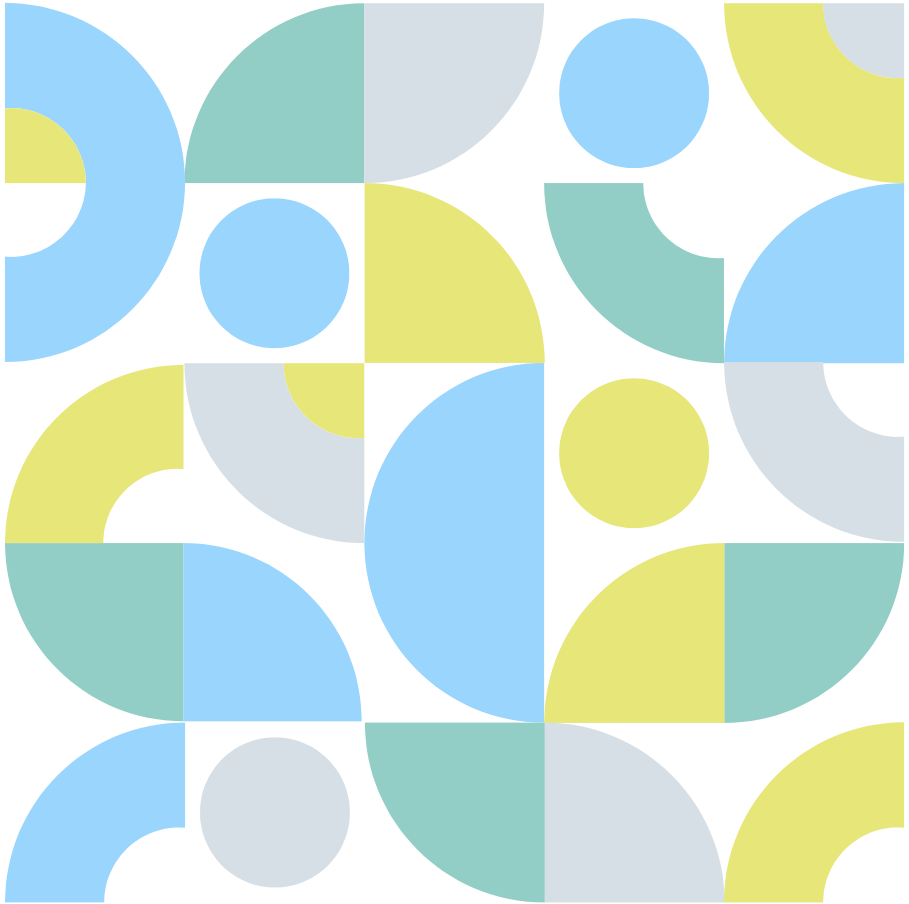
Transportation Technology: A World of Possibilities

