


Meter Data Telemetry Technologies in Advanced Revenue Meter Applications

Presented by: Dan Hollow of TESCO

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ROCKY MOUNTAIN METERING ASSN
EDUCATION - INSTRUCTION - EXPERIENCE

Bio: Dan Hollow Rocky Mountain Regional Sales Manager for TESCO

Background in Micro Electronics. Have worked for TESCO as the Rocky Mountain Regional Sales Manager since 2015. Have worked in the utility industry since 1988. Began career in the utility industry as the Production Test Department Supervisor for Aptech and accepted an outside sales position with Aptech in 1992 and have been in outside sales ever since. Have also worked for companies such as UTS/Itron, Datamatic, and Metrum Technologies/Aclara.

Have worked in the technology industry since 1980 and have worked in other industries prior to working in the utility industry as an Electronics Technician for companies that manufactured products for Banking Equipment, Industrial CNC Controls, Process Controls and Flight Simulator Equipment.

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Meter Data Telemetry Technologies used in Advanced Revenue Meter applications

An overview of past, present and future trends for meter data acquisition and SCADA communications.

- Types of Communications and Technologies
- Physical Communications Technologies
- Configuration of Communications Parameters
- Network Issues
- Wireless Technologies
- LTE Wireless 4G
- Antenna Issues
- 4G and 5G
- Beyond 5G

With the elimination of 2G and 3G/CDMA cellular service, 2023 is a year of transition in meter data telemetry industry.

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AMI Administrator or Head-End System Operator can Identify where there are gaps in the Proprietary Fixed Network System Coverage

- Identify areas within the utility's service territory where there are unreliable meter reads requiring an estimated bill.
- Look at the various Cellular Carriers coverage maps to determine if there is good coverage in these hard to read areas.
- Is the cost to build out additional network infrastructure cost prohibitive or impractical.
- If so, then consider a Cellular Based Gap Filling Solution to address these areas.

Additional Communications Topics

- Fixed networks
- Mesh networks
- Point to Multi-Point
- Power Line Carrier
- Fiber Optic
- Satellite
- In home communications, ZigBee In-Home Displays/Smart Thermostats
- NERC CIP/Security - ANSI C12.22/IEEE Std 1703

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Types of Meter Communications

Revenue, Billing, Translation

- MV-90 Software first two-way AMI system available – POTS lines & Analog Cellular
- Inbound communications using shared phone lines
- Including Register Reads, Interval Data, Validation, Diagnostic Information, Event Log, and Power Quality Data
- Usually collected periodically – for example: hourly, daily, monthly, etc..

Real Time and Control Data

- SCADA – frequently continuously polled on a near real time basis
- Protocols – DNP3, Modbus, etc.
- Including Instantaneous Voltage, Current, Watt, Var, etc., Register readings, frozen registers, inputs/outputs, control

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Historical Revenue and Billing

- Visual Reads
- Encoder Readings
- Telephone Modem via POTS Line
- Analog Cellular
- Serial, Ethernet and 485 Connections via External Cellular Communications Boxes
- Circuit Switched Digital Cellular, Packet Data
- Local wireless ISM, WiFi, Zigbee, etc.
- Packet Wireless
- Ethernet
- T1 Line

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Historical Real Time Translation

- Pulse Outputs
- Analog Outputs
- Serial Connections to Local RTU/Data Gathering Devices
- Serial Connections to External Comm Boxes
- Local wireless ISM, WiFi, ZigBee, etc.
- Ethernet
- Packet Wireless
- RS-485

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Serial Communications

Serial direct connections to local equipment or communications boxes.

