

# NXP MPC574xB/C/G (CALYPSO 3M / 6M) UPDATE Q4'2019

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SECURE CONNECTIONS  
FOR A SMARTER WORLD

# Content

- MPC574xB/C/G Product Update
- MPC574xB/C/G MCAL and HSM Update
- MPC574xB/C/G Target Application
- MPC574xB/C/G Gateway Reference Design
- MPC5748G-GW FOTA Demo
- Intrusion Detection System (IDS) Reference Design



# NXP AMP Roadmap

- Safety 
- Hardware Security 
- Ethernet 
- USB 
- 135-150°C Ambient 

## ADAS

- Vision
- Automated/Fusion
- Surround
- Front/rear

## Radar

## VDS

- Powertrain/hybrid
- Chassis/safety

## GATEWAY

- Advanced FOTA
- Traditional ENET/FR
- Displays/Clusters

## GPIS

- Body Electronic
- Actuator/sensor
- FET/relay Motor
- CAN/LIN
- LCD/Gauge

Vision processing for autonomous  
Surround cameras  
Short/Medium/Long range Radar  
Sensor Data Fusion



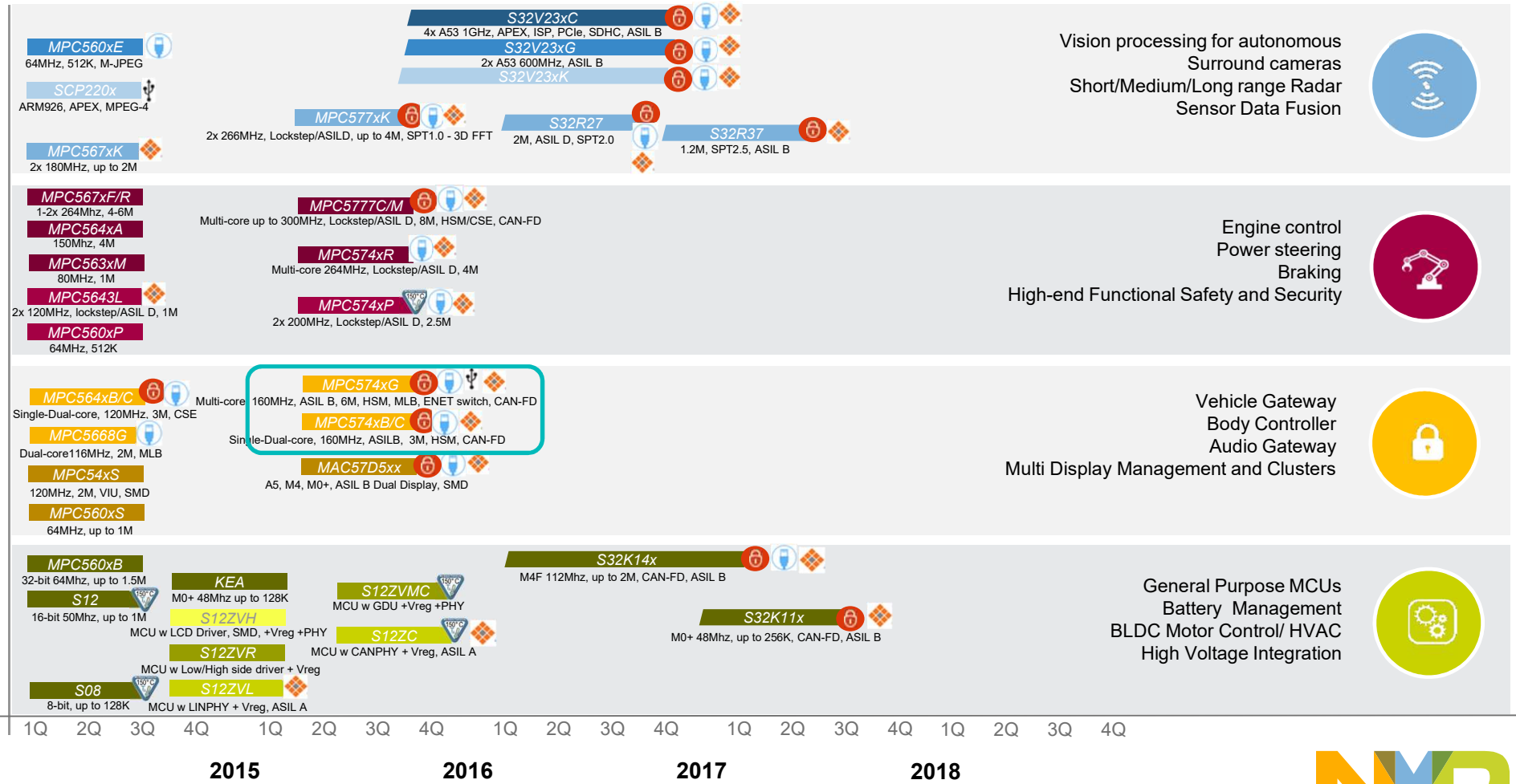
Engine control  
Power steering  
Braking  
High-end Functional Safety and Security



Vehicle Gateway  
Body Controller  
Audio Gateway  
Multi Display Management and Clusters



