

Global Semiconductors

China EDA Deep Dive Part 2 – Structurally Challenged, Primed For A "Big Bang" Moment

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Deep dive into China EDA market, competition and China govt initiatives

Export regs are leading CDNS/SNPS to evaluate their China strategy on a per customer basis ([Part 1](#)). In this report we double-click into China EDA oppty of ~\$800MM-\$1B, structural challenges holding back local China EDA competitors & China govt. initiatives. We use conversations w/ local China customers incl. engineers using China EDA offerings & public competitor mgmt. comments in Mandarin to connect the dots. In [Part 3](#) we quantify CDNS/SNPS exposure to Tsinghua UNIGROUP, a large China semi.

China EDA landscape primed for a "Big-Bang" Moment

CDNS/SNPS/Mentor offerings still dominate China EDA market (\$800MM-\$1B) w/ indigenous China EDA offerings ~10% of revs. Our field work suggests that leading China EDA vendors – Huada Emphyrean, Avatar, Pro-Plus are small (<\$50MM in revs), Analog focused, w/ point tools for Digital that cover only ~30% of the full flow. We think that the Entity List restricts HiSilicon from obtaining updates to US EDA platforms & w/ EDA platforms getting updated at the cadence of mfg. technology shifts & a 3-5 yr lag between EDA dev & tape-out, design activity on advanced nodes can potentially be impacted. Although our conversations suggest China EDA vendors are seeing more engagement from larger China Chipmakers, there is a recognition that they remain far behind the US vendors & we don't think they represent a solution to large China chipmakers. Although the Chinese Govt has prioritized mfg over EDA for investment (EDA <1% of Big Fund investments), recent activity suggests that things may be changing. Nevertheless, we think EDA remains a source of weakness for China semis ecosystem & do not see a short term fix to structural challenges. In our view status quo for China EDA is likely unsustainable as export restrictions tighten. We see ingredients in place for China EDA's very own "Big Bang" moment to structurally change the direction of EDA – large scale govt commitment, hiring of experienced talent, ecosystem dev, w/ larger Chipmakers potentially funding custom EDA.

How this impacts our view on CDNS/SNPS

We don't see a major competitive threat from local China EDA providers, who while making incremental progress, are hampered by predominantly structural factors – dearth of a critical mass of talent, access to leading edge mfg technology & inherent stickiness of CDNS/SNPS/Mentor EDA offerings. A trade regs driven bifurcation into distinct US/China spheres could present a far more significant LT risk to CDNS/SNPS.

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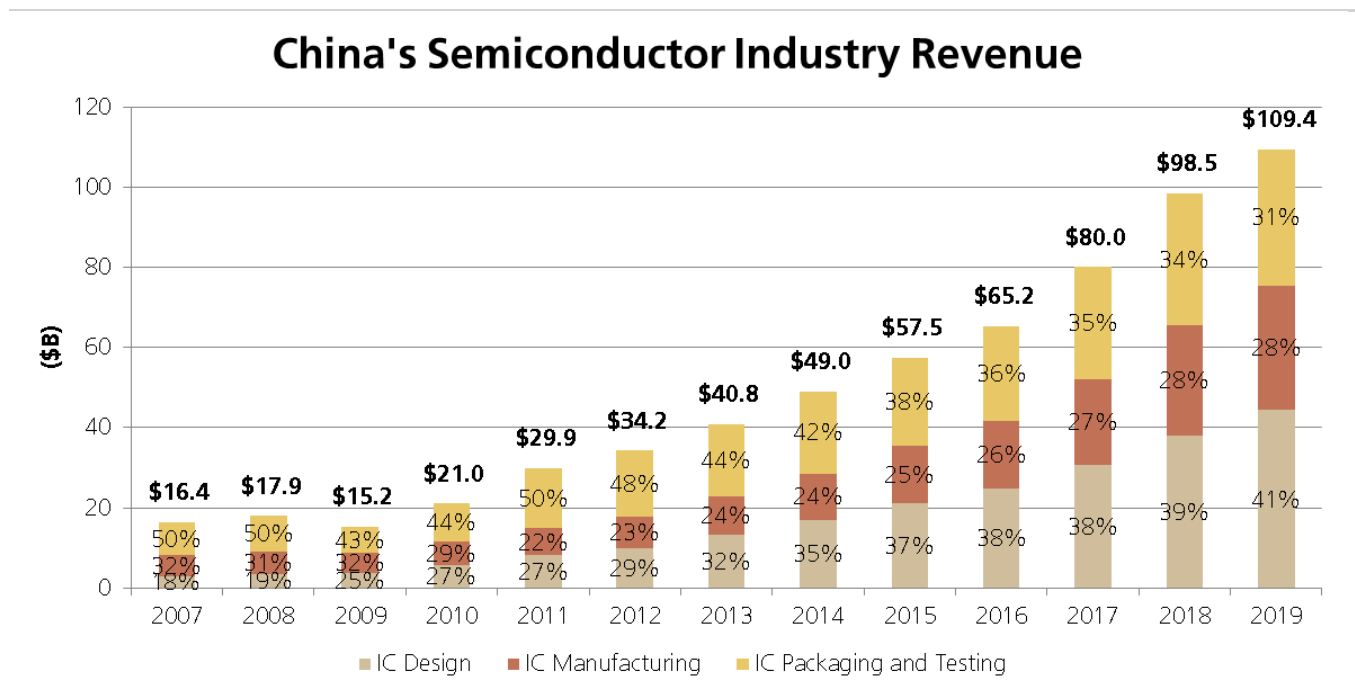
Pivotal Questions for China EDA