Connect to Wireless, Ethernet, or other conversion devices

RS-232

RTU/
Com
Device

RS-485

RTU/
Com
Device

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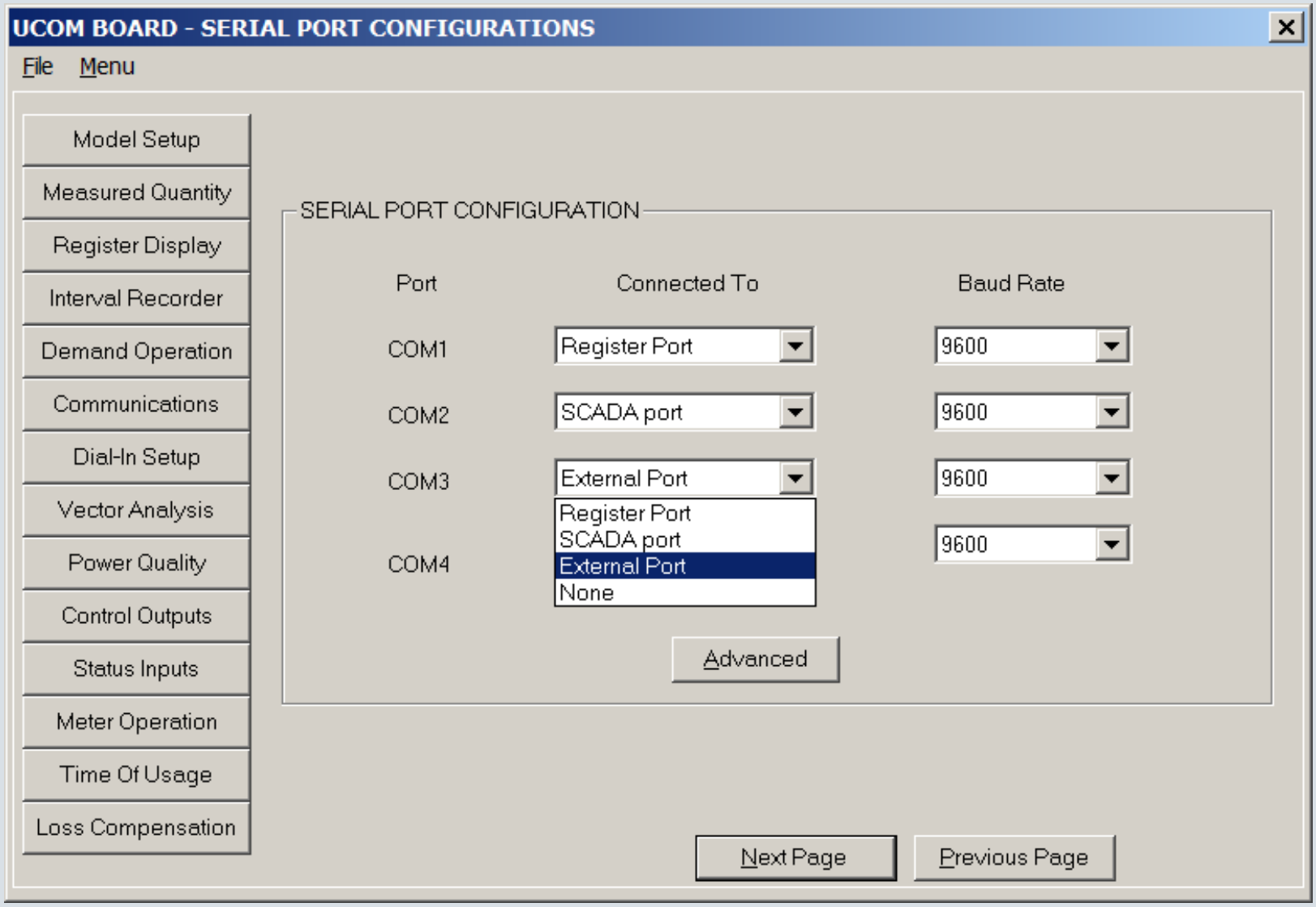
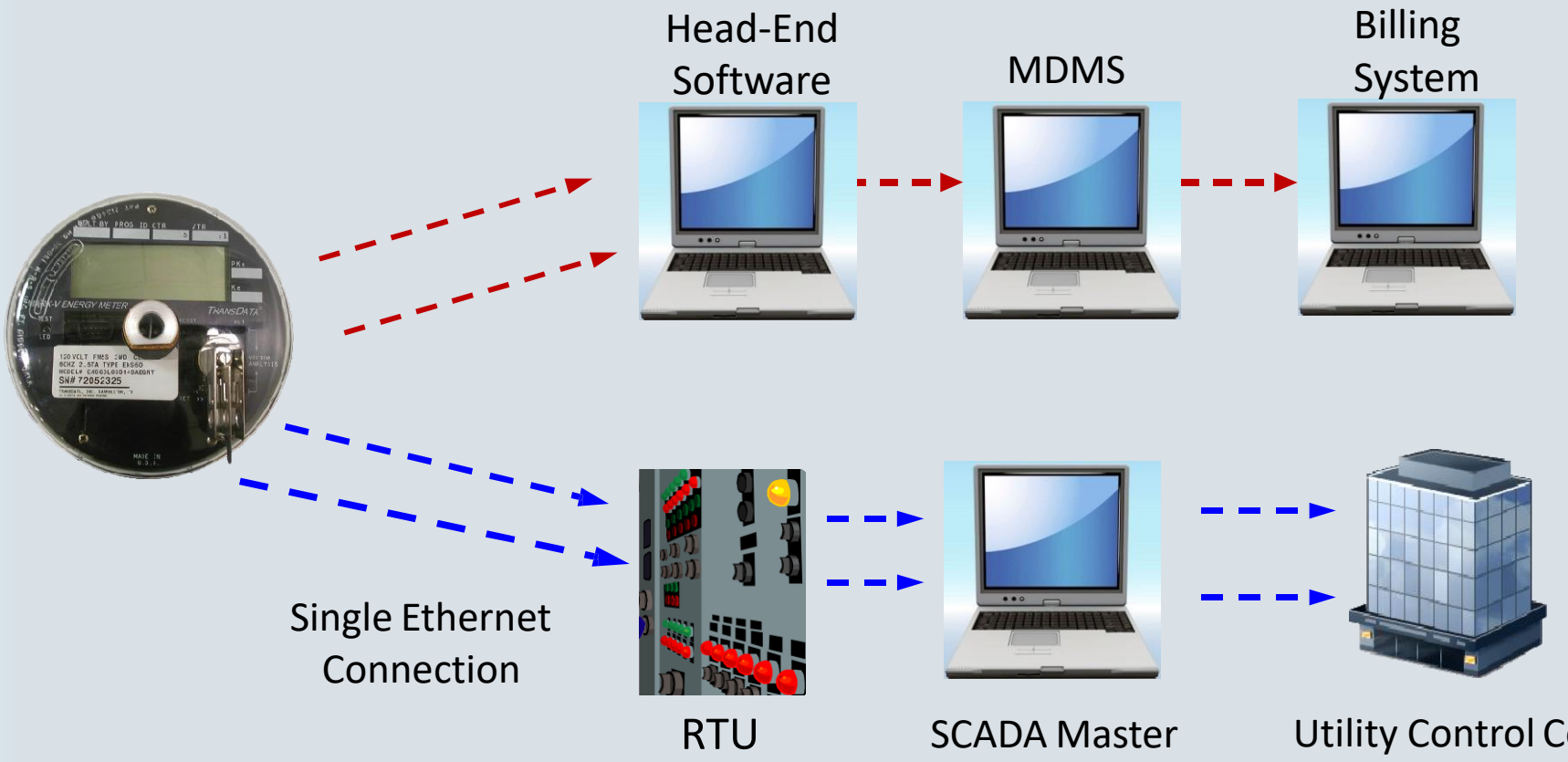
Example Serial Port Configuration



Network/Ethernet Communications

Can use a single connection via Ethernet to obtain real-time and billing data from a revenue-certified energy meter.



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Wireless Communications

Can use a single Wireless connection to obtain
real-time and billing data from a revenue-certified energy meter.

