

CDS

Networked and Regulated

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Chromatography data systems flow on, meeting FDA regulations and becoming more integrated with computer networks.

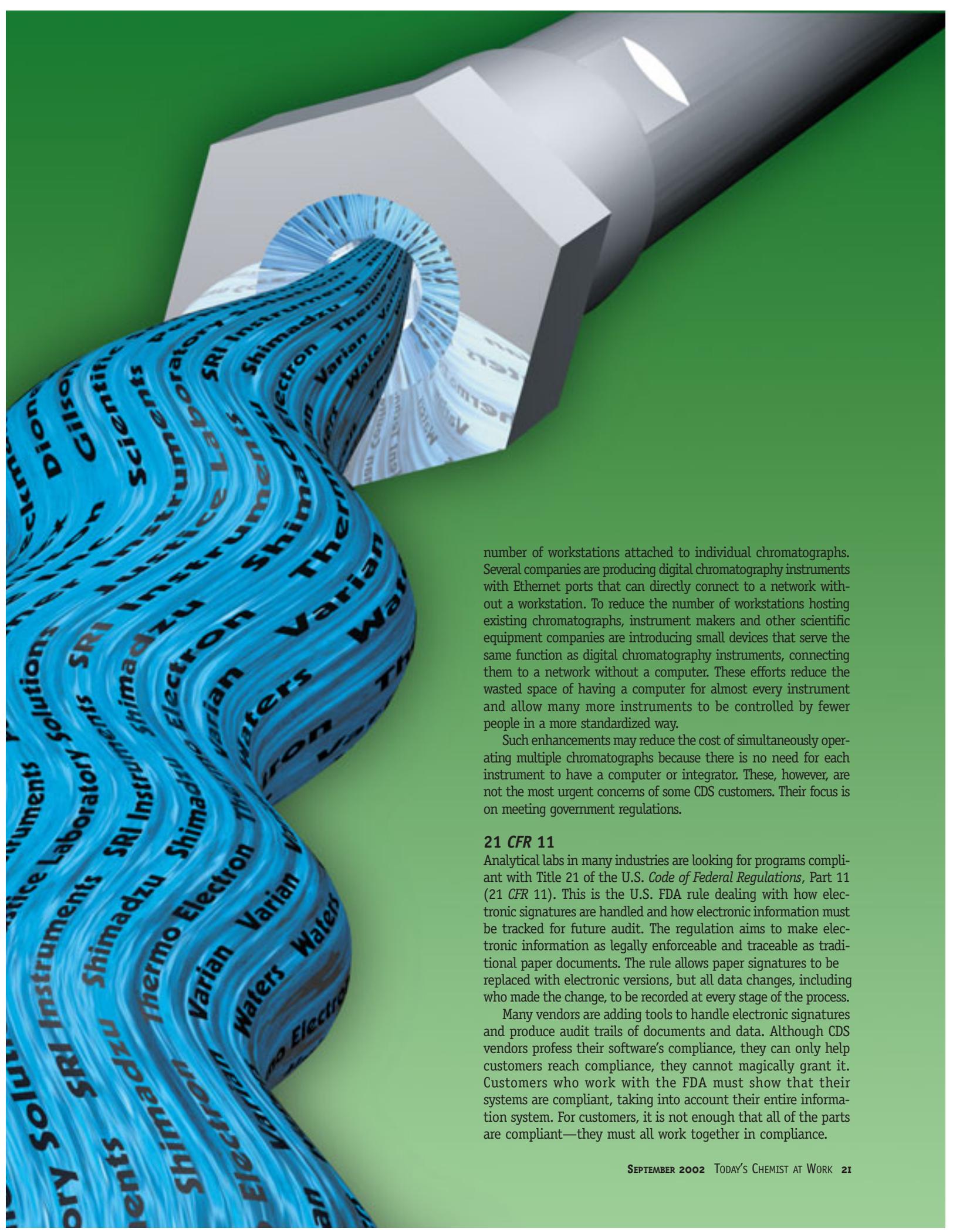
Chromatography data systems (CDSs) are now more than two decades old and depended on by hundreds of thousands of chemists. Their importance was recently underscored by the choice of the Chemical Heritage Foundation and Pittsburgh Conference on Analytical Chemistry's first annual Pittcon Heritage Award winner: David Nelson.

