENHEID VAN UITVINDING**  
**AANVULLINGSBLAD B**

Octrooiaanvraag Nr.:

NO 139555  
NL 2016189

De instantie belast met het uitvoeren van het onderzoek naar de stand van de techniek heeft vastgesteld dat deze aanvraag meerdere uitvindingen bevat, te weten:

1. conclusies: 1-19, 23, 24, 26(compleet); 22, 25(gedeeltelijk)

Methods, apparatuses and computer program product directed to enabling scheduled transmission of data to a client.  
---

2. conclusies: 20, 21(compleet); 22, 25(gedeeltelijk)

Apparatus directed to solving the problem of how to provide another node with power in order to operate.  
---

Het vooronderzoek werd tot het eerste onderwerp beperkt.

**AANHANGSEL BEHORENDE BIJ HET RAPPORT BETREFFENDE  
HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK,  
UITGEVOERD IN DE OCTROOIAANVRAGE NR.**

NO 139555  
NL 2016189

Het aanhangsel bevat een opgave van elders gepubliceerde octrooiaanvragen of octrooien (zogenaamde leden van dezelfde octrooifamilie), die overeenkomen met octrooischriften genoemd in het rapport.

De opgave is samengesteld aan de hand van gegevens uit het computerbestand van het Europees Octrooibureau per  
De juistheid en volledigheid van deze opgave wordt noch door het Europees Octrooibureau, noch door het Bureau voor de Industriële eigendom gegarandeerd; de gegevens worden verstrekt voor informatiedoelenden.

16-11-2016

In het rapport genoemd octrooigeschrift		Datum van publicatie	Overeenkomend(e) geschrift(en)			Datum van publicatie
US 2008046616	A1	21-02-2008	GEEN			
US 2015215952	A1	30-07-2015	CN 105191294 A			23-12-2015
			US 9001689 B1			07-04-2015
			US 2015215952 A1			30-07-2015
			WO 2015112627 A2			30-07-2015
WO 0143390	A2	14-06-2001	AT 311713 T			15-12-2005
			AU 2021001 A			18-06-2001
			DE 60024486 D1			05-01-2006
			DE 60024486 T2			13-07-2006
			DK 1238509 T3			06-03-2006
			EP 1238509 A2			11-09-2002
			ES 2253276 T3			01-06-2006
			US 2002187775 A1			12-12-2002
			WO 0143390 A2			14-06-2001

## SCHRIFTELIJKE OPINIE

DOSSIER NUMMER NO139555	INDIENINGSDATUM 01.02.2016	VOORRANGSDATUM	AANVRAAGNUMMER NL2016189
CLASSIFICATIE INV. H04L29/06 H04L29/08 H04W4/00			
AANVRAGER Head Technologies International			

Deze schriftelijke opinie bevat een toelichting op de volgende onderdelen:

- Onderdeel I Basis van de schriftelijke opinie
- Onderdeel II Voorrang
- Onderdeel III Vaststelling nieuwheid, inventiviteit en industriële toepasbaarheid niet mogelijk
- Onderdeel IV De aanvraag heeft betrekking op meer dan één uitvinding
- Onderdeel V Gemotiveerde verklaring ten aanzien van nieuwheid, inventiviteit en industriële toepasbaarheid
- Onderdeel VI Andere geciteerde documenten
- Onderdeel VII Overige gebreken
- Onderdeel VIII Overige opmerkingen

DE BEVOEGDE AMBTENAAR

Konrad, Markus

## SCHRIJFTELIJKE OPINIE

Aanvraag nr.:  
NL2016189

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### Onderdeel I Basis van de Schriftelijke Opinie

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1. Deze schriftelijke opinie is opgesteld op basis van de meest recente conclusies ingediend voor aanvang van het onderzoek.
2. Met betrekking tot **nucleotide en/of aminozuur sequenties** die genoemd worden in de aanvraag en relevant zijn voor de uitvinding zoals beschreven in de conclusies, is dit onderzoek gedaan op basis van:
  - a. type materiaal:
    - sequentie opsomming
    - tabel met betrekking tot de sequentie lijst
  - b. vorm van het materiaal:
    - op papier
    - in elektronische vorm
  - c. moment van indiening/aanlevering:
    - opgenomen in de aanvraag zoals ingediend
    - samen met de aanvraag elektronisch ingediend
    - later aangeleverd voor het onderzoek
3.  In geval er meer dan één versie of kopie van een sequentie opsomming of tabel met betrekking op een sequentie is ingediend of aangeleverd, zijn de benodigde verklaringen ingediend dat de informatie in de latere of additionele kopieën identiek is aan de aanvraag zoals ingediend of niet meer informatie bevatten dan de aanvraag zoals oorspronkelijk werd ingediend.
4. Overige opmerkingen:

