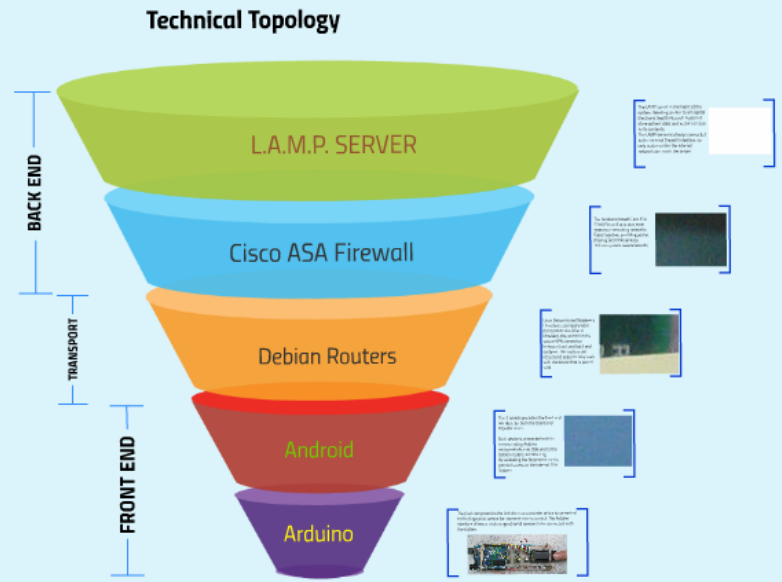
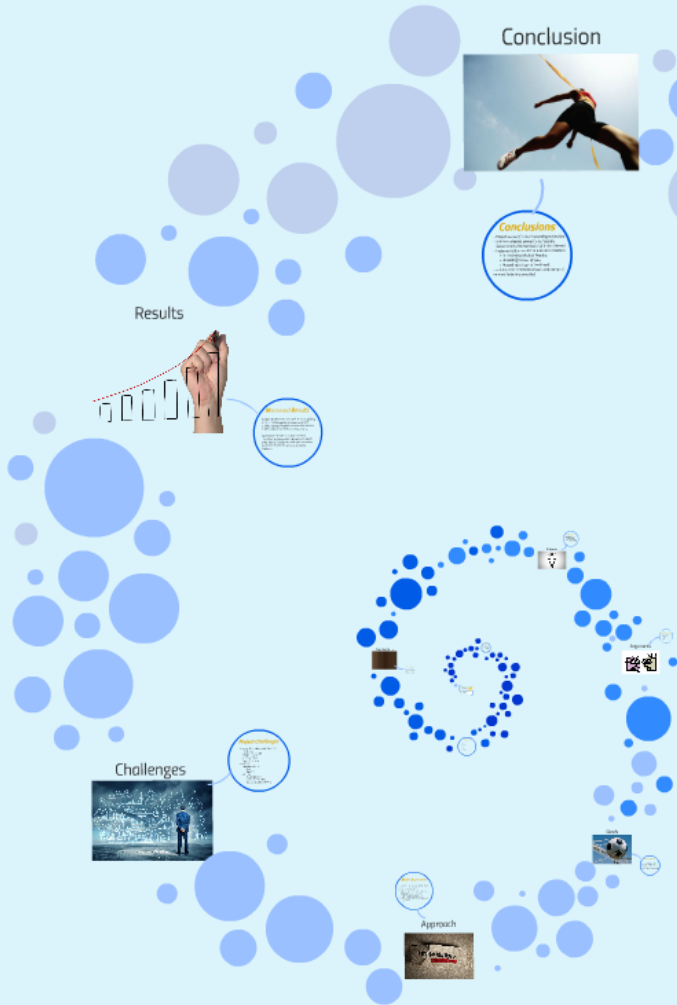


Mobile P2P Telehealth

Senior Capstone project

Bruno Lopes

Supervisor: Dr Cavalcanti



Mobile P2P Telehealth

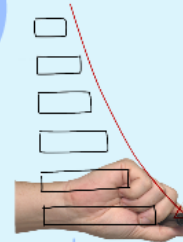
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Challenges



