LoonyBin:

Keeping Language Technologists Sane through Automated Management of (Hyper)Workflows

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Carnegie-Mellon University

LREC 2010
Thursday, May 20, 2010

Outline

- Empirical NLP Research
  - Day-to-day issues
  - Current problems
    - LoonyBin's solutions
- Workflows
- HyperWorkflows

Empirical NLP

- Plumbing: Gluing (Linux) tools together
- Recording results
- Sanity checking
- Running variations
- Moving between clusters & schedulers

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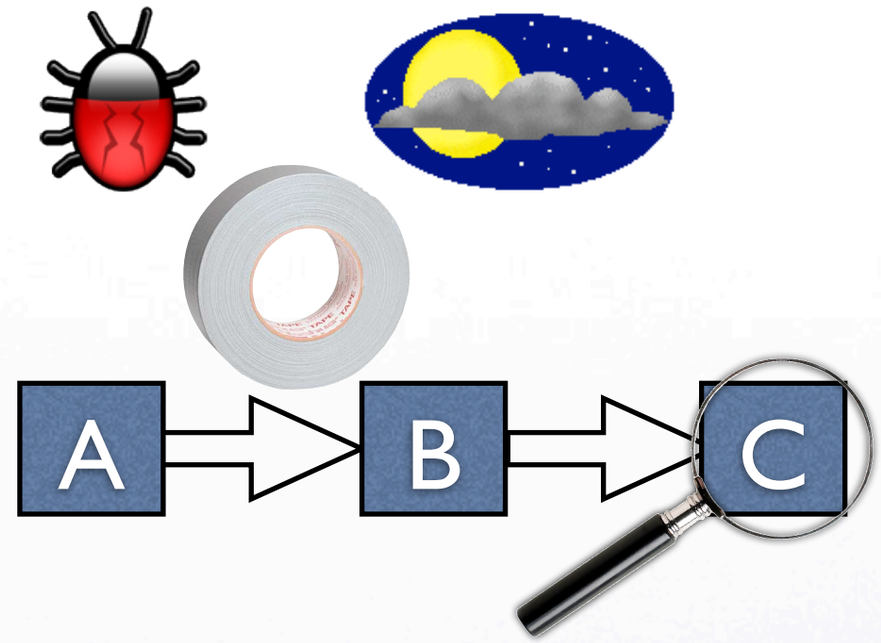

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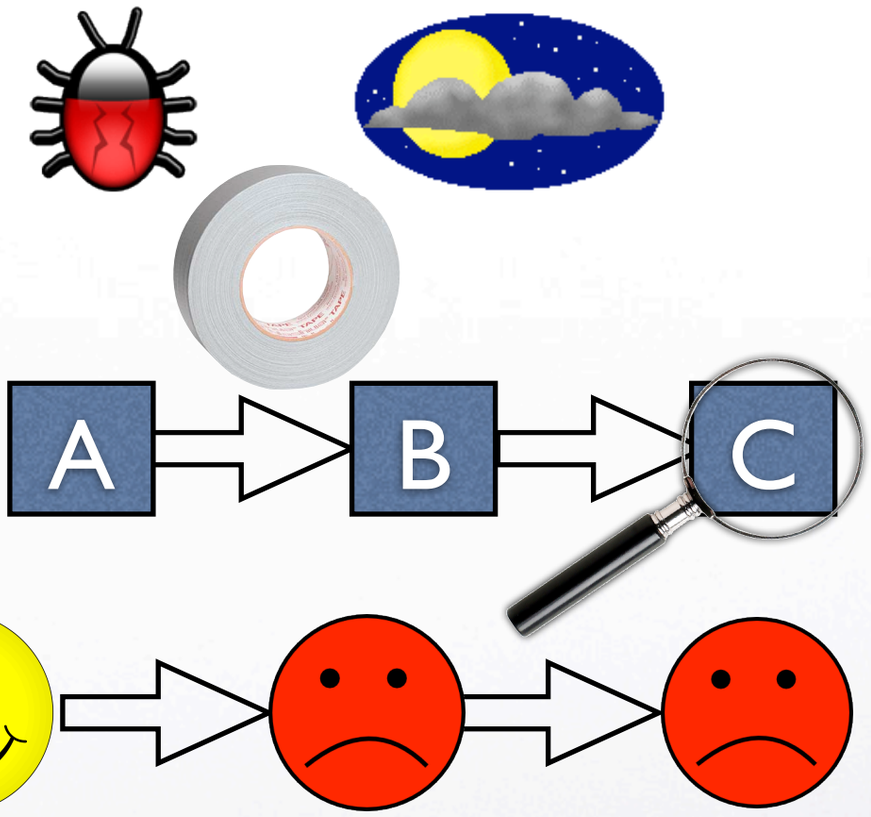

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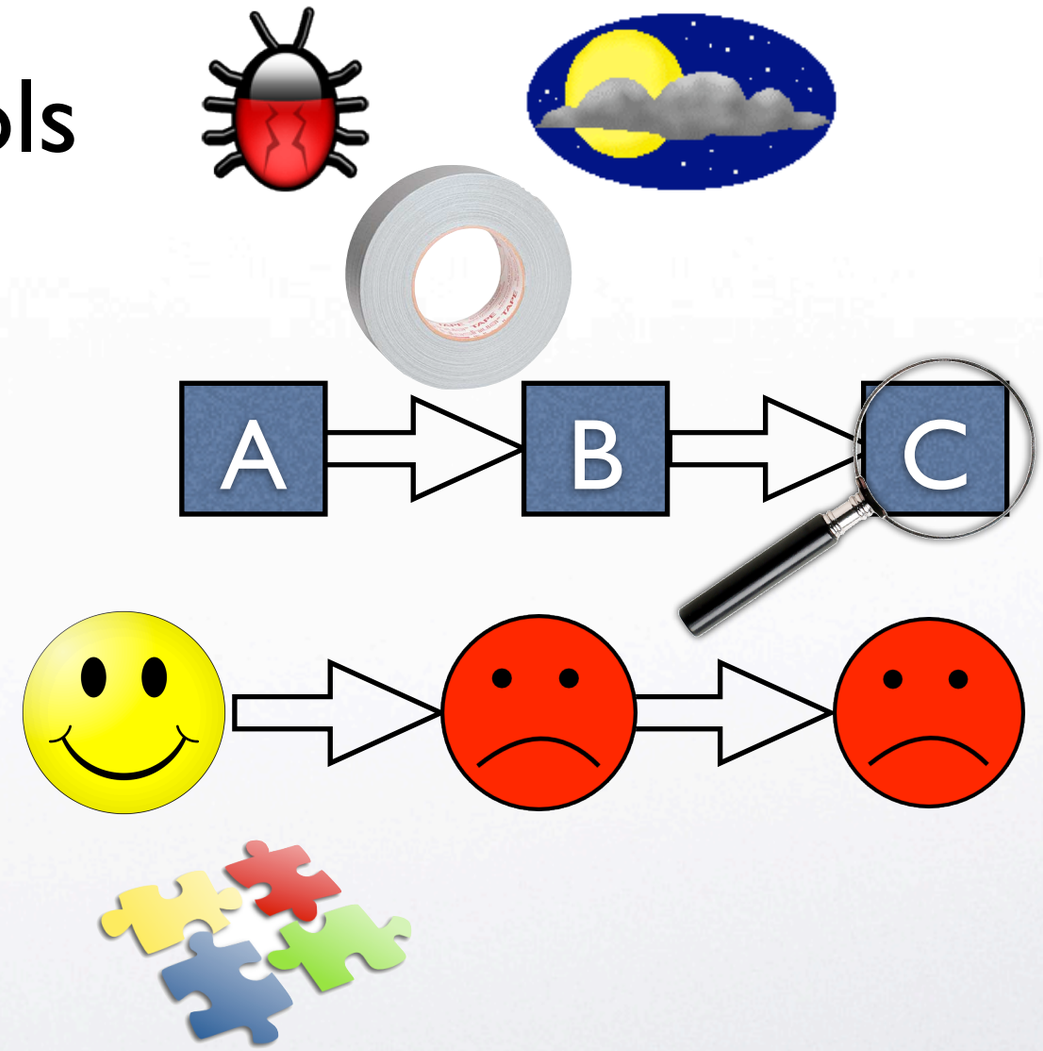

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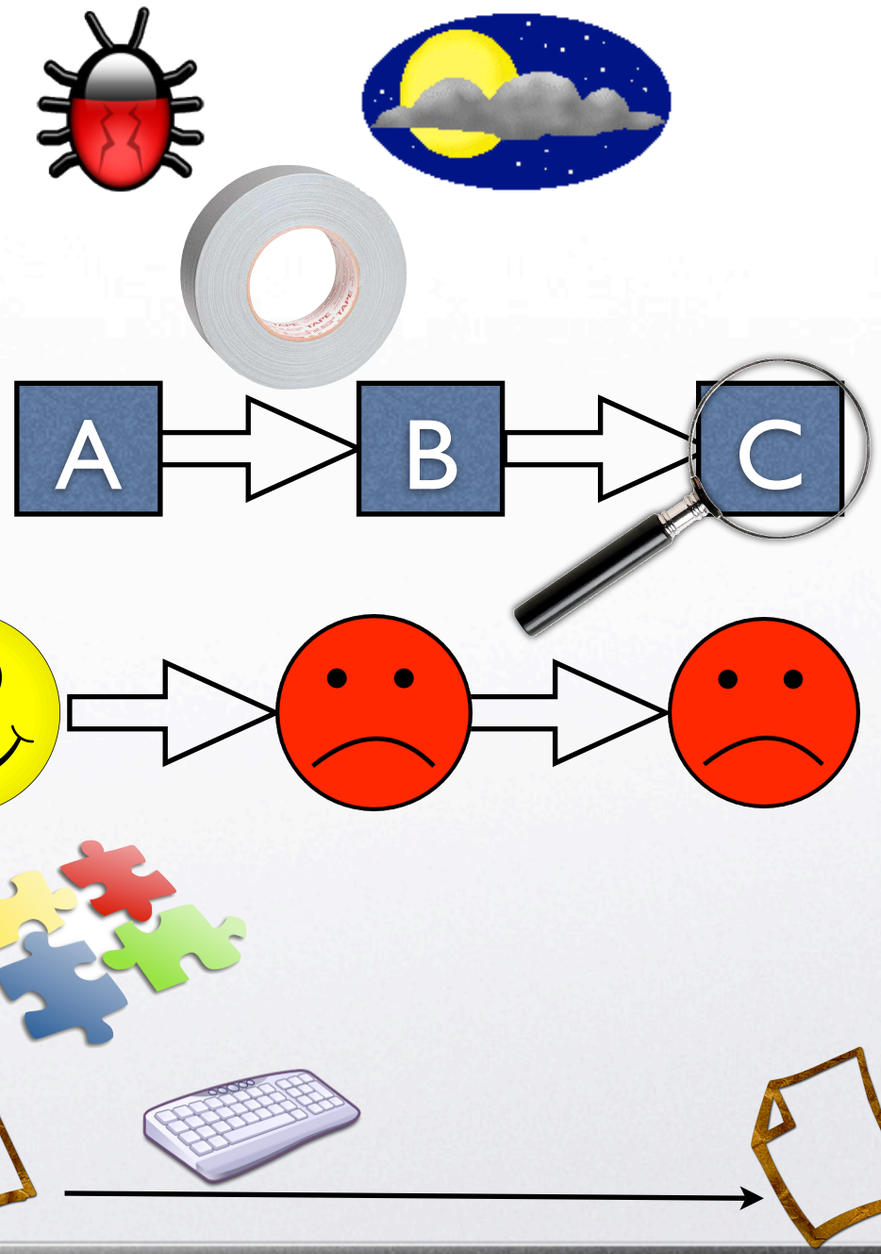

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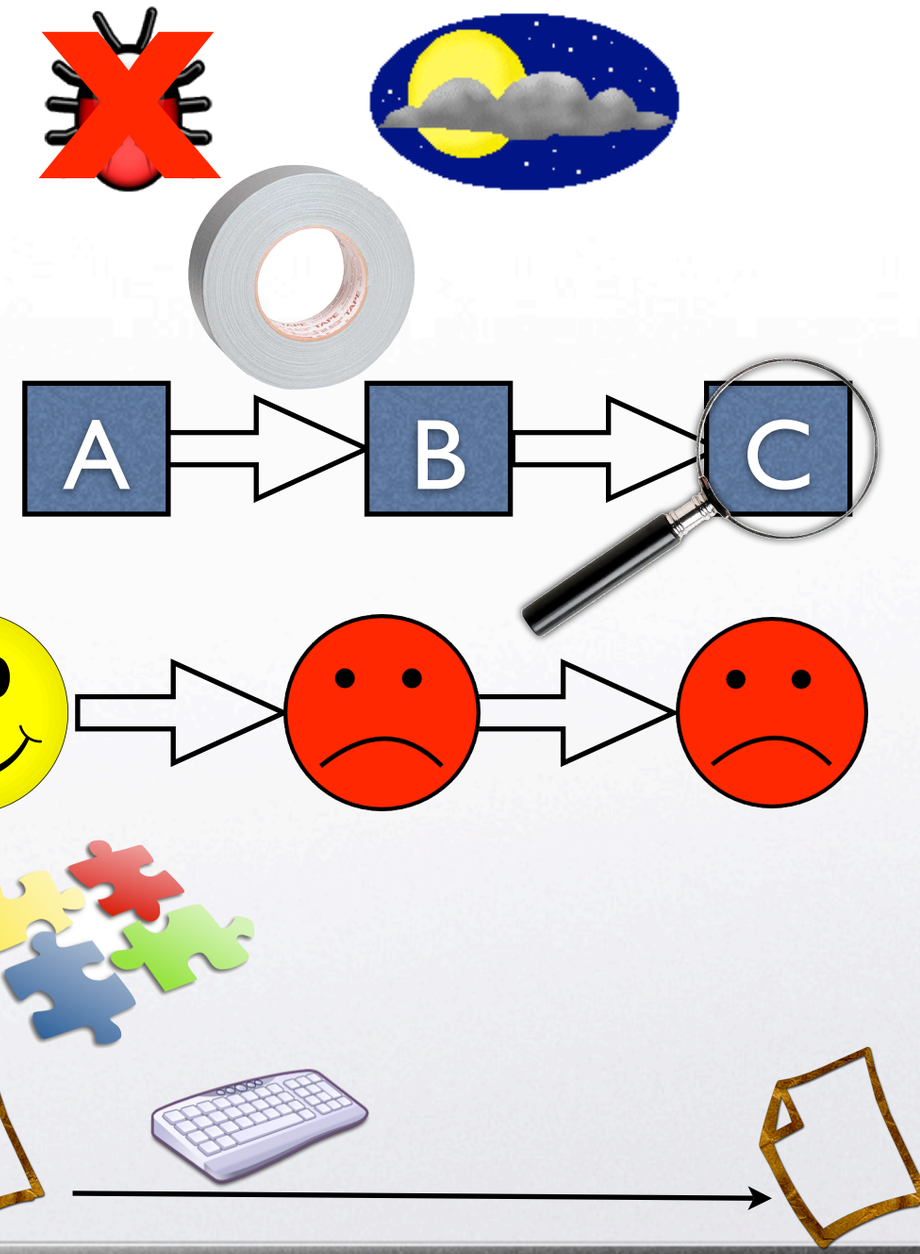

