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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: LAUNCH DELAY OFFSET DATA FLOW PROTECTION

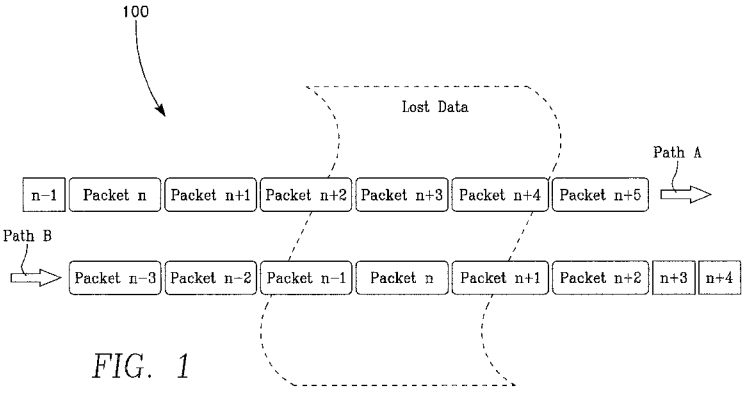


FIG. 1

(57) Abstract: A signal protector utilizes a dual data path delay offset enabling signal recovery on both paths following simultaneous data loss on both paths.

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LAUNCH DELAY OFFSET DATA FLOW PROTECTION

PRIORITY CLAIM

[001] This application claims the benefit of U.S. Prov. Pat. App. No. 61/625,901 filed April 18, 2012 and entitled LAUNCH DELAY OFFSET DATA FLOW PROTECTION.

BACKGROUND OF THE INVENTION

[002] Known signal protection schemes include error correction using multiple channels and/or large static buffers. Such systems utilize excessive bandwidth and/or introduce relatively long latency. Although signal protection innovations are not a focus area of the telecommunications industry, improvements that are adopted by the industry have the potential to benefit large groups of consumers.

Field of Invention

[003] This invention relates to the electrical arts. In particular, a signal is protected through the use of launch delay offset.

Discussion of the Related Art

[004] Some signal protection systems are known. For example, some signal protection systems merely use simultaneous broadcasts on dual paths allowing for redundancy via switching between the paths. However, signal protection developments have not generally been a focus area of the telecommunications industry, perhaps due to the widespread use of the dual path protection system mentioned above. But, known systems generally suffer from one or more of hardware complexity, software complexity, high initial cost, high operating costs, large additions to required bandwidth, and signal degradation. Selected embodiments of the present invention provide solutions to one or more of these problems.

SUMMARY OF THE INVENTION

[005] The present invention provides a signal protector utilizing dual data paths with a delay offset. In an embodiment, a data protection method comprises the steps of: providing data path A and data path B; each of the data paths extending between first and second stations; paths A and B transporting the same data; and, offsetting the data transported by path A from the data transported by path B by a time "t" such that following a simultaneous data loss on both paths during a time interval that is less than or equal to "t" an uninterrupted data flow can be recovered using a combination of information from both data paths.

[006] In an embodiment, a data protection method comprising the steps of: providing a data transmitting block for receiving and forwarding data and a data receiving block for receiving the forwarded data and delivering data; coupling dual redundant data paths A and B between the data transmitting block and the data receiving block; configuring the transmitting block to transmit redundant data on data path B time "t" later than the data transmitted on path A; and, maintaining an uninterrupted flow of delivered data following a simultaneous data loss on both paths of duration less than or equal to "t" by merging data from paths A and B to provide at least some of the data delivered following to the data loss.

BRIEF DESCRIPTION OF THE DRAWINGS

[007] The present invention is described with reference to the accompanying figures. The figures, incorporated herein and forming part of the specification, illustrate the present invention and, together with the description, further serve to explain the principles of the invention and to enable a person skilled in the relevant art to make and use the invention.

[008] Figure 1 shows a protection system in accordance with the present

invention.

[009] Figure 2 shows an embodiment of the protection system of Figure 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[010] The disclosure provided in the following pages describes examples of some embodiments of the invention. The designs, figures, and descriptions are non-limiting examples of certain embodiments of the invention. For example, other embodiments of the disclosed device may or may not include the features described herein. Moreover, disclosed advantages and benefits may apply to only certain embodiments of the invention and should not be used to limit the disclosed inventions.

[011] Where parts are connected, descriptions herein include the term "coupled" which refers to either direct or indirect connections. Direct connections provide for a first part connected directly to a second part, for example A connected directly to B. Indirect connections provide for a first part connected indirectly to a second part, for example A connected indirectly to C via B.

