High-Performance RADIUS Server and Converged Prepaid & Postpaid Billing

ISP, VOIP, Wimax, Mobile & Wifi Providers
About Aradial Technologies

• Designer and provider of Billing, AAA and Policy control servers for IP services.
• Targets multiple vertical markets, xDSL/FTTH, WiMAX, LTE, Wifi, VOIP, Cable/MSO, 3G mobile and Wifi offload.
• Experienced personnel from top networking and billing companies
• Private, self funded, profitable
Aradial Products

- Aradial AAA/RADIUS
- Aradial Enforcer – AAA with Prepaid Enforcement
  - Spotngo add-on for Payment and top-up vouchers
- Aradial Converged Billing
  - Billing and CRM
  - Prepaid and Postpaid billing
  - Voucher management
  - Self Care
  - PRM – Partner management including Hierarchies
  - Wholesale Data and Voice
  - PCRF – Policy Control Engine - module
  - Diameter support for Gx/Gy and Ro/Rf - LTE
- PCRF – including AAA and optional billing
- HSS (including dual protocol Diameter and Radius)
- Aradial SMART-HLR - connector for 3G offload
Key Customers
ISP / WISP

- Nepal Telecom – xDSL, Dialup and Wimax
- NewRoz Telecom – IRAQ
- Vodafone Ghana – GhanaTel
- MTN Uganda – Wifi 3G offload
- MTN Rwanda – Wifi 3G offload
- DHI Telecom Group – USA, multiple locations
- Kewiko – Mongolia
- Bezeq Israel PTT – ADSL, Wifi and Wimax
- Smile / Orange Israel
- PMI – Philippe Morris – Enterprise
- Cable & Wireless Atlantic – broadband ISPs
- Sure IO
ISP / WISP

- Palau Telecom
- GTlink – Mexico
- STAN Telecom
- Digicel group – Caribbean
- IOG – Norway
- Multivision – Djibouti
- Rye Telecom – USA
- Jefferson Telecom – USA
- Bentley Walker – Canada
WiMAX

- Airspan – multiple installations including LTE
- Telrad – multiple installations including LTE
- Cisco ASN-GW and Starent
- Huawei and ALU
- Cambium (Motorola PMP / Canopy Wimax)
- Runcom – multiple installations
- Wichorus/Tellabs – multiple installations
  - Sprint USA
  - Augere Uganda
Mobile GSM/CDMA (3G)

- **nPhase / Verizon Wireless**
  - 16M subscribers for supporting all the smartphones
- Maingate – M2M
  - 700,000 mobile subscribers in Sweden
- Orange Senegal
- NSSL – UK
- Applied Satellite Technology – UK
- STI – Mobile
  - mobile subscribers in Indonesia
  - Installation with FTS
- Telikom – PNG
  - With Telrad and Amdocs
- Globe Wireless – UK – DRP deployment
LTE

• Airspan - LTE and Wifi and Aricent EPC
  – Vanuatu
  – IPI9
  – RLTT
  – Others in the trails
• Telrad - LTE and HSS with Telrad EPC
• Cello Wireless / Neragon
• Adax
• StarSolutions
VoIP

- Net4India
  - VoIP provider with 2.5 M subscribers
- GCS - IDT
  - VoIP termination provider in USA
  - 100 million calls per month
- Globe Comm Systems
- Globe Wireless – USA/UK
- NetCiti / Datacom - Indonesia
Hotspots/WiFi Installed Base

Over 500 hotspots network installed worldwide

- Interstate USA
- Bell Aliant Canada
- Kewiko Mongolia - Ruckus
- STAN Telecom - AF
- O'Fallon Wireless USA
- Telecell - Burkuno Passo
- Easy Kiosk - Australia
- PTK – Aruba networks
- Teledata – MZ

- MTN Rwanda - Balton/Alvarion
- MTN Uganda – Balton/Alvarion
- Dekal Telecom–Jamaica-Altai
- Noble Telecom - Jamaica
- Saudi Telecom - Altai
- Angola Telecom
- Namibia Telecom - Nomadix
- BSNL – India – Nomadix
- Paamul Mx– Motorola + MTK
Aradial
Converged Billing

