

Institute for
Innovation and
Public Purpose



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@daeaves

Key Messages

- <1> Software is Infrastructure**
- <2> Models of Digitization are Poor**
- <3> MDBs as Market Shapers**

**First -
(Old) Infrastructure Thinking**

**Highways leverage
a form of platform
thinking.**



Fed Highways

Shipping



Mack trucks



Fed Highways

Errands

Shipping

Commuting

Leisure



Smart

Mack trucks

Ford

Lotus



Fed Highways

Errands

Shipping

Commuting

Leisure



Smart

Mack trucks

Ford

Lotus



State Highway



Fed Highways

HIGH ST

Local Roads

Activities

Errands

Shipping

Commuting

Leisure

Application Layer



Smart



Mack trucks



Ford



Lotus

Network Layer



State Highway



Fed Highways



Local Roads

Activities

Errands

Shipping

Commuting

Leisure

Application Layer



Smart



Mack trucks



Ford



Lotus

Regulatory Layer



Highway Act



CAFE



AASHTO

...

Network Layer



State Highway



Fed Highways



Local Roads

Interoperability

**High
Variability**

**Stable
Interfaces**

**Low
Variability**

High Variability

Errands

Shipping

Commuting

Leisure



Smart

Mack trucks

Ford

Lotus

Stable Interfaces



Highway Act

CAFE

AASHTO

...

Low Variability



State Highway

Fed Highways

Local Roads

**What Government
looks like today,
*digitally.***

Department

Application

Database

Department

Tax Dept

DMV

Social Services

HR Intranet

Department

Tax Dept

DMV

Social Services

HR Intranet

Application

Sign On

Address Search

SIN request

Form

Department

Tax Dept

DMV

Social Services

HR Intranet

Application

Sign On

Address Search

SIN request

Form

Database

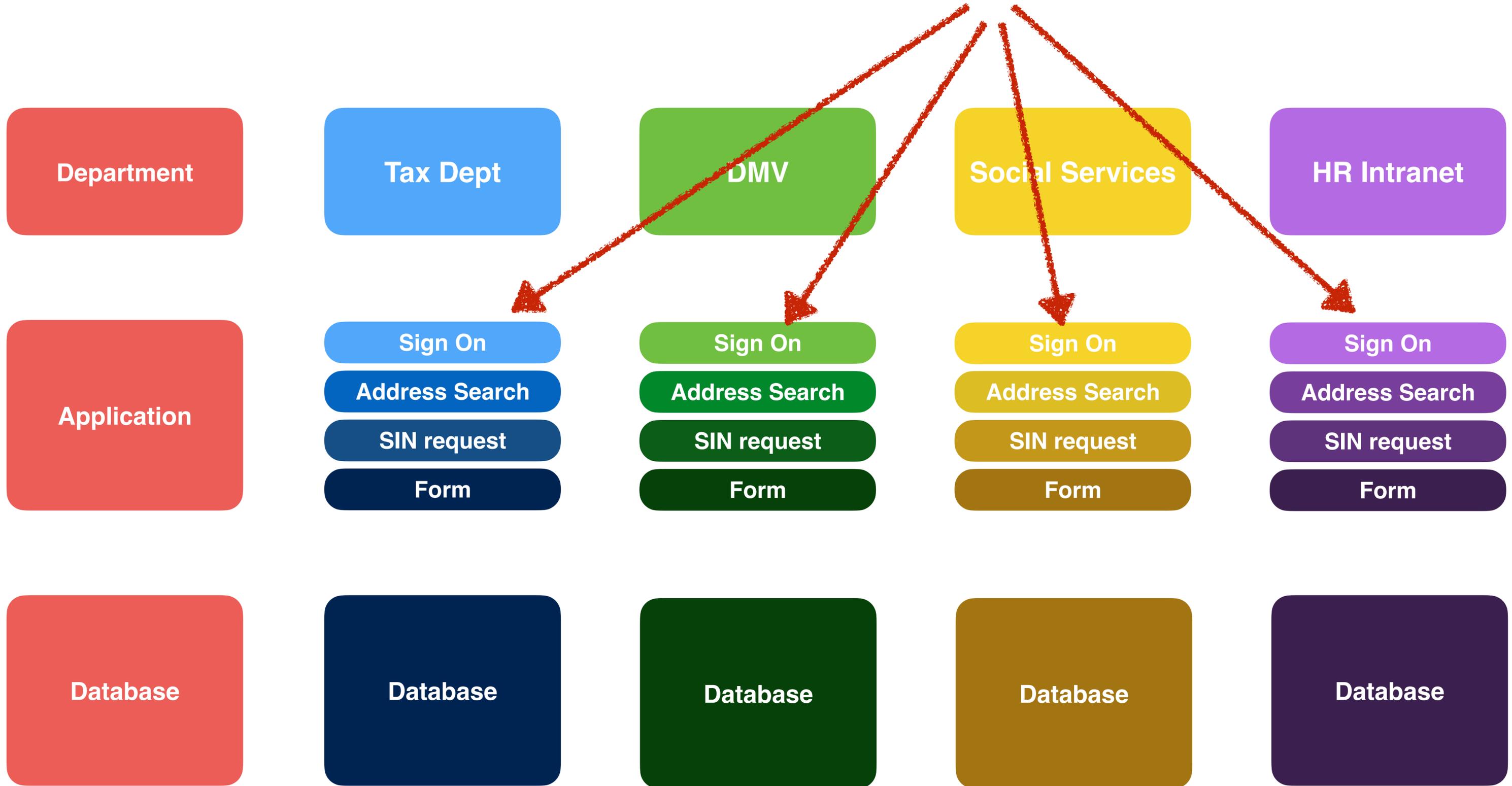
Database

Database

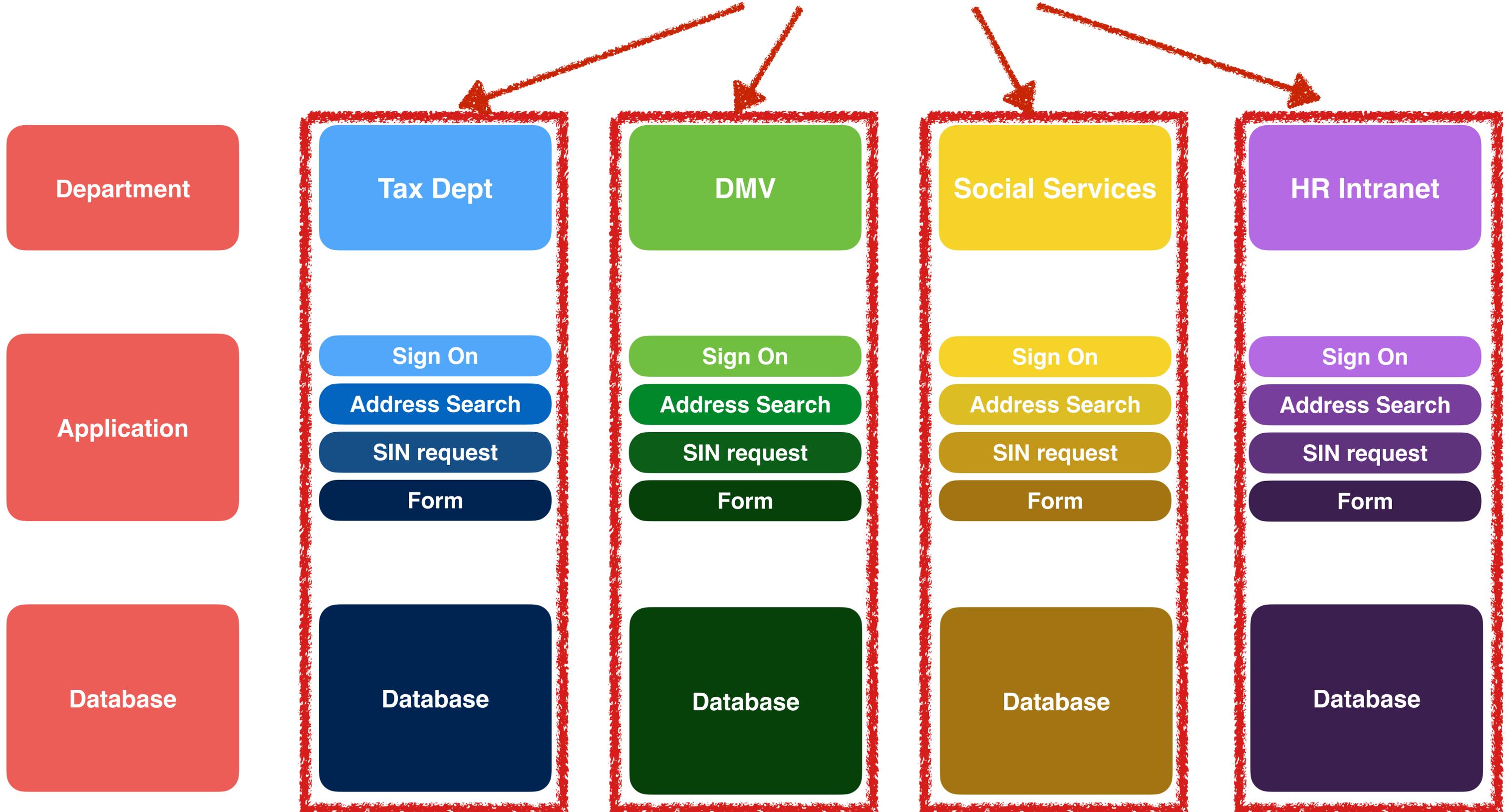
Database

Database

Duplication, Few standards, etc..



Vertical accountabilities



Actually...

