Release Notes
11/16/2021

18.4

- 18.4t Fixed incorrect implementation of the "LC.shunt' parameter.
- 18.4t Added 'ToLeft' and 'ToRight' built-ins to allow access of the circuit element "to the left" and "to the right". The implied direction is valid only for 'traditional' displays.
- 18.4p Added check for 'null' parameters to RUSE and N block circuit elements. (Which caused crashes.)
- 18.4n Minor tweaks.
- 18.4n Added support for variable number of arguments to functions.
- 18.4k Fixed problem with LC circuit elements. Things didn't work well when you programmatically set the parameter values.
- 18.4j Improved accuracy in characterizing the F block transfer function.
- 18.4h Enhanced the 'isolation' block to dis-ambiguate its use. In addition to the previous functionality, 'rotations' are provided to clarify the use of a 'file', or 'R + j X', or an 'expression'. See the SimSmith manual for details. Old files containing the 'LGx' block can still be read but new isolation blocks are 'ISOx'.
- 18.4h Added Single Pole Double Throw switch to the RUSE block.
- 18.4g Changed warning mechanism for a 'file[]' parameter which has no file specified. It used to signal the error in the text dialog. Now, it is signaled by the coloring of the parameter pink.
- 18.4f Added Signum() function.
- 18.4f Added support for functions with variable numbers of arguments.
- 18.4e Added 'ideal' transformer model.
- Changed order of parameters in transformer model to make 'mdl' first (instead of Lr).
- 18.4e reworked 'auto transformer' internals.
- 18.4e Fixed hang that occurred if a directory contained 'special' files.
- 18.4e Fixed bug that disallowed Angle() to have a single argument.
- 18.4e Added return value to BodyGraphic() function.
- 18.4b Added support for nanoVNA version 2 (Use "CDC-ACM Demo" port).
- 18.4b Made some changes in nanoVNA1 Connect dialog.
- 18.4a Added new library support. Allows you to augment the 'circuit element menu'. "See help/Less Used Manuals/Custom Elements" for details.
- Reworked file chooser file examiner (thing which chooses an icon)
- Fixed (I hope) bug which caused crash when clicking on 'loadCircuit' when none was selected.

18.3

- 18.3i Added ability to 'draw your own' RUSE graphic. See the SimSmith manual and search for "BodyGraphics".
- 18.3i Added 'Cw' to auto transformer. Note that 'Cw' is NOT shown on the graphic but is listed as a parameter.
- 18.3i Made the ad hoc file reader more tolerant of characters inside a string quoted by '"" marks.
- 18.3h Fixed Square chart to display correctly display multiple symbols when G.MHz has multiple values.
- 18.3h DG8SAQ Connect. Removed 'listen' option. Added 'serial', 'shunt', etc. to automate computation of equivalent impedances.
- 18.3g Fixed serial port timeout on nanoVNA
- 18.3f Fixed various internals.
- 18.3a Added nanoVNA Connect dialog. See 'help/Less Used Manuals' for details.
- 18.3a Changed computation of equivalent impedances when using s2p files which measured impedance using a shunt configuration. Now uses s21 instead of s11.
- 18.3a Added 'Through()' plotting command. This allows the plotting of a complex value directly on the Smith chart. Works the same as 'Smith(x)' except x is not assumed to be an impedance.

18.2

- 18.2o Changed semantics of InCircuitWith. See Anvil Manual for details.
- 18.2o Fixed Anvil documentation of NelderMead builtin. The 'PRECISION' should have been 'TOLERANCE'.
- 18.2o Fixed problem with 'path' display of LG block when power was reporting element power (as opposed to power entering).
- 18.2n Fixed problem with 'path' display of transmission line stubs of length greater than ¼ wave.
- 18.2n Fixed bug in 'Save Trace' on Windows machines.
- 18.2n Added second argument to Angle() to determine angle between two, two dimensional vectors.
- 18.2m cleaned up impedance file reading. I may have broken some error messages.
- 18.2m Transmission Lines: added ability to change display from "~deg" to "~rads", "~waves", or "~secs". Right click on the value (just like setting the format) to set display option.
- 18.2m Transmission Lines: setting @MHz to 0 will now use G.MHz as the frequency for ~deg, ~waves, ~rads parameter values.
- 18.2m Added check for non-ascii characters in impedance files.
- 18.2k Added optional 'reference' to SWR() plotting command.

- 18.2j SWR Chart. Added ability to specify a reference for the SWR plotting command. For example, 'SWR(Zin,25);'
- 18.2j RXZ SWR Chart: Fixed markers… fixed drawing imports… fixed 'SWR()'.
- 18.2i Fixed various issues with markers on the square chart.
- 18.2h Fixed 'units' in T() function.
- 18.2h Updated title to 'choose color' dialog for plotting.
- 18.2h Fixed bug in S1P file support.
- Reminder: the square chart 'power' axis can be either W or dBW. The value plotted corresponds to the power being reported under the various circuit elements. This means that the square power chart may contain both the 'power entering' components AND 'power dissipated by' components. Lines representing the former are dashed 6 on, 4 off. Lines representing the latter are 16 on, 4 off.
- 18.2f Added support for AIM2180 two port files.
- 18.2c Fixed problem with ".R" type operators.
- 18.2d Changed formatting of the Warning Frame to break up long lines.
- 18.2a Added 'DG8SAQ Connect'. See 'less used papers' and youtube video for details.

