



Automated Builds

Rules

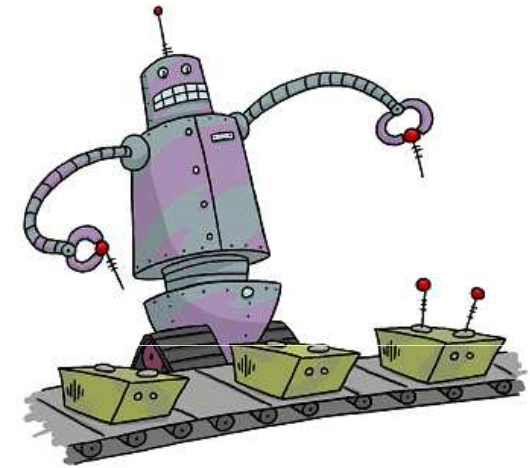


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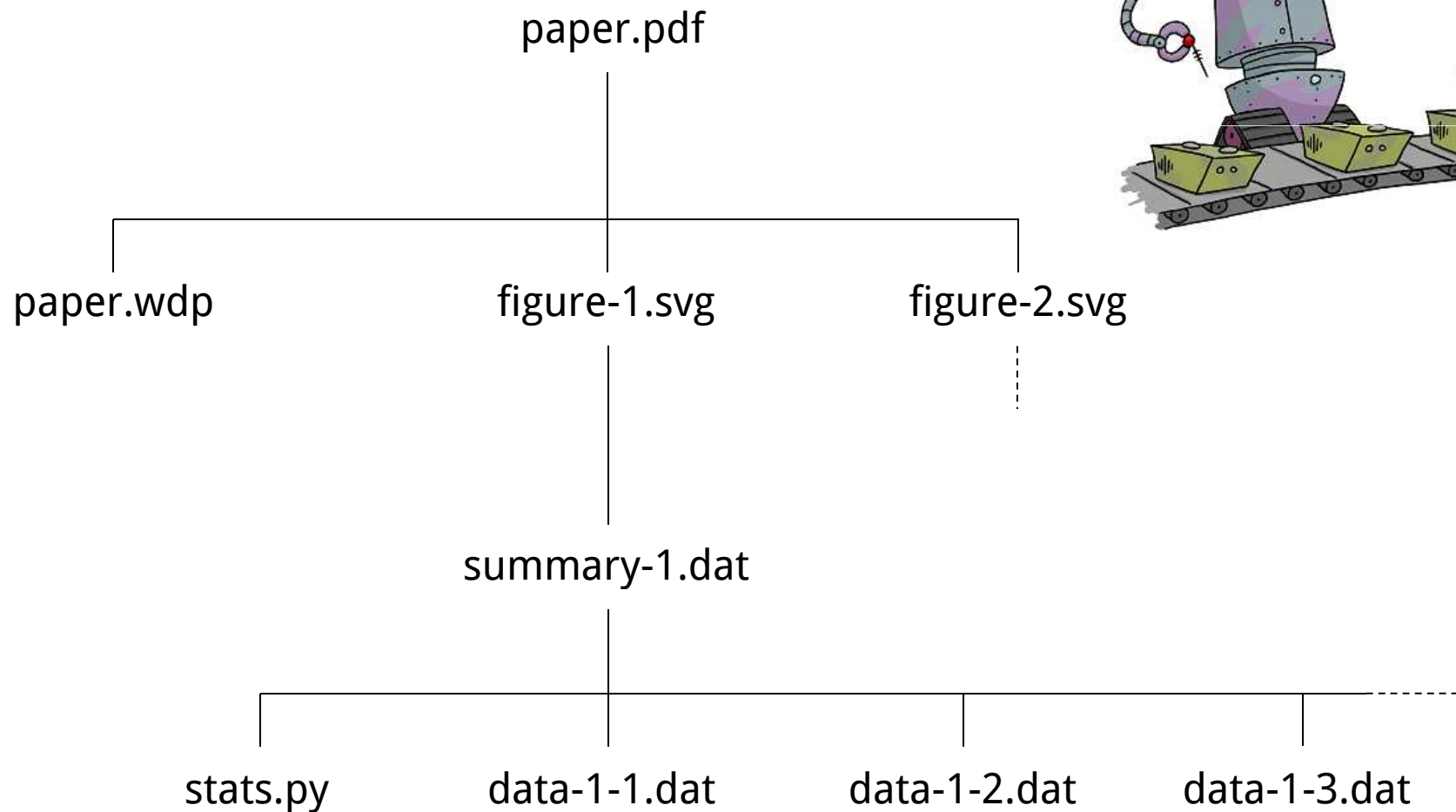
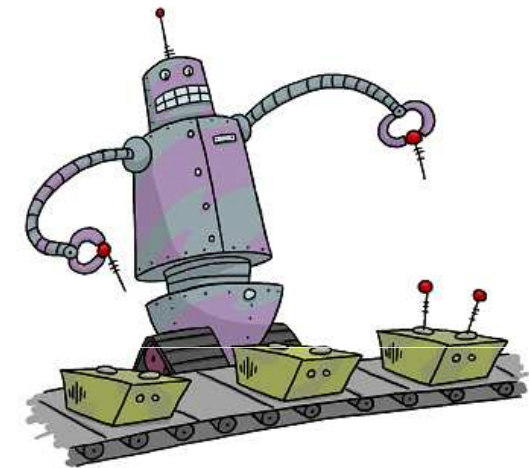
