如何快速搭建面向下一代EE架构的服务型网关原型

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OCT 2021

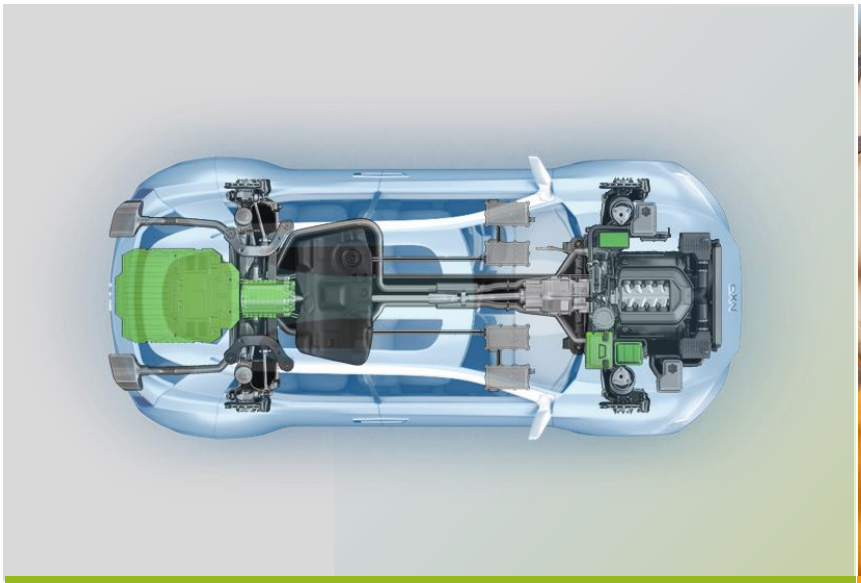
SECURE CONNECTIONS
FOR A SMARTER WORLD

EXTERNAL

AGENDA

- Vehicle Architecture Transformation
- S32G and Enablement Introduction
- S32G GoldVIP + GoldBox in Action
- Summary

ONE CAR, DIFFERENT MISSIONS & TECHNOLOGY EVOLUTIONS



THE SELF-DRIVING CAR

Be conscious, decide, learn
Mega sensing + processing
New infrastructures

THE ELECTRIC VEHICLE

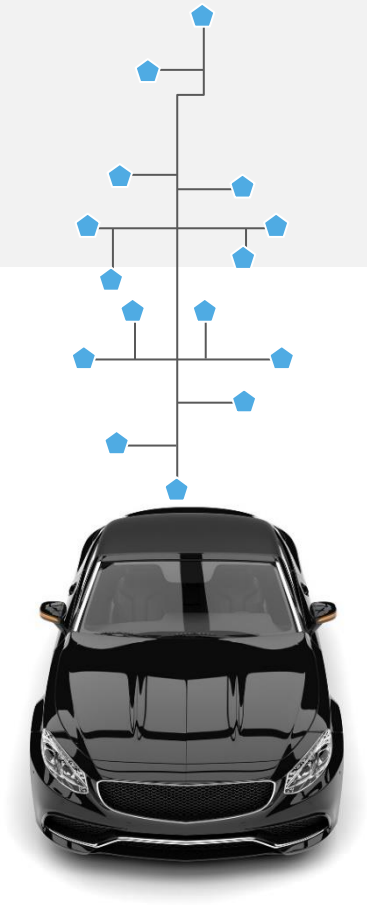
Transport at top efficiency
New infrastructures
Battery technology

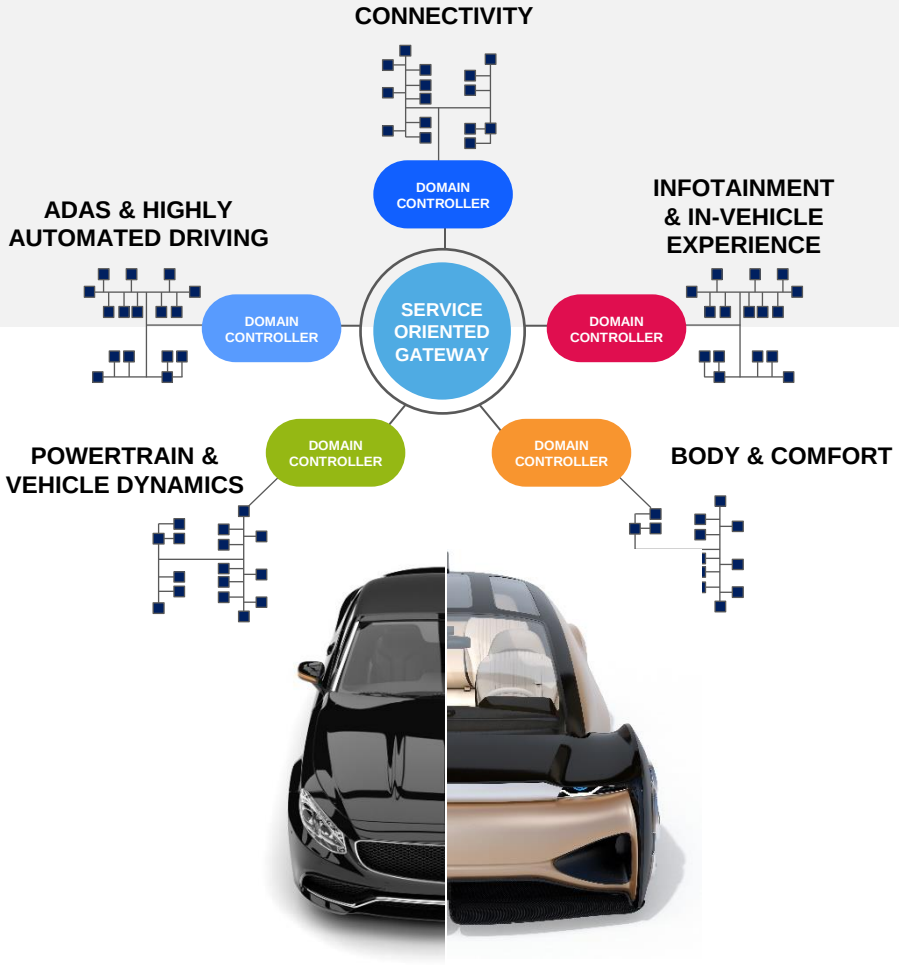
THE SERVICE-ORIENTED CAR

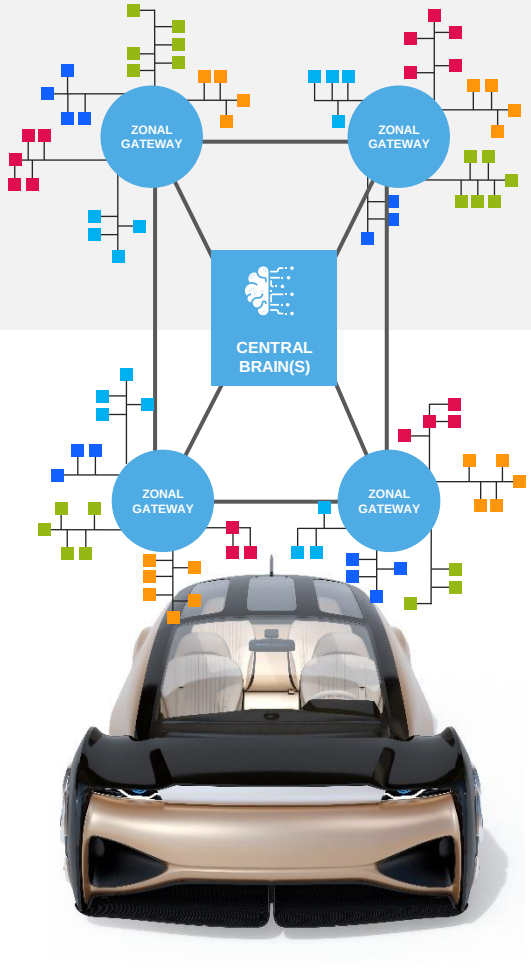
Update, customize, reconfigure
Hardware virtualization
Safe hyper-connectivity

Source: NHTSA 2016

VEHICLE ARCHITECTURE TRANSFORMATION







TODAY | FLAT

UNFIT TO FUTURE MOBILITY

LOGICAL RESTRUCTURE | DOMAINS

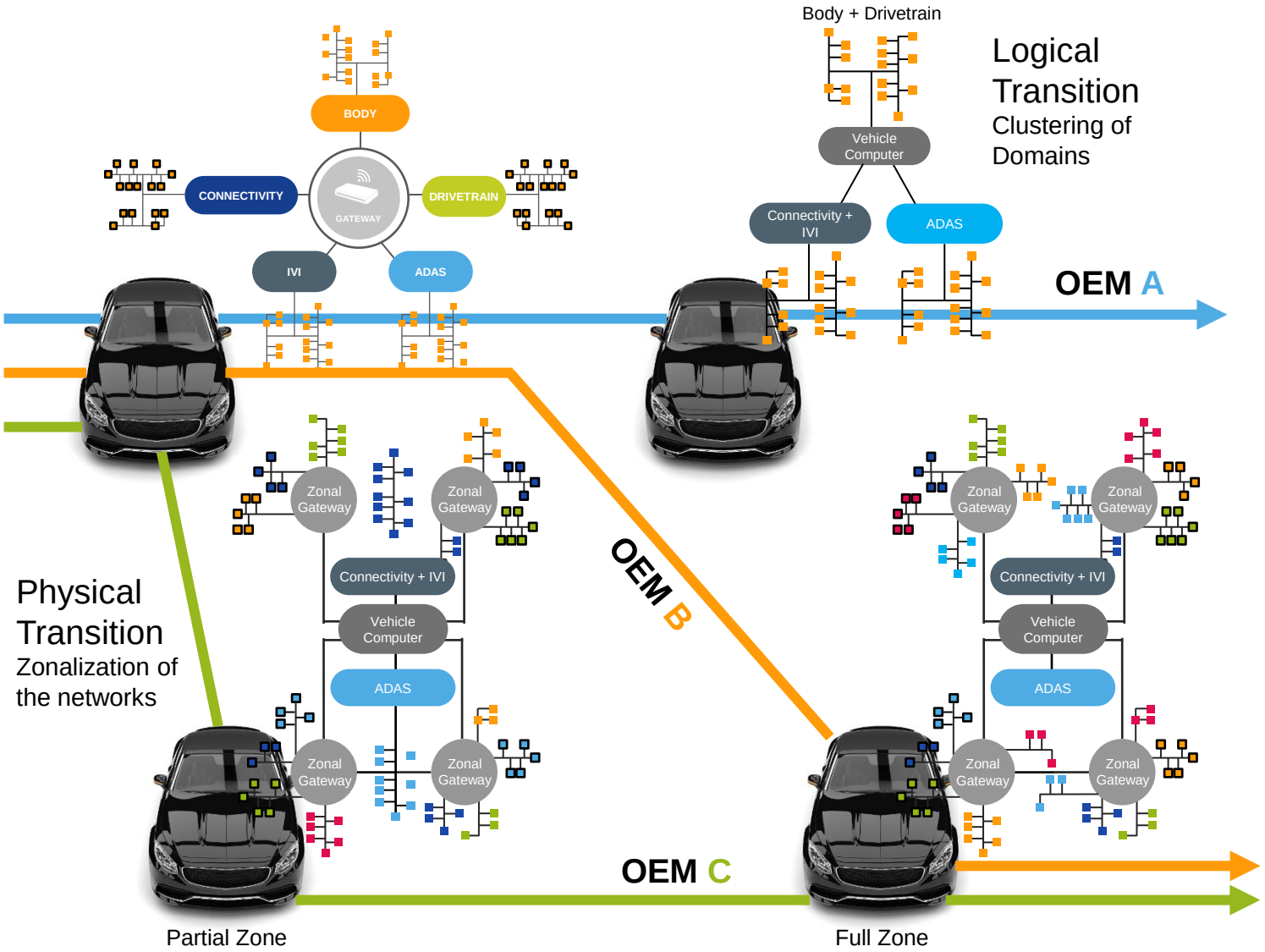
ENABLING AUTONOMOUS CAR

PHYSICAL RESTRUCTURE | ZONES

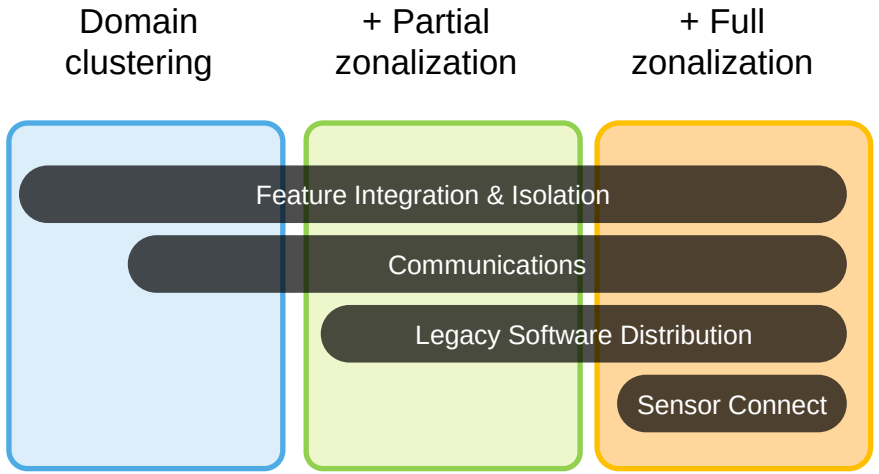
ENABLING USER-DEFINED CAR

KEY ARCHITECTURAL TRANSITION: EVOLUTIONARY OR REVOLUTIONARY?

