PANACEA FRAMEWORK
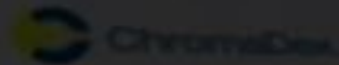
The Cure-All Patient Data Solution

Problems

Patients don't yet have control.

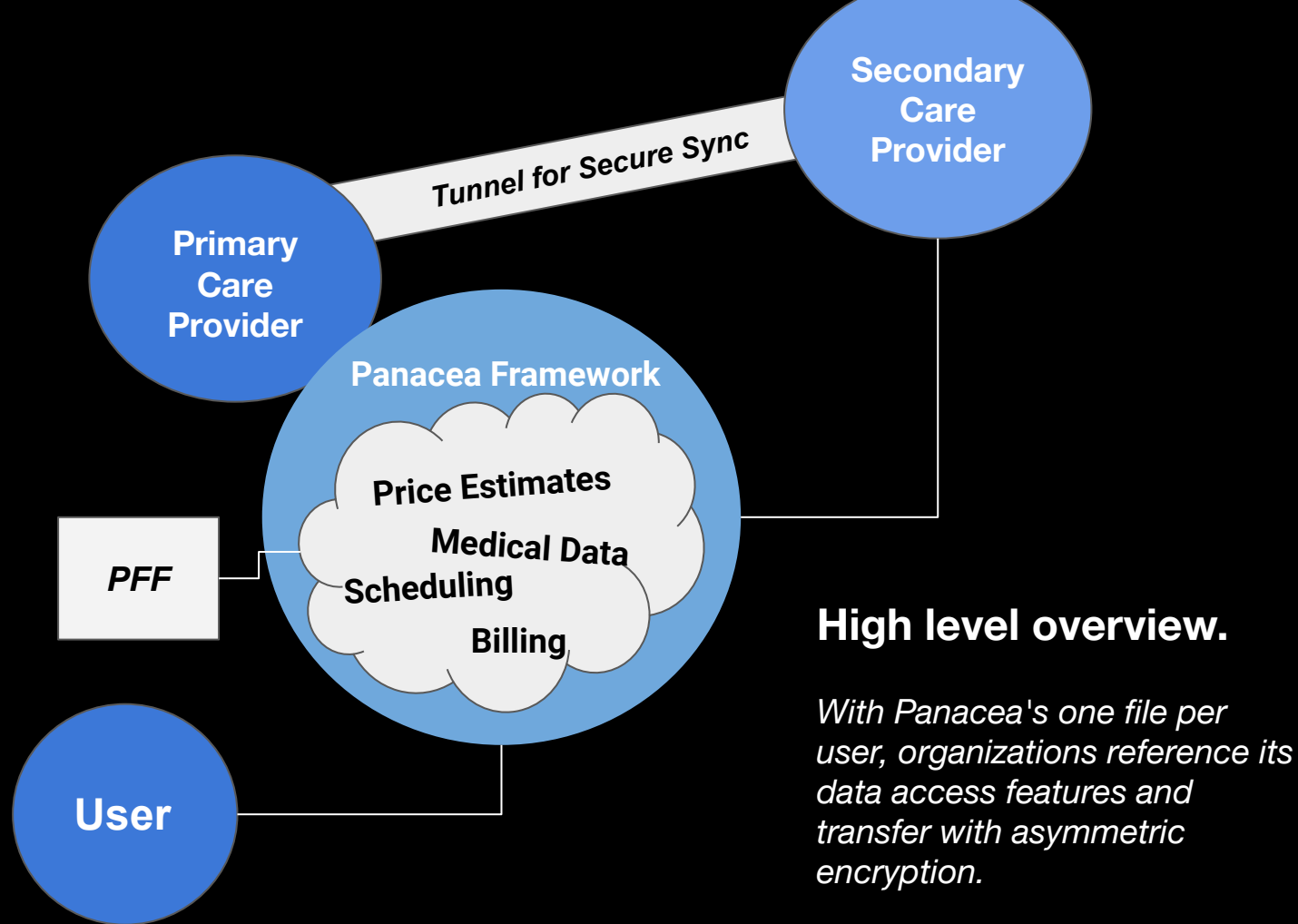**Care teams don't have ease of use.**

- ○ Need to **know** about upcoming appointments
- ○ Need to be able to **pay and anticipate** their cost of care
- ○ Need to **know all of their current medications**
- ○ Need to feel **in control** of their data
- ○ Need to easily **communicate with doctors**
- ○ Need to have their data **easily transferred**

