Software Engineering

Through the eyes of a hacker, academic, employee, and CEO

Chad Spensky
chad@allthenticate.net
Founder and CEO of Allthenticate

My Journey

1990s: Internet pirate, hacker, and master tinkerer

2004-2008: College student at Pitt

2008-2011: PhD student (and dropout) at UNC - Chapel Hill

2012-2015: Research Staff at MIT Lincoln Laboratory (DoD work)

2015 - Present: PhD student at UCSB in the SecLab

2015 - Present: Member of Shellphish (CTF team)

2019 - Present: CEO and Founder of Allthenticate

Software Engineering

My definition:

Building software that is built to last, easy to share, amenable to collaboration, and has long-term maintenance in mind.

Software Engineering for Hackers

Alias: Shortman

Skills: Site Tech, Eggdrop programmer, Founder of the best “precheck” in “the scene”

Programming Languages: SQL, HTML, TCL, some C, mIRC scripting

Software Engineering for Hackers

Version Control: Hard No

Budget: Unlimited games and movies

Hosting provider: My basement server

Developers: Me

Release structure: as needed

Format: tarball with l33t README file, ASCII art was more important than content

Other high-school projects

Porganizer: Visual Basic .NET program that prints your weekly or daily schedule in the morning

Porganizer on the Go: An online organizer that interfaced over SMS to keep track of calendar events (pre-G Calendar)

Carputer: An in-car-computer that would automatically sync my downloaded mp3 files with my computer (pre iPhone)

r0x0rs.us: An online video upload site, targeted at funny videos (pre YouTube and CollegeHumor)

Music Anywhere: An in-home networked media player to play music in every room (pre Sonos)

XBOX Modding: A fun side business

Tooling: Highschool Hacker

mIRC (Polaris plugin)

Writing websites in Notepad.exe

Scripting in pico and vim

Hard drives and partitions everywhere

Soldering Iron

Undergraduate

Degrees: B.S. in CS (Honors), B.S. in Mathematics, Minor in Economics

My take: Universities can kill creativity

Learned a lot of “science”

Learned how to pronounce computer terms (e.g., “my-SEE-QUAL” and “TICKLE”)

Stopped “engineering” things, and had effectively zero side projects

Attended some epid parties, and made some great friends

Software Engineering Required: No

Tooling: Pitt

Eclipse (Pitt was a Java school)

Still doing stuff in Notepad, because it thought it was l33t

Books and pencils...

Graduate School (round 1)

Degrees: M.S. in Computer Science (Security), Ph.D. Dropout

My take: Graduate school can be amazing if you like the project that you are working on

You actually have time to build something great

Too much emphasis on “science” and “research,” which are very poorly defined

Tried to organize a class to teach *git* after my internship; it didn’t happen

Software Engineering Required: Yes! (but no one seems to think so)

Tooling: UNC-CH

Dropbox to sync files with home computer

Subversion for version control

No shared repositories in our group

Definitely no test scripts

Bugs galore

MIT Lincoln Laboratory

Title: Associate Staff in the Cyber System Assessments (Offensive) Group

My take: The best environment to be in as a software developer

Very interesting projects

Smallish teams (2-20)

Prototypes do not have to be “production” quality

Software Engineering Required: Definitely! (I felt very ill-prepared)

Tooling: MIT LL

Holy resources! I got my own 7 server cluster (~24 cores each) with a single email

Introduced to Github Enterprise

Tiled window managers! A must!

Equipment makes a huge difference

2 OS > 1: One pretty, one useful

Top Secret Engineering

Title: [REDACTED]

My take: The internet is amazing!

- Things come in, but never come out
- No internet
- Every tool needs to be approved (and takes forever to approve)
- What the heck is `git archive`?

Software Engineering Required: You betcha

Tooling: TS

DVD Burners

Programming books! (They actually exist...)

Offline versions of online docs

Thinking on your feet is critical

You better “really” know your programming languages

Graduate School (round 2)

Degrees: Ph.D. in Computer Science (Securing and Analyzing Embedded Systems)

My take: Got to work on some really awesome, complicated problems

Repeatability is really important

Experiments and continuous integration (CI) aren't very different

Open-sourcing code makes you a better programmer (others will see it)

Submodules are a must!