Results



Approach



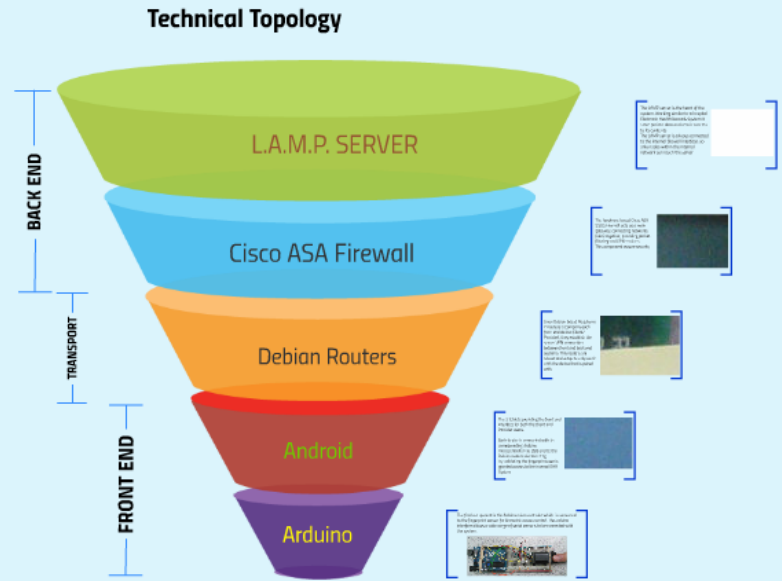
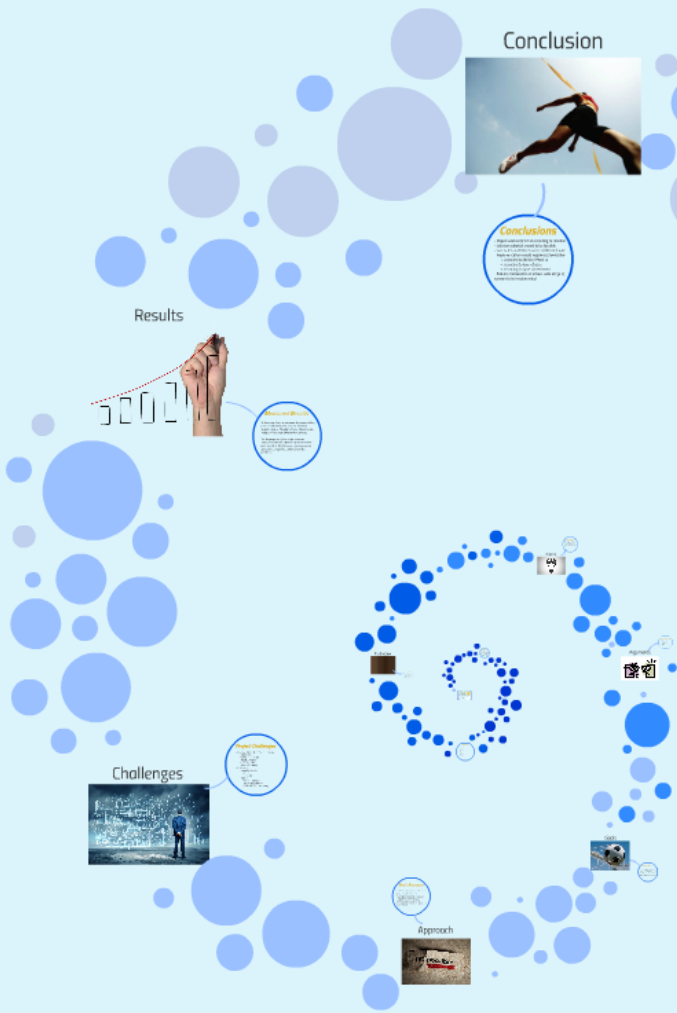
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University of Alaska Anchorage

College of Engineering



Dept of Computer Systems Engineer

Prototype design for
Mobile P2P Telehealth
by
Bruno Lopes



Background

- Born and raised in Brazil
- 14+ years of IT experience
- Visited over 20 villages interior AK
- AAS on System Administration, UAF
- Interest on integrating systems
- Interest on mobile development
- Interest on HCI

"Committed to build a better world"

Quick Outline

- Motivation
- Purpose
- Arguments
- Goals
- Approach
- Challenges
- Results
- Conclusion
- Future Work

Motivation



Personal Motivation

- Opportunity to provide a feasible solution to a known problem
- Break down health institutions bureaucracy black hole
- Health oriented patient care, opposed to capital oriented business structure
- Optimize patient/doctor interaction
- Opportunity to practice Systems Integration and development

- Big fight with big dogs, and I love a good challenge...

