2018 State of the VITA Technology Industry

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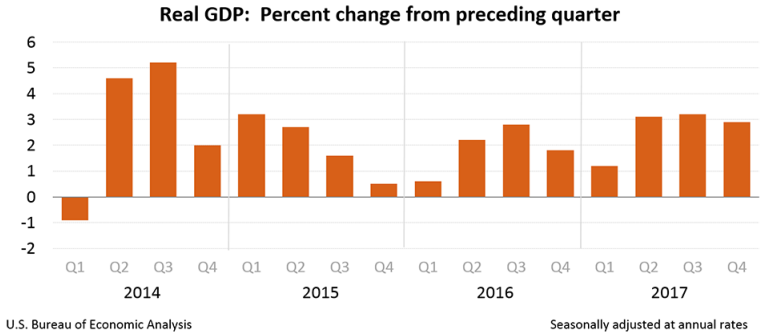
by: Ray Alderman, Chairman of the Board, VITA

This report provides the reader with updates on the state of the VITA Technology industry in particular and of the board and system industry in general, from the perspective of Ray Alderman, the Chairman of the Board of VITA. VITA is the trade association dedicated to fostering American National Standards Institute (ANSI) accredited, open system architectures in critical embedded system applications. The complete series of reports can be found at Market Reports. (www.VITA.com/MarketReports)

Business Conditions

U.S. GDP grew at 3.2% in the third quarter of 2017. Q4 growth was 2.5% in the second estimate. Growth for all of 2017 came in at 2.3%, considering a lackluster Q1 (1.4% growth) and excellent growth in Q2 (3.1%).[1] Q4/2017 was expected to be 3% or more but didn't hit the mark. Q1/2018 is forecast for 2.9% growth.[2]



China grew at 6.9% in 2017 if you believe the numbers.[3] Japan came in at 1.6% growth for 2017, after experiencing a decline in Q4.[4]

1 U.S. Bureau of Economic Analysis, https://www.bea.gov/newsreleases/national/gdp/gdp_glance.htm

2 James Picerno, "*Modest Pickup In Growth Expected For U.S. GDP In Q1*", Seeking Alpha, 27 February 2018, https://seekingalpha.com/article/4151016-modest-pickup-growth-expected-u-s-gdp-q1

3 Robin Brant, "*China's economy grows by 6.9% in 2017*", BBC News, 18 January 2018, http://www.bbc.com/news/business-42727781

4 Japan GDP - Gross Domestic Product, Countryeconomy.com, https://countryeconomy.com/gdp/japan

Contents

The EU actually had higher GDP growth than the U.S. in 2017, hitting 2.5% for the year.[5] How they did this with 8.7% unemployment probably has to do with exports between other EU countries, considering the UK has been blackballed over Brexit.[6]

But, let's examine more interesting topics. In the last report, I raked the EU over the coals for their persecution and oppression of U.S. technology companies with exorbitant fines for dubious infractions of their nebulous regulations and their variable tax laws. The euro-crats are still at it: they fined Qualcomm $1.23 billion in January.[7] Now, they plan to tax U.S. internet companies 3% of revenues in the EU.[8] The EU is also instituting new General Data Protection Regulations (GDPR) in May.[9] Fines for minor infractions run from $25 million to a maximum 4% of the total revenue of the offending company. Europe is becoming a minefield of protectionist laws and regulations for U. S. technology companies.

Bombardier has been dumping small passenger jets into the U.S. market to extract U.S. dollars. Boeing filed a complaint with the U.S. Department of Commerce (DoC), that Bombardier was selling small passenger jets to Delta Airlines at 70% below list prices, because the Canadian government is subsidizing the company to keep it from going belly-up. Quebec, the province where the C-series are made, gave Bombardier $1 billion USD in 2016, to keep them afloat.[10] The DoC agreed with Boeing's complaint and levied a 300% tariff on all C-series Bombardier aircraft coming into the U.S. from Canada.[11]

Airbus, an aircraft maker heavily subsidized by the EU, particularly France, Germany, Spain, and the UK, came in and took majority ownership of the C-series passenger jets without spending a single Canadian dollar (77 cents in American money), saying they would build the planes in their plant in Alabama, to get around the 300% tariff, and Bombardier-Canada could supply all the parts.[12] However, the DoC says the 300% tariff applies to any parts Bombardier ships from Canada to Alabama. The wings of the C-series are made by Bombardier in Ireland, so that brings the UK directly into this spat.

Airbus has been in trouble for years, so the Bombardier C-series acquisition looks like a very thin lifeline. They previously announced that they would shut-down their A380 production line in the next few months unless they received an expected large order from Emirates Airlines.[13] In January, Emirates gave Airbus the order for 20 of their jumbo A380's, with an option to buy 16 more, keeping Airbus from going into financial seizures.[14] We don't know if they deeply discounted the A380 price to get the order. Airbus has spent $24 billion invested by seven EU countries in

5 Ben Chu, "*Eurozone: EU economies grew at fastest rate in a decade in 2017, latest figures show*", Independent, 30 January 2018, http://www.independent.co.uk/news/business/news/eurozone-economy-growth-2017-fastest-gdp-eu-currency-financial-crisis-a8184806.html

6 Reuters Staff, "Euro zone unemployment falls to nine-year low as economy powers ahead", Reuters, 9 January 2018, https://www.reuters.com/article/us-eurozone-unemployment/euro-zone-unemployment-falls-to-nine-year-low-as-economy-powers-ahead-idUSKBN1EY1EB

