

**MICHIGAN STATE**  

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**U N I V E R S I T Y**

# Project Plan

## Connected Vehicle Test Harness and Evaluation

### The Capstone Experience

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*From Students...  
...to Professionals*

# Functional Specifications

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- Test Harness that can use a variety of Messaging Protocols
- Compares the raw performance of protocols against each other
- Discovery Box simulates the TCU Module of a vehicle
- Educated decisions about best Machine to Machine Protocol



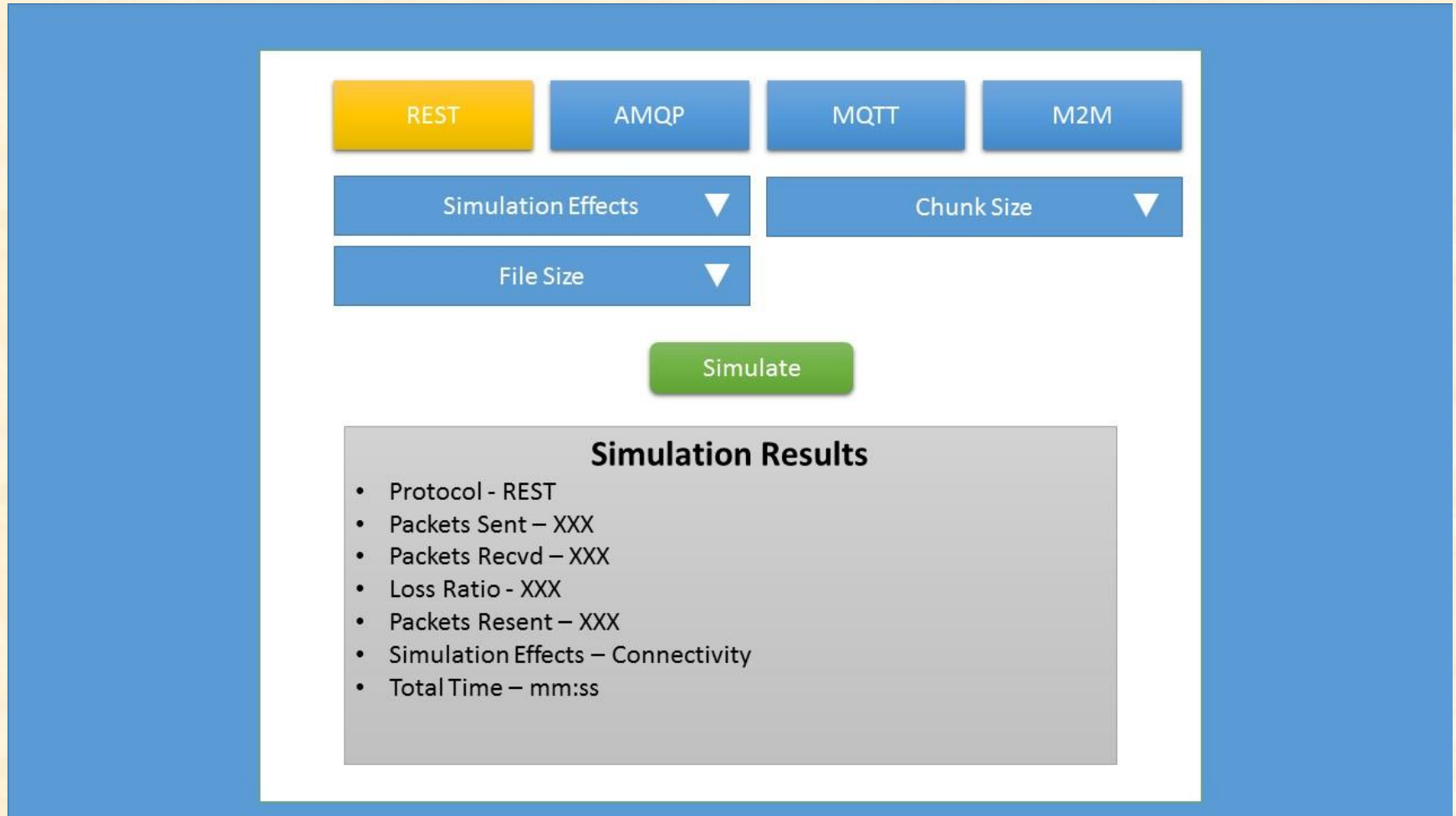
# Design Specifications

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- Web Interface to view test results
- Graphs to easily see differences between protocols
- Test Harness Interface to initiate the tests on the protocols



