TableGen Formatter

Extending Clang-Format Capabilities

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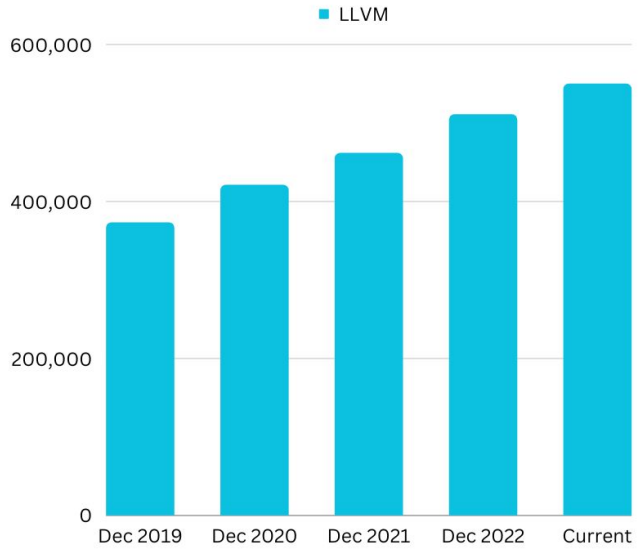
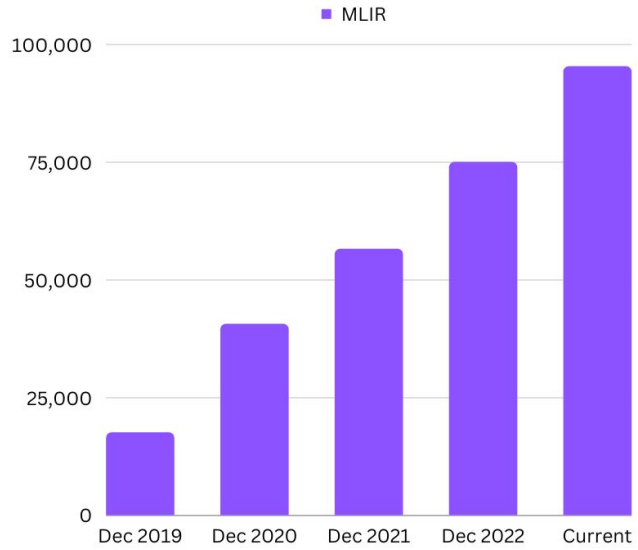
Introduction

- The TableGen framework plays a crucial role in both LLVM and MLIR.



Number of lines of TableGen code in LLVM over the years



Number of lines of TableGen code in MLIR over the years

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```
def FeatureFMV : SubtargetFeature<"fmv", "HasFMV", "true",
  "Enable Function Multi Versioning support.">;

def FeatureZCRegMove : SubtargetFeature<"zcm", "HasZeroCycleRegMove", "true",
                                        "Has zero-cycle register moves">;
```

Inconsistent def record formatting

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```
foreach vt = [v2f16, v2bf16] in {
  def: Pat<(vt (ProxyReg  vt:$src)), (ProxyRegI32 Int32Regs:$src)>;
}

foreach mma = !listconcat(MMAs, WMMAs, MMA_LDSTs, LDMATRIXs) in
  def : MMA_PAT<mma>;
```

