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Securing Enterprise VoIP

VoIP Vulnerabilities
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Arlinx manufactures a telecom carrier grade application specific IP Telephony and IP Security Linux open platforms. Ultra reliable (20 year MTBF and 85º C operating temperature) with hardware encryption and strong authentication with certified cryptographic storage. Very energy efficient (6 Watts*), executes 1.33 Billion instructions per second. Best performance per Watt and lowest Total Cost of Ownership. No fans or moving parts, two GigE ports (copper and fiber-optic), four USB 2.0 ports, immune to most malware, strong Administration, Maintenance and Provisioning features. Great alternative to a commercial grade PC.

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Enterprise VoIP Security

- **Arlinx Secure IP Optimized VoIP Platform**
  - Strong Authentication
  - Accelerated Encryption
  - Certified Cryptographic Storage Module
  - Dual Fiber and Copper GigE ports
  - No Moving Parts, 20 year MTBF
  - Amazing Performance per Watt (6 Watts)
  - Dual Power Supplies
  - 1 GB Low Voltage DDR2 RAM **with ECC**
  - Mini-ITX Form Factor, Open Platform with API and SDK
  - Speech and Video Media Processors

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- Reasons for VoIP Security
  - Financial Loss
  - Regulatory Penalties
  - Civil Damages
  - Repair and Maintenance Cost
  - Breach of Customer Trust
  - Thwart Espionage and Eavesdropping
  - Data Theft
  - Toll Fraud
  - Career at Risk

- **VoIP Infrastructure**
  - IP-PBX
  - IP Phones/End Points/User Agents
  - HTTP and Media Servers
  - Gatekeeper
  - Registration Servers
  - Redirect Servers
  - Media Gateways
  - Firewalls and Application Gateways
  - Proxies
  - IP Switches and Routers
  - AAA Servers, LDAP, DNS, SNMP, NAT, DHCP

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- **Basic Vulnerabilities Prevention**
  - Physical Security
  - Strong Authentication on Entire Infrastructure
  - End to End Media and Signalling Encryption
  - Voice and Data Segregation
  - Prevent Loss of Power
  - Prevent Loss of Data (Backups and Error Correction)
  - Stateful Firewalls and Packet Filters
  - Perimeter Security
  - Vulnerability Assessment and Torture Stress Testing
  - No Softphones, No WiFi

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- Physical Security
  - PBX secured in locked room
    - Access Control, Access Card, Biometrics
    - Video Surveillance
    - Entry Point Alarms
    - USB ports disabled
    - Strong Authentication, with No Remote Access
  - Theft of System, Hard Drive, or Data
  - Access to Authentication Keys and Certificates
  - Reset Passwords through BIOS
  - Alter OS, Plant Spyware
  - Fire and Flood Prevention
  - 2-5 Hours Battery Backup

- **VoIP Attack Methods**
  - Footprinting
  - Scanning, Host and Port Discovery
  - Enumeration
  - Espionage and Eavesdropping
  - Hijack and Redirection
  - Signaling Attacks
  - Denial of Service
  - Exploit OS Vulnerabilities, Virus, Worms, Spyware
  - Infrastructure Attacks

- **Footprinting the Attack Target**
  - Research Target Web Site
  - Enterprise Structure and Locations
  - Help and Tech Support intended for internal use
  - Job Listings
  - Phone Number and Extensions
  - Default Auto-Attendant Messages
  - Press Releases
  - User Groups and Support Forums
  - Search Engines
  - DNS Whois

- **Scanning Host Discovery and Device ID**
  - Hack Tools
    - **Nmap**
    - **SMAP**
    - **Sip-Scan**
    - **Superscan**
    - **SolarWinds**
    - **Nessus**
    - **Port Scanner**
    - **Hping**
    - **SIPVicious Suite**
    - **VLAN Ping**
    - **VoIP Audit**

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- **Ping Sweeps**
  - IMCP Ping, Easily blocked by Firewall
  - ARP Ping, reveals MAC addresses
  - TCP Ping finds active hosts and open ports
  - SNMP Ping, find active network devices & configuration

- **Port Scanning Device Discovery**
  - UDP Scan
  - TCP SYN/ACK
  - Stack Fingerprinting, OS detection
  - Server Detection, DNS, LDAP, RADIUS etc.

