



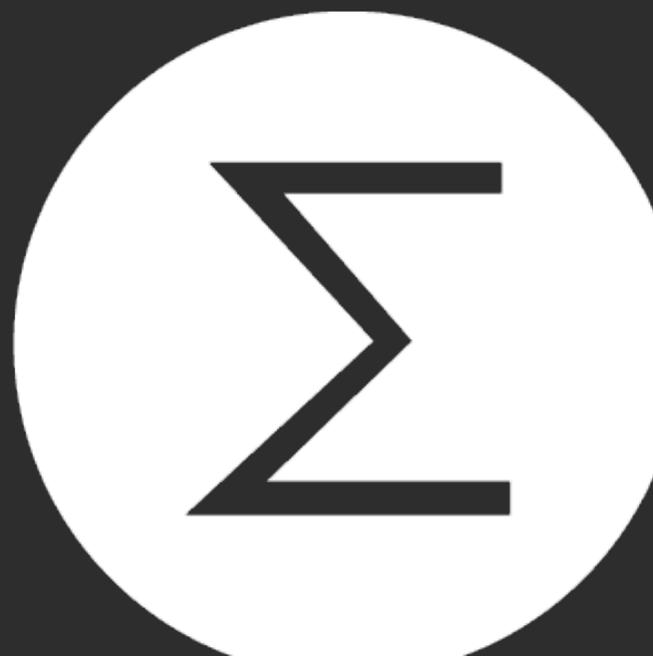
SUMZERO

MANAGER Q&A



THE 5G LANDSCAPE  
TAKES SHAPE:  
RAKUTEN, T-MOBILE,  
MICRON

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## ABOUT THE MANAGERS

**Stewart Gronek** is an investment professional with experience across domestic and international equities, most recently as Chief Investment Officer with Vela Investors in Singapore, from 2013 to 2017, where he launched and co-managed an Asia equity strategy. Prior to this, Stewart was a Director, Portfolio Manager, with Brown Capital Management in Baltimore, from 2006 to 2013, where he co-managed an International all-cap equity strategy. Previously, he has also served as an Associate Equity Analyst with JP Morgan, from 2004 to 2006, where he was a member of the US Food team and Mortgage Finance team, and an Equity Research Intern with Weatherbie Capital LLC, summer 2003, where he contributed ideas to a domestic small-cap growth strategy. Stewart has also worked for The Northern Trust Company, from 1998 to 2002, and PetSmart, summer 2006. Stewart received a bachelor's degree in Economics from Tulane University, in New Orleans, and a master's degree in Finance from Columbia Business School, in New York.

**William “Billy” Duberstein** is the Founder/Portfolio Manager of **Stone Oak Capital LLC**. has extensive investing experience consulting on family office decisions across public equities, angel investing, real estate, and asset-backed lending, since 2004, and managing his own public equity portfolio since 2010. Prior to setting up Stone Oak Capital, Mr. Duberstein worked at Tiburon Capital Management as part of their outsourced research team. Prior to Tiburon, Mr. Duberstein worked at Wedbush Securities, performing associate duties for both the Ecommerce and Semiconductor analysts, including extensive modeling, proprietary research, and channel checks. Mr. Duberstein received a Bachelor's Degree in Music with a Minor in English Literature from the University of Virginia, and a Masters of Business Administration in Financial Instruments & Markets and Strategy from New York University's Leonard N. Stern School of Business.



**AVERY PAGAN, SUMZERO:** *First off, Stewart and Billy - thank you so much for sitting down with me to discuss all things 5G. I think this will make for a timely and educational discussion. Before we dive in, can you both give a quick background on yourselves and your professional investing careers?*

**BILLY DUBERSTEIN, STONE OAK CAPITAL:** I think “interdisciplinary” is a good word to sum it up. I have a mix of both an unconventional background in many respects and a conventional background in others. Growing up just outside New York City, I have a family that makes a large portion of income from investments across a different asset classes. I also grew up playing sports which ingrained a healthy (I hope) competitive streak. So in that sense, an investor’s mindset was ingrained in me early on.

On the other hand, in college and my early career, I took a wide variety of courses, including economics and accounting, but really gravitated towards my love of the liberal arts. I played jazz guitar and majored in Music and English. In my early twenties, I worked in the film/television industry while also writing scripts, even directing and editing a couple short films and documentaries. So, that creative/storytelling qualitative side of my brain was exercised a bit more than others that might have gone the traditional finance/investment banking route. I remember reading Robert Hagstrom’s *Investing: The Last Liberal Art* as one of my first investing books and that was a real eye-opener.

