This is the format specification for Subnautica terrain patches, also known as the `optoctreepatch` format. This format is based on the Subnautica terrain data format (version 4) as specified at https://unknownworlds.com/subnautica/terrain-data-format/, and understanding that format is recommended before using this format.

Patch Format

File

Byte	0	1	2	3	...
Field	Version				Batches
Type	`uint`				`Batch[]`

Each patch file starts with a four-byte little-endian unsigned 32-bit integer, which represents the version field. The current version is 0. The patch then contains an array of any number of batches, which can be either modified batches that need to be patched, or new batches that must be created.

Batch

Byte	0	1	2	3	4	5	6	...
Field	X Position		Y Position		Z Position		Octree Count	Octrees
Type	`short`		`short`		`short`		`byte`	`Octree[]`

Each batch starts with six bytes that represent that batch's position. Each number is a signed little-endian 16-bit integer. In the game's terrain format, these fields are the three numbers in the name of the batch, e.g. `compiled-batch-12-18-12.optoctrees`. Then, there is a single unsigned byte representing the number of octrees in this batch that are being replaced or created, followed by an array of those octrees.

Octree

Byte	0	1	2	...
Field	Octree Number	Node Count		Nodes
Type	`byte`	`ushort`		`Node[]`

Each octree starts with a single unsigned byte representing the position of this octree in the final batch, from 0 to 124. This encodes the position of the octree as specified in the game's terrain data format. This is followed by a 16-bit unsigned integer representing the number of nodes in this octree, and then the array of nodes. The last two fields are identical to the game's terrain format.

Node

Byte	0	1	2	3
Field	Material	Signed Distance	Child Index	
Type	`byte`	`byte`	`ushort`	

Nodes themselves are also identical to the game's terrain format, containing an unsigned byte for the node material, an unsigned byte for the signed distance, and a 16-bit unsigned little-endian integer for the index of the node's first child.

Naming

Patch files must use the `.optoctreepatch` file extension. The file name should be the name of the mod that includes the terrain patch, or (if the mod contains multiple terrain patches) a short description of the contents of the patch.

Patch names should use only lowercase letters, numbers, and should use the dash symbol (`-`) instead of spaces. For example, `void-bottom.optoctreepatch`, or `distant-islands-3.optoctreepatch` are good file names for terrain patches.

Patch files should not contain words like "terrain" or "patch", unless they're part of the mod's name, to avoid redundancy.

Example Data

The following example patch replaces the first three octrees in batch (12, 18, 12) with a single-node empty octree, replaces the last octree in batch (0, 0, 0) with a single-node octree of material 23, and creates a new batch at (-2, 19, -4) with two single-node octrees of material 1.

00	00	00	00	0C	00	12	00	0C	00	03	00	01	00	00	00
00	00	01	01	00	00	00	00	00	02	01	00	00	00	00	00
00	00	00	00	00	00	01	7C	01	00	23	00	00	00	FE	FF
13	00	FC	FF	02	23	01	00	01	00	00	00	4C	01	00	01
00	00	00	1C	00	13	00	1C	00	02	64	01	00	23	00	00
00	03	01	00	23	00	00	00								

The bytes in blue are the version bytes. The bytes in red are the batch to edit, and the orange bytes are the number of octrees to replace. The yellow bytes are the position of the octree to replace, and the green bytes are the number of nodes in that octree. The white bytes are the node data, which is the same as the game's terrain format.

Explanation

The version number is `00 00 00 00`.

The first batch to modify is at position `0C 00 12 00 0C 00` (12, 18, 12). This batch has `03` octrees to replace. The first octree is at position `00`, and contains `01 00` node. The node data is `00 00 00 00`. The other octrees are the same, except their positions are `01` and `02`.

The second batch to modify is at position `00 00 00 00 00 00` (0, 0, 0). This batch has `01` octree to replace. This octree is at position `7C` (124) and contains `01 00` node. The node data is `23 00 00 00`.

The third batch to modify is at position `FE FF 13 00 FC FF` (-2, 19, -4). This batch has `02` octrees to replace. The first octree is at position `23` (35), and contains `01 00` node. The node data is `01 00 00 00`. The second octree is the same, except it's at position `4C` (76).

The fourth and final batch to modify is at position `1C 00 13 00 1C 00` (28, 19, 28). This batch has `02` octrees to replace. The first octree is at position `64` (100), and contains `01 00` node. The node data is `01 00 00 00`. The second octree is the same, except it's at position `03`.

As you can see from this example, the terrain patch format allows for creating new batches the same way you would patch an existing batch. It also allows for creating batches outside of the current world bounds, although this feature is not currently implemented by the terrain patcher.