Today’s utilities understand the advantages of investing in and deploying advanced metering infrastructure (AMI) systems. AMI systems allow utilities to measure, collect and analyze usage; interact with other advanced devices; and help utilities achieve total system monitoring. Itron’s tested, proven solutions leveraged with new and evolving technology and services target a utility’s most pressing needs.

Itron’s ChoiceConnect™ 100 Fixed Network system is the flexible answer for utility innovation. ChoiceConnect allows migration from one system (handheld, mobile) to Fixed Network, or use of a hybrid system (fixed + mobile). Itron’s industry-leading two-way network collects hourly interval meter data for enhanced operations, upgraded customer service, and improved overall cost recovery. Advanced, reliable two-way functionality to the endpoint allows the utility to achieve the many benefits of advanced network infrastructure. The ChoiceConnect 100 Series Network is Itron’s versatile next-generation solution that delivers on the promise of AMI by translating data into actionable knowledge.

The Benefits

The benefits of ChoiceConnect 100 Fixed Network to a utility include:

> Enhanced Customer Engagement. Having more data available allows a utility’s Customer Service Representatives (CSRs) to share consumption information with customers, resulting in more easily resolved billing disputes and increased cash flow.

> Operational Efficiency and System Integrity. Utilities that deploy Itron’s ChoiceConnect systems are better able to manage distribution systems more efficiently through the use of such features as:

   – Meter Right-Sizing. With meter data from the 100W ERT® Module, engineers can perform detailed analysis of field assets to right-size single and compound meters and optimize both asset utilization and billable flow through the meter.

   – District Metering Analysis. Advanced hourly meter data can also be used for detecting non-revenue water losses using district meter analysis, which aggregates time-synchronized interval reads from a feeder and subsequent retail meters in order to locate water losses.

   – In-Home or In-Business Leak Detection. Advanced metering data also reduces in-premise water losses with proactive leak detection using minimum flow rates that are analyzed against pre-set thresholds. After an in-home alert is triggered, the utility can notify the customer to correct the leak, resulting in water loss reductions and avoiding high bill issues through proactive customer service.

   – Alternative Rate Structures. Incentivizing customers with different rate structures throughout the day is made possible with data logging. Time-based rate structures
require time-synchronized interval data as well as data storage and the application of specific billing determinants. The ChoiceConnect network offers the capability to do all these things with streamlined, integrated Meter Data Management targeted to the specific needs of the water utility.

- **Water Distribution System Optimization** Includes hydraulic modeling, reverse flow analysis, and usage analysis. Managing customer consumption efficiency is fast becoming one of the top concerns for water utilities as increase in demand strains finite resources. Having important information – such as Reverse Flow alerts and granular data for improved hydraulic flow modeling calibration – gives a utility the tools it needs to manage and optimize its distribution system.

- **Move-In / Move-Out Readings.** With ChoiceConnect, a utility can conduct “virtual disconnects” and reconnects using the system’s advanced two-way capability to extract the most current read from the system during move-in or move-out. Utilities are also able to monitor an account in an inactive status for unauthorized consumption.

- **Acoustic Leak Detection.** Data from Itron’s other advanced metering devices such as the Leak Sensor acoustic leak monitoring system plays an important role in cost analysis. Utilizing actual sound recordings of leaks (rather than simple detection flags used for notification of in-home leaks) enables advanced analysis at a utility to understand the severity of the leak. In-depth interrogation and interpretation of the data increases the accuracy of readings, properly reflecting leaks while minimizing false readings.

- **True Migration/Hybrid Strategy.** The 100W ERT is capable of being read via the fixed network as well as by mobile and handheld readers, and each option is available without changing the ERT hardware or sacrificing any of its advanced functionality. Flexible and robust, ChoiceConnect offers a utility the unparalleled ability to migrate from a mobile to a fixed collection environment at its own pace or to mix the two technologies. ChoiceConnect takes the risk out of an all-or-nothing decision to deploy one collection technology or another. (See Figure 1)

**The Foundation**

Itron’s ChoiceConnect 100 Series Network Solution is built upon proven and enhanced Itron designed and manufactured product. The building blocks of this advanced two-way AMI network include:

- 100W ERT Module
- 100-Series Collectors (tower, roof-top, water tank, or pole mounted) and Repeaters
- Collection Engine to process the data. Runs on Itron’s Network Software
- Itron’s Enterprise Edition data repository for long-term data storage and easy access and analysis. Runs on Itron’s Customer Care software.