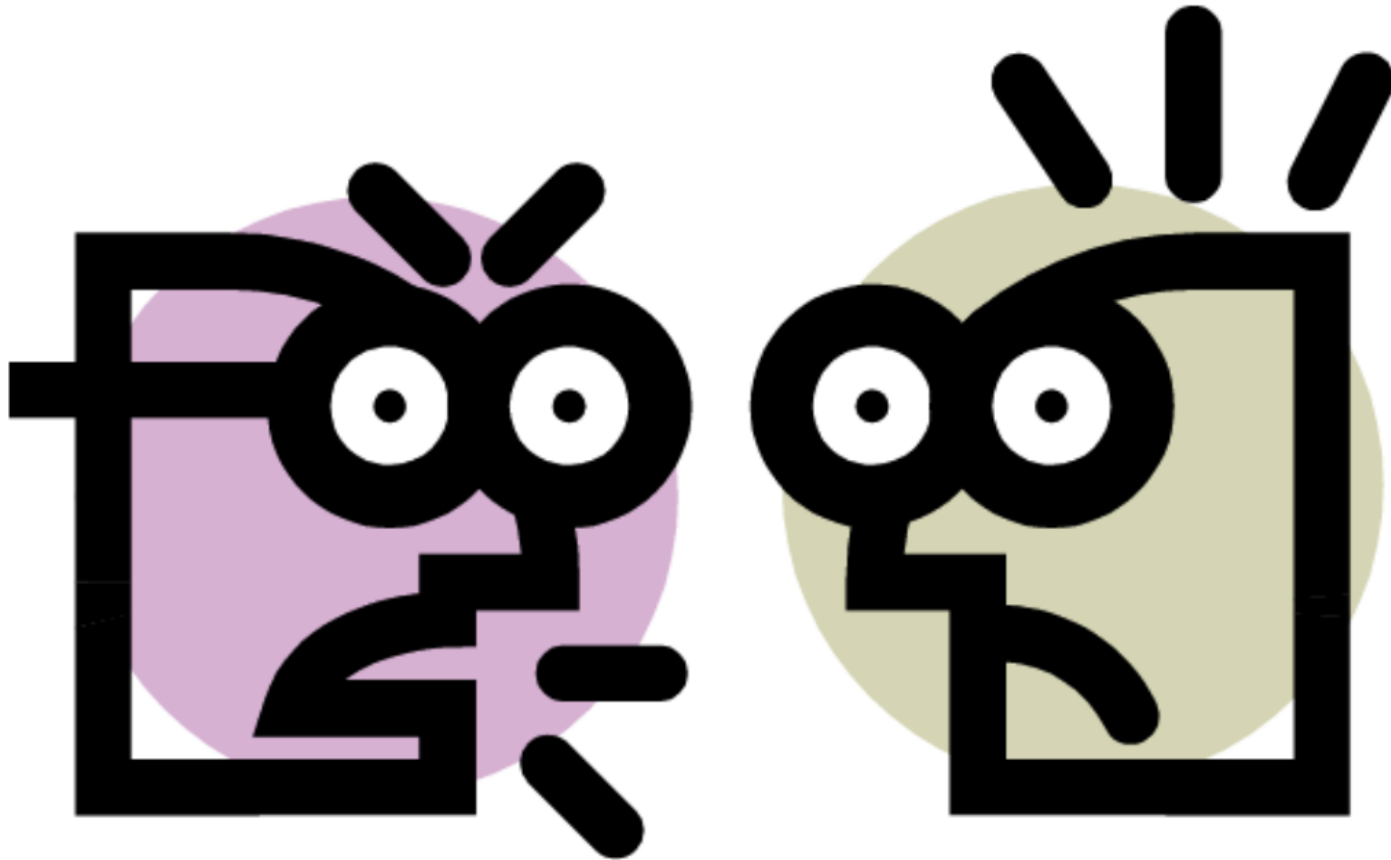
Purpose



Project Purpose

- Provide a secure prototype solution to directly connect clients/providers independently of Health institutions
- Decrease costs associate to doctor's visits
- Improve ongoing treatment alternatives
- Access control security using biometric sensors
- Integrate different technologies, provide a solution
- Extend to other type of treatments and patient care
- Innovate

Arguments



Possible Arguments

- Reinventing the wheel
- Patient obstruction
- Mislead diagnosis
- Redundancy
- Misuse
- Possibility of fraud

Goals



Project Goals

- Secured environment, direct access
- HIPAA, CFR, CMS and AMA CPT standards
- Billable: Medicare + Medicaid guidelines
- Simple and efficient
- Make best usage of available technology

Approach



Right Approach

Complex tasks require proper approach, determination and effort

- Break down large objective on smaller tasks
- Segment project onto 3 main parts
 - + Back end processing (Electronic Health Records System)
 - + Network transport (Secured Transmission)
 - + Front end interface (client/provider interaction)
- Accommodating current technology to solution needs
- A lot on medical technology and standards research
- Time management, project management and many different hats
- Focus, focus and focus
 - Focus

Challenges



Project Challenges

- Integrate different platforms and languages:
 - + Arduino = C
 - + Android = Java + XML
 - + Variables = JSON
 - + Scripting = PHP
 - + Database = MySQL
- Networking
 - + Integrity & Security
 - IPSec
 - OpenVPN
 - + Routing
 - Vlan & Subnetting
 - DHCP, DNS, NAT/NAP,
 - Static routes, packet filtering

Results



Measured Results

Boolean result can be measured by accomplishing a successful interaction between client and provider devices. The platform and infrastructure in place will provide further enhancements.

For the purposes of this project, required interaction regards a client device being able to write data to a database, and a provider device being able to read this contents from the database.

Conclusion



Conclusions

- Project worked finished according to timeline
- Solution adopted proved to be feasible
- Secure access/transmission of data achieved
- Implementation would require customization
 - + According to Medical Practice
 - + According to level of care
 - + According to type of treatment
- Arduino microcontroller allows wide range of sensors to be implemented

Future Work



Future Development

With the knowledge gained from this project I would like to apply the integrated technology to other fields.

