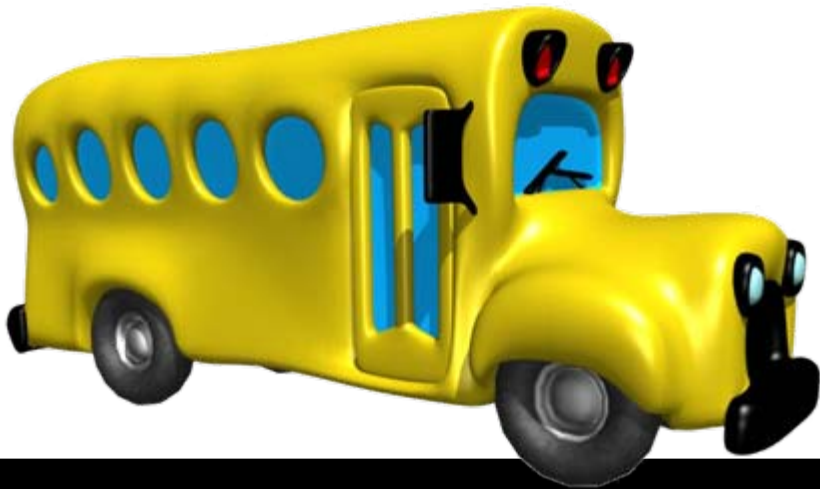


# **Edulog.nt Run Optimization**

## **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 [UPSTOP](#)

##### 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)
- [GEBndPlan \(GISMO\) Overview](#) (Dec. 2003)
- [Editing Run and Route Directions - TIMS NT](#)
- [Edulog's Map Registration System \(MARIS\)](#)
- [Edulog Maintenance Utility Training](#)
- [TIMS NT Introduction - Part 1](#)
- [TIMS NT Introduction - Part 2](#)
- [TIMS NT Introduction - Part 3](#)
- [Tims NT Run Optimization](#)
- [UPSTOP](#)

- [2007 TDTIMS Class](#)

# 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.



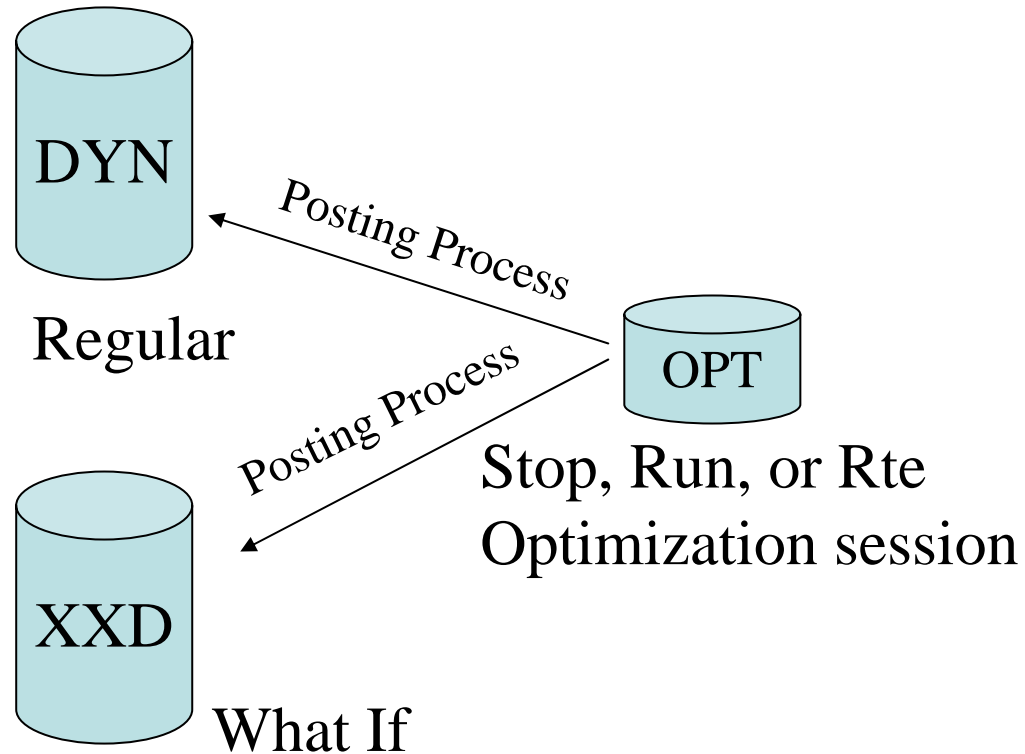
# Results

- Sim/Opt in Edulog.nt is much more similar to the regular program than Opt was in PTS III
- Fewer separate kinds of functions to learn to accomplish the same tasks
- Much greater flexibility in developing scenarios and saving various solutions



