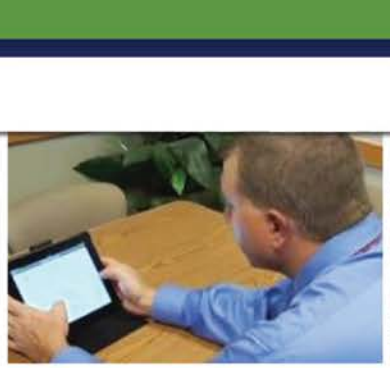
e-Construction
PEER-TO-PEER EXCHANGE

Summary Report






Florida Department of Transportation District 7
Tampa, Florida

September 16-17, 2015

massDOT
Massachusetts Department of Transportation
Highway Division

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
Federal Highway Administration

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1. Background

The Florida Department of Transportation (FDOT) hosted a peer exchange with the Massachusetts Department of Transportation (MassDOT) in Tampa, Florida on September 16-17, 2015. The focus of the peer exchange is e-Construction – or a paperless construction administration delivery process that includes electronic submission of all construction documentation by all stakeholders, electronic document routing/approvals (e-signature), and digital management of all construction documentation in a secure environment that nonetheless allows distribution to all authorized project stakeholders through mobile devices. The event was sponsored by the Federal Highway Administration (FHWA).

The morning sessions on the first day served as an introduction to the peer exchange and personal introductions, along with background information on each State's construction program and e-Construction activities. The afternoon of the first day consisted of discussion sessions on implementation of project collaboration sites and workflows. The morning of the second day consisted of a field visit to two FDOT project sites to demonstrate e-Construction field devices. The afternoon of the second day included a discussion session on implementation of digital signatures, followed by a summary discussion on next steps, action items, and follow-up.

The Peer Exchange was the first in a series designed to assist States with implementation, while allowing peers to network and share information across State departments of transportation (DOT) in a relatively small group setting.

Construction and Information Technology (IT) leaders, field personnel, and engineers from MassDOT, FDOT, and FHWA Headquarters and the FHWA Florida Division Office participated in the event. The list of attendees, along with contact information for each, is provided as an appendix to this document.

Participants discussed the important issues and challenges, potential solutions, and e-Construction practices that have proven beneficial to agencies and contractors. Application of e-Construction in the field through portable devices, documentation through project collaboration sites, and the use of digital signatures and workflows were all focus areas of the peer exchange.

This report includes a section that includes a summary of key findings from the event, along with the full notes from the peer exchange discussions during the FDOT host state presentation, the MassDOT presentation on current practices, and the FDOT e-Construction office and field demonstrations. To promote further networking and information sharing, a roster of participants along with contact information is included in Appendix A.

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2. e-Construction Implementation – Key Peer Exchange Findings

The peer exchange produced several relevant and practical "takeaways" identified by the group roundtable discussions. The following sections address the items that were highlighted by the group as a next step, implementation idea, document exchange, or focus area – all of which are designed to assist with future implementation within the States' e-Construction programs. Where available, Web site links are provided for some of the practices currently in use by the agencies. In some cases, FDOT and MassDOT shared documents by email that are not currently available on the internet.

FDOT shared a memorandum of understanding (MOU) between FDOT and the Florida contractor and consultant associations that established an agreement on the use of digital signatures. This document helped make implementation of digital signatures easier by establishing early buy-in from these two key stakeholder groups outside of the DOT. Firewalls, access, acceptance, and business processes are all addressed in the MOU. Early completion of the MOU ensured that all key stakeholders were in agreement on the process.

FDOT shared language from the Request for Proposals (RFP) for procurement of the project collaboration site. FDOT has had success in customizing the project collaboration site to meet the needs of field personnel, contractors, and project managers and engineers.

Link to FDOT invitation to negotiate for the development of the collaboration site:
https://facts.fldfs.com/Search/ContractDetail.aspx?AgencyId=550000&ContractId=BDY06

FDOT developed a "How-To" Guide for e-Construction and is developing computer-based training (CBT) and short videos on how to use the project collaboration site and how to use field devices for greater efficiencies. This guide is designed to assist practitioners with implementation of e-Construction by providing greater detail on the process. The computer-based training will be available in the near future and will allow for hands-on training for FDOT, contractors and consultants. Similar to web-based videos from Texas and Michigan, these CBT modules and videos will further assist with implementation of e-Construction.

Link to FDOT How-To Guide: https://www.fhwa.dot.gov/construction/econstruction/florida/howto.pdf

Links to FDOT interactive training: http://fldot.stridepoint.com/overview/presentation.html
http://fldot.stridepoint.com/obstacles/presentation.html

MassDOT and FDOT personnel established personal networking links. Construction, management, and IT staff all agreed to follow up directly on future detailed technical discussions and networking. One example of follow-up will include sharing software application source code for the FDOT materials management system (called MAC) as well as initial technical assistance.

MassDOT developed a survey to assist with implementation of a project collaboration site. Through identification of the types of information most interesting to field personnel, MassDOT developed requirements and the system architecture. The survey response rate was high and gauged interest in e-Construction applications. The online survey site is useful for organizing results of the survey and the results also ensured that questions were framed correctly (rating scales with fixed responses versus open-ended questions).

FDOT highlighted the need to evaluate State statute wording for analysis of digital signature requirements. FDOT also shared information on the application process for third party digital certificate authorities (notary form, identification needs, and process description).

Link to FDOT acquisition guidelines:
http://www.dot.state.fl.us/construction/forms/ElectronicSubmit/AcquisitionGuidelines.shtm

FDOT developed an e-Construction specification for use on projects. The specification outlines the requirements for delivering projects electronically for contractors and consultants and the use of digital signatures to eliminate paper.