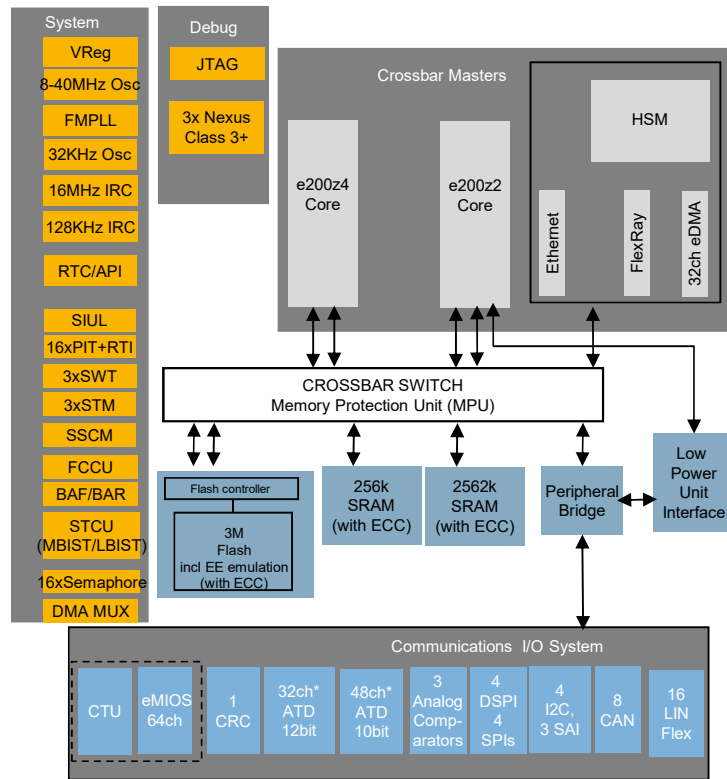
General Purpose MCUs  
Battery Management  
BLDC Motor Control/ HVAC  
High Voltage Integration



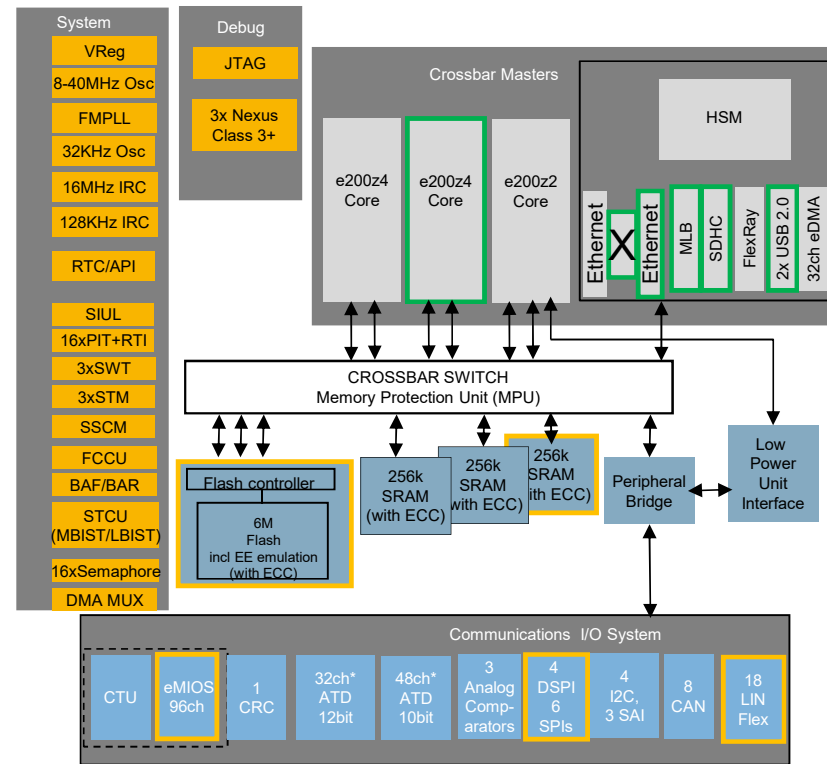
# Calypso系列有两个Family: 3M 和6M Flash Size版本

- MPC5744/5/6 B/C (Calypso 3M) 和MPC5747/8C / MPC5746/7/8G (Calypso 6M)
- 资源差异见绿色和黄色框, 通常按最大资源也简称为MPC5746C和MPC5748G.
- 两个Family主页链接: [www.nxp.com/MPC5748G](http://www.nxp.com/MPC5748G)

