# Blockchain and its applications
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**Lecture 58: Public Sector Use Cases**

- **Government use cases of blockchain**

- **Public data management**

- **Public taxation**

- **National strategies**

# Blockchain and Government

- Government needs to maintain (in digital or in paper form)
  - Daily operations and activities
  - Government assets (land records, buildings etc.)
  - Details of people, organizations and institutions
  - Records of people
  - Business transactions

# Multi-institutional and Multi-Organizational

- Different levels of governance



**Country**

**State**

**District**

**Village, Panchyat, Cities**

# Multi-institutional and Multi-Organizational

- Every level builds its own ledger of data
  - Different access management policies
  - Role based access control or access management


- Different priority of data
  - High priority or highly secured data - restricted access - needs to prevent from unauthorized access (example: AADHAAR Data)

# Blockchain and Government

- Blockchain can help in management of government data at different levels

- **Note**
  - Directly store the data on blockchain?
  - The data cannot be altered without colluding majority of the blocks
  - Data access as transactions - can check or verify who has accessed what

# Government and Cyber Crime

- Government database is a major target for hackers
  - In 2020, there are 1001 cases of data breaches that affected 155.8 million individuals (Source: https://www.statista.com/)


- **"Cyber War" -** actions by a nation-state to penetrate another nation's computers or networks (*Richard Clarke*)

# Theft of Government Data



**Nfld. & Labrador**

## N.L. patient, employee data stolen in health-care cyberattack

Hackers were able to access the information th

**CYBER SECURITY** **NEWS** 4 MIN READ

## Argentinian Government Database Containing ID Card Information of Entire Country Made Available on Dark Web Forum

SCOTT IKEDA · OCTOBER 25, 2021

News / LATEST / Economy / Info of 4.39 cr investors exposed
arm: CyberX9

## Info of 4.39 cr investors exposed twice within 10 days due to data breach at CDSL's KYC arm: CyberX9

The Central Depository Services (India) Limited (CDSL) is a Sebi registered depository and CDSL Ventures Ltd is a KYC registering agency separately registered with Sebi.

Home > News > Security > FBI warns of fake govt sites used to steal financial, personal data

## FBI warns of fake govt sites used to steal financial, personal data

By **Sergiu Gatlan**
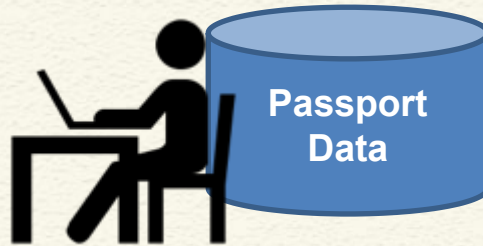
October 19, 2021    09:00 AM    0

# Processing of Government Data

- Data is shared among multiple organizations at different level of government structure

- The problem of data breaches increases at every level
  - Data duplication
  - Data multiplicity

