Anritsu envision:ensure

V2X 802.11p Message Evaluation Software MX727000A

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1. V2X Market Situation

Accelerating V2V and V2I Development & Diverse Specifications

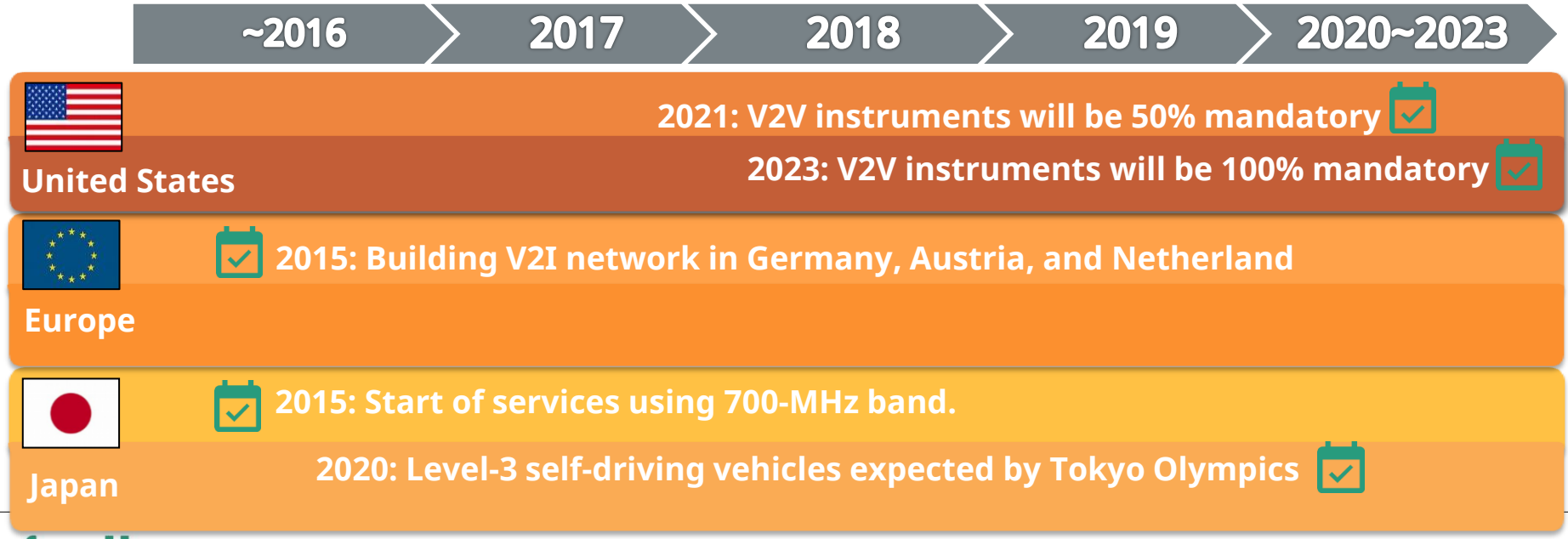
Accelerating V2V and V2I Communications Development

Fundamental research on V2V and V2I communications started in 2010 and the trend towards commercial release is especially active in the US, Europe, and Japan.

- In the US, V2X will be mandatory in 2023.
- In Europe, roadside networks were constructed in 2015 in Germany, Austria and Holland and large-scale field testing is in progress.
- In 2015, services using the 700-MHz band started in Japan where Level-3 self-driving vehicles are expected to be deployed for the 2020 Tokyo Olympics.

In line with these commercial trends, standardization measures are becoming active in the US, Europe, and Japan.

