The SMBX1...64 *.LVL file specification

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(100% done)

Level file is a TEXT file. All parameters are written sequentially with separating by CRLF new-line character (This file format requires CRLF line feed only and LF-only file will cause crash of SMBX).

Introduction

Standard parameters:

Standard size of one block	32x32 pixels
Possible on screen display height	19 blocks
Possible on screen display width	25 blocks
Height of screen	600 pixels (19 blocks without 8 pixels)
Width of screen	800 pixels (25 blocks)
Max level space size:	419998×419998 pixels (but it is allowed to come out of limits)

Limits of objects on one level map:

Blocks:	20000
NPCs:	5000
Background objects:	8000
Doors:	200

Level coordinate space

All elements of a level: blocks, Background Objects (BGOs), NPC's, warp points, liquid zones, playable characters start points, are in united space which dividing to 21 section (for file formats older 8 are 6 sections). Coordinate system has a pixels units.
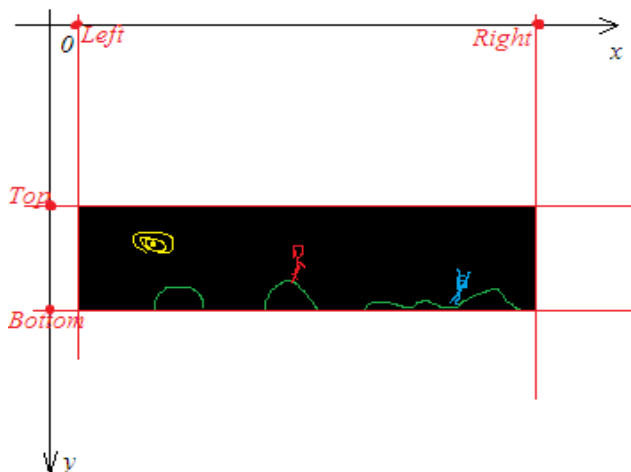X axis is directed from left to right.
Y axis is directed from up to down.
Minimal and maximal values of X and Y are equal to "Double" C/C++ type.

Each section is declared by the position of each side of the section.
height and width can be calculated with a formula:
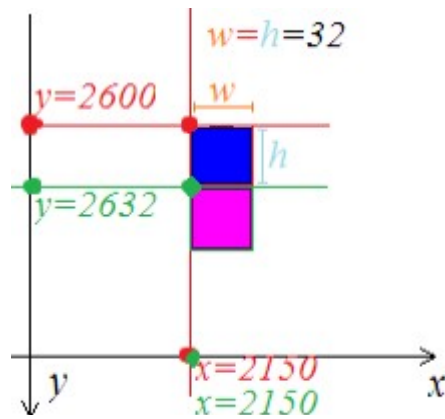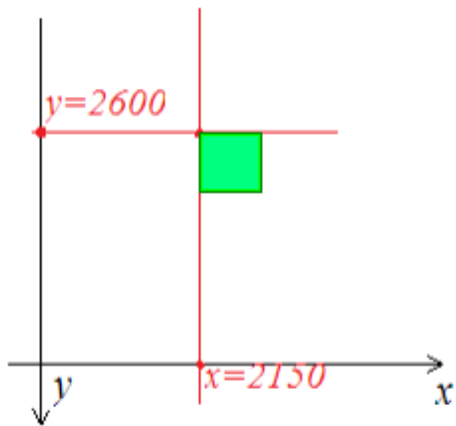$W = |L-R|$ $H = |T-B|$

The coordinates of an object's placement is set concerning its upper left corner:
In this example, the mushroom's coordinates on the current section is: X=2150; Y=2600
and the block coordinates are: X=2150; Y=2632

Remember!
As the Y axis is turned to move an object down, it is necessary to add to the Y offset and to move up, it is necessary to subtract.

File Format Specification

Structure

- [header]
- [sections settings]
- [player's start points]
- [blocks on level]
- "next"
- [background tiles]
- "next"
- [NPS's options]
- "next"
- [Warps/Doors options]
- "next"
- [Water/Quicksand]
- "next"
- [Layers]
- "next"
- [Events]

The reference designations:

- standard parameter
- **Comment title**
- Comment description
- **loop**
- variable
- *Special option, used only under special conditions, differently is absent*
- The option isn't known yet
- File format version limit
- Data type

File format version:
The version number of the file format defines data present or absent in the file.

