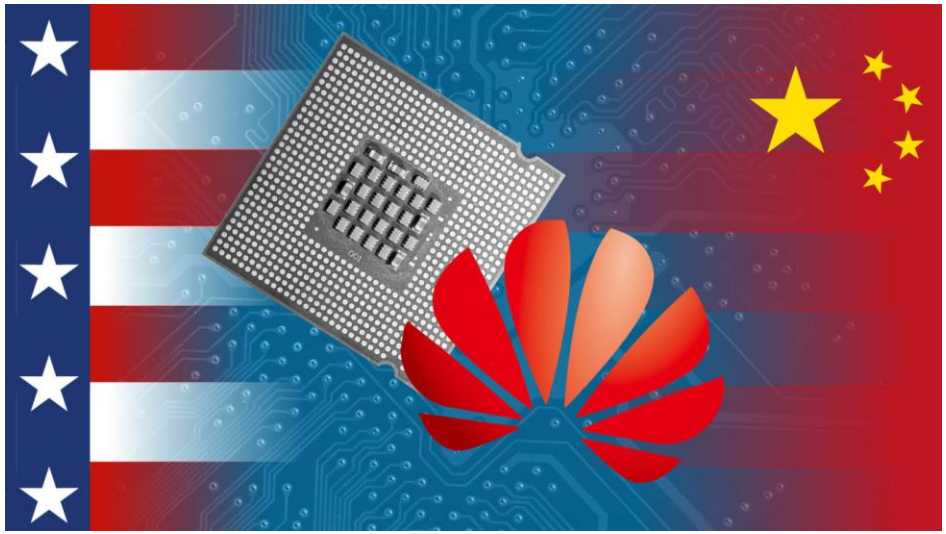
AI SUPERPOWERS

China, Silicon Valley, and the New Arms Race



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Yale University

June 3, 2020

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ALTHOUGH THE IMPORTANCE OF TECHNOLOGY IS SOMETIMES EXAGGERATED AND TOO MUCH ATTENTION PLACED ON IT, THE REALITY IS OFTEN THE OPPOSITE: TO SYSTEMATICALLY UNDERSTATE THE SIGNIFICANCE OF TECHNOLOGY.

US TECHNOLOGY COLD WAR EXAMPLE

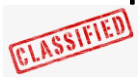
- US wins Cold War with innovative military technologies,
  @ ~ **7 % GDP**; peak of **18 Army divisions** (Moscow has 240 divisions)

- Tech is source of US global primacy in business and war for 50 years

- Creates military industrial complex, aerospace industry, Silicon Valley, and university research system

- DoD: the mother of all VC funds: the transistor, integrated circuit, computers, laser, satellites, Internet, software defined radio

SIGNIFICANCE OF TECHNOLOGY

- Manhattan Project 1943-5
- US ICBMs 1950s; Polaris; SAC alerting system
- CIA overhead reconnaissance ‘50s & ‘60s
- US Navy nuclear power & shift to missiles over guns
- Charles de Gaulle French nuclear program 1958-1962
- Shimon Peres and Israeli nuclear program
- Reagan buildup 1980s (Stealth, PGMs, offset strategy)
- Program 

- China PLA – anti access, cyber, 5G Huawei & ZTE
- Kim Jong-un N. Korean nuclear missile program 2014 - present
- US Cyber Command/NSA digital transformation – defense & offense