ARCB
Aradial Converged Prepaid & Postpaid, Multi IP Services

- Prepaid and postpaid billing subscribers
- Multiple play services on same platform
- Advanced AAA & HSS – RADIUS and Diameter
- PCRF - Policy Control management
- Customer Management and basic CRM
- Voucher Management system
- Captive portal with responsive design
- Partner Management system (Resellers)
- Self care including for Resellers
- Balance transfers between subscribers and resellers for virtual payments/Mobile payments
Aradial Converged
Prepaid & Postpaid, Multi IP Services

• Customer Management Hierarchy
  ▪ Account – shared balance for users
  ▪ Users under account
  ▪ Resource/ANI/CPE defined per users

• Account and user operation – including Roles
  ▪ View financial transactions, sessions and calls
  ▪ Adjustments to invoices
  ▪ Payment by credit card or PayPal
  ▪ Manual payments – cash, checks, banks
  ▪ Balance transfer between users and accounts
Aradial Converged
Prepaid & Postpaid, Multi IP Services

- Business Partners and Reseller Management
  - Hierarchy
  - Revenue Sharing with Business partners
  - Registering subscribers / account
  - Selling vouchers and prepaid cards
  - Receiving commissions
  - Balance transfer (like Mobile Banking)
- Multiple VISP support as Business entity
  - Hierarchy
  - Special administration for VISP/BE
  - Manage users and vouchers under the VISP account
  - External HTTP interface for VISP billing integration
- Revenue Sharing with Business partners
Aradial Converged
Prepaid & Postpaid, Multi IP Services

• Captive portal (customized per location)
  ▪ Responsive design—support all OS including phones
  ▪ Self registration
  ▪ SMS registration (sending PIN via SMS)
  ▪ Free registration (e.g. limit 30 min per day)
  ▪ Buying online by PayPal / CC
  ▪ Voucher registration and refill / top-up

• Web self care for users and accounts
  ▪ Users and passwords management
  ▪ Accounts - Payments and invoices
  ▪ Purchase new offers and upgrades
  ▪ View usage and sessions

• Trouble ticketing
Aradial Converged Prepaid & Postpaid, Multi IP Services

• Product catalog
  ▪ Price plans
  ▪ Offers using price plans
    ▪ Price plan
    ▪ Network profile provisioning
  ▪ One-time offers
  ▪ Add on offers
Aradial Converged Prepaid & Postpaid, Multi IP Services

• Flexible charging & rating
  ▪ Periodic Recurring Charges
  ▪ Usage charges
    ▪ Flat rate
    ▪ Pay as you go
    ▪ Allowances – multiple balances and counters
    ▪ Time of day and day of week and Calendar dates
    ▪ Destination charging – e.g use for VOIP and VOICE Prefix table
    ▪ Cost determination for wholesale
    ▪ Charging for movies and video on demand
  ▪ One-time charges
  ▪ Custom rate plans per customer requirement
Aradial Converged
Voucher management

• Voucher management
  • Top-up vouchers
  • Prepaid Cards - Activated on first use
  • Calling Cards
• Creating in Batches
• Generating and managing by Resellers/Business entity (self care for BE)
• Voucher reports including Revenue reports
• Vouchers used in Captive Portal and Self Care
• Advanced Life Cycle including export to files
  • Created
  • Shipped
  • Ready for use
  • In use
Vouchers

- 3 kind of Vouchers:
- Top-up Vouchers
- Prepaid Cards (Anonymous user)
- Calling Cards (VOIP)

- Reports
- Templates
- Manage vouchers
Invoicing
- Periodic automatic invoicing
- Invoicing sent by email
- XSL layout – branding
- Undo billing
- Discounting

Accounting reports
- Invoicing
- Payment
- Operator statement, per-account statement
- Aging payment
Aradial Converged
Prepaid & Postpaid, Multi IP Services

• Automatic payment
  ▪ Error management

• Account Receivables (A/R)
  ▪ Manual entered payment, fast payment screen
  ▪ Multiple Credit card payment gateways
  ▪ PayPal
  ▪ Bank Transfer (*)
  ▪ Mobile Payments (*)

▪ PMS – Micros (Fidelio/Opera support)
• CDRs processing & error management or rating problems

• Inventory and Resource management
  ▪ SIM
  ▪ MAC Address
  ▪ IP Address
  ▪ ANI
  ▪ DID
Aradial Policy Control

- PCRF - Policy Control quota management
- Fast definition of Policy rules, actions and step
- Handles various users events

