WELCOME!

INTRODUCTION

The competition has two-parts: a challenge to capture and present key requirements and considerations for a standard using **no or minimal text**; and a role-playing negotiation to establish a new standard addressing the defined requirements (which may be revised/refined during the negotiation.)

**Part 1: Minimal text presentation**

Standards are often text intensive, but particularly as new technologies emerge for which there may not be a common understanding and, as standards development increasingly crosses national, cultural and language barriers, there is value in simplifying standards and reducing associated text. Part 1 of the competition challenges teams to capture and present the following using as little text as possible. **(In fact, a maximum word count of 30 words is allowed with points deducted for exceeding the limit and points awarded for using less).**

- Use cases
- Trade-offs (except as noted)
- the proposed standard – omitting reference to CARCOM

As noted under the judging criteria below, the stress will be on clarity – unambiguous communication, and on thoroughness/completeness.

**Part 2: Standards development negotiation**

You will compete as a team representing a company or association and be given related background on your position. The roles are randomly assigned. The winner of the competition will be determined based on the extent to which you achieve specified primary and secondary objectives through your actions. **(Each team will be given a confidential one page briefing on their position before the negotiation begins. This should not be shared with other teams.)**
This negotiation “simulation” is intended to introduce the complexity and subtleties often involved in standards development, strategy and negotiation that inherently cross disciplines and are difficult to convey otherwise. The target domain is simplified; technology descriptions altered (and given fictional names), and roles are disguised. What might normally take an extended period of time and likely multiple iterations of negotiations by a range of committees is condensed and consolidated to fit available time. We have also incorporated elements (and hint at others) that may not normally be encountered in one negotiation. In discussion after negotiation, we will dig deeper into issues determining the potential impact of standards and factors affecting negotiation success and ultimate success of standards. Prior to the start of the negotiation, we will also provide a short briefing on standards and how they are developed.

The negotiation focuses on determining performance standards – the minimum attributes that related products should offer but also, potentially, designation by reference of an underlying technology. Such inclusion would offer strategic advantage to negotiation participants using that technology. Although technical background is given, negotiation will likely be based as much on strategic and market issues as on the technical merits.

In general, while you are committed to developing a standard that will address critical societal needs, your objective will be to maximize your organization’s strategic advantage both now and in the future. You might be able to hinder competitors if the standard incorporates your unique technology or has requirements they would have difficulty meeting.

**NOTE THAT YOU SHOULD RELY ONLY ON THE MATERIAL PROVIDED HERE AND IN THE ONE PAGE ROLE-SPECIFIC BRIEFINGS (AND WHAT YOU HEAR DURING THE NEGOTIATION)**

**BACKGROUND**

A 2015 SAE International report noted that in the US in 2012 alone, there were 1.6 million rear-end crashes, 634,000 side crashes at intersections, and 431,000 crashes caused by lane changes or cars drifting across lanes. While accidents have already been reduced by improved on-board safety devices and sensors, the US National Highway Safety Administration believes many more could be avoided with V2V (vehicle to vehicle) communication. V2V enables cars to continually transmit such data as location, speed, braking and steering to each other – which is translated by installed devices into driver alerts. V2V complements but goes beyond in-car (on-board) sensors by extending range and “seeing” around corners (not just line of sight) and “through” other cars. Adding to the urgency for a standard, auto manufacturers are hesitant to install V2V devices until a standard is established that clearly defines requirements and there is market demand. But V2V is ineffective until the majority of cars have compatible V2V capability. Although autonomous (self-driving) vehicles are anticipated and could also benefit from the
planned standard – in fact this potential might be a consideration in choosing the standard - the standard being negotiated is NOT at this point intended for this application.

There are currently two technology options for V2V either of which could be the basis for a standard: CARCOM and INTERCAR CELL. Though both have significant differences from their earlier technologies, CARCOM may be thought of as WIFI based whereas INTERCAR CELL is cellular based. They are NOT compatible with each other – installing a device based on one precludes the other.

CARCOM has been in development for some 15 years and is well tested in simulation and in the field. It is effective and already available but has some limitations. In particular its range and accuracy is somewhat restricted particularly in high speeds and when traffic is highly congested. Moreover, although it may have better security than INTERCAR CELL, the frequent renewal of certificates for vehicles exchanging information requires establishing Roadside Units (RSU’s) which have a cost to set up and maintain and are not yet in place.

