Project

TeamSTARS "tsWxGTUI_PyVx" Toolkit

with **Python** 2x & **Python** 3x based

Command Line Interface (CLI)

and **"Curses"**-based **"wxPython"**-style

Graphical-Text User Interface (GUI)

Get that cross-platform, pixel-mode "wxPython" feeling on platforms with:

- 64-bit processors, nCurses 6.x, 64-bit Python 3.6.x or later GUI applications and character-mode 256-/16-/8- color (xterm-family) and non-color (vt100-family) terminals and terminal emulators.
- 32-bit processors, nCurses 6.x/5.x, 32-bit Python 3.5.2 or earlier GUI applications and character-mode 16-/8-color (xterm-family) and non-color (vt100-family) terminals and terminal emulators.

Table of Contents (*with slide show* Hyperlinks)

Objectives (Table of Contents)

- Goals (Capabilities)
  - Mission Critical Capabilities
  - Cross-Platform Capabilities
  - Architecture Capabilities
  - Documentation Audience
  - Documentation Capabilities
  - Engineering Notebook Capabilities
  - User "How-to-Guide" Capabilities
- Non-Goals (Limitations)
  - Host Virtual Machine Limitations
  - GUI Virtual Machine Limitations
  - Retrofit Limitations

Goals (Mission Critical Capabilities) (Table of Contents)

- Provide a foundation of building block libraries, tools and utilities that:
  - Lets you work more quickly and integrate your systems more effectively
  - Facilitates the rapid prototyping of application software used to monitor, control and coordinate **Mission Critical Equipment**
- The foundation components must be general purpose and re-usable in order to support the following markets:
  - **Commercial** (as in building energy management)
  - **Industrial** (as in power generation)
  - **Medical** (as in Computerized Axial Tomography scan)
  - **Military** (as in weapon control)
- Foundation components must facilitate the rapid prototyping of application software on diverse assortment of:
  - **General Purpose Desktop & Laptop Computer Systems**
  - **Application-Specific Embedded Computer Systems**:
    - **Automation** (as in robotics)
    - **Communication** (as in network traffic)
    - **Control** (as in supervisory and feedback of equipment and processes)
    - **Diagnostic** (as in hardware and software failure modes and effects)
    - **Instrumentation** (as in sensor data acquisition and analysis)
    - **Simulation** (as in flight control)

Goals (Cross-Platform Capabilities) (Table of Contents)

- Foundation components must be compatible with and portable to a diverse assortment of popular and readily available hardware (HW) and software (SW) platforms:
  - **Open**
    - HW as in Arm & Intel microprocessor components
    - SW as in GNU's Unix-like tool components & Linus Torvalds' Linux operating system kernel components
  - **Proprietary**
    - HW as in Dell, HP, IBM & Lenovo systems
    - SW as in Microsoft's Windows & Oracle's Solaris operating system components

Goals (Architecture Capabilities) (Table of Contents)

- Foundation architecture must be modular to support product life-cycle.
  - **Segregation of Python language generations (such as 1x, 2x and 3x)** to facilitate:
    - Future Back-Porting to Python 1x from Python 2x.
    - Future Back-Porting to Python 2.0.x-2.6.x from Python 2.7.x using "**Six**", a Python 2.x and 3.x compatibility library
    - Porting to Python 3.x from Python 2x using Python syntactical converter "**2to3**"
    - Future Porting to Python 4x from Python 3x using Python syntactical converter "3**to4**"
  - **Non-Installable Developer Sandbox** to facilitate foundation component experimentation, development, maintenance and troubleshooting.
  - **Installable Site-Package** to facilitate foundation user's application software development and deployment.
- Foundation components must be customizable in order to support a diverse assortment of developers, operators, organizations & products:
  - **Customizable "**txCxGlobals" file of organization-/product-specific usage terms & conditions and operator-specific CLI theme-based feature settings
  - **Customizable "**tsWxGlobals" file of organization-/product-specific GUI theme-based feature settings

Goals (Documentation Audience) (Table of Contents)

- **Prospective & New Users** may only seek reason to dig deeper or look elsewhere
- **Student Users** seek rationale for unfamiliar computer hardware and software technology usage
- **Intermediate Users** may only seek rationale for architecture, design and implementation of unfamiliar “Python”, "Curses" and "wxPython" programming techniques
- **Advance Users** may only seek rationale for unfamiliar project planning and engineering techniques
- **Expert Users** may only seek rationale for unfamiliar troubleshooting, maintenance, porting and enhancement techniques

Goals (Documentation Capabilities) (Table of Contents)

