MDMS and the Paradigms of Time *

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A utility's operations are based on different paradigms of time — daily meter reading, monthly billing, near real-time distribution automation activities, etc. In this article, we will investigate the role of MDMS in different paradigms of time and discuss several integration architectures and functionality required to support these different paradigms.

THE PARADIGM OF THE DAY

Users of AMI and MDMS naturally fall into a daily rhythm. Meter data are received each day; validations and estimations are performed; business analysts review individual meter issues and broader trends. After the data processing is complete, the daily framing of billing determinants to support the on-cycle and off-cycle billing requests is performed. This is the daily rhythm of the MDMS and the paradigm of time MDMS is designed to support. The MDMS takes and prepares the previous day's data for the various business processes that use the data — Web presentment, customer calls/inquiries, revenue protection, proactive customer communications, or pre-pay calculations.

But does the MDMS provide equivalent value to support other paradigms of time? What functionality could a MDMS provide to warrant supporting other paradigms of time? What architectural choices can impact MDMS' ability to support other paradigms of time? Let us investigate these topics below.

THE PARADIGM OF THE MONTH

During the deployment of an AMI system, the utility straddles the daily paradigm of the AMI system and the legacy monthly paradigm of manual reads and/or drive-by AMR. The question is asked in every AMI project: should monthly meter reads be loaded into the MDMS? There are two camps on this issue.

The MDMS Does Not Receive Monthly Reads

Figure 1 shows a representation of an MDMS that does not receive monthly reads. The basic

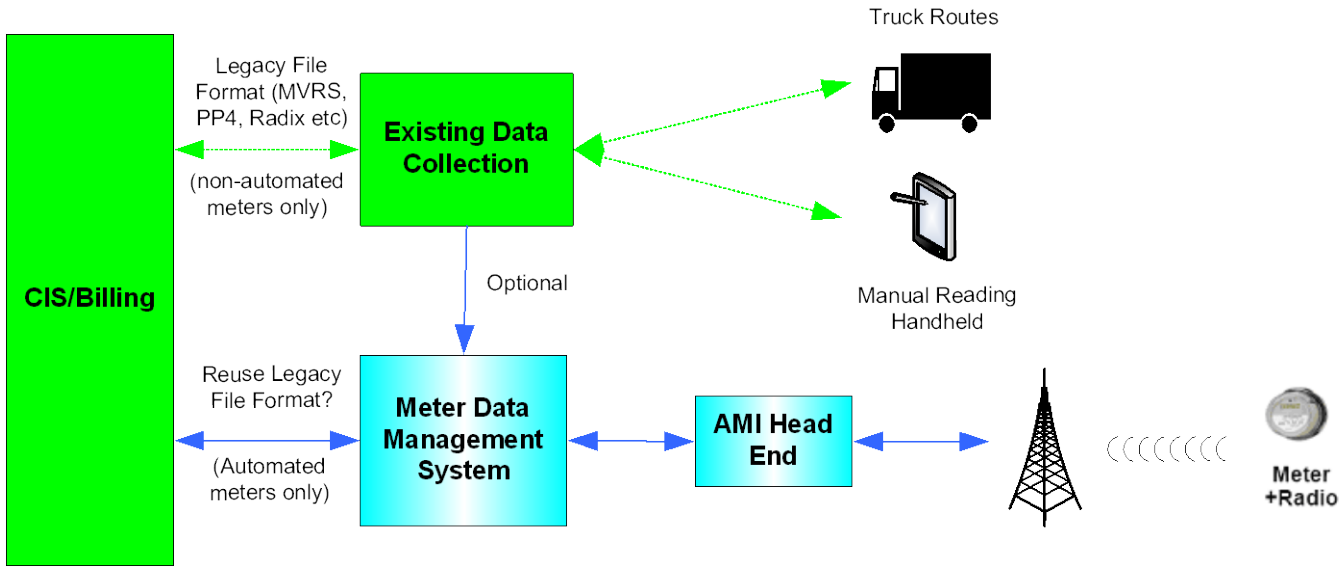

Figure 1. AMI and Monthly Reads Are Billed Separately

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approach states that conventional meter reads will be processed as they are today. Monthly reads will not have to go to the MDMS; they will be stored and billed via the CIS. AMI meters that must be read manually for billing, for example during field acceptance and commissioning, will be processed just as conventional meters are today. At the time the decision is made that the AMI meter reads are accurate and the meters will no longer be manually read, the MDMS will become the source of billing determinants that support the CIS billing process.