18.1

- 18.m Added '.s11', '.s21', '.s12', '.s22', '.Zo1', '.Zo2' suffix operators for two port scattering parameter files. See Anvil documentation for details.
- 18.1h Fixed the display of the operating point.
- 18.1e Load, LG, and Z components. Restored 'ohms' update mode to be geometric.
- 18.1d Fixed markers on the Smith chart for multi-frequency paths.
- 18.1c Corrected report of VI under RUSE, F, and N blocks.
- 18.1b XY Canvas… redefined 'scale' to be the size of the first step.
- 18.1a Added 'log' capability for the XY canvas axes.
- 18.1a Added generic XY plotting on the Square chart. See SimSmith manual for details.
- Improved detection of 'drag' in FileChooser.
- Fixed bug where touchpad horizontals scrolling was taken to mean a shifted scroll. There is an internal switch to disable this fix if you find a problem.
- Fixed inconsistent order of Zo and VF when using different syntaxes in a RUSE block.

18.0

- 18.0h Changed mechanism for 'guessing' if an F, RUSE, N, or S block is essentially a series or shunt component. If the sum of s11 and s21 is close to 1, the part is assumed to be a series impedance. If the difference of s21 minus s11 is 1 then the part is assumed to be a shunt impedance. 'Close' is within 1% or so.
- 18.0h Fixed bug in auto transformer which complained about loss of precision.
- 18.0d Moved location of SimSmith files to '.SimSmith'
- 18.0g Expanded Transmission line syntax in RUSE blocks.
- 18.0g Reworked all code in 'MultiResonant' circuits (LCL and LCC).
- 18.0d Moved 'lastSimSmithCircuit.ssx' and related files to directories under '.SimSmith'.
- 18.0c moved screen size and location, warning frame size and location, and file chooser history and configuration to preferences.
- 18.0c Fixed painting of symbol explorer.
- 18.0b When assigning the model to a transmission line, the 'best match' is used. This is consistent with practice in the RUSE block and 'ComputeInternals'. The enclosing "{}" should not be included. As an example: T1.Mdl = "Belden RG-8X";
- 18.0b Added 'SubArray' function to select pieces of an array.
- 18.0b Added 'DifferentialEvolution' optimization mechanism. See Anvil Manual for details.
- 18.0a Added 'InCircuitWith' function to make it easier to evaluate the circuit with parameters set.
- 18.0a Added 'saves' capability to trycatch syntax.
- 18.0a Updated NelderMead to make it easier to use. See Anvil documentation or contact me.
- 18.0a Upgraded to java version 15. This means the new jar files may be incompatible with older java virtual machines. The move from java8 was about 5 years coming....
- 18.0a Added 'EvaluateCircuit()' funiction call. Now you can set a circuits parameters and then 'EvaluateCircuit()' and get the result. Works only when executing a button routine. Very useful when using NelderMead

17.3

- 17.3r Added 'int' variable type that stores only integer values. All arithmetic still takes place using complex double values.
- 17.3r NEC output files: parsing has been, improved... I hope Be wary, I may have broken something. I don't have a large number of samples.
- 17.3r removed CSRC and VSRC from RUSE workset.

- 17.3q Changed where '$var's are allocated. They are now allocated at the outermost scope. Usually, this means at the 'dialog' level. This eliminates the problem of using a '$' in a compound statement. For example, the following used to fail:
    if (a<b) {$var = 1;}}
    else {$var = 0;}
    pl $var;
which used to print 'null' but will now print '1' or '0'. See the Anvil manual on '$name' variables for details.
- 17.3q 'featuresKeys' has been almost entirely deprecated. Most 'features' were really internal switches. These internal switches can now be examined, and altered using the new 'internal switches' button in the preferences menu.
- Pruned out many old internal 'switches'. Most obvious being the 'expandTLinesReport' that can now be done with a right click on the circuit element. Also did away with VCCS and VCVS that can now be done in the RUSE block title menu.
- 17.3p Added NelderMead builtin optimization.
- 17.3n Extended 'standard inductor values' up 910mH.
- 17.3m When a session is ended (via SimSmith/quit or simply closing the window), SimSmith was not aggressive enough about detecting changes AND did not provide a way to say, "I don't want to end the session after all". Behavior on both fronts has been improved.
- 17.3k Changed Markers to always be shown even when well off screen. This allows the user to delete them if necessary. (Add 'HideOffScreenMarkers' to preferences/featureKeys to revert to older behavior.)
- 17.3k FileChooser. Added ability to 'load a circuit' directly from the file chooser (rather than using 'files/load circuit').
- 17.3k Added ability to 'print' to and clear error and output frames in 'other' dialogs.
- 17.3k Improved speed in large sweeps.
- 17.3k Stopped clearing 'favorites' when loading a circuit file.
- 17.3k Corrected problem displaying 'Small Chart' when the Smith chart was zoomed bigger.
- 17.3j Force minimum impedance of element in RUSE block to be 1n ohms.
- 17.3j Corrected display of 'operating points' on the Smith chart.
- 17.3i Fixed crash when Sweep Expression was empty.
- 17,3h Fixed crash when numPnts was zero.
- 17.3g Fixed problem with access to and drawing of Match (LC) component parameters.
- 17.3f Fixed crash when using impedance file as sweep param.
- 17.3f Added macos 'full screen' option to menu bar (green button).

- 17.3f Improved sweep pruning.
- 17.3d Added choice of 'save image' format. Preferences/savedImageFormat can now choose between PNG and PDF. Pruned PDF format to be the same shape as the image being saved.
- 17.3c Refined sweep size pruning.
- 17.3c Added 'load circuit in new window'. Spawns a new instance of SimSmith and loads the selected file. (May not work with all installations.)
- 17.3b Fixed bug in progress wheel display.
- 17.3a Added 3 and 4 port SPRM support in RUSE block.
- 17.3a Added 'Workset' menu to RUSE blocks to allow control of the element menu sidebar. This replaces the "VCCS" and "VCVS" of the preferences menu.