The Solution: Panacea Framework

Based on the **ONE USER, ONE FILE** principles.
Integrates with cutting-edge technologies to perform
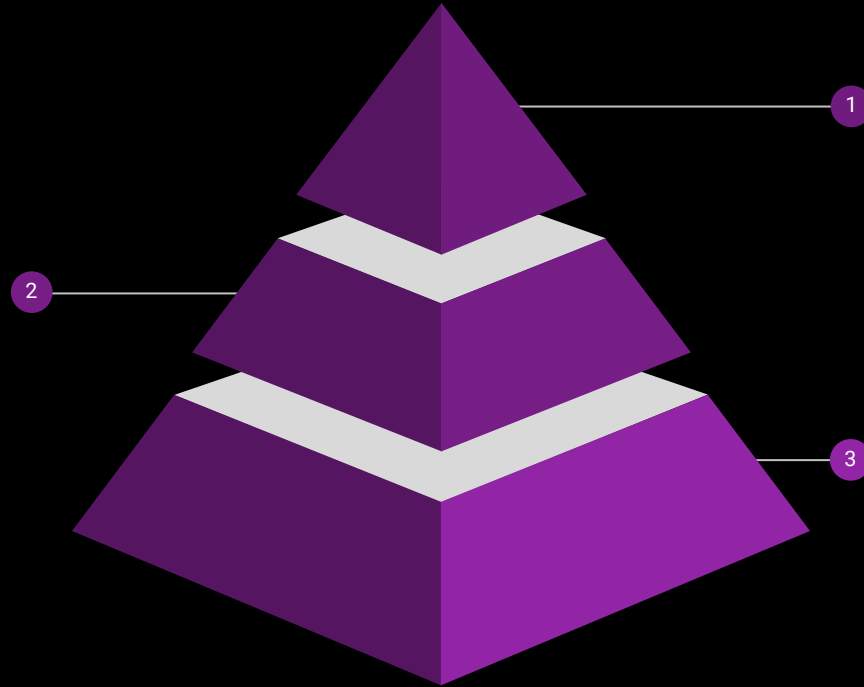**data-driven** actions.

- Serves as the **source of truth** for all patient data with secure transfers
- **Extensible integrations** for all components of the healthcare lifecycle
- **Standard data model** allows for easy import and export in different formats
  - *PANACEA FILE FORMAT (PFF) specialized JSON format*
- API for abstracted access to data model for internal IOT Applications
- **Web framework** allows easy access for both care providers and patients

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Secondary Care Provider

Tunnel for Secure Sync

Primary Care Provider

Panacea Framework

Price Estimates

Medical Data

Scheduling

Billing

PFF

User

High level overview.

With Panacea's one file per user, organizations reference its data access features and transfer with asymmetric encryption.

End-User Specific Interface

Customers, doctors, administrators, and other staff have customized interfaces built specifically for efficient, transparent content management

Generalized, Secure Data Access

Easily extensible API allows for rapid development of diverse applications

A Single Overarching Framework

All arms of the healthcare system have access to a single, *standardized*, data source

1

2

3

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My File
Analytics
Pricing
Scheduling
Options

Hello, Carl Smith

Hey Carl Smith, you have **3 action items.**
Head over to **scheduling** to check them out.

My Upcoming Visits

My File
Analytics
Pricing
Scheduling
Options

Hello, Debra

Hey Debra, you're all caught up!

My Upcoming Visits

User first interface design. By allowing centralized action items, it relieves a major source of stress in planning, appointments, and billing.

User first interface design.
Example of easy password help for elderly patients or those less familiar with technology.

Login

Username

Patient

Password

Password

Login

I Need Help Getting into My Account

✉ Send Password Reset Email   📞 Call a Representative

Future push notification integration.
Make life easier for patients with optional push notifications of emails
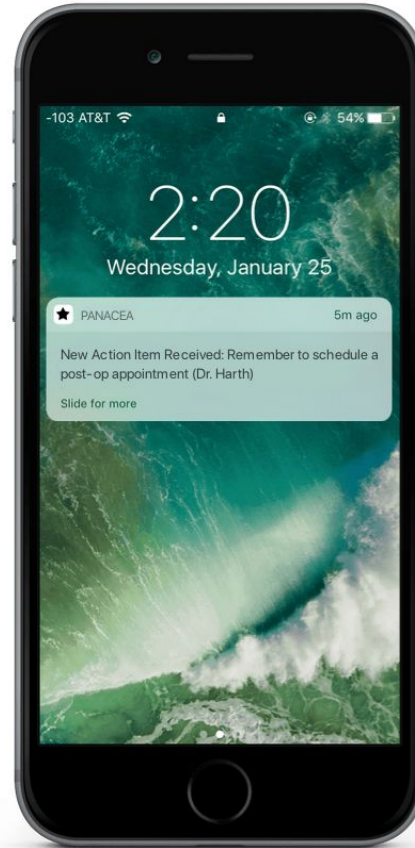
Secure Data Transmission with Asymmetric Encryption

Each hospital gets a set of **unique cryptographic keys** that allows it to encrypt customer information in a way that only allows the intended receiver to decrypt it.