7 Rachel England, "*EU fines Qualcomm $1.23 billion for abusing Apple partnership*", Yahoo! Fianance, 24 January 2018, https://finance.yahoo.com/news/qualcomm-hit-1-23bn-fine-112700156.html

8 "*EU Becomes A Graveyard For AAPL, FB, GOOGL, AMZN* ", Yahoo! Finance, 15 March 2018, https://finance.yahoo.com/news/eu-becomes-graveyard-aapl-fb-153603528.html

9 Danny Palmer, "*What is GDPR? Everything you need to know about the new general data protection regulations*", ZD Net, 16 November 2017, http://www.zdnet.com/article/gdpr-an-executive-guide-to-what-you-need-to-know/

10 Nicolas van Praet, "*Bombardier, Quebec finalize $1-billion C Series stake*", The Globe and Mail, Inc., 24 March 2017, https://www.theglobeandmail.com/report-on-business/bombardier-quebec-formalize-1-billion-c-series-deal/article30570998/

11 Benjamin Zhang, "*Boeing CEO attacks Canadian rival claiming they destroyed the market for its planes*", Business Insider, 19 December 2017, http://www.businessinsider.com/boeing-ceo-says-bombardier-sold-planes-unfair-prices-2017-12

12 Frederic Tomesco, Josh Wingrove, and Rick Clough, "*Airbus Snaps Up Bombardier Jet in New Challenge to Boeing*", Bloomberg, 16 October 2017, https://www.bloomberg.com/news/articles/2017-10-16/airbus-to-buy-majority-stake-in-bombardier-c-series-jet-program

13 Tim Hepher, "*Airbus ready to phase out A380 if fails to win Emirates deal*", Reuters, 27 December 2017, https://www.reuters.com/article/us-airbus-a380/airbus-ready-to-phase-out-a380-if-fails-to-win-emirates-deal-sources-idUSKBN1EL11L

14 Christopher Jasper and Benjamin D Katz, "*Airbus Handed A380 Lifeline With $16 Billion Emirates Order*", Bloomberg, 18 January 2018, https://www.bloomberg.com/news/articles/2018-01-18/emirates-orders-20-a380s-worth-9-billion-in-vital-program-boost

the A400 troop transport plane (to compete against the Lockheed C-130). But the A400 has serious engine problems and the on-board systems do not work. They just announced that they are dumbing-down the aircraft by removing those flakey systems, so the plane can fly reliably. No EU country really wants to buy the faulty A400's unless Airbus starts getting close to bankruptcy. Then, they will have to throw good money after bad.[15]

In the middle of all this, Airbus has been charged with bribery in the UK, France, Austria, and Germany.[16] So far, the VP of Sales, the COO, and others at Airbus have resigned. The president said he will leave the company at the end of his contract, unless he is forced to resign earlier. Seems they had a slush-fund they used to pay "middlemen" and "intermediaries" to get aircraft sales contracts across Europe. Charges are also pending that Airbus violated International Traffic in Arms Regulations (ITAR) by using sales agents to sell U.S. arms technology to other countries. On the surface it looks like Airbus has been playing games to get business for years.

Thoroughly miffed about their situation, the Canadian authorities immediately withdrew their commitment to buy 18 new F/A-18 fighter jets from Boeing and dropped their plans to buy 88 more at a later date.[17] Then, they called up their friends in Australia and bought 18 used 30-year old F/A-18's to tide them over.[18] That pulled the Australians into the mix. Additionally, Canadian authorities adopted new defense equipment procurement policies in December. Canada will not buy from suppliers who, in their judgement, are perceived to be creating harmful effects on the Canadian economy. However, they are allowing Boeing (F/A-18) to bid for their next-generation fighter jet contracts, along with BAE (Typhoon), Lockheed Martin (F-35), Dassault (Rafale), and Saab (Gripen).[19] So, don't be surprised when Boeing loses the deal, the Canadians are just being nice.

Now, the plot thickens. In January, the U.S. International Trade Commission (USITC) ruled for Bombardier in the previously mentioned case, nullifying the 300% tariff and reversing the DoC decision.[20] So, Bombardier can now make the C-series planes in Canada (and keep the jobs and all revenue there), ship them to the U.S. without a huge tariff, and try to back out of the deal with Airbus. Or, they can keep the deal with Airbus, ship parts to Alabama, and create American jobs and American revenue. I am reminded of what Sir Walter Scott once said: "O, what a tangled web we weave when first we practice to deceive." Canada's conspiracy with Airbus has backfired on them. They gave away the Bombardier C-series to Airbus for an advantage. Now, they don't have the C-series or an advantage. And, they are in bed with a partner (Airbus) who has serious financial, technical, management, and legal problems.

Bombardier has shipped 24 C-series planes as of December 2017, according to the latest stats.[21] They have sold a total of 372, mostly to small airlines in small countries, and have a backlog of 348. The biggest buyer of the C-series is AirCanada (no surprise there). They ordered 45 CS-300's with none delivered so far.