TECHNOLOGICAL INNOVATIONS

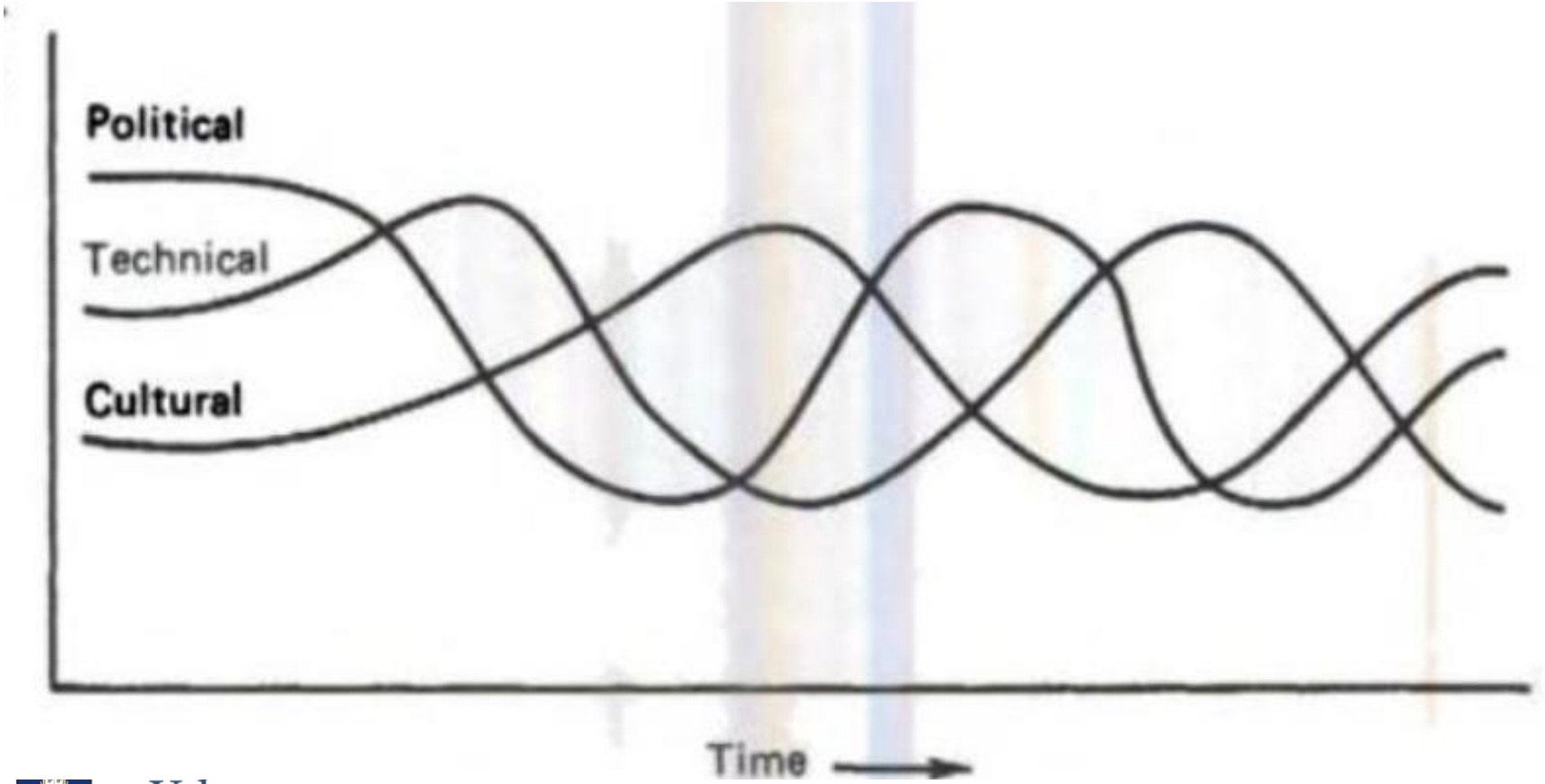
1950s

- Nuclear Weapons
- Jet aircraft
- Guided missiles
- Nuclear propulsion
- Radar in space
- Electronic warfare
- Spy Satellites
- Very little tech diffusion

NOW

- Drones
- Stealth
- Super accurate missiles
- Robot ships & subs
- Cyber
- Data analytics
- Cloud computing
- Satellite blinders, killers
- Much technology diffusion

Technology has its own cycles, rhythms, and fads; like politics & culture. The confluence of the 3 matter



THE NEEDHAM PARADOX

"…the essential problem [is] why modern science had not developed in Chinese civilization (or Indian) but only in Europe."

