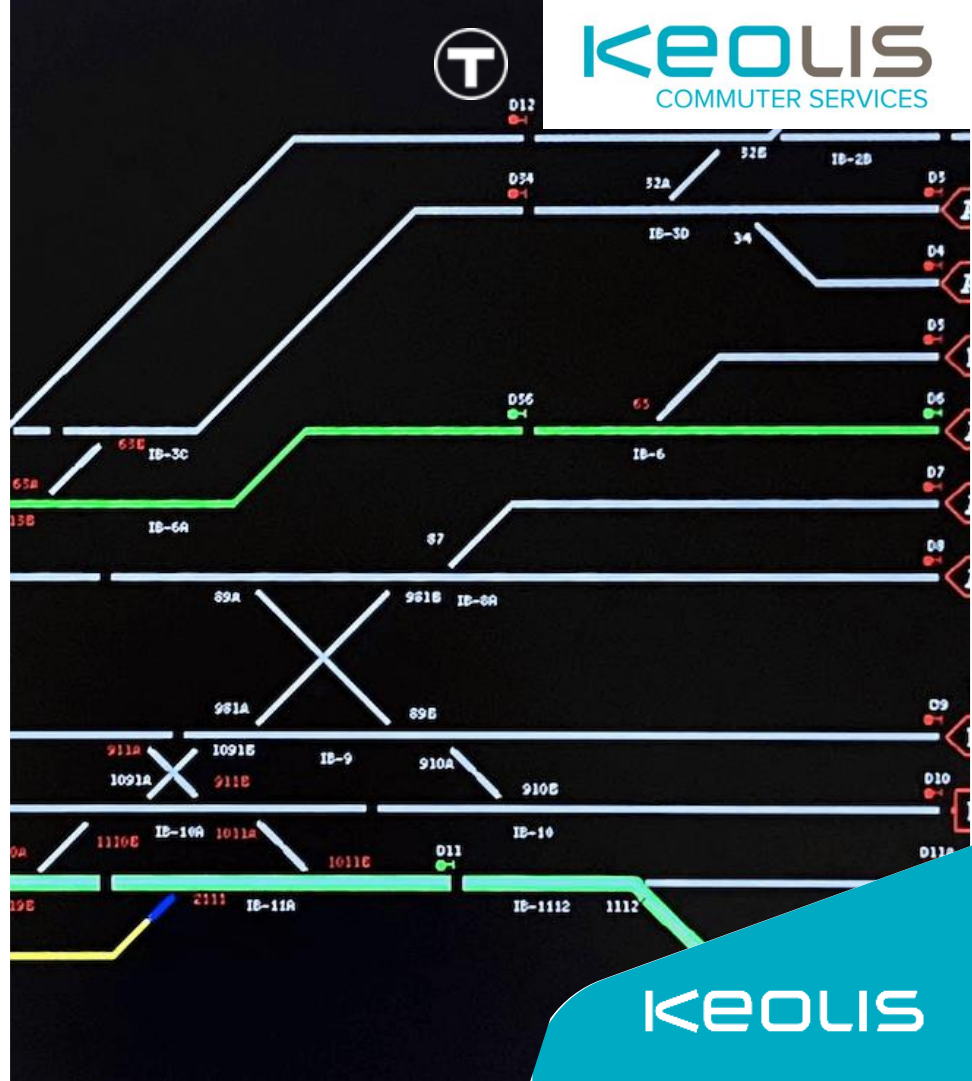# *From Unmet Need to New Data Standard:*
The Journey of TODS

Jeff Kessler, Director of Innovation @
Keolis Commuter Services (MBTA CR Operator)
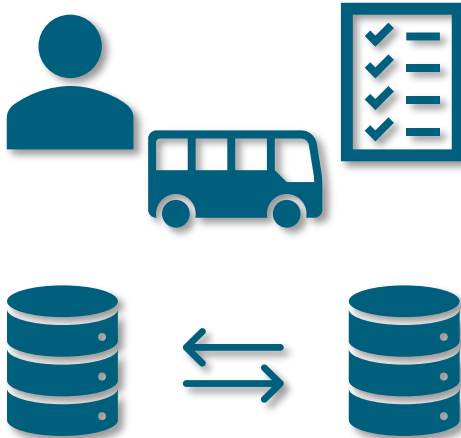
AP017 Member & TODS Board Member

January 2026

We're talking about TODS, not TODs

Transit Operational Data Standard ✅

Transit-Oriented Development ❌

Agenda

The need for TODS

Cal-ITP & "ODS" v1

The "TODS" v2+ evolution

TODS example

Into practice (…and the future)

The Journey of TODS
TRB Annual Meeting, January 2026

Massachusetts Bay Transportation Authority

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The need

The pre-TODS landscape

Transit systems rely on technical systems talking together

GTFS standardizes information exchange, eliminating redundant, resource-intensive custom interfaces

Vehicle & Crew Schedules

GTFS

Custom | Custom | Custom | Custom | Custom

What's Missing?