Billing Data Path

LTE Wireless Network

Translation System (Example MV-90)

Utility CIS Billing Software

Internal LTE Modem

SCADA Data Path

LTE Wireless Network

SCADA System

- Secure Private Network Capability w/Private IP
- Via Dedicated VPN, MPLS or dedicated circuit such as T1/DS3

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Examples of Cellular Devices used in the Field

Two meters connected via 485

Under Glass Cell

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External Communications Box

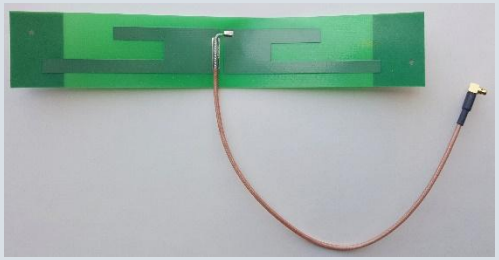
Major Components

- Wireless Modem/Router
- Power Supply
- Antenna and Cabling
- Internal Wiring
- Internal/External Mounting Hardware
- Protection Devices
- Additional Options
- Various Interfaces to Meter

Installation Considerations

- Programming/Configuration
- Device Programming/Configuration
- Mounting
- Device and Power Conduit and Wiring
- Antenna Mounting/Signal Tests
- Activation
- Device Over the Air Tests

Internal Antenna



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Internal/External Wireless Comparison

Internal Wireless

- Integrated Solution
- Easy Installation/All You May Need is the Meter Socket
- Lower Cost
- Single Software Configuration
- Antenna Placement
- Lack Of Upgrade Options
- Perceived More Complicated to Replace
- Vendor Specific Solutions

External Wireless

- More Features
- Perceived Easier to Replace
- Mounting Considerations
- Device Wiring/Conduit
- Power Wiring/Conduit
- Takes More Space
- More Expensive
- At Least Two Vendor Software Configuration
- More Points of Failure
- Multiple Interface Methods

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Internal Wireless Future Flexibility

- Flexible design and versatility of standard interface allows for easy switching of wireless modules
- PCIe mini-card
- M.2 (NGFF) card
- Skywire ® / XBEE ® modules
- Future standard module availability
- Wireless Network Certified
- Module Compatibility for LTE (Cat M1, 1, 3, 4, 6, etc..) for Verizon, AT&T, Sprint, T-Mobile, or other networks.
- All modules pictured communicate successfully over the air

Examples of versatile module change out capability

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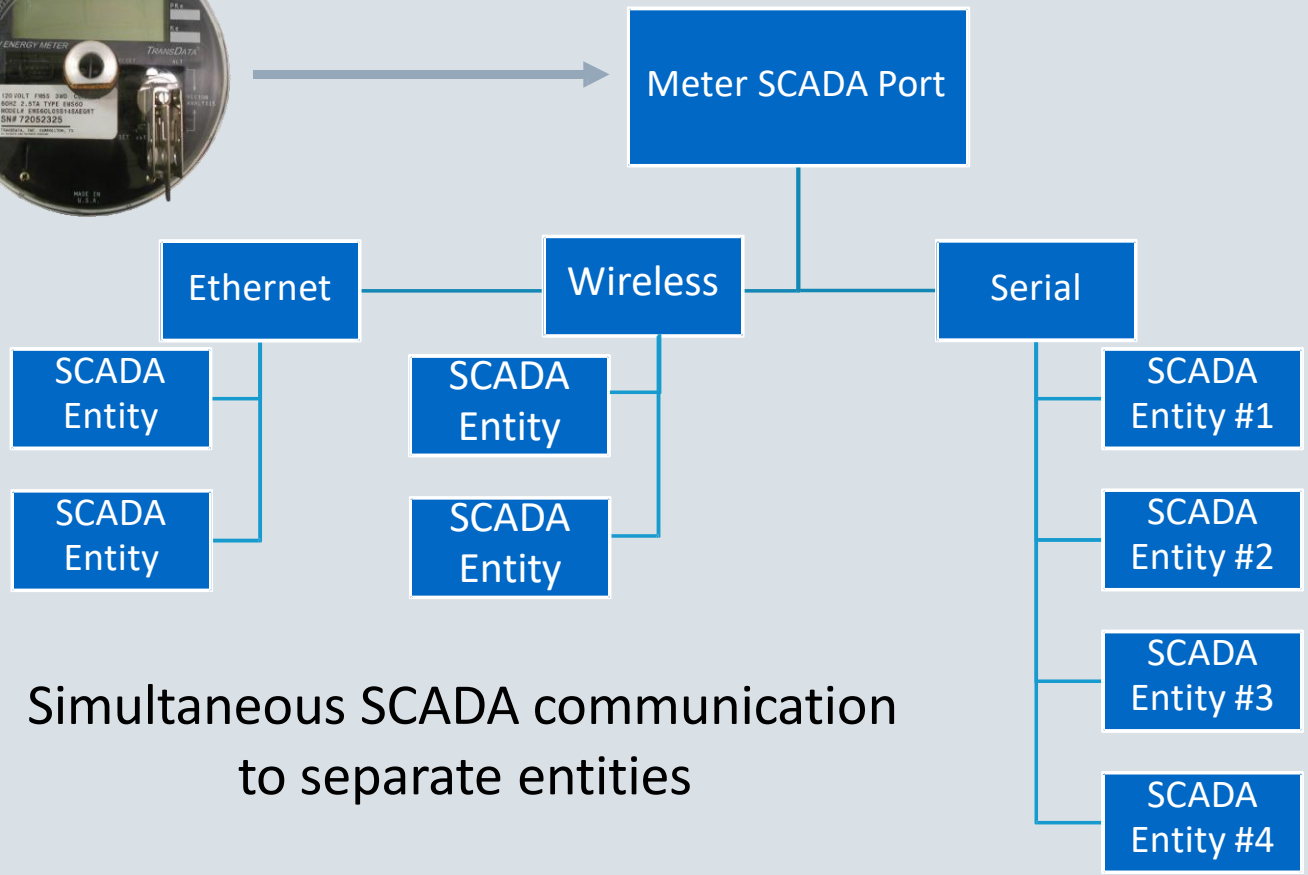
Multiple SCADA Connections

Meter supports multiple simultaneous SCADA connections via Ethernet, Wireless, and Serial for communications flexibility.



Simultaneous SCADA communication to separate entities

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Multiple Billing and Real Time Connections

Meter supports multiple simultaneous SCADA connections via Ethernet, Wireless, and Serial for communications flexibility.

