

THE RIVA METER AND PLATFORM

3rd International Workshop on Non-Intrusive Load Monitoring NILM2016, May 14-15, 2016 Robert Sonderegger, Director and Engineering Advisor, Itron, Inc.

ITRON's Share of Global Metering

ITRON AROUND THE GLOBE

North America

- » 3 manufacturing facilities
- » 9 R&D locations
- » More than 2,500 employees

EMEA

- » 15 manufacturing facilities
- » 9 R&D locations
- » More than 3,700 employees

Latin America

- » 3 manufacturing facilities
- » 1 R&D location
- » More than 700 employees

Asia-Pacific

- » 6 manufacturing facilities
- » 3 R&D locations
- » Nearly 1,000 employees

A WORLD LEADER

Leading Meter Provider

Share of Global Demand, in units



Itron Meter Data Management Share of Global Demand



Source: IMS Research: World Market Meter Reports, 2013 Edition Data excludes China



Source: CSC, Computer Sciences Corporation, Q4 2011 Based on number of meters processed



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Traditional AMI vs. Riva/Act

Traditional AMI:

- Meters at edge:
 - Metrology sampling at multi-kHz rates
 - Data Aggregation to 5, 15, or 60-minute intervals
- Comms to Back Office via Fixed Network, PLC or RF-Mesh

Riva/Act:

- Linux-based PC board at edge with RAM and Storage:
 - Metrology sampling at 4 kHz, aggregating to 1-sec (current V.)
 - Multiple Apps, native and 3rd party running on Linux
- Communication to Back Office <u>and</u> Peer-to-peer
 - IPv6 addressable
 - Dynamically optimized PLC and RF-Mesh



Overview – what is Riva / ACT Platform?

Riva: derived from "Rive" (French), "Riva" (Italian), loosely translated as "Edge" (-computing)

- Linux-based computer (ARM Cortex A8 MPU microprocessor with secure boot, protected mode) with memory (128 MB) and storage (256 MB) running downloadable Apps
- Integral Communication board featuring:
 - IPV6 addressability
 - Fully automatic support of RF Mesh and PLC
 - DLMS/COSEM communication standard
- Intended to be mated to sensing devices such as, but by no means limited to, meters (electric, gas, water, anything)
- Any Riva-enabled device can communicate with any other Riva-enabled device on the network
- A Riva-enabled network is a massively distributed, secure, computer network.



Riva comes in different form factors

This board is 6.3" × 4.72" × 3.39" (160 mm × 120 mm × 86 mm) Designed to fit in European-style, "square" meters







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RIVA Developer Kit



Same electronics as the single-board, but for independent developers of industrial IOT:

- Riva Edge Board
- Riva RF Daughter Board
- Riva PLC Daughter Board

Order your own today at https://itronriva.com/



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Adaptive Communications technology (ACT)

- Integral to any Riva board, incorporates RF and PLC on the same chip set and alternates between them as needed.
- Any application can communicate with routers or peer devices as easily as any two computers on a network.
- Standards-based and protected by network and application level security.
- Number of devices at a utility: 100,000 to 10,000,000!



Shown here integrated into meter



Protocols

Protocols Overview

- Standardization at all levels to ensure interoperability and reduce technology risk for utilities.
- Protocols enable common application layer services over various wired and wireless communication technologies.



Open Standards Reference Model



What is the OpenWay Riva Solution?

- Automated, widely distributed energy delivery network.
- Two-way flow of electricity and information.
- Merges the electrical and intelligence infrastructures.
- Capable of monitoring everything including:
 - Power plants
 - Occupancy patterns
 - Homes, Premises
 - Individual appliances
- Distributed Edge computing and communications in one.



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ACT communication paths

Two Head Ends

- Itron's OpenWay Operations Center (OWOC)
- Cisco Network Management System (CG-NMS)





What Does Itron Currently Do with Itron Riva?





'Location-Aware' Meters and Grid Devices

Outage Analysis and Grid Reliability



Localized Demand Response and Load Control



Instantaneous Theft Detection and Revenue Assurance



Connecting Smart Cities and IoT

What Will You Do with Itron Riva?

Non-Intrusive Load Monitoring? Real-time NILM to disaggregate interval data to Utility? NILM on gas meters with Riva board? Enable your own device to communicate with premises?



1-sec Data Available to Apps on Riva Meters

Any App downloaded to a Riva Meter has ready access to realtime, 1-second data:

- kW, kVA, kVAr, PowerFactor by Phase and Total
- Current (A) by Phase and Neutral
- Voltage by Phase and intra-Phase
- Temperature

Other devices or meters on the network can also be accessed transparently through secure, peer-to-peer communication that is integral to Riva Board.



Typical Data from a Riva-enabled Meter





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Imagine NILM with 1-second data!

Same data as previous slide, zoomed-in





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Summary: What constitutes Riva?

- Itron Riva Board: circuit board with...
 - ISOM (Itron System On Module) : the HW platform on which OpenWay Riva is based
 - MUSE (Meter Unified Software Environment): the Linux-based, software framework that runs on ISOM.
 - ACT (Adaptive Communications Technology): Unified Mesh RF, PLC, WiFi to communicate with peers and head-end.
- Apps: Downloadable, Use Case-specific softwares that run on Riva and have access to all data measured at the *Edge*.
- Device: Host of Riva; e.g., Meter, router, smart capacitor...
- Distributed Intelligence: Large networks of Riva-powered devices analyzing data and making decisions at the *Edge*.



Riva Implementations, Current and Future

- Itron Riva enables any device to communicate in the network of devices that constitute a truly smart grid.
- Any device third-party device can become part of the Riva network by integrating a Riva board.
- App Examples:
 - Meter-to-Cash process (traditional "metering")
 - Location Awareness
 - Theft Detection
 - NILM
- Apps can be deployed system-wide on the Electric Grid.
- Scalability is guaranteed by Edge Computing!



Questions?

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