- Internal "Deadhead" trips
- Crew information
- Equipment information

Clocks | Signs | Mobile Apps | Website | Ticket Sales | Incident Response | Onboard Info | GPS Tracking | OTP | Dispatch | Simulation | Crew Info | Fuel Use | Engine Idling

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Cal-ITP and "ODS" v1

The Cal-ITP program and the dawn of the original "Operational Data Standard"

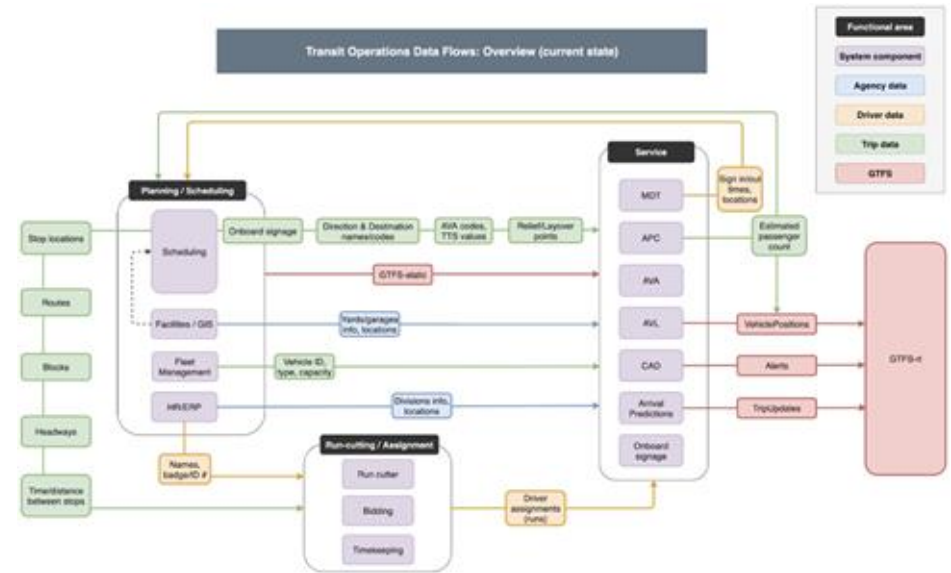# TODS origins in California Integrated Travel Project

+ **Cal-ITP established in 2017 by CalSTA and Caltrans with goal of making transit easier to use within the state**

  > Technical support to agencies: Payment modernization, data, etc

  > California Transit Data Guidelines

  > Master service agreements

+ **Found from agencies that lack of consistent data format between scheduling and real-time/dispatch software caused inefficiencies**

  > Switching one piece of software necessitated changes to the other

  > Different vendors have inconsistent nomenclature

Operational Data Standard Working Group

+ **Cal-ITP conducted market analysis, documented product requirements**

+ **Group of over 40 public and private stakeholders convened in 2021**

  > Developed a framework for an open data standard

  > Adopted v1 of ODS in May 2022

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"ODS" v1 drafted a standard for the initial missing link

How do we add crew and deadhead information to GTFS?

+ **Understanding the use case**

> Primary focus on sharing data **from a scheduling system to a bus AVL system**

> What doesn't GTFS already contain? Information about **driver runs** and the **deadhead bus trips** to/from garages and the start/end of shifts

+ **Structure**

> Added files **analogous to GTFS** for deadhead trips

deadheads.txt, deadhead_times.txt, ops_locations.txt

> Added files for **crew information**

runs_pieces.txt, run_events.txt

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TODS v2+

The evolution to the v2 standard and beyond

"ODS" v1's limitations preclude its use elsewhere *(especially RRs)*

Something is either "public" OR "private"; no means of adjusting existing public data

Railroads often have **public trips** that make **non-public stops** (e.g. train yards)

Railroads need to include **passing times** at interlockings (switches)

Railroads timetables sometimes have **different public vs internal times** for meets

Railroads often **subdivide public routes** into multiple internal routes

Railroads regularly swap equipment in terminals, so **"block" information is helpful for internal purposes** ONLY, but could lead to greater customer confusion

Railroads often have **internal place names** that differ from public names

Massachusetts Bay
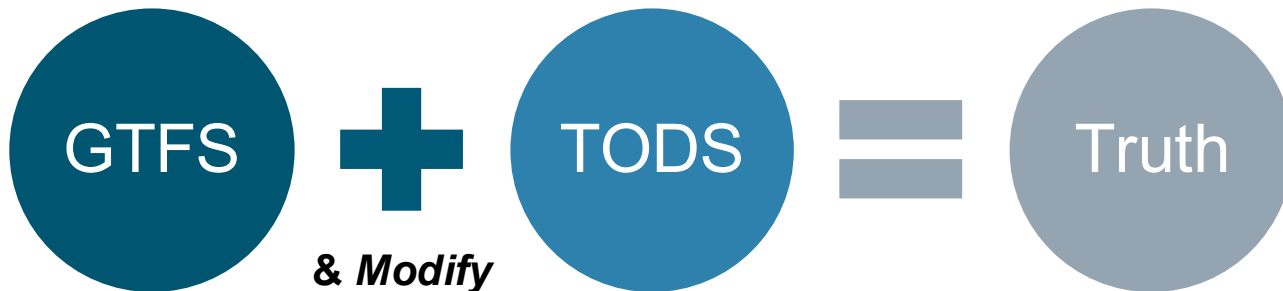Transportation Authority

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"TODS" v2 solves the key problem

Able to modify existing GTFS

+ Supplement file structure allows for **adding data to, AND modifying existing data in**, public GTFS

  > Enables **adding of non-public information to *existing* trips**

    Employee stops, interlocking timepoints, block information, etc.