Department

Tax Dept

Department

Tax Dept

Application

Sign On

Address Search

SIN request

Form

Duplication

Department

Tax Dept

Application

Sign On
Address Search
SIN request
Form

Database

Sign On
Address Search
SIN request
Form

My Desktop Computer

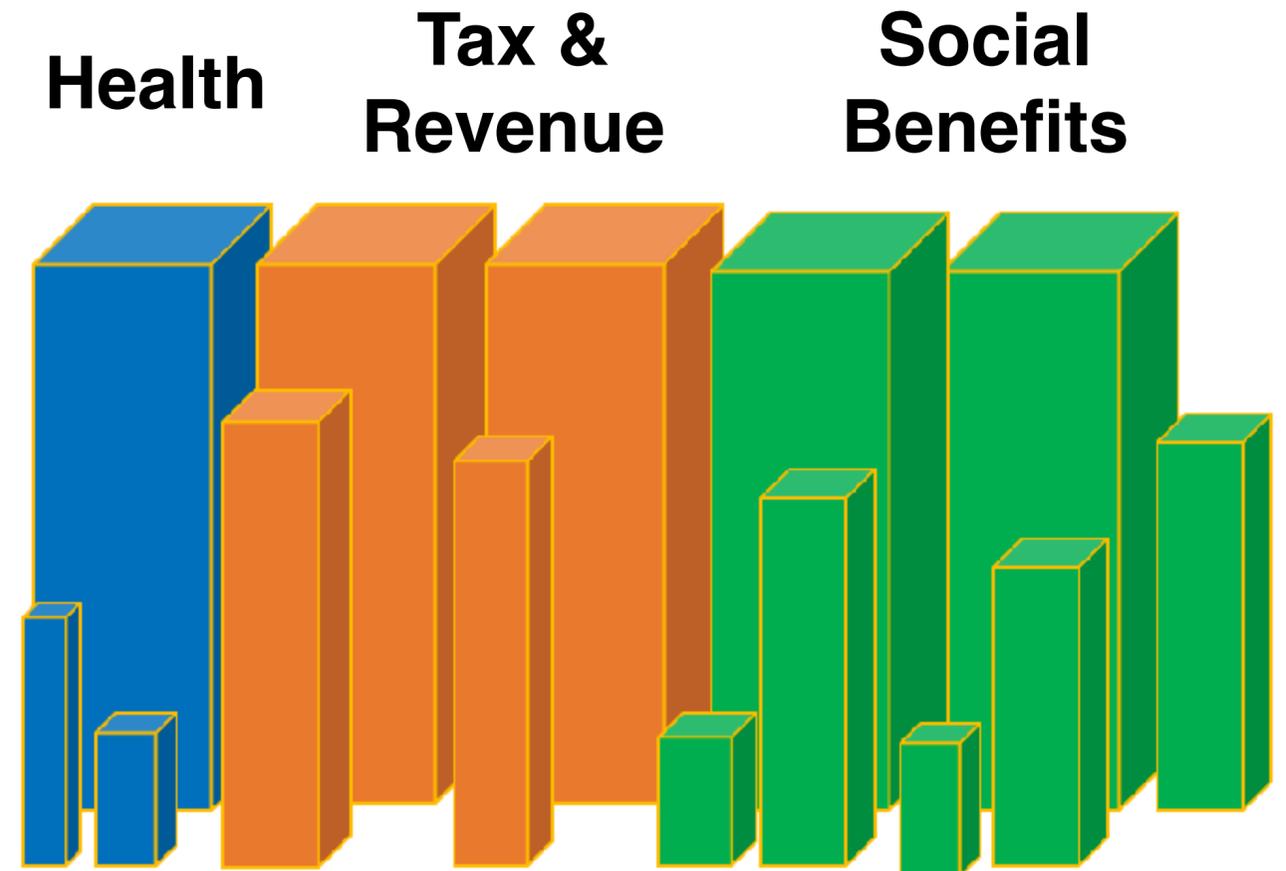
Sign On
Address Search
SIN request
Form

Unsecured Excel Spreadsheet in shared folder

Sign On
Address Search
SIN request
Form

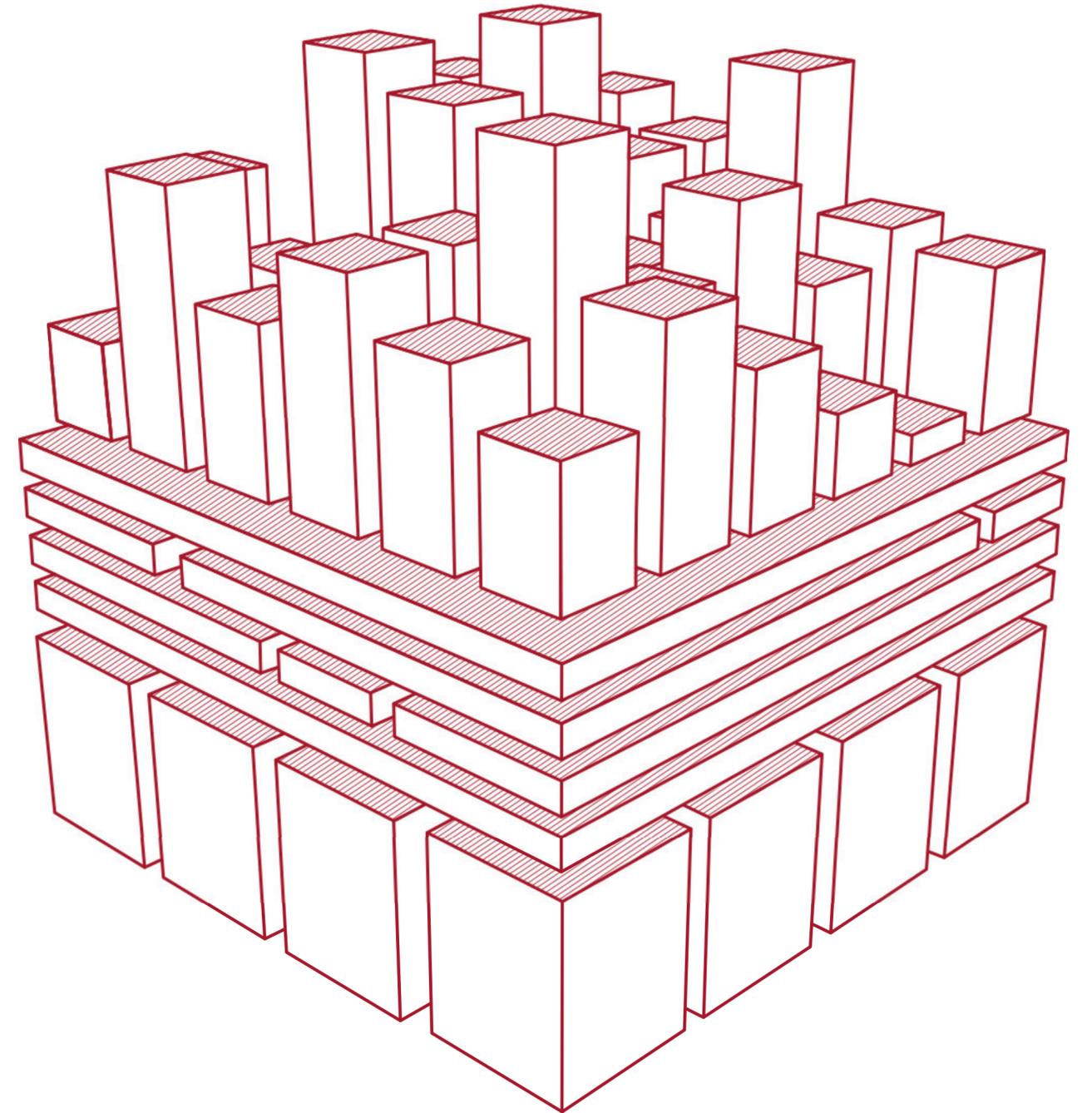
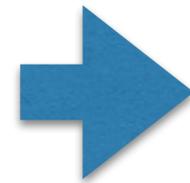
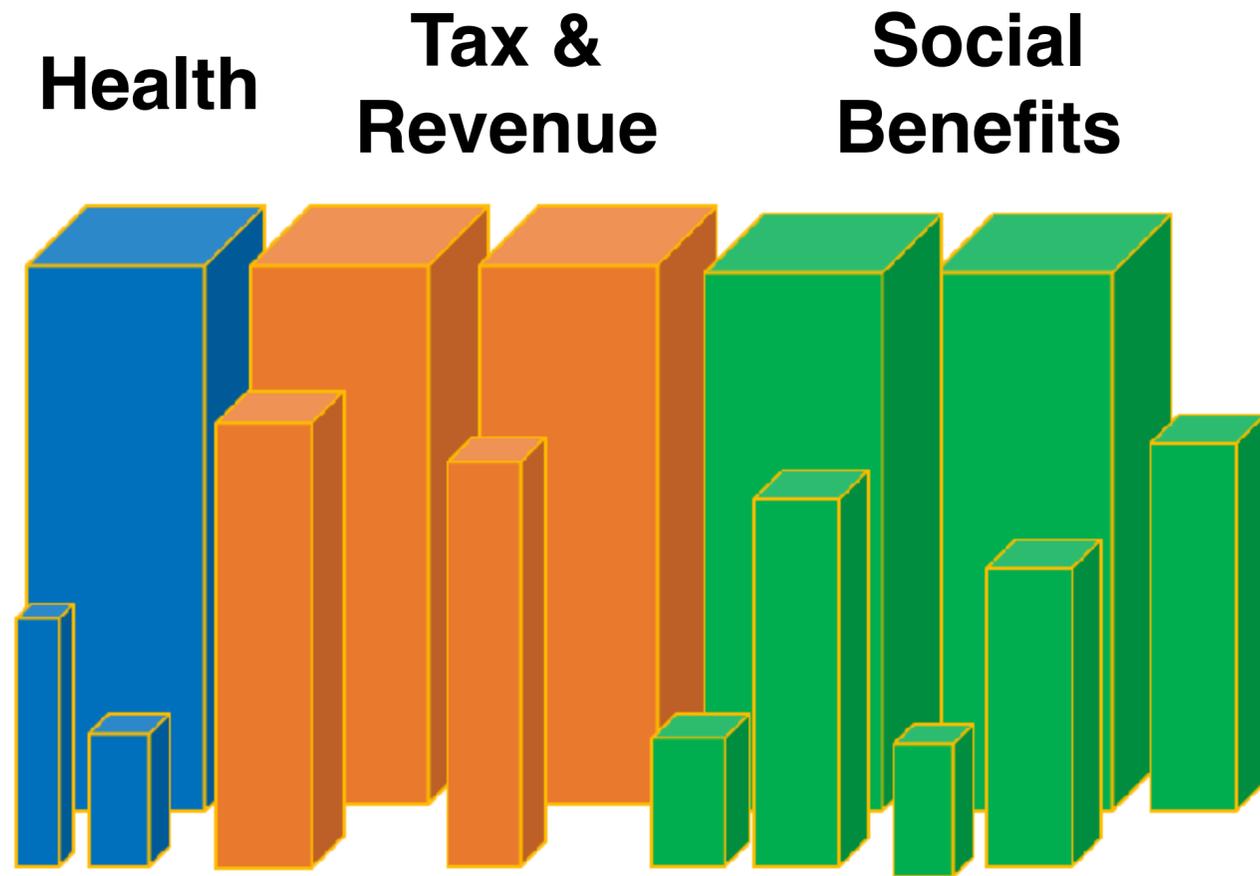
???
(likely dropbox)

We are creating digital monoliths



Silo

Infrastructure



The Problem of Fragmented Digitalisation

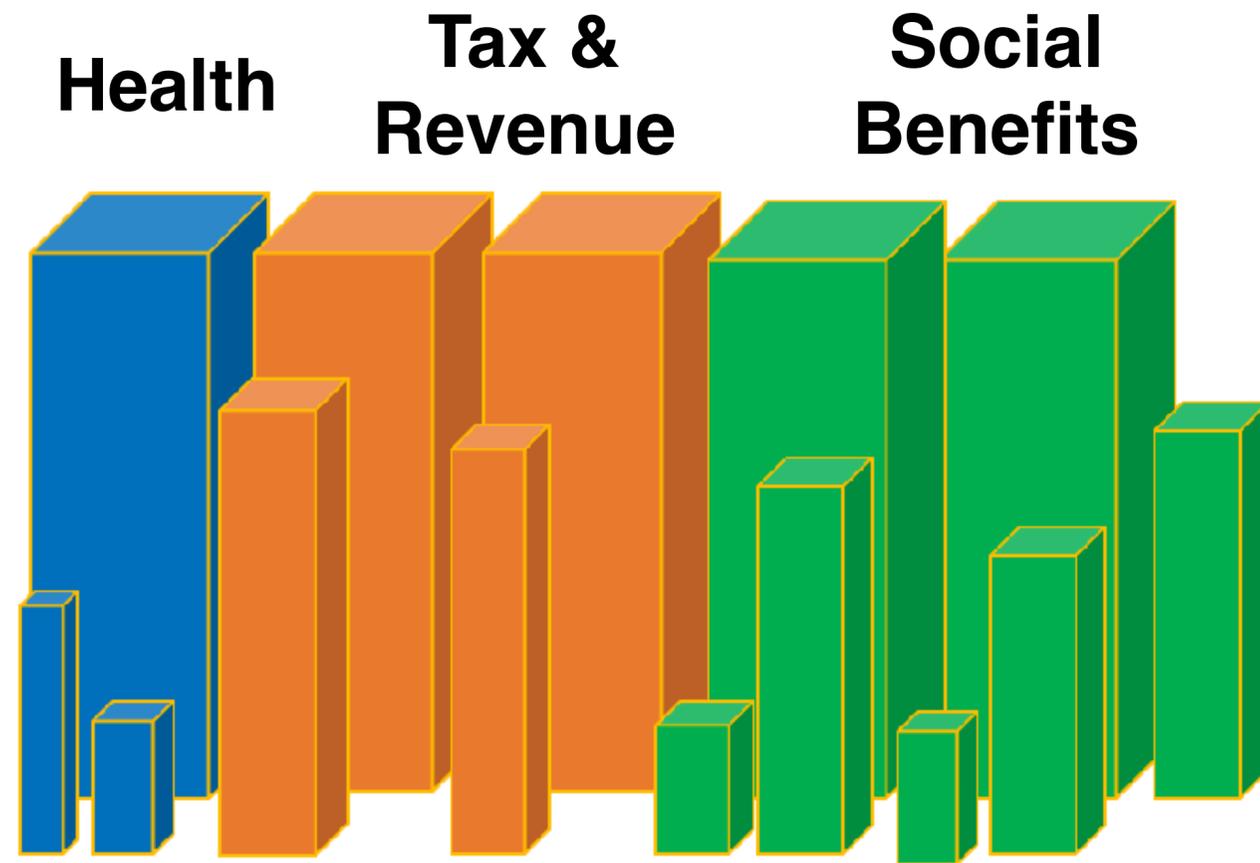


Digital technologies are now the backbone of modern societies – but despite decades of investment, many public digital systems remain fragmented and inefficient.

Traditional digitalisation challenges have included:

- **High duplication costs** → Ministries and agencies built separate IT systems, increasing procurement, maintenance, and staffing expenses.
- **Vendor lock-in** → Proprietary software limited flexibility, making upgrades expensive and reducing competition.
- **Limited scalability** → Each system was built for a specific function, rather than allowing reuse across government and society.
- **High transaction costs** → Government and private sector services struggled to exchange data, leading to expensive verification processes (e.g., repeated KYC checks, excessive paperwork).
- **Information asymmetry** → Lack of interoperable data systems meant that businesses, citizens, and other ministries and other layers of government had incomplete access to key information, leading to inefficiencies in decision-making.
- **Incomplete information** → Critical datasets (such as national ID, land registries, or business records) were often inaccurate, outdated, or inaccessible, increasing risks and limiting service delivery.

This approach is inefficient, costly and limits government capacity



In Nigeria, maintaining **overlapping identification systems** was estimated to cost

US\$4.3 billion

over eight years

Source: World Bank, 2015



In the US, a study estimates that, during COVID, only

23-34% of the \$800B

Paycheck Protection Program to save jobs went to the target population

Source: NBER Working Paper, 2022

THE PANDEMIC ECONOMY

Millions of People Face Stimulus Check Delays for a Strange Reason: They Are Poor

The IRS has had trouble getting money to people quickly because millions of Americans pay for their tax preparation through a baroque system of middlemen.

by Paul Kiel, Justin Elliott and Will Young, April 24, 2020, 11:40 a.m. EDT



THE PANDEMIC ECONOMY
Fiscal Responses to COVID-19

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With an officer from the Richmond County Sheriff's Office shouting for people to be quiet, the owner told the crowd of about 60, only a few of whom didn't have their money.

Your second stimulus check may be delayed if you changed your bank or moved

PUBLISHED THU, DEC 31 2020-11:50 AM EST | UPDATED THU, DEC 31 2020-2:28 PM EST

Carmen Reinicke
@CSREINICKE

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[stimulus checks is on the way](#), but for those who had changed their bank account information or moved



WORLD U.S. ELECTION 2024 POLITICS SPORTS ENTERTAINMENT BUSINESS SCIENCE FACT CHECK ODDITIES HEALTH VIDEO CLIMATE

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Iowa caucuses Emmy fashion Israel-Hamas war Winter storms Bills beat Steelers

U.S. NEWS

The Great Grift: How billions in COVID-19 relief aid was stolen or wasted



Your second stimulus check may be delayed if you changed your bank or moved

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Carmen Reinicke
@CSREINICKE

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PROPUBLICA

Millions of People Face Stimulus Check Delays for a Strange Reason: Th...

THE PANDEMIC ECONOMY

Millions of People Face Stimulus Check Delays for a Strange Reason: They Are Poor

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AP WORLD U.S. ELECTION 2024 POLITICS SPORTS ENTERTAINMENT BUSINESS SCIENCE FACT CHECK ODDITIES HEALTH VIDEO CLIMATE ...

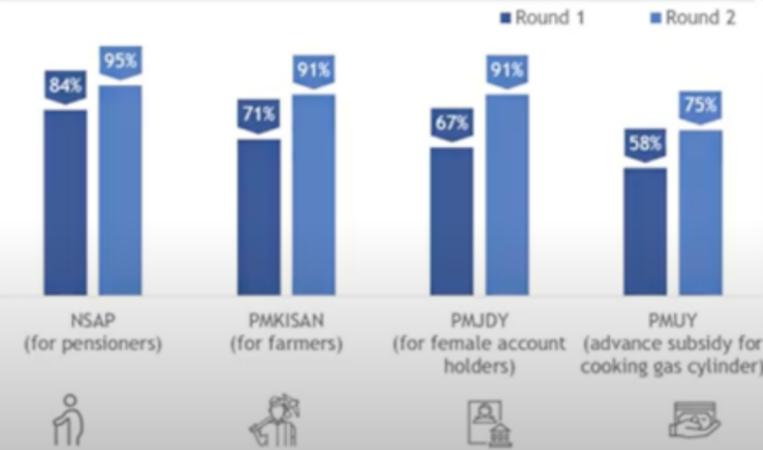
lowa caucuses Emmy fashion Israel-Hamas war Winter storms Bills beat Steelers

The Great Grift: How billions in COVID-19 relief aid was stolen or wasted



The Indian government used the existing Direct Benefit Transfer (DBT) system to deposit USD 9.3 billion in the bank accounts of 420 million-plus beneficiaries under PMGKY

Percentage of eligible households who received cash benefits under PMGKY (MSC's assessment)



India's DBT ecosystem allowed the immediate transfer of PMGKY cash benefits.