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- **Enumeration**, User Name and Extension Discovery
  - Hack Tools
    - **Netcat**
    - **Nessus**
    - **Retina**
    - **Saint**
    - **VoIPShield**
    - **Scapy**
    - **SiVus**
    - **Sipsak**
    - **SIPSCAN**
    - **SCTPScan**
    - **SFTF (SIP Forum Test Framework)**

- **Enumeration Methods**
  - SIP Register
  - SIP INVITE
  - SIP OPTIONS
  - TFTP Servers, used for configuring IP Phones
  - SNMP, Reveals IP Phone Configurations

- **Eavesdropping Sniffer Hack Tools**
  - Cain and Able
  - Vomit
  - VoiPong
  - Oreka
  - Wireshark, formerly Ethereal
  - Etherpeek
  - ILTY
  - RtpBreak
  - NetDude
  - PSIPDump
  - SIPomatic
  - SIPv6Analyzer
  - WIST

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- **Espionage and Eavesdropping**
  - Conversation Eavesdropping & Recording
  - Call Tracking
  - Number Harvesting
  - Network Sniffing
  - DTMF Capture
  - TFTP Configuration Sniffing

- Denial of Service Hack Tools
  - INVITE Flooder
  - RTP Flooder
  - UDP Flooder
  - SIP Bomber
  - AuthTool
  - SIPp
  - SIPNess
  - Seagull
  - Scapy

- **Denial of Service**
  - Distributed Flooding (Botnets)
  - UDP Flooding
  - TCP SYN Flooding
  - ICMP Flooding
  - SIP Phone Flooding
  - UDP Flood INVITE
  - Application Flooding

- **Targeted Flooding**
  - QoS Manipulation
  - RTP Flooding
  - Malformed Packets
  - INVITE Flood
- **SIP Proxy Flooding**
  - Invalid SIP Phone
  - Invalid IP Address
  - Invalid Domain Name
  - Invalid SIP Phone In Valid Domain
  - Authentication Requests

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- Media Hack Tools
  - AuthTool
  - RTP InsetSound
  - RTP MixSound
  - RTPInject
  - RTPProxy
  - SteganRTP
  - Vo²IP

- **Hijack Redirection**
  - **Man in the Middle**
    - Spoof User Agent/Phone
    - Spoof SIP Proxy
    - DNS Spoofing
    - DHCP Spoofing
    - ICMP Redirection
  - **RTP Manipulation**
    - Blocking Media Packets
    - Inserting Media Packets
    - Encrypt Packets

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- Signaling Attack Tools
  - BYE teardown
  - RedirectPoison
  - Registration Adder
  - Registration Eraser
  - Registration Hijacker
  - SIP-Kill
  - SIP-RedirectRTP
  - SIPRogue

- **Signaling Attacks**
  - Registration Removal
  - Registration Addition
  - Registration Hijacking
  - SIP Phone Hijack
  - Reroute Calls
  - Reroute Phishing
  - Teardown Conversations
    - SIP Proxy/ SIP BYE
    - SIP Phone/ SIP BYE
    - SIP CANCEL
    - SIP Phone Re-Boot

- **Infrastructure Attacks**
  - OS Vulnerabilities
    - Virus Worms Spyware
  - Firmware Vulnerabilities
  - Network Availability
  - Resource Consumption
  - Infrastructure Attacks
  - DHCP Exhaustion
  - DNS Cache Poisoning
  - DNS Flood

