CITY OF NEW YORK DEPARTMENT OF CITY PLANNING
INFORMATION TECHNOLOGY DIVISION
GEOGRAPHIC SYSTEMS

FILE DOCUMENTATION   **15 January 2013**

FILE NAME: **LION DIFFERENCES FILE (LDF)**

DESCRIPTION:

The LION Differences File (LDF) is a sequential file containing records documenting certain types of changes that have occurred between a particular release of LION and the immediately previous LION release. A new LDF 'edition' is 'published' in conjunction with each new production release of LION[1].

Identifying Segments and Nodes in LION Over Time

Every record in LION contains unique IDs that vary according to its geometric granularity. The IDs are Segment ID, Physical ID and/or Generic ID.

Segment IDs correspond to geographic entities (segments). Segments are defined as linear features with a from and to node. In most cases, there is a one to one relationship between a Segment ID and a LION segment. However there are certain cases where more than one LION segment will represent a physical LION record. Specifically, when a segment lies along a boundary of two boroughs, it is represented in LION by two records, one record for each borough. For example, a segment lying along the Brooklyn-Queens boundary is represented by a Brooklyn record and a Queens record; the two records have the same Segment ID (because they represent the same geographic segment). Note: Although the two LION records for a borough boundary segment represent the same physical LION record, the contents of certain fields may differ. Segment IDs represent the smallest level of segmentation in the LION file in order to accommodate many types of physical and non-physical geometry.

Physical IDs aggregate the more granular Segment IDs in order to represent a Physical View of the city's street network. The Physical ID is a unique number used to identify a physically existing piece of geometry that may or may not be comprised of several Segment IDs. For example, E 28 Street between 2nd Ave and 3rd Ave in Manhattan would have 1 Physical ID although there are 3 segments defining that block face, with 3 separate Segment IDs.

Similar to Physical IDs, Generic IDs are unique IDs assigned to aggregate the more granular

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[1] Production releases of LION correspond to major production releases of the Geosupport System. The first edition of the LDF was published as part of Geosupport Release 02A. It will document changes in LION between Releases 01B and 02A.

Segment IDs to represent a Generic View of the city's street network. Streets that contain multiple carriageways or roadbeds (such as Queens Boulevard in Queens and Park Ave in Manhattan) are represented by multiple centerlines corresponding to each roadbed as well as an imaginary 'single' generic centerline.

The endpoints of LION segments are called nodes. Every node in LION is uniquely identified by a Node ID. Every node in LION also has a real-world geodetic location, specified by its spatial coordinates. One of the nodes of every LION segment is designated as the segment's from-node, and the other node is designated as the to-node.

For purposes of the LDF, a segment is considered to derive its existence and retain its identity across LION releases by virtue of the continuing validity of its segment based IDs, regardless of what changes may have occurred to the segment (such as a change in the street name of the record(s) representing the segment, or a change in the Node IDs or the spatial locations of the segment's nodes.) Similarly, a node is considered to derive its existence and retain its identity across LION releases by virtue of the continuing validity of its Node ID, regardless of what changes may have occurred to the node (such as a change in its spatial location or in which segments are incident upon it).

In conjunction with the implementation of the LDF, the following LION updating policies will be instituted. If a LION segment is deleted, its Segment ID will be permanently 'retired', that is, it will never again be assigned to any segment. In this context, segment deletion refers not only to outright physical deletion (such as to reflect a street closure), but also splitting of the segment into other segments or merging of the segment with other segments. In all these cases, the Segment ID that was assigned to the segment prior to its deletion, splitting or merging, will never be re-assigned to any other segment, not even to an 'offspring' segment created by a split or merge. Similarly, if a node is deleted from LION, its Node ID will be permanently 'retired'.

The Segment ID serves as a unique, immutable identifier of a segment over time, and therefore is an appropriate data item to store in user application files as the unique segment identifier. If a user is not interested in storing/tracking LION segment at its most granular level, but wants to store/track a physical or generic view of segments then they should store either the Physical ID or Generic ID. There may be cases where a user may want to store one or more of the IDs. It is up to the user to determine which of the IDs are appropriate for their application.

Structure of the LDF

The LDF has five record types, identified by the Record Type Code. Each edition of the LDF has a single header record (Record Type Code = 'H'). Each edition of the LDF can also have one or more node change records (Record Type Code = 'N') and one or more segment-based change records (Segment ID Record Type Code = 'S', Physical ID Record Type Code = 'P' and Generic ID Record Type Code = 'G'). It is possible for an edition of the LDF to have no node change records and/or no segment-based change records.

The five record types all have a record length of 100 but they have different record layouts. The type 'N' records and the type 'S', 'P' and 'G' records are further differentiated by various types of 'actions', such as add, delete, move etc., identified by an Action Code.