How big is the China EDA opportunity?

China EDA market of \$800MM-\$1B, is largely dominated by CDNS/SNPS/Mentor. Two developments are tilting the scale further towards CDNS/SNPS: 1) The China Fabless ecosystem getting increasingly concentrated, meaning larger players can afford CDNS/SNPS tools; 2) Design activity and revs shifts to 5G & Digital and away from core Analog (where indigenous China vendors have some presence)

Data from China Semiconductor Industry Association indicate that China Semis revs was ~\$110B of which IC design accounted for ~\$45B in revenue

Figure 1: China's Semiconductor Industry by Sector (excluding Optoelectronics, Sensors, and Discrete Devices)



Source: CSIA

Notes: historical USD/CNY rates are used

While growth in the China Fabless ecosystem has slowed in 2019, it is also getting increasingly concentrated. Beyond the multinational design houses, a handful of large China chipmakers such as Huawei/HiSilicon, Tsinghua Unigroup & Foundries such as SMIC represent the bulk of the EDA opportunity. Our conversations suggest that there is a steep roll off in size/sophistication of R&D/EDA usage beyond these larger chipmakers & foundries.

Figure 2: China IC Fabless Industry (number of players)



Source: CSIA

Figure 3: China Fabless Industry Scale & Concentration

By Scale (#Employee)	2018	2019	Change
>1000	18	18	→
500-1000	21	33	↑
100-500	126	153	↑
<100	1533	1576	↑
Concentration of IC Fabless			
	2017	2018	2019
Revs of Top 10 IC Fabless (CNY B)	95.174	103.615	~153.175
Revs of Top 10 IC Fabless (\$B)	14.079	15.628	22.167
IC Design (CNY B)	207.350	251.930	306.350
IC Design (\$B)	30.673	37.998	44.334
Top10% as of Total Revs	45.9%	40.2%	>50.0%

Source: CSIA

Notes: historical USD/CNY rates are used

While the China Fabless ecosystem has been focused on Analog/Power, fewer core analog projects could raise funds in 2019, and 5G related and digital projects become more attractive to investors. And therefore, we are seeing an increasing number of start-ups focusing on 5G related communication and the Digital space (SmartCard/Computer Chips).

Figure 4: China Fabless Industry by End Market (# of Players)

By End Market	2018	2019	Change
Communications Chips	307	403	↑
SmartCard	71	102	↑
Computer	109	140	↑
GPS	28	41	↑
Consumer Electronics	783	847	↑
Multimedia	75	55	↓
Analog	210	102	↓
Power	115	89	↓

Source: CSIA

Figure 5: China Fabless Industry by End Market (Revenue)

Revs by End Market (\$B)	2018	2019	Y/Y
Communications Chips	15.785	16.327	7.8%
Total Revs of Top3 Comm Co.		>14.472	
SmartCard	2.083	2.491	24.6%
Computer	5.423	6.082	16.9%
GPS	0.086	0.213	157.4%
Consumer Electronics	9.309	13.897	55.6%
Multimedia	2.851	2.262	-17.3%
Revs of Top1 as of Total Multimedia		1.283	
Analog	2.137	1.899	-7.4%
Power	1.194	1.415	23.5%

Source: CSIA

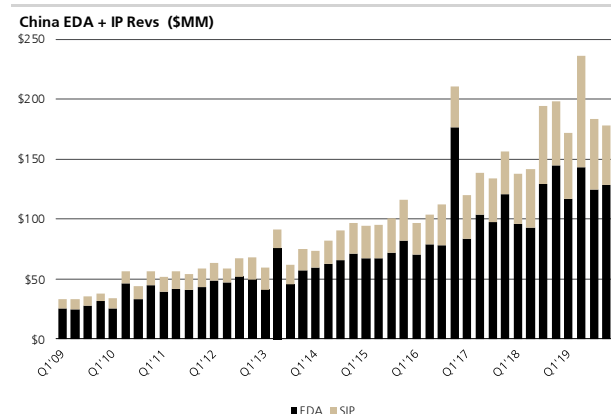
Notes:
Historical USD/CNY are used
Forex translation is not considered in Y/Y changes

Implications for EDA: We think increasing size/scale of the China Fabless ecosystem ultimately is a positive for CDNS/SNPS. Larger customers are more likely to be able to afford CDNS/SNPS solutions. Further, while indigenous China EDA vendors have had some analog presence, we think increasing Digital /communications design activity and revenue clearly favors CDNS/SNPS over local competitors.