  > Enables ***overwriting* of public information with internal data**

    Internal route identifiers, internal place identifiers, internal operating times, etc.

+ Standardization of **"TODS-Specific Files" consolidates** related information

  > run_events.txt revisions + new files employee_run_dates.txt; vehicles.txt; vehicle_assignments.txt

+ Provides a **framework for future standard evolutions**

  > Consistent processing means future adaptations easy to design, develop, and implement

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"TODS" v2+ solves the key problem

TODS allows users to add and modify their GTFS data with relevant non-public information critical to their operation

GTFS **+** TODS **=** Truth

& *Modify*

Public Information	**Internal Information**	**Accurate Model**
Trips & Schedules	Deadhead Trips	Fully-Accurate Trips
Routes	Non-Public Stops	System-Level View
Fare Information	Internal References	Context-Aware Terms
	Crew Runs	
	Vehicle & Employee Data	

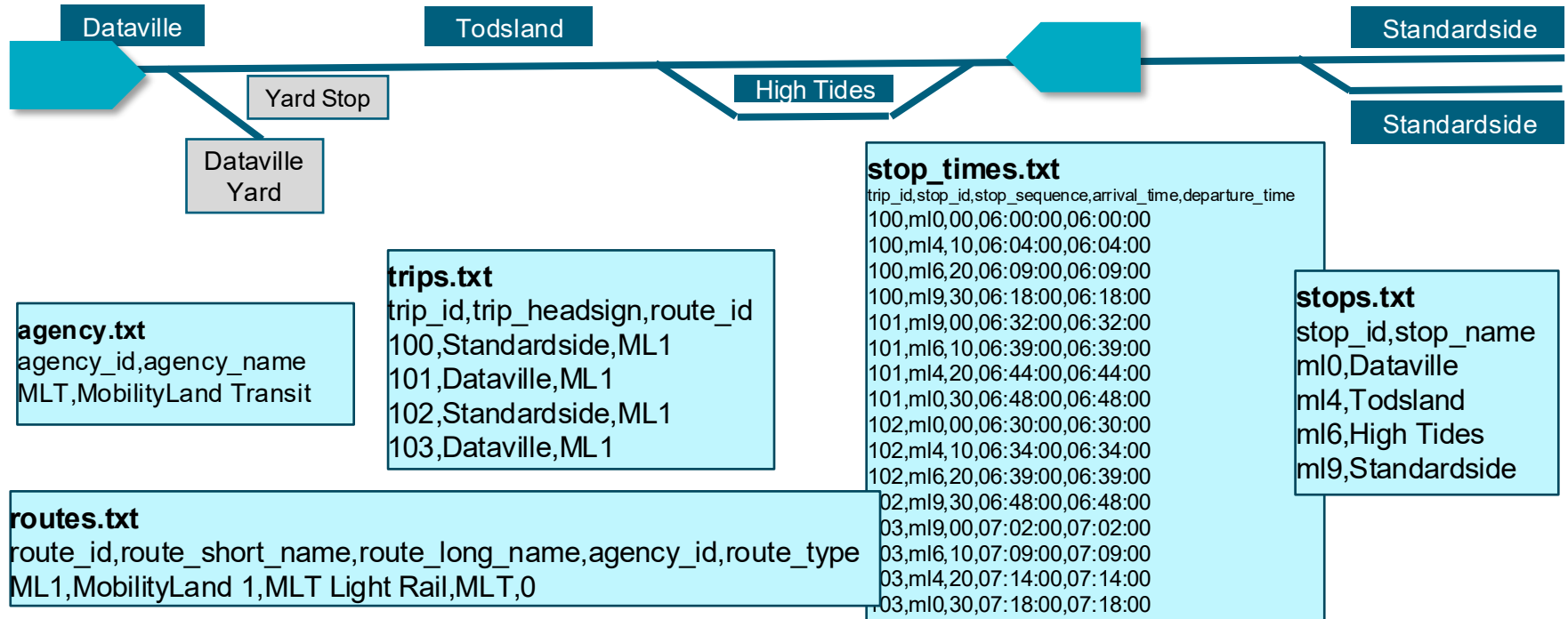Massachusetts Bay Transportation Authority

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Seeing it in action

Welcome to MobilityLand!

Introducing MobilityLand's new Light Rail line!