During the second quarter of 2020-21 (April to June), more than 830 million transactions were processed, while 1.47% failed.

However, several issues persist around the failure of DBT transactions, such as dormant or closed bank accounts, mismatch in bank details, inactive Aadhaar numbers, among others.

RECOVR | CASE STUDY

JULY 2021

Togo's Novissi Cash Transfer: Designing and Implementing a Fully Digital Social Assistance Program during COVID-19



In April 2020, the Ministry of Digital Economy and Digital Transformation (MENTD) of Togo launched the Novissi cash transfer scheme. An unconditional cash transfer (UCT) to assist informal workers whose livelihoods have been upended by the coronavirus pandemic, Novissi is a fully digital social assistance program. As of March 2021, Novissi has reached 819,972 beneficiaries and disbursed approximately US\$23.9 million (13,308,224,040 FCFA). This case study details the design process for the program, and its implementation during the coronavirus pandemic, which can interest leaders of social assistance programs in other contexts. It also highlights lessons learned on the use of mobile money to support fully digital social assistance.

Lessons Learned

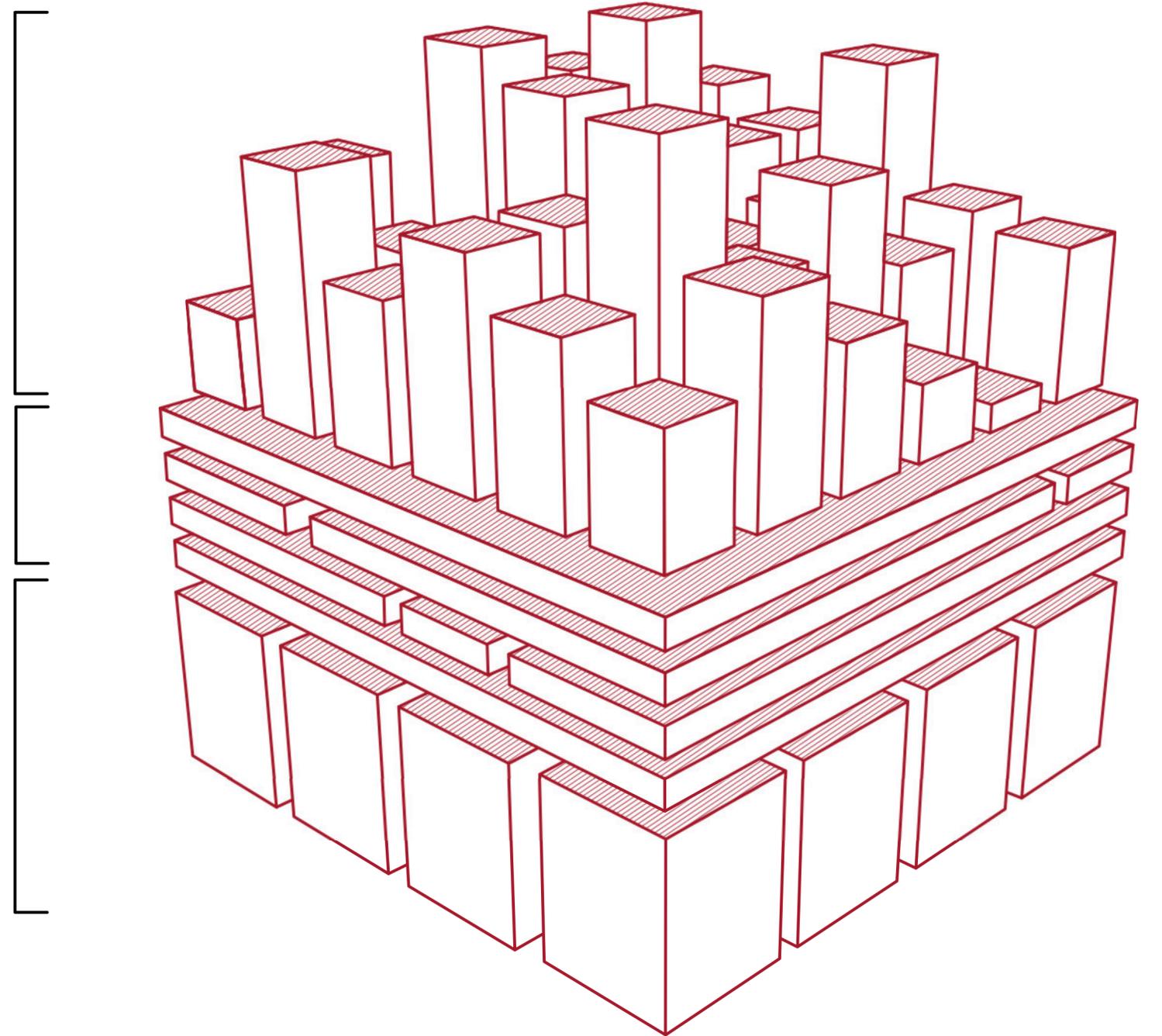
The fast-paced nature of the COVID-19 pandemic forced governments to quickly mobilize resources and emergency responses to address simultaneous health and economic crises. By launching a program as comprehensive as Novissi from scratch and implementing it during a prolonged period of crisis, the Togolese government learned several lessons, including:

**What does an
infrastructure view of
government look like?**

Services

Components

Data



Data (Registries)

Civic (birth, death, marriage)

Land (GIS)

