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Open Power, Hidden Dangers: IBM Partnerships in China

DGI Defense Group Inc.

Center for Intelligence Research and Analysis
Defense Group Inc.
2650 Park Tower Drive Suite 400
Vienna, VA 22180-7306
571-421-8300

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Executive Summary

In March 2015, IBM CEO Virginia Rometty told an elite Chinese audience in Beijing that the company was committed to sharing technology with Chinese firms and helping build the domestic Chinese information technology (IT) industry. The comments followed nearly two years of IBM's implementation of its "Open Power" business strategy in China, which focuses on developing the Chinese IT industry through the transfer and integration of IBM's technology and intellectual property. For IBM, the objectives of Open Power are to foster the adoption of IBM's own technologies in order to gain market share, and to transition from a failing business model focused on selling technology products to one focused on selling services and the technologies themselves.[i] For China, the objective of this partnership is to develop an indigenous IT industry no longer dependent upon American products, with their attendant security concerns.[ii] IBM expects its Chinese partners to design new versions of IBM products that support local security requirements, creating a trusted chain of source code and different levels of encryption.[iii]

Yet IBM's partners in this strategy are Chinese companies with deep and troubling ties to the Chinese military, defense industry, and state security apparatus: Beijing Teamsun Technology Co., Ltd., Suzhou Powercore Technology Co., Ltd., and the Inspur Group.[iv] These firms provide a range of technologies requiring sophisticated chips and software to Chinese military and security customers, including:

- High-performance computing
- Encryption systems
- Ruggedized handheld computers
- Truck-mounted mobile mapping systems
- Cloud computing
- VSAT satellite ground stations
- Military wireless communications, satellite navigation and control equipment
- Electronic countermeasures and radars

Primary responsibility for managing the transfer relationship between IBM and Teamsun rests with Shen Changxiang, a prominent cyber warfare specialist formerly employed by the People's Liberation Army who has regularly spoken out about the dangers posed by reliance on foreign information technology.[v]

Since 2014, IBM has transferred to these Chinese entities the core IP, source code, and usage rights for the following technologies:

- IBM Power8 Chipsets
- IBM Informix Database Software[vi]
- IBM WebSphere Application Server Liberty Base Software
- IBM MQ Middleware Software

IBM has also raised the possibility of helping Chinese clients to develop indigenous encryption for the company's powerful z13 mainframe computer, its primary remaining proprietary technology not yet sold or transferred to Chinese partners.[vii] Under the rubric of its Open Power initiative, IBM also supported the formation of 'China POWER Technology Alliance' (CPTA/POWER 技术产业生态联盟) with national-, provincial-, and local-level government organizations in China, with the specific objective of promoting Chinese companies' ability to digest and re-innovate IBM technology.[viii] IBM's strategy has

even extended to the sale of whole product lines to Chinese firms, including its low-end x86 servers to Lenovo in October 2014.[ix]

Through these partnerships IBM is endangering the national and economic security of the United States by providing the Chinese government with the means to perfect and innovate these sensitive, high-level technologies. In addition to risking the cybersecurity of their customers globally and undermining decades of U.S. non-proliferation policies regarding high-performance computing, IBM's new China strategy has three important implications for U.S. technological security and economic competitiveness:

- Threatens U.S. commercial and technological advantages: The transfer of these IBM technologies threatens key American corporate advantages in this sector, permitting Chinese firms to close the gap with their foreign competitors and better compete with them globally.
- Compromises U.S. military and government supply chains: The military and state security connections of IBM's partners raise serious concerns about supply chain security, especially for U.S. military and government customers. Security concerns related to this sale have already forced the U.S. Navy to find new sources for procuring the servers critical to Ballistic Missile Defense upgrades for the Aegis Combat System.[x]
- Enhances Chinese military technological capabilities: The transfer of these technologies to Chinese firms will potentially give the People's Liberation Army and the Chinese defense-industrial base access to new classes of advanced technologies, and thereby improve the sophistication of Beijing's military modernization as it seeks to challenge the U.S. military in the Western Pacific.

Why is IBM Betting Big on China? Motivations and Strategy

For some time IBM's back has been against the wall. Its revenues are declining, its business model is broken, and it has used debt to finance share buybacks. When Ginni Rometty took the helm IBM in 2012, she faced a situation verging on desperate, despite IBM's best attempts at financial engineering to make the company look outwardly sound. The answer for IBM was to abandon the business of selling technology products—where it was increasingly uncompetitive—in favor of selling the technologies themselves and services.

- The services market is mature in the United States and other developed countries, so IBM saw China as its best—or perhaps only—option for growth.
- As a result of a focus on its services business, IBM had significant technology it no longer wanted but which China valued, such as its Power8 microprocessor. The Power8 chip is an advanced technology leaps and bounds ahead of what China has been able to develop on its own. The chip can power weapons systems and enable research on advanced military capabilities.
- By transferring this technology and other hardware and software to China, IBM seeks to curry favor with the Chinese government and its affiliates and to become a go-to provider for technology services.

Over the past two years, IBM has engaged in a series of transactions with Chinese companies (including those with deep ties to the Chinese government and military) to support domestic Chinese development of high performance computing components, among other technologies. Now that Chinese companies have the blueprints to various IBM technologies, IBM is working with Chinese firms to implement and commercialize solutions, enabling them to build upon and develop new products that close the technological gap with the United States.

By providing the Chinese with the means to perfect and innovate these sensitive, high-level technologies that enhance Chinese military capabilities and monitor Chinese citizens, IBM is endangering the national and economic security of the United States, risking the cybersecurity of their customers globally, and undermining decades of U.S. non-proliferation policies regarding high-performance computing.

IBM's Revenue Decline in China and Open Power to the Rescue

IBM's strategy has helped reverse staggering losses in its China operations. Like other foreign corporations, the Chinese government's increasing emphasis on rapidly ending dependence on foreign technology products and providers undermined IBM's growth prospects. From 2013 to 2014, IBM's once robust growth rate in the Chinese market has been turned into a precipitous rout, as indicated in the chart below.[xi]
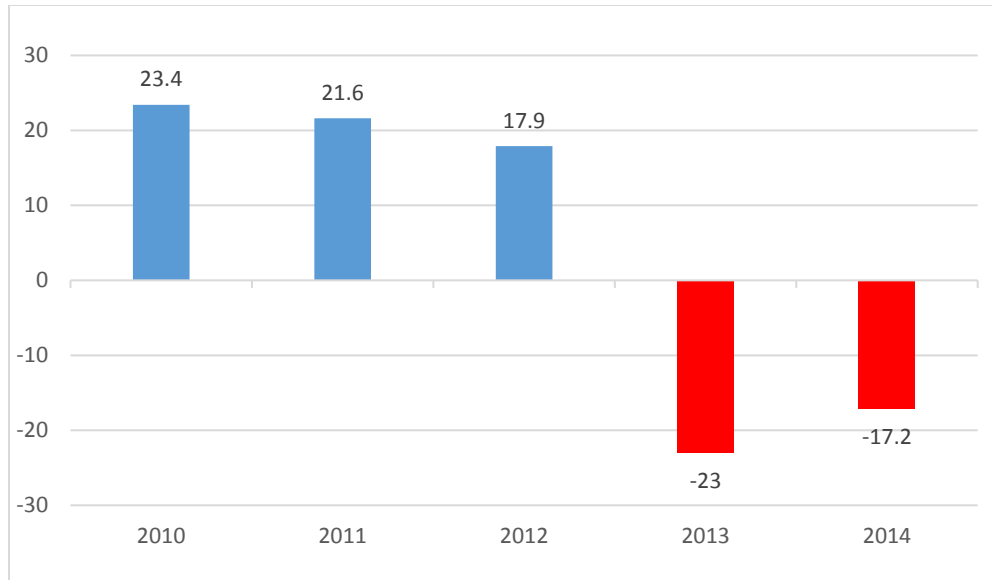
Figure 1: Rate of Change in IBM's China Revenue by Percentage

The Open Power initiative marked a wholesale change in market strategy, and begun to stabilize IBM revenue from China. In effect, IBM is maintaining and expanding its market access in China by surrendering much of its proprietary technology to erstwhile Chinese competitors who can placate the government's demands *vis-à-vis* localism and national security. Though IBM formally announced this strategy in March 2015, the key elements began to take shape much earlier, during the course of 2014. By the end of 2014, IBM's revenue numbers have reversed their hemorrhaging trajectory, bottoming out in the last quarter of 2014 at -1%. [xii] This stabilization was buoyed in large part by increased server sales to major banks.[xiii]

IBM Technology a Shot in the Arm for China's IT Industry

It is not surprising that Beijing welcomes and encourages IBM's new strategy, given China's rapid growth in the IT industry and technological constraints. Critical sectors of China's IT industry, including semiconductor fabrication, software development, and cloud computing are growing rapidly, but still heavily dependent upon foreign technologies and suppliers.

- Software: Though China's software sector is large and growing, it still lacks many core technologies and indigenous high-quality software products. The software sector is expected to maintain double-digit annual growth in the years ahead, and be worth more than $800 billion in 2017.[xiv]
- Cloud Computing: A growing majority of small and medium-sized enterprises are increasingly using cloud services, and state organizations depend upon cloud computing to achieve mandated e-government capabilities.[xv] The cloud computing sector in China is expected to be worth more than $55 billion by 2016.[xvi]
- Semiconductors: China is the largest consumer of semiconductors (for use both domestically and in export products), but is heavily reliant on imported integrated circuits (IC).[xvii] Integrated circuit chip imports reached $231.3 billion in 2014.[xviii]

Currently, the Chinese government is attempting a market-based investment approach focusing on creating national champions. Multinational corporations, in turn, are choosing to establish design

centers in China to benefit from local talent and achieve closer proximity to customers. The Chinese government believes that partnering with global leaders in these fields is a means to improve the local supply chain and talent base, and will likely encourage Chinese companies to pursue mergers and acquisitions in order to obtain intellectual property and achieve technology transfer.[xix]

National IC industry investment funds (国家集成电路产业投资基金) are a primary vehicle for industry support and guidance.[xx] At the direction of the Chinese government, these funds invest in Chinese semiconductor companies, some of which then pursue acquisition of foreign semiconductor firms. Senior Ministry of Industry and Information Technology (MIIT) personnel have taken positions of leadership at both the national IC industry investment fund itself, and at Chinese semiconductor firms in which the fund invested.

Chinese concerns over the security of foreign IT products and services adds impetus to these changes. China's information technology regulators have become increasingly focused on issues of security and on fostering the use of domestic products. They are especially concerned with the use of foreign hardware and technology in such critical sectors as the government, the armed forces, and banking.

Recent measures include a ban on Windows 8 in government offices, programs to encourage the use of indigenous systems and hardware in government departments, and an intrusive examination of the use of IBM technology in the banking industry.[xxi]

IBM Partners in China

IBM engages with numerous Chinese entities through business partnerships and technology sharing arrangements. According to IBM's website, the company has 3695 business partners in China, including service providers with particular skill sets, technology resellers, and consultants with industry expertise.[xxii] Many Chinese companies are members of the global Open Power initiative, the objective of which is to foster the adoption of IBM's own technologies in order to gain market share.[xxiii] Open Power allows users to use and customize IBM's POWER architecture, such as Suzhou PowerCore's customized products for Chinese servers and end users.[xxiv]

The primary purpose of China's participation in Open Power is the development of indigenous hardware and software for government, military, commercial, and financial end-users. In October 2014 China established the China POWER Technology Alliance to help promote IBM POWER technology on the Chinese market.[xxv] The alliance is under the guidance of MIIT,[xxvi] and consists of 31 Chinese members as of March 2015.[xxvii]