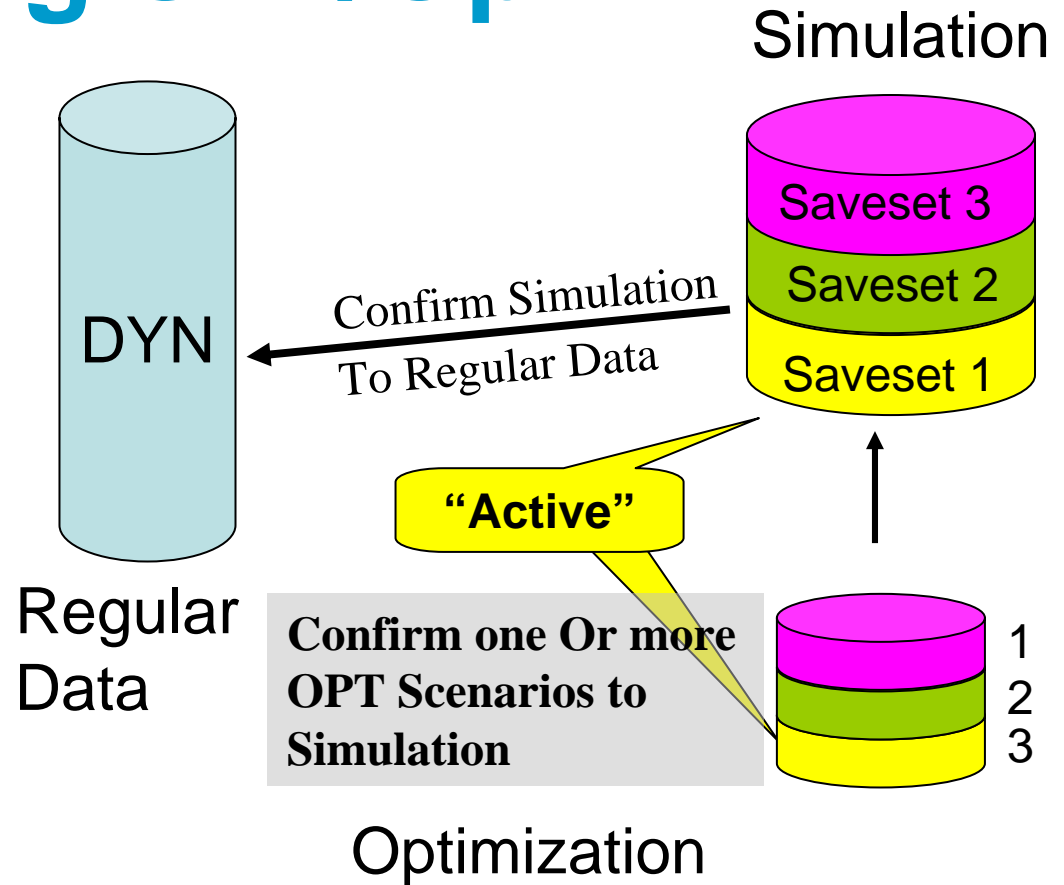
# Data Structure in PTS III

- Regular data in \DYN
- What if Data in \XXD
- Single optimization scenario stored in \OPT can be posted to either set of data