The primary advantage of this approach is that, early in the AMI project, you can continue to use existing processes to bill the vast majority of your meters. You will have enough CIS changes and testing to complete without having to redo all billing processes.

The MDMS Receives and Bills Monthly Meter Reads

Figure 2 shows a representation of an MDMS that receives and bills monthly meter reads. In this approach, the MDMS will be the repository for all meter reads: all meters will be billed through the MDMS and existing billing interfaces will be abandoned (with the possible exception of large commercial and industrial meters which is too big of a topic to be covered in this article.)

The primary advantage of this approach is the presence of a single integration path to bill all meters and a single repository for all read data. The risk of this approach entails abandoning well established billing processes early in the project. All meters will be billed through the new MDMS billing integrations in the first month.

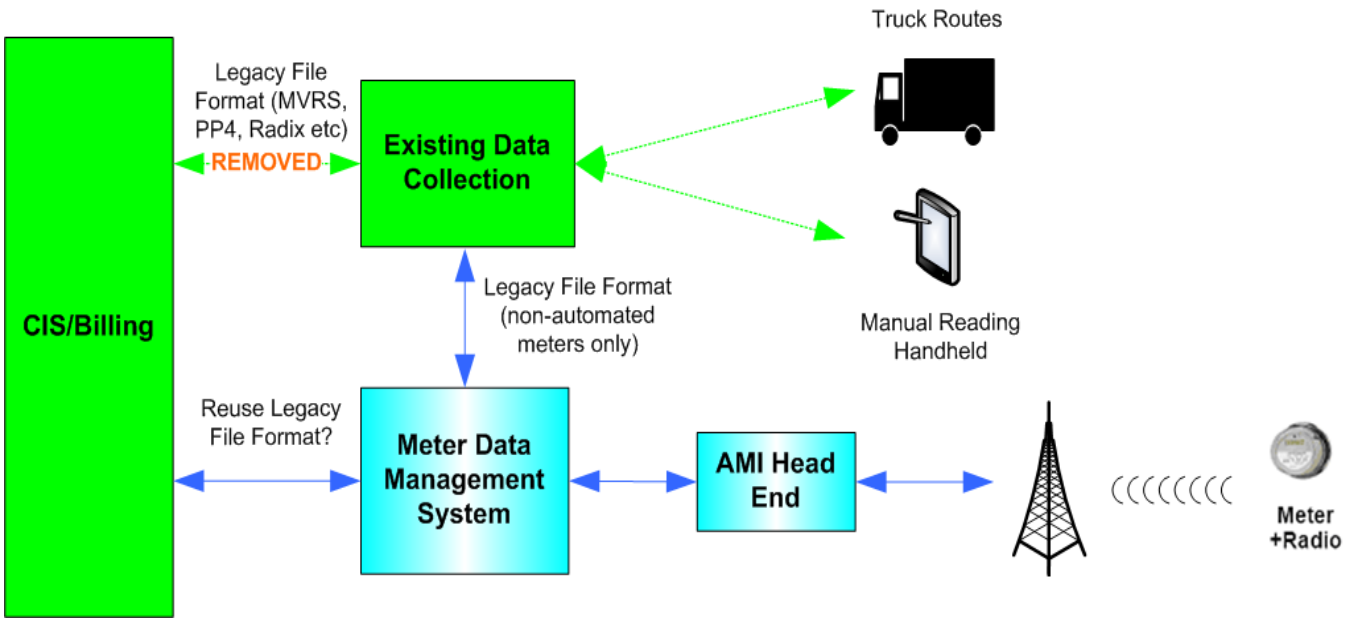

Figure 2. AMI and Monthly Meter Reads Are Billed Via the Same Process

Another potential advantage of loading manual reads into the MDMS involves the ability of the MDMS to provide functionality that compares monthly manual reads with the delivered AMI data to verify parallel read accuracy of the AMI data. This analysis can help to ensure that the meter is configured correctly (for example, correct meter multipliers), and it may also help to identify a meter that is installed at the wrong premise (switched meters). You do not have to bill the meters via the MDMS integrations to use this functionality.

THE PARADIGM OF ASAP

We struggle what to call this paradigm. If we call it "real time" or "near real-time", someone argues with the strict definition of each term. Therefore we will stay away from these terms and agree there are utility business processes that want an AMI action or AMI data to be delivered "as soon as possible" — ASAP. Each user and process will have a unique definition of the time frame that is acceptable.

