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(54) SYSTEMS AND METHODS FOR ENCODING AND DECODING

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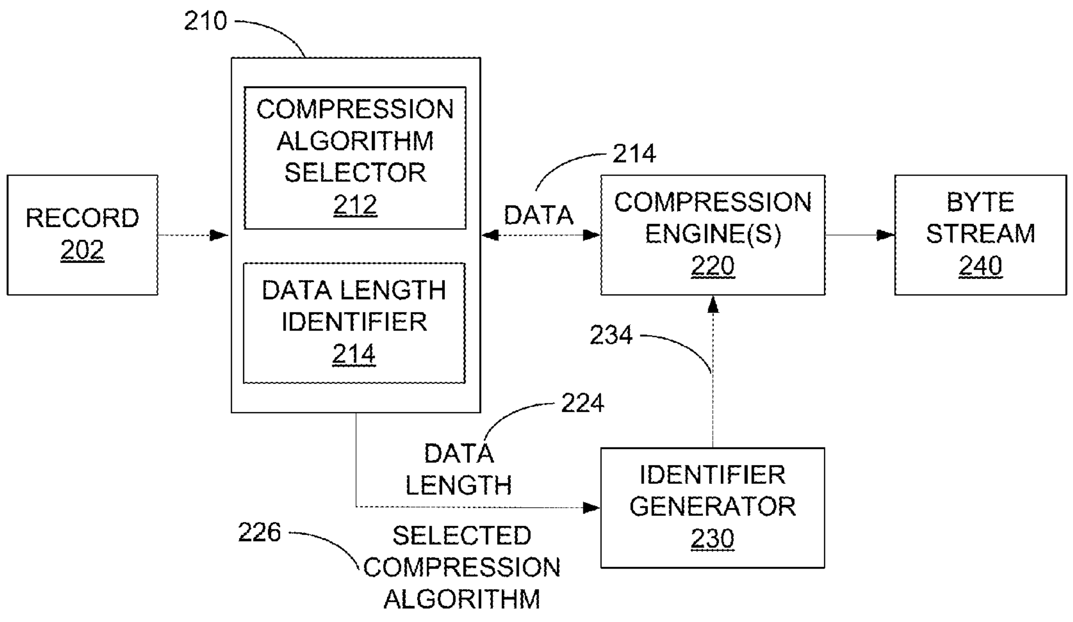
(57) **ABSTRACT**

Various embodiments of the invention provide systems, devices, and methods for decompressing encoded electronic data to increase decompression throughput using any number of decoding engines. In certain embodiments, this is accomplished by identifying and processing a next record in a pipeline operation before having to complete the decompression of a current record. Various embodiments take advantage of the knowledge of the method of how the records have been encoded, e.g., in a single long record, to greatly reduce delay time, compared with existing designs, when decompressing encoded electronic data.

200


210
COMPRESSION ALGORITHM SELECTOR 212
DATA LENGTH IDENTIFIER 214
RECORD 202
214
DATA
COMPRESSION ENGINE(S) 220
BYTE STREAM 240
234
224
DATA LENGTH
IDENTIFIER GENERATOR 230
226
SELECTED COMPRESSION ALGORITHM

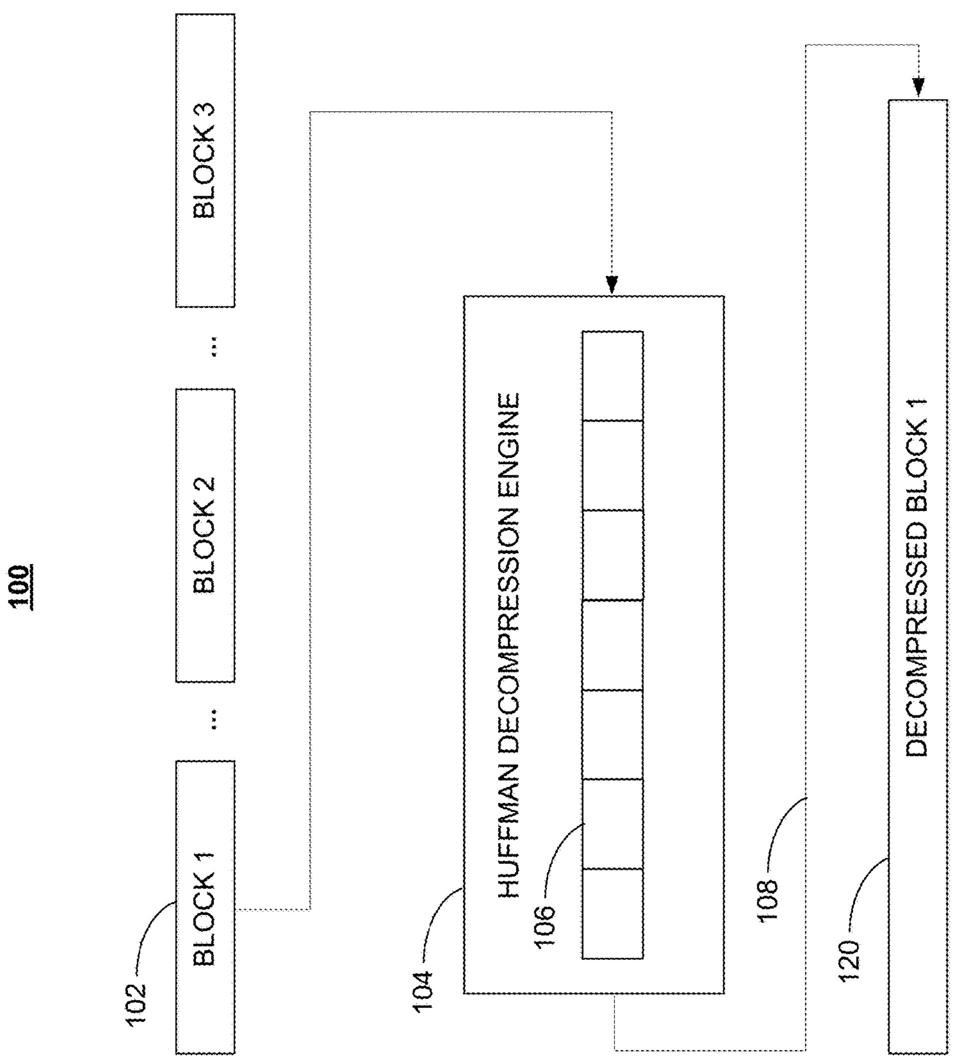


FIGURE 1
(PRIOR ART)