MobilityLand Route 1 between Dataville and Standardside

Dataville

Todsland

Standardside

Yard Stop

High Tides

Standardside

Dataville Yard

stop_times.txt
trip_id,stop_id,stop_sequence,arrival_time,departure_time
100,ml0,00,06:00:00,06:00:00
100,ml4,10,06:04:00,06:04:00
100,ml6,20,06:09:00,06:09:00
100,ml9,30,06:18:00,06:18:00
101,ml9,00,06:32:00,06:32:00
101,ml6,10,06:39:00,06:39:00
101,ml4,20,06:44:00,06:44:00
101,ml0,30,06:48:00,06:48:00
102,ml0,00,06:30:00,06:30:00
102,ml4,10,06:34:00,06:34:00
102,ml6,20,06:39:00,06:39:00
102,ml9,30,06:48:00,06:48:00
103,ml9,00,07:02:00,07:02:00
103,ml6,10,07:09:00,07:09:00
103,ml4,20,07:14:00,07:14:00
103,ml0,30,07:18:00,07:18:00

trips.txt
trip_id,trip_headsign,route_id
100,Standardside,ML1
101,Dataville,ML1
102,Standardside,ML1
103,Dataville,ML1

agency.txt
agency_id,agency_name
MLT,MobilityLand Transit

stops.txt
stop_id,stop_name
ml0,Dataville
ml4,Todsland
ml6,High Tides
ml9,Standardside

routes.txt
route_id,route_short_name,route_long_name,agency_id,route_type
ML1,MobilityLand 1,MLT Light Rail,MLT,0

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Updating trips.txt

Adding new trips and supplementing existing trip data

trips.txt
trip_id,trip_headsign,route_id,
        service_id
100,Standardside,ML1,sch1
101,Dataville,ML1,sch1
102,Standardside,ML1,sch1
103,Dataville,ML1,sch1

+

trips_supplement.txt
trip_id,block_id,,route_id,
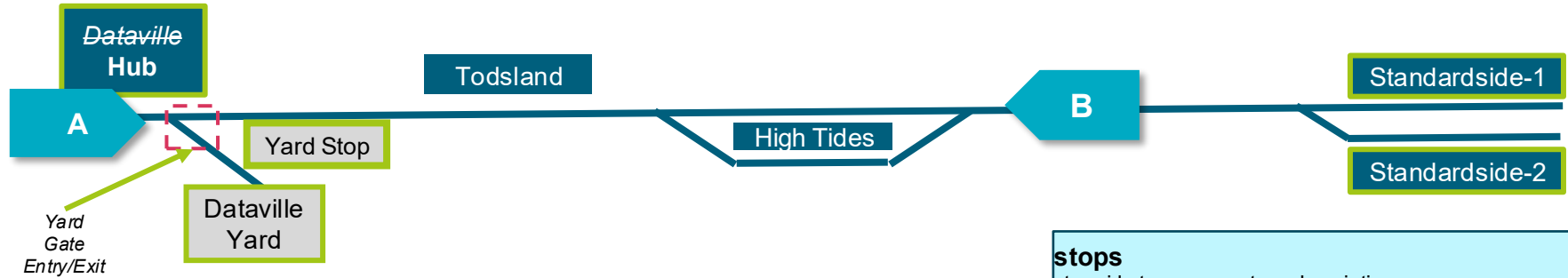   service_id
100,A
101,B
102,A
103,B
EQ100,A,ML1,sch1

=

trips
trip_id,trip_headsign,route_id, block_id, service_id
100,Standardside,ML1,**A**,sch1
101,Dataville,ML1,**B**,sch1
102,Standardside,ML1,**A**,sch1
103,Dataville,ML1,**B**,sch1
EQ100,,ML1,A,sch1

Updating stops.txt

Adding internal stops, renaming existing stops, and adding a parent station

Dataville ~~Hub~~ Hub

Todsland

Standardside-1

A

B

Yard Stop

High Tides

Standardside-2

Yard Gate Entry/Exit

Dataville Yard

stops.txt
stop_id,stop_name
ml0,Dataville
ml4,Todsland
ml6,High Tides
ml9,Standardside

