Xyce™ Parallel Electronic Simulator
Version 6.9 Release Notes

Sandia National Laboratories

May 29, 2018

The ***Xyce***™ Parallel Electronic Simulator has been written to support the simulation needs of Sandia National Laboratories' electrical designers. ***Xyce***™ is a SPICE-compatible simulator with the ability to solve extremely large circuit problems on large-scale parallel computing platforms, but also includes support for most popular parallel and serial computers.

For up-to-date information not available at the time these notes were produced, please visit the ***Xyce***™ web page at `http://xyce.sandia.gov`.

Contents

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New Features and Enhancements

New Devices and Device Model Improvements

- The VBIC 1.2 (Level=10) model has been deprecated since **Xyce** Release 6.6. It is still available in **Xyce** 6.9, but is unmaintained and will be removed in a future release. To remind users that this model is slated for future removal, **Xyce** will show the text "`*DEPRECATED*`" next to the model name in the device count summary.
- The Analog Behavioral Modeling (ABM) devices have been improved to handle "instantaneous transitions" which, for example, can be caused by IF statements in controlled sources. Those instantaneous transitions can cause convergence problems. The improved ABM devices can now provide smooth transitions in the simulation, and that feature can be enabled by specifying device options and instance parameters.

Enhanced Solver Stability, Performance and Features

- **Xyce** now provides three different device distribution strategies that can be controlled through the '`.OPTIONS DIST`' control line in the netlist. For flattened or post-layout netlists, these new strategies can provide improved parsing and simulation performance. See the Users' Guide chapter on "Guidance for Running Xyce in Parallel."

Interface Improvements

- Expression library now supports `floor` and `ceil` functions.
- Connectivity checker that ensures all voltage nodes have a DC path to ground has been fixed to remove limit of 10 lead groups. Parallel implementation of this check has been rewritten to eliminate performance issues.
- The -o command line option (which places the simulation results into the specified file) may be deprecated in a future release. See the entry for SON Bug 911 in the Fixed Defect Table for the recommended usage of the FILE= qualifier for .PRINT lines.
- .MEASURE and -remeasure are now supported for .DC analyses.
- Doping profiles for one-dimensional TCAD devices can now be specified using expressions.
- It is now possible to explicitly set time integration breakpoints from the netlist.
- It is now possible to specify a list of discrete timepoints for output.

Deployment Improvements

- Important new information regarding use of OpenMPI on Linux systems has been added to the Users' Guide "Guidance for Running Xyce in Parallel" chapter. *It is recommended that all users of parallel Xyce on Linux read this new section!*

Defects Fixed in this Release

Table 1: Fixed Defects. Note that we have two different Bugzilla systems for Sandia users. SON, which is on the open network, and SRN, which is on the restricted network.