Meanwhile, Boeing is not taking this USITC decision lying down. They are negotiating to buy a majority stake in Brazil's Embraer commercial aircraft division, the maker of the E-jet series of small passenger jets, similar to the

15 Tim Hepher, Andrea Shalal, "*Europe's A400M army plane may see some features axed*", Reuters, 12 February 2018, https://www.reuters.com/article/us-airbus-a400m-exclusive/exclusive-europes-a400m-army-plane-may-see-some-features-axed-idUSKBN1FW1TR

16 Tim Hepher, Cyril Altmeyer, "*Airbus corruption scandal widens as firm admits US arms trafficking filing 'inaccuracies'*", Independent, 31 October 2017, http://www.independent.co.uk/news/business/news/airbus-corruption-arms-trafficking-inaccuracies-us-filing-itar-a8028741.html

17 "*In trade blowback, Canada will buy used Australian jets rather than new Boeing aircraft*", Associated Press, 12 December 2017, http://www.latimes.com/business/la-fi-canada-f18-boeing-20171212-story.html

18 "*Canada to buy fleet of 30-year-old fighter jets from Australia in snub to US*", The Guardian, 13 December 2017, https://www.theguardian.com/australia-news/2017/dec/13/canada-to-buy-fleet-of-30-year-old-fighter-jets-from-australia-in-snub-to-us

19 David Pugliese, "*Canada names suppliers approved to bid in future fighter competition*", DefenseNews, 23 February 2018, https://www.defensenews.com/industry/2018/02/23/canada-names-suppliers-approved-to-bid-in-future-fighter-competition/

20 Benjamin Zhang, "*Bombardier scores shocking victory over Boeing in trade dispute involving Delta jets*", Business Insider, 26 January 2018, http://www.businessinsider.com/itc-vote-us-government-bombardier-delta-over-boeing-2018-1

21 Bombardier, "*Program Status Report - C Series Aircraft*", 31 December 2017, https://www.bombardier.com/content/dam/Websites/bombardiercom/supporting-documents/BA/Bombardier-Aerospace-20171231-CSeries-Program-Status-en.pdf

Bombardier C-series.[22] Boeing was going to buy all of Embraer, but the Brazilian government didn't want to give up control of their military aircraft division. Embraer makes the A-29 Tucano propeller-driven light fighter plane and the KC-390 jet-powered military cargo plane. They sell those to third-world countries who have limited resources. Boeing will have a competing small passenger jet aircraft line (Embraer E-jets), to compete against the Bombardier/Airbus C-series when the deal is done.

The U.S. Air Force has been holding evaluation trials for the OA-X light tactical fighter plane, to be used in wars against enemies who do not have sophisticated air defenses (like Afghanistan, Iraq, and Syria). The manufacturers of the planes in the trials were Textron (Scorpion), Hawker-Beechcraft (AT-6 Wolverine), Sierra-Nevada/Embraer (A-29 Tucano), and Air Tractor/L-3 (AT-802U Longsword).[23] Those tests reduced the field down to two final candidates: the Sierra-Nevada/Embraer Tucano and the Textron Scorpion. The Air Force bought two of each model and recently deployed them to war zones (Afghanistan and Iraq) for combat testing. At the end of the tests the Air Force will supposedly buy 300 of the aircraft that performs best.[24]

Sierra-Nevada builds the A-29 Tucano in Florida, under license and in partnership with Brazil's Embraer. Most of the parts are made in Brazil, shipped up to Jacksonville, and assembled at the Sierra-Nevada operation. If Brazilian authorities approve the Boeing majority ownership position in the Embraer commercial aircraft division, they might want something in return. That implies that Textron doesn't have a snowball's chance of getting the order for 300 light tactical fighter planes from the U.S. Air Force. Boeing will clobber Bombardier/Airbus' C-series jets in the market with the Boeing/Embraer E-jets, and the Air Force will buy 300 Tucanos from Sierra-Nevada/Embraer in Florida. I love it when a story has a happy ending.

"Textron doesn't have a snowball's chance of getting the order for 300 light tactical fighter planes from the U.S. Air Force."

End Notes:

- *In early March, Airbus announced they would significantly reduce the production schedules for the problem-plagued A400 and the slow-selling A380, and cut 3700 jobs (across France, Germany, UK, and Spain).*[25]
- *Also, in early March, Virgin Atlantic cancelled their order for six of the jumbo A380 airliners due to delays in shipments.*[26]

Crytocurrencies

There are over 1500 cryptocurrencies (like Bitcoin) on the market today[27] with a combined value of over $700 billion.[28]

In January, Kodak announced their Initial Coin Offering (ICO) for photographers.[29] Photographers can register their works with Kodak and be paid in Kodak coin when customers license and use their photos, and Kodak can take a piece of the action. Kodak has been in a financial death spiral for years since digital photography took over and can't get money from banks or by selling stock or bonds. So, they had to issue a cryptocurrency.

22 "*Boeing to have 51 percent stake in venture with Embraer*", Reuters, 25 February 2018, https://www.reuters.com/article/us-embraer-m-a-boeing/boeing-to-have-51-percent-stake-in-venture-with-embraer-paper-idUSKCN1G90P3

23 Oriana Pawlyk, "*Air Force Chooses AT-6, A-29 for Secondary Light Attack Experiment*", Military. com, 12 February 2018, https://www.military.com/dodbuzz/2018/02/02/air-force-chooses-6-29-secondary-light-attack-experiment.html

24 Kyle Mizokami, "*The Air Force Is Sending Its Light Attack Plane Competition to War*", Popular Mechanics, 27 September 2017, https://www.popularmechanics.com/military/aviation/a28413/the-air-force-is-sending-its-mini-attack-plane-competition-to-war/

