Formalising Chisel

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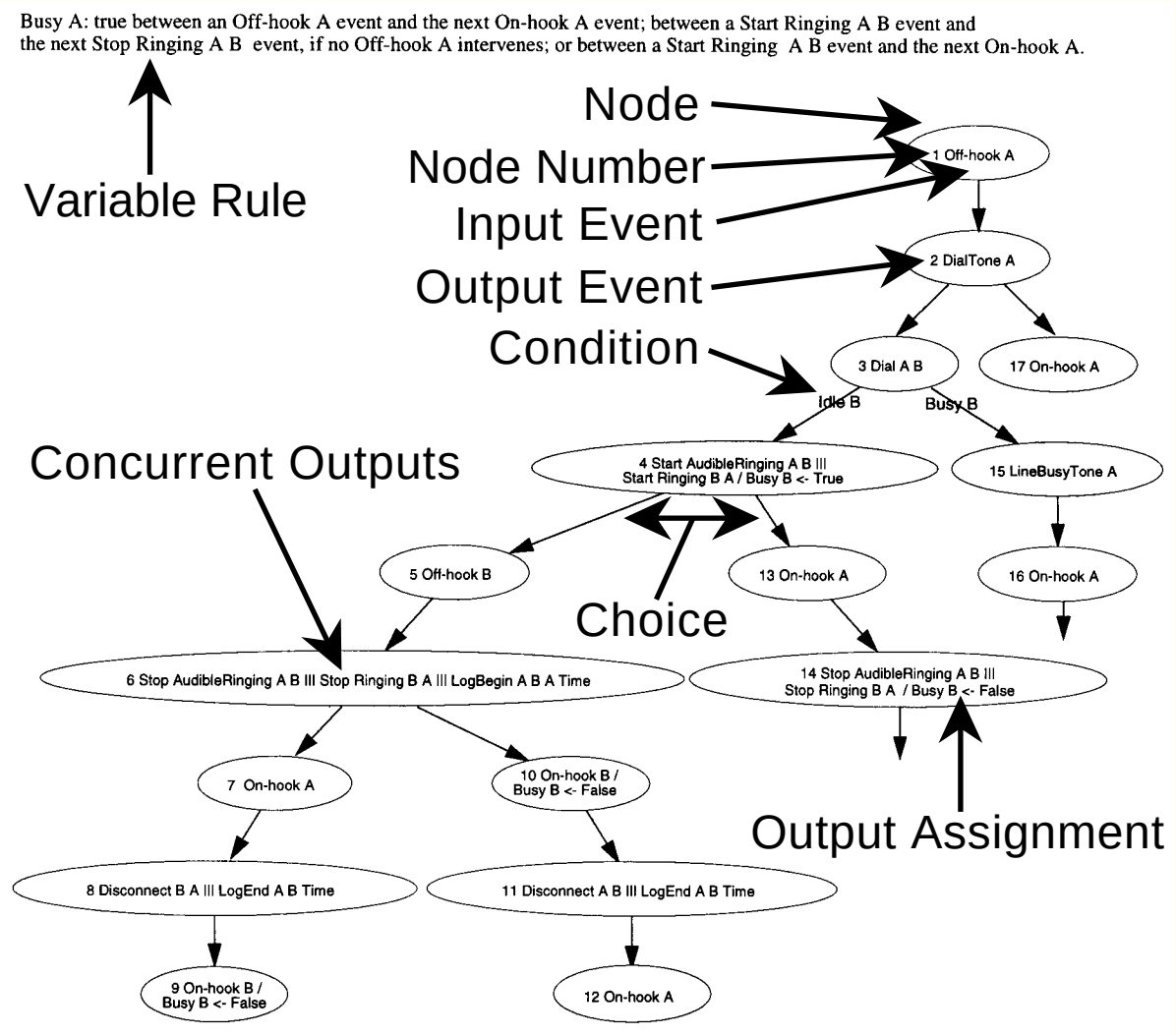
Introduction

- Chisel:
  - graphical notation for describing services/features
  - developed at BellCore
- formalisation desirable:
  - tighten up rules and interpretation
  - LOTOS and SDL considered
  - mapping to SDL developed