[012] Figure 1 shows a signal protection system in accordance with the present invention 100. Data paths A and B transport packet flows. As shown, Paths A and B are offset.

[013] An exemplary Data Loss is shown. Here, Path A packets n+2, n+3, n+4 are lost and Path B packets n-1, n, n+1 are lost.

[014] Recovery following the Data Loss is seen as follows. Path A is rebuilt using unlost packets n+2, n+3, n+4 of path B. Path B is rebuilt using unlost packets n-1, n, n+1 of Path A. In various embodiments, unlost packets are recovered and data streams are rebuilt using one or more of memories, buffers, switches, and other similar data processing equipment.

[015] Figure 2 shows the signal protection system of Figure 1 implemented in a

multi-channel audio transport system 200. Both data feeds are in the same pipe with VLAN separation and in this example Feed B is delayed with respect to Feed A by 70 ms. As shown, the feeds extend between an encoder originating the data and a decoder processing the data forwarded by the encoder.

[016] In various embodiments this data protection system enables recovery from simultaneous data loss in redundant, offset data paths. And, in various embodiments, dual path synchronized transmission data protection systems are adapted to implement the delay offset of the present invention.

[017] In an example utilizing an embodiment of the present invention, a national radio network entity operating a private IP network implemented the present invention to resolve short, simultaneous data losses on dual diverse paths through the network where disturbances were less than 50 milliseconds in duration. The solution provides at a transmitting end a network feed source and a network adapter for delaying one of redundant network feeds by 70 milliseconds. Exemplary equipment includes a network adapter in the form of a Nevion Ventura VS906 IP Media Edge Adapter. With an audio input, the adapter provides dual redundant IP data flows carrying the audio information.

[018] Receiving equipment provides delay equalization for the redundant paths and adjusts for both network delay and artificial delay to create one integral feed. A complementary receiving end adapter takes in the two network data flows and merges them to provide a merged data flow from which the audio information is decapsulated. This technique provides uninterrupted delivery of the transported audio information despite short, simultaneous network disturbances. Skilled artisans will of course recognize the present invention is not limited to particular transmission media or information transmission protocols.

[019] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. It will be apparent to those skilled in the art that

various changes in the form and details can be made without departing from the spirit and scope of the invention. As such, the breadth and scope of the present invention should not be limited by the above-described exemplary embodiments, but should be defined only in accordance with the following claims and equivalents thereof.

CLAIMS

What is claimed is

1. A data protection method comprising the steps of:

providing data path A and data path B;

each of the data paths extending between first and second stations;

paths A and B transporting the same data; and,

offsetting the data transported by path A from the data transported by path B by a time "t" such that following a simultaneous data loss on both paths during a time interval that is less than or equal to "t" an uninterrupted data flow can be recovered using a combination of information from both data paths.

2. A data protection method comprising the steps of:

providing a data transmitting block for receiving and forwarding data and a data receiving block for receiving the forwarded data and delivering data;

coupling dual redundant data paths A and B between the data transmitting block and the data receiving block;

configuring the transmitting block to transmit redundant data on data path B time "t" later than the data transmitted on path A; and,

maintaining an uninterrupted flow of delivered data following a simultaneous data loss on both paths of duration less than or equal to "t" by merging data from paths A and B to provide at least some of the data delivered following to the data loss.