**Solution Architecture – Fixed and Mobile**

Figure 1 below provides a high-level view of Itron’s fixed network and mobile architecture. This solution’s revolutionary capabilities have evolved from a proven foundation of Itron technology.
Itron’s ChoiceConnect 100 Fixed Network is a radio frequency communication network operating within the 902 – 928 MHz frequency band. The system is based on RF transceivers in the meter endpoints, which provide a reliable wireless link between the endpoints and the neighbourhood Cell Control Units (CCUs). These links make up the local area networks, or LANs.

From the LAN to the utility head office, and for data backhaul from the CCU to the head end, ChoiceConnect uses a wide-area network, or WAN. ChoiceConnect allows utilities to choose from a number of WAN options:

- Public Wireless (GPRS from AT&T, CDMA from Verizon, etc.)
- Direct Ethernet, or Ethernet-enabled devices which can directly connect to the Ethernet connector such as:
  - Wi-Fi
  - Fiber
  - Private IP-based networks

![Figure 1. Itron's ChoiceConnect 100 Fixed Network and Mobile Architecture](image-url)
Endpoint – 100W ERT Module

The advanced 100W ERT module allows water utilities to capture large amounts of information that can be used in many ways across the enterprise – from customer service, to engineering, to distribution planning, to conservation, to field service, and to executive management. The 100W ERT provides the advanced functionality desired by utilities AND Itron’s proven product reliability for a low total cost of ownership. A single ERT module gives water utilities the flexibility to collect meter data in mobile, fixed network, and hybrid environments. This dual mode capability sets ChoiceConnect apart from competitors’ solutions. At the same time, 100W ERT modules are compatible with water meters from all leading manufacturers.

100W Reliability
The 100W ERT circuit assembly and battery pack are fully encapsulated within a specially-formulated potting material that completely protects internal components from water, contaminants, corrosion, rough handling, and temperature cycling. With its simple design, the 100W ERT uses substantially fewer components than most competing products, resulting in lower overall service costs. The advanced, integrated antenna operates well within a wide range of meter box installations, and an optional remote through-the-pit-lid antenna design protects the 100W ERT from lawn mowers, vehicle traffic, and other hazards while improving RF propagation from difficult-to-read pit locations.

Lower Total Cost of Ownership
The 100W ERT module’s industry-leading 20-year battery life ensures the utility’s return on investment over competing products with typical battery lives of only 10 or 12 years. The 10-year or more frequent field visits for replacement are eliminated. Advancements in detection for leaks, reverse flow, and tampering, as well as a reliable low-battery alert, translate into fewer field investigations and substantially lower expenditures. Simplicity of installation and use also lower a utility’s overall costs.

100W Specifications

Functional
- Power source: Two “A” lithium cell batteries warranted for 20 years
- Maximum meter register pulse frequency: 4 Hertz
- Operating temperatures: -40° C to +70° C for remote applications; -20°C to +60°C for pits
- Storage temperatures: -40°C to +75°C for maximum of 1,000 hours
- Humidity limits: 0 to 100% (submersible)
- Maximum register cable dimension: 300 feet with Itron approved cable and splice connectors
- Meter compatibility: Encoded and pulse-generating register water meters. See Itron’s Water ERT Module Compatibility List, PUB-0063-002, for the complete list

Transmission Parameters
- Network Interval Message (NIM): ERT ID and type, most current meter register value, last 8 time-synchronized consumption intervals, communication error flags, reverse-flow and system leak status flag, low battery alarm
Standard Consumption Message (SCM): ERT ID and type, most current meter register value, communication error flags, reverse-flow and system leak status flags, low battery alarm

Transmitter output power:
- Mobile mode at standard power of 10 mW (+10 dBm conducted, +11.5 dBm peak radiated)
- Hard-to-read mode at higher power of 250 mW (+24 dBm conducted, +25.5 dBm peak radiated)
- Network mode at high power of 500 mW (+27 dBm conducted, +28.5 dBm peak radiated)