EDA Revenue

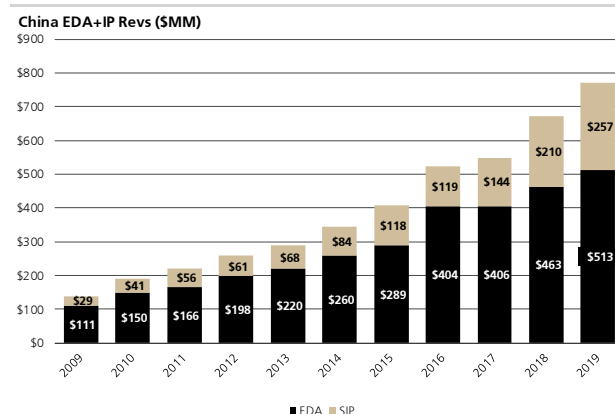
China EDA accounted for ~\$800MM. in revs (incl IP) in 2019. Assuming roughly 8% of SNPS revs from China and roughly 10% of CDNS came from China in C2019, CDNS and SNPS accounted for roughly 65% of China revs, adding in some Mentor, we think the big 3 together accounted for at least 90% of China revs. This implies that Indigenous China EDA accounted for roughly \$80MM in revs in C2019. Our field work (from anecdotal conversations, and piecing together mgmt interviews in Mandarin) suggests that with Huada potentially accounted for roughly \$40-\$50MM, and several other smaller vendors splitting the rest.

Figure 6: China EDA Revenue (\$MM) –Quarterly View



Source: ESDA, UBS estimates

Figure 7: China EDA Revenue (\$MM) – Annual View



Source: ESDA, UBS estimates

Figure 8: China remains heavily dependent on Large EDA Vendors

(\$MM)	2018	2019
Total EDA Revs in China	673	770
EDA	463	513
SIP	210	257
(\$MM)	93%	90%
Total EDA Revs from Overseas Co.	626	693
EDA	430	462
SIP	195	231
(\$MM)	7%	10%
Total EDA Revs from Local Co.	47	77
EDA	32	51
SIP	15	26

Source: ESDA, UBS estimates

How much Investment has EDA attracted from the Chinese Govt?

China's EDA industry has received very little support from the govt. The Big Fund has raised ~\$20B in Phase I, and another ~\$30B in Phase II. Less than 1% of The Big Fund investments thus far have been directed at indigenous EDA. However recent investment activity could indicate that things may be changing

The Big Fund is China's primary investment vehicle for the semis/Electronics verticals. The Big Fund Phase I has raised ~ \$20B from a combination of Govt/SoE/Private sectors companies. The Big Fund Phase II has raised ~\$30B of capital.

While EDA has ranked low on the priority list for the Govt

Figure 9: Big Fund Phase I- Source Of Funds

Company Name	Capital Raised (CNY B)
China Development Bank Capital	22
Beijing E-Town International Investment & Development Co., Ltd	10
Ministry of Finance of the People's Republic of China	36
China Telecom	1.4
China Electronics Corp.	0.5
San'an Optoelectronics	0.1
Da Tang Group	0.5
Wuhan Financial Holdings Group	5
China Mobile	5
Beijing Tsinghua Communication Technology Group (UNISOC)	0.1
SummitView Capital	0.1
China Unicom	1.4
Shanghai Guosheng Group Co., Ltd.	5
China National Tobacco Corp.	11
Huaxin Investment Management Co., Ltd.	0.12
China Electronics Technology Capital	0.5
Common Stock In Total	98.720
Preferred Stocks	40.000
Capital In Total (CNY B)	138.720
Capital In Total (\$B) (CNY/USD=7)	\$ 20

Source: National Enterprise Credit Information Publicity System

Notes: The Big Fund is leveraging CNY500B (\$70B) (1:5 compared with Common Stock)

Our work suggests that the bulk of the investment commitments for Phase I have already been completed over the past 4-5 years. The new round of investment (Phase II) has kicked off in March 2020.

