Keysight Technologies
BenchVue Software as an Educational Tool

Application Note

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Unlocking Measurement Insights

BenchVue software is a powerful tool for instructional laboratories, as well as for instructors. With support for hundreds of Keysight instruments typically found in electrical engineering labs and the ability to set up remote labs that are accessible over the Internet, BenchVue enables easy control, data capture, logging, monitoring, and report generation—all without requiring any programming. BenchVue's new Test Flow feature provides a simple, graphical method of sequencing instrument usage, also without requiring any programming skills.

BenchVue is currently installed in labs at many major universities. Keysight's BenchVue team is available to assist instructors in creation of labs using the software. One such example uses a B29xxA Source/Measure Unit to create a transistor curve tracer without requiring any other hardware. See Keysight application note *Using BenchVue Software's Test Flow Application to Characterize Transistors*, publication number 5992-1121EN.

BenchVue's major features include:
  – *It's free*. While there are "for-pay" versions of most applications that primarily extend data logging time, most other BenchVue features are available at no charge. Discounted educational packages for large labs are now available.
  – *It supports over 400 Keysight instruments*. Supported instruments include: Keysight's DMM, Function Generator, Oscilloscope, Power Supply, Data Acquisition, RF Power Meter, Spectrum/Signal Analyzer, and Network Analyzer families. Support will soon be available for RF Signal Generators, Frequency Counters and much more.
  – *Plug and play* connectivity with automatic detection of GPIB, USB and LAN instruments.
  – *Simple* point-and-click instrument control and data capture.
  – *No programming* or instrument drivers required.
  – One application to *integrate* all of your bench instrumentation.
  – Support for some instruments using iOS or *Android* mobile devices.
  – Easily create *custom sequences* and analyze *automated tests* using your instruments, thereby increasing test flexibility with *no programming*.
  – *Instrument access from anywhere on the Internet* using the free IO Server built into Keysight Connection Expert.
  – *Fast, dependable support* via email (bv_support@keysight,com), phone (1 800 829-4444, Press #, then 2), EEVBlog, or Keysight's online BenchVue Forum (**www.keysight.com/find/forums**, registration required)

Remote Teaching and Learning with BenchVue Software

In a remote teaching and learning scenario, each lab bench uses a Windows-based PC, which acts as an IO Server (a feature of the free Keysight IO Library Suite software). If desired, the PC's built-in webcam can even be aimed at the instruments for remote video monitoring. Any number of instruments can be connected depending on the size of the USB hub(s). Four typical instruments are shown in Figure 1; however, BenchVue supports over 400 Keysight instruments. In addition to the four instruments shown below, BenchVue also supports spectrum analyzers, power meters, network analyzers, and data acquisition instruments, with support for more instruments being added regularly.

Also shown in Figure 1 is a bench configuration, which is replicated a number times. Up to 254 benches can be created. A practical limit is 8 instruments per station. Each station can be operated locally in the lab, or from anywhere else, such as a dorm room, coffee shop, or the instructor's desk—any place with internet access.
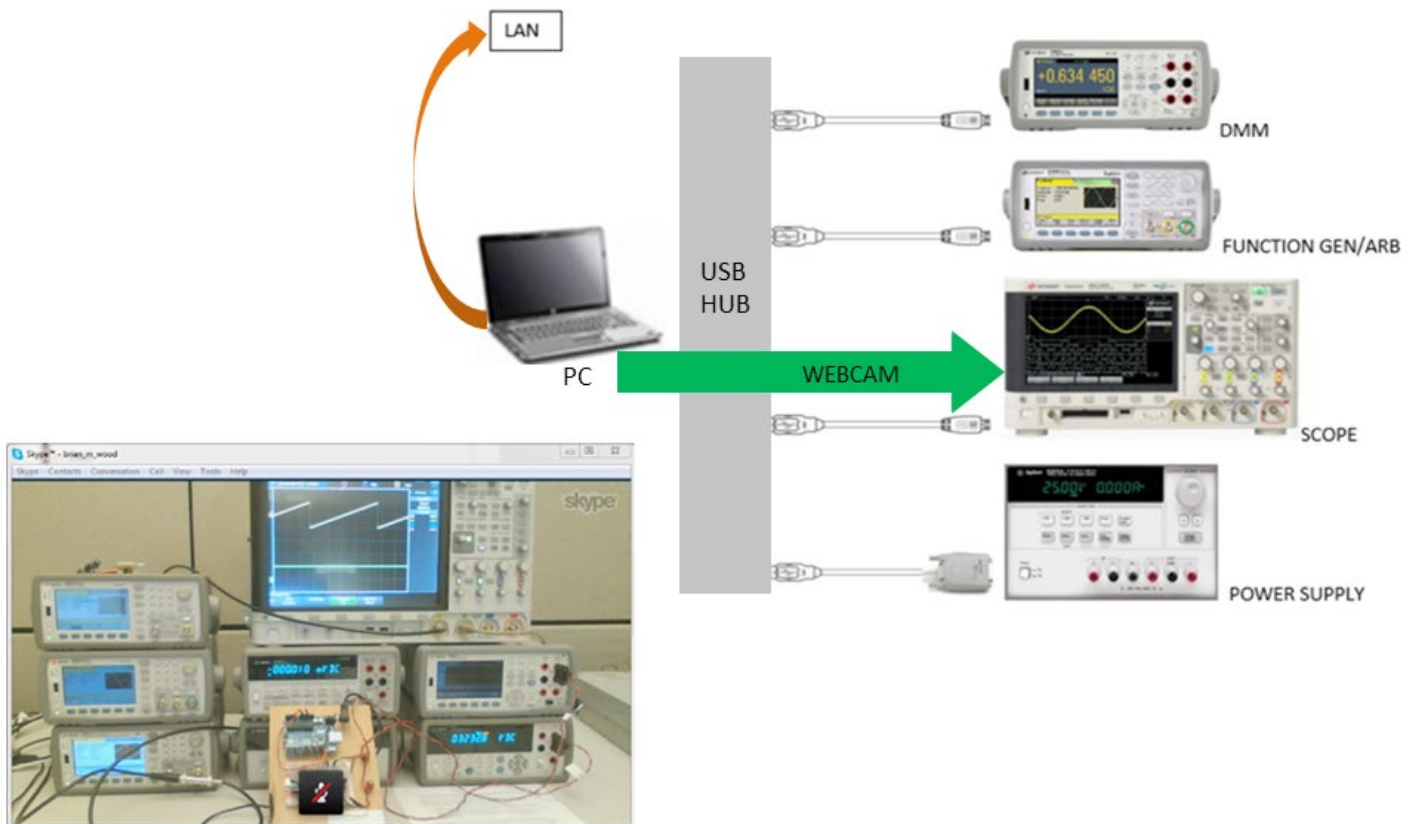

