High Density Data Logging in a Traffic Controller

By Donald Maas

If you ask most transportation professionals what they need to do a better job and they usually have the same answer; “Data”. Press them for more information and they tell you; “Better Data”. Better data means more accurate, finer resolution and focused elements that can be used to make incremental adjustments to an intersection’s signal timing, corridor offsets, transit route parameters, etc. Why incremental changes? Historically, signalized intersections in the US get retimed about every 5 years. If you could track and change smaller pieces of signal and coordination timing every few weeks or months the improvement would be easier to implement and measure the change.

One of the most widely used methods to gauge the level of traffic on roadways is the collection of vehicle volume and occupancy data. Historically, this was done using 15 minute count bins (00:00 – 00:15, 00:15 – 00:30, 00:30 – 00:45, etc.) to store the volume (count) of vehicles as well as the occupancy (presence time on loop) on a per sensor/detector basis. The basic problem with this scheme is resolution. Let’s assume the traffic engineer uploads the stored counts for the period 14:45 – 15:00 for the northbound through lane sensor at some arbitrary intersection and the data reports a total count of 21 counts (cars) in that bin. Since the window of data was 15 minutes how would the Traffic Engineer know that 20 of the vehicles had arrived in the minute between 14:59 – 15:00 and only one between the minutes of 14:45 – 14:48? They would not. They could look at changing their timing plan earlier or later to accommodate the large change in volume.

Better resolution
The first step to better data is better resolution. So what resolution would improve this example? One minute? Maybe. One second? Getting better. How about 1/10 of a second? Absolutely! If the data is sampled and stored every tenth of a second, extremely accurate volume and occupancy data could be captured. In addition, the current active phase(s) as well as the arrival type (was the phase Red, Yellow or Green when each count occurred) can be stored as well. This level of accuracy provides the transportation professional with a detailed view of the effectiveness of their signal/timing plan. Small variations in count activity that previously were missed in larger samples can be spotted and analyzed. Now it is just a matter of deciding what to capture and what the duration of the capture should be, hours, days, weeks, months, you decide.

Expanding the concept
Better data gets better. If the capture of volume and occupancy data at 1/10 of a second resolution is now a reality, what if we expand the scope of the data being captured? Some modern traffic controllers have the capability of selecting multiple areas of the controller for events to be sampled and logged every tenth of a second. These additional areas should include: Phase Status, Phase Timing, Detector Preemption, Unit Control (NTCIP), Channel Data, Transit Signal Priority (TSP), Phase Control, Overlap activity, Coordination, and Detector alarms. Imagine the detail that would be revealed by looking at the TSP data and seeing that the average time a TSP call was placed is 6.2 seconds? Or that the split time for phase 4 was consistently gapping out at 11.2 seconds! Now that is the way to tune the split times.

Better Data = Big Data
Better data means lots of storage. When you are reading and logging events with high resolution the storage media becomes a serious requirement. Normal capacity of memory in a conventional traffic controller (RAM/Flash memory, etc.) would be limited when looking at using 1/10 of a second resolution event logging. Enter the SD card. Some modern controllers i.e. ATC (Advanced Transportation Standard) units have the capability of using SD cards for option logging. A properly formatted SD card could provide the Traffic Engineer with literally months’ worth of essential data that could be retrieved, analyzed and archived. Timing consultants could be using this powerful tool as a before and after count study and confirmation of the proposed changes to timing plans before final implementation at a client’s site.

Interface to adaptive control
In the past few years many agencies have looked at the application of Adaptive Control. Product offerings vary among vendors but all require accurate, reliable detection data. As these systems continue to improve and mature, the algorithms will need to look at data in smaller finer pieces to best optimize the intersection or corridor’s performance. High Density data capture and logging will play a critical role as the interface to these new and advanced processes.