

2012 Los Alamos Computer Codes (LA-CC)



LA-CC #	C#	Software Title	Software Description	Date
12-001	C12013	Heat Transfer in Downhole Motors (HTDM), Version 1.x	The software calculates the temperatures of components inside of an induction motor used to drive down-hole Electric Submersible Pumps (ESPs) in oil/gas/geothermal applications. Given the geometry of the motor, the conditions of the fluid flowing past the motor (flow rate, temperature, pressure and composition), and the heat loads generated in the motor, the program calculates the temperature of all the major internal components (rotor bars, stator windings, bearings, etc.). Development of the code is described in: Jankowski et al. (2010). "Development and Validation of a Thermal Model for Electric Induction Motors," IEEE Trans. on Ind. Electronics, vol. 52, no. 12, 4043-4054, LAUR-09-04660.	1/5/2012
12-002	C12022	RadPack Reader	LANL has created a Windows compatible executable program called 'RadPack_Reader' to read the data generated by a RadPak radiation detection system and save the resulting information in to a text file. RadPack_Reader is capable of extracting data only from a RadPack radiation detection system.	1/19/2012
12-003	C12051	R Features Package, Version 1.x	R code to connect to public sequence databases and analyze genome features. The package is similar to the R genomes package released in 2010 (LA-UR-10-00990) to track genome sequencing project metadata.	1/19/2012
12-004	C12052	CHARADE Family, Version called "cha"	Characteristics hydrocode, used to calculate impacts with materials models: Mie-Grueneisen EOS, simple power law plastic strain dependence, HOM equation of state. LA-11993-MS code manual of earlier version.	1/24/2012
12-005	C12053	Vera, Version 0.5	Vera is a visualization tool for reverse engineering software binaries. Information is posted at csr.lanl.gov/vera including all relevant publications. A previous request was made under LA-CC-10-131. The changes from the current version include bug fixes, navigation icons, more detailed application help, and a graph animation feature.	2/1/2012
12-006	C12020	NMCOST 1.0.170	The NMCOST application is a standalone application that imports a Comma Separated Values file containing NM inventory and transaction data. The application includes functionality that is designed to generate datafiles and report products that satisfy both LANL Nuclear Material (NM) cost accounting and Department of Energy (DOE) reporting requirements. 'Nuclear Material Accounting Inventory Fund 52 Cost Procedure' is a users manual for the application.	2/9/2012
12-007	C12023	InfraMonitor Version 3.1	Code allows for both pipeline and analyst processing of infrasound data including the detection and location of infrasound events.	2/16/2012
12-008	C12046	PeakEasy, Version 4.x	PeakEasy 4.00 is a major update to Version 3.5 (LA-CC-09-084). We maintain a PeakEasy web page at http://peakeasy.lanl.gov/	2/17/2012
12-009	C12027	Altera NIOS2 BSP for RTEMS, beta release	The software to be released are RTEMS board support package (BSP) and GNU C/C++ compiler enhancements for Altera Field Programmable Gate Array (FPGA) NIOS2 central processing unit (CPU) hardware intellectual property (IP) module.	2/27/2012
12-010	C12054	TR-X Beta Distribution 0.8	TR-X is a wrapper to simplify the use of MCNPX for threat-reduction applications. It uses a suite of predefined objects to compose a scene for analysis by passive or active methods. It then creates a suite of input decks, (one for each passive or active source) and submits them either local or batch execution. Finally it can load in the results and present graphs or simple pass/fail analysis resulting from the MCNPX tallies. Current objects include North Atlantic ocean and desert scenes, zodiac, fishing trawler, and luxury yacht models, standard HEU cylinder, ISQ HEU & Pu sphere & shell, photon & muon beams. Generic cargo items. Version 0.8 adds Source and physics configuration wizards to the 0.5 distribution (LA-CC-09-082).	2/23/2012
12-011	C12021	NDLGS Ver. 1.0	The NDLGS is a LabVIEW code that controls a high power laser and a five axis control system. The software facilitates laser drilling very small holes in metal tubes, sampling any gas that is contained within the tube and then resealing the hole by welding it with the laser.	2/23/2012
12-012	C12024	OpenCL Mid-Level Abstractions, Version 1.0.0	Mid-Level abstraction layer for OpenCL development. This library provides a set of logical devices for use in OpenCL development that obviates much of the boiler-plate initialization normally required by the OpenCL runtime. Additionally, this library provides a Fortran 95 interface to the underlying C abstraction layer, thus providing accessibility for legacy codes. The code does not fundamentally enhance the capabilities of the OpenCL language--other than those features stated above--and actually provides a restricted subset of the overall OpenCL functionality.	2/23/2012
12-013	C12028	Altera Triple Speed Ethernet Driver for RTEMS, beta release	The software to be released is an RTEMS real-time operating system driver for Altera Field Programmable Gate Array (FPGA) Triple Speed Ethernet hardware intellectual property (IP) module. The software might also be used with other operating systems based on a BSD Unix derived IP kernel.	2/27/2012

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12-014	C12055	VPIC, Version 4.07	This is an update to the previous version of VPIC 3.0 (LA-CC_08-012). VPIC is a 3D particle-in-cell code that solves the relativistic Vlasov-Maxwell equations for plasma modeling. The new version of VPIC has been optimized for multi-core architectures, both homogeneous and heterogeneous platforms. It now includes a Fokker-Plank treatment of collision operator as well as many new diagnostics and input decks.	2/27/2012
12-015	N/A	Dynamic Activities Simulation (DASim), Version 1.0	DASim is a parallel discrete event hybrid agent-based model of dynamic activity generation. Supporting functionality for choosing activity locations and activity execution operates concurrently. As a simulation, daily activity schedules for individual agents are generated based on their demographics and the utilities, priorities, and time constraints of a chosen set of activities and optimized. Traditional agent-based technology and numerical methods are combined. This has been developed as part of a larger effort to understand the interdependencies among national infrastructure networks and their demand profiles that emerge in baseline and emergency scenarios. It operates both as a standalone model for population analysis and can be coupled with other infrastructure models such as for epidemics providing an alternative to ground-hog day schedules currently in use.	2/29/2012
12-016	C12026	FRAM version 5.x, version 5.xOrtec, version 5.xCanberra where x is 1, 2, 3, ..., 9	The Fixed-Energy Response-Function Analysis with Multiple-Efficiency (FRAM) code is used to measure by gamma-ray spectrometry the isotopic composition of plutonium, uranium, and other actinides. It uses the peaks obtained with germanium detectors in the energy range from 30 keV to greater than 1 MeV.	3/13/2012
12-017	C12056	area_source_inversion.f, Version 1	A source inversion code that produces area sources and associated release mass based on wind and concentration measurements. The underlying transport and dispersion model is segmented Gaussian plume code (LA-CC-06-059). It is a component of the BERT software tool.	3/16/2012