Inconsistent foreach loop formatting

Considered Approaches

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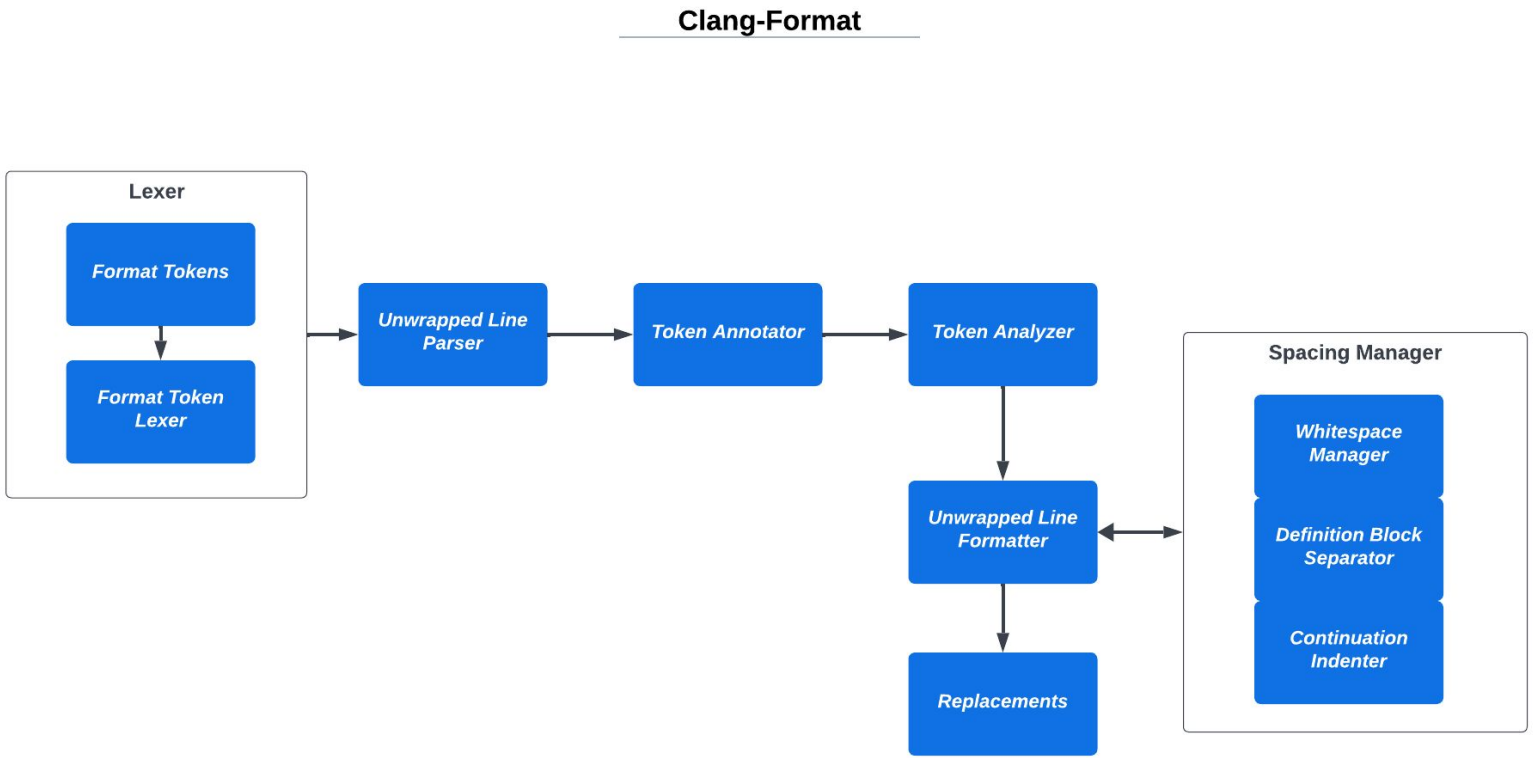