Bubble-up rate:
- Fixed Network
  - NIM is transmitted every 5 minutes at high power (+27 dBm).
  - SCM is transmitted at standard power (+10 dBm) every minute for contingency reads and/or for in-home display units
- Mobile has three modes
  1. Standard mode where SCM is transmitted at standard power (+10 dBm conducted, +11.5 dBm peak radiated) 10 mW every 9 seconds
  2. Hard-to-Read mode (+24 dBm conducted, +25.5 dBm peak radiated) where a SCM is transmitted every 30 seconds at 250 mW (This transmission mode will affect battery life)
  3. Mobile High Power Mode (+27 dBm conducted, +28.5 dBm peak radiated) where a SCM is transmitted every 60 seconds at 500 mW

Transmitter frequencies: 910 – 920 MHz

Transition from mobile to fixed mode: Drive-by command (physical site visit for re-programming not required)

Dimensions

<table>
<thead>
<tr>
<th></th>
<th>100W (Pit) (Figure 2.)</th>
<th>100WR (Remote) (Figure 3.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>4.5 inches</td>
<td>4.5 inches</td>
</tr>
<tr>
<td>Diameter / Width</td>
<td>Lower: 3.90 inches</td>
<td>5.05 inches</td>
</tr>
<tr>
<td></td>
<td>Upper: 1.70 inches</td>
<td>1.47 inches</td>
</tr>
<tr>
<td>Weight (Approximate)</td>
<td>9.6 oz.</td>
<td>9.6 oz.</td>
</tr>
<tr>
<td>Endpoint Cable Length</td>
<td>5 feet and 20 inches</td>
<td>10 inches</td>
</tr>
<tr>
<td>In-Line Connector Register Cables</td>
<td>5 feet and 25 feet</td>
<td>Non-applicable</td>
</tr>
<tr>
<td>Installation distance from meter</td>
<td>Up to 300 feet</td>
<td>Up to 300 feet</td>
</tr>
</tbody>
</table>
Mounting Options

> Rod-mount using standard 1/2" fiberglass
> Pit lid shelf-mount using snap on shelf mounting adapter
> Through meter pit lids with 1.75" to 2" diameter holes (up to 2.5" thick) using the optional remote pit antenna and security clamp

100WR Remote Mounting Options

> Wall-mount to any surface material including metal
> Pipe-mounting to pipe diameters up to 2 1/4"
> Direct-register-mounting (on select Badger, Elster and Hersey meters)

Regulatory and Standards

> FCC Part 15.247
> Industry Canada #210, Section 6.2.2(o)

Fixed Network Cell Control Unit (CCU) 100

The ChoiceConnect 100 Cell Control Unit (CCU) receives meter data from the 100W ERTs. The CCU 100’s radio technology employs advanced signal processing capability to provide exceptional radio performance and to maximize the effectiveness of the available 900 MHz ISM band radio spectrum.

Features:

> Two-way communication to and from the ERT and Repeater
> Collection of hourly interval data
> GPS receiver for network time synchronization of ERT clocks
> Synchronization accuracy of +/- 1 minute
> Retrieval of missing intervals in the event of a network outage
> Compact device footprint
> Flexible mounting options including tower, building top, or utility pole mount
> Solar powered configurations
> Multiple options for public and private WAN backhaul

CCUs gather message packets either directly from 100W ERT modules or through Repeaters. They store this data until it is uploaded over a public or private WAN to the Itron Network Software. The data uploads typically occur at every hour. CCUs are generally installed on:

> Cell towers
> Utility water towers
> Power poles
> Light poles
> Buildings

The CCU supports the following mounting options:

> Pole Mount
> Davit Arm or Street Light Mount
> Tower Mount
> Roof Mount
> Wall Mount
> Remote Antenna Mount
The CCU 100 reads the ERT modules that bubble up every five minutes with hourly interval data. Hourly interval data contains the following information:

- the most recent register read
- the last 8 intervals of time-synchronized hourly interval data (for frequent data logging information)
- leak flag
- tampers and alarms
- low battery alarm (if applicable)

In addition to high power mode, the ERT also bubbles up a Standard Consumption Message (SCM) every 1 minute for contingency reads and/or in-home displays.

Unique to the Itron solution is the ability to utilize two-way communications to obtain:

- On-Demand Consumption Read (ODCR) – Extracts a specific read from a single ERT module or from a specified group of ERT modules. Available in browser-based interface as well as client-based software.
On-Demand Interval Data (ODID) – Extracts a specified range of interval data reads from a single ERT module or specified group of ERT modules. Available through client-based software only.

