Advanced Convergent CRM, Prepaid & Postpaid Billing, PCRF and RADIUS/Diameter Servers

Fiber, Wifi, ISP, Mobile, IoT, VOICE, 4G/LTE & 5G, IPTV & Wimax Providers
About Aradial Technologies

- Designer and provider of Billing, AAA and Policy control servers for all IP services.
- 20+ year of selling, in 80 countries and more than 1000 operators.
- Targets multiple vertical markets, Fiber, Wifi, xDSL/FTTH, LTE, Voice, Cable, MNO/MVNO 2G/3G/4G/5G mobile, IPTV, WiMAX, IoT 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
  - CRM
  - Prepaid and Postpaid billing
  - Voucher management
  - Self Care and Captive Portal
  - Inventory, Workforce, Ticketing
  - PRM – Partner management including Hierarchies
  - Wholesale
  - PCRF – Policy Control Engine - module
  - Mobile 2G/3G/4G/5G support and IoT (Internet of things)
  - Diameter support for Gx/Gy/Gz and Ro/Rf – LTE
- PCRF – including AAA and optional billing
- HSS (including dual protocol Diameter and Radius)
- Aradial SMART-HLR - connector for 3G offload and Swx to HSS
Key Customers
• Kurdistan Network O3 – Fiber
• NewRoz Telecom – IRAQ
• Bezeq Israel ISP – Fiber, ADSL, Wifi, Wimax
• PMI – Philippe Morris – Enterprise
• Cable & Wireless Atlantic – broadband ISPs
• SurfNet, USA
• Jabbacom, USA
• DHI Telecom Group – USA, multiple locations
• Sure IO, deployment in multiple Islands
• MNBC – Mongolia
• Kewiko – Mongolia
• Nepal Telecom – xDSL, Dialup and Wimax
• Digicel group – Bermuda
ISP / WISP

- Vodafone Ghana – Wifi Prepaid
- MTN Uganda – Wifi 3G offload
- MTN Rwanda – Wifi 3G offload
- Coopeguanacaste – Costa Rica
- NEPTUNO – Costa Rica
- Digicel group – Caribbean
- GTlink – Mexico
- Alma Telecom – USA
- Jefferson Telecom – USA
- Tnext - Canada
- ISOCEL – Benin – Fiber
- Partner Mobile – Nigeria
- ICON+ - Indonesia
- Gilat Satcom – Israel
Mobile GSM/CDMA/4G

- **nPhase / Verizon Wireless**
  - 31M subscribers for supporting IoT and M2M
- Maingate / Sierra Telecom – M2M
  - 700,000 mobile subscribers in Sweden
- AireSpring – Multi MVNO deployment from USA
- L-Mobi, Netherlands – MVNO
- GTV – Greenland - LTE
- Somlink – MVNO and ISP
- Zamani Telecom – NIGER
- GECOMSA - Equatorial Guinea
- NSSL – UK
- Applied Satellite Technology– UK
- Sonatel - Orange Senegal – 300k+ users
- Globe Wireless – UK – DRP deployment
LTE

- Telrad - LTE and HSS with Telrad EPC
- Airspan - LTE and Wifi and Aricent EPC
- Neragon
- YATE BTS
- Parallel Wireless
- ZTE
- Adax
- StarSolutions
- Athonet
- Druid
- JRC
- IP Look
- EU-CAST
LTE - Deployment (partial)

- Safaricom
- Namibia Telecom
- Seaside USA
- Millennium
- WAW Senegal
- Togo Telecom
- Microcomm – Congo
- Afghan Telecom
- Africom
- Multitel – Angola
- Netpage – Gambia
- QCELL - Gambia
- Muni – EG
LTE - Deployment (partial)

- Premiere Broadband USA
- IPX – EG
- Real Time (RT) Zambia
- Azqtel
- Iway Africa Kenya
- IPI9
- Comsys – Telesol
- Nepal Telecom
- Albidinet
DPI

- Cambium QoE
- Preseem
- Allot
- Sandvine
- SAISE
- And others working with Radius or Diameter Gx
WiMAX

- Telrad – including AeroMACS
  - NASA
  - China
  - Japan
  - More

- Airspan – multiple installations including LTE

- Cisco ASN-GW and Starent

- Huawei and ALU

- Cambium (Motorola PMP / Canopy Wimax)

- Runcom – multiple installations

- Wichorus/Tellabs
Voice

• Most of the Mobile / LTE billing include 3G VOICE or VoLTE (supported)
• Net4India
  – VoIP provider with 2.5 M subscribers
• GCS - IDT
  – VoIP termination provider in USA
  – 100 million calls per month
• Globe Comm Systems
Hotspots/WiFi Installed Base

