North/West Passage

Transportation Pooled Fund TPF-5(190)

Operations Task Force

Webinar Topic: Camera Placement, Integration and Maintenance

SUMMARY

May 16, 2018

North/West Passage conducted a webinar on May 16, 2018 to share experiences with camera placement, integration, and maintenance. All 7 North/West Passage states participated in the discussion. Following are highlights from the discussion.

Washington DOT (WSDOT)

Camera Placement

- WSDOT has 827 cameras in both metro and rural areas. Rural cameras use snapshots due to connectivity issues. Urban cameras provide a livestream with PTZ capability.
- Portable cameras may be used where there are gaps in coverage and where there is a need for additional viewing such as ramp meters that are out of view. Portable cameras experience some difficulty because they are run by a cellular modem connection.
- The process for camera placement is based on traffic volumes. I-5 is where WSDOT typically places cameras with state routes being the next priority. WSDOT uses bucket trucks to see what a camera may see, which is essential in camera placement. For example, trees can block the camera view in the summer, but winter viewing can be different.
- If cameras are mounted on overpasses or luminaires there can vibration which distorts image when zooming in. If this location is necessary, it is placed over a column to minimize vibrations.
- WSDOT identifies the distance that camera coverage needs to be and allows contractors to calculate the spacing between cameras.

Camera Integration

- WSDOT streams video to TMC operators to view for congestion spots, incidents, and assist the state patrol with car chases.
- State patrol and media have access to the live video streaming. WSDOT can block streams to the media if necessary.
- Maintenance uses RWIS cameras to assess situations before going out in the field.
- Live video streaming is also provided to incident response units to allow them to assess the situation before going out.
- WSDOT provides camera integration at the TMC. They have a central system software (NGTMC) that most of the 6 regions in the state use. The eastern region in Spokane is not using WSDOT'S sponsored software. They use different software because their TMC is integrated with multiple agencies, including cities and counties, and staffed by WSDOT.
- WSDOT is working to provide livestream video sharing with trusted partner agencies.
- WSDOT has established video recording policies. They are able to record video but choose not to do it on an ongoing basis; video recordings must be requested by an internal agency partner.

The issue is public disclosure. If someone records video, it must be retained for 6+ years which storage becomes an issue.

- The public website only provides still shot images.

Camera Maintenance

- WSDOT has a quarterly preventative maintenance plan for cameras and ITS devices. Maintenance activities are tracked in an internal database, Sims.
- WSDOT's maintenance is reactive. When TMC operators notice a problem, they call maintenance out. If a camera goes out it can wait for a couple days. When a group of cameras in the same area are out WSDOT sends out people immediately to rule out wire theft since that has been a problem.
- Rural cameras have the same schedule as the metro cameras but WSDOT focuses on the metro cameras that have a higher level of use.
- WSDOT requires mechanical plugs on conduits to keep rodents out.

Idaho Transportation Department (ITD)

Camera Placement

- ITD deploys 4 types of cameras around the state
    - Intersection video detection cameras. These cameras can be shared with the TMC in Pocatello and are used for traffic surveillance
    - 131 RWIS cameras - both fixed and high def PTZ. The RWIS cameras broadcast snapshot images back to the data hosting contractor.
    - Approximately 60 highway surveillance cameras statewide in both standard def and hi def PTZ.
    - 4 dashboard cameras on vehicles are being used in a pilot project in partnership with the Idaho National Lab. One camera is deployed on a bus and one on a pickup scout vehicle. 2 cameras are deployed by ITD on snow plows
- ITD does not use portable cameras and has no formal process for camera placement although they do inquire at the district level regarding district needs and then coordinate with the state communications center.

Camera Integration

- ITD pulls snapshots from selected cameras for the 511 web site. ITD does not provide streaming video.
- ITD has a central software system and central ITS control system, iNET by Parsons. All camera control is executed from iNET and available at district offices, the state communications center, and headquarters so ITD has multiple access points for central software.
- ITD uses Parson's iNET software.