200

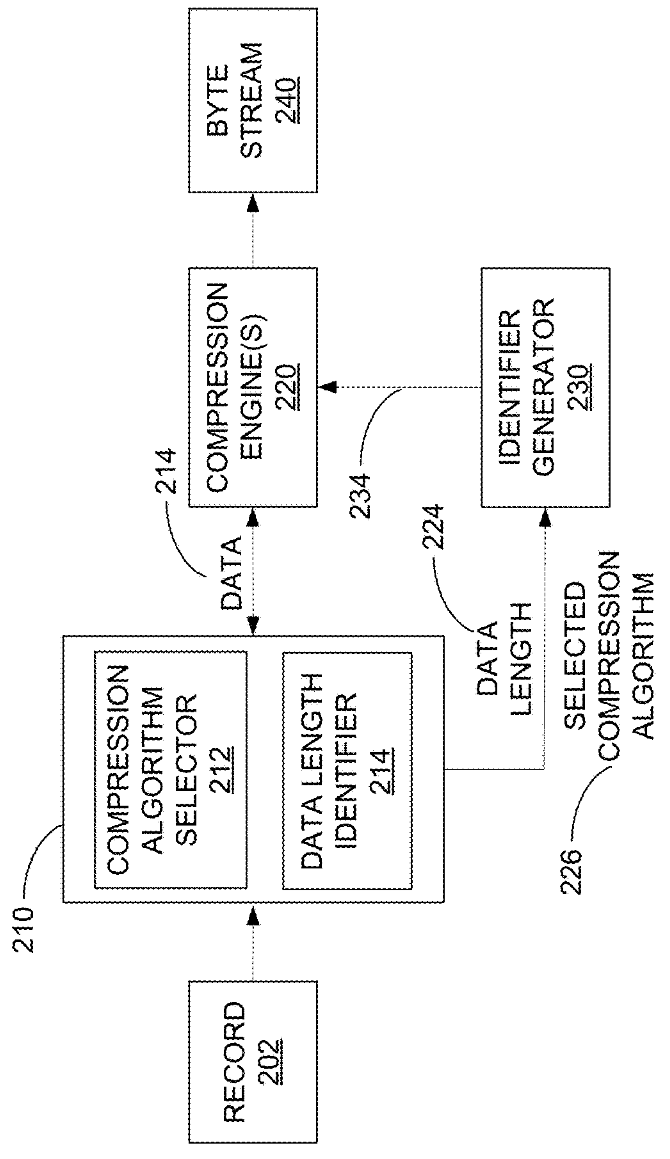

RECORD 202
210
COMPRESSION ALGORITHM SELECTOR 212
DATA LENGTH IDENTIFIER 214
DATA
214
COMPRESSION ENGINE(S) 220
BYTE STREAM 240
IDENTIFIER GENERATOR 230
234
224
DATA LENGTH
SELECTED COMPRESSION ALGORITHM
226