- Protection of data gets diluted if multiple copies of same data exist
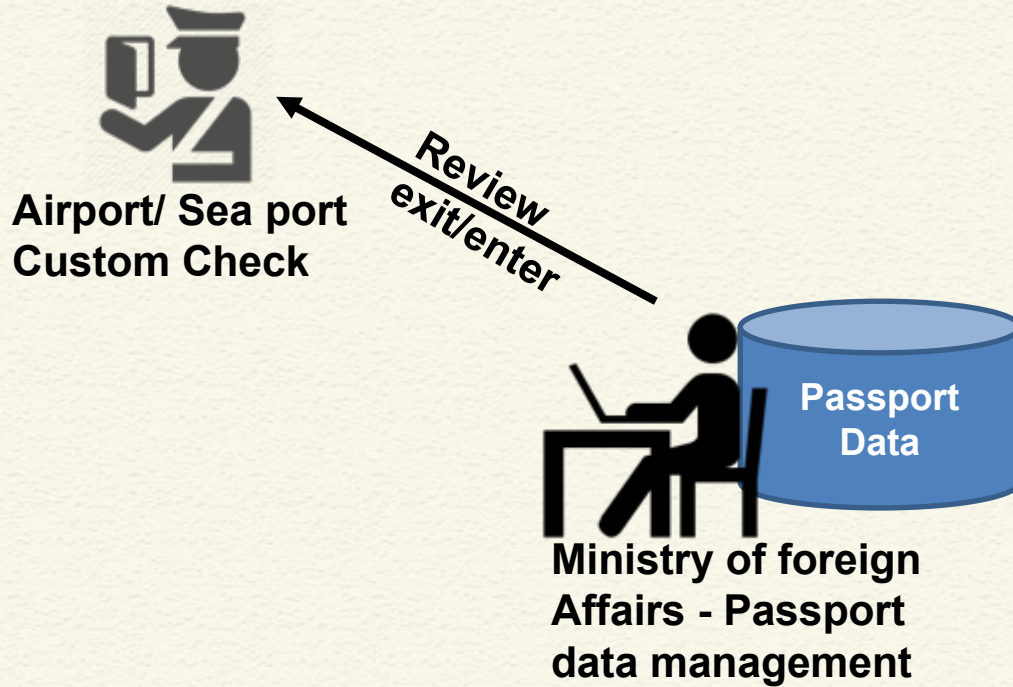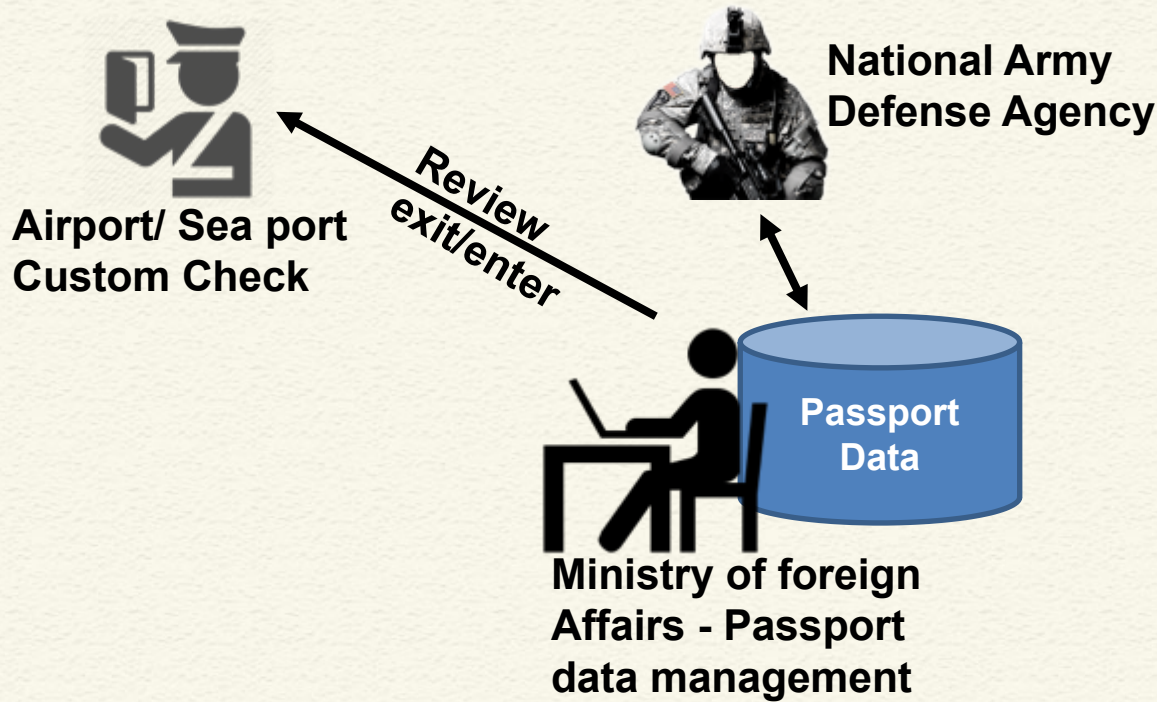
# Sharing of Passport Data: An Example