COMPLEMENTARY PATHS AHEAD



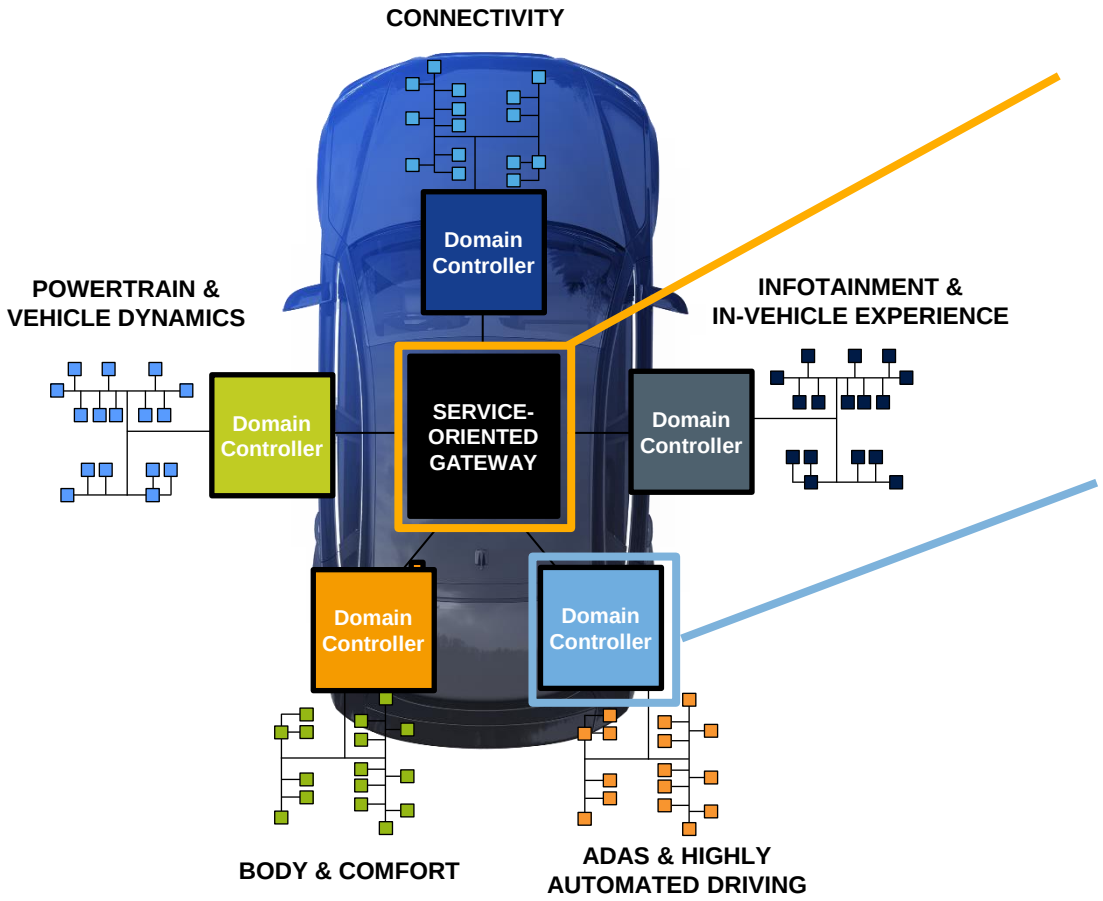
CHOICES AND CHALLENGES



- Co-Hosting Applications
- Legacy Software Integration
- Data & Resource Sharing
- Distributed Safety & Security
- Predictable, Reliable Networks

VERSATILE USES OF THE S32G2 VEHICLE NETWORK PROCESSOR

DOMAIN VEHICLE ARCHITECTURES

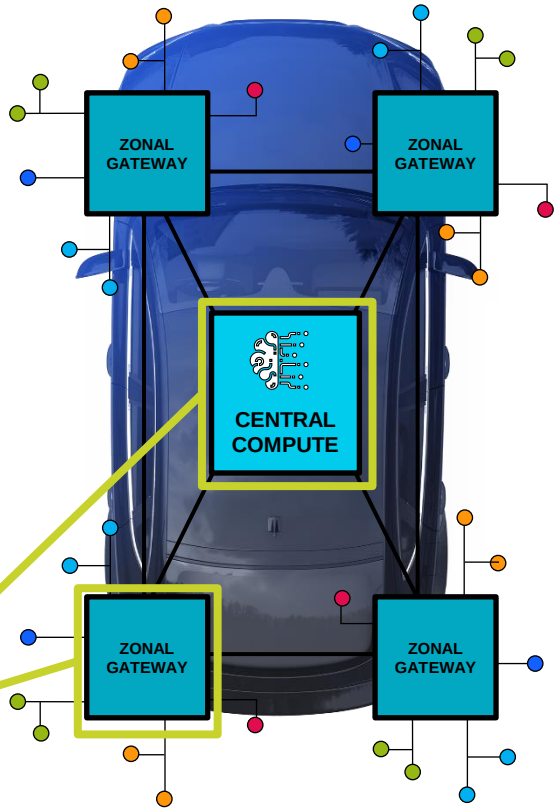


Service-oriented Gateway

Domain Controller / ADAS Safety Controller

Zonal Compute / Gateways

ZONAL VEHICLE ARCHITECTURES



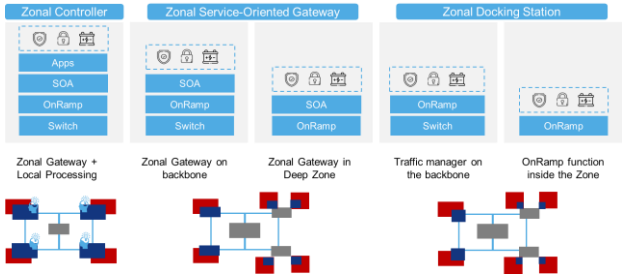
NXP MISSION: SOLUTIONS FOR ALL ZONAL HOT SPOTS

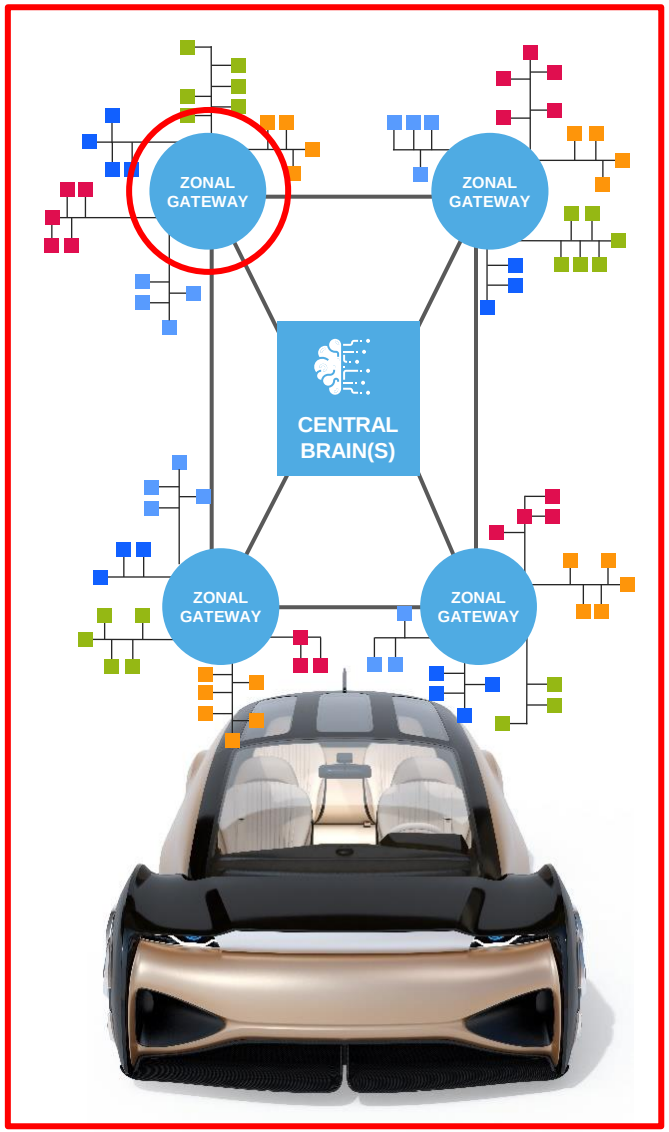
Focus Products

S32G/K
SJA1110
TJA1103
TJA115x
SJA1124
PMICs
eSwitch

On Zonal Controllers:

provide full spectrum of solutions





On Ethernet Backbone:

provide zonal-optimized switches

Full TSN + ASIL B + Strong TCAM + SoC synergy

Focus Products

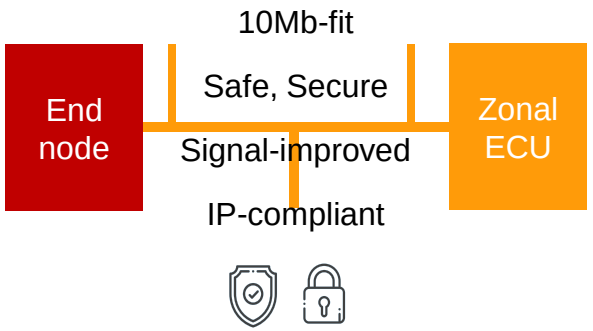
SJA1110 family

Focus Products

S32K/E
TJA146x
TJA115x
10BT1S
CAN XL
FSBCs

In the Zones:

future-proof portfolio



On Full Architecture:

provide unrivaled, full range competence

CAN XL 10BTS bus systems + Ethernet Traffic Eng + System Safety + System Security + Mature ref. designs e.g. RDB