+

stops_supplement.txt
stop_id,stop_name,stop_description,
    platform_code,parent_station,location_type
ml0,Hub
ml1,Yard Stop,Employees Only
stn-ss,Standardside Station,,1
ml9,,,stn-ss
ml9-1,Standardside,Track 1,1,stn-ss
ml9-2,Standardside,Track 2,2,stn-ss
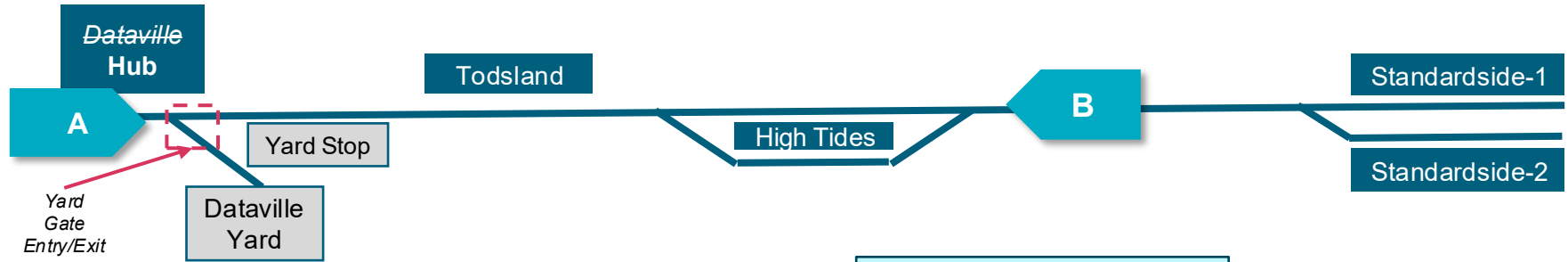yd,Dataville Yard
gate,Yard Gate Entry/Exit

=

stops
stop_id,stop_name,stop_description,
    platform_code,parent_station,location_type
ml0,**Hub**
ml1,Yard Stop,Employees Only
ml4,Todsland
ml6,High Tides
stn-ss,Standardside Station,,1
ml9-1,Standardside,Track 1,1,stn-ss
ml9-2,Standardside,Track 2,2,stn-ss
ml9,Standardside,,**stn-ss**
yd,Dataville Yard
gate,Yard Gate Entry/Exit

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Updating stop_times.txt

Adding times for internal trips, changing times on public trips, adding stops to public trips

Dataville
Hub

A

Todsland

B

Standardside-1

Yard Stop

High Tides

Standardside-2

Yard Gate Entry/Exit

Dataville Yard

stop_times.txt

trip_id,stop_id,stop_sequence,
    arrival_time,departure_time
100,ml0,00,06:00:00,06:00:00
100,ml4,10,06:04:00,06:04:00
100,ml6,20,06:09:00,06:09:00
100,ml9,30,06:18:00,06:18:00
101,ml9,00,06:32:00,06:32:00
101,ml6,10,06:39:00,06:39:00
101,ml4,20,06:44:00,06:44:00
101,ml0,30,06:48:00,06:48:00
102,ml0,00,06:30:00,06:30:00
102,ml4,10,06:34:00,06:34:00
102,ml6,20,06:39:00,06:39:00
102,ml9,30,06:48:00,06:48:00
103,ml9,00,07:02:00,07:02:00
103,ml6,10,07:09:00,07:09:00
103,ml4,20,07:14:00,07:14:00
103,ml0,30,07:18:00,07:18:00

+

stop_times_supplement.txt

trip_id,stop_id,stop_sequence,arrival_time,
    departure_time,pickup_type,drop_off_type
100,,20,20,06:10:00,06:10:00
101,,10,10,06:40:00,06:40:00
102,,20,20,06:40:00,06:40:00
103,,10,10,07:10:00,07:10:00
100,ml1,05,06:02:00,06:02:00,3,3
102,ml1,05,06:32:00,06:32:00,3,3
100,ml9-1,30
101,ml9-1,00
102,ml9-2,30
103,ml9-2,00
EQ100,yd,1,05:45:00,05:45:00
EQ100,gate,1,05:45:00,05:45:00,1,1
EQ100,ml0,2,05:50:00,05:50:00

=

stop_times.txt

trip_id,stop_id,stop_sequence,arrival_time,
    departure_time,pickup_type,drop_off_type
100,ml0,00,06:00:00,06:00:00
100,ml1,05,06:02:00,06:02:00,3,3
100,ml4,10,06:04:00,06:04:00
100,ml6,20,**06:10:00,06:10:00**
100,**ml9-1**,30,06:18:00,06:18:00
101,**ml9-1**,00,06:32:00,06:32:00
101,ml6,10,**06:40:00,06:40:00**
101,ml4,20,06:44:00,06:44:00
101,ml0,30,06:48:00,06:48:00
continued…

