Report

Deep Down in the Stack

China's Entrenchment in Serbia's Technology Landscape

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Preface

About GMF Technology

The German Marshall Fund of the United States (GMF) Technology Program is dedicated to ensuring that democracies collectively win the strategic technology competition against autocrats. With a transatlantic team based in Washington, D.C., Berlin, Brussels, and Paris, GMF Technology harnesses technical expertise towards three strategic directions: advancing democratic values in Artificial Intelligence (AI) innovation and policy, developing research and analysis to inform the emerging EU-US-China Technology Competition, and enhancing Allied Coordination and Competitiveness in critical and emerging technologies including AI, biotechnology, defense technology and quantum information.

About the Report

This study is part of a research report series by GMF Technology that uses a "technology stack" or "tech stack" framework to assess the technology footprint of the People's Republic of China (PRC) in Europe and Central Asia. The report maps the presence of the PRC and its affiliated entities across countries' technology landscapes. These entities include publicly owned companies, PRC-registered private firms, and other organizations connected to the government and the Communist Party of China (CCP). Building on previous work detailed in two reports by GMF's Alliance for Securing Democracy (ASD) on the future internet and the digital information stack released in 2020 and 2022, this series introduces a five-layered "tech stack" framework: network infrastructure, data infrastructure, device, application, and governance. The reports present findings from desk research and study tours conducted by GMF Technology in the summer of 2024, as well as recommendations for policymakers informed by these findings.

Acknowledgements

This publication was written under the supervision and guidance of Lindsay Gorman, managing director, and Astrid Ziebarth, deputy managing director of GMF Technology. It has been edited by Sabine Muscat and Nicolas Bouchet. The author thanks Romana Vlahutin, Vuk Vuksanović, Andrijana Ristić, Bojan Prekov, and Aleksandar Djokic for their feedback on and input to this report. Gratitude also goes to GMF's Belgrade Office and Zorana Gajic from GMF's Berlin Office for their support in coordinating a study tour to Serbia by Lindsay Gorman and the author in the summer of 2024. Sincere appreciation goes to all the interviewees for their time and insights. Finally, appreciation goes to Subigya Basnet and others from the digital communications team at GMF for their support in refining and enhancing the outreach of the piece. The views expressed in this publication are solely those of the author.

A Note on Methods

This analysis provides an indicative, rather than exhaustive, overview of the PRC's technology footprint in Serbia, offering key examples and highlighting where policymakers may focus their attention. It is grounded in qualitative research, drawing on sources including government statements, official policy documents, news reports, and investigative articles. These sources shed light on the policy priorities, geopolitical dynamics, and sectoral developments within Serbia's digital technology ecosystem. Complementing desk research, the study incorporates interview data from civil society actors, gathered during a study tour to Belgrade in the summer of 2024. These interviews offer context and local perspectives on the PRC's technology presence in Serbia.

The following caveats must be considered: First, desk research relies on the availability and reliability of publicly accessible information. Second, the interviews reflect the views of a specific group of stakeholders and may not capture the full spectrum of opinions or experiences within Serbia or the broader Western Balkan region. Despite these methodological limitations, this research seeks to combine desk research and interview data to deliver a nuanced and well-sourced analysis for policymakers and other interested readers.

Executive Summary

Serbia, a land-locked nation with a population of under seven million, has emerged as a key player in the PRC's Digital Silk Road (DSR) initiative within the Western Balkans. Its strategic location, connecting Southeastern Europe to Central and Western Europe, coupled with its role as a regional hub for internet traffic, has positioned Serbia as a valuable springboard for the PRC to market its technologies to the EU.

Since 2012, Serbia has been an EU accession candidate and has prioritized digital transformation in its international engagements, notably with the PRC. The country's commitment to digital advancement is also evident through its participation in the European Commission's Digital Agenda for the Western Balkans in 2018 and the Digital Europe Program in 2023.

Building on previous research conducted at GMF, this report delves into the evolution of the PRC's DSR in Serbia, employing a technology stack (tech stack) framework to analyze the PRC's presence. This framework encompasses five layers: network infrastructure, data infrastructure, device, application, and governance. By mapping the involvement of PRC-based entities within each layer, the report offers a detailed overview of the PRC's technological engagement in Serbia, complete with illustrative examples.

The report finds that the PRC and its affiliated entities have emerged as key players in Serbia's rapid digitalization and modernization of its technology ecosystem. Many PRC technology firms such as Huawei, Nuctech, NetDragon, and BGI (formerly Beijing Genomics Institute)—are present across Serbia's tech stack. Huawei, in particular, has made notable inroads into Serbia's foundational network infrastructure. This includes its partnership with Serbia's largest internet service provider (ISP), the state-owned Telekom Srbija and its positioning as a key partner in the country's 5G rollout anticipated in 2026. Huawei's involvement also extends to Serbia's national and municipal data infrastructure—as a commercial tenant in the national data center and as a financer in Kragujevac's city data center. These roles, coupled with limited transparency regarding the data stored in state-run facilities, have raised alarm among journalists, activists, and civil society actors about data security and the potential for state-enabled digital surveillance. These concerns have deepened with the introduction of surveillance systems supplied by PRC vendors, particularly under Serbia's smart and "safe city" initiatives. The PRC's deepening technological engagement exists in the context of weak implementation of Serbia's data protection regulation.

Serbian political leaders have consistently praised the PRC's role in supporting their country's technological ambitions, reflecting a broader strategic partnership that now also includes military cooperation—evident in the procurement of PRC-manufactured military drones and related technology transfers. The PRC's growing technological footprint also coincides with Serbia's democratic backsliding, as evidenced by its declining democracy score and its reclassification by Freedom House in 2019 as a "transitional or hybrid regime," down from a "semi-consolidated democracy".[1] Collectively, these developments, have created an enabling environment for the emergence of digital surveillance in Serbia.

Key Findings:

- **Network infrastructure layer:** Huawei has strong ties with Telekom Srbija and partnered with it to upgrade connectivity and broadband services. It is positioned as a key partner in Serbia's 5G rollout anticipated in 2026.

- **Data infrastructure layer:** Huawei is a commercial tenant at Serbia's state-owned Kragujevac data center. It is developing an AI platform to support e-government and education services. Additionally, Huawei has independently financed a city data center in Kragujevac.

- **Device layer:**

    a. Huawei is a strategic partner in implementing "safe city" projects, installing surveillance cameras in Belgrade, Niš, and Novi Sad. Civil society organizations and journalists have raised concerns about the potential use of facial recognition technology in these devices, such as during protests. Additionally, PRC firm Nuctech has donated mobile scanners to help Serbia manage migrant movement along the Balkan Route.

    b. Serbia imported armed drones in 2019 and CH-92A drones in 2020 from the PRC, marking the first export of PRC-manufactured military aviation equipment to Europe. As an EU candidate, Serbia is not bound by the EU arms embargo against the PRC, in place since the 1989 Tiananmen Protests.

- **Application layer:** PRC technology is applied across various sectors, which include education, biotechnology, and scientific research. Huawei and NetDragon collaborate with the Serbian government on smart-education initiatives. The Serbian government and BGI work together on scientific research, industry development, public health, and precision testing.

- **Governance layer:** Serbia's non-transparent deployment of surveillance technologies and potential use of biometric surveillance raises concerns about the effectiveness of its data protection framework.

Policy Recommendations:

For EU policymakers:

- Under Executive Vice President for Tech Sovereignty, Security and Democracy Henna Virkkunen, the European Commission should use the tech stack framework to widen the 2023 technology-related risk assessment recommendations that urged member states to initiate collective risk assessments for advanced semiconductors, AI, quantum technologies, and biotechnologies to candidate countries like Serbia.

- The European Commission's Directorate-General for Enlargement and the Eastern Neighborhood (DG ENEST) should include technology-related chapters within Cluster 3 (competitiveness and growth) and Cluster 6 (external relations) of accession negotiations with candidate countries.

- The European Commission's Directorate-General for Enlargement and the Eastern Neighborhood (DG ENEST) should direct financial and technical assistance under the Instrument for Pre-accession Assistance (IPA III) to support Serbia in achieving democratic digital standards.

- Provide technical assistance through projects like the EU Technical Assistance to Civil Society Organizations in the Western Balkans and Turkey (TASCO 3) to Serbian civil society organizations tracking digital authoritarianism.

- The European External Action Service (EEAS) should prioritize strategic communication and public diplomacy to promote EU contributions to Serbia's digitalization as a counter to Serbian state-controlled media narratives that commend the PRC and Russia as donors and trading partners in the country.

For United States policymakers:

- Use the tech stack framework to develop a common operating picture of the PRC's technology threat.

- Revitalize USAID's Digital Ecosystem Country Assessments (DECA).

- Strengthen and ensure compliance of the Washington Agreement in diplomatic relations with Serbia.