Software Engineering Required: Yes! (but no one seems to think so)

Tooling: UCSB

Time to “pro up”

I3 + Terminator

Pycharm, Clion, … (IntelliJ)

TexShop

Internal Gitlab

direnv + virtualenv a must have

CTF Player

Title: N00b hacker

My take: An incredible experience to a lot about alot in very little time

Like drinking computer science from a fire hose

Much more than just “hacking”

Stresses your knowledge about how computers work (like... that the even turn on)

Software Engineering Required: Maybe?

Software Engineering in a CTF

Speed over correctness

Correctness is extremely important

Speed is also important

Extensibility isn’t important, but it also might be

from pwntools import *

Tooling: Shellphish

IDA Pro, Ghidra, Binary Ninja, Radare: Collaboration is a mess!

Git with some special sauce to “throw” exploits to “grill” the other teams

Slack or Discord with a different channel for every challenge

Physical separation of teams for each challenge

Complicated networks for sharing “floor” data with people in the suite

Intern at IBM Research

Title: PhD Research Intern

My take: Big things move slowly and have a lot of moving parts

The resources were incredible! More cores than you could ever want

Lots of amazing coworkers and internal knowledge

Took 3 months to acquire the hardware required for my research

Software Engineering Required: Yes. This has to work on my computer back at UCSB

Tooling: IBM Research

Apparently you can do software development on a Mac, although I wouldn’t recommend it

SizeUp (kind of allows for tiled windows)

Starting to doing VIM practice to pro up

VS Code! Love it. (but not for the Python yet)

Parallelizing Python is way to hard, still

Spent my evenings re-organizing git repositories for my real passion…

What am I doing with all of this knowledge?

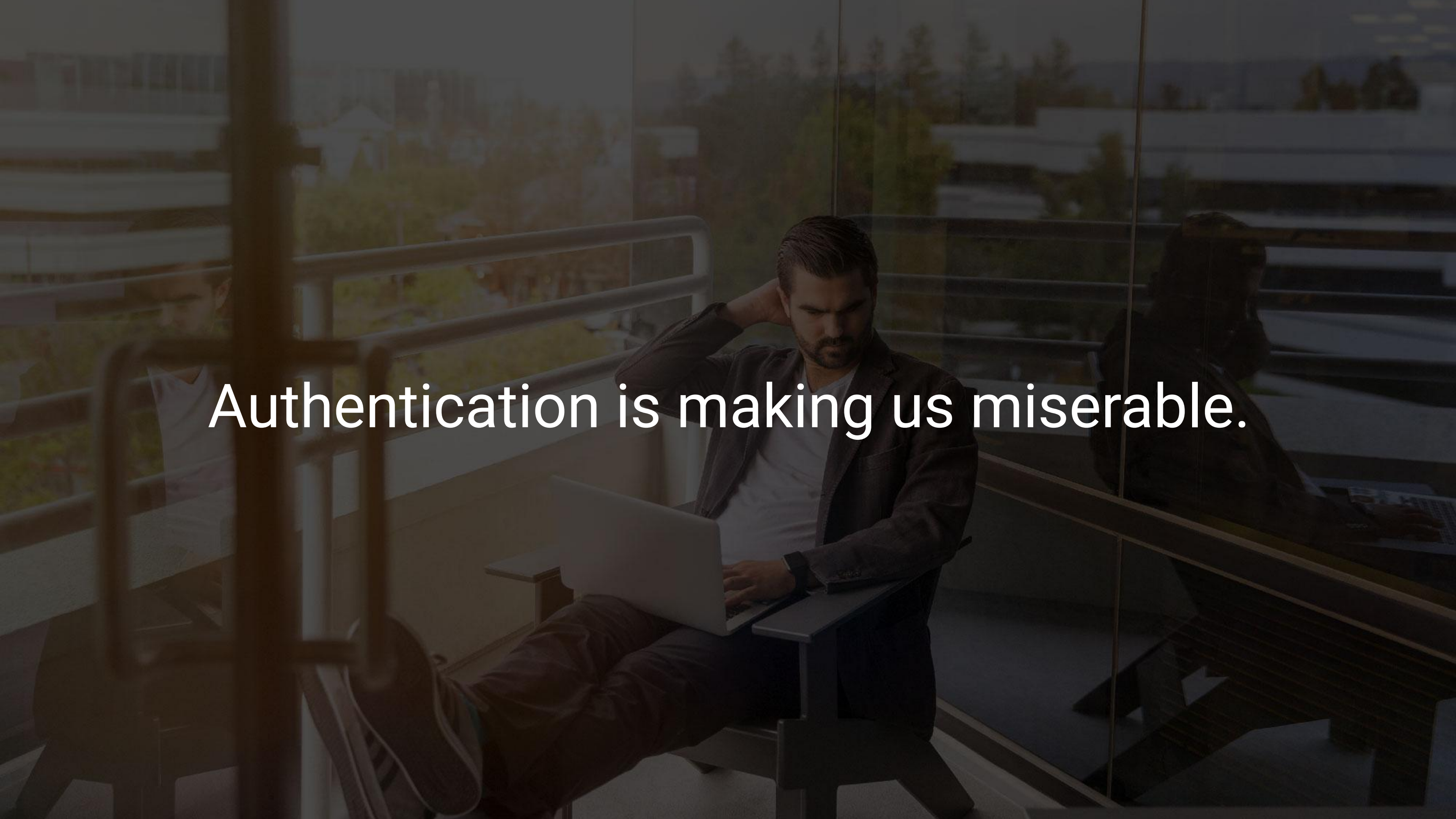
(Insert impressive company pitch here)