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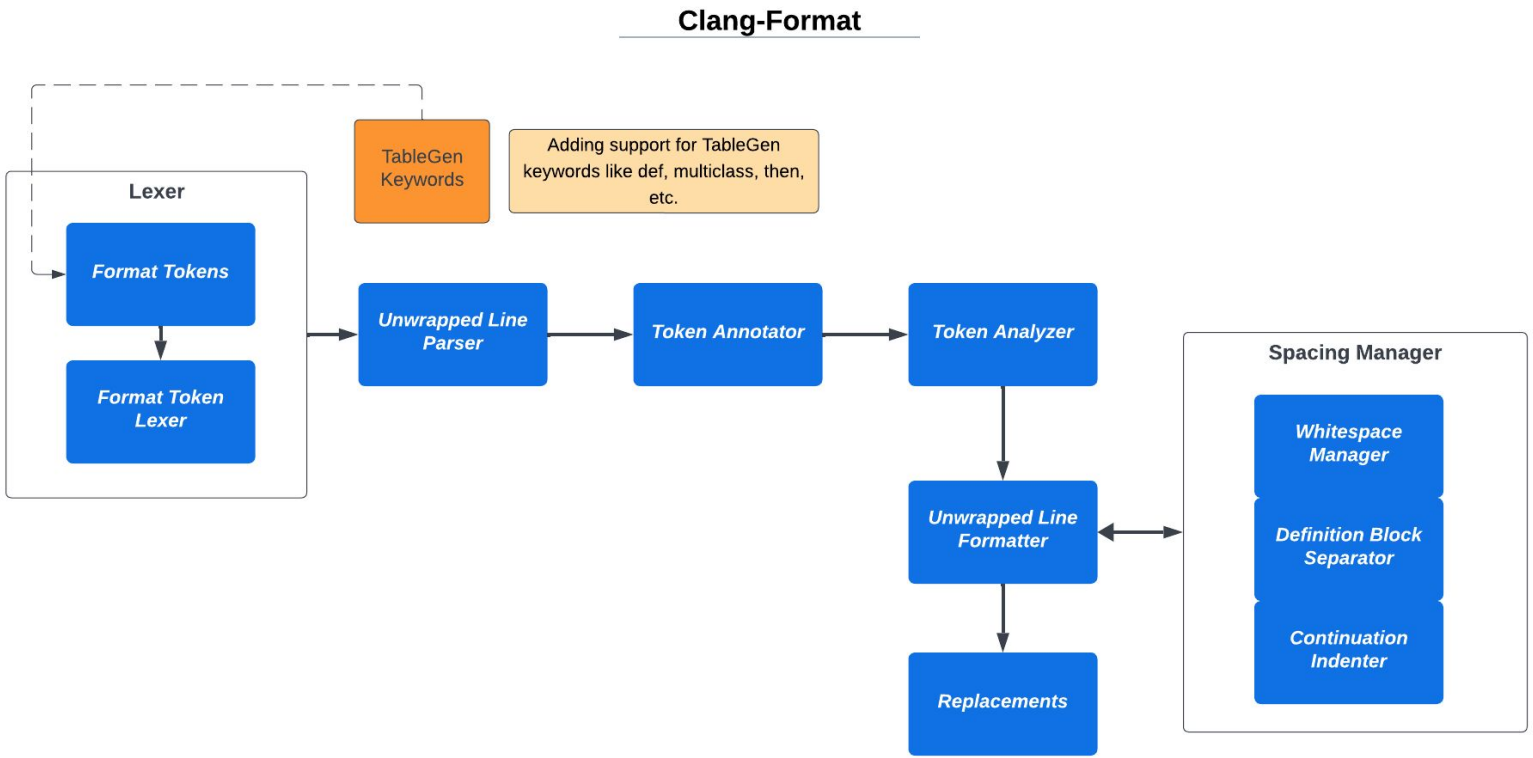

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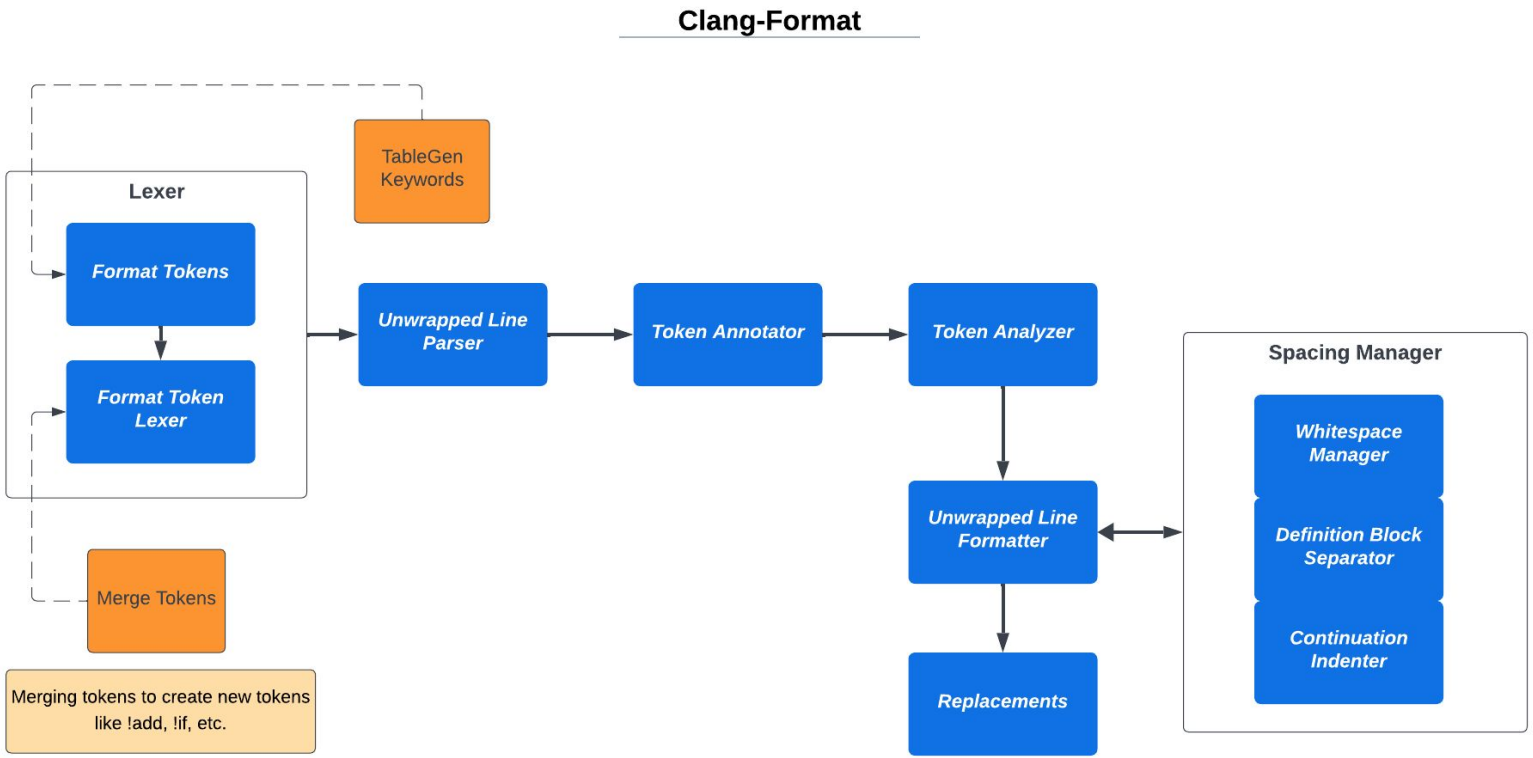