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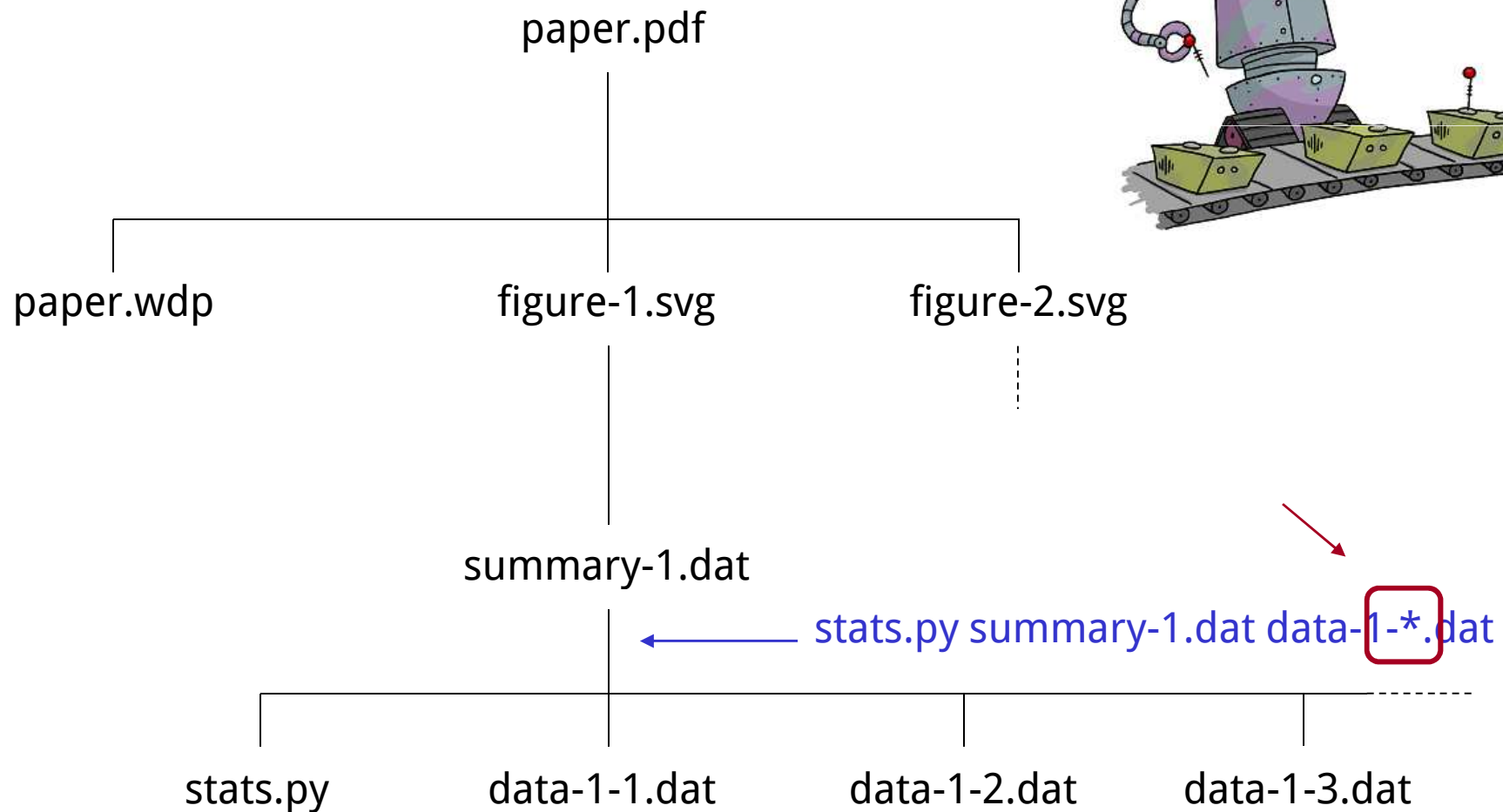
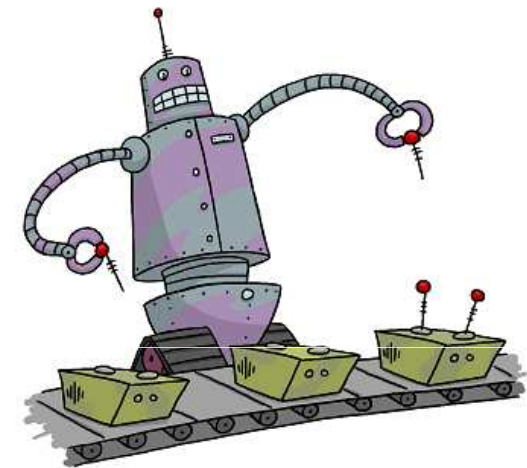
Manage tasks and dependencies