INTERCAR CELL is expected to have superior range and capacity to function in heavy traffic and high speeds particularly when cars are within cellular networks (functionality is reduced to just over CARCOM levels when only device-to-device systems are used.) It also promises faster alerts giving drivers more time to react. INTERCAR CELL may also offer a better platform for emerging use cases such as autonomous vehicles. But, although it is close to being ready and can leverage strong market penetration in related devices and services, INTERCAR CELL is still in development and testing has only recently begun. Still, advocates point out that at least one V2V use case – forward collision warning - has already been at least partially addressed using cellular connectivity specifically through crowd sourced on-board sensor information giving location and speed of multiple vehicles.

Spectrum use is still evolving and may differ between the two technologies (and vary for INTERCAR for cellular network versus device-to-device), both require spectrum that is also used in part by other applications. Suggestions have been made for spectrum sharing with the two most promising options being V2V having priority when in active use, and /or relegating V2V only usage to a smaller than currently envisaged and isolated part of the spectrum with open sharing of broader spectrum. Given that V2V use cases are already expanding (as is broader internet access), any sharing may be a significant constraint. Moreover it is argued V2V should always be “on” for effective and timely crash avoidance.

A challenge for both technologies and still being worked out is the business model that will support required system operation including security updates and any required new infrastructure and maintenance. INTERCAR has the potential to apply cellular fee approaches (though not all drivers have plans and agreement would need to be worked out for variations
across network operators) as well as fees for telematics and entertainment services that could interplay with V2V (also attractive to car manufacturers). CARCOM argues that such interplay would reduce security.

**Standard strategic options:**

<table>
<thead>
<tr>
<th>CARCOM</th>
<th>INTERCAR CELL</th>
<th>Technology neutral</th>
<th>Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready now (but requires new infrastructure). May have superior security. CARCOM designation would preclude INTERCAR</td>
<td>Not yet ready (but specification would give clear guidance) but may have superior capabilities and could be quickly deployed. INTERCAR designation would preclude CARCOM</td>
<td>Performance requirements would be defined - allows some planning and continued development of both CARCOM and INTERCAR (and maybe other approaches) but likely no deployment as car manufacturers wait for clear market selection of technology</td>
<td>No standard, nothing defined (unless standard is spelled out but simply deferred to a specified start date)</td>
</tr>
</tbody>
</table>

**OVERVIEW OF WHO IS AT THE TABLE**

Participants in the negotiation come from 6 organizations (A-F) with varying interests and concerns.

Organization A is a device manufacturer focused on CARCOM technology. After many years of development and testing of CARCOM (laboratory and field - though limited real world testing - with varying numbers of vehicles equipped with CARCOM devices and under varied road conditions), Organization A has begun marketing related devices. Current devices are intended for installation in new vehicles. If a standard specifying CARCOM is approved, organization A may also develop aftermarket devices for use in older vehicles.

CARCOM is well recognized by vehicle manufacturers though car purchasers may not be familiar with the technology. The added cost of the device for new vehicles is expected to be a few hundred dollars (likely the same for INTERCAR CELL devices). One vehicle manufacturer has committed to including the device in at least some models, pending the standard, with others considering. Impacting the attractiveness of V2V to the vehicle manufactures is the extent to which it fits with telematics, entertainment and other services valued by consumers.

Organization B manufactures devices that use the alternative INTERCAR CELL technology. This approach builds on cellular products and networks which are also well accepted by both car manufacturers and consumers – in fact, within a few years, cellular market penetration at least for personal devices is expected to be near universal. The V2V application is different but can leverage the cellular platform and existing towers (rather than requiring new RSU’s to be
deployed.). The INTERCAR CELL technology and devices are close to production though no timeline has been set for product introduction. Testing has also begun. Although performance degrades somewhat (still may exceed CARCOM particularly in range and latency - see trade-offs below), the INTERCAR device can operate on a device-to-device basis without cellular networks.

