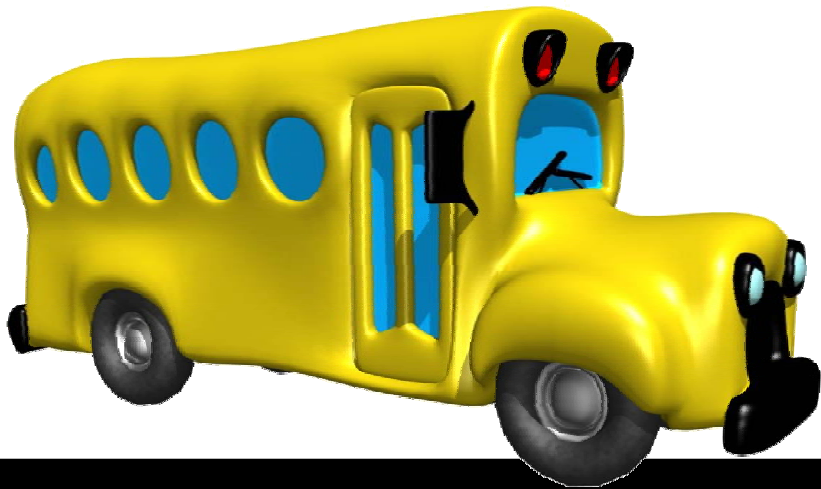


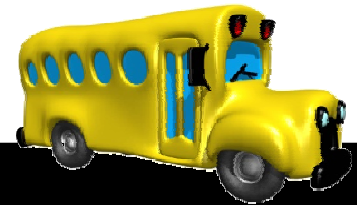
Edulog.nt Run Optimization
Using Simulation & Optimization
to
Develop a More Efficient
Transportation Plan



Simulation Concept in Edulog.nt

- Using the simulation feature is a way to make run and route changes in your system in “practice” mode.
- You can try any new routing scenario from a simple change to a complicated revision without worrying about affecting your real data.

Note: Run and Route Optimization are only available *through* Simulation.



NOTE 1

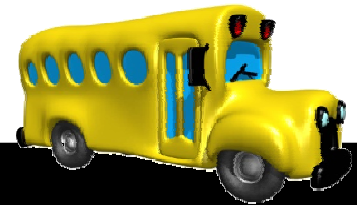
All manual references refer to the:

2007 TIMS/Edulognt User Manual

This manual may also be downloaded by following these directions:

WWW.NCBUSSAFETY.ORG

- > **TIMS** – School Bus Routing
- > **Documentation**



NOTE 2

The full Optimization PowerPoint may be viewed and/or downloaded at:

WWW.NCBUSSAFETY.ORG

- > **TIMS – School Bus Routing**
- > **Training Presentations**


A journey of a thousand miles begins with a single step.

North Carolina School Bus Safety

ncbussafety.org

North Carolina Department of Public Instruction - Raleigh, North Carolina

safety NC resources vehicles library calendar mailing lists archived news contact safety center home search



TIMS Training Presentations

The Transportation Information Management System (TIMS)

Web Presentations

- o [Autostreeter Setup](#)
- o [Basic & Advanced Reporting TIMSNT part 1](#) (Dec. 2003)
- o [Basic & Advanced Reporting TIMSNT part 2](#) (Dec. 2003)
- o [Basic & Advanced Reporting TIMSNT part 3](#) (Dec. 2003)
- o [Boundary Creation](#) (Dec. 2003)
- o [GEBndPlan \(GISMO\) Overview](#) (Dec. 2003)
- o [Editing Run and Route Directions - TIMS NT](#)
- o [Edulog's Map Registration System \(MARIS\)](#)
- o [Edulog Maintenance Utility Training](#)
- o [New User](#)
- o [TIMS NT Introduction - Part 1](#)
- o [TIMS NT Introduction - Part 2](#)
- o [TIMS NT Introduction - Part 3](#)
- o [Tims NT Run Optimization](#)
- o [STOP](#)

Powerpoint Presentation Downloads

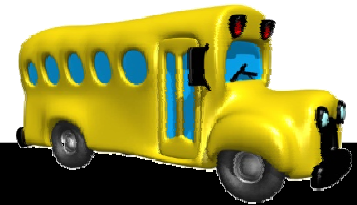
If you would like to download the presentation to your local computer, use the right mouse button when you select the link. When the pop-up menu appears, select SAVE AS.

- [Autostreeter Setup](#)
- [Basic & Advanced Reporting TIMSNT](#) (Dec. 2003)
- [Basic & Advanced Reporting TIMSNT](#) (Dec. 2003)
- [Basic & Advanced Reporting TIMSNT](#) (Dec. 2003)
- [Boundary Creation](#) (Dec. 2003)
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- [TIMS NT Introduction - Part 1](#)
- [TIMS NT Introduction - Part 2](#)
- [TIMS NT Introduction - Part 3](#)
- [Tims NT Run Optimization](#)
- [STOP](#)

- [2007 TDTIMS Class](#)

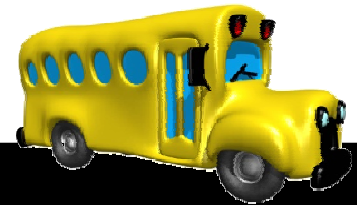
What Is Run Opt?

Run Opt is a component of simulation that helps you create a new set of bus runs from an existing set of stops



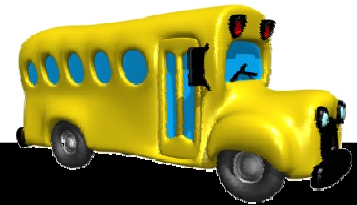
Overview

1. Define your problem
2. Verify that your Data is up to date
3. Run Optimization - Get First Best Solution
4. Run Simulation – Refine your Solution
5. Route optimization
6. Implement Solution



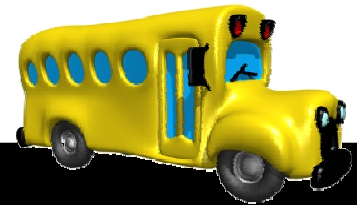
Define Your Problem

- **One time specific need** or part of a plan for **monitor your transportation plan.**
- Are you trying to reduce runs
 - For total fleet
 - Certain schools or area
 - Is there a target number?
- Are you optimizing due to redistricting, new schools, or staggered bell times ,Single tier to multi tier?