> *SCOPE OF THE WORK (ELECTRONIC SUBMITTAL OF DOCUMENTS).*
> *(REV 12-15-14)*
> *ARTICLE 4-1 is expanded by the following:*
> *Upon execution of the contract, the Contractor and Department agree that all informational, contractual and other business required for this project will be through a system of paperless electronic means. When the specifications require a written submission of documentation, such documents must be submitted electronically.*
>
> *All documents requiring a signature must be executed electronically by both parties in accordance with Chapter 668, Florida Statutes, and have the same force and effect as a written signature. The Department will provide a web-based collaboration site to facilitate the electronic document exchange. All persons requiring access to the collaboration site shall be identified during the preconstruction conference. All persons that normally sign paper documents, and will be using the site, must acquire digital signature certificates.*

FDOT developed a white paper on digital signatures. The white paper outlines the use of third-party authentication and the various software packages that are in use for applying a digital signature to a document. FDOT also worked closely with the entity responsible for licensing professional engineers to develop a practice for use of a digital engineer of record seal in addition to the digital signature, along with a reference standard that lists the page numbers in plan sets that the signature applies to.

Link to FDOT digital certificates
guide: http://www.dot.state.fl.us/construction/forms/electronicsubmit/digitalcertificatesguide.pdf

Link to FDOT guidelines on application of digital signatures:
http://www.dot.state.fl.us/construction/forms/ElectronicSubmit/AcquisitionGuidelines.shtm

FDOT purchased software for electronic as-builts. FDOT shared detailed information on the third-party software in use currently for generating electronic as-builts and commenting on plans.

FDOT also noted that there are some preliminary steps to take as foundational for implementation of e-Construction. First, agencies should coordinate with builder and consultant associations to partner and develop agreements to ensure parallel implementation on all sides. Second, having a multi-disciplinary task team organized will help with ease of implementation (IT, construction, etc.). This also helps with identifying the components of e-Construction and the priorities. Third, sell stakeholders on the implementation based on the cost savings – costs are a small percentage of the overall savings anticipated for FDOT ($1.5 million investment for an estimated $22 million in cost savings). Finally, develop the needs first and then design a system based on the formal needs as identified.

The peer exchange confirmed the approaches and provided confidence that the DOTs are headed in the right direction. MassDOT will share this information with upper level management to help others understand how

construction and IT are coordinating to move e-Construction forward. MassDOT will investigate an equivalent version of FDOT's Electronic Document Management System, Materials Management System, and will work to implement digital signatures.

3. Peer Exchange Discussion Notes

This section provides additional notes following the organization of the agenda. The full agenda for the Peer Exchange is included as an appendix to this document, along with a roster of participants with contact information for each participant. This report is designed to facilitate additional networking and discussion on the topics summarized from the event.

Kathryn Weisner from FHWA welcomed the group, and several Florida DOT executives participated via videoconference. Statewide innovator teams are deployed within FDOT – the mission is to encourage innovation and not be afraid of trying something regardless of the outcome. FDOT continuously gathers input from employees on how to better manage construction projects. FDOT manages a $3 billion construction program, where $1.5 million is spent on e-Construction and is expected to garner $22 million in cost savings. The expectations for the event are to share ideas both ways between States and with FHWA.

Patricia Leavenworth from MassDOT also provided opening remarks welcoming participants to the exchange. She communicated with Michigan DOT at a workshop in the past and learned that MDOT was planning to go paperless with projects. MassDOT had discussions prior to the EDC-3 initiative – their construction program is over one billion annually. MassDOT is interested in savings from e-Construction and taking pressure off field staff by allowing more time and increasing efficiencies. MassDOT has a pilot project for iPads on bridge inspections. MassDOT IT services Highway, Registry, and others but also has a shared services group covering engineering/operations, finance administration, and intermodal services.

In July of 2014, FDOT began the procurement process for the project collaboration site. An Innovator Team from Central Office initiated the process and named the group the CPR – or consistent, predictable, and repeatable. Step-up is a program designed to encourage innovation and enhancements to processes. This is helping implementation by providing input, as the group governs how sites look for each project. Consistent support is one of the goals from IT as implementation progresses. The Florida Agency for State Technology is one year old and is a statewide IT agency. As one anecdote, a resident engineer bought an iPad mini on his own to help with minimizing paperwork transport and making the job easier, helping foster e-Construction within FDOT.

A suggestion was made to develop a site with a frequently asked questions section where new ideas could be updated frequently.

Q&A

The following questions were posed by MassDOT, with responses from the FDOT construction and construction systems (labeled CONST), along with responses in some cases from the Florida Office of Information Technology (labeled OIT).

Q: Did Florida DOT hire any new staff to work on eConstruction initiatives or did they give additional roles to current employees (Engineers & IT professionals)? How many new full time staff did Florida DOT bring on to implement these eConstruction initiatives?
A: CONST: In our procurement process we made provisions such that our provider can assist our efforts via Task Work Orders. For the present our internal Staff has stepped up and is taking the charge of developing our environment.
A: OIT: No additional IT staff has been hired at this point for service and support by the Office of Information Technology.

Q: How many new consultant service contracts have been required to implement these initiatives?
A: CONST: Some of our Districts already use Staff augmentation positions. Where appropriate, these positions are being used. We have an individual that works for one of our Consultants which has been very helpful.
A: OIT: None for the Office of Information Technology.

Q: Are there any future plans to bring in more employees to work on e-Construction initiatives?
A: CONST: At this time, no. We think that after the initial push the workload will begin to diminish to a manageable level. However, this decision is truly up to the District.
A: OIT: Not at this time.

Q: Did you do an RFQ/P or some other procurement method for the project collaboration site? What type of a commitment or contract duration do you have with the consultant? Are you required to bid this service? If so how will you transition from the current project collaboration site consultant to another vender if another vendor wins this bid?
A: We utilized an RTN-Request to Negotiate. This method provided us an opportunity to express our needs at a high level while proposers submitted detailed ways to meet them. After they were scored and prioritized we began negotiating with the winner and developed the scope during the negotiation. Our highest level requirement was: We want an off-the-shelf product that we can dynamically configure to suit our own needs. Our contract is for 5 years with a 5 year renewal. So, we have our arrangement for a possible 10 years. Since it is an off-the-shelf product we could conceivably obtain server image backups and have the servers hosted by others if it should come to that. We could use a cloud based server.

Q: Do you have any budget information associated with eConstruction Initiatives?
A: We anticipated a $200 per month per hosted contract. However, our contract was awarded at $125 per month per hosted contract. We also have the ability to authorize work through task work orders.