17.2

- 17.2z Fixed crash which occasionally occurred on exit.
- 17.2z Improved user defined parameter ordering.
- 17.2 y Fixed crash caused by 'SetParamColor' call.
- 17.2 y Preserve File Chooser 'recents' when loading a file from the command line.
- 17.2 x When starting up, SimSmith first looks for a ".lastSimSmithCircuit.ssx" file (note leading "."). If this file exists, SimSmith uses it. If the file does not exist, SimSmith looks for "lastSimSmithCircuit---.ssx".
- 17.2 x Fixed bug which caused crash when editing RUSE block in Ubuntu. This fix can occasionally cause SimSmith to lose a mouse click event. Not sure why.
- 17.2 w Fixed bug in the writing of S1P files. Extended the writing of S2P files to use scientific notation. Allow fractional reference impedances for both.
- 17.2v Added 'displayFormat' to parameter formats; you can now choose between 'polar' and 'rect'. Also added as system default to Preferences. Parameters can now be entered at any time in any mode. For example, "1/_90" is the same as 'j'.
- 17.2t Added '.abcd' parameter to circuit elements and ABCDtoSPRM function to compute SPRM of a given circle element.
- 17.2t Added 'Extended' keyword so you can put parameters down by the chart.
- 17.2t Added 'ClearDocument()' to allow you to clear output or errors.
- 17.2t Changed 'show extra info' to be a dialog rather than sneaking it between the element menu and the chart.
- 17.2t Changed String, FileName, SelectOneOf, and Button to run synchronously.

- 17.2t Added 'MultiValued' parameter declaration. USE OF THIS PARAMETER WILL CAUSE A .ssx FILE version 5 that is NOT readable by previous versions of SimSmith.
- 17.2t Fixed bug with G.MHz having multiple values introduced in cook 'p'.
- 17.2t Tracked down several memory leaks that caused things to get slow as time went on.
- 17.2s Added 'ToUpper' and 'ToLower' functions.
- 17.2s Fixed bug in computing revV when NOT delivering 1 watt.
- 17.2s Added 'Circle()' command to draw circles on the Smith chart.
- 17.2s Added 'CircleFill' to… yep… fill Circles.
- 17.2s If SimSmith can't find an impedance file, it will now look in the circuit's directory to see if there is one of the same name there….
- 17.2r Renamed generator and isolation block "V" to "V_". Documentation does NOT YET reflect this change.
- 17.2r Did minor work on top level circuit icons.
- 17.2r Fixed zooming bug in Wave displays.
- 17.2q Added 'zip' and 'unzip' commands to FileChooser… right click on a directory to zip or unzip it.
- 17.2q Made FileChooser 'delete' command recursive so you can delete entire folders.
- 17.2q Added ability to 'negate' RUSE, N, and F blocks. See SimSmith manual for details. Search for 'Negate'.
- 17.2q Removed check for s2p files written by older versions of SimSmith.
- 17.2q "Inverse" operation. Found two flaws in the code that appear to have cancelled each other out. Fixed both. Hopefully this doesn't introduce any new bugs but PLEASE be on the lookout.
- 17.2q Added ability to 'negate' an S block. There are now four options: the old ones "1<>2" and "2<>1" remain, and two new ones "-(1<>2)" and "-(2<>1)" have been added. This is analogous to setting a component value (such as resistance) negative.
- 17.2q Changed marker reports of power to reflect the power axis banner.
- 17.2q Fixed bug in 'simplified' transformer model which ignored programmatic changes to 'Hr'.
- 17.2p Changed markers on Y1 and Y2 plots in square chart to use the the axis banner (instead of "val") as the reported datum.
- 17.2p Set programming dialogs to 'readOnly' so you can't easily lose all your program. You can 'SetReadOnly(param,0);' to enable writes if you need to. Alternatively, remember that the ":-" operator ignores read only….
- 17.o   Added ability to disable the tuning controller menu. Use 'view/show controller'.
- 17.o Fixed graphics bug in transmission line selection dialog.

- 17.2n Fixed bug in File Chooser where directory entry had username appended unnecessarily. Sometimes you would see something like "wardh/documents" instead of just "documents".
- 17.2n Installation now allows for 'file associations' for ".s1p" and ".csv".
- 17.2n If you use SimSmith to 'open' an impedance file it will now load that file into the L.file parameter, set the sweep to cover that file, and set the display to SmithChart, 'Both'.
- 17.2m Added 'pe' to 'print expanded'. Will print large top level items rather than saying 'really_big_thing'. Much like "for (dcl a:lst) pl a;".
- 17.2m Added 'GetTLineOptions()' to get a list of all the transmission line items in the database.
- 17.2m Changed RUSE and N block items to allow variables in transmission line arguments. Now you can say, "length {variable}" and have 'variable' specify the transmission line model. (Previously, it had to be a constant string.) Get the latest 'SimSmithSamples' (help) and look in the "TLineModelsInRUSE" directory.
- 17.2m Improved transmission line database selection dialog to allow for keyword searching.
- 17.2m Improved 'suggestions' for missing method names and dictionary members.
- 17.2k Splat report: added fifth format that reports the 'parallel equivalent' for impedance and admittance.
- 17.2k Added 'ns' to the 'expanded Transmission line report'.
- 17.2k added fps and mps constants.
- 17.2k added 'circular' mode to TreeInterp().
- 17.2k added 'GetChartInfo' to get SWR and Q info from the Smith chart.
- Fixed shortcoming (decade old?) problem with text cut/paste in parameters. This NEVER worked before. I think I fixed it. Small (undisclosed) feature sacrificed….
- Fixed problem with hang when displaying square chart horizontal 'log' scales.
- Fixed bug in updating text markers.
- Extended 'GetPreferences' to include ALL preferences. Most can be updated programmatically.
- Added 'run/stop' to control circuit evaluation.
- Enhanced String, SelectOneOf, and FileName to include a function declaration. Added ability to set the parameters programmatically AND call the appropriate function (if available) when set occurs.
- Enhanced ShowDialog routine to allow for dictionary arguments which allow the modification of numbers and strings in the dialog.
- Added interpolation routines for ordered trees. Both polar and rectangular interpolation is supported.