Verify Your Data

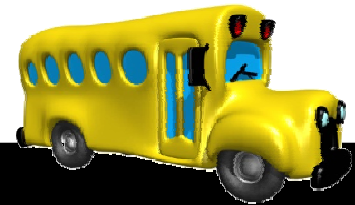
- **Stop data** – Must be Current and ALL stops located – Do NOT have to be on runs.
- All other transportation data should be current.
- **Maps** must be current.
- Student data – **Assignments** must be current for capacity to be accurate.
- If redistricting, **Boundaries** must be current.
- **Bell times** must be current or set to proposed changes.



Verify Your Data

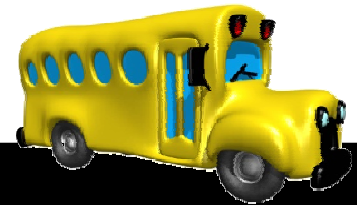
Things to Consider:

- Run optimization **will not work with transfers.**
- **Which stops** to include - Fall Planning, Staggering, Merging Transportation?
- **Multi-school** scenarios - current or possible?
- **Bell time changes** – Current/Proposed?
- Are new tiering scenarios possible?



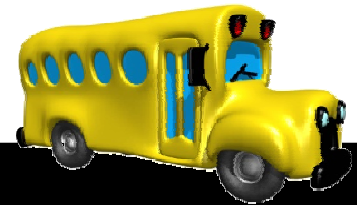
Improvements

- One set of tools for manipulating Runs and Routes are used in Simulation and Regular Data.
- Optimization functions are limited to the creation of new “starting points” --- all the other tools used for cleanup and refinement are the same as those used elsewhere in the system.



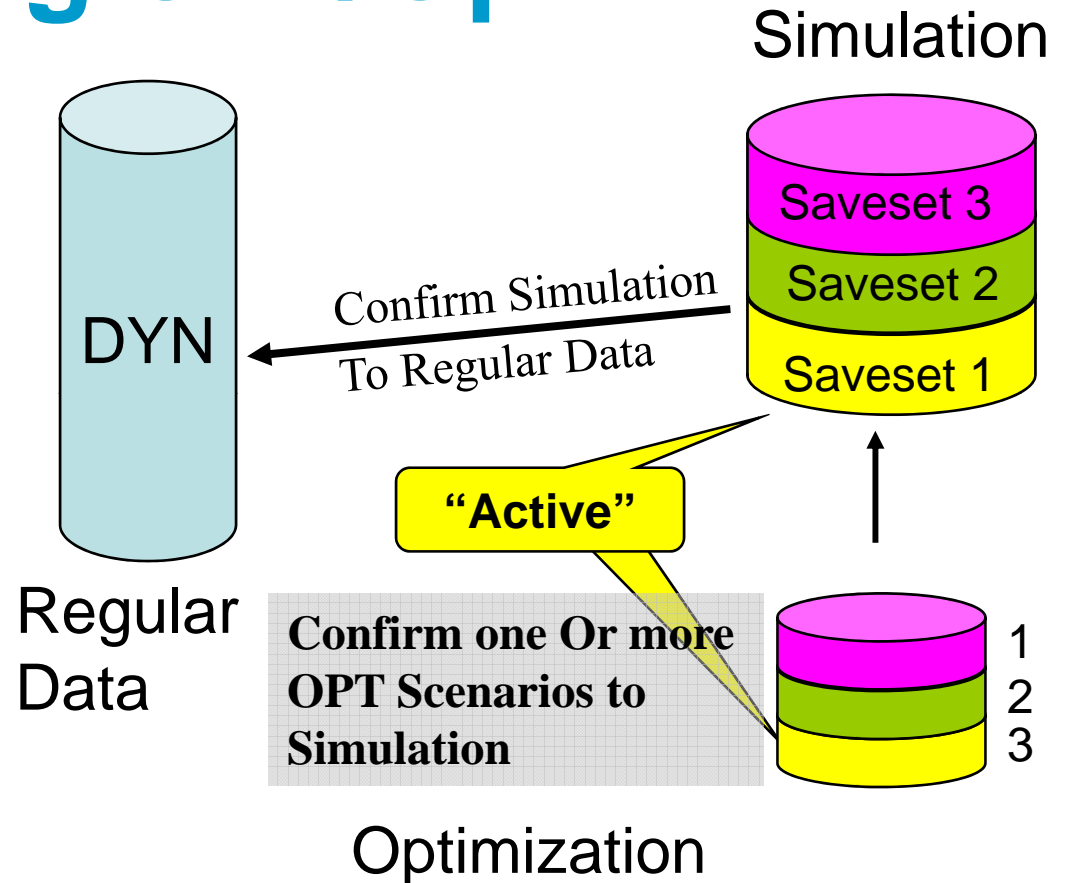
Results

- Sim/Opt in Edulog.nt is similar to what you see in Edulognt with stops and runs
- Fewer separate kinds of functions to learn to accomplish the same tasks
- Much greater flexibility in developing scenarios and saving various solutions



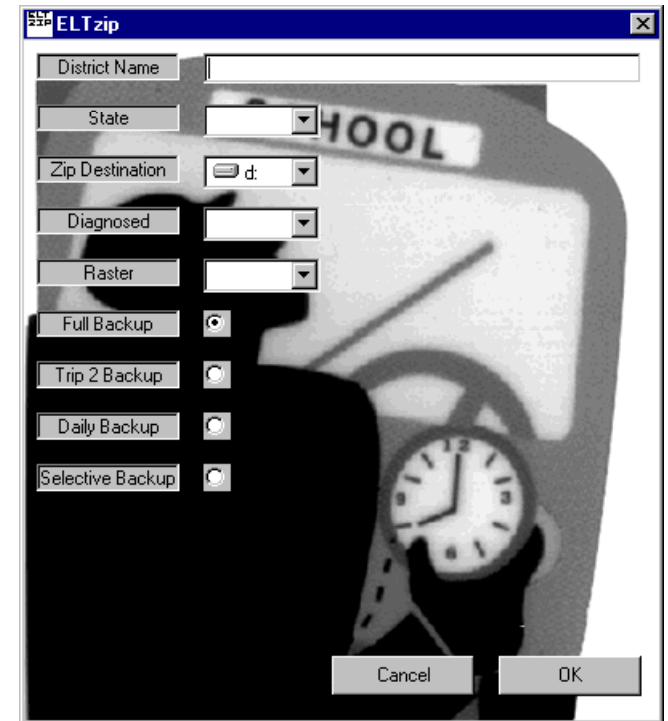
Using Sim/Opt

- Optimization may or may not be used once you are in Simulation
- If you do use OPT, you confirm OPT to SIM, then SIM to regular data

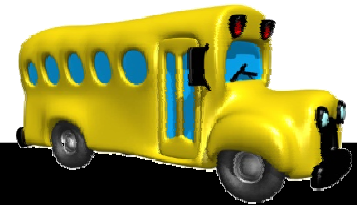


Back Up Your Data!

