

Dec. 2017 - An overview of the IBTTA efforts to achieve National ETC Interoperability

In 2010 the International Bridge Tunnel and Turnpike Association (IBTTA) began working to meet the requirements of what MAP-21 would call for (in 2012) – a nationally interoperable system of electronic toll payments – with the creation of a Interoperability (IOP) Steering committee and multiple working groups addressing specific aspects of the issue.

A major barrier to developing a national electronic toll collection (ETC) system was the development of individual ETC systems introduced by many agencies since the advent of ETC in 1989. Significant time and resources have been expended by individual agencies to develop systems suitable for their local needs and to market, issue and service these systems to their local customers. These agencies now manage tens of millions of customer accounts and any restructuring of either the mechanical or business systems associated with ETC presents complicated and expensive challenges that can irritate their customers so any such changes are very carefully considered.

Taking on this problem required the cooperation of the toll agencies as well as their equipment suppliers and technical support contractors. IBTTA has always felt that a collaborative effort of the agencies was a much more plausible path to success than a forced and unfunded governmental mandate.

In 2015 IBTTA issued an RFP and entered into a contract to pursue a testing process that would identify one protocol among the multiple protocols in use across the country that could be determined as the "national" tag. The traditional path to such testing would involve extensive use of manned vehicles driving laps at varying speeds and with differing combinations of ETC tags being used in a live environment. Such testing is prohibitively expensive.

The IBTTA effort focused on creating a lab based testing process that could replicate and replace live testing with a goal of identifying a single protocol that could best address any toll agency's current ETC setup and data needs. The intent of identifying a single "national" protocol was to allow individual agencies the opportunity to, in the short term, offer any customer desiring an interoperable tag a choice and recommendation as to how they could best address that need. In the longer term, as existing ETC systems needed replacement or upgrading, having identified a single "preferred" protocol among the several in use, agencies would migrate towards a common protocol and in doing so become increasingly interoperable.

IBTTA's effort was fiscally constrained from the start and it was engaged as an entirely self-funded process which didn't contemplate or seek any Federal assistance. As engaged, the project envisioned performing the work as funds were raised or otherwise made available. IBTTA was only made aware of the FHWA Notice of Funding Opportunity (NOFO) in January 2016, and was able to finalize the agreement with FHWA in September 2016, more than a year after the original testing contract was engaged.

A critical element of the effort to build a lab-based surrogate for live testing was a cross-check mechanism that would test whether the lab based method was, in fact, an accurate surrogate for live testing. In August we received the preliminary results of that cross-check which tells us that the lab based path does not, in fact, accurately reflect the real-world roadway interactions with enough precision. Therefore, the lab testing approach we had proposed is not viable going forward.

This is not to say that lab testing does not provide useful and valuable information. Lab testing **has** confirmed the candidate protocols' adherence to specifications (known as "conformance testing") and multi-protocol handshake degradation requirements (Test Rounds 1 & 2). "Degradation" in this instance refers to any loss of precision in identifying any one tag if another protocol tag is in the same environment, i.e. "is it harder to read

you own “local” tag if non-local tags are also in the vehicle mix.” Because “bad reads” equals revenue loss and customer dissatisfaction this is a critical concern for toll agencies.

In Test Rounds 3 & 4, we were able to confirm adherence to the handshake degradation requirement in the field but were not able to statistically correlate all of the performance requirements between the lab and field environments as originally envisioned. This was due to our inability to replicate conditions between the lab and field environments (dual or multilane environments).

The specific elements of the work plan incorporated in the FHWA agreement that would not be performed are the Test Rounds 5 and 6 which focused on Read/Write performance (highlighted on table below). It is deemed unhelpful to pursue this testing as planned since the lab test environment has been determined to not accurately reflect real world events.

In order to follow the testing path further, we would have to conduct massive numbers of live driving laps with professional drivers on a dedicated high-speed facility at a minimum cost of \$800,000 and potentially much higher. This would significantly exceed our current contract with OmniAir and our membership has expressed little enthusiasm for raising or spending further funds in support of the effort, mainly because we are seeing rapidly growing regional interoperability which has occurred parallel to our testing effort.

The IBTTA Board of Directors discussed these findings in September. We are confident that the work effort and testing completed thus far **does** provide useful information that IBTTA can report to FHWA and the public to fulfill the requirements of the agreement. Furthermore, we are **not** be seeking additional funding either from IBTTA members or from US DOT.

IBTTA and our members fully intend to continue working on the **business practices** associated with interoperable transactions to fulfill the interoperability intent of MAP-21. That intent is found in this language: “all toll facilities on the Federal-aid highways shall implement technologies or business practices that provide for the interoperability of electronic toll collection programs.”

In short, it is our belief that no additional testing is needed to accomplish that objective. IBTTA is not seeking any additional funding from FHWA beyond the scope of the original agreement.

Separately and parallel to IBTTA's work on protocol testing, our member agencies are using the work products from the testing effort to coordinate, design, finance and implement multi-state toll Interoperability solutions that weren't envisioned in 2010 or even 2015 as we entered the formal testing process. These "regional interoperability hubs" are already in operation in Texas, Oklahoma, Kansas, Florida and Georgia. The Ez-Pass Consortium maintains its own hubs as part of it's ongoing business practice and covers the greater Northeast of the country (16 states). In the next 18 months we will see additional "regional hubs" that will link the states of NC, SC, GA, FL, TX, OK, KS and CO. Also, currently planning to join this effort through a Western Region Toll Operator MOU are CA, OR, WA, UT, NV and AZ.

In summary, while the efforts of our protocol testing path have not performed as we hoped, we believe there has been significant progress made to fulfill the intent of the MAP-21 requirements and that both our efforts, and those enabled through FHWA's participation, have been useful. These efforts have contributed significantly to the efforts to achieve national interoperability in the near future.

NIOP Timetable

2016

- Testing developed by OmniAir → ROSC provides oversight
- Phase 1 – Conformance Testing (completed)
 - 6C - Passed
 - TDM - Passed
 - SeGo – Passed
- Phase 2 – Performance Testing – Planning efforts (completed)
- Lab Test track tool developed (completed)

2017

- Testing led by OmniAir → ROSC provides oversight
- Test Approach Doc –Approved by Steering Committee 3/2017
- Statistical methodology established (completed)
- Final review of Test Plan (completed)
- Responding to Agency & Vendor comments (completed)
- ~~Phase 2 – Performance Testing~~
 - ~~Lab~~
 - ~~Field~~
- Update Industry survey and model (completed)
- ~~Schedule: Final Lab test report results 9/2017 (planned target)~~

Test Round Number	Description	Tests	Lab Trials	Field Trials	Total Trials
Round 1	Single Protocol Correlation	12	600		600
Round 2 (Pass/Fail)	Dual Protocol Handshake Performance	12	600		600
Round 3	Handshake Correlation	18	900		900
Round 4	Variable Correlation	24		1,200	1,200
Round 5 (Pass/Fail)	R/W Performance	12	19,308-45,744		19,308-45,744
Round 6 (Pass/Fail)	R/W Performance	3		4,827	4,827
TOTALS		75	21,408-47,844	6,027	27,435-53,971