TECHNOLOGY UPDATE

ARTIFICIAL INTELLIGENCE

Out of the future and into the office

INSIDE: **H**ACKERS FOR HIRE

TECH FOR SMALL BUSINESSES

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EMAILS ARE AN OPEN WINDOW INTO YOUR NETWORK

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THIS COULD ALTER MOST EVERYTHING

[From health care to finance to driving, artificial intelligence could change our world]

By STACY WESCOE
swescoe@lvb.com

When many people think of artificial intelligence, they envision a science fiction future where lifelike robots interact with people and show charm and a deep understanding of the human condition.

That's not quite it, at least not yet, said Michael Bartolacci, professor of information sciences and technology at Penn State Berks.

"People have a misconception. They think robotics is AI. It's not," he said. "Traditionally, robotics are used in manufacturing. A robot is trained and it does the same thing over and over again. They don't think. They're not R2D2 or C3PO."

Artificial intelligence, or AI, is in use in various industries today. It's just a lot more simple and ordinary than the AI dreamed up by science fiction writers.

At its most basic, artificial intelligence is a computer programmed to perform tasks that normally require human intelligence, Bartolacci said. Examples include visual perception, speech recognition and decision making.

AI programming already is in wide use in the automotive industry, health care, stock market prediction, customer service and even in people's homes.

If it seems a bit overwhelming, it is.

"There's a lot of confusion in the market about what AI actually is," said Doug Eadline founder of Basement Supercomputing, a Bethlehem-based high performance computing software and clusters provider. "It's one of those blanket terms that is thrown out to cover a lot things that aren't actually artificial intelligence, but are on the spectrum."

DIGITAL DIAGNOSIS

AI technology is transforming health care with its ability to sort through layers and layers of data to determine likely treatment outcomes, identify at-risk individuals and improve diagnostics.

For example, an AI system can often detect cancer earlier than a human radiologist can. It can see smaller details and can analyze a spot found on an X-ray and compare it with data from other patients with similar results.

It can use data from former patients to determine the likelihood that something is cancer and then ascertain what treatments have been used successfully for such a diagnosis.

CODE PREDICTION

Artificial intelligence also can help with heart care. Ochner Health System of southeast Louisiana recently launched an AI tool that assists doctors in analyzing data to predict which patients are more likely to deteriorate after treatment for a heart-related ailment.

The system then triggers a "pre-code" alert to let the health care providers intervene sooner.

Bartolacci said AI can be developed for something as simple as the concept of "a doc in the box," he said. A patient's symptoms can be entered, prompting suggestions for a diagnosis.

ON THE ROAD AGAIN

Some of the most basic AI technologies have been in cars and trucks for years.

If a car has lane assist to keep it from drifting out of its lane – that's AI. The system has been programmed to recognize when a vehicle is leaving its proper lane and make adjustments to keep it driving within the lines.

'True AI is about action now, but [it] can make a prediction about what someone wants and take action.'

– Doug Eadline, Basement Supercomputing

Such automotive technology includes the simple warning beep that lets the driver know another vehicle is coming too close when making a turn. It also includes driverless vehicles now being developed that may someday have people as passengers as AI takes control of the wheel.

Even for drivers without assistive technology, artificial intelligence is everywhere on the nation's highways.

"Every time you go on the turnpike, [the authorities] take a picture of your license plate that is put through a trained network of optical character recognition," Eadline said.

BANK ON IT?

Stock market investors have been trying to use computer algorithms to predict what the market is going to do since the earliest days of computing.

With the ability to analyze more data faster and sort through years of historical data in a micro-second, those predictors are more popular than ever.

Boston-based Opimas LLC, an international financial research and analysis firm, recently issued a report on the use of AI in financial management and saw some good things.

"Opimas does foresee myriad benefits coming to financial players in the future from the robots and machines that think and learn and analyze mountains of unorganized data," the report said.

Opimas predicted that by 2021 finance companies around the world would be investing $2.8 billion annually in AI-related technology.

While that seems like great news, Bartolacci cautions that no perfect program has ever been developed to accurately forecast the stock market because there are too many unpredictable factors – mostly the human element.

DATA IN, JOBS OUT

Still, AI can be reprogrammed based on its past success-fail rate, which gives it a continuing chance to improve.

Even if it's not perfect, it's being used and already is replacing humans in the financial field. Opimas predicts 230,000 jobs could disappear from the financial industry by 2025.
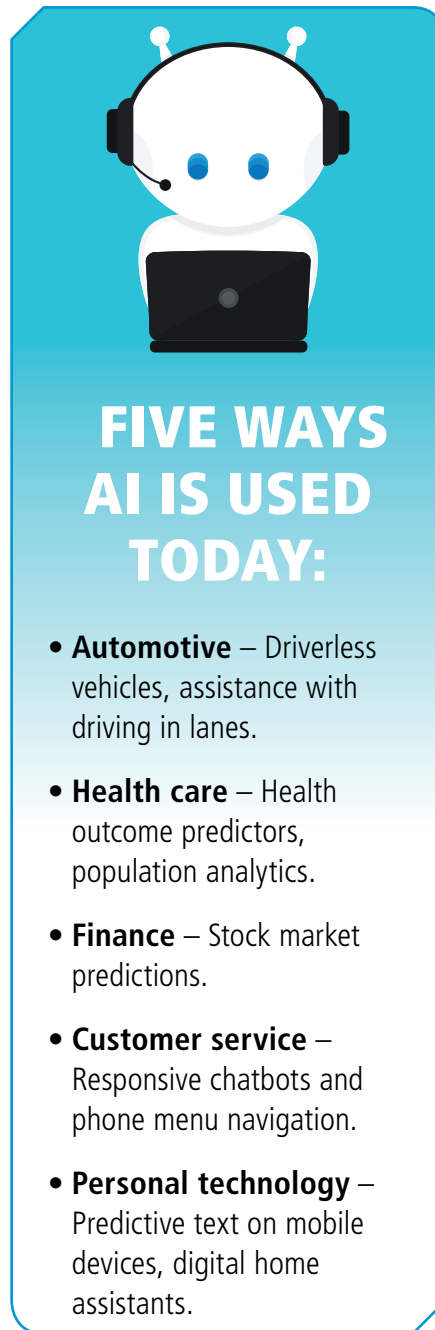
Opimas isn't the only one making such a prediction.

Anthony Jenkins, former CEO of Barclays Bank, predicts that over the next 10 years, advances in technology – especially in artificial intelligence – could cause the number of people employed by the financial services sector to decline by as much as 50 percent.

A VOICE ON THE PHONE

Not being able to get a human on the phone long has been a complaint of consumers using customer service help lines.

And with increasing AI technology, that

FIVE WAYS AI IS USED TODAY:

- **Automotive** – Driverless vehicles, assistance with driving in lanes.

- **Health care** – Health outcome predictors, population analytics.

- **Finance** – Stock market predictions.

- **Customer service** – Responsive chatbots and phone menu navigation.

- **Personal technology** – Predictive text on mobile devices, digital home assistants.

isn't likely going to change, Eadline said.

White collar jobs, such as customer service operators, are among the hardest hit by AI technology.

That's because AI technology is getting better at "thinking" like a human and getting users the info they need faster, all while decreasing costs because of lower staffing needs.

"True AI is about action now, but this can make a prediction about what someone wants and take action," Eadline said.

QUESTIONS AND ANSWERS

A voice-activated AI customer service system can ask basic questions such as, "What can I help you with?"

Then it can direct the customer to the appropriate department or directly to the answers he or she seeks without having to go through a human.

And, Eadline noted, it's not just phone service. Chat bots are becoming popular on websites to provide real-time answers to consumers using a text-based AI program.

HOME SWEET AI HOME

AI technology has become so pervasive, it has found its way into many people's homes.

Anyone who has an in-home digital assistant, such as Amazon's Echo or Google Home, is interacting with an AI program.

It uses voice recognition and other AI programming to answer simple questions such as, "What's the weather forecast for the weekend?" Or, "What's the score in the Phillies' game?"

And it can turn on and off your lights with a simple command.

THE GOOD NEWS

With the use of ever-improving AI technology, businesses are able to do things quicker, better and more cheaply than ever before.

It's even saving lives.

But it is definitely going to cost jobs.

THE BAD NEWS

Wall Street isn't the only area that could face job cuts with the proliferation of artificial intelligence. AI will be hitting hard many other white collar jobs, according to most experts.