Michigan School Business Officials

Technology for Operational Management

March 2023

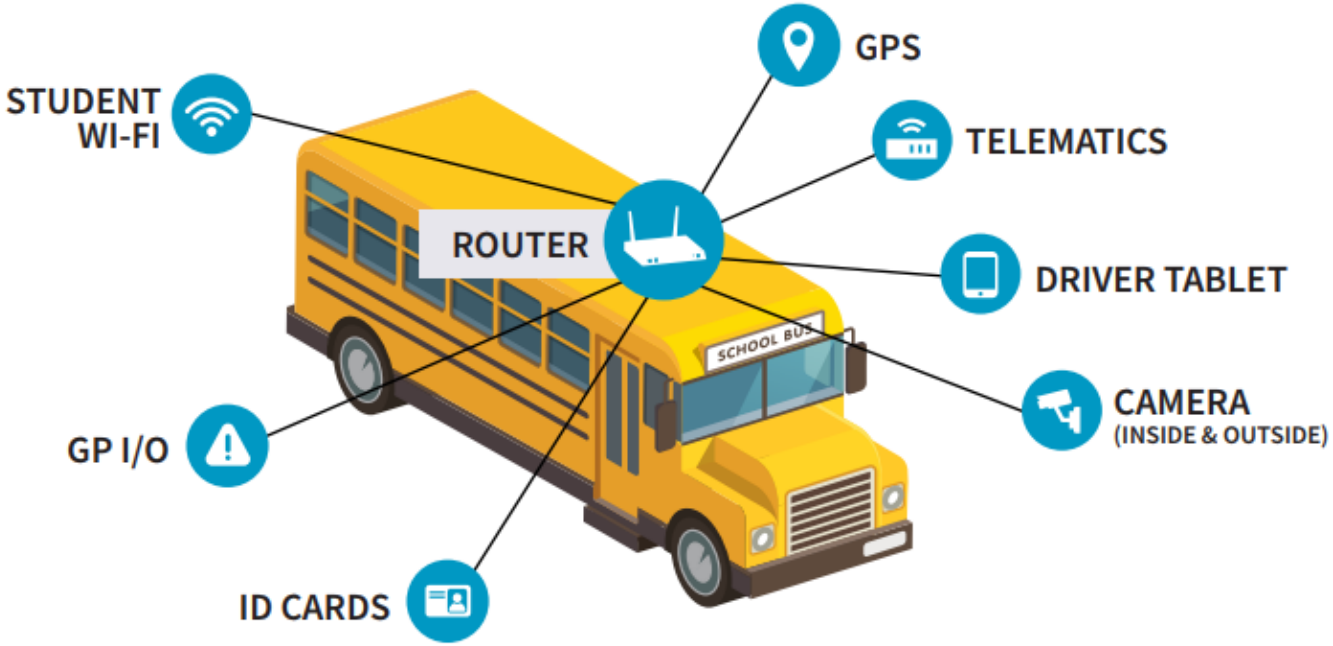
Tim Ammon



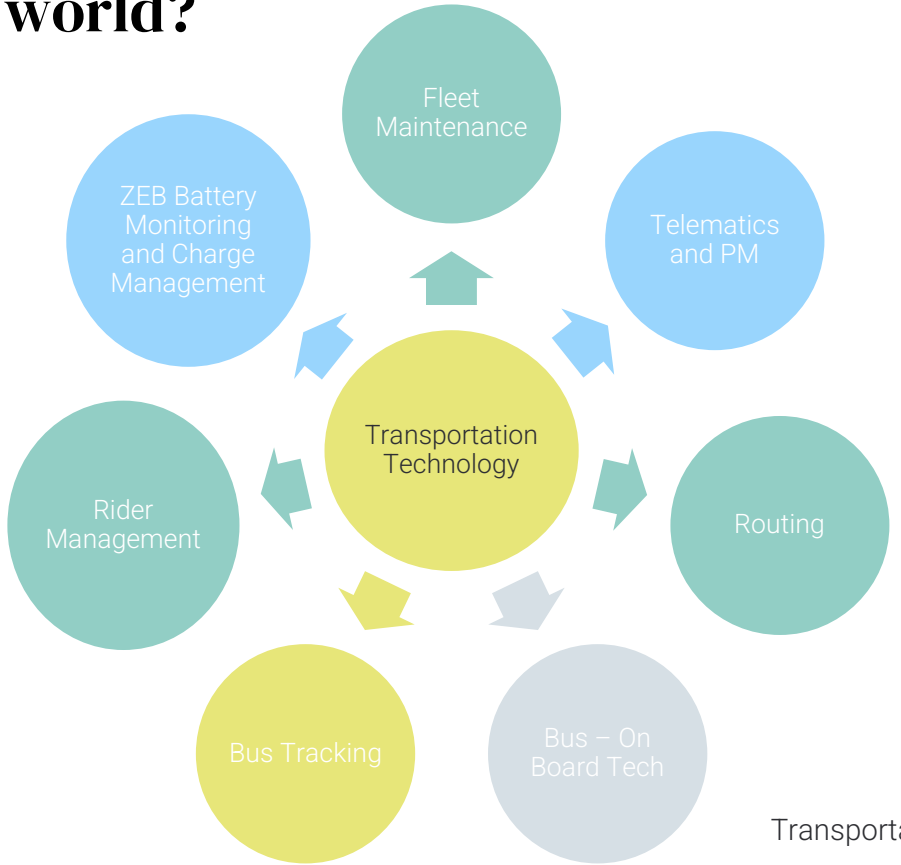
Those were the days

A.M.	RTE #10	RTE# 11	RTE# 12	RTE# 13	RTE # 14	RTE # 15
6:30						
6:33						
6:36						
6:39						
6:41						
6:43						
6:45						
6:48						
6:51						
6:54						
6:47					19th & Winstanley	
6:50	8688 Bunkum Rd.		24th + Kansas		9th Natalie	
6:53	87th & Parksdale				1009 N 15th St	
6:56	Parksdale & Bermuda		17th & Converse Ave.	43rd & Baker Ave.	450 N 6th Gompers Hms.	
6:59	Black Ln & Washington Park Blvd	71st & Laguna	17th & Bond Ave.	42nd & Broadway Ave.	9th & Ohio Ave	
7:01	8500 Forest Ave. & Chevy Chase (Trailer Ct.)	71st & Belmonte	17th & Central Ave.	42nd Walnut Ave.	14th & State St	
7:04	57th & Forest Ave.	71st & Delmar	17th & Tudor Ave.	42nd & Bond Ave.	17th & College	
7:07	Kingshighway & Forest Ave.	71st at Baptist Church	15th & Baker Ave.	42nd & McCasland Ave.	572 Alexander Pl	
7:10	Kingshighway & Hallows Ave.	71st Church Ln.	13th & Baker Ave.	41st & Converse Ave.	Vogel Pl & State St.	
7:13	8615 Washington Park Blvd	73th & State St. (Donut Shop)	1065 Liberty (Rush City)	40th Converse Ave.	Alhambra & State St.	
7:15	Arrive Mason Clark	Arrive Mason Clark	Arrive Lincoln Middle	Arrive Lincoln Middle	Arrive Mason Clark	
7:16				1069 Liberty St.	23rd + Summit	
7:19				Liberty St. & Mississippi Ave.	Franklin + Rockford	
7:21				8th Market Ave.	39th + Summit	
7:24		82nd & Belleview		15th & Piggott Ave.	31st + Summit	
7:29	42nd & Forest Blvd	85th & State St.	Trailer Ct. on Forest	17th & Tudor Ave.	1634 Gaty Ave.	
7:31	25th & Waverly Ave.	82nd St & State	57th & Forest	17th & Russell Ave.	12th & Kansas Ave.	47th & Piggott Ave.