## SCHRIJFTELijke OPINIE

Aanvraag nr.:  
NL2016189

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### Onderdeel III Vaststelling nieuwheid, inventiviteit en industriële toepasbaarheid niet mogelijk

---

De vraag of de uitvinding in de aanvraag nieuw, inventief en industrieel toepasbaar is, wordt niet behandeld in deze schriftelijke opinie met betrekking tot:

- de gehele aanvraag
- conclusies: 20, 21(compleet); 22, 25(gedeeltelijk)
- omdat:
- deze aanvraag of deze conclusies „ , betrekking hebben op materie waarvoor het niet zinvol is een schriftelijke opinie op te stellen.
- de beschrijving, figuren of deze conclusies „ , zo onduidelijk zijn dat het niet zinvol is een schriftelijke opinie op te stellen.
- deze conclusies „ , onvoldoende steun vinden in de beschrijving waardoor het niet zinvol is een schriftelijke opinie op te stellen.
- geen onderzoek naar de stand van de techniek is uitgevoerd voor deze conclusies 20, 21(compleet); 22, 25(gedeeltelijk).
- een zinvolle schriftelijke opinie niet opgesteld kon worden omdat de sequentie opsomming niet beschikbaar was in het juiste formaat, of in het geheel niet beschikbaar was (WIPO ST25).
- een zinvolle schriftelijke opinie niet opgesteld kon worden zonder de tabellen met betrekking tot de sequentie opsommingen; of deze tabellen waren niet beschikbaar in elektronische vorm.
- Zie aparte bladzijde

---

### Onderdeel IV De aanvraag heeft betrekking op meer dan één uitvinding

---

1. Vastgesteld is dat de octrooiaanvraag betrekking heeft op meer dan één uitvinding.

**Zie aparte bladzijde**

2. Het onderzoek naar de stand van de techniek is beperkt tot de eerstgenoemde uitvinding in de conclusies en betreft:

- alle conclusies
- conclusies: (zie nieuwheidsrapport)

## SCHRIJFELIJKE OPINIE

Aanvraag nr.:  
NL2016189

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### Onderdeel V Gemotiveerde verklaring ten aanzien van nieuwheid, inventiviteit en industriële toepasbaarheid

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#### 1. Verklaring

Nieuwheid	Ja: Conclusies 2-4, 7-14, 16-18, 24(compleet); 22(gedeeltelijk) Nee: Conclusies 1, 5, 6, 15, 19, 23, 26(compleet); 25(gedeeltelijk)
Inventiviteit	Ja: Conclusies Nee: Conclusies 1-19, 23, 24, 26(compleet); 22, 25(gedeeltelijk)
Industriële toepasbaarheid	Ja: Conclusies 1-19, 23, 24, 26(compleet); 22, 25(gedeeltelijk) Nee: Conclusies

#### 2. Citaties en toelichting:

**Zie aparte bladzijde**

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### Onderdeel VII Overige gebreken

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De volgende gebreken in de vorm of inhoud van de aanvraag zijn opgemerkt:

**Zie aparte bladzijde**

**Re Item IV**

- 1 Reference is made to the following documents:
  - D1 US 2008/046616 A1 (VERZUNOV SERGEY [RU] ET AL) 21 februari 2008 (2008-02-21)
  - D2 US 2015/215952 A1 (HINMAN BRIAN [US] ET AL) 30 juli 2015 (2015-07-30)
  - D3 WO 01/43390 A2 (MARKPORT LTD [IE]; CORRIGAN LOUIS [IE]; DOYLE JOHN [IE]; HARTE ROBERT) 14 juni 2001 (2001-06-14)
  