- Documentation for system administrators & installers, developers & maintainers, operators, troubleshooters and students.
  - Establish a reference library (for Objectives, Plans, Requirements, Architecture, Design, Implementation, Debug, Test & Release)
    - Orients & Trains new contributors & users
    - Focuses or reminds contributors of goals, non-goals, plans and unresolved issues
  - Establish a convenient reference library of third-party material, found on internet, which was relevant but might eventually be subject to change or removal
    - Computer & System Engineering (Definitions, Theory, Technology & Practices)
    - External Resources for Goods & Services

Goals (Engineering Notebook Capabilities) (Table of Contents)

- Typical engineering project information with commentaries describing rationale and evolutionary changes (for System, Hardware, Software & Interfaces):
  - Concept, Dictionary, Use Cases & Development Plan
  - Requirement, Design, Test & Qualification Specifications
  - Release Notes & User's Manuals
- Typical engineering project contributor information:
  - Document Authoring & Publishing Tools
  - Software Development Tools
  - Introduction and Training
- In various formats with text, tables and complex graphical images requiring office suite application programs (such as from "Adobe", "Microsoft", "LibreOffice" etc.) typically found on a general purpose desktop computer system.

Goals (User "How-to-Guide" Capabilities) (Table of Contents)

- Documents
  - Typical install, configure, operate and troubleshoot how-to guides with applicable terms and conditions for usage and redistribution.
  - In a plain text format suitable for embedded systems with only character-mode terminals.
- Manual Pages
  - Typical on-line information about Command Line Interface & Graphical User Interface use and application programming for each building block and tool.
  - In a plain text format suitable for embedded systems with only character-mode terminals.

Non-Goals (Host Virtual Machine Limitation) (Table of Contents)

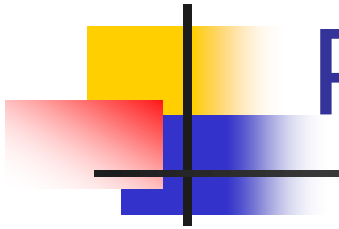
- Project will NOT provide *"Magical"* Host Virtual Machines which:
  - **Run incompatible Processor & Operating System Specific Applications:**
    - You should **NOT** expect to be able to run application programs designed specifically for one make & model processor and operating system on a different make & model processor and operating system.
    - You should **ONLY** expect to be able to run applications designed to run on a Python "virtual machine" that itself has been designed (by the Python Software Foundation) for the specific processor & operating system, tested and certified to correctly interpret and execute source code appropriate for the Python language generation (such as obsolete **1x**, mature **2x** or evolving **3x**).

Non-Goals (GUI Virtual Machine Limitation) (Table of Contents)

- Project will NOT provide *"Magical"* GUI Virtual Machines which:
  - **Run incompatible GUI Applications:**
    - You should **NOT** expect to be able to run pixel-mode "wxPython", "wxWidgets", "Qt" or "Tcl/Tk" applications that can copy graphic images from a file to the display and dynamically construct and output an array of pixels to the display which depicts the desired icons, graphic objects and text images.
    - You should **ONLY** expect to be able to run character-mode "wxPython"-style GUI applications designed to dynamically construct and output to the display an array or sequence Curses-standard alpha-numeric, punctuation and line-drawing characters (with escape sequences to control output to a desired display screen column and row position).

Non-Goals (Retrofit Limitations) (Table of Contents)

- Project will **NOT** provide *"Magical"* Python Virtual Machine cross-platforms for use with a diverse assortment of obsolete Hardware and Software platforms.
  - **Open** (HW such as 8-/16-bit Intel & Motorola microprocessors, 32-/64-bit Intel iAPX 432, i860; SW source code such as implemented in assembler, Ada, C/C++, FORTRAN and Python 1.x languages)
  - **Proprietary** (HW as in Digital Equipment Corp. & SGI systems; SW such as VAX/VMS & IRIX operating systems)
- Even if others have or could obtain such long discontinued platforms, Project author will **NOT** endeavor to obtain, reconstruct or simulate such platforms.