Meanwhile, blue collar jobs still are at risk as robotics and automation evolve alongside AI. It means that almost all industries will be affected by technology in some way in terms of the number of jobs and the kind of jobs.

But to what degree?

A 2017 analysis combining the effect of AI and automated robotics by accounting and consulting firm PwC showed that technology could take as many as 38 percent of jobs in the next 15 years.

THE LIMITATIONS

Total AI takeover is unlikely because of the technology's lack of basic human common sense.

"It doesn't know if an action makes sense or not. It just doesn't know," Eadline said. "It's like a copier when you've hit print too many times. It won't stop printing."

Humans and their organic intelligence are still needed.

"Any machine is only as smart as the people that program it," Bartolacci said. "We still haven't figured out the human brain. And until we do, we'll never have a machine as smart as a human being." ●

IT'S GOOD
TO BE BAD

[Businesses hire firms to hack into their network to detect, then correct, flaws]

Gideon Lenkey of Ra Security Systems Inc. says his firm can tap into a company's computer system in minutes and expose weaknesses in the network.

FILE PHOTO

By JENNIFER TROXELL WOODWARD
Special for Lehigh Valley Business

To combat online attacks, businesses intentionally hire hackers to get into their company computers.

These are not the crooks you might expect, but rather reputable cybersecurity firms given the green light to hack into company computers to detect criminal activity and data breaches, to find weaknesses in the network and to secure and monitor company data and employee information. "We can get into a company's computer system within minutes, and no one knows we are there," said Gideon Lenkey, president and co-founder of Ra Security Systems Inc. in Milford, N.J. "We can get in through an email, maybe HR [human resources] opens a resume, and we can put out cameras and microphones."

Lenkey said one the most interesting jobs his team was hired to do was for an insurance company in Pennsylvania.

When Lenkey and his team began hacking into the company's computers, they discovered it already had been hacked by two hacker organizations – and that the cybercriminals were fighting for two years to gain control of the data they had stolen. This activity was going on at night while the office was closed.

Ra Security resolved the problem by taking all computers offline at the insurance office and shutting down the hackers' efforts.

"When we disconnected the office computers from online, all the phones in the office started to ring. …The hackers were trying to find a modem," Lenkey said.

This scenario is one example why businesses are hiring firms such as Lenkey's to hack into their own systems, determine their weaknesses and build a better line of defense against cyberattacks.

Lenkey said he also has been hired by companies to visit on-site, physically steal hard drives and even walk away with computers and photocopied documents.

HACKERS FOR HIRE

Those in computer technology say there are several benefits that businesses receive from hiring another company to break into their computer systems. Here are some incentives:

- **Penetration testing** allows a company to investigate specific vulnerabilities or weaknesses in the system of which the client would not be aware.

- **By hacking** into company computers, one has the opportunity to do a full discovery, which will uncover all unusual activity and classify weaknesses from low level situations to the greatest threats.

- **While breaking** into a network, hackers-for-hire can find things such as how many servers need to be updated, is the information technology firm or team the company uses doing its job, and if employee personal information, addresses, phone numbers and Social Security numbers are stored securely.

- **It proves or disproves** assumptions a business may have regarding its safety and better prepares it for a real attack.

VULNERABILITY, PENETRATION

Businesses from throughout eastern Pennsylvania hire Domain Technology Group Inc. of Wyomissing to do vulnerability testing and what the information technology world refers to as penetration testing. Both tests involve gaining access to company computers to find things such as viruses and to detect suspicious activity, said Larry Goncea, a senior IT consultant at Doman Technology.

That first step, the vulnerability test, uses software to find flaws in the system,

'The subject of hacking and cyber-security protection is an endless topic, and a lot of monitoring is done to mitigate this to the highest possible extent.'

– Antonio Haddad, Infradapt

decide what is missing and to determine if data were breached or the system was configured incorrectly. All weaknesses found are classified from high to low priority.

The next step, the penetration test, is when Domain Technology takes on the role of hacker. "Essentially, if I am running a penetration test, it means that I

found holes in the system during the vulnerability testing," Goncea said, adding that a vulnerability test will target any strange activity, and the intentional hack attempt that follows will determine if there is a big problem. Goncea said some of Domain's best clients are financial institutions and health care organizations.

ENDLESS TOPIC

Antonio Haddad, managing partner at Infradapt LLC in Upper Macungie Township, said he handles IT security and works with businesses to find flaws in computer networks. He sees it is as necessary for companies to have a security company break into their systems.

His company provides IT security, provides remote and on-site monitoring and manages firewalls, but when it comes to hacking into computers, the client has to use a third party. "We make sure the shields are up and we validate our services, but we cannot certify our work," Haddad said, and that is where a third party is hired to hack into the system to verify Infradapt's work.

"The subject of hacking and cyberse-

curity protection is an endless topic, and a lot of monitoring is done to mitigate this to the highest possible extent," he said.

FINAL STEP

Don Welch, chief information security officer for all Penn State University campuses, said companies hire security firms to do penetration testing as a final step in a broader process. According to Welch, large firms already have their IT

team doing the security. But companies, especially those that deal with many merchants, for example, must do penetration testing as an annual compliance requirement.

"When you think you have everything set, you may decide to bring in someone to do a [penetration] test," said Welch, based in University Park.

"You want to make sure you catch all the vulnerabilities. So, it is good to have an outside party to do that testing." •

SMALL BIZ TECHNOLOGY:
[WHAT YOU DO AND DON'T NEED]

By KATHY RUFF
Special for Lehigh Valley Business

A waterproof Bluetooth speaker. A 3-D printer. A portable printer. The latest iPhone.

The list of new technologies grows almost as fast as weeds in the garden.

What technologies do you really need to work more efficiently and productively?

Is the cost of the newest gadget prohibitive or a good investment?

Will it improve your workflow or bottom line, or do you just want more bells and whistles?

"There is no one-size-fits all in technology," said Todd Schorle, president of TS Tech Enterprises Inc., Wyomissing. "What works for one business does not necessarily always apply to another company.

"It's good to be current with your technology, but you don't want change for change's sake."

What a company needs depends on a number of factors such as the industry and the type and size of the business. At a minimum, every business needs backup, anti-virus, firewall and update management.

"If you ask them what their needs are, most small businesses don't know," Schorle said. "… I would recommend having a consultation with a technology professional at least once a year to evaluate your needs, because, as businesses grow and change, those needs are not static.

"They're going to change, as well. What worked last year isn't necessarily always going to be the same approach, because technology changes so much."

FULLY VETTED

Though technology changes, the need to protect company data and for due diligence before buying remain priorities.

"The most important piece is the operating system updates and updates for things like Java, Adobe, which is where we're seeing breaches," Schorle said. "What you want is to have security.

"Often, we will tell clients don't run out and buy this new thing until they talk with us or until it has been fully vetted and tested and we understand how it's going to impact your business. Avoid the bleeding edge. It's good to be current, but taper the current against functionality."

SECURITY

In addition to functionality, users need knowledge of and prevention against potential threats created by today's interactive technology.

'We strongly suggest people have a strong plan for storing their data and being able to recover it.'

– Melissa Confalone, Fraser Advanced Information Systems

"We say there's no identity theft protection; all there is is identity theft detection," said Michael Bubernack, CEO of ET&T, a family owned business in Bethlehem. "It doesn't matter how big a business is, isn't or wants to be.

"We bring security awareness, in particular cybercrime awareness, to business owners and their employees who can minimize the risk on the Internet and the dark web."

ET&T works with a checklist of about a dozen tools to protect business owners' interests.

"Firewalls and anti-virus are simply not enough," Bubernack said. "Your last line of defense is a proper backup. You want to minimize spam email. You want to perform computer updates; Microsoft Windows changes every day."

Schorle

WEB BANKING

For web banking and other sensitive financial data, Bubernack recommends a dedicated tool to protect data.

"I will recommend that everybody buy a $199 Chromebook and use it only for web banking and things like that," he said. "A Windows PC is always vulnerable to these hacker people on the dark web. It's a huge business."