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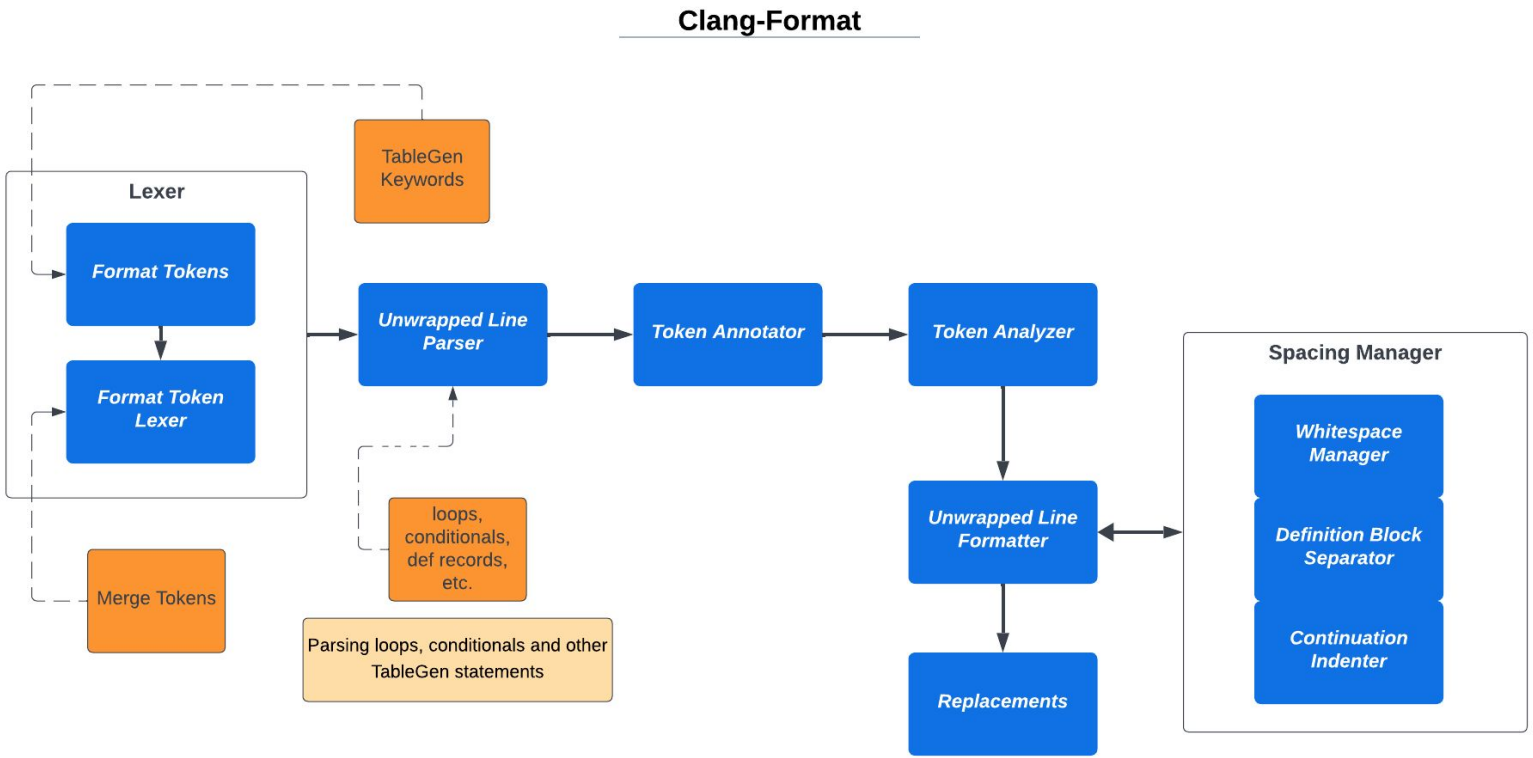