25 Pierre Tran, "*Airbus cutting 3,700 jobs across Europe, slashing A400M aircraft production*", Defense News, 7 March 2018, https://www.defensenews.com/industry/2018/03/07/airbus-cutting-3700-jobs-across-europe-slashing-a400m-aircraft-production/

26 David, Kaminski-Morrow, "*Virgin cancels long-dormant A380 order*", FlightGlobal, 7 March 2018, https://www.flightglobal.com/news/articles/virgin-cancels-long-dormant-a380-order-446556/

27 Cryptocurrency Market Capitalizations, Cashbet Coin, https://coinmarketcap.com/all/views/all/

28 Jon Buck, "*Total Crypto Market Cap Hits New All-Time High Over $700 Bln*", CoinTelegraph, 3 Janaury 2018, https://cointelegraph.com/news/total-crypto-market-cap-hits-new-all-time-high-over-700-bln

29 Shannon Liao, "*Kodak announces its own cryptocurrency and watches stock price skyrocket*", The Verge, 9 Janaury 2018, https://www.theverge.com/2018/1/9/16869998/kodak-kodakcoin-blockchain-platform-ethereum-ledger-stock-price

In February, Venezuela announced their ICO of the "Petro", a cryptocurrency backed by the price of one barrel of Venezuelan oil and their reserves.[30] There's a lot of flap going on that this coin is actually a futures contract (i.e., a security) based on Venezuelan oil sales, and therefore illegal. Venezuela is bankrupt, so none of the world's banks, or even Maduro's mother, will lend them money. On March 19, President Trump signed an executive order barring any U.S. company or person from financial transactions involving the Petro. On the first day of trading in February, the Petro attracted $735 million for Maduro's insolvent dictatorship.[31]

The next day, riding on the success of the Petro coin offering, Maduro announced their new "Petro Oro" coin (Petro Gold), based on Venezuela's gold reserves and what gold might be in the ground there.[32] Look for other insolvent countries and companies, run by incompetent management, to announce new coins at any time.

"Look for other insolvent countries and companies, run by incompetent management, to announce new coins at any time."

PC sales fell by 0.2% again in 2017, continuing their decline for six straight years.[33] Some numbers I have seen say PC sales fell by a total of 30% over those six years. We've already seen HP blow up and split apart into multiple companies. And we saw Dell go private in 2013 to avoid public financial scrutiny. Expect PC sales to continue their slide into financial purgatory. Could we see a new "PC Coin" announced?

Smartphone sales declined for the first time ever in Q4/2017, down 5.6%.[34] Like PC's, there's no compelling reason to buy a new smartphone, not at the prices they are charging. Everyone who wants a cellphone, and can pay for the airtime, already has one. We saw Nokia and Motorola blow up years ago when times were good. Now, Apple is having trouble selling their latest models. Samsung, LG, and Apple have had some cellphones explode or catch fire over the past few years, from faulty batteries. And Apple surreptitiously slowed older phones in 2017 because of battery problems. Smartphones are a replacement market now, not a growth market. Is there a "Phonecoin" in our future?

In Europe, the average revenue per customer (ARPC) for EU telecom service providers is one third that of the U.S. service providers, and about half that of Japan's telecoms.[35] That means potentially less money to upgrade and expand the networks in the EU. Politics and nationalism preclude any significant mergers and acquisitions for efficiency, so they'll muddle along until they need the governments of their home countries to subsidize them before they go broke. Gen-5 cellular networks might only come to the EU countries if the governments pay for it. How will they do that? With a "Telecoin" offering, of course.

Russian GDP grew at 1.5% in 2017, after several years of decline. All their military platforms are rusted, antiquated, and dilapidated, so they need money for new weapons. Could they release a "Borschcoin", backed by their beet crop?

For your information, each bitcoin transaction uses over 800 kilowatt-hours of electricity (KWh). Total bitcoin mining operations used over 50 Terawatt-hours (TWh) of energy last year. That's about the same amount of energy used by the country of Israel in a year.[36] That, in turn, has raised the cost of mining bitcoins in countries with high electricity

30 Sujha Sundararajan, "*Venezuela's President Announces 'Petro' Token Pre-Sale*", Coindesk, 31 January 2018, https://www.coindesk.com/venezuelas-president-announces-petro-token-pre-sale/

31 Lesley Wroughton, David Alexander, "*U.S. bans transactions with Venezuela's digital currency*", Reuters, 19 March 2018, https://www.reuters.com/article/us-crypto-currencies-venezuela-usa/u-s-bans-transactions-with-venezuelas-digital-currency-white-house-idUSKBN1GV29W

32 Adam James, "*Venezuela Decides One Coin's Not Enough, Readies New 'Petro Gold' Token*", Bitcoin News, 22 February 2018, http://bitcoinist.com/venezuela-decides-one-coins-not-enough-readies-new-petro-gold-token/

33 Shannon Liao, "*Holiday PC sales grew for the first time since 2011*", The Verge, 12 January 2018, https://www.theverge.com/2018/1/12/16883160/pc-market-growth-demand-rise-holiday-2017-hp-lenovo-apple

34 Shara Tibken, "*Smartphone sales fall for first time ever, says Gartner*", C/NET, 22 February 2018, https://www.cnet.com/news/smartphone-sales-fell-for-the-first-time-ever-in-q4-apple-samsung-gartner/