After Hagstrom’s book, I read all of Warren Buffett’s shareholder letters going back to 1977, which is probably the best Investing 101 education one can receive. That happened

around the time of the financial crisis and the 2008 election, where I kind of realized my interests really lay in the investing world. I’m pretty even-keeled and objective, and love to learn about the world and how things work, so investing ideally suited my personality more than creative pursuits, and I haven’t looked back.

After getting “the bug,” I decided to go to business school at Stern, where I had the good fortune to study directly under valuation “guru” Aswath Damodaran, took special situations investing with JANA founder Gary Claar, international value investor James Rosenwald, and others. I also got a lot out of business strategy courses designed for consultants. I’ve taken bits and pieces from each and incorporated all of them into Stone Oak’s opportunistic strategy, which seeks a handful of outsized risk-reward situations across high-quality compounders as well as deep value investments on a more opportunistic basis.

After working briefly on both the sell side and the buy side, I had the good fortune of having family, family friends, and business school peers back me to begin Stone Oak. Starting my own firm was always the goal, but given the uncertainty in active management along with the near-term opportunity at that time, that plan got accelerated.

**STEWART GRONEK:** Thank you for the opportunity to be part of this discussion on 5G. My investment education kicked off with an internship at Weatherbie Capital, LLC during the summer of 2003, a small-cap domestic growth investment firm in Boston where my formal education met the realities of what is involved in dissecting and analyzing companies.

After completing an MBA at Columbia Business School, I joined JP Morgan as an Associate Equity Analyst. Buy-side investors often rely on sell-side research as a guide in formulating investment decisions. From this experience, I found sell-side research to be too focused on short-term events that have little to do with long-term outcomes. In late 2006, I joined Brown Capital Management in Baltimore as a portfolio manager on their international equity team.

In 2013, and after observing a rising tide of compelling investment opportunities across the Asia region, I made the decision to move

to Singapore to launch an Asia equity strategy. After setting the groundwork, the strategy launched in March 2014 as a concentrated portfolio that targeted investment in capital efficient companies that benefit from rising living standards in the Asia region. By this time, China had already become half of Asia's GDP and, by extension, the strategy was half weighted to Greater China equities. In addition, it quickly became clear that many of the ex-China companies were increasingly dependent on China.

Notwithstanding solid performance, despite a challenging market environment, the Asia equity strategy was wound-down in 2017.

Reflecting extensively on these experiences, and after learning about the emergence of SumZero's online community, I became a contributor of research as a means of sharpening my analytic skill at dissecting companies and arriving at determinants of intrinsic value. Often investment professionals work within hierarchical firms and report to a few people who render judgement on their analytic work. By contrast, SumZero's community of over 16,000 investment professionals around the world, many of whom are willing to constructively rip apart a person's analysis, provides an excellent vehicle for continuing education.

**SZ:** *When did you start investing in ecommerce/telecom/tech names and why?*

**DUBERSTEIN:** I had owned "household" tech names going all the way back to when I was a kid, and I've always been interested in futurism and the "next big thing" just out of sheer curiosity. One of my favorite movies is Stanley Kubrick's *2001: A Space Odyssey*.

However, I started to make a deliberate effort to learn a lot about the technology sector probably around the time I started Stone Oak about 6 years ago.

This wasn't due to an overt affinity for technology, but rather based a realization that an outsized portion of stock market gains would likely come from the tech sector due to the sector's relatively capital-light

business models, network effects, and superior growth prospects. As Willie Sutton said when asked about why he robbed banks, "because that's where the money is."

**SZ:** *5G technology has been a bit of a mythical creature looming on the horizon for years now. With the unveiling of 5G-enabled iPhone 12 models, do you think Apple will help create a much-needed wave of consumer buy-in and validation around the concept?*

**DUBERSTEIN:** I think the iPhone 12 is the first step on a decade-long journey. Some uninformed customers may be disappointed initially, for two reasons. First, most of the network carriers aren't yet delivering an appreciably different experience relative to 4G in a wide enough area. That will take more time.

Second, there aren't any new consumer applications that I'm aware of that are "only" possible on 5G. Of course, Uber and Lyft weren't around when the first 4G phones came out.

I guess there will be a small portion of tech "mavens" that may be very interested in the new 5G capabilities and tracking their speeds to the nearest megabit, but honestly, most will probably buy the iPhone 12 because they are either due for an upgrade or they will be taking advantage of the generous iPhone promotions carriers have begun offering.