Multiport Ethernet Connection to 1st Utility Network can support Simultaneous Billing and multiple SCADA Communications Ports

2nd Ethernet Connection is Internally connected via a Serial port with no routable path or connection to the 1st Network

Utility 1
Billing System

Utility 1
SCADA/RTU

Utility 2
SCADA/RTU

Separate Ethernet Connection on 2nd Network,
(can also be serial connection, if needed)

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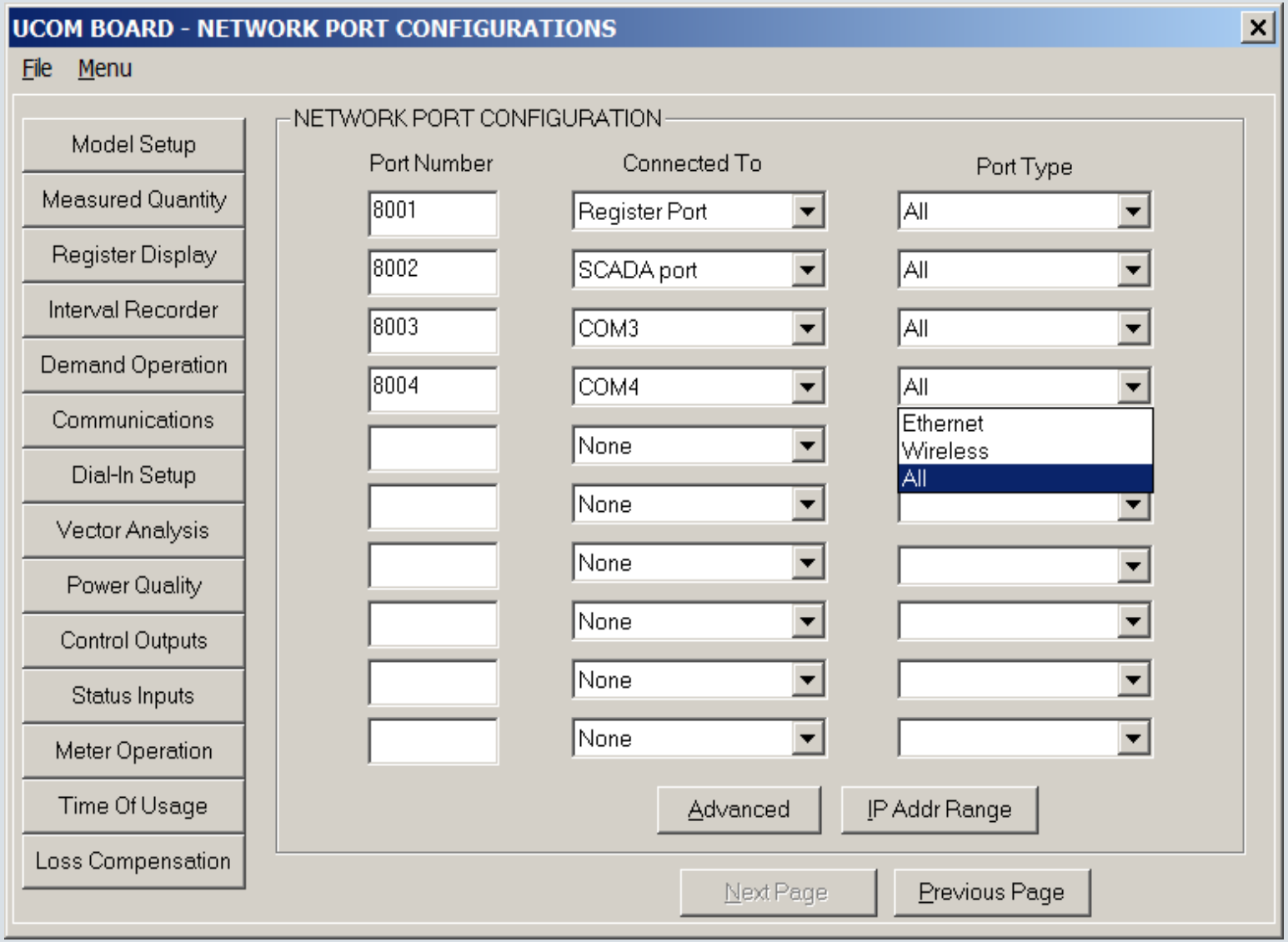
Example Network Port Configuration



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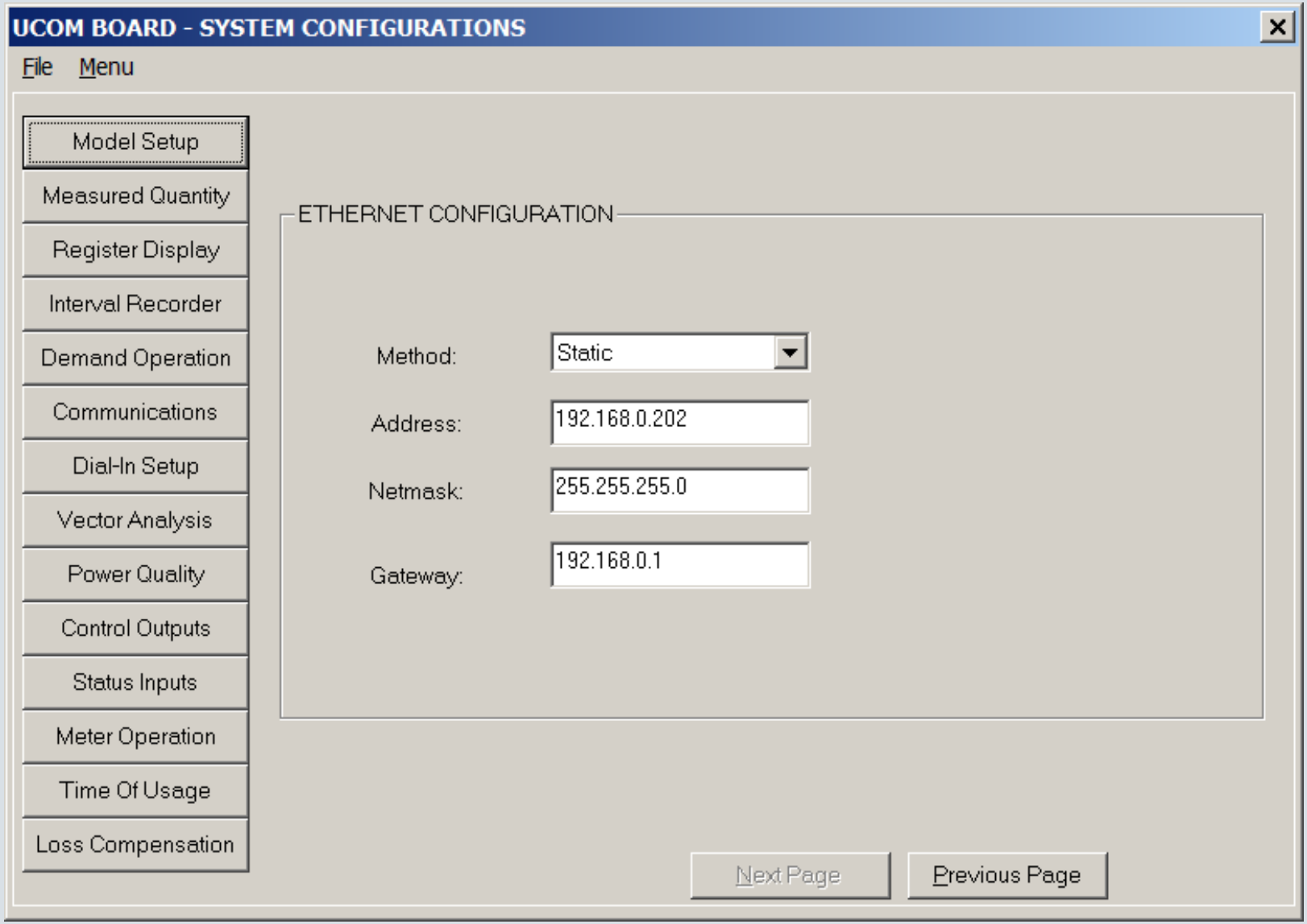
Example IP Address Configuration