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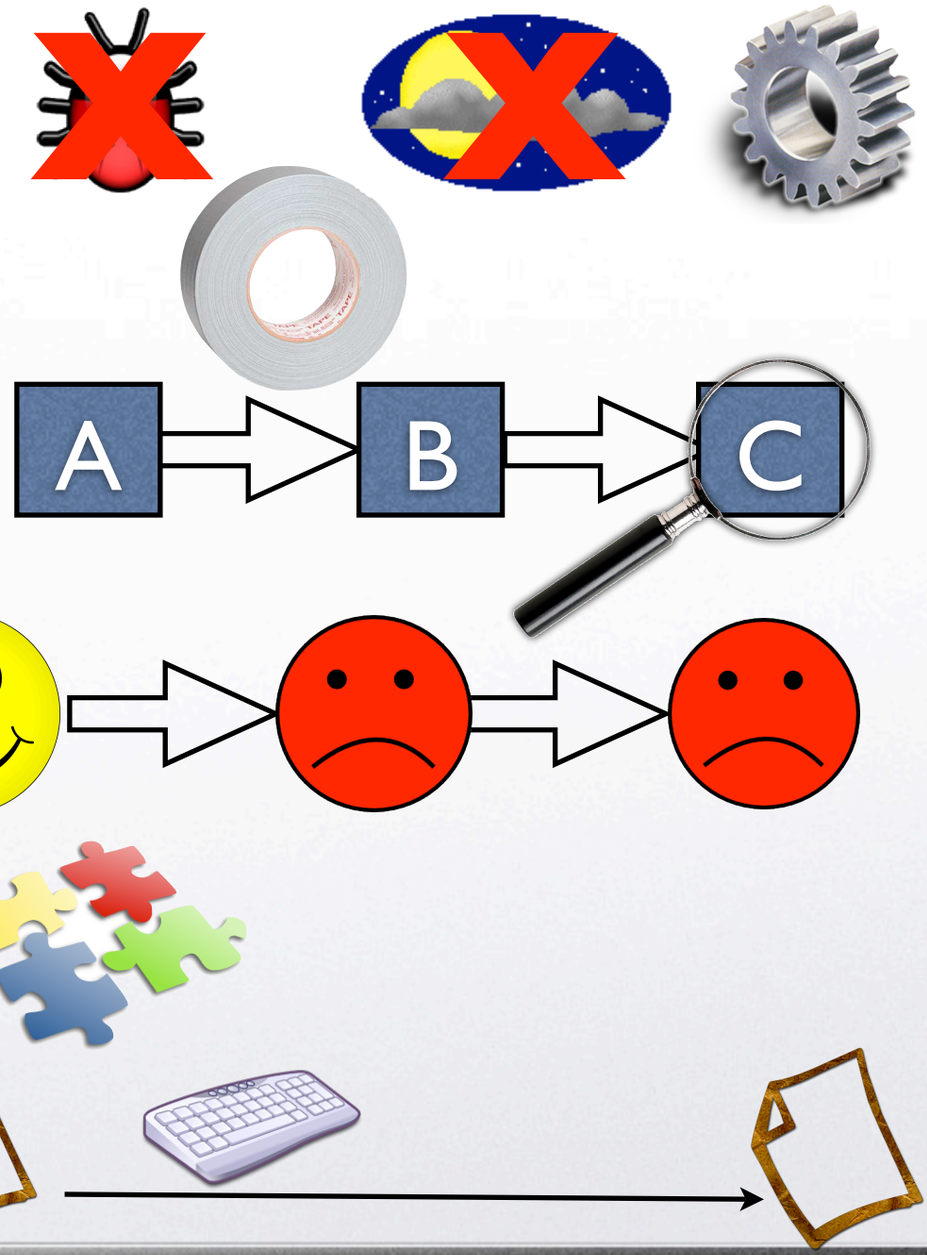

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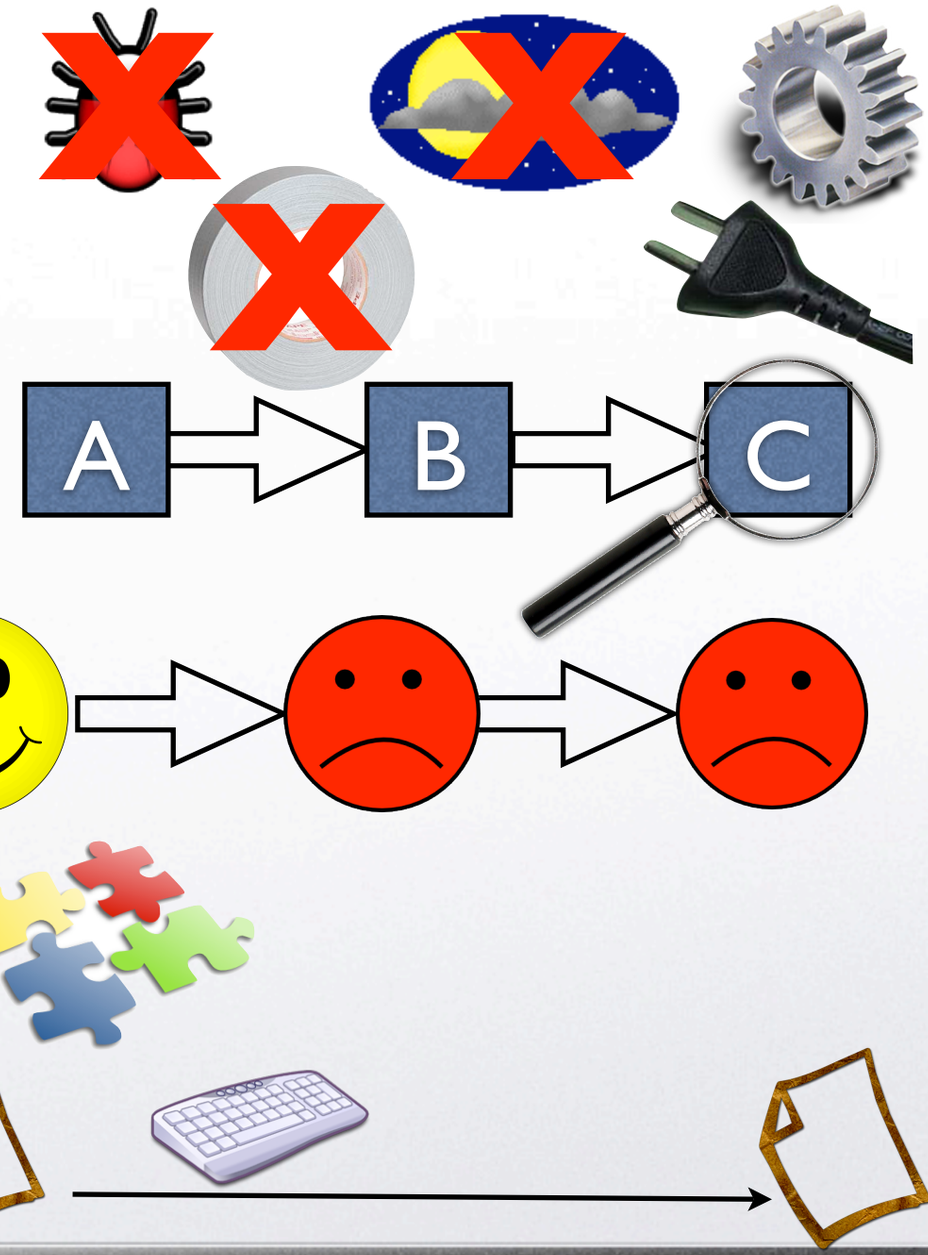

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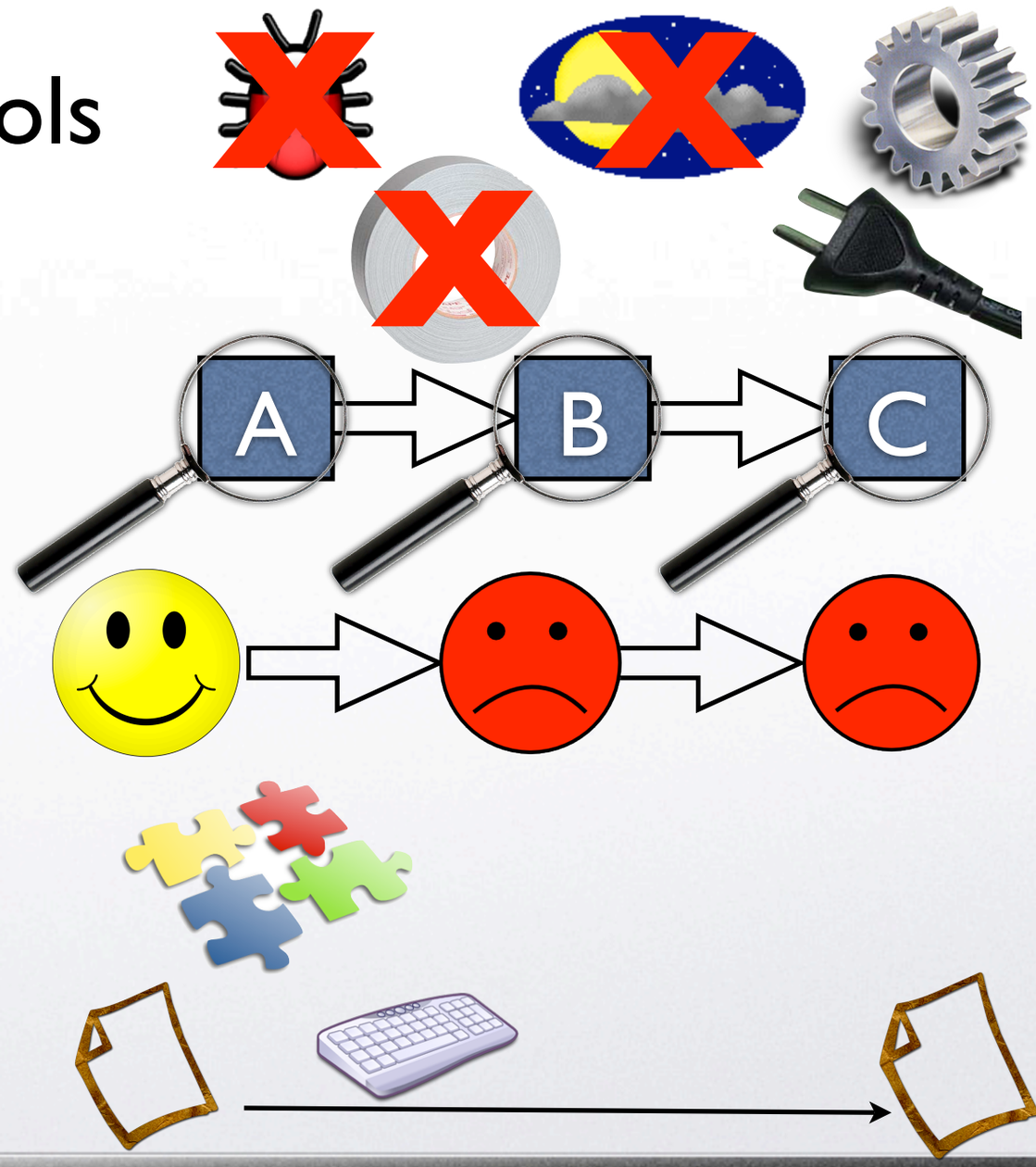