FIGURE 2

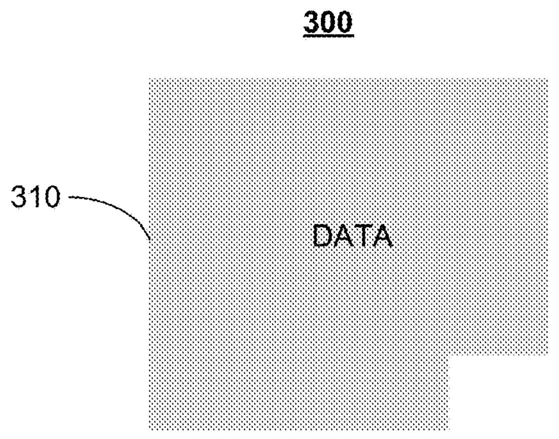


FIGURE 3A

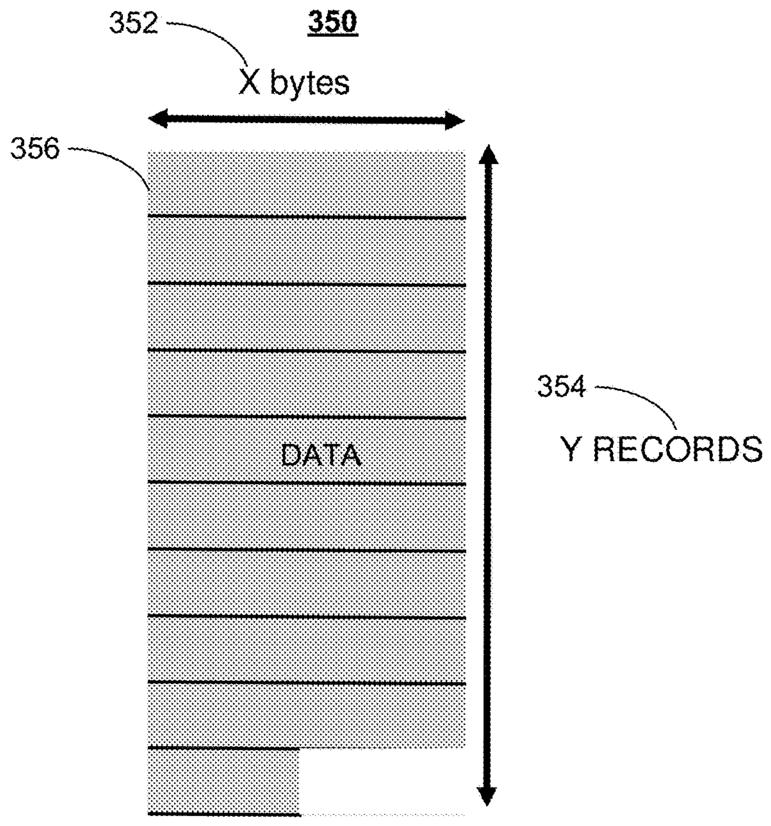


FIGURE 3B

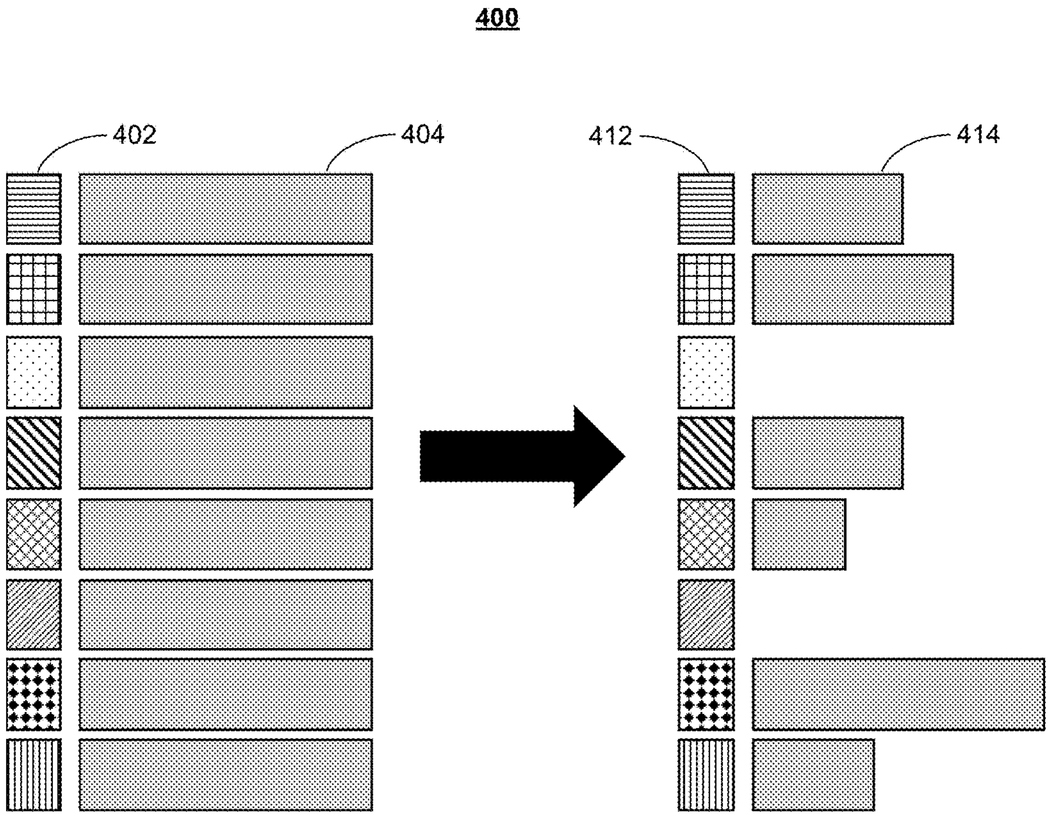


FIGURE 4A

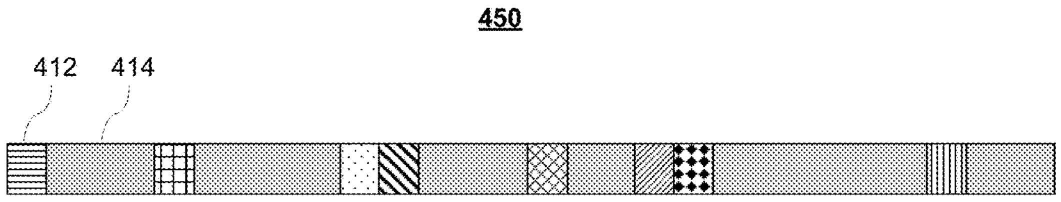


FIGURE 4B

500

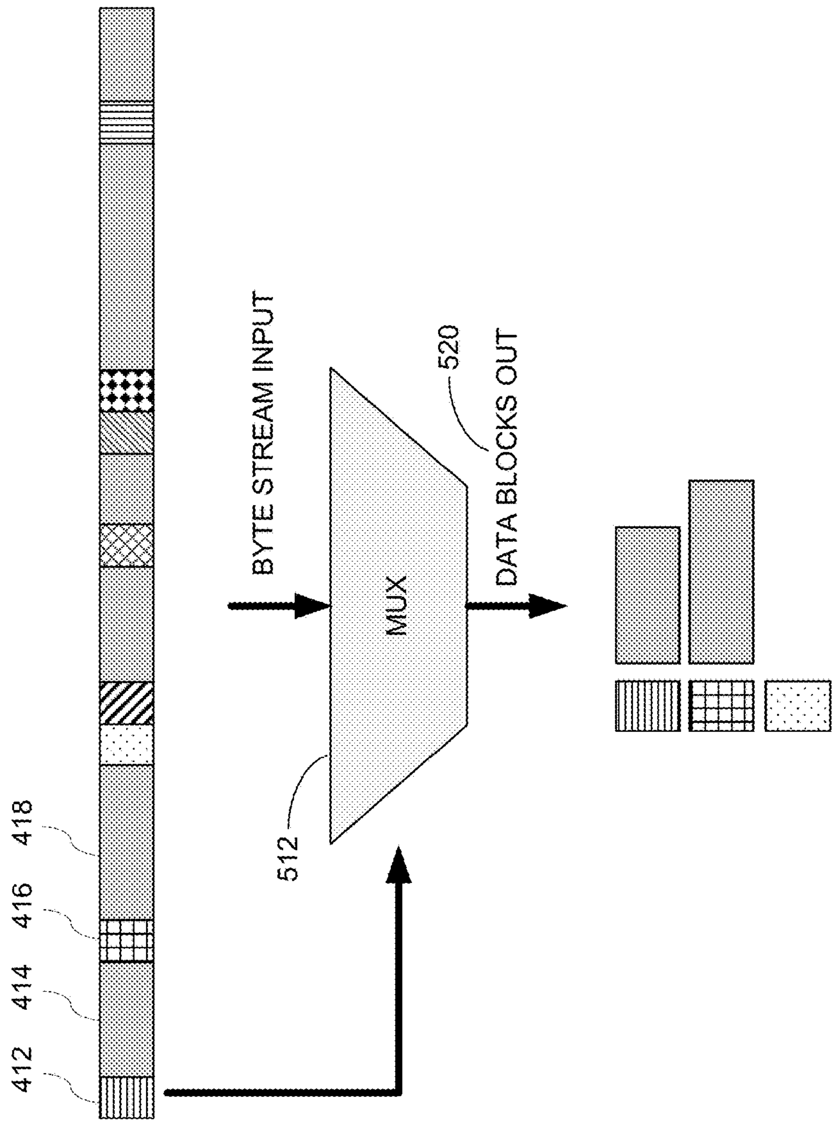


FIGURE 5

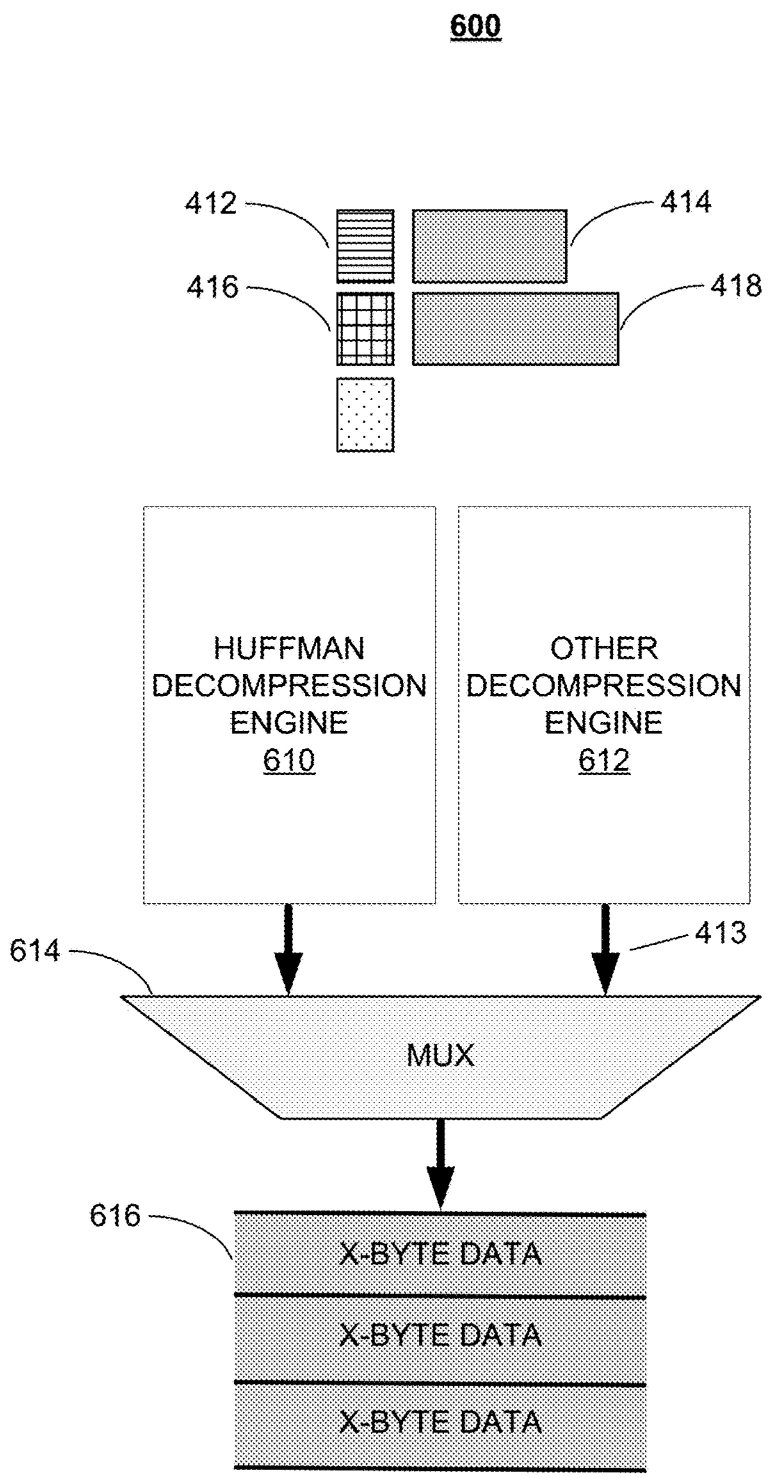

600
412
414
416
418
HUFFMAN DECOMPRESSION ENGINE 610
OTHER DECOMPRESSION ENGINE 612
614
413
MUX
616
X-BYTE DATA
X-BYTE DATA
X-BYTE DATA

FIGURE 6

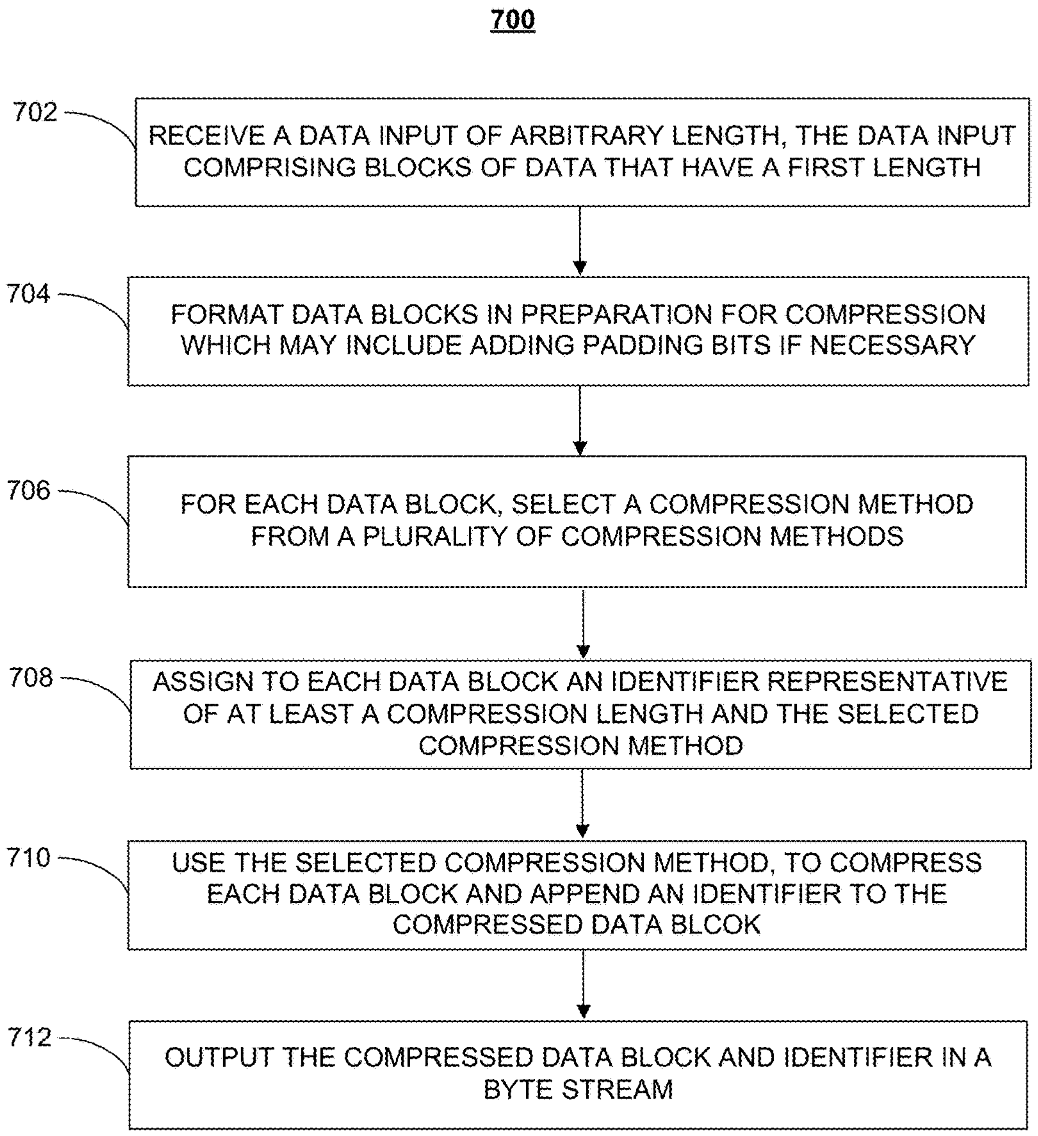

700
702
RECEIVE A DATA INPUT OF ARBITRARY LENGTH, THE DATA INPUT COMPRISING BLOCKS OF DATA THAT HAVE A FIRST LENGTH
704
FORMAT DATA BLOCKS IN PREPARATION FOR COMPRESSION WHICH MAY INCLUDE ADDING PADDING BITS IF NECESSARY
706
FOR EACH DATA BLOCK, SELECT A COMPRESSION METHOD FROM A PLURALITY OF COMPRESSION METHODS
708
ASSIGN TO EACH DATA BLOCK AN IDENTIFIER REPRESENTATIVE OF AT LEAST A COMPRESSION LENGTH AND THE SELECTED COMPRESSION METHOD
710
USE THE SELECTED COMPRESSION METHOD, TO COMPRESS EACH DATA BLOCK AND APPEND AN IDENTIFIER TO THE COMPRESSED DATA BLCOK
712
OUTPUT THE COMPRESSED DATA BLOCK AND IDENTIFIER IN A BYTE STREAM