First 3th lines (Header):

Parameter	Description
64	(unsigned int) File format number (last in SMBX is 64)
0	(unsigned int) number of stars on this level (>= 17)
"Level name"	(string) Level title (>=60)

Section properties

(loop 21 times) (if <8, loop 6 times)

Parameter	Description
-200000	(long) **Left** size (-left/+right)
-200768	(long) **Top** size (-down/+up)
-200000	(long) **Bottom** size (full screen is -200600 -down/+up)
-199200	(long) **Right** size (full screen is -199200 +left/-right)
24	(unsigned int) Music number (24 is enable custom music file)
16291944	(long) Background color *(In old versions editors)* [0] = black, [16291944] = blue, [10520656] = dark blue-green
#FALSE#	(bool) Is Level wrap
#TRUE#	(bool) enable Off Screen exit
13	(unsigned int) Background number
#FALSE#	(bool) No turn back (>=1)
#TRUE#	(bool) Under water (>=30)
"somefile.mp3"	(string) Custom music file (>=2)

(End loop)

Note: Format 0 is an intro.dat file of SMBX 1.0

Player start points

Parameter	Description
-199996	(long) First player Position x (+left/-right) (0 – player point isn't set)
-200600	(long) First player Position y (+up/-down) (0 – player point isn't set)
24	(unsigned int) Width of character (0 – is is first player point isn't set)
54	(unsigned int) Height of character (0 – is is first player point isn't set)
-199242	(long) Second player Position x (0 – player point isn't set)
-200068	(long) Second player Position y (0 – player point isn't set)
24	(unsigned int) Width of character (0 – is is second player point isn't set)
60	(unsigned int) Height of character (0 – is is second player point isn't set)

Blocks

Description of the blocks placed on a map:

(Loop = how many blocks are in this level)			
-241408	(long) Block position x		
-180512	(long) Block position y		
32	(unsigned int) Height		
32	(unsigned int) Width		
63	(unsigned int) Block ID		
0	(unsigned int) Containing NPC number 0 – empty, 1-99 coins, or 1000+npc_id – NPC. **Note:** SMBX1 and SMBX2 formats (<18) have a special values of NPC-ID: 100 => 9, 101 => 1, 102 => 14, 103 => 34, 104 => 35 Coin number same which in newer formats.		
#FALSE#	(bool) Invisible		
#TRUE#	(bool) Slippery	(>=61)	
"Default"	(string) Layer name	(>=10)	
"BlockDestroy"	(string) Block destroy event name	(>=14)	
"hitme"	(string) Block hit event name	(>=14)	
"NoMore"	(string) "No more object in layer" event	(>=14)	
(Loop end)			

Note: Array must be sorted by x and by y;

Marker between Backgrounds and blocks:

"next"

Background objects description:

(Loop = how many backgrounds are in this level)		
-199808	(long) Position x	
-200480	(long) Position y	
15	(unsigned int) Background-1 number	
"Default"	(string) Layer name	(>=10)
(Loop end)		

Note: Array must be sorted by x and by y and grouped by special priory by ID;

Marker between NPC and Backgrounds:

"next"

(Loop = how many NPCs are in this level)	
-199966	(long) Position x
-200480	(long) Position y
-1	(int) [-1] left, [0] random/none, [1] right
91	(unsigned int) NPC number
71	(int) Special option: (>=15 for NPC76 and >=30 for NPC28)
	Included NPC: used only if the NPC is
	Buuble(283)/Burred(91)/Lakitu(284)/Egg(96)
	CoopaTroopa algorithm: (NPC-76, 121, 122, 123, 124, 161, 176, 177) and Paragoombas: NPC-243, 244
	0 chase, 1 jump, 2 hover L/R, 3 hover U/D, >4 idle in air
	Cheep-cheep algorithm: (NPC-28, 229, 230, 232, 233, 234, 236)
	0 Swim, 1 jump, 2 projective, 3 swim L/R, 4 swim U/D
	Firebar position (NPC 260) 0-32
	Warp to section: -1-20 (Section number -1) (NPC-288, 289)
12	(int) Second special option: (Only for NPC-91 with special=288)
	Section number for included magic potion: -1-20
#FALSE#	(bool) Generator enable (>=3)
3	(int) Special: Generator direction: [1] up, [2] left, [3] down, [4] right (>=3)
2	(int) Special: Generator type [1] Warp, [2] Projective (>=3)
155	(unsigned int) Special: Generator period (sec*10) [1-600] (>=3)
""	(string) Message by this NPC talkative (>=5)
#FALSE#	(bool) Friendly NPC (>=6)
#FALSE#	(bool) Don't move NPC (>=6)
#FALSE#	(bool) Legacy Boss (>=9)
"Default"	(string) Layer name (>=10)
"Activate"	(string) Activate event (>=10)
"GOldCoin D"	(string) Death event (>=10)
"Talk"	(string) Talk event (>=10)
"NoMoreObj"	(string) No more object in layer event (>=14)
"AttachToLayer"	(string) Layer name to attach (>=63)
(Loop end)	