Q: With electronic systems, do IT staff handle Freedom of Information request or are these compiled in the District Office?
A: CONST: None of this will change. We will provide information as required from both our project collaboration site and our electronic document management system (EDMS) if it is requested.
A: OIT: The Office of Information Technology (OIT) is in charge of Microsoft Exchange e-mail and Skype for Business chat messaging through Office 365 and their related archives utilizing Symantec Enterprise Vault and Microsoft's native archiving utility. Freedom of Information/Public Records e-discovery requests are conducted against these archives under the direction of the General Counsel's Office with results provided to

the General Counsel's Office for review and for conducting any required redactions prior to documents being provided to the requestor.

Q: On the topic of record retention, MassDOT is required to retain records for 7 years and is also frequently served with requests for public records (Freedom of Information Act). A concern of some with paperless systems and e-signatures is the agency's ability to fulfill its obligations associated with both. Did any within your organization have similar concerns? How did you resolve these concerns?
A: We have the same type of retention issues where some document types have longer periods than others. This is all controlled by our internal EDMS system and policies, which allow timeframes for keeping archives – beyond those timeframes, all files are completely removed from the archives.

Q: Courts, attorneys general, and lawyers in lawsuits associated with claims make requests for access to documents for discovery. They typically want full access to files. How do you handle these types of requests?
A: CONST: Typically we dump the files to electronic media and give them to the requestor. However, if the effort to produce the information exceeds a certain level it may be deemed as too labor intensive.
A: OIT: The Office of Information Technology's roll in this process primarily surrounds e-discovery against e-mail and messaging archives. Requests for access to messaging archive records are coordinated through the General Counsels' office, which reviews and determine what documents can or cannot be granted open or full access to depending on content of the requested records and the entity making the request.

Q: In Massachusetts the State Comptroller's office has full authority as to processes associated with payments made by the Commonwealth of Massachusetts. Our Comptroller's office is very concerned about making sure security measures are in place prior to allowing DOT to move forward with a Proof of Concept regarding e-Signatures. What agencies outside of your organization did you or are you required to get concurrence or approvals from and how are you going about doing that?
A: It is the same for us. Our Department of Financial Services (DFS) is the governing Agency for payments. On our construction contracts (Selective contract types) we are allowed to do electronic payment requests directly from SiteManager. Those requests are transferred electronically to DFS for issuance of payment. Then DFS cuts the payment voucher or does direct deposit into the vendor's accounts. This process is called EED.

3.1 Exploring State Presentation – Background on MassDOT and Current Practices in e-Construction

Dan Casaletto with MassDOT presented on current practices in e-Construction in Massachusetts. The program controls office works closely with design and construction and is responsible for capital planning. MassDOT includes Mass Highway Department, Mass Bay Transportation Authority, and other groups. There are six districts within MassDOT, one of which covers the Boston area and totals approximately 75 percent of the overall construction program. Resident engineers and inspectors can volunteer to cover maintenance shifts (snow and ice treatment) during the off season, which is December 1 through March 15 and covers the winter season. MassDOT is also using pre-cast elements for construction, which allows for activity to continue during colder months. In 2008 12 percent of the State's bridges were considered structurally deficient, creating the need for additional work and MassDOT looked to e-Construction for greater efficiencies in project delivery.

MassDOT looked to other technologies such as heavy lift (self-propelled modular transport), bridge-in-a-backpack where hollow concrete cased tubes are used with composite decking systems, folded steel plates, NEXT Beam, and aluminum decks. The project controls team evaluates Primavera-developed schedules and coordinates with DOT engineers and contractors. MassDOT used e-Construction to exceed a goal of less than 450 structurally deficient bridges.

MassDOT implemented an electronic bidding system in 2011 which includes plans, specifications, and addendums. Previously, plan sets would be printed and mailed to contractors and responses were expected on paper. Likewise, any addendums to the plans would be mailed. But MassDOT has since changed CAD standards to pull documents directly from CAD files. Approximately 9,000 pay estimates were mailed previously – now all estimates are emailed, which saves time and costs. MassDOT prints documents and uses ink signatures currently for approvals. One primary area of focus for the peer exchange is to explore how to implement digital signatures in Massachusetts.

The MassDOT Construction Management System is a consolidated system to replace the stand-alone construction contracts database and district construction database. MassDOT built the current application through the IT services group – there was no off-the-shelf solution at that time that would interact with existing systems. The system is good for internal use but does not allow contractors and consultants to access it (currently this is a dot net system built in early 2000s. It is a directory, but is not ideal for document control). Conformance-based payment is used instead of retainage at MassDOT now. MassDOT is beginning to look at a cloud-based system – they just need to carefully examine bandwidth requirements to accommodate this approach.

MassDOT's collaboration site is a pilot program that provides access to consultants and contractors and provides for implementation of workflows (a cloud-based site). Design documents, requests for information (RFI), and non-conformance reports are all posted on the site. User access is the largest use of resources (a much higher total number of times the site is accessed by the group of users, as some users play different roles on different projects). Security is key, as users are not able to see MassDOT internal documents due to the firewall.

Submittals come in and are routed for approvals through workflows designed into the system. Also offer training courses (217) on the system.

Working to preserve in-house inspection program – have made investments in staff training and many have a lot of experience – a key to some of MassDOT's design-build successes. Savings in field staff time is important. Specialized fabrication inspections, pre-cast inspections, and bridge painting and similar items are outsourced. On-site inspection is nearly 100 percent staffed by MassDOT inspectors. MassDOT uses contractors' test results for quality control and the DOT handles acceptance testing for quality assurance.

MassDOT has an EDC-3 Implementation Plan that is being updated continuously and includes a timeline for various activities. They also have a committee named READI – review, evaluate, and accelerate the deployment of innovation to eliminate redundancy within MassDOT in implementing innovations such as bar code pilots. MassDOT distributed a survey to gather input on the most pressing elements for e-Construction implementation.

Q&A

Q: How are Division Offices planning to support implementation of e-Construction?
A: The pilot study is helping with establishing guidelines for FHWA Division Offices. FHWA Florida Division approves items electronically now and has a paperless process. Specifications, standard plans, and other documents are all available electronically.