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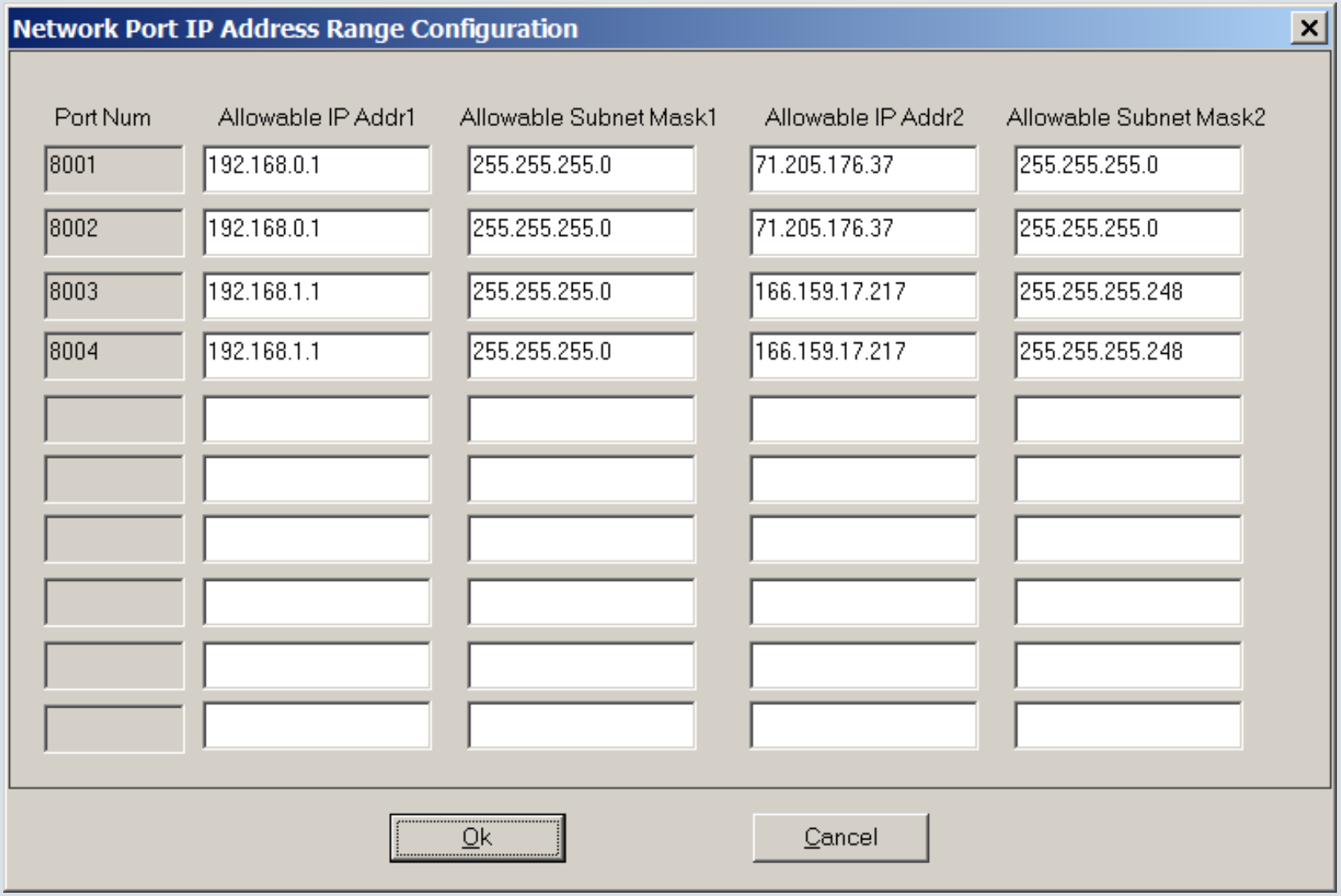
Example IP Address Range Configuration



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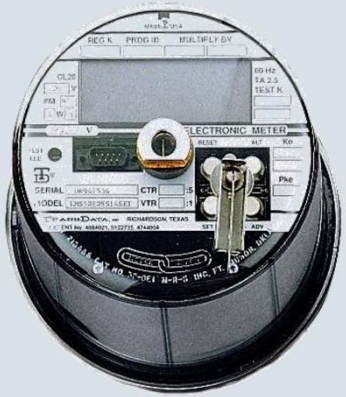
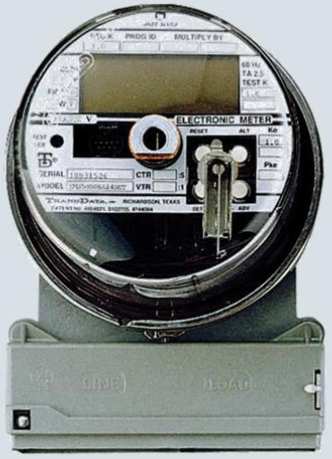
Example Case Configurations

Multi-Connection Wireless, Ethernet and Serial capability is available in many form factors

Switchboard Case



Socket Base



A-Base

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Verizon 2G/3G Sunset Notice

As a valued customer, you were recently notified of upcoming network changes that may impact your devices that do not support 4G LTE technology.