Camera Maintenance

- ITD camera maintenance is handled exclusively through a statewide contract. The contract includes repairs and lens/dome cleaning as well as a scheduled preventative maintenance program which is typically is performed during the summer months to get ahead of the winter season.
- In between the preventative maintenance cycle, they do repairs that are indicated by camera faults that have been reported internally by viewing images. When a problem is observed, ITD issues a service call to the contractor who is under contract to respond within 72 hours. This system has worked well. Occasionally ITD receives complaints about missing images from the public.

Montana Department of Transportation (MDT)

Camera Placement

- MDT uses a combination of fixed, PTZ, and full motion cameras. They have 62 RWIS cameras that are a combination of fixed and PTZ. Montana's goal is for all their cameras to PTZ except at solar sites where fixes cameras are used. PTZ is the preferred camera. Operators prefer the ability to display multiple images – specifically for winter travel and watching oncoming weather.
- MTD uses hi def cameras on selected construction sites such as bridge projects. In addition, MTD has 10 mobile cameras with wide view technology deployed in tow plows around the state. Tow plow cameras primarily use still images for the traveling public but have the ability to stream video for anyone with access to live view server. Occasionally MTD uses portable cameras for construction projects or emergency maintenance projects.
- Fixed PTZ or fixed focal length cameras are deployed on existing infrastructure (ex. portable DMS signs or permanent structures such as luminary or traffic signal poles).
- MDT goes through an informal process to place RWIS cameras and tow plow cameras by bringing management together. They determine sites to give the most support for winter maintenance operations and identify a rank across the state each year to determine which sites would be deployed in any year.

Camera Integration

- MDT uses cameras for maintenance operations and traveler information purposes. They only provide still images for both. Images are shared through a FTP site to give the public or media access. MDT does have the ability to log in to see live video internally through LiveView.
- MDT does not have a TMC yet so there is no integration into a central system. Still images are provided on the camera page and RWIS and camera locations are available as a layer on the traveler information page. Plow camera images are also available as a layer on that page.
- MDT uses SCAN Web but that is at the end of its life, so they are looking at other options.

Camera Maintenance

- MDT does not have a formal camera maintenance plan. MDT tries to do formal inspection on each camera yearly. However, maintenance is usually reactive.

Wyoming Department of Transportation (WYDOT)

Camera Placement

- Wyoming is entirely a rural state. They have 175 cameras deployed statewide. These cameras are generally all PTZ with a couple of older fixed cameras that they hope to upgrade. PTZ cameras are the best option since Wyoming has primarily remote options. WYDOT does not do livestream because they are limited to cell modems and radios.
- WYDOT uses 6 portable trailer cameras from LiveView for events such as mud slides, rock slides, and during construction. For example, during a bridge replacement project WYDOT may take still images and post them images to their website. LiveView can provide a time lapsed video at end of the project with all views.
- WYDOT uses an informal process for camera placement based on crash data and maintenance concerns and needs.
- WYDOT uses PTZ cameras to view several different images and to see the skyline and horizon to track weather that is coming.
- Camera images are available on the public website and to allow the TMC to view the existing road conditions.

- Surveillance cameras are used in rest areas. Video is recorded to DVR for authorities to review, if necessary.
- WYDOT uses 1 camera for avalanche monitoring.

Camera Integration

- WYDOT uses cameras for maintenance personnel, TMC personnel, and traveler information on their 511 website.
- PTZ camera images are sent to a FTP server in Cheyenne where the TMC is located and then distributed through an HTML page to the web site so public receives still images of all the cameras in the state. The TMC has access to all camera IP addresses so they can see live video, but WYDOT does not provide live video to the public due to the reliability of the communications.
- WYDOT does not have commercial or custom software although a developer did provide some software so that the TMC could see multiple camera images on a grid system.