S32G and Enablement Introduction

SECURE CONNECTIONS
FOR A SMARTER WORLD

S32G2 VEHICLE NETWORK PROCESSOR – A NEW TYPE OF AUTOMOTIVE PROCESSOR

SAFE PROCESSING

Lockstep Arm® Cortex®-M7 Microcontrollers

Cluster Lockstep Cortex-A53 Microprocessors

NETWORKING

20 x CAN/CAN FD Interfaces

LIN and FlexRay™ Interfaces

4 x Gigabit Ethernet Interfaces

PCI Express Gen 3 Interfaces

NETWORK ACCELERATION

Low Latency Communication Engine

Ethernet Packet Forwarding Engine

SAFETY & SECURITY

ASIL D Functional Safety Support

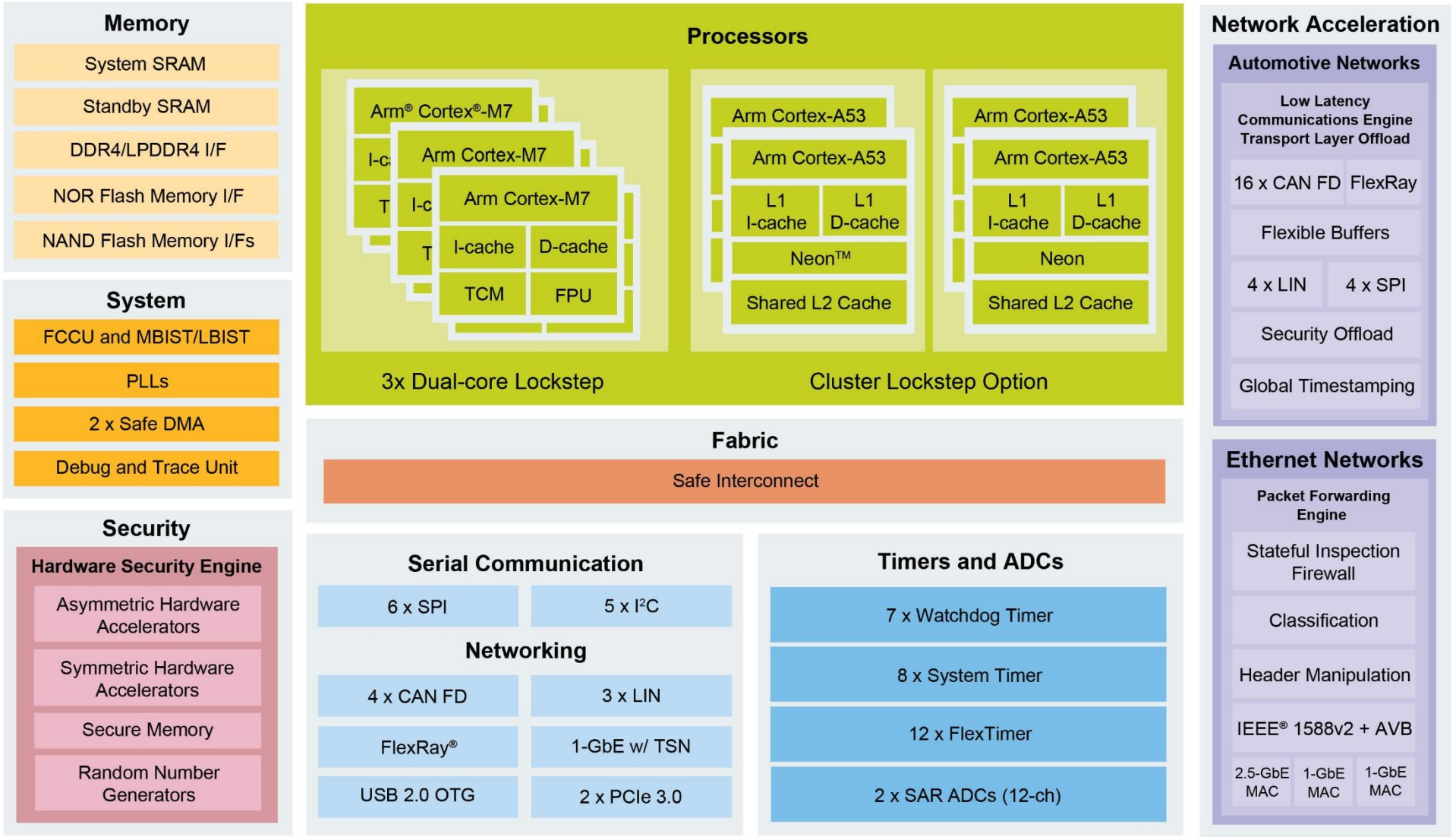
Advanced Hardware Security Engine

SAFE ASSURE™ by NXP

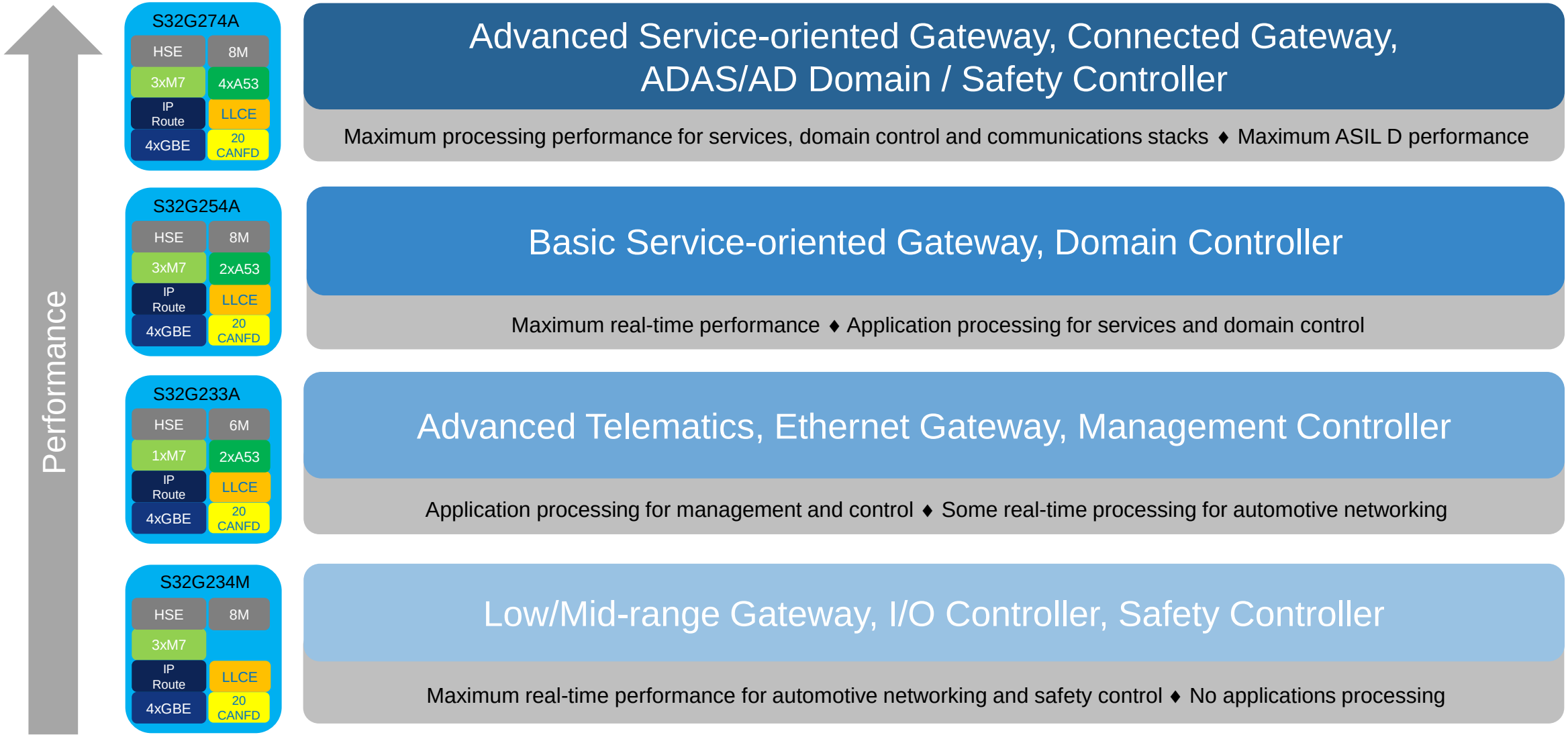
EDGELOCK™ ASSURANCE by NXP

www.nxp.com/S32G2

S32G274A VEHICLE NETWORK PROCESSOR HIGH-LEVEL BLOCK DIAGRAM

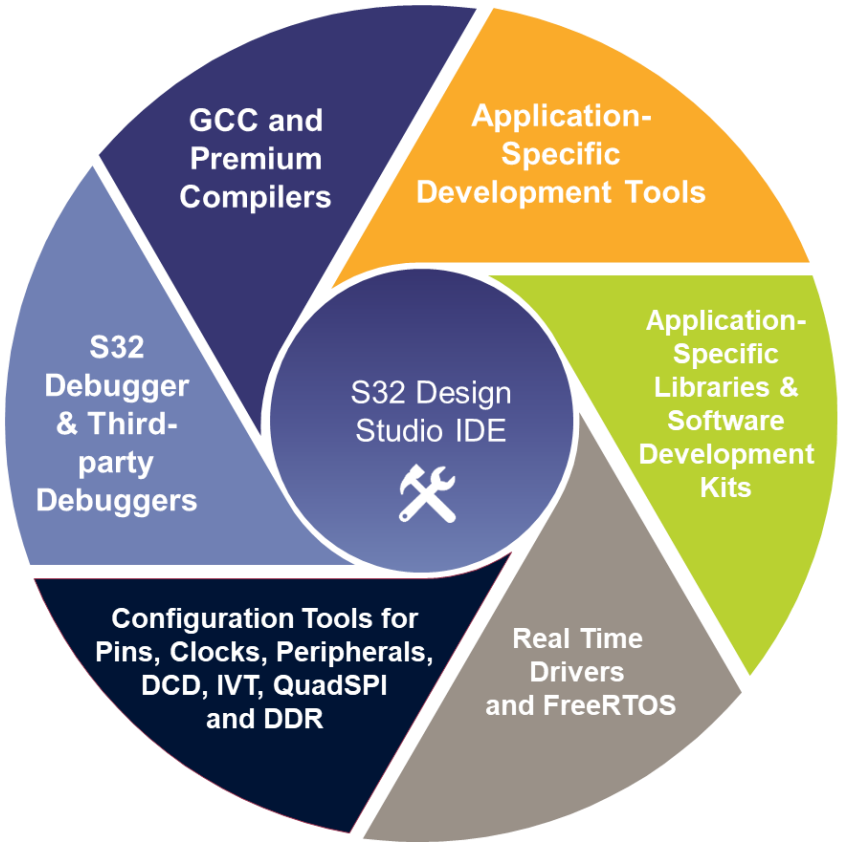


S32G2 SCALABLE FAMILY APPLICATIONS*

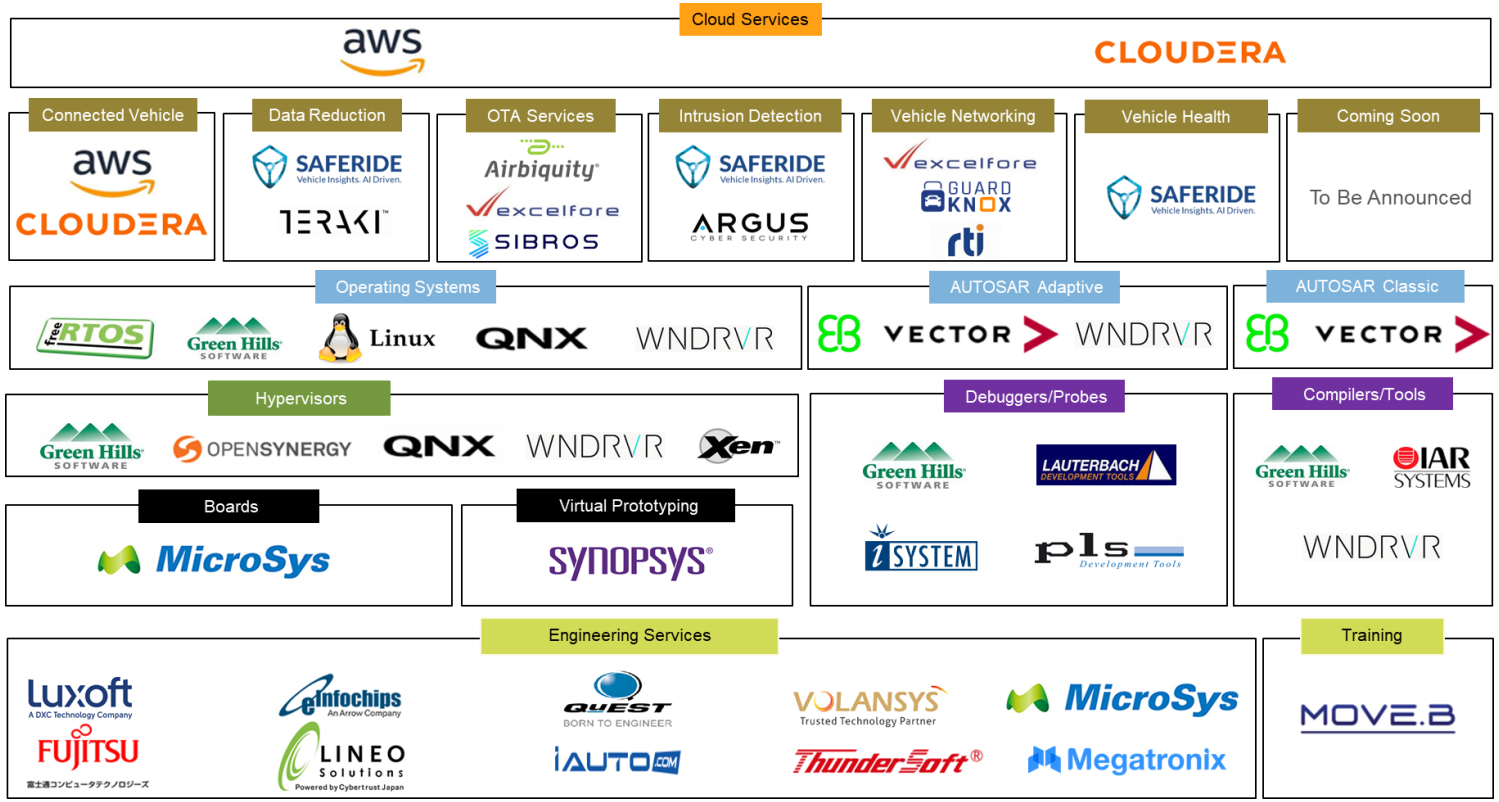


*These applications are not comprehensive. They are only for guidance and can vary based on customer requirements.

SUPPORTED BY NXP SOFTWARE TOOLS AND STRONG ECOSYSTEM OF PARTNERS



NXP Software Tools

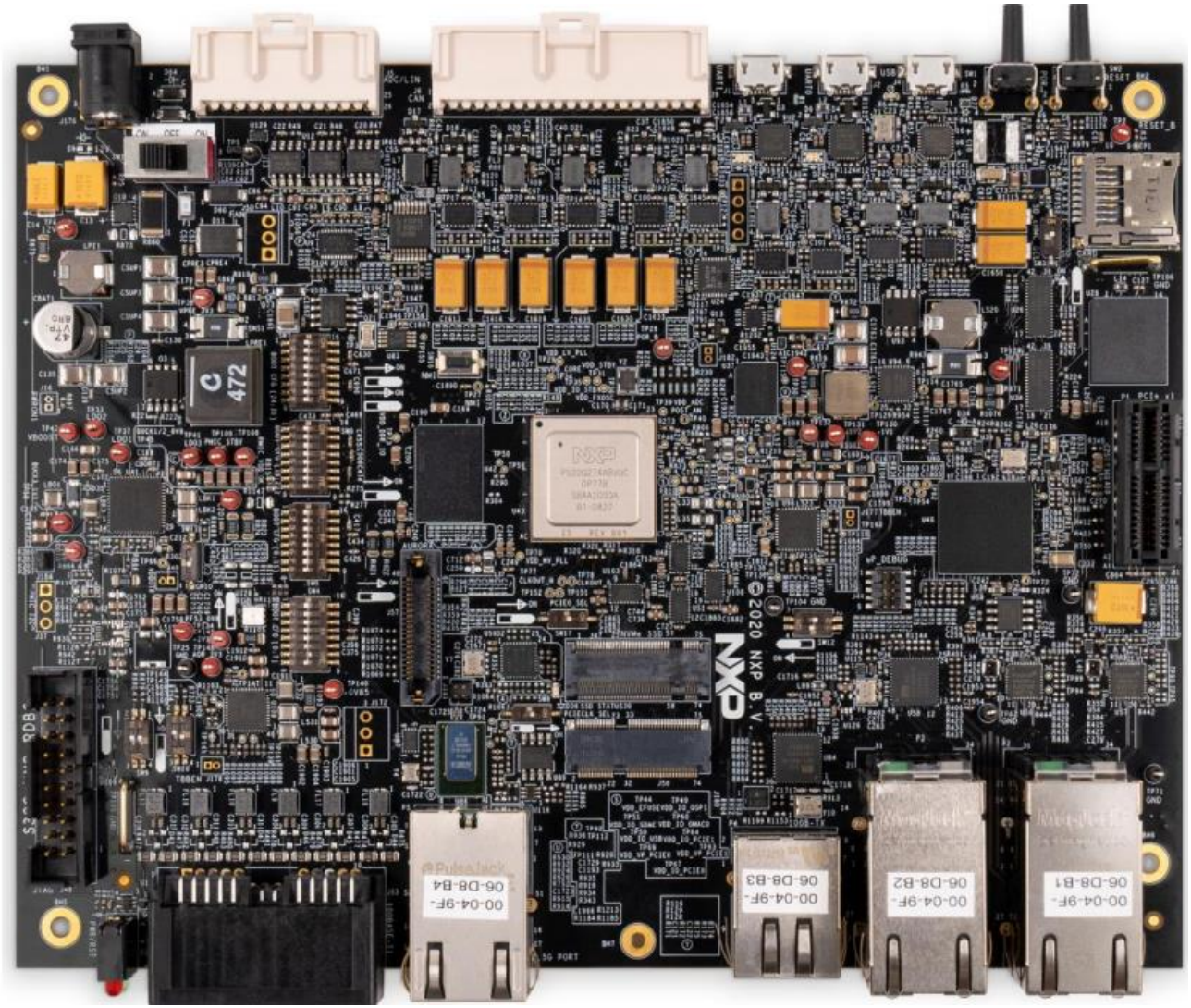


NXP S32G Ecosystem Partners*

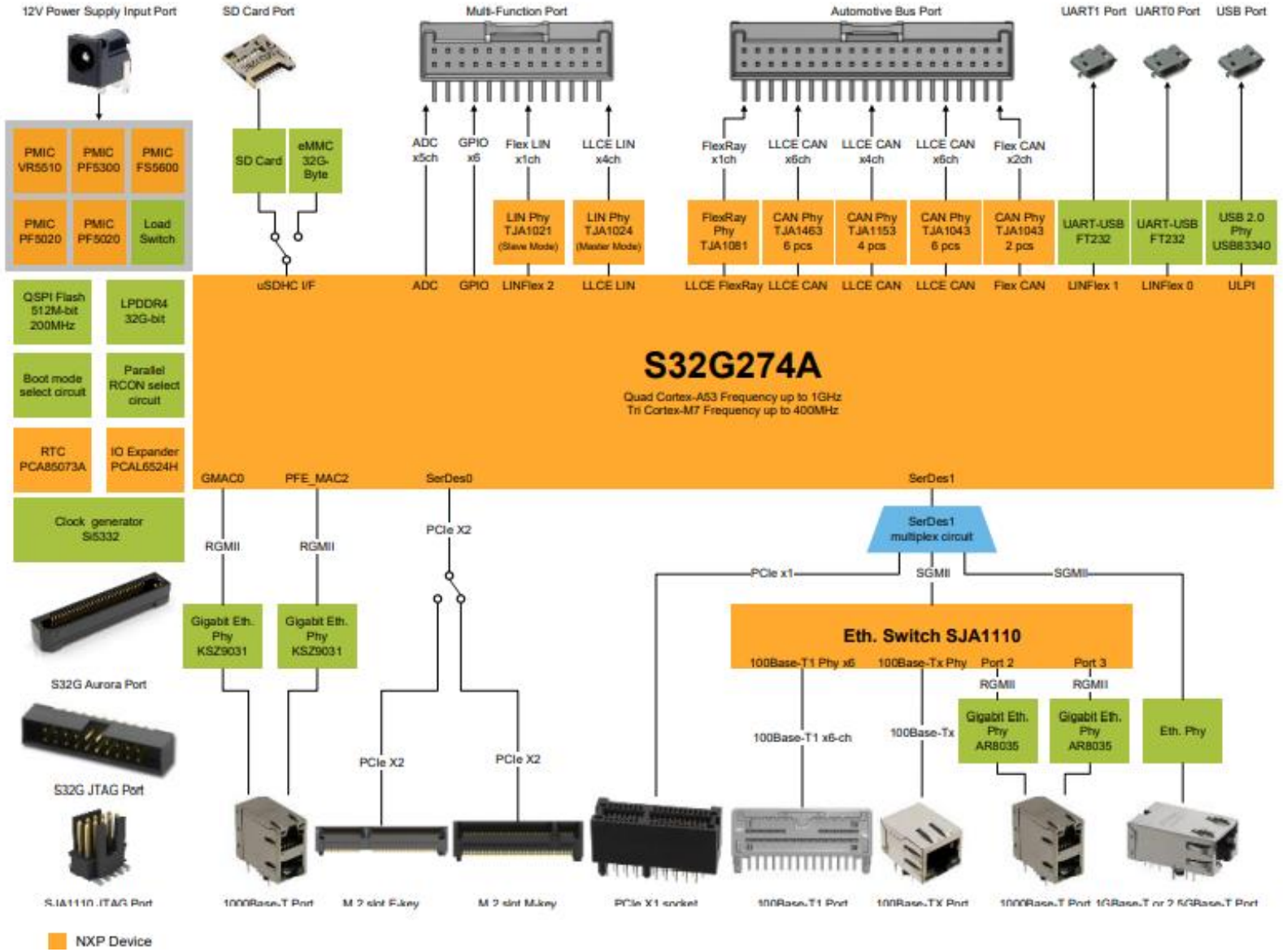
* As of 9/22/21 – New partners are in the pipeline. Check with your NXP sales representative for the latest list.