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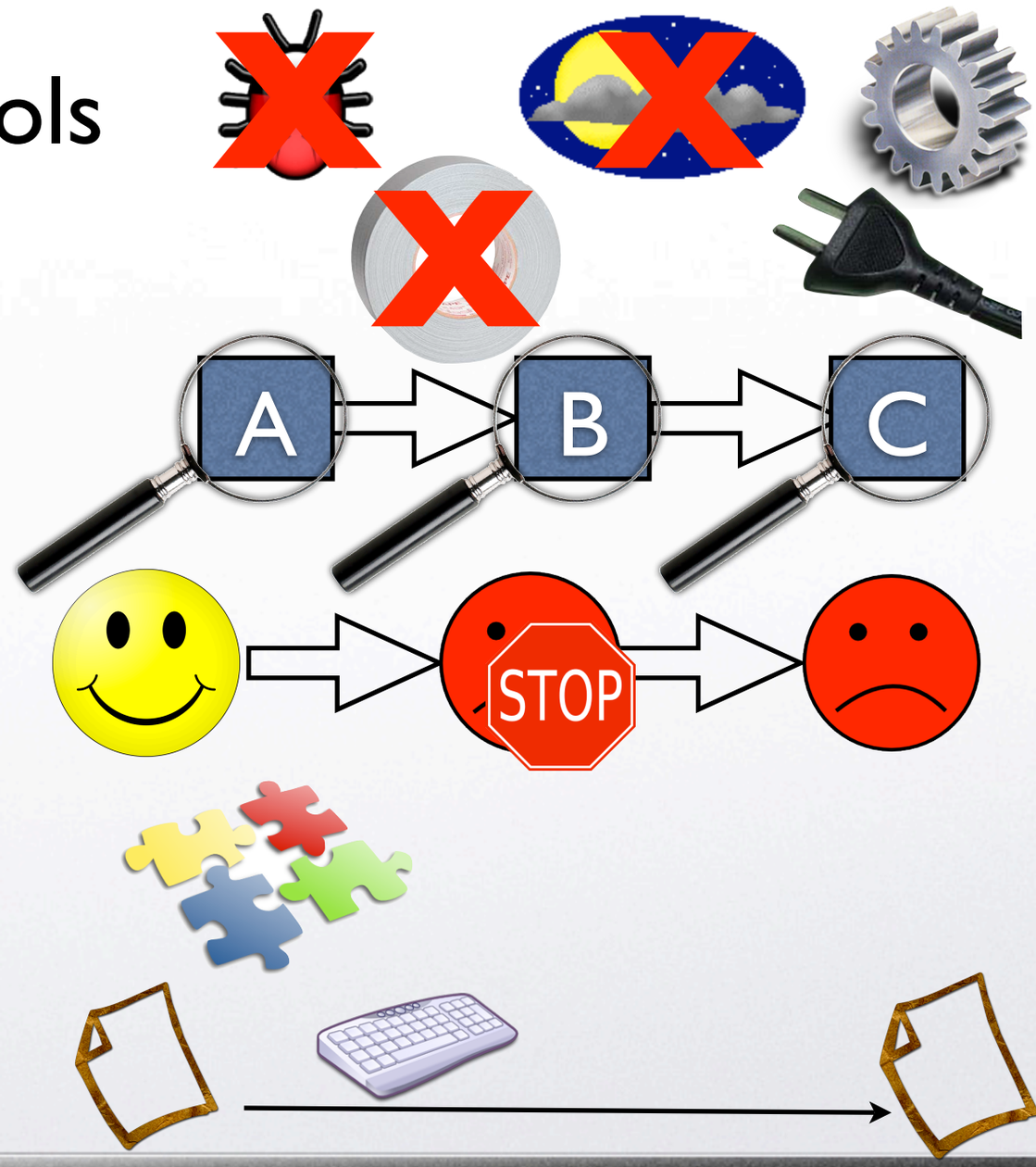

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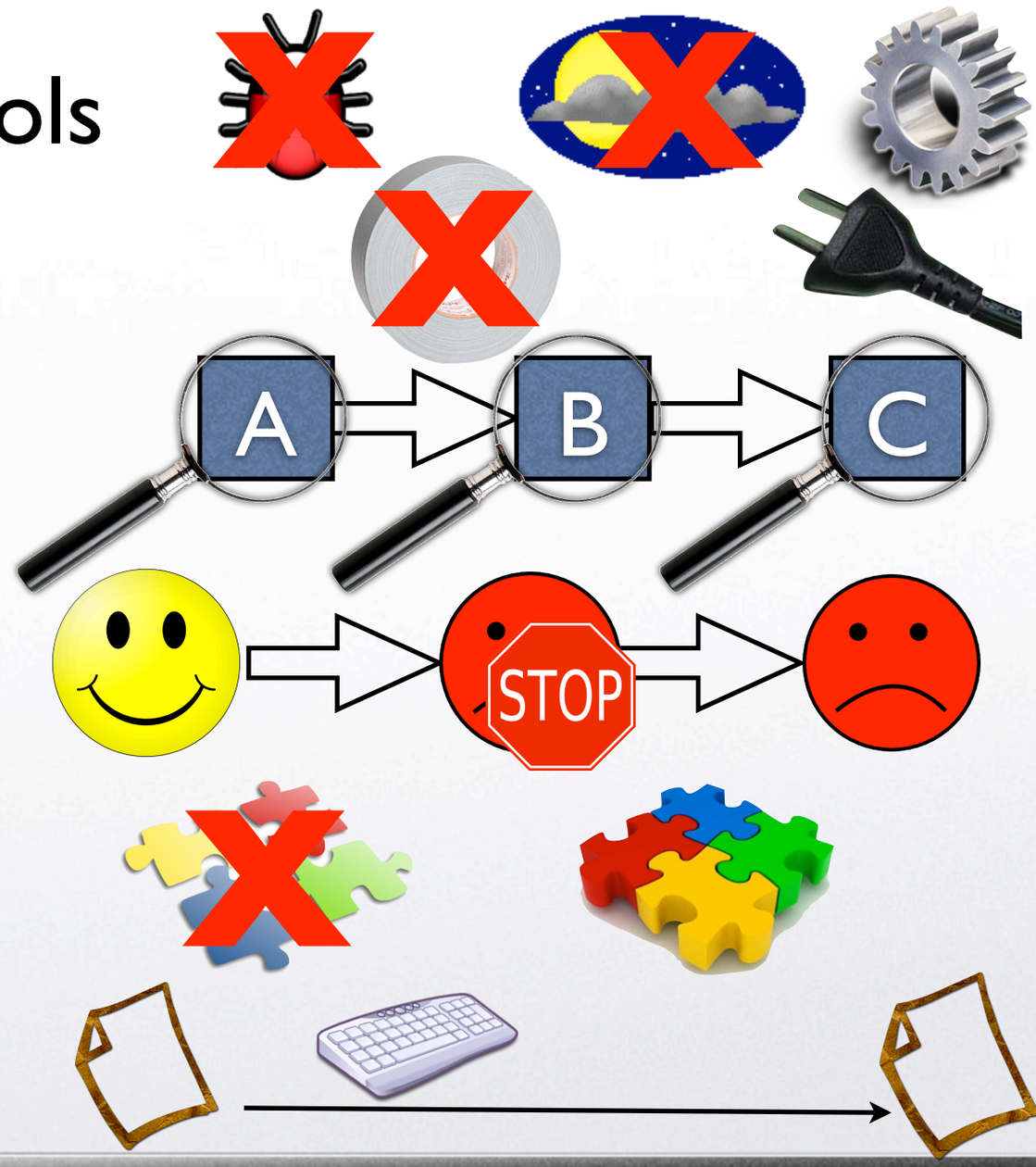

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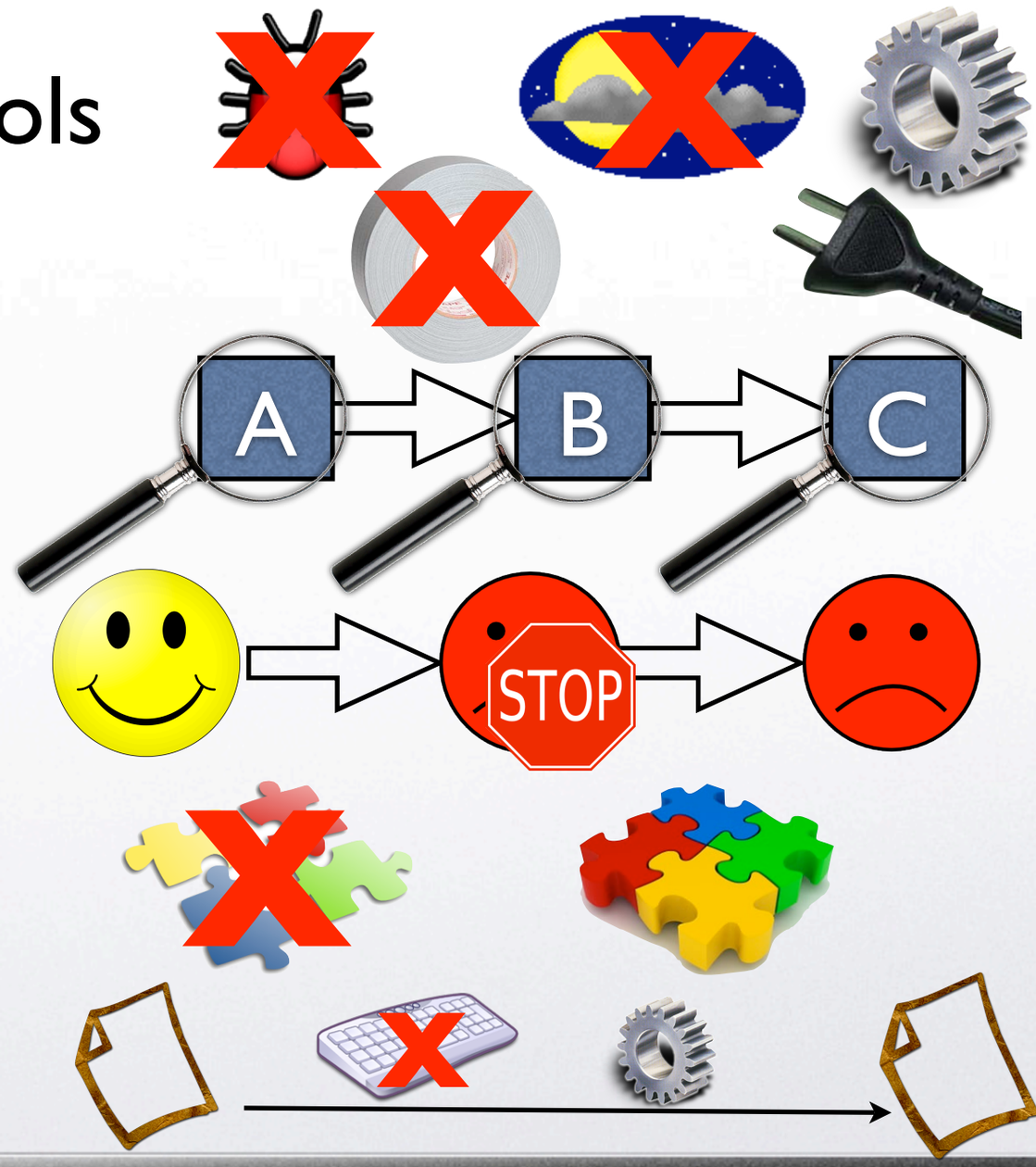

Proposed Solution:

HyperWorkflow Management

LoonyBin

- Define the tools
  (inputs/outputs/parameters → shell commands)
- Define the workflow
  (DAG of steps and dependencies)
- Generate & run a shell script

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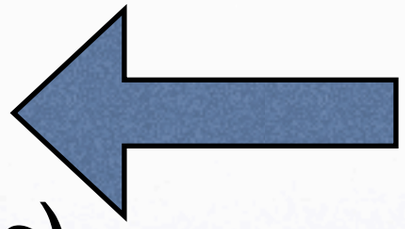

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LoonyBin HyperDAG Designer V0.4.0

Pipeline Options

Mouse Mode | Scrolling | Selecting | Editing | Transforming Mode

- Tools
  - MANUAL FILESYSTEM
  - MANUAL HDFS
  - OR
  - PARAMETER BOX
  - Machine Translation
    - Decoders
    - Grammars and Tables
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    - Mono Corpus
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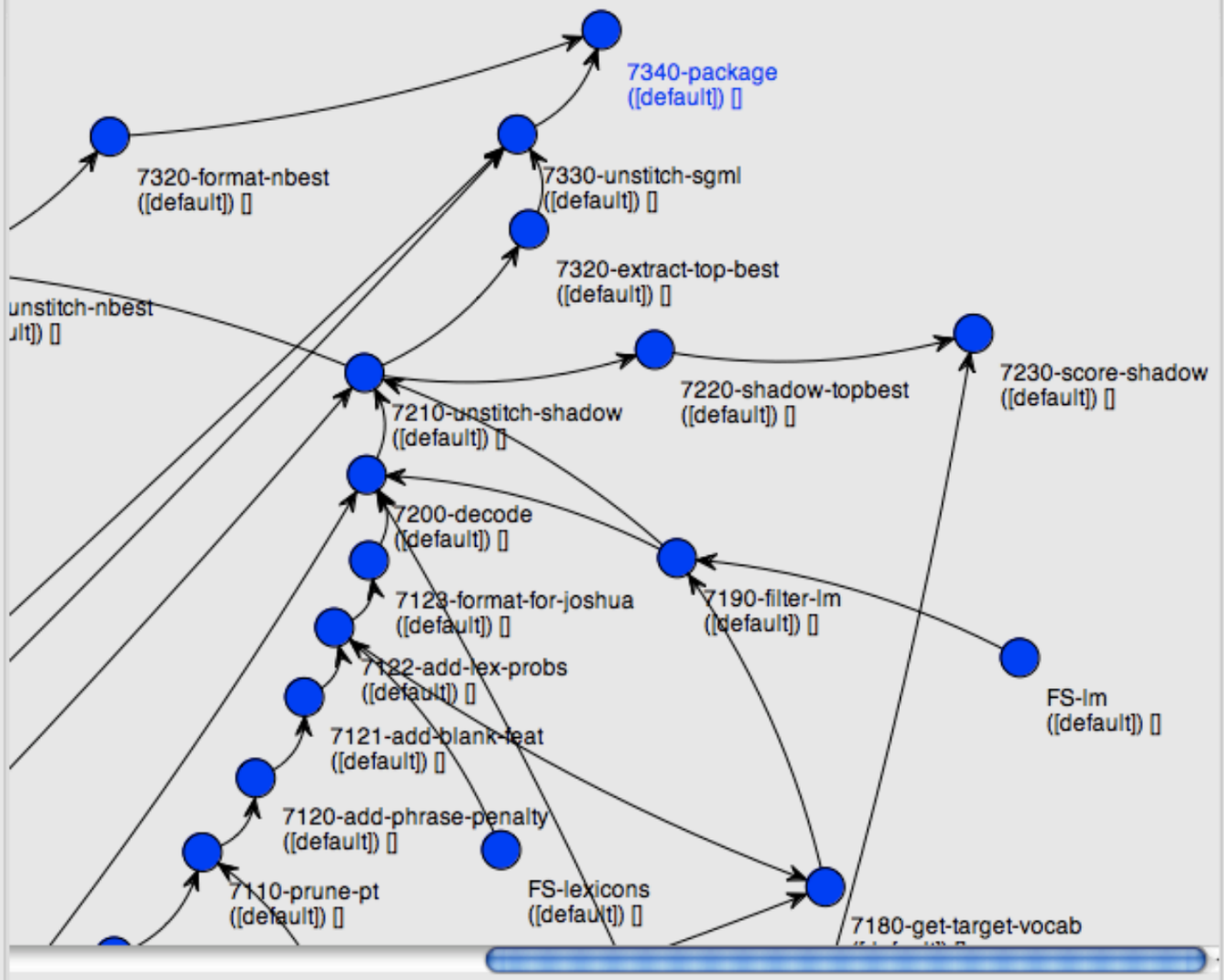
    - Parsing
    - Scoring
    - Tuning
    - Word Alignment
  - Trashed Tools
    - Errors