35 Mathieu Rosemain, Pamela Barbaglia, "*Plenty of smoke in European telecoms M&A but little fire*", Reuters, 26 February 2018, https://www.reuters.com/article/us-telecoms-mobileworld-m-a/plenty-of-smoke-in-european-telecoms-ma-but-little-fire-idUSKCN1GA1WI

36 Bitcoin Energy Consumption Index, Digiconomist, https://digiconomist.net/bitcoin-energy-consumption

rates.[37] The city of Plattsburgh, NY, banned cryptocurrency mining recently, because they surpassed their power allocation for the past few months.[38]

For comparison, China used 6307 TWh of electricity in 2017. The U.S. used about 4100 TWh, and the EU-28 used about 3100 TWh.[39] This brings-up the Kardashev Scale, that classifies a civilization by its energy consumption: planet earth is barely a Type-I civilization. However, we are moving toward becoming a Type-II civilization: bitcoin mining used 0.25% of all the power generated on earth in 2017, and that number is rising at 30% per month. If you extrapolate this growth, it shows that all energy generated on earth will be diverted to cryptocurrency mining by February 2020.[40] So, start stocking-up on candles, batteries, bottled water, and canned food now.

Markets

Military and Aerospace

President Trump unveiled his National Security Strategy (NSS) in mid-December. The upshot of this report is that with the decline of ISIS, Taliban, and Al Qaeda in the Middle East, the U.S. will turn its attention to peer threats from China and Russia, and the rogue states of North Korea and Iran. We are shifting from counterterrorism back to warfare between nation-states.[41] Let the Russians bog themselves down against Turkey and the terrorists in Syria for ten years. Let them get in the middle of the Sunni-Shia feud that's been going on since 632 AD and see if they can do any better.

In January, the Department of Defense released their National Defense Strategy (NDS). The NDS is the military version of the NSS. It basically states that the U.S. will build-up military assets in the Asia-Pacific region and the Atlantic, to counter China and Russia respectively. Neither China nor Russia want to trade missiles with the U.S., Iran doesn't have the weapons, and Kim Jong Un (KJU) will only use nuclear weapons to protect his dictatorship.[42]

The Electronic Warfare Strategy (EWS) report was released only to military personnel and defense contractors in June 2017. This is super-secret stuff, we don't want to tell our enemies what we are doing. Just consider that there is a lot of discussion inside the Pentagon to make the Electro-Magnetic (radio) spectrum another warfare domain. Back in 2011, the Pentagon declared cyberspace as a new warfare domain. The commander of the cyber domain is the Director of NSA (DIRNSA). There have been discussions about breaking-off the cyber command from the NSA, because it gives DIRNSA too much power and gives the NSA offensive weapons. Putting EM spectrum command under NSA would only exacerbate that problem and putting cyber and EM spectrum commands under Air Force, Navy, or Army would create a fire storm of inter-service rivalry.[43]

In early February the Pentagon released the Nuclear Posture Review (NPR). The new capabilities outlined in this report are small low-yield nuclear warheads for our present submarine-launched ballistic missiles and a new submarine-launched nuclear-armed cruise missile. Low-yield is defined as something less than the explosive power

37 Aaron Hankin, "*Here's how much it costs to mine a single bitcoin in your country*", Market Watch, 29 March 2018, https://www.marketwatch.com/story/heres-how-much-it-costs-to-mine-a-single-bitcoin-in-your-country-2018-03-06

38 Thuy Ong, "*Plattsburgh has become the first city in the US to ban cryptocurrency mining*", The Verge, 16 March 2018, https://www.theverge.com/2018/3/16/17128678/plattsburgh-new-york-ban-cryptocurrency-mining

39 Brian Wang, "*China added the electricity consumption of France and will pass combined USA-EU-28 energy in 2020*", Financial Times, 17 March 2018, https://www.nextbigfuture.com/2018/03/china-added-the-electricity-consumption-of-france-and-will-pass-combined-usa-eu-28-energy-in-2020.html

40 Tyler Durden, "*Will Bitcoin Mining Consume All The World's Current Electricity Production By Feb 2020?*", ZeroHedge, 24 November 2017, https://www.zerohedge.com/news/2017-11-24/will-bitcoin-mining-consume-all-worlds-current-electricity-production-feb-2020

41 Zalmay Khalilzad, "*A Realist National Security Strategy*", The National Interest, 19 February 2018, http://nationalinterest.org/feature/realist-national-security-strategy-24555

42 Mark Canian, "*A Tough National Defense Strategy*", Breaking Defense, 19 January 2018, https://breakingdefense.com/2018/01/a-tough-national-defense-strategy/

43 Sean D. Carberry, "*DOD releases electronic warfare strategy to stakeholders*", FCW, 22 June 2017, https://fcw.com/articles/2017/06/22/ew-strategy-pentagon-carberry.aspx

of the Hiroshima bomb (less than 15 kilotons). These weapons are a response to Russia's recent aggression in Crimea, Ukraine, and Syria. This report names Russia as our primary nuclear-peer enemy. These low-yield nuclear weapons would be used to stop a Russian tank invasion of the Baltic states coming through the Suwalki Gap. The NDS feeds into the NPR so you can see how low-yield nuclear weapons are entering the conventional-weapon kill chain. These new tactical weapons assume that we can fight a limited nuclear war against fielded military forces, without the destruction of cities and populations by high-yield strategic nuclear weapons.[44]