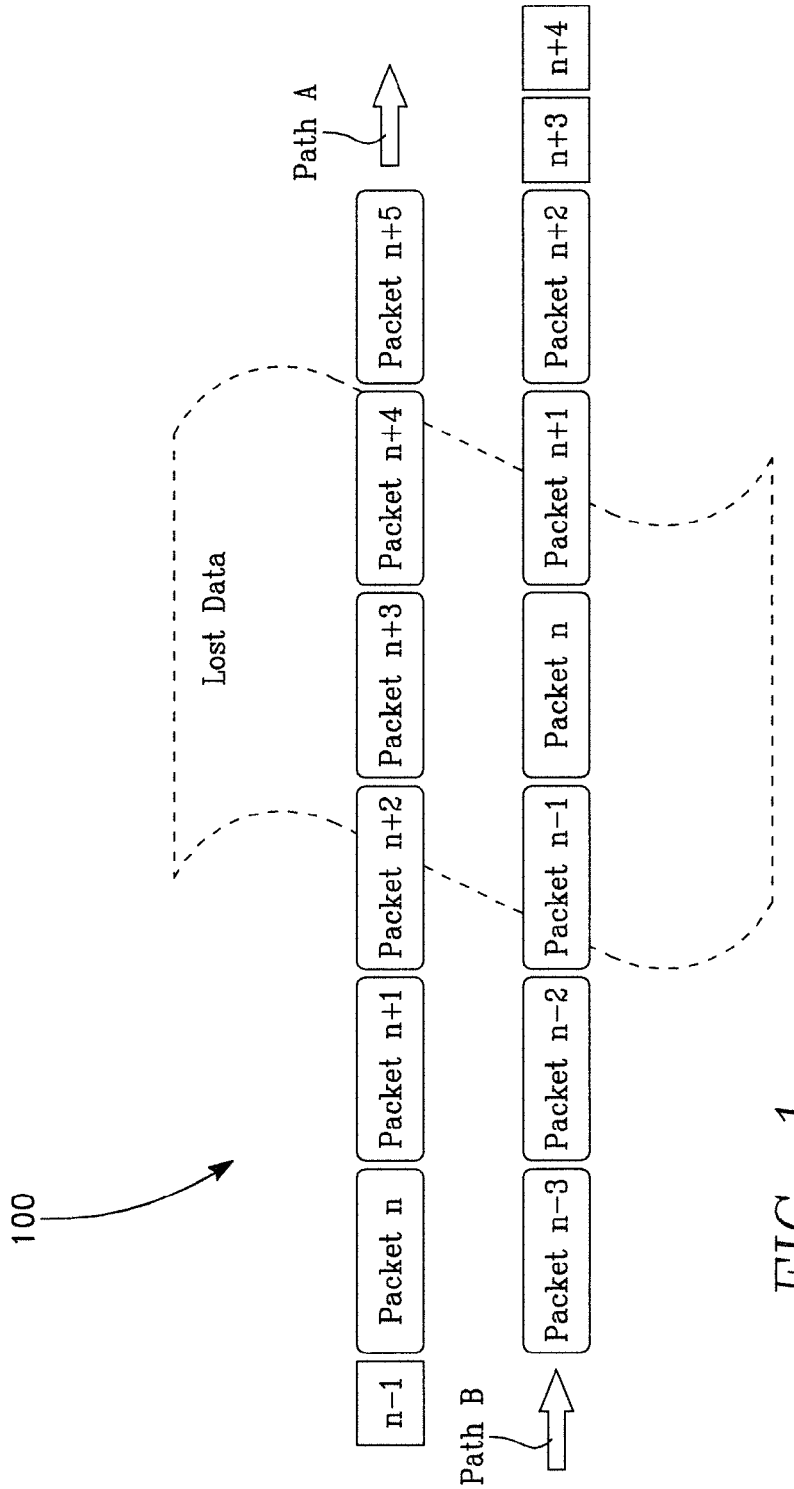

100
Path A
Path B
Lost Data
n-1
Packet n
Packet n+1
Packet n+2
Packet n+3
Packet n+4
Packet n+5
Packet n-3
Packet n-2
Packet n-1
Packet n
Packet n+1
Packet n+2
n+3
n+4