**"The iPhone 12 is the first step in a decade-long journey."**

**SZ:** *What significance has 5G accrued beyond its technological applications? At a high level, how has 5G become an agent in the US-China trade conflict and who are the key stakeholders in this proxy war?*

**DUBERSTEIN:** There are two angles here from a national security standpoint. One, U.S.

intelligence agencies have posited that 5G radios made by Huawei could contain a secret backdoor that would allow it to spy on foreign citizens and governments. Whether or not that is true is above my pay grade.

**“5G is the tip of an iceberg in the US-China tensions that traverse trade in goods to all elements of China’s national development aspirations, which are intertwined with military modernization goals.”**

The second is whether China’s leadership in 5G would give it a military advantage. That’s also above my pay grade, but certainly, the combination of 5G communications with other advances like AI could lead to some sort of speed advantage or automation advantage over other military systems.

Of course, Huawei’s rise as a dominant radio manufacturer could be owed to a) some stolen technology and b) a protected Chinese market and generous government subsidies, which gives it an unfair advantage over “free market” players in Europe. So the U.S. may be looking to right some wrongs on those fronts in any industry, whether 5G, steel, or others.

**GRONEK:** 5G is the tip of an iceberg in US-China tensions that traverse trade in goods to all elements of China’s national development aspirations, which are intertwined with military modernization goals with a clear objective to obtain foreign technology through all means possible which include industrial, cyber espionage, and theft.

In one notable event in December 2009, subsequently named Operation Aurora by McAfee, there were a series of cyberattacks conducted by a hacking team based in Beijing with close ties to the People’s Liberation Army that led to the theft of intellectual property (IP) from dozens of Western companies including parts of Google’s source code.

5G is yet another front in this ongoing struggle to innovate and, wherever possible, protect those innovations. Stakeholders include everyone from companies, both their employees and investors, whose businesses either benefit from, or are disadvantaged by, IP theft, governments, who are either geopolitically advantaged by, or disadvantaged by, misappropriation of IP, and people, whose data is up for sale to the highest bidder on dark-web platforms where access to your personal Gmail account can fetch on average \$156.50.

5G specifically has become an agent in the US-China trade conflict given the economic and military implications of this emerging technology.

**SZ:** *Huawei’s CEO, Ren Zhengfei notably compared the importance of a country’s “switching equipment” to its military. Can you explain the national security implications of network equipment and why this is a uniquely politicized industry?*

**GRONEK:** National implications fall into one of two categories: economic and military. Economic implications involve a common practice by China of obtaining - either by legitimate means or otherwise - advanced technology then reverse engineering this technology in a process that harks back to the TV series “Star Trek: The Next Generation” with The Borg Collective which travels the known universe assimilating the technologies of other civilizations.

Although understandable during a period of total war, this type of behavior during peacetime on such a grand-scale goes against international norms with China's actions damaging relations not only with the US, but also with other countries, including Russia. A leading military equipment company in Russia, Rostec, recently accused China of reverse engineering most Russian military hardware exported to China, including, Sukhoi aircraft, S-400 surface-to-air missile (SAM) systems, and T-90 tanks.

Similarly, China's leading telecom equipment company, Huawei, is party to many accusations of IP appropriation over the years, including by, Cisco, Motorola, Nortel, PanOptis, SolarEdge, and T-Mobile. Accusations of IP appropriation are not uncommon among technology companies, with the global clash between Apple and Samsung a notable example. However, in the case of Huawei, persistency and scale of IP appropriation, significant government subsidies received by Huawei, and rapid growth in revenue to \$124.0 billion in 2019, from \$46.8 billion in 2014, do raise serious concerns. Increasingly, Huawei is viewed as an instrument of economic warfare unleashed on the world by China.

Military implications are expansive in part because the US Department of Defense (DoD) already uses 5G frequency bandwidths for military applications such as Advanced Extremely High Frequency satellites that provide assured global communications for US forces that will need to be relocated in a process that can take upwards of 10 years to allow for commercial use of sub-6 spectrum.

Telecom carriers in the US are currently confined to mmWave high-band spectrum in their rollout of 5G which requires a much larger investment in capex than would otherwise be required for a 5G network operating on sub-6 spectrum, due to the need to deploy significantly more base stations to achieve the same coverage and performance. China's leading telecom

equipment companies, Huawei and ZTE, are deploying 5G equipment that operates on sub-6 spectrum across dozens of countries. They may interfere with US military applications when they operate overseas due to security vulnerabilities often required by the Chinese intelligence community that could be exploited for data exfiltration.