Plans (Table of Contents)

- Adopt Cross-Platform Technology Plan
- Adopt Modular Software Architecture Plan
- Adopt Python 2x Source Code Plan
- Adopt Python 3x Source Code Plan
- Adopt Development, Debug and Test Environment Plan
- Adopt Python Virtual Machine (VM) Environment Plan
- Adopt Python Virtual Machine (VM) Plan
- Adopt Engineering Notebook Plan
- Adopt Operator, System Administrator & Field Service Plan
- Adopt Document Focus Plan
- Adopt Release & Publication Plan

Adopt Cross-Platform Technology Plan (Table of Contents)

- Apply Hardware & Software Technology that lets you work more quickly and integrate your systems more effectively:
  - Popular, readily available and/or within the project budget
  - Suitable for rapid prototyping
  - Field proven with a long term track record of support
  - Software & Documentation must be free to study, modify, use and redistribute

Adopt Modular Software Architecture Plan (Table of Contents)

- Provide source code for cross-platform software development:
  - **Libraries** of Application and Troubleshooting Building Block components.
  - **Tools** for Facilitating and Tracking developer productivity.
  - **Utilities** for Monitoring and Changing hardware and software configuration.
  - **Tests** (Unit, Integration, System, Regression and Acceptance) for design verification and quality assurance.
  - **Examples** for Algorithms, Coding Style, Programmer Productivity Metrics and System Performance.
- Provide source code and associated install tools for:
  - **Site-Packages** (tailored for each Python 2x and Python 3x generation language) that installs and thereby connects third-party packages with one or more System Administrator designated previously installed Python 2.x.y or 3.x.y distribution.
  - **Developer-Sandboxes** (tailored for each Python 2x and Python 3x generation language) that will isolate untested code changes and outright experimentation from the production ("Site-Package") environment or repository.

Adopt Cross-Platform Software Environment Plan (Table of Contents)

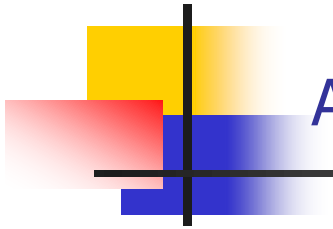
- **POSIX**, a Unix-like operating system complying with the Portable Operating System Interface:
  - **Apple Mac OS X** (Darwin-/BSD-based Unix)
  - **GNU/Linux** (combination of Unix-like GNU tools with Linux kernel)
  - **Microsoft Windows** (requires **Cygwin**, the GNU/Linux-like toolkit and command-line interface plug-in from Red Hat)
  - **Unix** (derived directly or indirectly from the original AT&T UNIX)
- **Python**, an interpreted, object-oriented programming language and cross-platform virtual machine:
  - **Python 3x** (**actively evolving & maintained** 3rd generation language)
  - **Python 2x** (**mature & actively maintained** 2nd generation language)
  - **Python 1x** (**obsolete & unmaintained** 1st generation language)
- **wxPython**, a cross-platform GUI Application Programming Interface

Adopt Python 2x Source Code Plan (Table of Contents)

- Develop software in mature & actively maintained Python 2x (2nd generation language)
  - Create non-installable Python 2x **Developer Sandbox** to facilitate troubleshooting
    - "__init__.py" defines nested package structure and dependency relationships
    - Modules import from other modules & packages within "try-except" logic to report import errors
  - Create installable Python 2x **Site-Package** to facilitate to use of Toolkit building blocks in same manner as library components registered in Python Global Module Index.
    - Copy Python 2x **Developer Sandbox**
    - Replace "__init__.py" modules with empty ones
    - Replace "try-except" import logic with explicit references to site-package identifier

Adopt Python 3x Source Code Plan (Table of Contents)

- Develop software in actively evolving & maintained Python 3x (3rd generation language)
  - Create non-installable Python 3x **Developer Sandbox** to facilitate troubleshooting
    - Copy non-installable Python 2x **Developer Sandbox**
    - Convert syntax of Python 2x to Python 3x (3rd generation language) using Python "**2to3"** utility
    - Debug to identify and resolve remaining issues
  - Create installable Python 3x **Site-Package** to facilitate to use of Toolkit building blocks in same manner as library components registered in Python Global Module Index.
    - Copy Python 3x **Developer Sandbox**
    - Replace "__init__.py" modules with empty ones
    - Replace "try-except" import logic with explicit references to site-package identifier



Adopt Development, Debug and Test Environment Plan (Table of Contents)

- Representative & Readily Available
  - Processors (32-/64-bit data register width)
    - Single Core --- A component containing a single processor performing all of the work.
    - Multi-Core or Multi-Processor --- One or more components containing multiple processors each performing their delegated portion of the work.
  - Processor-specific “Host” and optional “Guest” operating systems
    - Host OS --- Primary operating system connected to other computers or terminals to which it provides data or computing services via a hard-wired connection or switched telecommunication network.
    - Guest OS --- Secondary operating system that is either part of a partitioned system or part of a virtual machine (VM) setup.
- Develop, Debug and Test on available Sample Platforms

Adopt Python Virtual Machine (VM) Environment Plan (Table of Contents)