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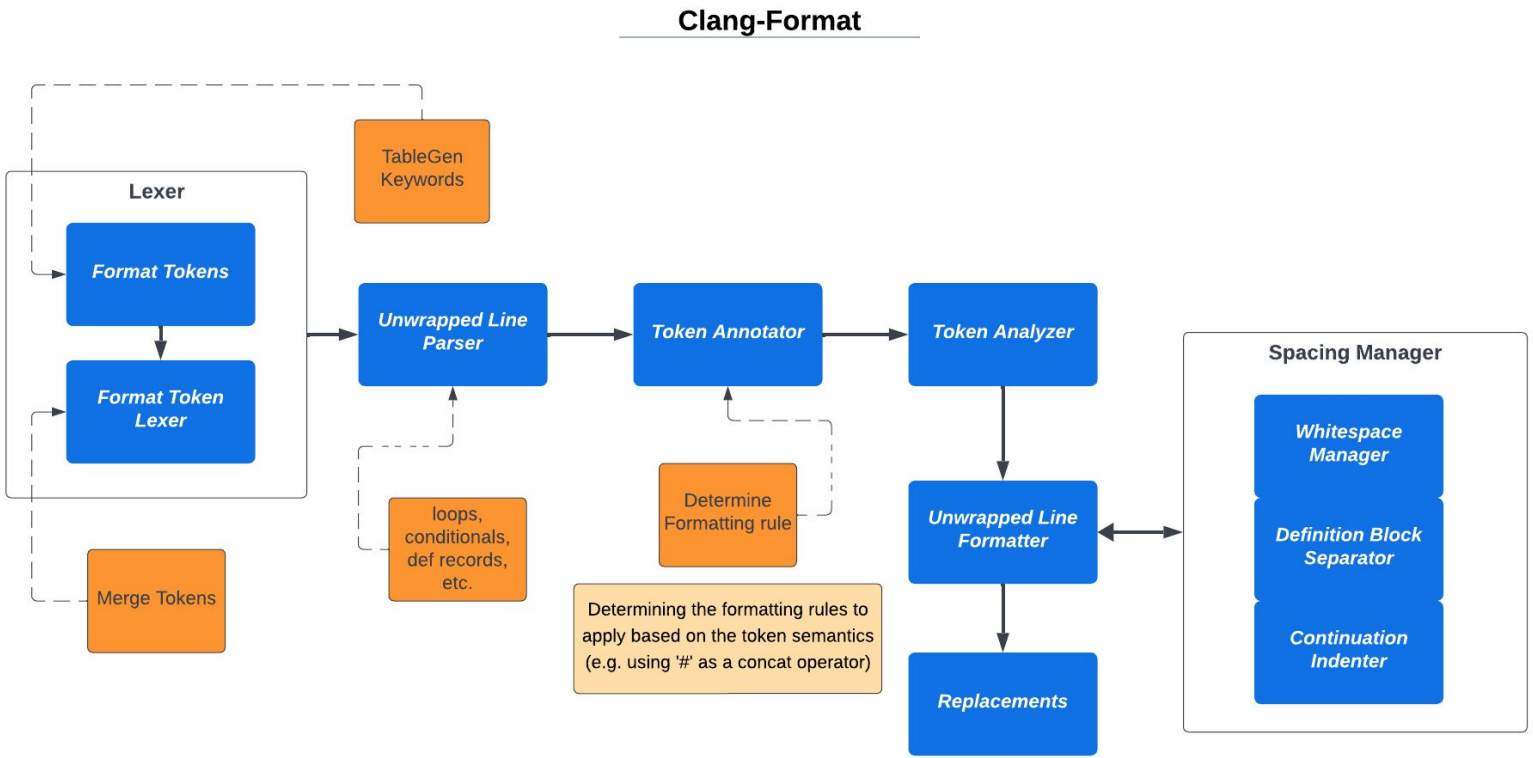

