STORAGE DEVELOPER CONFERENCE
SDC 22
Fremont, CA
September 12-15, 2022
BY Developers FOR Developers

A SNIA Event

JESD312: An SSD for Automotive Applications

Bill Gervasi
Principal Systems Architect
bilge@nantero.com

AGENDA

What's up with cars these days???

The features needed in an SSD for cars

Where do we go from here?

JESD312: SSD Standard

Insights into the new standard

Automotive electronics used to be a second thought…

Market	2019 market size ($bn)	2024 market opportunity ($bn)	CAGR (%)
Smartphone	106	155	7.9%
Personal computing	86	99	2.8%
Consumer electronics	42	61	7.7%
Automotive $41B → $65B +9.5%			
Industrial electronics	49	71	7.8%
Wired and wireless infrastructure	34	45	5.5%
Servers, datacenters and storage	61	102	10.6%
	419	**598**	**7.3%**

ASML Annual Report, Feb 2021

…but have emerged as a crucial and growing market

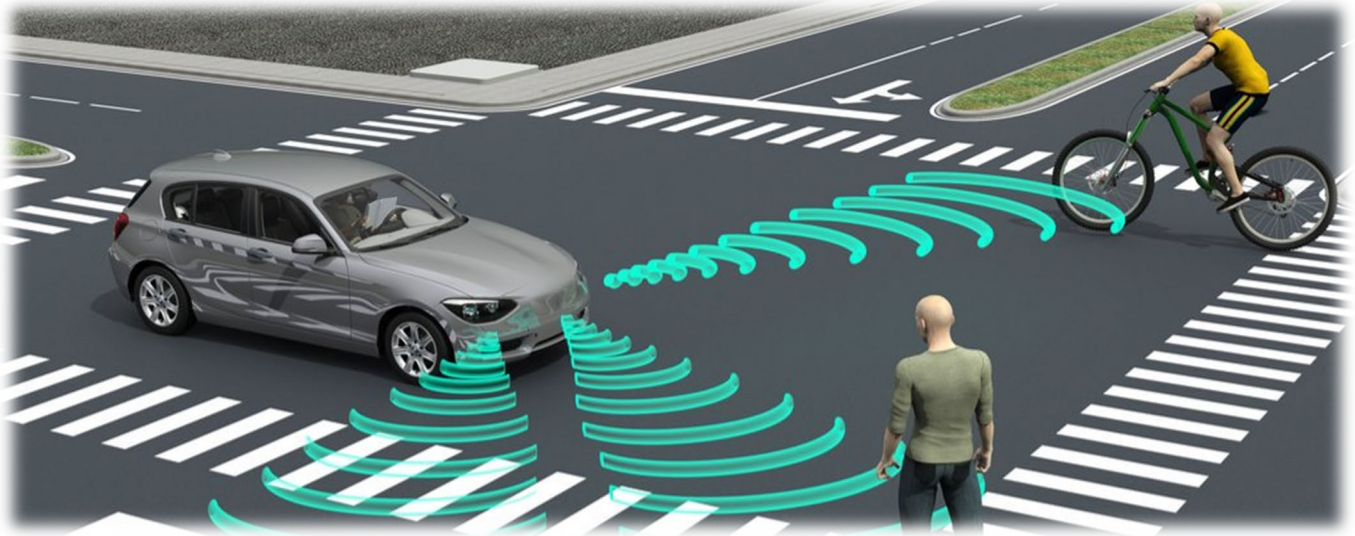
Multiple input sensors

Multiple displays

Cloud/network stream

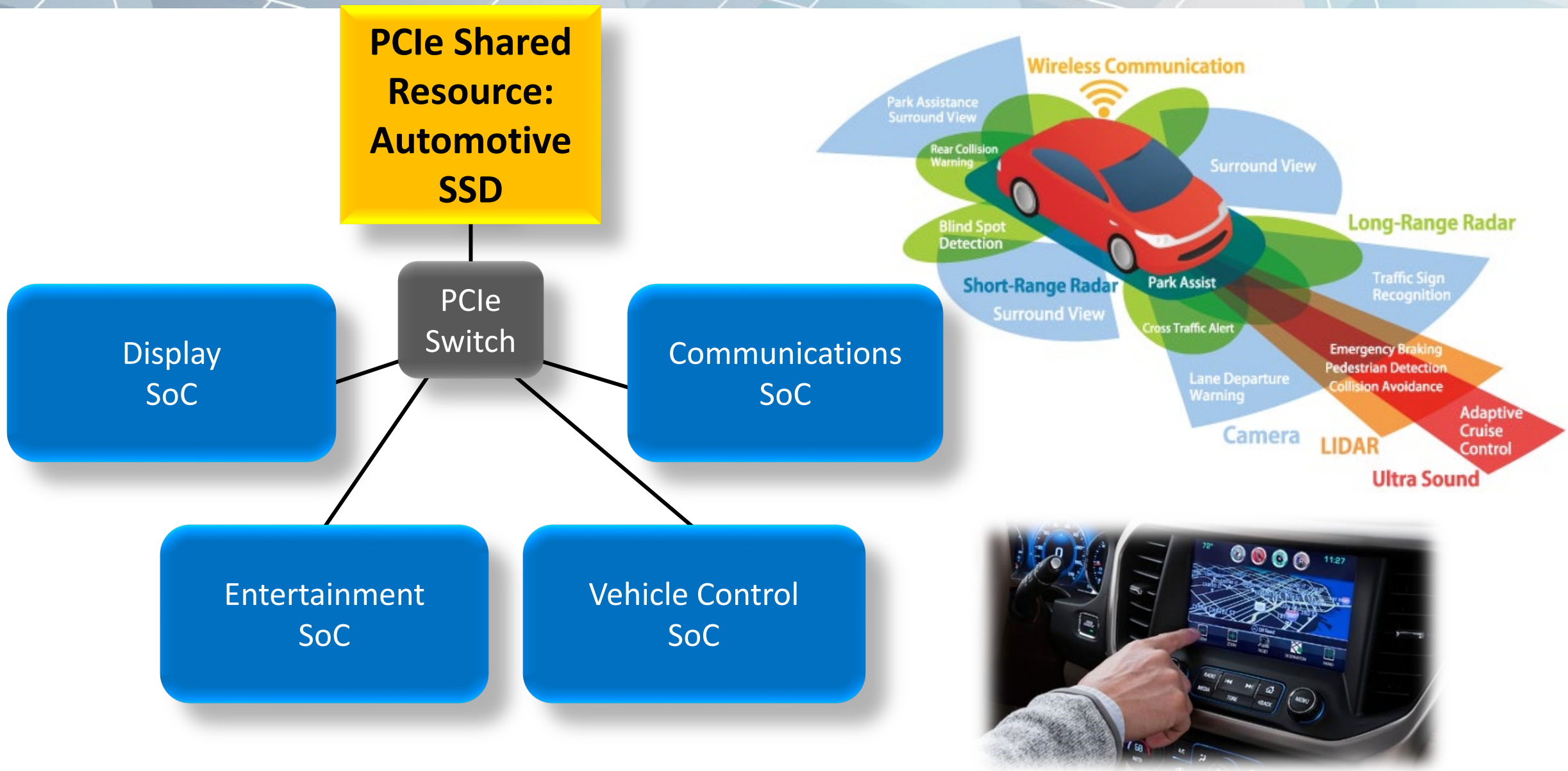
In-vehicle entertainment

Maps & Traffic



Data bandwidth up to 300 GB/s

Data storage = 128 GB to 4 TB



Variety of Control Systems

High performance

Wide temperature range

What is needed?