S32G GOLDBOX OVERVIEW

- Service-oriented Gateway reference design – RDB2 + Enclosure
- A-sample-like design for development/demos/evaluation
- 12x Ethernet, 18x CAN FD, 5x LIN, 1x FlexRay interfaces
- PCI Express x1 slot for system expansion and USB 2.0 OTG connector
- M.2 slot support for SSD storage and AI/ML acceleration modules
- JTAG debug and Aurora trace support
- Rugged enclosure with integrated thermal management



NXP S32G RDB2 / GOLDBOX BLOCK DIAGRAM



Items	Resources	Description
Processor	S32G274A	• 4 Arm Cortex-A53 cores (with optional cluster lockstep) • 3 dual-core lockstep Arm Cortex-M7 cores • Hardware Security Engine (HSE) supports SHE / EVITA • CAN, LIN and FlexRay offload with Low Latency Communications Engine (LLCE) • Gigabit Ethernet Packet Forwarding Engine (PFE) • 8MB Embedded System RAM with ECC • 32KB Standby RAM with ECC
Memory	LPDDR4	1 x LPDDR4 (4GB) with inline-ECC and self-refresh
	NOR flash	1 x NOR Flash (64MB)
	eMMC	1 x eMMC(32GB)
	SD card	1 x Slot for SD card
Connectivity	Ethernet	1 x 100BASE-TX 6 x 100BASE-T1 5 x 1000BASE-T
	USB	1 x USB 2.0 port as host/device mode
	FlexRay	1 x LLCE FlexRay
	LIN	4 x LLCE LIN as master mode by default 1 x LINFlexD as slave mode by default
	CAN/CAN_FD	16 x LLCE CAN/CAN FD 2 x FlexCAN /CAN FD
	ADC	5 x ADC input
	GPIO	6 x GPI/GPIO with multiplexable functions (GPI/GPIO, I2C, DSPI, EIRQ, Wakeup input, and FTM)
Debug & Trace	UART	2 x UART
	JTAG	1 x 20PIN JTAG for S32G274A 1 x 10PIN JTAG for SJA1110A
	Aurora Trace	1 x AURORA
Additional Features	Low-power mode	• Supports Low-power mode • Supports Low-power mode with DDR self-refresh
	RTC	Supports internal RTC and external RTC
Expansion Connector	M.2 slot	1 x M.2 M-key slot 1 x M.2 E-key slot Tips: When M.2 M-key card is inserted, M.2 E-key slot will not be available, and vice versa.
	PCIe x1 socket	1 x PCIe x1 socket

NXP S32G2 GOLDBOX REFERENCE DESIGN

S32G2 Reference Design accelerates automotive innovations and customer designs

(includes BoM, schematic, layout)

Carmakers	Application Developers	Cloud & Service Providers
Proof of concepts	Innovation platform	Symbiotic compute
Benchmarking	Software development	Over-the-Air (OTA) updates
Vehicle data insights	Test and validation	Machine learning deployment
New services deployment	Demo showcase	Vehicle service deployment

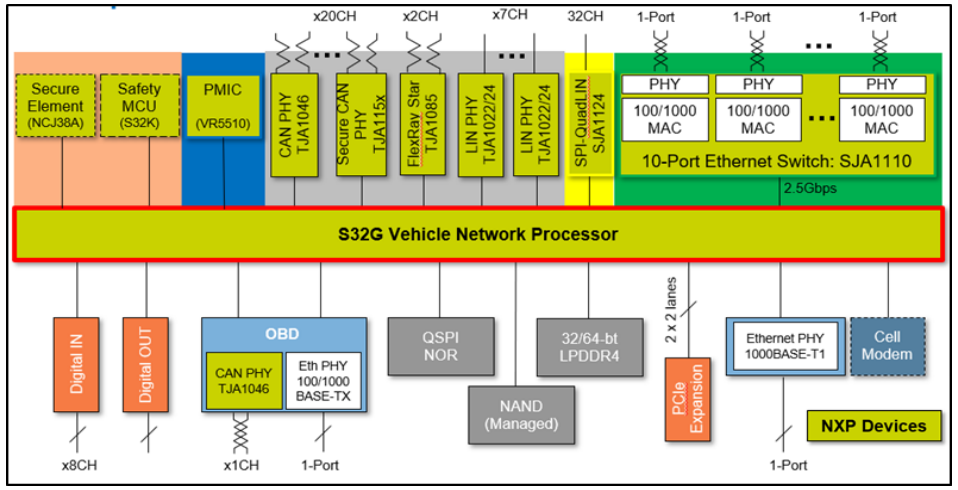
Accelerating Transformation Across the Automotive Ecosystem

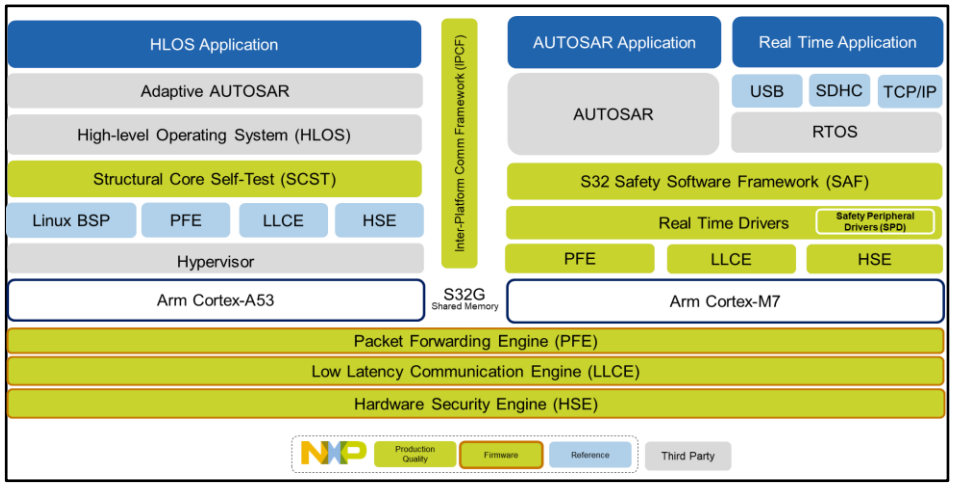
GoldVIP Overview and Value Propositions

SECURE CONNECTIONS
FOR A SMARTER WORLD

NXP FOCUSED ON BROAD DESIGN ENABLEMENT FOR S32G CUSTOMERS

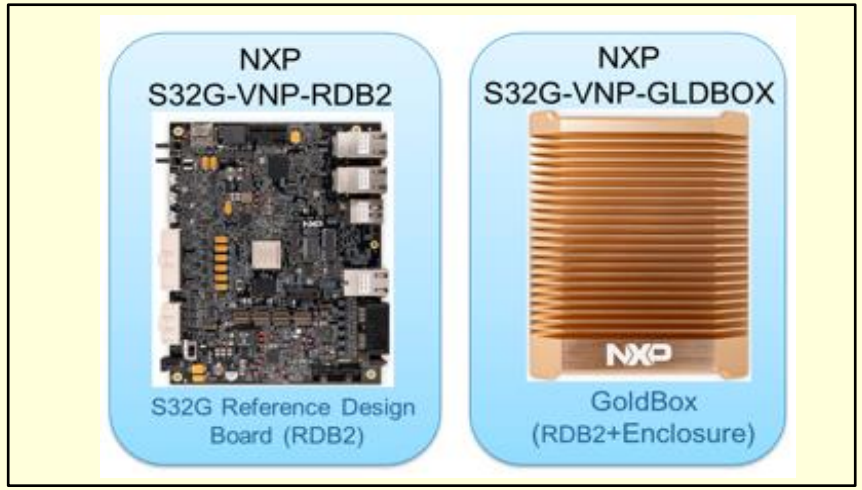
NXP S32G System Solution

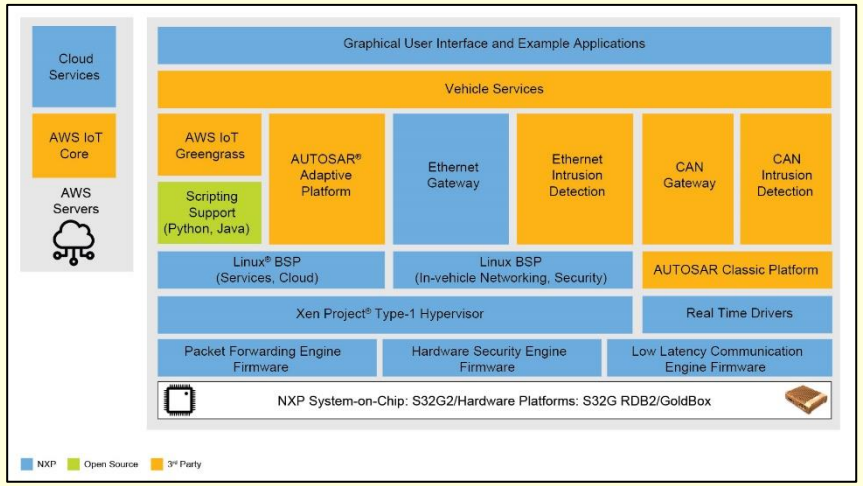




S32G Software Enablement Stack

NXP S32G Hardware Platforms





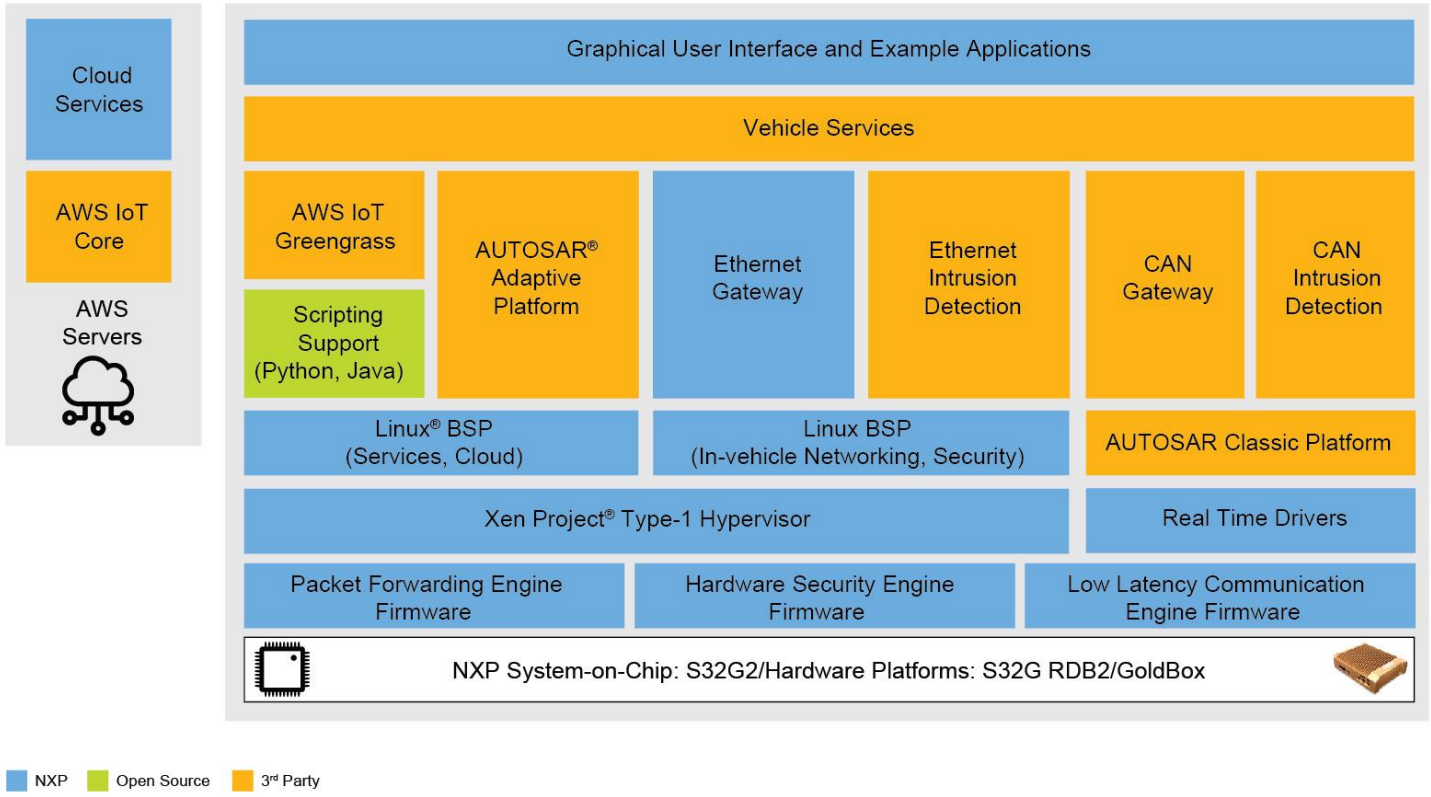
S32G Vehicle Integration Platform (GoldVIP)

NXP GoldVIP (VEHICLE INTEGRATION PLATFORM) HIGH-LEVEL VIEW

- Provides reference platform for vehicle network processing applications like Service-oriented Gateways

- Addresses key use cases & trends:
  - Vehicle Networking
  - Service-Oriented Architecture (SoA)
  - Data Analytics
  - Over-the-Air (OTA) Services (in integration)
  - Virtualization & Isolation
  - Network Security and Security Services

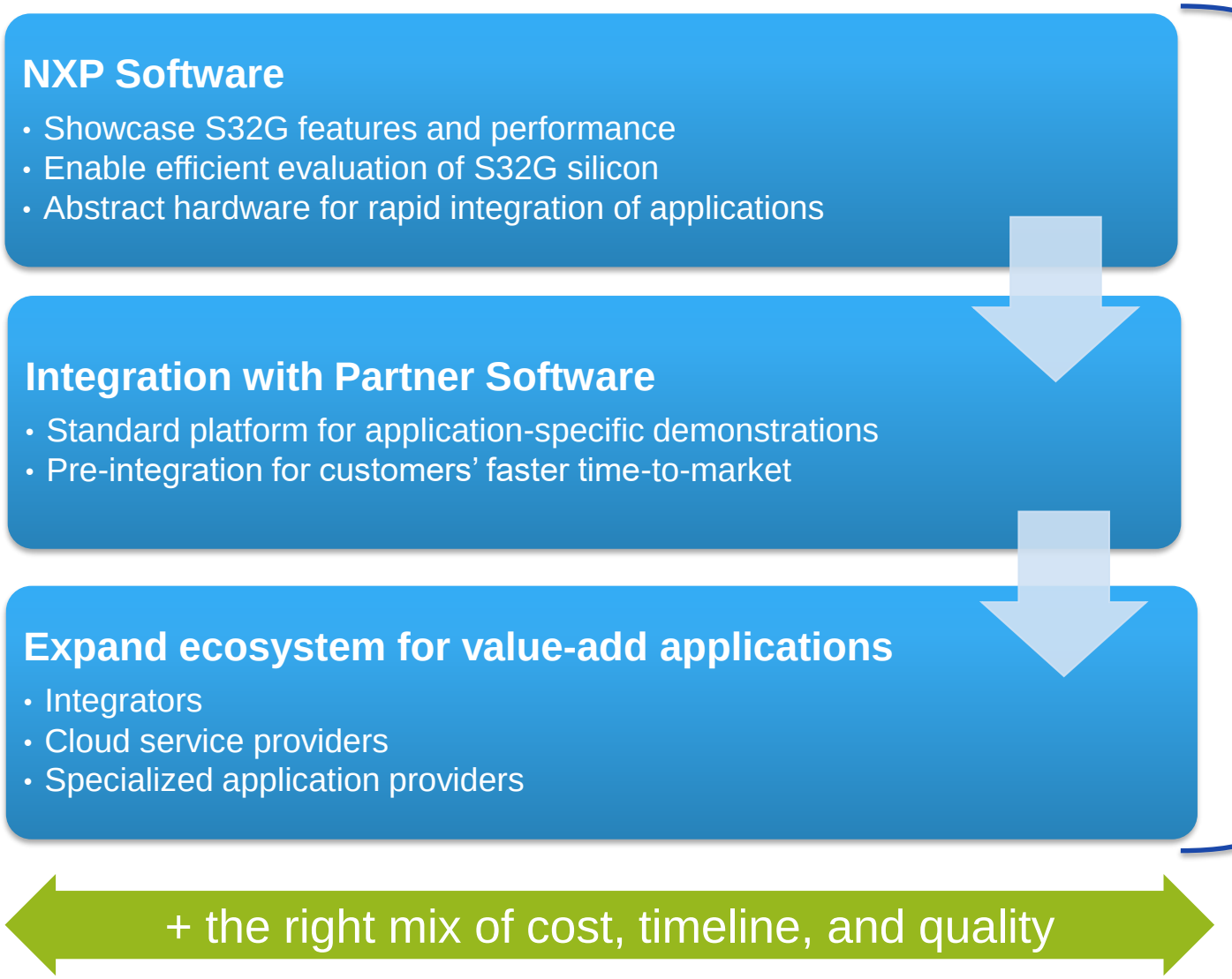
- Accelerates customers through ease of use
  - Demonstrate KVPs* of the S32G2 in 10 mins
  - Customers to create a prototype gateway in 1hr
  - Abstraction of hardware complexity
  - Minimize support with a software reference



nxp.com/GoldVIP

* KVP = Key Value Proposition

GoldVIP APPROACH AND KEY BENEFITS



Key Benefits

Customers:

- Faster and more efficient evaluation
- Reduced risk from pre-integration
- Accelerated proof-of-concept and development

Partners:

- Pre-integration ahead of customer programs
- Wide exposure to automotive customers
- Synergistic collaboration opportunities

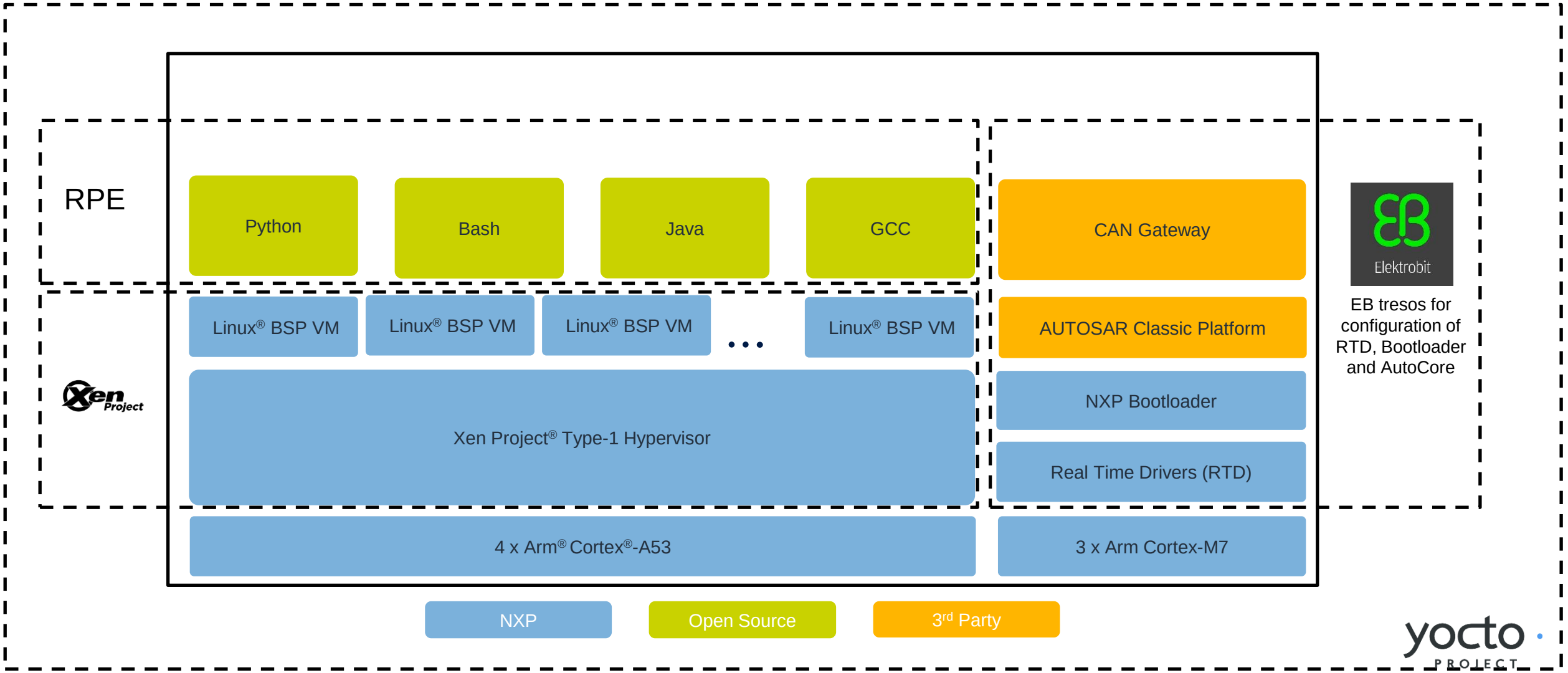
NXP:

- Showcasing of S32G capabilities and use cases
- Enablement SW improvements from integration
- Common platform for streamlined support

GoldVIP KEY TECHNICAL VALUE PROPOSITIONS

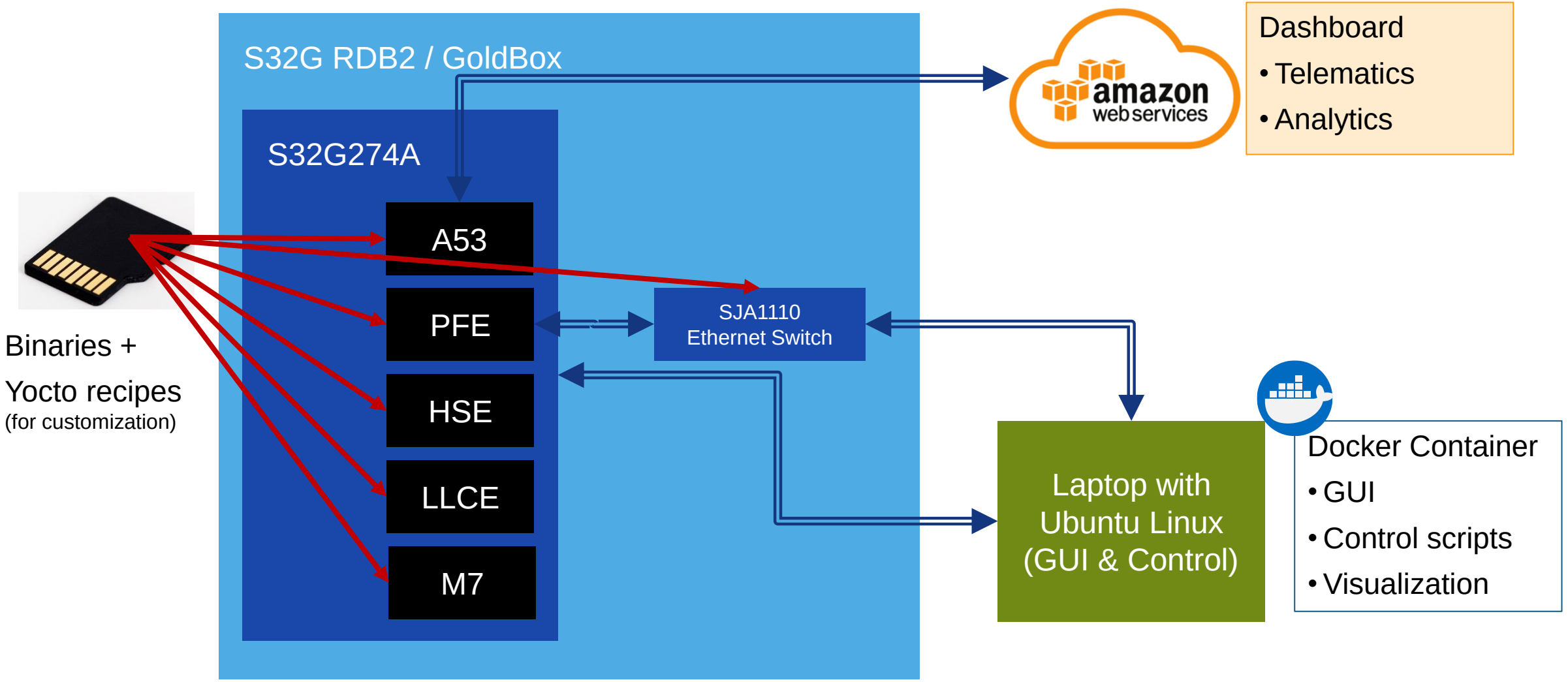
- **Streamlines integration** of NXP, open source and 3rd parties' software
- Supports **edge** computing and **cloud** analytics
- Provides a **system-level approach** to support complex, real-world applications
- **Showcases key S32G capabilities and use cases**
  - Showcases the **value of hardware acceleration** provided by S32G
  - LLCE, PFE and HSE accelerator performance with **close-to-0% Cortex®-A/M processor utilization**
- Provides non-intrusive **application isolation**
- Provides low-latency, zero-copy **inter-OS communication**
- Demonstrates SoC-level **safety concepts**

GoldVIP SOFTWARE DEVELOPMENT ENVIRONMENT



RPE = Rapid Prototyping Environment

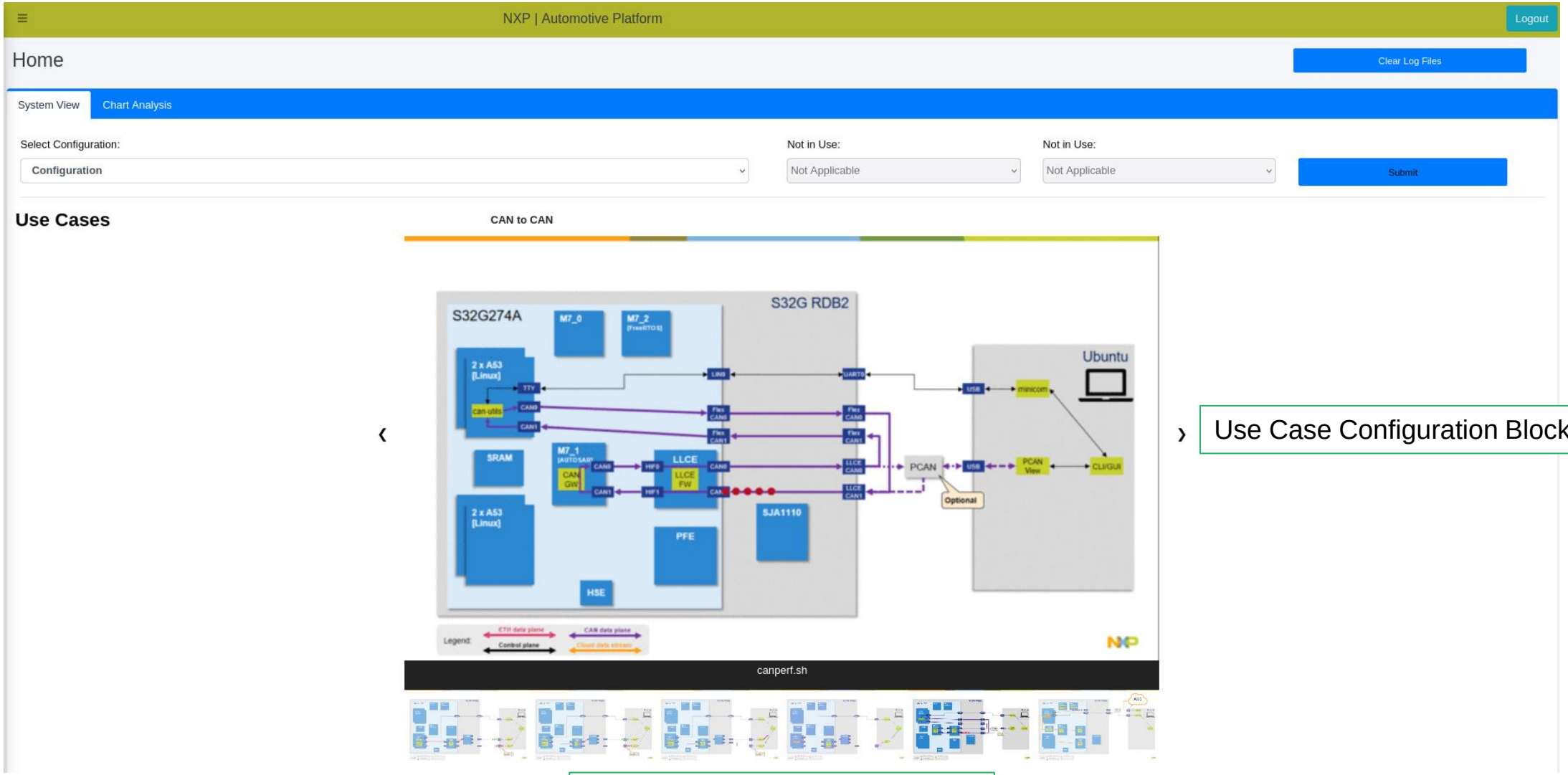
GoldVIP DELIVERABLES AND DEMONSTRATION SETUP



S32G GoldVIP + GoldBox in Action

SECURE CONNECTIONS
FOR A SMARTER WORLD

THE GoldVIP USER INTERFACE – SYSTEM VIEW (WITH MULTIPLE USE CASES)



