Musical Performance As A Service

Exploring orchestra workflow, performer discovery, and music (service) composition

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CENTER FOR COMPUTATION
& TECHNOLOGY

Unintended Consequences

Ian Knight (c 1977)

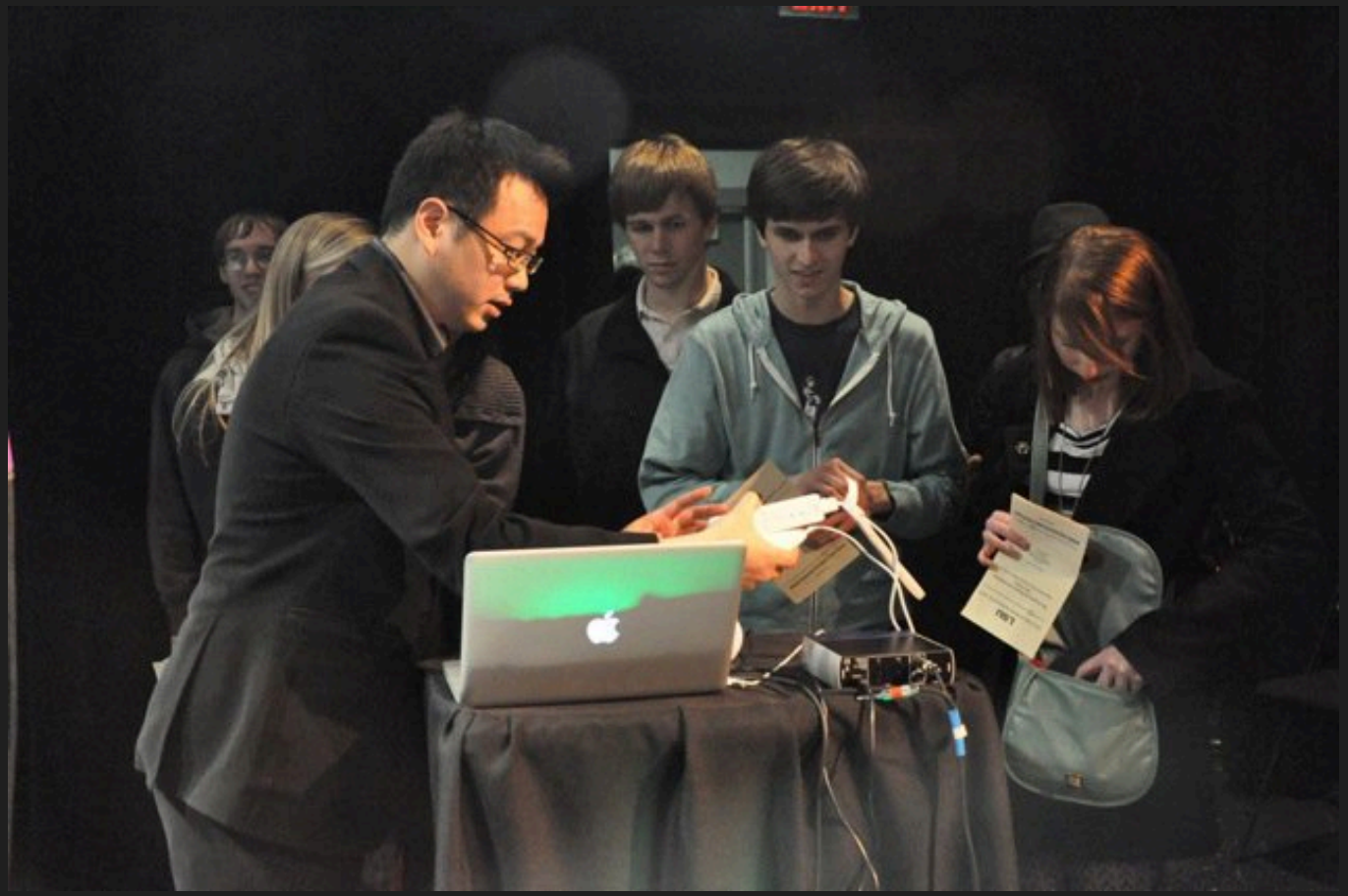

Trespass
Nursery Cryme
Foxtrot
Selling England By The Pound
The Lamb Lies Down On Broadway
A Trick Of The Tail
Wind & Wuthering
Seconds Out
And Then There Were Three . . .

Trajectory

- Grendl project
  - Collaboration of Laptop Orchestra of Louisiana (LOLs) and LSU CCT
- Enabling and supporting performance
- Consequent framing of ensemble, performance, composition

Initial challenge

- Issues with piece transitions
- Different LO compositions often require (significantly) different resources
  - distributed applications common
- Changes to venue or ensemble bring novel challenges



GRENDL

- GRid ENabled Deployment for Laptop orchestras
- Treat LO as computational grid
  - composition as job
- Simple API for Grid Applications (SAGA) distributes and executes compositions and instruments

Early questions

- How to represent (score) a composition?
- How to specify a performance?
- How to identify ensemble members and respective parts?
- How to manage and distribute all of the above?

Grid model answers

- Composition = job
- Part = collection of tasks
- Ensemble members = service and resource providers
- Distribution of tasks through service advertising and discovery

Performance Representation

- Program as primary artifact
- Ensemble (service providers)
- Other cast and crew (other services)
- Set lists (jobs)
- Other performance metadata
  - composer(s)
  - date, time, location, etc.