FIGURE 7

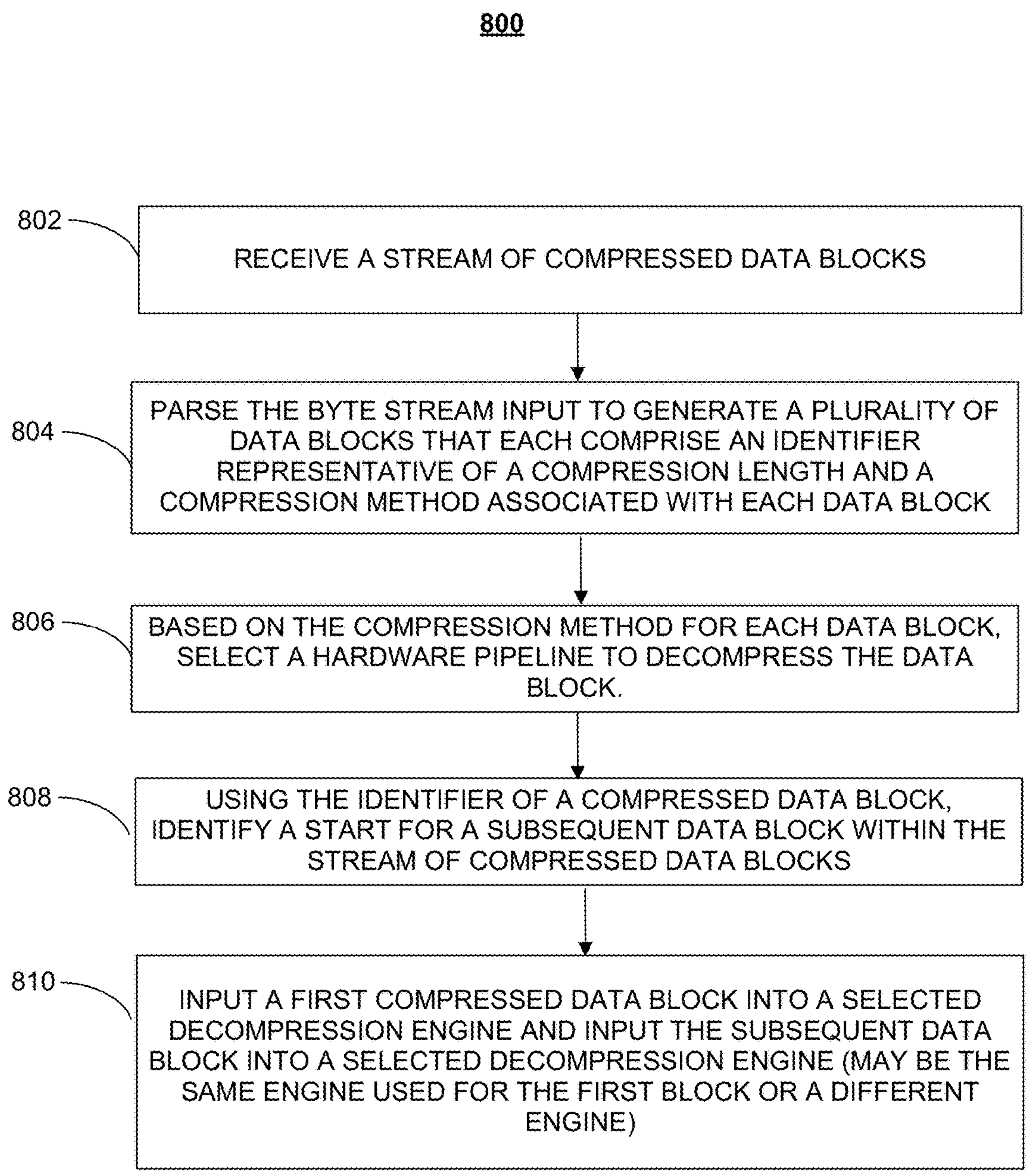

800
802
RECEIVE A STREAM OF COMPRESSED DATA BLOCKS
804
PARSE THE BYTE STREAM INPUT TO GENERATE A PLURALITY OF DATA BLOCKS THAT EACH COMPRISE AN IDENTIFIER REPRESENTATIVE OF A COMPRESSION LENGTH AND A COMPRESSION METHOD ASSOCIATED WITH EACH DATA BLOCK
806
BASED ON THE COMPRESSION METHOD FOR EACH DATA BLOCK, SELECT A HARDWARE PIPELINE TO DECOMPRESS THE DATA BLOCK.
808
USING THE IDENTIFIER OF A COMPRESSED DATA BLOCK, IDENTIFY A START FOR A SUBSEQUENT DATA BLOCK WITHIN THE STREAM OF COMPRESSED DATA BLOCKS
810
INPUT A FIRST COMPRESSED DATA BLOCK INTO A SELECTED DECOMPRESSION ENGINE AND INPUT THE SUBSEQUENT DATA BLOCK INTO A SELECTED DECOMPRESSION ENGINE (MAY BE THE SAME ENGINE USED FOR THE FIRST BLOCK OR A DIFFERENT ENGINE)

FIGURE 8

SYSTEMS AND METHODS FOR ENCODING AND DECODING

A. TECHNICAL FIELD

[0001] The present disclosure relates to accelerated decompression of compressed data, and more particularly, to systems and methods for accelerated and efficient decompression of compressed data blocks using an appended identifier that identifies a compression method and length of each compressed data block.

B. DESCRIPTION OF THE RELATED ART

[0002] One skilled in the art will recognize that there are numerous methods to compress and decompress electronic data. The efficiency of these compression algorithms varies based on the specific characteristics of data blocks to be compressed and the particular steps of a compression algorithm. An optimal compression algorithm for certain data blocks may not be as efficient for other data blocks based on the specific data within the block, the length of the block and other characteristics known to one of skill in the art. The term "data block" is intended to be broadly construed and includes any type of data that may be compressed or decompressed such as data symbols, fixed-length data blocks, variable-length data blocks, previously encoded data blocks, etc. In time-sensitive systems, the decompression and subsequent processing of data blocks may represent a significant aspect in the timing and throughput of the system.

[0003] Most decompression algorithms are sequential in nature, which limits throughput and may render the system sub-optimal for certain high-speed applications including, but not limited to, image processing, autonomous driving, artificial intelligence, analysis of large amounts of data and video processing. In one example, decompressing binary data that has been compressed using Huffman compression requires that bits be parsed one at a time, each bit containing information about the next bit. As a result, the decompression algorithm has to wait to find (e.g., identify a running edge) and decode a next data block until the entire decoding process for the previous data block has been completed.

[0004] FIG. **1** illustrates a common sequential decompression scheme within the prior art. System **100** comprises a Huffman decompression engine **104** that performs sequential decompression of data using the Huffman algorithm. In particular, the Huffman decompression engine receives previously Huffman-based compressed blocks **102** of data that are sequentially decompressed by the decompression engine **104** to output decompressed blocks **120**.

[0005] While used in the prior art, Huffman compression and decompression methods may not be optimal for certain data blocks. In addition, Huffman encoding may not be preferred in certain pipelined processes because of its inability to fully utilize the speed advantage of the pipelined process itself. Huffman encoding dictates that blocks **102**, which each contain information about a next block **103**, be decompressed and parsed one at a time. The Huffman decompression engine **104** cannot proceed to process block **103** until the entire decoding process for block **102** has been completed. The resulting waiting time causes unnecessary delays and limits data throughput through Huffman decompression engine **104** to one data block at a time.