■ New/Added Feature  
■ Feature Enhancement



**SPC5744/5/6 B/C Family**



**SPC5747/8C / SPC5746/7/8G Family**



# 产品资源概览(以datasheet为准)

X: 不推荐用在新设计

## Calypso 3M Family

## Calypso 6M Family

	Single Core			Dual Core					Triple Core		
	MPC5744B	MPC5745B	MPC5746B	MPC5744C	MPC5745C	MPC5746C	MPC5747C	MPC5748C	MPC5746G	MPC5747G	MPC5748G
Core	z4	z4	z4	z4 + z2	z4 + z2	z4 + z2	z4+z2	z4+z2	z4 + z4 + z2	z4 + z4 + z2	z4 + z4 + z2
FPU	Yes	Yes	Yes	Yes on z4	Yes on z4	Yes on z4	Yes on z4	Yes on z4	Yes on z4	Yes on z4	Yes on z4
Max Speed (MHz)	160	160	160	160 + 80	160 + 80	160 + 80	160 + 80	160 + 80	160 + 160 + 80	160 + 160 + 80	160 + 160 + 80
Flash Size	1.5M	2M	3M	1.5M	2M	3M	4M	6M	3M	4M	6M
DataFlash	Emulated up to 64k	Emulated up to 64k	Emulated up to 64k	Emulated up to 128k	Emulated up to 128k	Emulated up to 128k	Emulated up to 128k	Emulated up to 128k	Emulated up to 192k	Emulated up to 192k	Emulated up to 192k
RAM	192k	256k	384k (512k option)	192k	256k	384k (512k option)	512k	768k	768k	768k	768k
Security Module	HSM Option	HSM Option	HSM Option	HSM Option	HSM Option	HSM Option	Optional	Optional	Optional	Optional	Optional
MBIST/LBIST	MBIST	MBIST	MBIST	MBIST	MBIST	MBIST	LBIST/MBIST	LBIST/MBIST	LBIST/MBIST	LBIST/MBIST	LBIST/MBIST
DMA	32-ch	32-ch	32-ch	32 ch	32 ch	32 ch	32 ch	32 ch	32 ch	32 ch	32 ch
MPU	16	16	16	16	16	16	24	24	32	32	32
ADC	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 32ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 32ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 32ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 32ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 32ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 32ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 64ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 64ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 64ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 64ch external	1x12 bit (32 channels) 1x10-bit ADC (48 channels) 64ch external
Analog Comparators	3	3	3	3	3	3	3	3	3	3	3
Timers/PWM	4ch System Timer 16ch x PIT Up to 64eMIOS channels	4ch System Timer 16ch x PIT Up to 64eMIOS channels	4ch System Timer 16ch x PIT Up to 64eMIOS channels	4ch System Timer 16ch x PIT Up to 64eMIOS channels	4ch System Timer 16ch x PIT Up to 64eMIOS channels	4ch System Timer 16ch x PIT Up to 64eMIOS channels	4ch System Timer 16ch x PIT Up to 96eMIOS channels	4ch x System Timer 16ch x PIT Up to 96eMIOS channels	4ch x System Timer 16ch x PIT Up to 96eMIOS channels	4ch x System Timer 16ch x PIT Up to 96eMIOS channels	4ch x System Timer 16ch x PIT Up to 96eMIOS channels
CTU	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FlexRay 2.1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethernet	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2nd Ethernet+Switch	No	No	No	No	No	No	optional	optional	optional	optional	optional
MLB	No	No	No	No	No	No	No	No	Yes	Yes	Yes
USB	No	No	No	No	No	No	No	No	Yes	Yes	Yes
SDHC	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
LINFlex	12	12	12	16	16	16	16	16	18	18	18
SPI	6	6	6	8	8	8	10	10	10	10	10
CAN	6	6	6	8	8	8	8	8	8	8	8
CAN FD	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs	Optional Feature on all CANs
I2C	4	4	4	4	4	4	4	4	4	4	4
SAI / I2S	3	3	3	3	3	3	3	3	3	3	3
MLB	No	No	No	No	No	No	No	No	1	1	1
USB 2.0	No	No	No	No	No	No	No	No	2 (OTG + Host)	2 (OTG + Host)	2 (OTG + Host)
Additional features	Low power Unit	Low power Unit	Low power Unit	Low power Unit	Low power Unit	Low power Unit	Low power Unit	Low power Unit	Low power Unit	Low power Unit	Low power Unit
Debug	JTAG + Nexus 3+ (z4)	JTAG + Nexus 3+ (z4)	JTAG + Nexus 3+ (z4)	JTAG + Nexus 3+ (z2+z4)	JTAG + Nexus 3+ (z2+z4)	JTAG + Nexus 3+ (z2+z4)	JTAG + Nexus 3+ (z2+z4)	JTAG + Nexus 3+ (z2+z4)	JTAG + Nexus 3+ (z2+z4)	JTAG + Nexus 3+ (z2+z4)	JTAG + Nexus 3+ (z2+z4)
Packages	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA (debug only)	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA (debug only)	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA (debug only)	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA (debug only)	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA (debug only)	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA (debug only)	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA (debug only)	176 LQFP 256 MAPBGA 100 MAPBGA 324 MAPBGA	176LQFP 256 MAPBGA 324 MAPBGA	176LQFP 256 MAPBGA 324 MAPBGA	176LQFP 256 MAPBGA 324 MAPBGA



# SPC574xB/C/G Silicon Revisions 芯片版本

Family (CAN-FD version)	Silicon revision	Mask set number	Part Numbers	Remark
Calypso3M* (CAN-FD 1.0)	Cut1.1*	<b>1N06M</b>	<b>SPC</b> 574xB/C/Dx <b>K1</b> xxxx <b>SPC</b> 574xB/C/Dx <b>K1</b> xxxx(R)	Mass Production Not for new designs!
Calypso3M (ISO CAN-FD)	Cut2.0**	<b>0N84S</b>	<b>PPC</b> 5746CS <b>K0A</b> xxxx	Not for new designs!
Calypso3M (ISO CAN-FD)	Cut2.1	<b>1N84S</b>	<b>PPC</b> 5746CS <b>K1A</b> xxxx <b>SPC</b> 574xB/Cx <b>K1A</b> xxxx <b>SP</b> 574xB/Cx <b>K1A</b> xxxx(R)	Mass Production
Calypso6M* (CAN-FD 1.0)	Cut2.0*	<b>1N81M</b>	<b>SPC</b> 574xC/Gx <b>K1</b> xxxx <b>SPC</b> 574xC/Gx <b>K1</b> xxxx(R) <b>PPC</b> 5748GS <b>K1</b> MMN6A***	Mass Production Not for new designs!
Calypso6M (ISO CAN-FD)	Cut3.0	<b>0N78S</b>	<b>PPC</b> 5748GS <b>K0A</b> Mxx6 <b>SPC</b> 574xC/Gx <b>K0A</b> xxxx <b>SP</b> 574xC/Gx <b>K0A</b> xxxx(R)	Mass Production