Regional Commercialization Trends

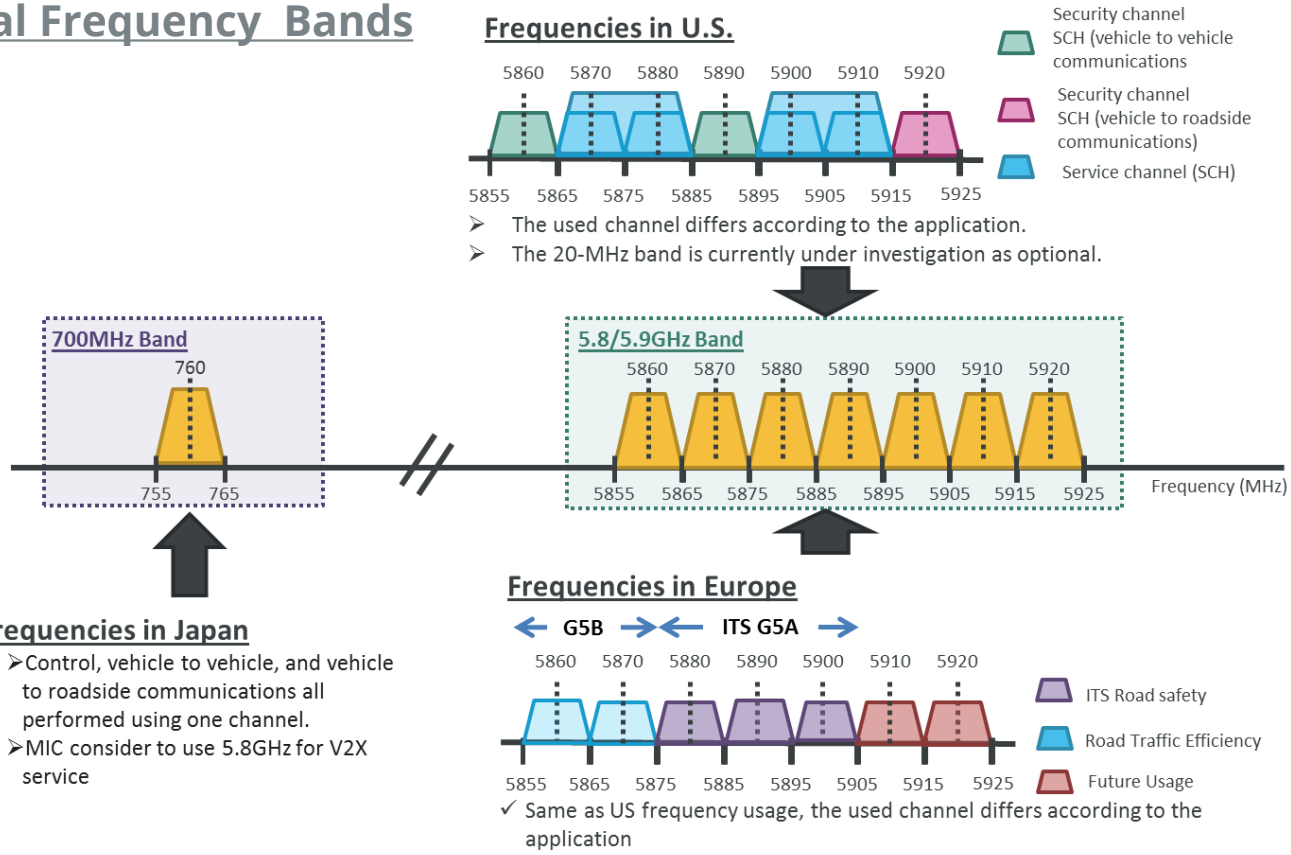


Accelerating V2V and V2I Development & Diverse Standards

Diverse V2V and V2I Communications Specifications (1/2)