Nelson is synonymous with the history of CDSs. In 1980, after working for Beckman, Cary Instruments, and Hewlett-Packard, he started Nelson Analytical, which produced the first CDS software for personal computers. The company went on to create Turbochrom for Microsoft Windows. In 1989, Nelson Analytical was purchased by PerkinElmer, which continues to develop Turbochrom.

Nelson and Harmon Brown, his partner at Nelson Analytical, had the vision to use personal computers rather than develop hardware for CDSs. Nelson, now retired, suggests that the future of chromatography might lie in the ability to run more samples at the same time. "The historical problem with chromatography that is still with us [today] is that you can only run one sample at a time. So if you want to run multiple samples simultaneously, you have to buy another chromatograph." Nelson adds that using a large number of chromatographs could get extremely expensive if maintenance costs and operators are considered.

Capillary chromatographs with many columns running simultaneously in one instrument might solve this problem, Nelson points out, but the potential has yet to be realized. To increase throughput, some CDS packages are addressing the operation of multiple machines as part of a network.

CDS manufacturers are introducing equipment to reduce the



number of workstations attached to individual chromatographs. Several companies are producing digital chromatography instruments with Ethernet ports that can directly connect to a network without a workstation. To reduce the number of workstations hosting existing chromatographs, instrument makers and other scientific equipment companies are introducing small devices that serve the same function as digital chromatography instruments, connecting them to a network without a computer. These efforts reduce the wasted space of having a computer for almost every instrument and allow many more instruments to be controlled by fewer people in a more standardized way.

Such enhancements may reduce the cost of simultaneously operating multiple chromatographs because there is no need for each instrument to have a computer or integrator. These, however, are not the most urgent concerns of some CDS customers. Their focus is on meeting government regulations.

21 CFR 11

Analytical labs in many industries are looking for programs compliant with Title 21 of the U.S. *Code of Federal Regulations*, Part 11 (21 CFR 11). This is the U.S. FDA rule dealing with how electronic signatures are handled and how electronic information must be tracked for future audit. The regulation aims to make electronic information as legally enforceable and traceable as traditional paper documents. The rule allows paper signatures to be replaced with electronic versions, but all data changes, including who made the change, to be recorded at every stage of the process.

Many vendors are adding tools to handle electronic signatures and produce audit trails of documents and data. Although CDS vendors profess their software's compliance, they can only help customers reach compliance, they cannot magically grant it. Customers who work with the FDA must show that their systems are compliant, taking into account their entire information system. For customers, it is not enough that all of the parts are compliant—they must all work together in compliance.

This is also a growing concern for labs that are regulated by agencies other than the FDA. The EPA is developing a new set of regulations for electronic signatures and data (CROMERRR) and has made it clear that it will be based on 21 *CFR* 11 (see "Regulations and You", p 35). Because so many customers want 21 *CFR* 11 compliant software, these regulations will probably become industry standard.

CDS Improvements

CDS vendors are including 21 *CFR* 11 compliance, networking abilities, and other improvements in their new software releases. Some have developed these new features in-house; others have acquired or work in partnership with other companies to develop new functions or entirely new programs.

Waters (www.waters.com, Milford, MA) Millennium³² CDS version 4 is 21 *CFR* 11 compliant and has been updated with an icon-driven menu aimed at increasing usability. The program's report functions can generate PDFs for easy e-mailing and Web posting. To extend the usability of CDS software, Waters released a new CDS called Empower Software. Empower is Millennium³² with a new user interface and other added features. The Quick-Start interface is designed so that all lab workers, regardless of familiarity, training, or skill, can access what they need. However, for those familiar with Millennium³², there is an interface that is essentially the same as previous versions.