Untitled Workflow | gale-p4-audio-eval.pipe



Tool Name: GALE Packager

Step Name: 7340-packag

sysName: CMU-StatXfer-201

occassion: P4 Audio Evaluatio

Machine Config: barrow

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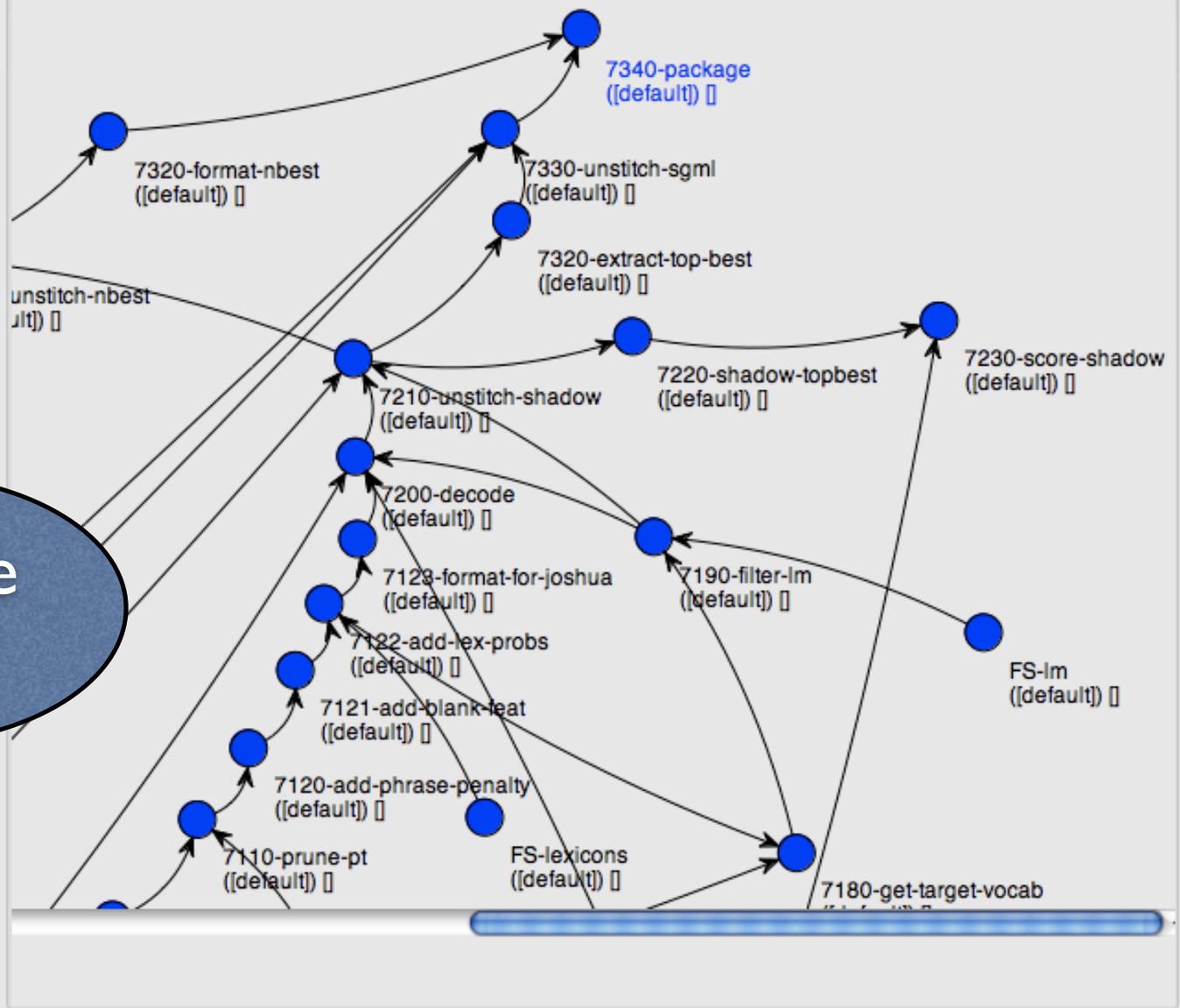

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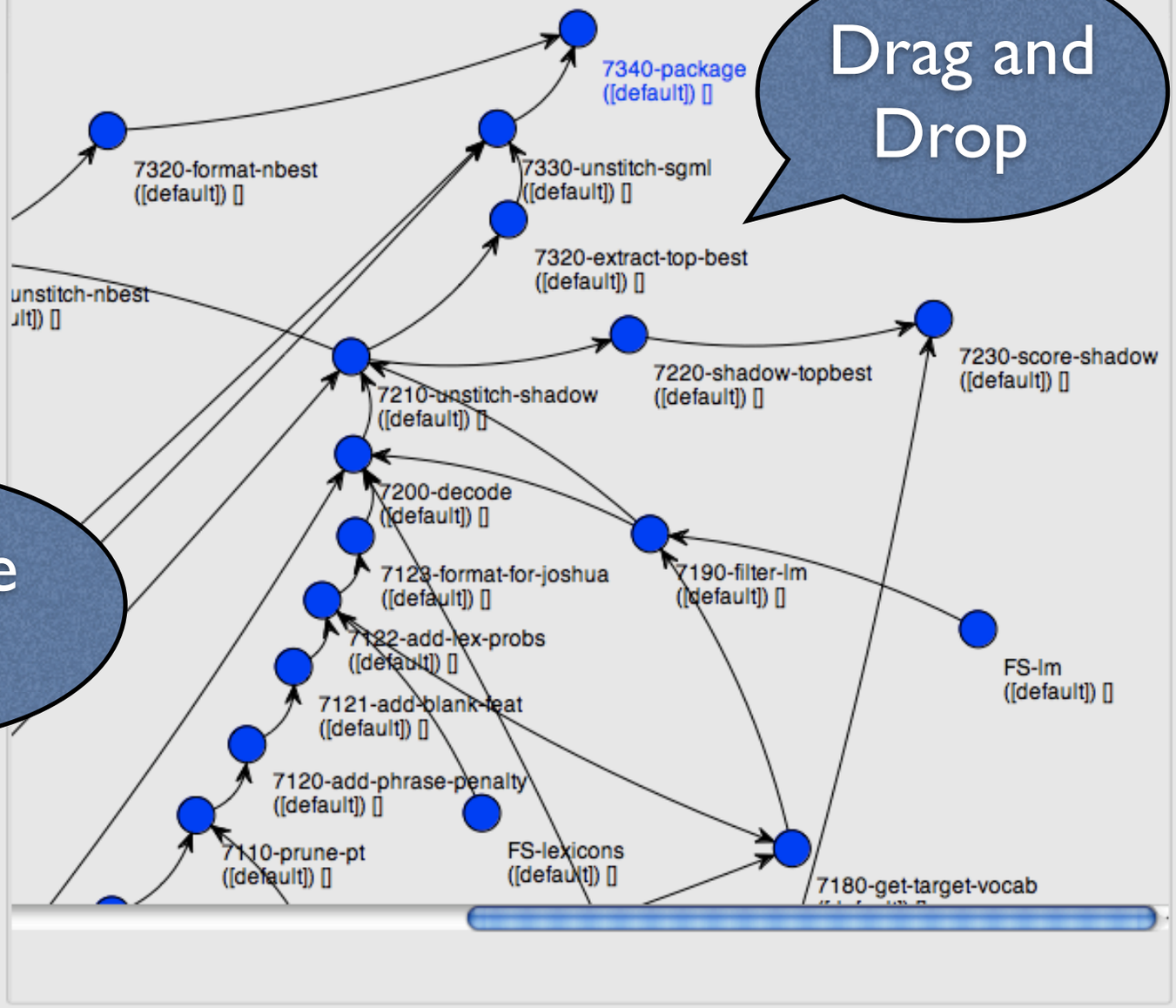

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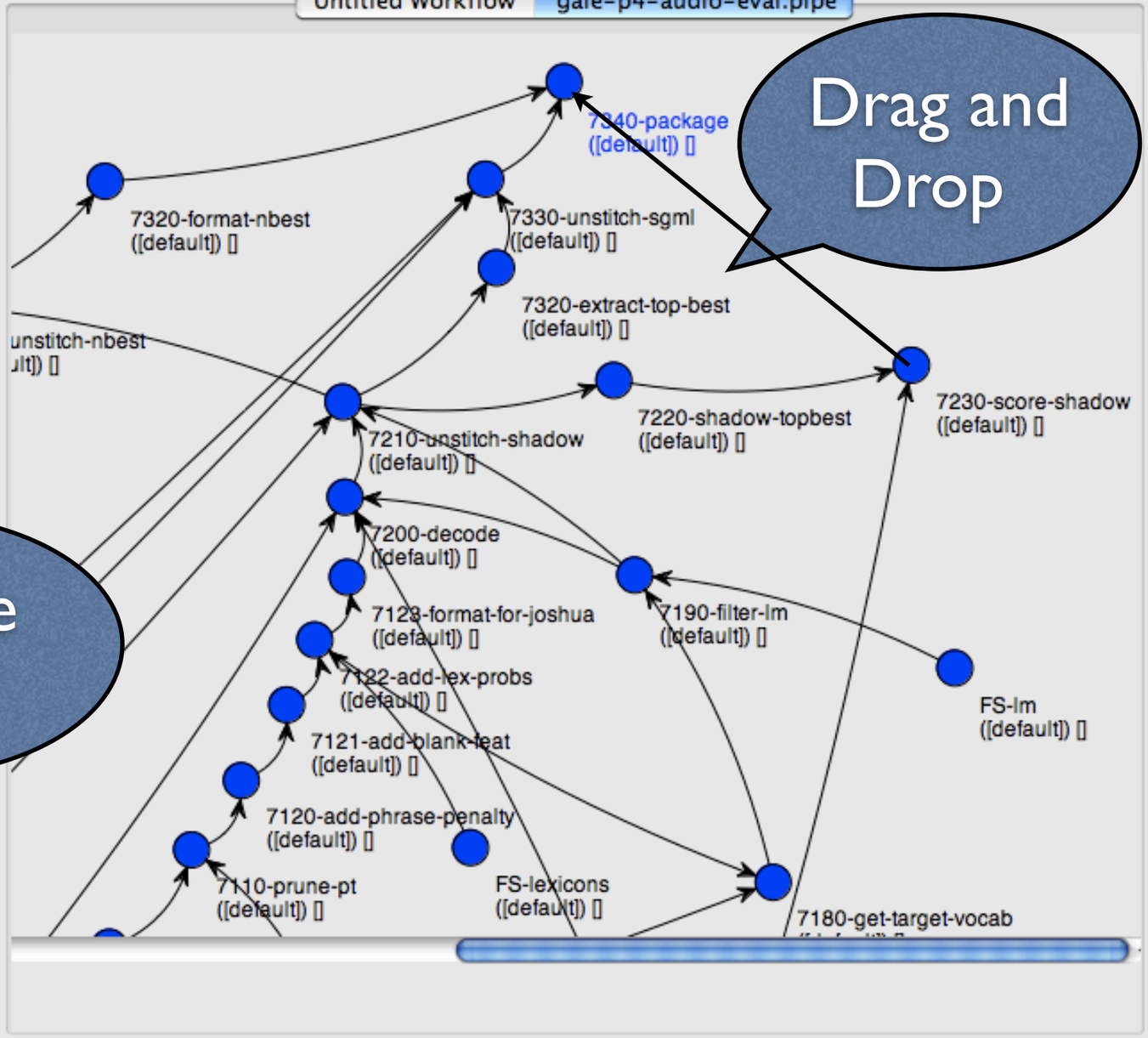