Camera Maintenance

- WYDOT tries to maintain each camera at least 1 time per year. WYDOT checks the camera's operation, housing, and mounting during the annual inspection. WYSDOT also makes sure all conduits are blown out and free of water as part of its annual maintenance to make changing cable in the winter less difficult.
- Most maintenance is reactive. WYDOT takes care of cameras that are not working properly and tries to get to them as soon as possible.
- WYDOT has found brass works to keep rodents out.

North Dakota Department of Transportation (NDDOT)

Camera Placement

- North Dakota has 105 cameras, 95% of them are in rural areas.
- Twelve of the 105 cameras use LiveView communications. NDDOT has contracted with LiveView for 8 years where there is no access to power or communications. After this year's construction season they will have 129 cameras.
- NDDOT does not typically use portable cameras, but they deployed some last year in construction zones on 2 bridge projects. The contractor provided LiveView communication trailers.
- The process NDDOT uses to determine camera placement includes:
    - Asking each district to provide their requests for cameras (ex. problem areas, section turnaround points, locations with existing infrastructure to add cameras at a low cost)
    - Deploying cameras on all new DMS. NDDOT has started retrofitting some existing DMS or AVR sites where a camera can be added at low cost.
    - Once they have all the district requests, NDDOT looks at the state as a whole to determine camera placements.
- Typically, only PTZ cameras are installed. NDDOT is phasing out fixed cameras. Most cameras use cell modem communication but they do use point to point communication when there is a radio tower nearby (currently 16 miles is the longest distance). NDDOT uses fiber for communications when it is state owned.

Camera Integration

- North Dakota's cameras are mainly used for traveler information as still snapshot images. However, in Bismarck and Fargo they may be used for incident management.
- All cameras are integrated into Parsons ATMS software for viewing and control.

- NDDOT used to provide video from 12 cameras to the public for a fee. That worked out pretty well, but the reliability was not the best during storms or at times needed. Since the cameras weren't working right and there was a lot of delay, NDDOT discontinued providing video. Depending on the success of the fiber cameras used in Fargo and Bismarck, NDDOT may consider going back to providing video to the public.

Camera Maintenance

- NDDOT districts each have a Radio Tech or Sign Shop employee who is sent to each camera twice a year to maintain it. They trim the grass around the site, clean the camera, check the camera connection, and clean up the cabinet. Depending on the camera placement, some cameras need more frequent cleaning.
- NDDOT prefers to use pull over tower or pull over pole for simpler maintenance.
- NDDOT uses stainless steel wool (regular steel wool deteriorates) to keep rodents out.

South Dakota Department of Transportation (SDDOT)

Camera Placement

- SD DOT has deployed 116 RWIS cameras at permanent DMS sites and on 60 snowplows.
- SDDOT is not currently using portable cameras but may consider it in the future.
- SDDOT uses an informal process to determine camera placement. They poll the regions to find possible turnaround spots for maintenance. They also identify open holes in the system for the general public and look for intersections.
- South Dakota uses PTZ across the state. They have deployed infrared illuminators with all their cameras. These are favorable with their maintenance staff because they can see the roads early in the morning. SDDOT is looking at new PTZ cameras (Access) with infrared built in. If these cameras work well, SDDOT will replace older PTZ cameras this summer.
- SDDOT does not use solar cameras, all are land powered. Still images are posted on their website.

Camera Integration

- All SDDOT cameras are in rural areas.
- Images are housed by SDDOT, sent to an FTP site, and grabbed by others such as Safe Travel. South Dakota's MDSS uses the same images.
- SDDOT does not have any custom sharing software, however, news stations can grab images from FTP site. SDDOT also shares FTP images with the National Weather Service.
- Snow plows provide still images to maintenance and operations staff, not to the public.