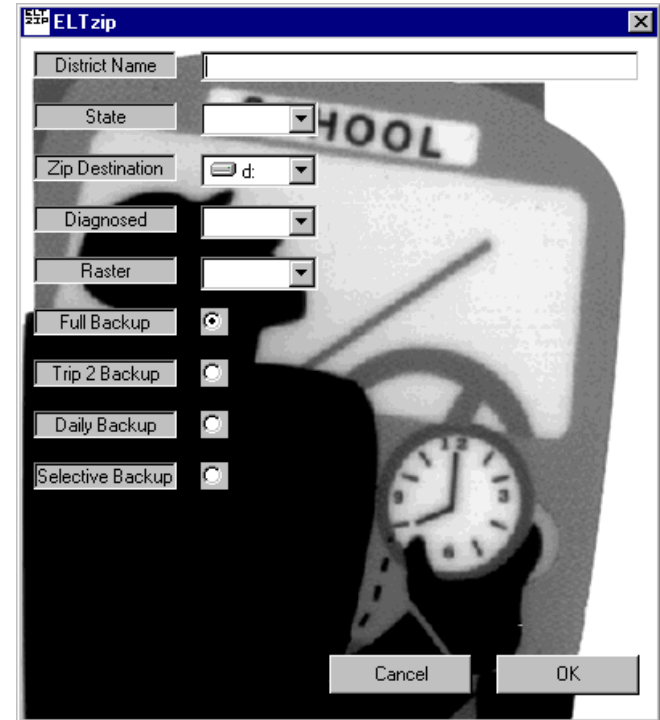
# Using Sim/Opt

- 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!**



# 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

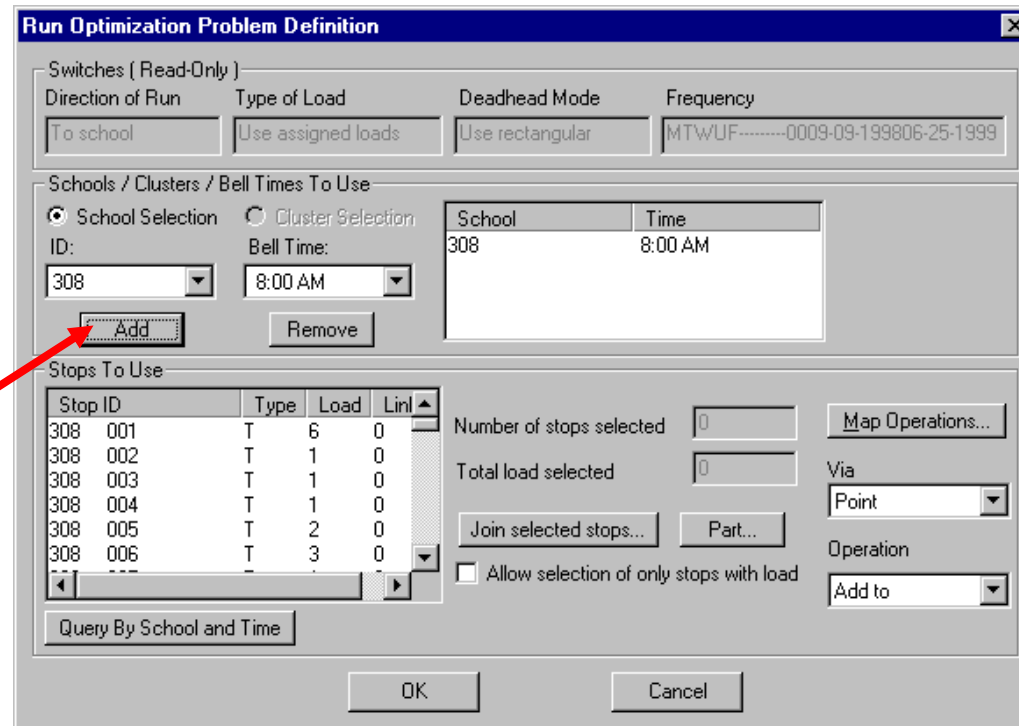
Change Frequency

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' (MTWUJF-----0009-09-199806-25-1999).
- Schools / Clusters / Bell Times To Use:** This section has two radio buttons: 'School Selection' (selected) and 'Cluster Selection'. Below them are dropdown menus for 'ID:' (308) and 'Bell Time:' (8:00 AM). To the right is a table with columns 'School' and 'Time', containing one row: '308' and '8:00 AM'. Below the table are 'Add' and 'Remove' buttons. A red arrow points to the 'Add' button.
- Stops To Use:** Contains a table with columns 'Stop ID', 'Type', 'Load', and 'Lin'. The table lists six stops for school 308:

Stop ID	Type	Load	Lin
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

Below the table are 'Join selected stops...' and 'Part...' buttons. To the right of the table are fields for 'Number of stops selected' and 'Total load selected', both set to 0. There are also 'Map Operations...', 'Via' (Point), and 'Operation' (Add to) dropdown menus. A checkbox 'Allow selection of only stops with load' is unchecked.
- Buttons:** 'OK' and 'Cancel' buttons are at the bottom.



