Musical Performance As A Service

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

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Unintended Consequences

Ian Knight (c 1977)
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 Processing Modes**

- **Transfer**
  - Run pre-transfer script on master
  - Transfer files to clients
  - Run config scripts on clients
  - Run post-transfer script on master

- **Launch**
  - Run pre-launch script on master
  - Run applications on clients
  - Run post-launch script on master

**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
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Questions?