Allthenticate

More Security. Less Burden.

A smartphone-based solution.

Chad Spensky | Allthenticate.net | chad@allthenticate.net



Authentication is making us miserable.

It’s time for a revolution.

76% of businesses were victims of **phishing** last year

Avg. cost of data breaches is nearly **$4 million** per business

80% of hacking-related breaches tied to **passwords**

Existing readers cost over **$2,500 per door**

Upgrades require **replacing** the **reader** and issued **cards**

Proximity cards are easily **forgotten**, **lost**, or **stolen**

Chad Spensky, CEO

Ph.D., Computer Science
(Security)

MIT Lincoln Laboratory
IBM Research
IBM PhD Fellowship recipient
15+ academic publications

Rita Mounir, COO

B.S., Financial Mathematics
and Statistics

Carpe Data
Center of Academic Achievement
Startup Weekend organizer
1st place Port Hueneme Startup Weekend

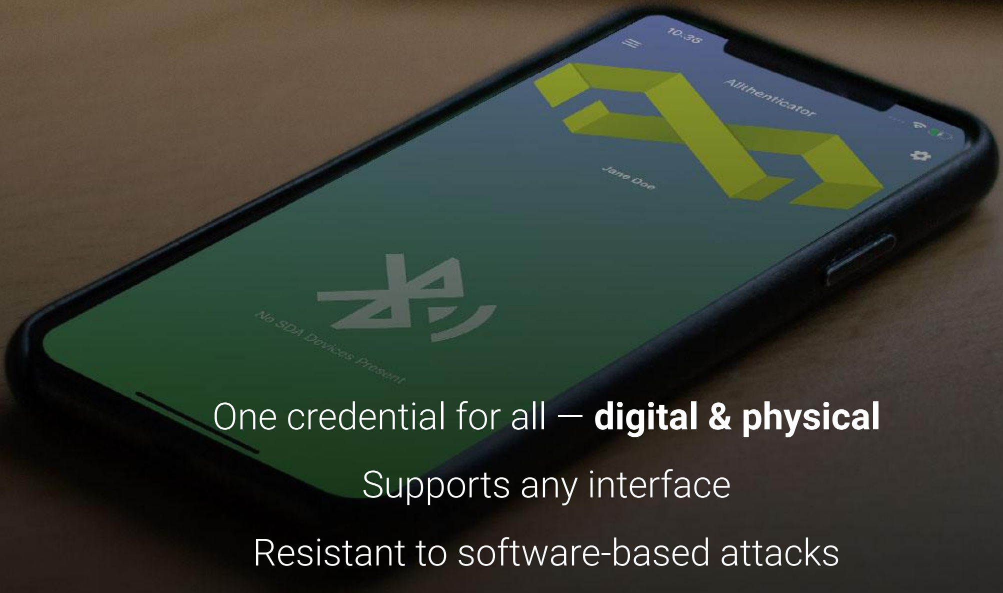
Evan Blasband, CTO

M.S., Electrical
And Computer Engineering

Lockheed Martin
Best UCSB EE project
1st place SpaceX Hyperloop Competition
1st place UCSB Startup Weekend