Reasonable price point

Long life expectancy

High security

JEDEC STANDARD

Automotive Solid State Drive (SSD) Device Specification

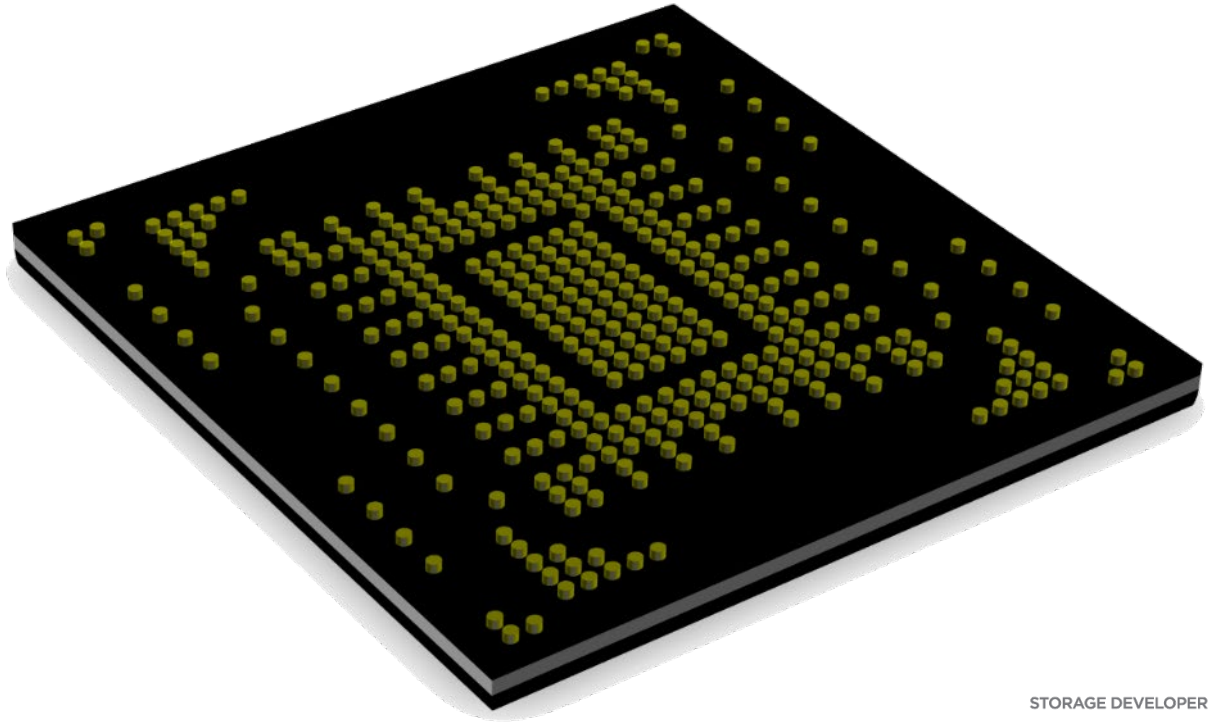
Rev 1.0

JESD312

September 2022

NEWLY APPROVED

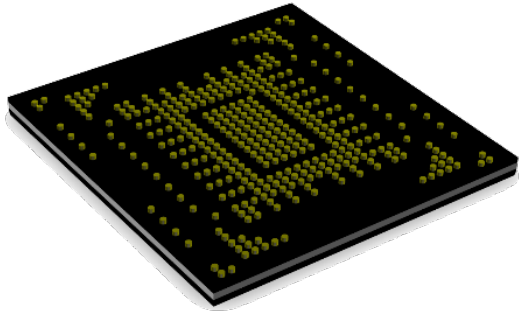
A New Standard SSD for automotive applications