Defect	Description
972-SON: Some of the parameter names for the transient sources were incorrect in the **Xyce** Reference Guide	The parameter names for the `SIN`, `PULSE`, `EXP` and `PWL` sources were incorrect for the I device. The parameter names for the `SFFM` source were incorrect for both the V and I devices. This has been fixed now.
957-SON: Segfaults during device instance-line processing	**Xyce** could segfault on improperly formatted device instance lines. Examples included invalid X device lines and invalid composite parameter definitions on YPDE device lines. This is fixed now.
955-SON: Improper handling of netlist lines that only contain an inline comment	If a netlist line only contained an inline comment (e.g., the line started with a semicolon) then **Xyce** would all treat subsequent netlist lines as comment lines. This is fixed now.
948-SON: Stepped parameter values are wrong in the ZONE data in .HOMOTOPY.dat files.	The values in the ZONE data in the **Xyce**-generated .HOMOTOPY.dat files were incorrect when `.PRINT HOMOTOPY FORMAT=TECPLOT` was used with `.STEP` They would either be "all zeroes" or the values from the previous step, rather than the correct values for the current step. This is fixed now.
942-SON: Fix issues with ordering of .PRINT AC_IC and .PRINT AC lines, and of .AC and .OP statements in a netlist	If an explicit .PRINT AC_IC line came before a .PRINT AC line in a netlist then **Xyce** would fail to run. In addition, the output from an explicit .PRINT AC_IC line could contain "extra columns" that were on the .PRINT AC line but not on the .PRINT AC_IC line. Finally, the .PRINT AC_IC behavior could depend on the relative ordering of the .OP and .AC lines. This is fixed now.
930-SON: Fix and improve information sent to stdout for .NOISE	The stdout for a `.NOISE` analysis was incorrect when `.STEP` was used. The values output for the "Total Output Noise" and "Total Input Noise" were wrong. This is fixed now. As an improvement, the stdout for `.NOISE` analysis with `.STEP` now also includes the values of the stepped parameters.
715-SON: I(*) for subcircuit devices does not work properly on .PRINT lines	A bug in the handling of the wildcard expression for branch currents (I(*)) led to **Xyce** emitting a "Netlist Error" about an undefined function or variable if any voltage sources appeared inside subcircuits in the netlist. This bug was fixed, and **Xyce** will now properly output the branch currents for voltage sources inside subcircuits. Only currents associated with devices for which the current is a solution variable are printed by this wildcard. Voltage sources and inductors are the primary devices of this sort. Lead currents of other devices, for which the current is not a solution variable, are not included.
618-SRN: Fix FORMAT=CSV output for sensitivity output	The print format `FORMAT=CSV` was nominally supported for `.PRINT SENS` and `.PRINT TRANADJOINT` in previous **Xyce** releases. However, the resultant output files had .prn extensions rather than .csv extensions. This is fixed now.
2107-SRN and 2109-SRN: Fix segfaults and inscrutable error messages when parsing vector composite parameters and MPI hangs when parsing .model statements	Misformated vector composite parameters could cause **Xyce** to either segfault or emit inscrutable error messages when parsing device models. The triggering of some existing **Xyce** error/warning messages for misformatted `.MODEL` statements could cause **Xyce** to hang during parallel execution. These issues have been fixed.

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Defect	Description
977-SON: .MEASURE FOUR is incorrect after the first solve using .STEP	A failure to reinitialize some internal storage variables in the FOUR measure code resulted in incorrect values after the first solve of a .STEP analysis. This is fixed now.
1001-SON: Improve Bsrc that leads to convergence problems	The users can specify expressions that have instantaneous transitions with ABM devices. This can lead to convergence problems when **Xyce** reaches the transition point. The improved ABM devices now allow smooth transitions and can be enabled by specifying device options and instance parameters.
37-SON: Connectivity checker is broken if netlist contains any node with more than 10 connected leads	The topology of any circuit is checked to ensure that there is a DC path to ground for all voltage nodes. This code artificially limited the number of lead groups to 10. Furthermore, the parallel implementation of this topology check exhibited severe performance issues for certain circuit topology structures. These issues have been fixed.
980-SON: Example .LIB statement that "swallows" the rest of the **Xyce** netlist	**Xyce** supports the HSPICE .LIB syntax, but in some instances the parser would attempt to treat `.LIB <name>` statements the same as `.INC <name>` statements. The logic that supported this was flawed and has been removed. Now **Xyce** rigorously supports the HSPICE .LIB syntax where there is a library definition (`.LIB <library_name>`) and a library inclusion (`.LIB <library_file> <library_name>`). Incorrect use of .LIB will now return informative errors.
702-SON: Expressions that use vsrc-currents (in Bsrc's or in .SENS objfunc specifications) can produce wrong derivatives	This problem was caused by an obscure issue in the expression library, and it could result in incorrect derivatives. When this issue was invoked via a sensitivity calculation it resulted in incorrect answers. When the issue was present in Bsrc devices, it potentially impacted convergence and robustness. This issue has been fixed.
772-SON: Order of analysis statements can cause transient sensitivity calculation to incorrectly exit with error.	**Xyce** used to allow only a single `.PRINT` statement to be present in the netlist file, and that single `.PRINT` statement had to explicitly refer to the analysis type that was invoked by that file. To insure this, the parser contained some error traps for this. In other words, if the user specified transient analyis, but then invoked `.PRINT DC` that would result in an error. The code for this error trap was fragile, and not properly updated when **Xyce** was updated to handle multiple `.PRINT` lines. As a result sometimes a fatal error would get improperly thrown. This issue, as it pertains to transient sensitivity analysis, has been fixed.
774-SON: Improperly posed objective function causes sensitivity analysis to coredump.	Error handling code was missing from the sensitivity analysis functions in the **Xyce** source. As a result, even if the user-specified objective function expression was not parsable, **Xyce** would still attempt to compute sensitivities, causing a coredump. Error handling code has been added to **Xyce** to address this issue.