MIIT highlights the alliance as a key development in innovative methods for developing secure and reliable hardware and software. Partners plan to "digest and absorb" technology in order to foster innovation, secure IPR, and advance China's computer chips, servers, and software technology. Citing national security concerns, PowerCore's Zhu Yaodong stated that the alliance's purpose is to bring IBM's Power technology to China and develop processor technology that is "controllable."[xxviii]
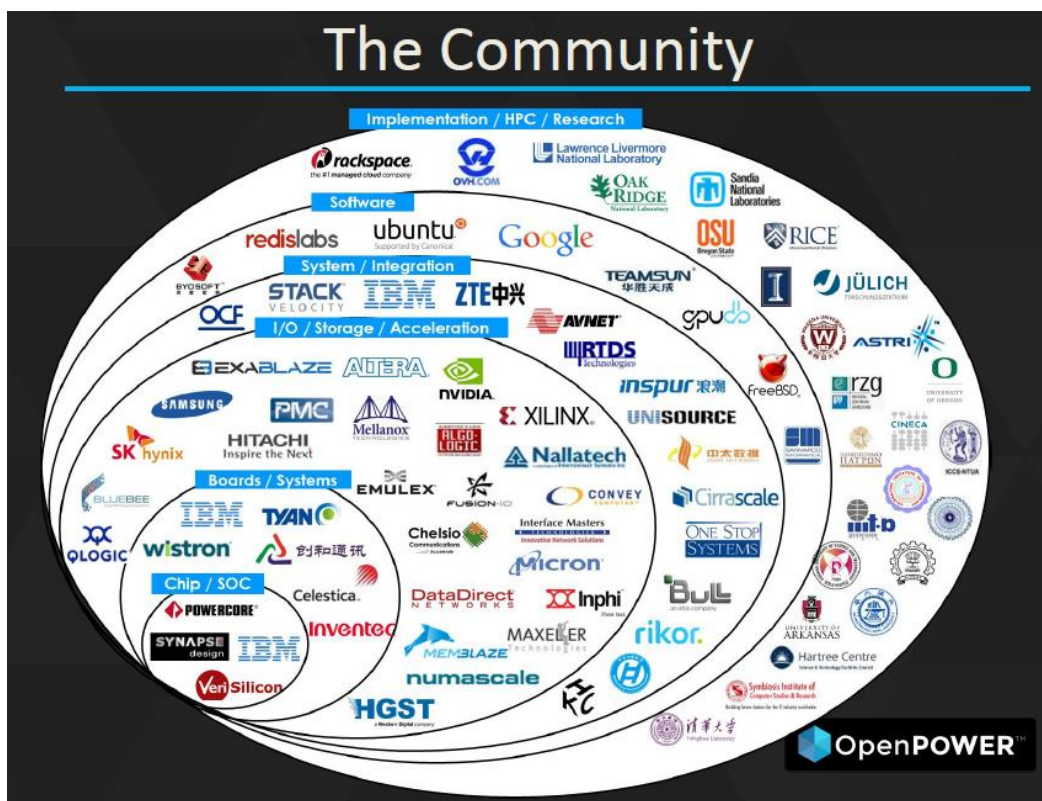

Figure 2: Open Power partners worldwide

IBM Partners and End-Users of Concern

IBM's leading Chinese partners include the Inspur Group, Beijing Teamsun Technology Co., Ltd, and Tsinghua Tongfang Co., Ltd. Each of these companies and its subsidiaries are suppliers for the Chinese military, government, military industry, and security services. Items include but are not limited to servers, software middleware platforms, handheld and desktop computers, high-end communications equipment, and support for the Beidou satellite navigation system. In addition to being Communist Party members, key executives at these companies also maintain ties of concern to the government and armed forces. One individual of particular interest is Shen Changxiang:

Shen Changxiang (沈昌祥)

Key Findings

- Chief Technical Officer for Beijing's TOP Program, charged with integrating and re-innovating IBM technology and intellectual property
- Former naval officer and a longtime military researcher, closely associated with leading state and military research organizations
- Associated with various advisory committees established to guide China's information and network security policies

Background

Shen Changxiang (沈昌祥), born 22 August 1940, is the Chief Technical Officer (CTO) for Beijing's TOP Program, charged with integrating and re-innovating IBM technology and intellectual property transferred to Teamsun Technologies. Shen was appointed CTO in December 2014 by the Beijing Municipal Economic and Informatization Committee.[xxix] Shen is a former naval officer and a longtime military researcher, closely associated with leading state and military research organizations dedicated to information and network security.

Shen is also associated with advisory committees that guide China's information and network security policies, and has regularly advocated for the 'localization' and 'nationalization' of China's software, integrated circuit, and cloud computing sectors. He contends that this is a necessity due to the national security threat inherent in China's dependence on foreign suppliers.[xxx] Shen is also an adjunct professor at several leading Chinese universities, including the National University of Defense Technology. [xxxi]

Shen's Military Background

Shen is a former Rear Admiral of the PLA Navy.[xxxii] Early in his career, Shen was a researcher at the General Staff Department's 51st Research Institute (GSD 51st RI), a key military research organization for computer networks and communications. The 51st RI is currently the third-largest customer of C*Core, a chief beneficiary of Shen's TOP Program.[xxxiii] Since at least 2004, he has been associated with the PLA Navy's Institute of Computing Technology in Beijing, having served as chief engineer and deputy-director.[xxxiv] In 2005, Shen served as the leader of a 23-member expert group which certified the quality of a 'multifunctional support system for missiles' used by China's strategic missile forces.[xxxv]

Shen's Policy Expert Role

Shen presently serves as an expert advisor to the Communist Party's Central Leading Group for Cyberspace Affairs, which oversees the Cyberspace Administration of China.[xxxvi] He also holds a number of other prominent advisory positions related to national-level information security policy, including:[xxxvii]

- Director of the Expert Committee of the National Administration for the Protection of State Secrets
- Director of the Expert Committee of the National Information Security and Protection
- Member of the Consulting Committee for National Informatization Experts
- Advisor to the National Encryption Management Committee
- Expert advisor to the Ministry of Public Security's Golden Shield Project
- Information Security Adviser to the People's Bank of China
- Information Technology Advisory Committee Member for the State Administration of Taxation

Chinese End-Users of Concern

IBM's Chinese partner companies have significant – and at times alarming – business interests in the political and military infrastructure of China. These customers and end-users of concern include:

- **People's Liberation Army (PLA)** – The armed forces of the Chinese Communist Party, including ground forces, navy, air force, and strategic missile forces.
- **Chinese Government** – Includes local governments and civilian ministries such as the Ministry of Public Security.
- **Military Industry** – Encompasses Chinese enterprises developing and producing weapons and equipment for the PLA.
- **Ministry of State Security (MSS)** – The external foreign and counterintelligence agency of the PRC.
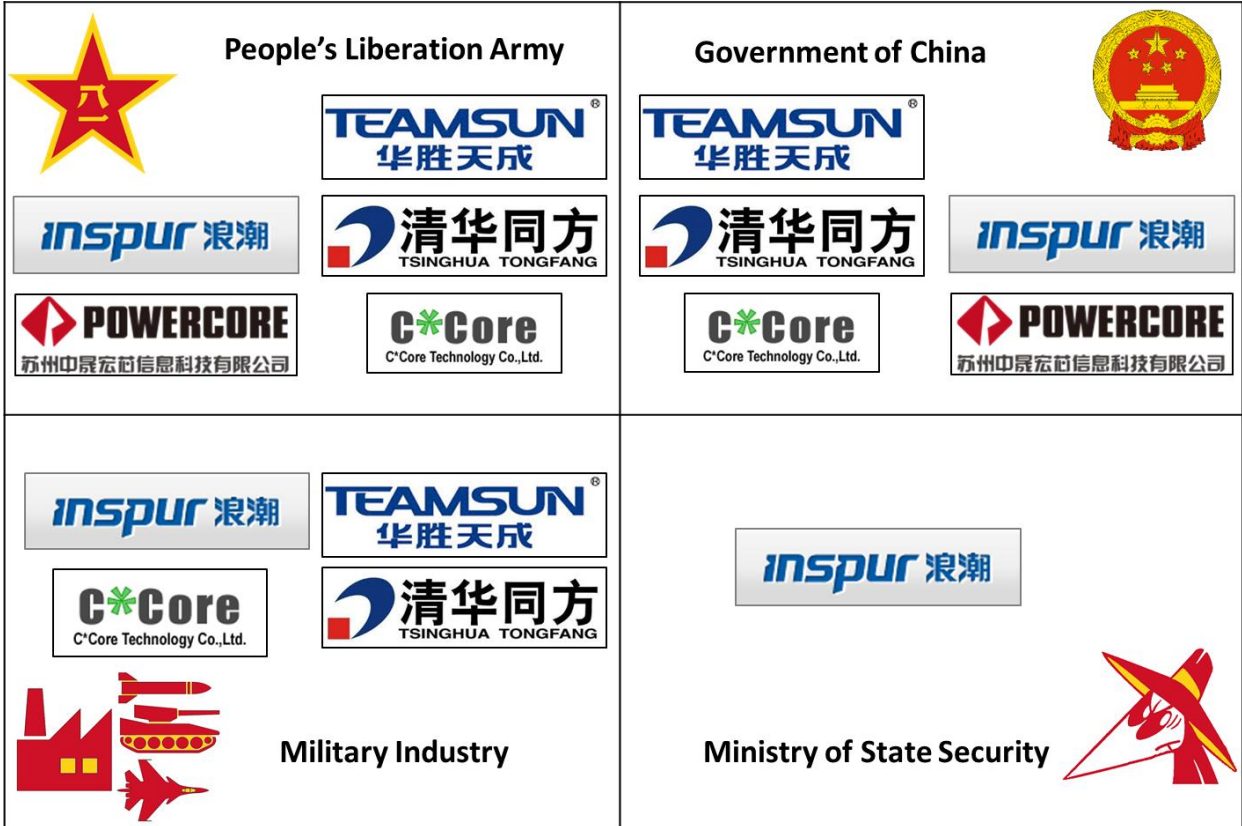

Figure 3: Relationships between Chinese IBM Partners and Customers of Concern

Inspur Group (浪潮集团有限公司)

IBM has agreed to provide proprietary database technology and other software to Inspur and help develop Inspur's own server product line. In October 2014, Inspur subsidiary Inspur Electronic Information Industry Co., Ltd. (浪潮电子信息产业有限公司) joined IBM's China POWER Technology Alliance',[xxxviii] obtaining full access to IBM's Power technology for the entire Inspur family. Inspur clients include the PLA, defense industries, and public security organizations.

- The PLA uses Inspur's desktop computers,[xxxix] mobile mapping systems,[xl] communications systems, geographic information system (GIS) platforms, and database/cloud software.
- Inspur provides comprehensive management systems and technologies to defense industry clients including the China Academy of Engineering Physics, China Air-to-Air Missile Research Academy, and factories and research institutes subordinate to China's aerospace industrial conglomerates, CASIC and CASC. [xli]
- Current Inspur CEO Sun Pishu (孙丕恕), born 1962, is a member of the National People's Congress, China's national legislative body.[xlii]

Figure 4: HL3211 hand-held computer, for field use by PLA troops (left); DS3010 desktop computer, for use in PLA command posts (center); and Truck carrying RM5226 mobile mapping system (right)

Beijing Teamsun Technology Co., Ltd. (北京华胜天成科技股份有限公司)

In November 2014 IBM signed an MoU with the Beijing City Government and Beijing Teamsun Technology Co., Ltd. (Teamsun) to transfer core technology to Teamsun.[xliii] Teamsun established the TOP Program specifically to facilitate the transfer of IBM technology and absorb and "re-innovate" it. [xliv] The program is under former senior Chinese military cyber expert Dr. Shen Changxiang. [xlv]

- Teamsun has obtained or stands to obtain: IP rights for POWER servers, operating systems, middleware, and database technology;[xlvi] IP rights, source code, and technology support for the IBM Informix Database Software Technology;[xlvii] and source code/IP usage rights of the IBM WebSphere Application Server Liberty Base Software and the IBM MQ Middleware Software in China.[xlviii]

Figure 5: TS-ARK&A0800 VSAT

- Teamsun clients include the Second Artillery Equipment Academy;[xlix] the People's Armed Police; and the Ministry of Public Security.[l]
- Products and services to these clients include: *ad hoc* network communications and portable satellite communications equipment;[li] computer software;[lii] and information security services.[liii]
- Teamsun subsidiary Beijing TEAMSUN Information Development Technology Co., Ltd. (北京华胜天成信息技术发展有限公司) is a registered military supplier. Its main product listing is the TS-ARK&A0800, a very small aperture terminal (VSAT), or two-way satellite ground station.[liv]

Tsinghua Tongfang Co Ltd (同方股份有限公司)

Tsinghua University is a member of IBM's Open Power community, which allows members to acquire IBM processing technology. A Tsinghua University company of primary concern is Tsinghua Tongfang Co. Ltd, which supplies a vast array of products

and services to the PLA, public security services, and Chinese government.[lv] The company has a strong focus on civil-military integration technical support systems.[lvi] It also provides "safe and reliable" computer hardware to China's space industry, finance sector, and government agencies.[lvii]

- Tsinghua Tongfang is a comprehensive supplier of military products and services including but not limited to: military wireless communications and control equipment;[lviii] military building and informatization support;[lix] technical surveillance, electronic countermeasures, and satellite navigation equipment; and naval minesweeper ships and high-speed patrol boats.[lx]
- In addition to this business relationship with the PLA, key Tsinghua Tongfang leaders have personal military ties. Yang Zhiming was a former leader at two Chinese military factories,[lxi] and Zhao Xiaoyan was a former PLA member and graduate of the PLA's Information Engineering University.[lxii]

Suzhou PowerCore (苏州中晟宏芯信息科技有限公司)

Suzhou PowerCore develops CPUs for Chinese servers based on IBM's Power8 processors and POWER architecture.[lxiii] PowerCore is licensing IBM's POWER architecture, intellectual property related to Power 8, and electronic design applications (EDA) to develop processors for Chinese servers.[lxiv][lxv] The CP1, a custom Power 8 designed by Suzhou PowerCore, includes a custom encryption module for the China market, but otherwise appears to be a straight Power 8 design.[lxvi]

- According to a PowerCore press release, PowerCore is collaborating with Tsinghua and the GSD 56th Research Institute, the Chinese military's oldest computer research institute.[lxvii]

Figure 6: The CP1, a custom Power 8 designed by Suzhou PowerCore

- For future products PowerCore plans to "integrate party, government, and military requirements."[lxviii]
- Zheng Jiang (郑茳) is the Chairman of the Board for PowerCore and C*Core.[lxix] Zheng repeatedly calls for "Chinese ICs to have a "China Chip" (中国芯) with its own intellectual property" through the absorption of foreign technology.[lxx]

C*Core (苏州国芯科技有限公司)

C*Core is a leading Chinese enterprise for embedded CPU design through the indigenization of foreign technology, notably Motorola's M*Core ISA and IBM's PowerPC ISA.[lxxi][lxxii] In 2010 C*Core received a PowerPC ISA license from IBM, and began developing CPU cores based on PowerPC to license to customers.[lxxiii]

- According to CEO Zheng Jiang, C*Core and an unidentified research institute collaborated on a program for the military's encrypted machinery. They developed a specialized chip for weapons control based on the C*Core CS310.[lxxiv]
- According to C*Core's 2013 audit report, the PLA's GSD 51st Research Institute, a key military research organization dealing with computer networks and communications, was C*Core's third largest customer with over 4 million RMB in sales—9.19% of C*Core's total sales for the year.[lxxv]
- C*Core developed the C*Core CPU C320 information security chip that will be used in police encryption, VPN, and USB drives with an unnamed unit of the Ministry of Public Security.[lxxvi]

Implications

IBM's partnerships in China endanger the national and economic security of the United States by providing the Chinese government with the means to perfect and innovate sensitive high-level technologies. Selling not only the products but also the technology and proprietary information for advanced hardware and software risks the cybersecurity of their customers globally, and undermines decades of U.S. nonproliferation policies for high-performance computing. This strategy has three important implications for U.S. technological security and economic competitiveness:

Threatens U.S. commercial and technological advantages

The transfer of this combination of these IBM technologies threatens key American corporate advantages in IT sectors.