- Collaborate with like-minded partners on the provision of technical assistance and scale up investment in technology projects in Serbia.

For Serbian policymakers:

- Invest in securing core technology infrastructure with the goal of attaining long-term stability and competitiveness.

- Identify and conduct risk assessments of long-term dependencies in its tech stack with a specific focus on data security.

- Mitigate risks of overdependence on PRC-manufactured technology and attract other providers by committing to regulatory provisions in EU accession negotiations.

- Commit to secure and democratic AI in the role of chair of the Global Partnership on Artificial Intelligence (GPAI).

The Tech Stack Framework: Assessing China's Technology Footprint and Associated Risks in National Technology Ecosystems

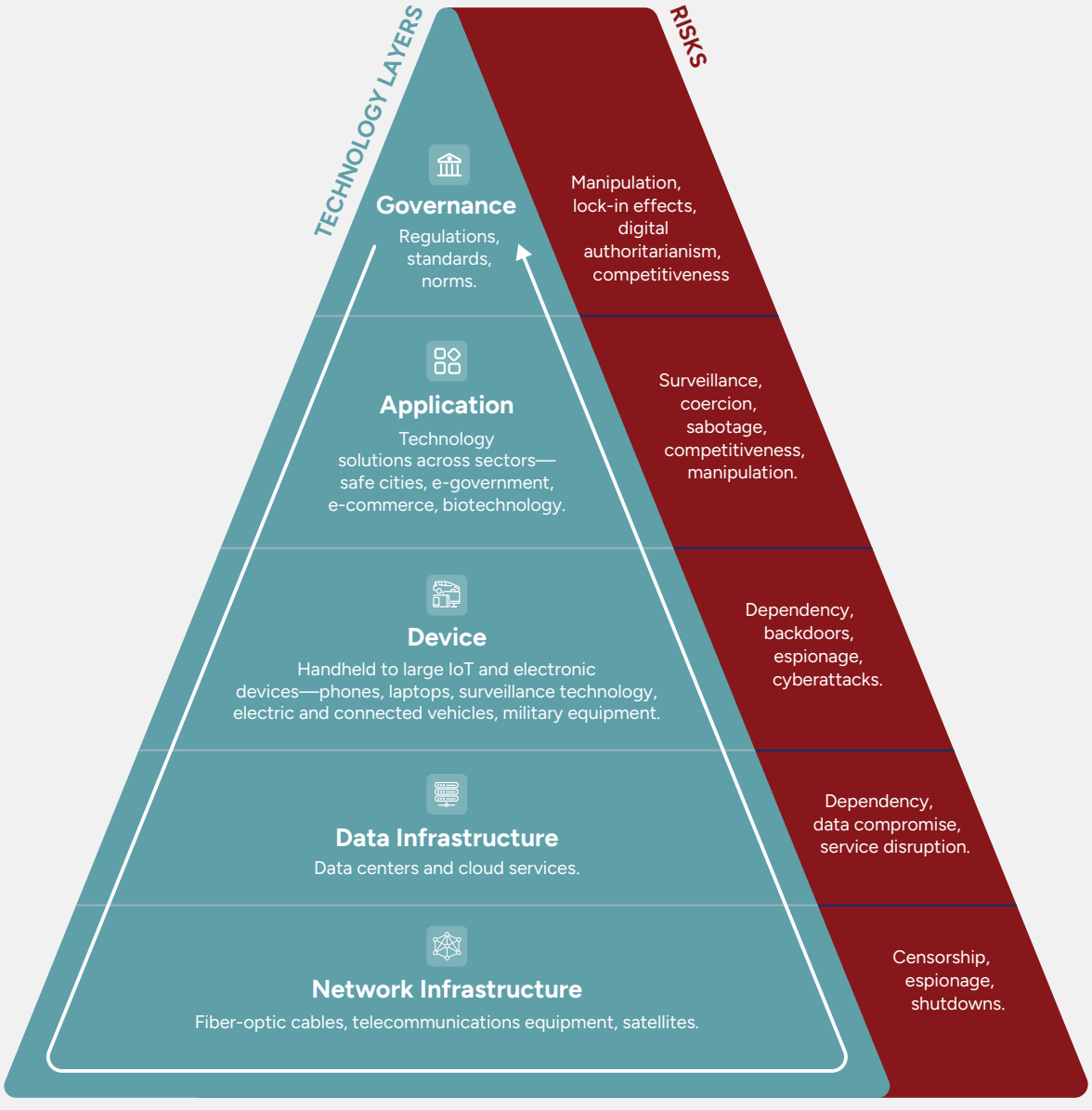

Figure 1: The tech stack framework illustrates how China's digital footprint penetrates a country's technology ecosystem and the associated risks across five layers: network infrastructure data infrastructure, device, application and governance. The framework is detailed on pages 8 and 9.

Familiar to technologists, the term "tech stack" refers to all aspects of information technology (IT) infrastructure required to deploy and manage digital applications and services: hardware and software components, databases, middleware, storage and networking.[43] In the recent past, GMF and others have transferred the concept to the policy discourse, broadening it to include the hardware, governance, and infrastructure that a country's digital systems are built on.[44]

The tech stack framework (figure 1) builds on two prior studies by GMF's Alliance for Securing Democracy program. The first, Lindsay Gorman's 2020 "Future Internet for Democracies: Contesting China's Push for Dominance in 5G, 6G, and the Internet of Everything" presented a "Future Internet technology stack" to analyze China's expanding footprint in global telecommunications, the Internet of Things, applications, and international technical standards -- and the threats it poses to the United States and its allies.[45] The second, in 2022, "China and the Digital Information Stack in the Global South" by Bryce Barros, Nathan Kohlenberg, and Etienne Soula adapted this stack framework to the digital information landscape and applied it to five country case studies: Thailand, Myanmar, Uganda, Nigeria, and Jamaica.[46]

In this analysis, the tech stack framework spans five layers to assess how the PRC and its affiliated entities penetrate and influence the breadth of a country's technology landscape: network infrastructure, data infrastructure, device, application, and governance. Each layer is examined in relation to the potential dependency or influence risks therein.

Network Infrastructure Layer: The physical infrastructure that transforms isolated computers into a vast, interconnected network defining the modern internet. It includes but is not limited to optical cables (terrestrial and undersea), telecommunications equipment, satellites, and space-based connectivity infrastructure.

Risks: Actors with malicious or autocratic intent who control network infrastructure can censor, filter, or shut down internet access, and reroute, copy, and exfiltrate data flows for espionage and surveillance purposes.

Data Infrastructure Layer: The physical infrastructure used to store, manage, access, and process data, including cloud technology and data centers. These technologies are foundational to compute-intensive applications like AI, connected devices in the Internet of Things (IoT), and smart and safe cities.

Risks: Actors with malicious or autocratic intent can abuse control over data centers and cloud infrastructure to create dependencies, compromise sensitive data, and disrupt key services.

Device Layer: The physical devices used by individuals or institutions to access the internet such as hand-held consumer devices like mobile phones, tablets, and laptops. This layer also encompasses IoT devices, such as surveillance equipment; larger devices, such as electric and connected vehicles; and equipment used in defense and law enforcement.

Risks: Actors with malicious or autocratic intent can abuse their dominance in device manufacturing to create dependencies and gain strategic leverage, while backdoors built into these devices enable data theft, cyberattacks, network infiltration, and espionage.

Application Layer: The application of technological tools, systems, and innovations to tackle sector-specific challenges and enable new capabilities. It comprises hardware, software, data analytics, and digital platforms

used to deliver tailored solutions to consumers, sectors, and industries. This layer therefore includes technology solutions that are applied across sectors like sectors like public security (surveillance systems, safe cities), digital services (e-government), education (e-learning platforms), transport (smart traffic systems), manufacturing (robotics, automation), healthcare (telemedicine, biotechnology), and consumer-facing applications (e.g. e-commerce, e-finance, social media).

Risks: Actors with malicious or autocratic intent can leverage their dominance in digital services to create strategic dependencies and gain commercial advantages. By controlling social platforms, they can surveil users, harvest data, and manipulate public discourse. Additionally, their control over critical applications enables them to disrupt or disable critical infrastructure, including energy grids, transportation networks, and financial systems.

Governance Layer: The legal and normative framework that governs technology use across the entire tech stack. It serves as a "layer of layers" and includes regulations, norms, and standards.

Risks: Actors with malicious or autocratic intent can circumvent or find loopholes in a country's data protection laws and other relevant technology-related regulations. They do this through knowledge-sharing initiatives and by influencing standards-setting bodies to institutionalize their regulatory models. Their influence on technical standards also poses cybersecurity risks, as they retain deep knowledge of system vulnerabilities, which they can exploit.