The timing for the standard and device (and any required new infrastructure) to be fully deployed matters both in addressing critical safety demands and because new technology is also in development – in particular and even more advanced cellular approach and the potential for autonomous/self-driving vehicles. Both are still at least several – perhaps up to 10 years away for full implementation. INTERCAR argues that their approach is a better platform and transition to these advances. If INTERCAR is designated in the standard, the device manufacturer anticipates developing aftermarket in addition to new car installed product,

Other innovations may also develop altering the comparative strengths of the two technology approaches being considered in this negotiation. It can be costly to switch to a different technology once a form of V2V is deployed and installed in vehicles. Accordingly, although a technology neutral standard could be approved in the current negotiating session and would provide guidance for planning, as the two approaches are incompatible with each other, the standard’s impact may be limited as manufacturers would likely still wait to implement new systems until the market then determined the “winning” approach.

Organization C represents a component manufacturer/supplier consortium that supplies both Organization A and B and could support either CARCOM or INTERCAR. They are eager for direction in terms of both technical specifications (preferably even beyond broad performance requirements) and how the market will develop going forward.

Organization D is a WIFI advocacy that is very concerned with V2V use of spectrum that could limit what is available for current and potential broader internet services.

Organization E is a city government that is planning to establish an adaptive traffic system in which traffic signals change based on information received from approaching cars to minimize congestion and accidents. Such a system could also alert cars to pending signal changes and traffic patterns. Organization E would value training/design support. Consistent with the rules of the standard body coordinating the negotiations, this can be discussed in private NOT in general sessions and would not be included in the standard.

Organization F is part of the US Department of Transportation (DOT) that is pushing for a fully deployed V2V system ASAP in a way that will maximize safety, security and reliability, without constraining innovation.
Initiated by Organization A, negotiations will attempt to develop a new performance standard which would apply to V2V.

**SUMMARY OF PARTICIPATING ORGANIZATIONS**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CARCOM device manufacturer</td>
</tr>
<tr>
<td>B</td>
<td>INTERCAR CELL device manufacturer</td>
</tr>
<tr>
<td>C</td>
<td>Component manufacturer/supplier consortium that supplies both Organization A and B and could support either CARCOM or INTERCAR</td>
</tr>
<tr>
<td>D</td>
<td>WIFI advocacy very concerned with V2V use of spectrum</td>
</tr>
<tr>
<td>E</td>
<td>City government planning adaptive traffic system that could use V2V</td>
</tr>
<tr>
<td>F</td>
<td>Part of the US Department of Transportation (DOT) that is pushing for a fully deployed V2V system ASAP (maximizing safety, security and reliability)</td>
</tr>
</tbody>
</table>

**USE CASES** (emphasis on safety)

- Do not pass - warns a driver of an oncoming, opposite direction vehicle when attempting to pass a slower vehicle on an undivided two or more lane roadway
- Lane change - alerts drivers to vehicles approaching or in their blind spot in the adjacent lane.
- Forward collision warning – warns driver of stopped, slow and slowing vehicles
- Left turn assistance/ Blind intersection – warns driver of vehicles approaching from a lateral direction at intersection even if obstacle such as a building blocks view
- Curve warning – like blind intersection, warns of vehicles or obstacles unseen around a curve
- Traffic flow optimization- interacts with traffic signals giving the signals information that car is approaching, and alerts driver of changing signal and traffic conditions

**TRADE-OFFS**

- Range and alert time/latency; Ability to maintain accuracy and response (reliability) in intense traffic and at high speeds; minimize false alarms

INTERCAR can function without significant degradation in accuracy up to 900m in all directions using cellular networks (although extensive network usage may cause interference) and some 450m in device-to-device mode even in traffic intense/urban environments. It also has better latency (less than 10ms.) CARCOM cannot exceed 400m and, in traffic intense/urban environments, range may drop below 300m. Range combines with alert time/latency to allow driver response time. Implicit within proposed standard is a response time of 4 seconds. The 300m range and 4 second response time is adequate for most use cases and drivers, but may not be sufficient for older drivers,
very high speeds, severe weather conditions and Do Not Pass/Left Lane assistance cases. Self-driving cars may also require longer lead times to address erratic human driver behaviour (until all cars are autonomous)