Package & Pinout

Electrical Interface

Endurance



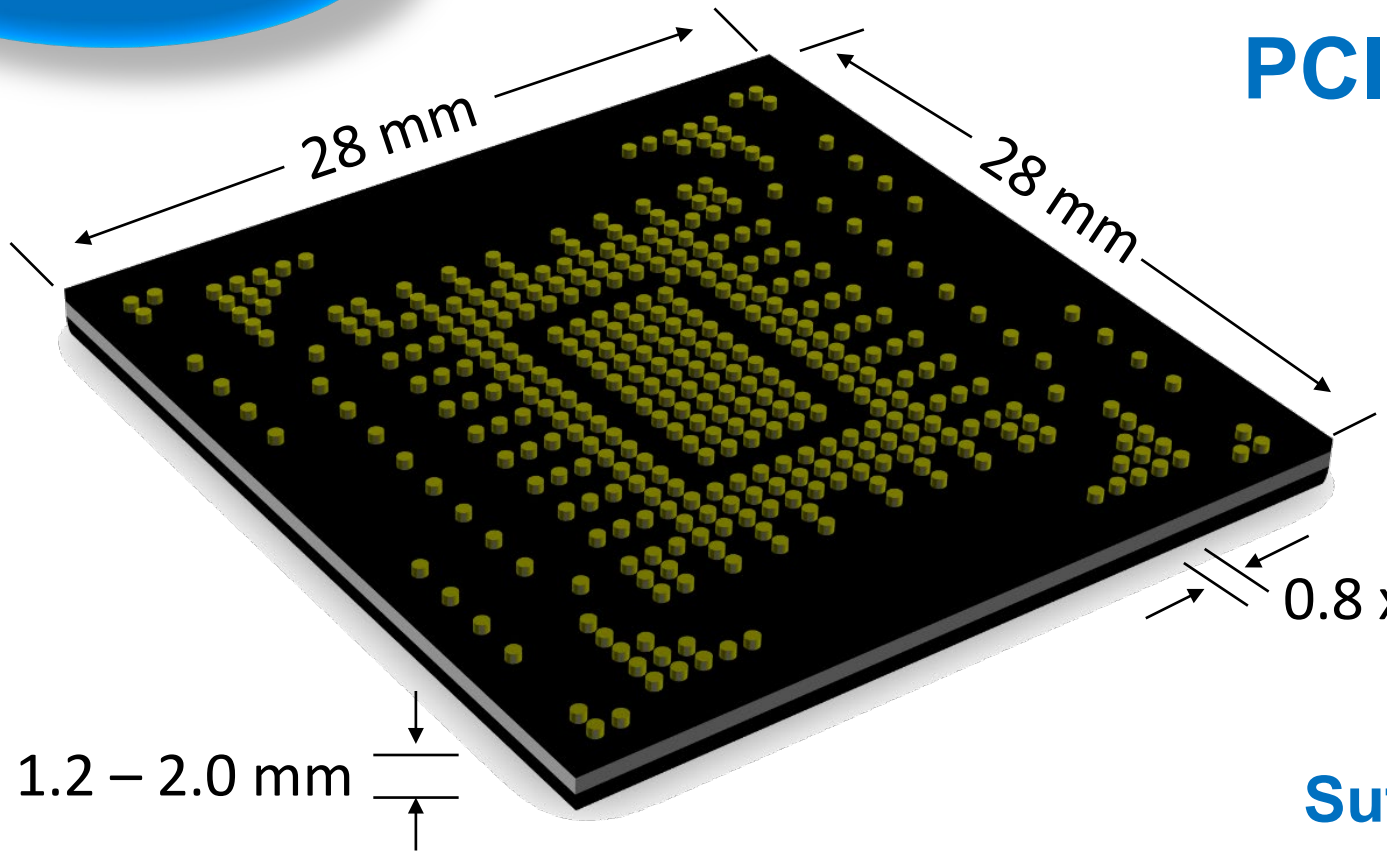
Command Protocol

Storage Regions

Security

Package & Pinout

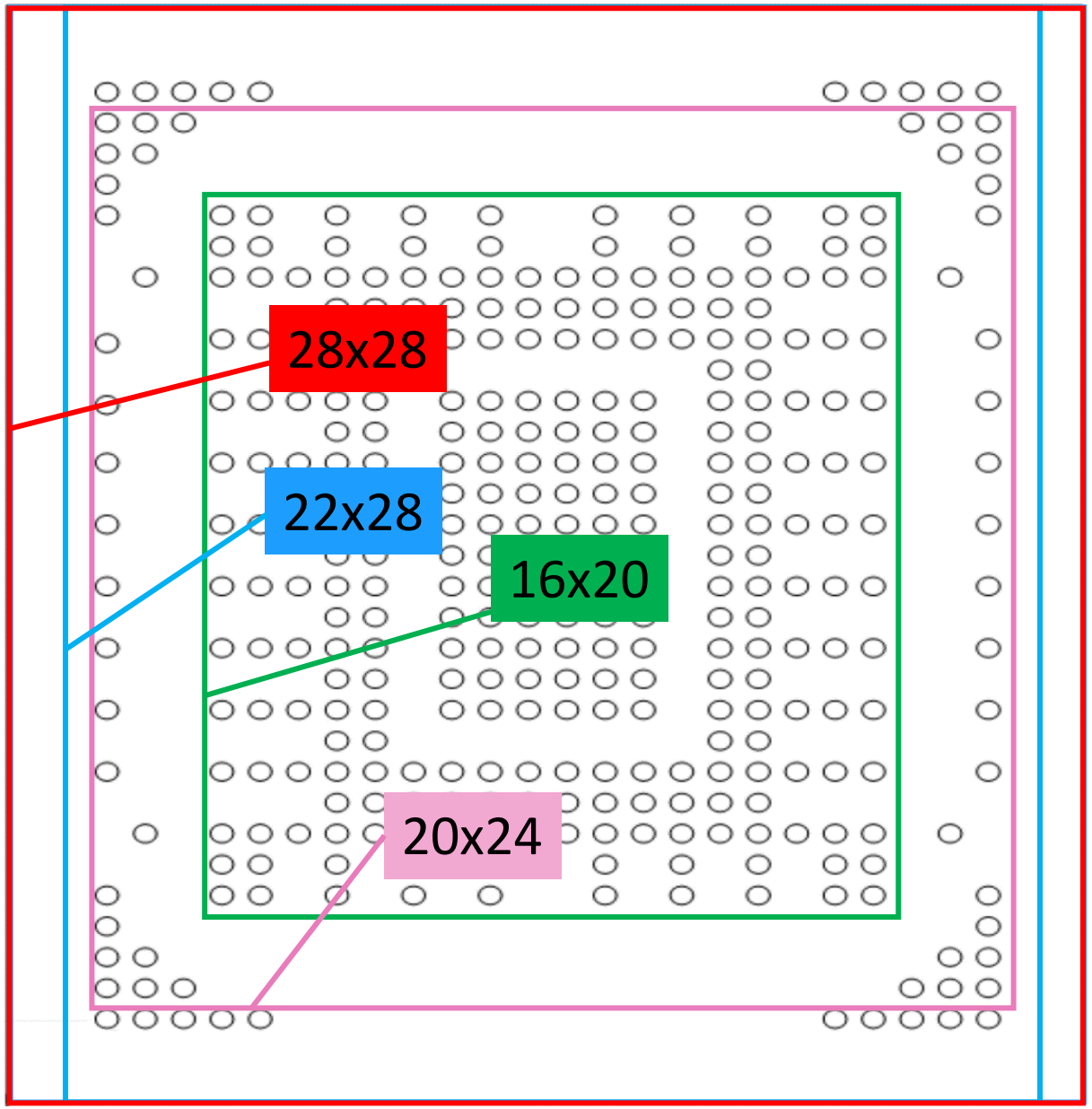
PCI-SIG 2828 BGA



Sufficient power delivery

Case exposed for cooling

Ref: PCI Express M.2 Specification



To assist suppliers in offering well priced options without sacrificing compatibility:

1) End users design to 2828, allow any part to drop in

2) Allows suppliers to use any of the footprint compatible options

   16 x 20 mm
   20 x 24 mm
   22 x 28 mm
   28 x 28 mm

Electrical Interface

32 GB/s peak throughput

PCIe 4.0 x4

SMBus

JTAG

Automotive SSD

Ref: PCI Express Base Specification 4.0

Command Protocol

Required: PCIe 4.0

Required: NVMe 1.4c+

Encouraged: Single Root I/O Virtualization

Required: SMBus

Required: JTAG

Physical interface

Logical interface

Optional virtualization

System and power management

Testability

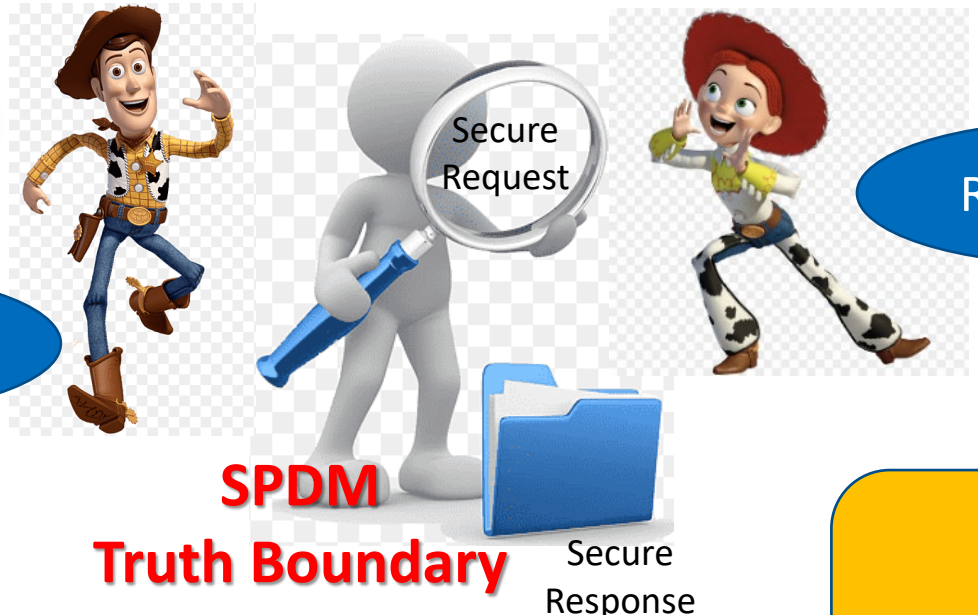
Ref: JTAG (IEEE 1149.1) Specification

Ref: System Management Bus (SMBus) Specification

Ref: NVM Express (NVMe) protocol

Ref: PCI Express Base Specification 4.0

Security



Requester

Responder

SPDM

Truth Boundary

384-bit Minimum Security

Signature: TPM_ALG_ECDSA_ECC_NIST_P384

Hash: TPM_ALG_SHA_384

Firmware Resilience

Ref: Component Measurement and Authentication (CMA)

Ref: NIST Platform Firmware Resiliency Guidelines 800-193

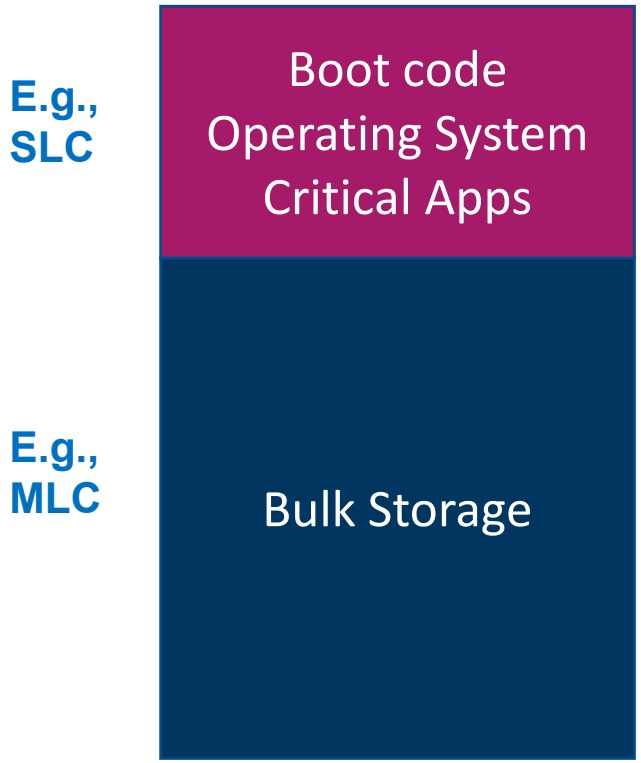
Ref: FIPS PUB 180-4 Secure Hash Standard (SHS)

Ref: Digital Signature Standard (DSS)

Ref: Security Protocol and Data Model (SPDM)

Storage Regions

Optional Feature: High reliability system storage region



Drive Capacity Class	Minimum System Region Capacity	Bulk Region Capacity
128 GB	0	128 GB
256 GB	0	256 GB
512 GB	32 GB	512 GB
1 TB	32 GB	1 TB
2 TB	64 GB	2 TB
4 TB	64 GB	4 TB

The system and bulk regions may have distinct parameters including temperature range, retention, etc.

E.g., Terabyte Write (TBW) for -40°C to +95°C supported for system and storage regions, -40°C to +105°C for system region only

Endurance

Defined by Market Segments

Personal Auto
344 days/year
3 hours/day
15 year life

Professional Auto
365 days/year
12 hours/day
8 year life

Professional Auto market, bulk storage region capacity 1 TB class from -40 to +95 °C = 200 TBW
DWPD = 200 TBW [1 TB * 8 years * 365 days/year * (12 ÷ 24 hours)] = minimum 0.24 DWPD

Personal Auto market, system storage region capacity 64 GB from +95 to +105 °C = 12.8 TBW
DWPD = 12.8 TBW [0.064 TB * 15 years * 344 days/year * (3 ÷ 24 hours)] = minimum 0.31 DWPD