# 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	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	Link
308 001	T	3	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...

Allow selection of only stops with load

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

Query By School and Time

OK    Cancel



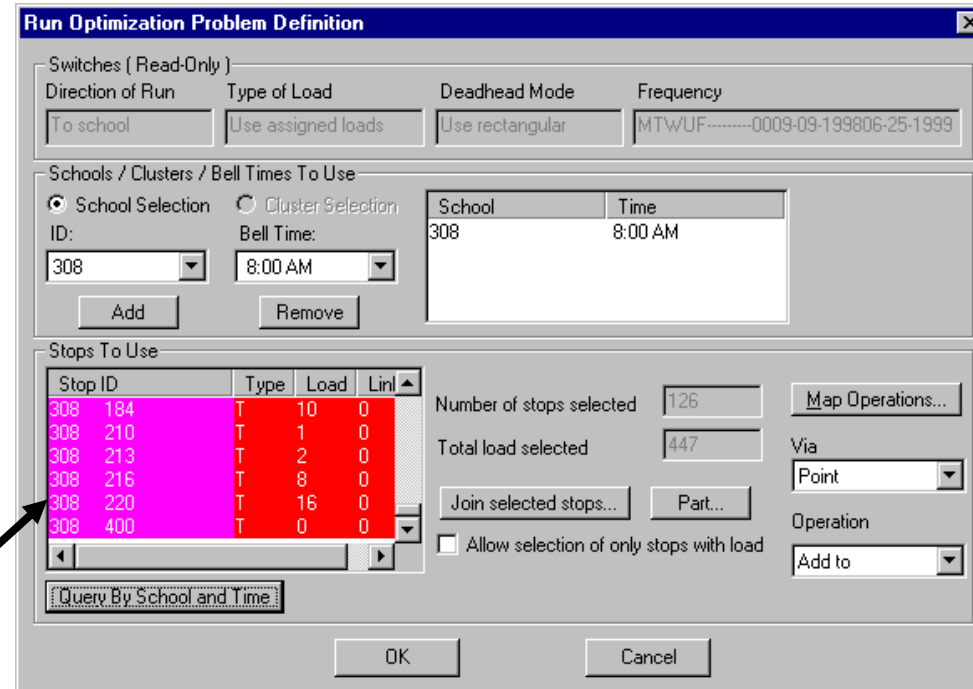
# Loading Data

- 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	MTWUUF-----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

Query By School and Time



# 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

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

Number of stops selected: 126    [Map Operations...]  
Total load selected: 447    Via: Point  
[Join selected stops...]    [Part...]  
 Allow selection of only stops with load    Operation: Add to