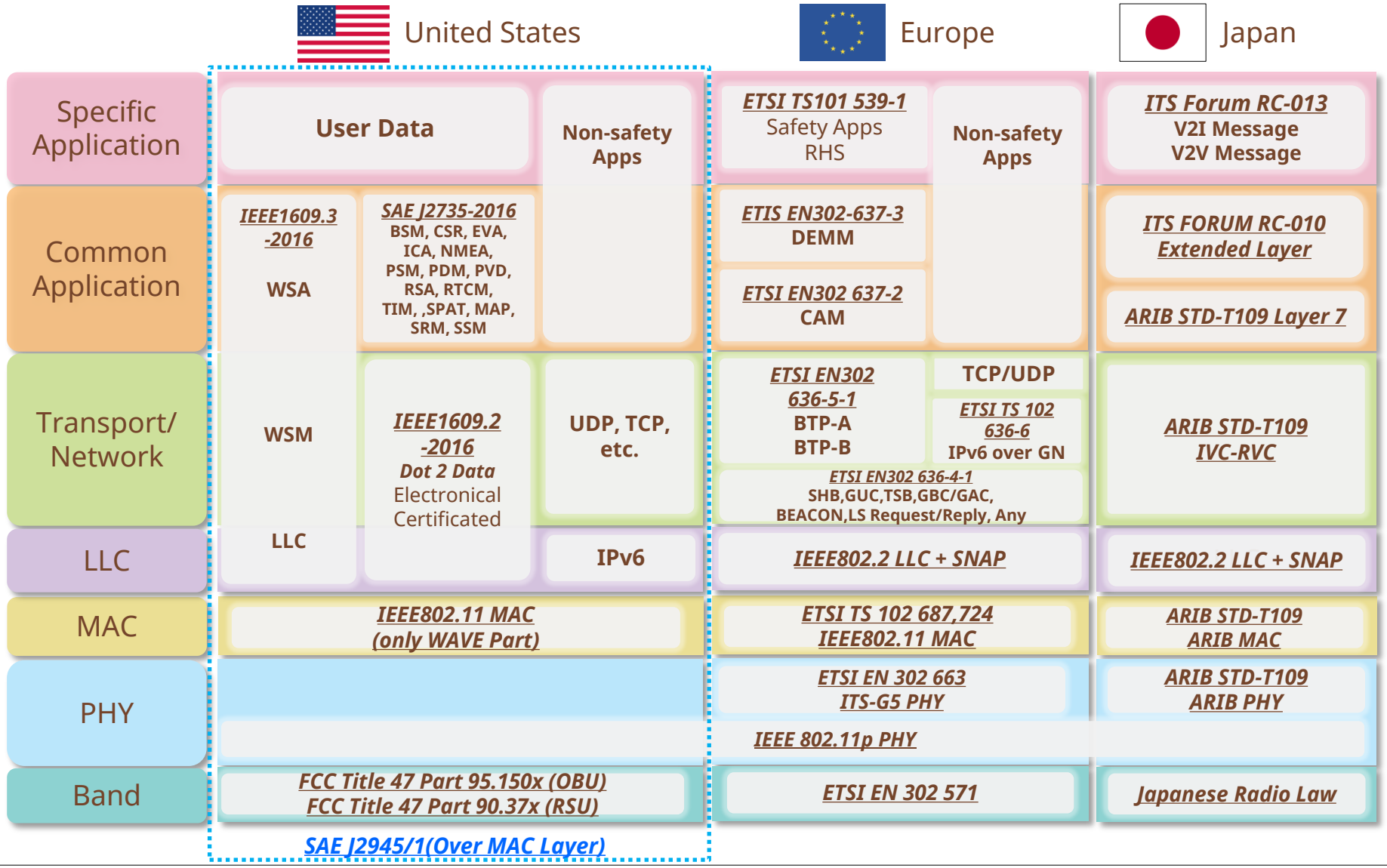
Although the Physical layer uses the IEEE802.11p standard, regional frequencies and V2X message definitions differ in each country based on the usage environment and transport circumstances. Due to these circumstances, vehicles shipped to different regions have different measurement and evaluation requirements.