Verizon is committed to providing you with the best wireless experience possible and we're sending this notice because you have M2M/IoT devices using the CDMA network.

On December 31, 2019, Verizon plans to retire its CDMA network (1x/EVDO, 2G/3G), and we will stop activating new devices on CDMA after June 30, 2018. But we will continue supporting the following account services through July 1, 2019: Device ID Change, MDN Change, Price Plan Change, Suspend and Resume, and Reactivate MDN.

Now's the time to start moving your solutions to our 4G LTE network. And we have the experts and experience to help you manage this important technology upgrade with the least impact to your business.

There are multiple 4G LTE options to choose from, including new Category-1 and Category-M1 choices. These industry-leading, cost-competitive, advanced technologies enable the development of next generation solutions on the 4G LTE network.

To upgrade your M2M/IoT devices, please contact your Verizon Wireless Account Manager or visit Verizon's IoT support page for more information regarding these changes.

Contact your rep

Phones **Tablets** **Accessories** **Plans** **Contact Rep**

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When will 3G be phased out by my carrier?

The 2G/3G turndown is coming! AT&T has already shut down its 2G network, while Verizon has publicly stated a complete 3G shutdown by the end of 2019. Other carriers have not made public announcements yet, but may share information under NDA. Lastly, many carriers are preparing their 5G networks, which will also use the same wireless spectrum.

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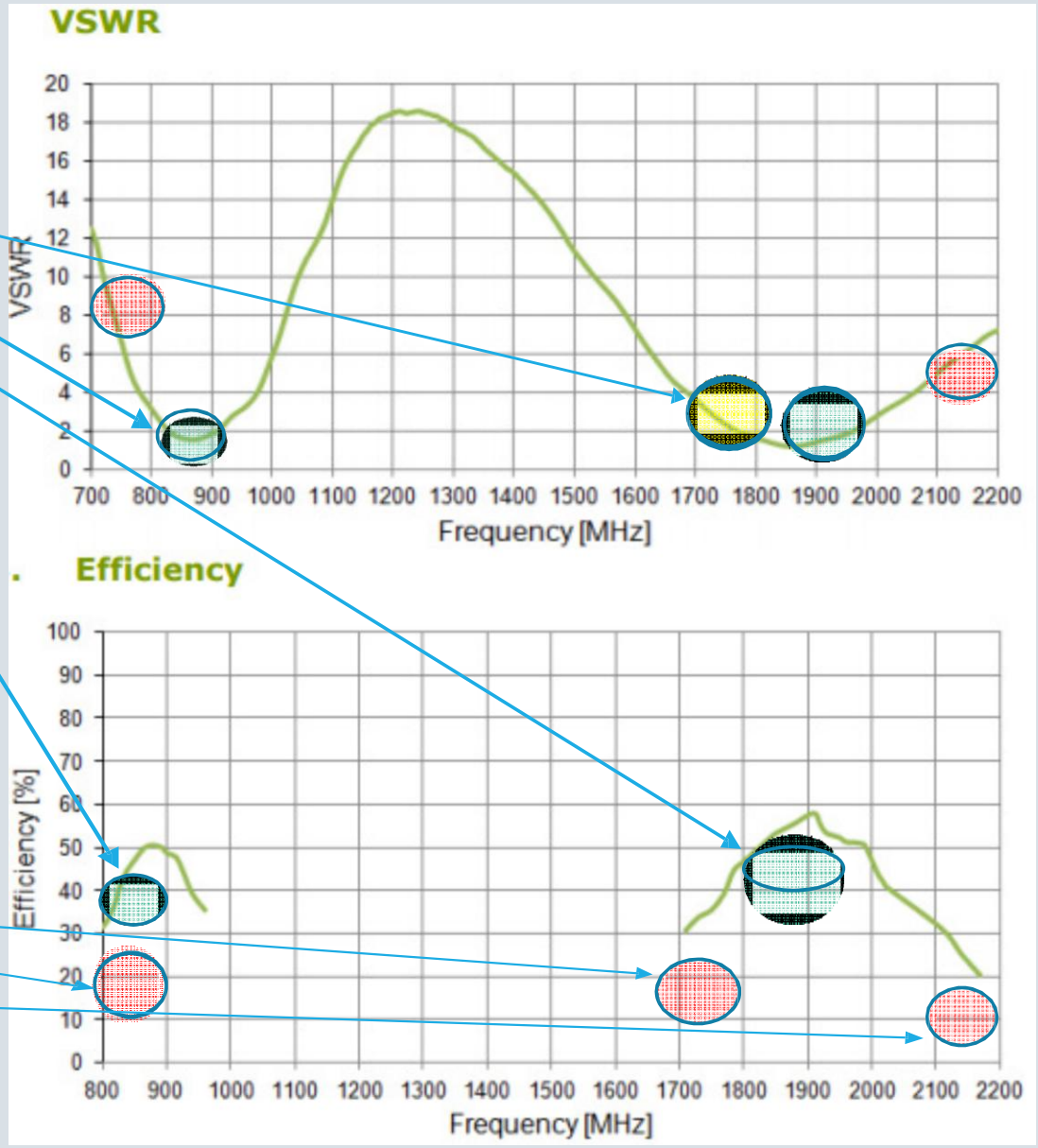
Use LTE Capable Antennas For LTE Applications

Existing 2G/3G Antenna worked at 800 and 1900MHz bands



Desired VSWR under 2:1

4G/LTE Applications may use different frequencies like 700,1700, and 2100 MHz bands