Figure 10: Big Fund Phase II – Source of Funds

Company Name	Registered capital (CNY B)	Paid-up capital (CNY B)	Current % of registered capital
Anhui Xinhua IC Investment Fund	7.5	0.375	5%
Jiequan IC Investment Fund	10	0.5	5%
Beijing E-Town International Investment & Development Co., Ltd	10	0.5	5%
Fujian IC Investment Co., Ltd	3	0.15	5%
Fuzhe IC Industry Development Co., Ltd	15	0.75	5%
China Electronics Corp.	0.5	0.025	5%
Chongqing Emerging Industries Investment Fund	15	0.75	5%
Guangzhou Industrial Investment Fund Management Co., Ltd	3	0.15	5%
China Telecom	1.5	0.075	5%
Shanghai Guosheng Group Co., Ltd.	15	0.75	5%
Beijing Tsinghua Communication Technology Group (UNISOC)	0.1	0.005	5%
Optics Valley Financial Holding Group	15	0.75	5%
Anhui Anhua Modern Industrial Investment Company	7.5	0.375	5%
Tianfu Group	15	0.75	5%
China Unicom	1	0.05	5%
GCL-Power Capital Management Co., Ltd.	0.1	0.005	5%
China National Tobacco Corp.	15	0.75	5%
Shenzhen Shenchao Tech Investment Co., Ltd.	3	0.15	5%
SummitView Capital	0.1	0	0%
Beijing Guoyi Hospital Co., Ltd.	10	0.5	5%
A Subsidiary of GDD Industry Fund Investment Group	2	0.1	5%
Ministry of Finance of the People's Republic of China	22.5	0	0%
Huaxin Investment Management Co., Ltd.	0.15	0.008	5%
Beijing Jianguang Asset Management Co., Ltd.	0.1	0.005	5%
San'an Optoelectronics	0.1	0.005	5%
China Development Bank Capital	22	1.1	5%
China Mobile	10	0.5	5%
Capital In Total (CNY B)	204.150	9.078	4%
Capital In Total (\$B) (CNY/USD=7)	\$ 29	\$ 1	4%

Source: National Enterprise Credit Information Publicity System

Notes:

Paid-up capital as of CYE2019; paid-up capital should finally be the same as registered capital
Some of the company names are translated from Chinese

The Big Fund also invests in other IC-related funds, leveraging funds from other companies, PE, or local governments.

Figure 11: Major Big Fund Investments – List of IC-related Funds

Target Company	Ecosystem	Deal Amount (CNY MM)	Deal Amount (\$MM)	Big fund's %Share In Target In Total (Directly+Indirectly)
A fund set up along with San'an Optoelectronics	RFFE, mmWave, GaAs	2,500	357	
MTM		1,600	229	30%
SPC; Set up along with BOE (owns 37.35% share)	IoT, Material, IC Design, V2X	1,500	214	37%
Shanghai Semi SPE and material investment fund		1,000	143	20%
Shanghai JYJX IC Investment Funds		998	143	45%
A fund created along with SMIC and Shenzhen gov.		800	114	50%
BJ IC Mfg&SPE Fund		700	100	
Shenzhen Hongtai Investment Funds		700	100	44%

Source: Tianyancha, National Enterprise Credit Information Publicity System, Company disclosures

Notes: Assuming CNY/USD=7:1

The first two investments made are SMIC South (\$1.5B in total planned by Big Fund, and another \$750MM from Shanghai IC Fund) and UNISOC (\$320MM in total planned). SMIC will increase the capacity of 14nm node and make further improvements in leading nodes. UNISOC will focus on the development of 5G modem chips.

Figure 12: Major Big Fund Investments – List of IC Companies (Investment Size >CNY 500MM/~\$70MM)

Target Company	Classification	Major Products	Deal Amount (CNY MM)	Big fund's %Share In Target In Total (Directly+Indirectly)
YMTC	IDM	Memory	23,550	49%
SMIC Phase I	Foundry		18,571	23%
SMIC Phase II	Foundry		11,053	
Huali Fab (Subsidiary of Huahong Group)	Foundry		12,483	42%
San'an Optoelectronics	Foundry	LED driver, RFFE, G	6,410	10%
JCST Group	OSAT		4,886	19%
SINO IC Leasing Company	SPE	Leasing	3,751	35%
Subsidiary of Huahong Group	Foundry		3,654	29%
Goodix	Under Display Fingerprint		2,829	6%
Tongfu Microelectronics (Nantong Fujitsu)	OSAT		2,561	22%
UNISOC Phase I	IC Fabless	5G Modem	1,696	27%
UNISOC Phase II			2,487	
NAVTECH	IC Design	MEMS, GPS, Aeros	1,658	
Naura	SPE	Etch, PVD, CVD	1,511	10%
Beijing BDStar Navigation	GPS		1,500	12%
Giga Device	IC Fabless	SSD Controller	1,450	8%
Jingjia Micro	IC Fabless	GPU; Defense	979	9%
Taiji	OSAT		949	6%
Silan	IDM	8inch IC Chip; Pow	800	48%
China Wafer Level CSP	OSAT	WLCSP	680	9%
Wanye Enterprise	SPE		677	7%
JCET Semi.	OSAT		650	26%
National Silicon Industry Group	Material	300mm silicon wa	567	23%
YDME	IDM	Analog; Discrete d	506	20%
Ninestar (Lexmark, Pantum, Apexmic)	IC Fabless	Printers related	500	3%
GCL-Power	Material	300mm silicon wa	500	49%