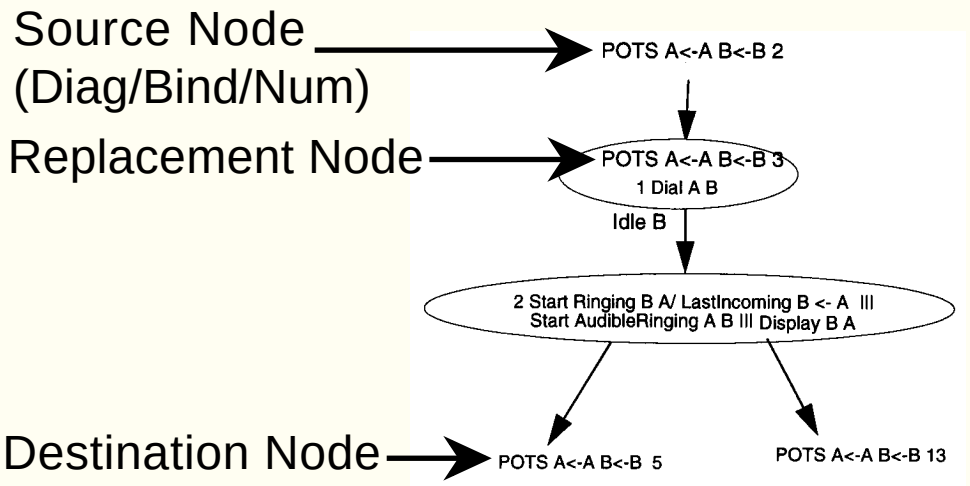
Sample Chisel Diagram

- POTS base-line in Chisel:



Sample Feature Diagram

- Calling Number Delivery in Chisel:



Need for Formalisation

- rules for constructing diagrams loose
- rules for incorporating features loose
- better handling of concurrency needed
- rigorous interpretation would offer:
  - simulation
  - validation and verification
  - model-checking
  - test derivation
- already some formalisation: FSM, RE, MSC, process algebra

LOTOS and SDL for Chisel

- LOTOS mapping apparently used by Ottawa, though not made explicit
- SDL mapping apparently not developed

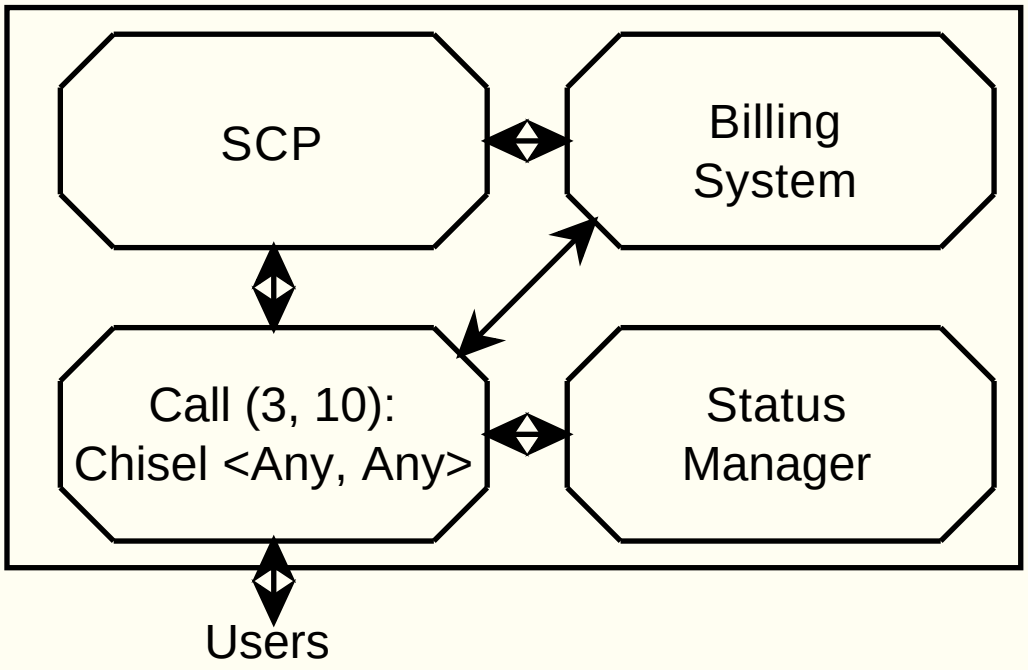
Aspect	LOTOS	SDL
semantics	fully defined	clear?
complexity/size	medium	high
analysis	good	validation
communication	synchronous	asynchronous
input-output	neutral	directed
globals	no (faked?)	yes (no mutex)
concurrency	yes	yes
redefinition	no	yes (but limits)