Joseph Needham, *Science and Civilization in China,* 1969

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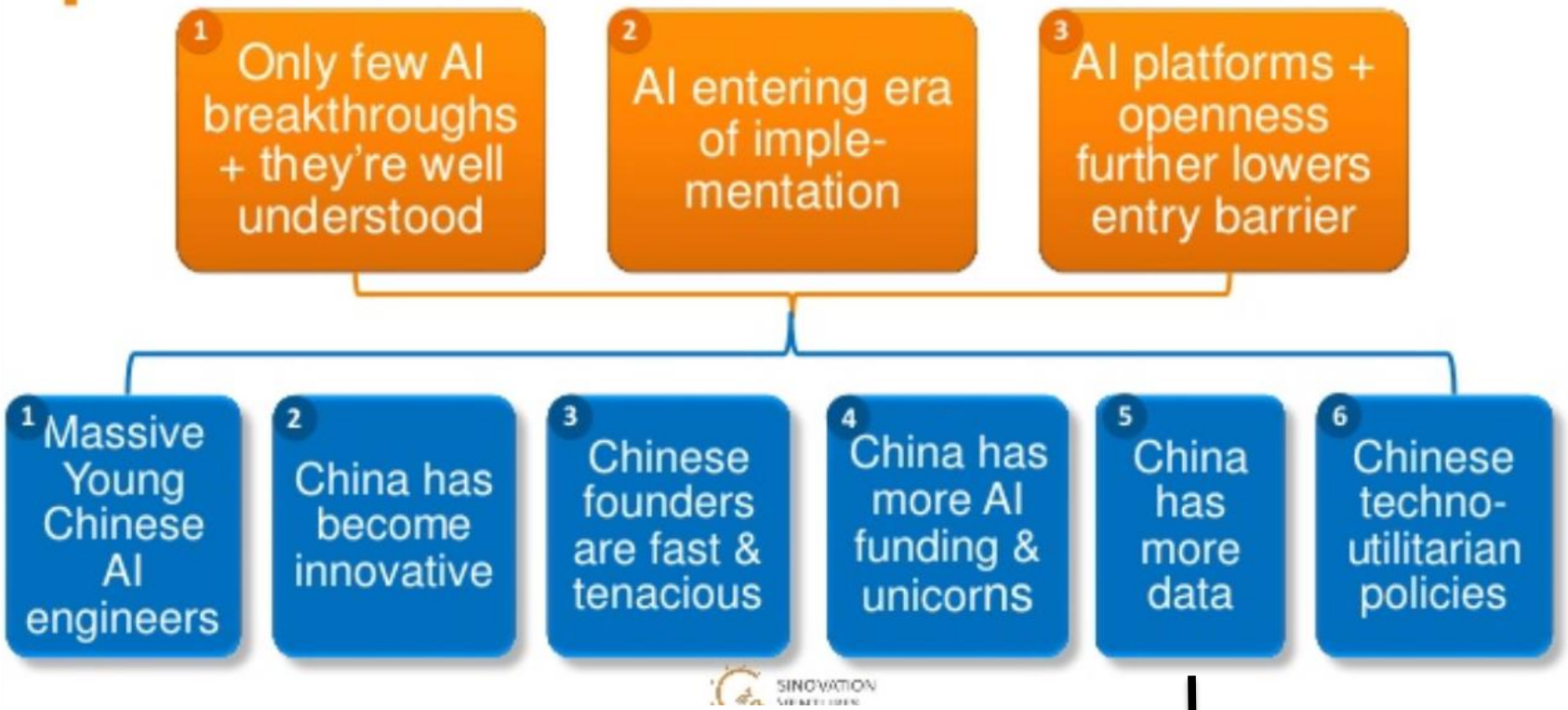
CHINA

- China was born in 1949 into a nuclear world of two superpowers – when China was neither
- Humiliated by US & SU in Taiwan crisis 1958
- Crisis as metaphor – Taiwan ‘58 is Beijing's Cuban missile crisis -- with very different outcome
- China surrounded now by 5 nuclear weapon states: US, Russia, North Korea, India, Pakistan

