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Report (Performance)

All the following performance outputs were run using the following sudoku puzzle (hard) encoding.

```
4.....8.5.3.........7......2.....6.....8.4......1.......6.3.7.5..2.....1.4......
```

This is the stats output for the minimal encoding on a hard sudoku puzzle.

```
WARNING: for repeatability, setting FPU to use double precision
============================[ Problem Statistics ]=============================
|                                                                             |
|  Number of variables:            729                                        |
|  Number of clauses:         8829                                        |
|  Parse time:                0.00 s                                      |
|  Eliminated clauses:        0.00 Mb                                     |
|  Simplification time:       0.00 s                                      |
|                                                                             |
============================[ Search Statistics ]==============================
| Conflicts |           ORIGINAL          |           LEARNT           | Progress |
|           |     Vars  Clauses Literals |      Limit  Clauses Lit/Cl |          |
===============================================================================
|     100 |       231   1559  4288 |      571         94    13 | 46.512 % |
===============================================================================
restarts              : 2
conflicts             : 105            (16442 /sec)
decisions             : 252            (0.00 % random) (39461 /sec)
propagations          : 4372           (684623 /sec)
conflict literals     : 1255           (13.57 % deleted)
Memory used           : 11.00 MB
CPU time              : 0.006386 s

SATISFIABLE
```

This is the stats output for the efficient encoding.

```
WARNING: for repeatability, setting FPU to use double precision
============================[ Problem Statistics ]=============================
|                                                                             |
|  Number of variables:            729                                        |
|  Number of clauses:         11745                                           |
|  Parse time:                0.00 s                                          |
|  Eliminated clauses:        0.00 Mb                                         |
|  Simplification time:       0.00 s                                          |
|                                                                             |
============================[ Search Statistics ]==============================
| Conflicts |           ORIGINAL          |           LEARNT            | Progress |
|           |     Vars  Clauses Literals |     Limit  Clauses Lit/Cl |       |
===============================================================================
===============================================================================
restarts              : 1
conflicts             : 94             (12383 /sec)
decisions             : 179            (0.00 % random) (23581 /sec)
propagations          : 3730           (491371 /sec)
conflict literals     : 934            (13.12 % deleted)
Memory used           : 11.00 MB
CPU time              : 0.007591 s

SATISFIABLE
```

This is the stats output for the extended encoding.

```
WARNING: for repeatability, setting FPU to use double precision
============================[ Problem Statistics ]=============================
|                                                                             |
|  Number of variables:            729                                        |
|  Number of clauses:         11988                                           |
|  Parse time:                0.01 s                                          |
|  Simplification time:       0.01 s                                          |
|                                                                             |
============================[ Search Statistics ]==============================
| Conflicts |           ORIGINAL          |           LEARNT            | Progress |
|           |     Vars  Clauses Literals |      Limit  Clauses Lit/Cl |       |
===============================================================================
===============================================================================
restarts              : 1
conflicts             : 7              (456 /sec)
decisions             : 26             (0.00 % random) (1695 /sec)
propagations          : 1309           (85349 /sec)
conflict literals     : 40             (23.08 % deleted)
Memory used           : 11.00 MB
CPU time              : 0.015337 s

SATISFIABLE
```

Observations:

There is an inverse relationship between CPU runtime and the amount of propagations. As the number of clauses goes up CPU run time goes up and propagations goes down.

The amount of conflicts and conflict literals go down at an increasing rate as more clauses are added by the efficient and extended encodings.

Comparing minimal to efficient, it is almost the exact same but there are more propagations on minimal. This makes sense because there are more clauses in minimal compared to efficient.

Extended took longer compared to all the other ones since it has more clauses.