FIG. 1

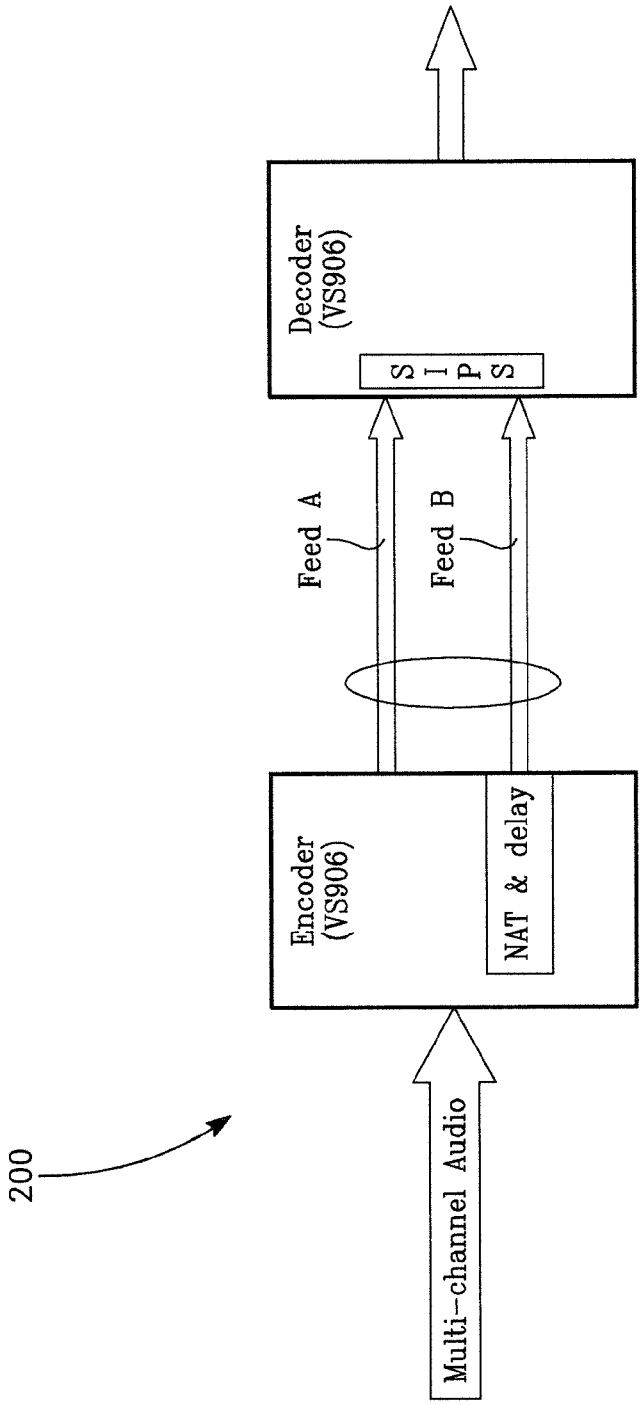

200
Multi-channel Audio
Encoder (VS906)
NAT & delay
Feed A
Feed B
Decoder (VS906)
S I P S

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/036809

A. CLASSIFICATION OF SUBJECT MATTER

H04L 12/703(2013.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L 12/703; H04J 3/14; H04W 16/10; G06F 1/04; H04L 12/66; H04L 12/26; G06F 12/00; G01R 31/02; G06F 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: delay offset, data protection, dual data path, signal recovery

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02-067120 A1 (ROAD RUNNER) 29 August 2002 See abstract; page 3; page 8, line 8 - line 10; page 10, line 12 - page 11, line 19; claims 1, 2, 5; and figs. 1, 2.	1
A		2
A	US 2009-0003320 A1 (LUO, YUN FENG (MASON) et al.) 01 January 2009 See paras. 6-11; claims 1, 2; and fig. 1.	1-2
A	US 2006-0077888 A1 (KARAM, ROGER et al.) 13 April 2006 See paras. 25-27, 54-56; and fig. 2.	1-2
A	US 2011-0121838 A1 (GILLIS, PAMELA S. et al.) 26 May 2011 See paras. 11-12; claims 1, 6; and fig. 1.	1-2
A	KR 10-2008-0059976 A (SAMSUNG ELECTRONICS CO., LTD.) 01 July 2008 See abstract; paras. 30-33, 84; and fig. 4.	1-2

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2013/036809

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 02-067120 A1	29/08/2002	AT 547754 T	15/03/2012
		AU 2002-251697 A1	04/09/2002
		CA 2471878 A1	29/08/2002
		CA 2471878 C	30/08/2011
		EP 1358553 A1	05/11/2003
		EP 1358553 A4	27/01/2010
		EP 1358553 B1	29/02/2012
		US 2003-0142670 A1	31/07/2003
		US 6839865 B2	04/01/2005
		WO 02-067120 B1	03/04/2003
US 2009-0003320 A1	01/01/2009	CN 101335690 A	31/12/2008
US 2006-0077888 A1	13/04/2006	US 2006-0077891 A1	13/04/2006
		US 2006-0078093 A1	13/04/2006
		US 2006-0092826 A1	04/05/2006
		US 2006-0117089 A1	01/06/2006
		US 2010-0232298 A1	16/09/2010
		US 2011-0004779 A1	06/01/2011
		US 2011-0041001 A1	17/02/2011
		US 2011-0047407 A1	24/02/2011
		US 7724650 B2	25/05/2010
		US 7793137 B2	07/09/2010
		US 7823026 B2	26/10/2010
		US 7849351 B2	07/12/2010
		US 8042006 B2	18/10/2011
		US 8259562 B2	04/09/2012
		US 8386832 B2	26/02/2013
		US 8411575 B2	02/04/2013
US 2011-0121838 A1	26/05/2011	US 8381050 B2	19/02/2013
KR 10-2008-0059976 A	01/07/2008	None	