**Passport Data**

**Ministry of foreign Affairs - Passport data management**

# Sharing of Passport Data: An Example



Airport/ Sea port Custom Check

Review exit/enter

Passport Data

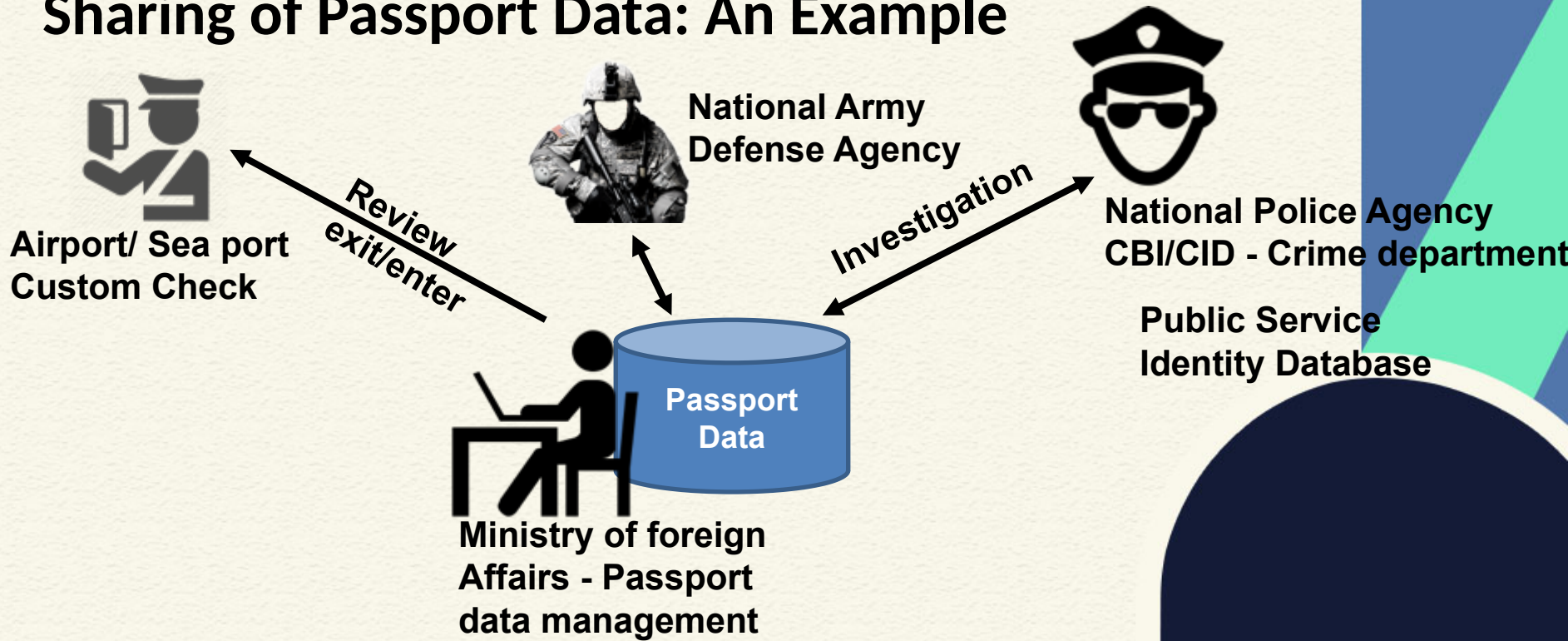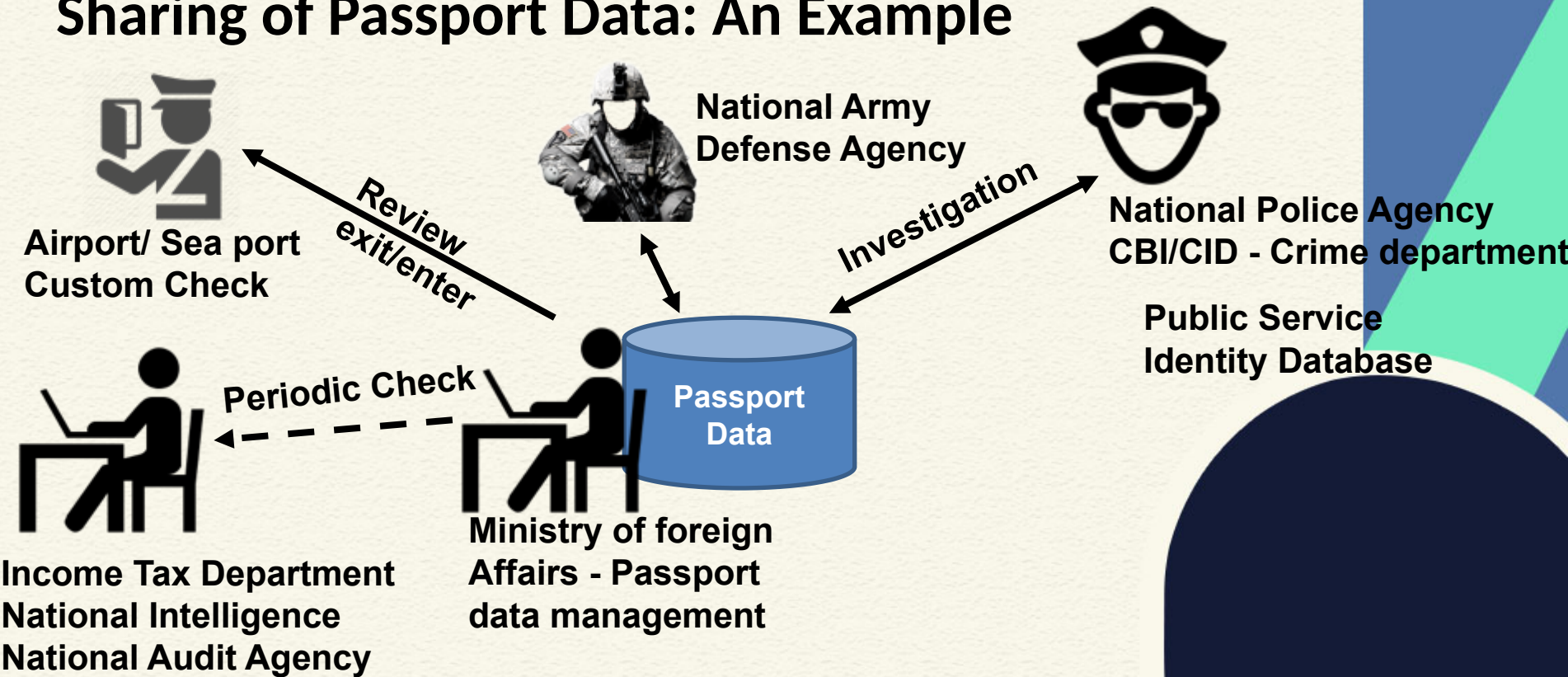Ministry of foreign Affairs - Passport data management