Ensemble

- Performers -- human or otherwise
- Instruments, middleware, other devices
- Network configuration
  - other relevant configurations (e.g. spatial layout or connection types)
- Services offered
- Can be published, advertised and discovered at “playtime”

Composition (Job)

- Score is primary artifact
- Services required
  - conventionally often described by instrument (e.g. violinist) with context assumed
- Service specifications and constraints
  - parts
- Resources and other requirements
- Workflow (arrangement, special instructions …)

Initial version

- Wrapper on SAGA C++ library
- Stateless command-line application
  - independent operations
  - static ensemble configuration
- "Push" data using SAGA
- Piloted throughout 2010 season

Results

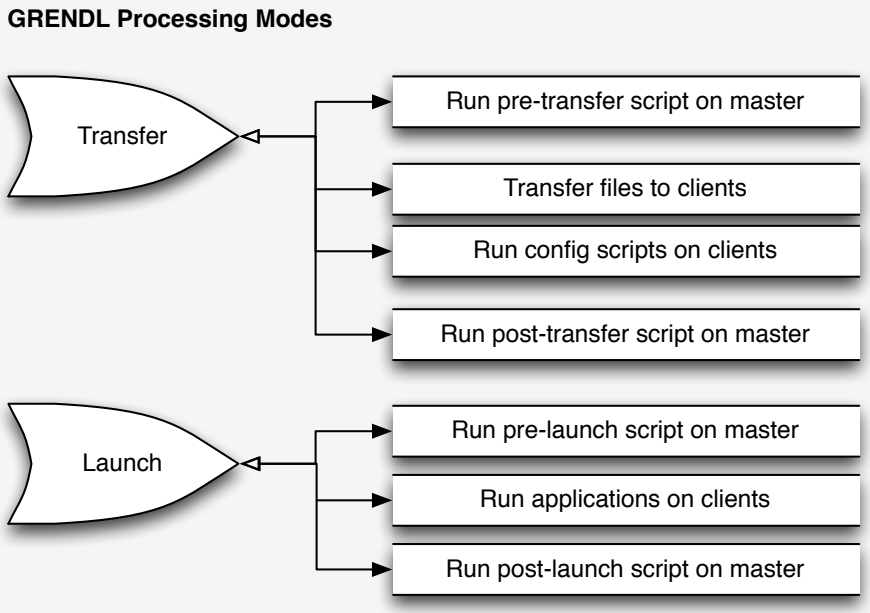
- GRENDL worked (almost) flawlessly
  - pre-concert transfer of latest files
  - piece transitions much faster
- Some challenges remained
  - non-trivial setup & execution
  - bottlenecks transferring large packages
  - difficult to troubleshoot

Second iteration (2011)

- OSC-wrapped SAGA server with remote Java client
  - performance spec. (program) + state
  - ensemble remains largely static
- Result was improved reliability + control
- Limitations on expanding scope
  - service advertising and discovery
  - scalability (still pushing data)

Course correction

- Assumptions about operating environment shaped SAGA implementation
- Static network configuration
- Implied coupling via grid middleware



GRENDL with SAGA paralleled HPC workflow

Current version

- Primary goal of restoring music focus
- Single Java executable per machine
- DNS Service Discovery (Bonjour) to publish and discover services
- Inherited GRENDL OSC interface
- Much simpler composition spec.
- Ensemble members added and removed dynamically

Impact of grid model

- Grid implementation reinforced model of ensemble as distributed services
- Fusion of musician, instrument, playing
- Program as job specification
- Representation of score
- Relation of service composition to music composition and performance

Benefits

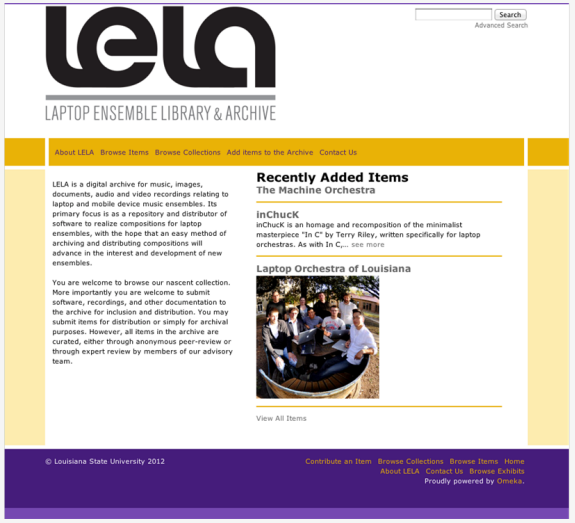
- Demonstrated effectiveness for performance management
  - workflow support
- Well-aligned with current system development practices
  - growing support in Web and OS domains
- Flexible and adaptable
- Platform independence (theoretically)
- Computer and human performers can be viewed similarly by the system

Research Opportunities

- Timing and service synchronization
- Representation of program, score, ensemble, …
- Performance workflow management
- Service composition and discovery
  - constraint-based compositions
  - fractional performers | instruments

Current directions

- Configuration management, distribution, and archiving
  - representation and metadata
- Reduced overhead | learning curve
  - "pickup" ensembles"
  - individual rehearsal
- Composition support



Acknowledgements

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Questions?