The Ballistic Missile Defense Review (BMDR) was due to be released in late February, but it didn't happen. There has been speculation by credible sources about what that document contains. We have 44 mid-range interceptor missile systems presently deployed in California and Alaska. Speculation is that we will increase those to 100 systems. We will also see requests for more Patriot, THAAD, and Aegis-Ashore intercept missile systems. Many of those will go to allies in Europe, the Middle East, and the Pacific to intercept Russian, Iranian, and North Korean missiles. We'll have to wait and see the details of this report.[45]

The FY2019 DoD budget, under the National Defense Authorization Act (NDAA), was released in February. The Army got the largest amount, followed by the Navy and then the Air Force. The Army requested 5,113 JLTVs (Joint light Tactical Vehicles), 135 M-1 Abrams tank upgrades, 30 Amphibious combat vehicles, 197 armored multi-purpose vehicles, 60 attack helicopters, and lots of ammunition. The Air Force requests 77 new F-35 fighters. Also, they will begin phasing-out the B-1 and B-2 bombers as more B-21 bombers come into service. They will upgrade and keep the B-52's until the bomber fleet reaches 175 B-21's. The Navy requested three new DDG-51 destroyers, two Virginia class submarines, and 24 new F/A-18 fighter jets. The Army has been in the Pentagon's doghouse ever since the FCS (Future Combat System) program imploded. Now, it looks like the Navy is in budgetary purgatory for banging their ships into commercial vessels in the Pacific regularly, and the Army has been forgiven. There's lots more in the 2019 DoD budget,[46] but not enough room to discuss it here. It's best that you read the document.

In early March, the Pentagon released their Space Reforms Report (SRR).[47] It basically says that we might need to break-off space from the Air Force and create a new command. It indicates that we need more satellites and we need to deploy them soon.

There are three thorny structural management issues being discussed at the Pentagon these days: (1) breaking-off the cyber command from the NSA, (2) making the electromagnetic spectrum (RF) a new domain of warfare (in addition to land, sea, air, cyberspace, and space), and (3) breaking off space from the Air Force into a separate service (Space Command). In mid-March, President Trump said creating a "Space Force" independent of the Air Force sounded like a good idea.[48]

44 Rebecca Hersman, "*Nuclear Posture Review: The More Things Change…* ", Breaking Defense, 8 February 2018, https://breakingdefense.com/2018/02/nuclear-posture-review-the-more-things-change/

45 Paul McLeary, "*Some Clues Emerge On New Pentagon Ballistic Missile Defense Review*", USNI News, 9 February 2018, https://news.usni.org/2018/02/09/some-clues-emerge-on-new-pentagon-ballistic-missile-defense-review

46 Sydney J. Freeberg, Jr., "*DoD R&D Soars 24%, Procurement Up 15%; Army Up Most*", Breaking Defense, 12 February 2018, https://breakingdefense.com/2018/02/dod-r-army-up-most/

47 Marcus Weisgerber, "*Pentagon May Create a Combatant Command for Space*", The Global Business Brief, 6 March 2018, http://www.defenseone.com/technology/2018/03/pentagon-may-create-combatant-command-space/146430/?oref=d-topstory

48 Marcus Weisgerber, "*Trump Calls for a Space Force, a Concept His Pentagon Opposes*", The Global Business Brief, 13 March 2018, http://www.defenseone.com/politics/2018/03/trump-calls-space-force-concept-his-pentagon-opposes/146647/

Technology

Artificial Intelligence (AI) is unquestionably the big new trend in computing. And, it will have some effects on our industry and the standards processes at VITA. I have written two articles on what might happen, one in ConnectorSupplier[49] and one with an attorney from Chicago for Law360, a legal journal.[50]

"Artificial Intelligence is unquestionably the big new trend in computing."

There are more than 45 start-up companies designing AI chips these days, not to mention Nvidia, AMD, Google, Facebook (with Intel), and Amazon.[51] That puts Intel behind the power curve again, just like they were in cellphones. Wall Street people are now saying that Nvidia will overtake Intel in processors in a few years.[52] There are 26 different neural network types (mentioned in my last report), and probably as many AI algorithm types already identified.[53] Expect to see a number of these algorithms implemented in ASICs for specific applications. This stuff goes way beyond our college statistics classes, so you should probably start doing some serious reading.

Cryptocurrency mining has created a shortage of GPUs in the market.[54] You got an idea about the power consumption and the size of the cryptocurrency markets in the Business Conditions segment of this paper.

Next up is PCIe Gen-5. That's going to be very messy for designers, depending on your configuration. There are a number of ways to hook Gen-5 into a system[55], and that raises serious signal integrity (SI) issues. We have seen a series of different SI problems pop up with serial differential connections. And they have evolved as frequencies have risen and signaling protocols have become more complex.[56] As I said a few years ago (Alderman's second law of data transmission): as the frequency goes up and the signaling protocol becomes more complex, the signal-to-noise (S/N) ratio drops like a rock.

In previous reports, I have stated that quantum cryptography will obsolete even the most advanced encryption algorithms in the future. IBM has come up with "lattice cryptography".[57] And from that, others have created Fully Homomorphic Encryption (FHE), to thwart quantum code breaking. The mathematicians have been burning a lot of midnight oil, coming up with new crypto ideas to protect our communications.

"Quantum cryptography will obsolete even the most advanced encryption algorithms in the future."