7:34	37th & Waverly Ave.	71st & Laguna Ave.	Police Station on Forest	17th & Central Ave.	11th Divison Ave.	36th & Bond Ave
7:36	36th & Caseyville Ave.	71st & Belmonte	Kingshighway & Forest	19th & Baker Ave.	12th Bond Ave.	33rd & Bond Ave.
7:38	44th & Caseyville Ave.	71st & Delmar	Kingshighway & Caseyville	10th & Broadway Ave.	14th & Baker Ave.	29th & Bond Ave.
7:40	47th & Caseyville Ave.	73rd & Lake Dr.	Kingshighway & Bunkum Rd.	16th & Kansas Ave.	17th & Trendley Ave.	26th & Bond Ave.
7:42	Kingshighway & Bunkum	73th & State (Donut Shop)	44th & Bunkum Rd	16th & Cleveland Ave.	3405 Converse Ave.	25th & Louisiana Blvd.
7:45	Arrive at ESL High	Arrive at ESL High	Arrive at ESL High	1400 Missouri Ave.	39th &Aloca Ave.	Arrive at ESL High
7:50	157 & Meole			13th & King Dr.	35th & Converse Ave.	
7:52	8688 Bunkum Rd.		40th & State Street	17th & Ohio Ave.	33rd & Market Ave.	
7:54	87th & Parksdale Ave.		36th State Street	Arrive at 9th Gas Ctr.	2438 Gaty Ave.	
7:56	Parksdale Ave. & Bermuda Ave.	Chevy Chase Tr. Ct. 85th Forest	37th & State Street	25th Bond	29th & Louisiana Blvd.	57th & Hallows Ave.
7:58	Black Ln & Washington Blvd.	1719 Black Ln.	37th & St. Clair Ave.	19th & State Ave.	27th & State St.	54th & Rosemont
8:00	8500 Forest Chevy Chase Tr. Ct.	86th & Botanical	23th & State St.	25th & Kansas Ave.	2700 Summit-(Old McHenry Sch.)	48th & Hallows-(Wilson School)
8:02	2150 N 81st St.	8809 Parksdale	21st State St.	13th St. Louis Ave.	31st & Summitt Ave.	44th & Bunkum Rd.-(Roosevelt Hms
8:04	57th & Forest Blvd.	88th & Bermuda	15th & Natalie Ave.	13th & Market Ave.	Alhambra & State St.	44th & Caseyville Ave.
8:06	Kingshighway & Forest Blvd.	55TH & Kingshighway	19th & Belmont Ave.	13th & Baker Ave.	Vogel Pl & State St.	1800 N. 25th St.-(Mandela School

The Big Yellow Data Warehouse



What's in the world?