- 2 **Lack of unity of invention**
  - 2.1 It is considered that there are two inventions covered by the claims indicated as follows:(1) Claims 1-19, 22(partially), 23, 24, 25(partially), 26: Methods, apparatuses and computer program product directed to enabling scheduled transmission of data to a client.(2) Claims 20, 21, 22(partially), 25(partially): Apparatus directed to solving the problem of how to control power provision to a computation node.The reasons for which these (alleged) inventions are not so linked as to form a single general inventive concept are as follows:
  - 2.2 Prior art document D1 (US 2008/046616 A1) discloses werkwijze voor het gebruiken van een gegevensverbindingseinrichting, (abstract: "the appliance accumulates data from a payload of the intercepted transport layer packets, determines data accumulated for transmission should be compressed based on one or more compression trigger, and compresses the accumulated data into a self-contained compression block for transmission."; paragraph 122: "At step 525, the appliance 200 determines to start compression of the accumulated data 275 in response to a compression trigger 405. At step 530, the appliance 200 compresses the accumulated data 275 into a compressed block 450")waarbij de werkwijze omvat:het ontvangen van gegevens uit ten minste één gegevensbron

(paragraph 125: "a server 106 [...] transmits the network packets to the appliance 200 to be transmitted to a computing device 100."; paragraph 122 with fig. 5: "At step 515, the appliance receives a stream of network traffic as a transport layer packets communicated between a client 102 and a server 106. [...] At step 520, the appliance accumulates data from the payload of the one or more transport layer packets.");

het comprimeren van de ontvangen gegevens tot een berichtenblok;

(paragraph 103: "The appliance 200 **compresses the accumulated data 275 into a self contained compression block 405.**"; paragraph 104: "the appliance 200 stores the accumulated data 275 into a timer queue as the appliance 200 waits for more data to come. If new data has not arrived for a predetermined time period, e.g., expiration of a time, the appliance 200 starts compressing [...] the accumulated data 275. [...] the appliance 200 compresses the accumulated data 275 into a self-contained compression block 405."); paragraph 122 with fig. 5: "At step 525, the appliance 200 determines to start compression of the accumulated data 275 in response to a compression trigger 405. At step 530, the appliance 200 compresses the accumulated data 275 into a compressed block 450"; paragraph 127 with fig. 5: "At step 525, the appliance 200 determines when to start compressing accumulated data 275 in response to one or more compression triggers 405. [...] upon receiving a quantum of data, such as 56 KB of data. [...] the appliance 200 determines to start compressing accumulated data 275 upon receiving a push flag or command from the sender of the data, such as TCP PUSH flag for a TCP type of transport layer protocol. [...] the appliance 200 determines to start compressing accumulated data 275 upon expiration of a timer 242. [...] the appliance 200 determines to start compressing accumulated data 275 based upon a combination of compression triggers 405. [...] the appliance 200 determines to start compression based on expiration of a timer 242 and receipt of a quantum of data. [...] the appliance 200 determines to start compression based on receipt of a push flag and receipt of a quantum of a data.");

compression algorithms: paragraph 110: "the compression type 420 includes a Huffman coding or an adaptive Huffman coding technique, such as the Vitter algorithm or the Faller-Gallager-Knuth (FGN) technique. In some embodiments, the compression type 420 includes bzip2, a combination of the Burrows-Wheeler transform and Huffman encoding. In some embodiments, for audio and/or video data, the

compression type includes any type and form of lossy compression algorithms."; paragraph 109: "Although some embodiments of compression types 420 are described above with GNU zip or gzip and deflate compression, the compression types 420 can include one or more of a wide range of different types and forms of compression techniques. In some embodiments, the compression type 420 may include any type and form of compression or packaging file format such as winzip or tar.")

en het, onafhankelijk van het feit of er al of niet een verzoek tot het pullen van de ontvangen gegevens is ontvangen vanuit een knoop van een communicatienetwerk, autonoom naar de knoop pushen van het berichtenblok dat de gecomprimeerde gegevens omvat

(The compression and subsequent delivery of data to the client is independent of any pull requests but is triggered based on e.g. a timer mechanism (see paragraphs 104, 122, 127 with fig. 5). Thereafter, the compressed block is sent to a client:

paragraph 129 with fig. 5: "At step 535, the appliance 200 transmits the compression block 450 to the client agent 120."; paragraph 130 with fig. 5: "At step 540, the client agent 120 receives the compression block 450 and decompresses the compression block 450 in accordance with the identified compression type 420 and/or compression policy 410.").