[0006] Therefore, it would be desirable to have systems and methods that improve throughput and efficiency in the decompression of data blocks.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] References will be made to embodiments of the invention, examples of which may be illustrated in the accompanying figures. These figures are intended to be illustrative, not limiting. Although the invention is generally described in the context of these embodiments, it should be understood that it is not intended to limit the scope of the invention to these particular embodiments.

[0008] FIG. **1** illustrates a common sequential decompression scheme.

[0009] FIG. **2** illustrates a system for compressing records using an identifier, according to various embodiments of the present disclosure.

[0010] FIG. **3**A shows input data in an arbitrary length buffer, according to various embodiments of the present disclosure.

[0011] FIG. **3**B illustrates the input data of FIG. **3**A being arranged into records of a certain length.

[0012] FIG. **4**A illustrates compression of records based on compression type, according to various embodiments of the present disclosure.

[0013] FIG. **4**B illustrates an output stream of data bits comprising records and identifiers, according to various embodiments of the present disclosure.

[0014] FIG. **5** illustrates parsing of a byte stream of compressed data into records prior to decompression, according to various embodiments of the present disclosure.

[0015] FIG. **6** illustrates decompression of records based on various compression types, according to various embodiments of the present disclosure.

[0016] FIG. **7** illustrates a selective compression and identification method for records to reduce decompression time, according to various embodiments of the present disclosure.

[0017] FIG. **8** illustrates a decompression method for records having identifiers, according to various embodiments of the present disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] In the following description, for purposes of explanation, specific details are set forth in order to provide an understanding of the invention. It will be apparent, however, to one skilled in the art that the invention can be practiced without these details. Furthermore, one skilled in the art will recognize that embodiments of the present invention, described below, may be implemented in a variety of ways, such as a process, an apparatus, a system, a device, or a method on a tangible computer-readable medium.

[0019] Components, or modules, shown in diagrams are illustrative of exemplary embodiments of the invention and are meant to avoid obscuring the invention. It shall also be understood that throughout this discussion that components may be described as separate functional units, which may comprise sub-units, but those skilled in the art will recognize that various components, or portions thereof, may be divided into separate components or may be integrated together, including integrated within a single system or component. It should be noted that functions or operations discussed herein may be implemented as components. Components may be implemented in software, hardware, or a combination thereof.

[0020] Furthermore, connections between components or systems within the figures are not intended to be limited to direct connections. Rather, data between these components may be modified, re-formatted, or otherwise changed by intermediary components. Also, additional or fewer connections may be used. It shall also be noted that the terms "coupled," "connected," or "communicatively coupled" shall be understood to include direct connections, indirect connections through one or more intermediary devices, and wireless connections.

[0021] Reference in the specification to "one embodiment," "preferred embodiment," "an embodiment," or "embodiments" means that a particular feature, structure, characteristic, or function described in connection with the embodiment is included in at least one embodiment of the invention and may be in more than one embodiment. Also, the appearances of the above-noted phrases in various places in the specification are not necessarily all referring to the same embodiment or embodiments.

[0022] The use of certain terms in various places in the specification is for illustration and should not be construed as limiting. A service, function, or resource is not limited to a single service, function, or resource; usage of these terms may refer to a grouping of related services, functions, or resources, which may be distributed or aggregated. Furthermore, the use of memory, database, information base, data store, tables, hardware, and the like may be used herein to refer to system component or components into which information may be entered or otherwise recorded.

[0023] FIG. **2** illustrates a system for compressing records using an identifier according to various embodiments of the present disclosure. In embodiments, system **200** comprises pre-processor **210**, compression engine **220**, and identifier generator **230**. As depicted in FIG. **2**, pre-processor **210** further comprises compression algorithm selector **212** and data length identifier **214**. In certain embodiments, the compression engine(s) **220** may be integrated within the pre-processor **210** such that data blocks are compressed at the time an appropriate compression algorithm is identified. In other embodiments, the compression engine(s) **220** is discrete circuitry and receives data blocks from the pre-processor **210** to be compressed in accordance with a selected compression algorithm.

[0024] In operation, pre-processor **210** receives record **202** and uses compression algorithm selector **212** to determine a suitable compression algorithm. The record **202** may be an image, a data file or any other type of data that is divided into data blocks for compression. In embodiments, compression algorithm selector **212** applies at least two different compression algorithms to data blocks from record **202** to identify a preferred compression algorithm for the particular data block. For example, a subset of data blocks from record **202** may be compressed using a first compression algorithm while another subset of data blocks is more suited to another compression algorithm. The compression algorithm selector **212** compares the results of the different compression algorithms in order to select one that produces a preferred compression algorithm. This selection may be based on the compression algorithm that has the shortest bit length, an algorithm that provides a meaningful improvement in decompression speed or other criteria known to one of skill in the art.

[0025] In embodiments, pre-processor **210** further uses data length identifier **214** to determine a compressed bit length for each data block from record **202** for a selected compression algorithm used on the particular data block. In embodiments, pre-processor **210** outputs data length **224** and selected compression algorithm **226** into identifier generator **230** that generates identifier **234** that is representative of at least one of data length **224** and selected compression algorithm **226**. One skilled in the art will recognize that the identifier generator **230** may be integrated within the pre-processor **210** or be discrete circuitry within the system.

[0026] In embodiments, in response to receiving identifier **234**, compression engine **220** compresses the data block **214** and appends identifier **234** to the compressed data block. In other embodiments, the compression engine **220** appends identifier **234** to the uncompressed data block and compresses both the data block **214** and the identifier **234**. The compression engine **220** outputs the result as byte stream **240** of compressed data. One skilled in the art will recognize that the present invention may support any compression method including Full Block Huffman compression, Bit Mask with Huffman compression, Zero Block compression, Full Block compression with seven bit values, Bit Mask compression with seven bit values, Bit Mask with eight bit values and other compression methods. In certain instances, the analysis of compression algorithms may result in a decision not to compress a particular data block.

[0027] FIG. **3**A shows a record from which input data blocks for compression are arranged and stored in a buffer according to various embodiments of the present disclosure. In embodiments, the record **300** may be stored in any length of buffer and may comprise data **310**, e.g., in X-bit value format. It is understood that data **310** may be pre-processed prior to being compressed by a compression algorithm. In addition, data **310** may be partitioned into data blocks using various techniques known in the art.

[0028] FIG. **3**B illustrates the input data of FIG. **3**A being arranged into data blocks of a certain length. As depicted it FIG. **3**B, input data **310** is arranged into a number Y data blocks **354** each having a length of a number X bytes **352** (e.g., 64 bytes). In embodiments, resulting data **350** is padded to inflate one or more data blocks **354** to the length of X bytes **352** to ensure uniform lengths for all data blocks **354**.