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Defect	Description
963-SON: expression library SDT function doesn't work on .PRINT line, and has lots of other problems	The expression library supports numerical time integration with the SDT function. This function is intended to work in both Bsrc devices and also in expressions on the `.PRINT` line. Unfortunately, there were several bookkeeping problems in the SDT source code, which prevented this feature from producing correct answers in a variety of `.PRINT` line use cases. These issues have been fixed.
978-SON: Vcvs (E-source) device can't be used with PDE devices present in circuit	PDE devices (TCAD devices) are often solved using methods that filter out the external circuit for certain phases of the solve. In order to support this filtering, non-Ohmic devices (such as Vsrcs and E-sources) are required to conditionally support diagonal matrix elements in their matrix stamp. Most independent sources in **Xyce** have conditionally supported diagonal matrix elements for a long time, but the E-source was neglected. The E-source has been updated now, so it will work properly in circuits containing TCAD devices.
1007-SON: Wrong nonlinear solver used for the TRANOP phase when running a `.STEP` analysis of a transient	This issue affected some transient calculations performed inside of a `.STEP` loop. **Xyce** uses a different nonlinear solver for the DCOP phase and time stepping phases of transient calculations. (When running in transient, the initial DCOP calculation is sometimes referred to as TRANOP) When performing a `.STEP` loop around a `.TRAN` analysis, the DCOP solver should be re-established at the beginning of each `.STEP` iteration. It was not, so the transient solver was used on all DCOP calculations other than the first one. As a result, various features unique to the DCOP solver didn't work, except on the first pass. These features include the use of `.IC` and GMIN stepping, among others. This issue has been fixed, and the DCOP solver is properly reallocated and reinitialized at the beginning of each `.STEP` iteration.

Interface Changes in this Release

Table 2: Changes to netlist specification since the last release.

Change	Detail
The FORMAT=PROBE and FORMAT=RAW print formats for .PRINT SENS output have changed	Those two print formats are still unsupported for .PRINT SENS output. However, they now default to FORMAT=STD with the file extensions of ".SENS.prn." In earlier versions of **Xyce**, their format was FORMAT=NOINDEX.
The FORMAT=PROBE and FORMAT=RAW print formats for .PRINT TRANADJOINT output have changed	Those two print formats are still unsupported for .PRINT TRANADJOINT output. However, they now default to FORMAT=STD with the file extensions of ".TRADJ.prn." In earlier versions of **Xyce**, their format was FORMAT=NOINDEX.
The expression package now supports floor and ceil functions	Support for floor (greatest integer less than or equal to argument) and ceil (smallest integer greater than or equal to argument) functions has been added to the expression package, and these functions may be used anywhere expressions are valid. Note that because the functions are discontinuous, use in B source expressions could lead to timestep-too-small errors in some cases, as documented in the Users' Guide chapter on ABM guidance.
The allowed syntax for .LIB statements was changed	**Xyce** now rigorously supports the HSPICE .LIB syntax where there is a library definition (.LIB <library_name>) and a library inclusion (.LIB <library_file> <library_name>). The use of .LIB <name> as a synonym for .INC <name> is no longer supported.
A new .OPTIONS DIST category to support parallel distribution options	There is a new .OPTIONS DIST category to support parallel distribution options that a user can use to improve the parallel performance of **Xyce**. At this time the only option available is STRATEGY, which can be used to select the device distribution strategy being used by **Xyce**. The new options are described in the Users' Guide chapter on "Guidance for Running Xyce in Parallel".