What, Why, and Who

- In thinking about transportation technologies, the possibilities are vast, so we have to ask:
  - What are we looking to accomplish?
  - Why do we need this?
  - Who will use the systems? Who will consume the data? Who will be impacted if the data is wrong?
- Very few services has as much opportunity as transportation to incorporate technology. Very few of the organizations who try do it well.
- Understanding the full scope of what is available can lead to:
  - Better purchases
  - Better integrations
  - Better use
  - Better value

Where to start

- Most people want to know what?
  - Where the bus is?
  - What time is it getting to point X?
  - How many kids are riding?
  - Is there a driver assigned?
  - Is there anything to worry about with the bus?
- These questions would imply the right place to start is with GPS and not with routing software.
  - Having both is better and necessary for most of the higher order questions.

GPS is more than late buses

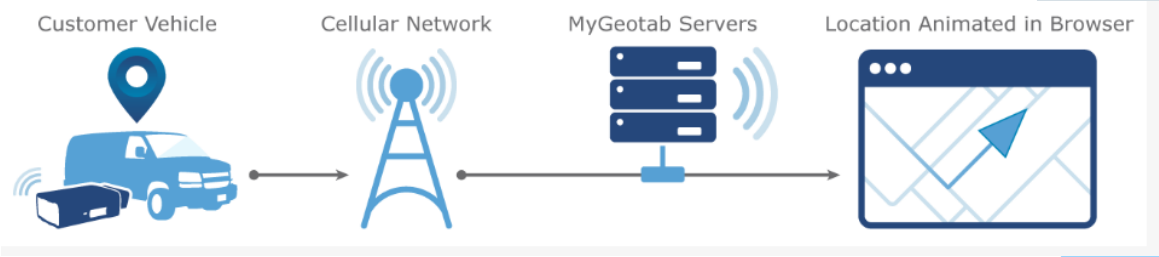
Telematics, is the transmission of computerized data such as engine diagnostics, driver behavior and even student tracking, is the future of the school bus industry.

Telematics have the potential to make school buses more efficient, safer, and easier to maintain than ever before, leading to a lower total cost of ownership.

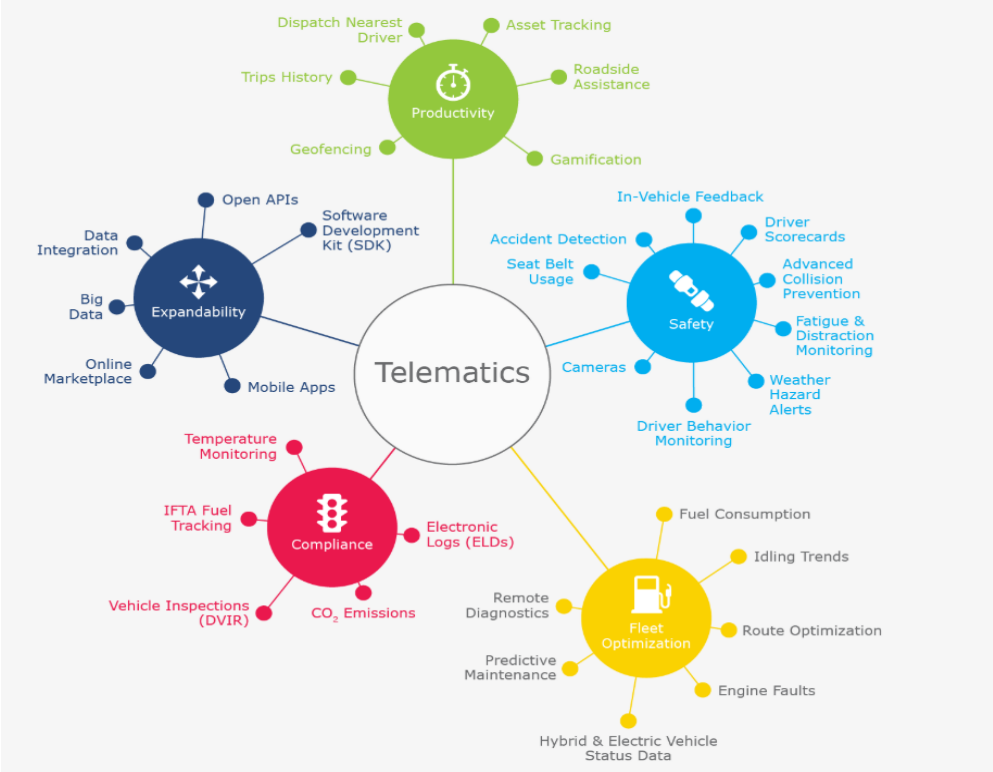
To track assets, information from the vehicle is recorded via a small, telematics device — also called a black box. A SIM card and modem in the device enables communication on the cellular network.

