Oasis Loss Modelling Framework – Technology update

Zurich Conference 2018
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Agenda

1. Software overview
2. Status update
3. Current and upcoming initiatives
4. Interoperability - with MDK demo
5. Q & A
Software overview
Oasis Software – 4 main components

1 - Oasis Platform (ktools)
This is a set of data standards, an API, tools and components for building and running catastrophe models.

2- Oasis User Interface (Flamingo)
This is a web based application for uploading exposure, running models deployed in Oasis, and retrieving results.

3- Oasis Model Development Kit (MDK)
This is a set of tools for building, calibrating and creating the deployment assets for model, ready to be deployed into an Oasis system.

4- Oasis Model Library
This is a hosted catalogue for Oasis models, centrally hosted in AWS.
Oasis Ecosystem
Development Approach

1. We build open source software.
2. We use open source technology.
3. We aim to have a “full stack” development team.
4. We use the community to drive development.
5. We use partnerships to provide scale, for hosting, support and non-core development.
Modern Technology Stack

User Interaction/Reporting
- R
- Shiny

Data engineering
- C
- Flask
- Python

Analytics
- C++
- boost

Data persistence
- SQL Server
- And others to come...

Deployment
- Docker
- AWS
Status update
We’re fully open source!

- Realisation of Oasis strategy
- Opportunity for community driven development and review
- All code open on GitHub
  - Release management
  - Code review
  - Issue tracking
Features and functionality review

Feature gaps identified through community feedback
Full backlog publicly available backlog on Trello: https://trello.com/b/7O0krVYr/backlog

12 month horizon
- Reinsurance*
- API*
- Disaggregation*
- Batch analysis
- Hazard and vulnerability viewing

24 month horizon
- Advanced modelling features:
  - Timeline analysis
  - Model adjustment features
  - Correlation

* In-flight
Technology review

- Review of architecture and direction in Q1 2018
- Range of organizational size and strategy - all technically forward looking
- All were positive about the Oasis technical approach and plans
- No major deficiencies in approach were identified …
  … but lots of useful ideas and suggestions
Six key findings of the review

**Finding 1**
The core Oasis technical stack is well suited to the purpose for building and operating an industrial catastrophe modelling system at insurance or reinsurance company.

**Finding 2**
The development of a robust, stable and well documented API is critical for adoption and interoperability.

**Finding 2**
Container driven deployment (Docker) is an appropriate approach for packaging and deploying components of a complex software platform.
Six key findings of the review

**Finding 4**
The acceptance for use of hosted environments and the public cloud is growing, but there is no consensus of approach and different organizations may choose different cloud providers and/or internal deployment depending on economic and operational considerations.

**Finding 5**
For security and authentication, there is a range of approaches that an organization could take. Oasis should pick an industry standard approach and implement within the API, then leave it to client organizations to integrate as required.

**Finding 6**
Common data formats for exposure, conditions, results and rating options that is supported by the Oasis framework/APIs and external providers is highly desirable to drive interoperability.
What is industrialization?

Production-ready industrial strength

- Stable, market-acceptable technology
- Maintainable by a support team, but monitoring and job management may be somewhat manual
- Deployable to a small cluster through a semi-automated process
- Can be scaled vertically (larger machines) and scaled horizontally to some extent (more machines)
- Inter-operable via an API
- Clear release schedule
- Supports operation by a small cat modelling team (<10 users) out of the box, supports operation by a large team (10-100s of users) with bespoke deployment and customization.

With planned work and current resources the Oasis platform would meet all these criteria in 2018
What is industrialization?

Enterprise-ready industrial strength

- Software and models are developed using modern, automated processes to maintain stability of features and model results between releases
- Can be easily scaled horizontally, including burst capabilities
- Inter-operable via a usable, modern, well-documented API
- Supports standard enterprise security protocols
- Easily maintainable with logging and monitoring tools
- Supports operation by a large team (10-100s of users) out of the box

With planned work and current resources, the Oasis platform would meet all these criteria in 2019
Current and upcoming initiatives
Upcoming initiatives

1. Reinsurance
2. API
3. OED (with Simplitium)
4. Disaggregation
5. Oasis UI upgrade
Reinsurance

• Identified as main feature gap for using Oasis model in pricing and portfolio management workflows
• Target delivery September 2018 –current focus of core team
• Community driven development
  • Workshop to review scope and get broad feedback, attended by 8 member organizations
  • Detailed testing assistance committed from Allianz, Guy Carpenter, Renaissance Re
Reinsurance