Source: Tianyancha, National Enterprise Credit Information Publicity System, Company disclosures

Notes: Assuming CNY/USD=7:1

Our analysis suggests that China's EDA industry has received very little support from The Big Fund in Phase I. The Big Fund has only committed to invest ~\$75MM to local EDA Industry; in comparison, ~\$20B in total has been invested to ~100 IC companies or IC-related funds (either directly invest or indirectly invest through another fund)

Figure 13: EDA investments still account for <1% of total investment

Target Company	Classification	Major Products	Deal Amount (CNY MM)	Deal Amount (\$MM)	Big fund's %Share In Target In Total (Directly+Indirectly)
Huada Emphyrean	EDA	Full-flow platform for Analog; Point Tools for Digital	24	3	14%
Giga-da	EDA	Physical design from Netlist-in to GDS-out	500	71	45%
*through Shenzhen Hongtai Fund					
*Big Fund plans to invest CNY500MM in total into Giga-da					
Total Planned Investments in EDA			~CNY525MM	~\$75MM	
Total Capital Raised and Total Investments Made by Big Fund Phase I			~CNY140B	~\$20B	
Total Planned Investments in EDA as % of Total Investments Made by Big Fund					0.38%

Source: Tianyancha, National Enterprise Credit Information Publicity System, Company disclosures

Notes: Assuming CNY/USD=7:1

We think there is some University ecosystem building that is on-going – Peking University will invest \$40MM to cultivate EDA talent by collaborating with foundries, Emphyrean on leading IC companies.

Emphyrean has been recently added to the list of companies that can receive subsidies on IP build-out and protection financed by Beijing gov.

Our work suggests that Chinese govt may be gradually increasing focus on EDA

In 2019 the Big Fund committed to invest CNY 500 (~\$70MM) in Giga-da via other funds. Giga-da focuses on physical design. The investment commitment of CNY500MM is about 20x Big Fund's last EDA investment in Huada Emphyrean (~CNY25MM), and we think this could be a leading indicator of an increasing emphasis on the development of EDA. When this is taken in context with other sustained investment efforts on IC manufacturing and IC design, we think there could be a push towards creating an ecosystem for EDA. Our work indicates that with the support of the Big Fund, Giga-da is able to offer competitive compensation packages to attract talent.

Our work suggests that the two shareholders of Giga-da are Shenzhen Hongtai Fund (90.91%) and SMiT (9.09%). Shenzhen Hongtai Fund is set up in Nov. 2018 by the Big Fund 49.50%, Shenzhen Guiding Fund Investment 49.5% (which is managed by Shenzhen Capital Group), and Giga-da Venture Capital 0.99%. The Shenzhen Hongtai Fund is committed to invest CNY1000MM in total to Giga-da, and CNY600MM has been paid as of CYE2019. The commitment was made in Nov. 2018. The Big Fund typically injects investment capital into the Hongtai Fund (and therefore to Giga-da) when needed and gradually.

Huawei Hubble

Hubble is an investment company set by Huawei in early 2019, focusing on the IC industry. The paid-up capital of Hubble is CNY700MM (~\$100MM), and the

registered capital would reach CNY1700MM. Hubble has largely focused on investing in Analog/RF. Although our work indicates that HiSilicon is beginning to work more closely with Huada as are China hyperscalers we are yet to see a major investment from HiSilicon in EDA.

Figure 14: Huawei Hubble Investments

Target Company	Classification	Major Products	Hubble's %Share In Target In Total (Directly+Indirectly)
Vertilite	IDM	VCSEL	6%
NewCo Semi	IC Fabless	Optical communication	9%
STARCONN	IDM	Connector	32%
SHOULDER ELEC.	IDM	Duplexer, Filters	6%
North Ocean Photonics	IDM	Structural light, TOF, AR Module	6%
Motor Comm	IC Fabless	Auto Ethernet chips	8%
iDeepWise	AI		4%
Joulwatt	IC Fabless	Power	5%
SICC	Material	SiC, Sapphire Substrate	8%
3PEAK Incorporation	IC Fabless	Signal; Battery Management	8%

Source: Tianyancha, National Enterprise Credit Information Publicity System, Company disclosures

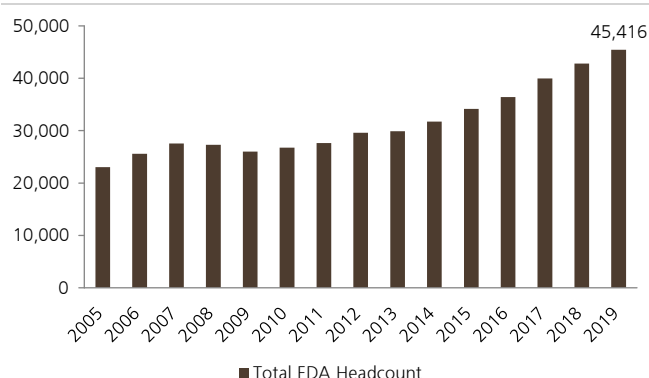
Notes: Most of the deal amount is not disclosed.

