Hewlett Packard
Enterprise

Advanced Editor Tooling for Chapel

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Advanced Editor Tooling

- Modern languages provide a variety of text editor tooling to writing code easier for the user
  - Syntax Highlighting
  - Code Intelligence
    - Hover information
    - Go-to-definition
    - Autocompletion
    - Type hints
  - Linting
  - IDE debugger support
  - Auto-formatters

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Until recently, Chapel has not provided such tooling.

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With 2.0, Chapel provides new tools that help fill this gap!

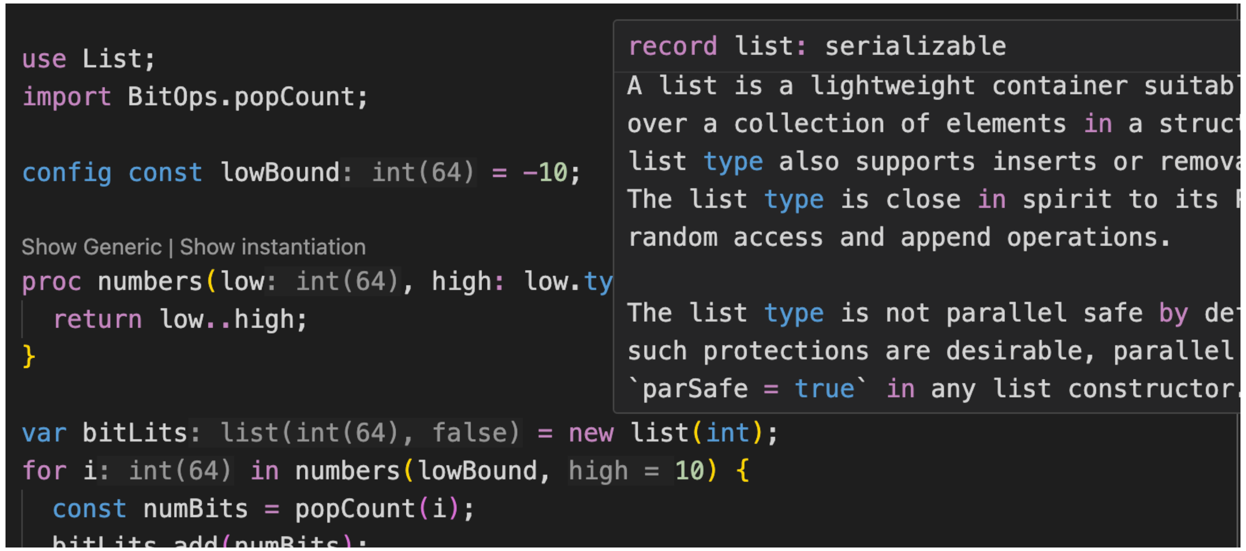
Introducing….

chpl-language-server

- Provides Dyno-based code intelligence
  - Go-to-definition
  - View documentation
  - Inspect generics
  - ……