We have been developing this patented technology for 8+ years

Single Device Authentication



One credential for all — **digital & physical**

Supports any interface

Resistant to software-based attacks

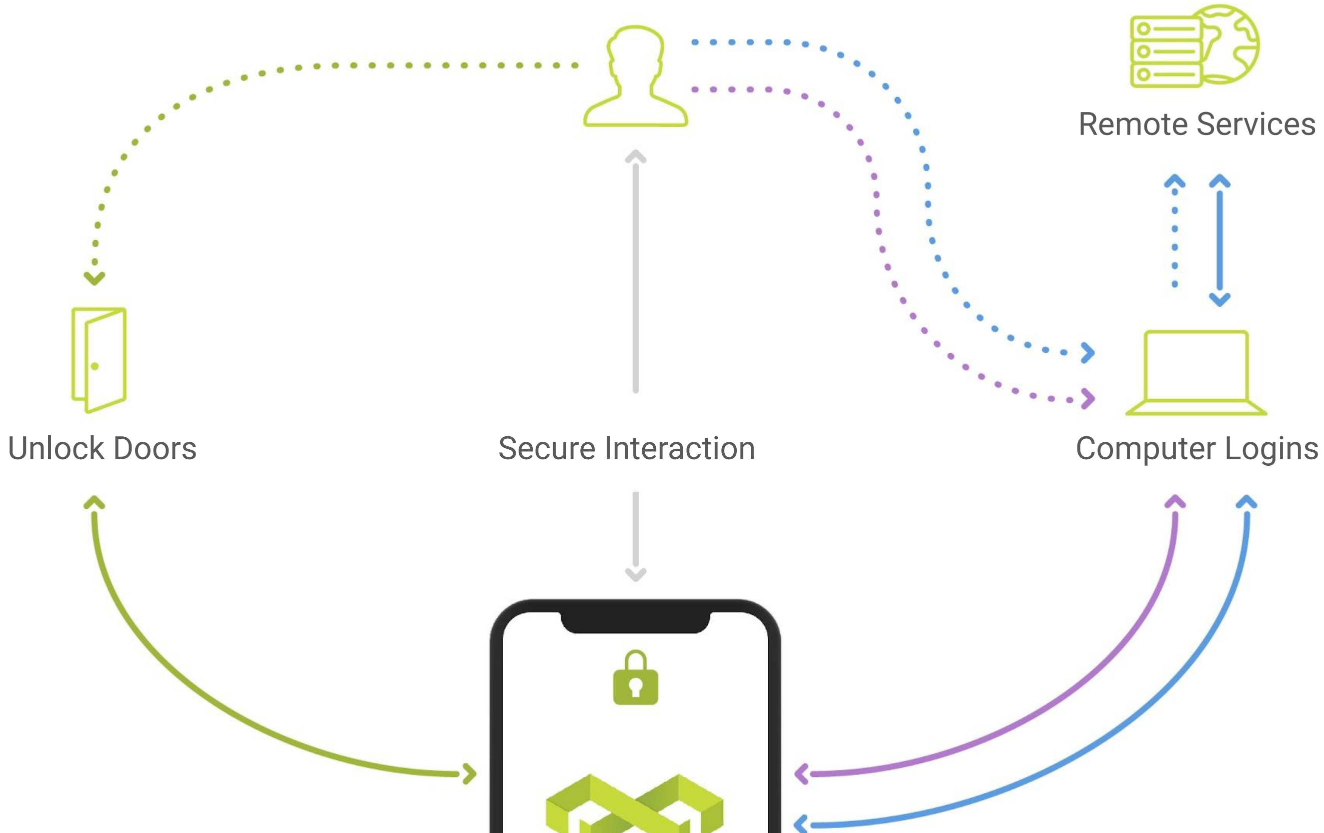
How it works

Unsecure

• • • • •

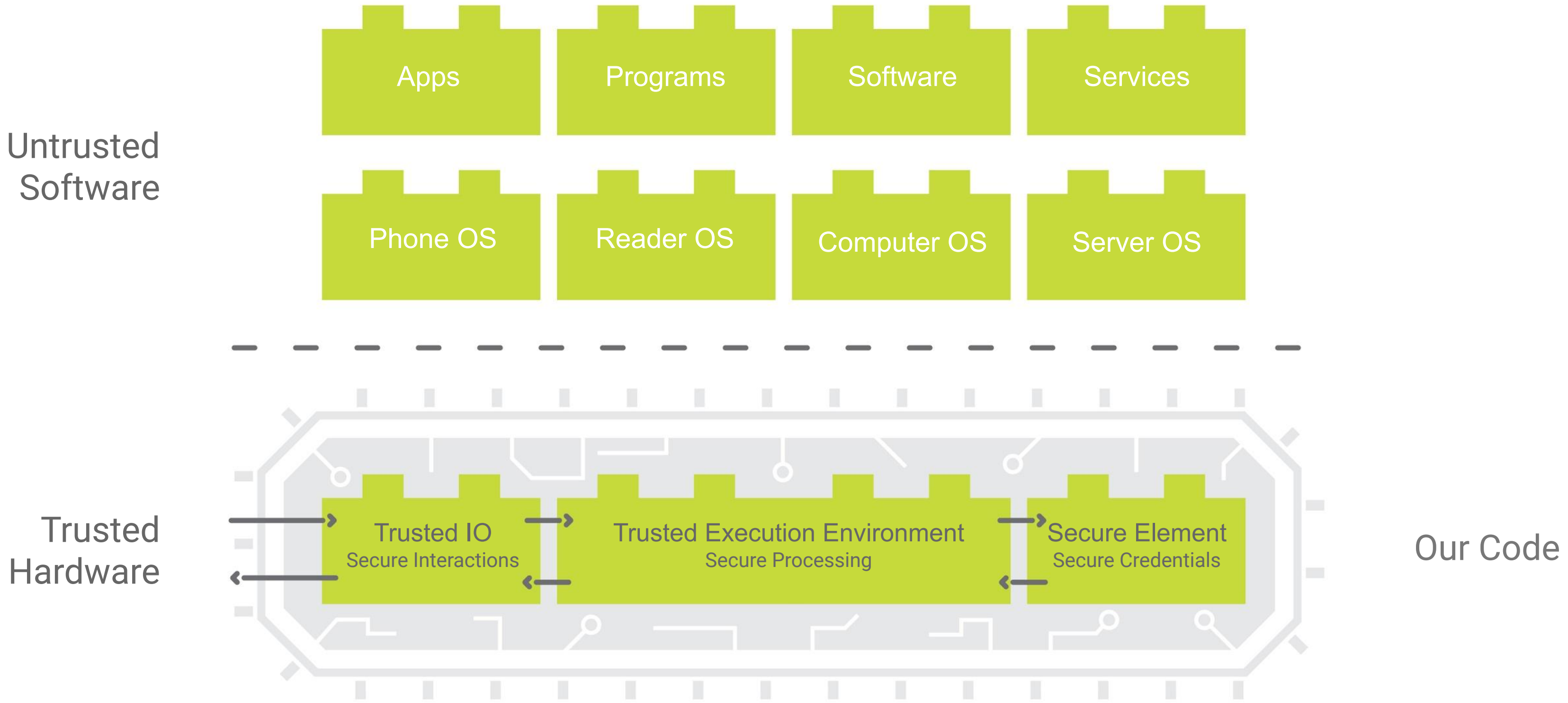
Secure