■ Regional Frequency Bands



Accelerating V2V and V2I Development & Diverse Specifications

Diverse V2V and V2I Communications Specifications (2/2) - Regional Standards

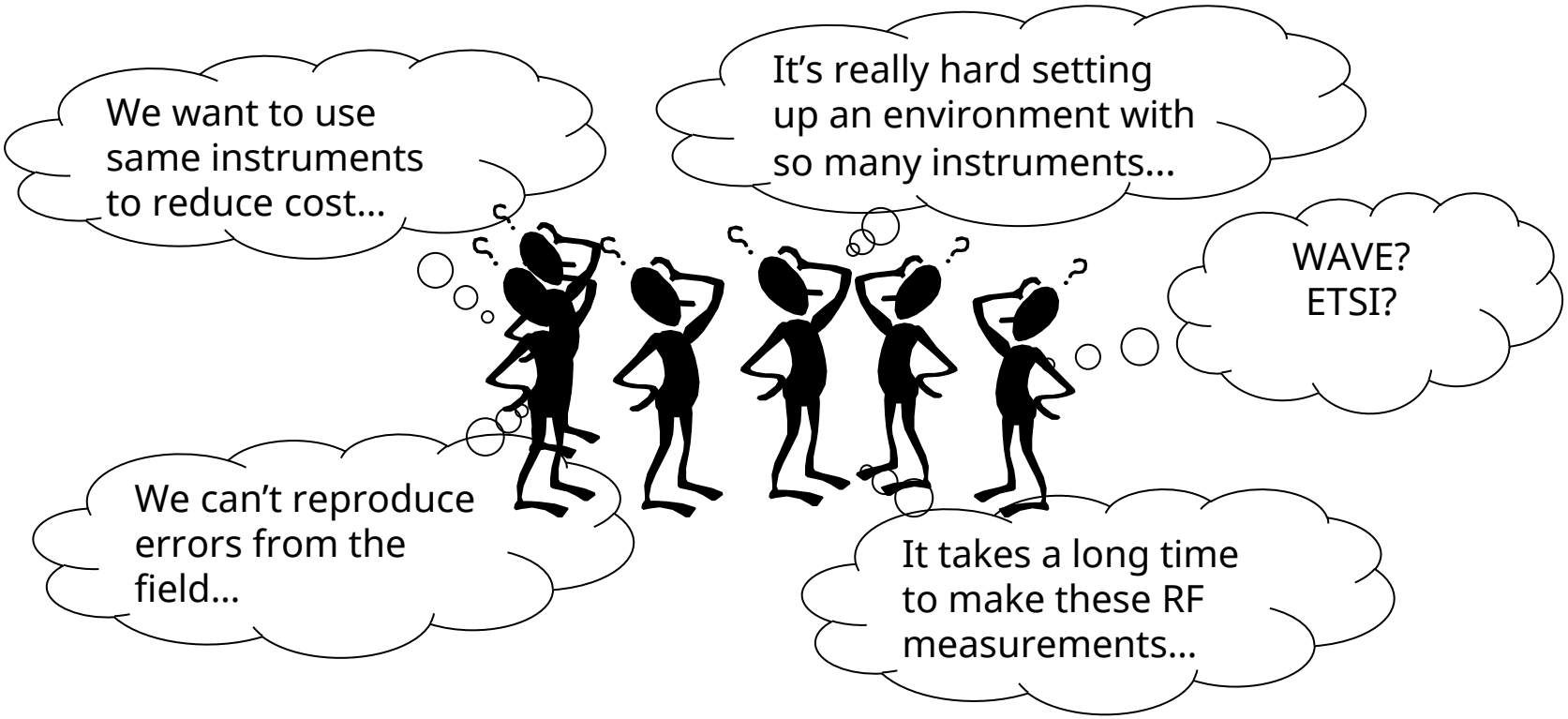


V2X Message Analysis MX727020A/30A/40A

Issues and Solutions in V2V and V2I Communications Development (1/2)

Issues in V2X RF Measurement and Message Confirmation

- To reduce instrument costs, use the same instrument to evaluate the three standards.
- V2X message confirmation is centered on field tests by communications between in-vehicle equipment. Confirmation of in-house developed DUT messages requires difficult configuration of an environment for confirming messages objectively.
- It is difficult to configure multiple pieces of equipment for confirming messages.



Issues and Solutions in V2V and V2I Communications Development (2/2)

Usage Issues and V2X 802.11p Message Evaluation

Issues	MX727000A Solutions
Due to differences between US, Europe and Japan standards, need to use different instruments for each message evaluation.	Message Analysis MX727020A, 30A, and 40A support message evaluation with Signal Analyzer MS269xA and MS2830A using same instruments for each message standard.
Difficult to build environment for objective message evaluation for interoperability test in lab.	V2X Message Analysis MX727020A, 30A and 40A support message decoding and displaying using digitize function of Signal Analyzer MS269xA and MS2830A. Support objective message checking by third party. Reduce burden of building environment.
The 2-way test with DUT cannot display the entire message stack. It is a huge burden to find the communication failure point.	The 2-way test with DUT cannot display Digitizing data used by V2X Message Analysis can capture all data from PHY to APP. At problems, the fault can be found by demodulating all layers. Also the V2X Message Analysis function has an “Incorrect Message Display Function” to find incorrect data easily.

MX727020A/30A/40A Product Key Features

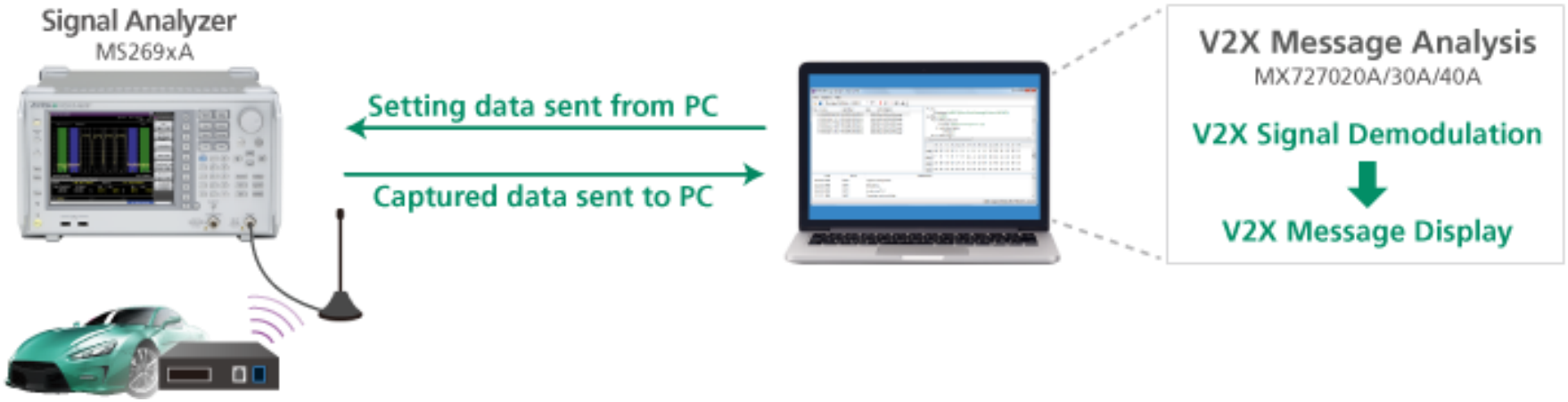
MX727020A/30A/40A Product key Features

I. Support three standards – US, Europe, and Japan
   I. WAVE and SAE J2735-2016 in US
   II. ETSI ITS in Europe
   III. ITS Forum and ARIB T109 in Japan