Another problem we face is that we have way too many I/O protocols to support. That is creating a massive level of complexity and latency, when you consider the different memory interfaces too. One method is to convert any incoming protocol to a universal protocol on the board. Then, translate that transaction to the protocol of the device receiving the data with a "black box" chip. That adds latency and power consumption, but it's more efficient that playing protocol translation games in software.[58]

49 Ray Alderman, "*Could Artificial Intelligence Spell Trouble for the Connector Industry?*", ConnectorSupplier.com, 15 January 2018, http://www.connectorsupplier.com/insider-perspectives/

50 Ray Alderman and David Newman, "*Could AI Take Over Standard Development Organizations?*", Law 360, 27 February 2018, https://www.law360.com/technology/articles/1016289/could-ai-take-over-standard-development-organizations-

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54 John McMahon, "*Crypto Mining Craze Creates Global GPU Shortage*", News BTC, 21 February 2018, https://www.newsbtc.com/2018/02/21/popularity-of-mining-has-created-a-worldwide-shortage-of-gpus/#

55 Rita Horner, "*32GT/s PCI Express Design Considerations*", Semiconductor Engineering, 18 March 2018, https://semiengineering.com/32gt-s-pci-express-design-considerations/

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57 Brian Wang, "*IBM predicts Lattice Cryptography will be big within 5 years to stop hackers*", nextBIG Future, 19 March 2018, https://www.nextbigfuture.com/2018/03/ibm-predicts-lattice-cryptography-will-be-big-within-5-years-to-stop-hackers.html

58 Ann Steffora Mutschler, "*Mixing Interface Protocols*", Semconductor Engineering, 21 December 2017, https://semiengineering.com/mixing-interface-protocols/

The drivers for the I/O market are changing, and our industry lives and dies in the I/O market. The PC market drove I/O link technology for many years, but PC sales are declining precipitously so don't expect anything exciting past PCIe Gen-5 from this segment. Nothing to see here either. The data center market moved to optical (in the network) and memory-based architectures on the boards, and they are looking to AI for their next generation upgrades. The primary driver for I/O going forward is AI, so we can expect to see some completely new link technologies and protocols to serve the massive bandwidth needed for GPUs and ASICs in the near future. These new link technologies will filter down to the sensors, where the data is generated. So, expect to see a fusion of GPU/ASIC interface standards with sensor standards.[59] Processor chips have moved from millions of gates to billions of gates, and each generation processes more data in less time. I/O chips have moved from thousands of gates to millions of gates, and all they do is make sure an incoming bit gets to the CPU while burning a lot of power and wasting a lot of time. Hopefully, ideas from the AI market will straighten-out this high-speed I/O mess.

Mergers and Acquisitions

At the macro-level, we saw the DoJ oppose the ATT/Time Warner merger in November. They say the combined company would put too much power in communications and content under one roof. That merger is now in the courts. Then, President Trump opposed the purchase of Qualcomm by Broadcom (a Chinese company based in Singapore), so Broadcom dropped their offer in early March. Qualcomm is still trying to complete their purchase of NXP Semiconductor, the old Philips Semiconductor company from the Netherlands.[60] Remember that NXP bought Freescale back in 2015, and that threw the PowerPC architecture into question. The latest speculation is that Intel might buy Broadcom.[61]

Also, back in September, President Trump blocked the sale of Lattice Semiconductor to Canyon Bridge Capital Partners (a Chinese company funded by government money). Lattice has technology for AI that could be used for military applications.[62] Any acquisitions of U.S. technology companies will be scrutinized heavily under this administration.

General Electric (GE) has a new president, and he is looking to sell-off several divisions to put the company on a better financial footing: lighting, transportation (locomotives), and maybe their aviation division (jet engines) are all possible sales. Wall Street speculation is that Boeing could buy the aviation division, but that might create some antitrust issues. Or, GE may spin-out the aviation group into a separate company.[63] Remember that GE sold their Intelligent Platforms Group to Veritas Capital in 2015 which became Abaco Systems.

In our corner of the world, Mercury Systems bought Themis Computer in December.[64] The purchase price was $180 million, and Themis was expected to hit $57 million in sales for 2017. That yields a multiple of 3.16 times sales (180/57), one of the highest seen in our industry. According to my records, the highest multiple paid for a board company was when GE Embedded bought Condor Engineering in 2006 at a 3.6 multiple.

Mercury Systems has purchased several companies at multiples above 3.0 time sales: Delta Microwave in 2017 (3.16), and Echotech in 2006 (3.27). There could be others on the list of the Mercury Systems acquisitions, but the financial data (purchase price and sales of the acquired company) were not publicly revealed.

59 Brian Bailey, "*New Drivers for I/O*", Semiconductor Engineering, 13 November 2017, https://semiengineering.com/new-drivers-for-io/

60 Anders Bylund, "*Can Qualcomm Close This NXP Semiconductors Merger Anytime Soon?*", The Motley Fool, 16 February 2018, https://www.fool.com/investing/2018/02/16/can-qualcomm-close-this-nxp-semiconductors-merger.aspx

61 Christine Wang, "*Intel reportedly considers bid for Broadcom*", CNBC, 9 March 2018, https://www.cnbc.com/2018/03/09/intel-considers-bid-for-broadcom-dow-jones-citing-sources.html

62 Liana B. Baker, "*Trump bars Chinese-backed firm from buying U.S. chipmaker Lattice*", Reuters, 13 September 2017, https://www.reuters.com/article/us-lattice-m-a-canyonbridge-trump/trump-bars-chinese-backed-firm-from-buying-u-s-chipmaker-lattice-idUSKCN1BO2ME