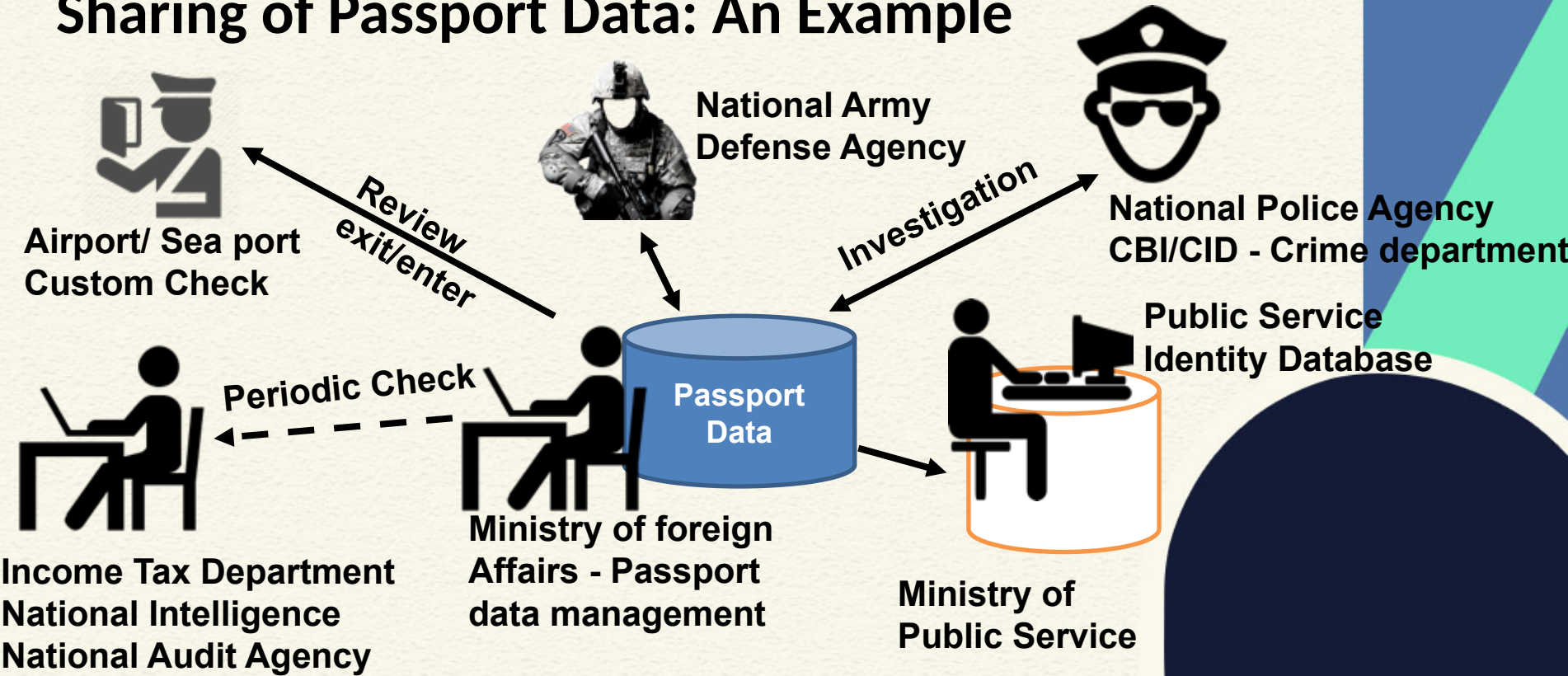# Sharing of Passport Data: An Example

# Sharing of Passport Data: An Example

# Sharing of Passport Data: An Example

**National Army Defense Agency**

**Airport/ Sea port Custom Check**

Review exit/enter

Investigation

**National Police Agency CBI/CID - Crime department**

**Public Service Identity Database**

Periodic Check

**Passport Data**

**Income Tax Department National Intelligence National Audit Agency**

**Ministry of foreign Affairs - Passport data management**

# Sharing of Passport Data: An Example

# Government Information Sharing System: A Typical Example

**Service Requester Organization**

Service Gateway 🚫

Civic Service System

Service Broker

**Agency Directory Service**

**Data Directory Service**

**Search, Account and Other Service**

**Government Information Sharing System Portal**

Service Broker

🚫 Service Gateway