Calypso 3M, new design 推荐用该型号

Calypso 6M, new design 推荐用该型号

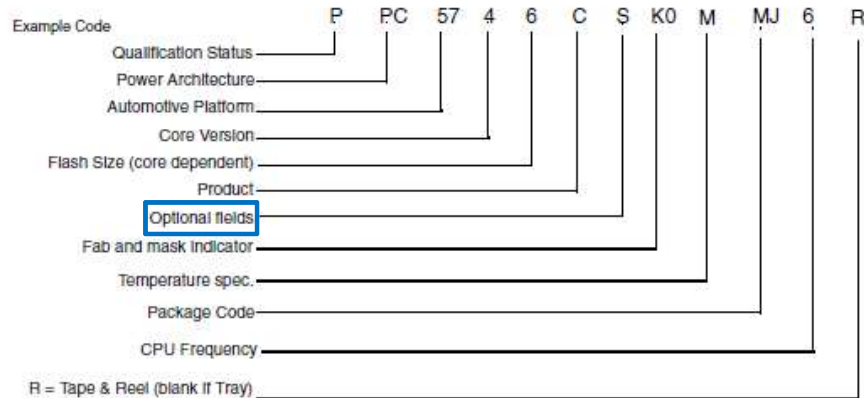
因为系统原因，Part Number字母长度受限至最长16个字母，所以T&R封装的型号在后缀需要加上R，那么型号前的SPC会变成 SP

\* Cal3M cut1.1 and Cal6M cut2.0 are not recommended for new designs  
 \*\* Cal3M cut2.0 fully SW compatible with cut2.1  
 \*\*\* Cal6M cut2.0 324BGA device will not be qualified, only prototype parts PPC available  
 Dates are target dates – to be re-confirmed.

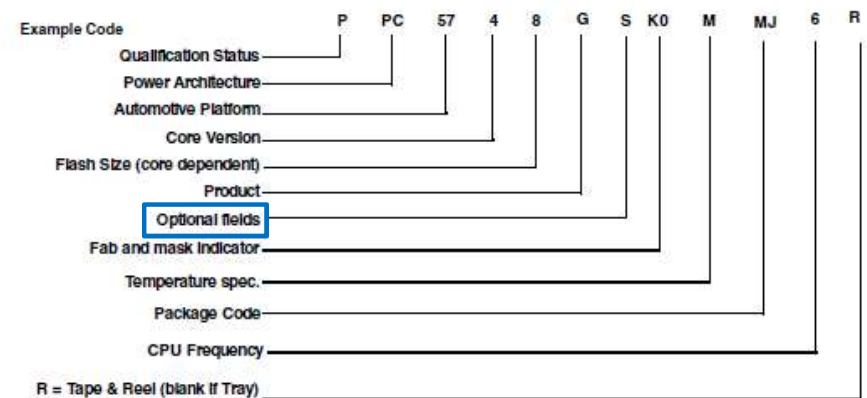


# 型号命名规则

## SPC5744/5/6 B/C Family



## SPC5747/8C / SPC5746/7/8G Family



### Qualification Status

P = Engineering samples  
S = Automotive qualified

### PC = Power Architecture

57 = Power Architecture in 55nm

### Core Version

4 = e200z4 Core Version (highest core version in the case of multiple cores)

### Flash Memory Size

4 = 1.5MB  
5 = 2 MB  
6 = 3 MB

### Product Version

B = Single core (FlexRay + Ethernet)

C = Dual core (FlexRay + Ethernet)

### Optional fields

Blank = No optional feature

S = HSM (Security Module)

F = CAN FD

B = HSM + CAN FD

R = 512K RAM

T = HSM + 512K RAM

G = CAN FD + 512K RAM

H = HSM + CAN FD + 512K RAM

### Fab and mask version indicator

K = TSMC Fab

#(0, 1, etc.) = Version of the maskset, like rev. 0=0N65H

1N84S, 新项目选K1A

### Temperature spec.

C = -40.C to +85.C Ta

V = -40.C to +105.C Ta

M = -40.C to +125.C Ta

### Package Code

KU = 176 LQFP EP

MJ = 256 MAPBGA

MN = 324 MAPBGA

MH = 100MAPBGA

### CPU Frequency

2 = Z4 operates upto 120 MHz

6 = Z4 operates upto 160 MHz

### Shipping Method

R = Tape and reel

Blank = Tray

### Qualification Status

P = Engineering samples  
S = Automotive qualified

### PC = Power Architecture

57 = Power Architecture in 55nm

### Core Version

4 = e200z4 Core Version (highest core version in the case of multiple cores)

### Flash Memory Size

6 = 3 MB  
7 = 4 MB  
8 = 6 MB

### Product Version

C = Body Control Feature Set  
G = Gateway Feature Set

### Optional fields

Blank = Feature not available

S = HSM (Security Module)

F = CAN FD

B = Both HSM and CAN FD

T = HSM and 2nd Ethernet

G = CAN FD and 2nd Ethernet

H = HSM, CAN FD, and 2nd Ethernet

### Fab and mask version indicator

K = TSMC Fab

#(0, 1, etc.) = Version of the maskset, like rev. 0=0N65H

### Temperature spec.

C = -40.C to +85.C Ta

V = -40.C to +105.C Ta

M = -40.C to +125.C Ta

### Package Code

KU = 176 LQFP EP

MJ = 256 MAPBGA

MN = 324 MAPBGA

### CPU Frequency

2 = Each z4 operates up to 120 MHz

6 = Each z4 operates up to 160 MHz

### Shipping Method

R = Tape and reel

Blank = Tray

Note: Not all part number combinations are available as production product

如需HSM模块, 务必联系原厂技术支持团队, 沟通确认SHE 固件出厂烧写以及费用事宜

Note: Not all part number combinations are available as production product

0N78S, 新项目选K0A



# 型号和封装

Flash/RAM	Package			
	100MAPBGA (11x11mm, 1mm)	176LQFP-EP (24x24mm, 0.5mm)	256MAPBGA (17x17mm, 1mm)	324MAPBGA (19x19mm, 1mm)
6M/768k		SPC5748G	SPC5748G	SPC5748G
6M/768k		SPC5748C	SPC5748C	SPC5748C
4M/768k		SPC5747G	SPC5747G	SPC5747G
4M/512k		SPC5747C	SPC5747C	SPC5747C
3M/768k		SPC5746G	SPC5746G	SPC5746G
3M/384k (512k optional)	SPC5746C	SPC5746C	SPC5746C	PPC5746C
3M/384k (512k optional)	SPC5746B	SPC5746B	SPC5746B	
2M/256k	SPC5745C	SPC5745C	SPC5745C	
2M/256k	SPC5745B	SPC5745B	SPC5745B	
1.5M/192k	SPC5744C	SPC5744C	SPC5744C	
1.5M/192k	SPC5744B	SPC5744B	SPC5744B	

