# Industrial Control Systems Honeypot

May1601

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**Client**: Alliant Energy
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# Problem Statement

The goal of the project is to create a standalone security device that can be placed in an industrial network to monitor traffic, looking for security-related irregularities, and act as a low interaction honeypot.

**Deliverable**

- Raspberry Pi (Raspbian)
- Hardened System
- Honeypot & Logging Framework
- Small, passive IDS
- Automated deployment process

# Conceptual Sketch

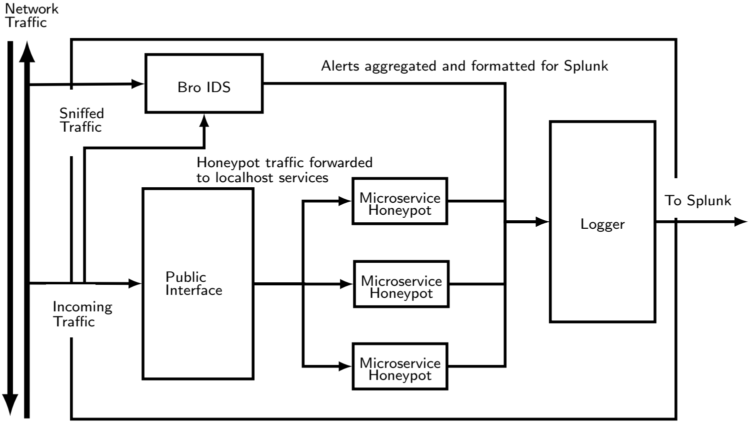


Figure: Simplified Device Internals

# Functional Requirements

System Behavior

- Provide SSH, HTTP, HTTPS and necessary SCADA protocols
- A minimized passive intrusion detection system
- Log attempted intrusion attempts and alert necessary personnel
- Automatic deployment and remote management
- Easily customizable protocols

# Non-functional Requirements

System Performance

- Secure system design
- Environmental considerations
- System must be low maintenance
- Simple stand alone device
- Capable of expansion beyond scope of project

# Technical/Other Constraints and Considerations

- ARM architecture
- Work with Alliant's existing logging architecture
- Limited RAM provided by hardware
- Unclear SCADA protocols
- Dealing with sensitive information

# Market Survey

**Open Source Honeypots**

| **ConPot** | **Kippo** |
|---|---|
| Low Interaction | Medium Interaction |
| Siemens s7-200 PLC | Fake file system |
| MODBUS, HTTP, SNMP, s7comm | SSH |

# Potential Risks

- ESD, RFI, EMI.
- Ethernet Cable
- Physical Ingress Protection
- Limited Memory
- Security Concerns

# Resource Cost Estimate

| **Item** | **Price** |
|---|---|
| Raspberry PI B+ | $69.99 (plus tax) |
| USB 2.0 Gigabit Ethernet Adapter | $16.99 (plus tax) |

**Total Device Cost: $89.98 (plus tax)**
**Total System Cost: $2,519.44 (plus tax)**[1]

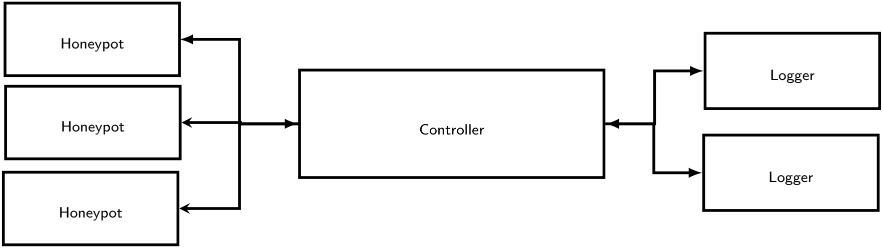
[1] Assuming 28 devices

# Functional Decomposition

| **Function** | **Component** |
|---|---|
| SSH, HTTP, etc. | Default plugin set |
| Monitor internal network traffic | IDS |
| Interaction Logs | Splunk Logger |
| Deployment/Management | Ansible |

# Detailed Design: Honeypot Framework

Figure: Plugin Framework Architecture



| Modular, Extensible | Secure by Design |
|---|---|
| 2 plugin types: Honeypot & Logger | Isolated, non-privileged processes |
| Communicate via unix socket RPC | Minimal protocol functionality |

# Technology Platform

**Raspberry PI** [2]

- Quad-Core 900 MHz Processor
- 1GB Ram
- Rasbian OS (Debian Based)

**Software**

- Ansible [3]
- Vagrant (Provisioned Testing) [4]
- Go Programming Language [5]

[2] http://www.amazon.com/CanaKit-Raspberry-Complete-Original-Preloaded

[3] www.ansible.com

[4] www.vagrantup.com

[5] https://golang.org

# Test Plan

**Go Programming Language**
Integration testing can be completed by combining multiple unit tests into a larger framework with the "testing" package. What about multiple configurations or platforms though?

**Vagrant** allows for easy replication of test environments through virtual machines. This provides a method for plugin end-end testing for any device setup.

Vagrant allows for **Provisioning**. This means that a newly created VM can be give startup tasks that will run as an automated script.

# Test Plan Continued

- Time complexity analysis
- Unit Testing, Integration Testing
- Code output verification

## Example (Unit Testing)

```
func TestSplunk (t *testing.T){
m := map[string]string{"username":"bob","password":"1234"}
http:=Http{Method:"POST",Path:"index.html",Parameters:m}
ev := Event{...,Http: &http}
fmt.Println(event)
//Output: [username: bob password: 1234 \
           Method: POST Path: index.html]
}
$ go test -v
=== RUN TestSplunk
--- PASS: TestSplunk (0.00s)
```

# Prototype Implementation

| Component | Code | Status |
|---|---|---|
| Default Plugin Set | HTTP<br>HTTPS<br>SSH<br>Splunk Logger | Done<br>Done<br>Done<br>Done |
| Automatic Deployment and Updates | Ansible playbooks | Done |
| Plugin Core | Framework | Work-in-progress |
| Physical Install | N/A | TODO |
| Testing | N/A | TODO |

# Current Project Status

**Product**

- Automated deployment complete
- Default honeypot plugins complete
- Near emulated prototype

**In General**

- Ahead of schedule
- Clear idea moving forward
- Flexible and prepared for change

# Team Task Responsibilities

**Dan Borgerding**

- Communication Leader
- Iptables, Ansible Verification, Environmental Considerations

**Nik Kinkel**

- Concept Holder, Software Architect
- Ansible, Web Authorization, SSH,Vagrant

**Jon Hope**

- Webmaster
- Ansible

**Jon Osborne**

- Team Leader
- Splunk Communication, Plugin Framework

**Korbin Stich**

- Concept Holder
- Ansible Verification, Device Selection, Evironmental Considerations

# Plan for Next Semester

| Month | Schedule |
|---|---|
| January | Full prototype demo for Alliant security team |
| February | Incorporate client feedback, augment default plugin set |
| March | Hit 90% unit test coverage |
| April | Integration and acceptance testing, physical deployment |
| May | Final presentation |

Table: Plan for Spring 2016

# Questions