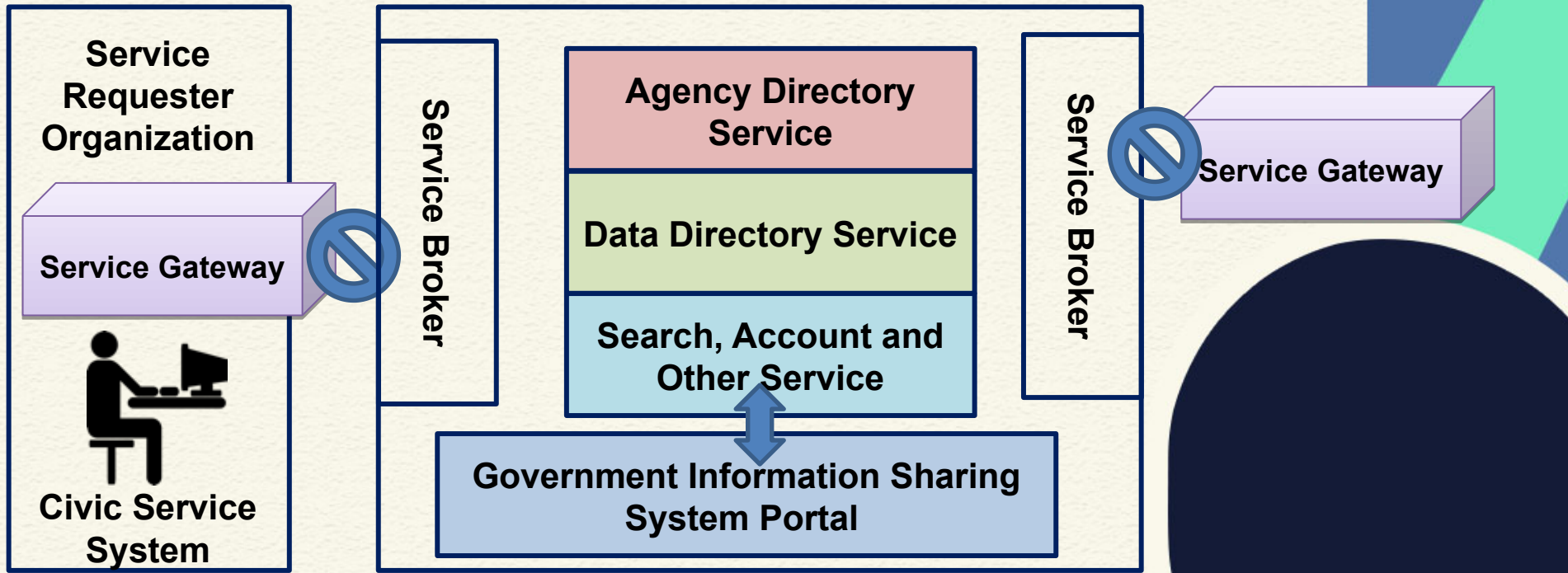
# How Blockchain Helps

- **Access and verification of a central data**
  - Data is in a central database
  - Access to the database are the transaction
  - Every such transactions (access to the data) is logged in a blockchain
  - Data can be accessed **only** through the blockchain
  - Anyone can verify who has accessed data and for what purpose

# How Blockchain Helps

- **Sharing of data**
  - Data is in the blockchain
    - (**May not be the ideal solution all the time**)
  - Everyone can verify which data has been shared
  - Data cannot be altered

# How Blockchain Helps

- **Sharing of data and access control**
  - Keep both the data and the access at a blockchain
    - **Depends on the size of the data**
  - Anyone can verify the data and the access
  - Neither data nor access can be altered
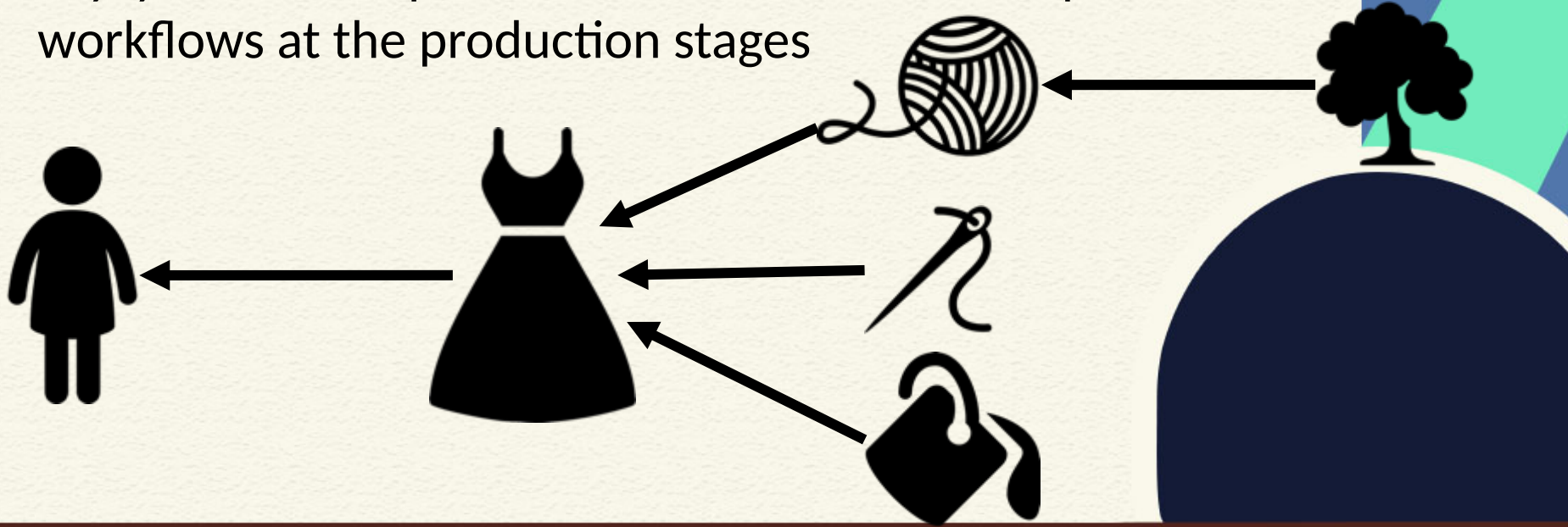  - Access cannot be denied

