EXO NitraLED™

Nitrate Monitoring, **Enlightened.**

LIGHT UP YOUR MONITORING!
Expand and enhance your water quality monitoring program with UV Nitrate for more informed decision making.

LIGHTEN YOUR BUDGET!
The world's most accessible monitoring solution for nitrate, at a fraction of the cost of lamp-based monitors.

LIGHTEN YOUR LOAD!
Fits in the palm of your hand—and integrates directly into any EXO Sonde. No external hardware required!

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Let's Solve Water

Olsson—ICWP Bronze Sustaining Partner

- Check out Olsson's work with the Twin Platte Natural Resources District (NRD) in Nebraska
- A New Paradigm for Groundwater Management
- https://www.olsson.com/News/a-new-paradigm-for-groundwater-management

Join the Water Data & Science Committee in early 2021 to hear a full presentation on this topic from Olsson

In-Situ
YOUR EYES IN THE FIELD

VuLink Data Logger and Telemetry

VULINK IS A GLOBAL CELLULAR AND SATELLITE TELEMETRY DEVICE THAT WILL CHANGE THE WAY YOU THINK ABOUT REMOTE MONITORING. OUR TURNKEY SOLUTION IS EASY TO SET UP, WORKS FROM ANYWHERE, AND DELIVERS LONG-LASTING POWER. SO, YOU NEVER HAVE TO WORRY ABOUT YOUR EQUIPMENT OR YOUR DATA.

ONE-PRESS SETUP

- VuLink autodetects any In-Situ device with one button press or scheduled report. Icons indicate battery life, instrument connection, network connection and HydroVu connection.

EXPANDED COVERAGE

- VuLink is truly global, offering cellular coverage across multiple networks. Future proof your system for decades with 4G LTE Category M1/NB-IoT technology, while ensuring backwards compatibility with quad-band 2G coverage.
- VuLink is also the first in-well Iridium satellite device featuring customized data compression and low power usage to lengthen battery replacement cycles.

FREE GLOBAL CELLULAR DATA

- VuLink offers free cellular data for life, right out of the box, no set up required. See back for details.

EXTENDED LIFE

- VuLink offers two-to-five times the battery life of similar devices. M1 and NB-IoT offer extraordinary power savings. And at faster reporting rates, VuLink offers exponential savings – more than two years of battery life at 15-minute reporting intervals.
- Say good-bye to custom, expensive batteries – VuLink uses off-the-shelf alkaline and lithium D cell batteries.

Applications:

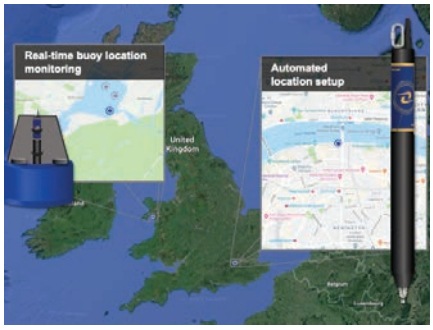
- CONTINUOUS GROUNDWATER MONITORING
- REMOTE SURFACE WATER MONITORING
- RIVER GAUGING
- SALT WATER INTRUSION MONITORING
- STORMWATER MONITORING
- REMEDIATION
- WASTE MANAGEMENT
- IRRIGATION
- MINING WATER MANAGEMENT
- INDUSTRIAL AND MUNICIPAL

www.in-situ.com

1-800-446-7488 (toll-free in U.S.A. and Canada)
1-970-498-1500 (U.S.A. and international)