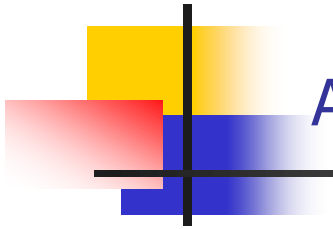
- A Cross-Platform Environment is created by VMs which are typically:
  - **Implemented** in a platform-independent programming language such as "C/C++"
  - **Compiled** into executable platform-specific VM building block library functions
  - **Executed** upon an operator's shell command (such as "python **DEMO.py** –help")
- VMs typically execute the Python application, upon its launch, via the following process:
  - **Compile** any un-compiled Python application & imported source code into a processor-independent byte-code containing tokens for each standard Python statement or subprogram operation
  - **Interpret** the VM tokens
  - **Execute** VM token-associated platform-specific VM building block library functions

Adopt Python Virtual Machine (VM) Plan (Table of Contents)

- Project Author and Release Adopters
  - Default use of popular Python (2.x.y and 3.x.y) Virtual Machines developed:
    - by the Python Software Foundation (PSF)
    - for popular and readily available Intel processors (x86 & x64) and processor-specific operating systems.
  - Optional use of equivalent Python (2.x.y and 3.x.y) Virtual Machines (or the source code to build them) developed:
    - by the Python Software Foundation
    - for other, less popular, processor types and processor-specific operating systems.

Adopt Engineering Notebook Plan (Table of Contents)

- **Engineering Notebooks (master kept in repository on development system)**
  - Collection of commentaries that express opinions or offerings of explanations about events or situations that might be useful to installers, developers, operators, troubleshooters and distributors of the toolkit framework.
  - Formats include text, tables and complex graphical images requiring an office suite application programs (such as from “Adobe”, “Microsoft“, “LibreOffice” etc.) typically found on a general purpose workstation, desktop or laptop computer systems.
- **Project (master kept in repository on development system; copy kept in site-package on embedded system)**
  - Excerpts from the Engineering Project Notebook that is in plain text format and suitable for embedded systems with only character-mode terminals.



Adopt Operator, System Administrator & Field Service Plan (Table of Contents)

- **Documents (master kept in repository on development systems with copies kept in developer sandboxes; copies also kept in site-packages on embedded systems)**
  - Typical install, configure, operate and troubleshoot how-to guides with applicable terms and conditions for usage and redistribution. In a plain text format suitable for embedded systems with only character-mode terminals.
- **Manual Pages (master kept in repository on development systems with copies kept in developer sandboxes; copies also kept in site-packages on embedded systems)**
  - Typical on-line information about command line use and application programming for each building block and tool. Each is generated, by a Python source code processing tool, in a plain text format suitable for embedded systems with only character-mode terminals.

Adopt Document Focus Plan (Table of Contents)

- **System Administrators** and **Field Service** will need to know or learn:
  - Hardware and Software Requirements for System and Applications
  - Available Hardware and Software Product & Support Resources
  - How to Install, Configure, Operate and Troubleshoot the Hardware and Software for System and Applications
- **Operators** will need to know or learn:
  - Available System and Application Hardware and Software features and how to use them
- **Developers** will need to know or learn:
  - Hardware and Software Architecture
  - Hardware and Software Interfaces
  - Software Design and Qualification Requirements
  - How to Install, Configure, Operate and Troubleshoot the Hardware and Software for local and remote Systems and Applications

Adopt Release & Publication Plan (Table of Contents)

- **Pre-Testing Stage Pre-Alpha Phase**
  - Phase begins during the software and documentation development.
  - Milestone versions include specific sets of functions and are released as soon as the functionality is complete.
- **Testing Stage Alpha Phase**
  - Phase begins when the software and documentation still may not contain all of the features that are planned for the final version.
  - The software can be unstable and could cause crashes or data loss.
- **Testing Stage Beta Phase**
  - Phase begins when the software and documentation is feature complete but likely to contain a number of known or unknown bugs.
  - It will generally have many more bugs in it than completed software, as well as speed/performance issues and may still cause crashes or data loss.
- **Pre-Publication Stage Release Candidate Phase**
  - Phase begins when the software and documentation has potential to be a final product, which is ready to release unless significant bugs emerge.
  - In this stage of product stabilization, all product features have been designed, coded and tested through one or more beta cycles with no known showstopper-class bug.
  - A release is called code complete when the development team agrees that no entirely new source code and documentation will be added to this release.
  - There could still be source code changes to fix defects, changes to documentation and data files, and peripheral code for test cases or utilities.
- **Publication Stage Release to World Wide Web Phase**
  - The means of software and documentation delivery, at the final release or at any previous testing stage, that utilizes the Internet for distribution.
  - No physical media are produced in this type of release mechanism by the manufacturer.