# Case Study: Processing Tax Payments

- Goods and Services Tax (GST) - indirect tax covering various goods and services during the production and service stages
  - IGST
  - SGST
  - CGST
- The entire workflow is pretty complex - Let's see how Blockchain can help!
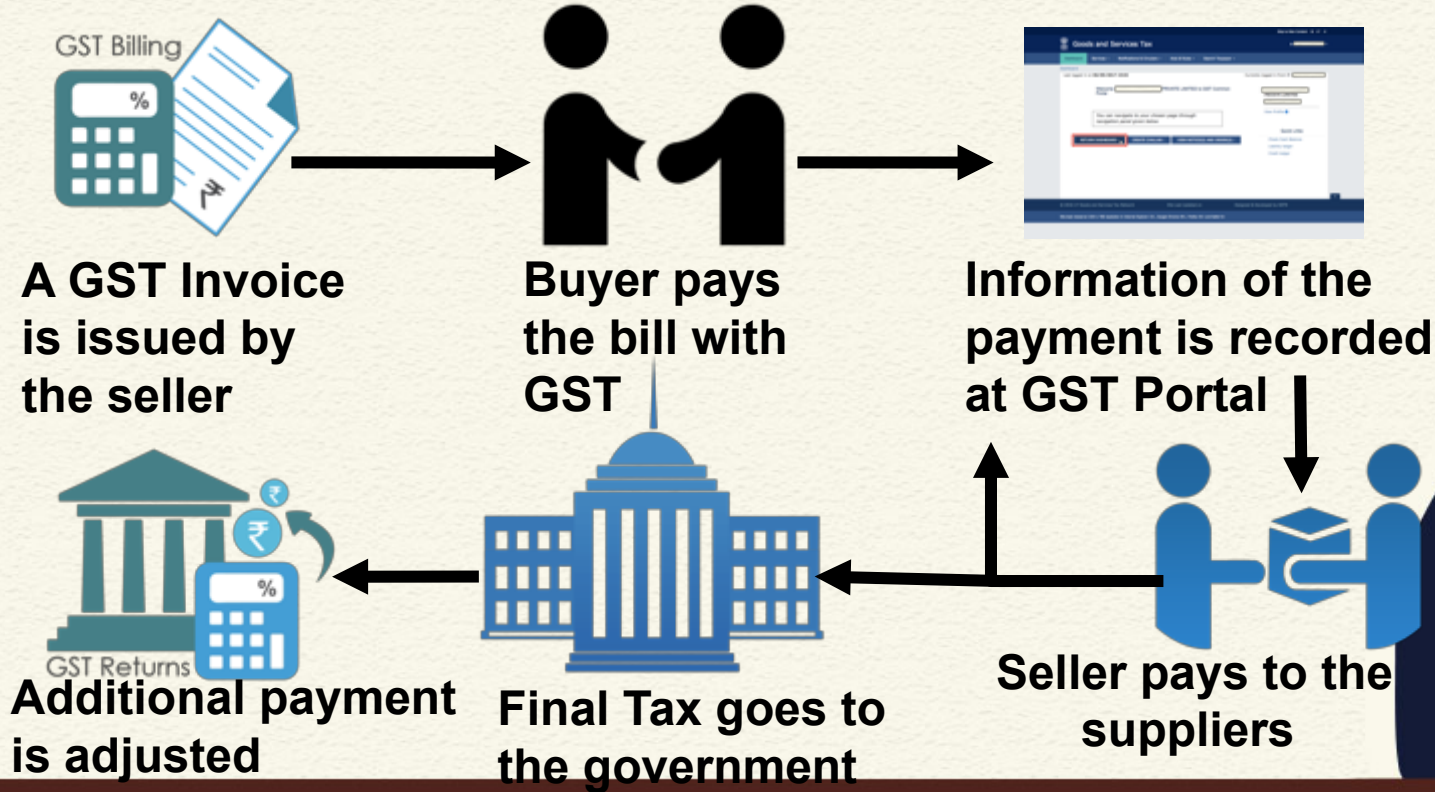
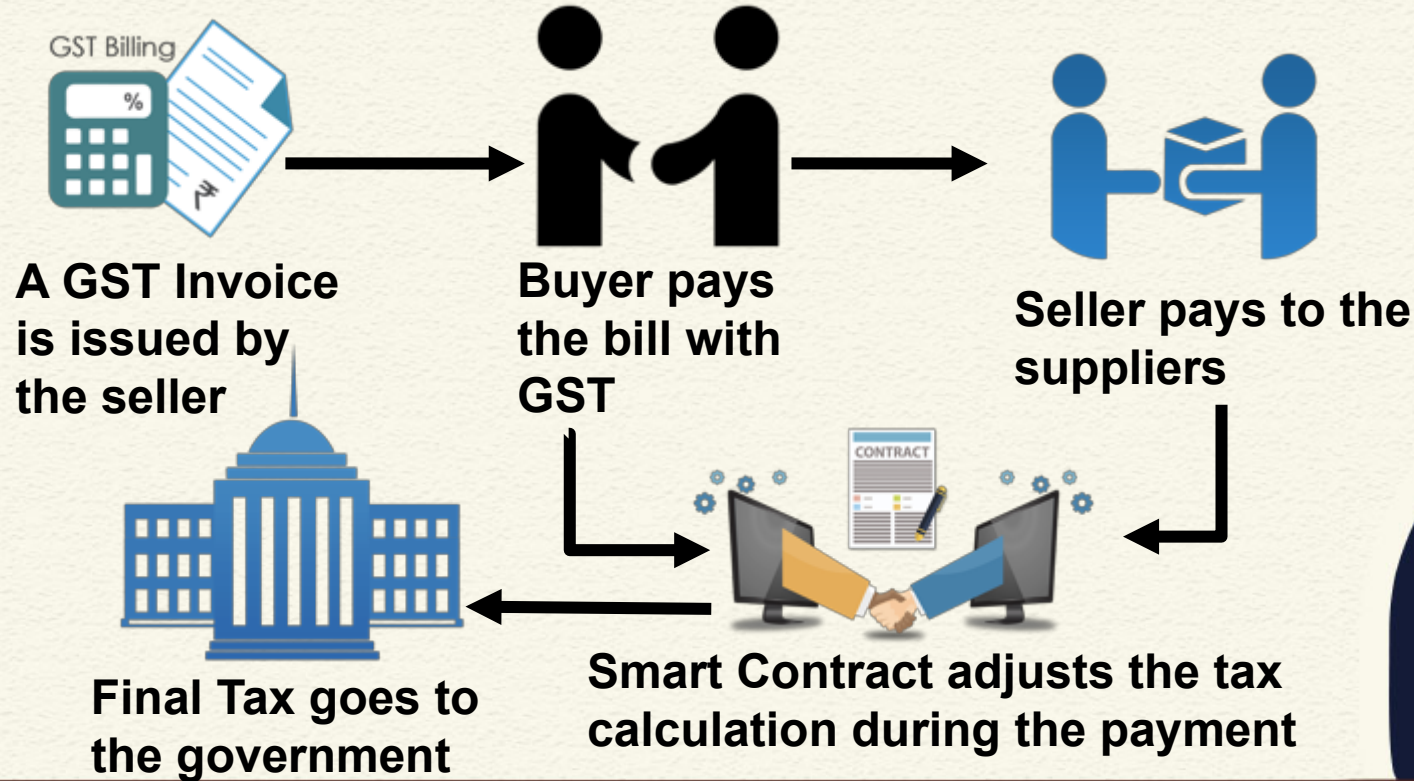# Case Study: Processing Tax Payments