[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**

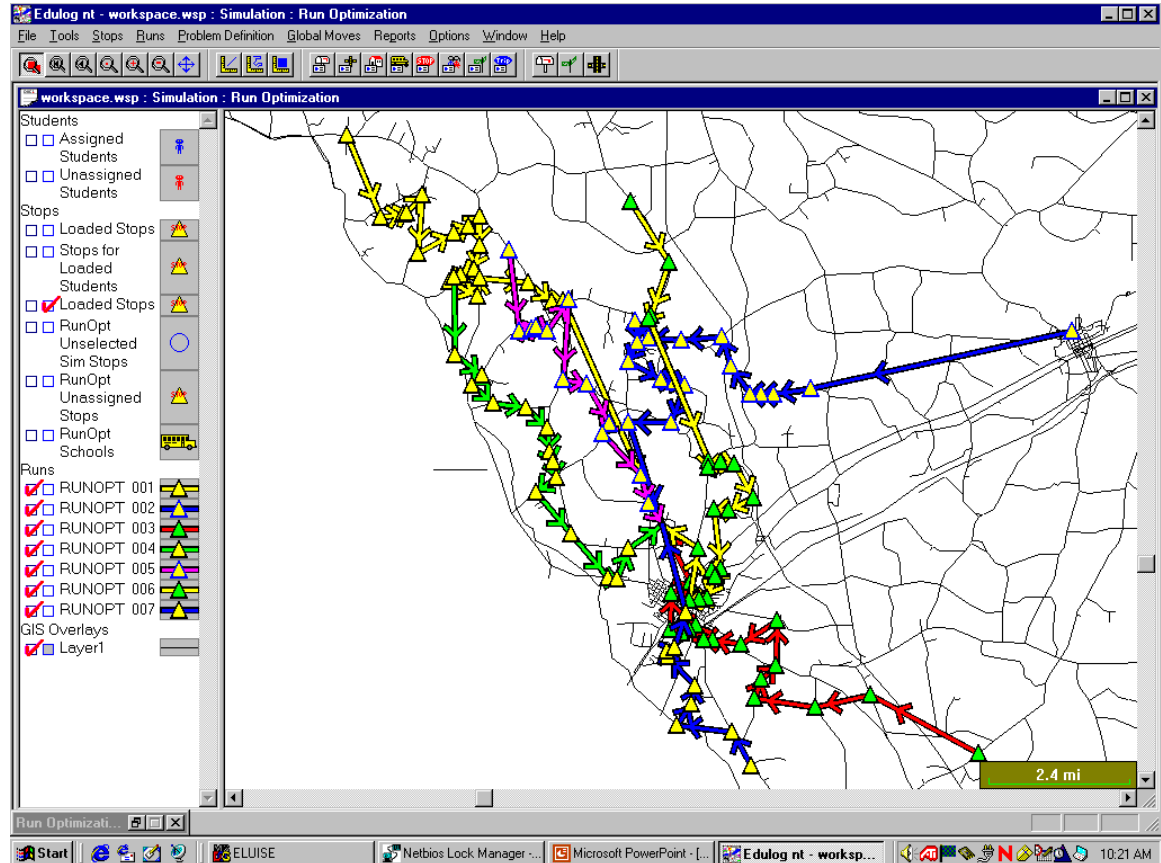
# Runs to create	<input type="text" value="7"/>	Total number of buses	<input type="text" value="7"/>
Capacity	Minimum <input type="text" value="0"/>	Maximum <input type="text" value="66"/>	
Riding time	<input type="text" value="0"/>	<input type="text" value="600"/>	

7 @ (0,66) (0,600)



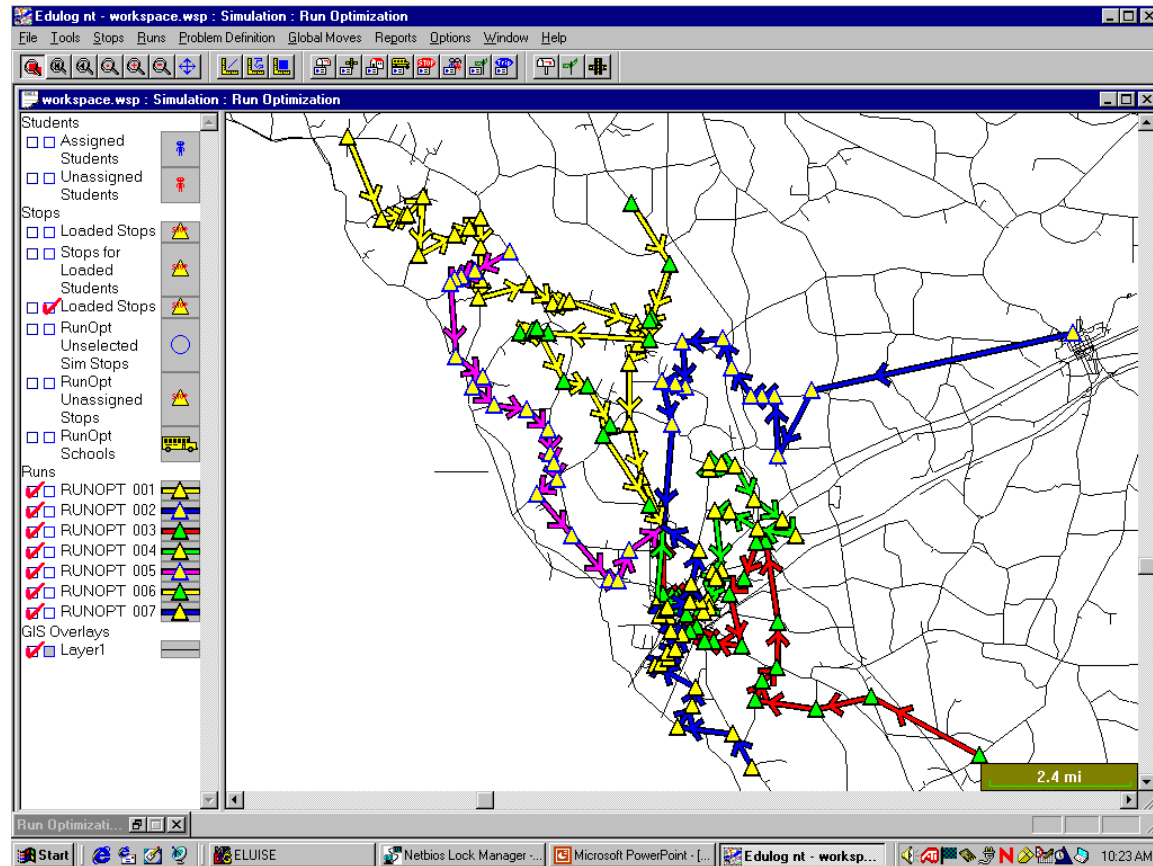
# Runs!