- 三核: 带Ethernet, FlexRay, USB, SDHC (可选HSM, 2nd Ethernet + Switch, )
- 双核: 带Ethernet, FlexRay, 可选HSM (5747C/48C可选带2nd Ethernet +Switch)
- 单核: 带FlexRay, Ethernet (可选HSM)
- 用于Debug的型号, 不量产





# Key Themes of the MPC5746C / MPC5748G Family

## • High Integration



- Multi Core up to 160MHz
  - Devide tasks
- High End Peripherals
  - 2x AVB Ethernet (with switch)
  - MLB, USB, SDIO, I2C, I2S
  - 8 CAN-FD, 18LIN
- Scalable Family
  - 2M – 6M Flash
  - 256k – 768k System SRAM
  - 100pin – 324pin packages

## • Low Power



- Low Power Unit runs
  - Z2 Core w/ 256k SRAM
  - Peripheral subset (1x CAN, LIN, SPI, ADC, timer, etc.)
  - Other functions power down
- Analog Comparator
  - Cyclic ADC measure and compare w/o core active
  - Other functions power down
- Pretended Networking
  - Wake-up on CAN

## • Safety and Security



- ISO26262 development and support (ASIL-B)
  - Safety HW, SW, Docs
- Hardware security module
  - Dedicated programmable core
  - Secure Flash + SRAM
  - Crypto HW (AES128, random number gen.)
- Product Lifecycle Scheme
  - Locking down features (e.g. debug access)

# Driving Low Power Consumption

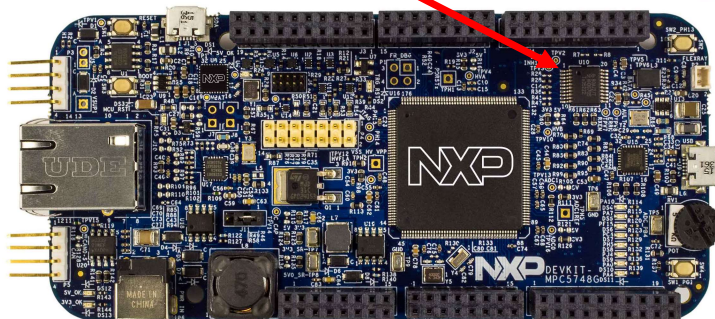
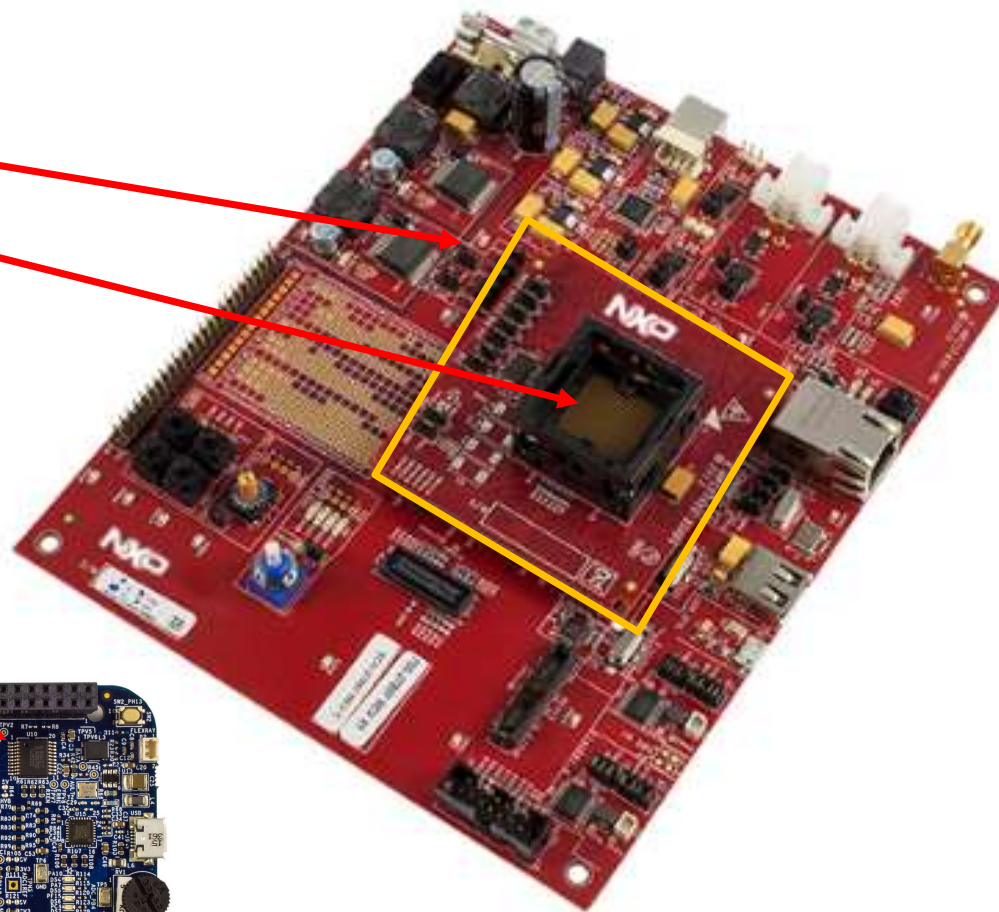
- **New Low-Power Unit**
  - Allows for increased functionality in a lower power state, reducing current consumption by over 30% for a typical cyclic wake-up application over previous generation devices
  - Provides a mechanism to bypass entire platform while supporting a smaller set of peripherals (1x CAN, LIN, SPI, ADC, timer, etc.) thereby providing very low power execution modes
- **Analog Comparator**
  - Typical periodic monitoring routines can be fully handled in Standby mode offering a significant improvement in power consumption
- **Pretended Networking Support**
  - Enabled through advanced filtering, wakeup capabilities and CAN availability in low power modes



