Serving Mathematics

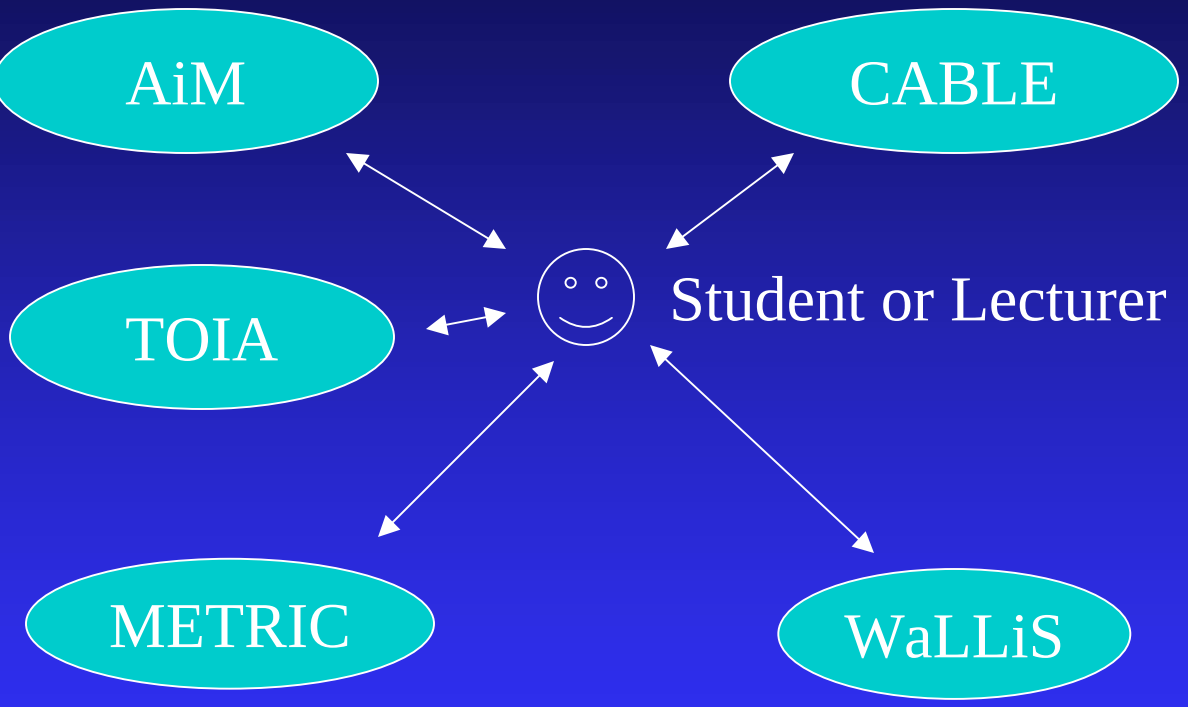
Web services for
online assessment
in mathematics

http://maths.york.ac.uk/serving_maths/

Mathematics assessment systems:

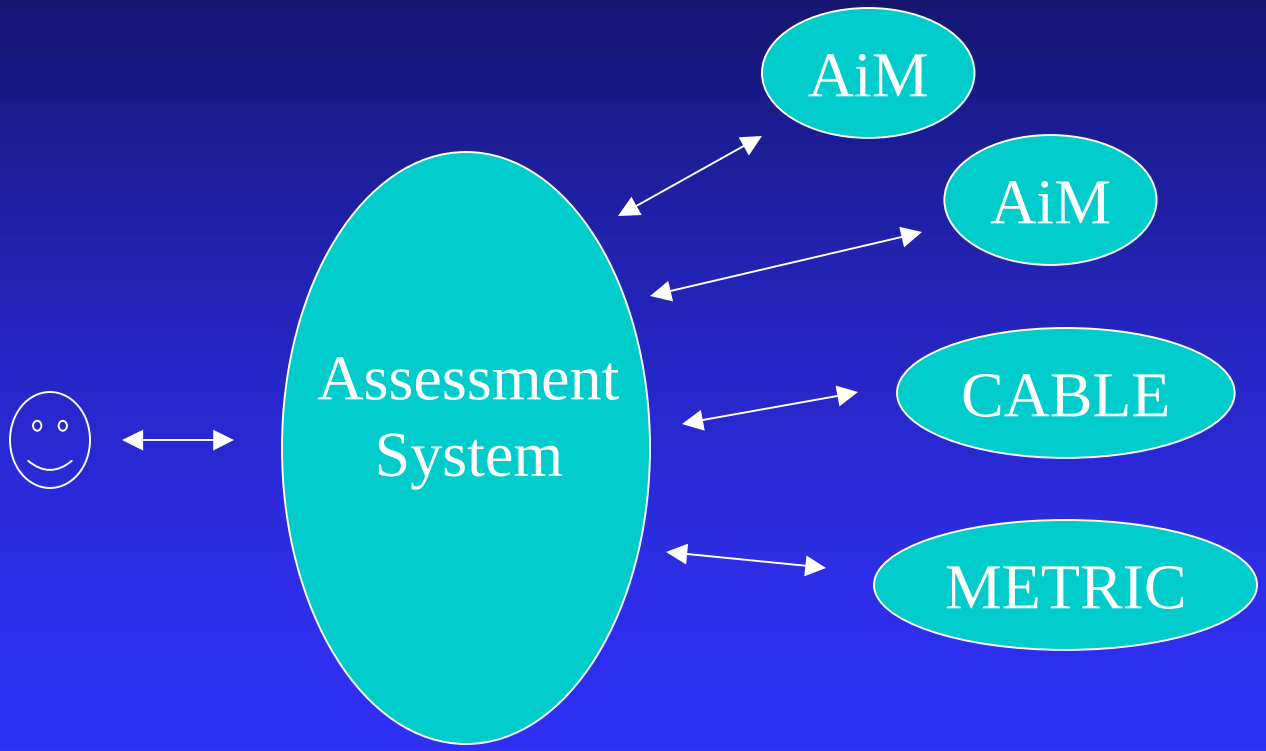
- Question can contain randomized mathematical expressions
- Student's answer is marked using a computer algebra system
- Can mark questions that have no unique answer
- Can render mathematical expressions

Separate Assessment Systems



- User has to deal with a different user interface and a different question syntax for each system
- Systems have to duplicate assessment system functionality