There are several key components of a telematics device:

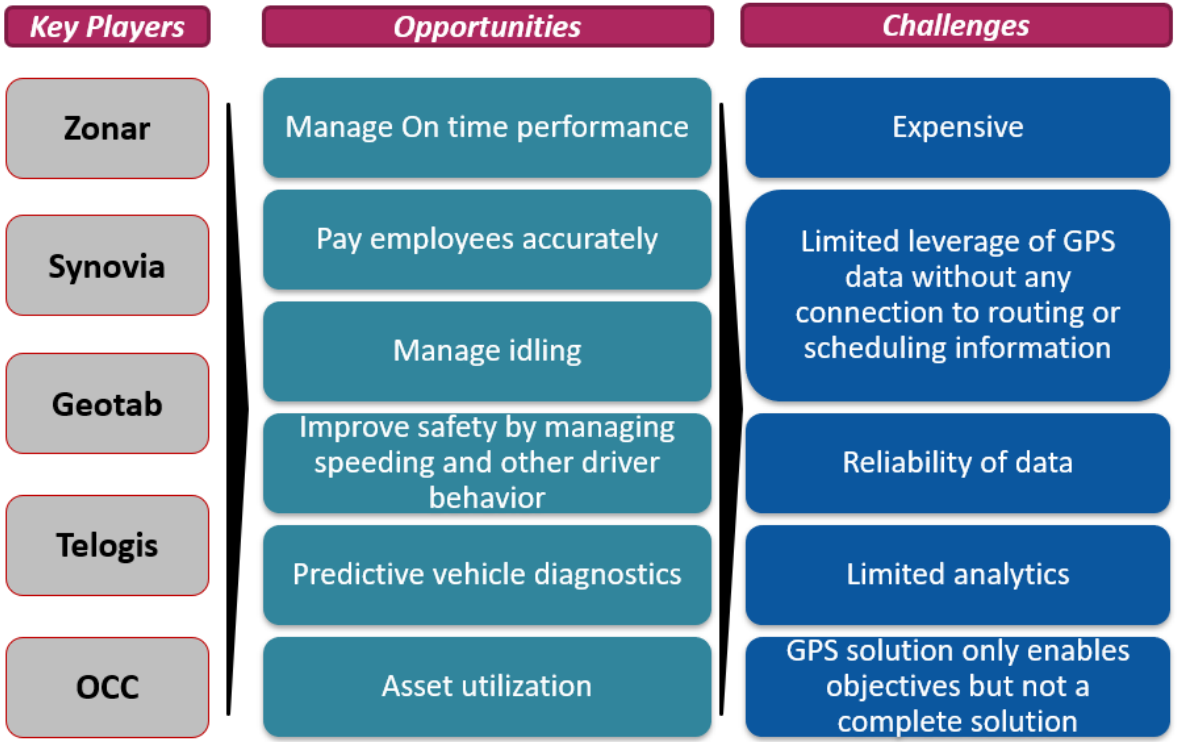
- GPS receiver
- Engine interface
- Input/output interface
- SIM card
- Accelerometer
- Buzzer