With the prevalence of mobile telephones, many small businesses also may
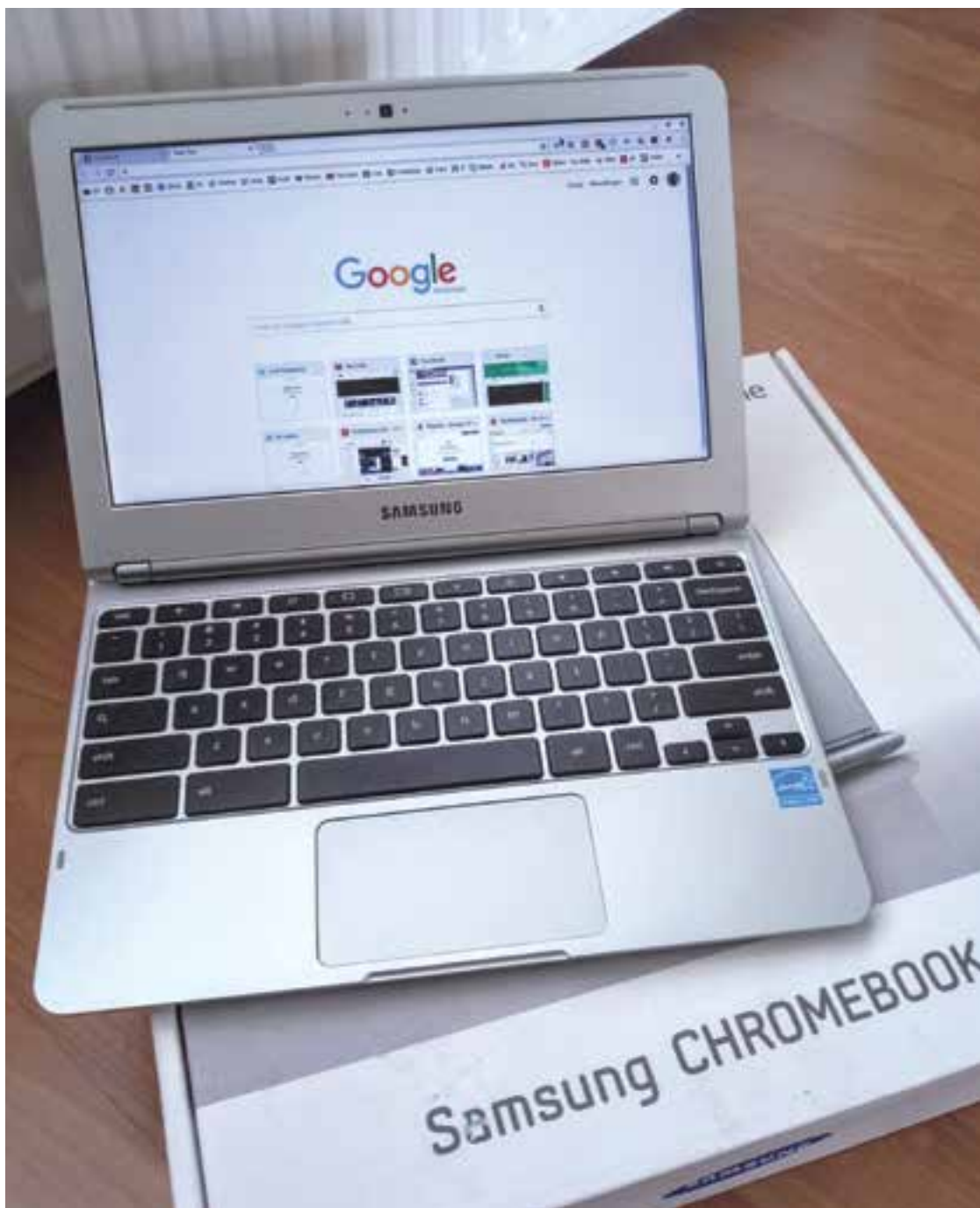
Chromebook: Michael Bubernack of ET&T recommends that businesses buy the $199 Chromebook and use it only for web banking.

FIVE TO THRIVE

🔥 **(1) Embrace security** – Be sure to use a firewall and anti-virus technologies.

🔥 **(2) Manage your updates** – Install critical security system updates and software patches as they become available.

🔥 **(3) Back up, back up, back up** – Invest in reliable backup resources to protect your data and create a plan to recover that data.

🔥 **(4) Be patient** – Don't buy the newest trend until you know how it will benefit your operations.

🔥 **(5) Ask the professionals** – Know what you don't know.

not need expensive commercial telephone equipment, Bubernack said.

"Everybody has a cellphone, and there are ways to operate cellphones for incoming business calls," he said. "They could find what I call a Cell-u-Voice business telephone, business solution. It simply just marries the cellphones to the voice-over internet protocol."

BACKUP, RECOVERY

Experts agree that priority solutions for small businesses include a solid technology strategy, especially for data backup and recovery.

"We advise our clients and potential clients that really the first thing is to have a plan," said Melissa Confalone, vice president of sales with Fraser Advanced Information Systems, headquartered in West Reading.

"We strongly suggest people have a strong plan for storing their data and being able to recover it."

COLLABORATIVE TOOLS

In addition to data recovery, Confa-

Collaboration tools such as cloud-based applications for file sharing can increase efficiencies.

lone recommends other technology tools to work smarter.

"Collaboration tools are important," she said. "Whether it's videoconferencing or cloud-based applications for file sharing, those are ways to grow your business and increase efficiencies to be more profitable."

The bottom line: If technology improves your workflow and bottom line and doesn't bankrupt you, it may be a worthwhile investment. ●

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PASSWORD STRENGTH REDEFINED

Base it on a phrase, capitalize a middle letter and use multiple authentication

By JENNIFER TROXELL WOODWARD
Special for Lehigh Valley Business

Computer tech professionals are debunking common misconceptions about password strength and giving businesses and individuals alike tips on how to create hard-to-hack passwords.

They advise businesses and employees where they can safely store passwords, how to design a strong password and how to use multiple authentications to deter hackers from gaining access to accounts.

"You don't have to have multiple passwords," said Jack Ressel, technician at Double Click Computers in Bethlehem Township. "…It is better to have one memorable password than one with a bunch of uppercase and lowercase letters and some numbers."

Ressel and others say that contrary to popular belief, complicated passwords with uppercase and lowercase letters, symbols and exclamation points will not prevent a cybercriminal from getting into one's online accounts, personal information and bank account information.

'If you have to change your password often, that is a good indication that it is too weak.'

— George Sanchez, TeamLogic IT

In addition, it is best to avoid using a password that includes your birthday, pet name, home address and other information that can be gleaned through social media or online research. These types of passwords are weak.

"If you are going to go the route of upper and lowercase letters, try putting the capital letter in the middle of the password and not right at the beginning or end," Ressel said, noting that using the same password across multiple accounts could work if you change the letters that get capitalized and where the numbers are placed.

MEMORABLE PHRASE

Often, computer users think they need to add sequential numbers in their password. Using "password123," for example, is a big no-no.

Ressel said someone still can use sequential numbers, but place them with a memorable phrase.

For example, consider "The door is locked." Use the first letter from each of those words and add 123 for a password of "tdil123."

"It really doesn't matter if the password is short or long," he said. "However, many websites will require a password with a set number of characters and uppercase and lowercase letters."

NEFARIOUS PROGRAMMING

Computer professionals said hackers do not make just a couple of guesses to crack into a business or person's computer.

CREATING A STOUT PASSWORD

A strong password results in fewer data breaches at companies and makes it easier to safeguard personal information. Here are tips from computer tech professionals when creating a password:

- **Choose a password** that doesn't come directly from a dictionary.

- **Create a password** that is memorable but not so personal that it is public knowledge. Avoid using pet names, birthdays and home addresses.

- **A password** with uppercase and lowercase letters, symbols and exclamation points still can be good, but one should mix it up by placing the capital letters in the middle of the word or password, not at the beginning or end.

- **Use a phrase or sentence** to design your password and perhaps add numbers or symbols. For example, the phrase, "He wore his yellow raincoat at 8 o'clock." That password would be "hwhyra8o."

- **Consider using** a password management program such as LastPass that stores all of your passwords and can be unlocked with a master password.

- **Use multifactor authentication** to protect the security of your password. There are the usual username and password, but then a second password is sent to your smartphone to access your account. Other multifactor authentication techniques include fingerprint and retina scans or using a key fob, card or token with a one-time passcode.

Instead, they use computer programs that guess millions and billions of passwords in a short amount of time.

Many times, hackers are focused on words from a dictionary.

CREATE A SENTENCE

Like Ressel, Wayne Will of Digital Forge Cyber Assurance Group in Utah recommended computer users create a phrase or sentence they will remember and use it to create their password.