CHINA: US BACKLASH & BRANCHPOINT

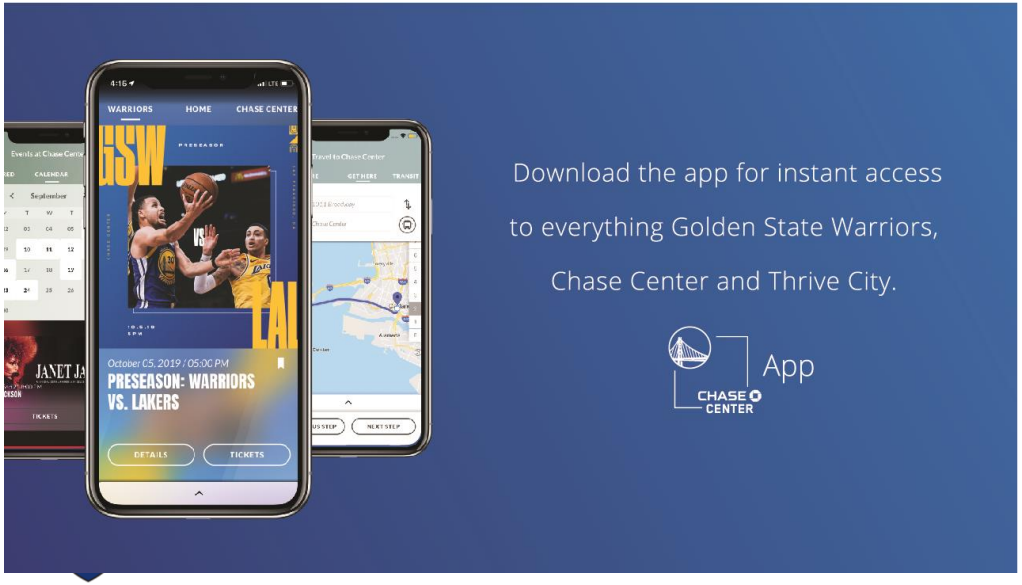
- Large buildup changes military balance in Asia
- Artificial islands as bases
- Hundreds of mobile missiles
- Advanced tech focus: drones, robot weapons, cyber, hacks, hypersonic missiles
- Leverage others' IP technology
- Huawei, ZTE dominant in global 5G
- Big home market for autonomous vehicles (AVs), facial recognition, 5G, mobile payments – all drive AI