- The number of savesets and locations of SIM and OPT data can be confusing
- Back up first in case you confirm something into your regular data by mistake!

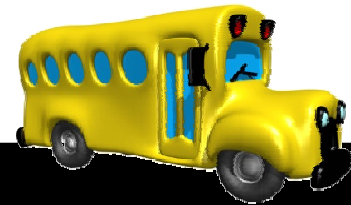


Back Up Your Data!
Back Up Your Data!
Back Up Your Data!
Back Up Your Data!
Back Up Your Data!
Back Up Your Data!
Back Up Your Data!
Back Up Your Data!
Back Up Your Data!



How does it all work?

1. Know what your plan is!
2. Start EdulogNT
3. >File > Enter Simulation
 - Load the Stops and/or Runs (Use Worklists!)
4. >File > Enter Optimization > Runs
5. Complete Optimization (save one or more SaveSets)
6. >File > Exit (This Returns you to Simulation)
7. Cleanup Optimization Solution
8. Exit Optimization (Save to real database if satisfied with solution)



Entering Simulation

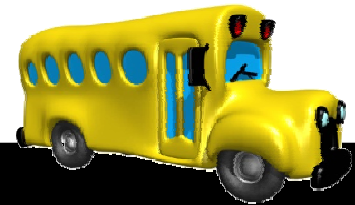
The 'Other' Option

- The yellow "S" the Simulation



takes you into

- Only after you enter Simulation can you proceed with Run Optimization

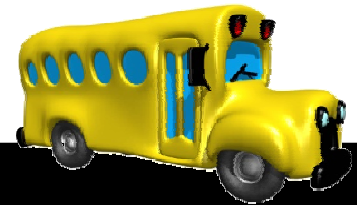


Enter Optimization

1. From Simulation: File>Enter Optimization>Run
2. >Problem Definition > School/Stop Selection

REMEMBER

- When to load data?
- You can only work with data loaded properly into your Simulation



Run OPT Problem Definition

The first screen you will see asks you to decide basic questions about your Run OPT session.

- AM or PM
- Assigned Load or Head Count
- Deadhead Mode

Problem Definition Switches

Direction of Run
 To school
 From school

Type of Load
 Assigned loads
 Head counts

Deadhead Mode
 Rectangular
 Crowflight
 Arterial time
 Arterial dist

Frequency
MTWUF-----0009-09-199806-25-1999

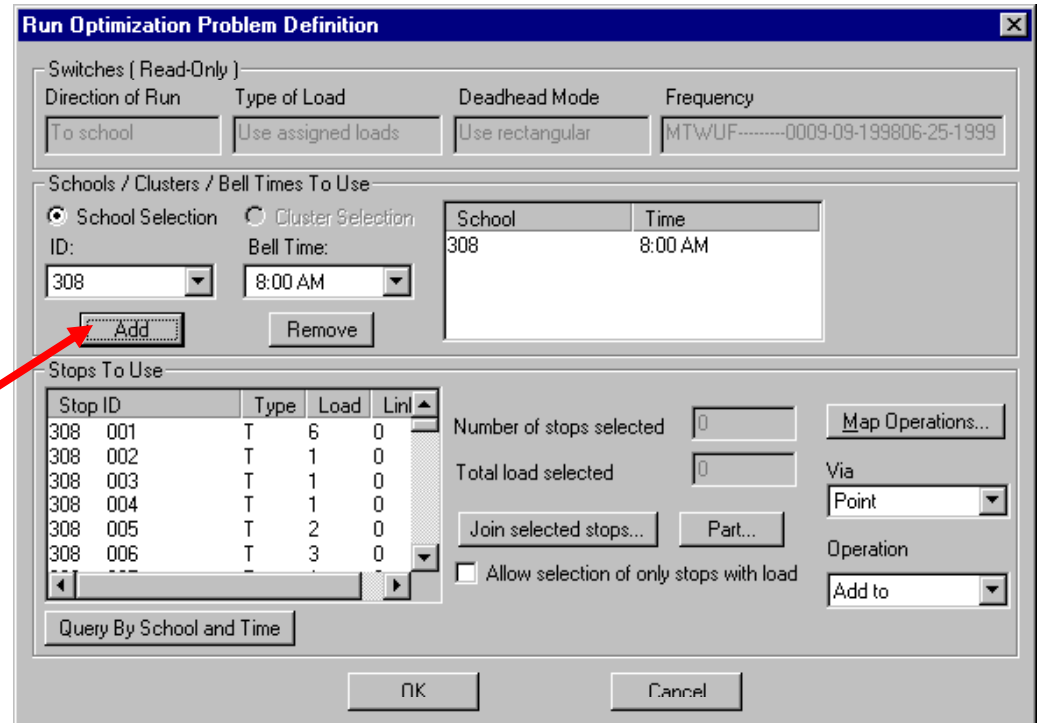
Change Frequency

OK Cancel



Run OPT Problem Definition

- Next, you will determine which of your loaded schools will be included in this problem
- Click the Add button to add your selections to the stops to use



The screenshot shows the 'Run Optimization Problem Definition' dialog box. It is divided into several sections:

- Switches (Read-Only):** Contains four sub-sections: 'Direction of Run' (To school), 'Type of Load' (Use assigned loads), 'Deadhead Mode' (Use rectangular), and 'Frequency' (MTWUF-----0009-09-199806-25-1999).
- Schools / Clusters / Bell Times To Use:** This section is highlighted. It has two radio buttons: 'School Selection' (selected) and 'Cluster Selection'. Below them are 'ID:' (308) and 'Bell Time:' (8:00 AM) dropdown menus. An 'Add' button is highlighted with a red arrow, and a 'Remove' button is also present. To the right is a table with columns 'School' and 'Time', containing one row: '308' and '8:00 AM'.
- Stops To Use:** Contains a table with columns 'Stop ID', 'Type', 'Load', and 'Link'. The table lists six stops for school 308. To the right of the table are fields for 'Number of stops selected' and 'Total load selected', both currently at 0. There are buttons for 'Join selected stops...', 'Part...', and 'Map Operations...'. A 'Via' dropdown is set to 'Point'. There is an 'Operation' dropdown set to 'Add to' and a checkbox for 'Allow selection of only stops with load' which is unchecked.
- Buttons:** At the bottom are 'OK' and 'Cancel' buttons. A 'Query By School and Time' button is located at the bottom left of the 'Stops To Use' section.