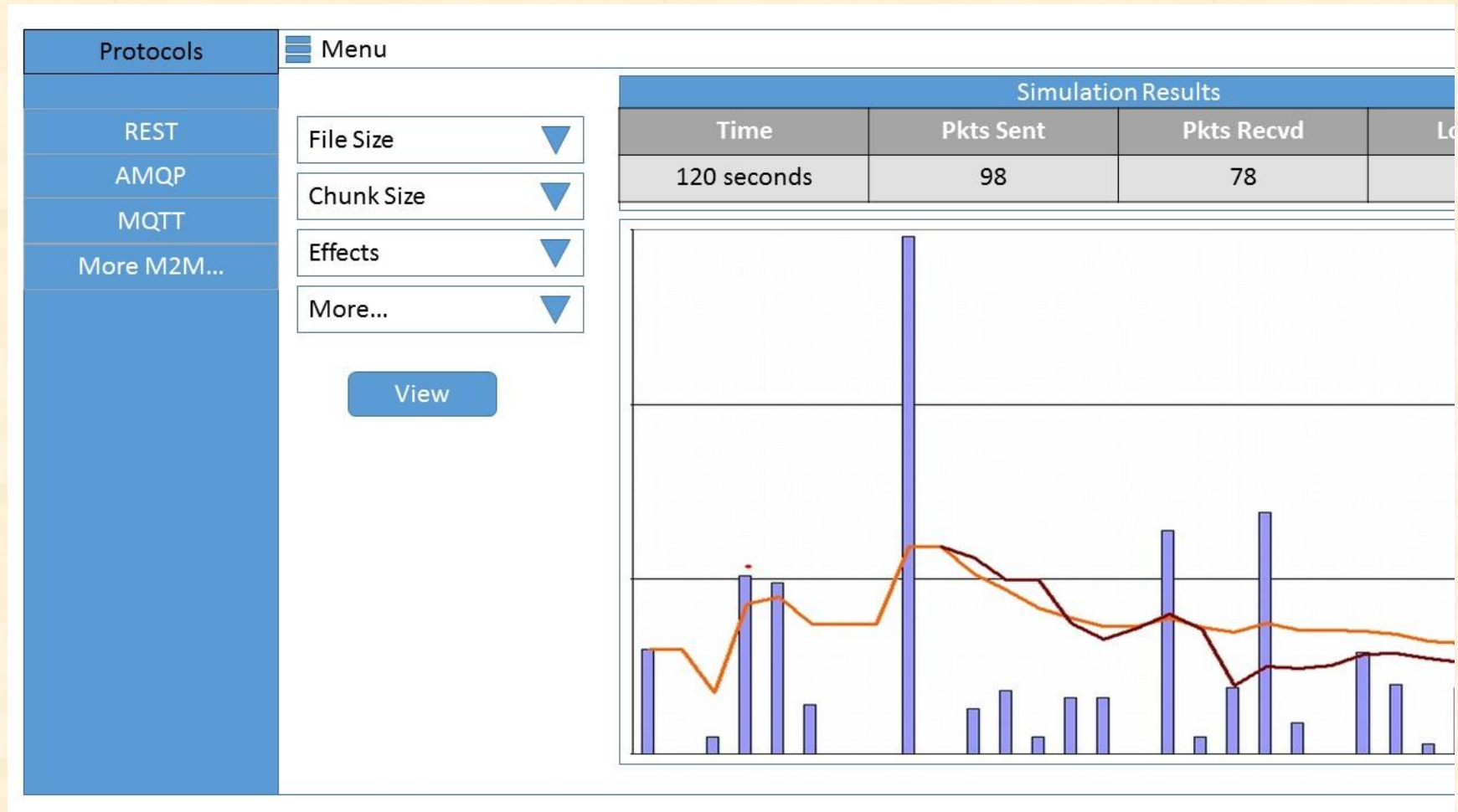
# Screen Mockup: Discovery Box



# Screen Mockup: Web Application View



# Screen Mockup: Web Application View



# Screen Mockup: Test Results Web

Menu

ID	Language	Pkts Sent	Pkts Recvd	Pkt Size	Pkts Resent	Loss Ratio	Time
1	MQTT						
2	AMQP						
3	MQTT						
4	REST						
5	MQTT						
6	AMQP						
7	MQTT						
8	REST						
9	AMQP						
10	AMQP						
11	MQTT						
12	MQTT						
13	REST						
14	AMQP						



# Technical Specifications

- Discover Box running RabbitMQ
  - Running Lubuntu
- Microsoft Server 2012 R2 with instances of RabbitMQ and MS SQL 2012
- Client Side web interface built on top of .NET MVC Framework and styled using Twitter Bootstrap.
  - Assumption: Web app is accessible from any authorized PC
- Ability to run on any PC
  - Runnable if Discovery Box out of commission.