# MPC574xB/C/G Hardware Enablement

## Development Boards

- Evaluation Motherboard: **MPC574XG-MB**
- Daughter boards (Calypso 3M & 6M):
  - **MPC574XG-324DS** (324BGA)
  - **MPC574XG-256DS** (256BGA)
  - **MPC574XG-176DS** (176LQFP)
  - **MPC574XG-100DS** (100BGA 3M only)
- Evaluation boards
  - **DEVKIT-MPC5748G**
  - **MPC5748G-LCEVB**
- Nexus Trace adapter boards for smaller packages.



# MPC574xB/C/G: Enablement

## • Development Boards

- Motherboard: **MPC574XG-MB**
- Daughter boards:
  - **MPC574XG-324DS** (324BGA)
  - **MPC574XG-256DS** (256BGA)
  - **MPC574XG-176DS** (176LQFP)
  - **MPC574XG-100DS** (100BGA)
- Low cost EVB
  - **MPC5748G-LCEVB**
- low cost demo board
  - **DEVKIT-MPC5748G**



## • IDEs / Compilers

- S32 Design Studio (NXP)
- Green Hills, Wind River



**WIND RIVER**

## • Debuggers

- Lauterbach, iSystem, P&E, PLS



## • Flash Programming Tools

- P&E Cyclone Max, Multilink
- iSystem Blue Box
- Lauterbach Trace32
- Promik

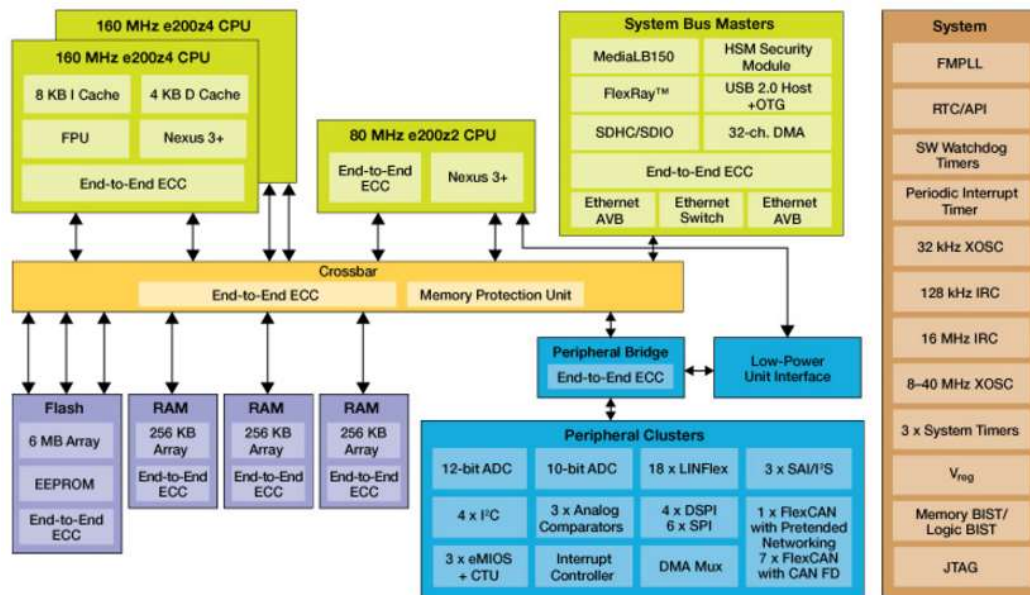


# MPC574xD/B/C/G: Value proposition

## Highlights

- Single-chip solution offering multi core architecture and advanced networking protocols for next generation communication requirements
- New low-power modes, analogue comparators and pretend networking support help meet stringent next generation system power budgets
- Security modules protect ECUs against various attack scenarios and Safety modules ensure robust operation as per ISO 26262 requirements

Temperature: -40 to 125 °C ambient  
 Packages: 176 LQFP, 256/324 BGA



Up to 3 Power® architecture e200z cores  
 Up to 160 MHz for easy task division in BCMs/gateways

**System Memory**  
 Up to 6 MB Flash and up to 768 KB SRAM for BCM/gateway app. storage, message buffering and additional Flash images for other vehicle nodes

**Connectivity**  
 Up to 8 CAN-FD (Flexible Data Rate) with enhanced payload and data rate, 2 Ethernet with AVB support + Ethernet switch, FlexRay™, Media Local Bus (MLB) for infotainment, USB, up to 18 LIN, SDIO interface and I2S

**Low Power Unit & Peripherals**  
 Analog & communications peripherals (ADC, ACMP, CAN, LIN...) function independently of CPU in low power modes delivering 30% reduction vs. previous generation products

**Functional Safety and Security**  
 ISO 26262 ASIL B, Hardware Security Module, ECC, BIST, MPU, Voltage & Clock Monitoring

**Debug & Enablement**  
 Nexus Class 3 in-circuit debug port for performance analysis with mother & daughter boards. AUTOSAR 4.0 MCAL and OS