- Added the 'Symbol Table Editor' for exploring circuit and program data.
- Added Discrete Fourier Transform and IDFT.
- Added a new 'impedance file interpolation mode'. You can set it to be 'polar' by editing Preferences/interpolationMode.

17.1

This release is aimed at improving the general-purpose programming environment of Anvil. The additions include asynchronous execution of programs, serial IO capabilities, dialogs, and try/catch support.

- Created three new parameter types to enhance programming. Now available: 'FileName', 'SelectOneOf', and 'Button'. See the SimSmith manual, 'Advanced Parameters' for more details.
- Added 'VerboseError' to send verbose prints to the error log.
- Added CCS internals caching to avoid repeating time consuming computations.
- Added 'k0,k1,k2' to ac6laInternals for 'Simplified' models.
- Added access to Menu and List selection parameters. This allows AParamsTrackB to work for transmission lines even when the model changes.
- Fixed 'MarkerSizeFactor' in preferences. It had stopped working sometime in the past.
- Added 'ComputeInternals' for bimetal, ccsCoax, and twinlead.
- Added 'ComputeInternals' for simplified.
- Added 'zip directory' command to 'files' in top menu.
- Added 'wheelLowPassFilter' to preferences. Useful when the wheel is too sensitive to movements. Used in vertical scaling of the square chart.
- Added 'g' suffix for adding 'diameter of wire'. For example, '14g' is equal to (about) 64m inches.
- Added 'except' option to AParamsTrackB. Allows A to track B leaving out some params. See Anvil document for details.
- Added 'twinllead' and 'ccsCoax' to transmission line database.
- In 'twinlead' and 'ccsCoax', replaced 'dieK' with 'k2'. This 'k2' should be essentially the same as ac6la's k2.
- In 'twinlead' and 'ccsCoax', replaced dieEPS with VFnom.
- Removed preview panel from the FileChooser.
- Add 'Np' constant dB ((20 Log10(e) == 8.685889638)

- Changed the Modified Nodal Analysis routines to support variable precision arithmetic. The code will start out using 64 bit IEEE numbers which maintain about 15 decimal digits. If necessary, it will (automatically) promote to using non-standard 'doubledouble' data which maintain about 30 decimal digits. There is a performance impact when promotion is necessary. Promotion occurs during matrix initialization but not during the actual solve. Underflow is still possible.
- Added serial port support. See Anvil documentation for details.
- Added 'SetVisibility' to control the visibility of parameters.
- Added 'SetReadOnly' to control the writability of a parameter.
- Added 'forget markers' to the help menu.
- Added serial port support.
- Added ordered list support. See Anvil 'Trees' for details.
- Made 'Button' and 'SelectOneOf' execution asynchronous.
- Added 'Fork', 'Join', and Stop to spawn other threads.
- Added ability to turn the display of an import on/off by clicking on the label AND allow the color to be set using right click of the label.
- Added try, throw, catch, finally exception processing statements.
- Added 'ShowDialog()' and 'CloseDialog()' calls to allow Buttons to provide messages and ask for responses.
- Added format control and ability to append lines when writing files. See FileWriteTokens and FileAppendTokens.
- Added a 'Symbol Table Explorer'. Read the Anvil manual for details.

17.0

- Restored Thev() option to G.V menu.
- Images and Captures: Added 'SimSmith frame with dialogs' option. This command includes the image of dialogs which overlap the main frame. (Previously, the 'whole window' command did NOT include the overlapping dialogs.) NOTE: this doesn't seem to work properly when running Windows under Parallels. This may not get fixed.
- Changed 'Notes' to be a normal text dialog.
- Fixed bug which occasionally added a '.' to the end of file names.
- Added 'comment' markers. You can now add a marker which does not report the associated parameter values. Rather, it allows you to provide arbitrary text. See the SimSmith manual on Markers for more details.
- Added ability to fix the location of a comment marker. (build b)
- New web pages released.
- 'Select All' (^a) now works in text dialogs. (build f)

- Updated macos and windows64 to use JRE 1.8.0_241. Windows32 still uses JRE 1.8.0_102. Unix (linux) does not bundle a JRE.
- Did some minor work to reduce memory utilization during large sweeps.
- Added warning when memory utilization gets too high. When utilization gets too high, SimSmith can become unresponsive. If you are working on large sweeps, patience will be rewarded. (build o). If you get a warning about memory utilization, it is best to exit out, change the heap size allows by java, and restart. (build o)
- Fixed error in transmission line database for KN5L 553 k values. (build o)
- Improved tLineDB processing a bit. (build o)