Figure 1. Some of the instruments that BenchVue supports are shown in this figure. By configuring these instruments in various ways, up to 254 benches can be created.

When configuring instruments in the lab, each bench is set up with a "USB#" and GPIB#, with "#" going from 1 to 254. Each station's instruments can be shown one set at a time, as shown in Figure 2.
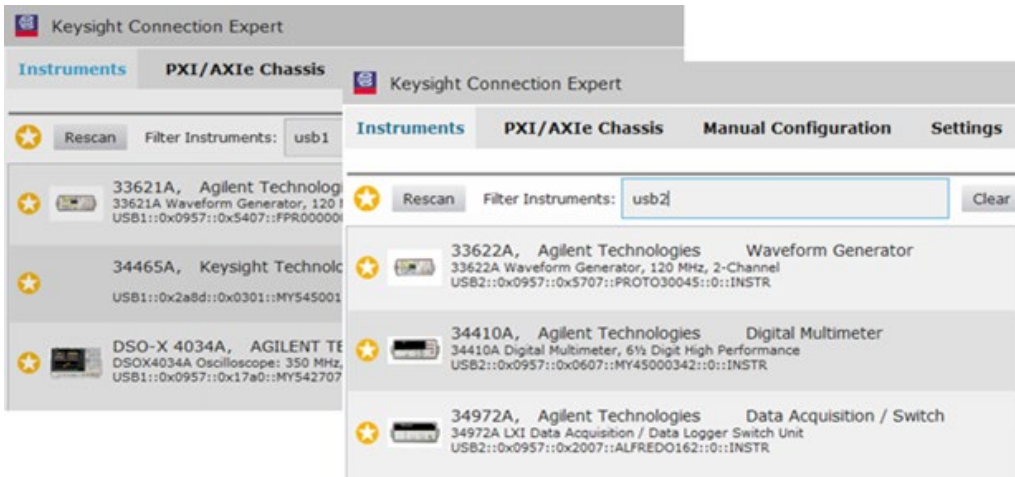
Figure 2. When configuring instruments using Keysight Connection Expert, each station's instruments are shown one set at a time.