Known Defects and Workarounds

Table 3: Known Defects and Workarounds.

Defect	Description
1009-SON: Transient adjoint sensitivities don't work with `.STEP`	Transient adjoint sensitivities require backward integrations to be performed after the primary transient forward integration. Doing this properly requires information to be stored during the forward solve, and for certain bookkeeping to be performed. Currently, these extra operations to support transient adjoints are not properly set up for `.STEP` analysis. ***Workaround***: None
1006-SON: SDT (expression library time integration) derivatives are not supported, so SDT can't be used for sensitivity analysis objective functions	SDT is a function supported by the **Xyce** expression library to compute numerical time integration. When this function is used, the expression library does not produce correct derivatives. This impacts Jacobian matrix entries, when SDT is used with a Bsrc, and it also impacts sensitivity analysis, when SDT is used in an objective function. For the former case, this can result in a lack of robustness for circuits that contain SDT-Bsrc devices. For the latter case, the objective function will simply be incorrect. ***Workaround***: None
991-SON: Non-physical BH Loops in non-linear mutual inductor	Nonlinear mutual inductors that have high coupling coefficients (i.e. model parameter `ALPHA` over 1.0e-4) and low loss characteristics (i.e. zero `GAP`) can produce B-H loops with nonphysical hysteresis. ***Workaround***: Lower `ALPHA` values or larger `GAP` values can ameliorate this issue, but the root cause is still under investigation.
989-SON: I(*) will not print branch currents that are part of a Y device	Bug 715-SON (I(*) for subcircuit devices does not work properly on .PRINT lines) was fixed for the **Xyce** 6.9 release. The caveat is that I(*) still does not work for branch currents that are part of a Y device. ***Workaround***: Explicitly request those Y-device branch currents on the `.PRINT` line.
971-SON: Use of default device parameter syntax on a .PRINT line causes **Xyce** to print 0 for that parameter	This line (`.PRINT TRAN R1`) will cause **Xyce** to print 0 for the resistance value of R1. ***Workaround***: Use `.PRINT TRAN R1:R` instead.
970-SON: Some devices do not work in frequency-domain analysis	Devices that may be expected to work in AC or HB analysis do not at this time. This includes, but is not limited to, the lossy transmission line (LTRA) and lossless transmission line (TRA). ***Workaround***: The LTRA and TRA models will need to be replaced with lumped transmission line models (YTRANSLINE).
967-SON: Zoltan segmentation fault with OpenMPI 2.1.x and 3.0.0 on some systems	It has been observed that when **Xyce** and Trilinos are built with OpenMPI 2.1.x or 3.0.0 a small number of test cases in the regression suite crash with a segmentation fault inside the Zoltan library. To date, these versions of OpenMPI versions have only been tested on FreeBSD, and we do not know if this bug is present on other systems.
966-SON: Improve Compatibility of -r command line option with multifile output	If the -r command line option is used to get RAW file output then any `.PRINT SENS` or `.PRINT HOMOTOPY` lines in the netlist will be silently ignored. ***Workaround***: Re-run the netlist without the -r command line option.