Camera Maintenance

- SDDOT's maintenance plan is semi-formal. They complete yearly maintenance, the bulk of which is done using summer interns. They visit all sites and check the camera seals.
- SDDOT is more reactive than proactive. If something goes down, they try to fix right away. They also do some proactive maintenance by monitoring the cameras daily. If they start seeing something looking peculiar they will try to take care of it before it becomes an issue.
- SDDOT buys and maintains Axis PTZ cameras. They buy the next generation of camera and make sure that all cameras are the same so there aren't multiple different cameras to fix. SDDOT makes sure all cameras are built the same to help with making repairs.
- SDDOT has found buying an extra 2 years in extended warranties comes in handy. Cameras are replaced about every 5 years so SDDOT is trying to put into a more formal replacement schedule using the warranty.
- SDDOT uses a short conduit pipe with a cap and steel wool to keep rodents out.

Minnesota Department of Transportation (MnDOT)

Camera Placement

- MnDOT has deployed approximately 1100 cameras with the majority of them being in the metro area. MnDOT also uses hundreds of snow plow cameras. All cameras are PTZ except specialty cameras installed at reversible gates where MnDOT is watching traffic at a gate in the metro area. MnDOT's also is participating in a truck parking project that is dedicated to using cameras to watch truck parking lanes.
- MnDOT uses 1-mile camera spacing in the metro area. In rural areas it varies. For example, in southern Minnesota 1-mile camera spacing is used but the western part of the state uses 2 to 2 ½ mile camera spacing, especially if the road is a straightway. MnDOT tries to deploy additional cameras to account for bridges and other blind spots. Busy intersections and high accident areas where cameras seem to be dedicated to point in 1 direction have 3-4 cameras.
- To determine camera placement MnDOT requests input from operations staff on what they want to see and where they would like to have cameras.
- All new MnDOT's cameras are HD, but there are some legacy analog cameras that convert in the field. They are rapidly trying to get rid of the analog cameras because operations want HD.

Camera Integration

- MnDOT buys all its cameras and has DOT staff install them. Video goes into IRIS (MnDOT's ATMS software) as a raw video stream. MnDOT purchased Milestone software for video buffering/ storage to share video with their partners such as PSAPs and the University of Minnesota. Currently, MnDOT uses a fiber connection to share video with the media but they would like to move away from that.
- MnDOT provides still images on the Minnesota 511 site for the public but are looking into streaming video to the public. MnDOT also uses snow plow cameras but these only provide still images and only go to the 511 website. They do not incorporate snow plow images into ATMS.

Camera Maintenance

- MnDOT uses a pole that bends in the middle to allow the camera to stay connected as it is tipped down. This is handy for maintenance and trouble shooting. MnDOT tries to have zero use of buckets hooks to service cameras so placement is important. MnDOT looks for places by bridges with guardrail or further back on slopes away from the clear zone.
- Minnesota has 10 maintenance staff in the metro area who do all their ITS maintenance. They have 2 outstate integrators who do both new projects and maintenance, so they handle all replacements and warranty issues. MnDOT buys cameras with a 3/4/5-year warranty.
- Although MnDOT has about 30 left, they prefer to not have domes on cameras. Instead, MnDOT prefers using wipers where they can aim the camera to the rain and use wiper to clean them off.
- MnDOT also has a tunnel with 6 cameras installed with a washer with external control. These cameras are located at the top of the lane, inches above semis, so they get dirty and MnDOT decided to make the investment to install washers to clean them off.
- MnDOT schedules no preventative maintenance, they get there when it breaks or has an issue.
- MnDOT generally does not have an issue with more the 2-3% of the cameras being out at a time.
- All MnDOT's cameras are maintained internally so they provide cameras to projects by buying off a multi-year state contract. That way they don't have a lot of different types of equipment.
- Between MnDOT operations, patrol, maintenance, and traffic management staff cameras are monitored 24/7. Network tools also notify MnDOT if a camera link goes down. During slow times each day, staff cycle through cameras to verify they are working. The public or the media will also contact MnDOT if a camera is down.