He said a password can be generated using the first letter of each word in the phrase or sentence and adding a few numbers or symbols.

In essence, this will make a password that most likely won't come out of a dictionary and is not easily detected by a hacker's sophisticated programs, said Will, whose company handles cybersecurity for Crossroads Technologies Inc. in Wyomissing.

OFF THE DESKTOP

Will said people make a big mistake by putting all of their passwords on their desktop or placing passwords in an online account such as Yahoo.

Given a choice between putting one's passwords on a computer or writing them on paper and storing in a desk, opt for the latter.

"If you create a phrase or a sentence, write that down as a way to jog your memory,' Will said.

"This way, if someone sees that phrase laying on your desk, they won't know what they are looking at and you can keep it right in front of you."

ONLINE VAULTS

Businesses now are using services available online that manage passwords.

For example, a program called LastPass encrypts the passwords of computer users and stores them in a vault online that can only be opened via a master password.

'I do not really trust these vault services. In this day and age, if it's online, it can get hacked.'

– **Wayne Will, Digital Forge Cyber Assurance Group**

Businesses also use multiple-factor authentication to keep hackers at bay.

George Sanchez, owner of TeamLogic IT in South Whitehall Township, said password management tools such as LastPass are highly secure, and the user only needs to remember one master password to tap into the vault.

SCRAMBLE THE LETTERS

Sanchez said users should not use simple or short words in passwords. And while people want to stay away from pet names or birthdays in their password, they should choose one that still is personal to them.

"For instance, you can use the street you grew up on but scramble the letters," Sanchez said, and put a few capital let-

ters in it or spell something backward. "If you have to change your password often, that is a good indication that it is too weak," he said.

MULTIPLE AUTHENTICATION

Will also said one of the best ways to protect accounts is to use two-factor authentication. The user has the standard username and password but also has a one-time second password sent to another device – one's smartphone, for example – in order to access online accounts.

Companies also can install fingerprint or retina scanners or give cards, tokens or key fobs to employees that generate a one-time passcode.

"I do not really trust these vault services. In this day and age, if it's online, it can get hacked. That master password can be found by a hacker," Will said.

"Multifactor authentication offers more robust security, but it can be cost-prohibitive for businesses to implement." ●

CURB THE CLICKS

[Text-only emails are safest, but they're as rare as faxes, so caution reigns]

By MELINDA RIZZO
Special for Lehigh Valley Business

Can we, or should we, try to put the techno genie back in the bottle?

In our continued quest for stylized attention-grabbing graphics, talking-head video clips and more complex imagery sized just right, is it possible to commit to sending text-only emails to avoid phishing scams or hack artists?

Last fall, Sergey Bratus, research associate professor of computer science at Dartmouth College in New Hampshire, posited in an article that "the only safe email is a text-only email."

Bratus wrote that email and electronic communications are "minefields filled with demands and enticements to click and engage … in an increasingly online experience."

Simply receiving an email with attachments or graphics isn't in itself dangerous to the person receiving it, according to James Sheerin, owner of Penn Information Technology LLC in Doylestown. The danger lurks in opening attachments or clicking on links.

Receiving emails and doing nothing with them isn't dangerous, either, because most email applications have built-in screening scripts to eliminate those issues.

And logos, photos and icons, such as those in electronic signatures, generally also are considered to be safe as long as they are not sent as attachments. (If so, don't open them unless they are from a trusted source or you had requested them.)

While even though Sheerin agreed in theory with Bratus' premise, Sheerin

TAKE AWAY THE TEMPTATION

If the only safe email is a text-only email, how do you participate in the digital world?

Stonaha

- **Never click on a website link** that doesn't show a valid link. "Hover over the link and see where it goes," said Craig Stonaha, president of Laughing Rock Technology in Spring Township.

- **Use caution at all times.** "Any type of attachment is a mechanism for deploying a payload," Stonaha said.

- **Don't open attachments** – the No. 1 method of computer infection – from people you don't know, or from whom you have not expected to receive something, such as an image, photo, graphic, etc.

- **Logos, photos and icons,** such as those in the body of the email or in electronic signatures, generally are considered safe because the email application runs scripts to ensure their safety, said James Sheerin, owner of Penn Information Technology LLC in Doylestown.

- **Don't click on anything in an email,** including videos, unless you trust the source. Instead, go to the website, Stonaha said.

- **Ask yourself:** "Do I trust the sender?" Be aware and pay attention.

- **Educate staff** about these safeguards.

countered that reality can't put "the horse back into the barn."

Email was created by the late Ray Tomlinson, a computer programmer, in 1972, using the @ symbol to identify a message sent from one computer to another. It began as text-only communication.

"Text-only emails are not reality for us as a society," Sheerin said, adding that communications will continue to evolve.

EDUCATING STAFF

Today's marketing environment often includes bombardment by email. Text, photos, images and video and web links encroach on business and personal communications 24/7 in a bid to create awareness and sales of products and services.

This proliferation of email marketing efforts, aimed at selling everything from the latest widget model to delivery services for pet products, further muddles the digital landscape for end users.

Sheerin said the allure of email marketing isn't likely to change. He said educating end users about email protocols, and including a layered approach to digital communications protection, go a long way to avoid data breaches and computer viral infections and work flow disruptions.

'If you get a message that seems or looks funny, assume it is.'

– James Sheerin, Penn Information Technology

"From a business standpoint, you've got to have layers of protection," Sheerin said.

CONSIDER THE SOURCE

Craig Stonaha, president of Laughing Rock Technology in Spring Township, said the uses of an email system are critical to its management.

"How much do you want to limit the user?" he asked.

User functionality and data protection are important considerations when dictating how email should be handled and managed, according to Stonaha.

Consider the source – and the voice – when deciding when to click on a link.

"Check the tone of the email," he said. "Spoofing emails that look legitimate but don't sound quite right should be a red flag. Do not reply to the email."

INSPECT THE LINK

Sheerin said email newsletters generally are safe as long as you have requested or signed up from them at the source.

It's when you start clicking on links that you open yourself to possible problems, Sheerin said.

Hovering over a link but not clicking and opening should provide enough information to alert the end user if it's a scam or phishing scheme.

"If you get a message that seems or looks funny, assume it is," Sheerin said.

Sheerin said contacting the sender by phone or sending a fresh email are the safest ways to find out if the original email is legitimate.

BE WARY OF VIDEOS, TOO

Stonaha said videos sent along with email should automatically raise the same concerns as any other graphic element because they carry the same types of risk for malware or virus infection.

And as video clip promotions continue to increase, clicking or opening them should prompt the same level of caution by end users.

"You have to assume people will make mistakes," Sheerin said.

TAKING CONTROL

In the end, users have the ability to control their digital environment by the way they send information and emails, and by what they opt to open, consume and use.

"Even a small business with cloud services can do a great job" at screening email communication, Stonaha said.

Sheerin and Stonaha agree that spam filters and high-quality firewall software are the first line of digital defense.

"Add good antivirus software," Sheerin said.

"It's a very easy environment to control. It doesn't have to be text only, unless you want it to be," Stonaha said of emails with attachments. •