- The full transfer of technologies for chips and servers permits Chinese firms to close the gap with their foreign competitors and better compete with them globally.
- Teamsun alone has received from IBM proprietary information for advanced technologies such as POWER servers, operating systems, middleware, database technology, the IBM Informix Database Software Technology, the IBM WebSphere Application Server Liberty Base Software, and the IBM MQ Middleware Software in China.
- PowerCore has already developed the CP1, a custom Power 8 design for which the only major modification is a custom encryption module for the China market.

Compromises U.S. military and government supply chains

The military and state security connections of IBM's partners raise serious concerns about supply chain security, especially for U.S. military and government customers.

- The transfer of IBM's intellectual property, source code, and proprietary information to Chinese end-users compromises the integrity of IBM systems used by the U.S. government and military.
- Security concerns related to this sale have already forced the U.S. Navy to find new sources for procuring servers critical to Ballistic Missile Defense upgrades for the Aegis Combat System.[lxxvii]

Enhances Chinese military technological capabilities

The transfer of these technologies to Chinese firms will potentially give the People's Liberation Army and the Chinese defense-industrial base access to new classes of advanced technologies.

- These technologies can improve the sophistication of Beijing's military modernization as it seeks to challenge the U.S. military in the Western Pacific.
- PowerCore and C*Core both receive IBM intellectual property and are collaborating with the PLA on computer and weapons control technologies.
- Teamsun, Inspur, and Tongfang have deep military and government connections, with subsidiaries that are registered suppliers to the PLA.

Annexes

I.   Timeline of IBM in China

October 2010: IBM establishes the POWER Technology Industry Ecology Coalition in order to promote its POWER chips on the Chinese market.[lxxviii] IBM agrees to open up its software and hardware systems and accept Chinese security investigations.[lxxix]

According to Chinese government, the coalition was a key development in innovative methods for developing secure and reliable hardware and software, as partners 'digested and absorbed' technology as a means for fostering innovation, securing IPR, and advancing indigenous chips, servers, and software.

6 August 2013: IBM announces the Open Power initiative to license the core intellectual property for IBM technologies (including chipsets, servers, operating systems, databases, etc.) to foreign and other companies for use in designing servers employed in cloud data centers.[lxxx]

19 January 2014: IBM identifies a group of seven Chinese partners for building an indigenous Chinese server technology ecosystem based upon transferred IBM intellectual property.[lxxxi]

22 August 2014: IBM and erstwhile competitor Inspur Group Co., Ltd. form a joint partnership to combine IBM's software with Inspur's hardware and develop server systems attractive to Chinese customers, especially state-owned enterprises.[lxxxii]

28 October 2014: IBM supports the formation of the China POWER Technology Alliance with MIIT, the Jiangsu provincial government, and the Suzhou city government.[lxxxiii]

3 November 2014: IBM announces transfer of source code and IP usage rights for IBM Informix database to GBASE, a leading Chinese database software company.[lxxxiv]

11 November 2014: As part of the Open Power initiative, IBM signs an MoU with the Beijing municipal government and Teamsun Technologies agreeing to transfer core technology to Teamsun and help develop China's indigenous high-performance computing technology in order to satisfy China's domestic information security needs.[lxxxv]

13 November 2014: IBM transfers IP rights and technology support for IBM Power Technology to Teamsun Technologies as per the MoU between Teamsun, IBM, and the Beijing municipal government.[lxxxvi]

19 November 2014: IBM transfers IP rights, source code, and technology support for the IBM Informix Database Software Technology to Teamsun Technologies as per the MoU.[lxxxvii]

12 December 2014: Shen Changxiang is appointed as CTO of Teamsun Technologies' integration program. Shen is Chief Engineer of the PLA Navy's Computing Institute and the Chief Technology Advisor to the Second Artillery's Cyber Assurance Program.[lxxxviii]

27 January 2015: IBM announces that it will discuss opening the encryption architecture interface for its high-end z13 mainframe computers to Chinese partners and supporting Chinese encryption algorithms.

29 January 2015: An MIIT vice-minister meets with IBM Senior Vice-President Steve Mills, in order to thank him for IBM's cooperation with Chinese chip manufacturers and software developers. Mills pledged that IBM would continue to expand its cooperation.[lxxxix]

18 March 2015: IBM transfers IP rights, source code, and technology support for the IBM WebSphere Application Server Liberty Core software and the IBM MQ Middleware software as part of the Open Power initiative, as per the MoU between IBM and Teamsun.[xc]

18 March 2015: IBM's Open Power Conference features several Chinese 'indigenous alterations' of products in its Power semiconductor line.[xci]

II.   China's Market and Regulations for Integrated Circuits (ICs)

China's IT Industry

Critical sectors of China's IT industry, including semiconductor fabrication, software development, and cloud computing are growing rapidly, but still heavily dependent upon foreign technologies and suppliers.

Software

Though China's software sector is large and growing, employing more than one million workers, it still lacks many core technologies and indigenous high-quality software products.

Until recently, foreign suppliers have especially dominated the high end of the software product spectrum, including application software and enterprise management systems.

The software sector is expected to maintain double-digit annual growth in the years ahead, and be worth more than $800 billion in 2017.[xcii]

Cloud Computing

The rapidly growing cloud computing sector is of paramount importance to both small- and medium-sized enterprises (60% of which were using cloud services in 2014[xciii]) and state organizations which depend upon cloud computing to achieve mandated e-government capabilities.[xciv]

The cloud computing sector in China is expected to be worth more than $55 billion by 2016.[xcv] The Chinese government intends the sector to be a key pillar of the domestic IT industry.[xcvi]

Semiconductors

China is the largest consumer of semiconductors (for use both domestically and in export products), but is heavily reliant on imported integrated circuits (IC).[xcvii] Integrated circuit chip imports reached $231.3 billion in 2014.[xcviii]

Previous government efforts to stimulate the growth of a strong indigenous semiconductor industry largely failed due to fragmented investments, spread across hundreds of sites and dozens of provinces.

Industry Development

Currently, the Chinese government is attempting a market-based investment approach focusing on creating national champions. Multinational corporations, in turn, are choosing to establish design centers in China to benefit from local talent and achieve closer proximity to customers.

The government believes that partnering with global leaders in these fields is a means to improve the local supply chain and talent base, and will likely encourage Chinese companies to pursue mergers and acquisitions in order to obtain intellectual property and achieve technology transfer.[xcix]

National IC industry investment funds will be a primary vehicle for industry support.[c] Local industry funds have also been established in the cities of Beijing, Shanghai, Wuhan and Hefei. Total government funds are estimated to reach US$100 billion.[ci]

Regulatory Environment

China has multiple regulatory organizations focused on information technology and security. Information technology regulations have become increasingly focused on issues of security and on fostering the use of domestic products. Chinese regulators are especially concerned with the use of foreign hardware and technology in such critical sectors as the government, the armed forces, and banking.

Information Technology Regulators

Since 2013, the regulatory environment for information technology in China has changed considerably, with an increasing emphasis on the use of regulations to rapidly foster the widespread of adoption and use of Chinese-made equipment and software.

Regulation of the information technology market in China rests in the hands of a number of organizations, which between them make policy and devise technical standards. The most recent senior group is the Communist Party's Central Leading Group for Cyberspace Affairs (中央网络安全和信息化领导小组), headed by Xi Jinping. Others include:

- the National Administration for the Preservation of State Secrets (国家保密局)
- the National Information Security Standardization Technical Committee (全国信息安全标准化技术委员会)
- the Integrated Circuit Office within MIIT's Electronic Information Department (工业和信息化部的集成电路处)

While each of the organizations regulating the Chinese IT market have their own regulatory role, the Ministry of Industry and Information Technology has been the most visibly active in issuing policies dealing with the security and reliability of information technology.[cii] According to MIIT Vice-Minister Yang Xueshan, China's semiconductor industry does not adequately support the country's information security and national defense building needs.[ciii]

- Announced in June 2014, the National Guideline for the Development and Promotion of the IC Industry builds upon previous government regulations meant to address China's network security concerns, and aims to overcome weaknesses by encouraging the use of secure hardware and software across the country.[civ]
- These regulations have included a ban on the use of Windows 8 in government offices and programs to encourage the use of indigenous systems and hardware in government departments.[cv]
- MIIT policies have also emphasized the primary importance of national security and marketplace potential in technology development and seek to promote indigenous development utilizing foreign resources and international cooperation.[cvi]
- The new policy will be implemented through national IC industry investment funds to support the development of a strong domestic semiconductor industry.[cvii]

Regulators responsible for specific sectors of the economy (most prominently banking and finance) have also involved themselves in the regulation of information technology and information security within their given sectors.

- In the case of the banking industry, during 2014 the China Banking Regulatory Commission, the National Development and Reform Commission, MIIT, the People's Bank of China, and the Ministry of Finance reportedly assessed whether IBM technology in China's banking sector represented a threat to the nation's financial security.[cviii] In 2014, some 90% of the Chinese banking industry's core systems were reportedly IBM products.[cix]
- The agencies also directed banks to conduct feasibility trials for replacing IBM servers with domestic substitutes.[cx]
- Such regulations in the banking sector have been opposed by Western technology companies, which would be required to turn over source code, submit to invasive audits, and allow backdoors into hardware and software.[cxi]
- Although new information technology regulations were suspended in April 2015,[cxii] in August 2015 representatives from Western technology companies were advised that their opinions were being sought for revised regulations.[cxiii]

Even if rules are relaxed, Chinese banks could still be discouraged from purchasing foreign equipment through less official means.[cxiv]

III.   China's National IC Industry Investment Fund

Key Findings:

- At the direction of the Chinese government, China's national IC industry investment fund (国家集成电路产业投资基金) is investing in Chinese semiconductor companies, some of which then pursue acquisition of foreign semiconductor firms.
- Senior MIIT personnel have taken positions of leadership at both the national IC industry investment fund itself, and at Chinese semiconductor firms that were invested in by the fund shortly after leaving their ministry posts.

Background:

Under the guidance of MIIT and the Ministry of Finance, China's national IC industry investment fund was officially kicked off in September 2014. The stated purpose is to act as an investment vehicle for the IC industry, specifically for supporting computer chip design, IC component packaging and testing, increasing the industry's production capacity, and facilitating a self-development capacity. MIIT states that the fund is operated in line with market economy rules and was formed as a company.[cxv]

The national investment fund is believed to amount to CNY 136 billion ($21.32 billion), and utilizes direct equity investments.[cxvi] In addition to supporting China's local industry, the fund seems to have helped finance the recent pursuit of foreign acquisitions by Chinese semiconductor firms, with the goal of more rapid technological advancement.[cxvii]

National IC Industry Investment Fund Leadership

Ding Wenwu: MIIT announced on February 6 2015 that on November 18 2014, the director of MIIT's Electronic Information Department, Ding Wenwu (丁文武), was replaced by Diao Shijing in his position.[cxviii] On November 24 2014, Ding Wenwu reportedly attended a Summitview Capital (武岳峰资本) ceremony as both the CEO of the national IC industry investment fund.[cxix] Ding is currently still the CEO of the national IC industry investment fund.[cxx]

Wang Zhanfu: MIIT announced on February 6 2015 that on November 18 2014, director of MIIT's Financial Affairs Office, Wang Zhanfu (王占甫), was replaced by Wang Xinzhe in his position.[cxxi] Wang Zhanfu is now the chairman of the board of the national IC industry investment fund.[cxxii]

Investments of Note by the National IC Industry Investment Fund:

On 14 February 2015, Tsinghua Unigroup (紫光集团) was awarded over $1.5 billion from the national investment fund.[cxxiii] Since July 2015, Tsinghua Unigroup has reportedly been pursuing a takeover bid for US Chip producer Micron Technology Inc. The potential deal has come under U.S. scrutiny given the use of Micron chips in U.S. weapons systems.[cxxiv] Tsinghua Unigroup is

part of the same Tsinghua University family as Tsinghua Tongfang, which has strong ties and clients with the People's Liberation Army (PLA) and Chinese government.