12-018	C12057	area_source_forward.f, Version 1	A forward plume code that produces downwind dosage fields for area source releases. The user specifies the mass released, stability class, and inputs a wind field from the Win2D code (LA-CC-06-060). The underlying transport and dispersion model is a segmented Gaussian plume code (LA-CC-06-059). The area_source_forward code is a component of the BERT software tool.	3/16/2012
12-019	C12058	line_source_inversion.f, Version 1	A source inversion code that produces line sources and associated release mass based on wind and concentration measurements. The underlying transport and dispersion model is segmented Gaussian plume code (LA-CC-06-059). It uses RMSE statistics to find the best solutions from a list of roads. It is a component of the BERT software tool.	3/16/2012
12-020	C12035	Transactional Web Archive, Version 1.0	The code implements a transactional web archive that has capabilities to: (a) Archive resources of a web server. The archiving of a particular resource takes place at the time the to-be-archived web server responds to a regular web client's request for that resource. (b) Make the archived resources accessible via the Memento (Time Travel for the Web) protocol (c) Selectively off-load archived resources. Post off-loading, archived resources can - for example - be uploaded in a more permanent, long term web archive). More information about the transactional web archiving software is available via a description of a test implementation at http://theresourcedepot.org . Information about Memento, including the protocol, is available at http://mementoweb.org .	3/22/2012
12-022	C13002	Hash, Version 1.0	Hash algorithms as describe in Journal article and presentations, "Hash-Based Algorithms for Discredited Data." Algorithms are to be distributed for starting points for optimization efforts.	3/30/2012
12-023	C12060	libjags, Version 1.0	Library of routines to interface with the Jaguar Gateway System (JAGS) software. JAGS is software supplied by Sandia National Laboratory.	4/4/2012
12-024	C12061	GDAR Local Cabinet Application, Version 1.0	This is service code with control UI collects data from List Mode Modules (Neutron data), and makes the data available to remote client software application over TCP/IP. Windows OS only; designed for the Glovebox Unattended Assay and Monitoring Data Acquisition and Review (GDAR) system. See GUAM Data Acquisition and Review, LANL/N-1, (Oct. 2007), LA-CP-07-1241, and Glovebox Unattended Assay and Monitoring System (GUAM) Software Requirements Specification (rev 3), LANL/N-4, (June 14, 2009), LA-CP-08-0820.	4/9/2012
12-025	C12062	GDAR Remove Terminal Application, Version 1.0	This client code provides data review and status for aggregated data streams collected by one or more GDAR 'Local Cabinet' application services. The code supports inspection of data details and machine status on each 'Local Cabinet' instance on the shared TCP/IP network. Windows OS only; designed for the Glovebox Unattended Assay and Monitoring Data Acquisition and Review (GDAR) system. See GUAM Data Acquisition and Review, LANL/N-1, (Oct. 2007), LA-CP-07-1241, and Glovebox Unattended Assay and Monitoring System (GUAM) Software Requirements Specification (rev 3), LANL/N-4, (June 14, 2009), LA-CP-08-0820.	4/9/2012
12-026	C12034	AnalyzeData, Version 1.0	This is data reduction and analysis code for time-dependent data from explosives experiments, written in Java. Nearly all components are straight implementations of routines from Numerical Recipes, but some algorithms were created for cross-correlation of data between the diagnostics we use in experiments. There is nothing proprietary or unique about any particular aspect of the software, except the combination of the different but related routines into one package and the ease-of-use aspects that enable faster analysis than in other packages.	4/9/2012

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12-027	C12063	DecayCalculator	This is software written in visual C++ to correct the activity of Cf-252 for decay time.	4/20/2012
12-028	C12064	Momentum	This is data analysis software created with visual C++ to analyze neutron multiplicity data from LANL's neutron detectors. This is an updated version of Replay Plus.	4/20/2012
12-029	C12065	Replay Plus	This is data analysis software created with visual C++ to analyze neutron multiplicity data from LANL's neutron detectors.	4/20/2012
12-030	C12066	DAQS	This is data acquisition software created with visual C++ to read, transfer, and display data from a neutron detector prototype.	4/20/2012
12-031	C12067	Fast Cluster	This code divides nodes of a network into subgroups (clusters, communities, modules) so that in-group links are much denser than between-group links. Our code is a modification of the publicly available graph partitioning code Metis (http://glaros.dtc.umn.edu/gkhome/views/metis). The algorithm behind the code is described in the report 'A Scalable Multilevel Algorithm for Community Structure Detection,' LA-UR-06-6261.	4/27/2012
12-032	C12033	PARTISN, version 7.x	PARTISN is a deterministic neutral-particle SN transport code (User's Manual LA-UR-08-07258). This latest version adds an XTM interface for host codes, the ability to run on Roadrunner, time-dependent geometry link files, spontaneous fission sources, material-dependent sources, and temperature-dependent and time-dependent cross sections.	4/27/2012
12-033	C12044	mph_to_tecplot.m, Version 2.0	Code employs the MATLAB LiveLink with COMSOL to read COMSOL mph files, extract the 3-D structures within the mph file and export that information in a form that can be read by TECPLOT. This version now supports all 3-D element order (e.g. linear, quadratic, etc.) and type (e.g. tet, pyramid, etc.) present in COMSOL.	4/27/2012
12-034	C12032	DPA-Site, Version 0.X	DPA-Site performs Dynamics Perturbation Analysis on an input protein structure model and outputs predictions of protein functional sites, e.g., where small molecules might bind. The input is a protein structure in PDB format, and the output is lists of clusters of points in the neighborhood of predicted functional sites, and lists of residues near these clusters that are predicted to belong to a functional site.	5/3/2012
12-035	C12068	Enzo-MHD	Ideal MHD, divergence free, AMR, Lagrangian dark matter particles, primordial chemistry. Collins, D.C.; Xu, H; Norman, M.L.; Li, H; Li, S. 'Cosmological Adaptive Mesh Refinement with Enzo,' Astrophysical Journal Supplements, 2010, 186:308-333	5/3/2012
12-036	C12030	Sequedex, Version 0.9	Sequedex is computer software to rapidly assign phylogeny and function to short sequences of DNA. It also identifies protein-coding regions of DNA, characterizes complexity of a data set and similarity to other data sets. It also characterizes DNA sequencer performance. The software may be available or exclusive or nonexclusive licensing.	5/10/2012
12-037	C12031	Sequescan v0.9	Bioinformatics software for analyzing biological sequence data. Ref LA-UR-12-00990 and LA-UR-12-20166. The former is posted to the web at http://www.lanl.gov/orgs/tt/pdf/techs/sequescan.pdf . This is for the publicly-available version of the code.	5/9/2012