Scientific Software, Inc. (www.scisw.com, Pleasanton, CA) released the latest version of its EZChrom Elite CDS (version 2.8.3) in February 2002, adding tools for 21 *CFR* 11 compliance as well as control capability for Hitachi LaChrom and ThermoFinnigan SpectraSystem LCs. EZChrom offers a user-customizable automation interface, which allows users to develop screens for common analysis runs that require just sample information or other run-specific information. An advanced report-writing feature uses a spreadsheet interface for ease of use.

Dionex (www.dionex.com, Sunnyvale, CA) is yet another CDS maker with a 21 *CFR* 11 compliant product. Chromeleon 6.40, released in November 2001, supports more than 150 different HPLC and GC instruments, including Agilent 1100 LCs and 6890 GCs, and ThermoFinnigan SpectraSystem LCs. To publicize the Chromeleon's compliance with 21 *CFR* 11, Dionex distributed a 16-page document that explained regulation details and showed real screen shots of how its program addresses compliance particulars. Dionex also produces PeakNet 6 for IC.

Beckman Coulter (www.beckmancoulter.com, Fullerton, CA), like many other companies, redesigned its flagship CDS to be 21 *CFR* 11 compliant. The Pinnacle CDS has been revamped to use electronic signatures but also allows system administrators to implement signatures only where needed. The company is looking past 21 *CFR* 11 to future regulations that might require better-designed human-computer interfaces. Part of the Pinnacle interface, called the Prospector, has been redesigned to look like Microsoft Outlook. According to the company, this feature allows new users to access information quickly and intuitively and puts almost all functions just one or two clicks away. Pinnacle users can add functions to the program using Microsoft's Visual Basic for Applications (VBA, the common language for writing macros and functions for Microsoft Office programs). Beckman Coulter also continues to offer 32 Karat for HPLC and CE instrument control.

Shimadzu (www.ssi.shimadzu.com, Columbia, MD) has developed a long line of CDS software; its latest, CLASS-VP v7.0, is 21

CFR 11 compliant. The CDS is not aimed at small labs but can operate as an enterprise system, connecting labs throughout the world. Instrument validation is made easier with additional chromatogram validation and virtual peak generation software. Shimadzu also produces CLASS-VP 4.3 for GC and LC, and CLASS-VP 5.0 for its new LC-VP instruments. The CLASS-VP CDS packages work with Windows NT and 2000, and Shimadzu is working closely with Scientific Software to integrate Shimadzu equipment with CyberLAB knowledge-management software.

PerkinElmer Instruments (www.perkinelmer.com, Wellesley, MA) has changed the name of its CDS software from Turbochrom to TotalChrom. TotalChrom is offered in several packages: workstation (for a single computer), client/server (for several networked computers or an entire enterprise), and a turnkey solution in which TotalChrom comes preinstalled on a computer. The turnkey solution is offered as a replacement for benchtop integrators. The software is basically the same in all three packages, allowing users to collect information from all commercial LCs and GCs according to the company. In addition to covering equipment from other companies, the software can work closely with the PerkinElmer AutoSystem XL GC and Series 200 HPLCs. The client/server version has auditing and other tools for 21 CFR 11 compliance, and all three versions come with TCPublisher, a reporting tool. Users interested in Web-based access can look into the company's Sombrilla instrument and data management system.

Gilson (www.gilson.com, Middleton, WI) is focused on control software for its own instruments. UniPoint, which comes in versions

for LC, SFC, and LC-MS, also includes a "what-you-see-is-what-you-get" (WYSIWYG) report editor and can work in conjunction with Gilson's other CDS, TopPoint. TopPoint adds multiuser abilities to UniPoint, allowing many users to access numerous instruments while continuing to keep track of sample location and data.