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

**Run Summary**

Current Run: Run ID:  Display Day: Day:

Edit Fields:

Description:  31

Frequency:

Max Load:  Max Time:  min. Time:  min.

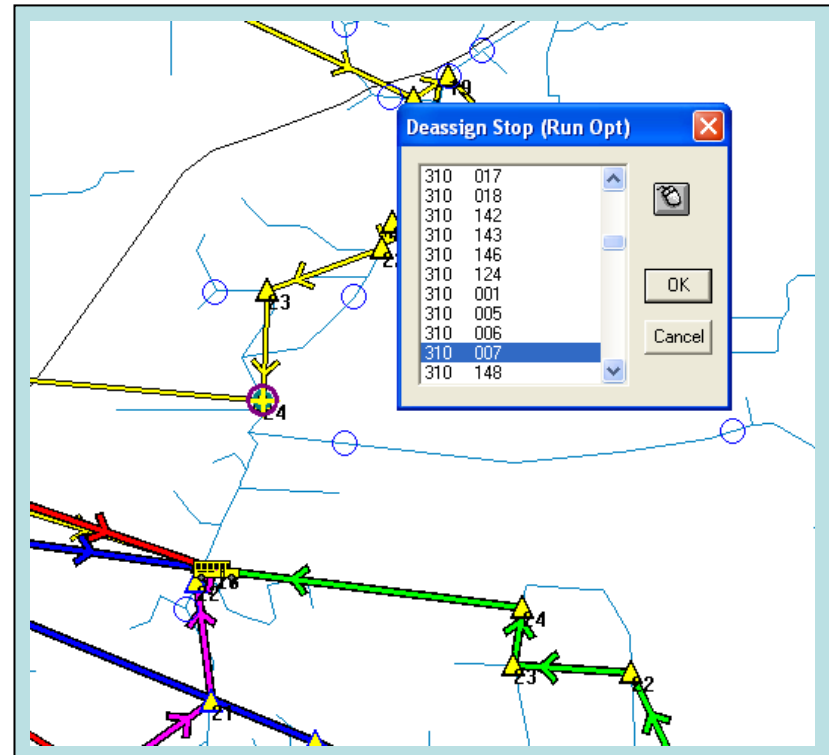
Stop ID	Time (h:...	Effective	Stop Desc
310.817001	6:54 AM	MTWUF--...	NOLLEY RD & STO
310.806001	7:00 AM	MTWUF--...	317 MARGINAL ST
310.803001	7:02 AM	MTWUF--...	179 WATT ST
310.804001	7:07 AM	MTWUF--...	764 PINE RIDGE R
310.906001	7:13 AM	MTWUF--...	394 HOBSON DR
310.079001	7:21 AM	MTWUF--...	6486 NC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