12-038	C12036	Aurora Map Website, Version 0.1	Client/server web application with the following capabilities: (a) collating observations of the aurora from different sources, including Twitter status updates, observations entered directly into the website by users, and public data from traditional (space-based) sensing, (b) estimating the current state of the auroral oval using the above observations, (c) estimating the future state of the oval, (d) presenting these observations and estimates in a map-based form (on the web, in smart phones, etc.), (e) pushing these observations and estimates to users who have requested them (e.g. by e-mail), and (f) standard web-app functionality such as user registration and login. LDRD Reserve proposal by MacDonald, LA-UR-12-20634.	5/15/2012
12-040	C12069	Neutron Event Adjudication Tool V.2.0.0.0	This code processes daily files generated by TSA Systems, Inc., radiation portal monitors. The tool allows the expert user to perform a set of statistical analyses and to rerun the TSA alarm algorithm to assess whether the data represent a threat.	5/17/2012
12-041	C12070	PAGOSA version 17.0	PAGOSA is multi-dimensional Eulerian hydrodynamics code. The physics of PAGOSA is documented in the 'PAGOSA Physics Manual,' LA-14425-M. The Input Reference for PAGOSA is 'PAGOSA Input Reference Manual,' LA-CP-00586.	5/23/2012
12-042	C12042	HashMark 1.0.0	HashMark is a set of C functions for creating and managing hash tables. It is designed to be thread-safe and simple and is built on top of the STL std::map class. The actual underlying C++ data type is a std::map<size_t, std::map<std::string, void*>>. Thread safety is achieved using std::mutex and std::guard_lock (these may or may not be very efficient).	5/25/2012
12-043	C12037	CHICOMA Vers. 1.0	3D shock capturing hydrodynamics.	5/25/2012
12-044	C12071	STUMP, version 0.1	STUMP (Simple Test of Unstructured Mesh Physics) is a mini-app intended for use in advanced architecture research. It has data structures for manipulating 2-D unstructured finite element meshes containing arbitrary polygons. It implements the staggered-mesh Lagrangian hydrodynamics algorithm of Caramana, Burton, et al. (J. Comput. Phys., 145:227-262, 1998).	5/29/2012
12-045	C12039	CoCoMANS-Materials: Multi-Scale Materials Test and Evaluation Suite, Version 1	The Multi-Scale Materials test and evaluation suite codes are used to iterate an optimization approach to code development. The software can produce time-dependent solutions to high strain rate material problems. Two distinct scales are modeled, which are linked via a scale-bridging algorithm. On the coarse scale, continuum mechanics equations are solved explicitly over the entire geometry, meshed via standard Lagrangian or Eulerian methods. The fine scale model involves a simple explicitly molecular dynamics method using standard interatomic potentials. The scale bridging algorithm links the two models self-consistently within the transient simulation. For optimization and testing purposes, the two models can be run independently or coupled.	5/30/2012
12-046	C12072	dirbags.protore 1.x	A Python 2.x library to assist in the iterative creation of network protocol decoders.	5/30/2012

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12-047	C12048	Parallel UPC-IO 1.0	Parallel UPC-IO is an I/O library for the UPC programming language: http://upc.lbl.gov/ and is based off of the UPC-IO implementation from George Washington University: http://upc.gwu.edu/download.html . Parallel UPC-IO version 1.0 contains PLFS: http://institute.lanl.gov/plfs/ support to take advantage of parallel file systems. Many fixes were made to the original UPC-IO from, which is open sourced, and we would like to submit those fixes to George Washington University.	6/4/2012
12-049	C12043	TriCyCL 1.0.0	TriCyCL is a tridiagonal solver library for accelerated and heterogeneous architectures. It provides parallel tridiagonal solvers for symmetric positive-definite (SPD) matrices. The current implementation uses OpenCL 1.1 and provides C/C++ and Fortran interfaces. The underlying algorithm combines Wang's method with cyclic reduction to allow the solution of arbitrarily large systems.	6/5/2012
12-050	C13029	xRAGE, Version 1203.00	The codes are one-, two-, and three-dimensional, multi-material Eulerian hydrodynamics code developed by LANL for use in solving a variety of high deformation flow of materials problems. The codes has been applied in several areas of interest. Among the features and assumptions of the family of codes are the following: 1D Cartesian, cylindrical and spherical coordinate systems 2DCartesian and cylindrical coordinate systems 3D Cartesian coordinate system Adaptive mesh refinement (AMR) redefinition every cycle on a cell by cell basis. Every material in every cell possible. Pressure and temperature equilibrium for all materials in a cell. Strength with various flow rules and yield strength models. Unique crush curves for any or all materials. Higher order piecewise linear Godunov numerical method. Exact conservation of mass, momentum and energy. Dynamic program memory allocation. Built in problem setup. Built in generation of graphics and color movies during runtime. Dynamic mix. Material models for damage.	6/11/2012
12-051	C12045	xRAGE, Version 1109.00	The codes are one-, two-, and three-dimensional, multi-material Eulerian hydrodynamics code developed by LANL for use in solving a variety of high deformation flow of materials problems. The codes has been applied in several areas of interest. Among the features and assumptions of the family of codes are the following: 1D Cartesian, cylindrical and spherical coordinate systems 2DCartesian and cylindrical coordinate systems 3D Cartesian coordinate system Adaptive mesh refinement (AMR) redefinition every cycle on a cell by cell basis. Every material in every cell possible. Pressure and temperature equilibrium for all materials in a cell. Strength with various flow rules and yield strength models. Unique crush curves for any or all materials. Higher order piecewise linear Godunov numerical method. Exact conservation of mass, momentum and energy. Dynamic program memory allocation. Built in problem setup. Built in generation of graphics and color movies during runtime. Dynamic mix. Material models for damage	6/11/2012

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12-052	C12041	Petascale Artificial Neural Network PANN (aka NeuralViz) version 3	<p>Petascale Artificial Neural Network (aka PANN aka NeuralViz), version 3.x, is a software package implementing computer vision models and algorithms for object detection, segmentation and classification for video, imagery and signals. PANN's models and algorithms are inspired by neuroscience models of structure and learning in mammalian brain, expressed in the theoretical framework of hierarchical sparse representations over adaptive dictionaries. PANN is designed as a high performance parallel code using MPI to exploit multiple scalar or vector computing cores configured in a cluster, including GPU or CELL acceleration of cluster nodes. PANN is written primarily in C++, with specialized C used for accelerator nodes (GPU, CELL), and python code used for high level scripting and auxiliary tasks. Some IDL scripts are in the code base to implement prototype visualization and post-processing tasks, including scoring.</p> <p>PANN version 3 is a substantial revision of PANN earlier versions including:</p> <ol style="list-style-type: none"> 1. parallel application of sparse and dense representations using multiple representation approaches, 2. parallel learning of the dictionary using multiple dictionary update approaches, 3. competitive contextual analysis using unsupervised clustering of data in sparse representation space, 3. vector acceleration using XMM intrinsics when possible, 4. acceleration for NVIDIA GPU compute nodes using NVIDIA's CUDA development system, 5. acceleration for IBM CELL compute nodes using IBM software, <p>PANN version 3 uses three third-party libraries as modules to do basic software engineering tasks:</p> <ol style="list-style-type: none"> 1. output visualization results to screen using Simple Data Layer (SDL) 2. video file IO using FFMPEG 3. image (including non conventional multispectral and hyperspectral image) file IO using GDAL. 	6/12/2012