How China leapfrogs in AI implementation



- **Facial recognition**
- **5G**
- **Autonomous vehicles**
- **Mobile payments**


The City of
OKLAHOMA CITY
POLICE
SomeCopChick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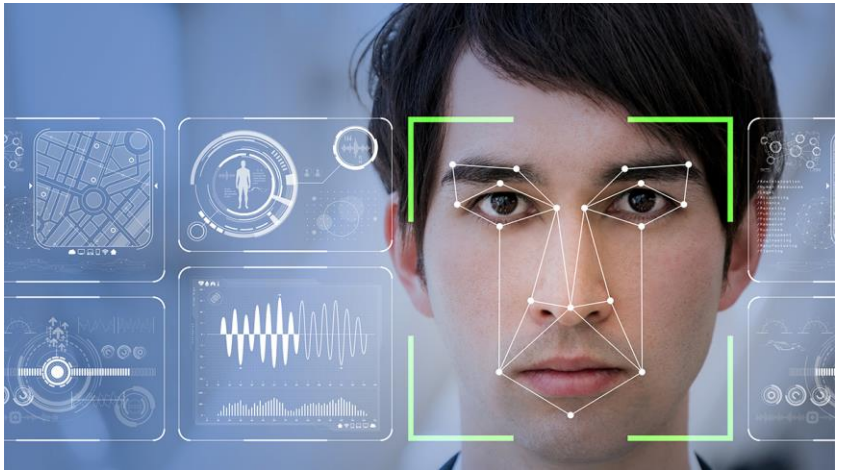
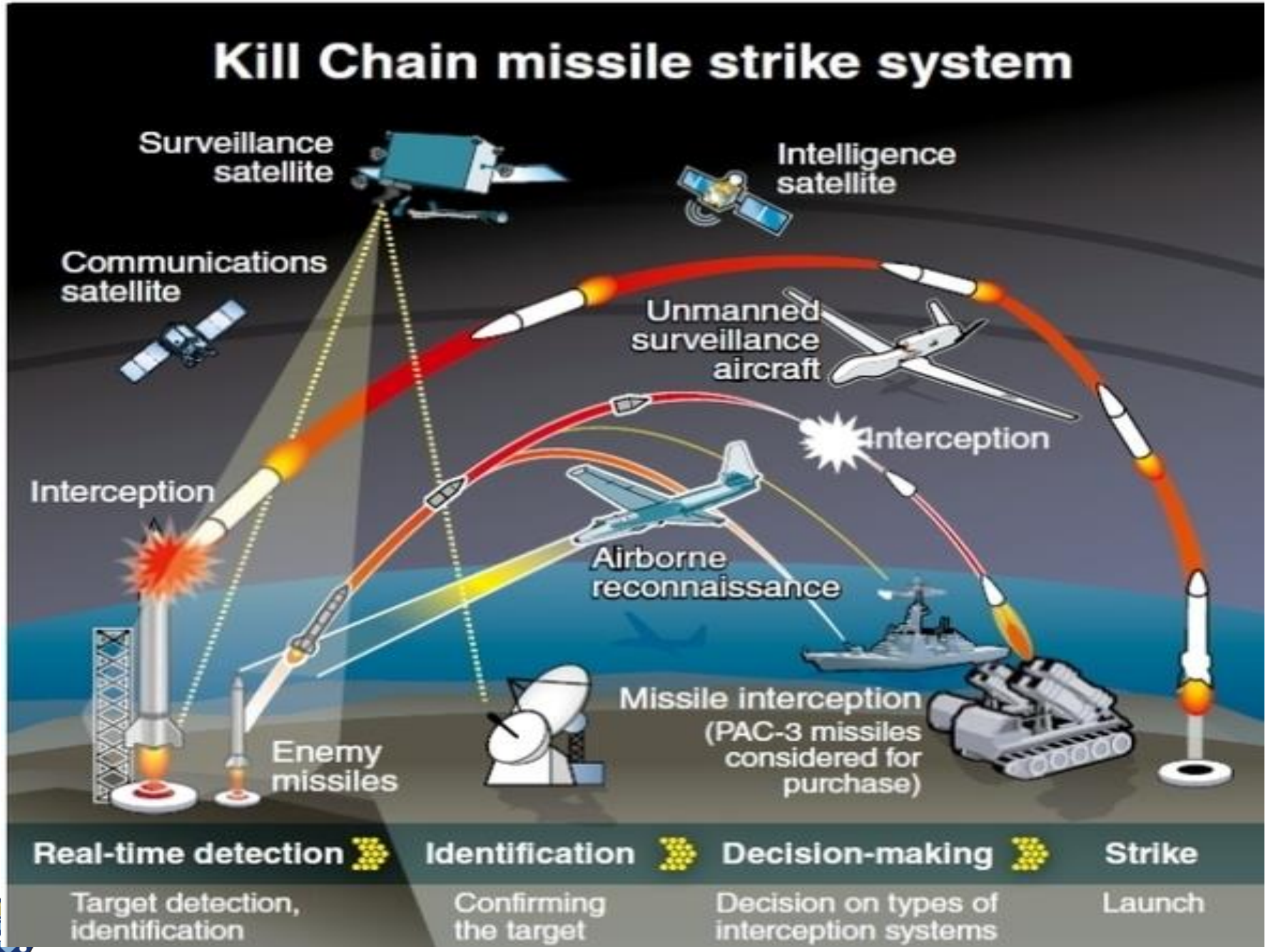