**“In the case of Huawei, persistency and scale of IP appropriation, significant government subsidies, and rapid growth in revenue...do raise serious concerns.”**

Imagine a scenario in the US-China conflict in which China is able to exfiltrate navigational data from F-35 aircraft and in-flight US hypersonic missiles. Risks aside, 5G enables substantial improvements in communications, command, and control, leading to better situational awareness and decision-making. These improvements were recently demonstrated by a US hypersonic glide body that came within 6 inches of its target which opens the way for high-precision hypersonic weapons and hypersonic defense systems.

**SZ:** *Stewart - you published your Rakuten report on SumZero, which has been an unexpected entrant into the 5G conversation. Can you walk us through the Rakuten ecosystem and new business segments the firm is currently pursuing?*

**GRONEK:** Rakuten's ecosystem is extensive - with a unifying goal to maximize lifetime value of each member while minimizing acquisition costs. At its core, **Rakuten** offers

marketplace services such as Rakuten Ichiba, accommodation booking services such as Rakuten Travel, and online cash-back services such as Rakuten Rewards, formerly known as Ebates. From this foundation in marketplace services, Rakuten extended into direct selling of goods and services to consumers with Rakuten 24, which sells daily necessities, Kenko.com, which sells health related products, Rakuten Books, which is an online book, CD, and DVD store, Rakuten Kobo, which sells eBooks and audiobooks, and Rakuten Fashion, which is an online brand fashion store. Simultaneous to building out ecommerce services, Rakuten built a FinTech business segment that traverses the financial needs of consumers by offering banking, brokerage, credit card, digital payment, life insurance, and general insurance services. In addition, Rakuten is incubating new concepts, including, Rakuten Farm, which provides regular delivery of organic produce and operates an online organic produce store, Rakuten AirMap, which provides airspace management services for drones.

**“Rakuten will be able to leverage an existing ecosystem of 100 million users in Japan to rapidly expand its cell phone subscriber base.”**

Other concepts which receive VC funding from Rakuten Capital include Airweave, a Japan based mattress company, BlueVine, a US based FinTech providing business banking services, Cabify, a Spain-based ride-sharing app, and ShopBack, a Singapore based provider of shopping rewards that operates across Asia.

Since many of Rakuten’s services are offered in Japan and rely on accessibility to smartphones that operate on low-cost and high-data plans in a country where cell phone service plans are high-cost and limited-data due to oligopolic market dynamics dominated by three service providers, Docomo, KDDI, and SoftBank, Rakuten made the momentous decision to launch its own telecom company by becoming a mobile network operator.

**SZ:** *Which business line generates the most revenue for Rakuten today and what is the long-term potential for the network service business if they are able to successfully poach users from incumbents in Japan and beyond?*

**GRONEK:** Today, Rakuten’s largest business segments by sales are ecommerce services, at 56.7%, FinTech, at 34.8%, and Mobile, at 8.6%. Since Rakuten is offering cell phone services for free for an initial twelve-month period, a vast majority of sales derived from the Mobile segment come from Viber, a messaging app, with 1.2 billion users globally which offers content, including, service messages, ads, stickers, and mobile games, and telco services, including, Viber Out, Viber In, and SMS. Looking into the future, network services may have the potential to overtake ecommerce in sales and to serve as a launchpad for Rakuten’s aspirations to further globalize.

Within Japan, there are 177 million cell phone subscribers which exceeds Japan’s population of 126.5 million suggesting many people have more than one phone; a work phone and a personal phone. The weighted average cost of these 177 million cellphone plans is around ¥5,200 per month. Rakuten is offering a better plan, at ¥3,000 per month, that requires no contract, unlimited data, and unlimited domestic calls.

Since incumbent network service providers are hobbled by expensive infrastructure and -

even if financially feasible - may be reluctant to cannibalize their respective business models, it is foreseeable that Rakuten will be able to leverage an existing ecosystem of over 100 million users in Japan to rapidly expand its cell phone subscriber base to a number somewhere in the midpoint between Softbank (44 million subscribers) and Docomo (78 million subscribers) by 2032. In doing so, Rakuten Mobile would become as important to Rakuten as is Rakuten's ecommerce segment today.

This outlook does not touch on Rakuten's other goal for network services which is to access the ¥30 to ¥40 trillion global addressable market for cell phone services by selling its virtualized network architecture as a platform to telecom companies, government organizations, and other enterprise customers worldwide and, in doing so, expand the number of members in its ecosystem to whom it can cross-sell ecommerce and FinTech services.