- **References**
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  - *Security Considerations for Voice Over IP Systems*,Recommendations of the United States National Institute of Standards and Technology
  - *Internet Protocol Telephony & VoIP Security Technical Implementation Guide*, Developed by United States Defense Information Systems Agency (DISA) for the United States Department of Defense (DOD)
  - **The above documents are available in PDF format at arlinx.com VoIP Security**
  - *Hacking Exposed VoIP: Voice Over IP Security Secrets and Solutions,* Authors: David Endler, Mark Collier, Publisher: McGraw Hill, 2007
  - How to Cheat at VoIP Security, Syngress Publishing, 2007 Authors: Thomas Porter, Michael Gough
  - **Additional and detailed information: www.arlinx.com VoIP Security**

Enterprise VoIP Security

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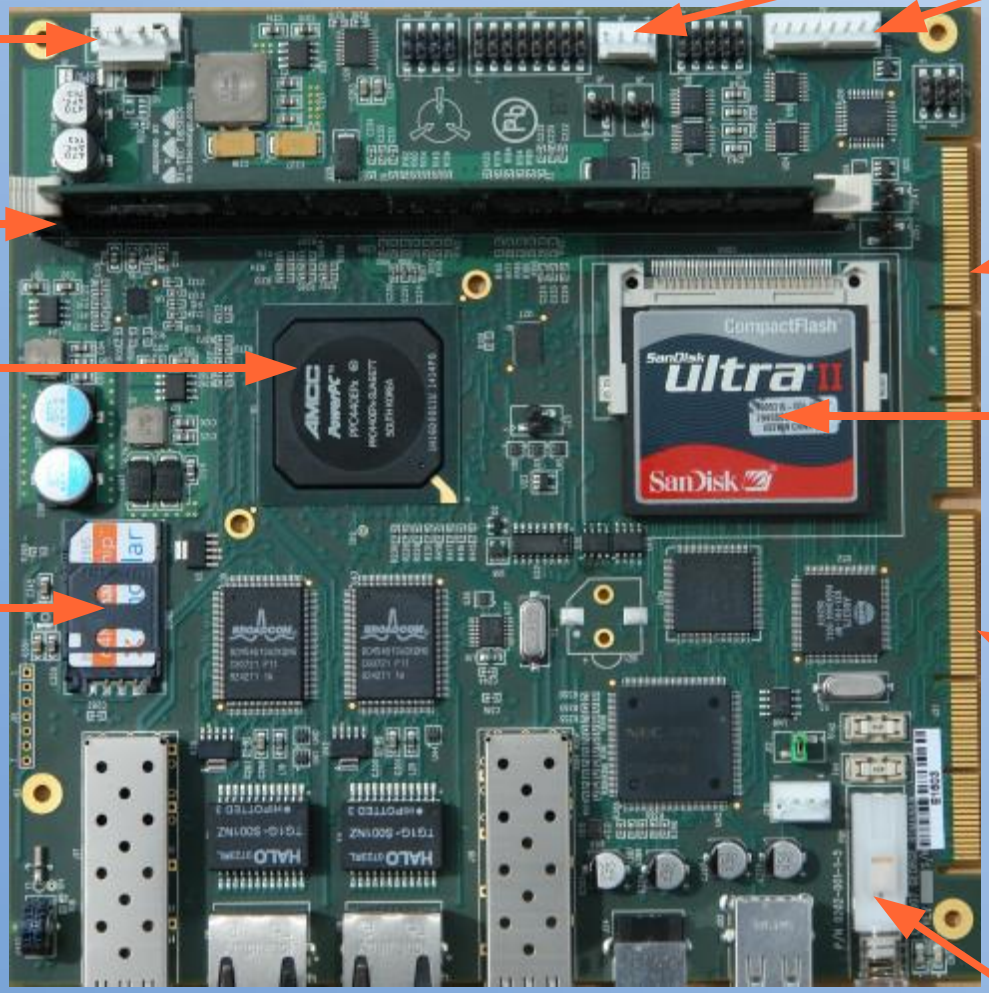

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