Kill Chain missile strike system
Surveillance satellite
Intelligence satellite
Communications satellite
Unmanned surveillance aircraft
Interception
Interception
Airborne reconnaissance
Missile interception (PAC-3 missiles considered for purchase)
Enemy missiles
Real-time detection
Identification
Decision-making
Strike
Target detection, identification
Confirming the target
Decision on types of interception systems
Launch

THE HUNT FOR MOBILE MISSILES
…is getting:

- **FASTER – real time info streams from drones, cyber, smart phones, sats, signals, spies**
- **CHEAPER – data fusion via AI, edge computing, Cloud computing, big data, predictive analytics**
- **BETTER – probability of location ↑, testable, kill with PGMs & hypersonics**


조선민주주의
인민공화국만세!

NK *NYT* 9-3-19

AI & DEEP LEARNING

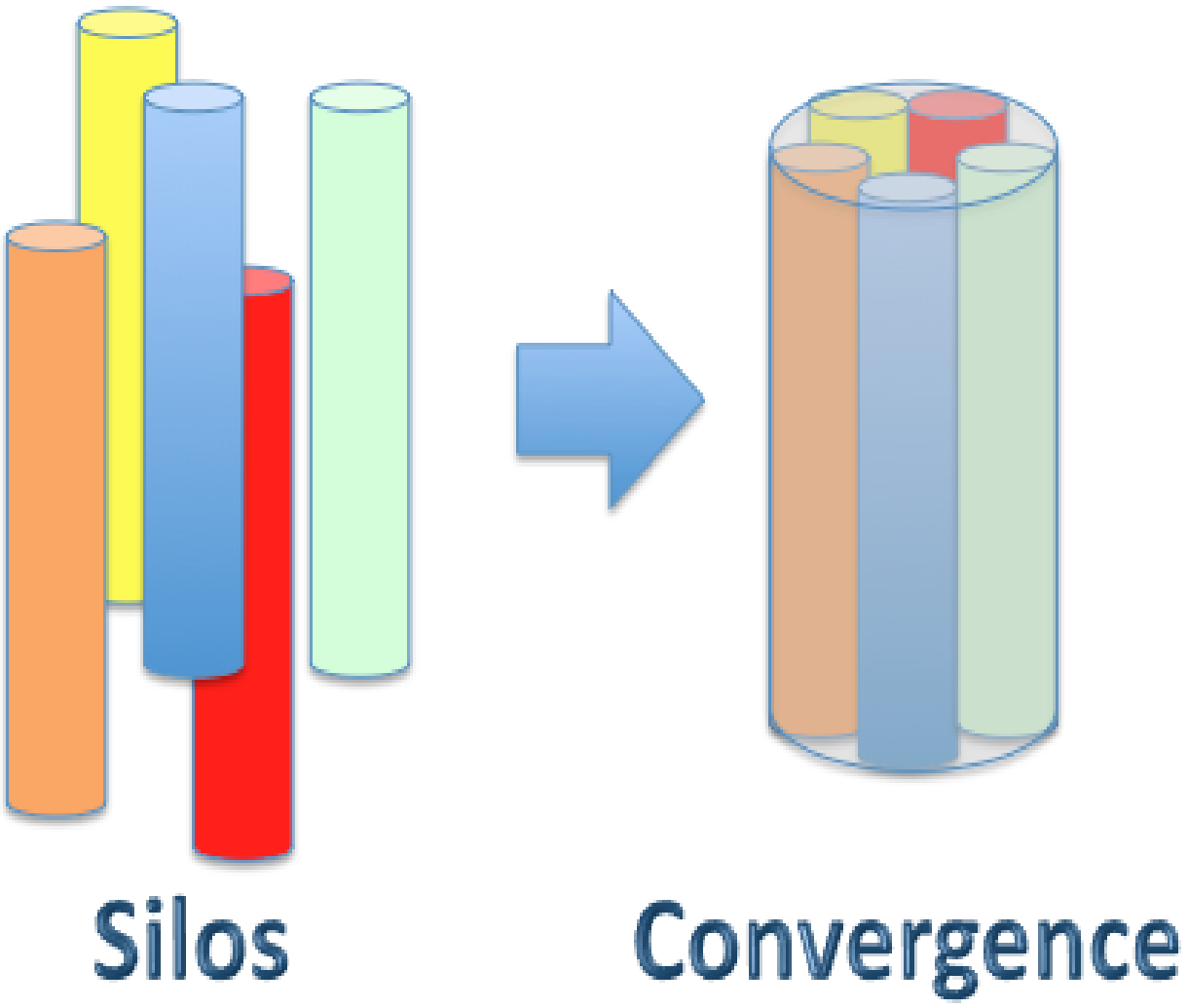
- DL is a *dominant design* for AI, beyond machine learning
- It is possible to train a DL program to find things that are impossible for humans or staffs to see
- Careful AI/DL observer would know more than the generals commanding the mobile missile force
- …know a lot more than political leaders of that force

TOUCHPOINTS ≡ ANY WAY THAT A MISSILE, WARHEAD, CREW INTERACTS WITH AN ADVERSARY INTELLIGENCE SYSTEM, E.G. CELL PHONE TRACK OF A CREW MEMBER, LICENSE PLATE HIT, RADIO INTERCEPT, DRONE VIDEO, APPEARANCE ON A HACKED SECURITY CAMERA, SATELLITE PICTURE.

"HIGH TOUCH RECONNAISSANCE" EXPLOITS THE LARGE AMOUNTS OF DATA AVAILABLE FROM DIGITAL TECHNOLOGIES. EXAMPLE: INTEGRATING CELL PHONE DATA OF DRIVERS WITH AUTOMATED LICENSE PLATE READERS.