Introduction

Serbia has steadily advanced the digitalization of its government, economy, and public services over the past decade.[2] In recent years, the government has introduced strategy documents focused on digital transformation and emerging technologies.[3] In 2022, Serbia was ahead of several EU countries including Croatia, Czechia, Hungary, and Slovakia as the only upper-middle-income country in Southern Europe to be placed in the "very high" category of the United Nations' e-Government Development Index.[4] Additionally, Serbia is the only country in the Western Balkans which has published a national artificial intelligence (AI) strategy.[5]

Serbia has also prioritized digital transformation in its engagements with international partners. In 2018, it joined the European Commission's Digital Agenda for the Western Balkans, a program designed to support the region's transition to a digital economy. The agenda was one of six flagship initiatives outlined in the commission's Credible Enlargement Perspective for and Enhanced EU Engagement with the Western Balkans.[6] In 2023, Serbia joined the commission's Digital Europe Program, aimed at reducing Europe's reliance on "systems and solutions coming from other regions of the world."[7]

In addition to the EU, the PRC has emerged as a very engaged actor in Serbia's digital transformation, through its Digital Silk Road (DSR).[8] The DSR is the digital side of The PRC's Belt and Road Initiative (BRI), a massive infrastructure investment project aimed at improving connectivity, trade, and communication across Eurasia, Latin America, and Africa. In 2023, Maja Stefanovic, Serbia's ambassador to the PRC publicly stated that the DSR, with its "aim of improving digital connectivity of participant countries", is of "great interest" to Serbia.[9]

This report evaluates the PRC's technology involvement across Serbia's technology stack (hereafter referred to as "tech stack"). Building on previous GMF research, the term "tech stack" is used to examine one country's presence and penetration across another country's technology ecosystem.[10] The tech stack framework spans five layers: network infrastructure, data infrastructure, device, application, and governance.

Before delving into the details of Serbia's tech stack, the report first provides a brief overview of Serbia's domestic context and foreign relations, with a focus on Sino-Serbian relations. Next, drawing on contemporary examples, it adopts the tech stack framework to map the PRC's presence in Serbia's technology landscape. Finally, it closes with recommendations to policymakers in the EU, the United States and Serbia.

The report finds that the PRC is integrated across 4 layers of Serbia's tech stack. PRC firms are involved in upgrading the country's network (internet connectivity) and building its data infrastructure (data centers). Additionally, they are present in Serbia's tech devices market particularly in surveillance systems and consumer electronics. Additionally, PRC-manufactured technologies are applied across various sectors in Serbia, such as safe and smart cities, e-government, biotechnology, and education. This extensive engagement in Serbia's tech stack is aided by a local governance framework that adheres to EU-style data protection regulations on paper but lacks key provisions and transparency in implementation.

Serbia's Foreign Relations: Background and Contemporary Dynamics

After World War II, Serbia was one of six constituent republics in the Socialist Federal Republic of Yugoslavia, under the leadership of Josip Broz Tito.[11] In addition to the six republics, the two separate regions of Kosovo and Vojvodina held the status of autonomous provinces within the Republic of Serbia.[12] Yugoslavia adopted a socialist, one-party system but remained independent of the Soviet bloc.[13] The 1990s saw the collapse of Yugoslavia, driven by rising nationalism and economic instability. Serbia, led by Slobodan Milošević, attempted to maintain control over the remaining Yugoslav federation.[14] The Yugoslav Wars lasted from 1991 to 2001, involving Croatia, Bosnia and Herzegovina, Kosovo and Albania, as Serbia sought to retain influence over ethnically Serb populations in these countries.[15]

Serbia's role in the Yugoslav Wars led to international condemnation, sanctions, and eventual NATO intervention in 1999 during the Kosovo War.[16] With the fall of Milošević in 2000, Serbia began democratic reforms under a new leadership but remained part of the Federal Republic with Montenegro until 2006, when Montenegro voted for independence.[17] In 2008, Kosovo declared independence, which has since been recognized by the United States and most EU and NATO countries (excluding Spain, Slovakia, Cyprus, Romania, and Greece) but not by Serbia.[18] Russia and the PRC have strongly rejected Kosovo's independent status.[19]

Since 2001, Serbia has sought greater integration with the EU. In April 2008, Serbia concluded a Stabilization and Association Agreement with the EU, followed by its official application for EU membership in 2009.[20] At the same time, Serbia sought to establish relations with other major powers. In 2009, former President Boris Tadić remarked that the country's foreign policy stood on four pillars: the EU, the United States, Russia, and the PRC.[21] While Serbia continues to engage with the EU on questions of enlargement—which is supported by financial aid and diplomatic backing from Washington—it has simultaneously worked to strengthen its relations with Russia and the PRC.[22]

Russia is Serbia's primary energy partner. Russian companies Gazprom Neft and Gazprom collectively own the majority stake (50% and 6.15% respectively) in Serbia's largest energy company, Naftna Industrija Srbije (NIS). Russia also offers diplomatic support for Belgrade's position on Kosovo.[23] Although Russia does not have a military presence in Serbia, it wields considerable political and media influence, particularly through pro-government newspapers that foster anti-Western sentiment and pro-Russian narratives.[24] In a paper published by the China Observers in Central and Eastern Europe (CHOICE) consortium, Serbian foreign and security policy expert based at the Foundation BFPE for a Responsible Society (BFPE), Stefan Vladisavljev noted that, while Russia was traditionally regarded as the principal ally of Serbia, the PRC has extensively increased its presence in the country (detailed in the following section).[25]

In 2024, the EU announced its adoption of a new Enlargement Package. European Commission President Ursula von der Leyen emphasized that the tense geopolitical climate has made the unification of the European continent more compelling than ever.[26] The announcement stated that the process of enlargement will continue to be "merit-based", grounded in democracy, the rule of law, and fundamental values.[27] But Serbia has a patchy record in these categories. As shown in figure 2 since 2019, Freedom House has categorized Serbia as a "transitional or hybrid regime", reflecting its status as an electoral democracy that only meets the "minimum standards" for

its selection of national leadership.[28] According to this classification, the country's "democratic institutions are fragile" and it faces "significant challenges to protecting political rights and civil liberties".[29] Since November 2024, Serbia has seen nationwide anti-corruption protests, which put President Aleksandar Vučić's regime under enormous pressure.

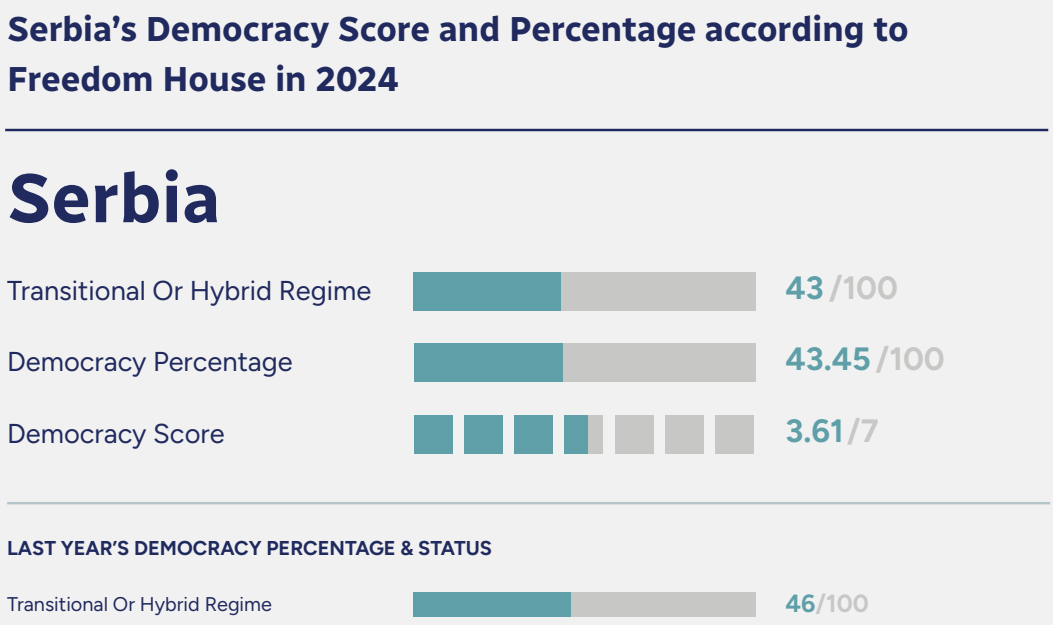

Figure 2: The ratings are based on a scale of 1 to 7, with 7 representing the highest level of democratic progress and 1 the lowest. The Democracy Score is an average of ratings for the categories tracked in a given year. The Democracy Percentage, introduced in 2020, is a translation of the Democracy Score to the 0-100 scale, where 0 equals least democratic and 100 equals most democratic.