"next"

Doors description:

(Loop = how many doors are in this level)		
-199824	(long) Entrance position x	
-200224	(long) Entrance position y	
-199824	(long) Exit position x	
-200224	(long) Exit position y	
3	(unsigned int) Entrance direction: [3] down, [1] up, [2] left, [4] right	
3	(unsigned int) Exit direction: [1] down [3] up [4] left [2] right	
1	(unsigned int) Door type: [1] pipe, [2] door, [0] instant	
"file.lvl"	(string) Warp to level	(>=3)
0	(unsigned int) Normal Entrance / To Warp [0-100]	(>=3)
#FALSE#	(bool) Level Entrance (can not enter)	(>=3)
#FALSE#	(bool) Level Exit (End of level)	(>=4)
-1	(long) Wrap to X on world map (-1 is empty)	(>=4)
-1	(long) Wrap to Y on world map (-1 is empty)	(>=4)
5	(unsigned int) Need a stars for enter	(>=7)
"Default"	(string) Layer name	(>=12 (8?))
#FALSE#	(bool) <unused>, always FALSE	(>=12)
#FALSE#	(bool) No Yoshi	(>=23)
#FALSE#	(bool) Allow NPC	(>=25)
#FALSE#	(bool) Locked	(>=26)
(Loop end)		

Marker between Doors and water/quicksand:

"next"   (>=10)

Water/Quicksand descriptions:
(>=29), else skip section

(Loop = how many water ranges are in this level)	
-159968	(long) Position X
-160096	(long) Position Y
160	(unsigned long) Width
64	(unsigned long) Height
0	(int) <unused>, always 0
#TRUE#	(bool) Is Quicksand, else Water (>=62)
"Default"	(string) Layer name
(Loop end)	

Marker between water/quicksand and layers:

"next"   (>=10)

Layers descriptions:
(>=10), else skip section

(Loop = how many layers are in this level)	
"Default"	(string) Layer name
#FALSE#	(bool) Is Hidden layer
(Loop end)	

Marker between layers and events:

"next" (>=10)

(Loop = how many events are in this level)	
"New Event"	(string) Event name
"All super-puper!!!))))))"	(string) Show message after start event (>=11)
0	(unsigned int) Play sound number (0 is don't play sound) (>=14)
0	(unsigned int) End game type (0 – none, or 1 – Bowser Defeat)(>=18)
↓ (loop 20 times = Show/hide/toggle layers lists)	
"hideme1"	(string) Hide layer
"showme1"	(string) Show layer
"Toggleme1"	(string) Toggle layer (>=14)
↑ (loop 20 times end)	
Warning: In SMBX exist bug: if you add 21'st layer in any list,	
you will lose opportunity to delete layers from list. Max 21 layers	
""	(string) Empty string (must by for SMBX)
""	(string) Empty string (must by for SMBX)
""	(string) Empty string (must by for SMBX) (>=14)
↓ (loop 21 times start (for each 21 sections) (>=13)	
-1	(int) Set Music ([-1] don't change; [-2] default; or number of music)
-1	(int) Set Background ([-1] don't change; [-2] default; or # of back)
-1	(long) Set Position ([-1] don't change; [-2] default;
	or **LEFT** x coordinates for section=current_loop)
0	(long) **TOP** y coordinates for section=current_loop
0	(long) **BOTTOM** y coordinates for section=current_loop
0	(long) **RIGHT** x coordinates for section=current_loop
↑ (Loop 21 times end)	
"Trigger event"	(string) Trigger event (>=26)
1532	(unsigned int) trigger delay in deciseconds. I. e. 153,2 sec(>=26)
#FALSE#	(bool) No Smoke (>=27)
#FALSE#	(bool) Hold **ALT-JUMP** player control (>=28)
#FALSE#	(bool) Hold **ALT-RUN** player control (>=28)
#FALSE#	(bool) Hold **DOWN** player control (>=28)
#FALSE#	(bool) Hold **DROP** player control (>=28)
#FALSE#	(bool) Hold **JUMP** player control (>=28)
#FALSE#	(bool) Hold **LEFT** player control (>=28)
#FALSE#	(bool) Hold **RIGHT** player control (>=28)
#FALSE#	(bool) Hold **RUN** player control (>=28)
#FALSE#	(bool) Hold **START** player control (>=28)
#FALSE#	(bool) Hold **UP** player control (>=28)
#FALSE#	(bool) Auto start (>=32)
"MoveMe"	(string) Layer name for movement (>=32)
0	(float) Layer moving speed – horizontal (-Left/+Right) (>=32)
0	(float) Layer moving speed – vertical (+Up/-Down)(>=32)
0	(float) Move screen horizontal speed (-Left/+Right) (>=33)
0	(float) Move screen vertical speed (+Up/-Down) (>=33)
0	(int) Scroll section x, (in file value is x-1) (>=33)
(Loop end)	

