A custom entropy bounded encoding in an X index and Y index format is generated for a segment of program code along with a custom decoding dictionary made up of an X pattern memory and a Y pattern memory. In run time decoding a mix mask is used with an X pattern selected from the X pattern memory according to the X index and with a Y pattern selected from the Y pattern memory according to the Y index to determine an executable instruction. The mix mask identifying the order of bits to combine from the X pattern and the Y pattern. Appropriate hardware implementation and placement of the decoding mechanism and address translation is described during execution of an encoded code segment. Methods including a genetic process are also described to determine the X index the Y index the X patterns the Y patterns and one or more mix masks.