12-053	C12079	HAWCNest, Version 1-12-00	HAWCNest is an application framework. It provides interfaces that other developers code to so that their software can all be integrated easily. It is used by the High Altitude Water Cherenkov (HAWC) collaboration in building its reconstruction and analysis applications. The code manages the user-written component configuration and provides an event processing model. The capabilities are fully documented in a collaboration memo "HAWCNest: Design, Philosophy and Usage" which is distributed with the code.	6/14/2012
12-054	C12047	MPI To UPC 1.0	MPI To UPC is a partial MPI library that uses UPC for communication. MPI To UPC allows the user to use MPI programs in a UPC environment with zero modification to the code.	7/9/2012
12-056	C12040	SimCore_OSS, v1.0	SimCore is a C++ and Python object-oriented and templated library for distributed discrete-event simulation. A technical user manual is given in LA-UR-07-0590.	7/9/2012
12-058	C13012	CoCoMANS-Plasma: Plasma Physics Test and Evaluation Suite, Version 1	CoCoMANS-Plasma is a development framework and suite of small applications, or proxy apps", that are characteristic of dual-scale plasma physics applications. The coarse scale, or "low-order" application is accelerated through the use of a fine scale, or "high-order" computation that is dynamically linked to the low order computation. The low order solution is typically implemented as a solution of PDEs (partial differential equations) while the high order solution is implemented a particle pushing through a grid. The CoCoMANS-Plasma suite is used in a "co-design" role to iteratively develop numerical algorithms and accelerate their execution on heterogeneous computing hardware."	8/1/2012
12-059	C13011	CoCoMANS-Ocean: Ocean Circulation Test and Evaluation Suite, Version 1	CoCoMANS-Ocean is a suite of small applications, or proxy apps", that are characteristic of z-level, free-surface ocean applications. The properties of ocean physics elicit a split of the model into two components: a "low-order" component, the sea surface, where stiff physics from surface gravity waves live and a "high-order" component, below the surface. This split allows for the full-physics to be simulated without necessitating encumbering small time steps in both components. In addition, the interaction of the high-order and low-order components allows for "co-design" studies where the numerical algorithms and the acceleration thereof can inform each other as they are tested in heterogeneous computing environments."	8/1/2012
12-060	C12076	Super-Resolution (SuperRes), vBeta	SuperRes takes a set of greyscale low resolution (LR) multi-look imagery and creates a single high resolution (HR) "super-resolution" image. It does this by selecting one LR image as a master image, registers all the other LR imagery to the master, performs iterative restoration of the greyscale values, and then outputs these restored greyscale values to a finer output grid.	8/9/2012
2012-063	C12078	SimX - Parallel Simulations Made Easy	SimX is a C++ and Python object-oriented and templated library for distributed discrete-event simulation. A technical manual is given in LA-UR-07-0590.	8/30/2012

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2012-064	C12077	radbelt2d Version 0.1	<p>The code solves a generalized diffusion equation in two-dimensions with Dirichlet or Neumann boundary condition, which is used to study the dynamics of energetic particles in the Earth's radiation belt.</p> <p>The main code makes use of the following subroutines, depending on the particular solver employed:</p> <ol style="list-style-type: none"> 1. solver_CN_LU --> implicit 2nd order Cranck-Nicolson solver with LU decomposition 2. solver_CN_ILU_GMRES --> implicit 2nd order Cranck-Nicolson solver with ILU-GMRES solver 3. solver_ADI -> semi-implicit 2nd order Alternating Direction Implicit solver 	8/31/2012
2012-065	C13001	ExMatEx: Scale-Bridging Materials Test and Evaluation Suite, Version 1.0	<p>The ExMatEx Material suite is a collection of codes used to inform the co-design process for a next generation multi-scale materials application. Many codes represent individual physics scales and are use to help select the acceleration device that best executes the code for that scale. Some codes are designed to test very specific characteristics of acceleration devices such as cache performance and network bandwidth. Finally, a few codes will aggregate the smaller single-scale codes into a multi-scale materials proxy application to test overall functionality.</p>	9/17/2012
2012-066	C13004	Sequedex-contrib, Version 0.9	<p>Sequedex-contrib consists of open-source downstream analysis code to work with the sequedex software package for phylogentic and functional characterization of DNA sequences. Functions included in sequedex-contrib include a graphical user interface to control sequedex, plotting sequedex output, generating synthetic data, comparative analysis of one data set versus another, and tools to enable writing and reading sequedex-generated databases in various formats.</p>	9/27/2012
2012-067	C12080	CamControl, Version 0.4	<p>The software is a compiled Matlab GUI for controlling various types of cameras. Tested cameras are AVT Pike, Grasshopper and pco.edge. The software allows to change the exposure times, gamma-value and other parameters of these cameras.</p> <p>The software is designed as a tool to align a laser to best-focus. The software therefore tracks the laser spot and gives online line-outs of the focus-spot and also different values such as a strehl approximation, horizontal and vertical FWHM, ellipticity and peak intensity.</p>	9/27/2012