16.9

- Added simple matrix operations for one and two dimensional items. Operations: multiply A*B, inverse A^-1, transpose A^T, complex conjugate A^*, and A^I for identity matrix construction. See Anvil manual for more details. Notice the '^' symbol is used to indicate what follows is a 'superscript'.
- RUSE and N block: added Y parameter support. See N block syntax manual for details
- Fixed bug where accessing a RUSE block wire precluded using the '.R' or '.M' access methods. Specifically, "A.w2.v.M" was not working, now it should.
- Fixed bug in RUSE block where connecting pin1 of P1 or P2 to ground caused an incorrect computation. Also removed requirement for resistor in N blocks although it is left in the prototype for historic reasons.
- Added 'OneWattIntoLdotZStar'. Used to compute power losses in the receive direction. See SimSmith Manual 'Backward Computation', 'Reverse Computation' for details.
- Fixed bug in 'control right click' tuning of load which caused crash.
- Reworked SWR and RL to work reliably with reflection coefficient 'rho' greater than 1. See the SimSmith Manual chapter titled: "Complex System Impedance…"
- Added a new optional parameter to the G block called Zrx. If it is present, it is used as the impedance looking into the generator during 'reverse' computations.
- Added a new section to the SimSmith manual called 'Complex System Impedance'. Please read this if you are setting G.Zo to something with a non-zero reactance.
- Added independent voltage and current sources to RUSE and N blocks. Use with caution. Read the "N Block Syntax" manual.
- Added generalized SPRM element to RUSE and N blocks. This allows one to specify things like circulators and isolators. Can also be used for multiport transformers.

- Added 'paper's submenu from 'help'. Used to access various papers of potential interest to the advanced user. This was to clean up the 'help' menu.
- Added ability to access multidimensional 'trace' files using array syntax. Linear interpolation is employed. I added this so you could access more than one 'source' impedance in a 'LastZ.txt' file.
- Improved behavior of the File Chooser: tries to preserve extension when renaming files, and prohibits editing of 'preview' component.
- Help: Added a section containing 'scholarly' papers. So far, just a few papers dealing with complex reference impedances.
- Attempted to unify SWR, Gamma, and RL computations in their multiple instances. They should all work the same now preferring G.Zswr as a reference. When G.Zswr is missing, G.Zo is used. This took a lot of editing... please pay attention to these things for a while.
- Changed 'splat' report to be referenced the same as SWR, Gamma, and RL.
- Added 'SetGenAuxLabel' function. Allows augmentation of the lines under the G circuit element.
- Added brightness control for the Z and Y lines and legends on the Smith chart.
- Swapped the order of ports when S2P files are written. Added warning if an S2P file written by an older SimSmith is detected. (added 16p9av).

16.8
- Finalized (Cleaned up) much of the font and line width drawing routines. Nearly everything is real time responsive to fontChoice, dialogLinesOnScreen, and lineWidthMulitiplier changes. (May be some oversights. Let me know.)
- Added 'save Trace' and 'add Trace' to the files menu. Support for saving traces is a work in progress, not tall traces can be saved correctly.
- Changed the options for Plot dot types. The Plot("X",Zin); will now label the button as 'X' rather than use 'X'es as the plot icon. To get 'X'es, use Plot("xes",Zin);
- Autotransformers. Fixed bug where sweeps of Hr and Hl didn't work properly along with other issues.
- Added RXZ vertical axis option for the SWR chart. Markers don't yet work properly on this axis.
- Rewrote auto transformer code to eliminate several bugs associated with sweeping.
- Changed 'power report' under each element to be INDEPENDENT of other element report and the axis choice on the Square chart. Thus, some components can be 'delta power in component' and others be 'power into the

component'. Some can be 'in watts' and others in 'dBW'. The Square chart axis is now either W or dBW and can be chosen independently.

- Added ability to click on the 'vi' report in the top level circuit elements to change reported information.
- Added 'MatrixSolve' to Anvil subroutines.
- Fixed bug in 'GetRawFileData'… couldn't read some data values.
- NOTE: changed 'Atan(x)' to assume X is purely real. Added Atan2(x) which interprets x as a complex number. Left Atan2 unchanged.
- Introduced new transmission line model for low frequency and copper clad steel applications. See "help/papers/modeling coax" for a discussion.
- Added a small 'SimSmithSamples' zip file. You can fetch a copy of this zip file using 'help/fetch SimSmithSamples'. You can select where to put it. You'll have to unzip it manually.
- Added 'AParamsTrackB' function so one circuit element can 'follow' another. Very hand with things like having transmission line elements track.

16.7

- Added ".R". ".I", and ".X" operations to access parts of a complex number. For example, 'dog.R' is the same as 'Real(dog)', 'dog.I' is the same as 'Imag(dog)', and 'dog.X' is the same as 'Imag(dog)'.
- Fixed problems with RUSE block component plot selection menus when multiple RUSE blocks are being used.
- Fixed bug where a transformers visual model changed but the mathematical model was not updated correctly. Fixed bug where a 'ratio' transformer which should have an assumed K of 1 did not always have a K of 1.
- Updated writing of touchstone files to allow writing touchstone s1p files in Y or Z format as well.
- Updated writing of all touchstone files to allow specification of the reference impedance. (The reference impedance of touchstone s2p files in Y or Z format must be 1.)
- Substantial rework on 'dialog font sizes'. The preference' dialogFontSize' has been replaced by 'dialogLinesOnScreen'. This was done to ensure SimSmith selects a workable scale regardless of screen resolution. This is not yet well integrated with text dialogs. However, text dialog font sizes can be adjusted independently.
- Substantial rework of the line drawing routines. All line widths can be scaled using the 'preferences/lineWidthMultiplier'. All drawn lines widths will be scaled by this factor. If the value is 0 then SimSmith will substitute a value based on the physical size of the screen. The computed value is not reported.

- For Smith chart tuning, holding 'Shift' and 'Control' will cause the Zoom to magnification 1 or magnification 10 depending on direction.