- **New infrastructure requirements; process to update to maintain security:** INTERCAR will require an extensive Roadside Unit (RSU) infrastructure to frequently update security certification (then offering superior security to INTERCAR) and support for traffic optimization.
- **Launch/implementation readiness:** CARCOM is much more tested than CARCOM in simulated and to a lesser degree real world driving conditions. It is also ready now although RSUs will need to be established. It will be years before sufficient numbers of cars have required V2V capability to allow the system to operate optimally. However, if RSUs are set up, CARCOM could address some use cases in the near term. INTERCAR is not yet fully developed but once it is, it can more rapidly be deployed building on existing cellular networks and infrastructure without requiring RSUs (which may also be costly to install and maintain). Car manufacturers are very familiar with CARCOM but consumers are much more aware of INTERCAR (cellular) networks and even some driving applications. INTERCOM has a more natural fit with telematics and entertainment automotive services

**Additional considerations that need not be addressed in the minimal text part of the competition:**

- **Spectrum usage:** both technologies require spectrum though perhaps at different frequencies; spectrum sharing with other applications has been discussed but not yet confirmed
- **Foundation for broader (e.g., traffic control) and future applications including autonomous vehicles.** INTERCAR offers a better platform for transitioning to autonomous vehicles

**INITIAL DRAFT STANDARD PROPOSED BY ORGANIZATION A**

1. The standard for V2V will be based on (reference) CARCOM including its infrastructure (RSU) requirement
2. The minimum range will be 300m in all directions
3. The maximum latency (alert time) will be 25ms
4. The basic safety message (BSM) will include location/position, vehicle size, speed, acceleration and path prediction. It will be sent 10 times/second
5. Spectrum will be dedicated to V2V
Notably, approval of a standard has limited meaning if the standard is not actually implemented in the marketplace.

NEGOTIATION STAGES (after overview of standards, minimal text part of competition and 5 minute instructions) Please have your team id visible at all times.

1. **20 minutes preparation within teams**
   
   Use this time to review role assignments and consider strategy. While you cannot embellish or change the technology, you can and should be creative in anticipating other parties’ positions (refining assessment as negotiations proceed), how you can address them and how they might respond. What is critical to you? What will you reveal - or not – and when about your interests and thinking? What do you need, how urgently? Who might be allies? Who might be enemies? **Select a spokesperson.**

2. **30 minutes formal negotiation:**
   
   *Each team will make brief opening statements and then offer comments and counterpoints/questions* with permission of Chair.

3. **20 minute break** (you may use this time for informal interactions with other teams; the Chair will call open sessions back to order as scheduled – organizations may request a couple more minutes of informal time)

4. **20 minutes formal negotiation**

5. **20 minute break** (you may use this time for informal interactions with other teams)

6. **15 minutes final formal negotiations** (if necessary)

**JUDGING CRITERIA**

**A. MINIMAL TEXT (max 30 words)**

- Up to 20 points will be given for clarity in communicating requirements and issues associated with the standard
- Up to 15 points for thoroughness in capturing critical requirements and issues
- Up to 10 points for the extent to which you use text **below** maximum allowed (points may be deducted if the team **exceeds** the maximum text allowed)
- Up to 5 points for creativity

**B. NEGOTIATION**

Each organization has pre-determined primary objectives, fall-back secondary objectives and results they want to avoid

- Up to 20 points for achieving primary objectives and the extent they feel a team achieved these objectives due to team actions
• Up to 10 points will be given for success in achieving fall-back objectives
• Up to 10 points for preventing results.
The judges will also consider how well a team uses interaction with other groups and functions as a team (up to 10 points). (Note: mentors advise and support but may not participate in negotiations or make decisions without points being taken away.) There will be one winning team.

AGENDA

8:00-9:00 Meet and greet breakfast
9:00-9:10 Welcome
9:10-9:30 Overview (importance of standards, goals of event); Introduction to 2 parts of competition
9:30-11:00 Minimal text work
11:00-11:30 Presentations
11:30-12:15 LUNCH
12:15-2:20 Part 2: Negotiation (broken into formal and informal sessions)
2:20-2:40 Debrief (while judges deliberate)
2:40-3:00 Winner announcement and closing