VuLink Data Logger

ELECTRICAL	CELLULAR	SATELLITE
BATTERY	3 x D cell (1.5V - 3.6V) Alkaline / Li-$SOCl_2$ [Lithium Thionyl Chloride] / Li-MnO_2 [Lithium Manganese Dioxide] supported. **Li-MnO_2 [Lithium Manganese Dioxide] recommended for best performance**	
OPERATION TIME (24 hour reporting, Li-MnO_2)	Up to 12 years*	Up to 3 years*
OPERATION TIME (24 hour reporting, Alkaline)	Up to 3 years*	Up to 1 year*
OPERATION TIME (hourly reporting, Li-Mno_2)	Up to 2 years*	Up to 6 months*
CLOCK ACCURACY	Less than 1 minute drift per year with ability to synchronize to network provided timefor accuracy +/- 1 second	
NETWORK COMMUNICATION	**CELLULAR**	**SATELLITE**
NETWORK TYPE	4G LTE Category M1 (LTE-M) / NB-IoT (Narrow Band) with 2G fallback	Iridium Short Burst Data
BANDS	**LTE Global -** B1(2100), B2(1900), B3(1800), B4(AWS1700), B5(850), B8(900), B12(700), B13(700), B18(800), B19(800), B20(800), B28(700) **Verizon -** B4(AWS1700), B13(700) **2G Quadband -** B2(1900), B3(1800), B5(850), B8(900)	N/A
PROTOCOLS	HTTPS (HydroVu), SMS (alarms)	HydroVu
DATA PROVIDER	Built-in free** global roaming (see Network List Addendum for details: in-situ.com/VuLinkNetworks), additional single 4FF slot for 3rd party SIM support	Iridium Short Burst Data
ANTENNA	SMA-M connector	
GPS	Up to 3m accuracy, built-in antenna	
FILE FORMAT (non-HydroVu)	CSV	N/A
REMOTE SETUP	Supported	
MECHANICAL	**CELLULAR**	**SATELLITE**
DIAMETER	1.85 in / 47 mm	
LENGTH	19.1 in / 485 mm	
WEIGHT	2.2 lb / 1.0 kg (with included alkaline batteries and carabiner, excluding antenna)	
MATERIALS	Ryton (housing), PVC (battery cover), Titanium (Twistlock connector, eyebolt), 316 Stainless Steel (carabiner), Silicone (keypad cover), Brass (SMA antenna connector), Polycarbonate (label), Viton (O-rings)	
STORAGE TEMPERATURE	-20°C to 60°C	
OPERATING TEMPERATURE	-20°C to 50°C (Li-SOCl2/Li-MnO2), 5°C - 40°C (Alkaline)	
INGRESS PROTECTION	Device: IP68 System: Up to IP68 per antenna specification	
INSTRUMENT COMMUNICATION	**CELLULAR**	**SATELLITE**
PROTOCOLS	Modbus over RS-485, Pulse low/high frequencies (max 40 kHz)	
CONNECTORS	1 In-Situ Twistlock (supports multiple instruments via Rugged Cable Splitter, TROLL Net Hub, or Load-Bearing Universal Adapter)	
SIMULTANEOUS CONNECTIONS	Up to 8 instruments (total maximum of 75mA provided to connected instruments at 16V)	
VENTING	Built-in on all models, no desiccant required	
BAROMETRIC COMPENSATION	Built-in on all models for automatic compensation of non-vented level readings	
BAROMETER ACCURACY	+/- 1 hPa	
ALARMS	Configurable based on instrument readings and device parameters, second reading/reporting schedule available when in alarm state	
POWER	Total maximum of 75mA provided to connected instruments at 16V (intended typically to power a single instrument)	
SETUP	**CELLULAR**	**SATELLITE**
WIRELESS SETUP	Supported via Bluetooth Low Energy	
LOGGING RATE	1 minute to 7 days	
TRANSMISSION RATE	5 minutes to 7 days	
MEMORY	512 MB (soldered to circuit board)	
WARRANTY	**2 YEAR**	



Continuous GPS – HydroVu uses VuLink's GPS to automatically locate and mark devices on maps, syncing devices and locations, increasing data quality, and making it easier to track free-floating buoys.

Encrypted Connections – VuLink with HydroVu offers SSL encryption of your data, and VuLink can password protect all local connections to prevent backdoor access.

Free Global Cellular Data – VuLink and HydroVu offer free data up to 1 transmission for 24 data points per day. Additional plans can be purchased at Hydrovu.com. No more worrying about provisioning SIM cards and checking multiple systems for data usage. VuLink works with all LTE networks that support LTE-M1/NB-IoT. For a complete list visit in-situ.com/VuLinkNetworks.

Expanded Connectivity – VuLink also can read high frequency and low frequency pulse inputs, configured in VuSitu. And the device's new **Load-Bearing Universal Adapter** can connect to anything.

www.in-situ.com

* Measured at a temperature of 23°C, LTE-M network connectivity, internally-powered instrument
** Free up to 1 transmission of 6 data points per day for life of instrument, additional plans can be purchased at hydrovu.com

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Let's Solve Water

OASIS

the most powerful and flexible software available for modeling the operations of water resources systems

Hazen and Sawyer uses advanced optimization and simulation techniques to improve long-term planning and short-term operations. OASIS allows us to help our clients find better, more workable solutions in a timely and cost-effective way.