INFORMATION TECHNOLOGY FIRMS RANKED BY TOTAL LOCAL EMPLOYEES

Rank	Name Address	Total local employees	Top local executive(s) Title(s)	Website Phone	Local/total locations Headquarters Year established locally	IT services provided
1	COMPUTER AID INC. 1390 Ridgeview Drive Allentown, PA 18104	350	Tony Salvaggio CEO	www.compaid.com 610-530-5000	1/30 Allentown 1981	Software development, software application maintenance, desktop user support, staff augmentation, provides software products for risk management, education, food safety and other uses
2	BERKONE INC. 1530 Valley Center Parkway Bethlehem, PA 18017	282	Tim Fehr President	www.berkone.com 610-954-9575 866-396-8194	1/7 Bethlehem 2003	Specifies, builds, updates and maintains secure computing environments, assistance and leadership in network and computing infrastructure including 24/7 help desk support services and monitoring, virtualization, cloud services, telecommunications, network and facility security, disaster recovery on-site and in the cloud, consulting
3	PENTELEDATA 540 Delaware Ave. Palmerton, PA 18071	235	Jeff Reinhard CEO	www.penteledata.net 800-281-3564	1/1 Palmerton 1994	Computer hardware, e-commerce, software, computer services, telecom equipment, networking, internet, wireless
4	APPRISE 3101 Emrick Blvd., Suite 301 Bethlehem, PA 18020	200	Jeff Broadhurst CEO	www.apprise.com 610-991-3600	1/DNR Bethlehem 1984	Enterprise resource planning software for distributors and manufacturers of consumer products
5	FRASER ADVANCED INFORMATION SYSTEMS 320 Penn Ave. West Reading, PA 19611	115	Bill Fraser Owner & CEO	www.fraser-ais.com 610-378-0101 800-422-8599	2/4 West Reading 1971	Office technology solutions and business IT automation, document management, managed print, software solutions and IT, cybersecurity and network support, authorized dealer of Sharp and Canon multifunction printers, copiers, scanners and fax servers
6	WEIDENHAMMER 935 Berkshire Blvd. Wyomissing, PA 19610	112	John P. Weidenhammer President	www.hammer.net 610-378-8600 866-497-2227	2/7 Wyomissing 1978	IT consulting, cloud, infrastructure, application development, e-commerce and creative services
7	CANON CAPITAL MANAGEMENT GROUP 357 N. Main St, Souderton, PA 18964	31	Michael Witter; J. George Sweeney and Peter Roland Founders	www.canoncapital.com 215-723-4881	2/2 Souderton 1987	Internet security, virus and malware intrusion prevention and removal, business continuity, system backup and recovery, virtual chief information officer services, strategic technology evaluation, planning and implementation, computer systems sales, installation, service, computer systems and infrastructure monitoring and administration, Wi-Fi solutions, network cabling and infrastructure
8	LYNX COMPUTER TECHNOLOGIES INC. 7 Bristol Court Wyomissing, PA 19610	28	Mark A. Diefenderfer President	www.lynxnet.com 610-678-8131 800-331-5969	1/1 Wyomissing 1994	Configure, install and maintain networks, backup and disaster recovery, security solutions, managed services, consulting services
9	APPLE INC. 946 Lehigh Lifestyle Center Whitehall, PA 18052	26	Jayson Boushell Business Manager	www.apple.com/lehighvalley 610-266-4863	1/DNR Cupertino, Calif. DNR	Help desk, computer training, computer repair, sales and service, software, IT services
10	RIGHT CLICK SYSTEMS LLC 1150 Glenlivet Drive, Suite C32 Allentown, PA 18106	25	Bharath Sundararaman CEO	www.rightclicksys.com 610-849-0477	1/1 Allentown 2008	IT services, application development and customizing commercial off-the-shelf products
11	GLEMSER TECHNOLOGIES 520 N. New St. Bethlehem, PA 18018	25	Ray Glemser President & Founder	www.glemser.com 610-317-9400	1/3 Bethlehem 1987	Life science and compliance IT solutions including content management, quality management and consulting services
12	NETIZEN CORP. 4905 Tilghman St., Suite 210 Allentown, PA 18104	20	Michael Hawkins CEO	www.netizencorp.com 800-450-1773	1/9 Allentown 2013	Cybersecurity, software engineering, software assurance, software testing and evaluation, data analysis
13	ET&T 2360 Avenue A Bethlehem, PA 18017	20	Fusun Bubernack and Michael Bubernack Owners	www.et-t.com 610-433-1000 800-733-8229	1/1 Bethlehem 1968	Cybercrime awareness training, remote monitoring, managed networks, personal computer hardware local support, security operations center/help desk, voice-over internet protocol solutions, call centers, business phone systems, advanced cybersecurity solutions, business continuity disaster recovery
14	RUNWELL SOLUTIONS INC. 575 Van Reed Road Wyomissing, PA 19610	19	Jonathan D. Myers and Todd J. Straub CEO and President	www.runwellsolutions.com 610-376-7773	1/1 Wyomissing 1990	IT and cybersecurity solutions
15	AMERICAVEN LLC 54 S. Commerce Way, Suite 180 Bethlehem, PA 18017	18	Victor Salicetti DNR	www.americaven.com 610-849-0474	DNR/DNR DNR 2004	IT services provider, desktop support, network management and cloud services
16	COMPUTER MANAGEMENT & MARKETING ASSOCIATES INC. 107 N. Commerce Way, Suite 100A Bethlehem, PA 18017	17	Colburn Q. Kent President	www.cmma.com 610-837-8262	1/1 Bethlehem 1984	On-site and remote IT support, disaster recovery support, cloud backup and managed services for network servers, computers and applications, sales and service for IBM, Dell, Microsoft, Apple and Cisco, consulting and application programming for business and websites
17	LANTEK 40 Willow St. Kutztown, PA 19530	17	Sue Cichelli President	www.lantekonline.com 610-683-6883 800-223-9264	1/1 Kutztown 1978	On-site and remote IT network services, hardware and software support, warranty services, backup and disaster recovery, cloud storage
18	STRATEGIC SOLUTIONS P.O. Box 90188 Allentown, PA 18109	17	Rick Cipoletti President	www.strategic-solutions.com 888-335-4775	1/2 Allentown DNR	Web design, application development, mobile, search engine optimization, hosting
19	XO COMMUNICATIONS 974 Marcon Blvd. Allentown, PA 18109	15	Victoria Grantham Manager	www.xo.com 610-862-5200	2/39 Herndon, Va. 1994	IT infrastructure, managed network and internet protocol communications solutions
20	EZ MICRO SOLUTIONS INC. 2670 Lehigh St. Whitehall, PA 18052	15	Dave Dooley CEO	www.ezmicro.com 610-264-1232	1/1 Whitehall 1992	IT management, IT project services, backup and continuity services, cloud services
21	AMSKAPE INC. 4272 Morgantown Road Mohnton, PA 19540	15	Regy Varghese CEO	www.amskape.com 610-856-0011	1/2 Mohnton 2002	Software development, web development, internet marketing, IT services
22	INFRADAPT LLC 1027 Trexlertown Road Trexlertown, PA 18031	14	Antonio Haddad Managing Partner	www.infradapt.com 484-546-2000	2/3 Trexlertown 2006	Managed IT services, cybersecurity solutions, outsourced IT services for small and mid-sized businesses, outsourced telephony for enterprises, business continuity and disaster recovery, private hybrid cloud
23	LEHIGH VALLEY TECHNOLOGY CO. 2158 Avenue C Bethlehem, PA 18017	12	Scott Gingold Owner	www.lhvtech.com 610-866-2828	1/2 Bethlehem 2006	Network administration, server maintenance and upgrades, cloud computing, off-site data backup, data security, help desk, mobile device management, hosted Microsoft Exchange, contingency and business continuity planning, disaster recovery, Health Insurance Portability and Accountability Act compliance, workstation repair, voice-over internet protocol phone systems, remote monitoring management, remote and on-site support and technology planning
24	TS TECH ENTERPRISES INC. 711 Spring St,, Suite 100 Wyomissing, PA 19610	12	Todd Schorle President	www.ts-tech.com 610-288-0780	1/1 Wyomissing 1996	Cloud hosting and virtualization, server, workstation and infrastructure upgrade projects, help desk services, security management, business continuity and disaster planning, prevention and recovery services, backup management, productivity, performance and IT optimization planning and implementation, IT strategic planning and budgeting consultation
25	ACCUFIND INTERNET SERVICES INC. Moorestown Road, Route 512 Wind Gap, PA 18091	10	Matt Fodor President	www.accufind.com 610-759-5456	1/2 Wind Gap 1995	IT solutions for businesses

DBA-doing business as   DNR-did not respond   NA-not applicable   IT-information technology   The Lehigh Valley Business list of Information Technology Firms is limited to those in or near Berks, Carbon, Lehigh, Monroe, Northampton, Schuylkill, Warren and Upper Bucks and Montgomery counties. Information came from the individual companies and other LVB research. To access the Lehigh Valley Business online database, visit www.LVB.com/lists. Surveys available at www.LVBlists.com. **Published June 4, 2018.**

