Optimizing Your World
**neos: Network-Enabled Optimization System**

Mathematical Formulation

Maximize $\sum_{j \in V} b_j y_j - \alpha \sum_{(i,j) \in A} d_{ij} x_{ij}$

Subject to exiting node on tour $\sum_{(i,j) \in A} x_{ij} - y_i = 0, \forall i \in V$

Subject to entering node on tour $\sum_{(i,j) \in A} x_{ij} - y_j = 0, \forall j \in V$

AMPL Model

```AMPL
set V;
set LINKS := {i in V, j in V: i <> j};
param alpha >= 0;
param d{LINKS} >= 0;
param b{V} >= 0; # default benefit of visiting a bar
param c{V} >= 0; # default cost of one drink
param B default 30; # default maximum budget for drinks
```

http://www.neos-guide.org/content/bar-crawl-optimization
Jobs Per Month

- Minho
- Klagenfurt
- Arizona State
- Argonne
- UW Madison
Our HTCondor Pool

- Rackmount Dell Servers running RedHat
  - Managed via puppet: [http://puppet.com/](http://puppet.com/)
  - Usage Reports in Ganglia: [http://ganglia.info/](http://ganglia.info/)
- 1 Central Manager
- 1 Submit Node
- 5 Execute Nodes with specialized solvers
Started Homegrown

Incoming

neos

Which Solver?

scip

ASU

Solver Pool
at UW-Madison
(March 2014)

HTCondor
Resource Allocation

- 3G memory per job
- 8 hour maximum
- 1-4 cores dependent on solver
- Adjust priority by length of job

Rapid solver additions with load balancing

- New node has over 2x CPU and memory
- Smaller servers were overloaded

```plaintext
# Original – don’t overload one by one
# APPEND_RANK = ( -1 * TARGET.TotalLoadAvg )

# Updated (slightly overloads largest)
APPEND_RANK = (TARGET.TotalCpus - TARGET.TotalLoadAvg)
```
User Authentication

- Wishlist
  - Provide additional resources and priority to some
  - Allow users to track, easily access jobs
  - Better analytics, tracking, problem resolution
  - Monetize?

- Integrated
  - SWAMP user authentication code
    - Name, Username, Password, Email
    - LDAP, MySQL backend
    - PHP/JavaScript handler headers on existing pages
    - Server hooks to connect user to job, give priority
Solutions and Diminishing Returns

- **8 hour job limit**
- **Partial Results** have value
1. Streaming results
   - Only on stdout, stderr
   - Doesn’t pass files created by solvers

2. Spool on evict
   - Undocumented debugging option for evicted jobs
   - Didn’t work through multiple HTCondor version updates

3. Transfer Output
   - First solution of Research Computing Facilitators
   - Works!

```plaintext
stream_output = true
stream_error = true
SpoolOnEvict = true
when_to_transfer_output = ON_EXIT_OR_EVICT
want_graceful_removal = true
+SpoolOnEvict = false
```
Ongoing Projects

- HTCondor
  - Migrate to Python bindings
  - Tie HTCondor job to neos job

- General
  - Adding Authenticated User to XMLRPC
Acknowledgements

http://www.neos-guide.org/content/domino-art