63 Robert Channick, "*GE looks to sell or spin off Chicago-based transportation division*", Chicago Tribune, 13 November 2017, http://www.chicagotribune.com/business/ct-biz-ge-transportation-20171113-story.html

64 Mercury Systems, "*Mercury Systems To Acquire Themis Computer* ", 21 December 2017, https://www.mrcy.com/press-center/press-releases/press-release-detail/?id=17261

In February, FIMI Opportunity Funds (an Israeli private equity firm) bought Aitech for $30 million. Aitech's sales were about $35 million, yielding a multiple of 0.86 times sales.[65]

Just announced was the acquisition of Atrenne Integrated Solutions by Celestica, Inc.[66] It looks like another contract manufacturer is trying to beef up its supply chain capabilities. Atrenne has been a major consolidator of backplane and packaging business over the years.

MEN Mikro Elektronik GmbH and duagon Holding AG are merging to become a provider of software and hardware solutions for safe computer and communication solutions in critical embedded applications.[67] MEN has been a longtime VITA member and player in the embedded computing industry.

Summary

We have touched on numerous issues in this report and added a few opinions. Clearly our economy is doing better, a claim backed-up by the latest GDP numbers. While the EU is going after U.S. technology companies for money, the DoJ and the Trump Administration are now going after Facebook and Amazon (respectively) for different reasons. Facebook played fast and loose with their member's data, and Amazon has eliminated jobs and small businesses in retail. These effects have been ongoing for many years. In both instances, the real problem is that technology has outrun the scope of antiquated business models and industrial-era 20th century laws. What's interesting is that neither Congress nor the courts took any interest in these trends – until now.

As another example of changing business models, Boeing is focusing on their aircraft services business, as sales of new airframes decline worldwide.[68] Airbus has announced that they will also focus on after-sale service revenue while pushing their existing airframes into the U.S. market.[69] In another few years, aircraft manufacturers' business models may look like car dealerships' business models: they make more money on parts and service than they do selling cars. Boeing has the F/A-18 fighter jet in the military market, too. Airbus is trying to become the home of the next-generation Future Combat Air System (FCAS), the replacement for the Eurofighter, in the EU military market.

On the military side, we are seeing new money and new technologies driving new strategies, platforms, and capabilities. That bodes well for our industry, because the electronic content in military platforms is rising dramatically. The Assistant Secretary of the Army: Acquisition, Logistics, and Technology (ASA-ALT) is now offering higher profit margins to companies who can bring new technology to market faster, for military applications.[70] They want to increase the rate of technology insertion.

With the death of the PC, smartphone sales faltering, and the data center market saturated, the general computer market is looking for a new technology driver. That driver seems to be artificial intelligence (AI) processors and software. New developments in AI will filter-down to us in the MIL segment quickly, since they offer tremendous advantages against our enemies. The president's new National Security Strategy identifies those enemies: we are moving away from counter-insurgency against terrorists, back to conventional wars against nation-states. Our concentration on terrorism for over 10 years has created some gaps in our strategic capabilities to fight conventional

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66 "*Celestica Completes Acquisition of Atrenne Integrated Solutions*", Celestica, 4 April 2018, https://corporate.celestica.com/news-releases/news-release-details/celestica-completes-acquisition-atrenne-integrated-solutions

67 "*A Unity for Computing and Communication – MEN Merging with duagon*", MEN Mikro Elektrnonik GmbH, 6 April 2018, https://www.menmicro.com/news-media/corporate-news/?tx_mennewsmedia_mennewsmedia%5Bnewsitem%5D=1401&tx_mennewsmedia_mennewsmedia%5Bcontroller%5D=Newsitem

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69 Tim Hepher, "*Airbus sets services goal, targets productivity gains*", Reuters, 6 March 2018, https://www.reuters.com/article/us-airbus-commercial-exclusive/exclusive-airbus-sets-services-goal-targets-productivity-gains-idUSKBN1GH2Y0

70 Sydney J. Freeberg Jr., "*Army Offers Much Higher Profits For Fast Innovation*", Breaking Defense, 28 March 2018, https://breakingdefense.com/2018/03/army-offers-much-higher-profits-for-fast-innovation-asaalt/

wars, against conventional enemies. Now, we have to play catch-up, with technology as a significant ingredient. As examples, we have seen new developments in directed-energy weapons[71] and new concepts for the 6th generation F/X fighter jet.[72] There are many more examples, just not enough room to list them here.

What this report points out is that we are in a cusp, a period of change, in technology, business models, and warfare. I know what you're thinking: ya, ya, ya, but these changes will take a long time. I disagree. Change is happening at an increasing rate. If you ignore what this report reveals, you are just feeding an alligator, hoping it will eat you last!

"We are in a cusp, a period of change, in technology, business models, and warfare."

71 Sean Gallagher, "*Non-Lethal Weapon: DOD seeks to use lasers to create shouting will-o-the-wisp*", ARS Technica, 22 March 2018, https://arstechnica.com/tech-policy/2018/03/non-lethal-weapon-dod-seeks-to-use-lasers-to-create-shouting-will-o-the-wisp/

72 Daniel Brown, "*The US Air Force just gave a sneak peek of its plans for the next generation of fighter jets*", Business Insider, 26 March 2018, http://markets.businessinsider.com/news/stocks/air-force-sixth-generation-fighter-jet-video-2018-3-1019499907

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