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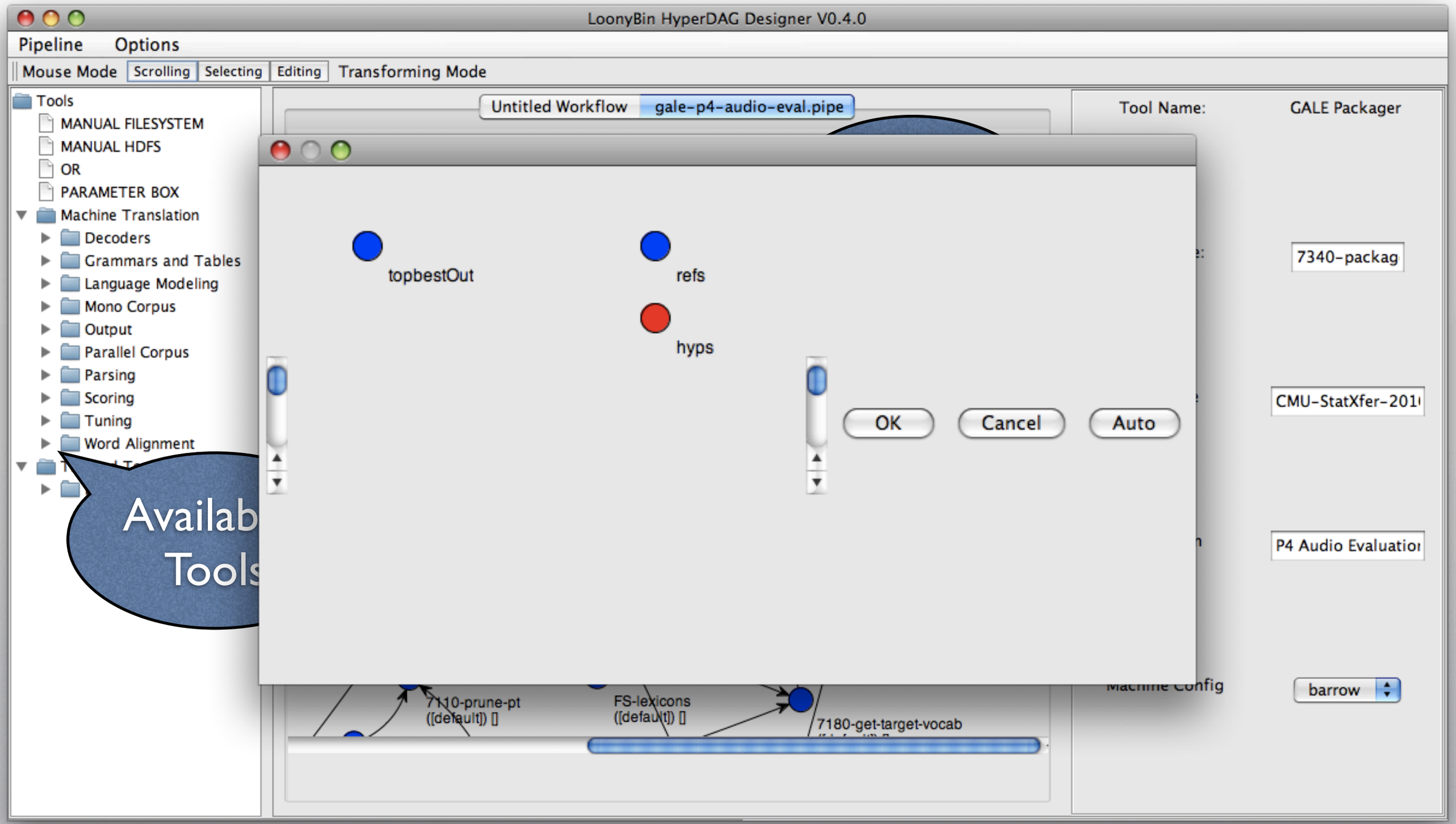
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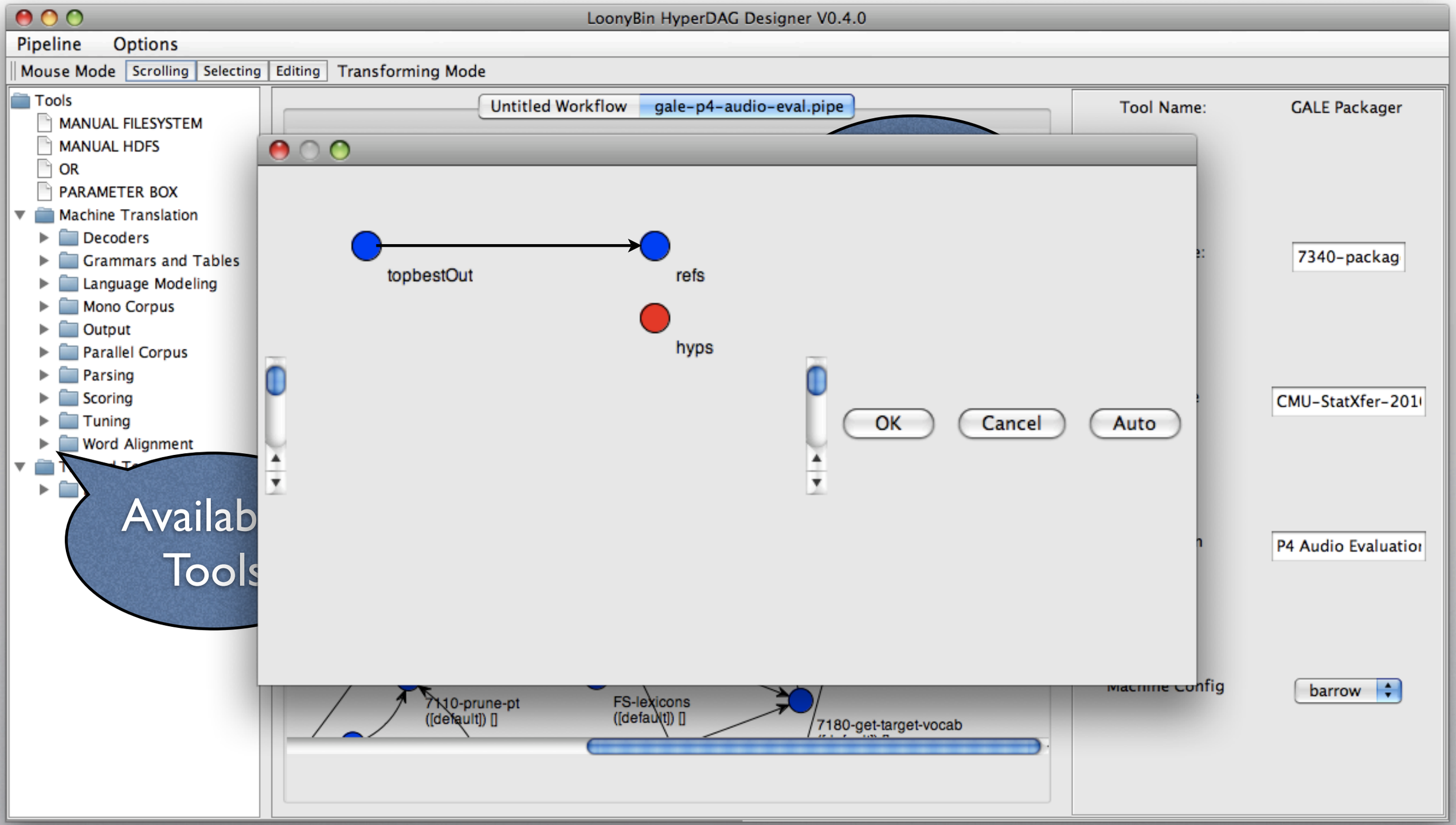
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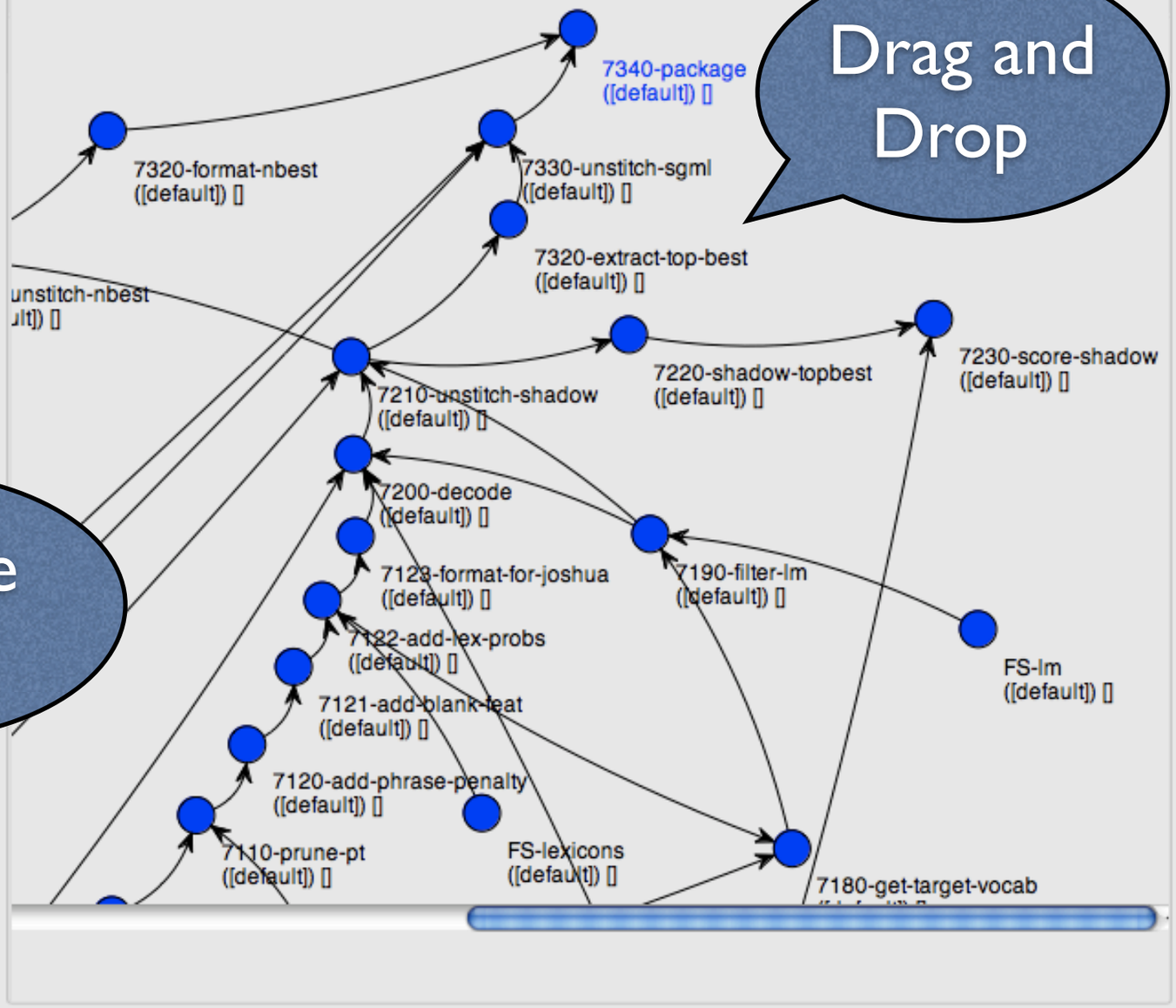

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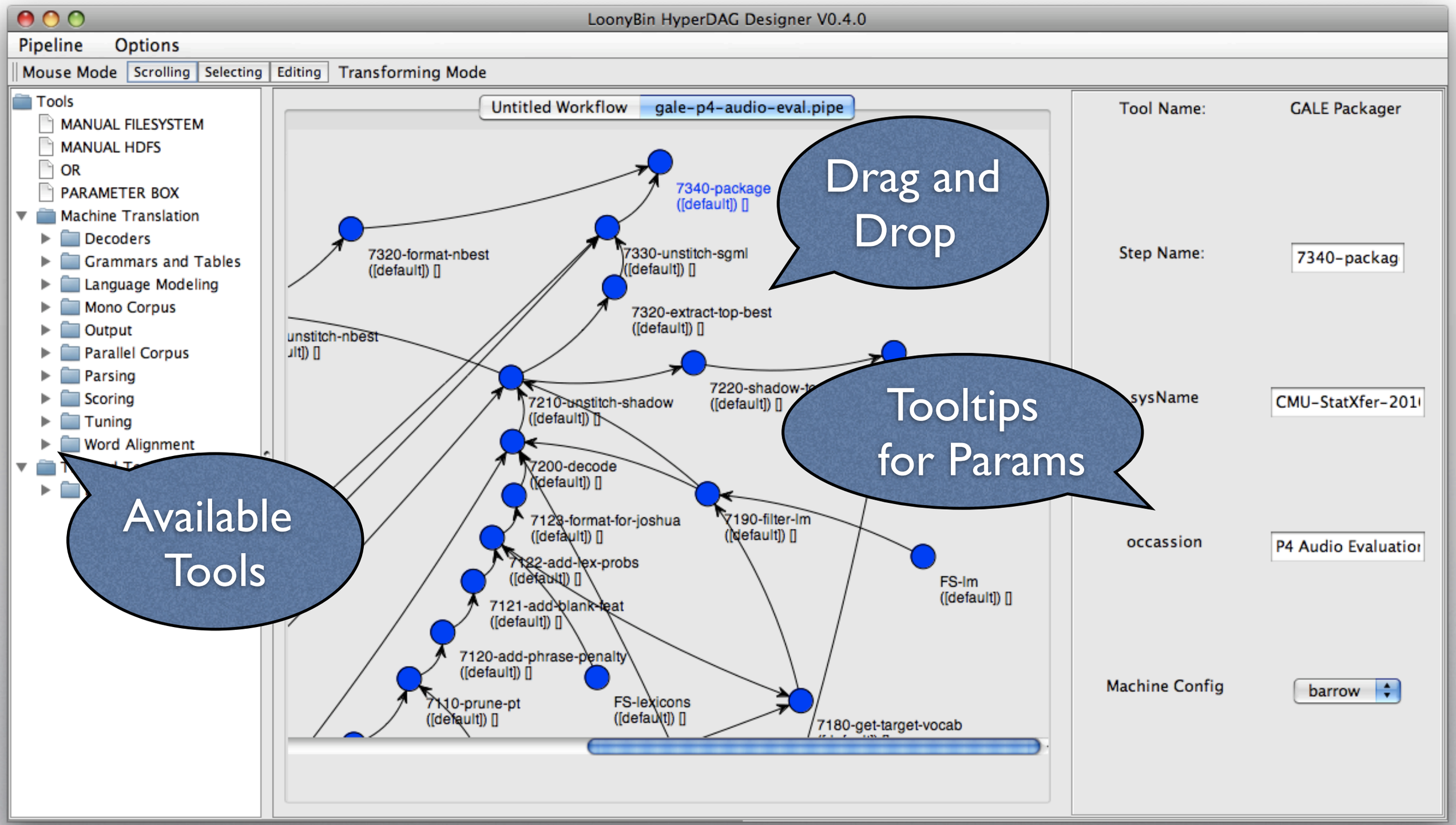
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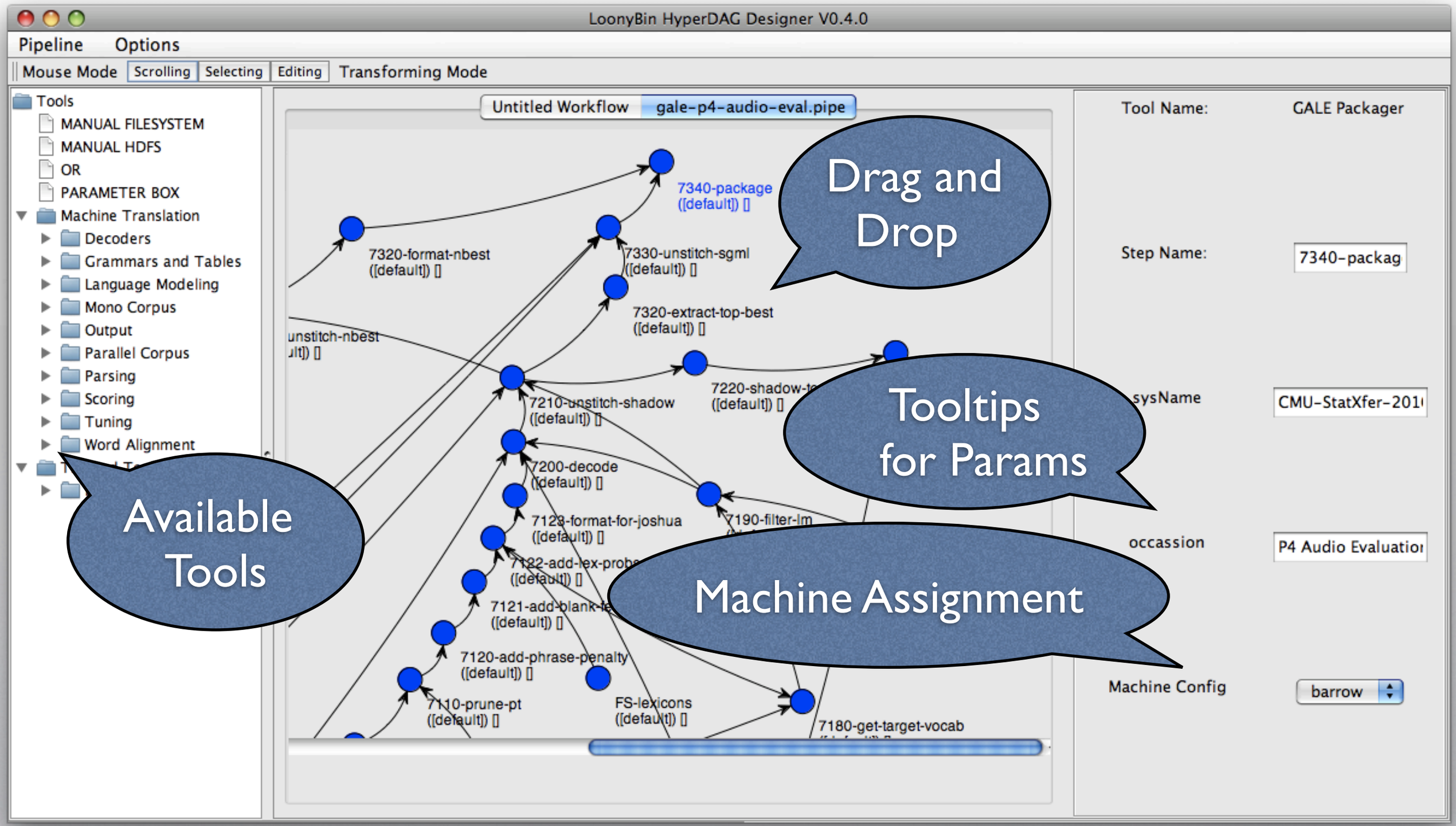
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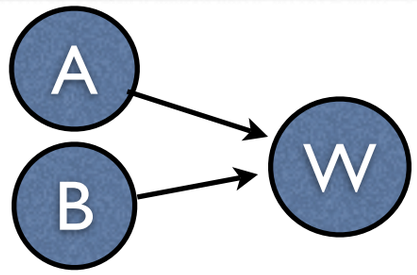
Generating a Script for