In February 2015, Semiconductor Manufacturing International Corporation (SMIC / 中芯国际集成电路制造有限公司), China's biggest and most advanced semiconductor foundry, was awarded an investment of $400 million by the national IC industry investment fund.[cxxv] On 6 March 2015 it was announced that Dr. Zhou Zixue, chief economist of MIIT as late as February 2015,[cxxvi] was appointed chairman of SMIC.[cxxvii]

The national investment fund is supplemented with local city funds:

Beijing's IC industry fund operates using sub-funds, including Hua Capital Management (北京清芯华创投资管理有限公司).[cxxviii] Currently headed by Zhang Xisheng, Hua Capital was established by MIIT, the National Development and Reform Commission (国家发展和改革委员会), and the Beijing City government.[cxxix]

- In April 2015 Omnivision Technologies Inc., a U.S. digital imaging chipmaker, agreed to a $1.9 billion takeover by: Hua Capital; CITIC Capital Holdings, a subsidiary of the Ministry of Finance-owned CITIC Group;[cxxx] and Gold Stone Investment Co, a holding of CITIC Group's CITIC Securities Company Ltd.[cxxxi]

Shanghai's city fund is named Shanghai Summitview Capital (武岳峰资本).[cxxxii]

- Summitview Capital is leading a consortium of Chinese investors named Uphill Investment Co. in the drive to acquire Integrated Silicon Solution Inc. (ISSI).[cxxxiii] ISSI is a designer of high performance integrated circuits, and the deal is in the final review of the Committee on Foreign Investment in the United States (CFIUS).[cxxxiv]

IV.   IBM Partner of Concern: Inspur Group

Inspur Group (浪潮集团有限公司)

Key Findings

- IBM has agreed to provide proprietary database technology and other software to Inspur and help develop Inspur's own server product line.
- Inspur provides servers, management systems, and other products to the armed forces, the defense industry, and public security organizations.
- Inspur's software subsidiary (Inspur Software Co., Ltd. / 浪潮软件股份有限公司) is currently listed as a sanctioned supplier for government use by the National Administration for the Protection of State Secrets.[cxxxv]

Company Profile

Overview	• Leading supplier of servers, cloud computing, and database software to military, defense industrial, government, and financial sector end users. • During 2014, Inspur participated in a pilot program in the city of Siping to test the transition of an entire city administration to solely Chinese servers and software.[cxxxvi]

IBM Partnership	• In August 2014, IBM agreed to provide Inspur with DB2 database and WebSphere application server software middleware platforms to support Inspur's own Tiansuo K1 mainframe system.[cxxxvii]
	• In October 2014, IBM pledged to support the continued development of Inspur's K1 mainframe.[cxxxviii]
	• Also in October 2014, an Inspur subsidiary (Inspur Electronic Information Industry Co., Ltd. / 浪潮电子信息产业有限公司) joined IBM's China POWER Technology Alliance.[cxxxix]
	• These decisions came in the wake of the 'IBM to Inspur' (I2I) market strategy inaugurated by Inspur in early 2014.[cxl]
	    ○ This strategy sought to rapidly reduce IBM's share in the China server market by leveraging increasing concerns over the security of foreign servers and other systems.
	    ○ Inspur also actively recruited IBM China personnel, eventually poaching more than 80 employees during 2014.

Customers of Concern	<u>Military</u>:
	• PLA command posts are procuring Inspur's Feilong DS3010 desktop computer as an indigenous system less vulnerable to foreign exploitation.[cxli]
	• The PLA's first ruggedized handheld computer (the Feilong HL3211).[cxlii]
	    ○ The HL3211 was considered suitable for military service because it used domestic processors and domestic software.
	• Inspur's Jingang RM5226 truck-mounted mobile mapping system.[cxliii]
	• Other products for the PLA include:
	    ○ A message-handling middleware for communications systems
	    ○ Two- and three-dimensional GIS platforms for use in the field
	    ○ Database and cloud management software

	Government
	• Inspur's SSR servers are widely used by government departments, military industrial units, and major industries.
	• Inspur provides technology solutions to the public security organizations of more than 20 provinces and cities.[cxliv]
	Ministry of State Security
	• Reported to provide information security and emergency services for MSS and the Office of Security Commercial Code Administration (OSCCA).[cxlv]
	Defense Industry:

	• Inspur provides comprehensive management systems and technologies to a wide range of customers in the Chinese defense industrial sector, including:[cxlvi]
	  ○ China Academy of Engineering Physics, engaged in nuclear weapons research and design
	  ○ China Air-to-Air Missile Research Academy
	  ○ Factories and research institutes belonging to ten research academies under the Aviation Industry Corporation of China (AVIC)
	  ○ Factories and research institutes belonging to twelve research institutes within China's aerospace industrial conglomerates (CASIC and CASC)

	• Inspur's predecessor, the Shandong Electronic Equipment Factory, originally produced transistors and other electronics used in China's first satellite.[cxlvii]

Political or Government Connections	• Current Inspur CEO Sun Pishu (孙丕恕), born 1962, is a member of the National People's Congress, China's national legislative body.
	  ○ As an NPC member, Sun has argued for legislation to foster the use of information technology in government and administration.[cxlviii]
	  ○ He has also argued for legislation mandating strengthened cyber security measures, including a network security auditing system.[cxlix]
	  ○ Simultaneously serves as Secretary of Inspur's Communist Party organization.[cl]

Key Products

Figure 7: HL3211 hand-held computer, for field use by PLA troops (left); DS3010 desktop computer, for use in PLA command posts (center); and Truck carrying RM5226 mobile mapping system (right)

Inspur Software Co., Ltd. (浪潮软件股份有限公司)

- Currently listed as a sanctioned supplier for government use by the National Administration for the Protection of State Secrets.[cli]

Inspur Electronic Information Industry Co. Ltd. (浪潮电子信息产业股份有限公司)

- Represents Inspur within IBM's China POWER Technology Alliance'.[clii]
- Engaged in a nationally-funded research project on critical technologies and systems for big data computing. Consortium includes National University of Defense Technology.[cliii]
- Organizational member of the National Information Security Standardization Technical Committee (全国信息安全标准化技术委员会).[cliv]

Inspur Communication Information Systems Co. Ltd. (浪潮通信信息系统有限公司)

- Offers consulting, systems integration, and systems management services.[clv]

Inspur General Software Co. Ltd. (浪潮通用软件有限公司)

- Designated as 'key software enterprise' by the State Planning Bureau for 10+ years.[clvi]

Inspur Beijing Electronic Information Industry Co. Ltd. (浪潮北京电子信息产业有限公司)

- Primary focus is high-end servers and big data storage equipment.
- Operates Inspur's dedicated State Key Laboratory.

Other subsidiaries:[clvii]

- Inspur Shandong Electronic Information Co. Ltd. (浪潮山东电子信息有限公司)
- Shandong Inspur Commercial Systems Co. Ltd. (山东浪潮商用系统有限公司)
- Ji'nan Inspur Systems Software Co. Ltd. (济南浪潮系统软件有限公司)
- Shandong Inspur Jinrong Software Information Co. Ltd. (山东浪潮金融软件信息有限公司)
- Shandong Chaoyue Shukong Electronics Co. Ltd. (山东超越数控电子有限公司)
- Ji'nan Dongfang Joint S&T Development Co. Ltd. (济南东方联合科技发展有限公司)
- Inspur Shike Shandong Information Technology co. Ltd. (浪潮世科山东信息技术有限公司)
- Ji'nan Inspur Mingda Information S&T Co. Ltd. (济南浪潮铭达信息科技有限公司)

V.   IBM Partner of Concern: Beijing Teamsun Technology Co., Ltd.

Beijing Teamsun Technology Co., Ltd. (北京华胜天成科技股份有限公司)

Key Findings

- IBM has agreed to transfer to Beijing Teamsun Technology Co., Ltd. (Teamsun) the IP rights for POWER Servers, operating systems, middleware, and database technology.
- Teamsun has acquired (or will acquire) source code and IP usage rights for IBM WebSphere Application Server Liberty Base Software and the IBM MQ Middleware Software.
- Teamsun has established the TOP Program to absorb and re-innovate IBM technology. The TOP Program's head is a senior cyber security expert with the Chinese armed military.

Company Profile

Overview	• Leading provider of IT products and services for telecommunications, finance, education, manufacturing, energy, government, and military clients.[clviii]

IBM Partnership	• In November 2014 IBM signed an MoU with the Beijing City Government and Teamsun to transfer core technology to Teamsun and help develop China's own high performance computing technology based on Power Architecture.[clix]
	• Has acquired or will obtain:
	    ○ IP rights for POWER servers, operating systems, middleware, and database technology.[clx]
	    ○ IP rights, source code, and technology support for the IBM Informix Database Software Technology.[clxi]
	    ○ Source code, and IP usage rights of the IBM WebSphere Application Server Liberty Base Software and the IBM MQ Middleware Software in China.[clxii]
	• Is one of seven Chinese members of alliance to license IBM's POWER architecture, intellectual property related to POWER8, and chip design tools to develop and market processors for servers in China.[clxiii]
	• Teamsun established the TOP Program specifically to absorb and re-innovate technology transferred by IBM, and appointed Dr. Shen Changxiang as its CTO.
	• Official IBM partner via IBM's website.[clxiv]

Customers of Concern	<u>Military</u>: • Teamsun's own 2011-2012 prospectus claims successful cases for a variety of customers including the Chinese military.[clxv] • Claims that its cloud computing services will support the rapid development of national and military broadband wireless communication technologies.[clxvi] • Names as client the Second Artillery Equipment Academy (二炮装备研究院), which provides materials and technologies for China's strategic missile force.[clxvii] <u>Government</u>: • Investor website noted in July 2014 that after the PLA established a network security strategy center, Teamsun stock immediately soared to a new high.[clxviii]

Key Personnel

	Shen Changxiang • Chief Technical Officer for Beijing's TOP Program, charged with integrating and re-innovating IBM technology and intellectual property. • Former naval officer and a longtime military researcher, closely associated with leading state and military research organizations. • Associated with various advisory committees to guide China's information and network security policies. • Regularly advocates for the 'localization' and 'nationalization' of China's software, integrated circuit, and cloud computing sectors.
	Su Gang (苏纲) • From 2004 to 2009, Su was Teamsun's largest shareholder.[clxix] In 2010 he was acting director of Teamsun, and currently holds 17,500,000 RMB of registered capital in the company.[clxx clxxi] • Su is a Party member and engineer who received his bachelor's degree in data communications from what is now the PLA Information Engineering University.[clxxii] • Su currently teaches personnel and manages work station sales at the Sixth Research Institute (RI) of the defense-focused China Electronics Corporation (CEC), a "key state-owned conglomerate directly under the administration [of the] central government, and the largest IT company in China."[clxxiii clxxiv]
	Wang Weihang (王维航) • CEO of Teamsun and Party member.[clxxv] • Also works at CEC's Sixth RI.

Beijing TEAMSUN Information Development Technology Co., Ltd.

(北京华胜天成信息技术发展有限公司)

Key Findings

- Beijing Teamsun Information Development Technology Co., Ltd (aka Teamsun Info)
- Registered supplier for Chinese military end users, offering computer, software, network communication, and satellite application products.
- PLA has likely used the company's satellite communications equipment since at least 2010.

Company Profile

Overview	- Teamsun Info is a Teamsun subsidiary focusing on broadband mobile communications technology. - Primary products are *ad hoc* network communications and portable satellite communications equipment.[clxxvi] - According to Teamsun Info's website, clients include the military, the People's Armed Police, and the Ministry of Public Security.[clxxvii]
Customers of Concern	Military: - Registered supplier for Chinese military end-users, offering computer, software, network communication, and satellite application products.[clxxviii] - In 2010 the PLA's General Staff Headquarters issued the company a "National Defense Communications Network Equipment and Materials Network Access Permit," permitting the equipment's use in PLA units.[clxxix] Government: - Registered supplier on Chinese government procurement website.[clxxx]

Key Products

The company's main product listing is the TS-ARK&A0800, a very small aperture terminal (VSAT), or two-way satellite ground station.[clxxxi] The system reportedly has five technologies with defense patents, and clients include military end-users for emergency communications.