- 2.3 A comparison of the first potential invention and document D1 yields the special technical feature "pushen van berichtenblokken ... op vastgestelde tijdsintervallen" (claim 2) as contribution of alleged invention 1 over document D1. This difference is considered to be associated with the technical effect that transmissions from a sender device of D1 are performed as soon as the compression phase at the transmitter ends. The differing feature can therefore be seen to be associated with the objective technical problem of how to enable scheduled transmission of data to a client.
- 2.4 The comparison of the second potential invention and prior art document D1 yields the special technical feature "een voedingsbeheerseenheid die werkzaam is om de voeding van de gegevensverbindingseinrichting te beheren" (claim 20) as contribution of alleged invention 2 over document D1. This special technical features is considered to solve the problem of how to control power provision to a computation node.

Consequently, neither the objective problem underlying the subjects of the two claimed inventions, nor the solutions as defined by the special technical features described, allow for the link of a common inventive concept to be established between the said alleged inventions.

- 2.5 In conclusion, the two groups are not linked by a single inventive concept. The application therefore does not meet the requirement of unity.

**Re Item V**

**3 Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

3.1 The present application does not meet the criteria of patentability, because the subject-matter of independent claims 1, 15, 19, 23 and 26 is not new.

3.1.1 Claim 1: The subject-matter of claim 1 is not new in view of the teachings of document D1 (see Section 2.2 ).

3.1.2 Claim 15: Document D1 discloses

werkwijze voor het gebruiken van een knoop, waarbij de werkwijze omvat: het ontvangen van een berichtenblok dat op autonome wijze gepusht werd vanuit ten minste één gegevensverbindingseinrichting, waarbij het berichtenblok gecomprimeerde gegevens omvat;

(The compression and subsequent delivery of data to the client is independent of any pull requests but is triggered based on e.g. a timer mechanism (see e.g. paragraphs 104, 122, 127 with fig. 5 regarding triggers/timers for starting compression of data into a data block to be delivered):

paragraph 104: "the appliance 200 stores the accumulated data 275 into a timer queue as the appliance 200 waits for more data to come. If new data has not arrived for a predetermined time period, e.g., expiration of a time, the appliance 200 starts compressing [...] the accumulated data 275. [...] the appliance 200 compresses the accumulated data 275 into a self-contained compression block 405. The predetermined timeout period may be set or controlled using a parameter 415, such as the 'compresstimeout' parameter illustrated in the table below."; paragraph 122: "At step 525, the appliance 200 determines to start compression of the accumulated data 275 in response to a compression trigger 405. At step 530, the appliance 200 compresses the accumulated data 275 into

a compressed block 450"; paragraph 127: "At step 525, the appliance 200 determines when to start compressing accumulated data 275 in response to one or more compression triggers 405. [...] upon receiving a quantum of data, such as 56 KB of data. [...] the appliance 200 determines to start compressing accumulated data 275 upon receiving a push flag or command from the sender of the data, such as TCP PUSH flag for a TCP type of transport layer protocol. [...] the appliance 200 determines to start compressing accumulated data 275 upon expiration of a timer 242. [...] the appliance 200 determines to start compressing accumulated data 275 based upon a combination of compression triggers 405. [...] the appliance 200 determines to start compression based on expiration of a timer 242 and receipt of a quantum of data. [...] the appliance 200 determines to start compression based on receipt of a push flag and receipt of a quantum of a data."

transmission of compressed data to the client: paragraph 129: "At step 535, the appliance 200 transmits the compression block 450 to the client agent 120.")

en het decomprimeren van de gecomprimeerde gegevens die aanwezig zijn in het berichtenblok

(paragraph 122 with fig. 5: "At step 530, the appliance 200 compresses the accumulated data 275 into a compressed block 450, and at step 535, transmits the compress block 450 to the client agent 120. At step 540, the client agent 120 decompresses the compressed block 450 according to the compress type 420 or compression policy 410, and provides the uncompressed data to an application."; paragraph 130: "the client agent 120 receives the compression block 450 and decompresses the compression block 450 in accordance with the identified compression type 420 and/or compression policy 410.")