16.6

- In the File Chooser... if the path does not fit within the dialog window, SimSmith will truncate the path starting on the left. This is more like what Windows does.
- Square Chart Clipping... changed clipping in the square chart. Now, if a trace is not visible OR is only slightly showing, SimSmith will draw an arrow toward where the center of the trace might be found.
- Text Dialog keyboard shortcuts. Rewrote much of this code and added some commands... it might have some bugs. See the Anvil manual for more information.
- Added 'control right click' keyboard shortcut. Holding the control key and right clicking on the Smith chart will set the ohms and johms of the Load element. On the square chart, control right click of an SWR trace or a reference trace will also set the load impedance.
- Square chart: rewrote the horizontal label generator.
- Added 'command /' which will comment or uncomment the present line in a text dialog.
- Added 'view/bands menu' to control band displays on Square chart. See SimSmith manual concerning multifrequency operation.
- Improve efficiency: when a programmatic assignment is made to a parameter where the value is not changed, SimSmith WILL NO LONGER repaint or re-analyze the circuit. If this causes a problem, add 'DoRedundantAssigns' to the featuresKeys.
- LC Matching circuit element: added multiband support. See theSimSmith manual section on 'MultiBand Analisys' for details.
- Added ability to assign arrays to multivalue parameters. You can now write: G.MHz = {3.75,7.1,14.2}; and get what you expect.
- Added 'GetParamValueArray(p0' to get an array of values from a multivalued parameter. You can write 'GetParamValueArray(G.MHz)' and get an array of the values. You can update a value in the array through simple assignment.
- Added "L" (load), "S", (save), and "C" (capture image) to all text dialogs (except RUSE).
- Fixed bug in reading 4NEC2 output
- Fixed bug where Wave command ignored Stroke (and maybe color) modifiers.
- Fixed bizarre behavior when first harmonic was set to 0.
- Added warning when a built-in in function is invoked in the wrong block.

- Fixed crash which occurred when specifying a coupling coefficient for nonexistent inductor.
- Wave plotting now allowed with logarithmic Square chart scaling.
- Transmission Lines: added 'peakV' dictionary which estimates the peak voltage on the line (NOT max RMS) and where it is.
- Square chart SWR axis… added 'RL(db)' as option for vertical scale. Click on banner to select desired format.
- SPRM Square chart… Added T(db) and Γ(dB) as options for 'transfer' and 'reflection' axes.
- Transmission lines: fixed bug in computation of '.i', '.v', and '.z' for series transmission lines. Also affected 'peakV' value.
- The computation of 'revV' has been changed. Previously, the 'revV' was computed the same way that 'useZo' was computed. Now, it is computed the same way as 'forXfer'.

16.5

- Added 'GetSweepParamInfoOf' function to allow the examination and limited modification of sweep menu parameters.
- Added 'at(epilog)'. See SimSmith 'Circuit Evaluation' for more details.
- Added 'UpdateChart("tag")' to allow trigger circuit evaluation. Used in conjunction with at(epilog).
- Added 'Sleep(milliseconds)' function to allow program to pause a moment.
- Added formal arguments to class creation so one can write things like $a=new b(1,2,3); This makes initialization of a class much easier.
- Added class augmentation when executing a new. So, one can write: $a = new b(1,2,3) {dcl func() {return "funcCall";}};
- Added hidden variables to scan dimensions in 'BuildArray'. Make sure and read the Anvil 'Fun With Arrays'.
- Added commands to text dialogs including '^s' to start search, '^o' to open a line, '^r' to search in reverse, and '^k' to kill to end of line (or delete an empty line). Added '^y' to retrieve the killed items and insert them at the cursor. (These are very 'emacs' like. A complete reference for text edit key shortcuts is coming…)
- Added cursor movements keyboard shortcuts to text dialogs. Added ^z for recovery as well.
- Changed the semantics of Add({},a) and Add({},n,a). The call Add({1,2},{3,4}) now results in {1,2,{3,4}}. Sorry.
- Changed 'Log(0)' to return -1e200. Changed Gamma() so that if the result is small, Gamma forces it to 0. The exact cutoff is still being decided. Let me know if there's a problem.

- Fixed problem with horizontal scale labels and ranges in the Square chart.
- Fixed vertical scale label issues with the Square chart.
- Fixed bug where RUSE blocks were not recompiled properly during edits or as a result of 'Commit' or 'window closure.
- Added GetParamFormatInfoOf(param) to get and manipulate the format information of a parameter.
- Added alias: GetParamSweepInfoOf(param) is the same as GetSweepParamInfoOf() for symmetry purposes....
- Added RL([z][,ref]) return -20*Log10(Mag(Gamma(z,ref))); Modified SWR and Gamma to be called with no arguments. See Anvil documentation for details
- Fixed problem where 3 dimensional plots didn't display properly.
- Changed a low-level routine that lied about the length of impedance files. If you run into any problems with impedance files, please let me know ASAP.
- Fixed problem with some systems and some mice. From Larry Benko: `"Some mice and some systems have problems with detecting 'single WHEEL clicks' after 2 or more large wheel movements that occur in the SAME DIRECTION closely in time; Specifically, they get in a mode where the first wheel click is ALWAYS ignored when changing wheel direction until some other area within SimSmith is selected with the primary mouse button which clears the problem"`.   If you observe this problem, it may be fixed (emphasis on 'may') by putting the string "UseMousePrecisionWheelFix" in the preferences/featuresKeys.

16.4

- FIXES RUSE PERFORMANCE PROBLEMS.
- Reworked RUSE code generator to allow 'Plot' and related functions in RUSE blocks.
- On round chart, moved SWR, Q and 'path' display to front so they aren't obscured by traces or dots on Smith charts.
- Reworked garbage collection to use less memory and cause fewer warnings.
- Reworked 'autosave' to reduce memory usage. Hopefully, this change has no effect on the user.
- Fixed 'Q' arcs when center of Smith chart isn't purely real.
- Added 'Stroke' support for dots so line width is taken into account when drawing dots.
- Show 'Smith()' plotted item values in 'path' display as well.
- Made using 'commas' as the decimal separator even more forgiving...
- Disallow assignments in conditional expressions (if, for, and ?:).

