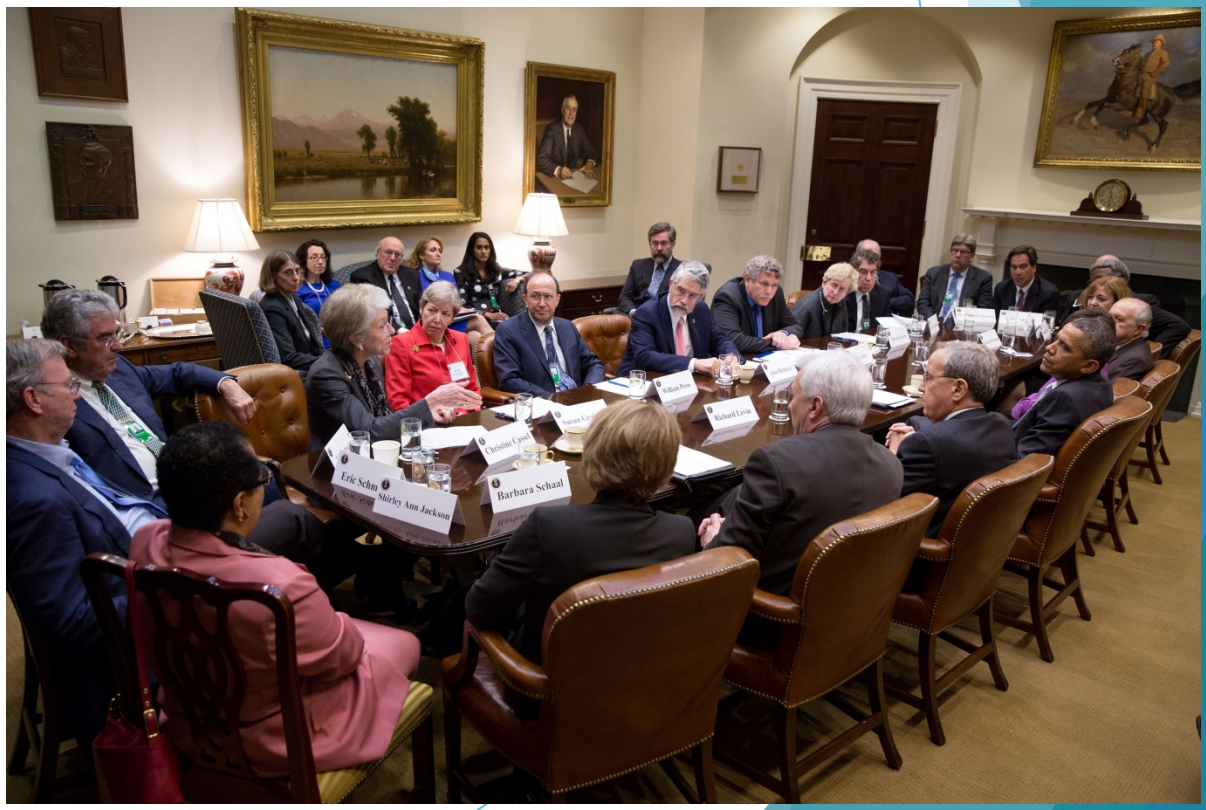
REPORT TO THE PRESIDENT
BIG DATA AND PRIVACY:
A TECHNOLOGICAL PERSPECTIVE

June 2014

Charge from President Obama

- January 17, 2014 speech requesting analysis of big-data implications for policy
  - Scoping study
  - PCAST report to inform and accompany White House report
- Objectives of the PCAST report
  - Assess current technologies for managing and analyzing big data and preserving privacy
  - Consider how such technologies are evolving
  - Explain what technological capabilities and trends imply for design and enforcement of public policy to protect privacy in big-data contexts



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Structure of Report

- Chapter 1: Introduction (what is new, what is enduring)
- Chapter 2: Examples and Scenarios (illustrating current and potential big data and privacy issues)
- Chapter 3: Collection, Analytics, and Supporting Infrastructure
- Chapter 4: Technologies and Strategies for Privacy Protection and building blocks for future privacy protection policies
- Chapter 5: PCAST Perspectives and Conclusions

What is Privacy?

- "Right to be left alone"
- Ability to share information selectively but not publicly
- Ability to make intimate personal decisions without government interference
- Protection from discrimination on the basis of personal characteristics (e.g., race)
- Intersection with anonymity
- Long history of interaction with technology

- **Invasion of private communication…byproduct of social networking**
- **Public disclosure of inferred private facts…byproduct of analytics**
- **Tracking, stalking…byproduct of locational tracking**
- **False conclusions about individuals…byproduct of group and sometimes personal profiles from big-data analytics**
- **Foreclosure of self-determination…byproduct of long-lived data and analyses**
- **Inhibition of private association…byproduct of concern about potential disclosures**

Changing Technological Contexts

- Privacy history conditioned on “small data”
  - Collection of data/development of data sets used w/conventional statistics
  - Context of a personal relationship (e.g., personal physician, local shop)
- Big data attributes
  - Quantity and variety of data available to be processed (3 Vs)
  - Scale of analysis that can be applied to those data (“analytics”)
  - Expansion of metadata
- Laws have not always kept pace w/technological realities

People Emit Data Continuously . . .

Born digital

- Generated for computer(s)
- Clicks and taps, GPS, cookies

Born analog

- Byproduct of the physical world
- Sensors collect (often invisibly)

Over-collection? Digital convergence?

