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

Integrated AC/AP

DSL / Cable / VPN

Wireless Cloud

Access Controller 1

Access Controller 2

Access controller n

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.

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

Aradial Centralized AAA and Billing for Wireless LAN Users

Aradial Converged Billing:
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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
  – Spotnggo Online Payments
  – Spotnggo 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]

- Hotspot 1
- Hotspot 2
- Aradial Radius Server
- Internet
- AP1 with Gateway
- AP2 with Gateway
- Home PC
- Laptop
- Smart Phone
Integration using Aradial Smart-HLR Gateway

Aradial EAP-SIM Mobile Offloading using Aradial SS7 MAP - HLR Gateway
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
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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• Integration using stored procedures calling external databases
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

Aradial Proprietary and Confidential
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
  - 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
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
    - 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
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
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, fast payment screen
  - Credit card
  - PayPal
  - Bank Transfer (*)
  - Mobile Payments (*)
- PMS – Micros (Fidelio/Opera support)
• 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
Typical High-Availability Deployment

Diagram of a typical high-availability deployment with redundant network elements, routers, switches, and database servers.
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)
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, 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
Thank You.

www.aradial.com