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 and 3G mobile, 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
  – 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
Hotspot/Wifi
And Case Studies
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
Typical Hotspot Deployment

Aradial Centralized AAA and Billing for Wireless LAN Users

Remote Locations

Laptop
PDA
Integrated AC/AP
DSL / Cable / VPN

Wireless Cloud

When the user tries to surf they 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

Wireless Cloud

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Hotspots/WiFi Case Study

• MTN Uganda – Wifi 3G offload
  – Alvarion (WBS/Wavion) base stations
  – Mikrotik
  – ARCB with integration to Mobile Core
  – Hotel deployments and hospitality

• MTN Rwanda – Wifi 3G offload
  – Alvarion (WBS/Wavion) base stations
  – Mikrotik
  – Enforcer integration with Mobile IN
Hotspots/WiFi Case Study

- Interstate – Wifi
  - Mikrotik
  - Military bases and travel stops in USA
- Kewiko – Wifi in Mongolia
  - Ruckus (Zone Director)
  - Mikrotik
- Seychelles – Wifi all the Island
  - 300 Alvarion (WBS/Wavion) base stations
  - Mikrotik
Hotspots/WiFi Case Study

• **Altai – Jamaica Dekal**
  - Altai base stations
  - Mikrotik controllers
  - 250,000 subscribers
  - Aradial Converged Billing - Prepaid

• **Sea Link Denmark**
  - Nomadix and Mikrotik
  - 250,000 subscribers
  - Prepaid cards
  - Spotngo Online Payments
  - Spotngo refill vouchers
Hotspots/WiFi Case Study

- Colima – Wifi Mexico
  - Alvarion (WBS/Wavion) – big coverage
  - Runcom controller for Wifi and Wimax
  - Wimax is for backhauling
Typical Hotspot Deployment

![Diagram of a typical hotspot deployment with devices connected through an internet gateway managed by a Radius server.]

Hotspot 1

Hotspot 2

Aradial Radius Server
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

Smart Phone

Laptop
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
- Runcom SG1
- Motorola WING
- Aruba Networks
- Nomadix
- HP Curve
- Zyxel, ValuePoint, Planet, Handlink
- 4IPNet
- Griffin, Dlink, NetGear,
- Chillispot based, Linksys - DD-WRT
- PfSense
- Ikarus OS
ISP/LTE/Wimax/VOIP/Mobile Customers
ISP / WISP

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

- Multivision - Djibouti
- BPK – Russia – multiple installations
- Rye Telecom – USA
- Jefferson Telecom – USA
- Bentley Walker – Canada
- Palau Telecom
- GTlink – Mexico
- DHI Telecom Group – USA, multiple locations
- Digicel group – Caribbean
- IOG – Norway
- STAN Telecom
Mobile GSM/CDMA (3G)

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

- Airspan – multiple installations including LTE
- Telrad – multiple installations including LTE
- Runcom – multiple installations
- Wichorus/Tellabs – multiple installations
  - Sprint USA
  - Augere Uganda
- Cisco ASN-GW and Starent
- Huawei and ALU - Telemax - Mongolia
- Motorola PMP / Canopy Wimax
  - Craig Wireless - USA – multiple projects
  - INEA – Poland
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
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)
• 100% web-based interface
• SSL security support
• Scalable Dynamic IP Pools
• Database
  – 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 or COA
  – MAC authentication and binding
Architecture
Integration with External Billing Systems

• Enhanced provisioning APIs
  – Internal support for traffic, duration metering & QoS
• Export usage to billing systems
• Advanced API for external online charging/billing servers using CORBA
  – Session duration limitation
  – Data transfer limitations – directional limiting supported
  – Bandwidth limit using VSA RADIUS Attributes
  – Quota-based access
  – QoS and subscriber profile
• Integration using stored procedures calling external databases
Typical High-Availability Deployment
Spotngo Payment Module
Add-on to AAA
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
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 SS7)
- Digest, MS-Chap and MS-ChapV2
- Proxying to other RADIUS servers
  - RFC-based RADIUS proxy
  - iPass & other specialized proxy support
- Tunneling
  - PPTP
  - L2TP
- Policy algorithms
Unique Functionality

- TCL & Lua scripting for policy algorithms
- Extended billing server provisioning 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.)

- User management
- User self care
- Hotspots WiFi walled garden portal
  - Customization of the portal per location
- Prepaid cards management
- Bandwidth management
- Quotas and balance enforcement and expiration
- Disconnect using POD on quota depletion
- MAC authentication and binding
- Viewing sessions and summaries
- Exporting usage
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

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Aradial

Converged Billing

ARCB
Aradial Converged Prepaid & Postpaid, Multi IP Services

- Prepaid and postpaid billing subscribers
- Advanced AAA & HSS– RADIUS and Diameter
- PCRF - Policy Control management
- Customer Management and basic CRM
- Voucher Management system
- Advanced Customizable Captive portal
- Multiple services on same platform:
  - Wifi / Hotspots and Wifi 3G/LTE Offloading
  - Wired Broadband – ADSL, FTTH– all ISP services
  - LTE & Wimax
  - Mobile 3G
  - VOIP, Traditional VOICE, SMS, MMS, VAS
  - VSAT, IPTV
• 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
  ▪ Payment by credit card or PayPal
  ▪ Adjustments to invoices
  ▪ 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)
- 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
Product catalog
- Price plans
- Offers using price plans
  - Price plan
  - Network profile provisioning
- One-time offers
- Add on offers
Flexible charging & rating
- Periodic Recurring Charges
- Usage charges
  - 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
- One-time charges
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
• Automatic payment
  ▪ Error management

• Account Receivables (A/R)
  ▪ Manual, fast payment screen
  ▪ Credit card
  ▪ 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
  - DID
  - ANI
  - MAC Address
  - IP Address
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
  - Change of QoS parameters in real-time
  - Disconnect
  - Redirect
  - Send balance 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
- Location based charging
Architecture
Typical High-Availability Deployment
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 for charging
- HSS - Diameter
- 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)
• 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, Runcom, Telrad/Alvarion, Cambium/Motorola PMP, Huawei, Alcatel Lucent, Ipaxiom, Soma, Samsung, Redline, Aperto, Expedience
Aradial VoIP
Prepaid
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
Typical Deployment Example
Thank You.

www.aradial.com