Source: Freedom House

Sino-Serbian relations

The PRC and Serbia trace their solidarity to May 1999, when NATO accidentally bombed the PRC's embassy in Belgrade.[30] The PRC frames this as a testament to the bond between the two nations, claiming that their friendship was "forged with the blood of compatriots".[31] The two countries established a "strategic partnership" in 2009. According to Vuk Vuksanović, senior researcher at the independent Belgrade Centre for Security Policy (BCSP), Serbia's "enthusiasm" about its new strategic partnership with the PRC was not immediately reciprocated.[32] This changed in 2012 with the inauguration of the 16+1 initiative to facilitate cooperation between the PRC and Central and Eastern European countries.[33] In 2015, Serbia became a member of the PRC's BRI.[34] The following year, PRC-Serbia relations were elevated to a "comprehensive strategic partnership".[35] The two countries align on key diplomatic priorities: Serbia formally endorses the PRC's "One China" policy and supports its territorial claims to Taiwan, while the PRC does not recognize Kosovo's independence. [36]

During the PRC's leader Xi Jinping's visit to Belgrade in May 2024, the two countries reaffirmed their commitment to deepening their comprehensive strategic partnership, and to building a new "era of a community with a shared future".[37] While Serbian leaders claim that EU membership is their main strategic goal, they also have highlighted the PRC as an "important partner for Serbia".[38]

Serbia-PRC technological ties have grown alongside deepening political relations. According to Vuksanović, the technological partnership between the PRC and Serbia is a "striking domain of cooperation between Beijing and Belgrade".[39] He notes that Belgrade relies on PRC technology companies to improve Serbia's technological infrastructure, with the desired result of a modernized and competitive economy.[40] Further, as Heather Conley and others explain in their 2020 report for the Center for Strategic and International Studies, Serbia serves as a strategic foothold for the PRC in the EU's semi-periphery. This allows the PRC to make substantial investments without facing EU regulatory constraints and to demonstrate its technological and infrastructure projects to neighboring countries that are keen on such investments.[41] Additionally, according to Vladimir Vučković, professor at Masaryk University, given its geographic location, Serbia also serves as a "springboard" for the PRC to market its technologies to EU countries.[42]

China in Serbia's Tech Stack

The PRC's involvement in Serbia's digital transformation predates the formal launch of its DSR initiative in 2015.[47] The two countries signed a framework agreement on economic, technological, and infrastructure cooperation in 2009.[48] Further, as BFPE's Vladisavljev observes, the DSR's footprint in Serbia has expanded across multiple domains, including the security sector, local governance, technology and innovation, and the broader IT industry.[49] The following analysis examines the PRC's presence in Serbia through the tech stack framework discussed above (pg 9 & 10).

Network Infrastructure Layer

Serbia shares borders with four EU member states—twice as many as any other Western Balkan country. Additionally, Croatia, one of these neighboring countries, hosts two of the three submarine cables that connect the region to the global internet infrastructure.[50] This proximity has facilitated closer connectivity with the EU: Serbia is the only Western Balkan nation included in the EU's 5G Public-Private Initiative, a joint initiative between the EU and EU industry.[51] It also serves as a regional hub for internet traffic with a high density of internet exchange points.[52] These connectivity advantages have positioned Serbia as a valuable "springboard" for the PRC to market its technologies toward the EU.[53]

Market shares of economic entities by number of subscribers in the second quarter of 2024

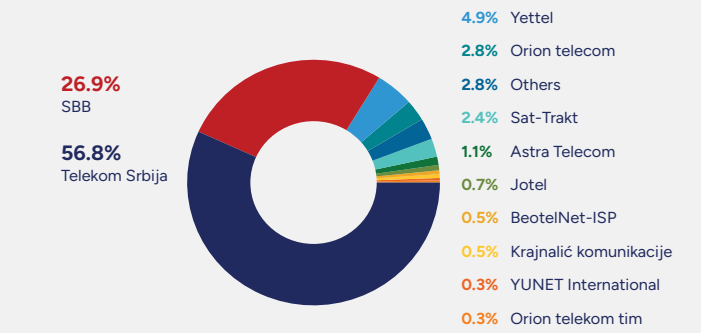

Figure 3
Source: RATEL, Regulatory Authority for Electronic Communications and Postal Services, Republic of Serbia

According to USAID's Digital Ecosystem Country Assessment (DECA) 2021, Serbia's connectivity infrastructure bears the legacy of its communist past in remaining significantly state-owned.[54] Telekom Srbija, a government-owned enterprise, dominates the country's connectivity ecosystem, alongside major private operators like Telenor, A1 (formerly VIP Mobile), and Serbia Broadband.[55] As of the second quarter of 2024, Telekom Srbija was Serbia's largest internet service provider (ISP) with a market share of 56.8% for broadband internet (figure 3). It is also the largest mobile operator with a market share of 44.06% (figure 4).[56] Initially, its broadband services ran on a robust copper telephone network via digital subscriber line (DSL) technology, later expanding to cable lines originally installed for television connectivity.[57] In recent years, the company has accelerated the development of its fiber-optic network.[58] Telekom Srbija and Telenor provide extensive network coverage across Serbia, complemented by a network from the state-run power utility, Elektroprivreda Srbije.[59] A 2015 study by the Belgrade-based digital rights non-profit SHARE Foundation noted the high degree of centralization of Telekom Srbija's network, with most main nodes and routers linked to just two primary servers.[60]

In 2024, Freedom House described Serbia's internet service as "generally reliable", and noted that the internet penetration rate had increased in recent years.[61] Data from the Statistical Office of Serbia shows that as of 2023, 85.6% of Serbian households had an internet connection,[62] a figure confirmed by data from the International Telecommunication Union (ITU).[63] Further, the ITU records a mobile broadband penetration rate of 114%, indicating more subscriptions than people, and a fixed-line broadband penetration rate of 31.3%.[64] While most users rely on DSL connections, 4G mobile internet technology is widely available across the country.[65]

Market share of economic entities according to the number of active users

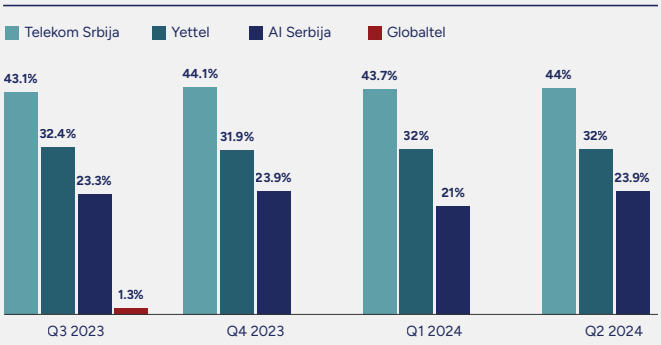

Figure 4

Source: RATEL, Regulatory Authority for Electronic Communications and Postal Services, Republic of Serbia

Note: The numbers in this graph have been rounded off to the first decimal point

According to the International Trade Administration's (ITA) 2024 assessment, while most of the major Western telecommunications providers (such as Nokia, Ericsson, Cisco, Siemens, and Juniper) are present in Serbia, Huawei stands out as a significant contractor, supplier, and advisor.[66] Further, ITA states that Huawei has "solid status within state-owned companies such as Telekom Srbija, and strong political ties with the government", while PRC company ZTE has also started to position itself in the market.[67]

In 2016, Telekom Srbija and Huawei launched a three-year, €150 million All-IP (internet protocol) transformation project to upgrade Serbia's landline network.[68] Since 2017, Serbia has strengthened its strategic partnership with Huawei through two nonbinding agreements aimed at advancing smart cities and broadband internet service.[69] In 2019, Huawei also collaborated with Telenor (rebranded as Yettel in 2022), a privately owned mobile, fixed, internet, and IPTV provider, with the goal to establish the country's first 5G base station at the Science-Technology Park in Belgrade.[70]

Vladisavljev noted that the Huawei-Telekom Srbija partnership positions Huawei as a key player in Serbia's telecom development.[71] The 2021 Pandora Papers leak, published by the International Consortium of Investigative Journalists, noted that contracts between Huawei and Telekom Srbija dated back to 2007.[72] Serbian leaders have publicly praised Huawei, describing it as one of the "biggest and best" with "an immense role in the digital transformation of [Serbia's] economy."[73] The company also claims to be "one of the most important partners of the Government of the Republic of Serbia", with a collaboration based on "innovation, creativity, research, and development".[74]