Run OPT Problem Definition

- If you are working with more than one school, you would select it from the pull down, and add it as well
- The second school would then appear in the right window

Run Optimization Problem Definition

Switches (Read-Only)

Direction of Run: To school Type of Load: Use assigned loads Deadhead Mode: Use rectangular Frequency: MTWUFD-----0009-09-199806-25-1999

Schools / Clusters / Bell Times To Use

School Selection Cluster Selection

ID: 308 Bell Time: 8:00 AM

Add Remove

School	Time
308	8:00 AM

Stops To Use

Stop ID	Type	Load	Link
308 001	T	1	0
308 002	T	1	0
308 003	T	1	0
308 004	T	1	0
308 005	T	2	0
308 006	T	3	0

Number of stops selected: 0 Total load selected: 0

Join selected stops... Part... Map Operations...

Via: Point Operation: Add to

Allow selection of only stops with load

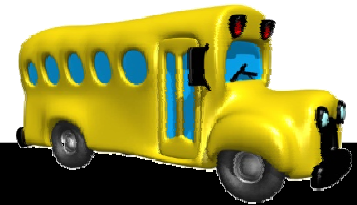
Query By School and Time

OK Cancel



Loading Data

- Load School Stops!
 - Run Optimization won't function until at least one school stop has been loaded (i.e. 304.000).
 - If you only load cluster stops, you will have to manually load schools before you can use Opt.
- Load Stops
 - Load the set of stops you want to work with from a worklist, range, or individually by stop number.



Selecting Stops

- You must select stops before you can proceed
- You can do this by selecting the top stop and scrolling down to the bottom of the window and holding <shift> down while selecting the last stop

Run Optimization Problem Definition

Switches (Read-Only)

Direction of Run	Type of Load	Deadhead Mode	Frequency
To school	Use assigned loads	Use rectangular	MTWUF-----0009-09-199806-25-1999

Schools / Clusters / Bell Times To Use

School Selection Cluster Selection

ID: 308 Bell Time: 8:00 AM

Add Remove

School	Time
308	8:00 AM

Stops To Use

Stop ID	Type	Load	Lin1
308 184	T	10	0
308 210	T	1	0
308 213	T	2	0
308 216	T	8	0
308 220	T	16	0
308 400	T	0	0

Number of stops selected: 126

Total load selected: 447

Map Operations... Via: Point

Join selected stops... Part... Operation: Add to

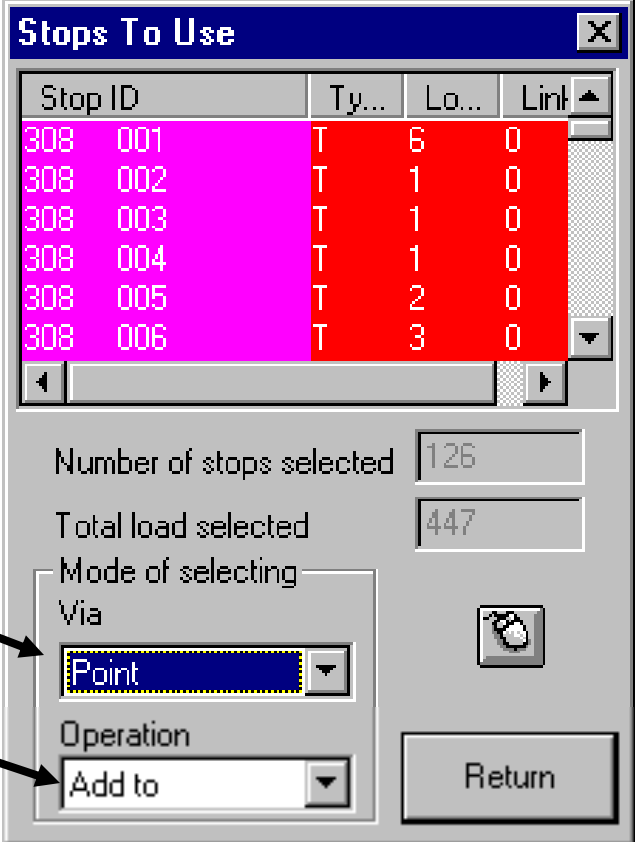
Allow selection of only stops with load

OK Cancel



Selecting Stops via the Map

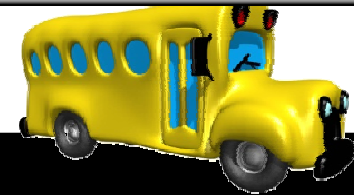
- Selecting on Map Operations brings up a different “Stops to Use” window
- This allows you to pick stops by [Point or Polygon](#) with options for [Adding or Removing stops](#)
- Click Return when you have finished selecting stops



The screenshot shows a window titled "Stops To Use" with a table of stop data and several control elements. The table has columns for Stop ID, Ty..., Lo..., and Link. The first six rows are highlighted in pink and red. Below the table, there are input fields for "Number of stops selected" (126) and "Total load selected" (447). A "Mode of selecting" section includes a "Via" dropdown menu set to "Point" and an "Operation" dropdown menu set to "Add to". A "Return" button is located at the bottom right of the window.

Stop ID	Ty...	Lo...	Link
308 001	T	6	0
308 002	T	1	0
308 003	T	1	0
308 004	T	1	0
308 005	T	2	0
308 006	T	3	0

Number of stops selected: 126
Total load selected: 447
Mode of selecting:
Via: Point
Operation: Add to
Return



Finishing Problem Definition

Note the number of stops and load selected before selecting OK

Run Optimization Problem Definition

Switches (Read-Only)
Direction of Run: To school Type of Load: Use assigned loads

Schools / Clusters / Bell Times To Use
 School Selection Cluster Selection
ID: 308 Bell Time: 8:00 AM
Add Remove

Stops To Use

Stop ID	Type	Load	Lin1
308 184	T	10	0
308 210	T	1	0
308 213	T	2	0
308 216	T	8	0
308 220	T	16	0
308 400	T	0	0

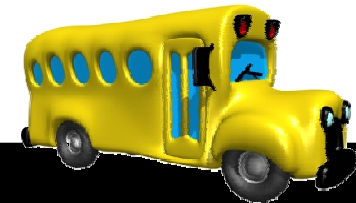
Number of stops selected: 126
Total load selected: 447