Researched by Christopher Holland

CYBERSECURITY COMPANIES RANKED BY FULL-TIME LOCAL EMPLOYEES

Rank	Name Address	F-T/P-T local employees	Top local executive(s) Title(s)	Website Phone	Local/total locations Headquarters Year established locally	Services provided
1	PENTELEDATA 540 Delaware Ave. Palmerton, PA 18071	235/0	Jeff Reinhard CEO	www.penteledata.net 800-281-3564	1/1 Palmerton 1994	Data, internet and voice, cybersecurity, information technology, web development and hosting, managed services, network solutions
2	BERKONE INC. 1530 Valley Center Parkway Bethlehem, PA 18017	224/58	Tim Fehr President	www.berkone.com 610-954-9575 866-396-8194	1/7 Bethlehem 2003	Transforms manual tasks into automated digital workflows using scanning, recognition, analytics, software robots, mobile forms, lockbox, printing, cloud computing and content management, information technology infrastructure, security, help desk and consulting services
3	FRASER ADVANCED INFORMATION SYSTEMS 320 Penn Ave. West Reading, PA 19611	115/0	Bill Fraser Owner & CEO	www.fraser-ais.com 610-378-0101 800-422-8599	2/4 West Reading 1971	Office technology solutions and business information technology automation, document management, managed print, software solutions and information technology, cybersecurity and network support, authorized dealer of Sharp and Canon multifunction printers, copiers, scanners and fax servers
4	BAKER TILLY VIRCHOW KRAUSE LLP 7535 Windsor Drive, Suite 300 Allentown, PA 18195	107/10	David Capitano Office Managing Partner, Central Pennsylvania	www.bakertilly.com 610-336-8180 800-362-7301	2/35 Chicago 1983	Assurance, analytics, enterprise transformation, forensic, litigation and valuation, government contractor advisory, employee benefit plan advisory, growth strategies, human capital, international, investment banking, performance optimization, risk, internal audit and cybersecurity, staffing and executive search, tax, technology, transaction advisory
5	CANON CAPITAL MANAGEMENT GROUP 357 N. Main St. Souderton, PA 18964	31/0	Michael Witter; J. George Sweeney and Peter Roland Founders	www.canoncapital.com 215-723-4881	2/2 Souderton 1987	Business startup planning and assistance, bookkeeping, cash flow and budgeting, forecasts and projections, compiled and reviewed financial statements, tax analysis and proactive planning, Internal Revenue Service and other audit representation, tax return preparation, audit services, personal financial planning, business advisory, succession planning, payroll services, information technology, cybersecurity
6	LYNX COMPUTER TECHNOLOGIES INC. 7 Bristol Court Wyomissing, PA 19610	28/0	Mark A, Diefenderfer President	www.lynxnet.com 610-678-8131 800-331-5969	1/1 Wyomissing 1994	Network design and implementation, disaster recovery, managed services, consulting services, on-site and remote support, cybersecurity, cloud and on-premise solutions
7	NETIZEN CORP. 4905 Tilghman St., Suite 210 Allentown, PA 18104	20/0	Michael Hawkins CEO	www.netizencorp.com 800-450-1773	1/9 Allentown 2013	Cybersecurity and compliance solutions for clients in government, defense and commercial markets
8	ET&T 2360 Avenue A Bethlehem, PA 18017	20/0	Fusun Bubernack and Michael Bubernack Owners	www.et-t.com 610-433-1000 800-733-8229	1/1 Bethlehem 1968	Wired and wireless voice and data systems and services for business, government and educational institutions, cybersecurity
9	RUNWELL SOLUTIONS INC. 575 Van Reed Road Wyomissing, PA 19610	19/0	Jonathan D. Myers and Todd J. Straub CEO and President	www.runwellsolutions.com 610-376-7773	1/1 Wyomissing 1990	Information technology and cybersecurity solutions
10	ALLIED CENTRAL SERVICES INC. 824 Eighth Ave. Bethlehem, PA 18018	19/0	Hal Lubsen President	www.alliedcentral.com 610-868-1912	1/1 Bethlehem 1969	Alarm monitoring, video verification, internet monitoring, cybersecurity, real-time online account access, 24/7 data entry support, bilingual Spanish-speaking operators and marketing materials
11	COMPUTER MANAGEMENT & MARKETING ASSOCIATES INC. 107 N. Commerce Way, Suite 100A Bethlehem, PA 18017	16/1	Colburn Q. Kent President	www.cmma.com 610-837-8262	1/1 Bethlehem 1984	Application development, consulting, programming, managed services, backup and disaster recovery solutions, web design, virtualization, on-site and remote information technology support, cybersecurity, hardware sales of IBM, Lenovo, Dell and Cisco
12	XO COMMUNICATIONS 974 Marcon Blvd. Allentown, PA 18109	15/0	Victoria Grantham Manager	www.xo.com 610-862-5200	2/39 Herndon, Va. 1994	Information technology infrastructure, managed network and internet protocol communications solutions, cybersecurity solutions, internet provider
13	INFRADAPT LLC 1027 Trexlertown Road Trexlertown, PA 18031	14/0	Antonio Haddad Managing Partner	www.infradapt.com 484-546-2000	2/3 Trexlertown 2006	Managed information technology services, cybersecurity solutions, outsourced information technology services for small and mid-sized businesses, outsourced telephony for enterprises, business continuity and disaster recovery, private hybrid cloud
14	TS TECH ENTERPRISES INC. 711 Spring St., Suite 100 Wyomissing, PA 19610	12/0	Todd Schorle President	www.ts-tech.com 610-288-0780	1/1 Wyomissing 1996	Information technology support, cybersecurity and network services for small businesses
15	LEHIGH VALLEY TECHNOLOGY CO. 2158 Avenue C Bethlehem, PA 18017	11/1	Scott Gingold Owner	www.lhvtech.com 610-866-2828	1/2 Bethlehem 2006	Network administration, server maintenance and upgrades, cloud computing, off-site data backup, data security, help desk, mobile device management, hosted Microsoft Exchange, contingency and business continuity planning, disaster recovery, information technology and security compliance audits, workstation repair, remote monitoring management, remote and on-site support and technology planning
16	MID-ATLANTIC TECHNOLOGY PROFESSIONALS 4949 Liberty Lane, Suite 125 Allentown, PA 18106	7/0	Trevor Miller Owner & Operations Manager	www.m-atp.com 610-434-8400	1/1 Allentown 2009	Computer/network sales and service, managed services and monitoring, virus/malware remediation, data backup and recovery, email and cloud computing, cybersecurity auditing, corporate compliance and forensics, residential automation, 24/7 services
17	TEAMLOGIC IT 5000 W. Tilghman St. Allentown, PA 18104	3/0	George Sanchez Owner	www.teamlogicit.com/allentownpa 484-838-7740	1/1 Allentown 2015	Computer services, information technology, managed services, security assessment and support, networking assessment, network design, computer support, cloud telephone systems, web design and email services
18	CMIT SOLUTIONS OF BETHLEHEM 1 W. Broad St., 11th Floor Bethlehem, PA 18018	2/0	John Bertram President & Owner	www.cmitsolutions.com/bethlehem 610-849-2762	1/150 Austin, Texas 1996	Information technology services for small and medium-sized businesses and nonprofits, includes managed services, cybersecurity, data backup/recovery, cloud hosting and storage, etc.
19	LAUGHING ROCK TECHNOLOGY 5 Old Wernersville Road Sinking Spring, PA 19608	1/0	Craig Stonaha Owner	www.laughingrock.com 610-678-1978	1/1 Sinking Spring 2008	Information technology, telecommunications, web services, cybersecurity solutions