Thermo Electron (www.thermo.com, Waltham, MA) has two divisions that produce CDS software. Thermo LabSystems released the 2002 edition of its Atlas CDS.* This year's update adds control of more instruments (Agilent 5890, 6890, and additional control for the Agilent 1100) and 21 CFR 11 compliance. Thermo Finnigan continues to produce the Target CDS. Target is compatible with more than 50 different chromatographic instrument systems and many MS systems.

Varian (www.varianinc.com, Palo Alto, CA) introduced a new CDS called Galaxie at Pittcon 2002. Varian purchased JMBS Developments (Grenoble, France) in October 2001 and turned its CDS system into Galaxie. The system links LC and GC instruments to form a network. Using interface boxes that connect directly to an Ethernet network, many instruments can be controlled by relatively few people. In addition, strong audit and security make the system 21 CFR 11 compliant.

Varian continues to produce its Star Chromatography Workstation. The current version (version 5) can operate up to four instruments from one computer. Reports can be generated using standard options such as scalable plots and tabular result tables, or by using a custom report generator, which includes a WYSIWYG editor. A new edition to Star is the StarFinder, a tool that

allows easy access to information recorded by the Star CDS without adding too much complexity.

SRI Instruments (www.srigc.com, Torrance, CA) produces the PeakSimple CDS for use on SRI instruments and other GC and HPLC systems. The multilingual software is not marketed to compete with major vendor programs, but it is no-nonsense and can be downloaded on a trial basis from the company's website.

Justice Laboratory Solutions (www.justiceinnovations.com, Denville, NJ) is one of the few vendors that is not indicating whether or not its CDS meets 21 *CFR* 11. This is most likely because the company has found most of its success in the chemical and petrochemical industries and 21 *CFR* 11 is not as urgent in these fields. Look for it in the future if the EPA uses 21 *CFR* 11 as a basis for CROMERRR. Justice's Chrom Perfect Spirit is a 32-bit Windows program that uses many Windows technologies such as Active X, OLE II (object linking and embedding) and COM (component object model) to draw on the power of popular Windows programs like Microsoft Word and Excel. Chrom Perfect also produces chromatograms in enhanced meta file format, which makes them compatible with many desktop publishing programs. Although data exchange with other Windows programs is a focus, Justice's Report Write Plus continues to be one of its strengths, and report results can now be easily incorporated into Microsoft Word and other word processing programs.

Agilent Technologies (www.agilent.com, Palo Alto, CA) produces three CDS titles described as Networked Data Systems (NDS), following the trend of incorporating chromatography instruments as part of computer networks. The newest of these systems, released in

June 2002, is the Cerity NDS for Pharmaceutical QA/QC. Cerity is aimed at quality assurance and control for pharmaceutical manufacturers, and as a result it meets requirements for 21 *CFR* 11 and general manufacturing practice (GxP) regulations. This includes level-4 control of instruments and other security features. The first Cerity product, Cerity NDS for Chemical QA/QC, is very similar to the product for the pharmaceutical industry; however, it lacks the 21 *CFR* 11 measures and is aimed at a different industry, namely all other QA/QC laboratories.

Agilent also continues to update its ChemStation CDS software (now called ChemStation Plus NDS). The newest version, released in January 2002, includes tools that assist with 21 *CFR* 11 and Pharmacopoeia requirements. In addition, ChemStation addresses instruments using Ethernet technology, eliminating common distance restrictions of other kinds of connections. The CDS is available for GC, LC, LC-MS, CE, and CE-MS.

Next year's developments are anyone's guess, but it is easy to imagine that the CDS market will continue to be highly sensitive to government regulations. In addition, growth in the pharmaceutical and biotech industries will likely foster the development of more products aimed at serving the needs of those markets. The strong foundation established by Nelson and others ensures that this will be possible.

Michael J. Felton is an associate editor of *Today's Chemist at Work*. Send your comments or questions regarding this article to tcaw@acs.org or to the Editorial Office address on page 6. ♦