Serbia has not joined Washington's 2020 Clean Network Initiative, which, according to the US Department of State, aimed to secure "assets including citizens' privacy and companies' most sensitive information" from "malign actors such as the Chinese Communist Party."[75] As part of the US-brokered Washington Agreement between Serbia and Kosovo in 2020, however, both parties agreed to prohibit the use of 5G equipment from "untrusted vendors", a clear reference to PRC vendors Huawei and ZTE.[76] Despite the agreement, in an article published by the European Council on Foreign Relations (ECFR) foreign and security policy experts Majda Ruge, senior policy fellow at ECFR and Stefan Vladisavljev observed that the signed document omitted a clause that

was present in the first draft of the document that would have established a five-year deadline for removing 5G equipment from untrusted vendors.[77] This deletion, they noted, implied that Serbia would not commit to a deadline and was instead opting to buy time to assess how the deal would progress.[78] Additionally, Belgrade sought to proactively mitigate fallout with Beijing because of the deal. Shortly after the Washington meeting, Vučić met with the PRC's ambassador to Serbia, and just ten days later, Huawei opened its Digitalization and Innovation Centre in Belgrade.[79] The event was attended by Prime Minister Ana Brnabić, who noted that "[m]any things [were] being prepared with Huawei" and "Serbia is not interested in unreliable technologies either, on the contrary, it is in the interest of the tender for the introduction of the 5G network to be open and transparent, while respecting international standards, which includes the agreement from Washington".[80]

Serbia is yet to introduce 5G in the country. One interviewee noted that Serbia's 5G rollout has been delayed. The interviewee stated that while some 5G towers are operational or under construction in high-tech parks, the government is yet to pass certain regulations, such as a rulebook on the minimum conditions for issuing individual licenses for the use of the radio frequency spectrum allocations through a public bidding process.[81]

Eagerly awaiting these allocations, Telekom Srbija expects full 5G coverage across Serbia by 2027.[82] Its CEO has highlighted the company's readiness for 5G deployment, having acquired base stations from Ericsson and Nokia, and has emphasized its importance for AI-driven innovation.[83] The company is also collaborating with Vodafone to explore new services.[84] In late 2024, Minister of Information and Telecommunications Dejan Ristić announced the launch of a formal procedure for 5G deployment, starting with the rulebook and a 30-day public consultation.[85] The ministry expects Serbia's Regulatory Authority for Electronic Communications and Postal Services (RATEL) to complete the bidding process for frequency allocation by mid-2025.[86] An interviewee noted that similar announcements have been made since 2021, and that the delay is damaging for Serbia's long-term competitiveness.

At present, despite statements by Telekom Srbija's CEO regarding the acquisition of base stations from Ericsson and Nokia, there is no guarantee that Huawei or other vendors described as "untrusted" in the 2020 Washington Agreement will be excluded from Serbia's 5G plans. Writing in 2020, soon after the Washington Agreement was signed, Ruge and Vladisavljev noted that "there is an informal understanding between Belgrade and Beijing that Huawei will be the main partner of Telekom Srbija for the installation of 5G infrastructure".[87] An interviewee confirmed that this statement is likely to still hold today and if so, could adversely affect Serbia's current relations with the United States under President Trump, given his first administration's push to exclude Huawei in Serbia.

Data Infrastructure Layer

The Serbian government has prioritized digitalization and e-government by investing in national data infrastructure.[88] Between 2017 and 2020, Serbia established two national data centers: one in Belgrade and another in Kragujevac.[89] The first center was built in partnership with Telekom Srbija and inaugurated in 2017.[90] Located within the premises of Serbia's Office for IT and eGovernment, it serves as a hub for storing data and hosting equipment for state institutions, including the Office for IT and eGovernment, the Ministry of State Administration and Local Self-Government, the Central Registry of Compulsory Social Security, and the Ministry of Agriculture, Forestry, and Water Economy.[91]

The state data center in Kragujevac was established in 2020. According to the ITA, it hosts "key information and communication infrastructure for the country".[92] The government's 2023-25 e-Government Development Program and Action Plan Proposal noted that the data center enables the development of a state cloud, which contributes to lower costs of development and maintenance of the ICT system for the entire public administration, and once fully established, would provide unified services to all public administration bodies.[93] The data center also functions as a safe location for backup data storage and applications located in the State Data Management and Storage Centre in Belgrade.[94] The Serbian government noted that value of the project was €30 million.[95] A 2019 loan appraisal document from the World Bank pursuant to its Serbia—Enabling Digital Governance Project noted that the data center would receive technical support from UNDP in 2019 and 2020.[96]

While IBM was the first commercial tenant of the Kragujevac state data center, Huawei also signed an agreement with Serbia's Office for Information Technologies and eGovernment to become another commercial user in 2020.[97] At the opening of the Kragujevac state data center, Mihailo Jovanović, the director of the Office for IT and eGovernment, noted that Huawei's decision to use the data center was "of great importance" to the country and that it is "proof of how much a large global IT company like Huawei believes in Serbia".[98] Further, he noted that Huawei would expand the amount of equipment and data it stores in Serbia and will provide as many services as possible in the countries of the region and the whole of Europe".[99] Huawei also provides cloud infrastructure to the national data center.[100] Additionally, Huawei independently financed a city data center in Kragujevac, with a $2 million grant for required equipment.[101]

Recently, Jovanović announced plans for a second block of the Kragujevac state data center, with a capacity of up to 16 megawatts, alongside the procurement of a new supercomputer for AI development, which will be the largest in Southeastern Europe.[102] When launching a new innovation district in Kragujevac in early 2024, Prime Minister Ana Brnabić stated that this development "will contribute to an even better image of Serbia in the world and be an important incentive for potential investors, new jobs, and additional economic value".[103] Given the government's focus on digitalization, industry analysts expect the country's data center market to grow, especially as there is a growing demand for cloud computing services from Serbian businesses and e-commerce platforms.[104] In terms of international private sector data center providers, Statista records indicate (figure 5) that as of 2022, Huawei had the second-largest market share (11%) in Serbia's data center market, behind Fujitsu (13%).[105]

In August 2023, the Serbian government announced plans to centralize healthcare data storage and connect the state data centers in Belgrade and Kragujevac.[106] The consolidation of all healthcare data into a unified, centralized registry began in 2024.[107] A 2023 report by Balkan Insight, however, noted the

Key Players in Serbia's Data Centre Market in 2022

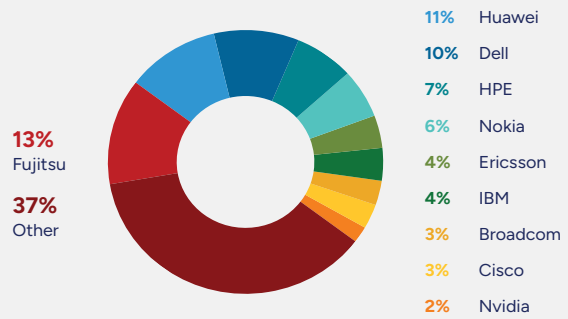

Figure 5
Source: Statista Market Insights

lack of clarity about what data is stored in Serbia's state data centers.[108] The report also raised concerns about the "political side of potential abuses", which centralizing databases could entail, such as the "introduction of new digital surveillance systems".[109]

Though one of many players in Serbia's data center market, Huawei's prominence must be assessed in light of the government's data centralization efforts. According to Huawei's website, its independently financed city data center in Kragujevac stores information related to city administration, public companies, and institutions, and connects to national databases.[110] When coupled with public statements from government officials, this description speaks to a meaningful presence within Serbia's national data infrastructure.

Device Layer

While PRC firms are some of the many players involved in Serbia's network and data infrastructure, their presence in the device layer is especially pronounced. The technology areas below illustrate the growing prominence of PRC-manufactured devices and equipment in Serbia.

Surveillance Devices: Investigative news outlets such as Radio Free Europe/Radio Liberty (RFE/RL), Balkan Insight and BIRN (Balkan Investigative Reporting Network) have highlighted the use and growth of PRC-manufactured surveillance devices in recent years in Serbia.[111] In 2019, the minister of interior announced plans to install 1,000 cameras across Belgrade. Huawei was not named in the announcement as the equipment supplier, but its official website (archived by the SHARE foundation) touted the deployment of its Safe City Solution in Belgrade (discussed below).[112] The website noted that "Huawei's project team deployed more than 100 High-Definition (HD) cameras and intelligent Video Content Management (VCM) system at more than 60 sites in key areas, and remodeled the command and data center in Belgrade."[113] According to the SHARE Foundation, this website was deleted shortly after the 2019 announcement.[114] SHARE's attempts to discern the equipment supplier and procurement process through freedom of information requests were unsuccessful, with the ministry responding that all documents on the public procurement of video surveillance equipment in Belgrade were protected as "confidential".[115]

The presence of these devices is not limited to Belgrade. According to a 2023 RFE/RL investigation, PRC-manufactured video surveillance devices are used across cities, towns and villages, some as small as central Osecina, with a population of not more than 2,700 people.[116] The investigation found that the expansion of PRC-manufactured surveillance cameras was financed from local budgets and not Belgrade's central budget under the auspices of Serbia's Interior Ministry.[117] The report further noted that municipalities and cities "appear to be moving forward with an arrangement in which the local municipality buys the equipment from its budget but [the equipment] is used by the Interior Ministry".[118] RFE/RL found that 42 local governments awarded contracts exclusively to Macchina Security, a Serbian company that has won tenders and imported PRC-manufactured surveillance technology in recent years.[119] Additionally, the report highlighted that the Interior Ministry declined to comment on how this equipment is used.[120]