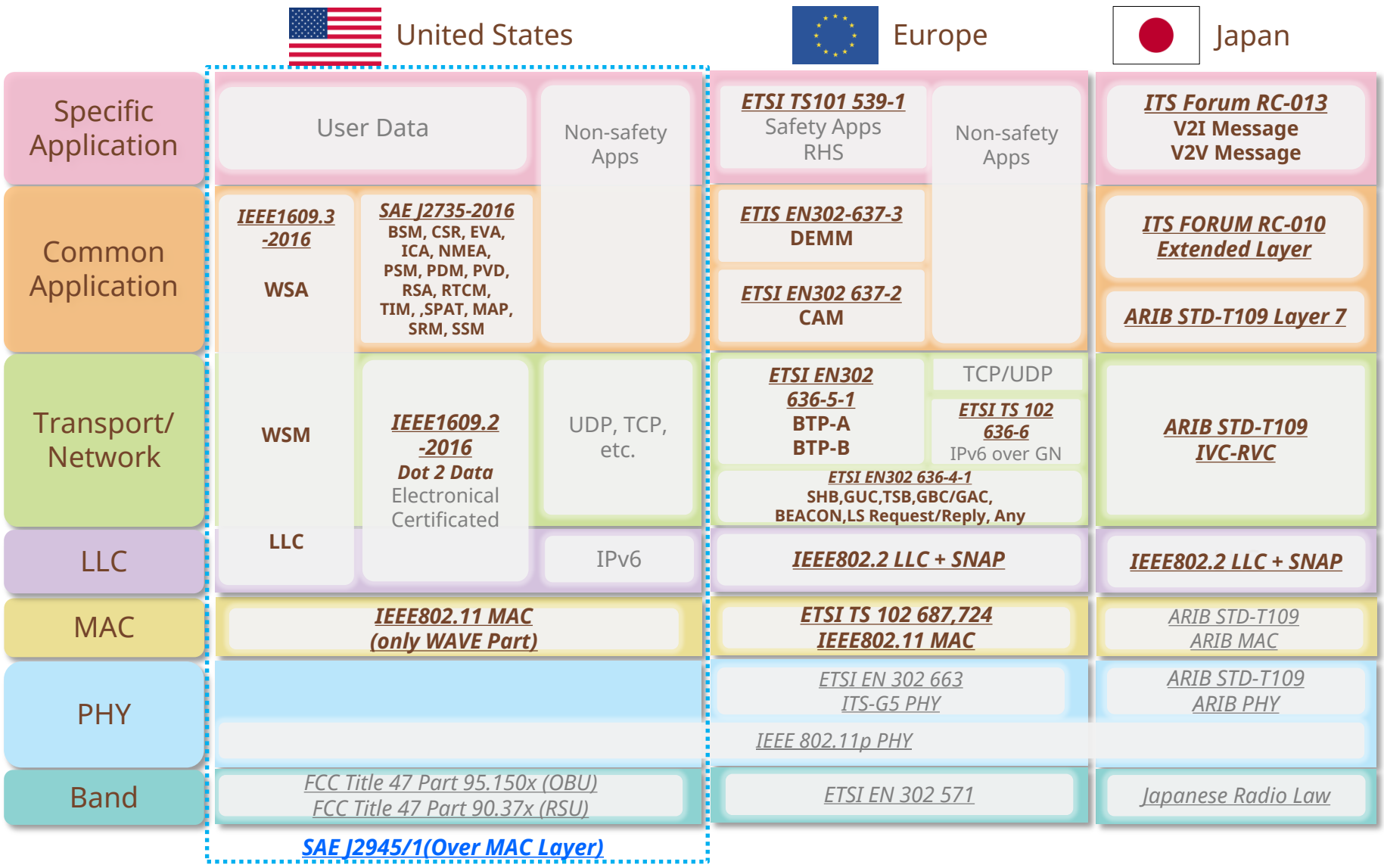
II. Objective message evaluation using measuring instrument