…
102,ml0,00,06:30:00,06:30:00
102,ml1,05,06:32:00,06:32:00,3,3
102,ml4,10,06:34:00,06:34:00
102,ml6,20,**06:39:00,06:39:00**
102,**ml9-2**,30,06:48:00,06:48:00
103,**ml9-2**,00,07:02:00,07:02:00
103,ml6,10,**07:10:00,07:10:00**
103,ml4,20,07:14:00,07:14:00
103,ml0,30,07:18:00,07:18:00
EQ100,yd,1,05:45:00,05:45:00
EQ100,gate,1,05:45:00,05:45:00,1,1
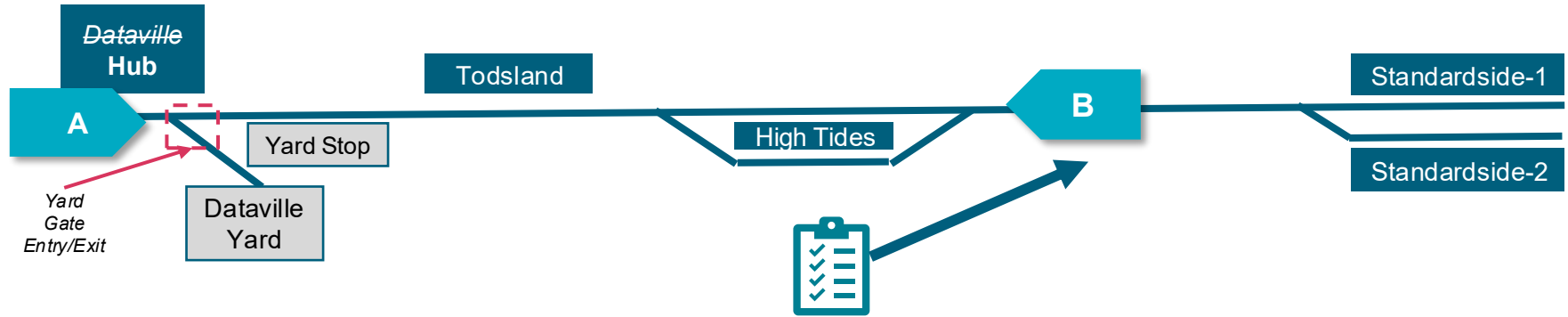EQ100,ml0,2,05:50:00,05:50:00

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Adding crew details

Adding times for internal trips, changing times on public trips, adding stops to public trips
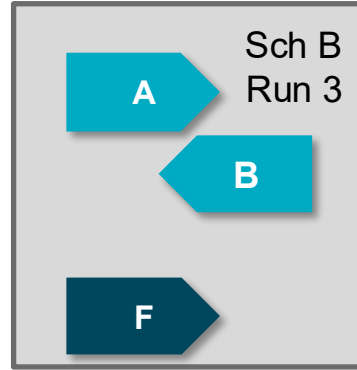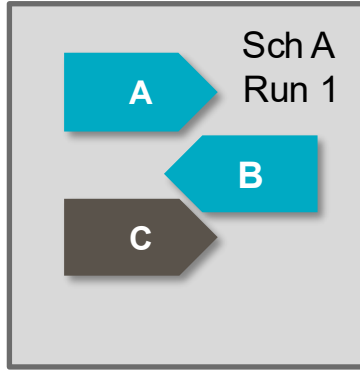


```
run_events.txt

service_id  ,run_id  ,event_sequence  ,job_type    ,event_type  ,trip_id  ,start_location  ,start_time  ,start_mid_trip  ,end_location  ,end_time
sch1A       ,1       ,0               ,Conductor   ,Sign-in     ,         ,yd              ,05:00:00    ,                ,yd            ,05:35:00
sch1A       ,1       ,1               ,Conductor   ,Conductor   ,EQ100    ,yd              ,05:45:00    ,                ,ml0          ,05:50:00
sch1A       ,1       ,2               ,Conductor   ,Conductor   ,100      ,ml0             ,06:00:00    ,                ,ml9-1        ,06:18:00
sch1A       ,1       ,2               ,Conductor   ,Conductor   ,101      ,ml9-1           ,06:32:00    ,                ,ml0          ,06:48:00
…
sch1B       ,1       ,0               ,AC          ,Sign-in     ,         ,yd              ,05:43:00    ,                ,yd            ,05:53:00
sch1B       ,1       ,1               ,AC          ,Walk        ,         ,yd              ,05:53:00    ,                ,ml1          ,05:58:00
sch1B       ,1       ,2               ,AC          ,Collector   ,100      ,ml1             ,06:02:00    ,1               ,ml9-1        ,06:18:00
sch1B       ,1       ,2               ,AC          ,Brakeman    ,101      ,ml9-1           ,06:32:00    ,                ,ml0          ,06:48:00
…
```

Assigning different crew runs to the same set of trips

Different crew schedules can share the same public trips e.g. across days of the week.

Sch A Run 1 — A, B, C

Sch B Run 3 — A, B, F

calendar_dates.txt
null

+

calendar_dates_supplement.txt
service_id,date,exception_type
sch1A,20260112,2
sch1B,20260112,1

=

service_id,date,exception_type
sch1A,20260112,2
sch1B,20260112,1

calendar.txt
service_id,monday,tuesday,wednesday,thursday,friday,saturday,sunday,start_date,end_date
sch1,1,1,1,1,1,0,0,20250101,20291231