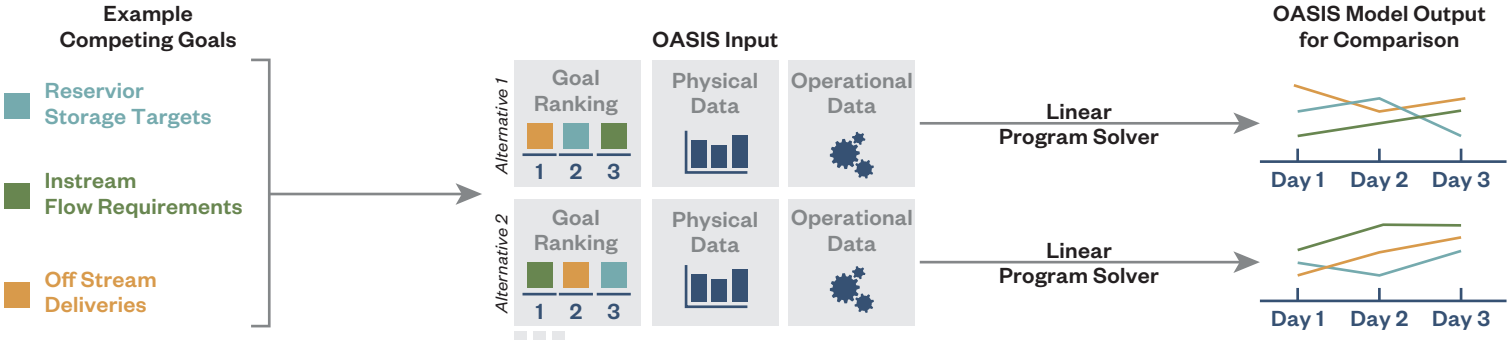
The software makes it easy to analyze operating rules that can yield large savings for managers faced with system expansion decisions or operating compliance. The very same software can be used as a planning model and decision-support model to ensure that the rules are properly implemented. OASIS can be customized to suit clients' needs and is supported with training and free upgrades.

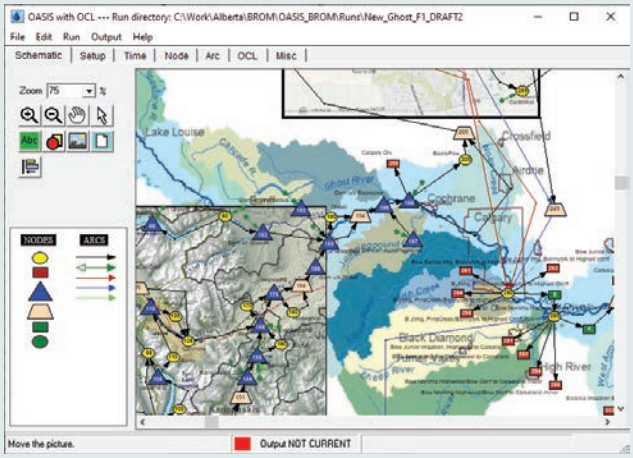
OASIS has application in

- River Basin Management
- Water Supply
- Hydropower
- Conflict Resolution

Mimics Operators' Intuition

A linear program solver is the engine hidden inside of OASIS. Because OASIS uses linear programming to simulate routing decisions, all operating rules are represented as either goals or constraints. A constraint is a rule that OASIS must obey, while a goal is a rule that OASIS tries to meet. Goals may be in competition with each other, and a system might not be able to satisfy some or all of the goals. Goal-seeking behavior is an efficient modeling approach which also corresponds to the way real-world operators and planners work. Other software requires these competing goals to be modeled with a complex set of "if-then" type rules. The OASIS approach greatly simplifies the task by cutting down on the need for "if-then" rules, while still allowing you the freedom to use them where they are appropriate.





The OASIS GUI allows you to build and work with the model by clicking on the schematic, which shows how each part of the system connects to the whole.

Includes a Graphic User Interface

Changing input, running the model, and viewing output are all done through a graphic user interface (GUI). Hazen and Sawyer can customize the GUI to reflect the specific needs of your application.

Reports Performance Measures

OASIS includes powerful post-processor programs that select, process, and display results in the form you need to judge the performance of the system. The GUI allows you to select any number of performance measures to be instantly generated after a model run is complete.