I. Evaluate MAC layer to APP layer

I. Incorrect message display function — reduces time to find point with incorrect message at each message definition



MX727020A/30A/40A Support Range



*Items in black supported by MX727020A/30A/40A; items in gray not supported by MX727020A/30A/40A

Merit V2X Message Evaluation using Measuring Instrument

Objective Evaluation

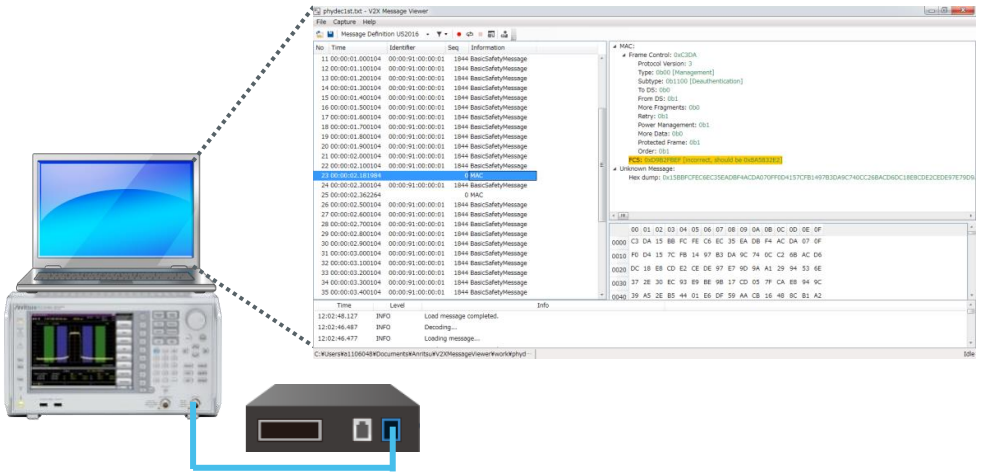
V2X Message confirmation centers on field tests by communications between in-vehicle equipment. It is a heavy burden preparing multiple DUTs due to unique DUT behavior preventing communications at laboratory interoperability tests. By using instruments without unique functions, V2X Message Analysis can display the V2X Message at that time, so V2X Message Analysis can evaluate V2X Messages objectively.

DUT 2-way Testing

- Difficult to prepare DUT for evaluation
- Communication failure due to unique DUT behavior.

⋯ Burden to locate fault point

Message Evaluation with Measuring instruments



- Display all V2X message stack from DUT

⋯Objective message data displayed to third parties by using measuring instruments

Easy to Identify Missing Point (1/2)

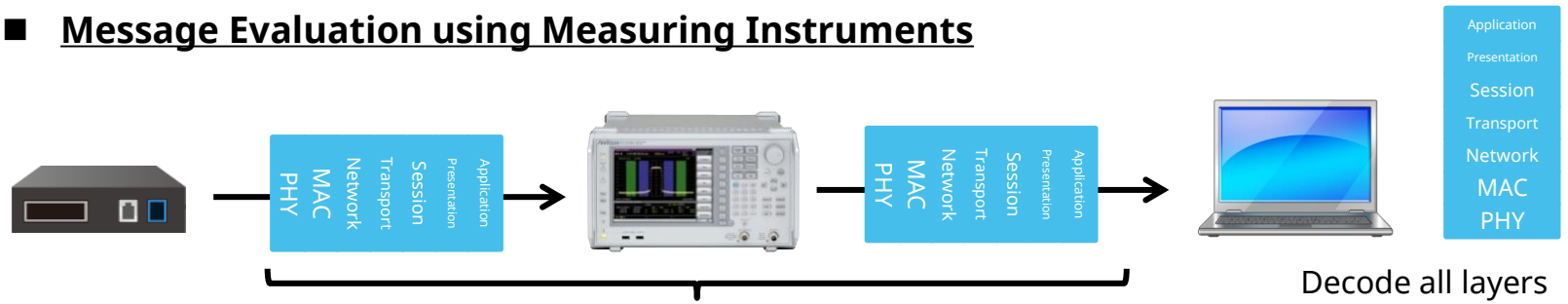
Evaluating from MAC to APP Layer with Digitizing Data

At MAC layer analysis, it is difficult to understand why communications fail between two DUTs because the MAC layer is important for V2X communications.

- It is impossible to display the MAC layer due to the DUT's limited ability to disclose the MAC layer.

→ Evaluating all layers is important to identify problems at early R&D and when updating firmware.