Transitioning to a Telematic Way of Thinking



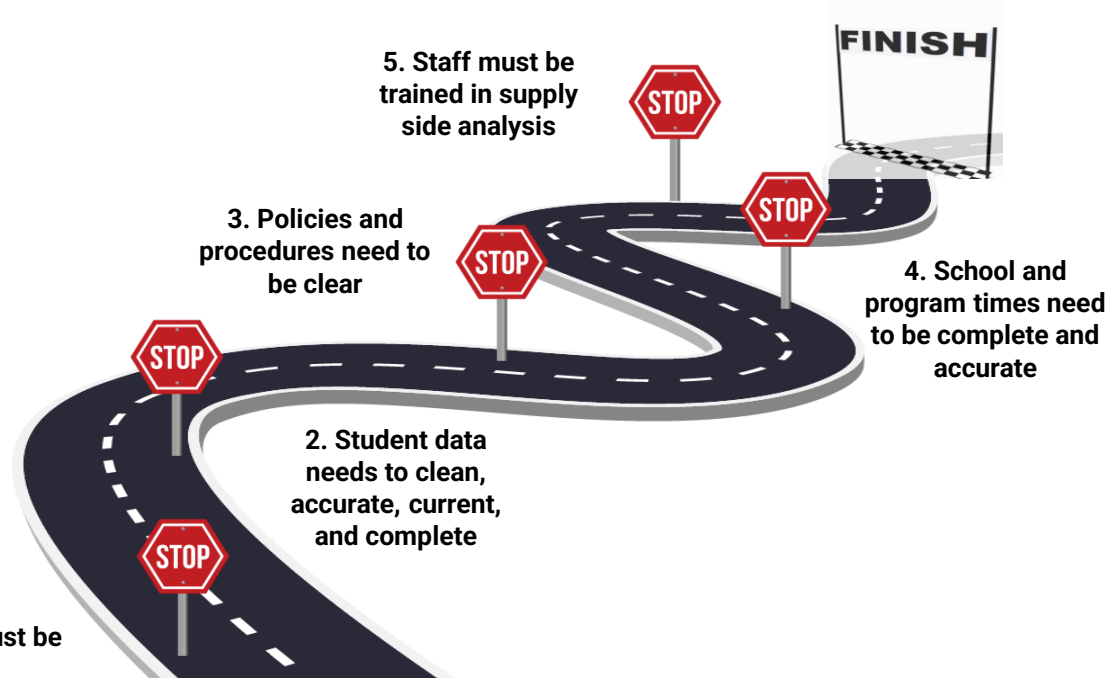
Opportunities and Challenges with Telematics



Routing Software: Know Before You Go

- Remember routing software is a planning tool; not a reality shaper
- Helps you understand what is possible not what will happen or what did happen.
- Seismic shifts in platforms occurring across this industry also from the desktop to the cloud
    - Dramatic increases in capability through integration of multiple products.
    - Significant changes in pricing structures to account for platform changes
    - Slower changes in the robustness of training efforts and elevation of expectations due to staffing challenges
    - Notable efforts to close the gap between the plan and reality (GPS derived) but still more limited than in other demand-response markets
- For many districts, the value of owning routing software may not be in the routes that get developed

The route to great routing software



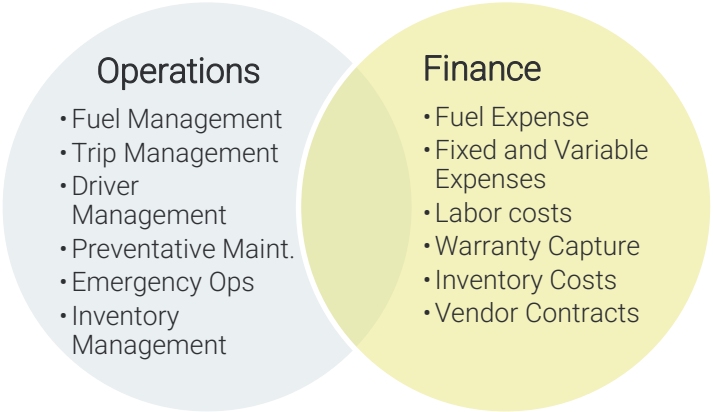
The Value of Routing Technology

Routing and planning software enables student transportation directors to;

- Develop the most efficient routes for students
- Enforce drivers are following pre-designated optimal and safe routes
- Automatically import information from your student database
- Optimize special needs routing
- Analyze historical data to optimize routes and improve on-time records
- Real-Time Location Real-time tracking of school buses
- Data can support route optimization studies to cut down on fuel costs, saving school districts money
- Create and analyze “what/if” scenarios to continually improve service and lower operating costs

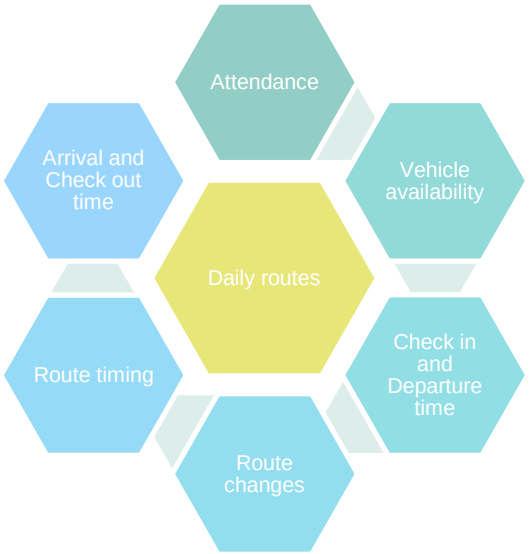
Fleet Management: 10% of the attention; 50% of the answer