Health Records

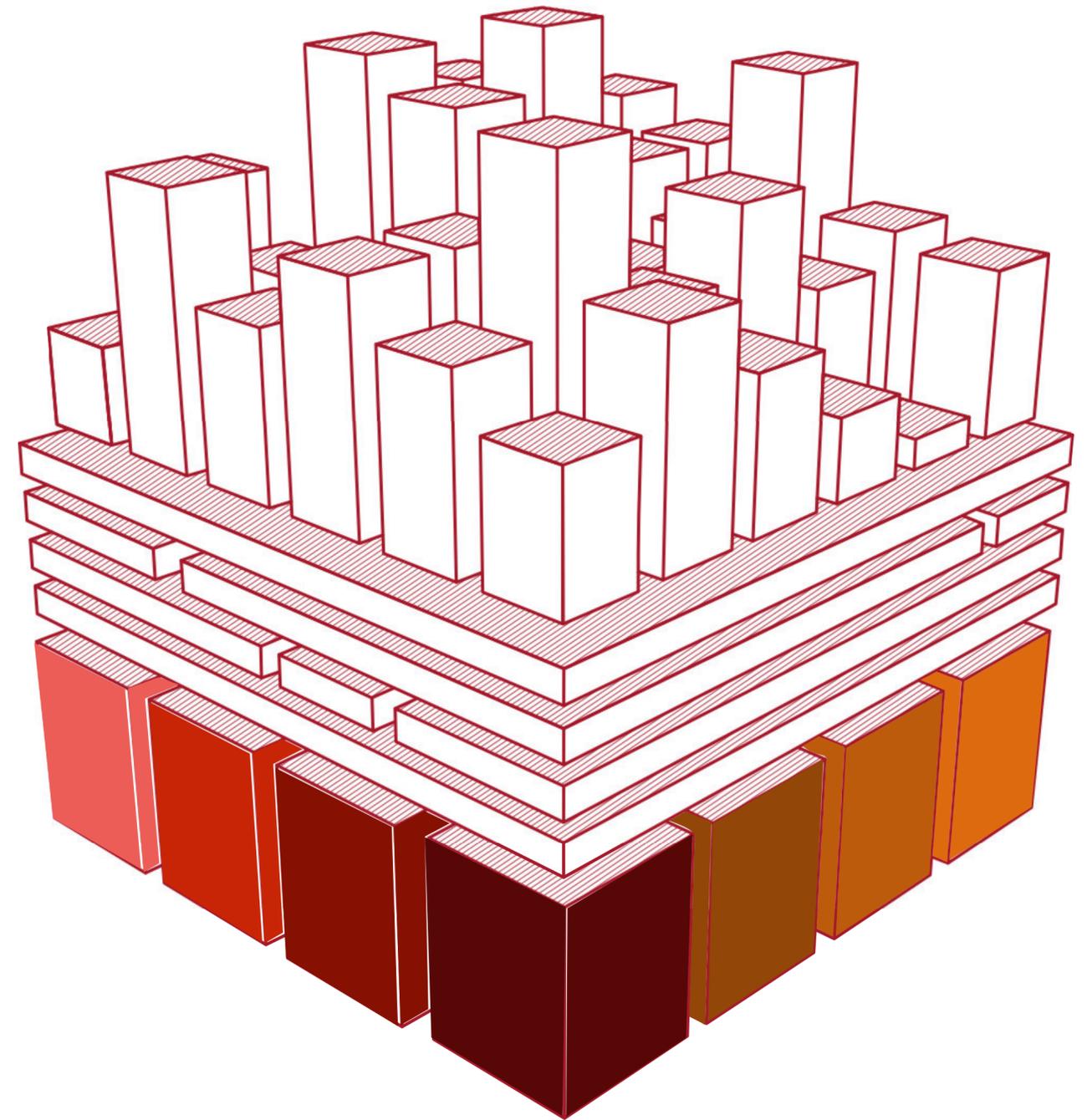
Education

Property

Business/Incorporated Entities

Registry of registries

Trade Documentation



Components

Identity

- Authentication
- ID
- e-KYC/Proof

Payments

Data Exchange

- Permissioning Registry?
- Security/Time Stamping/Auditing

E-Signature

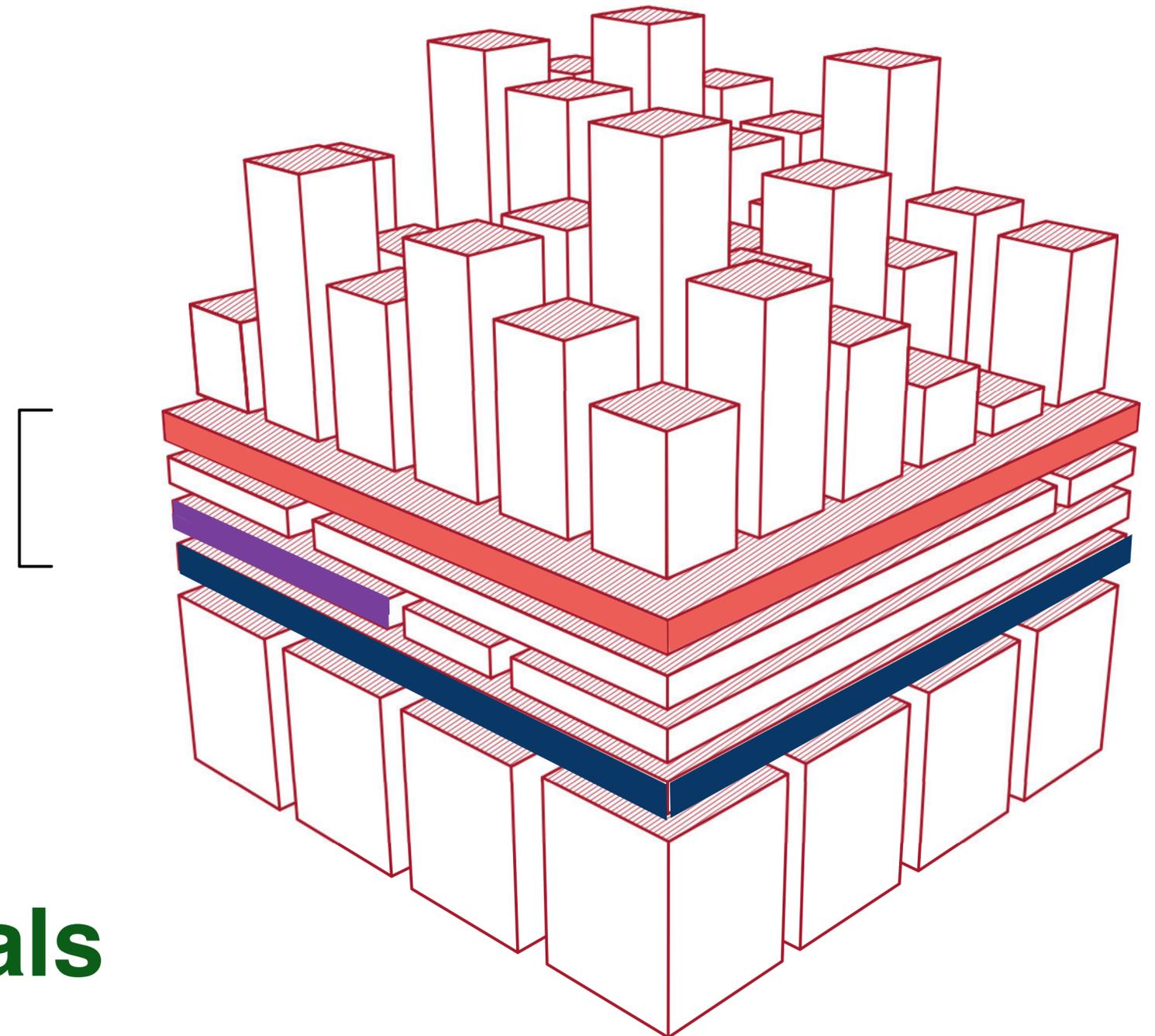
- Public Key Infrastructure

Notifications

Forms

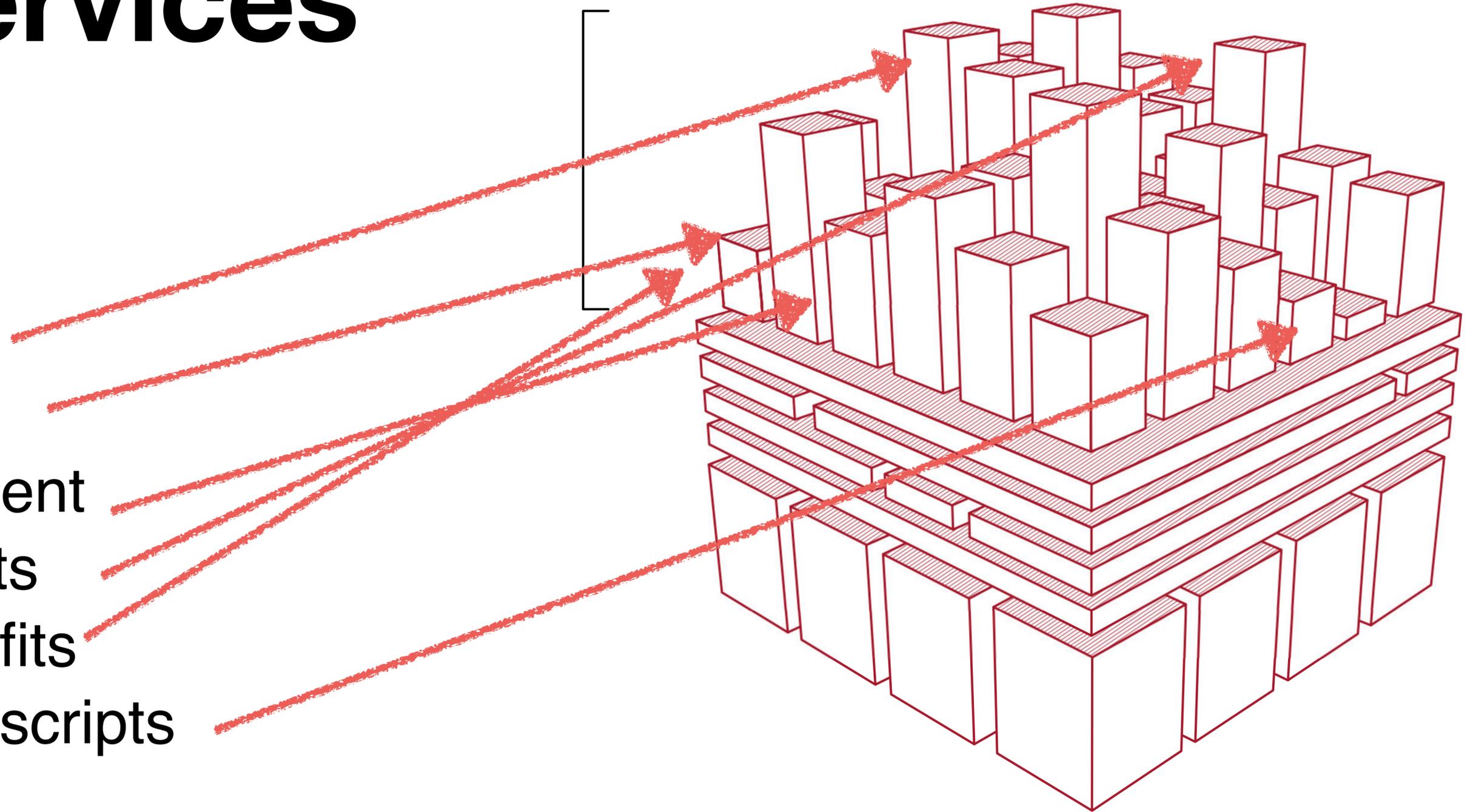
Credentials

Scheduling



Services

Passport
Healthcare
Unemployment
Work Permits
Social Benefits
School Transcripts



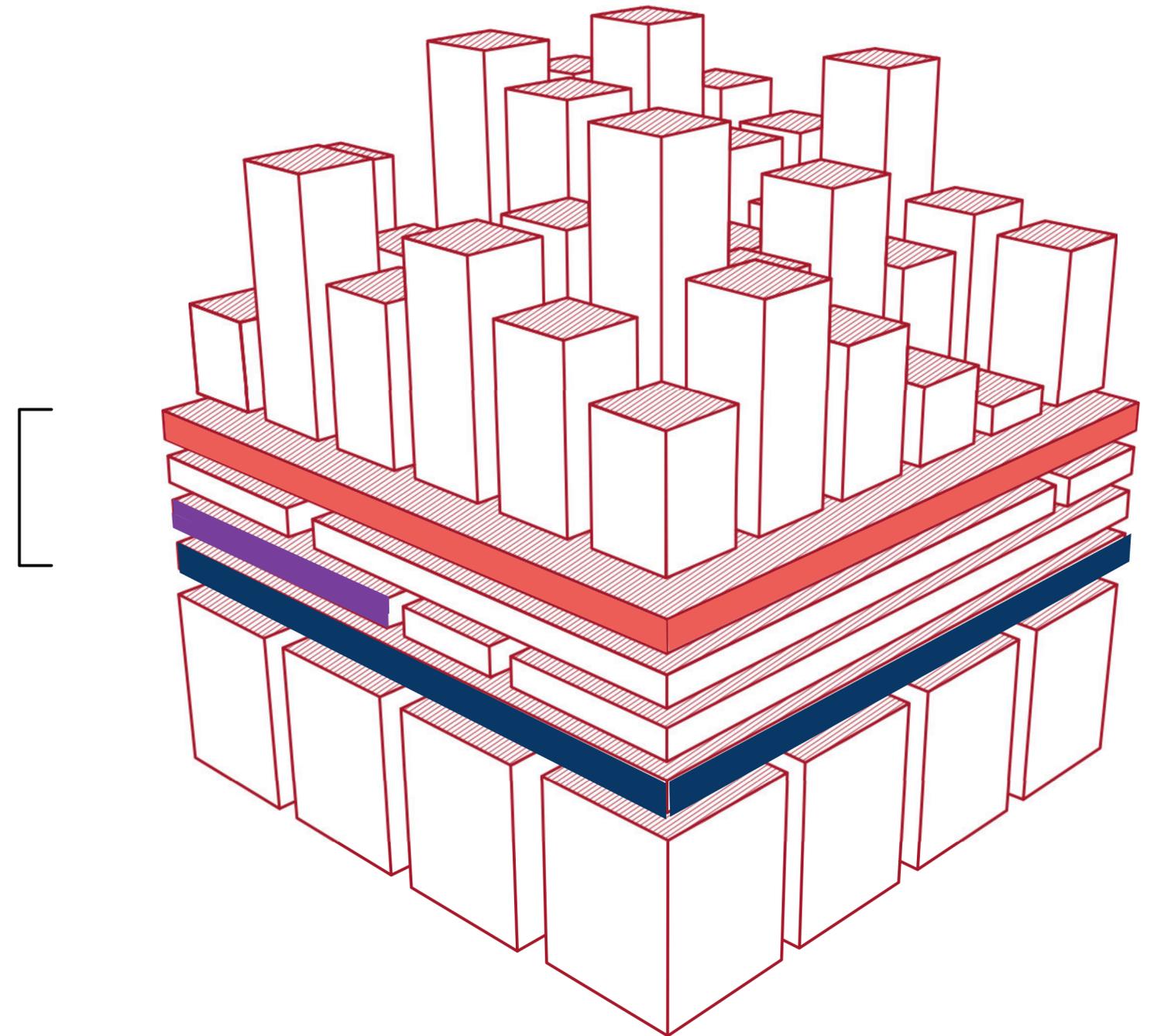
Authentication



Payments



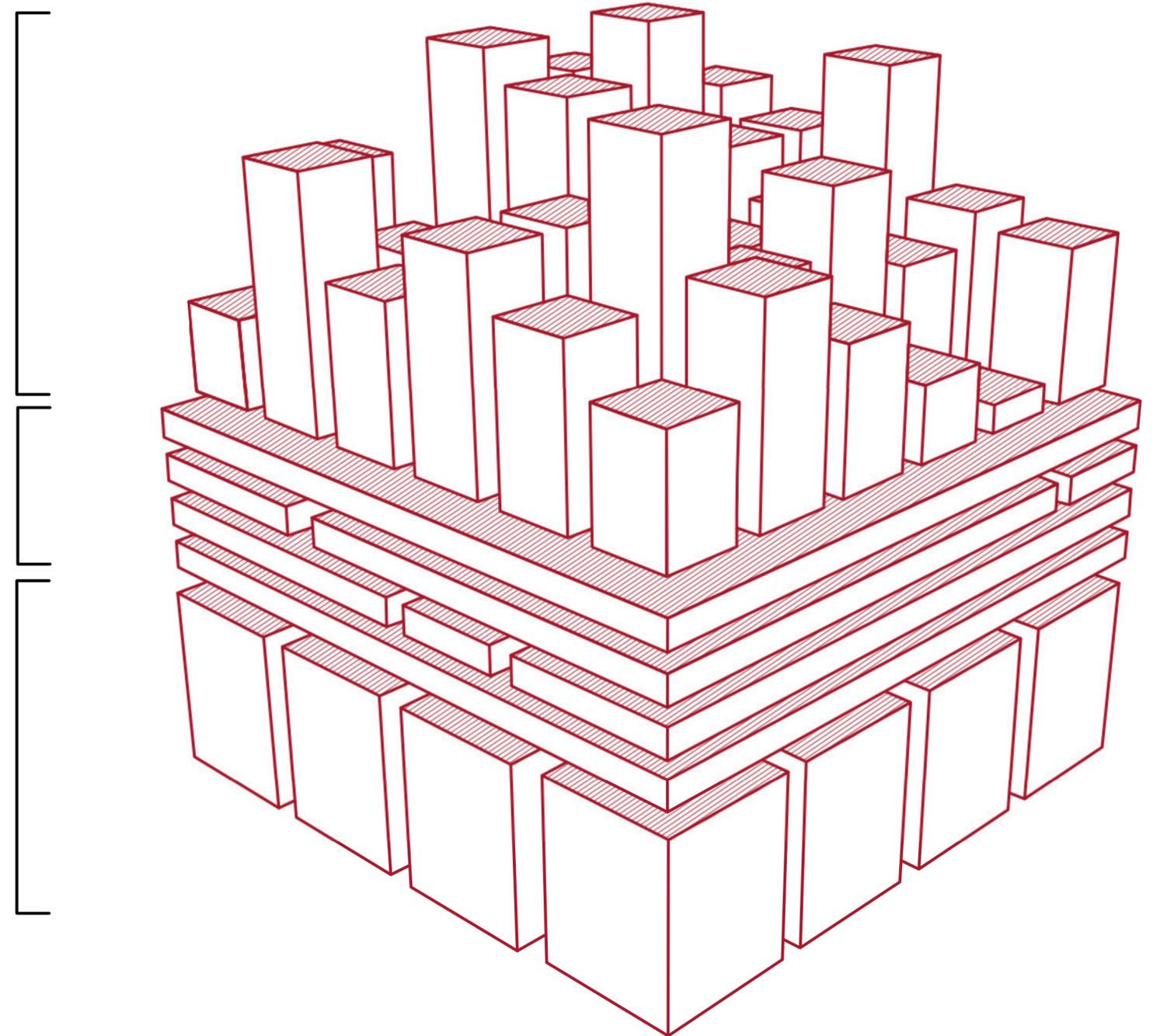
Data Exchange



High Variability

Stable Interfaces

Low Variability



DPI are society-wide, digital capabilities.

DPI are society-wide, digital capabilities.

DPI are essential to participation in society and markets as a citizen, entrepreneur, and consumer.

DPI are society-wide, digital capabilities.

DPI are essential to participation in society and markets as a citizen, entrepreneur, and consumer.

Because they are essential, public institutions should guarantee DPI are inclusive, interoperable, publicly accountable.