--End of file--

Attachments:

Initial section left-top positions
(Initial size of each section is 800x600 pixels)

(Section Center)	Section (X and Y axis ranges)
-200000	01 (-190000 : -219999)
-180000	02 (-170000 : -189999)
-160000	03 (-150000 : -189999)
-140000	04 (-130000 : -149999)
-120000	05 (-110000 : -129999)
-100000	06 (-90000 : -109999)
-80000	07 (-70000 : -89999)
-60000	08 (-50000 : -69999)
-40000	09 (-30000 : -49999)
-20000	10 (-10000 : -29999)
0000	11 (9999 : -9999)
20000	12 (10000 : 29999)
40000	13 (30000 : 49999)
-60000	14 (50000 : 69999)
80000	15 (70000 : 89999)
100000	16 (90000 : 109999)
120000	17 (100000 : 129999)
140000	18 (130000 : 149999)
160000	19 (150000 : 169999)
180000	20 (170000 : 189999)
200000	21 (190000 : 209999)

Background object Order Priority table (by fact)

Value	BGO ID list	Comment
1	14, 75, 76, 77, 78	[background-2] Backgrounds
2	12	SMB3 Goal zone
3	11, 61	SMB3 Goal zone
4	60	SMB3 Goal zone
5	66, 158, 159, 172	[background-1] Waterfall
6	26, 65, 82, 83, 164, 165, 166, 167, 168, 169	Water
7	79	Black dungeon block
8	52	Tree Trunk
9	2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 47, 53, 54, 55, 56, 57, 58, 59, 62, 63, 64, 67, 80, 81, 84, 85, 86, 89, 90, 91, 93, 94, 95, 96, 97, 98, 100, 101, 102, 103, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 132, 133, 134, 135, 136, 142, 144, 146, 147, 148, 149, 150, 151, 152, 153, 160, 161, 162, 163, 170, 171, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 189, 190	Most of BGOs
10	129	Wooden fence 1
11	131	Wooden fence 2
12	130	Wooden fence 3
13	1	Small bush
14	139, 140	Ghost house
15	48	Spiderweb
16	71, 72, 73, 74, 141	Rails, Ghosthouse door
17	70	Rail lift buffer
18	105	P-Switch door
19	87, 88, 92, 104, 107	Doors
20	99	Glass window fragment
21	143	[Foreground] Giant Gate top
22	23, 24, 25, 45, 46, 50, 51, 68, 69, 106, 137, 138, 145, 154, 155, 156, 157, 187, 188	Foreground-1 BGOs
23	49	Ghost house handrail

Note: Internally in SMBX are 14 priority numbers:
10, 20, 25, 26, 30, 50, 75, 76, 77, 80, 90, 98, 99, 125

How SMBX orders BGOs in a list: There's a mix of using hardcoded conditionals, but also some lookup from a table of boolean values, where this table of boolean values is only written once and not changed. Therefore in result BGOs are randomly sorting insode it's order group. With saving of same file 12 times (used a pre-generated file with all 190 SMBX64 BGO's) and with dumpung all BGO-ID's into united table gave a 23 vizible order groups.

PGE File Library orders BGOs by this order priorities table and by order of placement which gives a same result on every file save.