TOUCHPOINTS IN THE HUNT FOR MOBILE MISSILES

WHY CLOUD COMPUTING



Huge Impact On

- Agility
- Innovation
- Data fusion
- Deep Learning
- Analytics

AI APPLICATIONS

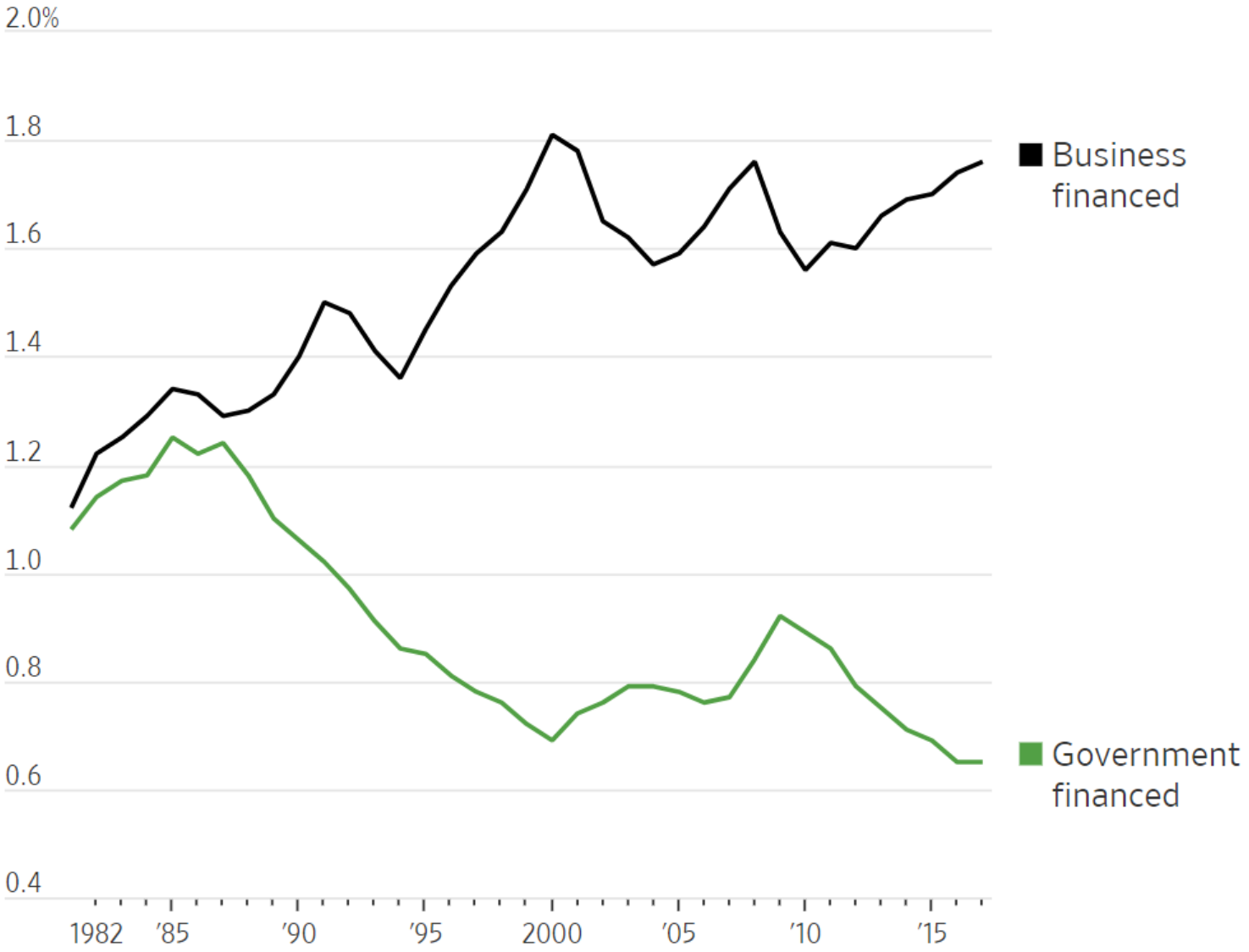
- Smart hacking into power grids, transport, banks, military installations, tech companies
- Automatic target identification
- Facial recognition
- Early warning
- Autonomous submarines
- Drone swarms
- Hunt for mobile missiles
- Computer vision

THE LOCUS OF TECHNOLOGY INNOVATION

A COMMERCIAL TRANSFORMATION HAS MADE MILITARY INNOVATION WORLDWIDE RESPOND INCREASINGLY TO MARKET FORCES INSTEAD OF THE DEMANDS OF GENERALS & NATIONAL LEADERS.