Figure 8: TS-ARK&A0800 VSAT

Other Key Teamsun Subsidiaries

Teamsun Software Technology Company (北京华胜天成软件技术有限公司)

- Fully-owned Teamsun subsidiary established in 2005 whose scope of business includes technology development, consulting, and services; computer technology training; computer systems integration; sales computer software, hardware, and related equipment and communications equipment.[clxxxii]
- In 2013 the National Administration for the Protection of State Secrets included Teamsun Software Technology in its Catalogue of High Quality Confidential Information Systems (涉密信息系统集成资质甲级目录), indicating that the company's systems are likely sanctioned for government use.[clxxxiii] The certification is valid through 2016.

Shenzhen Teamsun Information Technology Co., Ltd. (深圳华胜天成信息技术有限公司**)**

- Fully-owned Teamsun subsidiary for technology development, consultation, services, and training; integrates communications software and systems; sells its own products, computer software, and external equipment and communication equipment; e-commerce services.[clxxxiv]

Nanjing Teamsun Information Technology Co Ltd. (南京华胜天成信息技术有限公司**)**

- Provides systems integration, software development and production, technological services, and consulting services.[clxxxv]
- Services extend to cloud computing, mobile networks, internet, information security, and other fields. Provides IT system services, develops application software, and other IT services.[clxxxvi]
- IBM partner as developer and reseller. Industries listed on IBM website include "Aerospace & Defense" and "Government, Central/Federal".[clxxxvii]
- Takes raising IT core capabilities of industry and government clients as its mission."[clxxxviii]

Teamsun Technology Pakistan (Pvt) Ltd. (巴基斯坦办事处**)**

- IBM lists Teamsun Technology Pakistan as an international business partner in Pakistan.[clxxxix]
- Teamsun Technology Pakistan offers IBM Cognos, IBM InfoSphere, and IM Data Management through the IBM Business Analytics.[cxc]
- Supports technical and security measures by Zong (China Mobile Pakistan) and Symantec.[cxci]

Teamsun Technology (HK) Ltd. (香港办事处 **/** 華勝天成科技**(**香港**)**有限公司**)**
- In 2009 Teamsun Hong Kong acquired a controlling interest in Automated Systems Holdings, the leading information technology services provider to the Hong Kong government.[cxcii]

Guangzhou Automated Systems Limited (广州澳图美德信息科技有限公司**)**

- Licensed to develop computer technology and provide technological services; software development; data management and storage services; information systems integration services; information technology consulting services; electronics distribution; technology and goods import and export.

Taiwan Automated Systems Limited (台灣澳圖美德資訊科技有限公司**)**

VI.   IBM Partner of Concern: Tsinghua Tongfang Co Ltd

Tsinghua Tongfang Co Ltd (同方股份有限公司)

Key Findings

- Tsinghua University is a member of IBM's Open Power community, which allows members to acquire IBM processing technology.
- Tsinghua University has a number of subsidiary companies under Tsinghua Tongfang Co. Ltd, which supply a vast array of products and services to the PLA.
- Key Tsinghua Tongfang leaders Yang Zhiming and Zhao Xiaoyan have strong military connections.

Company Profile

Overview	• Tsinghua Tongfang, a holding of Tsinghua University, provides an array of services to China's public security, government, finance, and military establishments.[cxciii] • Has a strong focus on civil-military integration technical support systems.[cxciv]
IBM Partnership	• Tsinghua University is a member of IBM's Open Power initiative,[cxcv] which will transfer IBM processing technology to Open Power members.[cxcvi]
Customers of Concern	Military: • Tongfang's 2014 annual report notes that the January 2015 National Security Strategy Guideline (国家安全战略纲要) prioritizes security for military industrial sectors, and "provides ample market space." Tongfang writes that it has supported the PLA's "three-step" modernization strategy of mechanization to informatization.[cxcvii] • Supplies key industries with command equipment, high-end communications equipment, Beidou satellite navigation systems, and ship manufacturing.[cxcviii] • Comprehensive supplier of military wireless communications, navigation, and control equipment.[cxcix]
Political or Government Connections	• Provides "safe and reliable" computer hardware to China's space industry, finance sector, and government agencies.[cc]
Other	•

Key Personnel

	Yang Zhiming (杨志明) – Manager of military business profile • Held leadership positions at the formerly state-operated 4321 military factory (now Jiangxi Liansheng Electronic Co. Ltd) that is currently the military's number one source for aluminium electrolytic capacitor research and production.[cci] • Jiangxi Liansheng Electronic Co. Ltd contributes to China's "Assassin's Mace" hardware, including Dongfeng ballistic

	missiles, Long March rockets, radars, submarines, and manned space flight systems.[ccii] • Formerly the director of the 713 military factory,[cciii] which was acquired by Tongfang in 1998 and renamed Tongfang Electronic Science and Technology Co., LTD.[cciv] He continues to supervise the organization as an executive at Tsinghua Tongfang, and also supervises Tongfang Industrial Co., Ltd.[ccv]
	Zhao Xiaoyan (赵晓岩) - General Manager of Beijing Tongfang Time Link. • Zhao studied 4 years at the PLA's Information Engineering College, the predecessor to today's PLA Information Engineering University, specializing in computer science. He served two years in the military.[ccvi] • Leads Tongfang Timelink under the motto, "Science and technology services to the military industry, products that connect the mission" (科技服务军工，产品蕴涵使命).[ccvii]

Key Tsinghua Tongfang Subsidiaries

Beijing Tongfang Time Link Electronic Co., Ltd. (北京同方时讯电子有限公司)

- Formed in 2004 to support China's military building and informatization.[ccviii]
- Specializes in information systems, automated identification and logistics information, intelligence systems, material storage and transportation monitoring products.[ccix]

Tongfang Electronic Science and Technology Co., Ltd. (同方电子科技有限公司)

- Registered on China's military procurement website as a provider of equipment related to a range of needs including communications, technical surveillance, electronic countermeasures, satellite navigation, intelligence, command and control, radar, UAVs, and computer and software equipment.

Tongfang Industrial Co. Ltd. (同方工业有限公司)

- Provides the military with services related to civil-military integration (CMI) technical support, and provides services on the Beidou Navigation Satellite System.[ccx] Naval products include minesweeper ships and high-speed patrol boats.[ccxi]

Figure 9: Tongfang Industrial's fast patrol boat

VII.   IBM Partner of Concern: PowerCore

PowerCore (苏州中晟宏芯信息科技有限公司)

Key Findings

- Develops CPUs for Chinese servers based on IBM's Power8 processors and POWER architecture.
- Collaborating with Tsinghua and the military's GSD 56th Research Institute.
- Plans to "integrate party, government, and military requirements" for future products.

Company Profile

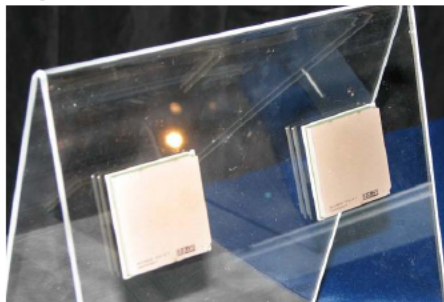|	
Overview	• Founded in 2013 to develop CPUs for Chinese servers based on IBM's Power8 processors and POWER architecture.[ccxii] • Initial target markets for these PowerCore processors are in banking, communications, retail, and transportation.
IBM Partnership	• In January 2014 IBM, Suzhou PowerCore and the Research Institute of Jiangsu Industrial Technology announced they would join the OpenPOWER Foundation. • Suzhou PowerCore is licensing IBM's POWER architecture, intellectual property related to Power 8, and electronic design applications (EDA) to develop processors for Chinese servers.[ccxiii ccxiv] • The CP1, a custom Power 8 designed by Suzhou PowerCore, includes a custom encryption module for the China market, but otherwise appears to be a straight Power 8 design.[ccxv]
Customers of Concern	• According to a PowerCore press release, the company is collaborating with Tsinghua and the GSD 56th Research Institute, the Chinese military's oldest computer research institute.[ccxvi] • For future products plans to "integrate party, government, and military requirements."[ccxvii]
Political or Government Connections	• In at least two meetings, representatives of the Jiangsu Department of Science and Technology told Chairman Zheng Jiang to accelerate the absorption and application of IBM technology for Chinese server CPUs.[ccxviii]

Key Products

Figure 10: The CP1, a custom Power 8 designed by Suzhou PowerCore

Key Personnel

	Zheng Jiang (郑茳) – Chairman of the Board for PowerCore and C*Core.[ccxix] • Led design of integrated circuits with Motorola's China operations before becoming C*Core chairman and promoting Chinese industry's adoption of M*Core technology.[ccxx] • Stated he "wants for Chinese ICs to have a "China Chip" (中国芯) with its own intellectual property."[ccxxi]

Timeline of IBM and Suzhou PowerCore Partnership[1]

The IBM partnership with Suzhou PowerCore and its decision to transfer critical Power chipset technology to the firm was brokered over a series of intensive meetings. In attendance were senior IBM company management, including the Company CEO, and leaders or representatives from the Chinese Communist Party, the Ministry of Industry & Information Technology (MIIT), and the local Suzhou Municipal Government:

13 January 2014: IBM Greater China President Qian Daqun meets with MIIT Vice-Minister to discuss "how to launch cooperation."

21 January 2014: IBM Global VP meets with Jiangsu Provincial officials, Suzhou Unisource Technology Institute, and the Suzhou Hi-Tech Zone Management Bureau to jointly form the "Suzhou PowerCore Company."

14 February 2014: IBM CEO Ginni Rommety meets with MIIT Minister Miao Wei to discuss "chipset technology cooperation." In the meeting, Minister Miao Wei noted that discussions between IBM and MIIT began in March of 2013.

8 August 2014: IBM Greater China President Qian Daqun meets with MIIT Vice-Minister to discuss "greater cooperation with Chinese industry."

28 October 2014: IBM and Chinese Government jointly launch the "China POWER Technology Alliance'" in Suzhou. The meeting was attended by MIIT Vice-Minister, Suzhou Mayer, Jiangsu Vice-Governor, and key senior officials.

12 November 2014: IBM CEO Ginni Rommety meets with Vice Premier and Politburo Member MA Kai to discuss cooperation regarding integrated circuits development.

Suzhou PowerCore's founding shareholders include

- Jiangsu Menglan Conglomerate Co. (江苏梦兰集团有限公司), which also owns Menglan Longxin, which partners with the China Academy of Sciences to commercialize the Longxin CPU technology.
- Suzhou High-tech Venture Capital Group Co., Ltd., (苏州高新创业投资集团有限公司), which is directly owned by the Suzhou Provincial Government.

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[1] Based on interview with industry expert.

VIII. IBM Partner of Concern: C*Core

C*Core (苏州国芯科技有限公司)

Key Findings

- Leading enterprise for embedded CPU design and application in Chinese technology.
- Developed series of CPU cores based on IBM's PowerPC ISA and Motorola's M*Core ISA.
- Collaborated with unidentified military research institutes to develop weapon control systems.
- With Ministry of Public Security developed a chip for encryption, VPN, and USB drives.

Company Profile

|	
Overview	- C*Core is a leading enterprise for embedded CPU design and application in Chinese technology. - Founded in 2001 with support from the Ministry of Information Industry of China to support the transfer of Motorola's 32-bit RISC CPU, M*Core, to China.[ccxxii] - Developed series of CPU cores based on IBM's PowerPC ISA and Motorola's M*Core ISA. - Clients are in industries including information security, digital media, data storage, office automation, satellite navigation, communications, industrial controls, public security, and national defense among others.[ccxxiii]
IBM Partnership	- In 2010 C*Core received a PowerPC ISA license from IBM, and began developing CPU cores based on PowerPC to license to customers.[ccxxiv] - In July 2013 CETC Vice-Chairman Zhang Dongchen said CETC is paying close attention to the program, and said PowerPC is the direction of China's silicon-based semiconductor industry.[ccxxv]
Customers of Concern	Military - According to Zheng Jiang, C*Core and an unidentified research institute collaborated on a program for the military's encrypted machinery. They developed a specialized chip for weapons control based on the C*Core CS310.[ccxxvi] - According to C*Core's 2013 audit report, the PLA's GSD 51st Research Institute, a key military research organization dealing with computer networks and communications, was C*Core's third largest customer with over 4 million RMB in sales or 9.19% of C*Core's total.[ccxxvii] Government - C*Core with an unnamed unit of the Ministry of Public Security developed the C*Core CPU C320 information security chip that will be used in police encryption, VPN, and USB drives.[ccxxviii]
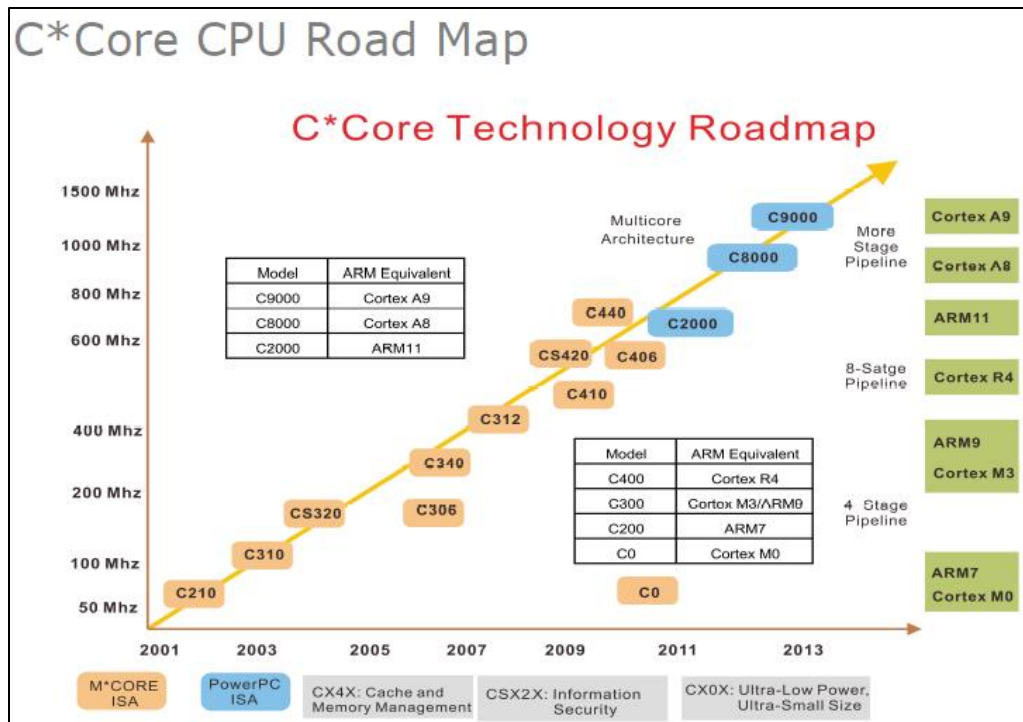
*Figure 11: Roadmap of C*Core CPU development based on Motorola and IBM designs*