CCU 100s can be powered using 120/240VAC power or solar power. They are equipped with a backup battery to support continued operation during power outages for 90 minutes. Depending on the CCU configuration, an optional 8-hour backup battery is also available. The CCU sends an alarm to report various events, including power loss, restoration, and low battery conditions.

**Fixed Network Repeater 100**

The installation of Repeaters enables utilities to reduce overall cost of ChoiceConnect ownership. Repeaters extend the range of the network and add reliability and redundancy to the communication path between ERTs and the CCU. This saves the utility the expense of populating its service area with CCUs. Itron provides utilities with comprehensive, detailed CCU and Repeater propagation studies prior to deployment to achieve maximum coverage of the service area.

Repeaters can be installed on towers, buildings, poles or other structures. Mounting options for Repeaters include:

- Utility pole installations
- Roof mountable
- Wall mountable
- Solar option

Itron ChoiceConnect 100 CCUs are designed for reliable, effective use regardless of the preferred communications platform. The Itron ChoiceConnect 100 Fixed Network solution deploys without the cumbersome configuration and investment required by competing systems.

**ChoiceConnect AMI Software Suite**

The ChoiceConnect-AMI Software Suite complements the advanced functionality of the ChoiceConnect network to create a complete solution. Itron’s ChoiceConnect-AMI software enables low cost, accurate, and effective billing along with such important additional capabilities as leak detection, consumption pattern analysis and optimization, support for conservation initiatives, and customer education around water usage. ChoiceConnect-AMI software combines the efficiency of fixed network data collection with the security of long-term data storage and the power of analytic reporting. High resolution data improves billing inquiry analysis, conservation program support, and adherence to water restrictions, time-based billing, and identification of leaks. The functionality of the software solution can be built out over time to support more advanced meter data management and advanced billing requirements as these needs migrate from the energy industry to water management.

The ChoiceConnect-AMI Software Suite consists of Network Software for data collection, network management, and operational reporting functions; and Customer Care for data management, long-term storage of collected data, and extensive analytic reporting functionality. Network Software is

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*Figure 6. ChoiceConnect 100 Repeater*
required to run the system; Customer Care is an optional but highly functional addition to the ChoiceConnect solution.

**ChoiceConnect Network Software**

ChoiceConnect Network Software controls the majority of collection system operations and includes a web server, a database server, and a graphical user interface that allows the operator to monitor functions, configure collectors, produce reports, and export files. There is also an API that allows access from external systems to multiple functions within the software. Network Software is a .Net based architecture running on Windows Server 2003 and a SQL Server 2005 database.

Microsoft COM+ applications and components, Active Server Page (ASP) applications, a web browser, and a rich client (in other words, a client-based software package rather than a web-based interface) are also included. Server applications are installed on application and database servers or distributed among several servers.

The Web Server includes a set of Active Server Page (ASP) applications running on Internet Information Services (IIS) as well as a COM+ application and its associated COM+ components. The Web Server receives data posted by the collectors through the ASP applications, validates the data, and passes it to the Message Processor.

The primary collection engine database has been designed and optimized for data collection performance. In addition to being the transitory data storage location for information collected from and presented to the network for up to 400 days, the Network Software database also provides a substantial amount of business logic in the form of stored procedures, constraints and triggers.

![Network Software User Interface](image)

**Figure 7. Network Software User Interface**
Among the features of Network Software is an Endpoint grouping tool that lets the user organize Endpoints into meaningful groups (Figure 7) for reporting and analysis purposes, such as a group that represents a particular route or one that represents a particular billing cycle. It also provides for two-way transactions to the Endpoint.

**Monitoring System Health**

ChoiceConnect Network Software employs a combination of tools to allow the system administrator to assess the operational health of the network. Errors and informational messages, such as processing failures, audit traces, and Collector alarms, are written to the Windows event log.

In addition, the database records all errors and Collector alarms. A Collector communications tool also audits the call-in schedule and reports any discrepancies as a percentage. Collection error logs and status information are available for upload at the time communications are established. Other tools, such as an automated ping utility, command line utility, and various communications logs, are also included for the purpose of application health assessment.

The Collector stores alarm logs such as power down, low battery, battery dying, unreported meter modules, etc., which can be downloaded from the Network Software and analyzed for troubleshooting.