In early 2024, BIRN revealed that video surveillance systems with facial recognition capabilities are used in schools, kindergartens, and student dormitories, as well as public spaces like streets, markets, parks, squares,

municipal buildings, and public companies across Serbia.[121] The report noted that "equipment from Chinese manufacturers, such as Dahua and Hikvision, predominates in all of these cases".[122]

Unmanned Aerial Devices: According to BIRN, Serbia's Ministry of the Interior has purchased advanced unmanned aerial vehicles (UAVs) from PRC manufacturers DJI and Yuneec, as well as from the Romanian company Hirrus.[123] Some of these UAV models come equipped with high-quality video recording capabilities and powerful zoom functions, allowing them to capture facial images from long distances.[124] Although Serbian law prohibits the use of biometric systems for public surveillance, in a report for the news outlet Biometric Update, former Commissioner for Personal Data Protection in Serbia, Rodoljub Šabić, noted the potential for misuse. He warned that police drones with advanced technology could be exploited for tracking not just criminals but also political opponents, civil society representatives, and critically inclined journalists.[125]

Border Control Equipment: In October 2023, Serbia's Interior Ministry announced the acquisition of mobile scanners from the PRC firm Nuctech to assist in managing the growing number of migrants passing through the Balkan Route.[126] Nuctech is a partially state-owned company in the PRC that produces X-ray machines, explosive detection systems, and biometric scanners.[127] According to RFE/RL, Serbia has been buying Nuctech equipment since 2009.[128] In 2022, Associated Press reported that Serbia owed Nuctech $9.1 million for the border control equipment.[129] Nuctech is on the US Department of Commerce's Entity List, which controls commerce with named entities. According to the US Federal Register, Nuctech's "lower-performing equipment, impair U.S. efforts to counter illicit international trafficking in nuclear and other radioactive materials. Lower performing equipment means less stringent cargo screening, raising the risk of proliferation."[130] Western security officials and policymakers have expressed concerns that the PRC might use Nuctech equipment to sabotage critical transit points or gain unauthorized access to sensitive government, industrial, or personal data from items passing through its devices.[131] In a report for the Associated Press, Bart Groothuis, former director of cybersecurity at the Ministry of Defense of the Netherlands and current member of the European Parliament, emphasized that the data processed by Nuctech devices includes personal, military, and cargo information, as well as trade secrets.[132]

Defense Technology: Over the better part of the past decade, Serbia's relations with the PRC have taken on an important military dimension.[133] In September 2019, Serbia bought nine armed drones from the PRC company AVIC—the PRC's largest military sale to Europe at the time.[134] RFE/RL reported that in 2020, Serbia imported CH-92A drones from the PRC worth $19.3 million.[135] The drones are manufactured by the state-owned China Aerospace Science and Technology Corporation (CASC).[136] The PRC's shipment of drones to Serbia was its first export of military aviation equipment to Europe. Not being a member state, Serbia is not a party to the EU's arms embargo against the PRC, in effect since the since the suppression of the Tiananmen Protests in 1989.[137] In an interview with the Communist Party of China (CCP)'s daily tabloid Global Times in October 2023, Defense Minister Milos Vučević held that, "The delivery of weapons and equipment from the PRC has attracted public attention globally, but what is most important and what should be highlighted is that the Serbian Armed Forces are strengthening significantly thanks to the modern weapons and equipment, and are thus acquiring capabilities that they did not have before."[138] In addition to preexisting PRC-Serbia military transactions, Nikkei Asia reported that amid heightened security tensions with Kosovo in 2023, Serbia's military turned to PRC arms suppliers to fill the gap left by Russian defense companies, which focused on equipping their own forces for the war in Ukraine.[139]

Consumer Technology and Education Equipment: According to Statista, PRC manufactures Lenovo, Huawei, and Xiaomi were prevalent in Serbia's laptop and smartphone markets as of 2024.[140] Lenovo and Huawei occupy

27% and 9% of the market share in laptops, and Xiaomi occupies 33% of the market share in smartphones.[141] Beyond consumer technology, Huawei's corporate social responsibility programs have donated interactive whiteboards to elementary schools in Serbia.[142] During a visit to Vuk Karadžić Elementary School in Lovćenac, Vojvodina, President Vučić highlighted how Huawei's initiative helps modernize Serbia's educational system.[143]

Application Layer

PRC-manufactured technology is present in physical devices and equipment, and it is also integrated into a wide range of sectors and applications throughout Serbia, ranging from safe cities to e-government, education, and biotechnology.

"Safe city" applications: Huawei is a strategic partner for the implementation of "safe city" projects in Belgrade, Niš, and Novi Sad.[144] Discussions between Serbia's Ministry of Interior and Huawei about implementing the "Safe Society" project (formerly "Safe City") began in 2011, followed by a memorandum of understanding (MoU) in 2017.[145] That year, the ministry made its first major public announcement on the installation of a smart surveillance system in Serbia, which would include facial recognition software. Two years later, Minister of Interior Nebojša Stefanović announced the installation of 1,000 surveillance cameras in 800 locations in Belgrade, without naming the equipment provider.[146] At that time, the official Huawei website had the complete description of the "safe city" project, which was deleted shortly afterwards, but the Share Foundation had archived the website.[147] As part of the first phase of Huawei's "safe city" solution in Serbia, Huawei's official website noted that "A large number of advanced technologies and products were used, including infrared license plate recognition, 4K video solutions, H.265 HD encoding, cloud-based cluster networking, SafeVideo to ensure data security, and virtual checkpoint systems."[148] According to a report published by Germany's Heinrich Böll Stiftung (HBS), as of early 2021, Belgrade was on track to become the first capital in Europe, where public spaces were almost entirely covered by cameras equipped with biometric technology for mass surveillance.[149] The HBS report noted that despite lacking necessary legal clearances required under Serbia's Law on Personal Data Protection (discussed in the following section), the cameras were still being used in Belgrade.[150]

E-government: In 2019, Serbia signed an MoU with Huawei to develop an AI platform for the development of e-government services. The project was supported by an €11.7 grant from the China International Development Cooperation Agency. The grant was used to purchase Huawei cloud infrastructure for the Kragujevac State Data Centre.[151]

Education: In 2020, NetDragon, a PRC company specialized in online gaming, mobile internet platforms, and educational technology signed an MoU for a smart-education initiative with Serbia's Ministry of Education, Science, and Technological Development. Through this project, NetDragon would employ cloud computing and AI to create a national education management system and develop a smart-education demonstration center.[152] NetDragon announced that it would also integrate education solutions such as ActivPanel and smart classrooms to build a digital learning platform.[153] The company also helped establish a Centre for Robotics and AI in Education (CRAIE) in Belgrade. CRAIE falls directly under Serbia's Ministry of Education.[154]

Biotechnology: In December 2021, in partnership with BGI (formerly Beijing Genomics Institute), Serbia established its first genome sequencing center—the Centre for Genome Sequencing and Bioinformatics—at the

state-run Institute of Molecular Genetics and Genetic Engineering.[155] Prime Minister Brnabić attended the launch of the center, noting Serbia's cooperation with BGI to build two "Fire Eye" laboratories for PCR testing of samples for coronavirus.[156] BGI's website noted that the center's new facilities "enabled it to apply for European-scale projects, such as the Horizon Europe Program".[157] In 2022, RFE/RL reported that Brnabic and BGI representatives announced that BGI will play "a central role" in a new project in the Serbian capital that was scheduled to open the following year.[158] The project in question was the establishment of the "BIO4 campus", which would serve as a hub for biomedicine and biotechnology research.[159] BGI is one of the corporations, alongside Pfizer, AstraZeneca, Roche, and others, that have signed MoUs with the Serbian government at its BIO4 campus.[160] In 2023, the Ministry of Health and BGI agreed to collaborate on scientific research, industry development, public health, and precision testing.[161] According to BGI's website, the cooperation was meant to "further strengthen the fields of bioinformatics, spatio-temporal omics, synthetic biology, and initiate cooperation in fields such as new medical diagnostic technologies".[162] Both parties also agreed to promote genomics testing in the clinical field, which included using BGI's DNA-based testing technology.[163] According to an RFE/RL report, the data gathered at the center, including results from prenatal screenings, was exclusively stored at the state data center in Kragujevac.[164] In 2023, several BGI entities were added to the US Department of Commerce's Entity List based on information that their collection and analysis of genetic data posed a significant risk of contributing to monitoring and surveillance by the PRC, and of being diverted to its military programs.[165]

Governance Layer

To contextualize PRC firms' technological presence in Serbia's tech stack, it is crucial to understand how Serbia's technology governance has either facilitated this presence or has the potential to do so in the future. This section focuses on three aspects of governance: data protection, biometric surveillance, and AI strategy.