# MPC574xB/C/G MCAL AND HSM UPDATE

Ultra-Reliable MCUs for Industrial and Automotive Applications



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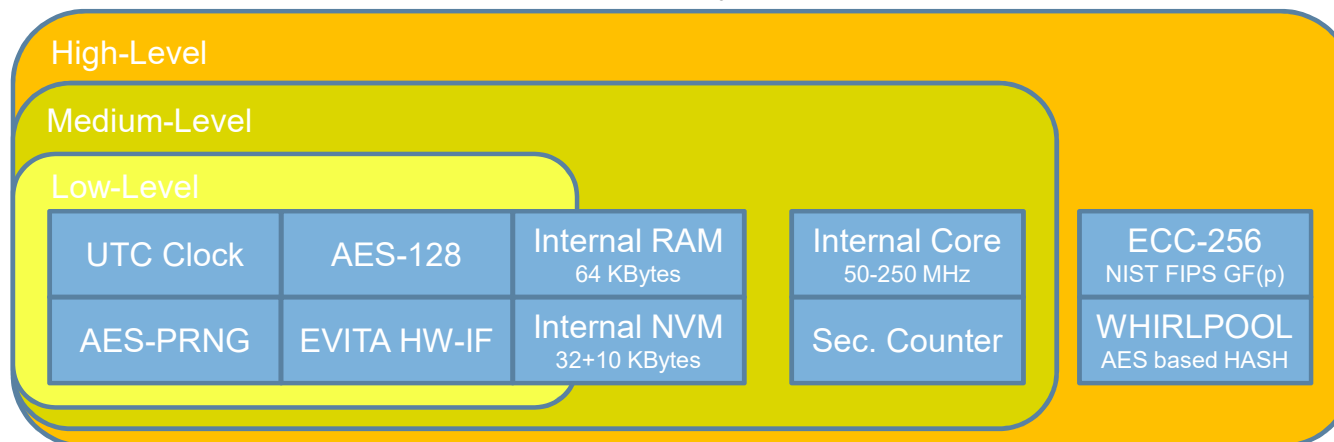
SECURE CONNECTIONS  
FOR A SMARTER WORLD



# CSE, HSM and the Security Standards

Security Standards	Evita Low	HIS-SHE	HIS-Medium (EVIT-Medium)	EVIT-High
Main features	UID Crypto engine	NVM is mandatory Fix function set	Programmable by customer	PublicKey HASH
CSE Module	supported by MPC564xB/C			
HSM Module	supported by MPC5746M & Calypso			

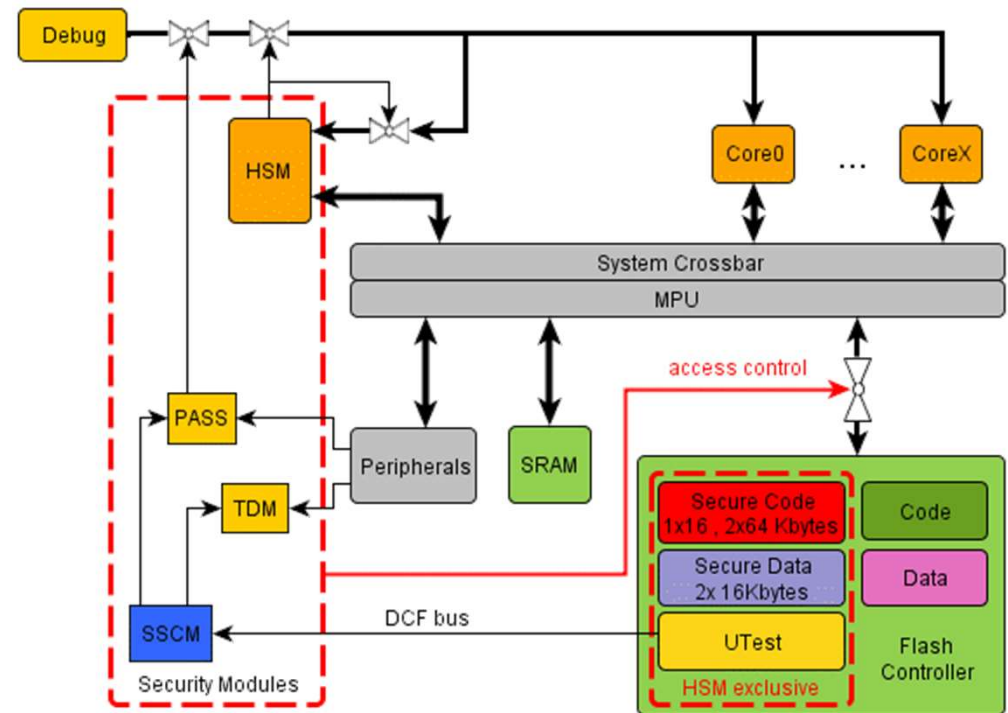
## EVITA Security Modules





# HSM – The overall security architecture

- **Device Life-Cycle scheme**  
Each state has a more restrictive set of controls than the previous state. No regression to a previous life cycle state is possible.
- **Debugger access**  
System access can be granted to three different levels (full, non-secure-only and no-access)
- **Flash Protection via PASS & TDM**
  - Each block can be set to one-time-programmable (OTP)
  - Customer can set read / write & erase restrictions per block
  - Diary-function to log flash erase steps
- **HSM**  
The HSM is a free programmable security module consisting of its own core, memories (FLASH & SRAM) and peripherals (e.g. advanced AES-128 cipher)



**SSCM:** System Status Configuration Module  
**PASS:** Password And Device Security Module  
**TDM:** Tamper Detection Module  
**MPU:** Memory Protection Unit  
**DCF:** Device Configuration Format