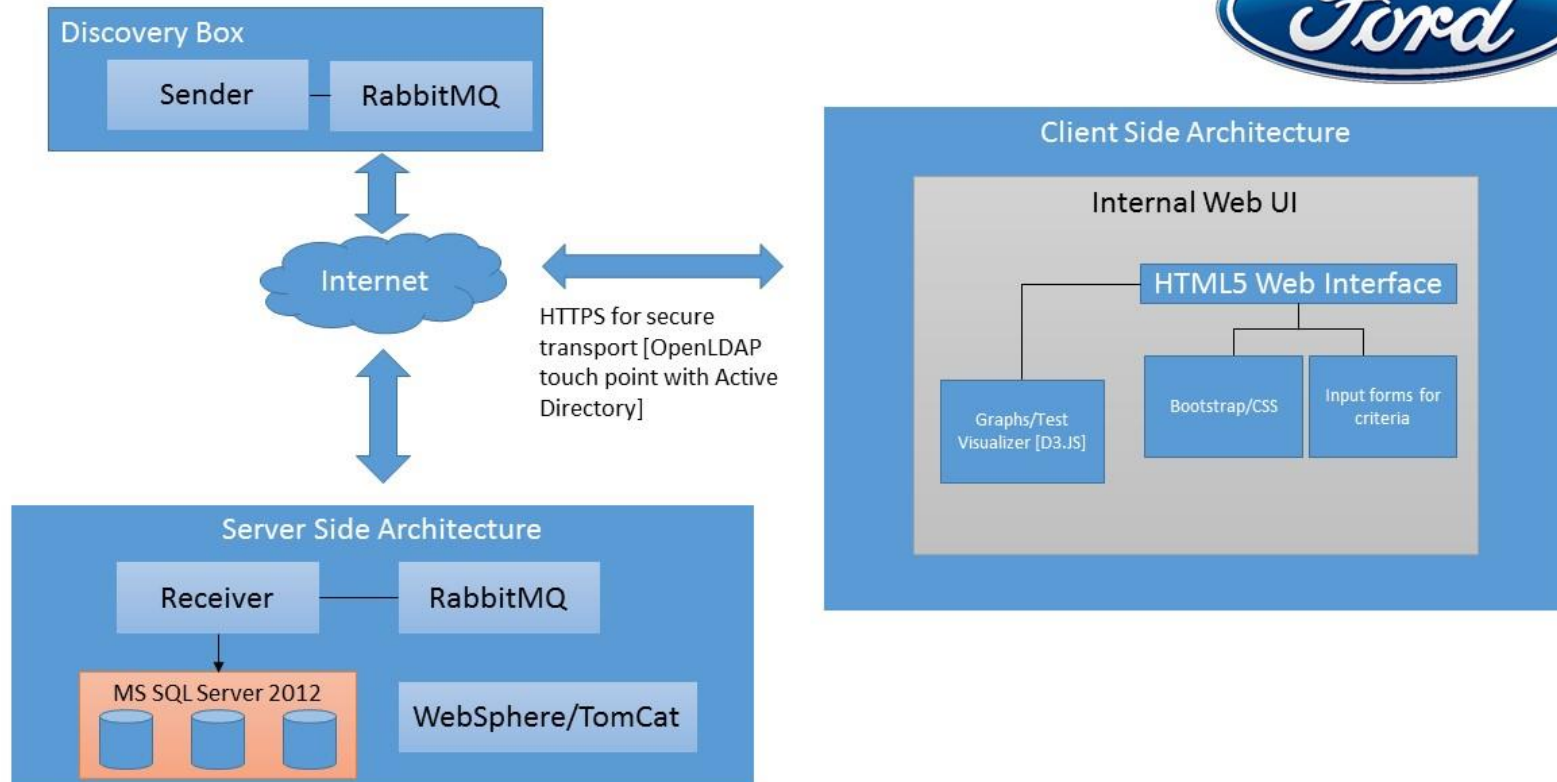




# System Architecture



## Connected Vehicle Protocol Test Harness and Evaluation



# System Components

- Hardware Platforms
  - Discovery Box
  - Capstone Lab Server
  - Browser enabled devices
- Software Platforms / Technologies
  - RabbitMQ - Messaging Broker
  - Windows Server 2012 R2
  - Windows SQL Server 2012
  - Eclipse Java Mars IDE