Data Protection: Reflecting the influence of the "Brussels Effect", Serbia leans toward EU-style regulations on data protection—at least in principle.[166] Serbia's Data Protection Law (DP law), which combines the EU's General Data Protection Regulation (GDPR) and Law Enforcement Directive, was enacted in November 2018 and came into effect in August 2019.[167] In 2020, Serbia also ratified the Council of Europe's Convention 108+, which is the only legally binding international treaty on the protection of personal data.[168] The SHARE Foundation's Bojan Perkov notes that Serbia's DP law "closely follows the EU's GDPR almost to the point of literal translation into Serbian".[169] In a report for Balkan Insight, privacy protection expert and executive director at Partners for Democratic Change Serbia Ana Toskić Cvetinović noted that the law has, in part, strengthened Serbia's legal framework for personal data protection by imposing stricter obligations on data controllers and processors, while also granting new rights to citizens whose personal data is collected or processed.[170] These include the rights of access to data; to rectification; to have incomplete personal data completed; to erasure, restriction, and data portability; to object; and to withdraw consent.[171] Yet Toskić Cvetinović has observed that these "novelties" have not fully taken root in practice.[172] She observed that Serbia's state administration, which processes vast amounts of personal data, faces genuine challenges in implementing adequate protection measures.[173] Additionally, she observed that the rapid digitalization of public services in Serbia, without adequate technical infrastructure and human capacities, has the potential to risk to citizens' rights.[174]

According to the European Commission's 2024 candidate country assessment, Serbia's DP law has been "insufficient" and "difficult to implement".[175] As seen in figure 6, the assessment noted a consistently low level of complaints received, decisions made, sanctions imposed, and declarations on data breaches between 2022

and 2024.[176] On their website, Serbia-based data protection lawyers Marija Vlajkovic and Andrija Saric highlight key differences between the GDPR and Serbia's DP law that contribute to implementation challenges.[177] They note that the DP law lacks the GDPR's preamble, which is central to its interpretation as it specifies key attributes pertaining to the law, such as the right to personal data protection in relation, to other fundamental rights.[178] Additionally, Vlajkovic and Saric highlight that Serbia's DP law

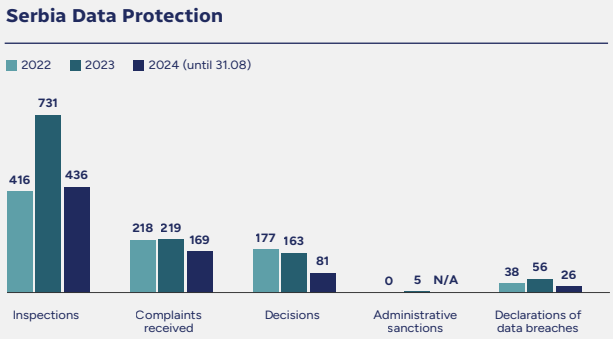

Figure 6

Source: Serbian Data Protection Authority, cited in the European Commission Staff Working Document on Serbia, 2024

lacks clear procedural provisions for the Commissioner for Information of Public Importance and Personal Data protection.[179] Further, as also noted by the European Commission's assessment, the commissioner's office remains under-resourced.[180] Lastly, the penalty framework of the DP law also diminishes its impact. Capped at approximately €17,000, penalties are far lower than the GDPR's penalties (up to €2 million or to 4% of a company's global annual turnover), reducing the incentive for companies in Serbia to invest in compliance.[181]

In an interview for this project, the former commissioner for personal data protection, Rodoljub Šabić, highlighted the flaws in Serbia's implementation of GDPR-like regulations. Šabić observed that Serbia lacks a legal framework for regulating intelligence surveillance and falls short of EU standards on privacy and civil liberties. In an article for Internet Policy Review, SHARE's Perkov noted that in Serbia, the DP law was approached as a box-ticking exercise to enter the EU.[182] Perkov pointed out crucial omissions in the law, which in practice means that state institutions or private companies processing personal data may arbitrarily restrict citizens' rights as data subjects.[183] In 2023, Serbia adopted a Data Protection Strategy for 2023-2030 to improve the implementation of data protection. As the EU's 2024 assessment notes, however, an action plan to do so has not been adopted.[184]

These challenges are amplified in the Serbian context, where, as Perkov observes, there is not "a high level of privacy culture".[185] In September 2023, the Internet Freedom Platform of Eastern and Central Europe and Eurasia, a body established by regional civil society organizations, noted that the Serbian public is insufficiently informed on privacy rights and the legal mechanisms available for protection of their data.[186] According to a public perception survey by the OSCE in 2020, 77% of Serbia's citizens said that the risk of misuse of personal data is somewhat or very high, while 64% said that citizens are not aware of their rights to personal data protection. Additionally, half of the respondents said that the available information on personal data protection is not clear at all or only to some extent.[187] Furthermore, *Šabić* also observed that some segments of Serbian society view surveillance as acceptable, believing that "a common person has nothing to hide"—a mindset he equated to dismissing free speech simply because one "has nothing to say".

Biometric Surveillance: Serbia's DP law does not cover video surveillance, which is a crucial aspect of personal-data processing.[188] This is especially important in the Serbian context, where, as discussed above, surveillance devices with "safe city" applications are used across the country. In a BIRN commentary, Maja Bjeloš, senior researcher at BCSP, stressed that in Serbia's current political context, the introduction of mass biometric surveillance remains the "greatest threat to privacy and data protection".[189] She highlighted that "China-style smart cameras (and base stations) spring up after every protest in Serbia".[190]

In 2021, the Serbian government attempted to pass a bill that would legalize biometric surveillance in the country, which according to SHARE foundation would have risked making it "the first European country conducting permanent indiscriminate surveillance of citizens in public spaces."[191] SHARE warned that the law would give the police access to technologies that would be intrusive to citizens' privacy, with severe consequences for human rights and freedoms, and a profound impact on democratic society.[192] Relatedly, BCSP issued a statement that the bill would be "entirely contradictory with European standards and the Law on Personal Data Protection (Serbia's Data Protection law)".[193] The bill was withdrawn after major public dissatisfaction. The government attempted to pass the law again in 2022, but the draft was withdrawn following discussions that involved experts and the general public.[194] Still, concerns of the potential use of biometric surveillance by law enforcement remain. In 2024, an Amnesty International report on digital surveillance in Serbia found that a previously unknown spyware it termed "NoviSpy" was installed on an independent journalist's phone by Serbian police when he was brought into a police station after a "seemingly routine traffic stop".[195]

AI Strategy: Serbia's first national AI Strategy, adopted in 2020 for the period 2022 to 2025, demonstrated alignment with the EU. The strategy stated: "The Republic of Serbia, as a candidate for EU membership, but also as a participant in the European Union Framework Program for Research and Innovation, seeks to provide the necessary extent of compliance with the European Union, which will enable full integration into the European Research Area and closer cooperation."[196] Serbia's AI agenda also benefits from support by the UNDP.[197] An interviewee highlighted that Serbia's first AI Strategy emerged from an inclusive process involving a range of stakeholders, including citizens, academics, and the business community. Despite this open process, the interviewee also noted that these developments may stand at odds with the PRC's technological involvement in Serbia. This is particularly relevant given the emphasis on AI during Xi Jinping's visit to Belgrade in May 2024.[198] Xi held that the PRC is "ready to work with Serbia to strengthen cooperation on AI".[199] He further stated: "It is important for China and Serbia to jointly reject hegemonism and power politics and oppose bloc politics or bloc confrontation."[200]

In January 2025, Serbia released an updated version of its AI strategy.[201] At a time of enhanced global visibility for Serbia as the elected chair of the Global Partnership on Artificial Intelligence (GPAI), the new strategy expresses its ambition to become a leader in the field of AI within Southeastern Europe.[202] It also notes that it adheres to UNESCO guidelines and EU recommendations on ethical AI, and that a working group has been formed to prepare Serbia's Law on Artificial Intelligence.[203] But as noted by Andrijana Ristić of the SHARE Foundation, the strategy primarily focuses on the development of AI, with risks a background concern. For instance, regarding AI's application in the public sector, even for high-risk systems the updated strategy only specifies that "consideration" will be given to assessing the impact, rather than outlining more robust or specific measures pertaining to AI safety.[204]

Conclusion and Key Findings

Through the case of Serbia, this report has aimed to illustrate the how the PRC's DSR is unfolding in the EU's immediate neighborhood. The report has shown that the PRC and its affiliated entities have become central to Serbia's rapid digitalization and modernization of its technology ecosystem and are now embedded across multiple layers of Serbia's tech stack. The PRC's deepening technological engagement exists in the context of weak implementation of Serbia's data protection laws.

