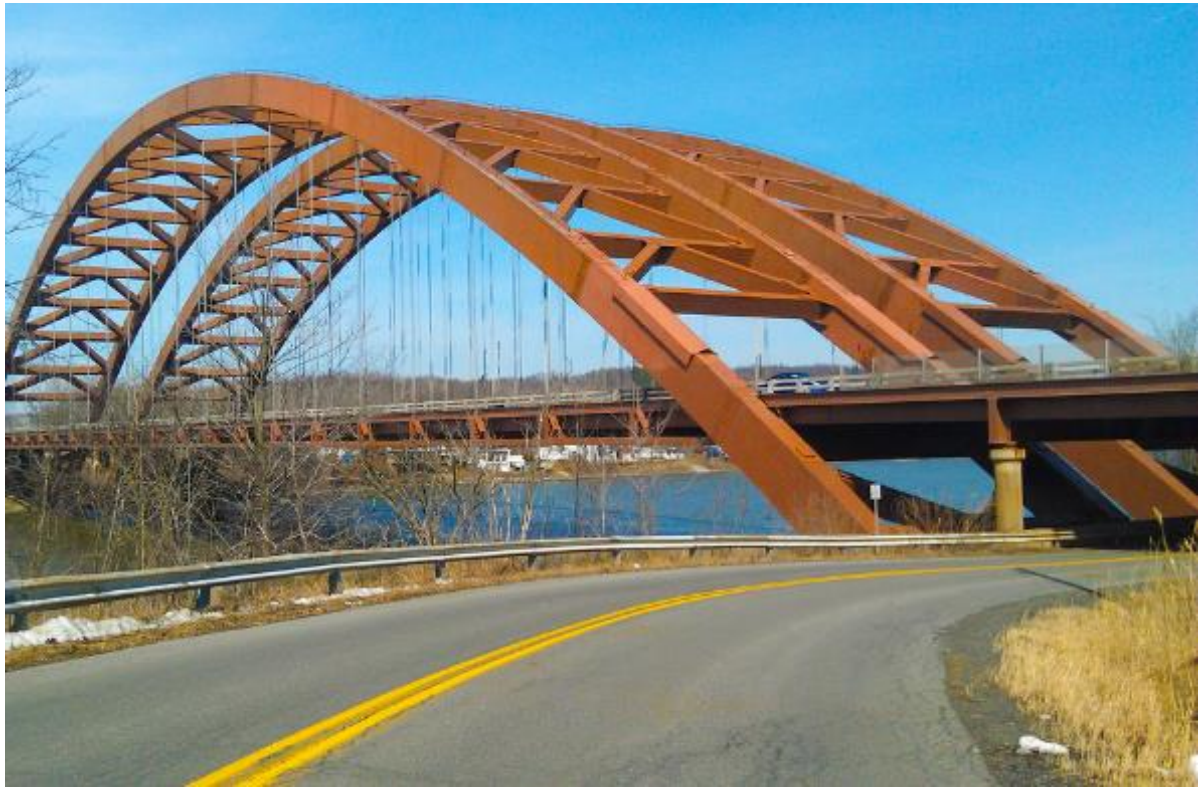
AASHTOWare Bridge Rating Design Update



RADBUG 2015

Albany, NY – August 4, 2015

Comprehensive Bridge Software

AASHTOWare Bridge Design and Rating

"A Software Success Story"

A 16 year history of the development progression

from common to complex bridge analysis

for more than 40 agencies and 600 consultants!

Modernization Update

*The modernization proposes to create **more powerful**, **easier to use** tools to assist agencies in designing and load rating their inventory in a **more cost-effective** manner.*

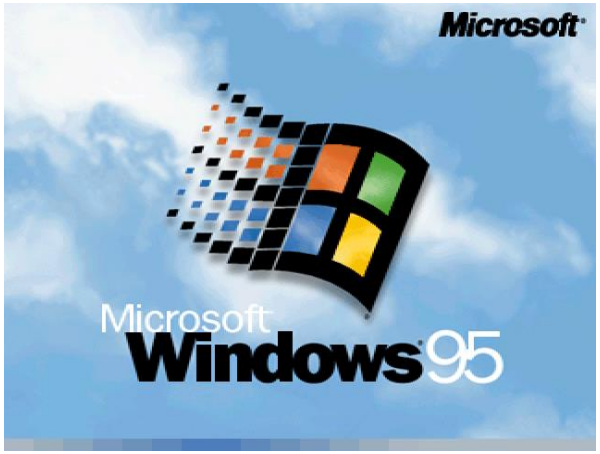
Modernization Update

Why Modernize?

- Life span of the Bridge Design/Bridge Rating predecessor, BARS, was 20+ years
- It has been nearly 20 years since the design and development of the current system began and 16 years since it's April 1999 release (formerly known as Virtis)
- The design is based on the technology of the late 1990s.

Modernization Update

Why Modernize?