WEBSITE DESIGN COMPANIES RANKED BY TOTAL LOCAL EMPLOYEES

Rank	Company Address	Total local employees F-T/P-T employees	Top local executive(s) Title(s)	Website Phone	Local/total locations Headquarters Year established locally	Services provided
1	**WEIDENHAMMER** 935 Berkshire Blvd. Wyomissing, PA 19610	112 110/2	John P. Weidenhammer President	www.hammer.net 610-378-8600 866-497-2227	2/7 Wyomissing 1978	Information technology consulting, cloud, infrastructure, application development, e-commerce solutions, creative services, data center, online strategy, user experience conceptualization, information architecture, wire framing, web design and development, mobile responsive/adaptive web and application design and development
2	**TRIFECTA TECHNOLOGIES INC.** 612 Hamilton St. Allentown, PA 18101	60 60/0	Douglas W. Pelletier Owner & CEO	www.trifecta.com 610-530-7200	1/3 Allentown 1991	Web-based technology services, including e-commerce, sales-force platform, custom web and mobile technologies
3	**LIQUID INTERACTIVE** 7540 Windsor Drive, Suite 100 Allentown, PA 18195	49 45/4	Jim Ludlow President & CEO	www.liquidint.com 484-891-5150	1/2 Allentown 2006	Marketing, research and analytics, search engine optimization, social media marketing, content marketing, lead generation, email marketing, media intelligence, content strategy, responsive web design, animation and motion graphics, user experience audits and analysis, video production, branding and brand design, Sitecore certified partner, full-stack web and mobile development, e-commerce, application programming interface and system integration, content management systems
4	**FIRST GENERATION** 410 Allentown Drive Allentown, PA 18109	32 32/0	William E. Carmody CEO	www.firstgencom.com 610-437-4300	1/3 Allentown 1987	Strategic integrated marketing and branding, print development and design, video production and editing, media (print, digital and social) planning, management and placement, web and interactive design and development, learning solutions (e-learning and classroom), mobile apps, search engine optimization, motion and 3-D animation, event planning and production
5	**ALTITUDE MARKETING** 417 State Road Emmaus, PA 18049	24 22/2	Andrew Stanten President	www.altitudemarketing.com 610-421-8601	1/1 Emmaus DNR	Integrated marketing firm serving the needs of technology-oriented business-to-business companies
6	**SMARTACRE INC.** 559 Main St., Suite 150 Bethlehem, PA 18018	24 24/0	Michael Carroll Jr. President	www.getsmartacre.com 610-419-4510	1/3 Bethlehem 2008	Lead and demand generation, inbound marketing, digital advertising, pay-per-click advertising, social media advertising, marketing automation, sales technology, web design and development
7	**KLUNK & MILLAN ADVERTISING INC.** 1620 Pond Road, Suite 300 Allentown, PA 18104	22 22/0	James S. Klunk President & CEO	www.klunkmillan.com 610-973-2400	1/1 Allentown 1989	Integrated business-to-business and business-to-consumer advertising, marketing, public relations, branding, campaign strategy, data management, media planning and buying, creative services, website and mobile app development, digital and search marketing, social media, video and event support
8	**SAGEFROG MARKETING GROUP** 62 E. Oakland Ave. Doylestown, PA 18901	20 20/0	Mark Schmukler CEO & Co-Founder	www.sagefrog.com 215-230-9024	1/3 Doylestown 2002	Integrated business-to-business marketing services specializing in health care and life sciences, software and technology and manufacturing and business services, including marketing strategy and planning, branding, website development and optimization, digital marketing, social media, content marketing, public relations, advertising, trade show and event marketing, direct and email marketing
9	**SWBR** 3865 Adler Place Bethlehem, PA 18017	20 15/5	Ernie R. Stiegler CEO	www.swbrinc.com 610-866-0611	1/1 Bethlehem 1969	Creative, marketing campaign strategy and execution, digital, public relations, media buying and planning, web design
10	**THE ANDERSON GROUP** 879 Fritztown Road Sinking Spring, PA 19608	20 18/2	Missy Orlando President & Chief Operating Officer	www.theandersongrp.com 610-678-1506	1/1 Sinking Spring 1987	Strategic, integrated marketing and communications services company specializing in creative, interactive, video, mobile design and development, focus on brand identity and positioning, market research, public relations and social media, DataIQ proprietary data analytics providing companies with metrics and analytics of core business data
11	**BUSINESSCREATOR INC.** 47 N. Jefferson St. Allentown, PA 18102	20 15/5	Edward Kundahl President	www.businesscreatorplus.com 610-437-8822 855-943-8736	1/1 Allentown 1994	Live call video lead generation, live call lead generation, local search marketing, pay-per-click, ad targeting and retargeting, web design, web development, video production, video marketing, social marketing, mobile apps, mobile websites, mobile marketing
12	**3SEED MARKETING / DESIGN / INTERACTIVE** 4315 Independence Drive Schnecksville, PA 18078	19 18/1	John Mulder Managing Partner	www.3seedmarketing.com 484-646-9300 4846469300	1/1 Schnecksville 2009	Marketing, advertising, design, websites, search engine optimization, search engine marketing, social media management and other interactive services
13	**LEHIGH MINING & NAVIGATION** 1 W. Broad St., Suite 1000 Bethlehem, PA 18018	18 14/4	Denis Aumiller Managing Partner, Creative	www.lehighminingandnavigation.com 484-821-0920	1/1 Bethlehem 2004	Strategic planning, advertising, web design, identity, public relations, digital and mobile marketing, social media, media planning and buying
14	**ENTER.NET INC.** 1633 N. 26th St. Allentown, PA 18104	18 14/4	Margo Corsa President	www.enter.net 610-437-2221 877-368-3711	1/1 Allentown 1995	Website design, search engine optimization, social media, mobile-friendly sites, online marketing
15	**COMPUTER MANAGEMENT & MARKETING ASSOCIATES INC.** 107 N. Commerce Way, Suite 100A Bethlehem, PA 18017	17 16/1	Colburn Q. Kent President	www.cmma.com 610-837-8262	1/1 Bethlehem 1984	Application development, consulting, programming, managed services, backup and disaster recovery solutions, web design, virtualization, on-site and remote information technology support, cybersecurity, hardware sales of IBM, Lenovo, Dell and Cisco
16	**STRATEGIC SOLUTIONS** P.O. Box 90188 Allentown, PA 18109	17 13/4	Rick Cipoletti President	www.strategic-solutions.com 888-335-4775	1/2 Allentown DNR	Web design, application development, mobile, search engine optimization, hosting
17	**KSA&D INC.** 3102 Berger St. Allentown, PA 18103	17 12/5	Bob Kraemer and Peter Schurman Partners	www.ksand.com 610-797-7909	1/1 Allentown 2000	Strategic marketing, creative print and website design/development, digital marketing, search engine optimization, search engine marketing, social media and email marketing, analytics, research and trend analysis, brand development, graphic design, language translation and media planning
18	**TIMMONS & CO.** 1753 Kendarbren Drive, Suite 622 Jamsion, PA 18929	16 12/4	Bob Kent President	www.timmonsandcompany.com 2672184341	1/1 Jamison 1974	Marketing and advertising, web design
19	**AMSKAPE INC.** 4272 Morgantown Road Mohnton, PA 19540	15 15/0	Regy Varghese CEO	www.amskape.com 610-856-0011	1/2 Mohnton 2002	Software development, web development, internet marketing
20	**STRUNK MEDIA GROUP** 14953 Kutztown Road, Suite 106 Kutztown, PA 19530	14 10/4	Matthew Strunk Owner & CEO	www.strunkmedia.com 610-814-7773	1/1 Kutztown 2015	Digital advertising solutions including website design/redesign with mobile responsiveness, search engine marketing, social media management and advertising, search engine optimization and content marketing, reputation management, email marketing, video and audio production, logos and branding and graphic design
21	**KEENAN-NAGLE ADVERTISING INC.** 1301 S. 12th St. Allentown, PA 18103	14 14/0	Michael C. Keenan President & CEO	www.keenannagle.com 610-797-7100	1/1 Allentown 1954	Marketing strategy plan design and execution, graphic design, web design, copywriting, email marketing, digital/interactive marketing, social media marketing including planning, content development, execution and reporting, digital analytics, cross-media planning and placement, search engine optimization, video shooting and production with PremierPro editing, photography, print collateral/print production, direct mail and direct response, event planning and coordination, specialized expertise in health care, financial and business-to-business markets
22	**ADCOMM INC.** 131 W. Hamilton St. Allentown, PA 18101	13 12/1	Richard D. Mikitz President	www.adcomm.tv 610-820-8565	1/1 Allentown 1971	Creative services, brand development, print and digital advertising, website development, direct mail and account management
23	**MARKETING PARTNERS INC.** 6583 Ruch Road Bethlehem, PA 18017	11 11/0	Tina Green President	www.marketingpartners.com 610-443-2220 888-641-1215	1/1 Bethlehem 1997	Business development, direct mail programs, website development, graphic design, online marketing solutions, branding, merchandising, social media, in-house printing
24	**DABRIAN MARKETING GROUP LLC** 500 Penn St., Suite 201 Reading, PA 19602	10 9/1	Daniel Laws Jr. President & CEO	www.dabrianmarketing.com 610-743-5602 844-564-4825	1/1 Reading 2008	Digital marketing, web design, email marketing, branding and strategy, paid search, search engine optimization, web analytics, social media marketing
25	**FORGE3 LTD.** 116 Research Drive Bethlehem, PA 18015	8 5/3	Jeff Teschke Founder & CEO	www.forge3.com 484-734-0005	1/1 Bethlehem 2004	Website development, digital marketing, app onboarding, training programs
26	**KILLER INTERACTIVE LLC** P.O. Box 634 Orefield, PA 18069	7 3/4	Jason Pijut Creative Principal	www.wearekiller.com 484-619-3323	1/1 Orefield 1999	Website design and development, e-commerce, social media and email marketing