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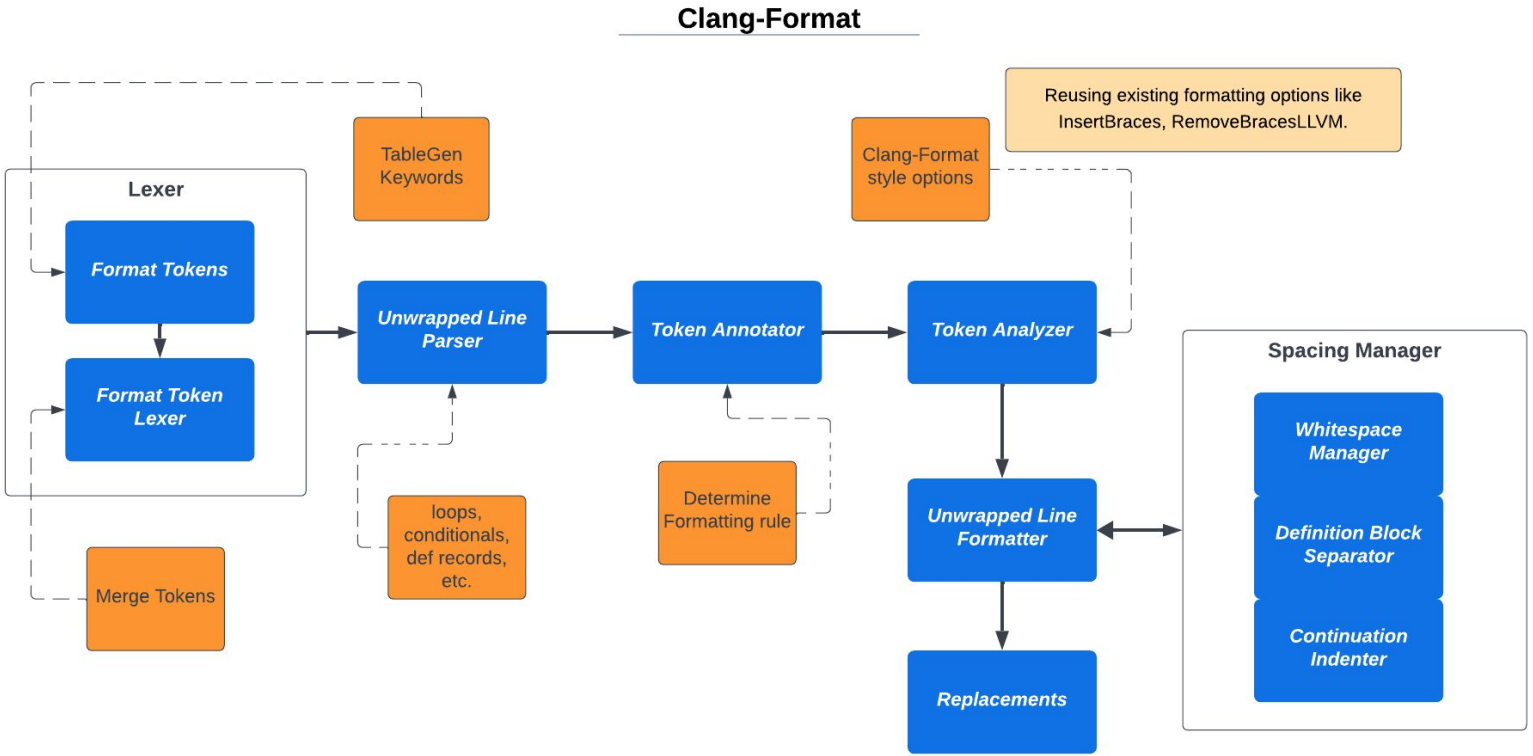