- Make Substring(str,n) work properly.
- Added 'GetRawFileData' to provide access to raw data from CSV files. Especially useful when using 'Generic' format.
- Added 'FindRowInArray' which can be used to quickly scan an array for a given key in a given column.
- Liberalized CSV file formats somewhat to allow for optional commas and comment lines.
- KN5L transmission line database: added frequency limitations to KN5L database. Moved frequency limited models to end of menu.
- Rewrote the 'hidden window' code to try to avoid hiding dialogs....
- Improved Marker placement.
- Improved 'logStep' in sweep expressions.
- Added '<save>' option to circuit elements that have been added by dragging them from a file chooser to the circuit. Clicking on <save> will write the element back to the file WITHOUT any confirmation. The fact that the element was loaded from a file is not yet stored in the ssx file.
- Can now attach markers to waveforms. The 'secs' field is the editable one...
- Restored array declarations and BuildArray() to the Anvil compiler and documentation.
- Added 'ValueOf' function for converting strings back to numbers.
- Added 'ComputeInternals' to allow access to the transmission line database and transmission line model.
- Added dictionaries for C and L in the LC matching circuit.

16.3

- Wrote new, concise, documentation for SimSmith.
- Old documents now in subdirectory under help.
- Wrote new programming manual.
- Expanded support for s2p files with s12 = s22 = 0.
- Refined when 'print' is executed.
- Added ability to control execution based on phase of evaluation
- Fixed various problems with Markers.
- Fixed a few bugs in the (now deprecated) plotting functions.
- Added 'at()' operation. See Anvil documentation.
- Added main menu item 'SimSmith'. Put preferences there. Put in 'About'. Moved 'references' to files.
- Fixed bug in expression parser where unary operators had wrong precedence.

- Added 'ArcC' and 'ArcL' to compute capacitance and inductance given impedance.
- Fixed bug in print in sweep expressions.
- Fixed bug in Plot labeling.
- Added "essentially Equals" (~=) and "not essentially equals" (!~=). Used when comparing numbers which should be the same but floating point rounding errors got in the way.
- Fixed bug in sweep expressions where assignments and mentions were taken as values to sweep.
- Added Zgen and Thev generator type.
- Added optional parameter Zcen.
- Widened the net for catching Zplots generated impedance files.
- Fixed hang when scanning from10 to 10.000000000001
- Reordered evaluation to invoke 'tunePhase' at correct time.

16.2

- Fixed bug where "~deg" in transmission line circuit elements was wrong.
- Augmented Transmission line database with data from KN5L.
- Added sweep capability to LC component F and H parameters.
- Suppressed generation of non-assignable parameters in Expression analysis.
- Added 'read only' to element parameters that should be read only.
- Fixed crash in Expression analysis when setting circuit element to a value.
- Fixed bug where plot couldn't 'print'.
- Fixed bug in G.V (and Isolation Block) where 'Zin' did not work properly.
- Fixed bug in G.V (and Isolation Block) where an equation was used (like Zin*a) instead of an internal generator (like useZo or xMtch).
- Improved RUSE block interactive behavior when editing parameters.
- RUSE block now rebuilds menu when features change.
- Fixed bug in tLineDB file reader. Provide for '//' comments in tLineDB.
- Allow DragTune of Isolation block. Doesn't tell you if you are assigning the load using cloneLoad or some other mechanism.
- Added plot controls to new plotting commands.
- Fixed bug in Markers where they wouldn't attach to components with certain names.
- Fixed crash where L or G were renamed
- Fixed bug in RUSE block where transmission lines ends were not allowed to float.

16.1

- Now allow the '.v' after a signal name in a RUSE block. Thus 'A.sig.v' is the same as 'A.sig'.
- Updated wireman 553 window line to reflect KN5L measured data.
- SimSmith now writes '.ssx' files. These files may or may not be compatible with previous versions… it depends on the features used. Older, '.ss' files can still be read.
- Mouse Wheel Gain and direction… have been replaced with a new preference: "wheelGain p S h v R". Takes five values close to 1. The gains are for the 'p'arameters, the 'S'mith chart, 'h'orizontal, 'v'ertical, and 'R'use.
- Added "x /_ y" operator (slash underscore). It rotates x by y degrees.
- RUSE: you can now zoom in and out in the schematic.
- TEXT DIALOGS: the font size of an expression text dialog can be increased or decreased using the '+' and '-' buttons on the lower right hand side of the dialog near the 'commit' button.

- Circuit Elements: if you have a circuit element in the main menu that is taking room but you don't need to see, you can make it narrow using the 'left arrow to margin' button on the upper left hand side of the element. Once narrow, you can widen it by clicking on it.
- Transmission Line Database: added ability to add transmission lines to the database. File/preferences/tLineDB. Entries should be of the form:
  `"description (display name)" 50 .82 66.01m .2888 2.125m`
  added entries will not overwrite built in ones but they will be listed first. There is nothing magic about any of the words. Quotes are required. The file has to be read in each time you start SimSmith.
- Added 'Preferences' document to 'help' menu.
- Added ability to control color and stroke for Plot(), Smith(), RMS(), etc commands.
- Make 'signal name' optional in Plot(), Smith(), etc. commands. So 'Smith(L.Z);' is the same as "Smith('L.Z',L.Z);"

16.0

bug fixes from 15.1:
- Fixed bug where SimSmith crashed when preferences/pinSizeAndLocation was set to something other than 'useIncoming' and certain older files were loaded.
- Changed the formatting of numbers in reports to provide the number of digits specified by that parameter. The number of digits shown for a frequency specified by a load file may be problematic.
- Smith Chart: fixed bug where operating points were not displayed for plotted items on the Smith chart.
- RUSE: added the ability to delete line segments. While wiring, if you hit 'd', SimSmith will delete all line segments attached to the wiring sprite.
- RUSE: fixed bug with cut/paste of blocks 'stitching' back in incorrectly.
- RUSE: fixed bug where things could be placed 'off canvas' and then become abandoned.
- Fixed 'run away' "Extra Info". Now it is limited to 30 lines AND will only be computed when it is being displayed.
- Fixed bug when drag tuning a component with a parameter with a 'format'.