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Defect	Description
964-SON: Compatibility of .PRINT TRANADJOINT with .STEP	The use of `.PRINT TRANADJOINT` is not compatible with `.STEP`. The resultant **Xyce** output will not be correct. ***Workaround***: There is none.
941-SON: Extra columns in .hb_ic.prn and .startup.prn files when separate .PRINT HB_TD and .PRINT HB_FD lines are used in a netlist	The columns in those two output files will be the combination of the columns requested by the `.PRINT HB_TD` and `.PRINT HB_FD` lines. ***Workaround***: Use explicit `.PRINT HB_IC` and `.PRINT HB_STARTUP` lines instead, to get the correct versions of those two files.
939-SON: Invalid fields (XBEGIN, XEND and SUBTITLE) in **Xyce**-generated HOMOTOPY.csd files	The fields in the #H header block of the .HOMOTOPY.csd files are currently hard-coded to 0 and 1, respectively. The `SUBTITLE` field is incorrect for `.STEP` data. It is missing the values for the stepped parameters. ***Workaround***: There is no workaround for the `XBEGIN` and `XEND` issue. However, it should not affect the "viewability" of those files in the PSpice A/D viewer. The workaround for the `SUBTITLE` issue is to put the stepped parameters on the `.PRINT HOMOTOPY` line.
932-SON: Analysis lines do not support expressions for their operating parameters	The **Xyce** parser and analysis handlers do not yet support the use of expressions on netlist analysis lines such as `.TRAN`. The parameters of these analysis lines (such as stop time for `.TRAN` or fundamental frequency for `.HB`) may only be expressed as literal numbers. ***Workaround***: There is no workaround internal to **Xyce**. Use of an external netlist preprocessor would be required.
928-SON: The .hb_ic.prn file can be incorrect when .STEP is used with .HB	**Xyce** should only output the initial condition (ic) data for the accepted tolerance in the `<netlist-name>.hb_ic.prn` file. However, it currently outputs all of the intermediate ic data while harmonic balance tries to find a good tolerance if `.STEP` is used with `.HB`. ***Workaround***: There is no workaround.

911-SON: Improve compatibility of multi-file output with the -o command line option	If **Xyce** is invoked with the -o command line option then the output may be "interleaved" in one file rather than appearing correctly in multiple files. For example, if the netlist `example.cir` has these two `.PRINT` lines:
	`.PRINT TRAN V(1)`
	`.PRINT HOMOTOPY V(1)`
	and is invoked with `Xyce -o output.text example.cir` then the output that would normally appear in separate `example.cir.prn` and `example.cir.HOMOTOPY.prn` files would be jumbled together in the single file `output.txt`. This may not be what the user intended.
	Workaround: There are two workarounds. First, don't use -o if your netlist could output more than one file. Instead, use separate `FILE=` qualifiers on every `.PRINT` line. Second, use -o if desired but add `FILE=` to every `.PRINT` line other than `.PRINT TRAN` and `.PRINT DC` lines in your netlist.

883-SON .PREPROCESS REPLACEGROUND does not work on nodes referenced in expressions	The `.PREPROCESS REPLACEGROUND` feature does not replace ground synonyms if they appear in B source expressions. ***Workaround***: Do not use ground synonyms (`GND`, `GROUND`, etc.) in expressions. Use a literal "0" when referring to the ground node in expressions.

Table 3: Known Defects and Workarounds.