The record layouts of the three record types are below.

Header Record (Type 'H' Record)

Item	Length	From	To	Value/Comment
Record Type	1	1	1	'H'
Filler	4	2	5	
Old LION Release	3	6	8	
Filler	3	9	11	
Date of Old LION Release	6	12	17	MMDDYY format
Filler	5	18	22	
New LION Release	3	23	25	
Filler	3	26	28	
Date of New LION Release	6	29	34	MMDDYY format
Filler	5	35	39	
Record Count	6	40	45	Includes header record
Filler	45	46	90	
Cumulative LDF Record Number	10	91	100	

The fields Date of Old LION Release and Date of New LION Release contain the dates on which those LION releases were deployed in production as VSAM files on the DoITT mainframe. (In general, mainframe LION releases, LDF editions and batch major releases of the Geosupport System are all deployed in production on the DoITT mainframe on the same dates.)

The field Record Count contains the number of records in the given LDF edition, including the header record. The field Cumulative LDF Record Number is discussed later in this document.

Node Change (Type 'N') Records

Item	Length	From	To	Value/Comment
Record Type	1	1	1	'N'
Filler	1	2	2	
Action Code	1	3	3	'A', 'D' or 'M'
Filler	7	4	10	
X-Coordinate	7	11	17	If Action Code is M, these are
Y-Coordinate	7	18	24	the coords. of original location
Filler	7	25	31	
Node ID	7	32	38	

Filler	2	39	40	
Destination X-Coordinate	7	41	47	Used only for Action Code M
Destination Y-Coordinate	7	48	54	Used only for Action Code M
Filler	36	55	90	
Cumulative LDF Record Number	10	91	100	

The possible action codes for a type N record are as follows:

Action Code	**Meaning**	**Description**
A	add node	A node (more precisely, a new Node ID) exists in the new LION release that didn't exist in the old LION release. The fields labeled X-Coordinate and Y-Coordinate contain the spatial coordinates of the new node. The fields labeled Destination X-Coordinate and Destination Y-Coordinate are blank (these fields are used only in Action Code 'M' records).
D	delete node	A node (more precisely, a Node ID) that existed in the old LION release does not exist in the new LION release. The fields labeled X-Coordinate and Y-Coordinate contain the erstwhile spatial coordinates of the deleted node. The fields labeled Destination X-Coordinate and Destination Y-Coordinate are blank.
M	move node	An existing node has been moved spatially, but retains the same Node ID. The fields labeled X-Coordinate and Y-Coordinate contain the old spatial coordinates of the node. The fields labeled Destination X-Coordinate and Destination Y-Coordinate contain the new spatial coordinates of the node.

If a node has been renumbered while remaining at the same spatial location, the LDF represents this by a combination of a delete and an add, i.e., there is an Action Code 'D' node change record for the old Node ID and an Action Code 'A' node change record for the new Node ID.

Segment-based Change (Type S, P and G) Records

Item	Length	From	To	Value/Comment
Record Type	1	1	1	'S', 'P' or 'G'
Filler	1	2	2	
Action Code	1	3	3	'A', 'C', 'D', 'M' or 'S'
Filler	7	4	10	
Items Appurtenant to Old Segment:				
Old Segment-based ID	7	11	17	
Old LION Key	10	18	27	Discontinued as of 11A
Old From Node ID	7	28	34	
Old To Node ID	7	35	41	
Filler	2	42	43	
Items Appurtenant to New Segment:				
New Segment-based ID	7	44	50	
New LION Key	10	51	60	Discontinued as of 11A
New From Node ID	7	61	67	
New To Node ID	7	68	74	
Filler	16	75	90	
Cumulative LDF Record Number	10	91	100	

Segment-based change records are classified into action types 'A' (add), 'C' (change node(s)), 'D' (delete), 'M' (merge) and 'S' (split). For new segments, changed nodes and segment deletions, there will be a single segment change record representing the added, changed or deleted segment. For merges and splits of segments, there will be one segment change record for each combination of a parent (old) segment and an offspring (new) segment. For example, if an old segment has been split into three new segments, there are three segment change records with Action Code 'S', each record relating the given old segment to one of the three new segments. The possible Action Codes for segment change records are as follows:

Action Code	Meaning	Description
A	add segment	A new segment exists. The old segment fields are blank. The new segment-based fields have values.
C	change node(s) of	At least one of an existing LION segment's nodes (i.e. existing segment Node ID's) has changed. The Old Segment-based field is identical to the New Segment-based field. Note: Mere spatial relocations of nodes with no change of Node ID do not engender records of this type; such cases are represented by node change Action Code 'M' records.