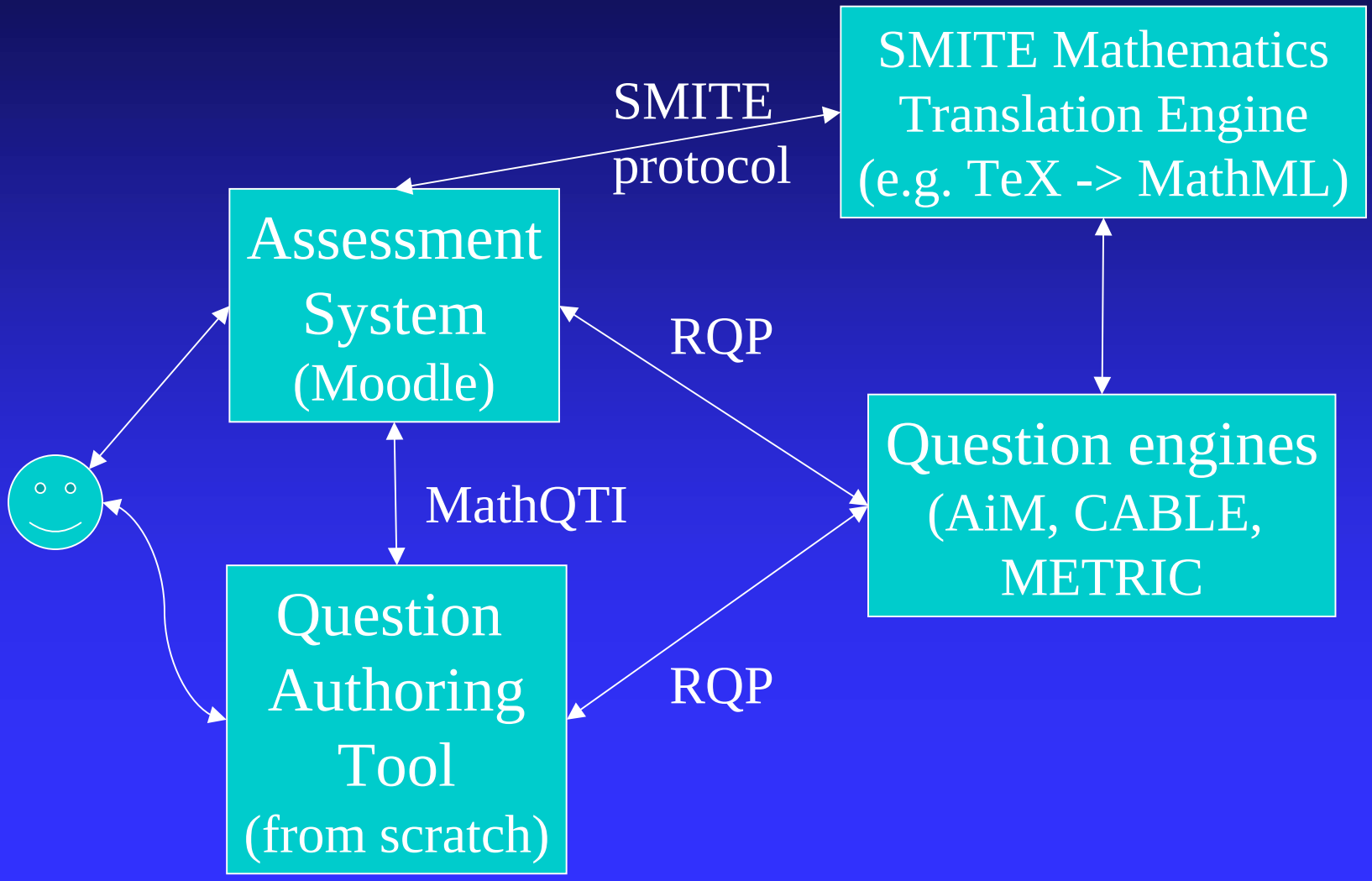
Single assessment system with remote question engines



Splitting up the tasks:

- Question engine (Item engine)
  - Template processing (randomization)
  - Item rendering (optional)
  - Response processing (may use CAS)
- Assessment system
  - Assemble questions into quizzes (items into tests)
  - Delivery of quizzes
  - Scoring and reporting
  - Keeping database of questions and responses

Components:


SMITE Mathematics Translation Engine (e.g. TeX -> MathML)
SMITE protocol
Assessment System (Moodle)
RQP
Question engines (AiM, CABLE, METRIC
MathQTI
Question Authoring Tool (from scratch)
RQP

The assessment domain


Learning Domain Services
Activity Author
Activity Management
Assessment
Competency
Course Management
Course Validation
Curriculum
Grading
Learning Flow
Marking
Personal Development
Quality Assurance
Reporting
Resource List
Sequencing
Tracking
ePortfolio
Common Services
AV conferencing
Alert
Archiving
Authentication
Authorisation
Calendaring
Chat
Content Management
Context
DRM
E-mail management
Federated Search
Filing
Format Conversion
Forum
Group
Harvesting
Identifier
Logging
Mapping
Member
Messaging
Metadata Management
Metadata Schema Registry
Packaging
Person
Presence
Rating / Annotation
Resolver
Role
Rules
Scheduling
Search
Service Registry
Terminology
User Preferences
Whiteboard
Workflow
Format translation

Interoperability

- MathQTI

  Mathematics extension of QTI allowing presentation MathML and OpenMath expressions in template and response processing

- RQP Remote Question Protocol

  Web service protocol to allow communication between assessment systems and question engines.

- SMITE (Translation Engine) Protocol

  allows clients to request translation between different mathematical formats (e.g., MathML, OpenMath, TeX, CAS syntax, HTML)