**SZ:** *How does Rakuten's virtualized network differ from existing providers and what are the inherent advantages of their cloud-native infrastructure?*

**GRONEK:** I will take the second part of your question first. Rakuten's virtualized network offers two important advantages: lower operating costs and enhanced security.

According to Rakuten management, capex is reduced by 40% and opex is reduced by 30% with Rakuten's virtualized network solution compared with traditional network equipment solutions from Ericsson, Huawei, and Nokia. In addition, unlike the traditional solutions which make telecom companies captive to specific suppliers of equipment, a virtualized network solution allows for interoperability of equipment from many suppliers which greatly increases the negotiating position of telecom carriers. Thus, not only do telecom carriers require less hardware due to virtualization and pooling of

capacity which reduces both capex and opex, they are in a stronger negotiating position for the equipment they do purchase.

Enhanced security is achieved by diminished reliance on telecom equipment suppliers who may pose a concern for national security. In fact, Rakuten's virtualized network is being built with components entirely sourced from countries deemed safe, including, Finland, Korea, Taiwan, and the US.

**“A virtualized network solution migrates...away from traditional equipment and software vendors such as Ericsson, Huawei, and Nokia.”**

How exactly is a virtualized network different from existing network solutions? A traditional mobile network is made up of three networked subsystems: an access network, which is all the equipment required to connect the smartphone to the carrier network; a transport network, which is the backhaul composed of subsystems that allow data to be carried to the carrier's core network; and a core network, which is the carrier's data center.

Although core networks benefit from open source hardware and software technologies, the same cannot be said about the access network which operates with proprietary hardware and software with telecom carriers locked within a certain vendor ecosystem with each new generation of cellphone service. A virtualized network solution migrates the equipment and software required for the access network away from

traditional equipment and software vendors, such as Ericsson, Huawei, and Nokia, to commercial, off-the-shelf, equipment and open source software solutions. Net result, interoperability of equipment and software that leads to enhanced efficiency at lower cost. By way of comparison, think of the 1980's with Apple's closed ecosystem and IBM's open ecosystem which led IBM compatible PCs and software to dominate the global computer industry.

**SZ:** *Why else is the network carrier market ripe for disruption and how is Rakuten making its cost structure appealing to new enterprise customers?*

**GRONEK:** In the absence of competition, and in the comfort of an oligopolic market for network services, Japan's three carriers, - Docomo, KDDI, and Softbank - became large, profitable, and insulated. Rakuten's entry into telecom services with an existing ecosystem of users whose lifetime value to Rakuten will increase with access to cellphone service plans that are less expensive and offer unlimited data are a threat to the status quo.

**“Rakuten is able to leverage the innovations achieved as first mover into a vRAN telecom network by offering this platform...to an addressable market of ¥30 to ¥40 trillion.”**

Rakuten will accrue benefits across its ecommerce and FinTech business segments by offering cellphone service plans that are more competitive with opportunities for

monetization that do not exist for incumbent telecom carriers.

In addition, Rakuten is able to leverage the innovations achieved as a first mover into a vRAN telecom network by offering this platform to telecom companies, government organizations, and other enterprise customers worldwide which is an addressable market of ¥30 to ¥40 trillion.

**SZ:** *What is the O-RAN Alliance and how does it provide the basis for Rakuten Mobile and others to sidestep the need for systems integrators like Ericsson, Huawei, and Nokia?*

**GRONEK:** O-RAN is an acronym for Operator-Radio Access Network that was founded by telecom network service providers to accelerate the delivery of products that support a common, open architecture, and standardized interface. By working in conjunction with other members of this alliance which include telecom carriers and contributors which run the gamut of academia, semiconductor companies, telecom equipment companies, and emerging technology companies, this alliance brings together a wide range of industry participants with a vested interest to find alternatives to the traditional way of doing things.

Reverting to our earlier discussion about the implications of 5G to the US DoD concerns: the US DoD recognizes that the commercial sector will be a driving force behind the rollout of 5G. By confining the US industry to mmWave high band spectrum to protect DoD interests as the rest of the world moves forward with sub-6, mid- and low-band spectrum is no longer commercially feasible.

As a result, the DoD has identified vRAN network solutions which allow for interoperability of equipment as a hybrid answer by enabling the switch-out of vendors, where necessary, without necessitating a complete rebuild of a

network. In addition, operating on the same sub-6 spectrum as Chinese 5G systems will allow the US DoD to not only benefit from industry-standard security of 5G, but also an additional layer of security that comes from anonymity with military traffic hiding in plain sight as traffic becomes more difficult to see and isolate. O-RAN is establishing these standards and Rakuten is among those companies leading the charge with the world's first fully virtualized end-to-end network.