Key Personnel

	Zheng Jiang (郑茳) – Chairman of the Board for C*Core and PowerCore.[ccxxix] • Led design of integrated circuits with Motorola's China operations before becoming C*Core chairman and promoting Chinese industry's adoption of M*Core technology.[ccxxx] • Stated he "wants for Chinese ICs to have a "China Chip" (中国芯) with its own intellectual property."[ccxxxi]

ⁱ Don Clark, 'IBM technology adopted in Chinese chips, servers', *The Wall Street Journal*, 19 March 2015, and Don Clark, 'IBM gets allies to chip away at Intel', *The Wall Street Journal*, 5 August 2013

ⁱⁱ Paul Mozur, 'IBM venture with China stirs concerns', *New York Times*, 19 April 2015

ⁱⁱⁱ Jessica Lipsky, 'IBM plugs partners into power', *EE Times*, 8 December 2014

^{iv} Paul Mozur, 'IBM venture with China stirs concerns', *New York Times*, 19 April 2015

^v Ted Ranosa, 'IBM-China venture raises red flag: Don't ask why', *Tech Times*, 21 April 2015

^{vi} 'GBASE and IBM to collaborate on locally innovated database in China', *IIUG Insider*, No.172, October 2014

^{vii} Ted Ranosa, 'IBM-China venture raises red flag: Don't ask why', *Tech Times*, 21 April 2015

^{viii} 李珣, 'IBM 在华成立 POWER 产业联盟 向中国公司开放芯片授权', *凤凰科技*, 30 October 2014

^{ix} Jon Russell, 'Lenovo agrees to buy IBM's low-end server business for $2.3B, will hire 7,500 of its staff', TNW News, 23 January 2014

^x Megan Eckstein, 'Navy needs new servers for Aegis cruisers and destroyers after Chinese purchase of IBM line', USNI News, 5 May 2015

^{xi} Data derived from IBM's annual reports for 2010-2014.

^{xii} According to IBM's annual report for 2014.

^{xiii} According to IBM's annual report for 2014.

^{xiv} Myssie You, 'China software sector to grow 15-18% until 2017: Morgan Stanley', http://www.ejinsight.com/20150429-china-software-sector-to-grow-15-18-until-2017-says-morgan-stanley/, 29 April 2015

^{xv} Yevgeniy Sverdlik, 'Chinese public sector uses cloud to implement e-government', http://www.datacenterdynamics.com/app-cloud/chinese-public-sector-uses-cloud-to-implement-e-government/63677.fullarticle, 5 April 2012

^{xvi} 'Foreign IT Giants Rush to Tap China's Cloud Computing Market - See more at: http://www.china-briefing.com/news/2015/02/03/cloud-computing-china.html', 3 February 2015

^{xvii} Gordon Orr and Christopher Thomas, 'Semiconductors in China: Brave new world or same old story?' http://www.mckinsey.com/insights/high_tech_telecoms_internet/semiconductors_in_china_brave_new_world_or_same_old_story, August 2014

^{xviii} 'Overview of China Semiconductor Industry', http://www.semi.org/en/sites/semi.org/files/data15/docs/China_IC_industry_overview2015-4-23.pdf, 23 April 2015

^{xix} Gordon Orr and Christopher Thomas, 'Semiconductors in China: Brave new world or same old story?' http://www.mckinsey.com/insights/high_tech_telecoms_internet/semiconductors_in_china_brave_new_world_or_same_old_story, August 2014

^{xx} Adam He, 'Will New Policy in China Trigger Big Changes?', http://www.semi.org/node/53856, current as of 27 August 2015

^{xxi} '2014 年我国安全可靠关键软硬件创新发展回顾与展望', 中华人民共和国工业和信息化部, 10 February 2015; 'China Said to Study IBM Servers for Bank Security Risks', Bloomberg Business, 27 May 2014.

^{xxii} 'Find a Business Partner', IBM, current as of 28 August 2015.

^{xxiii} 'IBM Gets Allies to Chip Away at Intel', *The Wall Street Journal*, 5 August 2013; and 'IBM Technology Adopted in Chinese Chips, Servers', *The Wall Street Journal*, 19 March 2015.

^{xxiv} 'Suzhou PowerCore Technology Co. Intends To Use IBM POWER Technology For Chip Design That Pushes Innovation In China', IBM, 19 January 2015; 'IBM Plugs Partners Into Power', *EE Times*, 8 December 2014; 'Suzhou PowerCore Technology Co. Intends To Use IBM POWER Technology For Chip Design That Pushes Innovation In China', IBM, 19 January 2014.

^{xxv} 'IBM 在华成立 POWER 技术产业生态联盟', Sina, 28 October 2014.

^{xxvi} '中国 POWER 技术产业生态联盟成立', Sina, 28 October 2014.

^{xxvii} Roger Kay, 'OpenPower Unlocks Floodgates For An All-Chinese Server Business', *Forbes*, 20 March 2015.

^{xxviii} Roger Kay, 'OpenPower Unlocks Floodgates For An All-Chinese Server Business', *Forbes*, 20 March 2015.

xxix '市领导调研北京可信开放高端计算系统产业化项目服务器生产基地',
http://www.bjeit.gov.cn/xwtt/80694.htm, 12 December 2014

xxx '沈昌祥：网络安全从"娃娃"抓起', *解放军报*, 21 February 2014; '沈昌祥等：可信计算联盟能否经受产业化大考', *中国电子报*, 22 April 2014; '沈昌祥：网络空间安全战略思考与启示', *光明网*, 25 November 2014; '沈昌祥：用可信计算构筑网络安全', *中国科学报*, 2 December 2014

xxxi '沈昌祥', http://www.cac.gov.cn/2014-11/22/c_1112062498.htm, 22 November 2014

xxxii '如何做好大数据时代"加减法"', http://www.aigoapp.com/html/2015/info_0527/1136.html, 27 May 2015

xxxiii '信息安全专家 中国工程院院士 沈昌祥', http://www.cnisa.cn/276.html, 8 July 2014

xxxiv '江苏省网络与信息安全重点实验室 – 学术部队', http://jssec.seu.edu.cn/xswyh.html; '沈昌祥',
http://www.cac.gov.cn/2014-11/22/c_1112062498.htm, 22 November 2014

xxxv '国产导弹多功能保障系统技术达国际先进水平', *科技日报*, 4 May 2009

xxxvi '沈昌祥', http://www.cac.gov.cn/2014-11/22/c_1112062498.htm, 22 November 2014

xxxvii '沈昌祥 中国工程院院士', http://www.bjut.edu.cn/szdw/lyys/15588.shtml; '网络安全从"娃娃"抓起', *解放军报*, 21 February 2014

xxxviii '中国 POWER 技术产业生态联盟在苏州成立',
http://server.it168.com/a2014/1028/1677/000001677485.shtml, 28 October 2014

xxxix '解放军采用飞龙 DS3010 计算机 防止外国窃密', 环球时报, 25 July 2014

xl '国防测绘尖兵：浪潮金刚 RM5226 破移动测绘难题', http://www.chinanews.com/mil/2015/08-21/7482190.shtml, 21 August 2015

xli '浪潮 ERP 军工行业整体解决方案',
http://www.inspur.com/lcjtww/443009/2183106/447403/448025/447794/index.html, 9 April 2014; '浪潮 ERP 军工行业综合经营管理平台解决方案',
http://www.inspur.com/lcjtww/443009/2183106/447403/448025/447789/index.html, 9 April 2014; '浪潮 ERP 军工行业集团管控解决方案',
http://www.inspur.com/lcjtww/443009/2183106/447403/448025/447798/index.html, 9 April 2014

xlii '浪潮集团董事长孙丕恕：政府开放数据红利尚待释放', http://it.people.com.cn/n/2015/0305/c1009-26642095.html, 5 March 2015

xliii '政府引导，企业落地：建立完整的可信高端计算系统产业链', http://www.ibm.com, 11 November 2014; '北京华胜天成科技股份有限公司: 重大事项进展公告', http://www.cninfo.com.cn, 13 November 2014.

xliv '市领导调研北京可信开放高端计算系统产业化项目服务器生产基地',
http://www.bjeit.gov.cn/xwtt/80694.htm, 12 December 2014

xlv '如何做好大数据时代"加减法"', http://www.aigoapp.com/html/2015/info_0527/1136.html, 27 May 2015

xlvi '北京华胜天成科技股份有限公司: 重大事项进展公告', http://www.cninfo.com.cn, 13 November 2014.

xlvii '北京华胜天成科技股份有限公司: 签署软件许可协议的公告', http://www.cninfo.com.cn, 19 November 2014.

xlviii '北京华胜天成科技股份有限公司: 签署软件许可协议的公告', http://www.cninfo.com.cn, 19 March 2015.

xlix '客户最佳实现', http://www.teamsun.com.cn/uploads/image/TEAMSUNSuccessStory.pdf, current as of 28 August 2015.

l '企业简介', http://www.teamsuninfo.com.cn/help.html, current as of 28 August 2015.

li '华胜天成', http://baike.baidu.com/view/1171728.htm, current as of 28 August 2015.

lii '北京华胜天成科技股份有限公司: 关于为全资子公司提供担保的公告',
http://static.sse.com.cn/disclosure/listedinfo/announcement/c/2007-11-15/600410_20071115_3.pdf.

liii '南京华胜天成信息技术有限公司', Tongcheng 58, current as of 28 August 2015.

liv 全军武器装备采购信息网, current as of 28 August 2015.

lv '军民一体化技术保障系统', http://www.thtf.com.cn/plus/view.php?aid=237, current as of 28 August 2015

lvi '军民一体化技术保障系统', http://www.thtf.com.cn/plus/view.php?aid=237, current as of 28 August 2015

lvii '信息安全解决方案', http://www.thtf.com.cn/plus/view.php?aid=181, current as of 28 August 2015

lviii '同方股份有限公司', www.thtf.com.cn/uploads/soft/150430/3-150430112022.pdf, 28 April 2015

lix '北京同方时讯电子股份有限公司', http://company.zhaopin.com/P2/CC1507/7851/CC150778516.htm , current as of 28 August 2015

lx '我们的产品', http://www.industrial.thtf.com.cn/index.php?m=product.cont&classid=101&id=67&page=3, current as of 28 August 2015

lxi '杨志明', http://www.thtf.com.cn/plus/view.php?aid=113, 21 January 2014

lxii '军装一直在心里穿着 ——访北大光华全球企业家项目学员赵晓岩', http://www.gsm.pku.edu.cn/exed/P2802964431341213918560.html?clipperUrl=94/48878.ghtmhttp://www.gsm.pku.edu.cn/exed/P2802964431341213918560.html?clipperUrl=94/48878.ghtm, 12 June 2014

lxiii Timothy Prickett Morgan, 'Chinese Startup To Make Its Own Power8 Server Chips', Enterprise Tech, 21 January 2014.

lxiv 'Suzhou PowerCore Technology Co. Intends To Use IBM POWER Technology For Chip Design That Pushes Innovation In China', IBM, 19 January 2015.

lxv Jessica Lipsky, 'IBM Plugs Partners Into Power', EE Times, 8 December 2014; 'Suzhou PowerCore Technology Co. Intends To Use IBM POWER Technology For Chip Design That Pushes Innovation In China', IBM, 19 January 2015.

lxvi '14 Views of the Open Power Summit', EE Times, 18 March 2015.

lxvii '苏州市副市长浦荣皋参观调研中晟宏芯', POWERCORE, 6 May 2015, accessed at http://www.powercore.com.cn/index.php?case=archive&act=show&aid=116.