- Advanced dynamic policies for active users
  - Fair usage
  - Change of QoS parameters in real-time
  - Disconnect
  - Redirect
  - Send notifications via email and SMS
Wifi / Hotspots Advanced Features

- Bandwidth and QoS per unique NAS
- Volume quota limiting
  - Using RADIUS attributes sent to the NAS
  - Using Interim updates and COA / POD
  - Exact volume charging without Interim accounting, using redirection with Runcom.
- Time bank / allowance
- Expiration
- POD - Packet-of-disconnect for live sessions
  - From the Admin
  - Using API from external system
- COA – change of Authorization
Wifi / Hotspots Advanced Features

- Different Portal per location or VLAN
- Different catalog/cart per location
- Doing MAC authentication prior to redirecting to web page.
- SMS and USSD registration flow
- Time Period charging and bandwidth
- Location based charging
Architecture
Typical High-Availability Deployment
Integration using Aradial Smart-HLR Gateway

Aradial EAP-SIM Mobile Offloading using Aradial SS7 MAP - HLR Gateway

Access controller Gateway or AP with RADIUS Client

RADIUS Accounting

Aradial Radius Server And Aradial Converged Billing

Operator’s Radius Server

IP based Interface API For EAP-SIM

Aradial SS7 GW - MAP

Operator’s HLR / VLR

Smart Phone

Laptop
Aradial LTE
LTE & AAA/Radius and Billing

- LTE Billing and policy control
- Prepaid and postpaid
- Diameter standard for Gx/Gy for PCRF
- Diameter Ro/Rf /Gz for charging
- HSS – Diameter based
- HSS & AAA supports LTE extension for HSS
- Radius to Diameter converter
Aradial WiMAX
WiMAX AAA/Radius and Billing

- WiMAX Forum standard compliant
- AAA supports 16e NWG 1.4 Stage 3 including:
  - Authentication and authorization
  - EAP-TTLS/TLS for authentication adapted to the WiMAX standard
  - Integration with leading ASN gateway partners
  - IP-based and flow-based accounting
  - Hotlining with CoA
  - Wimax Prepaid application
  - 16d support with all known BRAS
WiMAX AAA/Radius and Billing (Cont.)

- Real-time active session management
- Scalability and real-time AAA functionalities
- Cost-effective solution and fast ROI
  - Billing and ordering:
    - All services, including broadband data, VoIP, voice, IPTV, VoD for WiMAX
    - Allows controlling users balance, time and traffic in real time and with zero leakage
- Advanced user management for subscribers
- Advance creation of prepaid cards
- Self ordering and provisioning redirection to activation portal at zero balance and plans purchase (add on module or ARCB billing)
WiMAX AAA/Radius and Billing (Cont.)

- Integration with external billing systems and future systems - advanced APIs for external billing integration, for both real-time events and provisioning
- Support of the following base station providers: Airspan, Telrad/Alvarion, Cambium/Motorola PMP, Huawei, Alcatel Lucent, Ipaxiom, Soma, Samsung, Redline, Aperto, Expedience, Runcom
Enforcer - Aradial RADIUS & AAA Server
Aradial AAA Server/ Module

- High performance, fully-featured
- Compliant with RADIUS standards
- EAP support including EAP-SIM/AKA
- Wimax NWG support and LTE extension
- IPv4 and IPv6
- Scalable and High available (Multithreaded, Multi process)
- Geo redundancy
- Provisioning interface exposed to External system
- Diameter AAA and HSS - extra optional module
  - Diameter – Ro/Rf (DCCA), Gx/Gy (PCRF)
Aradial AAA Server (Cont.)

- 100% web-based interface
- SSL security support
- Scalable Dynamic IP Pools
- Databases
  - MS SQL, Oracle, MySQL, LDAP, Active Directory
  - Flat files
- Statistics and reporting modules
- Enforcer add-on module:
  - Prepaid cards management,
  - Bandwidth management
  - Quotas and balance enforcement
  - Disconnect using PoD on quota depletion
  - MAC authentication and binding
Typical High-Availability Deployment

![Diagram of network elements including routers, switch, and servers.]