Q: Firewall – how much can others see?
A: Most documents can be seen by everyone on the team, but workflows prior to submittal are controlled – security is robust in how roles are managed. With 400 active contracts, there is a practical piece about how to administer access to everyone involved with limited staff and resources (5 individuals support the security of the site).

Q: What happens to documents once the project is completed?
A: The site has permanent storage in compliance with the requirement to keep all documentation after the project ends for 7 years.

Q: Internal resources are used to provide access which must happen in person at the MassDOT Districts; do you have VPN for access outside?
A: MassDOT does have some use of VPN for outside access. FDOT users a VPN resource to provide access based on whether internal access or external access is needed.

A suggestion was made that agencies should consider a bandwidth study prior to implementation of the cloud-based approach.

FDOT shares source code with other State agencies along with documentation for the management systems.

A participant noted that Wisconsin DOT also has a process for using digital signatures as part of e-Construction.

Q: How do you handle materials testing?
A: We use a project collaboration site for data results from materials testing – the lab information system is part of the effort to consolidate systems.

3.2 Host State Presentation – Florida DOT e-Construction Overview

Amy Tootle, Doug Martin, and April Blackburn with FDOT presented on how the agency implemented e-Construction. FDOT is a decentralized organization where the central office sets policy and procedures and the district offices implement the process. FDOT included five components in the original deployment of e-Construction, including a collaborative sharing site, mobile devices, digital signatures, form automation, and electronic as-built plans. The collaborative site is an externally hosted, off-the-shelf, dynamically configurable product with workflows that automate construction management. FDOT's current plans include full deployment in September 2015 with a 12 month period where no changes will be made to the process. Redundancy is provided with an internal FDOT electronic document management system, where project files

transition once a project is complete. The EDMS is used to archive final files within the FDOT firewall. At any one time there are 520 active construction projects.

FDOT is currently finalizing form automation, including the addition of a digital signature block and forms pre-populated with project-specific data. Digital signatures are currently used, although the new forms will standardize how they are placed within documents.

FDOT tested three different types of mobile devices for application to construction. FDOT central office then selected a different device based on input gathered from other States. The central office pilot project matched a device with the types of activities that are performed in the field. They then made an assessment of time savings and cost savings. A phased implementation for construction is planned for winter 2015. Some of the newer technology has an additional process for evaluating necessary equipment, which is where e-Construction evaluation of benefits plays an important role. Ergonomics plays a key role in use of tablets in the field – something smaller than a laptop is needed to avoid limitations due to cumbersome transport of devices. Devices also need rugged cases or extra cases to protect them and to avoid need for replacement due to damage. Battery life is also an important component of device selection.

MassDOT outlined the bridge inspection tablet pilot—inspectors had to log in to internal software (no application existed)—Windows based tablets were easier to use due to the nature of the access needs. A VPN allows access to all enterprise applications for FDOT. MassDOT had issues with certain applications in transferring large photos to the management software.

The National Institute for Standards and Technology (NIST) is the governing entity on digital authentication processes. One third-party authenticator used in Florida has an acceptable level of security using a key code established once certificates are issued based on proper identification. NIST Level 3 certified products are evaluated and used – this is not a requirement for all types of use but, is industry recognized. Contractor and consultant associations and FDOT all agreed to the use of e-signatures based on a 2013 memorandum of understanding. FDOT also uses a note underneath each signature showing the Engineer of Record for specific sheets in the plans as part of the digital signature.

For electronic as-built plans, a computation book recorded plans and final quantities, and plan sets were marked up by hand. The question that arose was whether to use CAD software for markups or another document format to develop as-builts. Inspection staff members are responsible for as-builts – FDOT project administration staff members in-house are also responsible. FDOT evaluated several document manipulation software products and selected one based on ease of use. FDOT purchased over 400 copies for construction and is expanding into design and bridge maintenance as applicable. Any project let after July 2015 has a requirement for electronic as-builts. Contractors are not required to use a specific type of format or device as long as the final product is compatible with FDOT's tools.

The initial investment was $1.5 million with annual recurring expense of $834,000 to $1 million, with reductions in scanning costs of $125,000 and a full annual projected savings of $22 million with full implementation by July 2016. Specifications have been updated to remove language such as printing, paper, etc. to go truly paperless.

With the introduction of 3D models, contractors often have their own as-builts. This is something that could be requested with little burden to agency staff.

Florida Statute 668 governs electronic commerce and Florida Statute 471.025 governs regulation of digital approvals.

Q&A

Q: Did contractor or consultant associations mention a need for assistance with covering the cost of e-signatures?

A: Not directly – they understand the efficiencies in payment processing times.

Q: Did you run into issues with approval from the State itself?

A: The Department of Financial Services along with Comptroller's Office in Florida approved the use of digital signatures on monthly estimates in January 2015.

Q: What would be a typical timeframe for claim review?

A: It sometimes takes 6 months, but 3 months would likely be the fastest that would be allowed by the procurement process.

3.3 FDOT e-Construction System Demonstration

Doug Martin of FDOT presented and demonstrated FDOT's project collaboration site, which is hosted externally.

When a contract reaches award status in the preconstruction software, each morning the software emails the project information to the project collaboration site that automatically asks if the approval person wants to start a site for the new project. When activated, FDOT personnel add information to the project (resident assigned, etc.) and the project collaboration site is updated to include the new information. The preconstruction conference then includes requests for access, proper project roles for contractors and consultant inspectors – when a workflow kicks off that is set to notify the "contractor" group as an example. Control of user accounts was complicated – when something changed all sites hosted had to be changed. The FDOT solution to this was creating an active directory group for FDOT that includes control – when a group needs global access to projects they are added to this active directory group. If a district admin or materials engineer belongs to an active directory group in District 7, any workflow will allow the appropriate person to be notified. Changes are then made to the active directory group.

A MassDOT participant noted at this point that their site is used for design-build and since some users play various roles on different projects, changing workflow processes has been an issue.

All projects are stand-alone site collections, which do not require user access changes across project sites. The third-party authenticator has a site that explains the process for internal digital certificates.