Map Operations...
Via: Point
Operation: Add to

Join selected stops... Part...
 Allow selection of only stops with load

Query By School and Time

OK Cancel



Global Moves>Run Generation

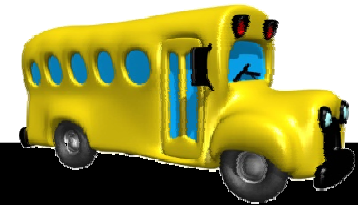
Select the number of buses and capacity

- Click on Add
- You can enter several different sets of buses/capacities before clicking OK
- Buses/capacities will appear in the right window

Fleet Information

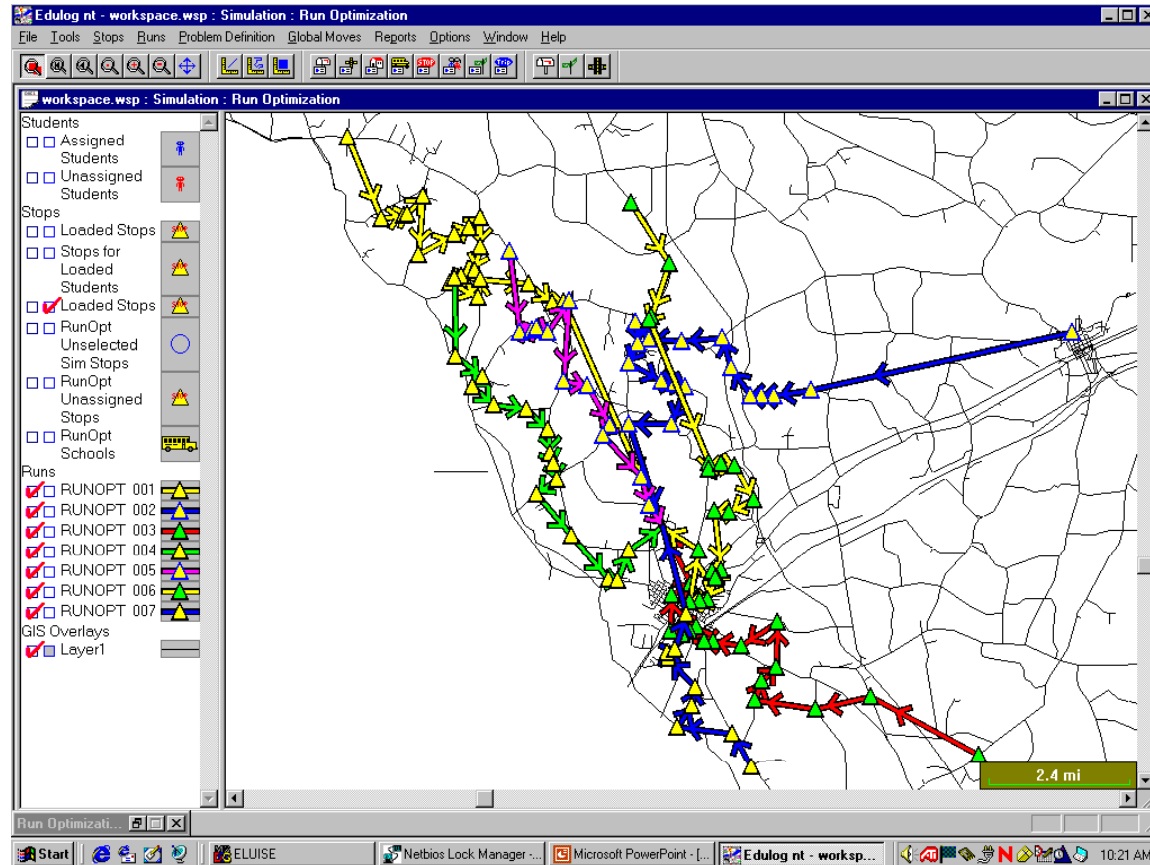
# Runs to create	7	Total number of buses	7
Capacity	Minimum: 0, Maximum: 66	7 @ (0,66) (0,600)	
Riding time	0, 600		

Buttons: Add, Remove, OK, Cancel



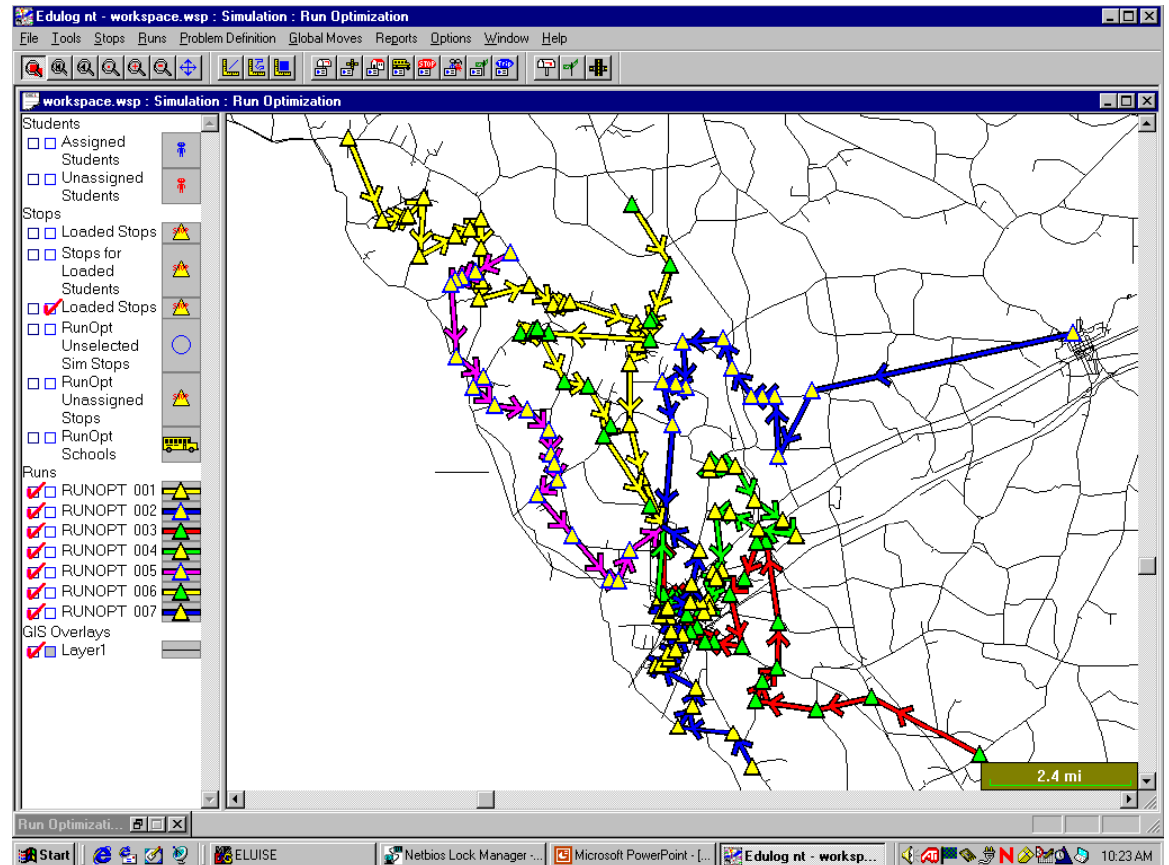
Runs!