[0029] Data blocks **354** may hold any type of information in any type of format (e.g., binary, symbols, etc.) that can be compressed. In embodiments, some or all of the data blocks **354** have the same bit length and are input to one or more compression engines (not shown in FIG. 3B) to select a compression method that may result in the relatively smallest compression size. Each compression engine may then compress some or all of the data blocks **354**. It is further understood that some data blocks **354** may not undergo any compression at all.

[0030] As shown in FIG. **4**A, the type of compression and the resulting data length are used to generate an identifier **402** that may, according to various embodiments of the present disclosure, be assigned and/or appended to data block **404**. Identifier **402** may be, for example, one or more control bytes that comprises information about the method that has been used, if at all, to compress data block **404**

and/or the length of the compressed data block **404**, e.g., in a length field. In embodiments, identifier **402** allows a decompression engine to determine a suitable decompression algorithm to properly decompress data block **404**.

[0031] In embodiments as previously discussed, identifier **402** may be compressed together with data block **404** to obtain compressed data block **414**. However, this is not intended as a limitation on the scope of the present disclosure as identifier **402** may equally be appended to compressed data block **414**. In other words, an algorithm may parse uncompressed data into fixed length chunks **404** and identify a preferred compression algorithm by cycling through a plurality of available compression algorithms and selecting the preferred compression algorithm based on the efficiency of each tested algorithm. A corresponding identifier **412** is generated and appended to compressed data **414**.

[0032] In embodiments, the compression engine(s) compress each data block **404** in order to compress it to a smaller size block **414**. It is understood that depending on the type of compression method that has been chosen and the content of data block **404**, the bit lengths of resulting compressed blocks **414** may vary.

[0033] FIG. 4B illustrates an output stream of data bits comprising compressed data blocks and identifiers according to various embodiments of the present disclosure. In embodiments, the encoded data blocks **414** may be output, together with identifiers **412**, from the compression engine, e.g., by shifting data, e.g., as a stream of data bits **450**, into a pipeline (not shown in FIG. 4B). In certain examples, a first subset of compressed data within the stream of compressed data bits **450** may have been compressed using a first compression algorithm and a second subset of compressed data within the stream of compressed data bits **450** may have been compressed using a second compression algorithm. These different compression algorithms are appropriately identified in one or more identifiers **412**.

[0034] FIG. **5** illustrates parsing of a byte stream of compressed data blocks prior to decompression and associating each compressed data block with a compression algorithm according to various embodiments of the present disclosure. A decompression process for each data block may be assigned to a particular decompression engine based on the compression algorithm used to compress the particular data block. In addition, the compressed data blocks may be sequentially aligned with other data blocks as an input into a decompression engine using the block length contained within the identifier.

[0035] In FIG. **5**, byte stream **450** may be parsed into data blocks **520** as follows: In embodiments, in an initial step, identifier **412** may undergo an initial decoding operation (if the identifier was previously compressed) intended to extract information contained therein, such as the length of compressed record **414**. In embodiments, the length of compressed record **414** may be implied or encoded, e.g., in a length field. In embodiments, the length of compressed record **414** may be used to determine the relative position of compressed record **418** and/or its identifier **416** within byte stream **450**. In other embodiments, if the identifier **412** was not compressed, then the compression algorithm and data length value may be immediately extracted.

[0036] In embodiments, the extracted information may be used by multiplexer **512** to parse the bits of byte stream **450** to determine how many bits multiplexer **512** has to move to access and process at the next record in byte stream **450**.

[0037] In embodiments, each compressed record **414** and its identifier **412** may be processed by multiplexer **512** and output in their original order. However, the original, i.e., uncompressed lengths of records **520** may be unknown to multiplexer **512**.

[0038] FIG. **6** illustrates decompression of a variety of different data blocks compressed using various compression types according to various embodiments of the present disclosure. In embodiments, the compressed data blocks are decompressed using one or more decompression engines **610**, **612**.

[0039] In embodiments, a compression algorithm selector (shown in FIG. **2**) may be used to select a certain compression algorithm, based on the compression type, utilization, etc., of each compressed data block, to which a corresponding decompression engine **610**, **612** is associated to decompress the particular compressed data block. In embodiments, decompression operations are optimized by operating one or more decompression engine **610**, **612** in parallel when processing data blocks. The use of the identifier **412** allows the routing of compressed data blocks within appropriate decompression paths within the system. The use of parallel, pipelined decompression engines results in an accelerated and efficient architecture to decompress a diverse set of compressed data blocks. It is understood that any number of decompression engines **610**, **612** maybe used and monitored to optimize calculations and utilize decompression engines **610**, **612** to full capacity.

[0040] In embodiments, based on information extracted from identifier **412**, the bit length of record **414** is known. As a result, the location of the data block **418** may be identified and used to determine a number of bytes to shift to arrive at that location in order to commence parsing of data block **418** before the parsing of data block **414** has been completed, thereby, enabling pipelined and/or parallel operations. In addition, any number of records and/or identifiers **412-418** may be sent to any number of different decompression engines **610-612** to be parallelly processed. In other words, by knowing the distance from data block to data block, the decoding process for a subsequent data block can begin without having to wait for an entire decompression process for a data block to complete, ultimately, increasing throughput.

[0041] Decompression engines **610**, **612** may be implemented in any number ways, for example, as hardware pipelines. A hardware pipeline may be a fixed pipeline having a known length (e.g., cycles deep). In embodiments, decompression engine **610**, **612** may receive one compressed data block **414**, **418** of a variable length and output one uncompressed data block of a certain size per cycle after processing record **414**, **418** in a number of cycles during a decompression step. As depicted in example in FIG. **6**, decompression engine **610** comprises one or more Huffman-type decompression engines, and decompression engine **612** that may comprise one or more decompression engine of any other type.

[0042] In embodiments, to increase decoding speed, compressed data block **414**, **418** has a variable symbol length with a fixed number (e.g., 4) of LSB bits of a symbol, as illustrated by the following example:

[0043] always @ (*)

[0044] casez(Bits[3:0])

[0045] 4'b???0: Length[4:0]=5'b00001; // 5b 16 symbols ????.0

[0046] 4'b??01: Length[4:0]=5'b00010; // 6b 16 symbols ????.01

[0047] 4'b?011: Length[4:0]=5'b00100; // 8b 32 symbols ?.????.011

[0048] 4'b0111: Length[4:0]=5'b01000; // 10b 64 symbols ??.????.0111

[0049] 4'b1111: Length[4:0]=5'b10000; // 11b 128 symbols ??.????.?1111 endcase

[0050] It is noted that this modified Huffman-type decompression method is different from a classical Huffman decompression that uses an algorithm to build a tree on the fly, which requires evaluating many bits, depending on the depth of the tree, to find the length of a current symbol. In contrast, in embodiments, a tree topology may be predefined, then values may be mapped to the resulting fixed tree topology for optimal compression. This facilities finding a next symbol quickly to repeat the process for all (e.g., 64) values in a compressed block, thereby, increasing throughput.