DBA-doing business as   DNR-did not respond   NA-not applicable
The Lehigh Valley Business list of Website Design Companies is limited to those in or near Berks, Carbon, Lehigh, Monroe, Northampton, Schuylkill, Warren and Upper Bucks and Montgomery counties. Information came from the individual companies and other LVB research. To access the Lehigh Valley Business online database, visit www.LVB.com/lists. Surveys available at www.LVBlists.com. **Published June 4, 2018.**

Researched by Christopher Holland

SOFTWARE DEVELOPERS/DATABASE COMPANIES RANKED BY TOTAL LOCAL EMPLOYEES

Rank	Company Address	Total local employees	Top local executive Title	Website Phone	Local/total locations Headquarters Year established	Services provided
1	**DUN & BRADSTREET** 3501 Corporate Parkway Center Valley, PA 18034	775	Bob Carrigan President & CEO	www.dnb.com 610-882-7585	1/DNR Short Hills, N.J. DNR	Commercial information and insight on businesses, database solutions
2	**COMPUTER AID INC.** 1390 Ridgeview Drive Allentown, PA 18104	350	Tony Salvaggio CEO	www.compaid.com 610-530-5000	1/30 Allentown 1981	Software development, software application maintenance, desktop user support, staff augmentation, provides software products for risk management, education, food safety and other uses
3	**BERKONE INC.** 1530 Valley Center Parkway Bethlehem, PA 18017	282	Tim Fehr President	www.berkone.com 610-954-9575 866-396-8194	1/7 Bethlehem 2003	Transforms manual tasks into automated digital workflows using scanning, recognition, analytics, software robots, mobile forms, lockbox, printing, cloud computing and content management, information technology infrastructure, security, help desk and consulting services
4	**APPRISE** 3101 Emrick Blvd., Suite 301 Bethlehem, PA 18020	200	Jeff Broadhurst CEO	www.apprise.com 610-991-3600	1/DNR Bethlehem 1984	Enterprise resource planning software solutions for global consumer goods companies
5	**FRASER ADVANCED INFORMATION SYSTEMS** 320 Penn Ave. West Reading, PA 19611	115	Bill Fraser Owner & CEO	www.fraser-ais.com 610-378-0101 800-422-8599	2/4 West Reading 1971	Office technology solutions and business information technology automation, document management, managed print, software solutions and information technology, cybersecurity and network support, authorized dealer of Sharp and Canon multifunction printers, copiers, scanners and fax servers
6	**SYNERGIS TECHNOLOGIES INC.** 18 S. Fifth St. Quakertown, PA 18951	106	David Sharp President	www.synergis.com 800-836-5440	2/2 Quakertown 1985	Developer of Adept engineering data and document management solutions, software development
7	**MAM SOFTWARE INC.** 512 Township Line Road Blue Bell, PA 19422	52	Brian Allibon President	www.mamsoftware.com 610-336-9045	1/1 Blue Bell 1996	Business management software solutions
8	**SOFTWARE CONSULTING SERVICES INC.** 630 Municipal Drive, Suite 420 Nazareth, PA 18064	40	Richard Cichelli President	www.newspapersystems.com 610-746-7700	1/1 Nazareth 1975	Publishing, digital asset management and advertising systems for small, mid-sized and large metro newspapers
9	**IDCS INC.** 3606B Nicholas St. Easton, PA 18045	37	Joe DeCapua President & CEO	www.idcsi.com 610-991-3105	1/1 Easton 1996	Integrated data communication systems, software development
10	**APPLE INC.** 946 Lehigh Lifestyle Center Whitehall, PA 18052	26	Jayson Boushell Business Manager	www.apple.com/lehighvalley 610-266-4863	1/DNR Cupertino, Calif. DNR	Help desk, computer training, computer repair, sales and service, software
11	**RIGHT CLICK SYSTEMS LLC** 1150 Glenlivet Drive, Suite C32 Allentown, PA 18106	25	Bharath Sundararaman CEO	www.rightclicksys.com 610-849-0477	1/1 Allentown 2008	Information technology services, application development and customizing commercial off-the-shelf products
12	**NETIZEN CORP.** 4905 Tilghman St., Suite 210 Allentown, PA 18104	20	Michael Hawkins CEO	www.netizencorp.com 800-450-1773	1/9 Allentown 2013	Cybersecurity and compliance solutions for clients in government, defense and commercial markets
13	**STRATEGIC SOLUTIONS** P.O. Box 90188 Allentown, PA 18109	17	Rick Cipoletti President	www.strategic-solutions.com 888-335-4775	1/2 Allentown DNR	Web design, application development, mobile, search engine optimization, hosting
14	**AMSKAPE INC.** 4272 Morgantown Road Mohnton, PA 19540	15	Regy Varghese CEO	www.amskape.com 610-856-0011	1/2 Mohnton 2002	Software development, web development, internet marketing
15	**K12SYSTEMS INC.** 7540 Windsor Drive, Suite 209 Allentown, PA 18195	12	Brenda Shahpari President & CEO	www.k12system.com 610-366-9540	1/1 Allentown 2002	Administrative software solutions for public education market
16	**CYLUTIONS** 121 N. Cedar Crest Blvd. Allentown, PA 18104	8	Matthew Walsh President	www.cylutions.com 484-860-3200	1/1 Allentown 1998	Designs, develops and maintains custom application and software, database administration, SharePoint and Dynamics
17	**MS HEALTH SOFTWARE CORP.** 128 Willow Grove St. Hackettstown, NJ 07840	7	Michael Sedita President	www.mshealth.com 908-850-5564	1/1 Hackettstown, N.J. 1985	Business-oriented computer software, data management
18	**MAP DECISIONS LLC** 116 Research Drive Bethlehem, PA 18015	5	Christian Birch CEO	www.mapdecisions.com 800-277-5789	1/1 Bethlehem 2012	Software provider for local government, field service, oil and gas
19	**IFULTECH** 817 Bare Path Road Reading, PA 19608	5	George Yoder Owner & President	www.ifultech.com 888-348-4743	1/1 Reading DNR	Web, mobile and software development solutions
20	**BLUE CRYSTAL SOFTWARE CORP.** 3627 Lynn Lane Nazareth, PA 18064	5	Mark Gorrie President	www.bluecrystalsoftware.com 610-837-0200	1/1 Nazareth 1999	Software products and services
21	**PICTURE WINDOW SOFTWARE LLC** 47 Cook Road Blairstown, NJ 7825	4	Clay Greene President	www.pwin.com 908-362-4000	1/1 Blairstown, N.J. 1995	Computer telephony integration applications, software solutions
22	**TEA SYSTEMS CORP.** 65 Schlossburg St. Alburtis, PA 18011	4	Terrence Zavecz President	www.teasystems.com 610-682-4146	1/1 Alburtis 1989	Process control, characterization and tuning software for semiconductor lithography in a unified framework for exposure tools, metrology and control of the process, software development
23	**TOWN SQUARE SOFTWARE** 1415 Parkside Drive North Wyomissing, PA 19610	3	Jan Orcutt President	www.civicall.net 610-374-7900	1/1 Wyomissing 1995	Citizen response software for cities and counties throughout the country
24	**KEYSTONE SOFTWARE SOLUTIONS** 844 Centre Ave. Reading, PA 19601	3	Bill Delgado Founder & President	www.keystonesoftware.com 610-685-2111	1/1 Reading 1998	Integrated accounting, business management, payroll, customer relationship management and fixed-asset solutions and software for small to mid-sized companies
25	**MIDCORE SOLUTIONS** 3 Park Plaza, Suite 301 Wyomissing, PA 19610	2	Jose Acosta President	www.midcoresolutions.com 866-803-0085	1/1 Wyomissing 2011	Software development and support services for businesses

DBA-doing business as   DNR-did not respond   NA-not applicable
The Lehigh Valley Business list of software development firms is limited to those in or near Berks, Carbon, Lehigh, Monroe, Northampton, Schuylkill, Warren and Upper Bucks and Montgomery counties. Information came from the individual companies and other LVB research. In some cases, the executive who heads the local office may not be locally based. To access the Lehigh Valley Business online database, visit www.LVB.com/lists. Surveys available at www.LVBlists.com. **Published June 4, 2018.**

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