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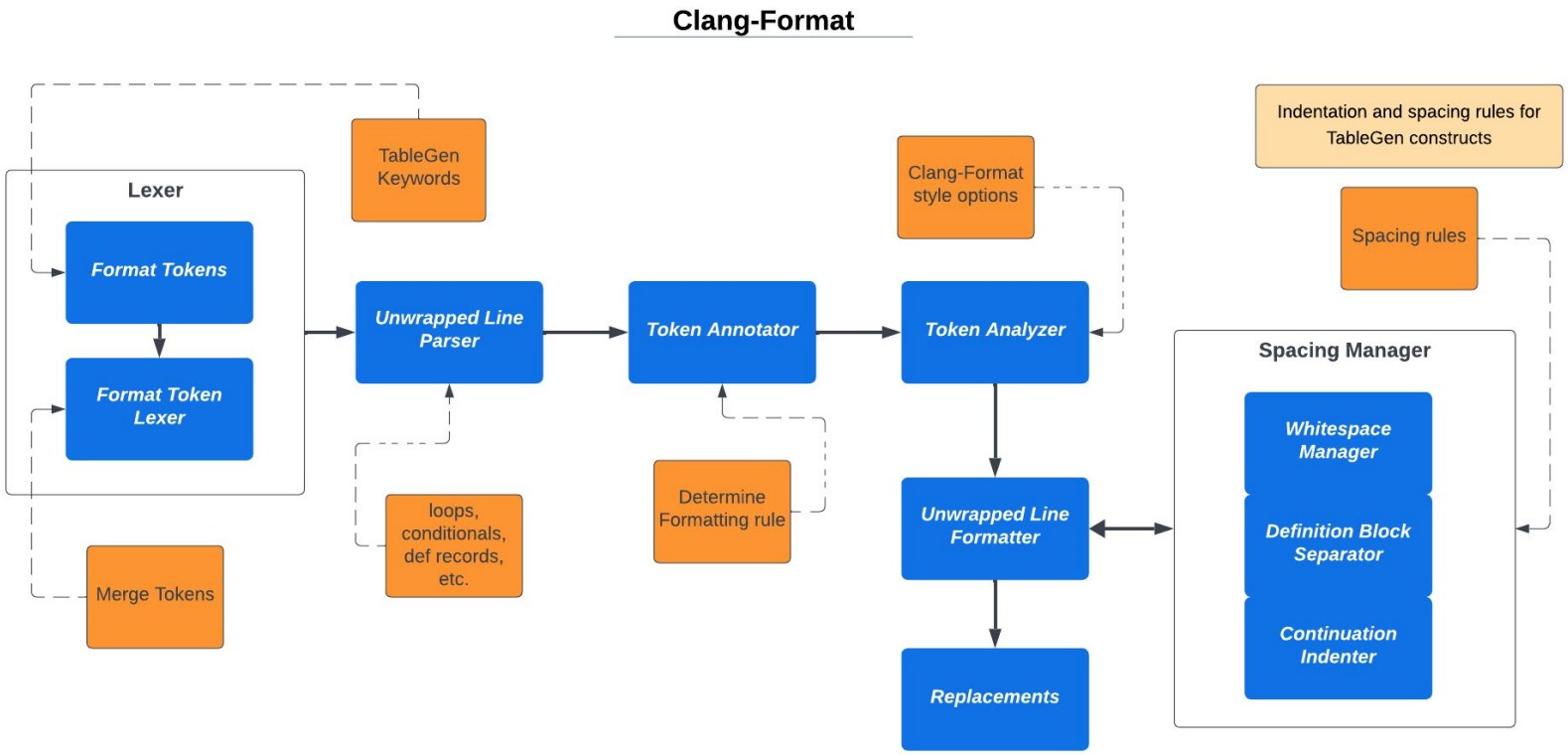