The major areas of focus for system health are:

- **Component Management**, which includes monitoring of devices on the network and the processes they are running and enforcing policies that have been defined for device management.
- **Event Processing**, which determines which events should be monitored, whether to raise the priority of an event based on frequency and severity, and which administrators should be notified of a given event.
- **Process Automation**, which is the mapping of redundant tasks an administrator is performing into a well-defined procedure.

Network Software delivers diagnostic/error messages on the network node and using email.

**Additional Network Software Features**

**Metered Leak Detection**

The 100W ERT uses a patented leak detection algorithm for monitoring leaks behind the meter and reporting them via an alarm flag. By identifying areas where potential leakage is occurring, this feature allows targeted leak investigations, potentially increasing customer service, reducing utility liability, and making water conservation programs both practical and manageable. The Customer Care Usage & Variance Analysis screen can identify leakage trends for reporting purposes.

**Frequent Move-In/Out Virtual Reads**

ChoiceConnect can provide daily or more frequent reads in areas with high move-in/move-out rates, such as college residences or apartment complexes, or any place where an account is changing. In addition, every ERT can be flagged as Active or Inactive within the database. This function can be used to monitor usage on accounts where a move out is expected to ensure that it occurred.
On-Demand Reads
On-demand reads are initiated by the utility and can be processed via the user interface. They provide a fresh read from the database, or in the case where the latest read is not fresh, they provide the last recorded read directly from the ERT.

Automatic Device Discovery
There is no laborious effort to get ERT data into the system; the system provides automatic device discovery. Collectors automatically discover, manage, and maintain ERTs within communication range. Auto discovery means that any ERTs read by the collectors are immediately providing data to the utility and populating the database. This feature:

> Simplifies the deployment and field replacement of meters
> Facilitates reconciliation of asset records
> Provides information the utility can start to work with immediately
> Enables mapping functions if ERT and collector latitude and longitude coordinates are available. Maps are available in both 2D and 3D (satellite) formats.

Whether planning a strategic deployment or a complete rollout, the self-discovery feature provides flexibility, ease of installation, and immediate return on installation costs.

Collector Upload Scheduling
All call-in schedules are determined, modified, and maintained by the utility through Network Software. Data is backhauled every hour, but the schedule is configurable based on specific needs.

Software Download Capability
Downloading of system configuration information, enhancements, new applications and software fixes to Collectors can all be done through the Network Software and the network.

System Status Summary Report
The system status summary report provides a snapshot of the number of collectors and ERTs reporting data or not reporting data, and offers the ability to drill down to a variety of detailed reports, such as:

> Collector Detail Report – provides a detailed description of the status of each collector in the network including ID, type, active status, and most recent contact, as well as Collectors which are not reporting
> ERT Detail Report – provides a detailed description of the status of each ERT in the network including ID, type, location, address, and most recent contact, as well as ERTs that are not reporting
> Tamper Summary Report – provides a summary of the total number of ERTs reporting, and allows all ERTs reporting tampers to be listed
> Leaks Summary Report – provides a summary of the total number of ERTs reporting leaks, and lists all ERTs reporting leaks plus the time and date when the leak was reported
> Alarms Summary Report – provides a summary of the total number of alarms received from each collector, including potential reverse flow alarms, and lists each alarm reported by each collector by time and date
Network Software Operational Reporting Views and Details

ChoiceConnect Network Software provides extensive information about the performance of the system to support monitoring and diagnostics, to determine device status and configuration, and to analyze device performance. Errors and informational messages are written to the Windows event log. In addition, the database records all errors and Collector alarms. A Collector communications tool also audits the call-in schedule and reports any discrepancies as a percentage. Collector error logs and status information are available for upload at the time communications are established.

Network Software graphically displays system performance information in easy-to-read reports.

The properties of various reports offered through Network Software, their purposes, and the fields available in each report are listed in the tables below. Note that each of these reports is configurable by the user to meet utility-specific needs. Each report is also available independent of the others.