▬



Patented

A Secure Foundation



Patented

How we do it

Cloud-based Management

One-stop authentication stop

Comprehensive Logging

Per employee entries
Digital and physical
Unforgeable

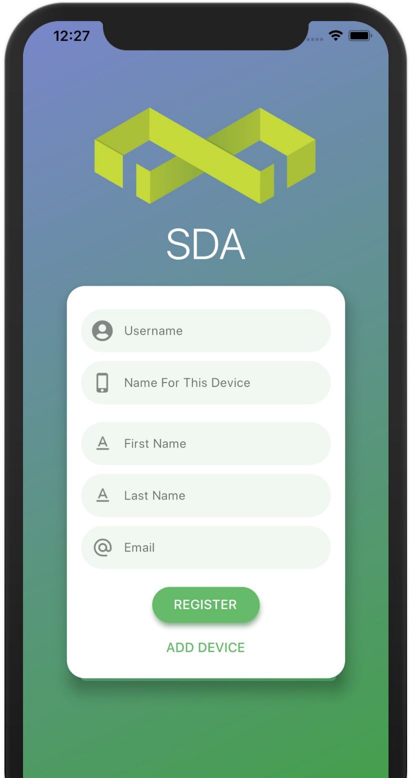
Device Management

Laptops
Phones
Doors
(Anything)

Flexible Policy

Create user groups
Time of day