Structural Factors are limiting Indigenous China EDA

We think China EDA competition lags far behind the Big three due to structural factors: 1) a lack of experienced engineering/ managerial talent; 2) EDA remains sticky and few customers want to voluntarily switch away from CDNS/SNPS/Mentor offerings; 3) Lack of a leading edge foundry ecosystem is hampering China EDA competitiveness in Digital. We don't see a near term fix for these structural issues.

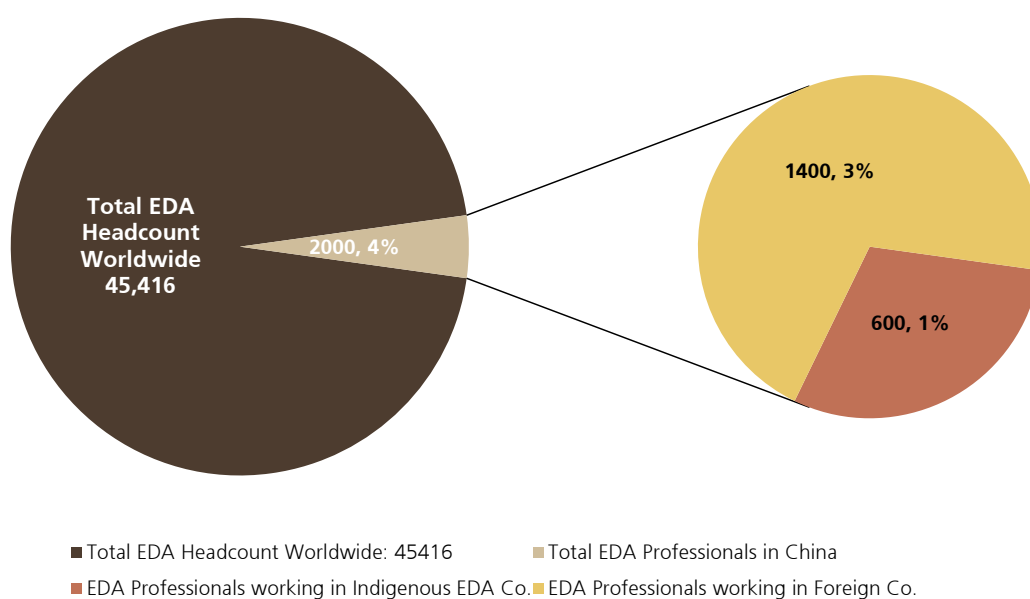
Talent remains the biggest constraint. Our work suggests that EDA talent remains scarce in China. Our conversations suggest that out of ~45,000 EDA employees world-wide, only roughly 2000 work in China. Further, out of the ~2000, only about 600 are employed by indigenous China EDA companies of which Huada employs ~300-400. This talent pool is being replenished at a rate of only ~50 EDA engineers graduating from school each year.

Figure 15: Total EDA headcount Worldwide



Source: ESDA

Figure 16: China EDA headcount as % of Total



Source: ESDA, UBS Analysis

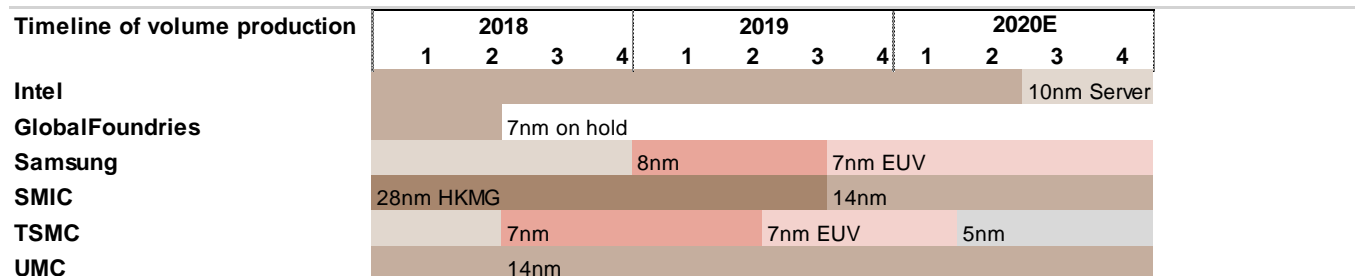
EDA remains sticky and dominated by CDNS/SNPS/Mentor. Although the trade regulations are prompting a re-think – migration costs remain high, meaning barrier to entry is very high for local EDA vendors

Access to leading edge foundry technology is the key to driving competitive digital EDA offerings. Although China EDA vendors are making progress on this front, CDNS/SNPS have decades of experience working with foundries on the leading edge and as such remain entrenched.