The key findings in this analysis are listed below, followed by recommendations for policymakers in the EU, the United States and Serbia.

1. **Huawei plays a prominent role in upgrading Serbia's network infrastructure.** Huawei plays a key role in Serbia's network and broadband infrastructure, notably through its partnership with state-owned Telekom Srbija, the country's largest internet service provider (ISP). Huawei is also positioned as a key partner in Serbia's 5G rollout anticipated in 2026.

2. **Huawei is present in Serbia's national and municipal data center infrastructure.** Huawei uses Serbia's state-owned Kragujevac data center as a commercial tenant and is seeking to develop an AI platform for Serbia. The platform will focus on enabling the development of services such as e-government and education, by providing cloud infrastructure to the Kragujevac state data center. Huawei has also independently financed a city data center in Kragujevac.

3. **Huawei is a strategic partner for "safe city" projects in Serbia.** Huawei is a strategic partner for the implementation of "safe city" projects, which have involved setting up surveillance cameras in Belgrade and other cities like Niš and Novi Sad. Civil society organizations and investigative journalists have raised concerns about facial recognition technology in some surveillance devices and its possible use by law enforcement during protests. PRC surveillance firm Nuctech has donated mobile scanners to help Serbia manage migrant movement along the Balkan Route.

4. **Serbia imports defense technology from the PRC.** Serbia has imported armed drones (2019) and CH-92A drones (2020) from the PRC. Its 2020 purchase marked the first export of military aviation equipment from the PRC into Europe. Not being a member state, Serbia does not have to abide by the EU arms embargo against the PRC.

5. **PRC's technology engagement in Serbia extends to education biotechnology, and scientific research.** Huawei and PRC company NetDragon are working with Serbia's government on smart-education initiatives. The government and BGI (formerly Beijing Genomics Institute) collaborate on scientific research, industry development, public health, and precision testing.

6. **The Brussels Effect has not been effective in Serbia.** Serbia's nontransparent deployment of surveillance technologies and potential use of biometric surveillance raises concerns about the effectiveness of its data protection framework. Although Serbia has adopted GDPR-inspired data protection laws, they are insufficient and ineffectively implemented. Successful enforcement hinges on the independence of local monitoring institutions, which is not always assured in the Serbian context.

Policy Recommendations

To EU Policymakers

1. **Extend the 2023 technology-related risk-assessment recommendations to candidate countries.** Under Executive Vice President for Tech Sovereignty, Security and Democracy Henna Virkkunen, the European Commission should utilize the tech stack framework to broaden the 2023 risk-assessment recommendations to candidate countries. These recommendations request the commission and member states to initiate collective risk assessments for advanced semiconductors, AI, quantum technologies, and biotechnologies. The tech stack framework can inform de-risking priorities by accounting for the layering of technologies and the resulting dependencies.

2. **Include technology-related chapters in the EU's accession negotiations with candidate countries.** The European Commission's Directorate-General for Enlargement and the Eastern Neighborhood (DG ENEST) should include technology-focused chapters within Cluster 3 (competitiveness and growth) and Cluster 6 (external relations) of EU accession negotiations, with the aim of assessing:

    - whether and to what extent candidate countries' digital transformations are enabling autocratic practices (Cluster 3) and;

    - whether identified technological dependencies would undermine long-term alignment with the EU's Common Foreign and Security Policy (Cluster 6).

3. **The European Commission's Directorate-General for Enlargement and the Eastern Neighborhood should direct its financial and technical assistance under the Instrument for Pre-accession Assistance (IPA III) to support Serbia in achieving democratic digital standards by**:

    - Enhancing data protection implementation: Focus assistance on strengthening the enforcement of Serbia's data protection framework, including building the institutional capacity of the Office of the Commissioner for Information of Public Importance and Personal Data Protection.

    - Advancing integration into the Digital Single Market (DSM): Prioritize Serbia's alignment with the DSM to foster convergence with EU regulatory, normative, and human rights standards in the digital sphere. The EU should, however, only proceed after conducting a thorough technical risk assessment of Serbia's tech stack.

4. **Provide technical assistance to Serbian civil society organizations tracking digital authoritarianism.**The EU should prioritize funding civil society organizations, researchers, academics, and investigative journalists who have highlighted the use of PRC-manufactured surveillance devices in Serbian society through projects such as EU-TASCO 3 (EU Technical Assistance to Civil Society Organizations in the Western Balkans and Turkey). TASCO 3 in Serbia

can also collaborate with civil society organizations to spread awareness of digital rights and privacy through public educational campaigns.

5. **Prioritize strategic communication and public diplomacy on EU support for Serbia's digitalization.** The European External Action Service (EEAS) should step up its digital communication efforts to promote the EU's contributions to Serbia's technological development. Through its public diplomacy and strategic communications division, the EEAS should aim to strengthen Serbian public trust in the EU as the country's leading economic partner and to counter Serbian state-controlled media narratives that commend the PRC and Russia as donors and trading partners in the country.

To US Policymakers

1. **Use the tech stack framework to develop a common operating picture of the PRC's technology threat.** As Lindsay Gorman has recommended in "A Foreign Policy Memo to the New Administration", the State Department and the intelligence community in the United States should adopt a tech stack framework for understanding PRC penetration of network infrastructure (5G/6G, satellites, undersea cables), data and cloud services, devices, applications, and governance at home and abroad.[205] This framework should be pursued and developed jointly with allies and partners towards a common understanding of the PRC's technology presence across global technology ecosystems to guide allied responses.

2. **Revitalize USAID's Digital Ecosystem Country Assessments.** In the context of the changes to USAID, its Digital Ecosystem Country Assessments (DECA) initiative, which has provided in-depth analyses of countries' digital technology sectors through public data and expert interviews, should continue. These reports are valuable resources for policymakers, researchers, and investors considering how the United States and its partners can compete globally in digital technologies. Future DECA assessments should leverage the tech stack framework to highlight strategic investment opportunities for the United States and its allies, while also identifying risks associated with technology infrastructure linked to the PRC.

3. **Strengthen and promote compliance with the Washington Agreement in diplomatic relations with Serbia.** Although in 2020 Serbia signed the Washington Agreement, which includes a commitment to exclude untrustworthy vendors from its 5G infrastructure, it has not explicitly ruled out the possibility of partnering with Huawei in its 5G rollout planned for 2026. The United States should ensure that secure 5G is on the bilateral agenda and seek Serbia's commitment to clear deadlines for phasing out untrusted vendors from its networks.

4. **Coordinate investment programs with like-minded partners.** As Heather Conley and others have emphasized, U.S. institutions such as the International Development Finance Corporation should collaborate with like-minded partners—including the European Investment Bank and the Japan Bank for International Cooperation—to coordinate technical assistance and scale up investment in technology projects in Serbia that align with Western standards. Such joint efforts would enhance strategic financing and promote trusted infrastructure development in the region.

To Serbian Policymakers

1. **Invest in diversifying Serbia's core technology infrastructure.** Serbia should recognize technology dependencies at the foundation of its tech stack, such as networks and data centers, create long-term dependencies that are difficult and costly to undo. Serbia must invest in securing its tech stack by creating opportunities for a diversification of players in these crucial layers of the stack. Additionally, it should prioritize long-term security over short-term gains, such as relying on cheaper vendors, and treat this as a long-term investment in its stability and competitiveness.

2. **Conduct risk assessments of long-term dependencies in Serbia's tech stack with a specific focus on data security.** As PRC firms penetrate Serbia's tech stack, the party-state by extension (as per The PRC's 2017 National Intelligence Act) gains access to vast pools of local data. Data stored in PRC-built or supported infrastructure, or collected through PRC-manufactured surveillance devices, are particularly at risk. This access erodes Serbia's ability to secure and control its digital data, not only putting citizens' privacy at stake, but making institutions and citizens vulnerable to network infiltration or espionage.

3. **Commit to regulatory provisions in EU accession negotiations with the goal to mitigate risks and to attract alternative providers.** To increase EU engagement in its technological development, Serbia must align its cybersecurity framework with EU standards. Serbia aims to complete the 5G frequency allocation by mid-2025.[206] The EU's 2024 assessment, however, notes that Serbia has yet to adopt necessary legislation for issuing 5G operator licenses and is expected to implement the EU 5G Cybersecurity Toolbox before doing so.[207] Failing to meet these requirements could hinder Serbia's accession process, compromise its 5G infrastructure security, and distance it from alternative providers.

4. **Commit to secure and democratic AI.** This year, Serbia has updated its AI strategy and assumed the chair of the GPAI, giving it a global platform for its role in AI governance. This position is however, undermined by reports of biometric surveillance and shrinking space for civil society. If Serbia is serious about positioning itself as a leading power in AI in Southeastern Europe, it must use its position to advance democratic AI and secure Serbians from high-risk AI applications such as biometric surveillance.

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