Everything on the site has to be voted on by the Consistent, Predictable, and Repeatable (CPR) group prior to the initiative or change going statewide. There are areas within the site where FDOT allows experimentation on various applications within the project collaboration site that can be tested. Any new changes have to be submitted to the CPR outside of the project collaboration site as of September 18, 2015. FDOT uses a share site add-in product to develop workflows within the site, which creates a graphic interface.

When FDOT purchased the product it was based on an invitation to negotiate, requiring a dynamically configurable product. The consultant brought a product that had been used within the Florida Turnpike Enterprise based on the general services contract. All the ideas that were included in the project collaboration site were transferred into the share site to encompass a customized tool for FDOT. Selection of a consultant was based on proposal scores, but previous experience was factored into the decision.

Work has to be done each time a third party software upgrade occurs – MassDOT is currently analyzing whether this type of software is the best solution. The more customization, the more conversion issues when

version updates occur. The cost is $125 per month for each project site with unlimited users, backups, and guaranteed 99 percent up time.

Q&A
Q: If a project crosses districts will one be the lead on management?
A: A lightning tool rolls up all project sites into one district site within the project collaboration tool.

3.4 Discussion on IT Security Solutions

Several MassDOT IT personnel called in to the meeting via teleconference. The following are the questions they asked the FDOT staff and the discussion that ensued.

Q: How did you balance the need for security, current IT Security guidelines, and the need to share information outside of the DOT networks with contractors, designers, FHWA other agencies etc.?
A: CONST - Our hosted sites reside outside our firewall. All users must be added to the Active Directory Group assigned to FDOT. We have the ability to add new users (presently two persons inside FDOT have this authorization). Even our internal personnel must be given a user account to access PSSP. FHWA members have accounts to access (read only) for all sites. We are still working out this configuration. However we think we have it fairly determined.
A: OIT - In addition, FDOT utilizes Office 365 through a secure Government G3 cloud which provides external collaboration capabilities through both Microsoft SharePoint and Microsoft OneDrive for file sharing with external partners. We also have use of a secure internal File Transfer Appliance (FTA).

Q: Fraud Detection is a major concern for MassDOT. From information received from Florida DOT we see that you use one certificate authenticator for signature security. How did you go about procuring their services and are there any other services you evaluated?
A: CONST - Our CADD section started the process of getting proper authentication for digital signers. It was determined that we must have National Institute for Standards and Technology (NIST) level III imposed on the entities that wish to do business with FDOT. Certificate Authorities (CAs) authenticate applicants through a rigorous process which includes Notary sign off. Once they are duly identified they are issued the certificate they use to sign the documents.
A: OIT - FDOT researched a number of companies that provide digital signatures and chose the certificate authenticator due to their ability to authenticate the digital signature certificate holder's identity.

Q: How long did it take from start to finish to implement the applications in Site Manager? Did you have to settle on certain applications because they were not as customizable as you thought?
A: We have been using SiteManager for a very long time. SiteManager is a client based application where the only communication to the servers is database calls. SiteManager, for the most part, is very stable for us. In the early days the largest hurdle was getting all the users trained. We will experience this same issue when we go to the Web version. The web version still uses the same business practices. However, the interface with the user will change. For this reason we must train all the users. We are keeping a very close eye on the developing web version.

Q: We see that you use a Citrix interface so that your iPad can access Site Manager. Is this an additional cost? How is this working in the field?
A: CONST - We are using CITRIX in any case. It can be via Windows PC, which is our most prevalent platform at this time. Or, it can be used by mobile devices through the CITRIX RECIEVER.
A: OIT - There is cost associated with Citrix connection licenses. However, licensing is based on concurrent connections so the number acquired is based on estimates of how many people at any one time will need to access the system, not on the total number of user who have been given access. It is apparently working well.

Q: Where is everything stored? Backup? Are there size limitations? Would records ever be deleted or destroyed after a time?
A: CONST - All of our databases accessed through CITRIX reside inside the firewall. All the servers with the data are located at the SSRC. The SSRC has standard backup and redundancy policies in place.
A: OIT - FDOT utilizes an Electronic Document Management System (EDMS) for the purpose of providing secure electronic storage, retrieval, and archiving of electronic documents. Construction is a Business area within the EDMS and the "Construction Document Management system" (CDMS) is utilized to store, retrieve, and archive all construction project records. CDMS is an electronic recordkeeping system containing all construction project documentation and correspondence generated or received by the Agency throughout the construction phase, including the final estimate and project completion.
With regard to backing up data, lost or corrupted electronic files are not easily recovered. Also, in years to come our file types may not be supported by the future versions of programs. We have concerns with this because it is out of our control.
A: OIT - Documents are scanned to or converted to the .TIFF or .PDF file formats before being imported into the Agencies EDMS so they are in formats that will remain readable.

Q: Based on the size of your program, are there any concerns with storage space for large files (CAD drawings) for all projects?
A: CONST - Over time the storage space needs may exceed capacities of systems/warehouses.
A: OIT - Storage space requirements/growth is always a concern and all efforts are made by the Office of Information Technology to address funding each year to support the anticipated growth. However, with the availability of cloud-based unlimited storage options, future concerns may be eliminated.

3.5 Exchange Topic 1: Collaborative Project Sites and Workflows

Prior to the peer exchange, MassDOT organized a list of questions ahead of time. These questions provide the basis for the facilitated discussion session that ensued.

Q: We use Bid Express for bidding. Does Florida use a similar system and has there been any integration between Bid Express and other programs being used?
A: Yes. We also use Bid Express.

Q: Do you have electronic Certified Payrolls and if so do you also require paper copies?
A: We do not have electronic payrolls at this time. However, we are allowing the use of external services (Paid for by the Contractors).

Q: You use the project collaboration site to administer Contract Modifications. Did you find that this software was customizable?
A: RFIs can be initiated through the project collaboration site. Contractual Supplemental Agreement Documents can also be exchanged through it. All signatures can be captured digitally without ever producing a paper document. However, for contract costing and tracking these authorized agreement values must be coded into SiteManager to ensure that the authorized payments meet the requirements.