Location etc.

Interface



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SDA

Username

Name For This Device

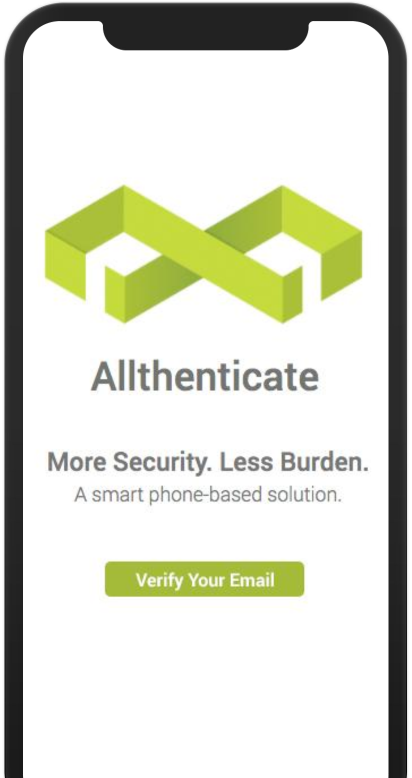
First Name

Last Name

Email

REGISTER

ADD DEVICE

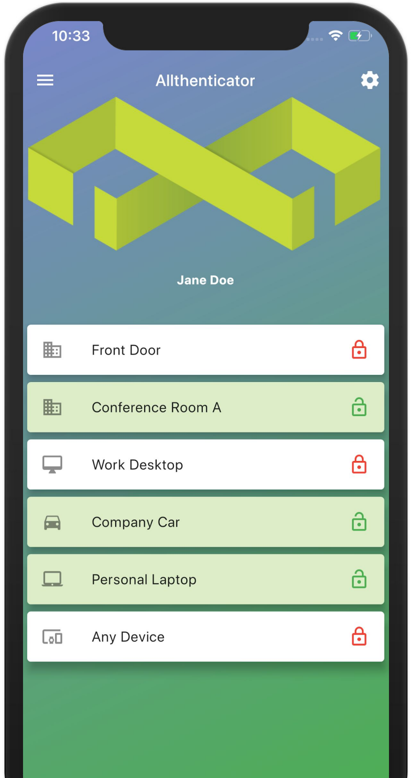


Allthenticate

More Security. Less Burden.

A smart phone-based solution.