Runs are now available to work with



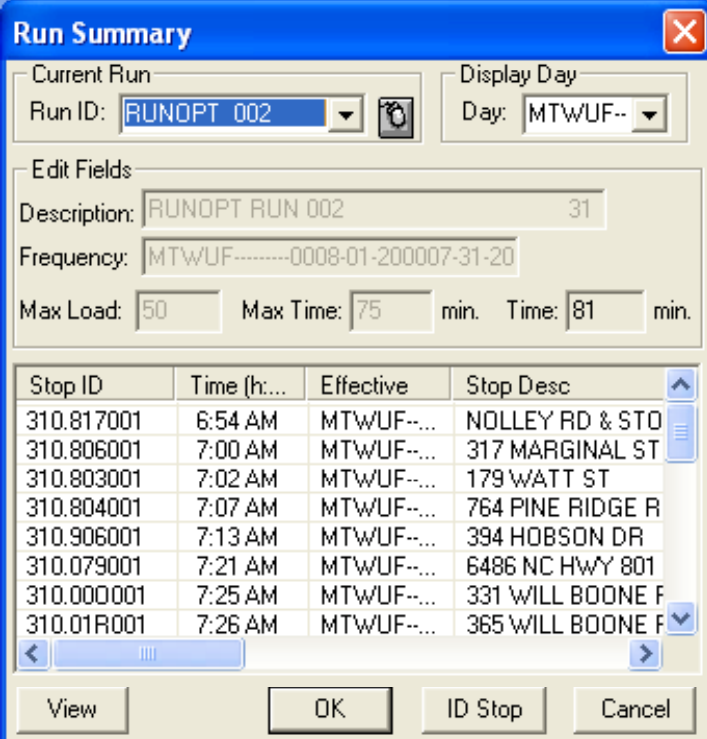
Global Moves>Improving Runs

- Use the **Improve Runs** function under Global Moves until no moves are made.
- Runs shown have been through 3 sets of the improve function.



Checking Runs

- **Runs > Open Run Summary** shows you stats about one run at a time
- Check each run by selecting the mouse and clicking on the run on the map, or select the run ID from the pull down menu

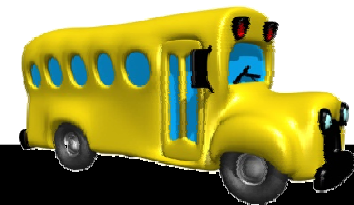


The screenshot shows a 'Run Summary' dialog box with the following fields and data:

- Current Run:** Run ID: RUNOPT 002, Display Day: MTWUF--
- Edit Fields:** Description: RUNOPT RUN 002, Frequency: MTWUF-----0008-01-200007-31-20
- Max Load:** 50, **Max Time:** 75 min, **Time:** 81 min.

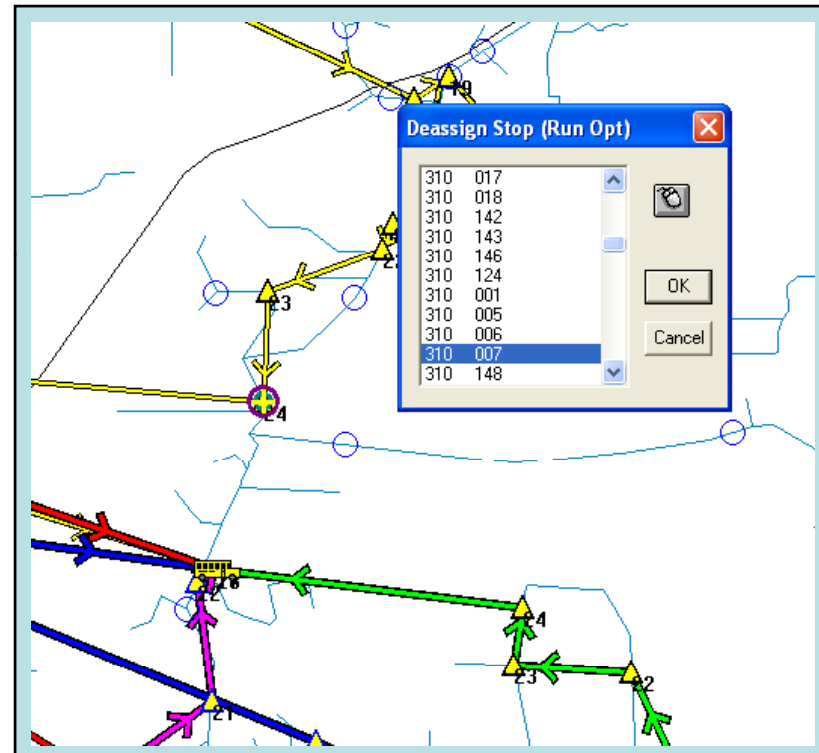
Stop ID	Time (h...	Effective	Stop Desc
310.817001	6:54 AM	MTWUF--...	NOLLEY RD & STO
310.806001	7:00 AM	MTWUF--...	317 MARGINAL ST
310.803001	7:02 AM	MTWUF--...	179 WATT ST
310.804001	7:07 AM	MTWUF--...	764 PINE RIDGE R
310.906001	7:13 AM	MTWUF--...	394 HOBSON DR
310.079001	7:21 AM	MTWUF--...	6486 NC HWY 801
310.000001	7:25 AM	MTWUF--...	331 WILL BOONE F
310.01R001	7:26 AM	MTWUF--...	365 WILL BOONE F