Saving and Recalling Lab State Information

When a lab experiment is first configured, the state of all instruments is saved in a state file that can then be loaded by the PC at each station using the Windows file system. Students must first start BenchVue on the PC at each bench. The instruments are then located and started automatically. Next, students load the state file to initialize the hardware (Figure 3). Once set up, BenchVue can either be closed so the instructor can monitor the state of the instruments, or it can be used by the students at each bench to control and capture data from the instruments. If benches and lab experiments are left running unattended, they can be accessed remotely, 24x7, as long as internet access is available.
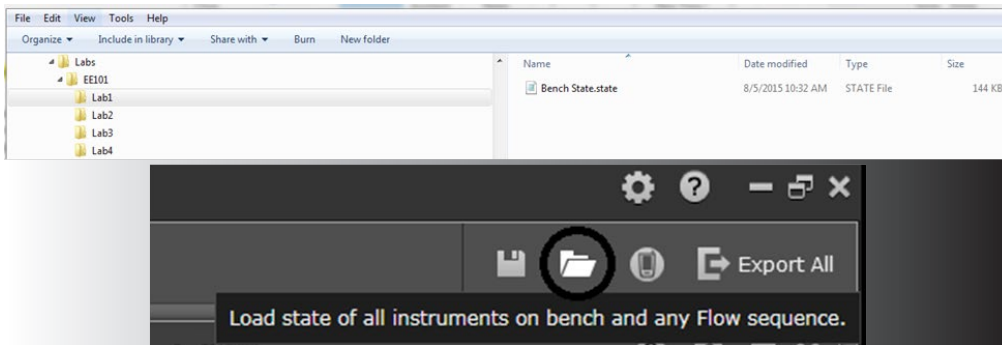

Figure 3. Using BenchVue, the state of all instruments is saved in a state file and later recalled.

Instructor Monitoring

Instructors can run BenchVue from their central PC and operate up to nine instruments on each station. In Figure 4, four instruments are set up for remote access by the central computer running BenchVue. One is shown with a red X, indicating a connection problem. The bench can be identified by the "USB1" ID. Each bench has a different ID. The instrument bar at the bottom of BenchVue can show hundreds of instruments, and can be scrolled left and right. Any of these instruments can be brought into BenchVue's main viewing window to see the state, but the front panel will be disabled while the instructor has control. Figure 5 shows what it would look like with lab station 1 active (left side) and available (right side).
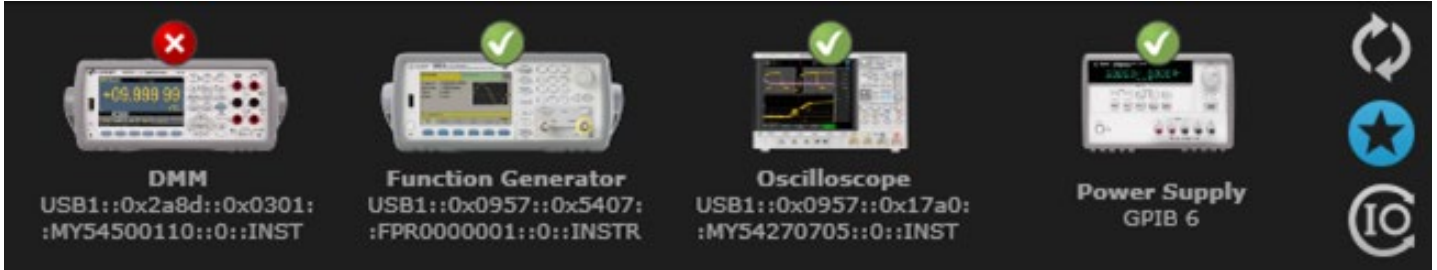

Figure 4. Of the four instruments set up for remote access, the left-most instrument has a connection problem.

Figure 5. Here lab station 1 is shown as active and available.

Information about each instrument can be obtained by right clicking on the instrument, as shown in Figure 6.

Figure 6. Right clicking on an instrument pulls up information about that instrument.

Saving Lab Experiment Results

Students can run BenchVue on each station and easily export screen images and trace data to Word, Excel, MATLAB or CSV files, with the files being saved anywhere on the LAN network. Students can then access the data from their PCs or mobile devices as long as they have access to the school's network (Figure 7).
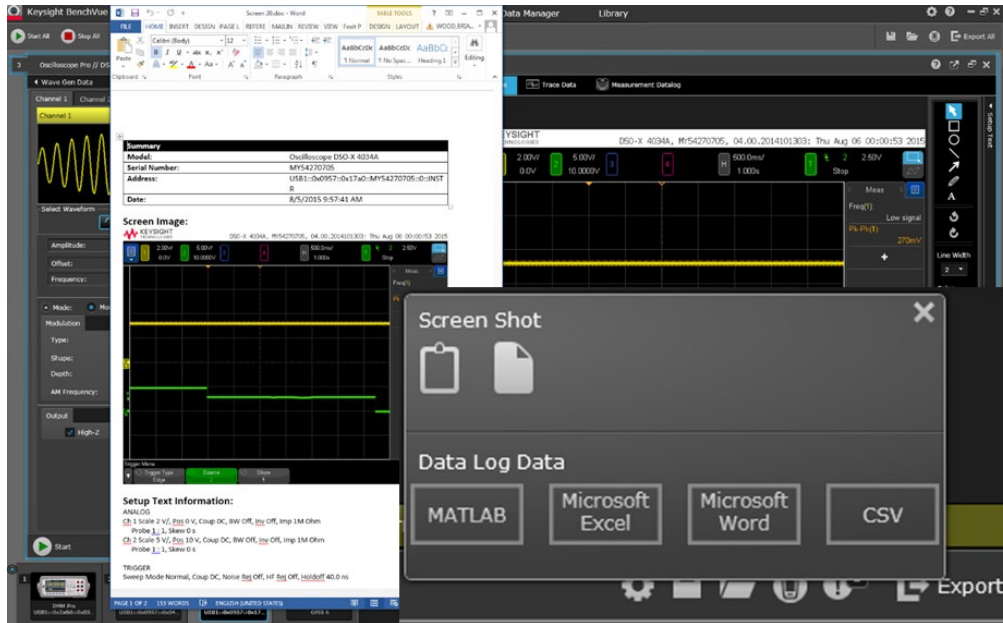