DPI is Infrastructure

Infrastructure that is

Software

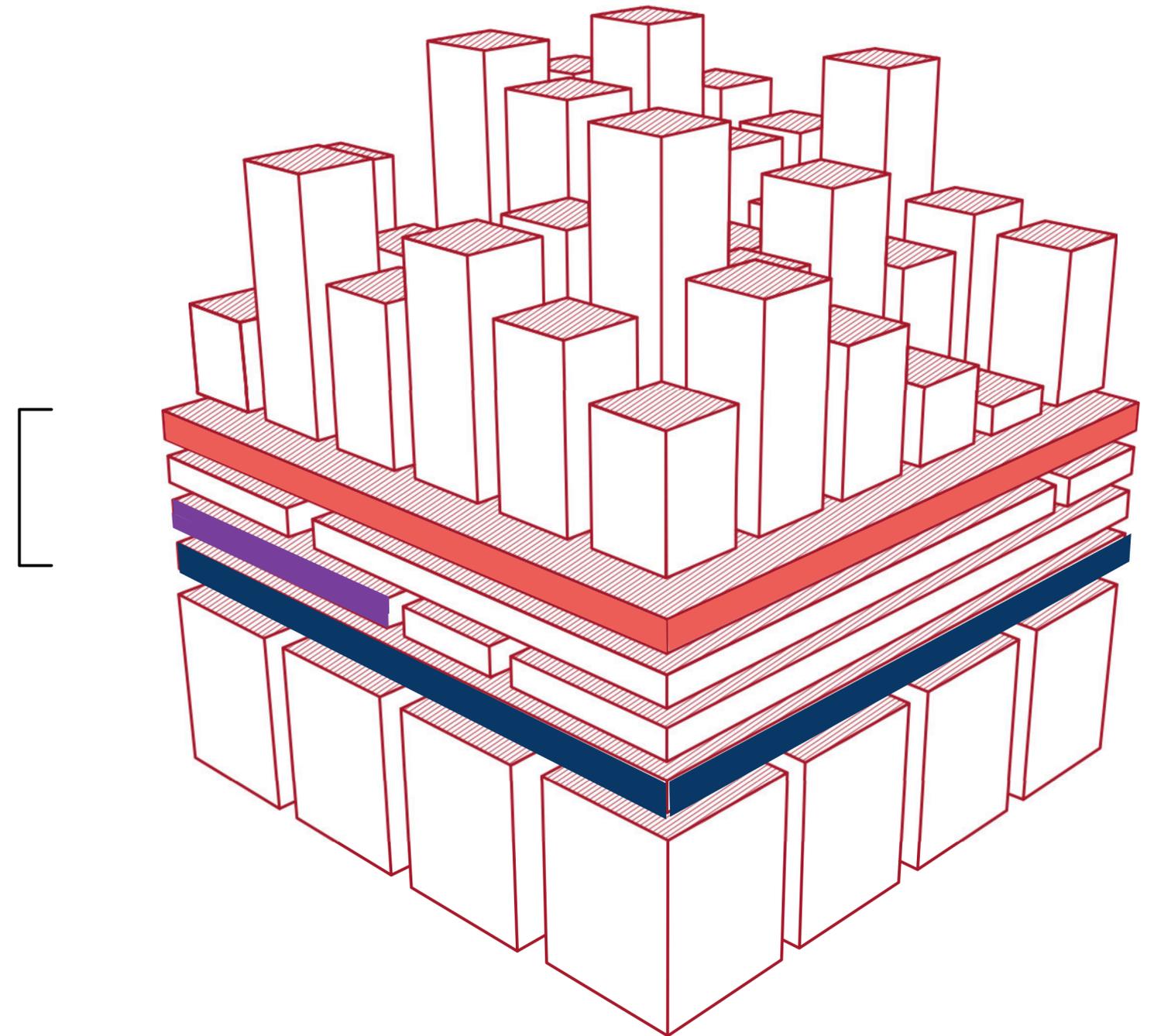
Authentication



Payments



Data Exchange



DPI is Public

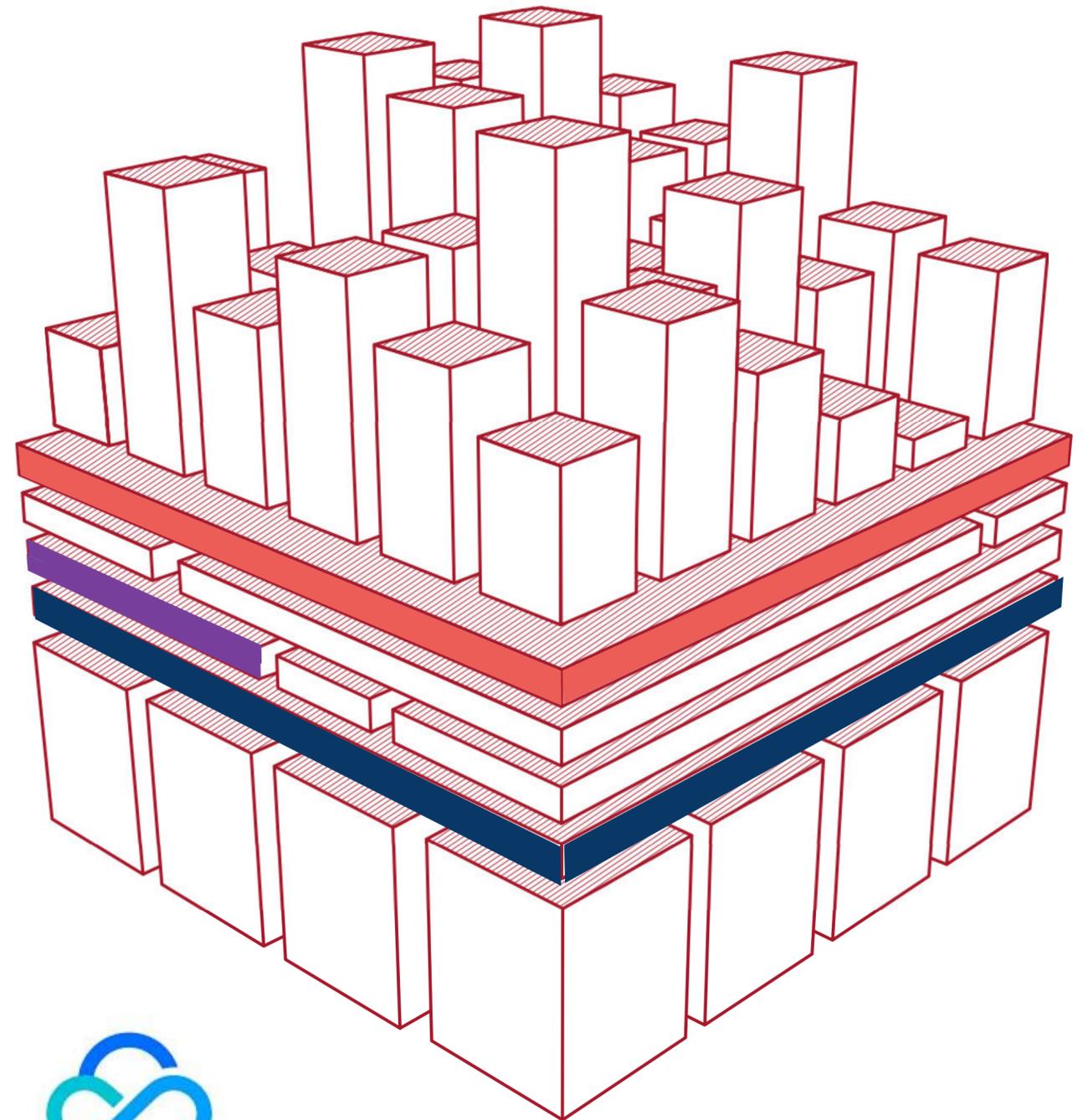
Authentication



Payments



Data Exchange



**<1> Global Challenge -
Financing Digital
Government**

**Who led the digital transformation
of your organization?**

A) CEO

B) CTO

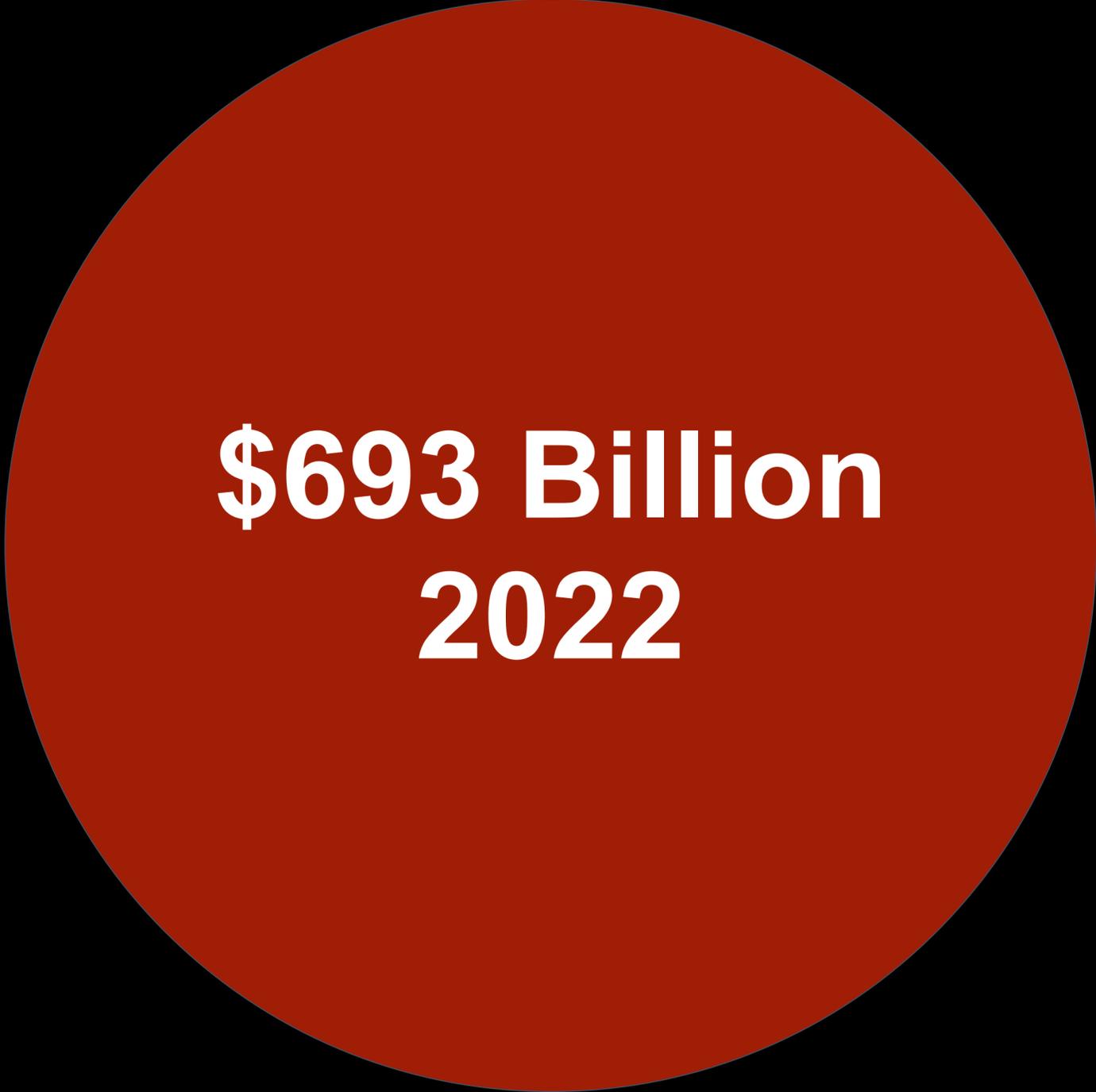
C) COVID-19

The problem:

Current models of funding digital government cannot and will not scale.

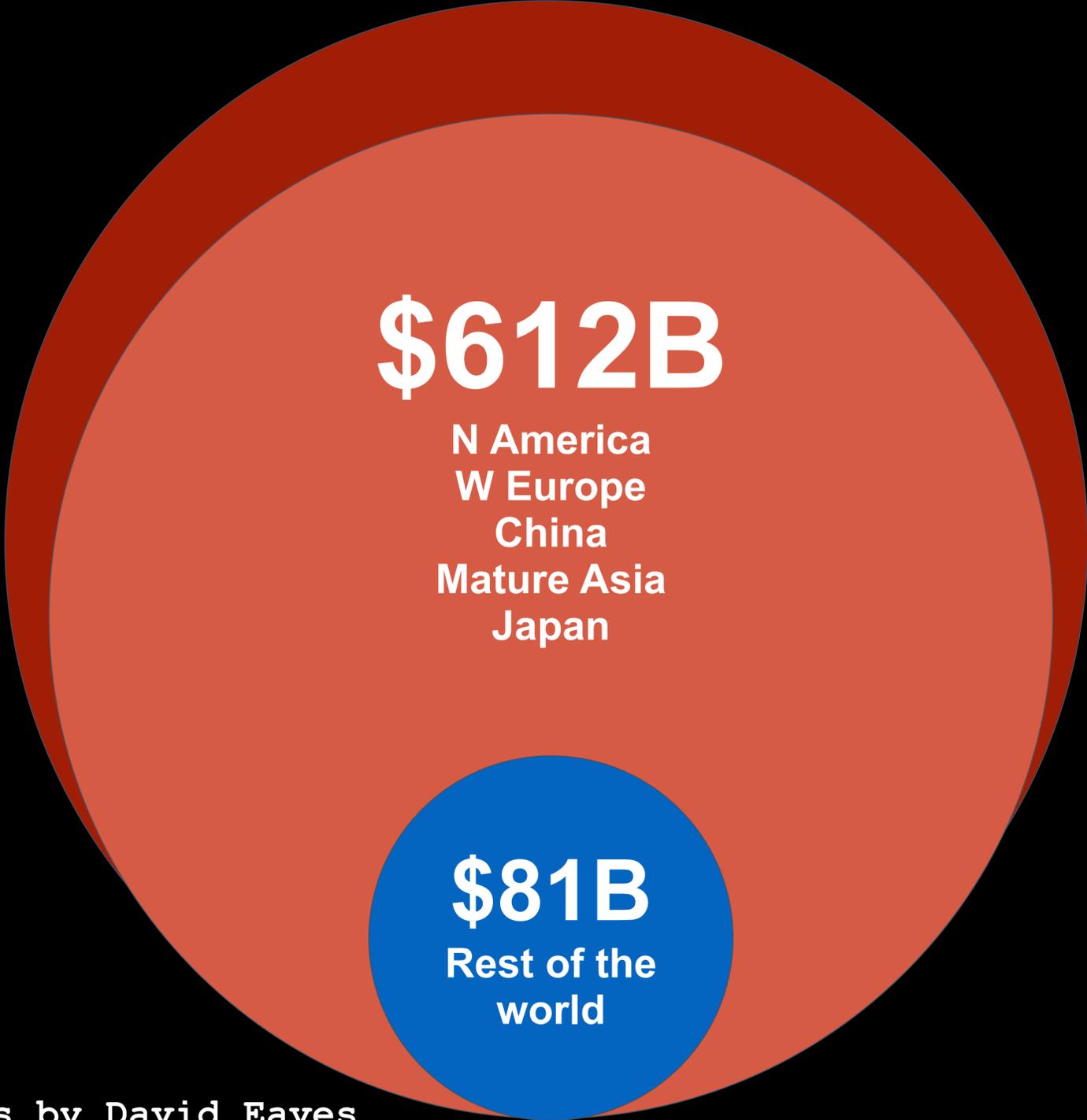
We need a new “infrastructure” approach to funding digital to drive development