Q: MassDOT is always struggling with building solutions in-house vs. using outside vendor products. Did you look at building any of your programs in-house?
A: We too struggle with the same issues. Our business areas have differing opinions relative to their own functions. For example: What we look for is a ready-made product which approaches, as nearly as possible, a 100 percent solution. Development carries a very large price tag. In the construction area our philosophy is to find and implement a 98 percent ready-made solution and spend development dollars or in-house resources on the remaining 2 percent. For Construction Management we are staying with AASHTOWare/Project.

Currently we are using SiteManager and are planning to move to the web-based version Mid-2017. However, other business areas do not share the same philosophy. Subsequently, FDOT is developing a Construction Materials application as well as a Pre-Construction costs estimating application with our own or contracted resources.

Q: Transition from older to newer systems is always a critical component of rolling out changes. Did you have any situations where customer service (i.e., contractor payment) was interrupted due to such roll outs, and do you have any lessons learned to share with MassDOT?
A: We have not experienced any reduction to our service to the community during any rollouts. However, we are constantly chasing issues related to our infrastructure. Issues related to servers and system access is a very common problem. This began to increase after the consolidation of multiple Agencies to a single Data Resource Center (SSRC).

Q: Did you eliminate paper files upon implementation of e-construction or did you keep both paper and electronic documents?
A: We are eliminating paper documents as a primary goal of e-construction. This will occur over time as on-going projects which are not e-construction build out and new projects begin under e-construction policies.

Q: How did you incorporate existing databases into your e-construction system? Did you keep redundant systems?
A: We have redundant electronic document management only for a period of time that a contract is actively being administered. All incoming documents are transferred to our internal EDMS and as long as the contract/project is being constructed will also reside with the project site. When the contract is completed the site will come down making room for new contracts and all the documentation is internally housed.

Q: Do field personal have the same access as main office personnel? DOT has a field-ops site that field engineers use, that is not as user friendly as main office access.
A: CONST - No. Field personnel have access only to the project they are assigned. Central Office personnel have read access to all projects. Specific users across the State (System Administrators) have access to change things on sites. This is for the purpose of initial set up and user support.
A: OIT - It has been a standard practice to setup any temporary field operation sites when needed with the same access as provided permanent site office personnel. This may include the use of a standard T1 line connection to the FDOT network or establishing a Digital Subscriber Line (DSL) connection for internet access to support the use of the Agencies Secure Sockets Layer virtual private network (SSLVPN) for establishing a remote connection to the FDOT Network.

3.6 Exchange Topic 2: Mobile Devices and Field Review of e-Construction Technologies

The group visited project sites to observe FDOT's use of tablets in the field that are linked to e-Construction software systems.

The first project site is located near Dade City, Florida and is on US 601, where a 6-mile milling and resurfacing project is combined with the construction of a mixed-use path and Geosynthetic Reinforced Soils (GRS) pedestrian bridge. FDOT project administrators outlined one anecdote on the time and cost savings from e-Construction:

A subcontractor began work on the abutment and piers for the pedestrian bridge and placed filter fabric and back filled with coarse aggregate. Inspectors noticed that the area was supposed to have graded aggregate base material. Using the field tablets, inspectors had access to the plans and specifications, and evaluated the specifications for the required material. FDOT was able to coordinate on the issue with the subcontractor prior to the bulk of the work being done. The tablet device also provided direct access to the State Materials

Office manuals. Without the tablet device, inspectors would have made a trip to the district office to look up the information, and the subcontractor would have likely continued working, thereby requirement more material to be removed to correct the issue. The tablet also allowed field personnel to find the code for the correct material and inventory was available the following day. The issue was noted in the daily work report.

On the same project, a video meeting linked field personnel with other project personnel to evaluate where to relocate a utility pole. Inspectors typically only use laptops when inside parked vehicles due to the difficulty in transporting a laptop around a construction site. The tablets, with a rugged case and shoulder sling, provide for greater flexibility in transport and thus personnel are more likely to use them.

FDOT tested the devices in a pilot project with Wi-Fi turned off at all times to test the connectivity of the cellular network connected them to the internet. A third-party software program allows tablet users to create documents with photos embedded. SiteManager does not provide a feature to upload photographs, although inspection reports are saved within the software program. FDOT can also track the devices if stolen, and they are password protected and FDOT also has the ability to disable remotely and delete all information.

The peer exchange group reviewed a second FDOT project on State Route 52, which included 2 miles of resurfacing, added sidewalks, drainage improvements, and an addition of an emergency signal for a fire station (a several million dollar project). One instance where e-Construction provided greater efficiencies over normal processes occurred when the contractor discovered a pipe underneath a driveway that was labeled as corrugated metal pipe when the plans showed a reinforced concrete pipe. A real-time video application on a tablet device linked field inspectors with district personnel and allowed others to view the area without having to physically be there. Project personnel contacted the engineer of record through a request for information that was added to the FDOT project collaboration site. These are also emailed in certain cases. The engineer was able to verify that the pipe was corrugated metal and that it was not supposed to be removed – this was a case where there was an error on the plans. A third party software tool was then used to mark the plans and upload the as-built back to the collaboration site.

Project personnel noted that they are able to access documents behind the FDOT firewall either through VPN or an ad-hoc web-based FDOT connection. The project collaboration site is also used to generate searches and dashboard metrics data that help with evaluating contractor performance for future bids. The CPR Team also has a feedback loop on the project collaboration site where users can upload suggestions for improvement for review and incorporation as needed.

Q&A

Q: We see that you use AASHTOWare/SiteManager for inspection daily reports. Did you evaluate other products like Doc Express, Project Wise? What was it about Site Manager that made you choose this over other applications?
A: We have used AASHTOWare since before the other products even existed. In our Construction Division we have no desire to change at this time. This product has been fairly stable and works very well for us.

Q: Could we incorporate the use of a "scanner app" with bar codes for identifying and tracking samples? Barcodes can be printed on peel/stick tabs.
A: This is an excellent idea. We also think that these technologies could be levied to simplify the data collection in the field by producing HR Codes on the batch tickets. This would have to include interaction with the Asphalt Manufacturers because the batch tickets are produce by them.

Q: Do you have docking ports in the field office to allow handheld devices to be place into desktop for seamless integration?
A: No such docking ports have been found to be available for the iPad at this time.