Aradial Proprietary and Confidential
Typical DRP Deployment

Network Diagram – DRP Deployment – Database on same machine

Router1
Router2
Router n

Load Balancer / Direct connection

Aradial 1 + Database server

Aradial 2 + Database server

Fast Link

Connect the Routers To the internet If allowed
Spotngo Payment Module
Add-on to Enforcer
Spotngo Enhanced Vouchers and Credit-Card Payment Module

- Plan/tariff management (time, traffic and expiration)
- PIN generation and management using plans
- User signup from the portal using a PIN
- Refilling users with a new PIN (PIN attached to a tariff plan with time, traffic or expiration)
- Refill by credit card
- Creating users with a credit card
- Configurable and customizable payment interface
- View/query payment history
- Secured portal (SSL)
- Secured PIN and plans management (SSL)
- Printing and exporting PINs to CSV files
- Customizable flows
Aradial Prepaid VoIP
Prepaid VoIP with Aradial

- Aradial VoIP supported services:
  - IVR calling
  - Direct calling using ANI/calling cards
  - Username
  - Peering
  - Termination and origination

- Two charging models:
  - Single session – entire balance is allocated for the user during the session
  - Multisession – the session is split into time quotas for all users that use a single balance
Prepaid VoIP with Aradial (Cont.)

- Centralized authentication and accounting for all routers or gateways
- High-performance and reliable server
- Scalable to handle millions of users and concurrent sessions on low-end hardware

Converged IP services

- SSL secured HTML-based administration
- Dealer/business partner management – dealers can manage their own users
- Extended HTML UI for user database and user groups
Prepaid VoIP with Aradial (Cont.)

- Self-care user module
- User and calling-card management, rating, import and export from/to CSV files
- Balance, duration and traffic enforcement
- User concurrence enforcement and view of concurrent calls from the administration tool
- Optional integration with SNMP-based NMS
- Multiple admin types
- Admin activity tracking
- External billing system interface using stored procedures or CORBA
Prepaid VoIP & Calling Cards

- Calling-card based prepaid billing
- Calling-card generation, import and export
- Username or ANI based (caller ID) prepaid VoIP billing
- Rating according to call destination, time of day, day of week
- Different rounding intervals per tariff or per destination
- Call setup cost
- Replenishing API or voucher refilling with payment module.
- Support of multiple tariffs and destinations rating tables that can be assigned to a calling card
- Session and summary reports per calling card, system, destination and period
- Optional module – termination billing including wholesale credit limit and fraud control
Supported Services and Equipment vendors
Aradial Supported IP Services

- Any broadband, BRAS, xDSL or cable
- WiMAX – WiMAX forum standard
- Mobile
  - GSM: GPRS, WAP, MMS
  - CDMA 2000 and 3GPP dictionaries
  - PDSN 3GPP prepaid and postpaid
- Wireless LAN
- 3G Wifi Offloading
- Wide Area Wireless basestations
- Mesh technologies
WiMAX

- Huawei and ALU
- Airspan
- Telrad / Alvarion
- Cisco Starent
- Runcom
- Wichorus/Tellabs
- Cambium / Motorola PMP / Canopy Wimax
- Samsung – IOT
- Getek - IOT
- Others that support NWG 1.3 and above
ISP: ADSL / Dialup

- Redback
- Huawei
- Cisco
- Juniper
- Runcom
- ALU
- All types of dialup RAS
Aradial Supported Wide Area Base stations

- Ruckus
- Alvarion Networks (WBS/Wavion)
- GoNet
- Altai Technologies
- Motorola Solutions WING
- Cisco WLC
- Ubiquity
- Aruba
- Autelan
- Motorola Canopy - Cambium
- Xirrus
Aradial Supported WiFi Access Controllers

- Ruckus Zone Director
- Mikrotik OS
- Cisco WLC
- Motorola WING
- Aruba Networks
- Nomadix
- HP Curve
- Zyxel, ValuePoint, Planet, Handlink
- 4IPNet
- Griffin, Dlink, NetGear
- Chillispot based, Linksys - DD-WRT
- PfSense
- Ikarus OS
- Runcom SG1
Typical Hotspot Deployment

Aradial Centralized AAA and Billing for Wireless LAN Users

Remote Locations

Wireless Cloud

When the user tries to surf the Access Controller redirects him to a SSL secured login page