Over 600 hotspots network installed worldwide

- Interstate USA
- DHI USA
- Jabbacom Wifi USA
- O'Fallon Wireless USA
- Telecell - Burkina Faso
- Easy Kiosk – Australia
- Tnext – Canada
- Avanti - UK
- MTN Rwanda - Balton/Alvarion
- MTN Uganda – Balton/Alvarion
- Dekal Telecom–Jamaica/Altai
- Noble Telecom - Jamaica
- Saudi Telecom - Altai
- Angola Telecom
- Namibia Telecom
- SurfNet USA
Aradial
Converged
Billing

ARCB
Aradial Converged
Prepaid & Postpaid, Multi IP Services

- Prepaid and postpaid billing subscribers
- Multi-Play 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
- Self care end customers
- Partner Management system (Resellers)
- Self care for Resellers
- Balance transfers between subscribers and resellers for virtual payments/Mobile payments
- Advanced REST API to integrate with external system
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
  - Role based for Admin types
  - 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
• Captive portal (customized per location/SSID)
  ▪ Responsive design—support all OS including phones
  ▪ Self registration - template
  ▪ SMS registration (sending PIN via SMS) - template
  ▪ Free registration (e.g. limit 30 min per day)
  ▪ Buying online by PayPal / CC
  ▪ Voucher registration and refill / top-up

• 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
Product catalog

- Price plans
- Offers using price plans
  - Price plan
  - Network profile provisioning
- Additional offers – enhances an offer
- One-time offers
- Add on offers – e.g. for defining top-up products
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
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
Aradial Converged Prepaid & Postpaid, Multi IP Services

- 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)
Aradial Converged Prepaid & Postpaid, Multi IP Services

- 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 - template
- Time Period charging and bandwidth
- Location/SSID based charging
Architecture
Typical High-Availability Deployment

Network Diagram – Redundant Deployment

Router 1
Router 2
Router n

Network Elements

Switch

Aradial 1
Aradial 2

Master DB
Secondary DB

Connect the Routers To the internet If allowed

Radius Auth/Acct
Radius Auth/Act
Radius Auth/Act
Radius Auth/Act
Radius Auth/Act
Radius Auth/Act
Possible GEO/DRP Deployment

Network Diagram – DRP Deployment – Database on same machine

Router1

Router2

Router n

Network Element

Load Balancer
/Direct connection

Aradial 1 + Database server

Fast Link

Aradial 2 + Database server

Connect the Routers To the internet If allowed

Radius Auth/Access

Radius Auth/Access

Radius Auth/Access

Radius Auth/Access

Aradial Proprietary and Confidential
Integration using Aradial Smart-HLR Gateway
Aradial LTE
LTE & AAA and Billing

- LTE Billing and policy control
- Prepaid and postpaid
- Diameter standard for Gx/Gy/Gz for PCRF
- Diameter Ro/Rf/Gz for charging
- Client for Wifi offloading – Diameter Swx
- 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), SWx
100% web-based interface
Web User management
Web Role based user interface
Group - Policies for group of users
SSL security support
Scalable Dynamic IP Pools
Databases
- MS SQL, Oracle, MySQL, LDAP, Active Directory
Concurrency management - Online sessions
Statistics and reporting modules
REST API for external application
Aradial AAA Server (Cont.)

• Enforcer add-on module:
  – Prepaid cards management
  – Volume, Time and expiration enforcement
  – Bandwidth management
  – Disconnect using PoD on quota depletion
  – MAC authentication and binding
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
- LTE 4G
- Mobile
  - GSM: GPRS, WAP, MMS
  - CDMA 2000 and 3GPP dictionaries
  - PDSN 3GPP prepaid and postpaid
- IoT
- Wireless LAN
- 3G Wifi Offloading
- WiMAX – WiMAX forum standard
- Wide Area Wireless base stations
- Mesh technologies
Aradial Supported
BRAS/GPON and PCEF

- Cisco all models including PDSN
- Redback SmartEdge
- Juniper ERX and JRX
- Alcatel
- Huawei
- ZTE
- Meraki
- Runcom SG-BA and SG-1
- Others
LTE

- Telrad - LTE and HSS with Telrad EPC
- Airspan - LTE and Wifi and Aricent EPC
- Cello Wireless / Neragon
- Parallel Wireless
- ZTE
- Adax
- StarSolutions
Aradial Supported Wide Area Base stations

- Ruckus
- Huawei
- 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 (vSCG, Zone Director, etc)
- Huawei AC
- 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
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
Typical Hotspot Deployment

Aradial Centralized AAA and Billing for Wireless LAN Users

Remote Locations
- Laptop
- PDA

Wireless Cloud
- AP 1
- AP 2
- AP n

Internet
- DSL / Cable / VPN

Access Controller 1
Access Controller 2
Access controller n

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

Aradial Converged Billing:
- RADIUS Server
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- 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)
  – YATE
  – Cisco
  – 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
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