Q: Have you used tablets/smartphones that include voice recognition apps/programs for easier recording of info (instead of typing on small screen keyboard)?
A: No voice recognition apps/programs are used at this time.

Q: Would personal use be allowed for smartphones or tablets – within acceptable use policy limits (this way the inspectors aren't carrying multiple devices for personal & professional use – and they are more likely to be in contact at all times)
A: No. However, the Agency does have a program where employees can request and be authorized to use personal mobile devices in the workplace. (BYOD)

Q: Do you use GPS on tablets? Do you use GPS stations owned by Florida DOT or do you use standard phone Apps for GPS locations?
A: Not at this time. However, part of the criteria used in the selection of iPad as the current tablet of choice was because certain models provide GPS and LTE capabilities.

3.7 Discussion on Field Implementation to the Districts

This session linked other participants by phone to discuss how to implement e-Construction technologies throughout all Districts within MassDOT. The following questions and answers were discussed by the group.

Q: How do you process time sheets and mileage request for field staff? Are these electronic?
A: Not at this time. However, we are preparing to do electronic timesheet reporting for our consultant resources on our hosted sites.

Q: The following two paragraphs are from a field engineer's perspective. Do your field engineers have any of the same issues with your applications?

- One tablet device does not integrate with the SharePoint site at all. A system where, once the contractor has completed a NCR repair, an inspector could take the tablet out to the site, take a picture of the repair, and sign off on the field inspection portion of the NCR, all from the tablet, would be helpful. The same issue exists with the daily reports. As currently constituted the daily report form is difficult to fill out using a tablet. Thus, most inspectors write down all relevant information in their field books and then complete their daily report in the office, at their computer (to include a picture you have to download it to your computer and then upload it to the daily report). If the daily report tool integrated with the tablet I think inspectors would be more likely to use the tablet to complete their daily reports.

For the Construction Section:

- Project Diary - Although this system of daily reports is much easier than hand writing in the LL book, it has one major shortfall: compiling the information. Currently, the final product for the project diary is essentially 7 different daily reports from our inspectors. Although the LL book is a cumbersome job, it results in one person reading through all these daily reports and compiling the information in a coherent format. The SharePoint site does not combine any of our daily reports. The end result is 7-10 pages of information for every day in the project diary. The real problem with this is that it makes it very difficult to try to go back into the diary and dig out information from earlier in the job.

Q: Inspectors at DOT have identified the need that electronic notifications are sent at the field inspector level when design changes have been made to either the record set of drawings, specifications changes, or any

approved field design changes. It is critical to get these revised plans with some sort of markings/signatures to show that they have been approved. Do you have any work flows for this in your electronic systems?
A: CONST - Plans revisions can be uploaded to the Project Plans library. Alerts can be set to notify individuals that need to be kept up to date. We are exploring these capabilities now. Since we are using SharePoint this is an easy feature to implement.
A: OIT - The Agency has made a significant investment in the use of the a third party markup tool for documents for its ability to easily embed pictures and allow staff to annotate, and create markups for use with paperless plans processing. There is also an iPad component to this software tool.

Q: What type of training module did you roll out with the new software and how did you keep consistency across your districts?
A: CONST - We are training the trainers and then they are training the Contractors and CEIs as a part of the Pre-Construction information exchange.
A: OIT – See document titled "How to obtain and use a Digital Signature."

Q: Have you found issues with senior construction staff or finals/audit engineers having trouble with electronic documents and systems. They are infrequent users of the systems that are used to going into a field office and requesting to see the hardcopy ledgers and reports for auditing. Do you use a LIMS (Laboratory Information Management System) for tracking samples? If so is it integrated with any other systems?
A: Yes. This is true in all cases where we are implementing new changes. We are trying to keep things as intuitive as we can. SharePoint helps with this because it is very intuitive. Any new software enhancements scare our long term savvy users. It pushes them outside their comfort zone.
We are in the process of re-writing our Materials application. It is an in-house/consultant development.

3.8 Exchange Topic 3 – Electronic/Digital Signatures

Participants discussed various challenges associated with implementation of digital signatures on contract documents and for change orders. FDOT outlined their process for implementation, and a question and answer session followed the discussion.

MassDOT is currently working with the State Comptroller's Office to determine requirements for implementation of digital signatures. MassDOT inquired about estimates signed and processed (estimate and fiscal document with two signatures) and one signature was placed in ink over 30,000 times. Now one signature can cover multiple estimates, but the first page must have an ink signature. Demonstrating security will be important along with the infrastructure to implement. Extra work orders, time extensions, original contracts, etc. will also benefit from this approach. The electronic bidding system already has a similar digital signature process.

NIST Level 3 security documentation will be shared among the group. An application must be submitted along with two forms of identification and the application is then sent to the third party authenticator for verification. FDOT pays approximately $116 for a 2-year license. Time savings from digital signatures is one of the primary benefits – if someone is traveling they are able to apply a signature without delay.

With another device or computer, certificates have to be transferred to a new device and a pin authenticates the user based on the certificate client software. Validation has to be checked for each signature placed. The forms could include a check box that asks the latest approver to certify that the prior signatures have been validated, or consideration for programming in a rule to validate that the workflow process integrity is intact. Automated forms will allow for completion of workflow activities without checking out and checking back in documents. A public key infrastructure (PKI) validates the certificate via the internet.

Department of Financial Services, Comptroller, and FDOT all met and observed the digital signature and discussed challenges with implementations. Showing the process manually to all stakeholders (or using videos) helps to convince them that the process is secure.

The consulting community has been using electronic signatures for years and they are now converting to a similar digital signature as FDOT. Florida administrative code explains requirements for language to be included in a professional engineer seal to be included in the signature. Each title sheet denotes which pages are being signed and sealed by the professional engineer. FDOT requires a digital version of the professional engineer seal but does not allow a wet signature over the digital version of the seal.

Q&A

Q: The State comptroller is concerned about the need for external signatures on payment documents. Specifically, the authentication and validation issue for digital signatures of outside vendors and the possibility of fraud. Have you had to deal with these types of concerns? If so any advice?
A: Our CADD section started the process of getting proper authentication for digital signers. It was determined that we must have National Institute for Standards and Technology (NIST) level III imposed on the entities that wish to do business with FDOT. Certificate Authorities (CAs) authenticate applicants through a rigorous process which includes Notary sign off. Once they are duly identified they are issued the certificate they use to sign the documents.
We are open to having new providers meet the approval for use. They simply need to be able to provide NIST Level III authentication. When a provider proves they can meet this requirement we will add them to the acceptable providers list.