Chisel Diagram Rules

- each event designated input/output according to event names
- node is input/output/interleaved output
- alternating input/output nodes (not entirely necessary)
- source diagram node assumed input (not entirely necessary)
- replacement diagram node:
  - must be input node
  - must have same event as original
  - binding identical to source node

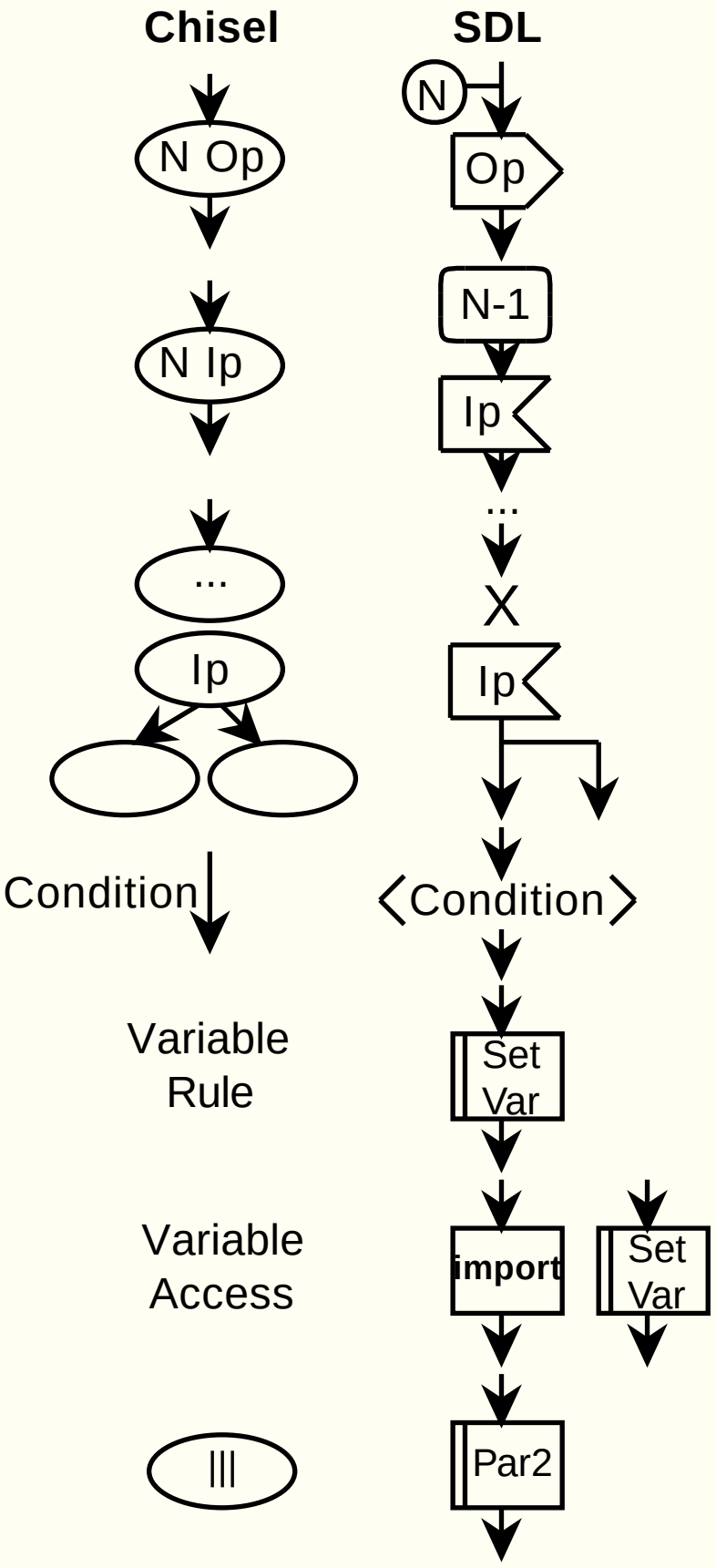
Approach using SDL

- SDL structure for a Chisel ‘network’:

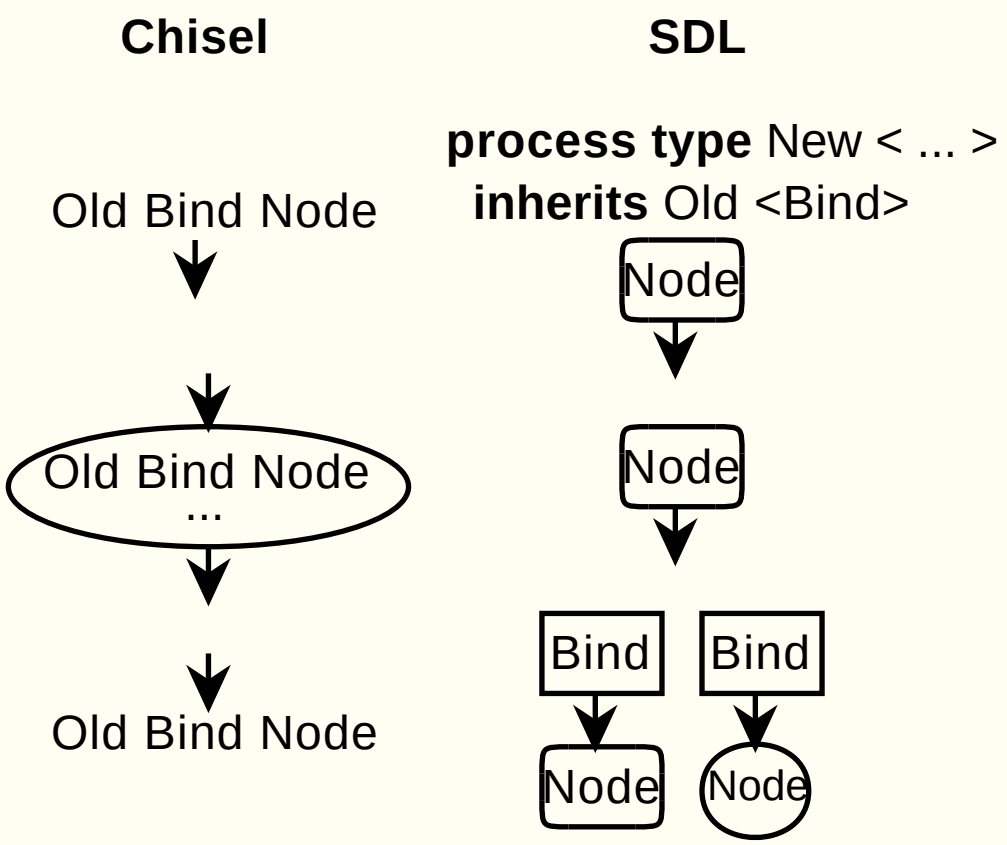


- Chisel diagram separate process type
- features rigorously combined with each other and POTS
- complete description processed by tools:
  - standard problems (deadlock, unspecified reception, ...)
  - POTS+Feature as MSC against POTS+Feature1+Feature2
  - automated test derivation

Chisel Diagram in SDL



Feature Diagram in SDL



Conclusion

- formalisation of benefit to Chisel
- LOTOS vs. SDL considered, but SDL worked through
- mapping rules developed in outline
- future work:
  - small changes to existing diagrams
  - translation to SDL – manual/automatic
  - trying various forms of validation
  - application to FIW'98 competition