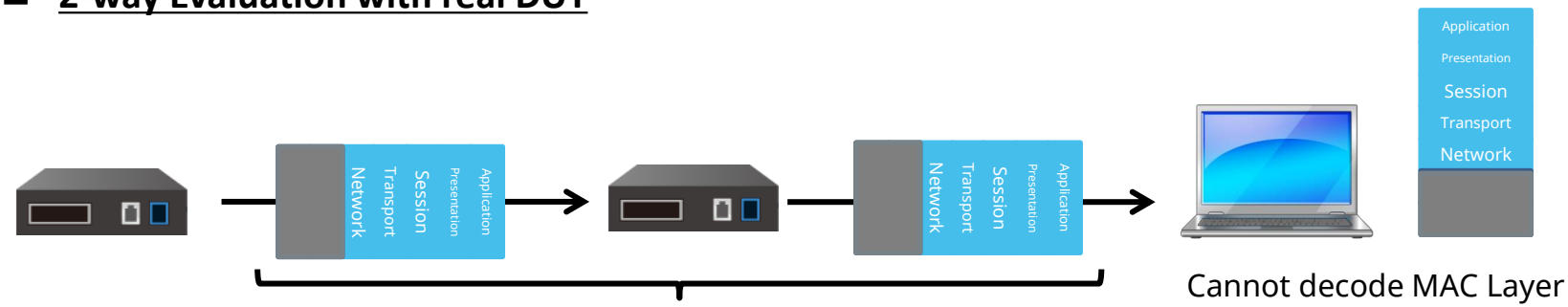
- **Message Evaluation using Measuring Instruments**



Capturing all data from PHY to APP layer using Digitize Function

Decode all layers

- **2-way Evaluation with real DUT**



Cannot disclose MAC layer due to limitations of some DUT models

Cannot decode MAC Layer

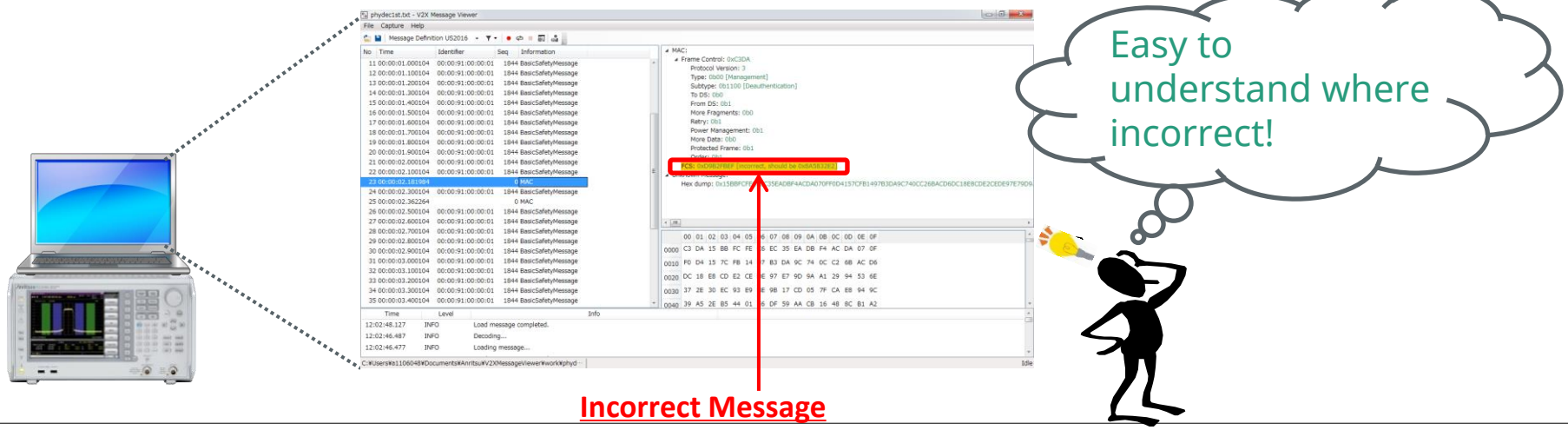
Easy to Identify Missing Point (2/2)

Incorrect Message Display Function

- Very difficult to find the failure point with debugging tools
  - ✓ Takes long time to find failure point from own message stack
  - ✓ Possible bugs at firmware updates to improve RF and message stack at early R&D

- Display Incorrect Message Function
  - ✓ Easy to find failure points from huge message stack
  - ✓ Shortens time to find failure point based on each message definition