Q: Do you have any SOPs or directives associated with eSignatures and could we get a copy?
A: OIT –
Yes, http://www.dot.state.fl.us/construction/forms/ElectronicSubmit/AcquisitionGuidelines.shtm
Also – Please see draft documents "Acquiring and Managing Digital Certificates" and "Security and Use of Digital Certificates."

Q: It appears that some electronic signatures are associated with internal processes and do not require any outside agency approval. We recognize that laws in each State are different, but are there certain signatures (i.e. daily reports) that do not require approval outside of the Agency? Did you take a similar approach?
A: Our daily reporting is all electronic except for some special projects which might not be administered through SiteManager. So users are electronically authenticated rather than digitally authenticated for daily reporting.

Q: Do you have any written documentation that you have provided to your State Comptroller's office to get e-Signatures approved? If so would you be willing to share?
A: We will share the letter about the Department of Financial Services approval to sign estimates.

Q: MassDOT is looking at a simple approach of using Adobe forms and Adobe signatures. Adobe has add-ons and third-party services that authenticate signatures that could be quickly rolled out similar to how Michigan is handling these. Did you look at any such simple approaches, and if so why did you choose not to pursue?
A: CONST - We have provided an automated process for pre-filling forms for our projects. The user only provides the pertinent information on the form. Our long-term plans are to migrate all of these forms for auto generation with use of some tool and SharePoint (Nintex forms, PDF SHARE, etc.) This is still being researched.

A: OIT -The use of Adobe Forms and Signatures is something we have and continue to assess from an IT perspective. However, we have other products currently in use within our environment that are capable of using and authenticating digital signatures. Also, per the information provided at the below site, current free Adobe Reader versions can be used to authenticate digital signatures.

Q: Do you use Electronic signatures for contractors (and other "signers") also? This would allow us to process documents without having to actually mail or circulate paper documents between organizations.
A: CONST - Yes. This is our plan. But, we are using digital signatures.
A: OIT - External design consultants can go directly to the certificate authenticator website to obtain their certificate. They may need approval from their consultant management, but this does not involve anyone at FDOT. Consultant employees of the Department, on the other hand, must use the AARF system, the same as State employees. Approval comes from their cost center manager and security coordinator. The approval process continues thru Office of Information Technology until they finally get their certificate from the authenticator.

Q: Validation of an electronic signature is critical. Are you satisfied with your certificate authenticator in this regard?
A: During validation the certificates must be matched with root certificates of the providers. One of the drawbacks of using the certificate authenticator is that they do not pay for Microsoft to include their root certificates in the normal distribution of the windows operating system. They do this to keep their costs down and subsequently lower the costs to their customers. With the certificate authenticator we must install the root certificates ourselves. Sometime this can be cumbersome. However, once it is overcome the systems operate smoothly. In any case the use of digital certificates function slightly differently between PDFs and Microsoft Office Documents. These differences need to be pointed out during any training efforts. Users will not get it from the beginning but after using it several times it becomes second nature.

Appendix A – e-Construction Peer Exchange Agenda

Florida/Massachusetts e-Construction Peer Exchange

FDOT District 7 – 11201 N Mckinley Dr.
Tampa, Florida 33612

Agenda

Day 1 – September 16, 2015		
Time	**Topic**	**Presenters / Facilitators**
8:00am – 8:15am	Welcoming Remarks and Introductions	Patricia Leavenworth, MassDOT Chief Eng. Brian Blanchard/Tom Byron, Florida DOT Kathryn Weisner, FHWA
8:15am – 8:30am	Peer Exchange Background and Overview	Tim Luttrell, Leidos Tom Zagorski, Michael Baker International
8:30am – 9:00am	MassDOT Current Practices in e-Construction	Dan Casaletto, Massachusetts DOT
9:00 am – 10:00 am	FDOT eConstruction Overview	Amy Tootle/Doug Martin/April Blackburn, Florida DOT
10:00am – 10:15am	Break	
10:15am – 11:45am	Demonstration of Host State e-Construction Technologies and Systems	Florida DOT/All
11:45am – 1:00pm	Lunch (on your own)	
1:00pm – 2:30pm	Discussion on IT Security Solutions*	All/Conference Call with MassDOT and FDOT IT
2:30pm – 2:45pm	Break	
2:45pm – 3:45pm	Technical Exchange Topic #1: Collaborative Project Sites and Workflows	MassDOT/FDOT/All
3:45pm – 4:15pm	Discussion on Day 1 Takeaways for Implementation	Tom Zagorski, Michael Baker International
4:15pm – 4:30pm	Preview of Day 2 Agenda Items and Field Review Safety Briefing	Tom Zagorski, Michael Baker International
4:30pm	Adjourn	
Dinner on your own		

Day 2 – September 17, 2015		
Time	**Topic**	**Presenters / Facilitators**
7:45am – 8:00am	Recap of Day 1 Discussion – Challenges and Themes	Tom Zagorski, Michael Baker International
8:00am – 11:00am	Technical Exchange Topic #2: Mobile Devices and Field Review of e-Construction Technologies	Florida DOT/All
11:00am – 11:30am	Discussion on Field Implementation to the Districts*	All/Conference Call with MassDOT District Construction Engineers
11:30am – 12:45pm	Lunch	
12:45pm – 2:15pm	Exchange Topic #3: Electronic/Digital Signatures	Florida DOT/All
2:15pm – 2:30pm	Break	
2:30pm – 3:15pm	Discussion on Takeaways for Implementation – Suggestions for MassDOT Implementation Plan	Tom Zagorski, Michael Baker International Tim Luttrell, Leidos
3:15pm – 3:30pm	Closing Remarks, Feedback on Peer Exchange, and Next Steps	All
3:30pm	Adjourn	

Appendix B – e-Construction Peer Exchange Roster

Name	Agency	Title	Email Address
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