2012-068	C13003	LanIDSD v1.x	<p>LanIDSD in an implementation of the Detonation Shock Dynamics numerical method for computation of high explosive (HE) burn-front arrival times at specified locations on a hydro-dynamics mesh or grid (hydromesh). These DSD arrival times (burn times) are then used together with an appropriate HE energy release model during a hydro-dynamics code (hydrocode) simulation of an HE-driven problem.</p> <p>LanIDSD is composed of two components.</p> <ol style="list-style-type: none"> 1) The DSD solver, which employs an explicit, modified level-set, finite-difference scheme to generate the burn-front arrival times on a spatially-uniform DSD point grid. 2) The DSDdriver, which extracts geometric information from the initial hydro-dynamic simulation configuration (HE and surrounding inert material region definitions) to construct a static level-set function, by which the DSD solver apprehends the problem geometry. DSDdriver also provides other needed information (DSD material parameters, boundary condition specification, other user input) to the DSD solver and interpolates the DSD grid-based solution back onto the hydromesh. <p>DSDdriver was originally implemented as a stand-alone application, which would be executed following creation of an initial restart dump" by a supported hydrocode. The hydrocode would then read the DSD arrival times from file and proceed with tiem integration of the physics simulation. DSDdriver is now being extended to provide an application programming interface (API) which allows the DSD solution to be generated and interpolated to the hydromesh "in-line". LanIDSD is also being extended to run in parallel using a hydrocode-specific parallel-decomposition of the hydromesh for several supported hydrocodes."</p>	10/3/2012
2012-070	C13008	Pandemonium, version 2.0	<p>The Pandemonium codes are used to perform approximate dose analysis for glovebox systems. The geometry is constructed using two-dimensional planar geometry and the transport is in one-dimensional spherical geometry. The geometry allows for modeling of gloveboxes, hydrogenous shields, other shields, and detector points. The geometry is constructed in Microsoft Visio using a Visio stencil with the pertinent icons; a Visual Basic macro converts the geometry into a text file that is to be read into a fortran code that performs the dose calculation and outputs the data in text format. The code consist of the Visual Basic macro and the fortran dose calculation code.</p>	10/16/2012

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2012-071	C13009	MAMA, Version 1.0	Mama V1.0 is a C++ application that implements (and integrates) several general purpose image quantification algorithms. The main components of the code include: 1) A graphical user interface for viewing and interacting with images based on the open source FLTK widget library. 2) A number of image segmentation routines based on the open source ITK watershed implementation. 3) A number of segment quantification algorithms that measure color, shape, size attributes based on the open source OpenCV library. 4) A workflow tracking and storage system that enables users to backtrack and replay their image quantification based on the open source MySQL and SQLite databases. 5) A set of multi-image comparison tools based on the open source Orange machine learning library.	10/16/2012
2012-072	C13010	PFTOOL Version 2.0	PFTOOL is a parallel file operation tool for HPC clusters as well as personal computers that can walk across the filesystem using threads or MPI. Once a list of files is built, it can do operations such as copy, compare, or stat. This allows for parallel data movement and querying.	10/16/2012
2012-073	C13007	HKED_JNFL_x where x is 1,2,3,...9	The Hybrid K-edge/X-ray fluorescence Densitometer (HKED) software allows the collection and analysis of spectra from an HKED instrument. This instrument, also called a hybrid densitometer, uses an x-ray generator in conjunction with two separate x-ray detectors to determine the actinide content of a liquid sample.	10/16/2012
2012-074	C13016	CCSI 1MW Adsorber MFI Input Deck, Version 1.0	CCSI MFI input file and code modifications for the 1MW adsorber design.	10/16/2012
2012-075	C13013	MotorControl, Version 1.0	The software is a compiled Matlab GUI for controlling stepper and pico motors through LAN and SR232 serial interface, respectively. The software allows to control up to 9 stepper and 4 pico motors at once. If a Meilhaus AD card is installed, LVDT's can be used in a closed loop to control position of the different motors. The software is able to save and load motor positions, home the motors to these positions or do any other arbitrary movement.	10/16/2012
2012-076	C13015	Simple Buried Magnetic Dipole Model, Version 1	The Simple Buried Magnetic Dipole Model" is intended to provide simple estimates of the RF signals from buried magnetic dipole. It predicts the fields from magnetic dipoles in cylindrical coordinates, either in a uniform linear isotropic electrical medium, or in a space that consists of two half spaces interfacing at the plane z=0, with the upper half having the electrical properties of free space and the lower half having arbitrary isotropic linear conductivity and electrical permittivity. It takes a time series representation of dipole, a frequency dependent specification of the ground properties, and a specification of the problem geometry, and predicts the time dependent fields at the location of interest.	10/16/2012
2012-077	C13017	MSTK based Parallel Surface and Volume Unstructured Mesh Optimization - OptMesh	OptMesh is a library to optimize surface and volumes meshes with respect to either the condition number shape measure or reference Jacobian matrix measure. Minimizing the condition number based objective function improves the mesh as much as possible while minimizing the reference Jacobian matrix based objective function results in improvement of mesh quality while not allowing the mesh nodes to drift too far from their original positions. OptMesh can work on unstructured meshes of any element type including general polyhedra. The surface mesh optimization procedure optimizes the mesh while keeping the nodes on the original discrete surface. Both procedures are capable of smoothing distributed meshes in parallel.	10/25/2012
2012-078	C13014	HIGRAD_C	HIGRAD is a fluid dynamics model designed for application to complex atmospheric problems in which it is important to preserve high gradients. Various numerical schemes are options within HIGRAD, including a numerical scheme ideally suited for simulation of coupled fire/atmosphere and turbine/wind interactions. This latest version is written in C language (previously in Fortran).	10/16/2012
2012-079	C13018	CCSI Financial Risk Analysis Tool, Version 1.0	The CCSI Financial Risk Analysis Tool is an (Excel) spreadsheet model that estimates discounted present value of a stream of net revenues under alternative parameter values and distributions to determine how variation in technical performance and cost characteristics affect the profitability of carbon capture retrofits.	10/25/2012
2012-080	C13019	Static Kernel Analyzer (SKA), Version 1.x	SKA is a static kernel analysis tool that uses the LLVM intermediate representation (IR) of an input instruction stream coupled with an architecture specification to simulate the issue of instructions on the given architecture. This static simulation correctly models data-dependency hazards, i.e., data hazards excluding load/store operations, structural hazards and arbitrary multiple issue (depending on the capabilities of the architecture). SKA supports basic analysis of the resulting simulation, including the computation of various metrics such as algorithmic balance, strahler number, and spatial and temporal locality.	10/31/2012