- Say, you want to purchase a dress - it has multiple workflows at the production stages

# GST without Blockchain

**A GST Invoice is issued by the seller** → **Buyer pays the bill with GST** → **Information of the payment is recorded at GST Portal**

**Additional payment is adjusted** ← **Final Tax goes to the government** ← **Seller pays to the suppliers**

# GST with Blockchain



A GST Invoice is issued by the seller

Buyer pays the bill with GST

Seller pays to the suppliers

Final Tax goes to the government

Smart Contract adjusts the tax calculation during the payment

# Case Study: Processing Tax Payments

- During the payment for a good or a service
    - Blockchain smart contracts can calculate the invoice based on the tax amount that is already levied during the production process
    - Smart contract directly transfers the tax amount to tax authority (CGST or SGST)
    - The refund, if any, is directly paid to the customer's account

# Advantages of using Blockchain

- The administrative burden for accounting services is drastically reduced
- All the transactions are done in real time, no "return filing" is required, or "return filing" can be avoided
- All the transactions are transparent
  - Reduces risk of fraud and mistakes
  - Immediate auditing from the transaction log

# Draft National Strategy of Blockchain in India

- Published by **Ministry of Electronics and Information Technology (MeiTY)** during January 2021

# Draft National Strategy of Blockchain in India

- Highlights a number of use cases for possible national interests

    - Transfer of Land Records (Property Record Management)
    - Digital Certificates Management (Education, Death, Birth, agreements, sale deeds …)
    - Pharmaceutical supply chain
    - e-Notary Service (Blockchain enabled e-Sign Solution)
    - Farm Insurance
    - Identity management
    - Power distribution
    - Duty payments

# Draft National Strategy of Blockchain in India

- Highlights a number of use cases for possible national interests

  - Agriculture and other supply chains
  - eVoting
  - Electronic Health Record Management
  - Digital Evidence Management System
  - Public Service Delivery
  - IoT Device Management and Security
  - Vehicle lifecycle management
  - Chit fund operations administration
  - Microfinance for Self-Help Groups