Use Case Configuration Block Diagram

Multiple Use Case Configurations

THE GoldVIP USER INTERFACE – CHART ANALYSIS VIEW

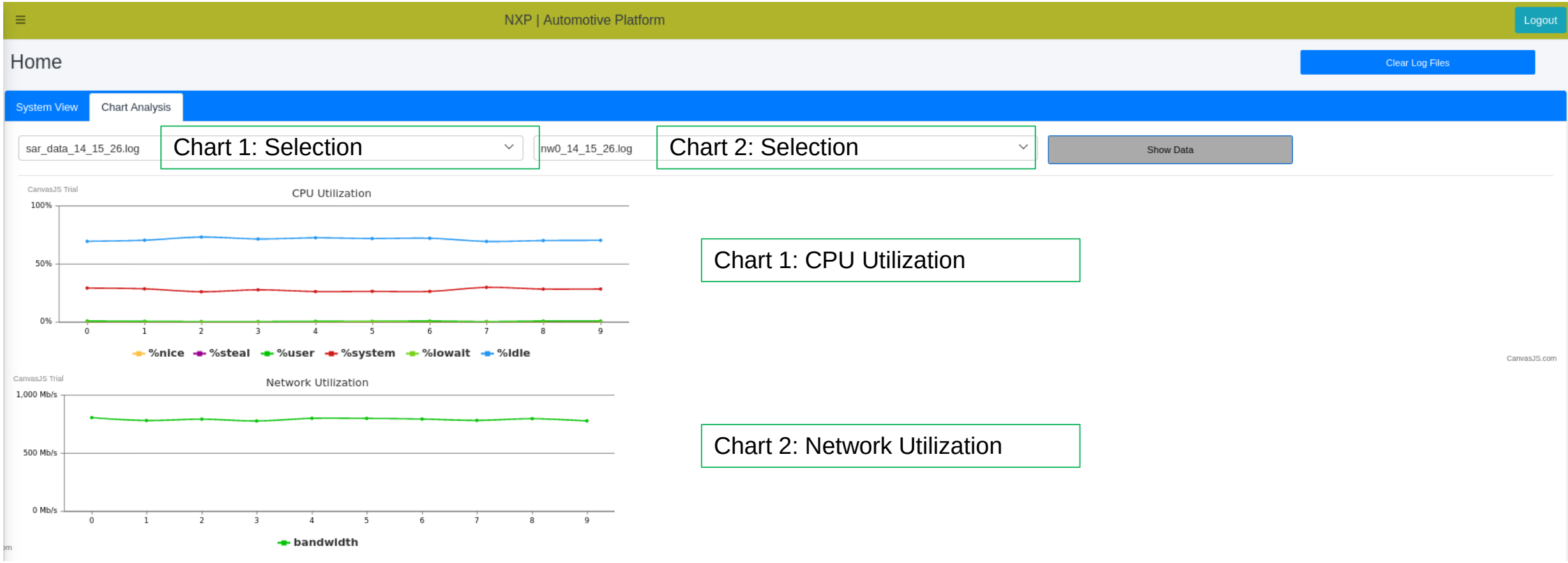
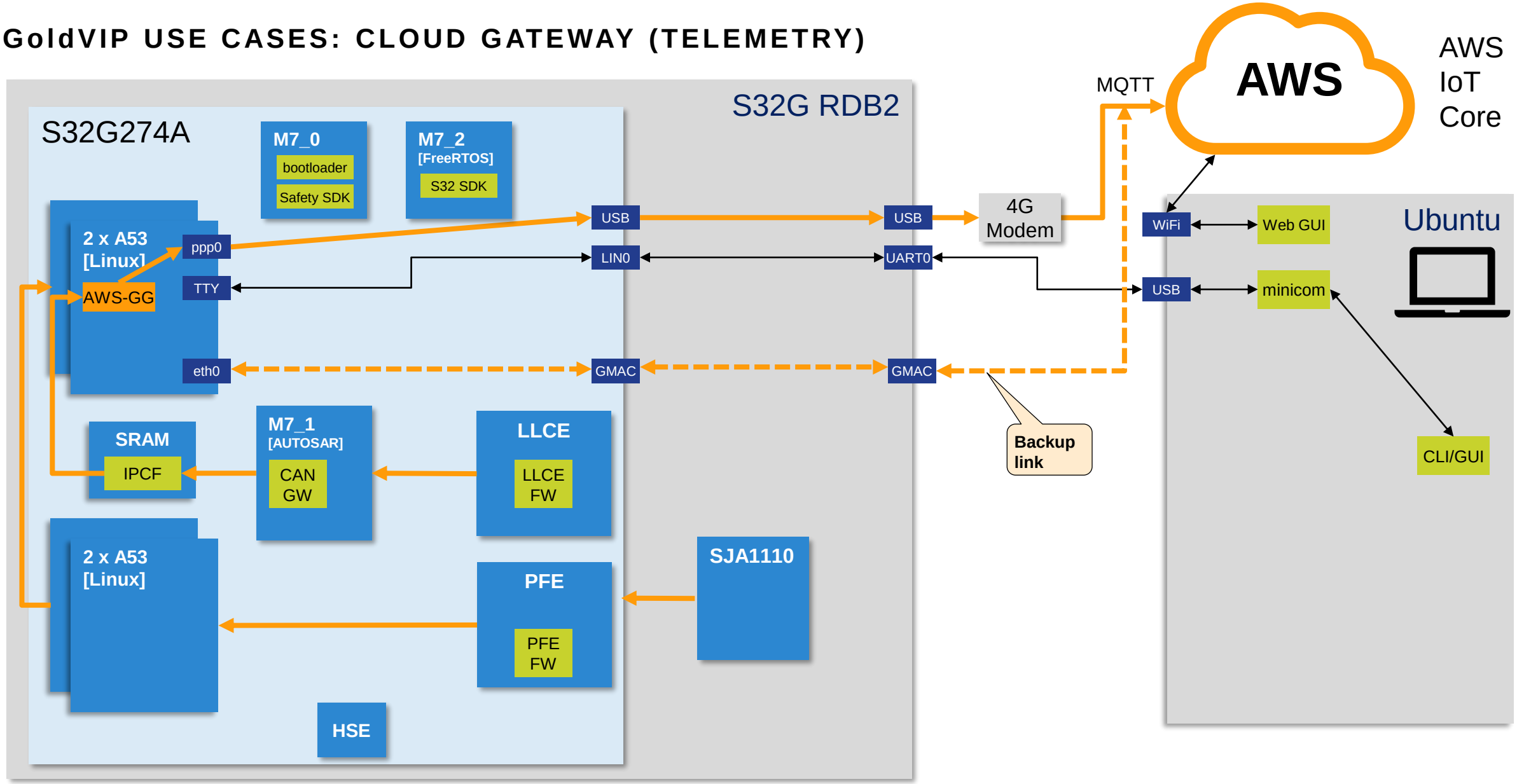


Chart 1: CPU Utilization

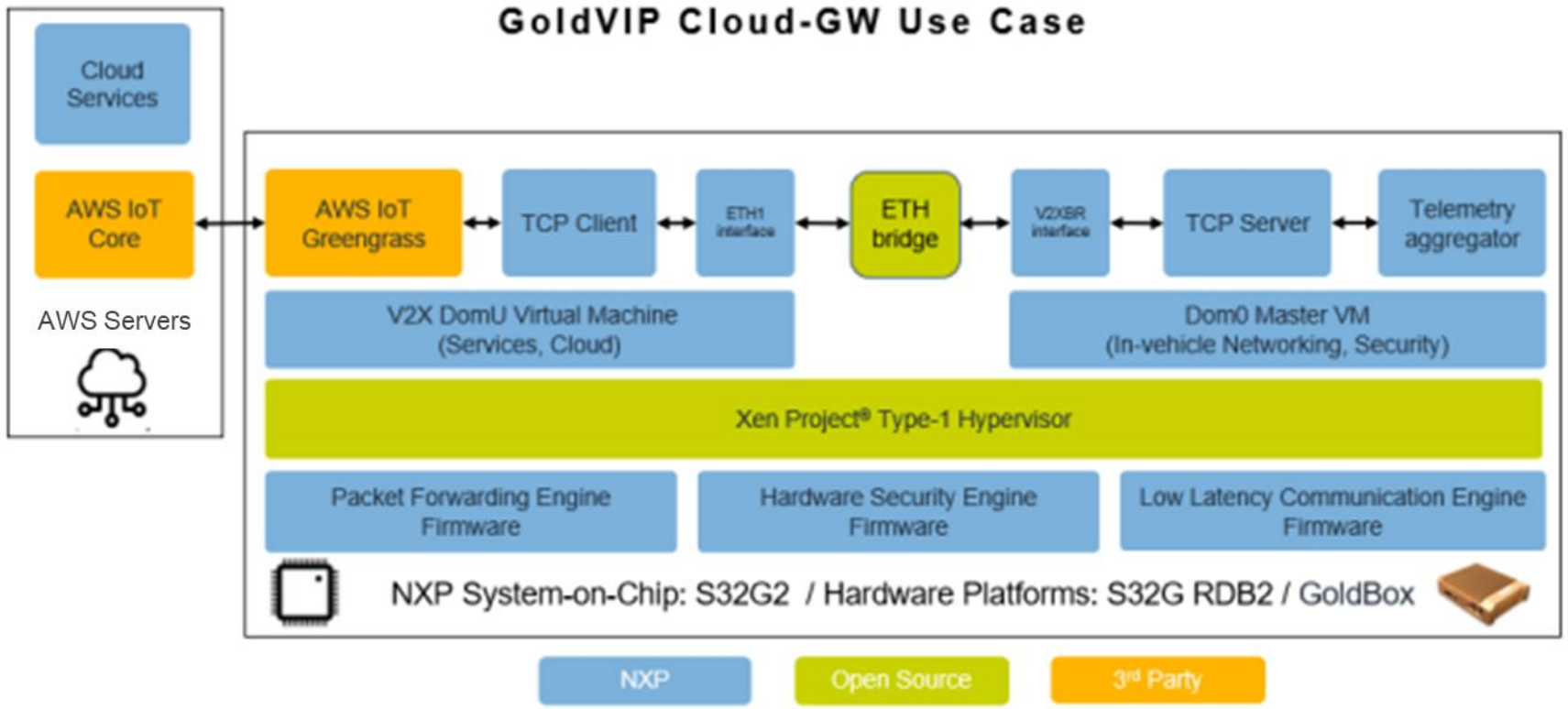
Chart 2: Network Utilization

GoldVIP USE CASES: CLOUD GATEWAY (TELEMETRY)



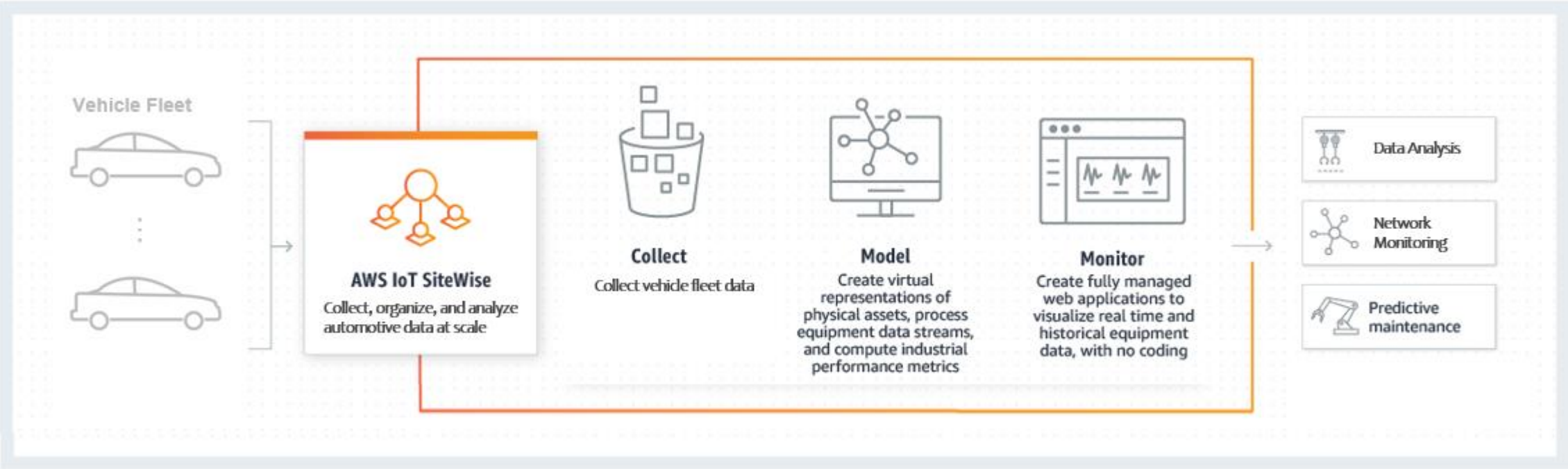
Telemetry statistics examples: networking accelerator and Ethernet switch usage, real-time cores load, Domain-0 VCPU load and Domain-0 Memory utilization statistics…

VIRTUAL MACHINES PROVIDE ISOLATION BETWEEN CLOUD AND INTERNAL NETWORKS



- System Resources are protected from outside interference
  - Domain 0 (Dom0) has access to all system hardware resources
  - Domain U (V2X DomU) has access to limited hardware resources virtualized through Xen hypervisor