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2012-081	C13020	ReactCFD-hpFE, Version 1.x	ReactCFD-hpFE (Reactive Turbulent Computational Fluid Dynamics using hp-adaptive Finite Element method software for solving the physics of multi-species turbulent reactive flow. \n\nThis construction is a Galerkin type Finite Element Method (FEM) solving conservative momentum, species, and energy transport equations along with two-equation turbulent models that uses the transcendental wall-law. The method also uses a Petrov-Galerkin (P-G) stabilization along with pressure stabilization. We employ hierarchical basis sets, constructed on the fly with enrichment in areas associated with relatively larger error as determined by the Zienkiewicz-Zhu stress-error estimation method among other error methods. \n\nThis is projection method that combines higher-order polynomial approximation for model dependent physical variables (p-adaptive) and grid enrichment (locally higher grid resolution – h-adaptive). The hp-adaptive FEM is at a minimum of: 2nd order in space and 3rd order on advection terms everywhere in the solution and is higher order when and where required as prescribed by the adaptive procedures. The system can include the KIVA multi-component spray model and reactive chemistry.	10/31/2012
2012-082	C13021	Spectrum Analysis Tools, Version October 23, 2012	Spectrum Analysis Tools is a package of functions intended to be called from other software for the purpose of analyzing a gamma-ray spectrum. It does not stand by itself at this time. Major functions include: Find Full-Width at Half-Maximum (FWHM) Curve - determine what the FWHM curve is for the spectroscopic detector used to acquire a spectrum. Find Peaks - Finds peaks in a spectrum or spectrum fragment. Fit Peaks - Fit peaks in a spectrum or spectrum fragment with a Gaussian function(s). Convolve Library - 'Smear' a gamma-ray library so that it reflects the FWHM curve for a given gamma-ray detector. Identify Nuclides - Determine which nuclide(s) are responsible for the peaks found in a spectrum. Analyze Region of Interest - Find and fit peaks in a spectrum fragment. Together, these functions can be used to determine what nuclides are present in front of a spectroscopic gamma-ray detector and help quantify them.	10/31/2012
2012-084	C13023	LaGriT, Version 3.x	Three-dimensional, moving adaptive, grid generation is an essential enabling technology allowing scientists and engineers to solve time-dependent, three-dimensional (3D) problems that use techniques such as finite-element methods. This software (LaGrit) provides a full set of grid generation and grid optimization tools for constructing and maintaining 3D unstructured grids.	11/1/2012
2012-085	C13024	The Zoo, version 1.0	The Zoo is a Scala framework for simulating contagious disease outbreaks among human and animal populations. The vector-borne spread of disease between human and zoonotic reservoirs can be modeled as well. The Zoo represents each individual in a simulation -- human, bird, mosquito, etc. -- as an independent agent. Agents can move between locations and exhibit behaviors (such as reproduction). Transmission is modeled between agents who are at the same location during a time step. Various aspects of a simulation can be exported after a run, including: aggregate numbers of species in a particular disease state, locations of individuals and their disease state, and the transmission network following the spread of the disease through the human and animal populations.	11/5/2012
2012-086	C13058	ionpython.py 1.X	This python code can analyze deep sequencing data from 454, Ion Torrent and Miseq sequencers. It finds all the HCDR3s present in the library and bins them by abundance.	12/6/2012
2012-087	C13063	MeGAMerge V-1.0	"MetaGenomic Assembly by Merging" (MeGAMerge) is a novel method of merging of multiple genomic assembly or long read data sources for assembly by use of internal trimming/filtering of data, followed by use of two 3rd party tools to merge data by overlap based assembly. The two tools utilized are Newbler (Roche), and minimus2 (part of the AMOS package), followed by specific mining of these results to make a final improved Metagenomic assembly.	12/11/2012

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2012-088	C13054	MAMBA (MPO Advanced Model for Boron Analysis), Version 1.x	MAMBA v1.x is a Fortran computer code which simulates the deposition/growth of crud on a single nuclear fuel rod in two-dimensions: the radial distance from the cladding surface (r) and the axial distance along the rod (z). A non-linear, two-dimensional heat transport equation is solved including heat sinks due to localized sub-cooled boiling within the crud layer. The boundary conditions include the heat flux at the cladding surface and the coolant temperature (or heat flux) at the crud's surface. An adaptive time-dependent computational grid is used which "grows" in the radial direction as the crud layer thickens due to the deposition of particulate nickel ferrite (NiFe_2O_4). The non-linear heat transport equation with heat sinks is solved using an iterative self-consistent solution approach based on finite differences and the Crank-Nicholson algorithm. The deposition rate of particulate nickel ferrite on the surface of the crud is governed by a temperature and concentration dependent first-order chemical kinetics rate equation. The deposition rate also increases over regions of localized sub-cooled boiling within the crud. The deposition rate of boron in the form of lithium tetraborate ($\text{Li}_2\text{B}_4\text{O}_7$) within the crud layer is also governed by a temperature and concentration dependent first-order chemical kinetics rate equation which increases in regions of localized sub-cooled boiling within the crud. The boron concentration within the crud is replenished by diffusion through the porous crud layer (convective transport due to boiling induced Darcy flow within the crud is ignored in v1.x, this effect is included in v2.x). In v1.x the micro-structure (i.e. porosity) of the crud layer is taken to be constant in time (time dependent porosity is included in v2.x).	12/3/2012
2012-090	C13056	MAMBA (MPO Advanced Model for Boron Analysis), Version 2.x	The MPO-crud modeling framework has been extended from 2D to 3D as documented by the release of the MAMBA 3D v2.0 Fortran computer code to CASL. Advanced engineering and microscale models have also been incorporated. In summary, a general non-linear, time-dependent 3D heat transport equation is solved to obtain the temperature distribution throughout the crud layer on a single pin (or on selected regions of a single pin). The heat transport solution also includes the localized heat sinks due to regions of sub-cooled nucleate boiling (SNB) which may be occurring inside the crud deposit. The rod heat flux at the cladding surface and coolant temperature (or flux) at the crud surface represent the external boundary conditions.	12/4/2012