INPUTS

foreignCorpus

nativeCorpus

PARAMETERS

fertility

OUTPUTS

alignments

Python Tool Descriptor

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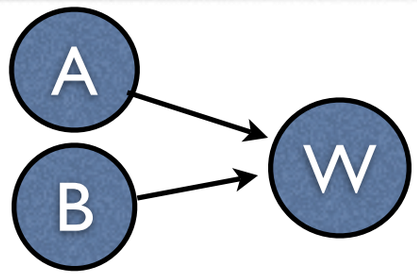

INPUTS

foreignCorpus	A's output "x"
nativeCorpus	B's output "y"

PARAMETERS

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Parameters & dependencies from workflow

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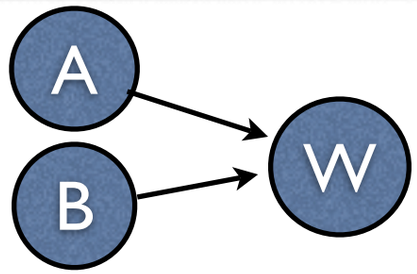

INPUTS

foreignCorpus	A's output "x"	…/inputs/f
nativeCorpus	B's output "y"	…/inputs/n

PARAMETERS

fertility	0.01

OUTPUTS

alignments	…/outputs/wa

LoonyBin assigns paths

Parameters & dependencies from workflow

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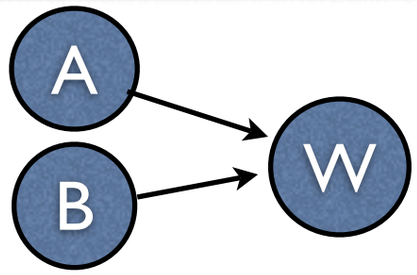

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PARAMETERS

fertility	0.01

OUTPUTS

alignments	…/outputs/wa

LoonyBin assigns paths

Parameters & dependencies from workflow

Python Tool Descriptor

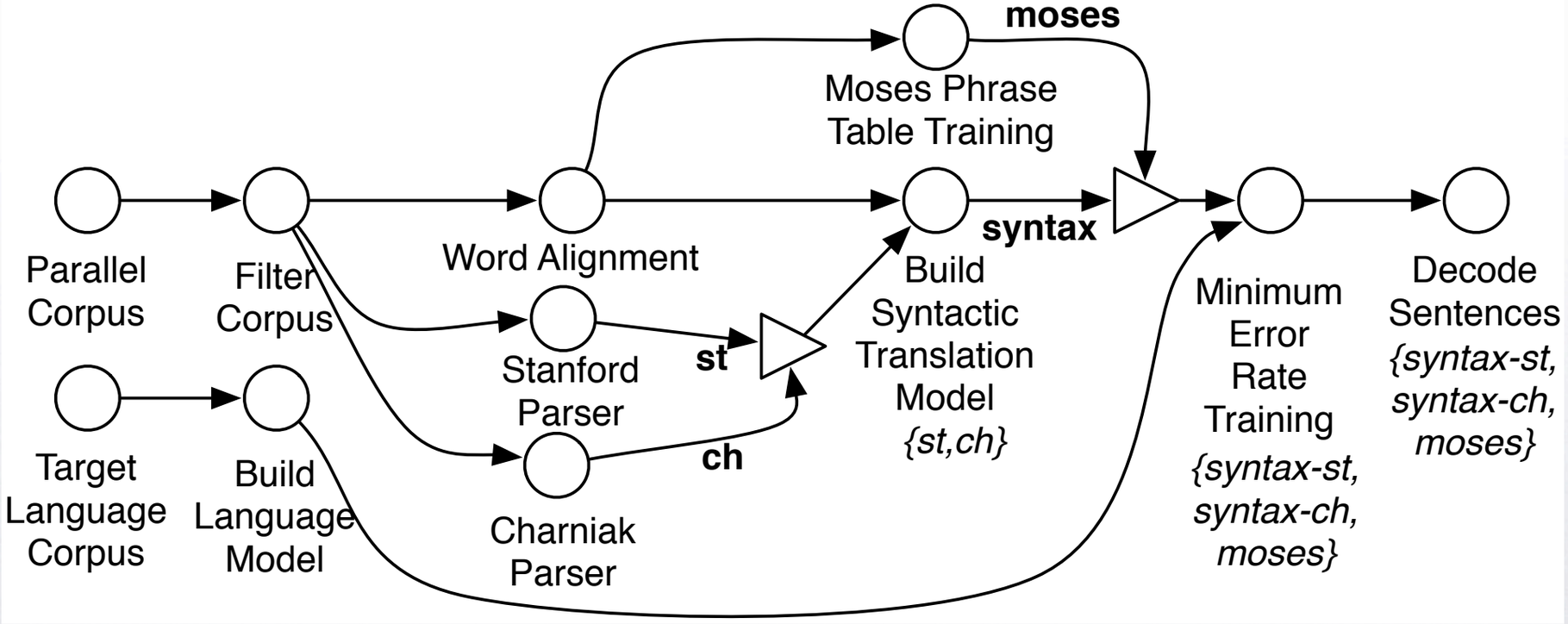
java edu.cmu.Tokenizer ../inputs/f ../inputs/n > ../outputs/wa

So far...

- Complaints about current implementation of empirical NLP experiments
- Define the tools
  (inputs/outputs/parameters)
- Define the workflow
  (DAG of steps and dependencies)
- Generate & run a shell script

HyperWorkflows

- **HyperWorkflows:** Shared substructure in experiments
- Encode small variations in a HyperDAG



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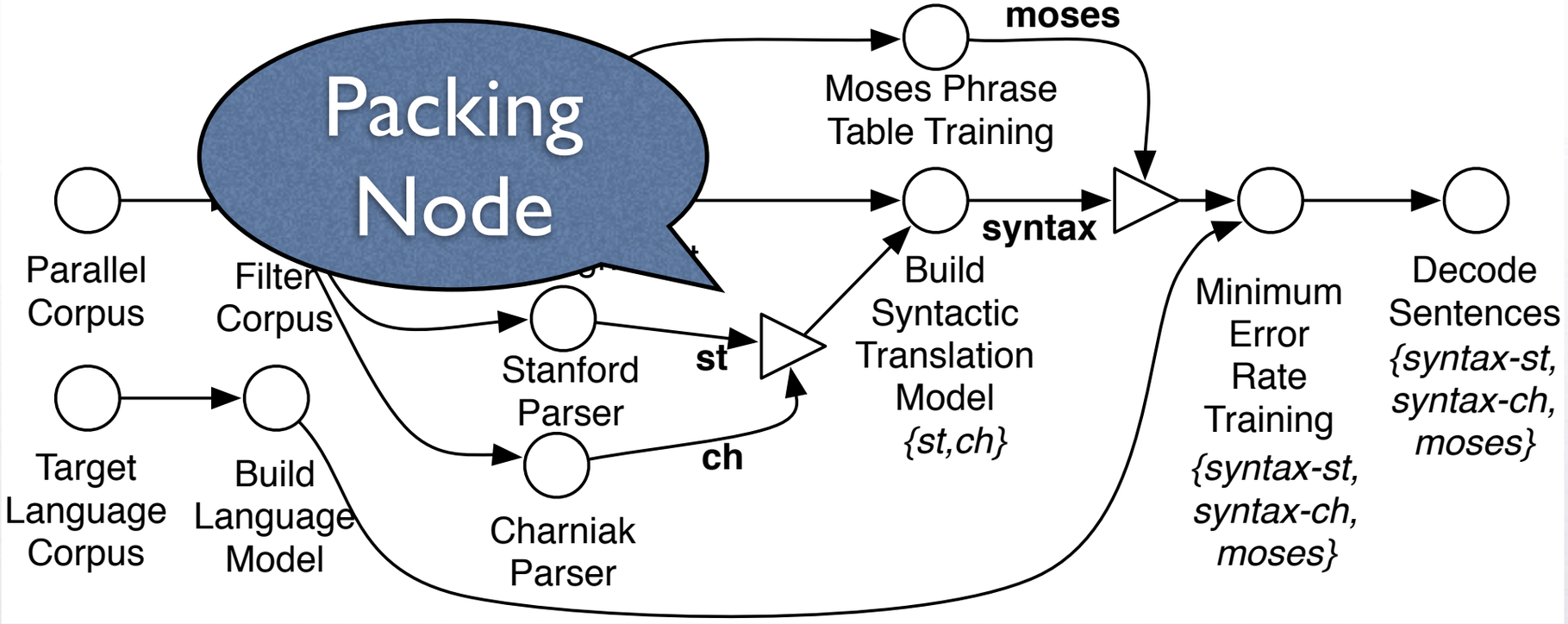

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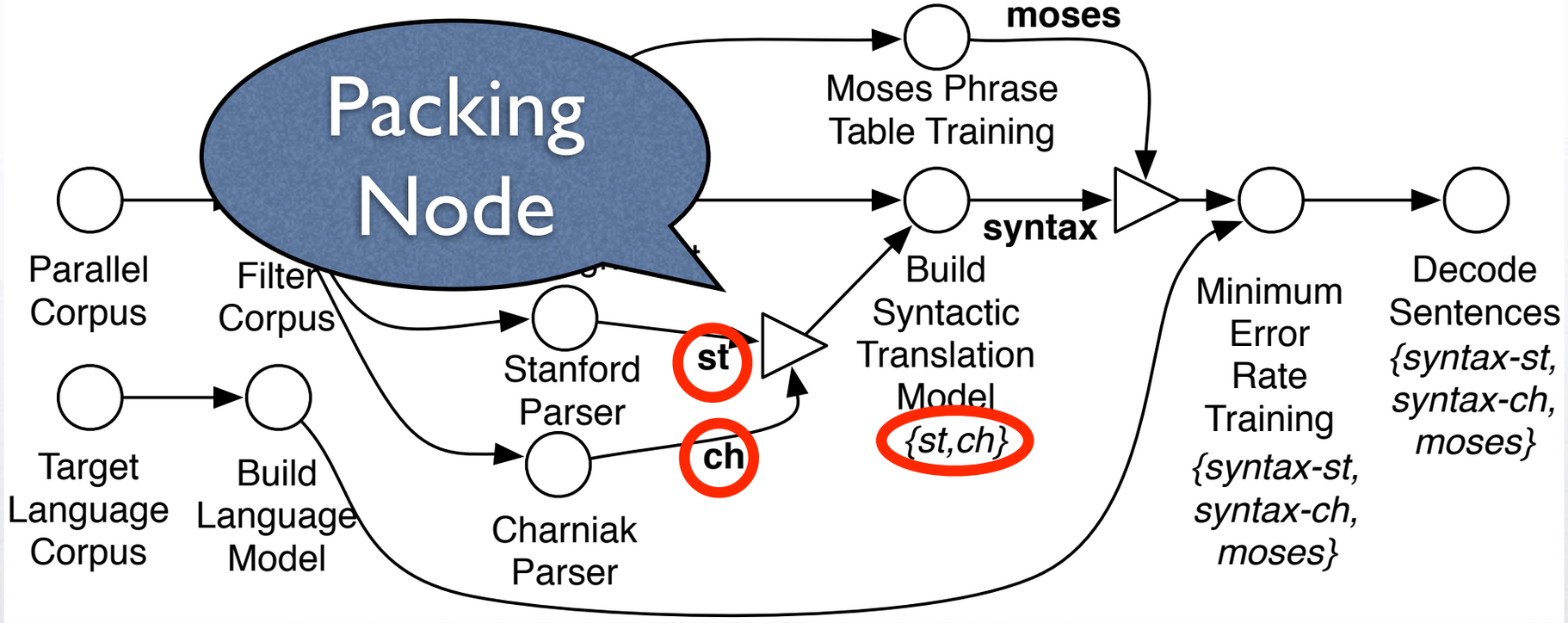