We think these factors are structural and we don't see a near term fix for China's heavy dependence of CDNS/SNPS/Mentor tools. Indigenous China providers in the

present form do not have the critical mass to compete at a large scale. Ultimately we think there is a large leap to be made from making progress in point tools to developing a full flow EDA platform for leading edge technology, and as such the indigenous China industry in the present form seems subscale. We therefore view this as a structural challenge for the indigenous China ecosystem.

Figure 17: Mfg Process node roadmaps



Source: Company data, UBS

Source: Company data, UBS

With the entity list potentially limiting the US of EDA tools in advanced nodes, going forward should trade regulations become increasingly more restrictive, we think this could ultimately catalyze a "Big-Bang" moment for China EDA – that funnels Govt backing with large scale hiring from US based competition, more vertical integration/EDA ecosystem funding by Chipmakers such as UNISOC, HiSilicon and a more wholehearted drive to develop a talent pool.

What our field work revealed about indigenous China competition in EDA

Our field work suggests that some of the China EDA point tool vendors include

- Huada Emphyrean
- Avatar
- Xpeedic
- Pro-Plus

Huada Emphyrean – Largest Indigenous China EDA Vendor by Revenue

Management commentary/interviews in Mandarin suggest that Emphyrean revs of ~\$50MM in 2019. Emphyrean employs roughly 300-400 employees, having almost doubled its head count in the last year, w/ >70% in R&D.

Analog:

- Analog platform is well regarded in China w/ Emphyrean having >300 customers world-wide including customers such as Renesas, DIODES; ALPS (a parallel simulator) remains well regarded by industry.

- Empyrean Flat Panel Display solutions are also well regarded in the industry

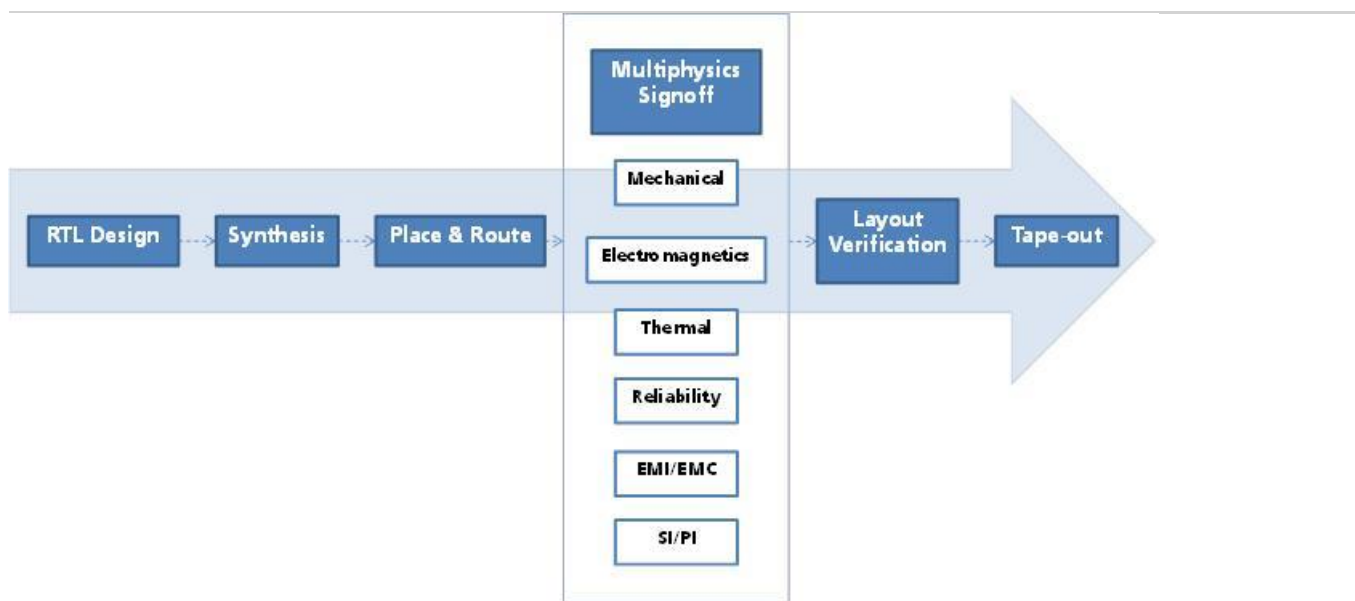
Layout:

- Empyrean is beginning to make strides in Layout. Our field work suggests that Skipper is well regarded by China Foundries with some engineers preferring Skipper for its User Interface that permits faster viewing of large size layout files, relative to US peers.
- Huada is seeing traction in Digital – XTOP and XTime supporting 10nm/7nm nodes and they have already delivered tens of successful tape-outs and is deployed at leading China IC vendors including HiSilicon.