Global Government IT Spend

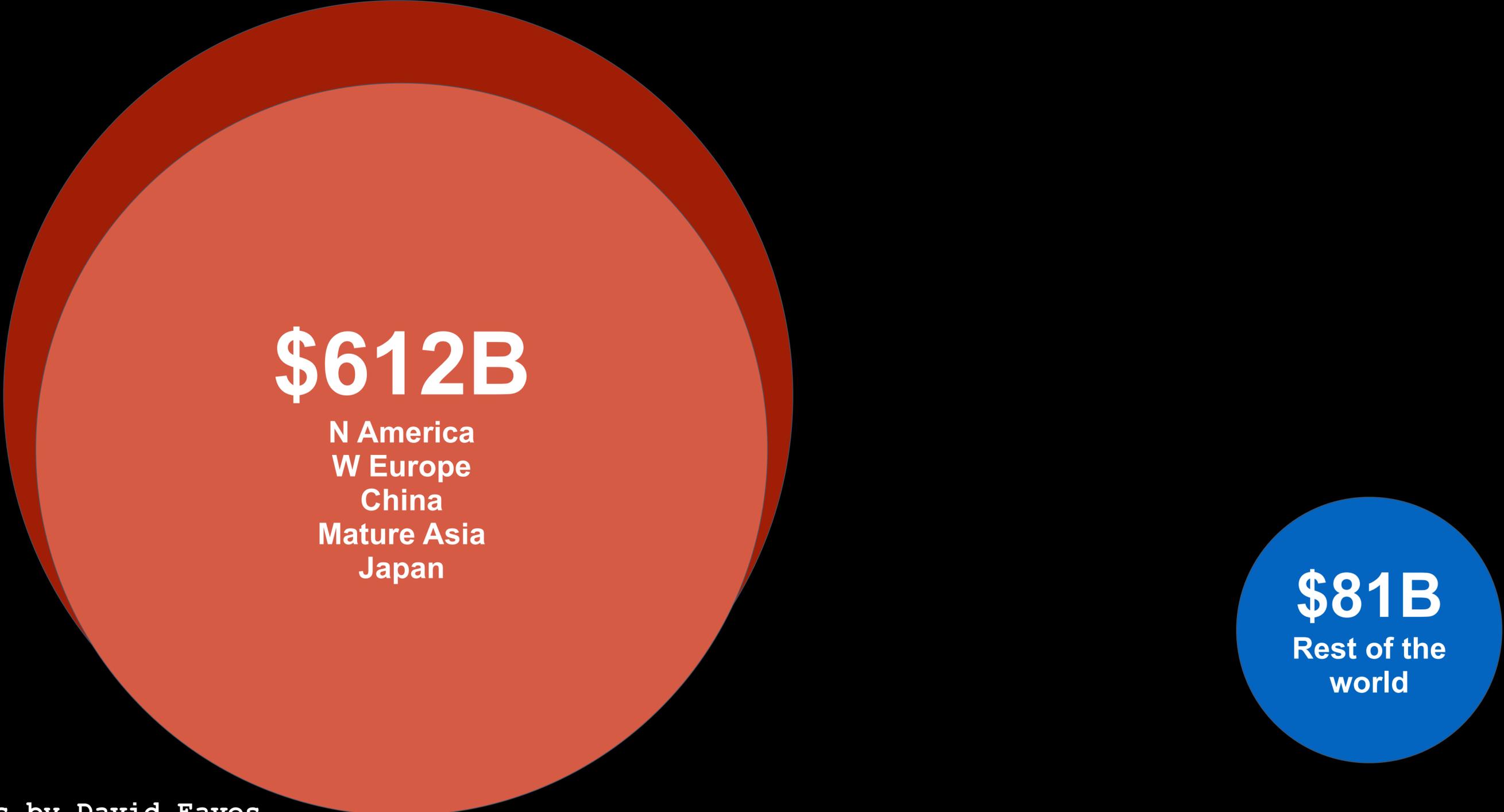


\$693 Billion
2022

Global Government IT Spend (Total Dollars)



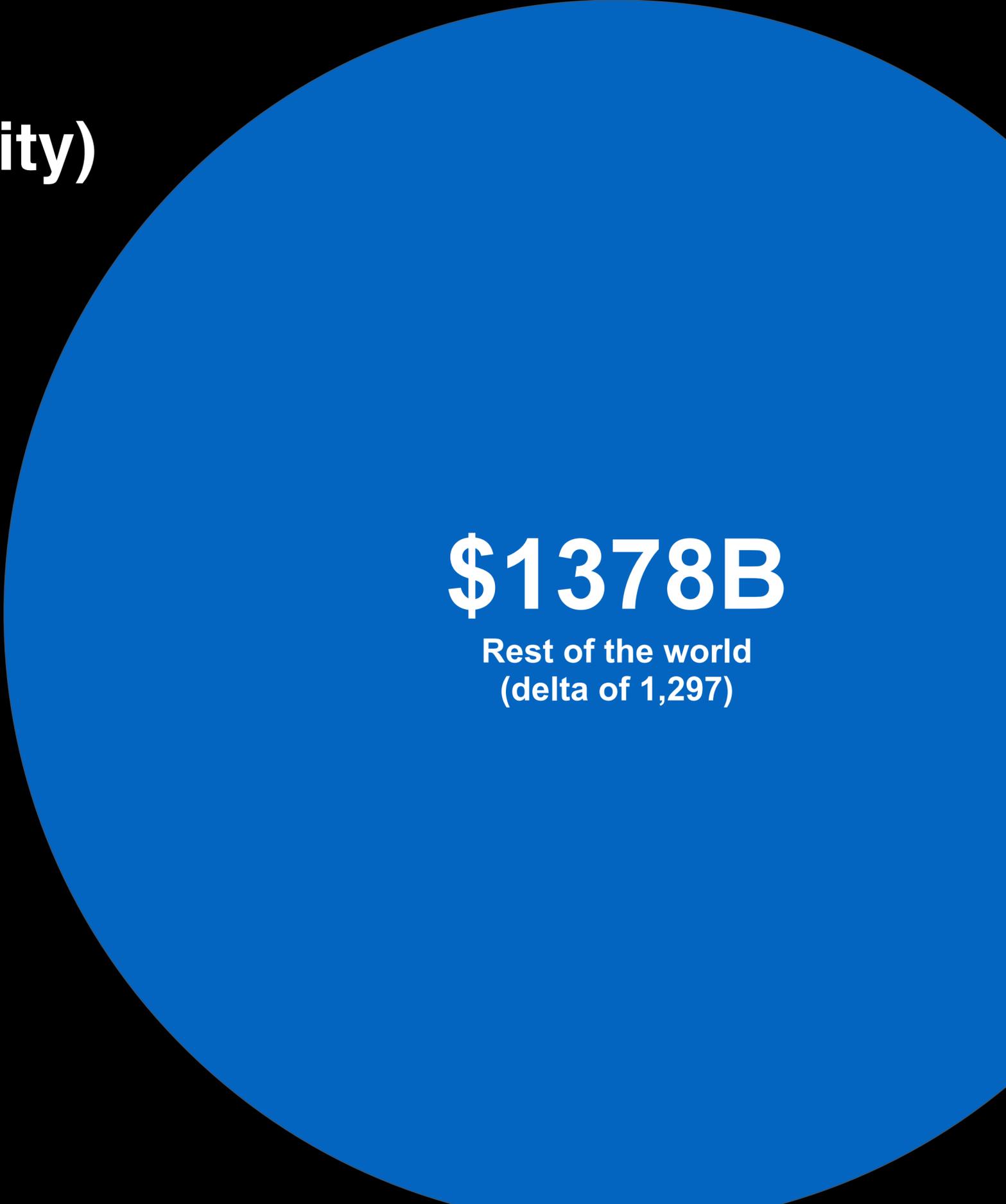
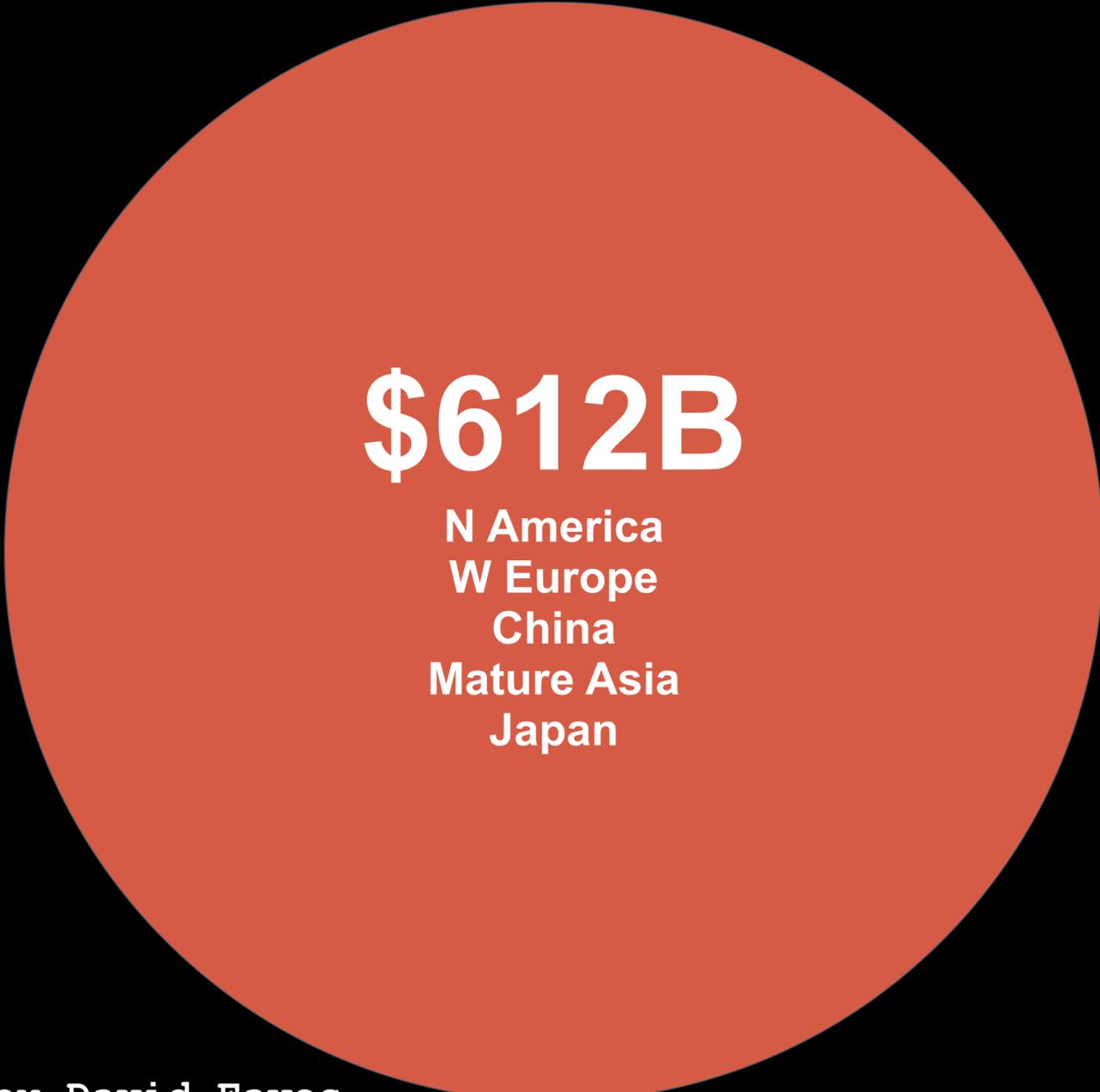
Global Government IT Spend (Total Dollars)



