



Elastic Executions from Inelastic Programs

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Motivation

Elastic resources Cores, memory, storage CPU voltage, FPU unit

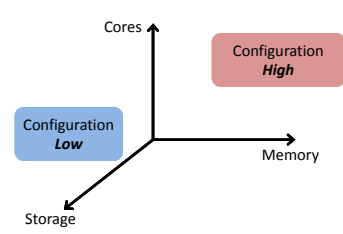
Elasticity = runtime adaptation to changes in hardware resources
Legacy, *inelastic applications* are moving to *elastic platforms*

Our position: we can “elastify” inelastic applications

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Why aren't applications elastic?

- Separate **High** and **Low** compile configurations
- Need recompilation (→restart) to scale, i.e., take advantage of more resources



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Sample inelastic applications

- SQLite SQL engine
 - compile-time memory allocator selection

SQLite **H**
high memory usage; high throughput

```
#ifdef SQLITE_ENABLE_MEMSYS1 ...
```

SQLite **L**
low memory usage; low throughput

```
#ifdef SQLITE_ENABLE_MEMSYS1 ...
```

Kiss FFT **H**
high core/memory usage; high throughput

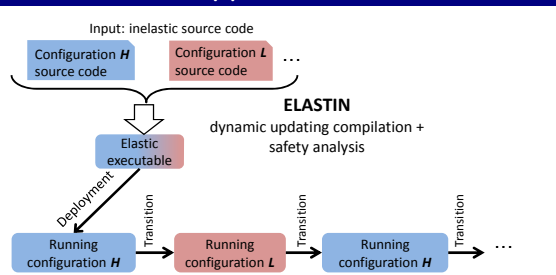
```
#ifdef _OPENMP
```

Kiss FFT **L**
no FPU, low memory usage; low throughput

```
#ifdef FIXED_POINT
```

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Our approach: ELASTIN



- Elastic executables/executions from inelastic source code
- Runtime adaptation ($H \leftrightarrow L$ transition) via dynamic updating
- Safety guarantees: transactional version consistency [POPL'08]

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Results

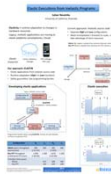
- Elastic executions
 - SQLite **High**: **17%** more memory, **12%** faster than SQLite **Low**
 - Kiss FFT **High**: FPU, **23%** faster than Kiss FFT **Low** (no FPU)
- High** ↔ **Low** transition time: 125—672 μsec
- ELASTIN overhead: 0—6%
- Programming burden for using ELASTIN
 - 16 lines of code (SQLite)
 - 15 lines of code (Kiss FFT)

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For details, come see our poster at the ICSE poster session on Thursday, May 25@10 a.m.



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