When development started:

- Windows 95 or NT was common and was replacing Windows 3.11
  - Needed a 386DX processor
  - Needed minimum 4 MB RAM (8 MB recommended)
  - Hard drives in the 40-100 MB size were common

- There have been 7 versions of Windows OS since development began:
  - Windows 95, 98, ME, XP, Vista, 7, and 8 and Windows 10 last week

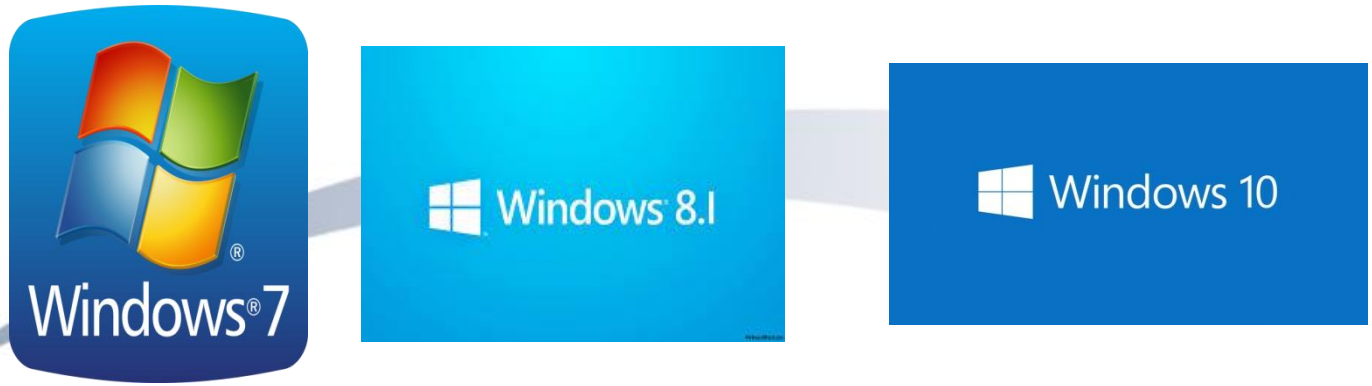
Modernization Update

Why Modernize?

Currently:

- Windows 7 or 8 – 64 bit
- Memory – 16 to 32 GB common
- Hard drives in 1 or 2 TB are common, very fast solid state drives becoming common in 250-500 GB range

Tremendous changes in OS and hardware over the last 15-20 years



Modernization Update

Why Modernize?

- Recent addition of 3D analysis pushes the computational limits of the current system
- Software tools for development have significantly improved
- User expectations have matured
- Hardware has improved, need to take full advantage of new hardware capabilities (e.g. multi-threading)

Modernization Update

Benefits:

It is time to migrate to a new architecture using the latest development tools.

- Significantly upgrade the core technology to a modern software architecture that better utilizes current and future hardware, and the latest software development technologies
- Improve analysis performance by taking advantage of multi-threading (running multiple tasks simultaneously) capabilities of the latest hardware

Modernization Update

Benefits:

- Improve and simplify the user interface - easier to use for beginners without losing modeling flexibility for advanced users
- Improve reporting capabilities
- Reduce maintenance costs
- Reduce implementation time for new features

Modernization Update

Progress:

- Conducted a workshop with stakeholders to identify the requirements that drive the software design.
  - Summer 2013 – Task Force, Users, Contractor
  - Let by specialist from Carnegie Mellon
- Completed an architecture design that will satisfy those requirements.
- Prepared conceptual user interface mockups of the modernized user interface.
- Solicitation for funding later this month

Quality Attributes

- #1 Performance
  - Reduced analysis time
- #2 Usability
  - User Interface, Error Reporting, Output
- #3 Extensibility
  - 3rd Party, Adding new functionality
- #4 Modifiability
  - Ease of making changes

Proposed Schedule

- 3 + 1 year
- 3 years for the actual modernization with 1 additional year for enhancements
- Modernization will be funded by solicitation
- Enhancements funded by license fees
- BrDR 6.8 last release with enhancements
- Interim – bugs and Spec Updates

Project will:

- A new, more robust architecture
- A modernized user interface similar to the existing interface so as not to require retraining of users but with sufficient changes to improve and simplify data management
- All capabilities of the existing system
- Complete reuse of all data contained within the existing database.

Project will:

- A new analytical engine that matches the analysis results of the existing engine but is significantly faster when running on hardware containing a multi-core processor. As hardware containing more cores becomes available the performance of the new analytical engine will continue to improve.

Project will:

- Improved reporting of analysis results
- Many of the enhancements requested by the users
- A code base that is less costly to maintain

Trivia items:

- Over 8 million lines of software code
- Over 1000 windows
- Support 10 superstructure types
- Estimated agencies have spend $100,000,000 to model their bridges in the software (conservative estimate)

3 Phases:

- Add new analysis engine
- User interface and data access
- Enhancements

Testing:

- Regression testing
- NCHRP 12-50
  - Report 485
- Easier to test between software versions
- Contractor using it –
  - make it available to the users

Progress to date:

- Finite Element engine modernization - underway
- New enhancements, when possible done in the new modernization architecture
- Design tools being developed in the modernized architecture
- Rating tool will be developed in modernized architecture

Other items:

- Task Force met with Bala in Fall of 2013 and he gave feedback on the product.
  - Overall he thought the product followed AASHTO Specifications
  - Offered some suggestions for additional enhancements
- Task Force works closely with T-18 (and other committees) to ensure the product is following the specs and their intent
- Continue to do this moving forward

SPR Funding option

- Task Force has worked with FHWA and have secured approval letter from FHWA to allow use of SPR funds.

Modernization Update

In conclusion…

Improve efficiency *for more than 600 consultants and 40 agencies.*

"It's all about the data!" *Licensing agencies have an enormous investment in their bridge data.* ***The data and your investment will be preserved.***

Thank you