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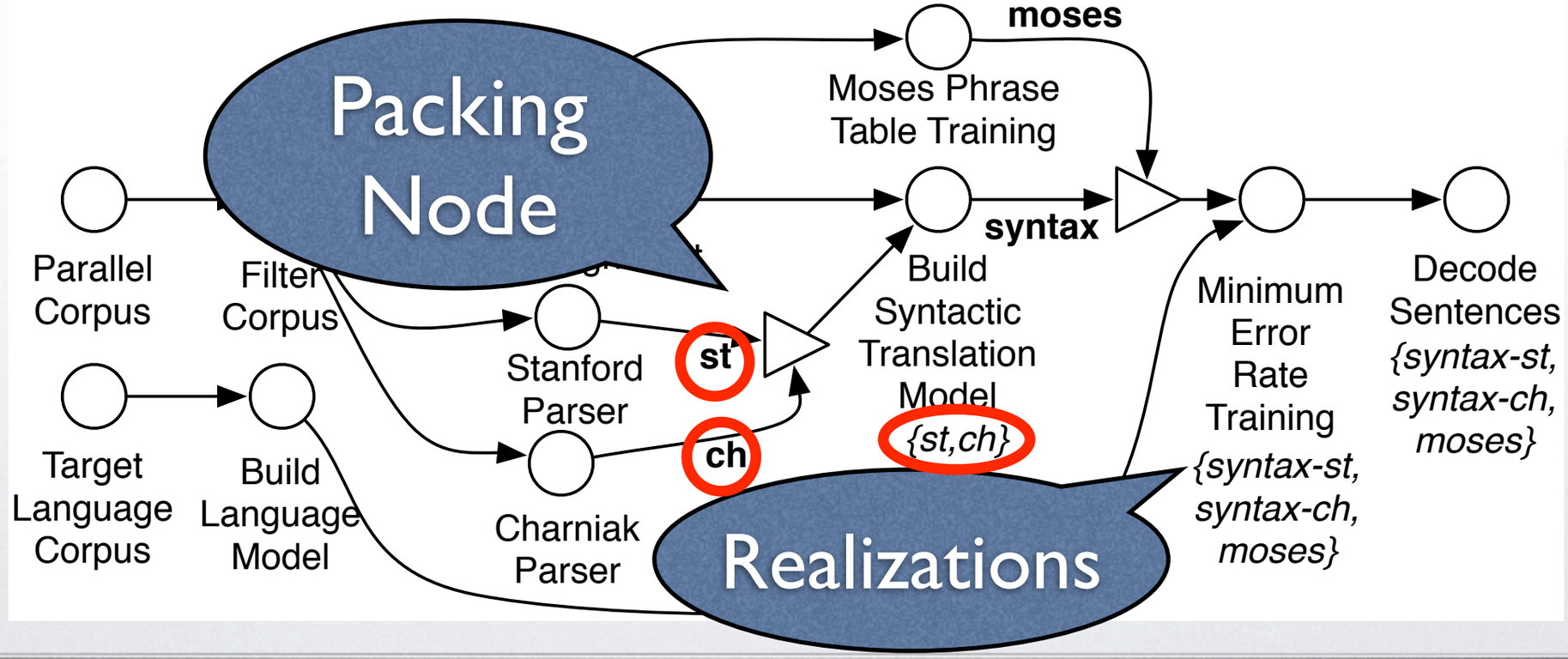

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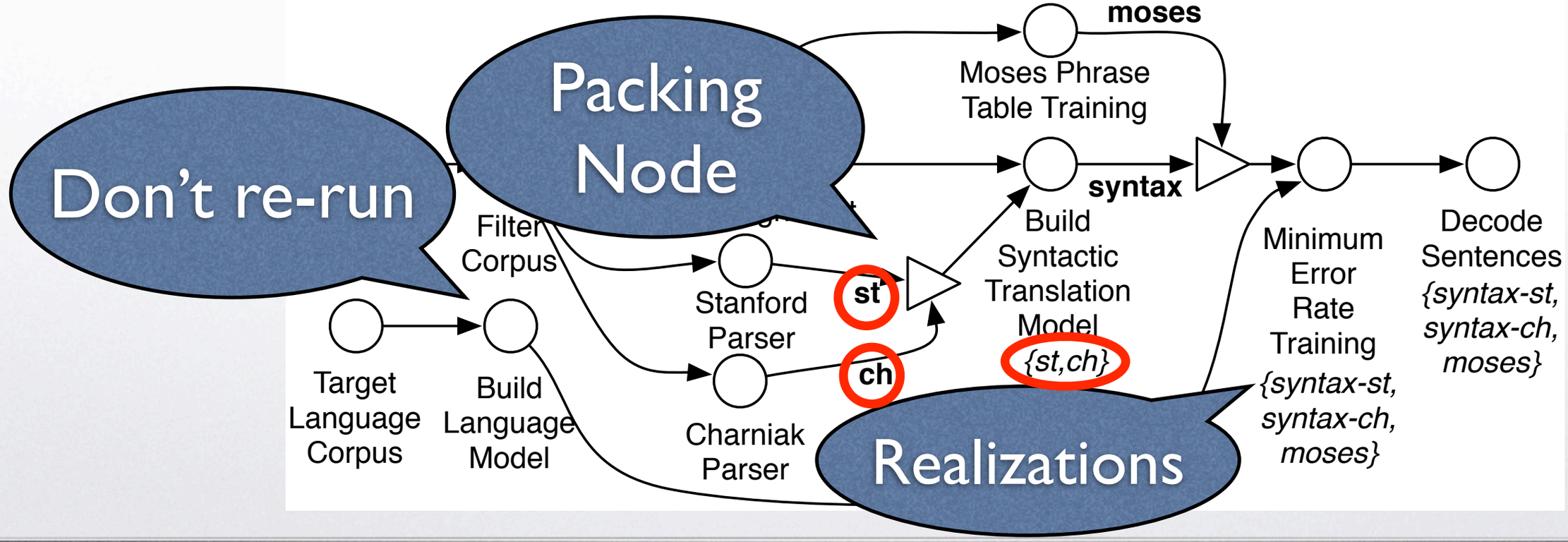

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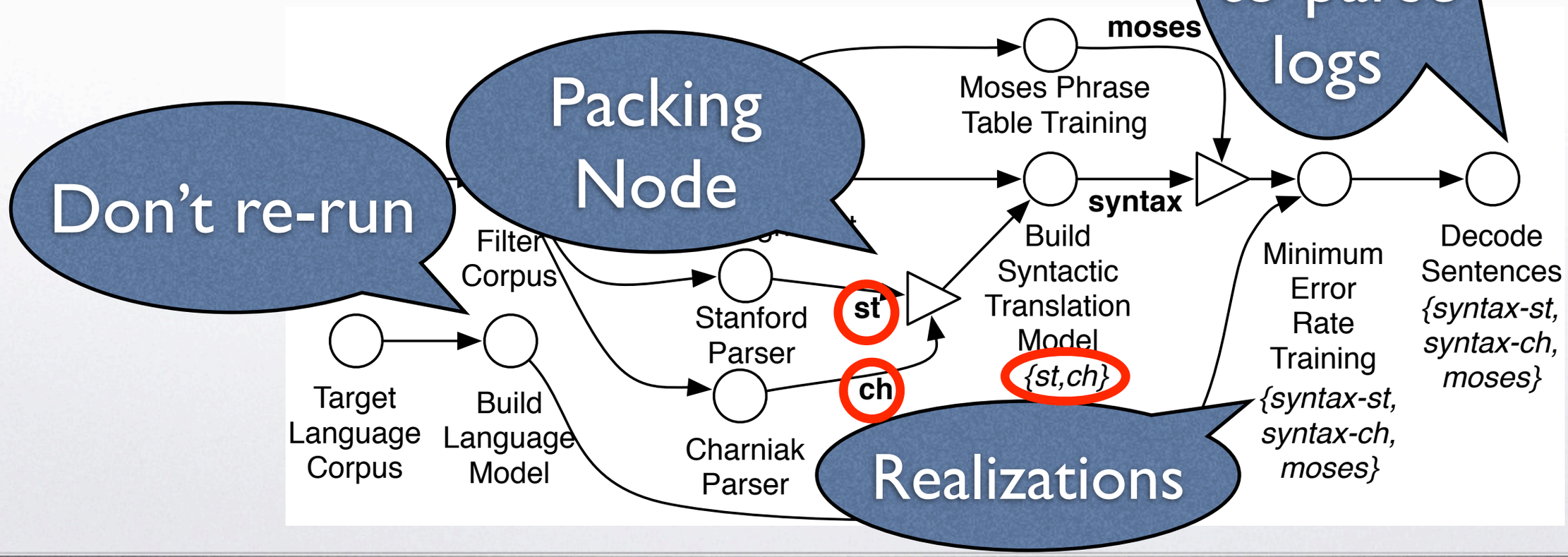
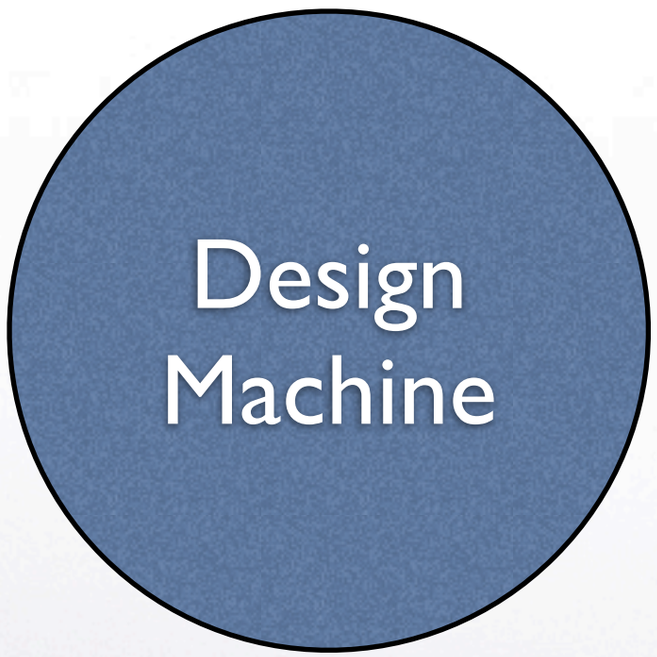
Organized directory structure & easy-to-parse logs