Defect	Description
855-SON: Missing error message when a netlist uses an operator (e.g., IR or P) that is not supported for .AC analyses	This is related to SON Bug 718. **Xyce** will output all zeroes or all NaNs, for the requested quantity, when a netlist uses an operator (e.g., `IR` or `P`) that is unsupported for .AC analyses. Instead, **Xyce** should report a netlist-parsing warning or error for this case. ***Workaround***: There is none, other than noticing that an output waveform value is unexpectedly all zeroes or all NaNs.
812-SON: Undocumented limitations on, and bugs with, parameter and global parameter names	Based on external customer input and pre-release testing, there are some bugs and undocumented limitations on parameter and global parameter names in **Xyce**. Parameters and global parameters should start with a letter, rather than with a number or "special" character like #. In addition, the use of a single character V as a global parameter name can result in either netlist parsing failures or incorrect results from `.PRINT` lines.
807-SON: BSIM4 convergence problems with non-zero rgatemod value	There have been reports of convergence problems (e.g., the **Xyce** simulation fails part way through and says that the "time step is too small") when the `rgatemod` parameter is non-zero.
794-SON: Bug in TABLE Form of **Xyce** Controlled Sources	In some case, a **Xyce** netlist that contains a controlled source that uses the TABLE form will get the correct answer at first. However, it may then "stall" (e.g, keep taking really small time-steps) and never complete the simulation run. ***Workaround***: In some cases, the TABLE specification for the controlled source can be replaced with a Piecewise Linear (PWL) source that uses nested IF statements.
783-SON: Use of ddt in a B-Source definition may produce incorrect results	The `DDT()` function from the **Xyce** expression package, which implements a time derivative, may not function correctly in a B-Source definition. ***Workaround***: None.
727-SON: **Xyce** parallel builds hang randomly on OS X	During Sandia's internal nightly testing of the OSX parallel builds, we see that **Xyce** "hangs on exit" with an estimated frequency of less than 1-in-5000 simulation runs. We have not seen this issue with parallel builds for either RHEL6 or BSD. The hang is on exit, whether on a successful exit or on an error exit. The hang occurs after all of the **Xyce** output has occurred though. So, the user will get their sim results, but might have trouble if the individual **Xyce** runs are part of a larger script. ***Workaround***: None.
718-SON: Missing error message for invalid nodes in expressions on .PRINT lines	If an invalid node is specified on a **Xyce** `.PRINT TRAN` line then **Xyce** should return a fatal error during netlist parsing (e.g., `.PRINT TRAN V(BOGONODE)` will produce an error message of `undefined symbol in .PRINT command: node BOGONODE`, if `BOGONODE` does not exist in the netlist). However, if the invalid node is inside a **Xyce** expression (e.g., `.PRINT TRAN {V(BOGONODE)}`) then **Xyce** will not produce an error message during netlist parsing and the output value for `{V(BOGONODE)}` will be zero for all time-steps. ***Workaround***: There is none, other than noticing that an output waveform value is unexpectedly all zeroes, and correcting the `.PRINT` statement.

Table 3: Known Defects and Workarounds.

Defect	Description
707-SON: Behavior for invalid nodes on .FOUR lines and in .MEASURE statements	There are issues with `.FOUR` lines and `.MEASURE` statements that accidentally use node names that are not in the netlist. In that case, the `.cir.four` output file will contain a mix of all zero's and NaN's, and **Xyce** will not produce a warning or error message about the invalid node name. Similarly, the measure statement will run without a warning message about the invalid node name. The measure result will then be zero, rather than FAILED.
661-SON Branch currents and power accessors (I(), P() and W()) do not work properly in .RESULT Statements	There are two issues. First, `.RESULT` statements will fail netlist parsing if the requested branch current is omitted from the `.PRINT TRAN` line. As an example, this statement (`.RESULT I(R1)`) requires either `I(R1)`, `P(R1)` or `W(R1)` to be on the `.PRINT TRAN` line. Second, the output value, in the `.res` file, for the lead current or power calculation will always be zero.
652-SON: HB output is buggy	While a straightforward use of `.print HB` works as described in the users and reference guides, several of the documented features do not work as intended. `.print HB_FD` and `.print HB_TD` are intended as a way of specifying variable lists for frequency- and time-domain outputs, respectively. It has been discovered that these only produce output if there are print specifications for *both* frequency and time domain. That is, if only one of `.print HB_FD` or `.print HB_TD` is present in the netlist, no output will be produced at all. ***Workaround***: When performing harmonic balance analysis, always specify enough print lines so that both time- and frequency-domain variables are output. This could be by specifing `.print HB` alone, by specifying both `.print HB` and `.print HB_TD`, or by specifying both `.print HB_FD` and `.print HB_TD`.
583-SON: Switch with RON=0 leads to convergence failure.	The switch device does not prevent a user from specifying `RON=0` in its model, but then takes the inverse of this value to get the "on" conductance. The resulting invalid division will either lead to a division by zero error on platforms that throw such errors, or produce a conductance with "Not A Number" or "Infinity" as value. This will lead to a convergence failure. ***Workaround***: Do not specify an identically zero resistance for the switch's "on" value. A small value of resistance such as 1e-15 or smaller will generally work well as a substitute.
469-SON: Belos memory consumption on FreeBSD and excessive CPU on other platforms	Memory or thread bloat can result when using multithreaded dense linear algebra libraries, which are employed by Belos. If this situation is observed, either build **Xyce** with a serial dense linear algebra library or use environment variables to control the number of spawned threads in a multithreaded library.
468-SON: It should be legal to have two model cards with the same model name, but different model types.	SPICE3F5 and ngspice only require that model cards of the same type have unique model names. They accept model cards of different types with the same name. **Xyce** requires that all model card names be unique.