Data usage model = Enterprise model

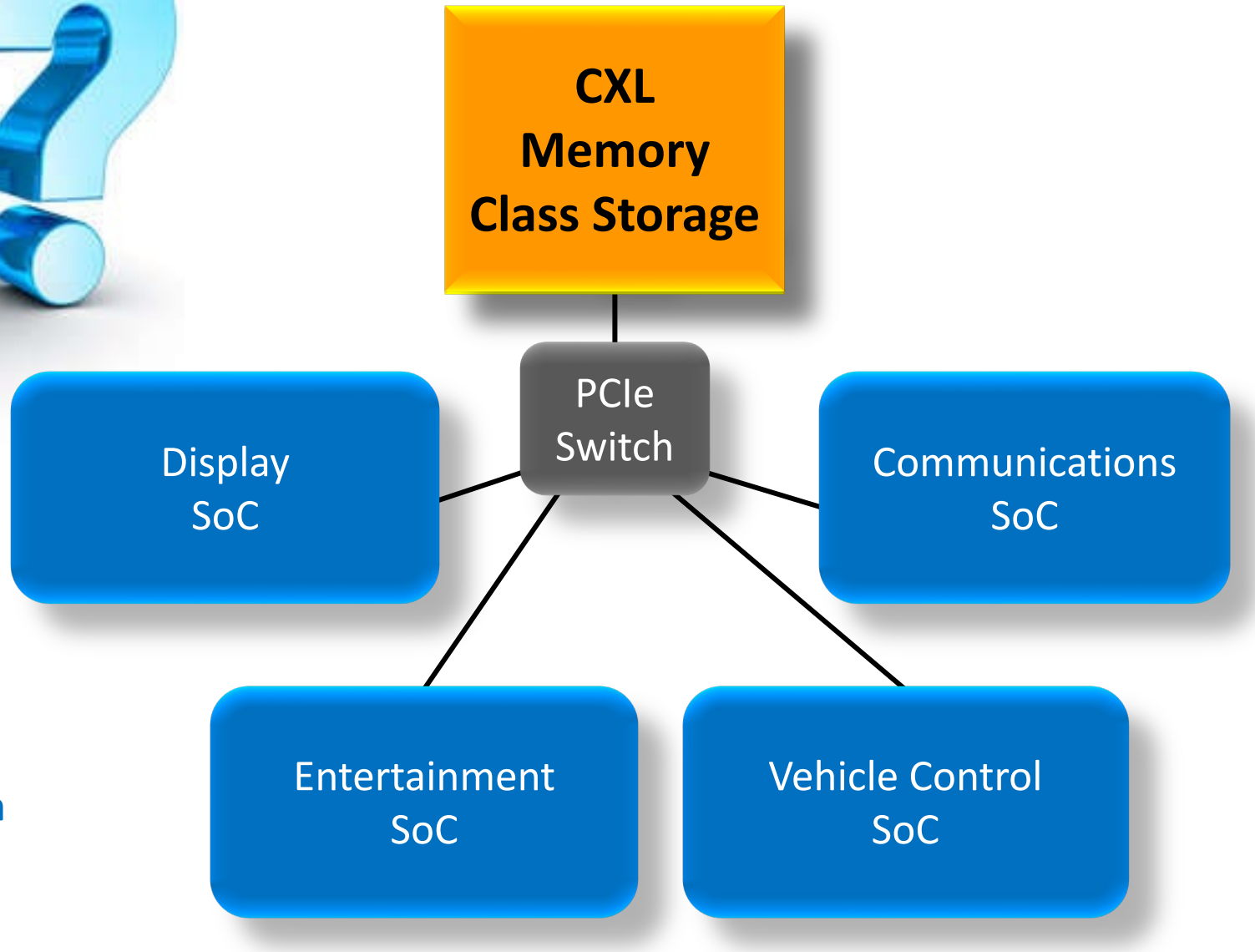
TBW = Terabytes written
DWPD = Drive writes per day

Ref: JESD218B-01 Solid State Drive (SSD) Requirements and Endurance Test Method

Ref: JESD219 Solid-State Drive (SSD) Endurance Workloads

It came together!

(and no, THIS wasn't my rental car…)



Migration to CXL enables

- **Instant-On**
- **Leave-it-in-place data & XIP**
- **Improved fabric coordination**

SUMMARY

Self driving cars will be moving incredible amounts of data

A new generation of PCIe-based SSDs for cars coming

Adoption of PCIe for auto fabric enables future CXL expansion

JEDEC coordinated with other orgs to create this standard

JESD312 combines interoperability with optional innovations

Bill Gervasi

bilge@nantero.com

Please take a moment to rate this session.

Your feedback is important to us.