In the remaining sections, we will discuss example processes that require an AMI action or AMI data to be delivered in the paradigm of ASAP and the functional/architectural role that MDMS may play in these processes.

On Demand Reads

An On Demand Read (ODR) is an ASAP request for the latest register read from a specific AMI meter. For example, a Customer Service Representative may initiate an ODR to help answer a customer billing question. To minimize call duration, the AMI system must respond quickly in order for the ODR function to have value in this process. Or a billing analyst might use an ODR to verify an extremely high or low bill. Because the customer is not waiting on the phone, ASAP can take longer than the previous example.

Will ODR requests and responses need to go through the MDMS? This depends on whether the MDMS will provide value-add functionality in processing the ODR flow. For Customer Service Representatives using the MDMS user interface to view AMI meter data, processing the ODR through the MDMS will be necessary to support the business process. You may also be able to leverage product integrations from the MDMS to the AMI, which will be simpler than going directly to the AMI.

If you plan to have multiple AMI systems, the MDMS may broker the ODR flow to the correct AMI system. Generally, these are not complex integrations, so you will have to weigh the value of the product MDMS-AMI integrations. Each of these factors will impact whether the ODR flows should go through the MDMS or go directly to the AMI head-end.

Outage Management

When using AMI data to support outage analysis, an important functional goal is to filter outage and power restoration events to reduce false outages sent to the Outage Management System (OMS). Some MDMS solutions have the ability to filter momentary outages and known service orders.

A momentary filter will hold the outage event for a configurable time period while waiting for a power restoration event from the same meter. If the restoration event is not received, the outage event is sent to OMS. A service order filter will not send the outage event to the OMS if the MDMS is aware of service work at the premise that may result in disconnecting the meter.

If the MDMS does not provide filtering or other OMS-lite functionality, the MDMS should not be involved in the outage management process. Some AMI systems filter for momentaries. You can also build momentary, service order, and known outage filters in the integration layer.

DA/DMS

For Distribution Automation (DA) and Distribution Management Systems (DMS), the focus is on understanding how the electric network is performing right now. The metering device at the end of every feeder can support this.

The DMS will likely want a 24-hour load profile for every customer. This data fits well with the daily paradigm of the MDMS and will be provided via a database extract procedure or daily data delivery.

To support the high value volt/var optimization for voltage conservation calculations in the DMS, the requirement will be similar to that of the on-demand read (ODR) discussed above. However, instead of a register read, the DA/DMS will want a voltage reading from a meter. This data is not required for every meter on a feeder, but, rather, for specific bellwether meters. External systems will need to track the specific bellwether meters that will be used in the analysis.

For self-healing FLISR applications, the DMS will want device open/close status information and fault indicator status from specific line DA devices (smart reclosers, fault circuit indicators, etc.) on the system. Since these new DA devices are being deployed with SCADA (DNP3) to AMI (vendor specific) protocol converters, there is no need to go through the MDMS for this type of 'ASAP' information. Typically, SCADA will be interfaced with the AMI head-end for the communication requirements down a distribution feeder.

If the DA integrations are bypassing the MDMS, then the logical flow will have the ODR voltage requests for bellwether meters also bypass the MDMS. However, there may be advantages for the MDMS to store the voltage data to support long term power quality analysis.

SUMMARY

The MDMS can have a role in the different paradigms of time. The real answer is not whether the MDMS should support these time paradigms but whether or not your operational benefits require these features in your MDMS. Just having an MDMS does not mean that every transaction to the AMI system must go through the MDMS. The costs and benefits of using the MDMS must be weighed for each use case and integration data flow.

If you are evaluating the purchase of an MDMS, each MDMS vendor has a different perspective on how their product should support different paradigms of time. The paradigm of the day is the essential paradigm a MDMS must support. The importance of the MDMS role in the other paradigms of time depends on your priorities, the functionality of your legacy systems, and the capabilities you need to add to achieve your Smart Grid vision.

About the author

Mark Hatfield is a Principal Consultant with Enspiria Solutions, Inc. — A Black & Veatch Company. He specializes in Smart Grid and MDMS for electric and gas utility operation. He holds an MA in Geography from the University of Illinois and a BS in Geography from the US Air Force Academy.

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