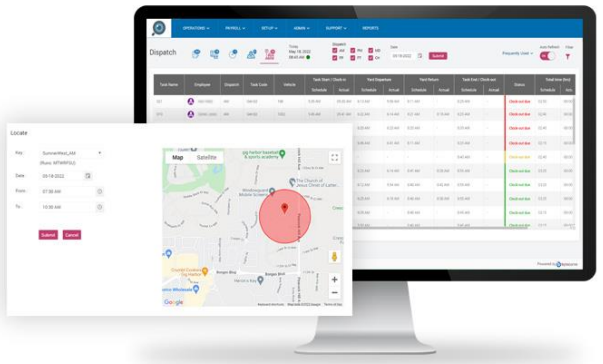
An effective fleet management program minimizes breakdowns, downtime, capital costs and inconvenience. The goal is to ensure your students are always riding a safe, secure bus, while also providing cost efficiency and reliability.



Dispatch: The Valley between plan and actual

- The only area where all areas collide
- Despite the obvious connection between the two, the industry has had limited dispatching tools
- Demand-response requirements and driver shortage has dramatically increased the need for this technology
- Significant need for increase in capabilities of staff to leverage these tools



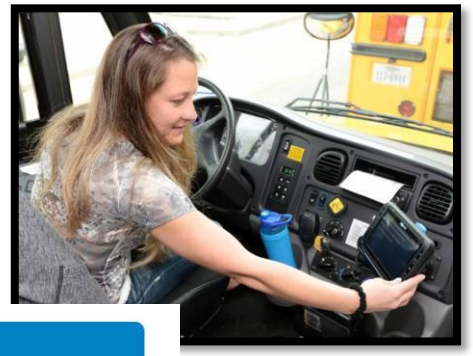


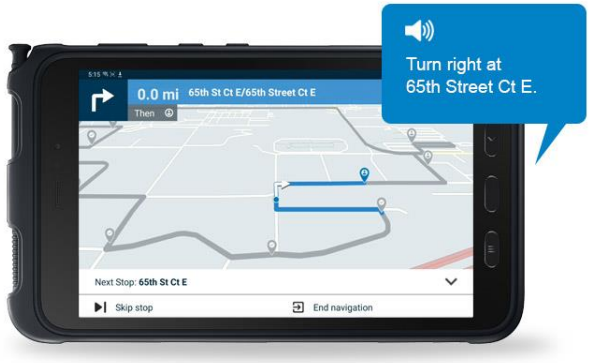
Tablets: The Next New Frontier

In-vehicle tablets help districts increase driver accountability, safety, and efficiency.

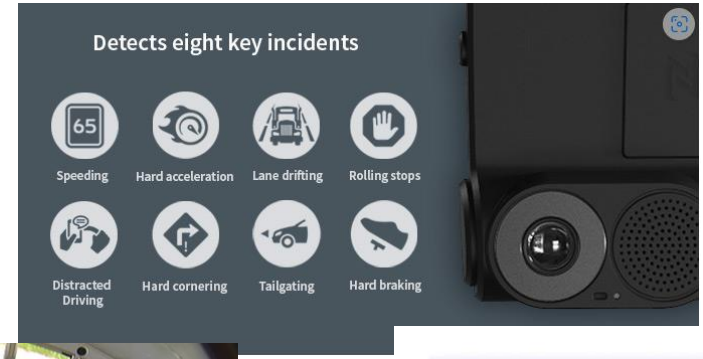
Can replace or enhance multiple existing technologies to enhance efficiency:

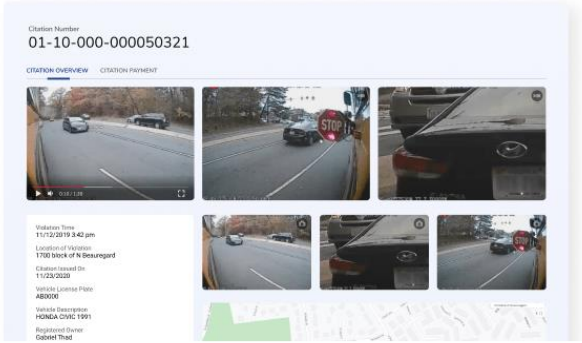
- GPS
- Pretrip
- Time clock
- Student management
- Student behavior
- Spare driver route sheets
- Cell phones/messaging
- Radio