Buttons at the bottom: View, OK, ID Stop, Cancel



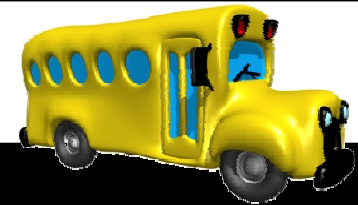
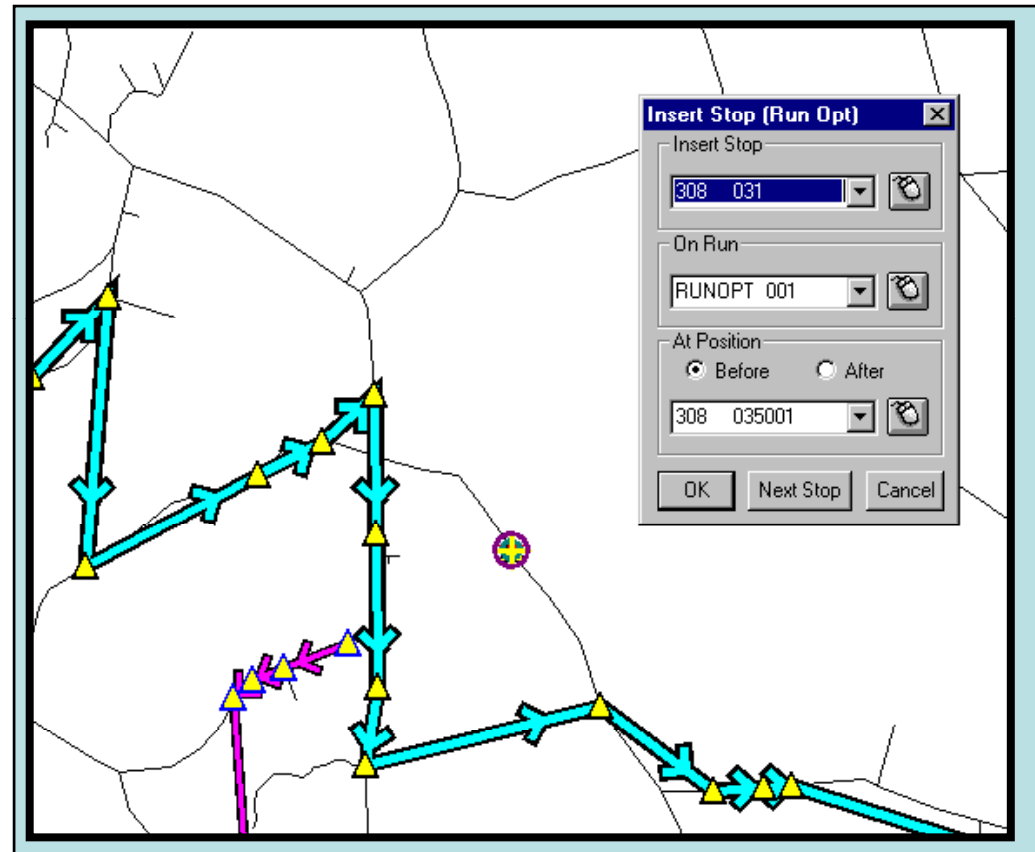
Making Edits to Your RUNOPT Runs

Stops > Deassign
allows you to
remove several
stops at once.



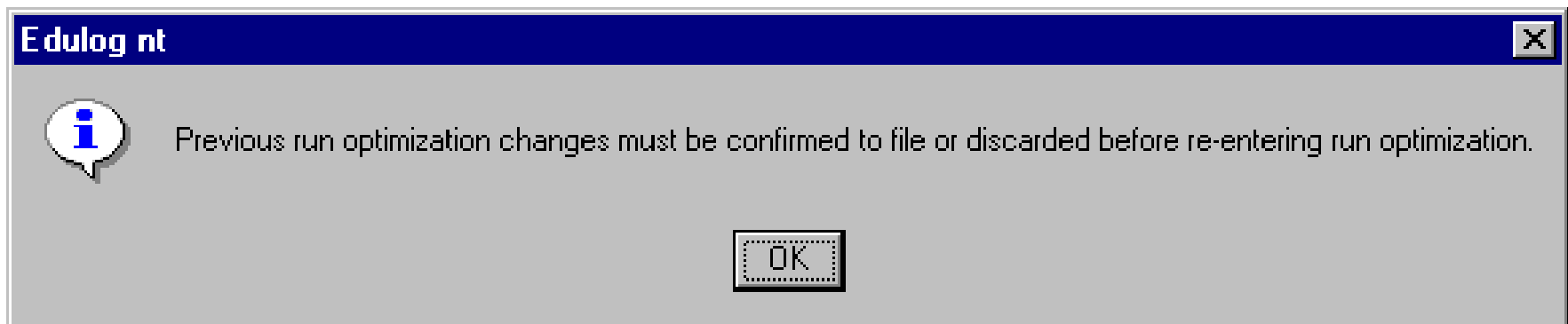
Inserting Stops On New Runs

- Inserting stops within run OPT is not very refined at this time
- Once you insert, you can run “improve runs” to make better sequences



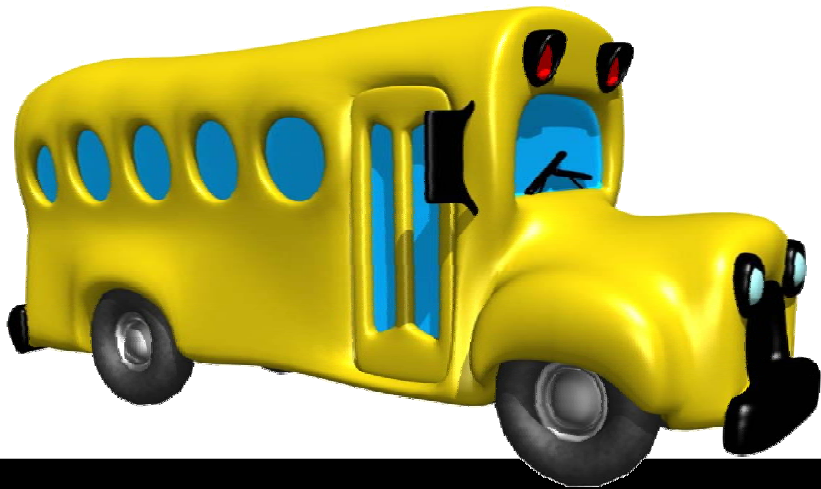
Saving OPT Runs to Simulation

- Saving runs back to simulation will allow you to make edits easily
- Once you do this, you must confirm your changes from the first session of run OPT to a file or your data before you can re-enter run OPT



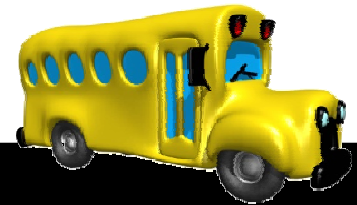
Making Additional Manual Modifications in Simulation