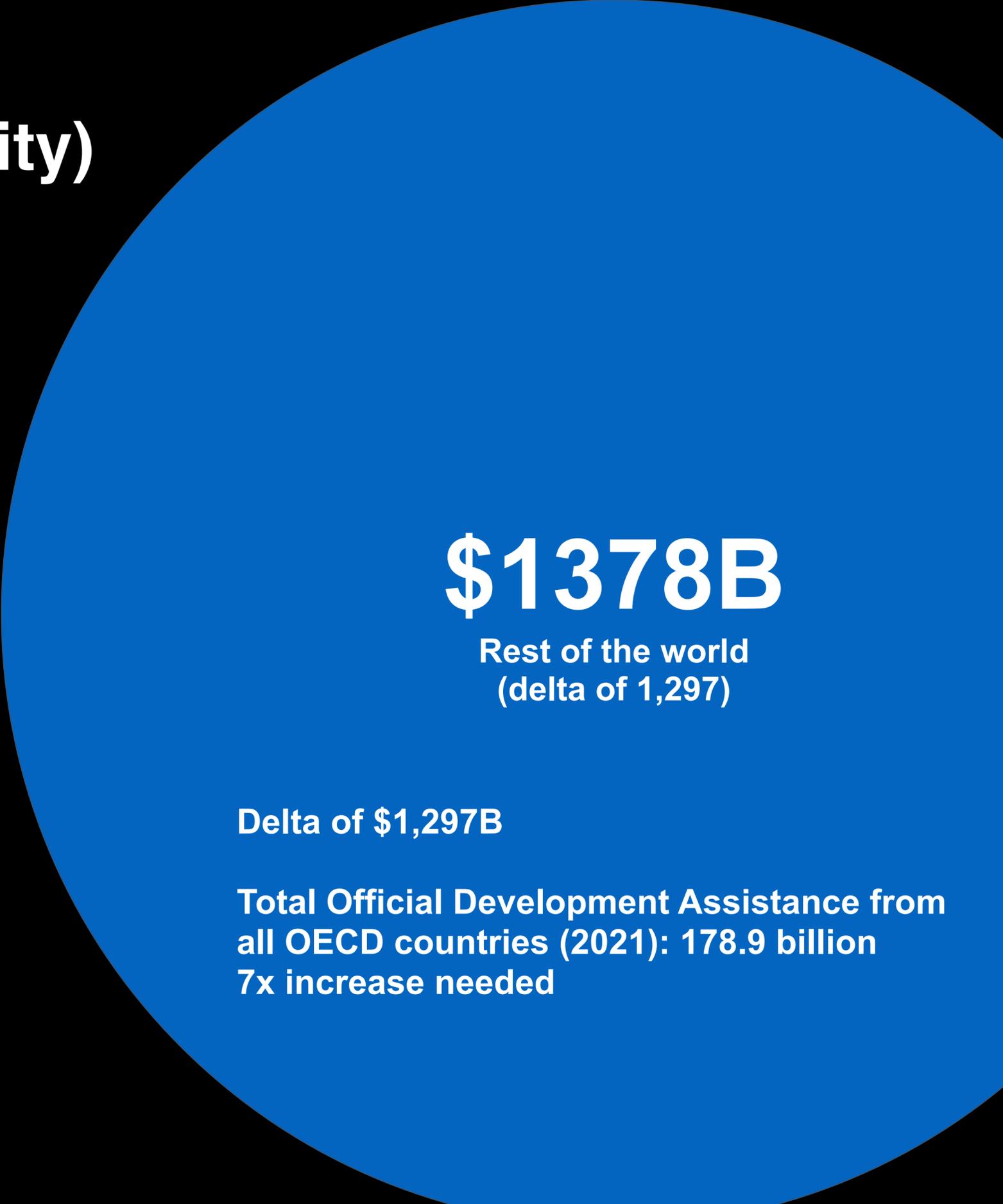
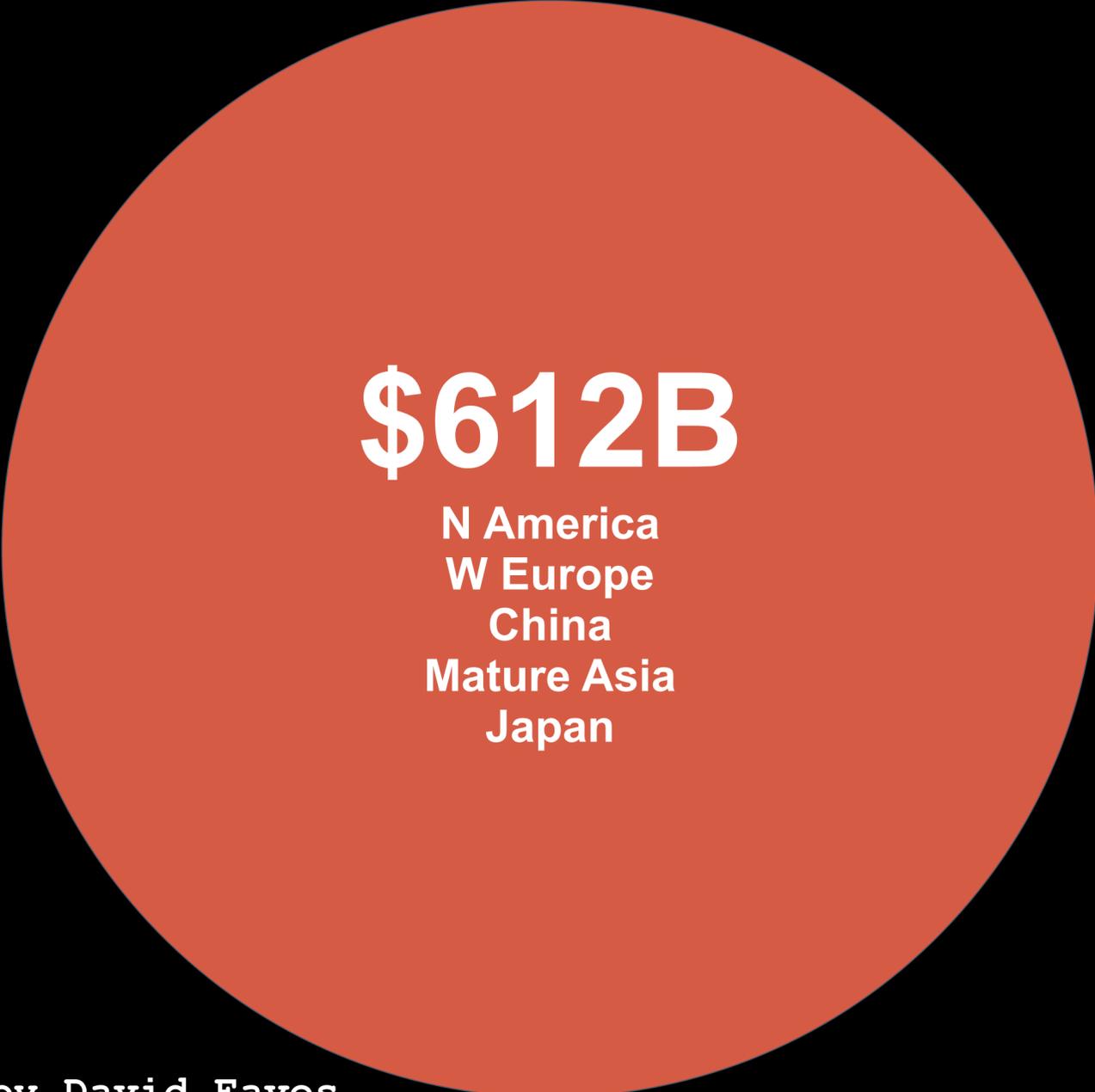
Global Government IT Spend (per capita)



Global Government IT Spend (parity)



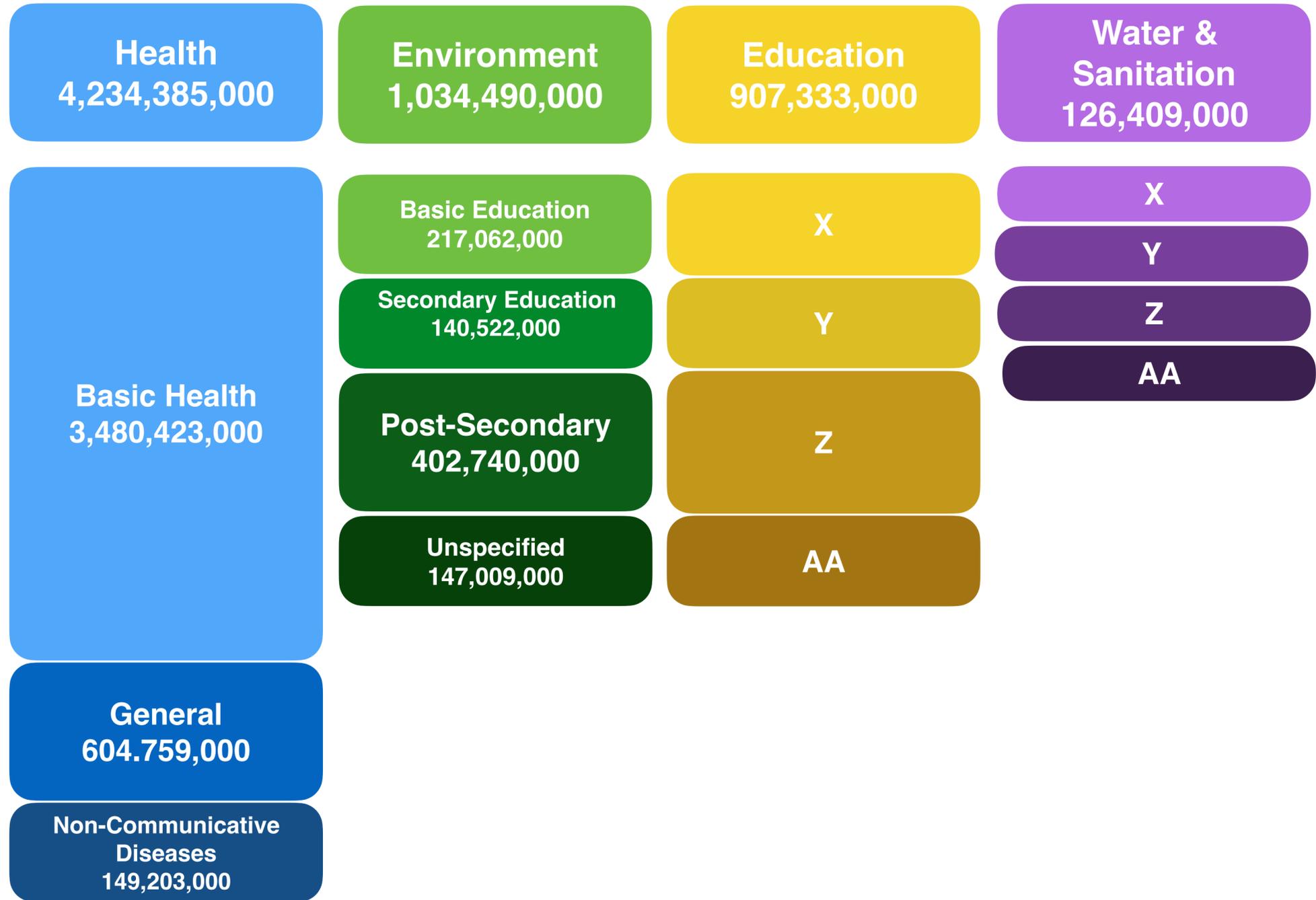
Global Government IT Spend (parity)



11B in private philanthropy across multiple sectors

Each project creating its own data registry, unique identifier for citizens, establishing or consuming its own payments system.

High “impact” low leverage



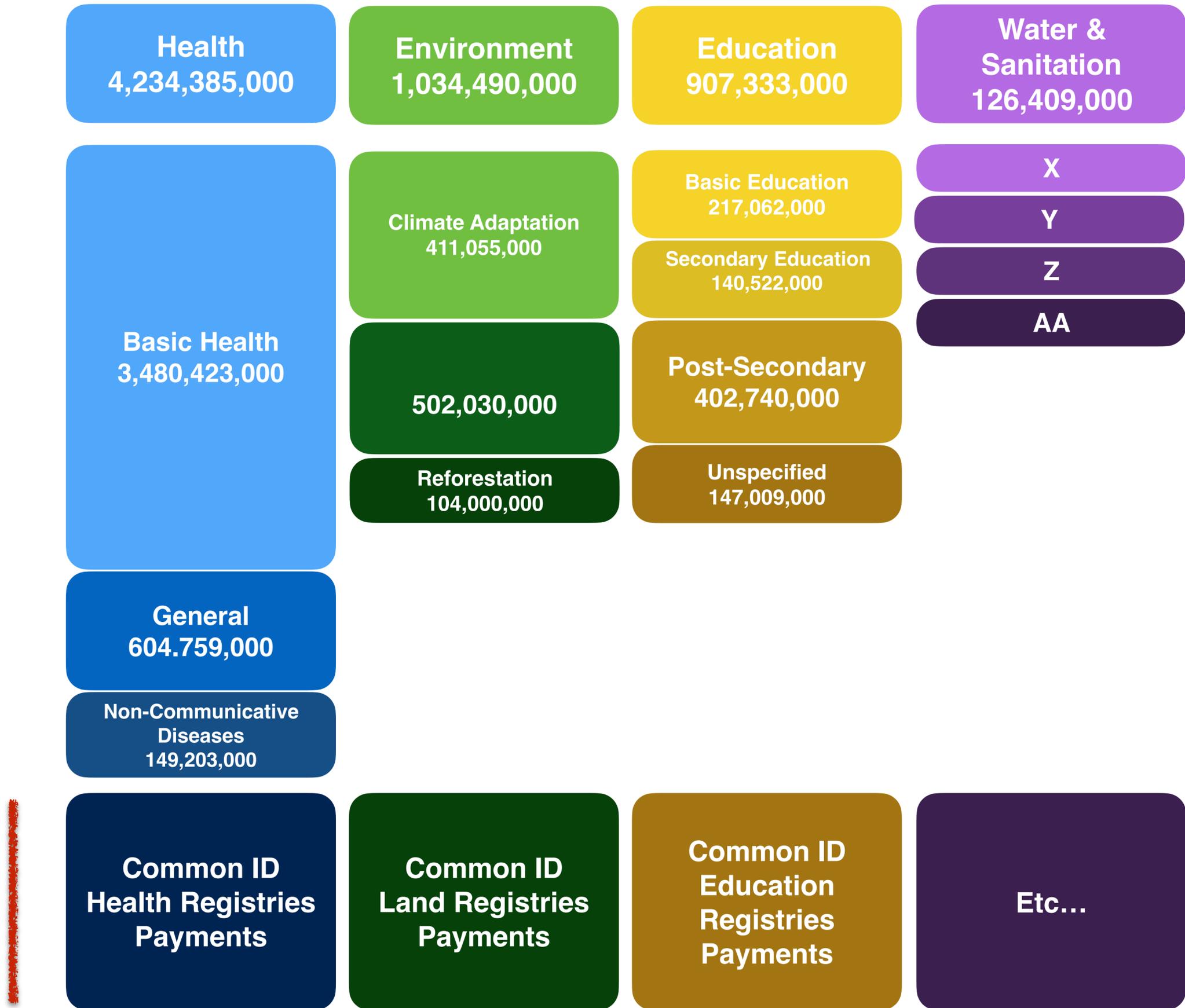
11B in private philanthropy across multiple sectors

Each project creating its own data registry, unique identifier for citizens, establishing or consuming its own payments system.

High “impact” low leverage

Almost no money invested in shared infrastructure, but it is low direct impact, high leverage

Slides by David Eaves



Economics of Digital Public Infrastructure

Economics of Shared Digital Infrastructure



The Economics of Shared Digital Infrastructures: A framework for assessing societal value

Policy Report — March 2025

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Public Policy at Cambridge University

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Policy Fellow | UCL Institute for Innovation
and Public Purpose (IIPP)

Sumedha Deshmukh
Research Fellow | Bennett Institute for
Public Policy at Cambridge University



Our method:

1. We outlined the **characteristics** of traditional infrastructure
2. We explored which **digital design characteristics** were associated with infrastructural characteristics
3. We built a **framework for assessing the public value of digital infrastructures** by:
 - a. Analyzing different conceptual models (e.g.: RQIV, public value framework)
 - b. Interviewing policymakers to understand the value of DPI
 - c. Analyzing over 60 policy reports and academic papers about the impact of DPI
4. We identified **additional factors** that impact value creation (4 enablers and 3 tradeoffs)

World Bank - Ethiopia

PDO Level Indicators

31. The achievement of the PDO will be measured by the following results indicators:
- (a) Number of people in Ethiopia who have received a Fayda ID
 - (i) Percentage of whom are women and girls.
 - (ii) Number of whom are refugees.
 - (iii) Number of whom are individuals living in refugee host communities.
 - (iv) Number of whom registered in remote and hard to reach areas.
 - (b) Number of successful digital ID authentications by Fayda ID holders to access public and private sector services.
 - (i) Number of which are in areas hosting refugees.

World Bank - Ethiopia

Do we have:

- No theory for impact in these areas?
- A methodology for measuring impact?
- Are we collecting data before/after?

Effects	 Direct	 Dynamic	 Market-Shaping
Defining characteristic	Operational and service efficiency gains within core DPI functions	Network effects, spillovers and cross-sector externalities expanding DPI impact	Structural transformation in industries, societies and market dynamics
Individual	<ul style="list-style-type: none"> • Number of people in Ethiopia who have received a Fayda ID • Percentage of whom are women and girls • Number of whom are refugees • Number of whom are individuals living in refugee host communities • Number of whom are in remote and hard to reach areas 	<ul style="list-style-type: none"> • Number of successful digital ID authentications by Fayda ID holders to access public and private sector services • Number which are in areas hosting refugees 	?
Public Sector	?	?	?
Private Sector	?	?	?