**SZ:** *Billy - shifting our focus over to the US for a moment, would you mind summarizing your T-Mobile thesis and why the company is well-equipped to absorb the 5G transition?*

**DUBERSTEIN:** Sure. Very simply, T-Mobile has been a successful company over the past decade with a lower-priced product, customer-friendly service, and a “good-enough” network. In the wake of its April acquisition of Sprint, combined with this once-in-a-decade technology transition to 5G, T-Mobile actually has the opportunity – actually, it’s the odds-on favorite – to not only be the lowest-priced player but now also the network leader.

If the company executes, it will have a superior product that’s also lower-priced, so there isn’t much reason to go with a competitor, is there? T-Mobile/Sprint will have a combined 30% market share or so in wireless and is now the number two player, so I think there is more market share it can steal in the next few years, if it gets its technology deployment and marketing right.

Even without network superiority, T-Mobile will get a lot of cost synergies and improve Sprint’s industry-worst churn towards T-Mobile’s industry-best churn. However, the combined companies now have the deepest 5G spectrum portfolio in the industry. AT&T and Verizon will have to buy more spectrum in upcoming spectrum auction in December, or rely on dynamic spectrum-sharing radios

in which the radio switches between 5G and 4G LTE signals. Recent technology results have shown that DSS sharing has some signal quality capacity issues, and the technology is still being worked out.

Additionally, both AT&T and Verizon have added burdens and distractions of questionable ventures into media and cable, along with their high dividend payments that T-Mobile doesn’t have to worry about. So, putting on the corporate strategy hat, T-Mobile is very well-positioned today, and its management team has a track record of success with acquisitions, going back to the successful 2013 merger with MetroPCS.

**“[Sprint and T-Mobile] now have the deepest 5G spectrum portfolio in the industry.”**

T-Mobile has greatly outperformed both AT&T, Verizon, as well as the broader market over the past one, five, and 10-year periods. So, this is a case of an already strong company and management team, with a catalyst to get even better.

**SZ:** *Can you describe the different spectrum types available and the advantages of each? Who governs the sale and distribution of spectrum in the US today?*

**DUBERSTEIN:** Spectrum auctions are governed by the Federal Communications Commission, and there’s actually a spectrum auction coming up in December.

You can think of different spectrum levels as a series of tradeoffs. Low-frequency spectrum provides lower speeds, but with broader coverage and the ability to go

through walls and other obstacles. High-frequency, or mm-wave is the other end of the "spectrum," which is what lots of people really think of as breakthrough 5G. MM-wave offers the highest speeds in the multiple-gigabit-per-second range. However, it doesn't travel very far, and has trouble going through obstacles. Mid-band spectrum is the happy medium between the two, with better coverage than mm-wave and faster speeds than low-band spectrum.

Sprint was a struggling business prior to the acquisition, but it also held valuable 2.5 GHz mid-band spectrum. That mid-band spectrum is, I think, really where the first fruits of 5G will really become apparent. That's because mm-Wave will only be available in very limited areas, and consumers may not notice much of a difference between low-band 5G relative to 4G.

Low and Mid-band spectrum might also be able to act as a wired broadband replacement in certain areas. In fact, T-Mobile just announced an expansion of its home LTE broadband efforts, from a small pilot project to 450 cities and towns in rural areas.

**SZ:** *How are the other key network carriers in the US designing their 5G infrastructure and what are the advantages/shortcomings of each?*

**DUBERSTEIN:** You can think of Verizon and T-Mobile occupying the two extremes, and AT&T falling somewhere in the middle. Verizon has the most mm-wave spectrum, and is concentrating on rolling out ultra-wideband 5G on mm-wave, offering the highest speeds. The problem is, according to a recent Ookla survey, the signal is only available 0.6% of the time in metro areas where this ultra-fast 5G has been deployed.

T-Mobile, on the other hand, has pursued a coverage-first strategy, but with lower speeds

– still better than 4G, but not as fast as mm-wave. T-Mobile has mm-wave spectrum, it's just choosing to emphasize coverage first because that's where it has an advantage. On the same Ookla survey, T-Mobile's 5G network was available 54.4% of the time and Sprint's was available 47.6% of the time in areas where deployed.