ChoiceConnect Customer Care software, discussed beginning on page 16 below, provides additional robust report functionality.
### Monitoring Collectors

<table>
<thead>
<tr>
<th>Report Type</th>
<th>Purpose</th>
<th>Fields Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Properties</td>
<td>Review collector configuration and change assigned WAN type and grouping</td>
<td>ID, Collector type, discovery date, WAN type, call-in schedule group, configuration group, software download group, latitude, longitude, alarms, battery status, communication statistics, software version, state</td>
</tr>
<tr>
<td>Communications</td>
<td>Communication properties depend on the type of network connection. The Collector Detail Communications read-only tab displays the Collector’s current communication settings</td>
<td>Vary depending on the communication method for the Collector, e.g., GPRS and Ethernet</td>
</tr>
<tr>
<td>Scan Schedule</td>
<td>Shows the scan schedule properties inherited from the configuration group the collector is currently assigned to</td>
<td>Begin time, end time or duration, configuration, tone, and frequency</td>
</tr>
<tr>
<td>Endpoint Type Exclusions</td>
<td>Summary view of the ERT type exclusion properties inherited from the configuration group that the collector is currently assigned to</td>
<td>Exclude, energy type, device type, description</td>
</tr>
<tr>
<td>Collector Alarms</td>
<td>Shows reported alarms for a specific time period</td>
<td>Device ID, device type, alarm condition, start value, start date/time, end value, end date/time, acknowledged</td>
</tr>
<tr>
<td>Collector Data Upload Log</td>
<td>Monitor communication status for the system devices. View communication statistics for the selected collector over a specified time period</td>
<td>Collector ID, message length, item count, creation date, transmit date, receive date, and process date</td>
</tr>
</tbody>
</table>

### Monitoring ERTs

<table>
<thead>
<tr>
<th>Report Type</th>
<th>Purpose</th>
<th>Fields Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERT Properties</td>
<td>Monitor the status and operation of every Endpoint in the network. Operators can filter to search for a particular endpoint, a group of endpoints, or all Endpoints that the system reads. The on-demand read function can be used to view the reading value for a specific Endpoint</td>
<td>ID; description; status; device type; interval data export (enabled/disabled); in reports (indicates if an endpoint is included in any reports); premise; meter; account; transformer; latest daily freeze time, reading date, and value; latest endpoint restore alarm date, time, alarm-collector; latest meter read-collector, date, and value; latest tamper read-collector; on demand read; latest tamper read date/time, type, and value; location address, latitude &amp; longitude.</td>
</tr>
<tr>
<td>ERT Readings</td>
<td>View readings for a specific ERT in the system</td>
<td>Device ID, device type, channel number, tamper type (reprogram, cut cable, tilt, security, power loss, inversion, reverse load, removal) tamper value, tamper date/time, latest reading, decode type</td>
</tr>
<tr>
<td>ERT Tampers</td>
<td>View tamper information for a specific ERT</td>
<td></td>
</tr>
</tbody>
</table>
## Monitoring Repeaters

<table>
<thead>
<tr>
<th>Report Type</th>
<th>Purpose</th>
<th>Fields Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeater Properties</td>
<td>Monitor the status and operation of every Repeater in the network</td>
<td>ID; description; status; interval data export (enabled or disabled); in reports (indicates if a repeater is included in Network Software reports); premise; meter; account; transformer; latest endpoint restore alarm; latest endpoint restore alarm-collector; latest meter read collector, date, and value; location address, latitude, and longitude.</td>
</tr>
<tr>
<td>Repeater Details</td>
<td>Shows ERT readings, tampers, and alarms collected by the selected Repeater</td>
<td></td>
</tr>
</tbody>
</table>

### Viewing Status on the Map (Figure 9)

- Spatial geo-location of each network element (ERTs, Collectors, Repeaters) in 2D or 3D (satellite) format
- Read quality from Collector, Repeaters, and ERTs
- On-Demand Reads
- Near real-time ERT status
- Color-Coding for easy status identification (Green/Yellow/Red)

![Figure 9. Endpoint Status Screen](image-url)

ChoiceConnect™ 100 Fixed Network  
Itron Confidential & Proprietary  
2011
Customer Care Software for ChoiceConnect

The Customer Care software package is key for any water utility whose current or future monitoring and customer service needs require increased functionality, the ability to isolate business processes and business systems from the details of metering and meter reading, or increased water-consumer engagement. Customer Care’s relational database provides a central repository for integration and access by all business and analytical systems and users of meter data throughout the utility organization.

The Customer Care database provides long-term storage of register data, interval data, leak data, and tamper data. The associated data management system provides persistent data store, customer relationship management, and data collection process management for all connected technologies.