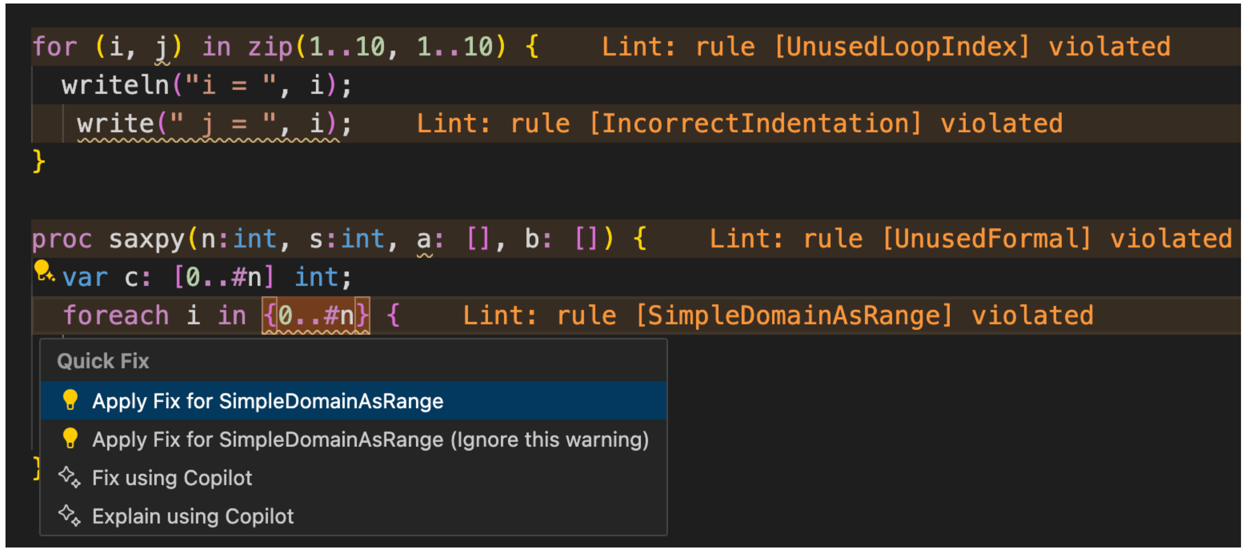
chplcheck

- Linter for common style issues and anti-patterns
- Used from the command line or from an editor
- Configurable with custom rules
- Automatically refactors code



```
use List;
import BitOps.popCount;

config const lowBound: int(64) = -10;

Show Generic | Show instantiation
proc numbers(low: int(64), high: low.ty
  return low..high;
}

var bitLits: list(int(64), false) = new list(int);
for i: int(64) in numbers(lowBound, high = 10) {
  const numBits = popCount(i);
  bitLits.add(numBits);
```

```
record list: serializable
A list is a lightweight container suitab
over a collection of elements in a struct
list type also supports inserts or remova
The list type is close in spirit to its P
random access and append operations.

The list type is not parallel safe by def
such protections are desirable, parallel
`parSafe = true` in any list constructor.
```

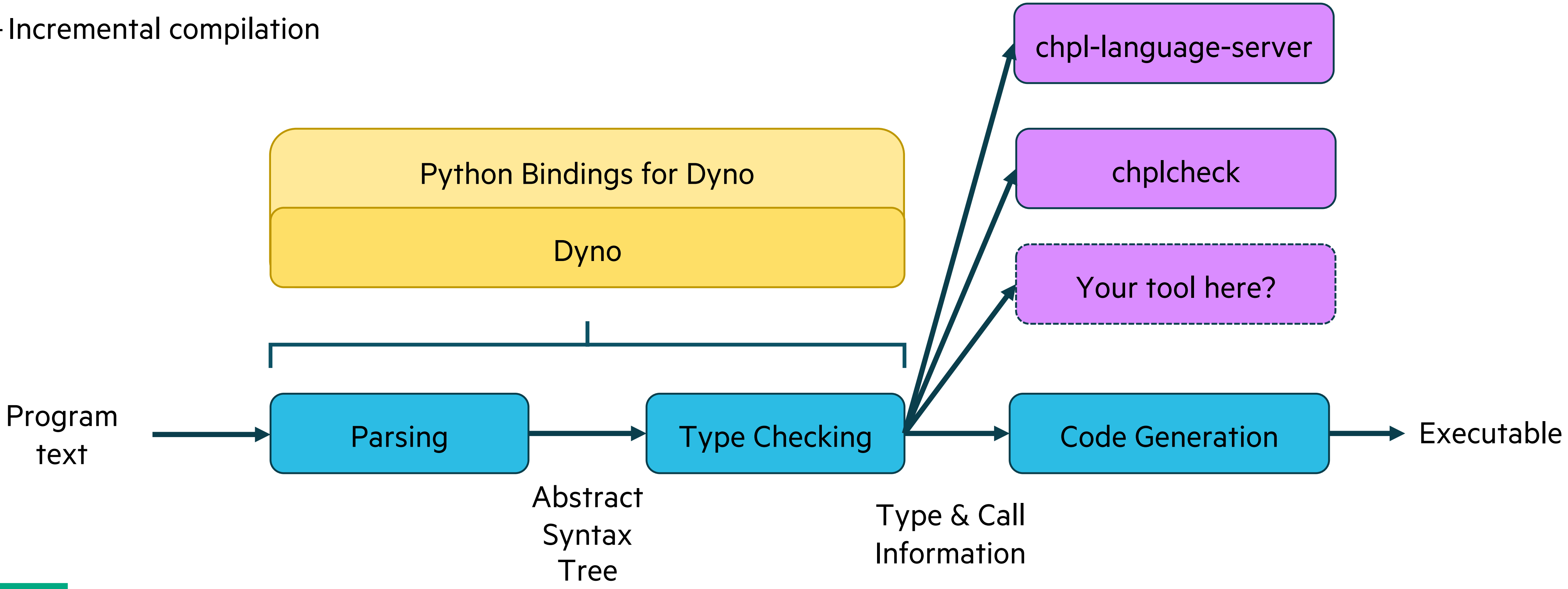


```
for (i, j) in zip(1..10, 1..10) {    Lint: rule [UnusedLoopIndex] violated
  writeln("i = ", i);
  write(" j = ", i);    Lint: rule [IncorrectIndentation] violated
}

proc saxpy(n:int, s:int, a: [], b: []) {    Lint: rule [UnusedFormal] violated
  var c: [0..#n] int;
  foreach i in {0..#n} {    Lint: rule [SimpleDomainAsRange] violated
}
```