EMPHASIS:

- TRANSFORMERS: ideal transformers aren't as ideal as they used to be. Transformers with inductors with values > 1 may be problematic.
- In the past identifier 'I' was used to specify the 'incoming impedance' in the various blocks (RUSE,N,F,V). This variable has been replaced by 'Zin'.
- Identifiers can be used for only one purpose. Thus, "RO R0 w1 w2;" is no longer allowed. To simplify the transition forward, in a RUSE block, any component where the location is the same as the value: the value is changed by adding an '_' to the name. Any RUSE or N block parameter which consists of one of the letters R, L, C, or T followed by a string of digits will be converted to lower case. Any RUSE circuit element which has the same value as location will have the location converted to lower case. This feature can be disabled by preferences/xlateNAndRUSEParam.
- New RUSE elements will have default parameter names set to their location name followed by an '_'.
- "I" cannot be used as a circuit element name.
- The parallel operator, that used to be '|' has been replaced with '|||'. The '|' operator is now 'bitwise or' to be consistent with C. I expect not many people used the parallel operator.
- The power operator '^' has been preserved but can also be invoked with "**": a to the b power is a^b or a**b. Bitwise exclusive or can be invoked with '^^'. For example, 1^^2 is 3. I doubt anyone will use it, but there it is.
- Filter generation routines are presently under development and not available in version 16.0.

additions:

- Plot and sweep expressions can now create main circuit element parameters.
- Added 'invZ' for plotting. This allows one to run the 'inverse' of the Circuit. This is essentially the same as reversing the circuit and negating all the values of the parameters. The most common use is probably "plot L.invZ;". The generator is set to 'xMtch(1)' when computing the 'inverse' info.
- This release is a rewrite all 'expression' parsing: literally a fork lift for everything F,N,RUSE,V,Plt,expr related. As a result, there will undoubtedly be incompatibilities and missing features, particularly semantic checking. This release is recommended for those requiring faster execution in circuits using expressions. It is expected this release will generate backward compatible .ss files for simple circuits. However, if you use any of the following features, chances are things won't be backward compatible.
- Numeric parameters can now hold complex values. The imaginary part may be ignored silently. The 'L' and isolation elements are special in that the

equation for the impedance is R + j X even when R and X are complex. (G.Zo also pays attention for the imaginary part.)

- Parameter values are now maintained with full machine precision. This means that the number displayed IS NOT NECESSARILY the value being used for the computation. This is how spreadsheets work. THIS IS A MAJOR CHANGE FROM SIMSMITH IN THE PAST although it is doubtful it makes any difference to the typical user.

- The expression editing window is now different. Please watch the video called "Introduction to SimSmith 16" for more details. It is easy to use but there are some hidden useful tricks.

- Added a 'Daemon' block which can be placed anywhere in the circuit INCLUDING before the Load element. It operates essentially the same as the F block except it is more efficient. It cannot affect the impedance passing through the block. Use of this element will generate files incompatible with previous releases.

- Added the ability to 'reverse' the display of the circuit. This does NOT change the order of evaluation in any way; it is strictly a display choice. The 'view' menu can be used to choose between 'legacy order' and 'standard order'.

- This release is a major break in GUI philosophy. I have started to use the Java Swing window layout managers and so the new windows are not as refined as those of the past. (Well, the file chooser used Java window layout managers as well...) I figured my time was better spent on 'core strengths' which is certainly not GUI stuff...

- NOTE: the old SimSmith used '^' and '|' in ways inconsistent with most modern programming languages. The '^' (power) operator has been preserved and '**' has been added as an equivalent. Future releases may remove the '^' so it should be converted to '**' any time a file is touched. The '|' (parallel) has been replaced with '|||'. The Java and C '^' (bitwise exclusive ok) can be invoked with '^^'. The reasoning: not many users of SimSmith will need bitwise exclusive or, but many already used power....

- Changed 'plot' selection menu to be two lines.

- Added 'plot selection' menu to RUSE block components... just right click on the component for a list of items easy to plot.

- Added the ability to do simple plots from Daemon blocks. See the end of the Presenter plotting discussion.

- Plot: horizontal and vertical lines and points are no longer supported. Additionally, many 'consistency' checks are not yet performed. For example, displaying total Power on the Smith chart is nonsense but may not be checked.

- Plot: the syntax for overriding elements in colors has changed. Now uses the 'With' function: With(color,"alpha",0) will result in a color with alpha = 0.

- Plot: assignments in the Plot expression assignments are no longer 'temporary'. If you used this feature in the past, I apologize; it was just too difficult to carry forward.
- Plot: only one signal can be plotted with a single plot statement: "plot G.V,L.V;" is no longer legal.
- In the F block: specifying a capacitance could be done saying "C318p". Now, the syntax is C(318p). Likewise, L(), R(), and X().
- PLOT: note that the 'internals' of RUSE and N blocks are now named differently. Please see the Presenter documentation.