Long-Term Data Storage

Data storage and repository options are configurable based on customer need, number and type of meters reporting data, interval of data collection, and other site-specific factors. Typical utility data storage requirement is 1 – 10 years, and Itron’s Customer Care solution has a flexible data model that enables a wide range of utility-specific elements and attributes. The data fields are extensive. A data dictionary can be provided upon request.

Analytic Reporting

The analytic reporting capabilities of Itron’s Customer Care software provide information that is critical and increasingly valuable to both the water commodity provider and the end use customer. These capabilities allow utilities to track and report:

> Detailed interval data graphs and tabular reports by hour, day, week, month, year, or specified time range with one or many channels in the same graph or report, including multiple accounts or groups of accounts
> Peak Day graphs and tabular reports by day, week, month or specified time range
> Summary graphs and reports by day, week, month, etc. with peaks, lows, totals, etc.
> Event reporting, which provides a summary of event data by service point or by event type
> Usage & Variance web report for usage analysis by hour, day, week, month, and year
> Trending web report for trend analysis across meters or against other data sources, such as temperature

Utilities will find that the data storage and aggregation and analytic report creation provide opportunities for improved operational efficiency, enhanced customer service, conservation, and system integrity management.

Improved Operational Efficiency

Through easy-to-use screens and data aggregated for use by internal resources such as Customer Service Reps (CSRs), a utility using Customer Care can improve efficiency and reduce bottom line expenses by performing functions online that historically required a truck roll and field personnel.

For example, CSRs can conduct a “virtual disconnect” (Figure 10) efficiently and effectively from the head office. First, the CSR or Billing Department retrieves the most current read stored in the
system using the On-Demand Read function. Next, the read is recorded into CIS and the account is closed out. Finally, the account is placed in “inactive” status; it can continue to be monitored using the “Usage on Inactive” report.

Virtual disconnects save headcount, fuel, and maintenance costs as well as reducing carbon emissions and highway congestion. As an added advantage, the image of the utility in the community is preserved.

Figure 10. Network Software Virtual Disconnect Screen from the Network Web Application
Enhanced Customer Service

Using Customer Care’s browser interface, CSRs can easily access information collected by the ChoiceConnect Network to quickly and thoroughly address customer concerns while the customer is on the phone. The Usage & Variance Analysis screen (Figure 11) clearly presents the usage in a bar chart as well as a table of data for use by the CSR to resolve billing complaints.

Use the Usage & Variance Analysis Report for:

> **Improved Access to Information.** The web browser interface easily allows access to information useful in reconciling high bill complaints or other customer inquiries

> **Better Complaint Reconciliation.** The ChoiceConnect solution will facilitate solving high bill complaints before the end of the conversation, thus encouraging bill payments

> **Export Reports to Adobe PDF.** CSRs can export the customer’s usage data to Adobe and send a PDF to a customer via email to confirm consumption.

> **Compare billing periods.** Billing periods can be compared to any previous timeframe (last month, last year, etc.)
Conservation

The ChoiceConnect solution using Customer Care supports conservation efforts through easy-to-use and easy-to-view screens. (Figure 12) Customer Care software provides the platform to measure, manage, and compare consumption before and after the implementation of specific conservation programs or initiatives. It also enables the detection of metered leaks, allowing the utility to avoid water loss and the financial liability that large leaks can create if undetected.

System Integrity Management

Using Customer Care’s web browser interface, the utility will be able to better manage its distribution network by:

- Delivering and storing granular interval data captured through the network, and conducting detailed analyses for right-sizing single and compound meters
Detecting meter decrementation, which can be an indication of potential reverse flow, as well as a potential indication of a stuck, broken, intentionally reversed, or otherwise malfunctioning meter register.

Grouping and aggregating endpoint data for monitoring system integrity through a variety of advanced analyses including detecting non-revenue water loss through the comparative analysis of time-synchronized data (i.e., “district metering”).

Delivering hourly empirical data from every meter in the network for improved hydraulic load analysis in third party software applications.

Figure 13. Customer Care Flow Analysis screen

The Customer Care Flow Analysis screen (Figure 13) shows the percentage of time the meter spent at each flow rate for the selected timeframe. In this example, if the meter were capable of 500 cfs/h, it would be too large (over-sized). Likewise, if it were only capable of 100 cfs/h, the peaks would be exceeding capacity (under-sized). This type of detailed analysis can be conducted on a meter-by-meter basis through the Customer Care user interface, and findings can be exported to Adobe Acrobat or Microsoft Excel for further analysis if desired by the user.