**This portion functions like
standard EdulogNT.**



Make Sure

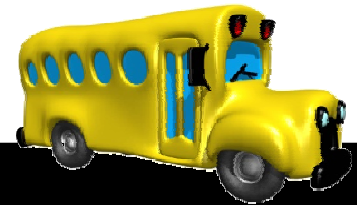
- Once you have confirmed your runs from Simulation back into your real data, **YOUR REAL DATA IS CHANGED!**
- You can only go back if you have a good **BACKUP!**



Recap

How You Should Use Run OPT

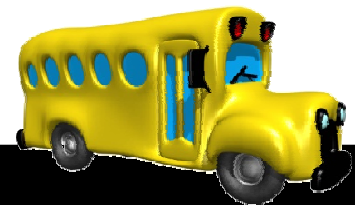
- You should think of OPT as a tool to be used as part of simulation
- It will give you a starting point for a particular set of runs
- Simulation allows you to continue to work with the runs to clean them up and make other needed edits



Recap

What You Do Where

- Optimization – Basic run generation, de-assigning and reassigning stops
- Simulation – Local moves with improved run data (no actual run directions, but time estimates in easier to use format)
- Regular Data – Real run directions and edits to run directions and reports!



TextPad - [C:\users\jchesse\TMP\RUNOPT.RPT]

File Edit Search View Tools Macros Configure Window Help

RUNOPT.RPT

REPORT CODE: OPTSYS- 2 DATE: 21-May-2002 TIME: 10:07 am
 PAGE: 1 OPTRNS RUN REPORT

0 RUN ID: unasgn 0 # STOPS: 112
 MINCAP: 0 RUN LOAD: 240 MAXCAP: 0 MINTME: 0 RUN TIME: 9999 MAXTME: 0

STP ID	STPTME	LODCHR	LODTME	CNTTME	STPLOD	RUNLOD	STOP DESCRIPTION
	8:09	-2	0	0	0	0	DUMMY CONNECTOR
310 001	8:13	1	0	73	11	11	MOUNTVIEW DR & WINDSONG RD
310 002	8:10	1	0	100	1	12	418 FORK BIXBY RD
310 003	8:12	1	0	80	1	13	832 WILLIAMS RD
310 005	8:12	1	0	83	5	18	WHITNEY RD & MORSE ST
310 006	8:08	1	0	125	2	20	531 CEDAR GROVE RD
310 007	8:17	1	0	31	3	23	897 CORNATZER RD
310 00A	8:05	1	0	147	1	24	CORNATZER RD & JOE MYERS RD
310 00B	8:11	1	0	87	1	25	228 RALPH RD
310 00C	8:12	1	0	78	1	26	JOHN CROTTS RD & DECK CIR
310 00D	8:12	1	0	84	1	27	991 MILLING RD-AM STOP
310 00E	8:06	1	0	139	2	29	3357 US HWY 64 E
310 00F	8:10	1	0	103	1	30	791 FORK BIXBY RD
310 00I	8:07	1	0	130	2	32	1384 FORK BIXBY RD
310 00J	8:09	1	0	114	1	33	162 DEACONS WAY
310 00N	8:05	1	0	154	2	35	DEADMON RD & REDWOOD DR
310 00Q	8:14	1	0	64	1	36	240 MULLINS RD
310 00R	8:08	1	0	123	1	37	647 CEDAR GROVE CHURCH RD
310 00S	8:16	1	0	44	1	38	232 JAMESTOWNE DR-AM STP
310 00T	8:08	1	0	121	1	39	168 HOWARDTOWN RD
310 010	8:09	1	0	108	2	41	278 FORK BIXBY RD- AM STOP
310 011	8:12	1	0	84	6	47	WHITNEY RD & FULTON ST
310 012	8:12	1	0	78	3	50	MARCONI ST & FULTON ST
310 013	8:07	1	0	133	1	51	NC HWY 801 S & BARNHARDT LN
310 015	8:12	1	0	76	5	56	META BREEZE LN & ROLLING HILLS LN
310 019	8:13	1	0	73	5	61	CREEKSIDE DR & META BREEZE LN
310 020	8:08	1	0	116	1	62	294 HOWARDTOWN RD
310 021	8:02	1	0	182	4	66	235 SEAFORD RD
310 023	8:12	1	0	77	6	72	MOUNTVIEW DR & HOLLOW HILL CT
310 024	8:06	1	0	139	2	74	CORNATZER RD & SPRY LN
310 028	8:15	1	0	51	2	76	NO CREEK RD & HICKORY TREE RD
310 029	8:12	1	0	82	4	80	779 TURRENTINE RD
310 031	8:09	1	0	115	2	82	3140 US HWY 64 E
310 032	8:01	1	0	191	3	85	SEAFORD RD & LYDIA LN
310 033	8:07	1	0	130	2	87	WILL BOONE RD & TUTTS TR
310 034	8:14	1	0	61	5	92	338 FRANK SHORT RD
310 035	8:13	1	0	66	3	95	DALTON RD & ERIC RD
310 037	8:07	1	0	126	2	97	CEDAR GROVE RD & BRANCHVIEW LN
310 038	8:13	1	0	71	3	100	485 WHITNEY RD
310 039	8:13	1	0	72	3	110	MOUNTVIEW DR & HUNNARD CIR STOP CT

ANSI Characters

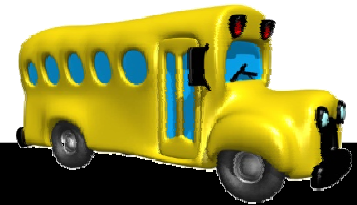
33 !
 34 "
 35 #
 36 \$
 37 %
 38 &
 39 '
 40 (
 41)
 42 *
 43 +
 44 ,
 45 -
 46 .
 47 /
 48 0
 49 1
 50 2
 51 3
 52 4
 53 5

Summer Conference Run Optimization

Run OPT Practice 2

Hints

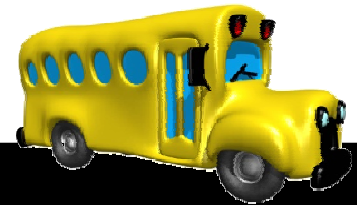
- Double-check the numbers to make sure your data matches the example.
- If it doesn't, adjust your solution to match your situation.
- Go ahead and save a preliminary solution, then save periodically to new names as you make progress – that way, you can go back to various stages and try different strategies



Run OPT Practice 2

Hints

- Practice checking the status of your manual changes by going to **Runs > Open Run Summary**, scrolling over to the run load columns.
- Periodically check the overall status of runs by going to **Reports > Generate Solution Reports.**



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Run Optimization

Using Simulation to Develop

More Efficient

Bus Runs

