THINKING BIG: NATIONAL SCALE FLOOD MAPPING

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Description of the problem

- Flood mapping at national scale, full coverage

**Why?**
- Insurance company
- Land use planning
- Risk filtering
- Mitigation measures
- Legal requirement
- Etc…

**What?**
- Large area: ~ 80,000 km²
- Flooding sources: rainfall, river flow, ground water
- Model resolution: 5~20m
- Hydrological analysis
- Inundation modelling
- Review, validation, publish
Challenges in National Scale Flood Mapping

- **Huge amount of data**
  - 10,000s ~ 100,000 models, ~10s TB of data, etc…

- **Automation** (model building and simulation management)
  - Scripts, utility programs, use of computer cluster, etc..

- **Selection of modeling software**
  - Fit for purpose, staff skills & efficiency, client’s influence

- **GIS data processing, DTM**
  - Stamp buildings, roads, defenses, etc..

- **Post processing**
  - Removal of isolated ponds, merge results, etc…
Derivation of a Modeling Framework

- Rainfall
  - Rainfall Depths
  - Urban/Rural Losses
  - Effective Rainfall

- Digital Terrain Model
  - Preliminary DTM
  - Pre-processing: buildings, roads, defences, structures...
  - Model Set-up

- Flow Grid
  - Flow Grid
  - Validation Verification
  - Boundary Conditions

- Inundation Modelling Software
- Post-processing

- Validation via flood portal
- Final Maps
- Communicate via flood portal
Catchment and model discretisation

Divide > Conquer > Merge

**Surface water:**
Full catchment coverage
ISIS FAST model for each sub catchment

**River flow:**
Extended floodplain
ISIS 2D covers all rivers with catchments > 3km²
## Automation and data management

<table>
<thead>
<tr>
<th>Batch scripting</th>
<th>Distributed modelling system</th>
</tr>
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<tbody>
<tr>
<td>E.g. DOS batch</td>
<td>E.g. HTCondor</td>
</tr>
<tr>
<td>Suitable for 100s ~ 1000s models</td>
<td>Suitable for 100,000s models</td>
</tr>
<tr>
<td>Runs on a fixed number of PC</td>
<td>Auto dispatch runs in a cluster</td>
</tr>
<tr>
<td>When it fails, it fails …</td>
<td>Live monitoring, auto retry etc…</td>
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- [http://research.cs.wisc.edu/htcondor/](http://research.cs.wisc.edu/htcondor/)

<table>
<thead>
<tr>
<th>External Hard disk</th>
<th>On premises cloud storage</th>
</tr>
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<tbody>
<tr>
<td>Risk of failure is high</td>
<td>Safer than External hard disk</td>
</tr>
<tr>
<td>Slow LAN connection</td>
<td>Great for internal access (different offices)</td>
</tr>
<tr>
<td>Suitable for small scale</td>
<td>Need IT skill to set up</td>
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Benefits of HTCondor

- Reporting
- Progress management
- Forecasting
Model Review, Validation and Publishing

Old way: comparing with historical datasets locally

- Modelling team may not have local knowledge
- Lack of recorded data

Collaborative way: cloud sourced map review and validation

- Share the map with local experts
- Web mapping and sharing is the answer

Solution: flood portal…
Flood Portal Map viewer

Interactive web mapping for reviewing and sharing
Discussion

- Advances in technology, able to do things never been before
- Still need local expert, local knowledge, users have the final say
- Flood portal gives them a platform
The end, thanks for your time!

Q & A

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How is Flood Portal developed?

Flood portal work flow and technologies used

<table>
<thead>
<tr>
<th>Item</th>
<th>Chosen technology</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database</td>
<td>Microsoft SQL server</td>
<td>MySQL, Oracle, PostgreSQL</td>
</tr>
<tr>
<td>Web server</td>
<td>Internet Information Server (IIS)</td>
<td>Apache, nginx, etc …</td>
</tr>
<tr>
<td>GIS server</td>
<td>ESRI ArcGIS Server</td>
<td>GeoServer …</td>
</tr>
<tr>
<td>Web interface</td>
<td>ASP NET WebForms</td>
<td>PHP, Ruby on rails, HTML5 …</td>
</tr>
<tr>
<td>Client web mapping</td>
<td>ArcGIS API for javascript</td>
<td>OpenLayers, Leaflet …</td>
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