lxviii '关于我们', http://www.powercore.com.cn/index.php?case=archive&act=list&catid=1, current as of 28 August 2015.

lxix '执行团队', http://www.china-core.com/page/jigou/index.php, current as of 28 August 2015.

lxx 任新勃, '中晟宏芯董事长郑茳：我的"中国芯"', DOIT, 15 January 2015.

lxxi 'C*Core's Scaleable Design Platform Help You to Win!', Asia Power Architecture Conference, 25 October 2012.

lxxii 'C*Core, Going Ahead with 'Innovation Power" Asia Power Architecture Conference, 25 October 2012.

lxxiii 'C*Core, Going Ahead with 'Innovation Power" Asia Power Architecture Conference, 25 October 2012.

lxxiv 郑茳, 'C*Core 技术创新与产业化', *中国计算机学会通讯*, January 2008.

lxxv '上海科技：苏州国芯科技有限公司 2013 年度审计报告', China.com, 24 May 2014.

lxxvi 郑茳, 'C*Core 技术创新与产业化', *中国计算机学会通讯*, January 2008.

lxxvii Megan Eckstein, 'Navy needs new servers for Aegis cruisers and destroyers after Chinese purchase of IBM line', USNI News, 5 May 2015

lxxviii 'IBM 在华成立 POWER 技术产业生态联盟', http://tech.sina.com.cn/it/2014-10-28/10389739326.shtml, 28 October 2014

lxxix '2014 年我国安全可靠关键软硬件创新发展回顾与展望', http://www.miit.gov.cn/n11293472/n11293832/n11293907/n11368277/16447983.html, 10 February 2015

lxxx Tom Rosamilia, 'Open and collaborative development is the future of cloud computing', http://asmarterplanet.com/blog/2013/08/open-and-collaborative-development-is-the-future-of-cloud-computing.html, 6 August 2013

lxxxi 'Suzhou PowerCore Technology Co. intends to use IBM POWER Technology for chip design that pushes iInnovation in China', PR Newswire, 19 January 2014; Michael Barris, 'Chinese firms join IBM's new chip-tech group alliance', *China Daily (USA)*, 2 May 2015

lxxxii Ellen Huber, 'IBM, Inspur set aside rivalry after partnership announcement', *China Business Review*, 5 September 2014

lxxxiii 'IBM 钱大群：用开放技术支持中国科技安全可控' http://www.enet.com.cn/article/2014/1114/A20141114425471.shtml, 14 November 2014; '1st China POWER Technology Alliance Kick-off Meeting in Suzhou' http://www.powercore.com.cn/en/?p=76, current as of 26 August 2014

lxxxiv 'Breaking News!!! Informix to become the national DBMS in China!!!', http://en.vercelletto.com/2014/11/03/breaking-news-informix-to-become-the-national-dbms-in-china/, 3 November 2014

lxxxv '政府引导，企业落地：建立完整的可信高端计算系统产业链', http://www.ibm.com/news/cn/zh/2014/11/11/Z131777L03969V53.html, 11 November 2014

lxxxvi *北京华胜天成科技股份有限公司重大事项进展公告*, 13 November 2014

lxxxvii *北京华胜天成科技股份有限公司签署软件许可协议的公告*, 19 November 2014

lxxxviii '华胜天成子公司首台服务器下线' http://company.cnstock.com/gszj/rdgs/201412/3271404.htm, 9 December 2014; '沈昌祥 中国工程院院士', http://www.bjut.edu.cn/szdw/lyys/15588.shtml, current as of 27 August 2014

lxxxix '杨学山会见美国 IBM 公司全球执行副总裁米尔斯', http://www.miit.gov.cn/n11293472/n11293832/n11293907/n11368223/16428615.html, 29 January 2015

xc 北京华胜天成科技股份有限公司 签署软件许可协议的公告, 19 March 2015

xci Rick Merritt, '14 Views of the Open Power Summit', *EE Times*, 18 March 2015

xcii Myssie You, 'China software sector to grow 15-18% until 2017: Morgan Stanley', http://www.ejinsight.com/20150429-china-software-sector-to-grow-15-18-until-2017-says-morgan-stanley/, 29 April 2015

xciii 'Foreign IT Giants Rush to Tap China's Cloud Computing Market, http://www.china-briefing.com/news/2015/02/03/cloud-computing-china.html', 3 February 2015

xciv Yevgeniy Sverdlik, 'Chinese public sector uses cloud to implement e-government', http://www.datacenterdynamics.com/app-cloud/chinese-public-sector-uses-cloud-to-implement-e-government/63677.fullarticle, 5 April 2012

xcv 'Foreign IT Giants Rush to Tap China's Cloud Computing Market - See more at: http://www.china-briefing.com/news/2015/02/03/cloud-computing-china.html', 3 February 2015

xcvi 'IT companies covet China cloud market', http://english.cntv.cn/2015/06/04/VIDE1433411167357193.shtml, 4 June 2015

xcvii Gordon Orr and Christopher Thomas, 'Semiconductors in China: Brave new world or same old story?' http://www.mckinsey.com/insights/high_tech_telecoms_internet/semiconductors_in_china_brave_new_world_or_same_old_story, August 2014

xcviii 'Overview of China Semiconductor Industry', http://www.semi.org/en/sites/semi.org/files/data15/docs/China_IC_industry_overview2015-4-23.pdf, 23 April 2015

xcix Gordon Orr and Christopher Thomas, 'Semiconductors in China: Brave new world or same old story?' http://www.mckinsey.com/insights/high_tech_telecoms_internet/semiconductors_in_china_brave_new_world_or_same_old_story, August 2014

c Adam He, 'Will New Policy in China Trigger Big Changes?', http://www.semi.org/node/53856, current as of 27 August 2015

ci Ibid.

cii '电子信息司',中华人民共和国工业和信息化部, current as of 28 August 2015

ciii '杨学山介绍《国家集成电路产业发展推进纲要》相关情况', 中华人民共和国工业和信息化部, 24 June 2014

civ '《国家集成电路产业发展推进纲要》正式公布', 中华人民共和国工业和信息化部, 24 June 2014

cv '2014 年我国安全可靠关键软硬件创新发展回顾与展望', 中华人民共和国工业和信息化部, 10 February 2015

cvi 《国家集成电路产业发展推进纲要》正式公布', 中华人民共和国工业和信息化部, 24 June 2014

cvii Adam He, 'Will New Policy Trigger Big Changes?', http://www.semi.org/node/53856, 13 January 2015

cviii 'China Said to Study IBM Servers for Bank Security Risks', Bloomberg Business, 27 May 2014

cix '国内银行业：想甩 IBM 不容易', 北京青年报, 29 May 2014

cx 'China Said to Study IBM Servers for Bank Security Risks', Bloomberg Business, 27 May 2014

cxi Paul Mozur, 'New Rules in China Upset Western Tech Companies', New York Times, 28 January 2015

cxii Paul Mozur and Jane Perlez, 'China Halts New Policy on Tech for Banks', New York Times, 16 April 2015

cxiii 'China summons Western tech firms, revives bank cyber rules', Reuters, 19 August 2015

cxiv 'China summons Western tech firms, revives bank cyber rules', Reuters, 19 August 2015

cxv '国家集成电路产业投资基金正式设立', 中华人民共和国工业和信息化部, 14 October 2014

cxvi Nobunaga Chai, 'Digitimes Research: China eyeing acquisitions to advance IC processes', http://www.digitimes.com/news/a20150831PD202.html, 1 September 2015

cxvii '集成电路产业投资基金来袭 去向何方?', http://tech.hexun.com/2014-12-23/171694566.html, 23 December 2014

cxviii '工业和信息化部关于王新哲等 5 名同志职务任免的通知', 中华人民共和国工业和信息化部, 6 February 2015

cxix '上海成立百亿规模集成电路基金 联发科等参与', http://tech.sina.com.cn/it/2014-11-24/doc-icczmvun0274029.shtml, 24 November 2014

cxx '马勇副巡视员陪同国家集成电路产业投资基金股份有限公司丁文武总经理赴南昌高新区调研', 江西省政府信息公开, 14 August 2015

cxxi '工业和信息化部关于王新哲等 5 名同志职务任免的通知", 中华人民共和国工业和信息化部', 6 February 2015

cxxii '国家集成电路产业投资基金首次落地', 人民日报, 16 February 2015

cxxiii '紫光获大基金百亿投资 产融结合打造集成电路产业"国家队"', http://www.unigroup.com.cn/newscenter/mtxw/2015/0303/139.html, 3 March 2015

cxxiv Chris Lange, 'Where Micron and Tsinghua Unigroup Can Go From Here', http://247wallst.com/technology-3/2015/08/31/where-micron-and-tsinghua-unigroup-can-go-from-here/, 31 August 2015

cxxv Peter Clarke, 'China Pumps Cash Into SMIC', http://electronics360.globalspec.com/article/5020/china-pumps-cash-into-smic, 18 February 2015

cxxvi '工业和信息化部领导春节前夕走访慰问老部领导', 中华人民共和国工业和信息化部, 15 February 2015

cxxvii '工信部总经济师周子学出任中芯国际董事长', http://finance.ifeng.com/a/20150306/13536402_0.shtml, 6 March 2015

cxxviii Adam He, 'Will New Policy in China Trigger Big Changes?' http://www.semi.org/node/53856, 13 January 2015

cxxix Xisheng Zhang, 'Xisheng Zhang: Partner/President - Hua Capital Management', http://www.linkedin.com/in/xishengzhang, current as of 2 September 2015

cxxx 'CITIC: Related Companies', http://www.citic.com/Links, current as of 2 September 2015

cxxxi *On Omnivision takeover:* George Stahl, 'OmniVision Agrees to $1.9 Billion Buyout', http://www.wsj.com/articles/omnivision-agrees-to-1-9-billion-buyout-1430396689, 30 April 2015
On Gold Stone Investment's relationship to CITIC Group: 'Company Overview of Gold Stone Investment Co. Ltd.', http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=95152457, current as of 2 September 2015

cxxxii Adam He, 'Will New Policy in China Trigger Big Changes?' http://www.semi.org/node/53856, 13 January 2015

cxxxiii Lisa Beilfuss, 'Uphill Tops Cypress Semi's Latest Bid for Integrated Silicon', Wall Street Journal, 23 June 2015

cxxxiv 'ISSI Provides Update on Closing of Acquisition by Uphill', http://www.prnewswire.com/news-releases/issi-provides-update-on-closing-of-acquisition-by-uphill-300128058.html, 13 August 2015

cxxxv '涉密信息系统集成资质甲级目录', http://cpc.people.com.cn/n/2013/0109/c351683-20145236.html, 10 January 2013; Shandong Inspur Software Co., Ltd. (山东浪潮齐鲁软件产业股份有限公司) is now known as Inspur Software Co., Ltd. (浪潮软件股份有限公司). '浪潮软件', http://vip.stock.finance.sina.com.cn/corp/go.php/vCI_CorpInfo/stockid/600756.phtml, current as of 27 August 2015

cxxxvi 'China said to plan sweeping shift from foreign technology to own', http://www.bloomberg.com/, 18 December 2014

cxxxvii '浪潮和 IBM 达成战略合作 天梭 K1 与 DB2 and WAS 深度融合', http://www.inspur.com/lcjtww/445068/445237/912302/index.html, 10 September 2014

cxxxviii 'Inspur world 主机分论坛举行 国产主机联盟成员增至 58 家', http://www.inspur.com/lcjtww/1042365/1367282/1384869/index.html, 25 October 2014

cxxxix '中国 POWER 技术产业生态联盟在苏州成立', http://server.it168.com/a2014/1028/1677/000001677485.shtml, 28 October 2014

cxl '浪潮挖角 IBM I2I 计划启动', http://stock.hexun.com/2014-05-30/165286388.html, 30 May 2014

cxli '解放军采用飞龙 DS3010 计算机 防止外国窃密', 环球时报, 25 July 2014

cxlii '解放军首款自主可控手持计算机亮相', http://mil.news.sina.com.cn/2015-07-27/1447835852.html, 27 July 2015

cxliii '国防测绘尖兵：浪潮金刚 RM5226 破移动测绘难题', http://www.chinanews.com/mil/2015/08-21/7482190.shtml, 21 August 2015

cxliv '公共安全解决方案概述', http://www.inspur.com/lcjtww/443009/443384/2174541/index.html, current as of 27 August 2015

cxlv '浪潮 SSR 入围国防科工委"十一五"电子政务工程', http://www.ems86.com/touzi/html/?30017.html, current as of 27 August 2014

cxlvi '浪潮 ERP 军工行业整体解决方案',
http://www.inspur.com/lcjtww/443009/2183106/447403/448025/447794/index.html, 9 April 2014; '浪潮 ERP 军工行业综合经营管理平台解决方案',
http://www.inspur.com/lcjtww/443009/2183106/447403/448025/447789/index.html, 9 April 2014; '浪潮 ERP 军工行业集团管控解决方案',
http://www.inspur.com/lcjtww/443009/2183106/447403/448025/447798/index.html, 9 April 2014