Even the hospital sending the data can't read it once it's sent!
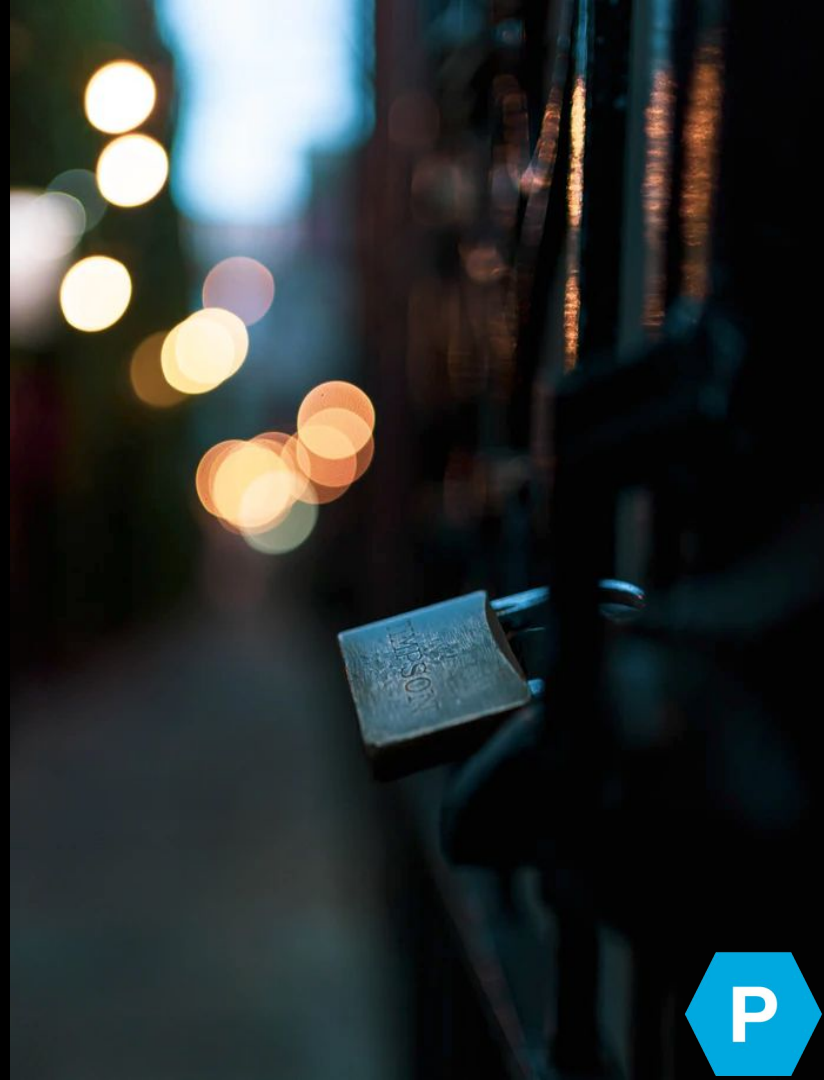
Mockup of Public Key Repository *for secure transfer of documents.*

Public Key Repository

Available Public Keys

Sanford Health	**Org. Number:** 1111	⌘ Download Public Key
John Hopkins	**Org. Number:** 8471	⌘ Download Public Key

1 Preparation

The source facility fetches the target's public key from a central keyserver

2 Encryption and Transmission

The facility transferring customer info encrypts the data with the target facility's public key

3 Receipt and Verification

On receipt, the target system verifies the integrity of the data

4 Decryption and Access

The data is encrypted with a secret private key, and the data is imported into the facility's Panacea framework for distribution

```
sanford@panacea:/srv/Panacea/data/tmpTransfer$  ./panacea-transmit 8471
[#########]   100%   0.02s  ===> Organization 8471 (John Hopkins Hospital) (Verified)
sanford@panacea:/srv/Panacea/data/tmpTransfer$
```

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Care Providers Are People Too

Backend: Designed for efficiency. Beautiful interface.

- Care team
    - Create action items
    - Authorize prescriptions
    - Answer questions
- Billing Departments have detailed data on all transactions in one unified interface-- the **PFF** and **Panacea Webapp Interface**.
- Data is **securely transferred** and stored with multiple redundant systems
- Each party has access to limited data to respect customer privacy

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Customer's Viewpoint

Scheduling

Email address or Username

name@example.com

What's the reason for appointment?

Routine Checkup

What times work for you?

8:30 AM
9:00 AM
9:30 AM
10:00 AM

Have anything else you want us to know?

Submit

Care Team's Viewpoint

Push Update

Push out update for... (select individual or group)

Carl Smith

Push out...

Action Item

Content of action item.

Submit

Future Work: *Analytics*

- Real-time feed of **patient data** for analytics (*machine learning, tensorflow*)

- Create a centralized data store (*Facebook, Google Analytics, Surveys*)
  - Deep integrations with Sanford Chip and other innovative solutions

- **Integrate with billing software** for accurate fee-for-value estimates

  - Chargemaster publicly available information

*Future Work: **Data Integrity with Blockchain***

- Blockchain ensures **data integrity**

- Decentralized **private ledger of hashes** shared between **care providers**

- Records **can't be retroactively changed**
  - Secure SHA256 hashes have 2^{256} possibilities: an incredibly massive collision domain

- **Timestamping** system permits ensuring most recent copy of patient file

Future Integrations

- **UBER**

- **STRIPE**

- **IOT**

- *Our secure open API allows integration with any potential emergent technologies*

Welcome to the future of healthcare and data. PANACEA.

[Login Demonstration](#)

[Home Page Demonstration](#)