DreamWorks Animation SKG

Only studio to release 3 CG animated features in one year

Consistently in top 5 each year

Collaboration and Innovation with partners
Scale of Digital Resources

Each Film Takes 4-5 Years To Make

- 200+ Workstations
- 65+ Million CPU Hours
- Peak use of 15,000 cores of 22,000 total cores
- 200+ TB's of data
- 500+ Million files
- 10Gb/s WAN, 12% of Mad3 rendered remotely

Imagine Having a **DOZEN** Films in Production at ONCE!
Renderfarm Scale

Hundreds of thousands of jobs per night

Up to 20,000 jobs running concurrently

Deadline-based turnaround on priority order

Average runtime ~ 15 min, >90% utilization
DreamWorks And Open Source

DWA helped lead industry toward Linux and open source

Enterprise class solution - Linux-based HP workstations

With Red Hat we helped to enable commodity computing for our industry...which still uses proprietary grid middleware

  Expensive in $$$ and effort

We followed the open source path for our grid middleware
## Renderfarm Requirements

<table>
<thead>
<tr>
<th>Dynamic Slots</th>
<th>HGQ</th>
<th>Round-Robin Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Group Priority Order</td>
<td>FCFS (PostJobPrio1)</td>
<td>Progressive Rendering</td>
</tr>
<tr>
<td>Job Policies and Steering</td>
<td>Resource Limits</td>
<td>Suspend/Continue</td>
</tr>
<tr>
<td>Schedd Scaleout</td>
<td>Multi-target VIEW_HOST</td>
<td>Negotiator &amp; Schedd Stats</td>
</tr>
</tbody>
</table>
## Looking Forward

<table>
<thead>
<tr>
<th>Improved schedd HA</th>
<th>Multiple default concurrency limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startd-local limits</td>
<td>Cgroups &amp; FS namespace isolation</td>
</tr>
<tr>
<td>&quot;Claim Partitionable Leftovers&quot; - but....</td>
<td>Plumage &amp; add'l statistics</td>
</tr>
</tbody>
</table>
Operational Visibility

Our artists need much more than a "black box"

Built our own management tailored for rendering workflow

Built a realtime cache of farm data (stock + our metadata) inclusive of unreleased / dependent jobs

Using provided statistics, finding areas of improvement
Lessons Learned From Neg Stats

Consistent Matches = Duration-bound

Need deeper stats around Rejections, why 2X?

No reschedules/drop interval - but verify knobs

Phase1Duration has become 40%+ of Duration
Workflow Improvements

DAGman Service Interface
   Query submitted AND dependent jobs
   Live editing (priority, kill a graph node)

Accounting group role-based access
   Team-lead manual (re)prioritization
   Deadline-oriented workflow enablement

DAG meta dependencies
Thank You!

Questions?

Lans Carstensen
Lans.Carstensen@dreamworks.com
Principal Engineer, Digital Operations