Digital

- While Empyrean SoC point tools have been adopted by UNISOC, Marvell, TSMC, SMIC, YMTC, NVIDIA, XILINX, our work suggests that it still remains largely point tool focused, meaning it lacks CDNS/SNPS like full flow design platform. Our conversations suggest that its tools account for ~30% (or less) of the design flow.

Figure 18: Typical Digital Chip Design Flow (Front End)



Source: UBS Analysis

- Empyrean is partnering with C-SKY a company acquired by Alibaba on IoT and AI designs using ICEplorer and we think this may be its path to break into China hyperscalers
 - **C-SKY (Now under T-head/Pingtouge)**
 - T-head launched the self-made NPU (Hanguang-800 [NPU](#), something should be similar to AWS Inferentia) for

Ali Cloud last September. The NPU is fabricated with TSMC 12nm process. However, till now, it has not been deployed in any of the Ali Cloud's instance. ([Instance list](#) in Chinese)

- T-head plans to launch the new version of the NPU (with TSMC 7nm process) this September ([link](#)).
 - We think some of the CPU products of C-SKY/T-head ([Link](#)) could be used for Edge Inference/IoT
- Our work suggests that a major GPU vendor is using Qualib to verify the quality of its IP library. Huada is working closely with the indigenous China foundry ecosystem as it strives to improve the collaboration across the supply chain.

Process Node Traction

- Our work suggests that Empyrean has long had a presence at SMIC. Although this relates to focus on lagging edge nodes 14nm and older, we note that given its focus on Analog thus far it seems to make sense. We think SMIC maybe one of Empyrean's largest customers
- Empyrean is also working with TSMC 7nm and is one of the members of TSMC OIP, meaning it may have a pathway to tune its offerings to 7nm and beyond

Business model/Focus

- Our field work suggests that although it has presence at the larger China Chipmakers such as HiSilicon and UNICSOC, Empyrean is also working closely with a large portion of the indigenous China Fabless ecosystem and has a reputation for being more flexible (than US vendors) in customizing offerings to their needs.
- Empyrean's tool sets while viewed as somewhat incomplete especially on the Digital/mfg side, appear to be of high quality overall.
- Field work suggest that while Empyrean offers similar 2-3 yr licensing contract duration as US vendors, and like other China EDA vendors compete by targeting smaller players in the China Fabless ecosystem with a combination of attractive pricing, services & customization of offerings.

Avatar Integrated Systems – Working on Advanced Nodes

Our field work suggests that Avatar (is US headquartered) executive team is made up of former CDNS/SNPS/ANSS. Avatar's Physical Implementation tools Aprisa and Apogee are well regarded in the industry and Avatar is working with foundries including TSMC at 7nm.

Xpedic

Focuses on Signal Integrity, packaging and RF solutions. Xpeedic has 100+ engineers and counts SMIC and HiSilicon as customers.

Pro-Plus

Mgmt team comes from ex. CDNS, UC Berkeley. Pro-plus has roughly ~100 engineers and focuses on simulation, yield enhancement.

How this impacts our view on CDNS/SNPS

We think the China chip design ecosystem remains heavily dependent on CDNS/SNPS/Mentor. While indigenous vendors make incremental progress, they are hampered by a lack of critical mass in terms of engineering & managerial experience, access to leading edge technology and inherent stickiness of EDA offerings, all of which appear to be structural factors. Even as we think Chinese govt is gradually increasing focus on EDA driven by restrictive export regulations, we don't see any specific indigenous China EDA vendor as a major threat to CDNS/SNPS over a 1/3 yr period.

However we think that ingredients are in place for China EDA's very own "Big-Bang" moment and tightening restrictions on US EDA vendors could ultimately provide a spark that catalyzes a large revamp of the indigenous China EDA industry driven by – increased government commitment, large scale hiring of experienced engineering and managerial talent from the Big three (CDNS/SNPS/Mentor), a focused effort by SoE and other larger China chipmakers towards creation of a local EDA platform. Ultimately a trade regs driven bifurcation of the chip ecosystem into distinct US/China spheres represents a far more significant LT risk to CDNS/SNPS rather than the local EDA industry in the current form.

Valuation Method and Risk Statement

We use various valuation techniques such as SOTP, EV/Sales for valuing the companies in this report. Risk factors include but are not limited to macroeconomic factors such as a downturn in the economy, a disruption of international trade, technological disruption due to new inventions, or business model innovation whereby structural changes in the industry alter the future course of unit sales, ASPs, and revenues.

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Buy	FSR is > 6% above the MRA.	49%	32%
Neutral	FSR is between -6% and 6% of the MRA.	39%	30%
Sell	FSR is > 6% below the MRA.	13%	20%
Short-Term Rating	Definition	Coverage ³	IB Services ⁴
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 June 2020.

1: Percentage of companies under coverage globally within the 12-month rating category.

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