CLOUD DATA VISUALIZATION: CREATING AN AWS IOT SITE WISE DASHBOARD

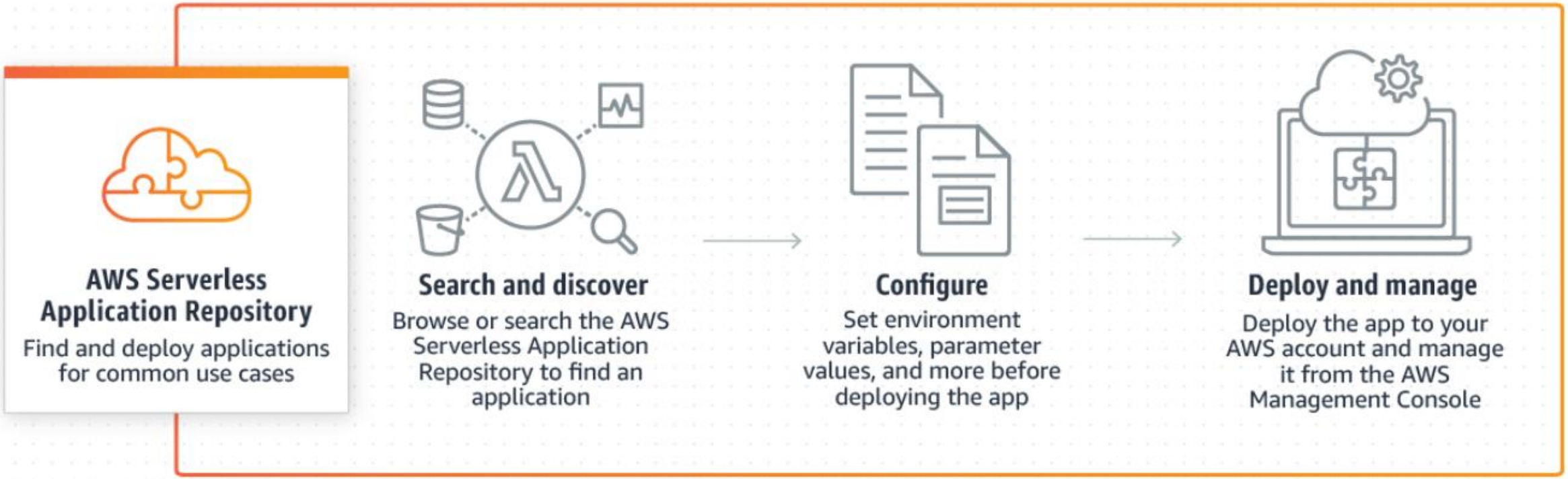


Supports remote data management and visualization in the cloud

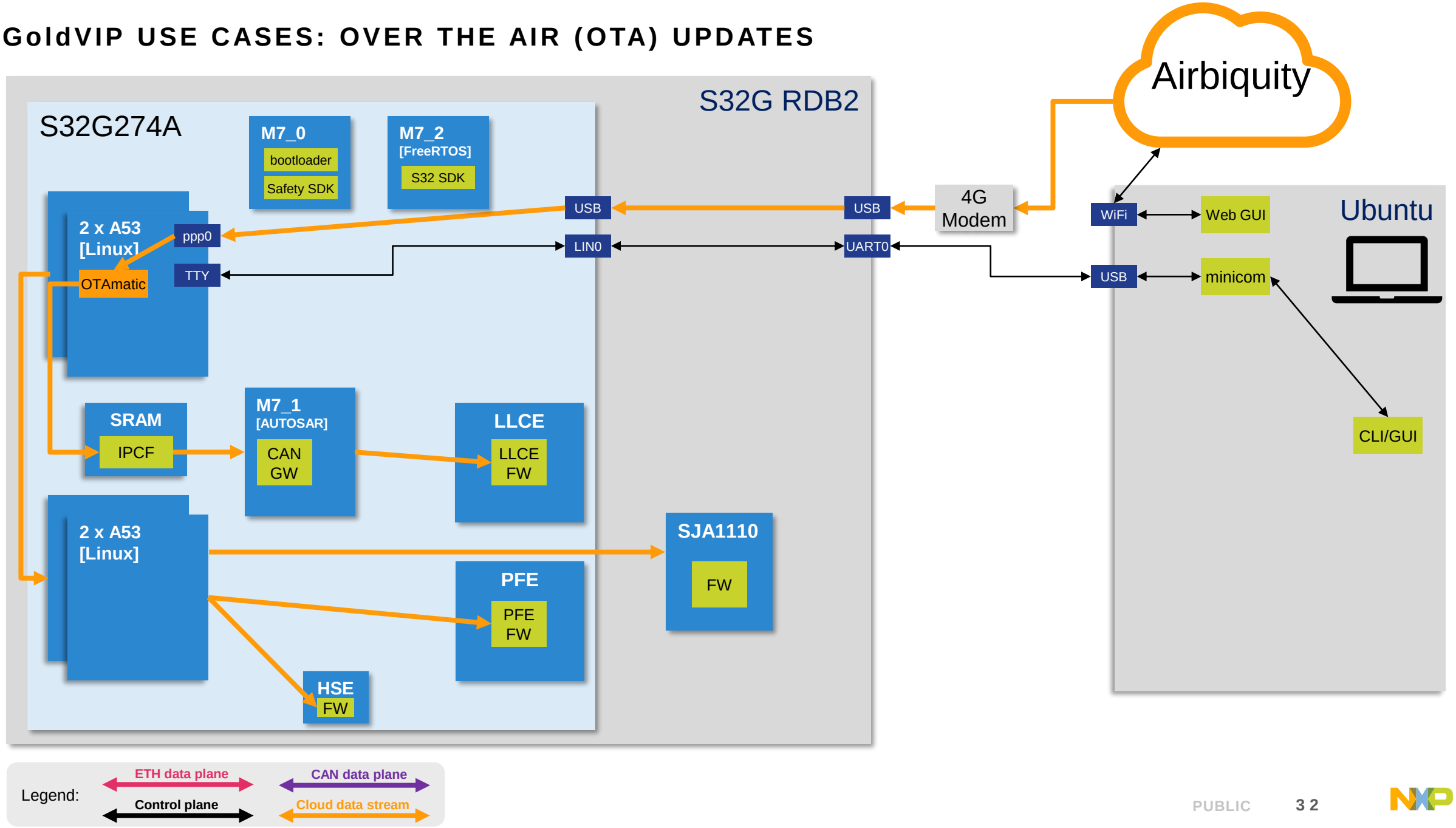
GoldVIP TELEMETRY DASHBOARD EXAMPLE – CORTEX-A53 LOAD AND PFE RX DATA BW

GoldVIP TELEMETRY DASHBOARD EXAMPLE – MEMORY LOAD, CORTEX-M7 LOAD, TEMP

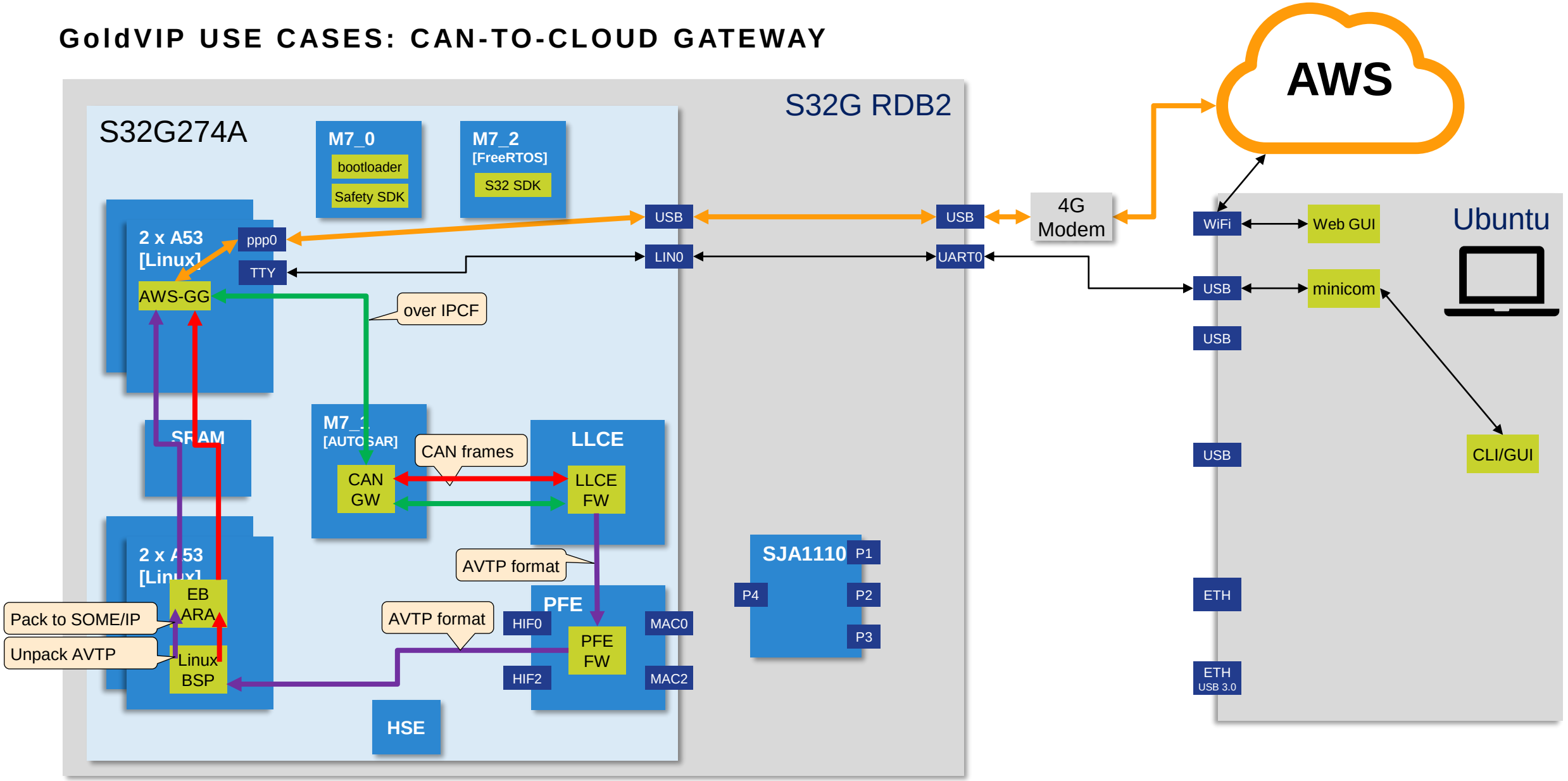
CREATING AN AWS SERVERLESS APPLICATION MODEL (AWS SAM) AND DISTRIBUTING VIA THE AWS SERVERLESS APPLICATION REPOSITORY (AWS SAR)



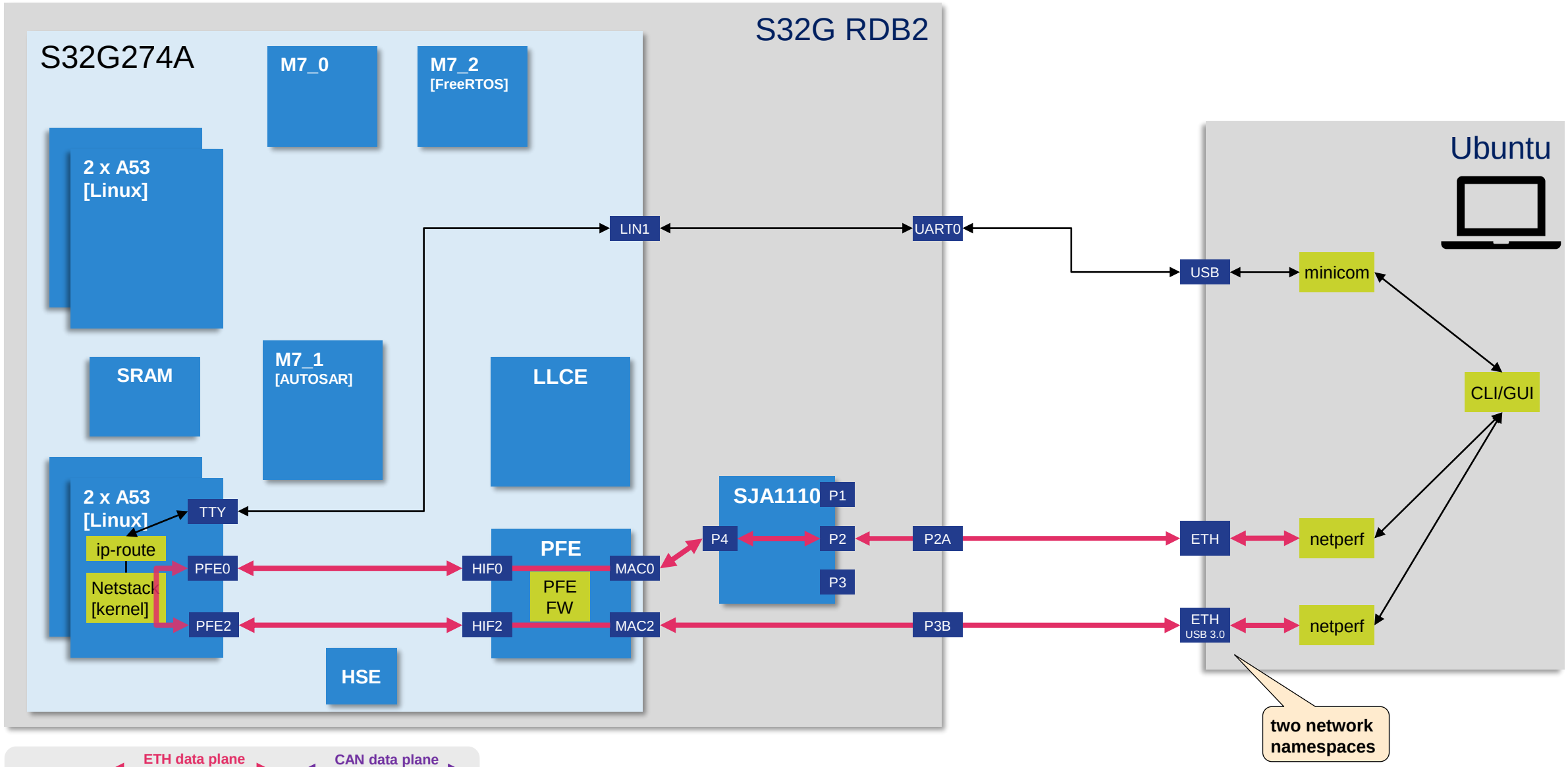
GoldVIP USE CASES: OVER THE AIR (OTA) UPDATES