Use the Flow Analysis screen to:

- View % flow over selected time period
- View peak flow volume and duration
- Provides relevant engineering design parameters to right size meters and optimize design
Export values to Excel for further analysis and computation

The Customer Care My Meter Groups screen (Figure 14) illustrates how to create customized groups of meters. A head-office user can select which endpoints to add to the group in order compare the groups and review tables. This tool makes every meter in the system capable of becoming a data logging device for further operational analysis.

For instance, it would be possible to group meters by neighborhood, by route, or by some other plan, i.e. “all the schools in the school district,” or “all the McDonalds in Zone 8.”

Scalability of Customer Care

Customer Care software is scalable up to Itron’s largest and most robust fully functional custom solution, the Itron Enterprise Edition Meter Data Management platform (IEE-MDM). Utilities that, for whatever reason, anticipate significant growth or integration in the future will find Itron’s ChoiceConnect and Customer Care solutions enduring and flexible in these situations.
Itron’s ChoiceConnect Water Loss Management Tools

Another feature supported by the ChoiceConnect fixed network system is the option to integrate Itron’s suite of water-loss detection systems. These tools provide utilities with effective solutions for managing distribution pipe water loss. Integration of water loss tools into the ChoiceConnect fixed network system gives utilities a blueprint for mitigating water loss and helps to recover lost revenue.

Conservative estimates for water loss are 20%, with some systems ranging significantly higher. Identifying leaks using Itron’s water loss technology enables utilities to improve overall operational efficiency and to repair leaks before they become major events.

System Components

Itron’s water loss management tools for the fixed network include the 100W Leak Sensor and the mlogonline™ Network Leak Monitoring System.

100W Leak Sensor

The 100W Leak Sensor is an advanced approach to distribution system leak detection and is an important part of Itron’s advanced metering solution for ChoiceConnect 100.

The sensor is the result of merging the 100W ERT module with an acoustic sensor to create a single point for collecting meter data and monitoring for distribution system leaks. Data from the 100W Leak Sensor integrates into the robust network capabilities of ChoiceConnect 100, allowing utilities to extract leak sensing data either through a fixed network or when used with a mobile collection solution.

Leak detection data is collected automatically through the ChoiceConnect fixed network, reporting to the head end on a regular schedule. Leak Sensor data can also be gathered in a mobile environment either during normal monthly field visits for meter data collection or during walk-by or drive-by applications. The data can also be read independently. In a mobile environment, the meter reader automatically downloads the current readings to a PC; the data is then uploaded to mlogonline for analysis.

Figure 15. Leak Sensor. Attaches to the service line with a stainless steel U-bolt
100W Leak Sensor Specifications

> Range up to 400’ on metal pipe
> Sealed, waterproof, IP68 rating
> Records vibrations every 22.5 minutes, or 64 times per day, and takes 96 samples per recording
> Stores the 8 quietest readings every 24 hours
> Stores up to 20 days of leak data
> Averages a lifespan of greater than 20 years

mlogonline™

mlogonline represents a true breakthrough in supply-side preservation for the water industry. It is a comprehensive network leak monitoring system that enables a utility to minimize water loss and optimize operating competency. This philosophy means that there are no barriers to immediate use:

> Requires only an Internet browser (IE7)
> Needs no technical support from utility
> Proficiency accomplished with 1 day of training
> Maintained behind the scenes by Itron

Core web applications of mlogonline consist of:

> Analysis Process
  – Receives readings (pipeline vibration recordings) by e-delivery to mlogonline
  – Ranks possible leaks by which sensor most closely resembles a leak, prioritizing which leaks need to be investigated first
  – Analyzes the acoustic samples behind the scenes, requiring no user intervention
> Browser Application(Figure 16), which allows users to:
  – View drinking water distribution system data (map or grid view)
  – Sign up for messages, alerts, and reports
  – Submit leak and noise source information about a water distribution network
  – Track the amount of recovered water from leak repairs
> Communications Module
  – Generates messages, alerts, and reports (plain text or HTML), for e-delivery to a phone or email account
Figure 16. mlogonline Screen Shot