Big-data analytics create new information

- Data mining and machine learning
- Data fusion and integration (data from different sources)
- Image/speech recognition
- Social-network analysis (self-censorship won't help…)

The Cloud as Dominant Infrastructure

- From commoditized data centers to a complex of software and communications to allow data to be ingested, accessed, and used efficiently
- Replication and distribution
- Infrastructure for mobility (e.g., smart-phone apps)
- Potential security benefits from automation, procedures, oversight
- “Producer-users”—companies that perfect the tech for themselves, may also offer to others

Cybersecurity and Privacy: Distinctions and Dependency

- Cybersecurity: technologies enforce policies for computer use and communication*
  - Systems to protect identity and to authenticate (are you who you say)
  - Systems to protect confidentiality, integrity, availability, non-repudiation; auditability (prove that something occurred)
- Poor cybersecurity is a threat to privacy, but . . .
- Violations of privacy are possible with no failure in computer security
  - Misuse of data, fusion of data
- * More challenging to codify privacy policies than security policies

Technologies and Strategies for Privacy Protection

- Cryptography and encryption
- Anonymization and de-identification
- Data deletion and ephemerality
- Notice and consent

Areas of Concern: Examples

- Healthcare:
  - Personalized medicine (including genetic info); mobile devices that monitor
    - New understanding, better diagnoses, and better treatment (esp. w/massive amounts of data)
    - De-identified data can be re-identified with growth in volume and variety of data
- Education:
  - New online platforms collect masses of data, enable longitudinal datasets
    - New insights are possible into learner abilities and learning styles, more customized support
    - Personal development may be undermined by the persistence of older information
- Home:
  - More ways of collecting, storing, and communicating
    - Fourth Amendment “persons, houses, papers, and effects”
    - Sensors and monitors, home WiFi networks, and Internet connections for more and more objects

What Might the Future Look Like?

- Taylor Rodriguez packs for a trip, leaves suitcase outside home for pick-up
  - Camera on streetlight watches the bag, suitcase has an RFID tag (anti-theft)
- Her suitcase is picked up at night by delivery company
  - Shipper knows Taylor's itinerary and plans
- Self-driving car arrives, its instructions for her itinerary delivered by the cloud
- No boarding passes or queues at the airport
  - Everyone is tracked by phone, facial recognition, gait, emotional state, RFID tags
- In this world, the cloud and robotic aides are trustworthy WRT personal privacy
  - Improvements in convenience and security of everyday life become possible . . .
  - *Not an endorsement, just food for thought!*

PCAST Perspectives and Conclusions

- Government role to prevent breaches of privacy that can harm individuals, groups
  - Tech *plus* law/regulation to generate incentives, contend with measure-countermeasure cycle
- New sources of big data are abundant; new analytics tools will emerge
  - New data aggregation and processing can bring enormous economic and social benefits.
  - Unintentional leaking of data and deliberate systemic attacks on privacy are potential risks
  - Cannot always recognize privacy-sensitive data when collected—may emerge w/analytics, may be able to home in on the moment of particularization to an individual
  - "Dual use" (same technologies usable for benefit or harm)
- Data collectors, data analyzers, and users of analyzed data as different actors
  - Policy can intervene at various stages of this value chain
  - Attention to collecting practices may reduce risk, but use is the most technically feasible place to apply regulation
- Technological feasibility matters

Recommendation 1: Policy attention should focus more on the actual uses of big data and less on its collection and analysis

- Any adverse consequences of big data arise from a program/app interacting with raw data or information refined via analytics
- Policies focused on the regulation of data collection, storage, retention, a priori limitations on applications, and analysis (absent identifiable actual uses of the data or products of analysis) are unlikely to yield effective strategies for improving privacy
- It is not the data themselves that cause the harm, nor the program itself (absent any data), but the confluence of the two

Recommendation 2: Policies and regulation should not embed particular technological solutions, but rather should be stated in terms of intended outcomes

- Technology alone is not sufficient to protect privacy
- To avoid overly lagging the technology, policy concerning privacy protection should address the purpose—the "what" —rather than prescribe the mechanism—the "how"
- Controlling the use of personal data is more effective than regulating technologies of data collection, storage, and retention (these may evolve rapidly)

Recommendation 3: With support from OSTP, the NITRD agencies should strengthen U.S. research in privacy-related technologies and in the relevant areas of social science that inform the successful application of those technologies

- Some of the technology for controlling uses already exists
- Research and research funding are needed for (1) technologies that help to protect privacy, (2) social mechanisms that influence privacy-preserving behavior, and (3) legal options that are robust to changes in technology and create appropriate balance among economic opportunity, national priorities, and privacy protection

Recommendation 4: OSTP, together with the appropriate educational institutions and professional societies, should encourage increased education and training opportunities concerning privacy protection

- Career paths for professionals (e.g., digital-privacy experts both on the software-development side and on the technical-management side)
- Programs that provide education leading to privacy expertise are essential and need encouragement

Recommendation 5: The United States should adopt policies that stimulate the use of practical privacy-protecting technologies that exist today. It can exhibit global leadership both by its convening power and also by its own procurement practices

- Nurture the commercial potential of privacy-enhancing technologies through U.S. government procurement and through the larger policy framework
- Promote the creation and adoption of standards
- Cloud computing offers positive new opportunities for privacy
  - Privacy-Preserving Cloud Services?
- PCAST is not aware of more effective innovation or strategies being developed abroad

White House Big Data Study

Big Data: Seizing Opportunities, Preserving Values

May 2014

Areas of Focus

- Preserving Privacy Values
- Educating Robustly and Responsibly
- Big Data and Discrimination
- Law Enforcement and Security
- Data as a Public Resource

Policy Recommendations

1. Advance the Consumer Privacy Bill of Rights
2. Pass National Data Breach Legislation
3. Extend Privacy Protections to Non-U.S. Persons
4. Ensure Data Collected on Students in School is used for Educational Purposes
5. Expand Technical Expertise to Stop Discrimination
6. Amend the Electronic Communications Privacy Act

Questions?

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