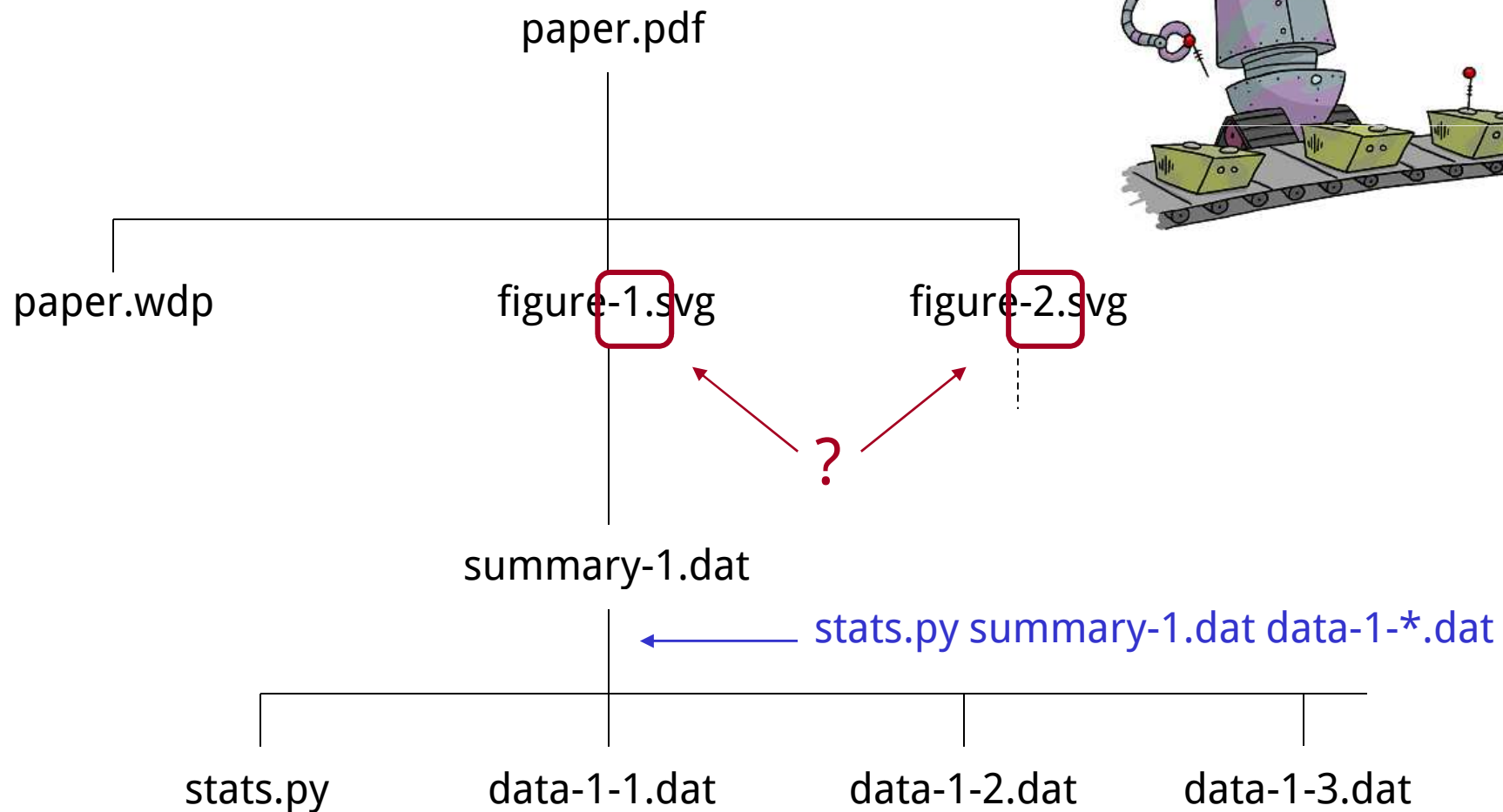
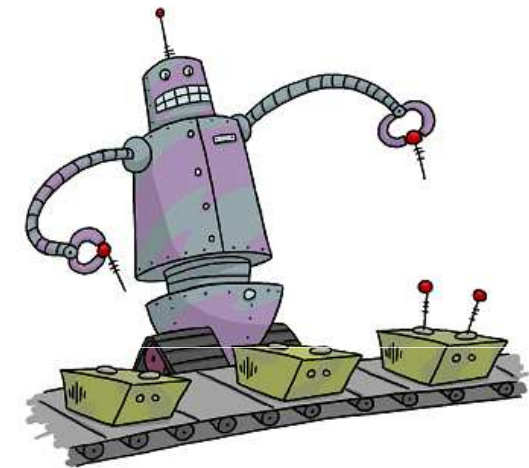
Manage tasks and dependencies



