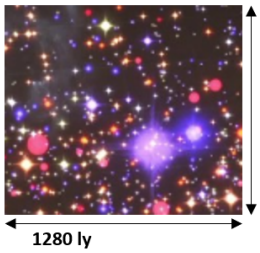
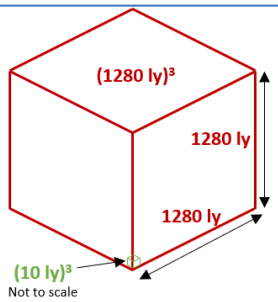
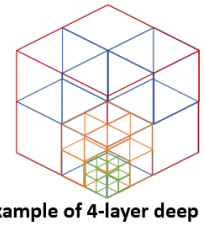






Example of 4-layer deep cube nesting. In E:D the nesting is *eight* layers deep

Boxel sizes by MCode

a	10Ly (2M/sector)
b	20Ly (262k/sector)
c	40Ly (32k/sector)
d	80Ly (4k/sector)
e	160Ly (512/sector)
f	320Ly (64/sector)
g	640Ly (8/sector)
h	1280Ly (1/sector)

- **Elite Dangerous (E:D) models a field of stars in layers of *nested cubes***
- **The largest of these cubes is (1280 ly)³, the smallest is (10 ly)³**
- **The largest mass stars/systems are rendered in the largest cubes. Smaller mass stars/systems are rendered in the smallest cubes.**
- **It is done this way for software optimization purposes, but explorers can use this feature *to our advantage* since procedurally generated systems have names that give an indication of the system's *total mass,* which in turn tells you about what kinds of stars and planets you can find there. This is useful.**[i]

- **Each rendering cube (boxel) is given a mass code (Mcode)**
- **The Mcode for the smallest (10 ly)³ boxel is 'a' and the largest boxel (1280 ly)³ is 'h'**
- **There is *one* 'h' boxel per sector. All boxels of other Mcodes exist within the 'h' boxel.**

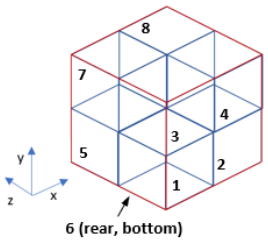
System Identifiers

The form of a procedurally generated system identification is: <word name> [L1][L2]-[L3] [Mcode][n1]-[n2]

Example: Synookio DA-Q b19-7
This name tells us the system is in the Synookio sector, is rendered in a "b" boxel at Cube ID: *DA-Q 19* and the system is the 7th star indexed at this Cube ID.

Cube IDs

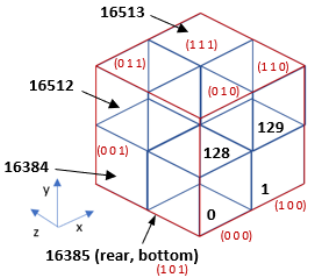
[L1][L2]-[L3] [n1] is the Cube ID, it gives position of a boxel within a sector and has a decimal number analog, the 'cube number'. The L indices are letters, essentially base 26 numbers where A=0 and Z=25. An extra decimal number, n1, is used when cube number is larger than 17575. n1 is absent from the System Identifier when zero. N1 is the most significant number and L1 is the least significant number.



Pattern of cube numbers

- **The pattern in which cube numbers increase is best seen with a simplified example using regular decimal numbers:**
  - **x row fills first, then the y columns and only then do you proceed to the first z boxel (see example at left)**
- **In E:D, however:**
  - ***Boxel counting starts at zero***
  - **Sectors are 128 'a' boxels per side *and all boxels are counted as if they were 'a' boxels in size*. This is a bit confusing, see example to the right for 'g' boxels →**
  - ***Depending on mass code, some (or many) Cube IDs are invalid***
- **'h' boxels are already 1280 ly in size and only have a cube number of 0.**
- **For a boxel of a given Mcode at coordinates (x y z) the decimal cube number in E:D is given by:**

$$\text{Cube Number}_{(x\,y\,z)} = z*128^2 + y*128 + x$$



Decimal cube numbers and (x y z) coordinates for g boxels, as counted in E:D

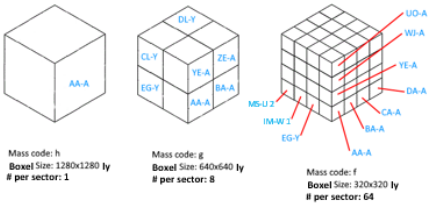
To Find L1, L2 and L3 convert the decimal Cube Number to base 26 (A-Z) used by E:D:
Example: g boxel at (0 1 1)
Cube Number$_{(0\,1\,1)}$ = 1*128²+1*128+0 = 16512
Perform the base conversion[ii]:
$16512_{10} = (24_{26})(11_{26})(2_{26})$=(Y)(L)(C)
In E:D [L1][L2]-[L3] notation this is written Cube ID = CL-Y

Example: f boxel at (3 1 0)
Cube Number$_{(3\,1\,0)}$ = 1*128+3= 131
$131_{10} = (0_{26})(5_{26})(1_{26})$ = (A)(F)(B)
Cube ID = BF-A

Example: f boxel at (0 0 3) in system "Synookio"
This example has a problem! Cube Number is too large for L numbers alone, so an extra number is added: "n1=2", a fourth significant digit for the Cube ID:
Cube Number$_{(0\,0\,3)}$ = 3*128²+0+0 = 49152 ← *too large for encoding by [L1][L2]-[L3]*
Reduce Cube Number with n1=2: 49152 – 2*26³ = 14000
$14000_{10} = (20_{26})(18_{26})(12_{26})$=(U)(S)(M)
Cube ID = MS-U 2 – in game this would appear as: *Synookio MS-U f2-n2, where n2 indexes a specific star within the boxel. Note that if n1=0 it is omitted from the System Identifier.*

Cube ID Examples

Cube Number	Cube ID
0	AA-A
1	BA-A
25	ZA-A
26	AB-A
27	BB-A
28	CB-A
17575	ZZ-Z
17576	AA-A 1
17577	BA-A 1
164101	PT-I 9



Cube IDs for 'h', 'g' and 'f' boxels[iii]. Note how 'f' boxels at coordinates (0 0 2) and (0 0 3) use the n1 number

Special thanks to [IGAU] Discord: CMDRs Urania Minora and Matt G, [DISC] CMDRs Jackie Silver, Alot and the [DISC] wiki: http://disc.thargoid.space/Main_Page

[i] https://edastro.com/mapcharts/
[ii] https://www.mathsisfun.com/base-conversion-method.html
[iii] adapted from: https://forums.frontier.co.uk/threads/rv-sonnenkreis-decoding-universal-cartographics.196297/page-19#post-4844802