Working with Treasuries and others



Dominican Republic



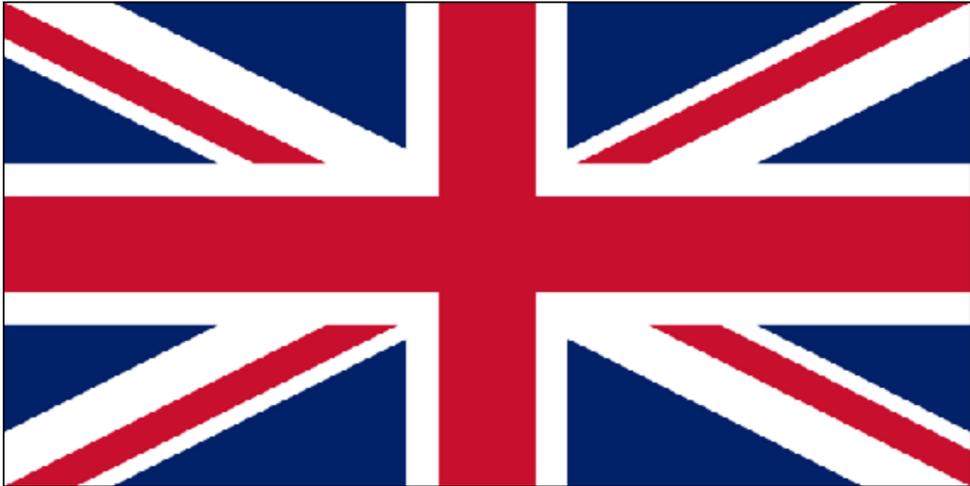
South Africa



World Bank



Brazil



United Kingdom

<3> Become a Market Shaper

Use



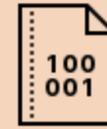
Applications

Distribution/Interface



Device

Data



Data

Platform as a Service



Microservices

Infrastructure as a Service



Compute

(cloud)



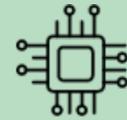
Storage

Networking Layer



Internet + Networks

Underlying Inputs



Chips



Grid



Power



Raw Materials

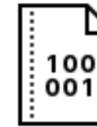
Sovereignty!



Applications



Device



Data



Microservices



Compute

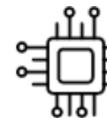
(cloud)



Storage



Internet + Networks



Chips



Grid



Power



Raw Materials

**Sovereign Tech that
isn't “portable” is a
~~gilded~~ cage.**

What is the Goal?

Sovereignty

?

Industrial Policy



Efficiency



Competition



Interoperability



Vendor Lock In



**How is the capital at
each level organized
(as that informs incentives)**

mixed



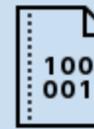
Applications

private



Device

private



Data

private



Microservices

private



Compute

private



Storage (cloud)

mixed



Internet + Networks

private



Chips

public



Grid

both?



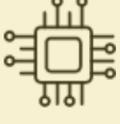
Power

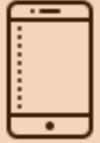
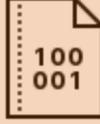
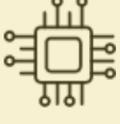
private



Raw Materials

What is the market structure?

mixed	Market/DIY		Applications
private	Oligarchy		Device
private	Oligarchy		Data
private	Oligarchy		Microservices
private	Oligarchy		Compute
private	Oligarchy		Storage
			(cloud)
mixed	Standards		Internet + Networks
private	Oligarchy/Standards		Chips
public	Standards		Grid
both?	Standards		Power
private	Standards		Raw Materials

mixed	Market/DIY		Applications
private	Oligarchy		Device
private	Oligarchy		Data
private	Oligarchy		Microservices
private	Oligarchy		Compute
private	Oligarchy		Storage
			(cloud)
mixed	Standards		Internet + Networks
private	Oligarchy/Standards		Chips
public	Standards		Grid
both?	Standards		Power
private	Standards		Raw Materials

Data Standards DPI Strategy

?

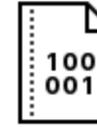
Standardize on S3?



Applications



Device



Data



Microservices



Compute

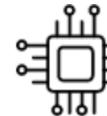
(cloud)



Storage



Internet + Networks



Chips



Grid



Power



Raw Materials

2006



S3 Buckets

2006

2008



S3 Buckets



Blob Storage

2006

2008



S3 Buckets

Blob Storage

2006

2008

2010+



S3 Buckets

Blob Storage

Other?

2006

2008

2010+

~88%

~11%

~1%



S3 Buckets

Blob Storage

Other?

**A multi-cloud
strategy is a
vendor lock
in strategy**



Readme.txt

DPIMap.org

DPI is far more prevalent than initially believed.

57 countries have a DPI-like Digital ID System



100 countries have a DPI-like Digital Payment System



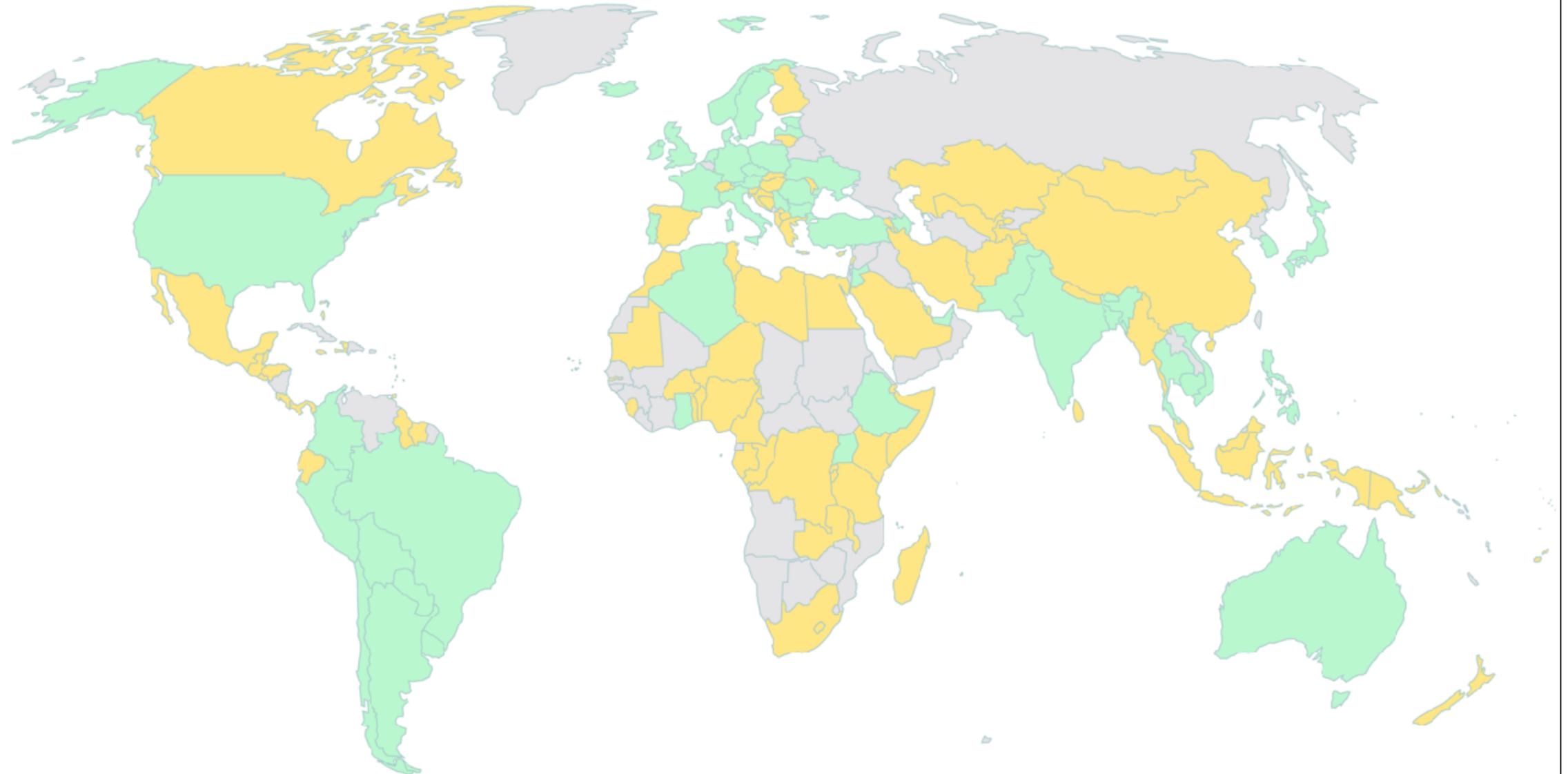
102 countries have a DPI-like Data Exchange System



This project aims to advance our understanding of digital public infrastructure and promote its inclusive and safe development.

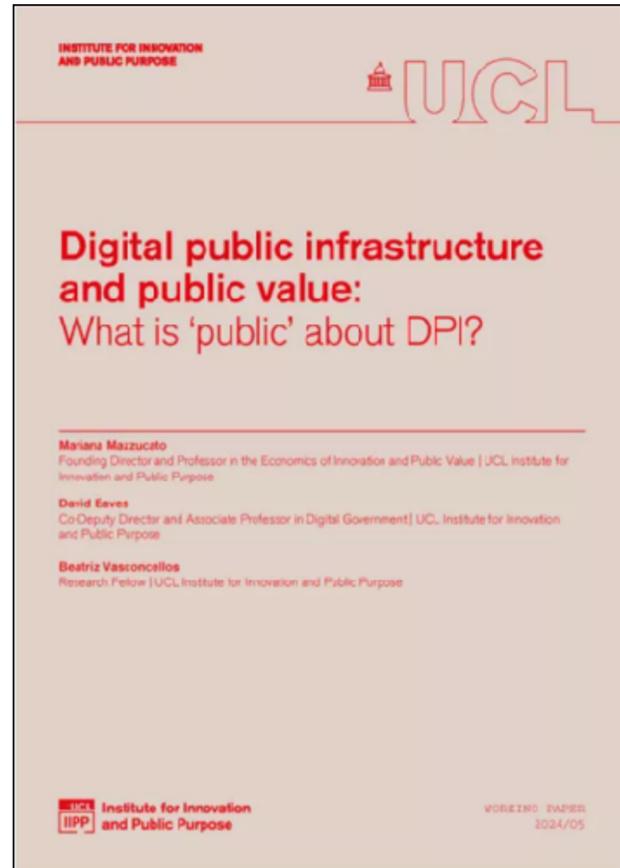
Read the [report](#), download the [data](#), and help [improve](#) it.

The cards below show DPI information about every region researched so far. Click on them to show the details and click on the region name to see all the DPI information for that region.

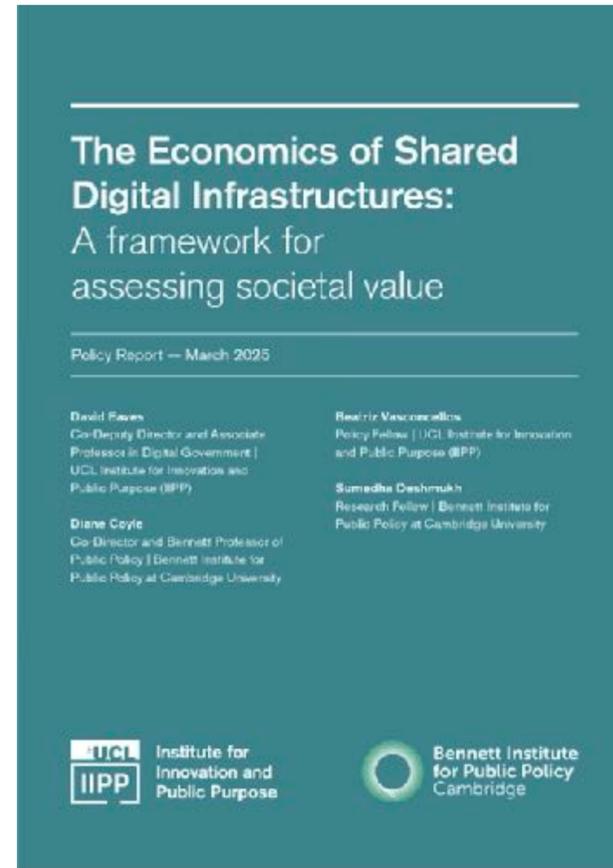


Digital ID System implementation status by country

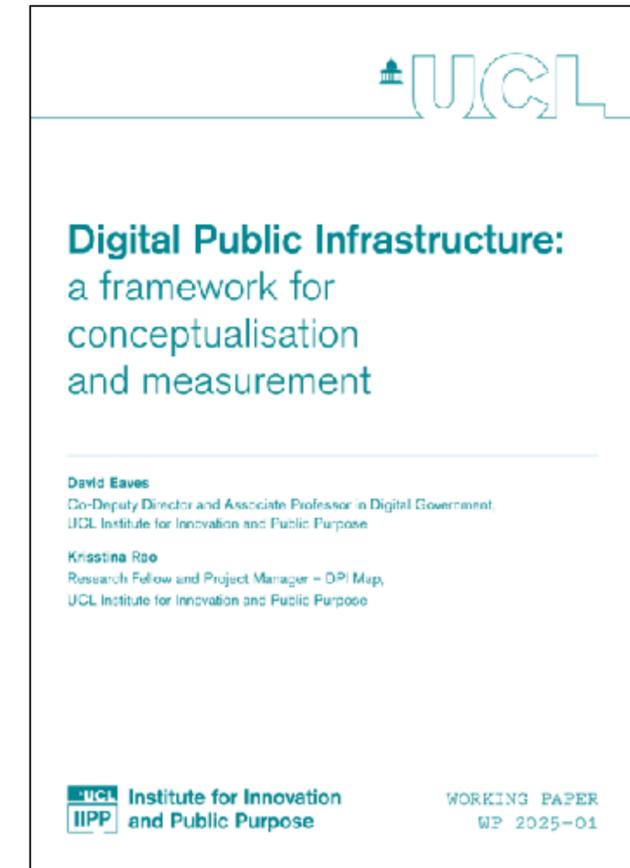
What is Public in Digital Public Infrastructure



Economics of Shared Digital Infrastructure



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