OASIS

the most powerful and flexible software available for modeling the operations of water resources systems

Provides Enormous Flexibility

OASIS is designed to be extremely flexible whether you are building a new model or modifying an existing one. You won't have to deal with complicated source code changes as with other models. OASIS will save you time and money.

Input data can be entered in many forms:

- Constants
- Time-series values
- Time patterns (values that cycle every year)
- Rule-based input

With OASIS you have the option of using pre-specified rule forms AND the freedom to write new rules. You can modify the form of the rule as well as the parameter values. For example, the code below sets a minimum flow requirement depending on storage in the reservoir and time of year.

```
// RESERVOIR_OPS.OCL

// Sets the Little River Reservoir minimum release,
// which is based on storage remaining and time of year.
// Reduce release as drought season develops.

Set LittleRiverMinRelease : min_flow1200.1205

{   // 0.6 cfs (or 1.2 acre-feet) when storage is below 70%
    condition : storage1200 / max_stor1200 * 100 < 70
    value     : convert_units {0.6, cfs, af}

    // 2 cfs from Jun - Nov
    condition : month >= 6 and month <= 11
    value     : convert_units {2.0, cfs, af}

    // 6 cfs from Dec - May
    condition : default
    value     : convert_units {6.0, cfs, af}
}
```

OCL: The Key to OASIS

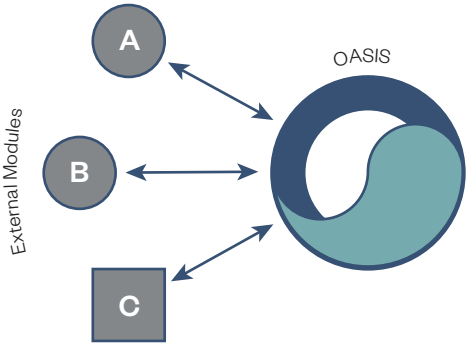
OCL, short for Operations Control Language, is a patented language for describing water system operating rules. OCL allows you to enter operating rules that are as simple or complex as the real-world rules that govern the system you are modeling.

The rules you write in OCL look like the rules that planners, operators, and policy makers use. For example, an agreement between water users might require that the diversion at point A, plus the diversion at point B, must be less than 70% of the flow at point C. In OCL, you would write the following constraint, which is readily recognizable as the mathematical form of that rule:

```
Constraint:
{ dDivert_A + dDivert_B < 0.70 * dFlow_C }
```

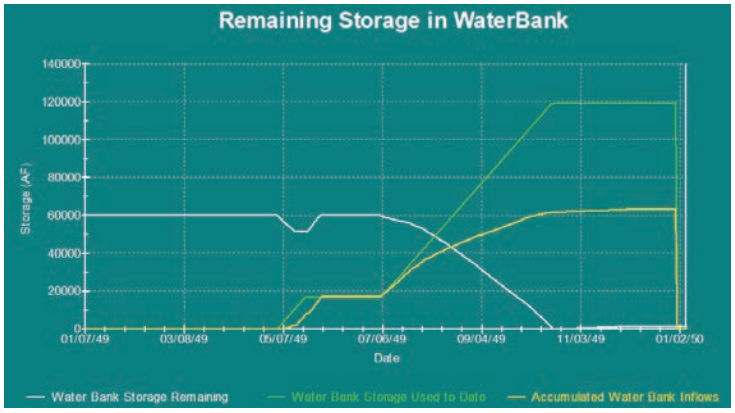
Runs In Parallel with Other Models

OASIS is able to send and receive data to and from other programs while the programs or "external modules" are running. External modules can be created from scratch or existing programs can be integrated. Some tasks suitable for external modules are: groundwater flow, water quality, contaminant transport, habitat availability, rainfall-runoff, and agricultural return flow. This approach allows different specialists to develop and maintain each module. Without OASIS, different models would have to run in series, often requiring an awkward iterative process. With minimal programming, OCL can even be used to control operations in external modules.



Brings Transparency to Modeling

OASIS input and output are stored in standard database formats. Because all OASIS results are stored in a database, there are no secrets about how the system is represented. Post processing provides tremendous flexibility in viewing results.



Environmental Solutions

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Install in remote locations that were previously out of reach with the help of our trained team of field experts.

Keep the data moving with routine maintenance of your sites including calibration, site upkeep, and more.