Aradial Server solutions includes:
- RADIUS Server
- Walled Garden Portal
- Web Self Care
- Web Admin
- Customer Management
- Vouchers and Prepaid Cards
- Online Credit Card support
- Resellers Dealers and Affiliates
- Usage reporting and statistics
- Bandwidth Management and Policy Control
- Postpaid and Prepaid Billing
- Integration to External Billing solutions.
Centralized deployment

Aradial Centralized AAA and Billing for Wireless LAN Users

- Laptop
- Integrated AC/AP
- DSL / Cable / VPN
- RADIUS
- Wireless Cloud
- AP n, AP 2, AP 1

Aradial Converged Billing:
- RADIUS Server
- Walled Garden Portal
- Web Self Care
- Web admin
- Customer Management
- Vouchers and Prepaid Cards
- Online Credit Card support
- Resellers Dealers and Affiliates
- Usage reporting and statistics
- Bandwidth Management and Policy Control
- Postpaid and Prepaid Billing
- Integration to External Billing solutions

When the user tries to surf the Access Controller redirects him to a SSL secured login page.
• Soft switches and SIP proxy (Class 4/5)
  – Cisco
  – Telrad
  – Teles
  – AudioCodes
  – Mailvision
  – RAD
  – NextGK
  – VocalTec
  – Asterisk
  – Any other that supports standard SIP VSA

• VOIP gateways
  – Cisco 53xx, 54xx,
  – Quintum Tenor
  – GNUGK and OpenSer

• IPTV using RADIUS
Aradial Supported
BRAS and PCEF

- Cisco all models including PDSN
- Redback SmartEdge
- Juniper ERX and JRX
- Alcatel
- Huawei
- ZTE
- Meraki
- Runcom SG-BA and SG-1
- Others
AAA & Enforcer
Advanced Features
Overview

• Policy algorithms
  – Handling RADIUS messages
• State server
  – What is happening in the network
• Prepaid user monitoring
• User management
• Process monitoring
  – Including SNMP MIBs and traps
• Load simulator to test the network
  – Test any scenario for any equipment
Policy Algorithm Mechanism

- Customizable handling flow for each RADIUS message type
- Flow made of a chain of RADIUS algorithms
- Core algorithms supplied with the product
  - Authentication and Authorization algorithm
  - Accounting algorithms
  - RADIUS proxy algorithm
- New algorithms can be developed using shared C++ and/or LUA & TCL scripting
Aradial AAA Features

- PAP and CHAP authentication
- EAP authentication
  - EAP-PEAP, MD5, LEAP
  - EAP-TTLS, TLS
  - EAP-SIM and AKA (need integration with HLR and/or HSS)
- Digest, MS-Chap and MS-ChapV2
- Proxying to other RADIUS servers
  - RFC-based RADIUS proxy
  - Boingo, iPAss & other specialized proxy support
- Tunneling: PPTP, L2TP
- Policy algorithms
Unique Functionality (Cont.)

- User management with roles
- Prepaid cards management
- Captive portal
  - Responsive design for Mobile Smartphone and laptops
  - Customization of the portal per location
- Self care
- Bandwidth management
- Quotas and balance enforcement and expiration
- Disconnect using PoD on quota depletion
- MAC authentication and binding
- Viewing sessions and summaries
- Exporting usage
- Importing users and managing changes from files
Unique Functionality

- LUA & TCL scripting for policy algorithms
- Extended billing server connectivity API
- Grouping and subgrouping
- Persistent IP pools (support H/A)
- Bandwidth control per NAS model
- Metering (on external billing databases)
  - Time and data accumulator
  - Service suspension based on traffic per NAS model
- Blocking or changing QoS for groups in time-of-day periods (for example, peak, offpeak configurations)
- POD and CoA support
Unique Functionality (Cont.)

- Spotngo payment system
  - Refillable vouchers
  - Credit-card processing
  - PayPal support
  - Customization of Spotngo per location
  - PMS system support – Fidelio/Micros
Integration with External Billing Systems

- Advanced API for external online charging/billing servers
  - Session duration limitation
  - Data transfer limitations – directional limiting supported
  - Bandwidth limit using VSA RADIUS Attributes
  - Quota-based access
  - QoS and subscriber profile
- Integration using Diameter Ro/Rf/Gy
- Integration using stored procedures calling external databases
- Export usage to billing systems
- Enhanced provisioning APIs
- Internal support for traffic, duration metering & QoS
Typical Deployment Example
Thank You.

www.aradial.com