D	delete segment	A Segment-based ID that existed in the old LION release does not exist in the new LION release. The old segment fields have values. The new segment fields are blank.
M	merge segments	The specified old segment has been merged with one or more other segments from the old LION release to form the new segment. Both the old and the new segment fields have values. Other segment change Action Code 'M' records represent the merging of each of the other old segments into the given new segment.
S	split segments	The specified old segment has been split into two or more new 'offspring' segments, one of which is the new segment specified in this Action Code 'S' record. Both the old and new segment fields have values. Other segment change Action Code 'S' records represent the splitting of the given old segment into each of its other 'offspring' segments.

Ordering of LDF Records

Within each edition of the LDF, the records are ordered as follows. The highest-level sort key is LDF Record Type. Thus, the single header record occurs first, followed by all node change records, followed by all segment change records. Within each record type, the records are ordered so that related records occur consecutively, as follows.

Node change records are related to each other only in the case when a node has been renumbered (i.e., given a new Node ID) while remaining at the same spatial location. Such a node renumbering is represented in the LDF by a combination of a delete (i.e., by an Action Code 'D' record to delete the old Node ID) and an add (an Action Code 'A' record to add the new Node ID). To insure that the records of such related pairs occur consecutively, the set of all node change records is sorted on the fields labeled X-Coordinate and Y-Coordinate.

Segment change records are related to each other in the case of a segment merge and in the case of a segment split. To insure that the set of records representing a particular merge or split occur consecutively, the segment change records are ordered as follows. The set of all segment change records is sorted on Action Code. The Action Code 'M' records (the merge records) are further sorted on New Segment-based ID followed by Old-Segment-based ID. The Action Code 'S' records are sorted on Old Segment-based ID followed by New Segment-based ID.

The sort ordering of the LDF can be summarized as follows, where indentation signifies a lower-level sort key:

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All records are sorted on Record Type.
    Type 'N' records are sorted on X-Coordinate, Y-Coordinate.
    Type 'S', 'P' and 'G' Records are sorted on Action Code.
        Type 'S', 'P' and 'G' Action Code 'M' Records are sorted on New Segment-based ID, Old Segment-based ID.
        Type 'S', 'P' and 'G' Action Code 'S' Records are sorted on Old Segment ID, New Segment ID.

Cumulative LDF Record Numbers

All the records (including header records) in all LDF editions collectively will be consecutively numbered, without gaps, in the field Cumulative LDF Record Number in positions 91-100. The Cumulative LDF Record Number will be cumulative across editions of the LDF, so that a given value will uniquely identify one record in one LDF edition. For example, if the first edition of the LDF were to contain 693 records, they would be numbered 1 through 693 consecutively; the records in the next LDF edition would be numbered consecutively beginning with 694, and so forth.

For City Agencies using the LDF on the DoITT mainframe
LDF Releases and Data Set Names

LDFs are sequential batch files. For each LION release, two copies of the LDF will be deployed, called the 'resynch' LDF and the 'archive' LDF of the given release. These files will be identical in content and will differ only in their DSNs and in how long they will exist.

The Resynch LDF: On the DoITT mainframe, the resynch LDF will have the same DSN in every release, A030.STREET.LDF. Whenever a new resynch LDF is deployed, it will replace the previous resynch LDF, which will be superseded and deleted. Users should code the full DD statement for the resynch LDF as:

//<anyDDname>   DD   DSN=A030.STREET.LDF,DISP=SHR

The resynch LDF is intended to be used with automated procedures to be developed by users to update their application files that are keyed to LION geography to reflect topological changes in new LION (and Geosupport System) releases, such as the creation, deletion, merging and subdivision of segments, and concomitant changes to Node IDs and Segment IDs if these identifiers are stored in the application file. Because of the constancy of the DSN of resynch LDFs across releases, the user need not change the DD statement for the LDF in the JCL for the resynchronization job each time it is run.

The Archive LDF: The DSN of the archive LDF will vary with each release. On the DoITT mainframe, the DSN of the archive LDF will be of the form A030.STREET.LDF.R<release-

ID>. If the user needs to access an archived LDF, the full DD statement for it should be coded as follows:

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//<anyDDname>    DD    DSN=A030.STREET.LDF.R<release-ID>,DISP=SHR
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Each archive LDF release contains the changes to LION between the LION release indicated in the archive LDF=s DSN and the immediately preceding LION release. For example, the first archive LDF release, which was deployed with LION Release 02A having the DSN of A030.STREET.LDF.R02A, and it contained the changes between LION Release 01B and LION Release 02A. When deployed, each new archive LDF release will join the set of archive LDFs deployed in all previous releases, which will continue to remain accessible indefinitely.

At data centers other than DoITT, to conform to local file-naming standards, the DSNs of LDFs may differ from those specified above. Users at those data centers should ascertain the proper DSNs from the appropriate local Geosupport System administrator.