# Testing

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- Code Reviews
  - Each member is accountable for other members
- Isolate Discovery Box and Server testing
- Full integration user tests
- Utilize as much as we can from Discovery Box
- Stretch
  - Code Coverage with JUnit



# Risks

- Machine to Machine Protocols
  - Mitigation: Tutorials, Ford contacts
- Data Visualization
  - Mitigation: Tutorials, professors, small projects
- Hardware and Limited Storage
  - Mitigation: Know what is needed, watch footprint
- Version Control
  - Mitigation: Utilize GitHub source control
- Scope Creep
  - Mitigation: Assumption logs, talks to ensure we align with expectations



# Schedule

- Week 3 (9/19 – 9/25)
  - **Project Plan Presentation and 1st draft project plan - Due 9/21 4AM**
  - Discovery Box UI created and skeleton
  - Send small file with AMQP
  - Set up REST protocol package code and port to Discovery Box
    - Get REST code working on Discovery Box
  - Begin looking into Data Visualization with D3.JS
- Week 4 (9/26 – 10/2)
  - Begin work with MQTT using RabbitMQ
  - Start collecting data on test results with AMQP
    - Log experiences with AMQP
  - More work on Data Visualization
  - Framework .NET MVC web application



# Schedule

- Week 5 (10/3 – 10/9)
  - Send small file with MQTT using RabbitMQ
    - Align connection needs to one area with AMQP team
  - Store REST protocol statistics in database
  - Complete REST protocol implementation and testing
  - Web application should have necessary screens and routing
    - Web application should also be able to dump data
- Week 6 (10/10 – 10/16)
  - Implement LDAP/OpenLDAP with Active Directory [Web App]
  - Finish up AMQP using RabbitMQ storing all necessary statistics
    - Run AMQP code using Discovery Box and Server separately
  - Web Application should be able to begin showing visualized data
  - Branch Project to *Alpha* branch
  - ***Have Alpha Presentation to Ford by Wednesday [10/14]***
    - *Teleconference with Ford to talk Alpha*



# Schedule

- Week 7 (10/17 – 10/23)
  - **Alpha Presentation - Due 10/19**
  - More LDAP/OpenLDAP with Active Directory as needed
  - Point Discovery Box and Server at each other and test AMQP and get stability
  - Finish up MQTT using RabbitMQ storing all necessary statistics
    - Run MQTT code using Discovery Box and Server separately
  - More Data Visualization with AMQP data and web application testing
    - MQTT data should fall into this mold easily
- Week 8 (10/24 – 10/30)
  - Point server and Discovery box at each other and test MQTT and get stability
  - If OpenLDAP with Active Directory is stable
    - **[Stretch]** Split small group off to see if another Protocol is feasible
  - User testing application and bug patching
  - Web application should be near completion





# Schedule

- Week 9 (10/31 – 11/6)
  - Web application user testing
  - More Discovery Box and server testing
    - Edge cases testing
  - **[Stretch]** Small group presents timeline of implementation to group
  - **[Stretch]** Small group starts working on new M2M protocols and integration
  - Begin Beta presentation
- Week 10 (11/7 – 11/13)
  - **[Stretch]** Small group starts merging into master branch
  - Polish web application and Discovery Box application
  - If everything is stable:
    - Branch Project to Beta
    - Implement JUnit testing >80% coverage
  - Branch Project to *Beta* branch
  - ***Have Beta presentation to Ford by Wednesday [11/11]***
    - *Teleconference with Ford to talk Beta*





# Schedule

- Week 11 (11/14 – 11/20)
  - **Beta Presentation - Due 11/16**
  - Begin taking Discovery Box out of application
    - Should be able to standalone on a laptop to server relationship
  - **[Stretch]** If another M2M protocol is achievable, present to team implementation timeline
  - **[Stretch]** Begin work on new M2M protocol
  - *Scripting & Recording Video*
- Week 12 (11/21 – 11/27)
  - **[Stretch]** Merge second M2M protocol into master branch
  - More JUnit tests
  - *Scripting & Recording Video*
  - *Finish Recording by Tuesday [11/24]*



# Schedule

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- Week 13 (11/28 – 12/4)
  - Thorough testing of whole system architecture
  - If more work is needed, branch a stable version before more work
  - Final Recording/Editing
- Week 14 (12/5 - 12/11)
  - Do not break anything!
  - **Delivery Day - 12/9 - Due by 1pm**
  - **Design Day - 12/11**

