Role of the Radiation Safety Information Computational Center (RSICC) in Knowledge Management

November 2016

Timothy E. Valentine, Ph.D.
Director of Radiation Safety Information Computational Center (RSICC)
http://rsicc.ornl.gov
Reactor and Nuclear Systems Division
Outline

• What is the Radiation Safety Information Computational Center (RSICC)?
• Who are RSICC’s key partners?
• What is the extent of RSICC’s customer base?
• How does RSICC contribute to knowledge promulgation and retention?
• What other unique services does RSICC provide to support code use?
Radiation Safety Information Computational Center (RSICC)

Mission:
Serve as a unique nuclear software and data center for government agencies, universities and private industry by providing a centralized resource for quality controlled modeling and simulation tools, processed nuclear data, and evaluated experimental benchmarks

Strategy:
Engage domestic and international efforts that develop advanced M&S tools, evaluated nuclear data and benchmark experiments to make them available to our customers

Statistics:
Over 2,000 packages in the RSICC collection
Nearly 4,000 packages distributed annually
16,000+ active customers from 100+ countries
Secure cloud server to support domestic and international collaborations e.g. ITER

Major sponsors:
DOE Office of Nuclear Energy
National Nuclear Security Administration
Nuclear Criticality Safety Program (NNSA)
RSICC’s distribution of nuclear M&S tools falls under the regulation of the U.S. Federal Government

- RSICC is the principle distributor of modeling and simulation tools and data used for nuclear technology applications
- RSICC software is under the Department of Commerce (DOC) or the Department of Energy jurisdiction – export control is strictly enforced.
- Because of proliferation concerns, certain codes were placed under the jurisdiction of the DOE in 2009 (MCNP®, RELAP and any of their variants)
RSICC collaborates closely with international organizations

• Nuclear Energy Agency of the Organization for Economic Cooperation and Development
  – Formal agreement on the exchange of M&S tools, data and benchmarks
  – Co-management of the SINBAD database
  – Partnering on the organization of the expert group of data certification, benchmarking and multi-physics M&S validation processes

• Research Institute of Science and Technology of Japan
  – Mutual agreement to provide RSICC’s M&S packages

• International Atomic Energy Agency
  – Support US engagement in FENDL data library development
RSICC provides services to customers throughout the World

Blue >750; Red 350-749; Green 150-349; Yellow 50-149; Light Blue <50
RSICC’s distribution of M&S tools and data contributes to knowledge retention and sharing

- 260 new or updated packages processed for release over the past 7 years
  - 22 in FY09
  - 38 in FY10
  - 41 in FY11
  - 69 in FY12
  - 60 in FY13
  - 14 in FY14
  - 16 in FY15

- From 2008 until 2011 the number of packages delivered has nearly tripled with the most growth in the University community and in deliveries to foreign nationals

- Updates to MCNP® and SCALE in FY16 have resulted in increases in requests
High Demand for Monte Carlo M&S Tools

Packages Distributed

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>MCNP®</th>
<th>SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY08</td>
<td>274</td>
<td>149</td>
</tr>
<tr>
<td>FY09</td>
<td>495</td>
<td>399</td>
</tr>
<tr>
<td>FY10</td>
<td>814</td>
<td>510</td>
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<tr>
<td>FY11</td>
<td>1930</td>
<td>843</td>
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<tr>
<td>FY12</td>
<td>1958</td>
<td>658</td>
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<tr>
<td>FY13</td>
<td>1978</td>
<td>568</td>
</tr>
<tr>
<td>FY14</td>
<td>2299</td>
<td>513</td>
</tr>
<tr>
<td>FY15</td>
<td>1650</td>
<td>539</td>
</tr>
<tr>
<td>FY16</td>
<td>1587</td>
<td>869</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15363</strong></td>
<td><strong>6024</strong></td>
</tr>
</tbody>
</table>
RSICC’s secure cloud server – an innovative mechanism for knowledge sharing

Increased interest in advanced modeling and simulation (M&S) tools due to
- New entrant countries pursuing nuclear power
- Increasing establishment and enrollment in nuclear engineering programs worldwide
- Fewer experimental facilities for development and application of nuclear technologies

Potential dual-use of advanced M&S tools and data remains a proliferation concern

RSICC’s secure cloud computing system serves to improve knowledge sharing while reducing proliferation concerns
- Foreign nationals from sensitive countries working or studying in the US and those supporting bilateral or multi-national activities that are in the interest of the U.S. Federal government may be given access

<table>
<thead>
<tr>
<th>Cluster</th>
<th>each node</th>
<th>each server</th>
<th>total cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 compute servers/cluster</td>
<td></td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>4 compute nodes/server</td>
<td></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2 processors/node</td>
<td></td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>16 cores/processor</td>
<td>32</td>
<td>128</td>
<td>2560</td>
</tr>
<tr>
<td>Memory</td>
<td>128 GB</td>
<td>512 GB</td>
<td>10,240 GB</td>
</tr>
<tr>
<td>Peak theoretical performance</td>
<td>0.307 TFlops</td>
<td>1.23 TFlops</td>
<td>24.6 TFlops</td>
</tr>
</tbody>
</table>
Summary

• RSICC provides a unique service for the DOE and other Federal agencies through its acquisition, preservation, and dissemination of modeling and simulation (M&S) tools and data that is essential for the continued support of vital M&S tools and data

• RSICC’s participation in and support of the development and dissemination of evaluated benchmark data is very important for knowledge preservation

• RSICC’s support of the university programs is critical to their future

• RSICC’s international collaborations with the OECD-NEA are important for sustaining and expanding its services

• RSICC’s demonstrated operation of secure cloud computing systems will be a model for other international collaborations that promotes knowledge sharing

• RSICC has been leveraged to facilitate other activities important for knowledge management
  – Provide support for SFCOMPO development and evaluation in partnership with the OECD-NEA
  – Provide support for launching codes to meet RSICC’s customers’ needs e.g. ADVANTG and SAMMY
  – Provide leadership and coordination of ORNL’s efforts in support of the DOE Nuclear Energy Knowledge and Validation Center