+

calendar_supplement.txt
service_id,monday,tuesday,wednesday,thursday,friday,saturday,sunday,start_date,end_date
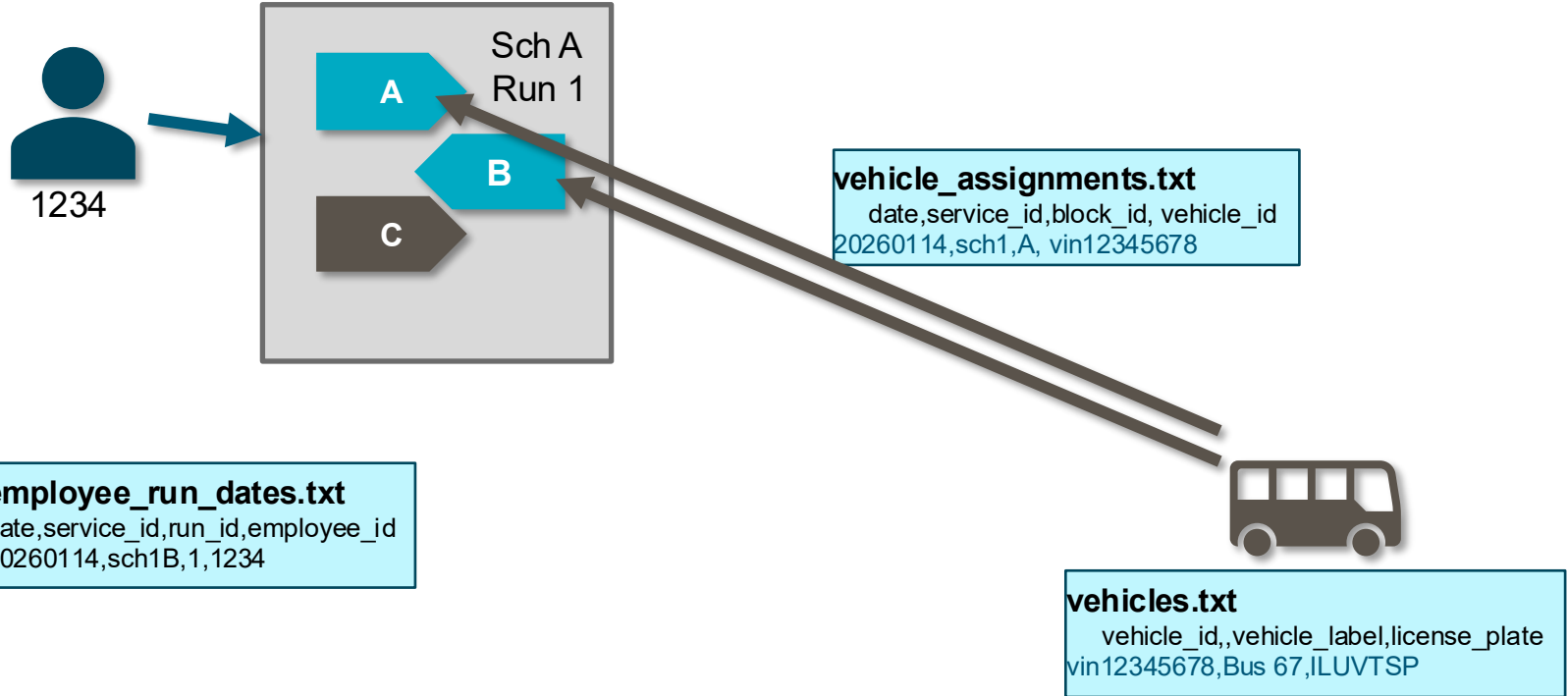sch1A,1,0,1,0,1,0,0,20250101,20291231
sch1B,0,1,0,1,0,0,0,20250101,20291231

=

service_id,monday,tuesday,wednesday,thursday,friday,saturday,sunday,start_date,end_date
sch1,1,1,1,1,1,0,0,20250101,20291231
sch1A,1,0,1,0,1,0,0,20250101,20291231
sch1B,0,1,0,1,0,0,0,20250101,20291231

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Assigning employees and vehicles on specific dates

TODS-specific files allow for definition of vehicles, and assignment of employees and vehicles to particular runs/blocks

Sch A
Run 1

1234

A

B

C

vehicle_assignments.txt
date,service_id,block_id, vehicle_id
20260114,sch1,A, vin12345678

employee_run_dates.txt
date,service_id,run_id,employee_id
20260114,sch1B,1,1234

vehicles.txt
vehicle_id,,vehicle_label,license_plate
vin12345678,Bus 67,ILUVTSP

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Into practice (…and beyond)

TODS outlook and how you can take part

Specification contributors

Public Organizations & Stakeholders (Transit Agencies, DOTs, Unions, Governments)

+ AC Transit

+ Clovis Transit

+ Foothill Transit

+ Golden Empire Transit

+ Kings Area Rural Transit

+ Los Angeles DOT

+ Marin Transit

+ Metrolink

+ Nevada County Connects

+ OmniTrans

+ Pasadena Transit

+ SamTrans

+ Stanislaus Regional Transit Authority

+ Community Transit

+ Massachusetts Bay Transportation Authority

+ Metro Transit

+ Sound Transit

+ TriMet

+ Amalgamated Transit Union

+ California Association for Community Transportation (CALACT)

+ California Integrated Travel Project (Cal-ITP)

+ Metropolitan Transportation Commission/511.org

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Specification contributors

Private organizations (Vendors, Operators, etc.)