Android + Arduino + Remote back-end processing

Final Considerations

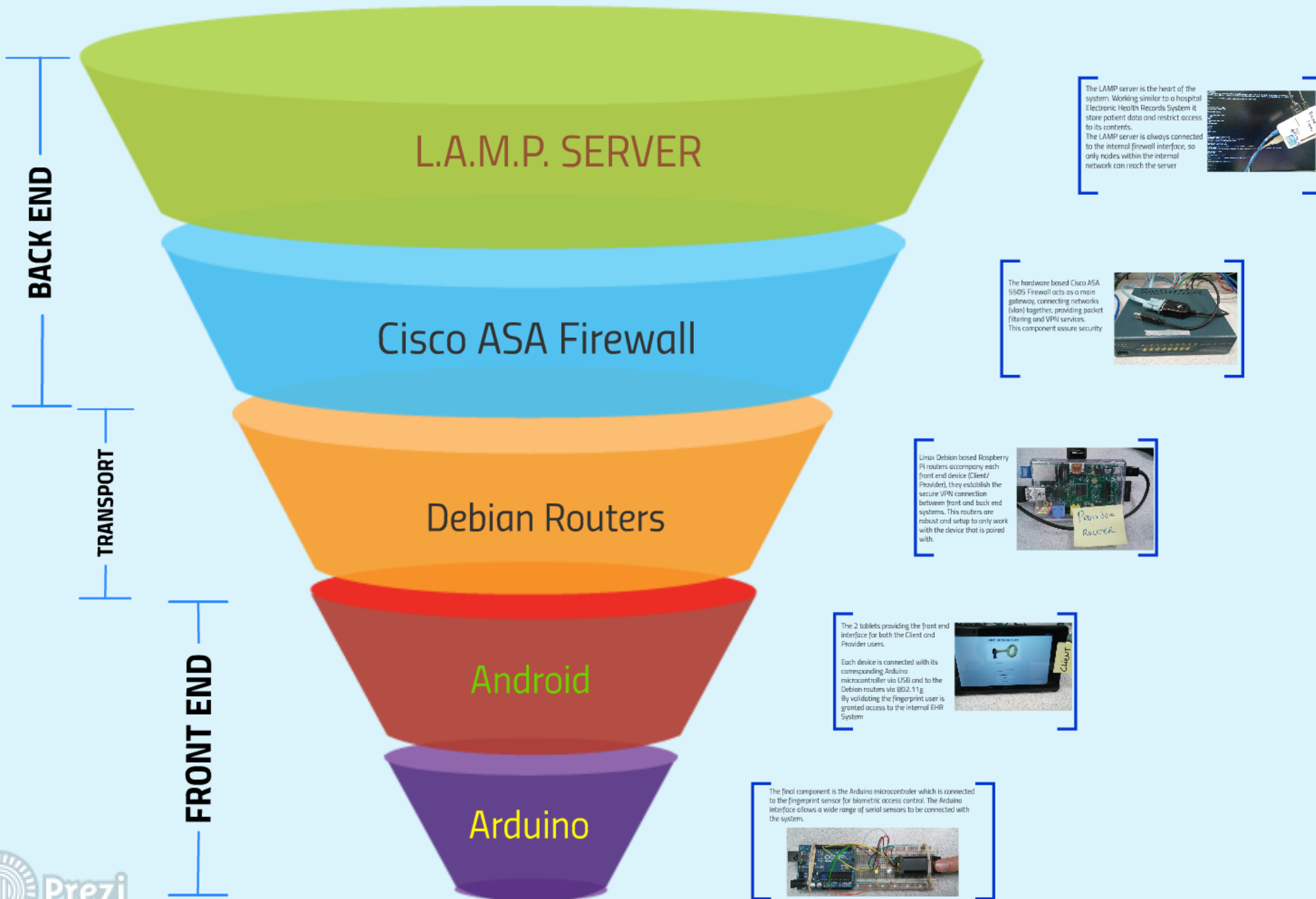
There were several challenges along the project that influenced my directions and decision making process.

One of the things that I would like to have implemented but I was not able to due time constrains was to power the Raspberry Pi server using POE provided by the Cisco Firewall

It is possible to drain up to 48V from a POE port without altering performance on a CAT5e network, the Raspberry Pi only needs 5v