Profit Power

U.S. research and development spending as percent of gross domestic product



Source: OECD

INNOVATION IN US

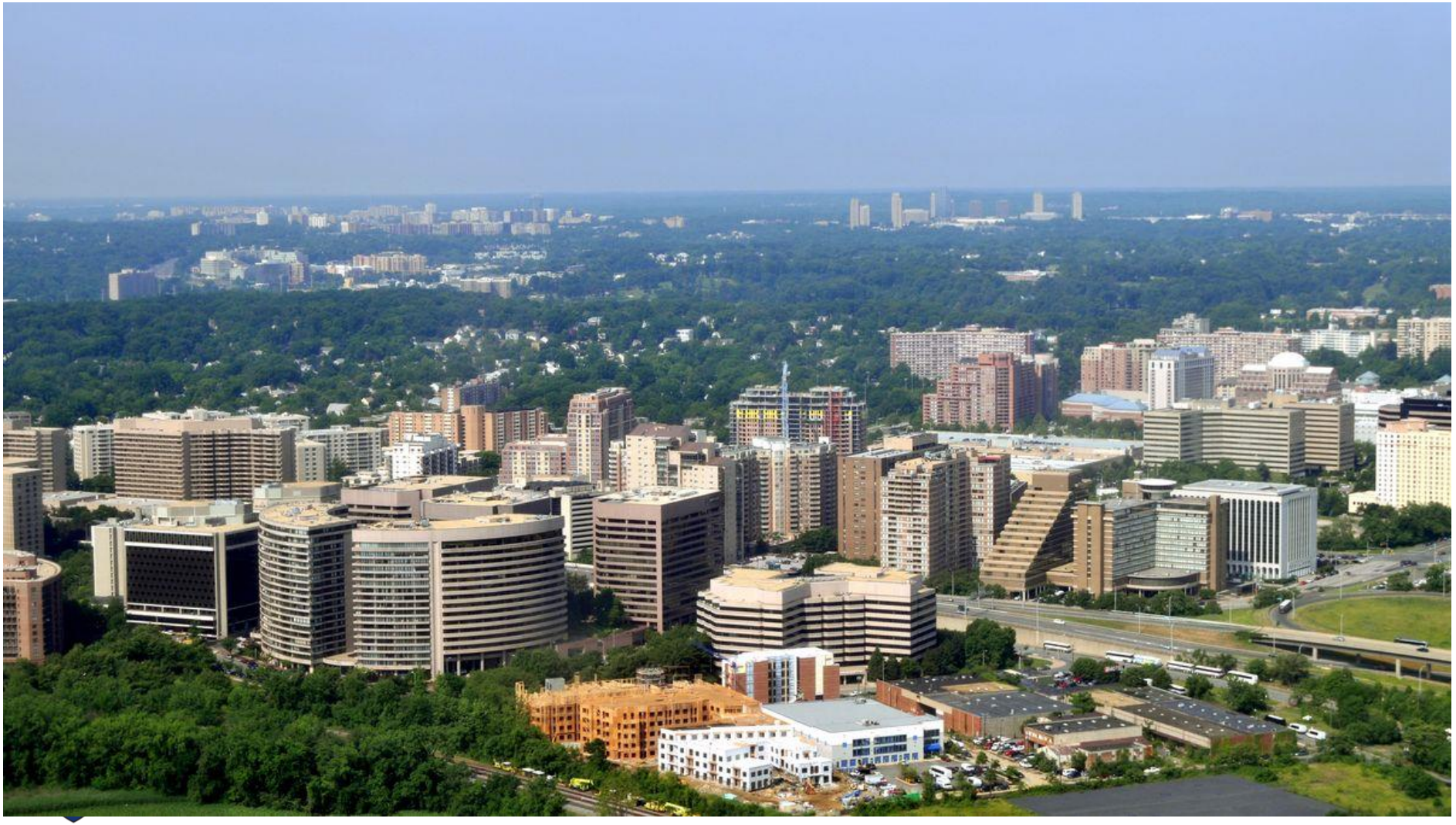
- Harness much faster commercial innovation cycle (Project Maven, DoD-SV Relations)
- Cooperative US – China developments ending
- National AI project
- Toyota $ 500m investment in Google AV

Early Adopter	Wide-spread Application
Research Driven	Application Driven
Expert is King	Data is King
Advantage US	Advantage China

US DEFENSE INNOVATION

- DoD & Intelligence Community (IC) are leveraging off private sector innovation cycles
- Locus of defense innovation shifted to SMEs
- A second “Silicon Valley” of defense has arisen, in Dulles corridor and dispersed
- New patterns of innovation ↑: in services, process, mission – not just products/weapons

A SILICON VALLEY OF DEFENSE



TEACHING TECHNOLOGY LEADERSHIP

- Technology and the Strategy Lag
- Need higher level language for govt. & corporate strategy to get “above the technology”
- Technology packages
- New skills needed: scale mgt, process innovation, value chains, design thinking…
- Use business experience: Cisco, Verizon, Disney, Samsung, TRW, Apple, GE

CONCLUSIONS

1. Game-changing technologies are coming to the military more rapidly than at any time since the 1950s
2. Silicon Valley → cyber, drones, precision strike, stealth, data analytics, 3-D printing, ASAT, cloud computing, small insider action forces (SIAF), robot weapons, etc.
3. New technologies are spilling into the nuclear arena – upsetting stability
4. Changing locus of innovation for defense technology
5. China & US dominate the new arms race, Russia trails, others matter (Israel, India, EU)
6. "Bottom up" rather than top down tech strategies now prevail
7. Technology strategy is over managed and under led

IS THERE A HAPPY ENDING TO THE ARMS RACE ?

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