Desired Efficiency as high as possible

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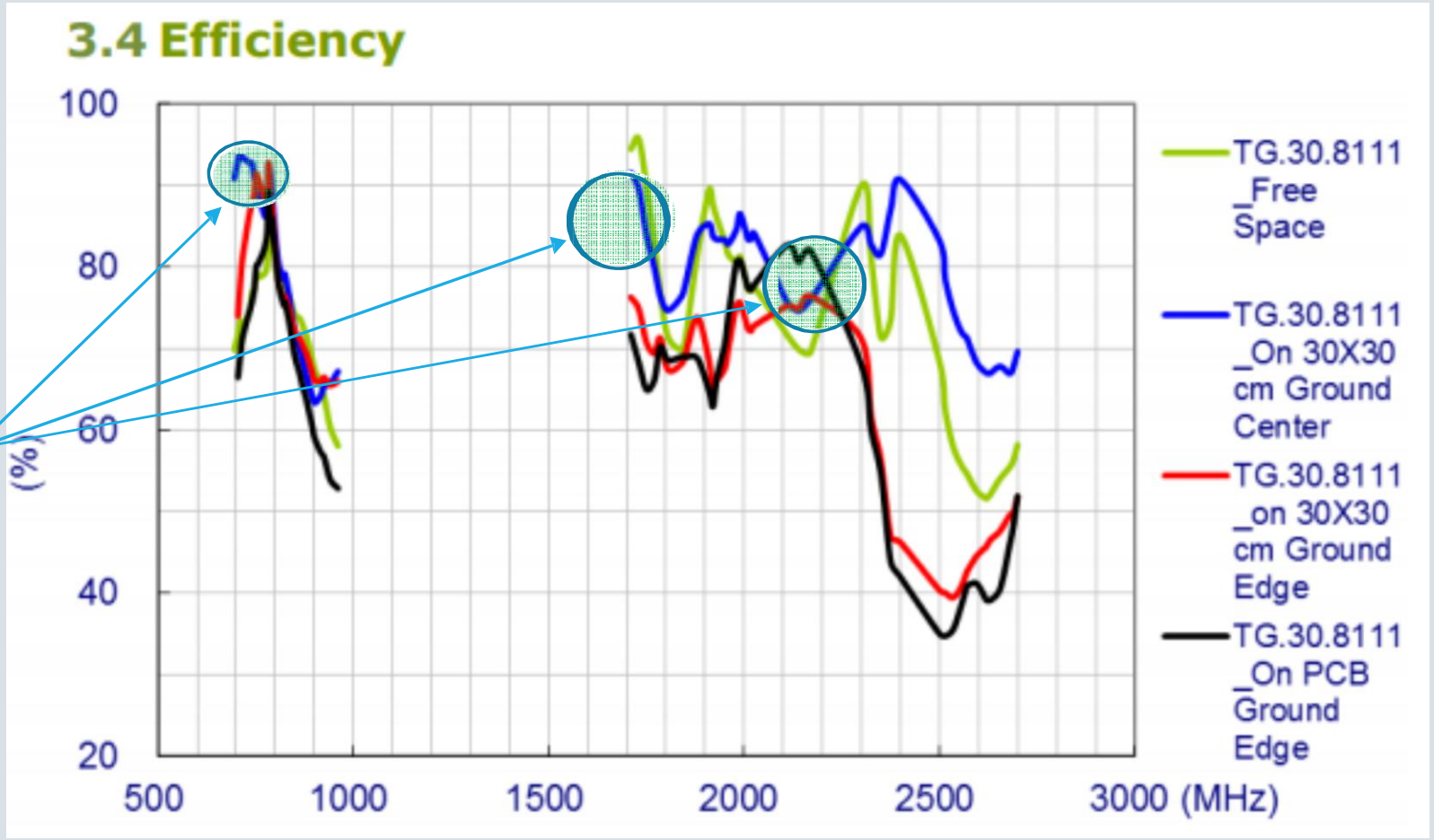
LTE Antennas Designed for LTE Frequency Bands

Example LTE antenna with excellent performance in 700, 1700, and 2100MHz Bands



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Example LTE CAT Characteristics

Specifications	Cat 1	Cat M1
Total bandwidth required	20 MHz	1.4 MHz
Download peak rate	10 Mbps	1 Mbps or 375 kbps
Upload peak rate	5 Mbps	1 Mbps or 375 kbps
Power demand	Low*	Very low*
Duplex mode	Full duplex	Full duplex or half duplex**
Complexity	Moderate (simpler than Cat 3 or Cat 4)	Much lower than Cat 1
Cost	2/3 of Cat 3	½ of Cat 3

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4G and 5G

- 5G has higher speeds, lower latencies, and higher system capacity
- Low-band 5G operates between 600-850 MHz, Mid-band 5G operates in the 2.5-3.7 GHz range, and High-band 5G is the band that is most commonly associated with 5G. Operating at 25-39 GHz
- 5G uses OFDM (orthogonal frequency division multiplexing) modulation using multiple simultaneous carriers and wider frequency channels
- 5G also uses Massive MIMO(Multiple Input Multiple Output) Antennas
- Millimeter waves have much shorter range and have trouble penetrating walls, so cells will be much closer together
- 5G devices use 4G for initiating connections to the cell and for areas where 5G is not available