- Initial delivery focussed on pre-cat net loss perspective
- Reinsurance contract types
  - Facultative at location or policy
  - Quota share with event limit
  - Surplus share with event limit
  - Per risk excess of loss
  - Catastrophe excess of loss, per occurrence only
- Loss perspectives
  - Net loss pre-cat
  - Reinsurance loss
- Outputs
  - ELTs, Loss Exceedance Curves, PLTs, AAL
  - All summary levels as per gross perspective (e.g. Portfolio, State, County, Location)
- Support for multiple inuring priorities and complex hierarchies
Reinsurance

Insurance

Reinsurance 1

Reinsurance 2
API

• Technical Review Finding 2: The development of a robust, stable and well documented API is critical for adoption and interoperability.

• Cat modelling APIs have been around for a while, but not very usable

• Extending Oasis REST API to entire cat modelling workflow

• Partnering with Wildfish

• Available in Q3 2018
Open Exposure Data (OED) - motivations

• Technical review finding 6: Common data formats for exposure, conditions, results and rating options that is supported by the Oasis framework/APIs and external providers is highly desirable to drive interoperability.
• An open, documented standard is required to aid adoption and integration of Oasis
• Transparency about how exposure input fields flow through to the Oasis financial model
• Simplification for model developers (one standard set of fields / codes to incorporate within their key-server)
• Less complexity within the Oasis mid-tier – potential performance benefits
• An exposure structure that takes full advantage of the Oasis financial model capabilities (especially for Reinsurance)
OED - plan

- Simplitium driven project and design
- Data standard will be fully open to use and develop against
- Work is well underway and is supported by:
  - Dedicated, Simplitium-funded, resource
  - Pro-active community members who volunteered to be involved from the outset
  - The AIR CEDE code-set based
- Target release to the community in Q3 2018
- Integral part of new Oasis API and reinsurance functionality
Disaggregation

How to run detailed models with aggregate or low resolution exposure?

• Currently, need a pre-analysis disaggregation tool
  • Complex workflow
  • Generates excessive data
• Problem common to all models
• Opportunity for community, (re)insurance and modelling firms to collaborate on standardisation of approach and development
• Proposed approach to include stochastic disaggregation in execution kernel for performance and data efficiency
• Coming towards end of 2018
Oasis UI upgrade

- External funding (H2020, German Government) to upgrade UI in particular for general model use
- Partnering with Mirai Solutions
- R Shiny architecture
- Look and feel refresh
- Simplified workflow
- Exposure/results visualizations
- Target release by end of 2018
Model Development Kit (MDK) v1 released. This is a suite of tools that allow models to be efficiently built, tested and deployed in the Oasis platform, and will enable the efficient build out of the models available in Oasis.

All Oasis code open source and available in GitHub, with full project documentation and installation instructions. This is the realisation of Oasis LMF's goal to provide an open loss modelling platform.

Oasis API v1 released. This provides a complete, published interface into the Oasis platform and represents the platform architecture reaching a key stage of maturity and stability.

Net loss pre-cat reinsurance functionality released. This fills the last major functional gap in using Oasis in primary model (re)insurance workflows.

Advanced modelling features to support efficient model translation into the Oasis platform, and best-practices and transparency of methodologies.

Technical development to support the operation of models at scale in a cost-effective manner, building on the core architecture already in-place.

Community driven development of new platform features to drive the adoption and use of the Oasis platform in production.
Inter-operability
## Inter-operability

<table>
<thead>
<tr>
<th>Model packaging</th>
<th>Model execution interfaces</th>
<th>Analysis programmatic API</th>
<th>Analysis web service API</th>
<th>Results data standards</th>
<th>Exposure data standards</th>
<th>Model data standards</th>
<th>Integrating models from many vendors in a single system</th>
<th>Integrating cat modelling with business processes and systems</th>
<th>Integrating cat modelling with advanced analytics</th>
<th>Building new models</th>
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Get involved!

- Evaluation system in AWS
- Code can be downloaded from GitHub
- Lots of initiatives running
Demo time

- Sneak peak of tomorrow’s workshop
- Cat model execution and data interoperating with modern data visualisation toolkits
- Use cases:
  - model development
  - model validation