Figure 7. Experiment results can be saved and accessed from a student's PC or mobile device.

Automatic Logging of Instrument Usage

Lab managers often need to see who's used what instruments and when. BenchVue's Data Manager archives all logged data by start and end time. Users can bring this information up in a viewer, as shown in Figure 8. Any file can be exported. The document contains chart images, trace data and information about the instrument (see the Table).

Figure 8. With BenchVue's Data Manager, data regarding a user's start and end time is logged for later reference.

Summary	
Model:	DMM 34465A
Serial Number:	MY54500329
Address:	USB0::0x2A8D::0x0101::MY54500329::0::INSTR
Acquisition Date:	2015-05-07 10:06:48
Sample Count:	10000

Table 1. Shown here is an example of the information about the instrument that is contained in each log document.

Access to a Wealth of Library Information

The BenchVue Library tab provides a great way for students to quickly access information. That information includes manuals, videos, app notes, and more—all sorted by instrument number.
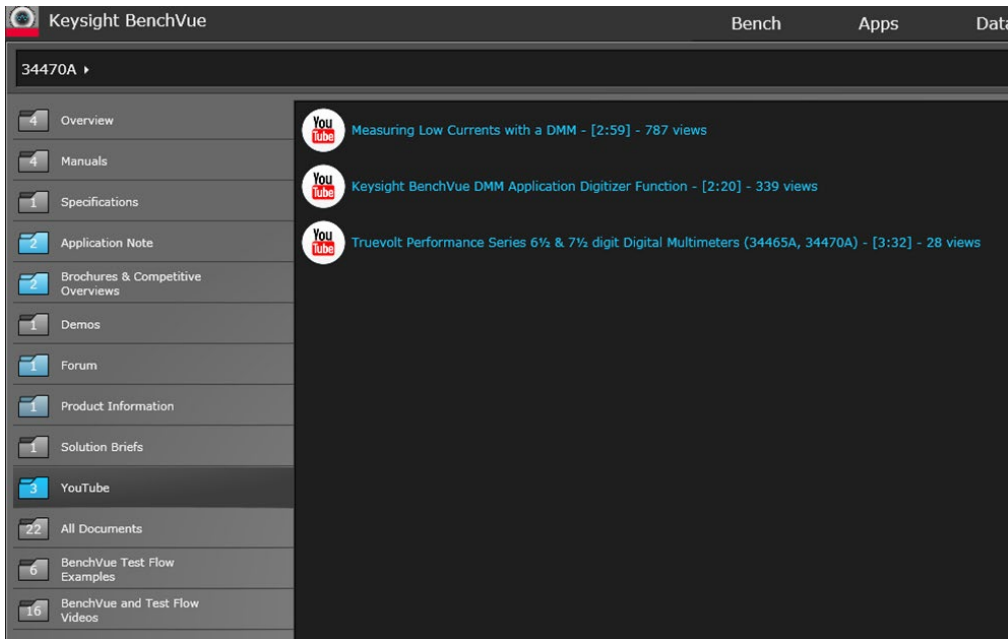

Figure 9. The BenchVue Library tab gives students access to a wealth of information.

Conclusion

BenchVue is a powerful software tool for instructional laboratories, especially in remote teaching and learning situations. Students benefit from BenchVue's ability to save and recall lab state information, save lab experiment results, and access those saved results from a PC or mobile device on the school network. Plus, they gain access to a wealth of library information. Instructors gain the ability to monitor student activity and access logs of instrument usage. Lab managers can access such information as serial numbers, firmware revisions, and available software updates. With such capabilities, BenchVue provides the perfect complement to any educational environment.

Get more information about BenchVue software at: www.keysight.com/find/BenchVue

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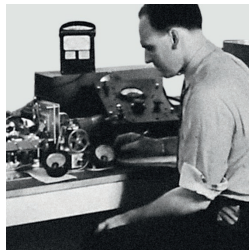
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