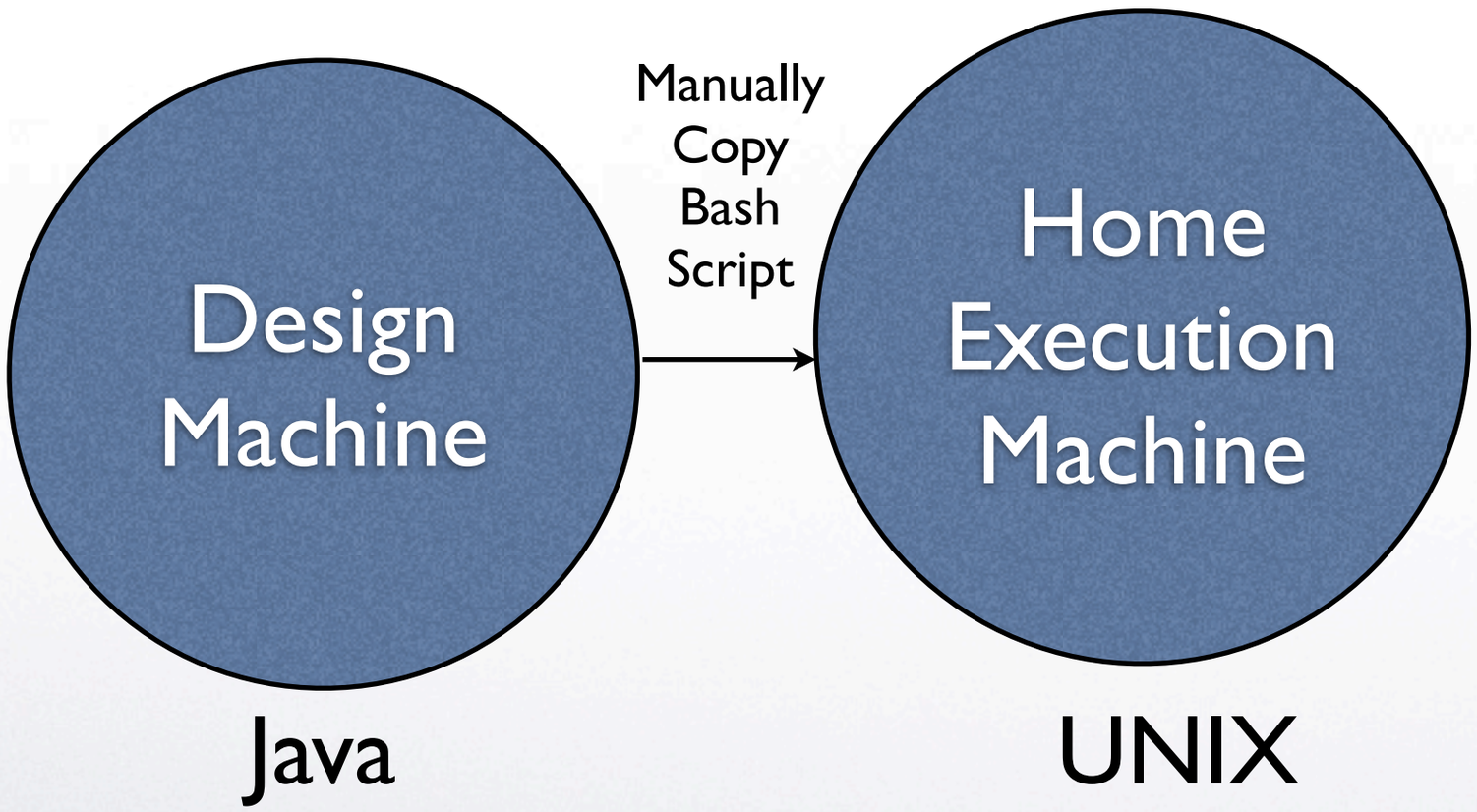


Multiple Machines and Schedulers

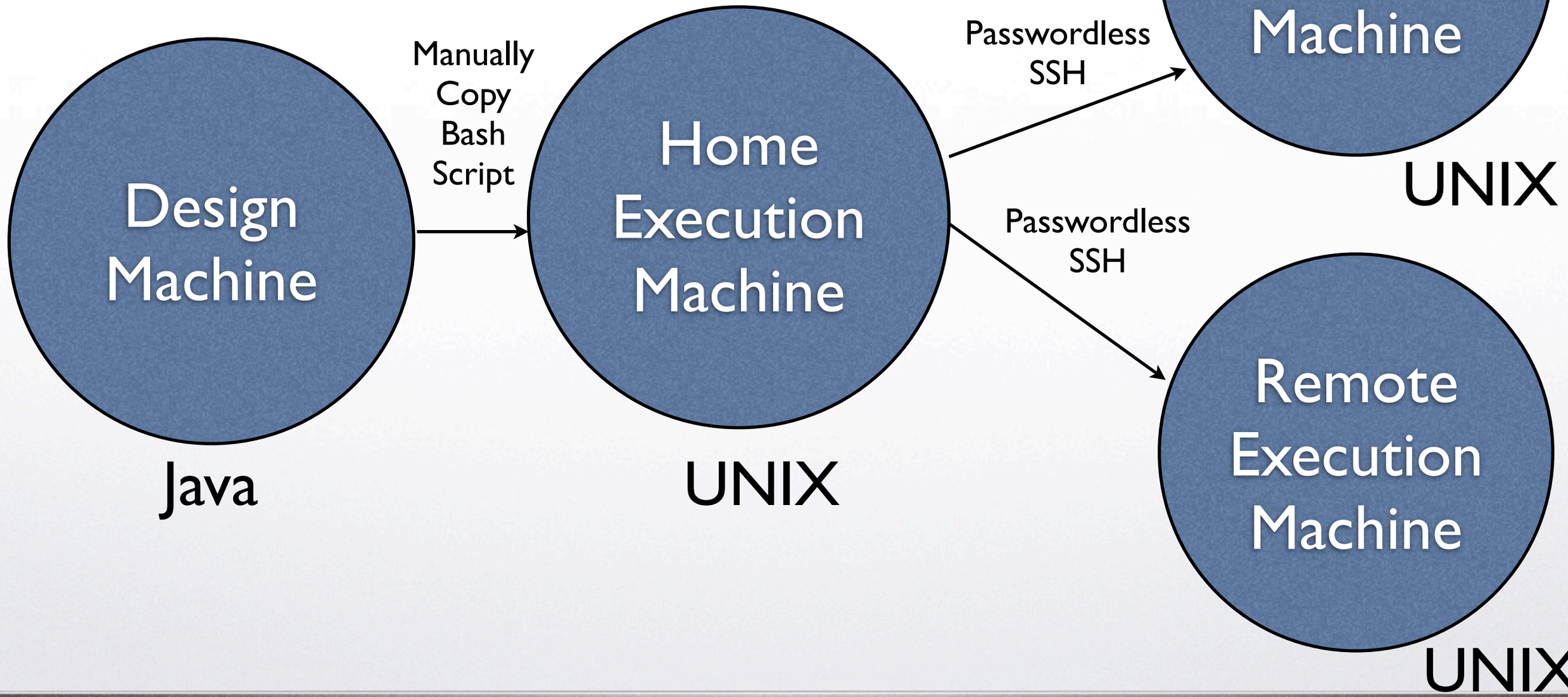


Java

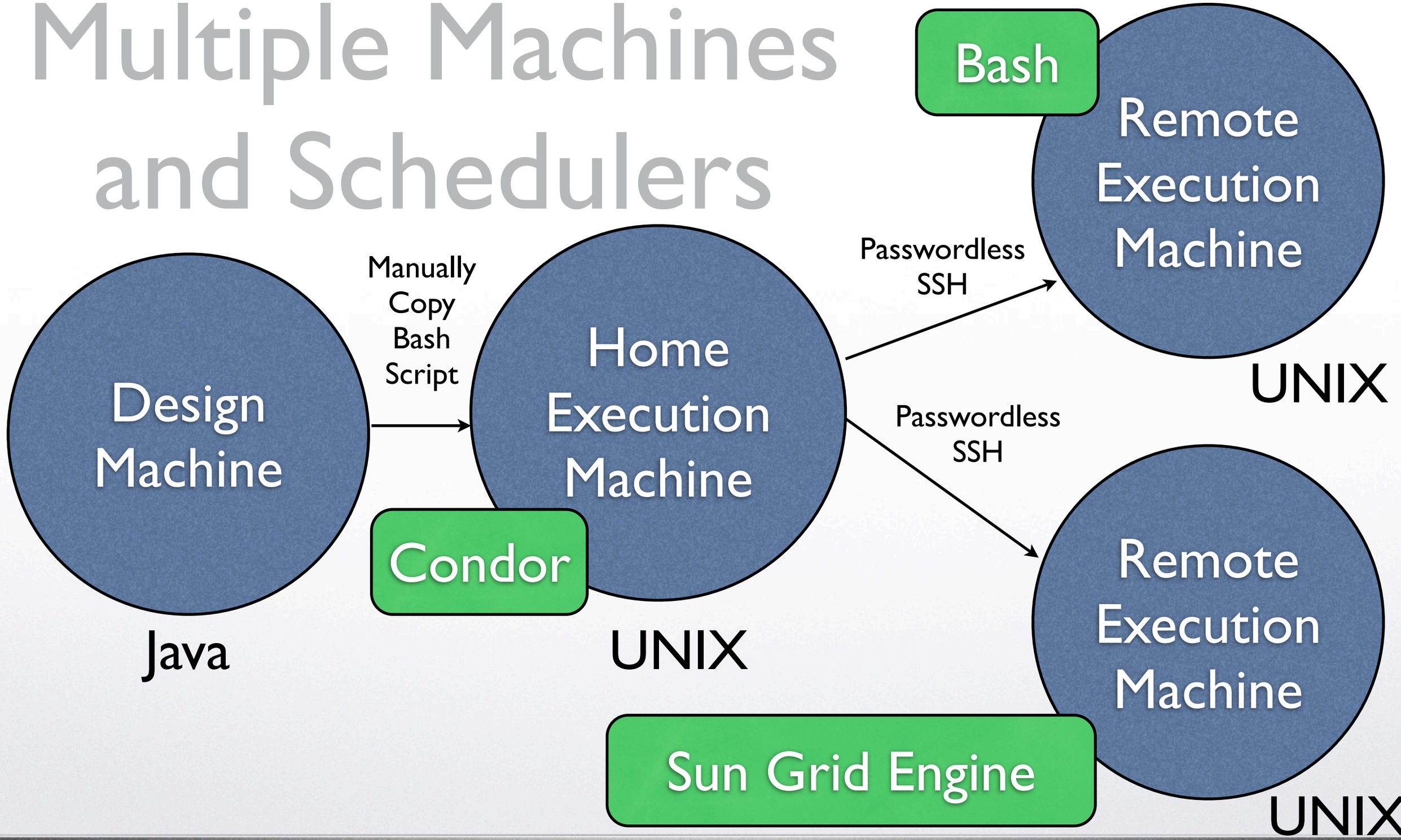
Multiple Machines and Schedulers



Multiple Machines and Schedulers



Multiple Machines and Schedulers



Other Things to Make Life Easier

- Sanity checking at each step (embedded in Tool Descriptors)
- Copying of files (including to HDFS)
- Text-based workflow definition (in SVN)
- Open-source LGPL License

WANTED

- Users & Contributors
- Machine Translation Toolpack (released)
- Corpus Processing Toolpack?
- Parsing Toolpack?
- Question Answering Toolpack?
- Resource Directory Toolpack?
- Speech Recognition Toolpack?

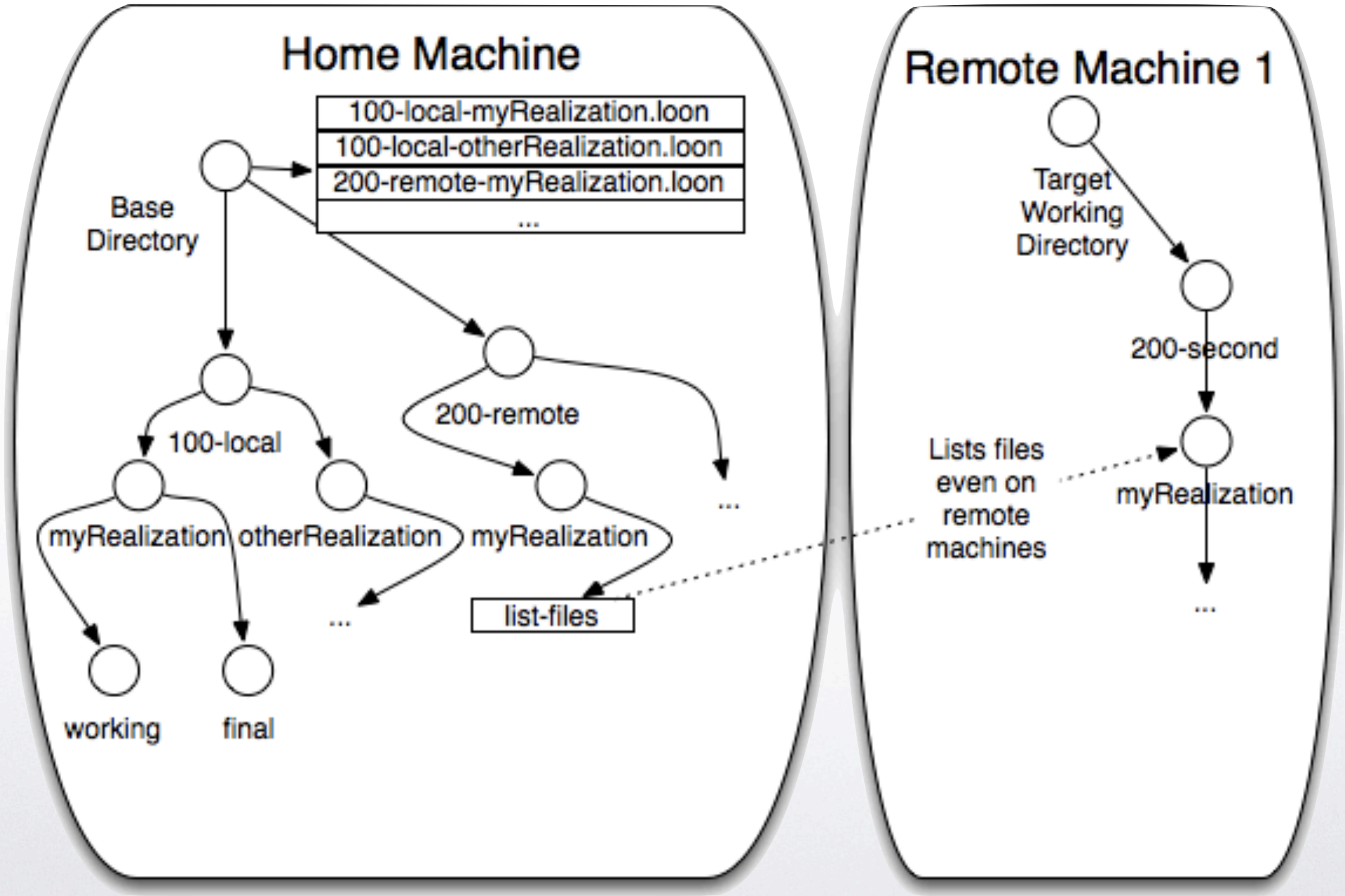
Conclusion

- Make your life easier
  - Automation
  - Sanity Checking
  - Logging
- Make your colleagues' lives easier
  - Reproducibility
  - Modularity

Questions?

Tutorial & Software at

http://loonybin.sourceforge.net


Home Machine
100-local-myRealization.loon
100-local-otherRealization.loon
200-remote-myRealization.loon
...
Base Directory
100-local
200-remote
...
myRealization
otherRealization
myRealization
...
list-files
working
final
Remote Machine 1
Target Working Directory
200-second
Lists files even on remote machines
myRealization
...

Practical Issues

- How does LoonyBin know when to run/ rerun a step?
  - Each vertex x realization has a loon log file. If the file does not exist, the step is (re)run
- What if I don't want that many steps?
  - Workflows have many granularities!

Recommendations

- Store your workflow files in SVN
- Store your log files in SVN -- experimental data is useful long after we get annoyed with size of data files!
- Log the SVN revision of frequently changing tools in your Loon logs -- Build them from SVN every time to ensure you're executing that version

Future Work

- Default parameters -- Short-term
- Asynchronous DAG execution (currently all steps are run in serial) -- Mid-Term
- Workflow monitoring and reprioritization during execution -- Long-term
- Encapsulation of workflows as “tools” (hierarchical tools) -- Long-term
- Automatic file compression -- Long-term