Manage tasks and dependencies



Manage tasks and dependencies



Makefile so far

```
paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-1.svg : summary-1.dat
    sgr -N -r $@ $^

figure-2.svg : summary-2.dat
    sgr -N -r $@ $^

summary-1.dat : data-1-*.dat
    stats.py $@ $^

summary-2.dat : data-2-*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```

Makefile so far

```
paper.pdf : paper.wdp figure-1.svg figure-2.svg  
    wdp2pdf $<
```

```
figure-1.svg : summary-1.dat  
    sgr -N -r $@ $^
```

```
figure-2.svg : summary-2.dat  
    sgr -N -r $@ $^
```

Eliminate this redundancy

```
summary-1.dat : data-1-*.dat  
    stats.py $@ $^
```

```
summary-2.dat : data-2-*.dat  
    stats.py $@ $^
```

```
summary-1.dat : stats.py  
summary-2.dat : stats.py
```

Use a *pattern rule* to capture the common idea

Use a *pattern rule* to capture the common idea

```
# pattern-rule.mk
```

```
figure-%.svg : summary-%.dat  
    sgr -N -r $@ $^
```

```
summary-1.dat : data-1-*.dat  
    stats.py $@ $^
```

```
summary-2.dat : data-2-*.dat  
    stats.py $@ $^
```

```
summary-1.dat : stats.py  
summary-2.dat : stats.py
```

Use a *pattern rule* to capture the common idea

```
# pattern-rule.mk
```

```
figure-%.svg : summary-%.dat  
    sgr -N -r $@ $^
```

← % is a wildcard

```
summary-1.dat : data-1-*.dat  
    stats.py $@ $^
```

```
summary-2.dat : data-2-*.dat  
    stats.py $@ $^
```

```
summary-1.dat : stats.py  
summary-2.dat : stats.py
```

Use a *pattern rule* to capture the common idea

```
# pattern-rule.mk
```

```
figure-%.svg : summary-%.dat  
    sgr -N -r $@ $^
```

← % is a wildcard

Has the same value on
both sides

```
summary-1.dat : data-1-*.dat  
    stats.py $@ $^
```

```
summary-2.dat : data-2-*.dat  
    stats.py $@ $^
```

```
summary-1.dat : stats.py
```

```
summary-2.dat : stats.py
```

Use a *pattern rule* to capture the common idea

```
# pattern-rule.mk
```

```
figure-%.svg : summary-%.dat  
    sgr -N -r $@ $^
```

← % is a wildcard

```
summary-1.dat : data-1-*.dat  
    stats.py $@ $^
```

Has the same value on
both sides

```
summary-2.dat : data-2-*.dat  
    stats.py $@ $^
```

Undefined in the action

```
summary-1.dat : stats.py  
summary-2.dat : stats.py
```

Use a *pattern rule* to capture the common idea

```
# pattern-rule.mk
```

```
figure-%.svg : summary-%.dat
               sgr -N -r $@ $^
```

```
summary-1.dat : data-1-*.dat
               stats.py $@ $^
```

```
summary-2.dat : data-2-*.dat
               stats.py $@ $^
```

```
summary-1.dat : stats.py
summary-2.dat : stats.py
```

← % is a wildcard

Has the same value on
both sides

Undefined in the action

Have to use \$@, \$^, etc.

Try running it

Try running it