Camera Systems: Not just for fighting anymore



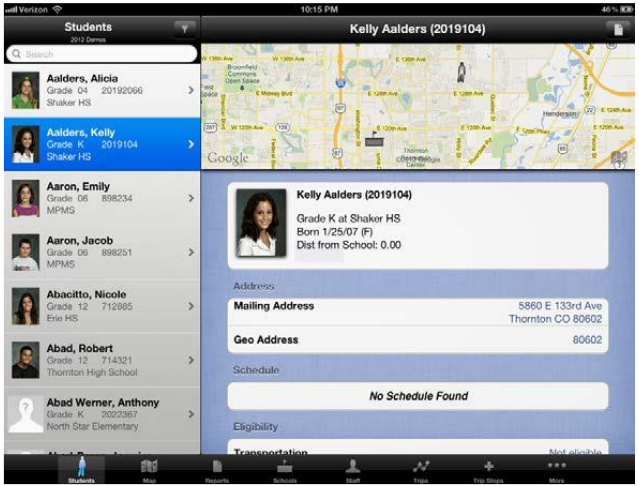


Cameras do more than see things

- Risk mitigation
- Loss prevention
- Time and location data
- IOT/V2X integration
- Driver protection
- Incident management
- Driver management and improvement
- Prosecution
- Revenue Enhancement

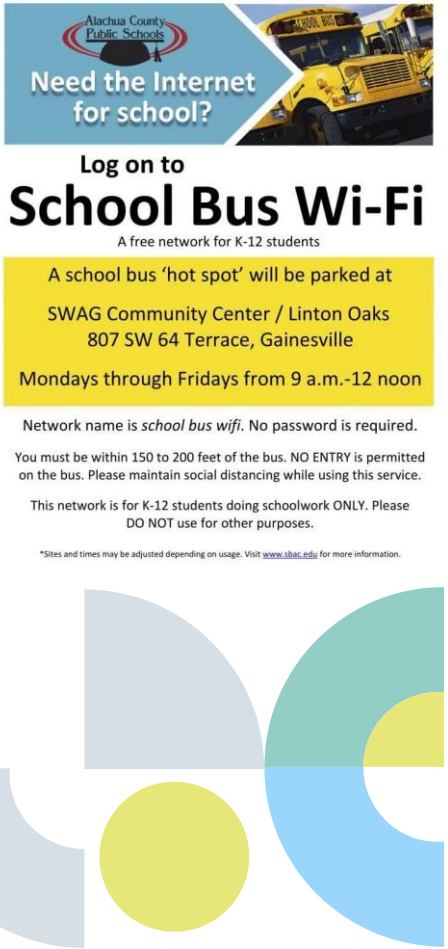
Student Management Technology

- Remember: You are managing students not tracking them
- Simple questions with very complicated answers requiring significant system integration
- Caution: Don't be wrong when you release this to the wild



The Rolling Classroom

- The pandemic showed the value of distributed wifi via school buses
- Concern about long bus rides and access in rural areas continue to serve as use cases
- Behavior management is anecdotally easier which is a leading concern in bus driver retention



Electric Avenue: The Road to Where?

Electric bus transitions are creating a need for technologies to monitor similar but different things.

Battery health was always a concern. Now it is an issue

- Range management
- Battery temperatures

Charging Stations: The brains of the operation

When and how much to charge is critical to maximizing the use and value of any electric bus. Managing the charge is complicated and complex.

- Charge type (AC/DC)
- Charger size
- Charge timing (peak rate charging can be a surprise)
- Number of charging stations
- Placement/location of charging stations
- Data management and ownership of charging information
- V2G funding/financing/availability

Managing Consequences

- The first law of data sharing: Whoever owns the data entry owns the responsibility
  - The key corollary to the law: Those that use the data, beware!
  - The more people who touch the data the more likely it is to be incomplete, incorrect, or inadequate.
- The second law of data sharing: If you make it public, people will look at it and hold you accountable
  - Implies that you better be accurate, or you will be answering a lot of questions
  - The timing of the rollout is more important than the volume of the rollout
- The third law of data sharing: If you are not sure someone else should have it, don't guess and don't share.

Where to from here?

- Internet of Things
- V2X – vehicle to everywhere
- Lane assistance/anti-collision technology on bus

Questions?

Contact

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