As I said, AT&T's rollout has been in between the two in terms of speed and coverage, available 18.4% of the time.<sup>1</sup>

Another noticeable difference is that T-Mobile has the enough spectrum to deploy 5G standalone, whereas the other two carriers are still using their 4G LTE core, but will move to standalone over time. T-Mobile also has dedicated radios for 5G, whereas Verizon and AT&T are employing dynamic spectrum sharing radios that shares spectrum for 4G and 5G through the same radio. That has the potential to limit capacity. Verizon and AT&T will eventually improve, but they will have to buy more spectrum, and T-Mobile is aggressively looking to expand its current lead.

**SZ:** *Billy, you've also written on Micron and I'm curious about the effects of 5G on semiconductors, a notoriously cyclical industry. How might the 5G catalyst play out within your Micron thesis?*

**DUBERSTEIN:** Micron's DRAM products enable data to move faster, so more data and faster speeds demanded by 5G applications can only mean good things for DRAM demand. NAND storage will get a demand boost from 5G as well, but **Micron** gets a vast majority of revenues (about 70%) and the lion's share of its profits from DRAM, given that it is a more consolidated industry.

Of note, the coming 5G phones – even on the low end – will have as much as double the amount of DRAM per unit. Even with the

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<sup>1</sup> (click on "mobile" <https://www.speedtest.net/global-index/united-states#market-analysis>)

rollout of 5G phones beginning this year, we'll still be exiting the year with something like a high-teens percentage of phones sold being 5G. Obviously, that number is going to grow a lot next year and through the 2020s.

Of course, new data-heavy applications enabled by 5G in things like gaming, AR/VR, and others will require more memory and storage in cloud data centers and edge computing data centers as well. So, it's not just about faster phones, but a whole ecosystem of compute-intensive applications that will pull up demand across data centers, PCs, connected IoT devices, etc. in a virtuous circle.

**“New data-heavy applications enabled by 5G in things like gaming, AR/VR...will require more memory and storage in cloud data centers.”**

We have just come out of a wicked down-cycle brought on by the onset of the U.S.-China trade war in mid-2018, which caused a dramatic down-tick in memory and storage demand, and just when we were coming out of it, COVID-19 hit. As a result, the three major DRAM suppliers have pulled back on capex for two years running. So, two years of cautious supply growth just as 5G is kicking in seems like a good setup for the supply/demand balance in the industry looking ahead.

It still appears the NAND industry is quite competitive, although Intel's recent sale of its NAND unit to **SK Hynix** will bring the total number of suppliers from six to five, ex-China. That's still more than the three major

competitors in DRAM, but it's an improvement.

Additionally, I think Micron's management has done a good job of improving its competitiveness relative to Samsung and SK Hynix, so its cycles should make higher highs and lows over time.

**SZ:** *Huawei accounted for almost 10% of Micron's sales last quarter, but new trade restrictions which halted all US-made chip sales to Huawei took effect in September. What near term setbacks will Micron experience and how will they absorb this revenue loss? How do you look at these moments as a value investor?*

**DUBERSTEIN:** As a value investor, you have to assess whether the loss of a customer like Huawei is a real threat to Micron's intrinsic value, or a recoverable loss that amounts to a temporary speed bump that comes up in the normal course of business.

Fortunately, it appears to be the latter. Management says it will be able to fill in demand from lost Huawei sales within two quarters. There is also the possibility Micron will receive licenses to begin selling to Huawei again, which would make sense since memory and storage is relatively commodity-like and doesn't give Huawei a material advantage. It's a bit unpredictable what the administration will do. But even if that doesn't happen, a one-to-two quarter blip in revenue doesn't affect the long-term thesis.

Though Micron took a 10% dip on the last day of the quarter after it reported (which was a bit of unfortunate timing for our quarter-end performance) it has already recovered all of those losses three weeks later. That's likely because investors realized that if Huawei is cut off, another vendor will fill in that demand, and the beauty of the DRAM oligopoly is that most large tech companies buy from all three players. Micron actually has a close relationship with **Xiaomi**, a stock we also own, which is a Huawei competitor in smartphones. So, Micron will be able to find a

home for its bits, assuming end customer demand stays the same. Rather than any one particular customer, global supply and demand for bits is really what will drive Micron's results over the long-term.

**SZ:** *Could 5G wireless networks eventually unseat traditional cable broadband in the average American household?*

**DUBERSTEIN:** It's possible we could see some of that in the near-term, and again, I like T-Mobile's strategy of going after rural areas with few good broadband alternatives. However, the "average American household" will still probably be a stretch for the foreseeable future. I'm skeptical about 5G replacing broadband in denser cities and suburbs, but if 5G tech advances over the next five years, it's certainly possible.