```
$ make -f pattern-rule.mk
```

```
stats.py summary-1.dat data-1-1.dat data-1-2.dat data-1-3.dat
```

```
$
```

Try running it

```
$ make -f pattern-rule.mk
```

```
stats.py summary-1.dat data-1-1.dat data-1-2.dat data-1-3.dat
```

```
$
```

Why didn't other commands run?

Pattern rule doesn't create dependencies itself

Pattern rule doesn't create dependencies itself

```
# pattern-rule.mk
```

```
figure-%.svg : summary-%.dat
               sgr -N -r $@ $^
```

```
summary-1.dat : data-1-*.dat
                stats.py $@ $^
```

```
summary-2.dat : data-2-*.dat
                stats.py $@ $^
```

```
summary-1.dat : stats.py
```

```
summary-2.dat : stats.py
```

← *If Make wants to create figure-1.svg, it can use this rule*

Pattern rule doesn't create dependencies itself

```
# pattern-rule.mk
```

```
figure-%.svg : summary-%.dat  
    sgr -N -r $@ $^
```

```
summary-1.dat : data-1-*.dat  
    stats.py $@ $^
```

```
summary-2.dat : data-2-*.dat  
    stats.py $@ $^
```

```
summary-1.dat : stats.py  
summary-2.dat : stats.py
```

← *If Make wants to create figure-1.svg, it can use this rule*

Still have to tell Make what it wants to do

Put the rule for `paper.pdf` back in the file

Put the rule for paper.pdf back in the file

```
# use-pattern.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-1.dat : data-1-*.dat
    stats.py $@ $^

summary-2.dat : data-2-*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```

Put the rule for paper.pdf back in the file

```
# use-pattern.mk
```

```
paper.pdf : paper.wdp figure-1.svg figure-2.svg  
    wdp2pdf $<
```

```
figure-%.svg : summary-%.dat  
    sgr -N -r @$ $^
```

```
summary-1.dat : data-1-*.dat  
    stats.py @$ $^
```

```
summary-2.dat : data-2-*.dat  
    stats.py @$ $^
```

```
summary-1.dat : stats.py  
summary-2.dat : stats.py
```

Make now knows that
it needs to create the
figures, so it finds and
uses the rule

This doesn't work!

```
# doesnt-work.mk

paper.pdf : paper.wdp figure-*.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-1.dat : data-1-*.dat
    stats.py $@ $^

summary-2.dat : data-2-*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```

This doesn't work!

```
# doesnt-work.mk

paper.pdf : paper.wdp figure-*.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-1.dat : data-1-*.dat
    stats.py $@ $^

summary-2.dat : data-2-*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```

Figures don't exist when
Make starts to run, so
this is empty

Get rid of more redundancy

```
# all-patterns.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-1.dat : data-1-*.dat
    stats.py $@ $^

summary-2.dat : data-2-*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```

Get rid of more redundancy

```
# all-patterns.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%-*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```

Get rid of more redundancy

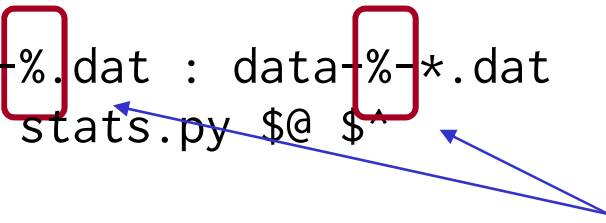
```
# all-patterns.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```



Make wildcard

Get rid of more redundancy

```
# all-patterns.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%*.dat
    stats.py $@ $^

summary-1.dat : stats.py
summary-2.dat : stats.py
```

Shell wildcard

But this doesn't work!

```
# all-patterns.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%-*.dat
    stats.py $@ $^

summary-%.dat : stats.py
```

But this doesn't work!

```
# all-patterns.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%-*.dat
    stats.py $@ $^

summary-%.dat : stats.py
```

summary-*.dat still only depends on data-*-.dat

But this doesn't work!

```
# all-patterns.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%-*.dat
    stats.py $@ $^

summary-%.dat : stats.py
```

summary-*.dat still only depends on data-*-.dat

Make only uses the first pattern rule it finds

Back to using false dependencies...

```
# false-dependencies.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%-*.dat
    stats.py $@ $^

data-*-*-*.dat : stats.py
    touch $@
```


Back to using false dependencies...

```
# false-dependencies.mk

paper.pdf : paper.wdp figure-1.svg figure-2.svg
    wdp2pdf $<

figure-%.svg : summary-%.dat
    sgr -N -r $@ $^

summary-%.dat : data-%-*.dat
    stats.py $@ $^

data-%-*.dat : stats.py
    touch $@
```

It's a less-than-perfect tool...



created by

Greg Wilson

August 2010



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