[0051] In embodiments, decompressed data blocks **613** may be first entered into multiplexer **614** that assembles the blocks generated by each engine **610**, **612** into decompressed data blocks **613** that may be restored, i.e., inflated, to their pre-compression size (e.g., 64 bytes). If, for example, identifier **412** is a single byte that indicates that the content of associated compressed record **414** is all zeros, then decompression engine **610**, **612** will inflate data block **414** to have 64 zeros. Records **616** may then be output and stored, e.g., in an SRAM device.

[0052] FIG. **7** illustrates a selective compression and identification method for data blocks to reduce decompression time according to various embodiments of the present disclosure. Process **700** begins at step **702** when a data input of arbitrary length is received. In embodiments, the data input comprises blocks of data that have a first length.

[0053] At step **704**, the blocks of data are formatted in preparation for compression. This formatting may include padding one or more of the blocks.

[0054] At step **706**, for each data block, a compression method may be selected from a plurality of compression methods.

[0055] At step **708**, an identifier may be assigned to each data block. The identifier is representative of at least a compression length and the selected compression method. The identifier is used to select a decompression path for the data block and support efficient serial alignment of the compressed data block into the decompression engine.

[0056] At step **710**, the selected compression method is used to compress each data block. In one embodiment, the data block is compressed and the identifier is appended to the compressed data block (i.e., the identifier is not compressed). In another embodiment, the identifier is appended to the data block before compression and both the data block and its identifier are compressed.

[0057] At step **712**, the compressed data blocks with identifiers are output, for example in a byte stream.

[0058] FIG. **8** illustrates a decompression method for records having identifiers according to various embodiments of the present disclosure. Process **800** begins at step **802** when a stream of compressed data blocks and corresponding identifiers is received as an input.

[0059] At step **804**, the stream of compressed data blocks is parsed to generate a plurality of compressed data blocks that each comprise an identifier that is representative of a compression length and a compression method associated with each data block.

[0060] At step **806**, based on the compression method that was used for each data block, a hardware pipeline is selected to decompress the decompress the data block. Using the length of the compressed data block found within the identifier, the system can identify **808** a start of a second compressed data block and schedule it for decompression.

[0061] Finally, at step **810**, the data blocks may be input into one or more hardware pipelines/decompression engines in order to decompress the data blocks to a pre-compression length. The decompression of the data blocks may occur in parallel across multiple decompression engines or may occur serially in a single decompression engine or a combination thereof.

[0062] It shall be noted that: (1) certain steps may optionally be performed; (2) steps may not be limited to the specific order set forth herein; (3) certain steps may be performed in different orders; and (4) certain steps may be done concurrently.

What is claimed is:

1. A decompression method for decompressing compressed data blocks, the decompression method comprising:

receiving a stream of compressed data blocks, a first data block within the stream of compressed data blocks having a first identifier comprising information related to a preferred compression method used to compress the first data block and a length of the compressed first data block;

selecting a first decompression engine for the first compressed data block based on the information related to the preferred compression method, the first decompression engine being within a plurality of available decompression engines;

identifying a start point for a second compressed data block using the information related to the length of the compressed first data block, the second compressed data block being adjacent to the first compressed data block within the stream;

selecting a second decompression engine for the second compressed data block, the second decompression engine being selected based on a second preferred compression method identified within a second identifier, the second decompression engine being within the plurality of decompression engines;

inputting the compressed first data block into the selected first decompression engine; and

inputting the compressed second data block into the selected second decompression engine.

2. The decompression method of claim **1** wherein the first and second decompression engines are the same decompression engine.

3. The decompression method of claim **1** wherein the first and second decompression engines are different decompression engines and function in parallel.

4. The decompression method of claim **1** wherein the plurality of available decompression engines comprises at least two decompression engines selected from a group consisting of a zero block decompression engine, a full block decompression engine, a bit mask decompression engine, a full block Huffman decompression engine, and a bit mask Huffman decompression engine.

5. The decompression method of claim **1** wherein the information related to the length of the compressed first data block is used to accelerate the inputting of the compressed second data block into the selected second decompression engine.

6. The decompression method of claim **5** wherein the information related to the length of the compressed first data block is used to identify the start point of the second compressed data block prior to complete decompression of the first compressed data block.

7. The decompression method of claim **6** wherein the second decompression engine operates in parallel to the first decompression engine.

8. The decompression method of claim **7** wherein a multiplexer switches the first compressed data block to the first decompression engine based on the first identifier and switches the second compressed data block to the second decompression engine based on the second identifier.

9. An compression system for compressing a plurality of data blocks, the compression system comprising:

a pre-processor coupled to receive a plurality of data blocks;

a compression algorithm selector coupled within the pre-processor, the compression algorithm selector determines a preferred first compression method for a first data block within the plurality of data blocks;

a data length identifier coupled within the pre-processor, the data length identifier identifies a first compressed block length associated with a compressed first data block using the preferred compression method;

an identifier generator coupled to receive information related to the preferred first compression method and the first compressed block length, the identifier generator generates a first identifier comprising the preferred first compression method and the first compressed block length; and

a compression engine coupled to receive the first data block and first identifier, the compression engine compresses the first data block in accordance with the preferred first compression method and appends the first identifier to the first compressed data block.

10. The compression system of claim **9** wherein the preferred first compression method is selected from a group consisting of zero block decompression, full block decompression, bit mask decompression, full block Huffman decompression, and bit mask Huffman decompression.

11. The compression system of claim **9** wherein the pre-processor, identifier generator and compression engine is integrated on a single substrate.

12. The compression system of claim **9** wherein the pre-processor and compression engine are discrete circuitry.

13. The compression system of claim **9** wherein first identifier is subsequently processed to identify the preferred first compression method and the first compressed block length by a decompression system.

14. The compression system of claim **9** wherein the compression engine outputs a stream of compressed data blocks and associated identifiers.

15. A compression method to compress a plurality of data blocks, the method comprising:

receiving input data having a first length;

arranging the input data into a plurality of data blocks;

identifying a preferred compression method for a first data block within the plurality of data blocks, the preferred compression method being selected from a plurality of available compression methods;

identifying a compression block length for the first data block based on the preferred compression method;

compressing the first data block in accordance with the preferred compression method;

appending an identifier to the first compressed data block, the identifier comprising information related to the preferred compression method and the compression block length of the first data block; and

outputting the compressed first data block and identifier within a stream of compressed data blocks.

16. The compression method of claim **15** wherein the plurality of available compression methods comprises zero block encoding, full block encoding, bit mask encoding, full block Huffman encoding, and bit mask with Huffman encoding.

17. The compression method of claim **15** wherein the preferred compression method is selected based at least partially on the resulting size of the compressed first data block such that the preferred compression method generates a relatively smaller data length than other compression methods within the plurality of available compression methods.

18. The compression method of claim **15** wherein the input data is arranged into a plurality of data blocks having a fixed length.

19. The compression method of claim **18** wherein at least one data block within the plurality of data blocks is padded such that the at least one data block has a length corresponding to the fixed length.

20. The encoding method of claim **15** wherein the identifier is appended to the compressed first data block in an uncompressed format.

21. The compression method of claim **15** wherein the identifier is appended to the compressed first data block in a compressed format.

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