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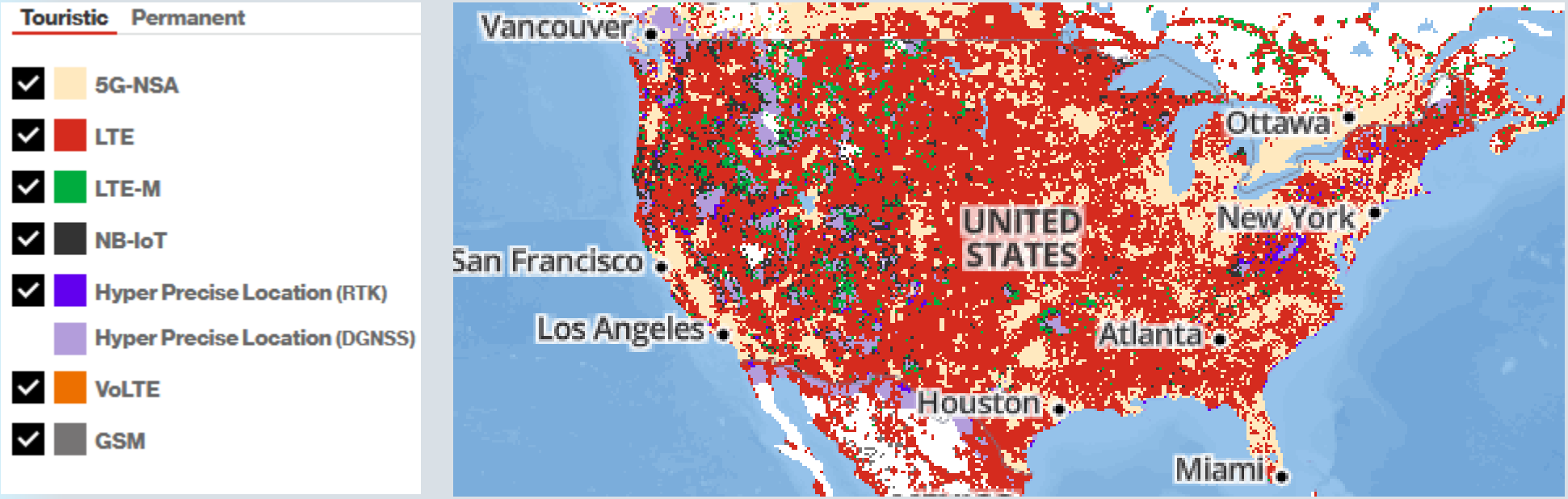
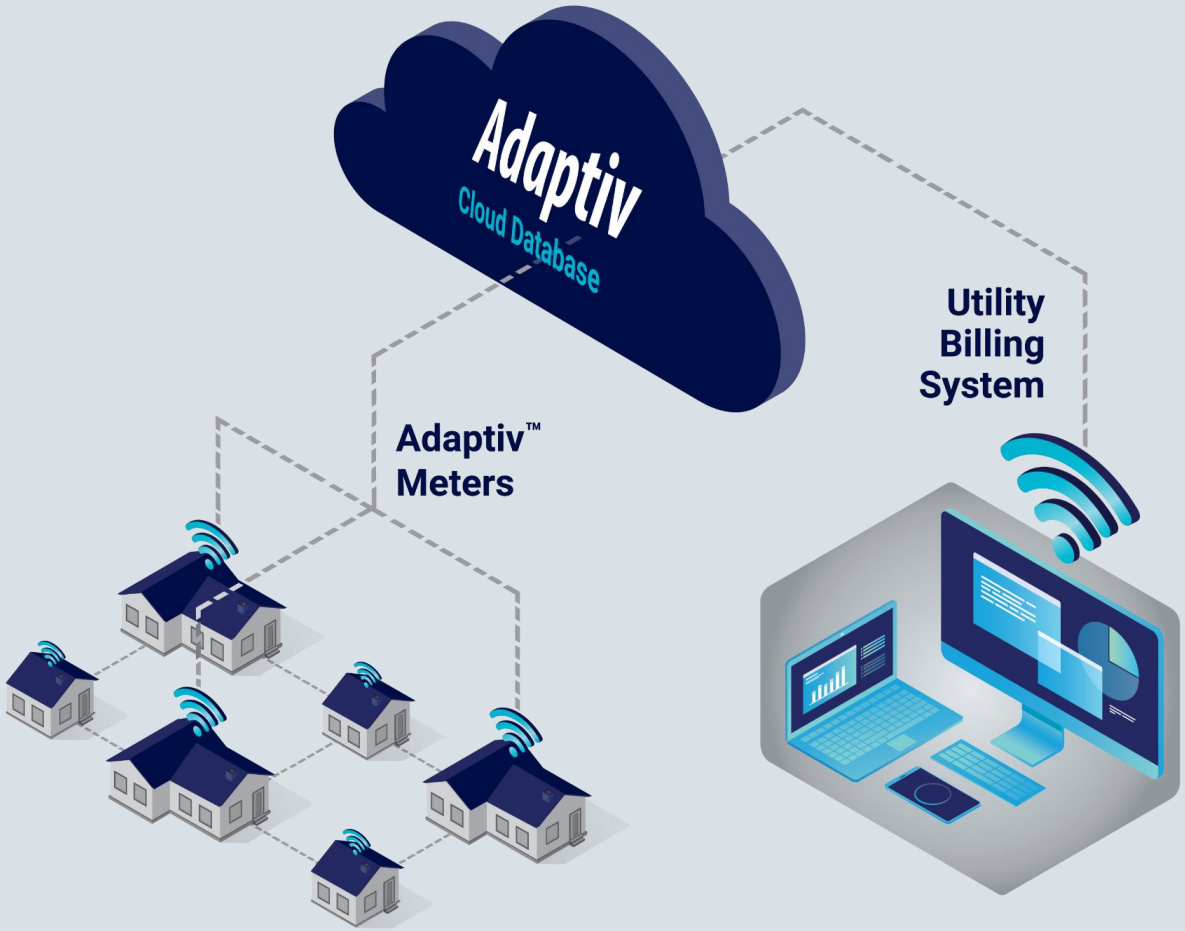
Verizon Coverage Map



AT&T Coverage Map

Cellular and Mesh Hybrid



Questions?

RMEA Required Quiz Question 1

Don’t worry it won’t be hard, just remember the presentation and it will be as easy as A,B,C

What was the first Two-Way Communications Method with Solid State Box Recorders & Meters?

A POTS Lines

B. Microwaves

C. Circuit Switched Data/Cellular

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RMEA Required Quiz Question 2

Is it possible to get a meter with multi-connect 4G LTE Wireless, Dual Ethernet, Multiport Serial with Internal Antenna all inside the cover without and external box?

A. No
B. Yes
C. Not in one device

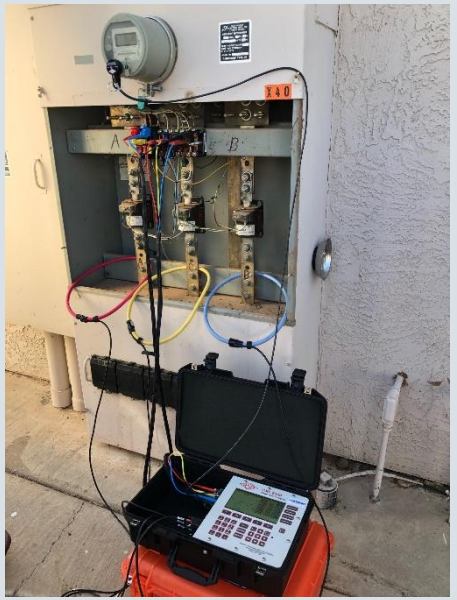
RMEA Required Quiz Question 3

Name a protocol used in real time SCADA communications?

A. ANSI C12.19
B. TCP/IP
C. DNP3

Thank you.
If you have additional questions, do not hesitate to call or email us.

Your Source for all things Metering



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