Verify Your Email



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Allthenticator

Jane Doe

Front Door

Conference Room A

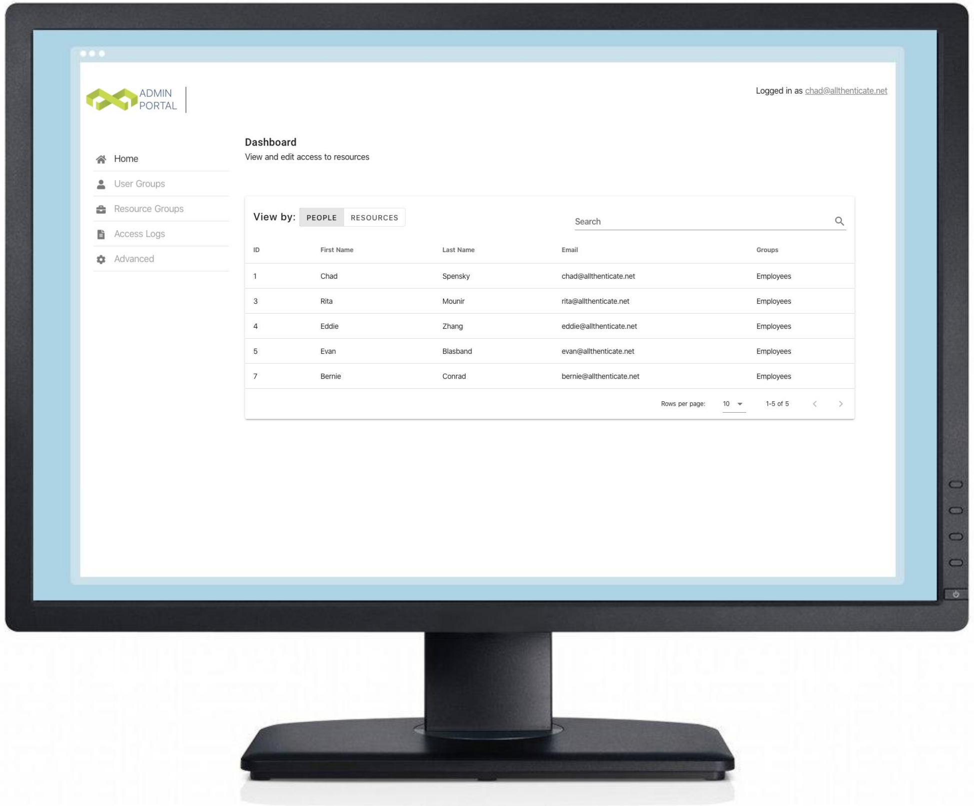
Work Desktop

Company Car

Personal Laptop

Any Device

Admin Panel



Logged in as chad@allthenticate.net

Dashboard

View and edit access to resources

View by: PEOPLE RESOURCES

ID	First Name	Last Name	Email	Groups
1	Chad	Spensky	chad@allthenticate.net	Employees
3	Rita	Mounir	rita@allthenticate.net	Employees
4	Eddie	Zhang	eddie@allthenticate.net	Employees
5	Evan	Blasband	evan@allthenticate.net	Employees
7	Bernie	Conrad	bernie@allthenticate.net	Employees

Rows per page: 10 1-5 of 5

Customizable Security

FLEXIBLE POLICIES

Time or Day

Location

Delegate Resource

Temporary Access

FLEXIBLE SECURITY INTERACTION LEVELS

Things magically open (lowest)

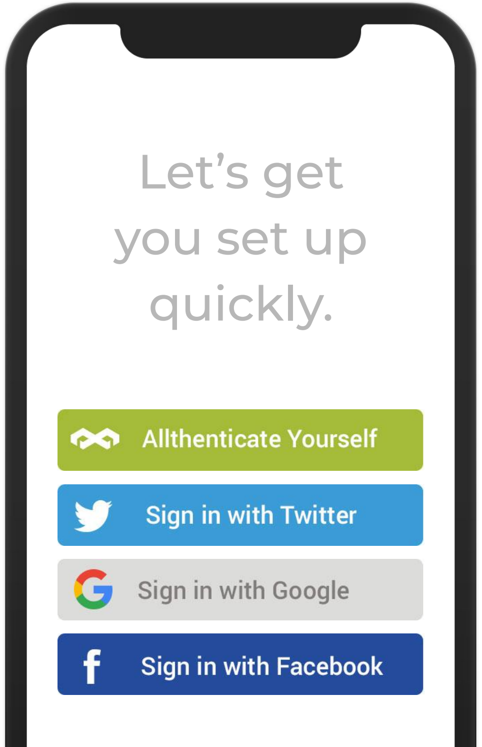
Intent to do something (intermediate)