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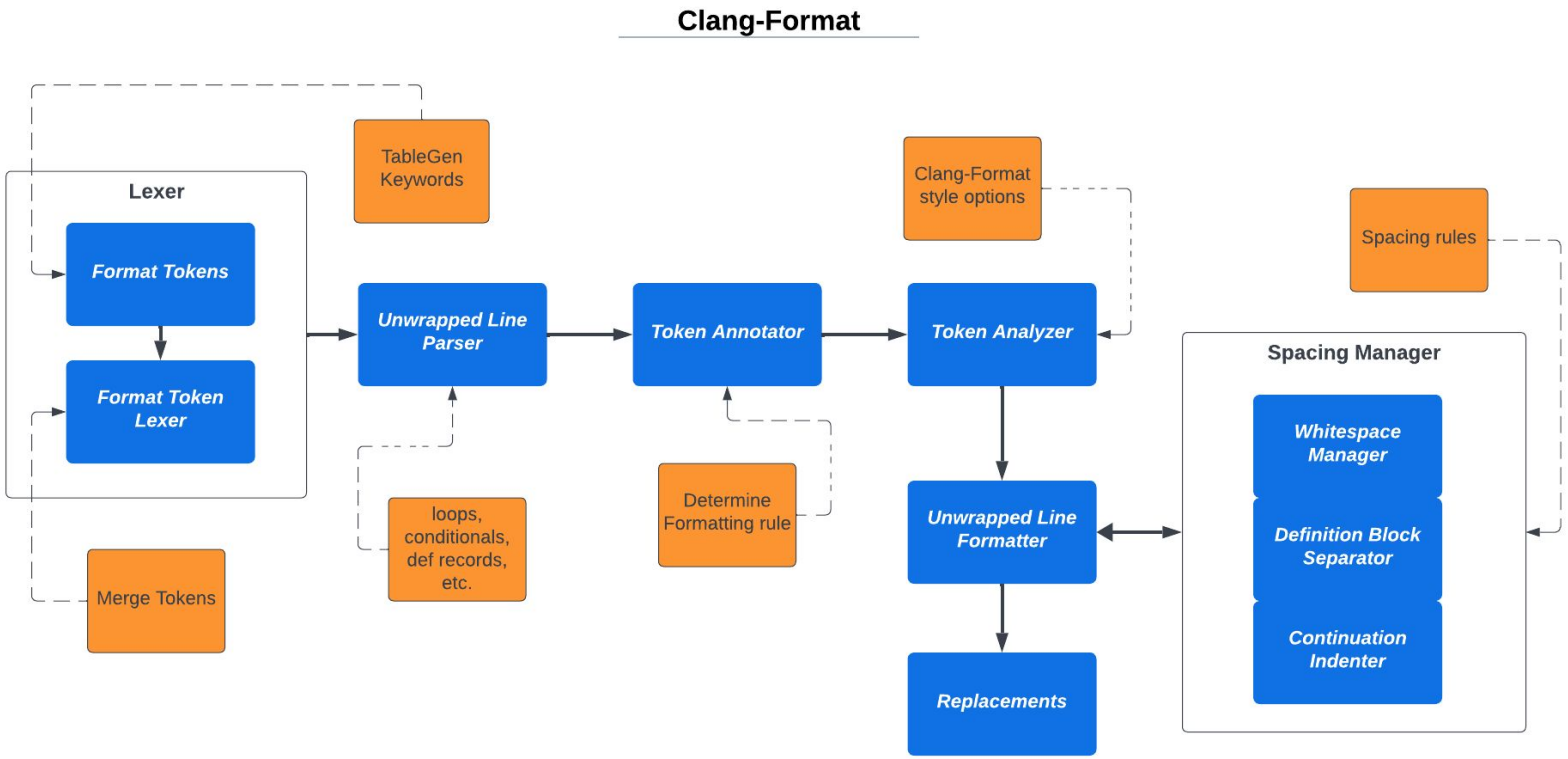

Testing the Formatter

- We ran the formatter on all the TableGen files under LLVM project.
- Following the formatting process, we ran all the LLVM regression tests using the *check-llvm* target.
- Overall, we successfully formatted 802 files of TableGen code without breaking the build.

Example: Recognizing TableGen keywords

```
def CARRY: SPR<1, "xer">, DwarfRegNum<[76]> {
  let Aliases = [XER];
}
multiclass DIV_Common <InstR600 recip_ieee> {
def : R600Pat<
  (fdiv f32:$src0, f32:$src1),
  (MUL_IEEE $src0, (recip_ieee $src1))
>;
}
```

```
let Predicates = [HasSSE3] in
  def rx : Instruction<opc, "rx">;
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SeparateDefinitionBlocks: true

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InsertBraces: true

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let Predicates = [HasSSE3] in {
  def rx : Instruction<opc, "rx">;
}
```

Example: Parsing loops and conditional statements

```
foreach Index = 32-63 in {
  def VSX : VSXReg<Index, "vs">;
}

if P.HasExtSDWA then {
  def : MnemonicAlias<opName # "_sdwa", opName>;
}
```

RemoveBracesLLVM: true

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  def VSX : VSXReg<Index, "vs">;

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Example: Support for existing Clang-Format options

```
class C<int x> {
      int Y     = x;
  int Yplus1 = !add( Y, 1 );
    int xplus1 = !add( x, 1 );
}

def imm16_31 : ImmLeaf<i32, [{
      int Y     = x;
  int Yplus1 = Y + 1;
    int xplus1 = x + 1;
    return Yplus1 >= 0;
}]>;
```

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Future Works

- Formatting of multi-line string literals between ‘[{‘’ and ‘}]’ (*TokCode*).
- Adding support for other TableGen keywords and constructs such as *defset*, *defm*, etc.
- Adding support for the remaining relevant Clang-Format Style Options.

Acknowledgement

- Dr. Min-Yih Hsu (@mshockwave) for providing guidance and support throughout the project.

Thank you