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2012-091	C13026	CASA Grande (Containment Accident Stochastic Analysis GSI Resolution And Evaluation), Version 1.x	<p>CASA Grande was developed to assist the nuclear utility industry to achieve a risk-informed resolution to Generic Safety Issue (GSI)-191 with the Nuclear Regulatory Commission (NRC). GSI-191 involves the postulated break of a high-energy pipe with subsequent creation and transport of debris to the emergency recirculation sump strainers. Debris that passes through the strainer can also accumulate in fuel channels and lead to adverse impacts on reactor core cooling. Traditional analysis methods select conservative or bounding values for the many dozens of factors that are involved with the hand calculation needed to assess impacts to the plant from the postulated scenario.</p> <p>The CASA Grande software tool automates the evaluation of a single postulated accident so that thousands of possible scenarios can be assessed to generate a spectrum of possible outcomes that range from successful performance of the plant safety systems to "failure" states that are defined by regulatory levels of concern. Because all input factors have ranges of uncertainty, CASA statistically samples probability distributions defined for each factor and propagates the uncertainty on input factors into an assessment of uncertainty on the measures of failure. Nonuniform latin hypercube sampling (LHS) is used to sample and propagate uncertainty through a basic event scenario that includes: debris generation, debris transport, and debris accumulation. Inclusion of plant-state timing in the uncertainty sampling is a novel adaptation of LHS that generates randomized event sequences that are not easily handled by traditional probabilistic risk assessment (PRA) methods.</p> <p>The key capability of CASA for supporting a risk-informed resolution that is acceptable to the NRC is the ability to sample probability distributions defined for the annual frequency of pipe breaks as a function of break size. The frequency of the initiating event (a broken pipe) provides a weighting factor that places each postulated scenario on a comparative scale with all other events analyzed in the random spectrum. "Risk" is often defined as the product risk = outcome x frequency, so the fraction of all events that lead to failure is now properly weighted by their very low frequency of occurrence. CASA also provides diagnostic capabilities to help judge which factors of the analysis are dominating the scenarios that lead to failure. This information is of vital interest for improving plant safety with respect to this particular generic issue. Estimates of failure probability generated by CASA are designed to interface with existing plant PRAs so that traditional estimates of core damage frequency and large early release frequency can be updated with new failure paths that are represented by the debris-related phenomenology addressed in GSI-191.</p> <p>A complete CASA analysis of a specific power plant is data intensive, but all plant-specific information is provided through input files that are never embedded in the native code. This separation enables protection of proprietary information and avoids many information security issues involved with distribution and licensing of the tool itself. Plant information begins with a geometric representation of the piping, insulation and concrete barriers throughout the containment building. Complete CAD models can be imported into CASA for the purpose of computing location-specific debris volumes associated with random breaks at any location. Additional required information includes descriptions of temperature histories associated with various break sizes, and descriptions of the number of strainers and pumps that would participate in the accident response. Industry-standard information on debris behavior is imported as a default, but plant-specific, proprietary test data could also be used.</p>	11/20/2012
2012-093	C13053	HPSS	HPSS is a High Performance Storage System	12/3/2012
2012-118	C13059	Potential Energy Surface Tools (PESTO), Version 0.1.0	PESTO - Potential Energy Surface Tools - is a collection of Python modules created to facilitate molecular statics based energy calculations. The overall goal of PESTO is to provide the tools required to run an adaptive kinetic Monte Carlo simulation in order to simulate long time scales with work distributed across multiple processors using MPI.	12/6/2012
2012-119	C13057	iWASP Analysis Software, Version 0.5	The software is a GUI intend for analysis of data taken with an iWASP (ion wide angle spectrometer). The GUI is a complex set of tools. Other than just generating spectra from raw data, it allows to calculate basic stopping ranges of ions in some materials, generating a B-filed calibration, basic image manipulation and a set of tools to view the spectra. The software is work in progress!	12/5/2012

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2012-121	C13061	Bayes Inference Engine, Version 7.47	<p>The Bayes Inference Engine (BIE) has been developed at LANL, by WX-4 starting in 1993. Since 1996, the development and maintenance of the BIE has been collaboration with the AWE under the auspices of JOWOG 32. This collaboration was setup to advance the BIE to deal with ill-posed (limited data) radiographic problems in 2D and 3D density reconstructions using the Bayesian approach. In the Bayesian framework, all available information (data and prior information) can be combined in a logically consistent manner enabling scientists to carry out scientific inference or plausible reasoning in their analysis. The reconstructed density information is used for validating hydrocode models.</p> <p>In 2002 the AWE HD staff put the BIE under their Quality Assurance Program. This document draws heavily upon their work.</p> <p>The BIE is written using a variety of software languages. The user interfaces and basic operations are written in VisualWorks Smalltalk. The computational intensive operations are written in a combination of Smalltalk, C and FORTRAN languages. The Smalltalk, C and FORTRAN source code, User Manuals and Test Plans and Test Results will be controlled.</p> <p>The BIE Custodian is responsible for the Master copy of the source code. After modification or new procedures are tested and validated, the custodian will incorporate the code in the Master source code directory structure. Approximately 2 times per year, a new version of the BIE will be released.</p> <p>Third Party software includes the C and FORTRAN compilers obtained from Intel Corp. The HDF library obtained from NCSA, the TIFF and FFT libraries. The HDF, TIFF and FFT source code and libraries are included in the Master source code tree and is controlled with the LANL/AWE provided code.</p> <p>The Smalltalk, C and FORTRAN source code will be controlled and archived. The user documentation including "BIE Installation Guide", "BIE Running" and the "Instruction Manual" and the version release notes will be archived in the same off site location. The Smalltalk source code or changes sets (that code which is different from a standard image file) and the C and FORTRAN code are delineated in Appendix A. The current offsite location is /hps/u096280; a Source Forge depository in under development.</p> <p>As the developer/user community of this software is small, the Software Configuration Board consists of the Software Custodian and the developer or user requesting the change or addition. The Software Custodian is free to confer with others in making the decision whether the change should be made.</p> <p>Each glyph in the BIE performs a specific task. The glyphs will therefore require statements of how they are expected to work against which they can be tested. While the individual glyphs of the BIE were tested by the person who wrote the code, these records are not available.</p>	12/11/2012