Prove identity (highest)

Feature Comparison

	PHYSICAL		DIGITAL			HAS IT ALL
	Legacy Solutions	Smartphone-based door readers	Password managers	Smartphone-based MFA solutions	Hardware tokens	ALLTHENTICATE
Flexible Security						✓
Backward Compatible	✓	✓	✓			✓
Simple Installation			✓	✓		✓
Over-the-Air Upgrades			✓	✓		✓
Eliminates Phishing				✓	✓	✓
Smartphone-Based Solution		✓		✓		✓
No Internet Required	✓	✓			✓	✓
Cross-domain Solution						✓
Price	$$$	$$$	$	$$	$$	$$

Allthenticate Yourself — Future state



Let's get you set up quickly.

Allthenticate Yourself

Sign in with Twitter

Sign in with Google

Sign in with Facebook

(Transition back to ugly slides)

Allthenticate (a cybersecurity startup)

Title: Founder and CEO

My take: WWWHHHHHEEEEEEEEEEE!!!!

Serious tradeoff between moving quickly and doing it “right”

Sound software engineering feels more expensive than ever

Managing a company is harder than managing a team

People are harder to coordinate than software

Software Engineering Required: Your company will certainly fail if you do not.

Allthenticate Internals

5 distinct products

40 gitlab repositories

Java, C++, Objective C, Dart, Javascript, CSS, SQL, Python 2 & 3, Bash scripts

Cross-compiled native libraries for every iOS and Android architecture

Environments supported: OSX, Linux, Raspberry Pi, Windows, iOS, Android, Chrome

Allthenticate Manufacturing

We design our own hardware from scratch

PCB design and testing

- Outsourced fabrication and **placement** (something you only want to do once

Mechanical design

- Designed in house, printed externally

Hardware debugging is much harder than software debugging (software developers have it easy)

Management Tools

JIRA, Asana, Trello, ...

Gitlab, GitHub, ...

Wikis, Issues, ...

Slack, Discord, ...

Meet, Zoom, ...

What we use

Trello: All technical issues, administrative issues, and hiring

Gitlab: Free runners mixed with custom runners (e.g., a Pi and Mac mini)

Slack: Sharing memes

G Suite: email, conferencing, and files

Google drive and slides are life savers!

Hardware tests require real hardware *(Phones as Pis)*

Payroll software, Quickbooks, and Zapier

CI/CD Awesomeness

Deploy keys are amazing!

ssh integration with CD is next level

Have you tried Netlify, or a similar CMS?

Linting in CI

Submodules!

Branch-dependant stages

My typical day

Sleeping	8 hours (+/- 30 min)
Exercise	1-5 hours
Adminstrativia	1-35 hours
Engineering	0-10 hours
Eating	1-2 hours

Lessons Learned

Learn git, really learn it, and use it as properly as you can

Do CI early and often

Practice, take time to not program, but make yourself more efficient

Ergonomics is important

Spend the money, don’t compromise. You only get 1 body

Invest in good equipment.

You should never be held back by your equipment. It’s too cheap to suffer.

Be nice to your colleagues and future you

Just because you “can” do something in a language, does not mean that you “should”

Pythonic code should only be used if it makes the code more readable, faster, or more extensible.

Function that returns the set of all subsets of its argument

```
f = lambda x: [[y for j, y in enumerate(set(x)) if (i >> j) & 1] for i in range(2**len(set(x)))]
```

No!

Questions?

chad@allthenticate.net