Technical Topology

Technical Topology



L.A.M.P. SERVER

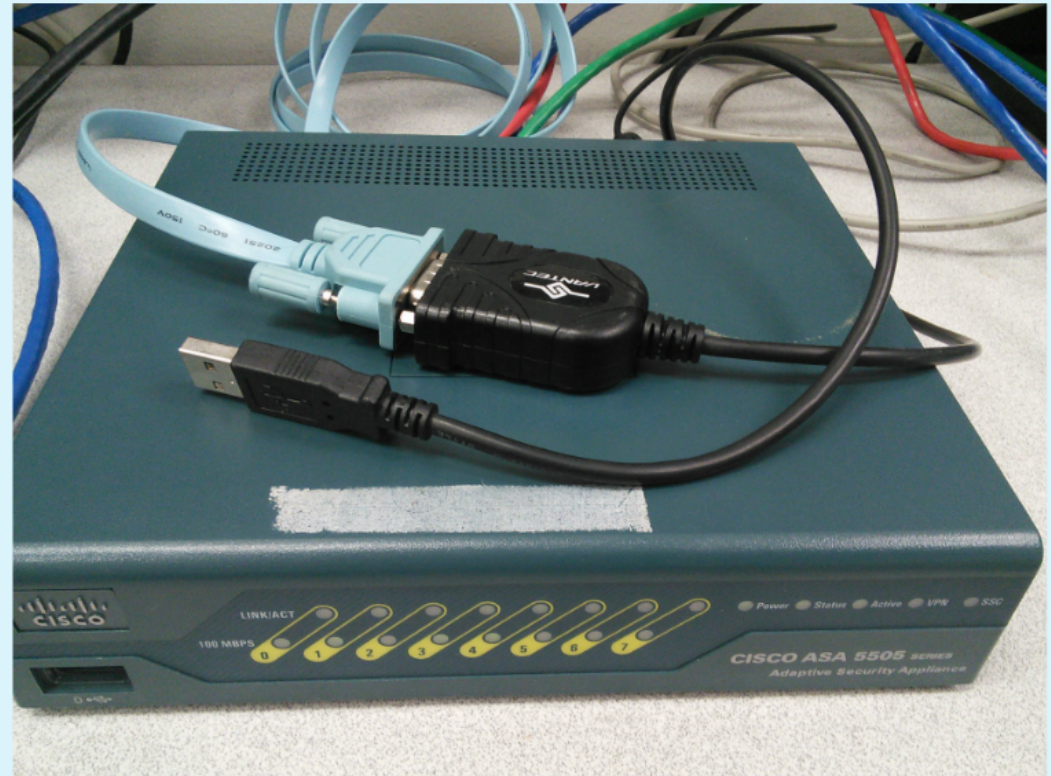
The LAMP server is the heart of the system. Working similar to a hospital Electronic Health Records System it store patient data and restrict access to its contents.

The LAMP server is always connected to the internal firewall interface, so only nodes within the internal network can reach the server



Cisco ASA Firewall

The hardware based Cisco ASA 5505 Firewall acts as a main gateway, connecting networks (vlan) together, providing packet filtering and VPN services. This component assure security



Debian Routers

Linux Debian based Raspberry Pi routers accompany each front end device (Client/ Provider), they establish the secure VPN connection between front and back end systems. This routers are robust and setup to only work with the device that is paired with.



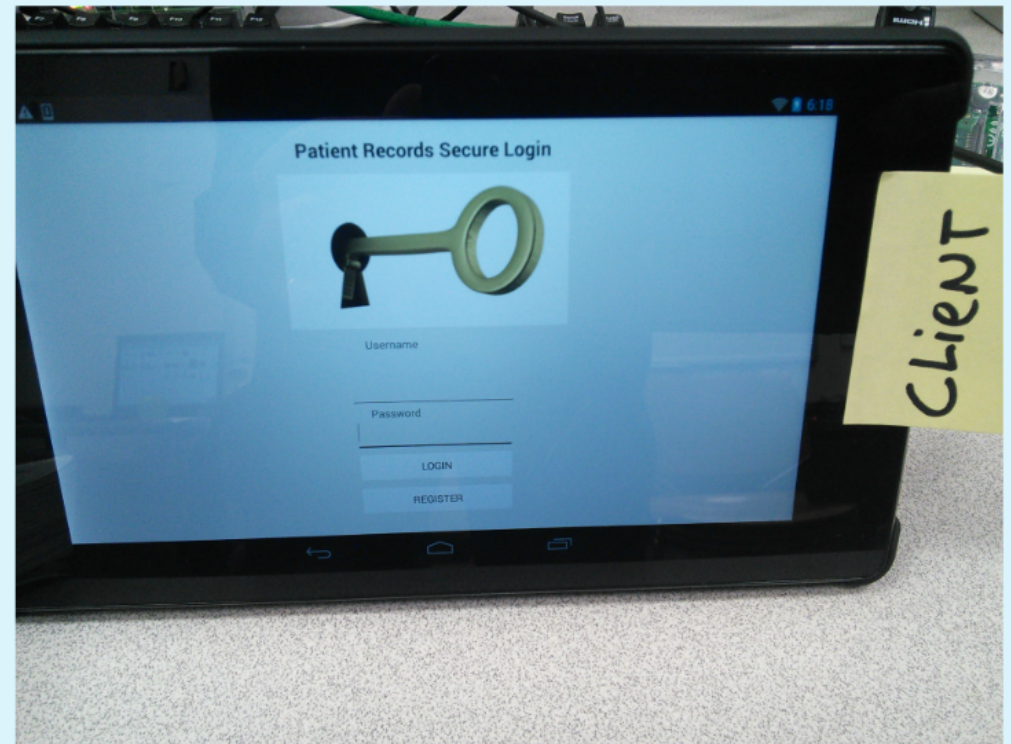


Android

Arduino

The 2 tablets providing the front end interface for both the Client and Provider users.