The subject-matter of claim 15 is therefore not new.

- 3.1.3 Claims 19: The reasoning for claim 1 applies mutatis mutandis to the subject-matter of corresponding independent claim 19.
- 3.1.4 Claims 23: The reasoning for claim 15 applies mutatis mutandis to the subject-matter of corresponding independent claims 23.
- 3.1.5 Claim 26: The reasoning for claims 1 and 15 applies mutatis mutandis to the subject-matter of corresponding independent claim 26.

- 3.2 Dependent claims 2-14, 16-18, 22, 24 and 25 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step, the reasons being as follows:
- 3.3 Claim 2: The teachings of D1 and the subject-matter of claim 2 differ in the feature "pushen van berichtenblokken ... op vastgestelde tijdsintervallen". This difference is considered to be associated with the technical effect that transmissions from a sender device of D1 are performed as soon as the compression phase at the transmitter ends. The differing feature can therefore be seen to be associated with the objective technical problem of how to enable scheduled data transmission.
- Document D2 discloses this feature within the framework of GPS synchronized TDMA whereby transmission is scheduled to match a given time frame (D2, paragraphs 41, 42).
- The skilled person attempting to solve the objective technical problem would find D2 and apply its teachings in order to solve it.
- Hence, the subject-matter of claim 1 is considered to lack an inventive step in view of the combined teachings of D1 and D2.
- 3.4 Claims 3, 4: The further features of dependent claims 3 and 4 are considered to be normal design features in view of the combined teachings of D1 and D2.
- 3.5 Claim 5: The features of claim 5 are considered disclosed by document D1 (see Section 2.2 ).
- 3.6 Claim 6: Document D1 discloses an encryption engine in the device which performs packet compression, said engine may be used to encrypt data packets. (paragraph 55: "As shown in FIG. 2, the kernel space 204 includes ... an encryption engine 234, a policy engine 236 and multi-protocol compression logic 238."); paragraph 60: "the encryption engine 234 encrypts and decrypts network packets, or any portion thereof, communicated via the appliance 200."). The subject-matter of claim 6 is therefore considered disclosed by D1.
- 3.7 Claims 7, 22: Buffering data scheduled for transmission at a particular time is obvious in view of the combination of D1 and D2.
- 3.8 Claim 8: The subject-matter of claim 8 is considered obvious in view of the combined disclosure of documents D1 and D3 (D3, page 4, last paragraph, page 5, 2nd paragraph; "said interface comprises means for setting **data filters**, for defining **push schedules**, and for configuring subscriber terminal

type"; page 9, lines 6-15: "Subscriber Self-Provisioning-'home page' ... The user can personalise and speed access to frequently used services by, for example, setting data filters, defining push schedules").

- 3.9 Claims 9, 17, 18, 24: Client requests for data from a server are disclosed by D1 (par. 32, 77). The subject-matter of claim 9 (and that of corresponding dependent claims 17, 18 and 24) is therefore obvious in view of this document's teaching.
- 3.10 Claims 10-13: The subject-matter of claims 10-13 corresponds to normal design features in the field of data compression. Hence the subject-matter of these claims cannot be considered to involve an inventive step.
- 3.11 Claim 14: The subject-matter of claim 14 corresponds to normal design features for the skilled person because they are known from common general knowledge and would be considered in view of the context of D1.
- 3.12 Claim 16: Document D1 discloses an encryption engine in the device which performs packet compression, said engine may be used to encrypt data packets (paragraph 55: "As shown in FIG. 2, the kernel space 204 includes ... an encryption engine 234, a policy engine 236 and multi-protocol compression logic 238."); paragraph 60: "the encryption engine 234 encrypts and decrypts network packets, or any portion thereof, communicated via the appliance 200."). It is therefore obvious for the client to decrypt encrypted packets when received.
- 3.13 Claim 25: Document D1 discloses the subject-matter of claim 25 which depends on both independent claims 19 and 23 (see Sections 3.1.3 , 3.1.4 ).

**Re Item VII**

**4 Certain defects in the application**

- 4.1 The features of the claims are not provided with reference signs placed in parentheses.
- 4.2 The relevant background art disclosed in document D1 is not mentioned in the description, nor is this document identified therein.