cxlvii '董事长致辞—务实造就成功 创新成就未来', http://www.inspur.com/lcjtww/445068/445233/index.html, current as of 27 August

cxlviii '浪潮集团董事长孙丕恕：政府开放数据红利尚待释放', http://it.people.com.cn/n/2015/0305/c1009-26642095.html, 5 March 2015

cxlix '浪潮挖角 IBM I2I 计划启动', http://stock.hexun.com/2014-05-30/165286388.html, 30 May 2014

cl '浪潮集团董事长兼党组书记孙丕恕', http://www.dongfangyi.org/tuozhanjingji/dongfangyijingjiguan/2014-06-01/20937.html, 1 June 2014

cli '涉密信息系统集成资质甲级目录', http://cpc.people.com.cn/n/2013/0109/c351683-20145236.html, 10 January 2013; Shandong Inspur Software Co., Ltd. (山东浪潮齐鲁软件产业股份有限公司) is now known as Inspur Software Co., Ltd. (浪潮软件股份有限公司). '浪潮软件',
http://vip.stock.finance.sina.com.cn/corp/go.php/vCI_CorpInfo/stockid/600756.phtml, current as of 27 August 2015

clii '中国 POWER 技术产业生态联盟在苏州成立',
http://server.it168.com/a2014/1028/1677/000001677485.shtml, 28 October 2014

cliii '"面向大数据的内存计算关键技术与系统" 国家 863 项目启动大会顺利召开'
http://www.cs.sjtu.edu.cn/NewsDetail.aspx?id=214, 28 July 2014

cliv '信安标委成员单位列表', http://www.tc260.org.cn/gywm6.jsp, current as of 27 August 2015

clv '浪潮通信信息系统有限公司', http://my.yingjiesheng.com/company_992118.html, current as of 27 August 2015

clvi '浪潮通用软件有限公司', http://www.asc.net.cn/Enterprise/EnterPriseShow.aspx?UserID=7FE5C7FC-62B1-46DF-B319-6B94A9593136, current as of 27 August 2015

clvii *浪潮软件股份有限公司预计 2015 年日常关联交易公告*, 16 March 2015

clviii '关于我们', Teamsun, current as of 28 August 2015.

clix '政府引导，企业落地：建立完整的可信高端计算系统产业链', http://www.ibm.com, 11 November 2014; '北京华胜天成科技股份有限公司: 重大事项进展公告', http://www.cninfo.com.cn, 13 November 2014.

clx '北京华胜天成科技股份有限公司: 重大事项进展公告', http://www.cninfo.com.cn, 13 November 2014.

clxi "北京华胜天成科技股份有限公司: 签署软件许可协议的公告', http://www.cninfo.com.cn, 19 November 2014.

clxii '北京华胜天成科技股份有限公司: 签署软件许可协议的公告', http://www.cninfo.com.cn, 19 March 2015.

clxiii 'IBM Plugs Partners Into Power', EE Times, 8 December 2014; 'Chinese firms join IBM's new chip-tech group alliance', *China Daily*, 2 May 2014.

clxiv 'Find a Business Partner', http://www.ibm.com, current as of 28 August 2015.

clxv 北京华胜天成科技股份有限公司: 2011 年年度报告 , http://file.finance.sina.com.cn/211.154.219.97:9494/MRGG/CNSESH_STOCK/2015/2015-4/2015-04-10/1704342.PDF, 2011.

clxvi '北京华胜天成科技股份有限公司: 2011 年年度报告',
http://file.finance.sina.com.cn/211.154.219.97:9494/MRGG/CNSESH_STOCK/2015/2015-4/2015-04-10/1704342.PDF, 2011.

clxvii '客户最佳实现', http://www.teamsun.com.cn/uploads/image/TEAMSUNSuccessStory.pdf, current as of 28 August 2015.

clxviii '华胜天成吧', http://guba.eastmoney.com/news,600410,114755653.html, 5 July 2014.

clxix '北京华胜天成科技股份有限公司: 2014 年年度报告',
http://file.finance.sina.com.cn/211.154.219.97:9494/MRGG/CNSESH_STOCK/2015/2015-4/2015-04-10/1704342.PDF, 2014.

clxx '北京华胜天成科技股份有限公司', Beijing Administration of Industry and Commerce, 2014.

clxxi '苏纲', http://www.baike.com/wiki/%E8%8B%8F%E7%BA%B2, current as of 28 August 2015.

clxxii '华胜天成 600410 - 公司高管', Aigu888.com, current as of 28 August 2015.

clxxiii 'Company Profile', http://www.cec.com.cn/En/about_us/Company_Profile/2760.aspx, 28 August 2015.

clxxiv '华胜天成 600410 - 公司高管', http://www.aigu888.com/gongsi/person.asp?zqdm=600410&pid=30005708, current as of 28 August 2015; '苏纲', http://finance.sina.com.cn/stock/company/sh/600410/17/17_7.shtml, current as of 28 August 2015.

clxxv '王维航', http://www.baike.com/wiki/%E7%8E%8B%E7%BB%B4%E8%88%AA, current as of 28 August 2015.

clxxvi '华胜天成', http://baike.baidu.com/view/1171728.htm, current as of 28 August 2015.

clxxvii '企业简介', http://www.teamsuninfo.com.cn/help.html, current as of 28 August 2015.

clxxviii '北京华胜天成信息技术发展有限公司', 全军武器装备采购信息网, current as of 28 August 2015.

clxxix '北京华胜天成信息技术发展有限公司', http://company.zhaopin.com/CC207625313.htm, current as of 28 August 2015.

clxxx '北京华胜天成信息技术发展有限公司', 中央国家机关政府采购中心, current as of 28 August 2015.

clxxxi 全军武器装备采购信息网, current as of 28 August 2015.

clxxxii '北京华胜天成软件技术有限公司', http://qyxy.baic.gov.cn/, **current as of 28 August 2015.**

clxxxiii '涉密信息系统集成资质甲级目录', National Administration for the Protection of State Secrets, 10 January 2013.

clxxxiv '北京华胜天成科技股份有限公司: 关于为全资子公司提供担保的公告', http://static.sse.com.cn/disclosure/listedinfo/announcement/c/2007-11-15/600410_20071115_3.pdf.

clxxxv '关于我们', Teamsun, current as of 28 August 2015.

clxxxvi '南京华胜天成信息技术有限公司', Tongcheng 58, current as of 28 August 2015.

clxxxvii 'Nanjing Teamsun information technology Co., LTD', IBM, current as of 28 August 2015.

clxxxviii '南京华胜天成信息技术有限公司', http://qy.58.com/32524786740743, current as of 28 August 2015.

clxxxix 'Teamsun Technology Pakistan (Pvt.) Ltd.', http://www-304.ibm.com/partnerworld/wps/bplocator/details?id=02a036c0-181c-11e0-98f0-020031000011, current as of 28 August 2015.

cxc 'Teamsun Technology Pakistan (Pvt.) Ltd.', http://www-304.ibm.com/partnerworld/wps/bplocator/details?id=02a036c0-181c-11e0-98f0-020031000011, current as of 28 August 2015.

cxci 'Zong Enhances Customer Data Protection with Symantec Software Solutions', ProPakistani, 14 January 2015.

cxcii Bien Perez, 'Teamsun to control Automated Systems', *South China Morning Post*, 8 May 2009; 'Teamsun Acquires Entire 68.4% Automated Interest from CSC', Bloomberg, current as of 28 August 2015.

cxciii '军民一体化技术保障系统', http://www.thtf.com.cn/plus/view.php?aid=237, current as of 28 August 2015

cxciv '军民一体化技术保障系统', http://www.thtf.com.cn/plus/view.php?aid=237, current as of 28 August 2015

cxcv 'Current Members', http://openpowerfoundation.org/membership/current-members/, current as of 28 August 2015

cxcvi 'Membership' http://openpowerfoundation.org/membership/, current as of 28 August 2015

cxcvii '同方股份有限公司', www.thtf.com.cn/uploads/soft/150430/3-150430112022.pdf, 28 April 2015

cxcviii '同方股份有限公司', www.thtf.com.cn/uploads/soft/150430/3-150430112022.pdf, 28 April 2015

cxcix '同方股份有限公司', www.thtf.com.cn/uploads/soft/150430/3-150430112022.pdf, 28 April 2015

cc '信息安全解决方案', http://www.thtf.com.cn/plus/view.php?aid=181, current as of 28 August 2015

cci '江西联晟电子有限公司 (四三二一厂)', http://jx4321.cn.china.cn/company-information.html, current as of 28 August 2015

ccii '江西联晟电子有限公司 (四三二一厂)', http://jx4321.cn.china.cn/company-information.html, current as of 28 August 2015

cciii '杨志明', http://www.thtf.com.cn/plus/view.php?aid=113, 21 January 2014

cciv '企业简介', http://www.jj713.com.cn/Company.aspx?classid=59 , current as of 28 August 2015

ccv '杨志明', http://www.thtf.com.cn/plus/view.php?aid=113, 21 January 2014

ccvi '军装一直在心里穿着 ——访北大光华全球企业家项目学员赵晓岩', http://www.gsm.pku.edu.cn/exed/P280296443134121 3918560.html?clipperUrl=94/48878.ghtmhttp://www.gsm.pku.edu.cn/exed/P280296443134121 3918560.html?clipperUrl=94/48878.ghtm, 12 June 2014

ccvii '科技服务军工，产品蕴涵使命', http://www.tftl.com.cn/3.htm, current as of 28 August 2015

ccviii '北京同方时讯电子股份有限公司', http://company.zhaopin.com/P2/CC1507/7851/CC150778516.htm , current as of 28 August 2015

ccix '物流信息自动识别技术应用系统集成', http://www.tftl.com.cn/wlzdsb.htm, current as of 28 August 2015

ccx '公司介绍', http://www.industrial.thtf.com.cn/about/87/34/ , current as of 28 August 2015

ccxi '我们的产品', http://www.industrial.thtf.com.cn/index.php?m=product.cont&classid=101&id=67&page=3, current as of 28 August 2015

ccxii Timothy Prickett Morgan, 'Chinese Startup To Make Its Own Power8 Server Chips', Enterprise Tech, 21 January 2014.

ccxiii 'Suzhou PowerCore Technology Co. Intends To Use IBM POWER Technology For Chip Design That Pushes Innovation In China', IBM, 19 January 2015.

ccxiv Jessica Lipsky, 'IBM Plugs Partners Into Power', EE Times, 8 December 2014; 'Suzhou PowerCore Technology Co. Intends To Use IBM POWER Technology For Chip Design That Pushes Innovation In China', IBM, 19 January 2015.

ccxv '14 Views of the Open Power Summit', EE Times, 18 March 2015.

ccxvi '苏州市副市长浦荣皋参观调研中晟宏芯', POWERCORE, 6 May 2015, accessed at http://www.powercore.com.cn/index.php?case=archive&act=show&aid=116.

ccxvii '关于我们', http://www.powercore.com.cn/index.php?case=archive&act=list&catid=1, current as of 28 August 2015.

ccxviii '省科技厅副厅长曹苏民一行来苏州高新区调研并重点考察了苏州中晟宏芯信息科技有限公司', POWERCORE, 2 April 2014; '工信部副部长杨学山一行日前来江苏省苏州市高新区考察', POWERCORE, 19 March 2014.

ccxix '执行团队', http://www.china-core.com/page/jigou/index.php, current as of 28 August 2015.

ccxx '执行团队', http://www.china-core.com/page/jigou/index.php, current as of 28 August 2015; 郑茳, 'C*Core 技术创新与产业化', *中国计算机学会通讯*, January 2008.

ccxxi 任新勃, '中晟宏芯董事长郑茳：我的"中国芯"', DOIT, 15 January 2015.

ccxxii 'C*Core's Scaleable Design Platform Help You to Win!', Asia Power Architecture Conference, 25 October 2012.

ccxxiii '苏州国芯肖佐楠入围科技部"创新人才推进计划"', Blog.People.com.cn, 11 January 2013; '苏州国芯肖佐楠入围科技部"创新人才推进计划"', current as of 28 August 2015.

ccxxiv 'C*Core, Going Ahead with 'Innovation Power" Asia Power Architecture Conference, 25 October 2012.

ccxxv '张冬辰会见江苏省经信委龚怀远副主任一行', CETC, 24 July 2013.

ccxxvi 郑茳, 'C*Core 技术创新与产业化', *中国计算机学会通讯*, January 2008.

ccxxvii '上海科技：苏州国芯科技有限公司 2013 年度审计报告', China.com, 24 May 2014.

ccxxviii 郑茳, 'C*Core 技术创新与产业化', *中国计算机学会通讯*, January 2008.

ccxxix '执行团队', http://www.china-core.com/page/jigou/index.php, current as of 28 August 2015.

ccxxx '执行团队', http://www.china-core.com/page/jigou/index.php, current as of 28 August 2015; 郑茳, 'C*Core 技术创新与产业化', *中国计算机学会通讯*, January 2008.

ccxxxi 任新勃, '中晟宏芯董事长郑茳：我的"中国芯"', DOIT, 15 January 2015.