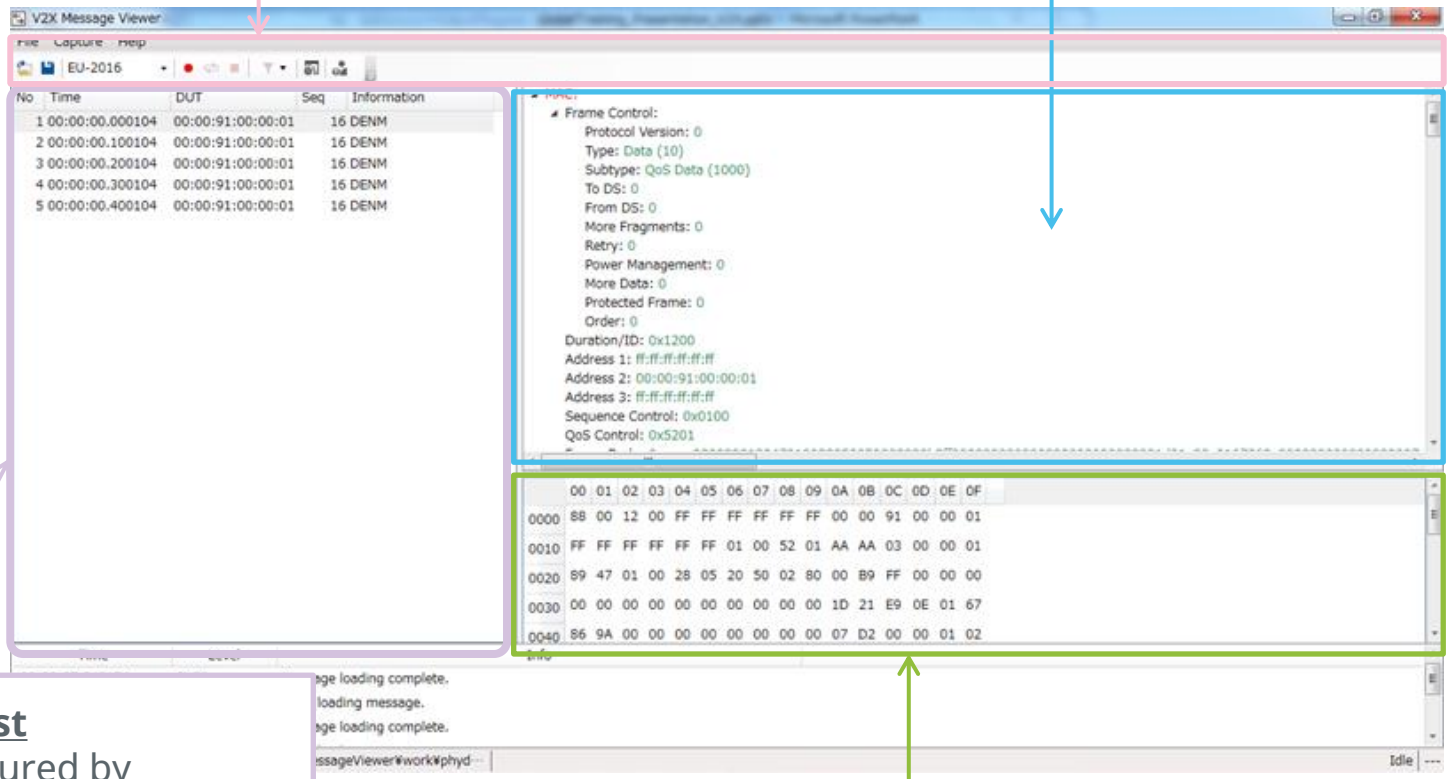
→ **Decreases burden of middleware development**



MX727020A/30A/40A Display Screens

Menu Bar
→File Settings, Operation Manual, Capture Settings Screen, etc.

Tree View
→Message Analysis Results



Message List
→Data Captured by MS269xA/MS2830A

Binary View
→Binary Data Display

MX727000A Series Product Configuration

V2X 802.11p Message Evaluation Software MX727000A

- V2X Message Analysis for US Standard MX727020A
  - Message Definition US2016 MX727020A-PL016
- V2X Message Analysis for EU Standard MX727030A
  - Message Definition EU2016 MX727030A-PL016
- V2X Message Analysis for Japanese Standard MX727040A
  - Message Definition JP2016 MX727040A-PL016

V2X 802.11p Message Evaluation Software MX727000A Specifications

V2X 802.11p Message Evaluation Software MX727000A Specifications

PC Operation Environment

PC Operation Environment	OS: Microsoft Windows 7 SP1 (64 bit) Microsoft Windows 10 (64 bit) Memory: 8 GB min. HDD Free Space: 20 GB min. Screen Resolution: Full HD 1920 × 1080 or more Interface: Ethernet I/F: 1000BASE-T (RJ-45) *V2X 802.11p Message Evaluation Software requires following software: National Instruments NI-VISA version 16.0 Microsoft .NET Frame work version 4.6.2

Anritsu

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