View OK ID Stop Cancel



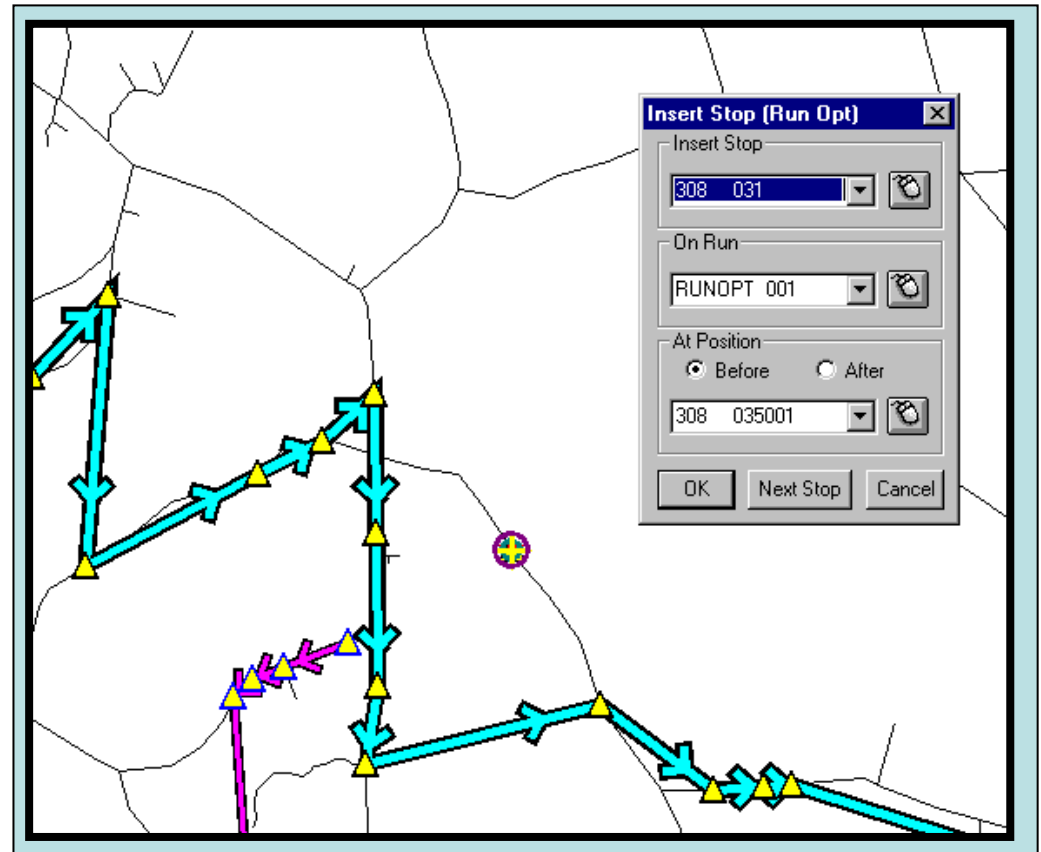
# Making Edits to Your RUNOPT Runs

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



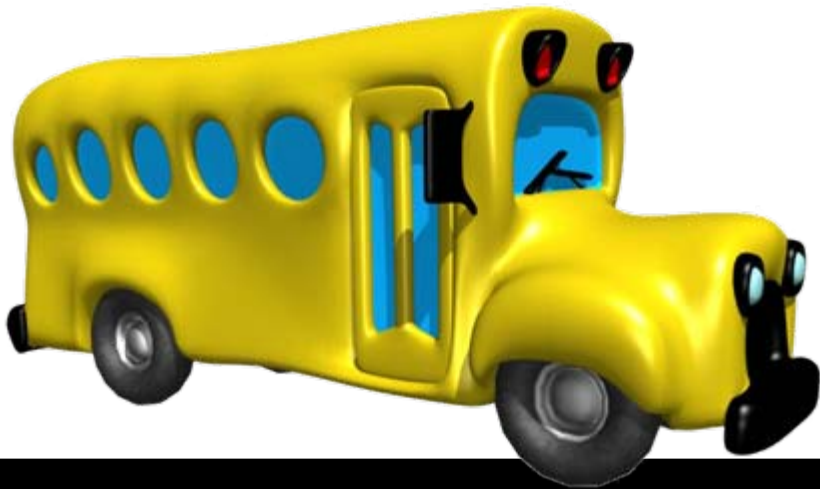
# Saving OPT Runs to Simulation

- 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!



Edulog.nt

# Run Optimization

**Using Simulation to Develop  
More Efficient  
Bus Runs**