2012-122	C13062	CO2-PENS, V1.X	<p>CO2-PENS is a system model that links together process-level modules that describe the entire CO2 sequestration pathway, starting from capture at a power plant and following the CO2 through pipelines to the injection site and into the storage reservoir. After injection, simulation of CO2 migration continues through the subsurface where it may mineralize, dissolve into brine, or react with wellbore casing or grout. CO2 that may escape from the storage reservoir is followed along pathways that lead back toward the surface, including leaking wellbores and faults. The system level of the CO2-PENS model manages global variables (e.g., CO2 mass balance, CO2 mass flow rate, and costs) and is being developed using the commercially available software package GoldSim.</p>	12/11/2012
2012-123	C13064	v2-test, version 1	<p>v2-test is a web application prototype for the next generation of LDRD's business management system. It is built using ICEfaces software components and is being released to vendor ICEsoft to allow LDRD's developers to communicate about software issues with the ICEfaces engineers under a support contract. No proprietary LANL information is included in the application.</p>	12/13/2012

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2012-124	C13065	ProjectWise Dashboard add-on, version 1.0	The software is coded entirely in JAVA. It provides for a graphical interface that reads data out of an Oracle database. The software is custom built to read data stored in a particular schema for a COTS software package, ProjectWise, that is manufactured by Bentley. No ProjectWise code, structures, or copy writable information is used in this software. It acts as a third party software that simply reads data collected via ProjectWise that is stored in an Oracle database. ProjectWise stores data related to automated workflow packages. This data includes file names, time stamps of when a file was opened and closed, when the file was moved between people accessing the file, and other file and time related information. This data exists as entries in a standard Oracle database. This software allows a user to select what workflow package they want information on, and will then pull information related to any file inside the database related to that workflow. Standard JAVA UI and graphics methods and classes are used, as well as standard classes for file handling. No unique methods and classes were created. No third party, copy writable, licensed or other author works is utilized in this software.	12/13/2012
2012-125	C13066	ChemPac, Version 3.x (Chemical kinetics coupled with Particle Convection/diffusion)	ChemPac v3.x is a FORTRAN computer code which couples multi-phase, multi-species chemical kinetics with particle/heat transport via convection (due to fluid flow) and/or diffusion (due to gradients). The transport solver is a general non-linear solver which is capable of computing the temperature and/or species concentration distribution given a user specified set of boundary and initial conditions. The boundary conditions can be specified using either Dirichlet (value) type: temperature/concentration, or von Nuemann (gradient) type: heat/concentration flux. Localized, time-dependent heat or species sources (e.g. due to radiation and chemistry) or sinks (e.g. due to evaporation, chemistry) can be included. The thermal/particle diffusivity may also depend upon the local temperature, species concentration, microstructure, or other variables. The resulting set of non-linear equations is solved using an iterative solution technique within a Crank-Nicholson finite-difference representation. A two- (2D) or three- (3D)-dimensional computational grid is supported using either Cartesian (x,y,z) or cylindrical (r, theta, z) coordinate systems. The computational domain can be static or time-dependent. A novel time-dependent (adaptive) surface grid can be used to model surface growth or "surface deposition" (e.g. due chemical vapor deposition, corrosive film growth, etc.). The grid is capable of "discretizing" arbitrary 2D or 3D geometries, multiple material types, and boundaries. Surface diffusion along the boundaries including the various fluxes between the different material interfaces can also be treated. Microstructure effects (such as porosity and tortuosity) on the various material transport properties and chemistry can also be included (these properties can be time-dependent). Subgrid models are used for including various micro-scale physics and chemistry, such as: crack formation, radiolysis, fluid flow, boiling, evaporation, volume expansion due to phase changes (e.g. hydrating), and other material changes (e.g., strength reduction associated with the polymeric molecular weight decrease due to hydrolysis). At each grid point and time step, a set of user specified chemical kinetics equations are solved numerically using Gear's method with automatic time step refinement. The number of coupled kinetics equations can vary from 1-200 (typical applications use on the order of 5 to 20 equations). The local temperature and species concentrations computed by the transport solver provide the local conditions for the chemical kinetics solver. The local change in the various species concentrations due to the chemical kinetics (and/or subgrid microscale models) is then fed back to the macro-scale transport solver as an effective time-dependent localized "source" or "sink". "	12/20/2012
2012-128	C13069	Randomized_Select_GPU 1.0_controlled	This code is an implementation of a randomized selection algorithm, implemented on the GPU using CUDA. The description of the basic selection problem (but not this algorithm) is found in Art of Computer Programming, vol. 3: Sorting and Searching" by Donald Knuth.	12/20/2012
2012-129	C13070	Mimetic Inspired Semi-Lagrangian Hydro Approach for ALE (MISHALE), Version 1.x	MISHALE is a one-/two-dimensional Lagrangian based Arbitrary Lagrangian-Eulerian (ALE) /Reconnection Arbitrary Lagrangian-Eulerian (Re-ALE) hydrocode. The code can be used to solve large deformation problems in solids and fluids. At heart of the algorithm implemented in the code is a second-order, cell-centered Lagrangian scheme formulated for both solids and fluids, and for polygonal meshes. A Hypo-elasto-plastic model based on J2 Von Mises yield condition is implemented for modeling the solid deformation. For ALE, MSTK based mesh (optimization) smoothing library is used. For the ReALE part, a voronoi generator library is used along with a suitable smoothing and reconnection algorithm is used. The remapping approach is based on a center of mass based reconstruction, which in turn ensures monotonicity of the reconstructed and remapped variables. The code is primarily written in C with a few fortran libraries. Most of the methods implemented in this code have been published and a few of them are currently being written for publication.	12/20/2012
2012-130	C13071	zcode, Version 1.0	zcode is an energy transfer code. It takes a system with three species---radiation, electrons, and ions---and evolves the temperatures of these species over time according to the LTE radiation and material energy equations. A 1D slab geometry is used. Radiation transfer, electron conduction, absorption and emission, Compton scattering, and electron-ion coupling are considered. Radiation transfer is treated either in an angle- and frequency-dependent manner using Monte Carlo techniques, or in a angle- and frequency-averaged flux-limited diffusion manner using discrete, matrix solve techniques.	12/20/2012