+ Avail

+ Clever Devices

+ Connexionz

+ Cubic

+ Dilax

+ Engie

+ Giro

+ GMV Syncromatics

+ Init

+ Keolis

+ MV Transit

+ Optibus

+ Passio

+ Remix by Via

+ Routematch/Uber

+ Swiftly

+ The Master Scheduler

+ Trapeze

+ Trillium Solutions

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Adoption of v1 ODS & v2+ TODS

WATER EMERGENCY TRANSPORTATION AUTHORITY

remix by Via

Swiftly

optibus

GiRO

NAVINEO an offer from EQUANS

Upon request

In-development

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MobilityData management

+ **TODS incorporated a governance structure and body**

+ **MobilityData selected as the day-to-day manager of ODS**

  > Change management process

  > Maintaining spec repository

  > Managing resources

  > Internal, external project communications

+ **Joins MDIP, GTFS, and TIDES under unified management**

Mobility Data Interoperability Principles

General Transit Feed Specification

Transit ITS Data Exchange Specification

Transit Operational Data Standard

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Working groups have set the path forward for more use cases

+ **Specific working groups have discussed topics like:**

> Rostering

Allocating personnel to runs, distinguishing crew and vehicle services…

> Run times

By segment, time of day, service…

> Electric vehicles

Charging infrastructure, vehicle types, energy charging and consumption curves…

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Boosting Adoption! 🚀

TODS's evolution has enabled it to cover most critical operating use cases

Service Providers

- Press for TODS as the standard-of-choice for data exchange in internal tools, RFPs, & contracts.

Industry Vendors

- Implement TODS as a native import/export in your tools for easy interoperability.

Data Analysts & Researchers

- Start building tools and platforms that leverage TODS
  - *The more that's built, the more valuable the ecosystem (and publishing data) becomes for the community!*

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How to learn more & get involved

+ TODS Working Group

> Quarterly development prioritization

> Current issue working groups

> Contact TODS Manager Josh: jfabian@mbta.com

+ Read, use the spec

> https://tods-transit.org/ *(QR Below)*

+ AP017: Transit Data and Emerging Technologies Committee

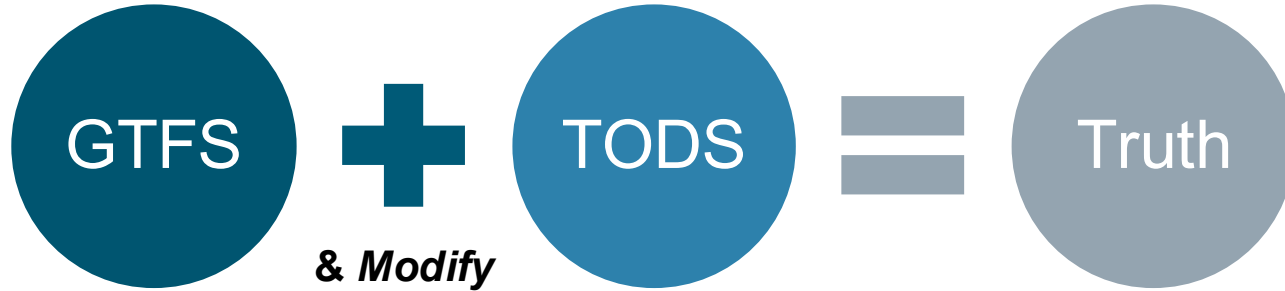> Looking for research & practice on new data standards & use thereof (e.g. TODS)

+ APTA Data Standards & Utilization Subgroup

> Agency Leadership Overviews & Staff Implementation / Best Practice Guides

> Connect with Chris Alfano and the jarv.us team for more on how to get involved

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"TODS" v2+ solves the key problem

TODS allows users to add and modify their GTFS data with relevant non-public information critical to their operation

GTFS **+** & *Modify* TODS **=** Truth

Public Information

Trips & Schedules

Routes

Fare Information

Internal Information

Deadhead Trips

Non-Public Stops

Internal References

Crew Runs

Vehicle & Employee Data

Accurate Model

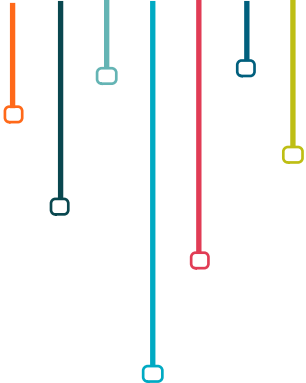Fully-Accurate Trips

System-Level View

Context-Aware Terms

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keolis

Let's talk TODS

Have questions? Feel free to reach out!

+ Jeff Kessler

> linkedin.com/in/**jeffkess**

> jeffrey.kessler@keoliscs.com

*Member of TRB AP017: Transit Data and Emerging Technologies Committee
& Transit Operational Data Standard (TODS) Board of Directors*

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From Unmet Need to *New Data Standard:*
The Journey of TODS

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January 2026