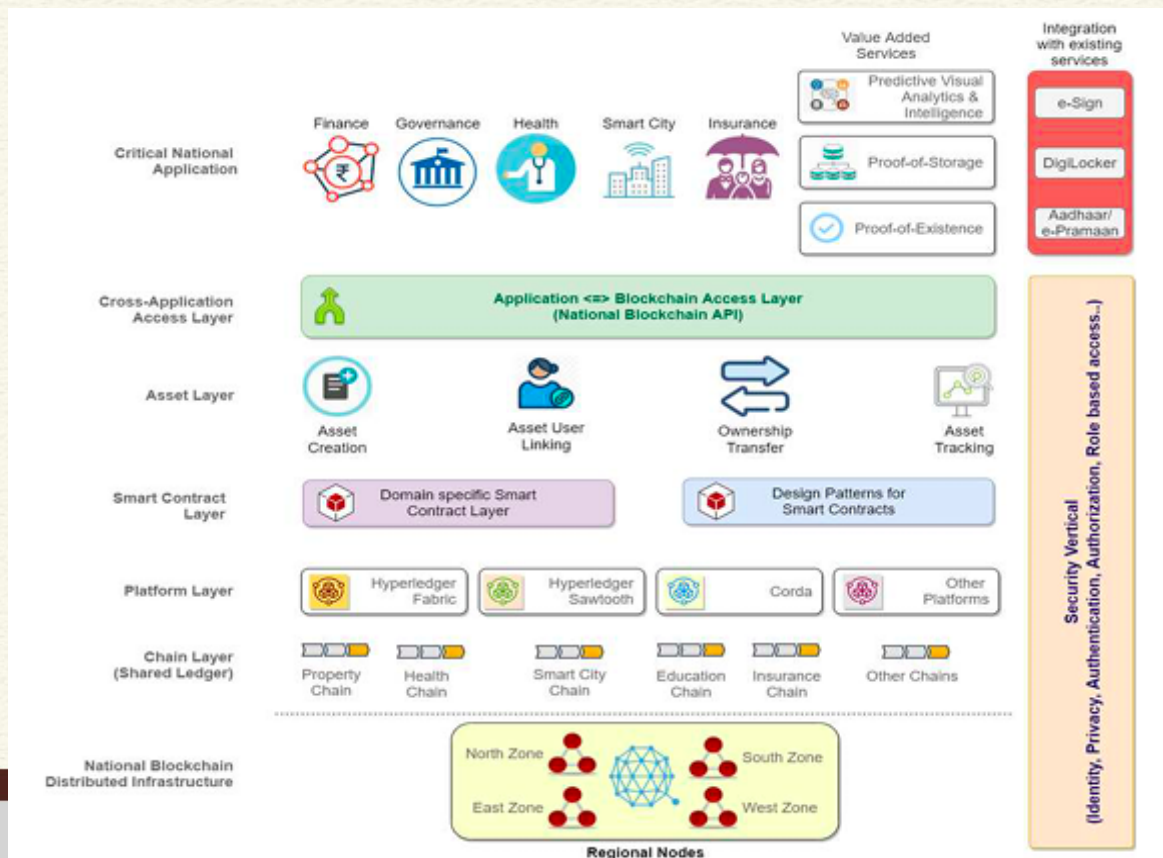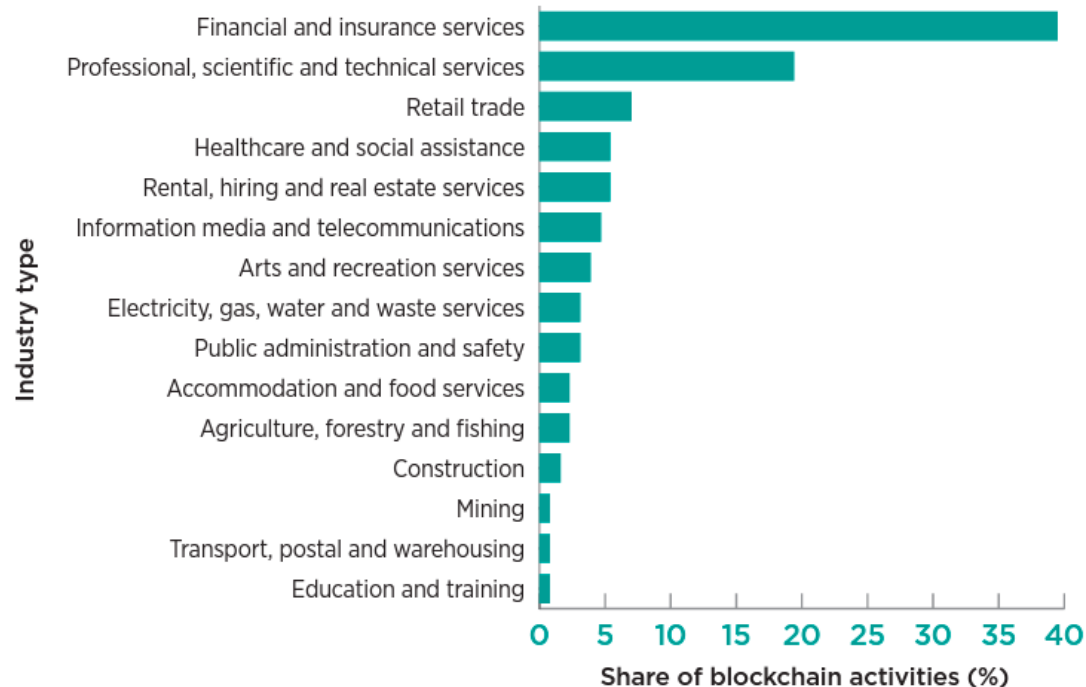# Draft National Strategy of Blockchain in India



Figure 8: A National Level Blockchain Framework

# National Blockchain Roadmap, Australia

# Conclusion

- There are various scopes for applying blockchains in public services that involve multiple stakeholders
  - Are we sufficiently prepared?

- However, we should be careful about the possible side channels