**SZ:** *How is Europe approaching the 5G transition? Which countries are implementing Huawei technologies despite growing discomfort around China's data integrity, human rights violations, handling of COVID-19 etc?*

**GRONEK:** Any country that installs equipment from Huawei is favoring China's national security over America's national security which may strongly influence world alliances going forward. As a result, each country, and each telecom carrier, needs to carefully consider the geopolitical implications of their decision. In Europe, at least one carrier has decided to go the Rakuten route with a fully virtualized network; United Internet's subsidiary 1&1 Drillisch with aspirations to be Germany's fourth mobile network operator. Although it is unclear if 1&1 Drillisch will utilize Rakuten's vRAN platform, or go it alone, it will be among the first to install a fully virtualized 5G network. Reliance Jio, an Indian telecom carrier, has also recently announced plans to install a fully virtualized 5G network.

<sup>2</sup> <https://itif.org/publications/2020/04/27/us-national-strategy-5g-and-future-wireless-innovation>

**DUBERSTEIN:** Unfortunately Huawei was already inside most European networks, due to Huawei's lower costs and outsized R&D budget, which was larger than those of Ericsson, Nokia, and Qualcomm combined in recent years.<sup>2</sup> Fortunately, while the administration's mere asking to take out Huawei largely fell on deaf ears, the recent sanctions against Huawei seem to be making a difference.

**“Huawei could soon be cut off from US components, and that could degrade performance, which seems to be making [EU] countries stand up and take notice.”**

Huawei could soon be cut off from U.S. components, and that could degrade performance in the future, which seems to be making countries stand up and take notice. The UK announced this summer that it was banning the use of Huawei products after this year. Other European carriers in France, Spain, Italy, and Germany have all hinted they could move on from the Huawei equipment in their networks over time if needed. Radio equipment is usually refreshed over five to seven years, so some are looking to buy time to allow for a natural transition when the time comes. The issue is still very much in flux and uncertain right now.

**SZ:** *What other industries/companies stand to benefit from the 5G era?*

**GRONEK:** Each new generation leads to significantly higher download speeds and lower latency. Entire tech sectors emerge with each new generation - with 3G ushering in mobile gaming and 4G ushering in semiautonomous driving vehicles.

Let's first evaluate those companies at risk of disruption from 5G. **Amazon** dominates ecommerce in part due to its ability to offer same day or next day delivery. 5G will transform delivery from vehicles to drones. Although Amazon is a leader in the emerging field of drone delivery services, the company is just one of several, including, **Alphabet**, **Wing**, **UPS**, and **7-Eleven**, that are developing this capability. As a result, ecommerce competitors to Amazon may be able to offer similar, quick and convenient, delivery services to those offered by Amazon diminishing the company's current comparative advantage in logistics.

Global auto companies and auto insurance providers are also at risk of disruption. 5G will usher in fully autonomous vehicles with many constantly on-the-go transporting people from place-to-place reducing aggregate demand for passenger vehicles. Most people will no longer require auto insurance since the vehicle, and not the passenger, will be navigating. Gone will be the need for parking garages with many converted into alternate use spaces. This may adversely impact global auto companies, including, **Renault**, **Toyota**, and **Volkswagen** and global auto insurance companies, including **Progressive** and **Sabre**.

In addition to Rakuten, many companies may enjoy enhanced comparative advantages from the emergence of 5G. **Unity Software** is the world's leading platform for creating and operating interactive, real-time 3D content with 53% of the top 1,000 mobile games on

Apple App Store and Google Play using Unity's platform. 5G will enable higher download speeds and lower latency leading to significant improvements in the gaming experience which may accelerate end-user demand for Unity's platform.

**WalMart** may be one company able to diminish Amazon's current comparative advantage in logistics with a recent partnership with Flytrex, an end-to-end drone delivery company, to pursue on-demand delivery in a pilot launch initially focused on select grocery and household essential items. **Snap** is at the forefront of augmented reality (AR) with a complete end-to-end platform on which third-party developers create immersive customer experiences, including "Showrooming" to browse through merchandise at a brick-and-mortar store then make purchases online, "Local Lenses" to transform whole real-life neighborhoods into interactive experiences, and Major League Baseball (MLB) to give fans a first-person look at batting practices through 5G BatterCams mounted on players' and coaches' baseball caps. All of these exciting innovations are either greatly enhanced by, or enabled by, the emergence of 5G.



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