Quick Fix
Apply Fix for SimpleDomainAsRange
Apply Fix for SimpleDomainAsRange (Ignore this warning)
Fix using Copilot
Explain using Copilot

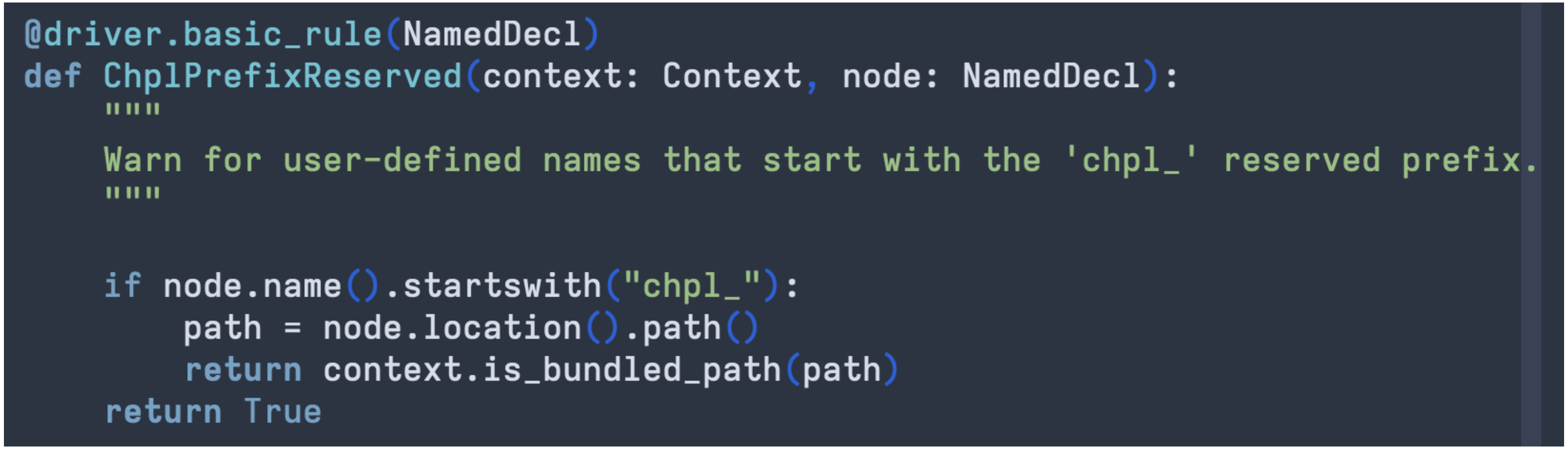
How is this possible?

- Dyno!
  - Chapel's compiler frontend rewrite
  - Among other things, provides:
    - Compiler-as-a-library (exposed to C++ and Python)
    - Incremental compilation



Dyno’s Python Bindings

- The Python bindings allow one to easily write language tooling that uses the compiler’s knowledge
- E.g., a function from ‘chplcheck’ written in terms of ‘chapel-py’ types



```
@driver.basic_rule(NamedDecl)
def ChplPrefixReserved(context: Context, node: NamedDecl):
    """
    Warn for user-defined names that start with the 'chpl_' reserved prefix.
    """

    if node.name().startswith("chpl_"):
        path = node.location().path()
        return context.is_bundled_path(path)
    return True
```

Using LSP Tools

- Documentation for ‘chpl-language-server’:
  - https://chapel-lang.org/docs/tools/chpl-language-server/chpl-language-server.html
- Documentation for ‘chplcheck’:
  - https://chapel-lang.org/docs/tools/chplcheck/chplcheck
- The Visual Studio Code extension:
  - https://marketplace.visualstudio.com/items?itemName=chpl-hpe.chapel-vscode

Editor Tooling in Action!