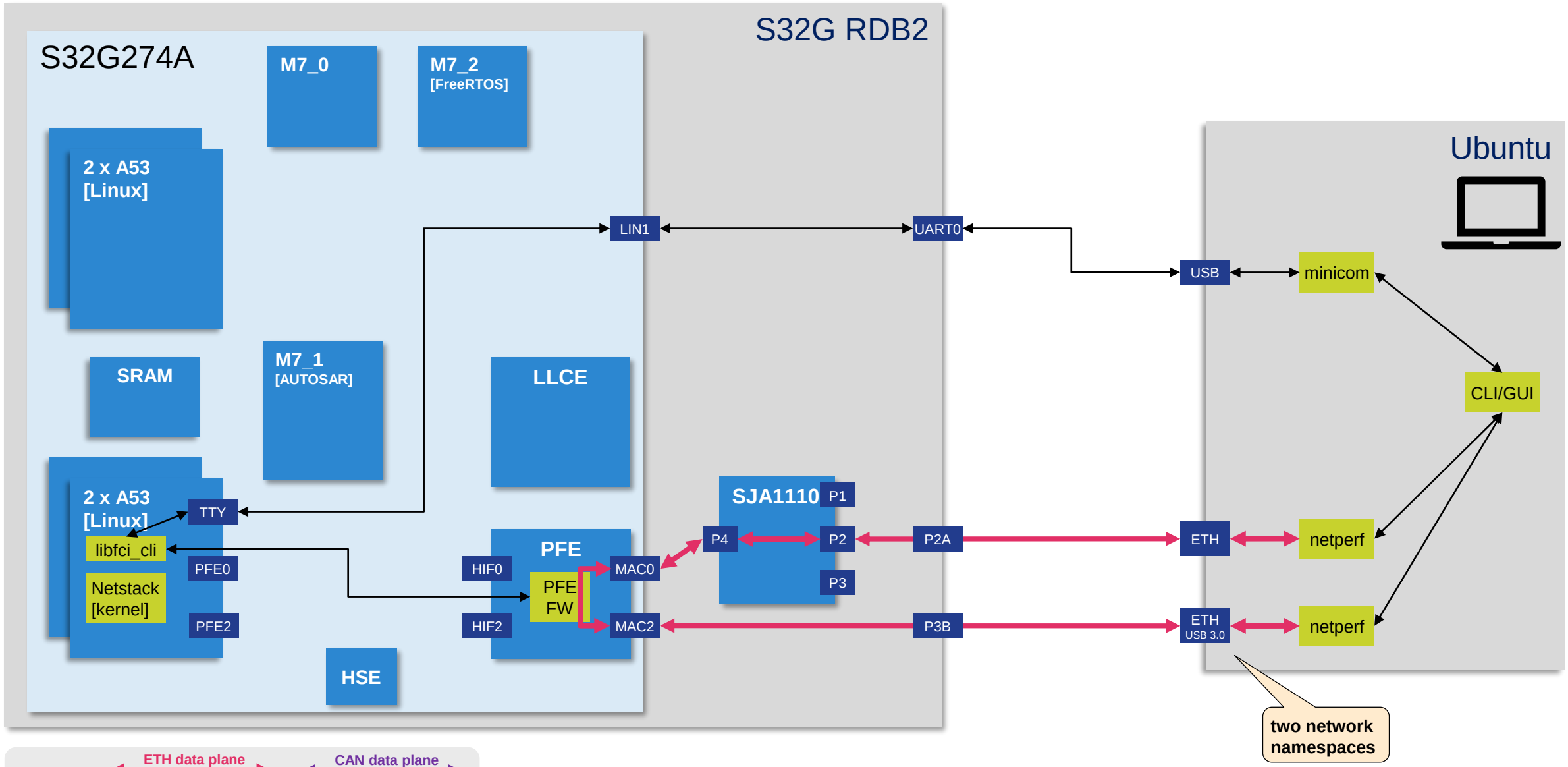
GoldVIP USE CASES: CAN-TO-CLOUD GATEWAY



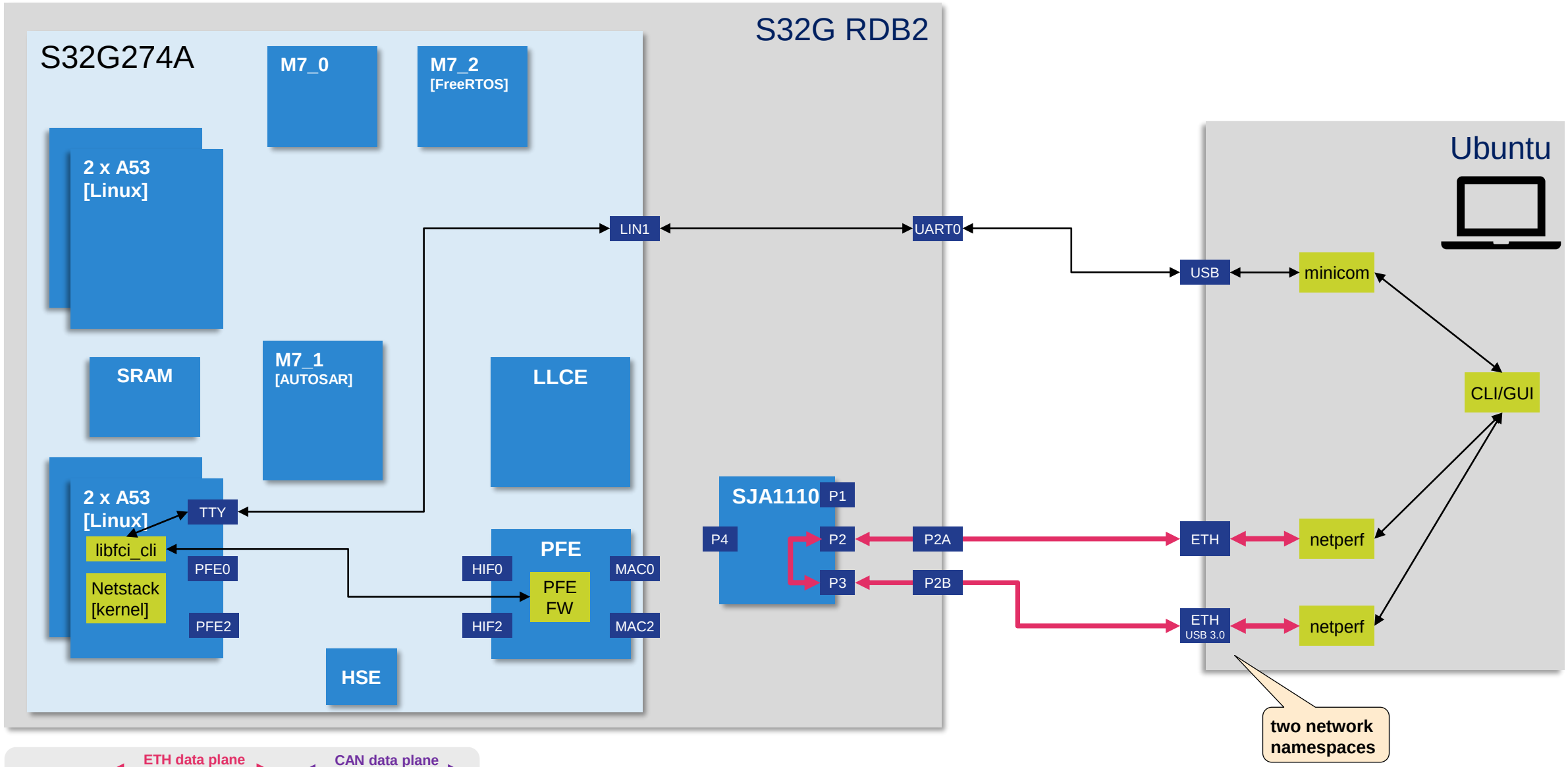
GoldVIP USE CASES: L2/L3 ETHERNET PACKET FORWARDING – SLOW PATH



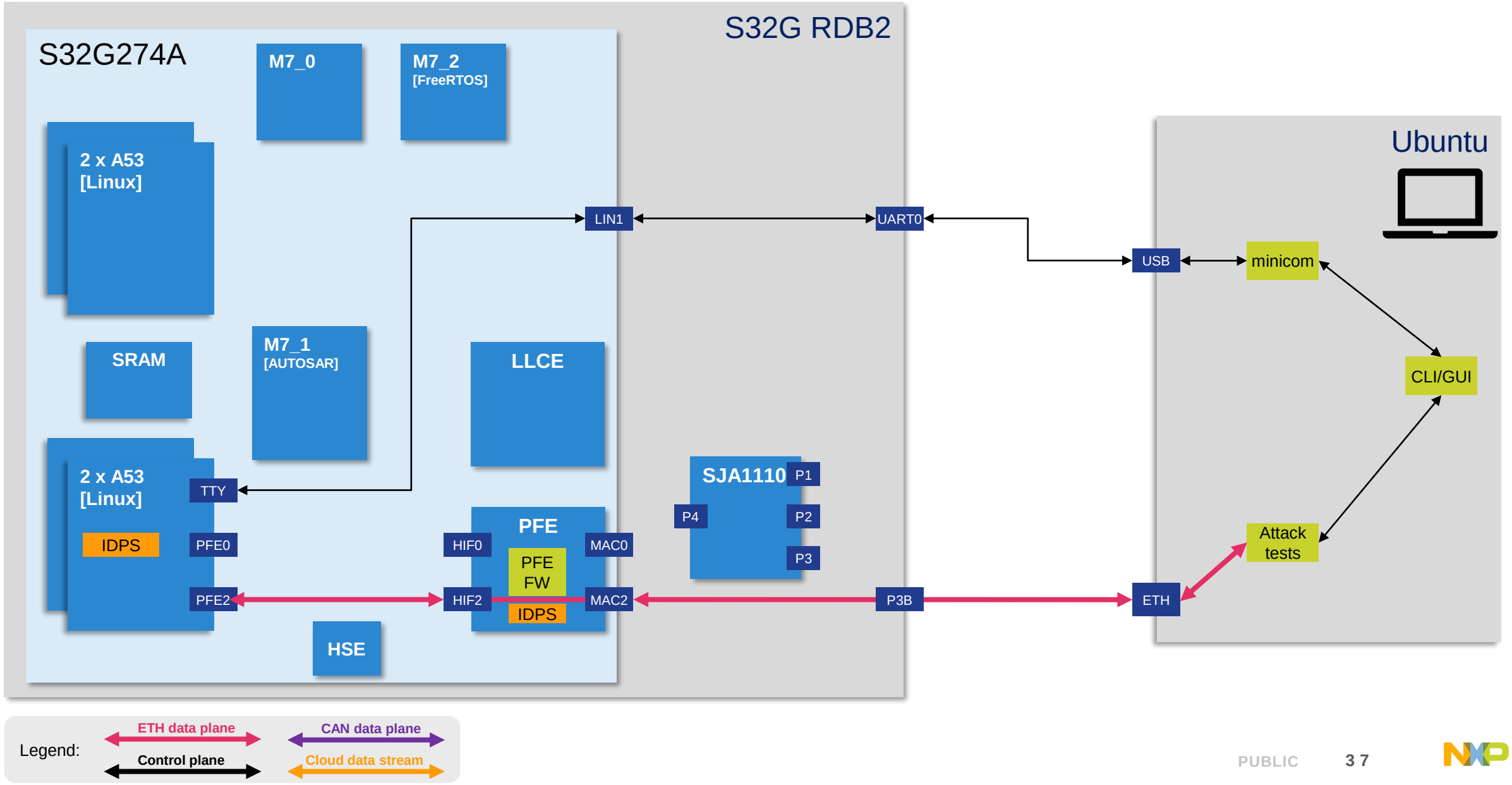
GoldVIP USE CASES: L2/L3 ETHERNET PACKET FORWARDING – FAST PATH (PFE)



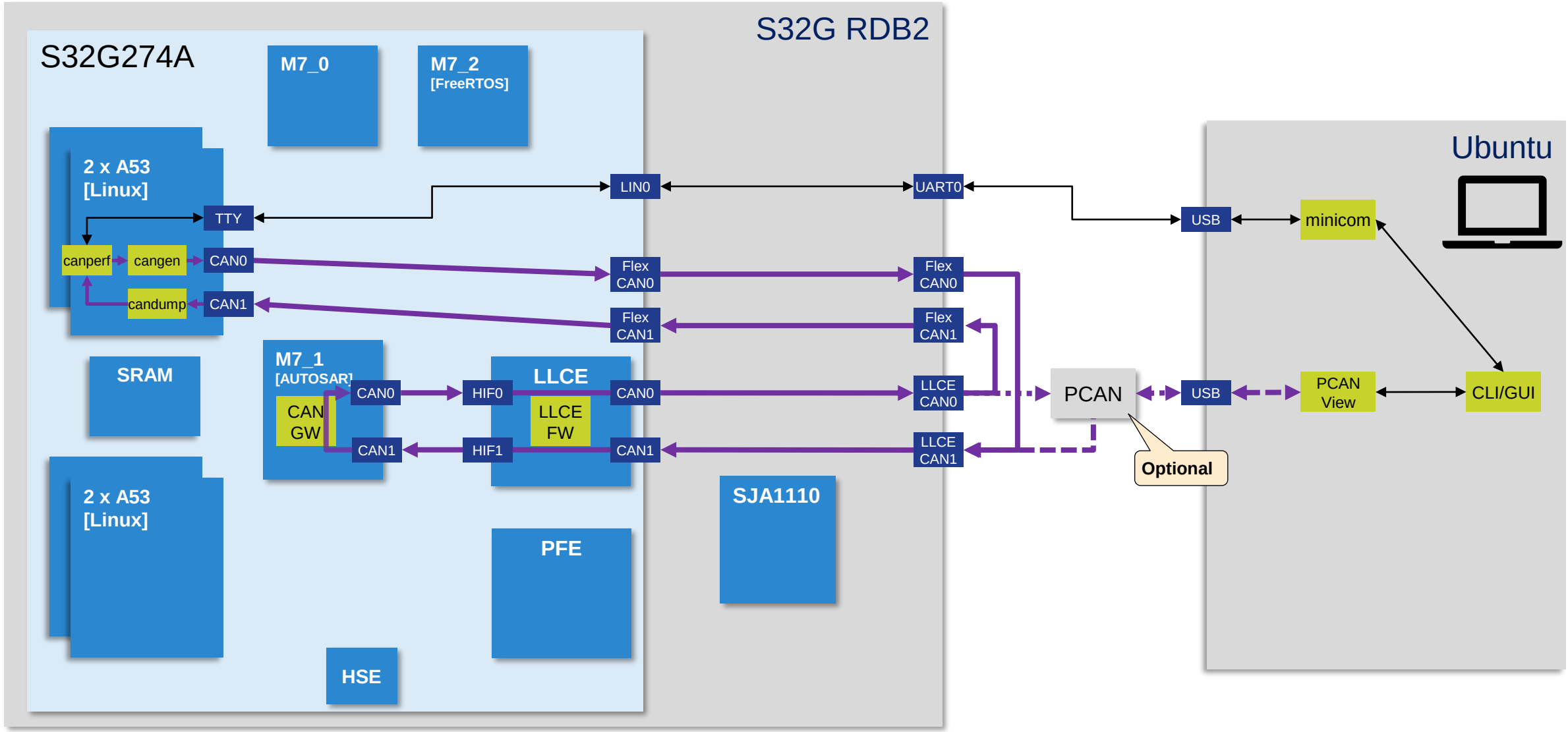
GoldVIP USE CASES: L2 ETHERNET PACKET FORWARDING – FAST PATH (SJA1110 SWITCH)



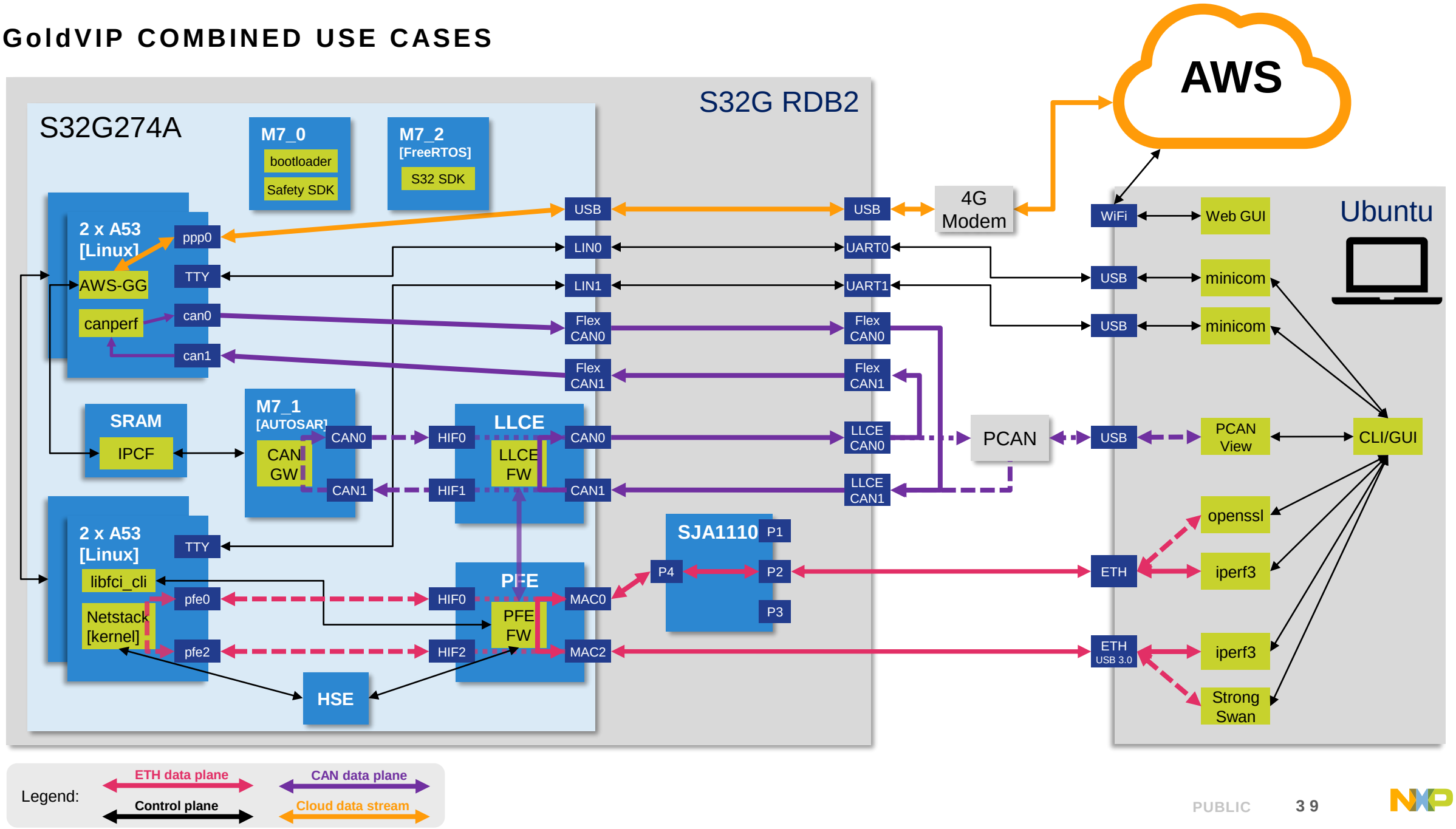
GoldVIP USE CASES: SECURITY – INTRUSION DETECTION & PREVENTION SYSTEM (IDPS)



GoldVIP USE CASES: CAN-TO-CAN ROUTING – SLOW PATH



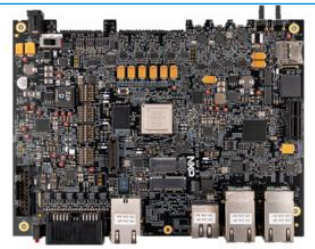
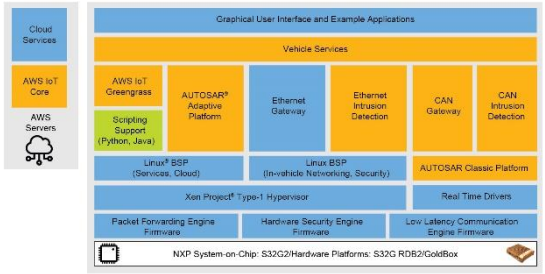
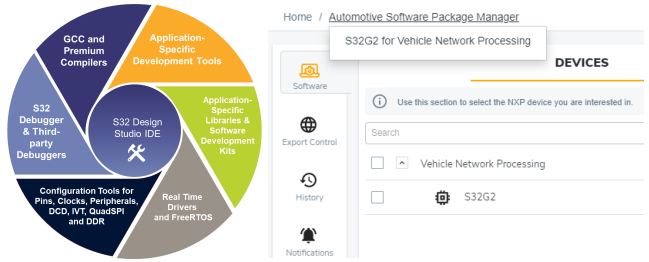
GoldVIP COMBINED USE CASES



Start Developing Now

SECURE CONNECTIONS
FOR A SMARTER WORLD

START DEVELOPING NOW WITH S32G TOOLS AND SOFTWARE TODAY

Tool	Visual	Part Number	Price	Status
GoldBox (RDB2 + Enclosure)		S32G-VNP-GLDBOX	Check Online	Production – (Available through Distributors)
S32G RDB2		S32G-VNP-RDB2	Check Online	Production – (Available through Distributors)
GoldVIP		Not Applicable	Free	Early Access Release (Contact NXP Sales Representative – Requires Marketing Approval)
S32G Enablement Software		Not Applicable	Free	Available on nxp.com

SUMMARY

- NXP offers the **GoldVIP** software platform and the **GoldBox** hardware platform to accelerate S32G evaluation and rapid development
- GoldVIP pre-integrates NXP, open source and partner software for application development
- GoldVIP has many built-in use cases with performance monitoring and cloud telematics support to showcase S32G capabilities
- GoldBox offers expansion capabilities through PCIe and M.2 modules for wireless connectivity, storage and AI/ML acceleration
- RDB2 andGoldBox is available today through NXP distributors. GoldVIP is available for early access with NXP marketing approval.
- Contact your NXP sales representative to get started with the NXP S32G processors today!

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