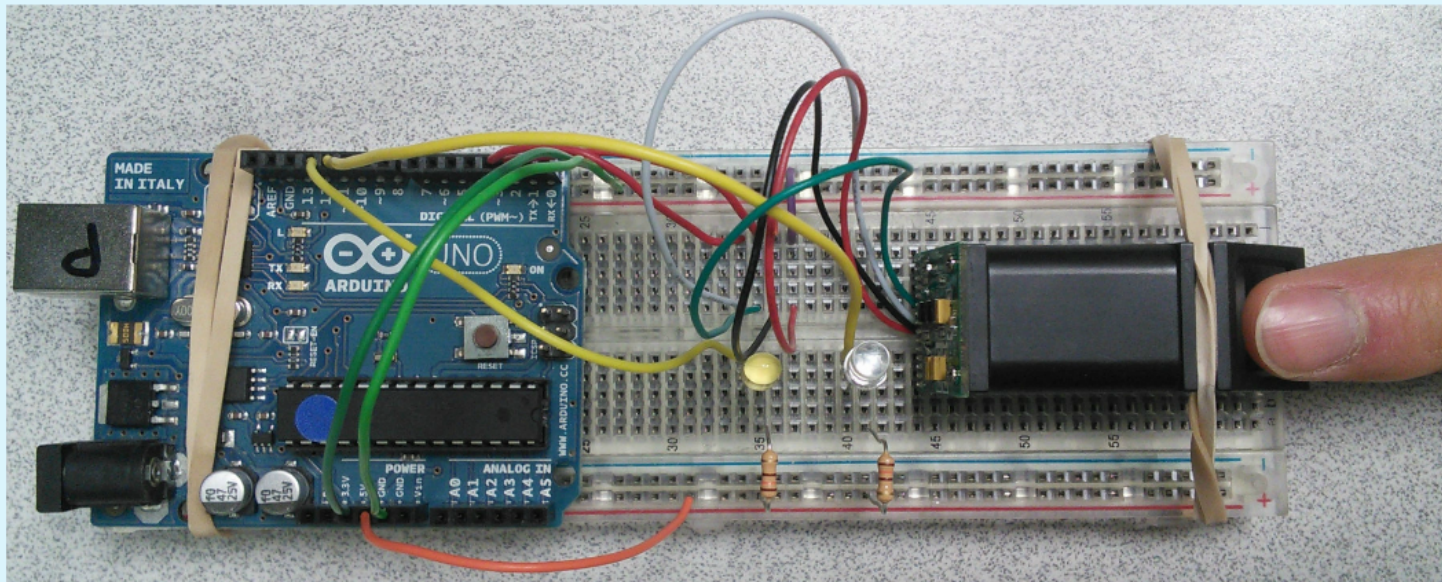
Each device is connected with its corresponding Arduino microcontroller via USB and to the Debian routers via 802.11g. By validating the fingerprint user is granted access to the internal EHR System.



Android

Arduino

The final component is the Arduino microcontroller which is connected to the fingerprint sensor for biometric access control. The Arduino interface allows a wide range of serial sensors to be connected with the system.



BACK END



TRANSPORT

CISCO ASA FIREWALL

Debian Routers

Android

Arduino

FRONT END

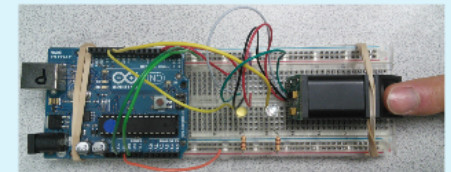
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