Let our experts help your experts with data delivery to base stations or your SCADA system.

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YOU'RE DATA DRIVEN

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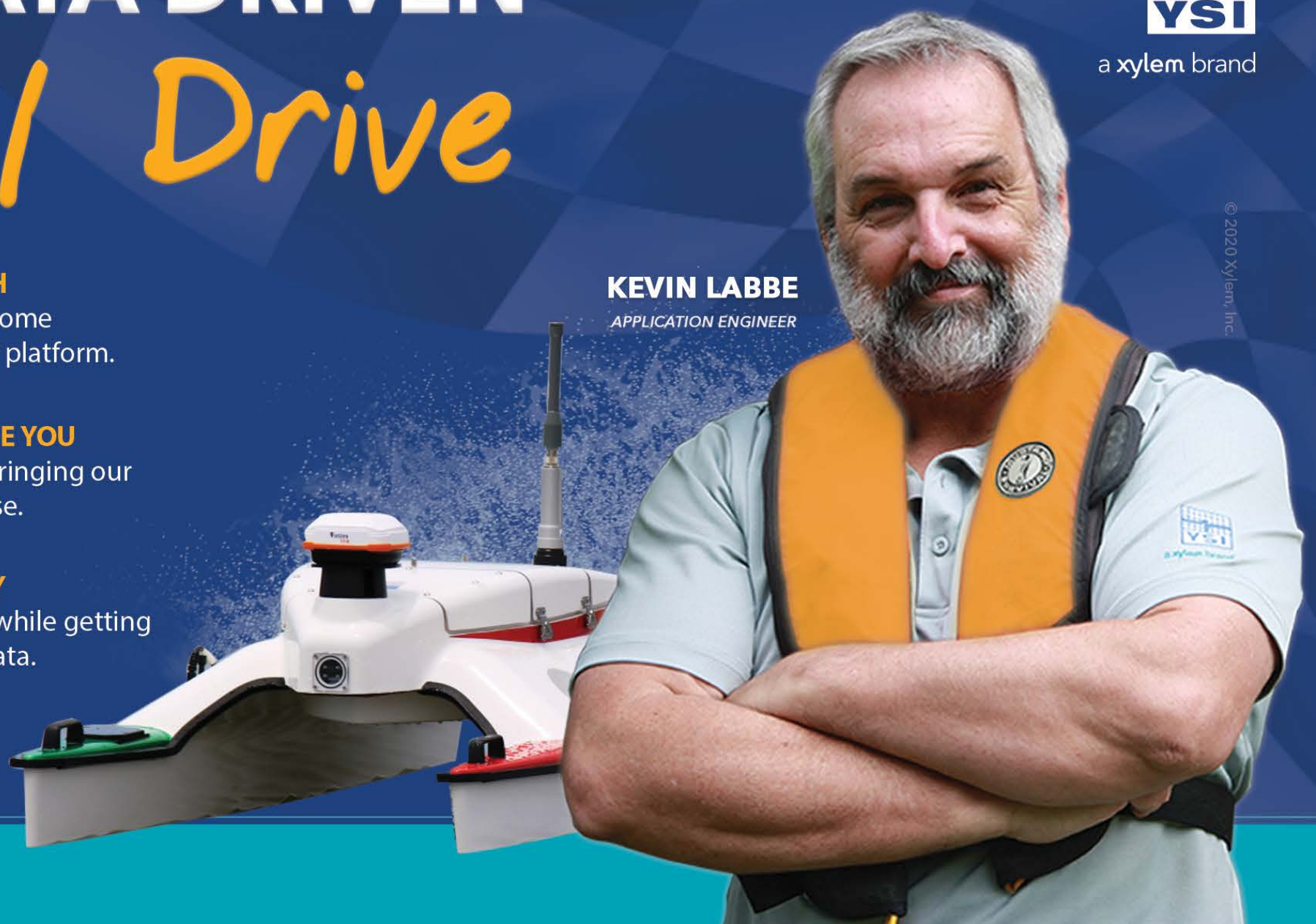
TAKE THE LEAD WITH TOP TECH
The top sensor technologies all come together in a single autonomous platform.

THE YSI CREW IS HERE TO SERVE YOU
Make your project a winner, by bringing our unsurpassed application expertise.

CROSS THE FINISH LINE SAFELY
Keep your people safely ashore, while getting countless man-hours' worth of data.



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