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Defect	Description
250-SON: NODESET in **Xyce** is not equivalent to NODESET in SPICE	As currently implemented, `.NODESET` applies the initial conditions given throughout a full nonlinear solve for the operating point, then uses the result as an initial guess for a second nonlinear solve with no constraints. This is not the same as SPICE, which merely applies the given initial conditions to a single nonlinear solve for the first two iterations, then lets the problem converge with no further constraints. This can lead to a **Xyce** `.NODESET` failing where the same netlist in SPICE might not, if the initial conditions are such that a full nonlinear solve cannot converge with those constraints in place. There is no workaround.
247-SON: Expressions don't work on .options lines	Expressions enclosed in braces ({ }) are handled specially throughout **Xyce**, and may only be used in certain contexts such as in device model or instance parameters or on `.PRINT` lines.
49-SON Xyce BSIM models recognize the model TNOM, but not the instance TNOM	Some simulators allow the model parameter TNOM of BSIM devices to be specified on the instance line, overriding the model parameter TNOM. **Xyce** does not support this.
27-SON: Fix handling of .options parameters	When specifying .options for a particular package, what gets applied as the non-specified default options might change.
1962-SRN: Voltages from interface nodes for subcircuits may not work correctly in expressions on `.PRINT` lines	An expression that uses a voltage from an interface node to a subcircuit on a `.PRINT` line may only work if that voltage node is also used outside of the expression on the `.PRINT` line. A simple example is as follows. The expression `{V(X1:a)*I(X1:R1)}` prints out as 0, unless `V(X1:a)` is also on the `.PRINT` line.
1923-SRN: LC lines run out of memory, even if equivalent (larger) RLC lines do not.	In some cases, circuits that run fine using an RLC approximation for a transmission line, exit with an out-of-memory error if the (supposedly smaller) LC approximation is used.
1595-SRN: **Xyce** won't allow access to inductors within subcircuits for mutual inductors external to subcircuits	It is not possible to have a mutual inductor outside of a subcircuit couple to inductors in a subcircuit. ***Workaround***: Put all inductors and mutual inductance lines that couple to them together at the same level of circuit hierarchy.

Supported Platforms

Certified Support

The following platforms have been subject to certification testing for the **Xyce** version 6.9 release.

- Red Hat Enterprise Linux® 7, x86-64 (serial and parallel)
- Red Hat Enterprise Linux® 6, x86-64 (serial and parallel)
- Microsoft Windows 10®, x86-64 (serial)
- Apple® OS X Sierra, x86-64 (serial and parallel)

Build Support

Though not certified platforms, **Xyce** has been known to run on the following systems.

- FreeBSD 10.x on Intel x86-64 architectures (serial and parallel)
- Distributions of Linux other than Red Hat Enterprise Linux 6
- Microsoft Windows under Cygwin and MinGW.

Xyce Release 6.9 Documentation

The following **Xyce** documentation is available on the **Xyce** website in pdf form.

- **Xyce** Version 6.9 Release Notes (this document)
- **Xyce** Users' Guide, Version 6.9
- **Xyce** Reference Guide, Version 6.9
- **Xyce** Mathematical Formulation
- Power Grid Modeling with Xyce
- Application Note: Using Open Source Schematic Capture Tools with **Xyce**

Also included at the **Xyce** website as web pages are the following.

- Frequently Asked Questions
- Building Guide (instructions for building **Xyce** from the source code)
- Running the **Xyce** Regression Test Suite
- **Xyce**/ADMS Users' Guide
- Tutorial: Adding a new compact model to **Xyce**

External User Resources

- Website: http://xyce.sandia.gov
- Google Groups discussion forum: https://groups.google.com/forum/#!forum/xyce-users
- Email support: xyce@sandia.gov
- Address:

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