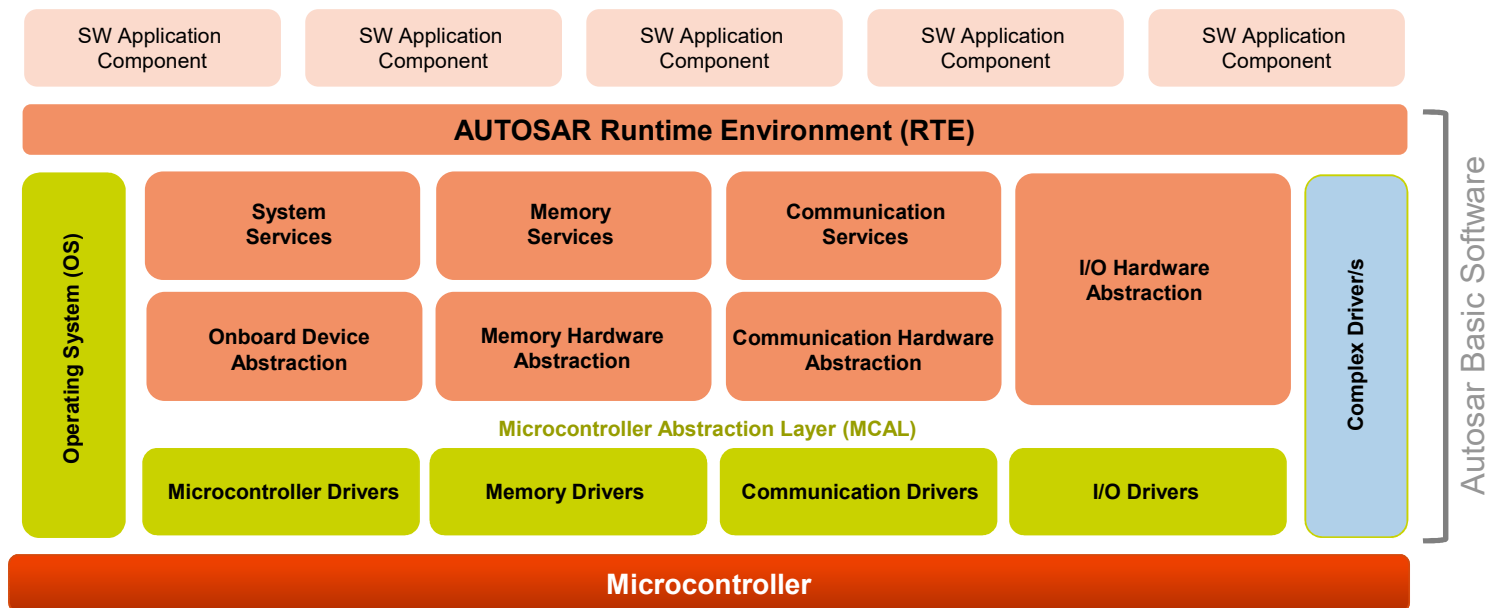
# Calypso Security Solutions Overview

Firmware package	HSM Firmware	Firmware Description	Current Version
<b>Basic</b>	HSM Security Firmware Basic Package	Covers SHE 1.1 specification + 24 user keys + additional flag on CMAC operation	<b>RTM 1.0.5</b>
<b>Standard</b>	HSM Security Firmware Standard Package	Basic + extended key management + extended cryptographic services (incl. RSA public-key cryptography) + extended secure boot & memory verification + secure tick management + X.509 certificate parser  Fully compatible with Basic Firmware.	<b>RTM 1.0.0</b>

- 出厂预烧HSM固件分为Basic基础版和Standard标准版两个版本，向下兼容，客户可以选择版本
- 出厂预烧HSM固件的芯片型号会变成SC66xxxx定制型号
- 出厂预烧HSM固件额外费用请联系Commercial Marketing Team
- HSM固件的相应文档在DocStore上，需要先开通DocStore账号来下载

# AUTOSAR Basic Software

- **NXP Standard Products** – MCAL (source code), OS (source code) and Config Tool (executable) for MCAL and OS
- **Partner Products** (Elektrobit, Vector, KPIT, etc.) – The rest of AUTOSAR basic software as needed & Integration Services (NXP IP + Partner IP + Customer IP)
- **Complex Drivers** – custom software offered by NXP Consulting & Professional Engineering Services



# NXP AUTOSAR Integration Partners



- ▶ NXP's AUTOSAR Integration Partners receive NXP MCAL and OS releases for pre-integration into their proprietary Autosar BSW products.



# Autosar MCAL Support

## for MPC574xB-C-G, MPC5777C

Price overview only! This does not replace a customer quotation!  
 July 2019 – Not all SW products available for all MCU families!  
 All price figures are per Autosar version!

	Older than 4.3	Autosar 4.3
<b>Support</b>		
<ul style="list-style-type: none"> <li>1 Year</li> </ul>	\$ 12.000 (QM) \$ 18.000 (ISO26262)	\$ 12.000 (QM) \$ 18.000 (ISO26262)
<b>Production License Models</b>		
	Free of charge for development and production  <b>No further code changes                      (bug fixes) to this software !</b>	Free of charge for development and production
<b>Services</b>		
<ul style="list-style-type: none"> <li>Customer Compiler Test</li> </ul>	for MCAL (QM) for MCAL (ISO26262)	SWALL-MCALCCT : \$ 6.000 SWALL-SMCLCCT : \$ 10.000
<ul style="list-style-type: none"> <li>Frozen Branch Release</li> </ul>	for MCAL (QM) for MCAL (ISO26262)	SWALL-MCALFBR : \$ 12.000 SWALL-SMCLFBR : \$ 20.000



# MPC574xB/C/G

## TARGET APPLICATIONS

Ultra-Reliable MCUs for Industrial and Automotive Applications



CONFIDENTIAL AND PROPRIETARY



SECURE CONNECTIONS  
FOR A SMARTER WORLD

## MPC574xB/C/G Target Applications:

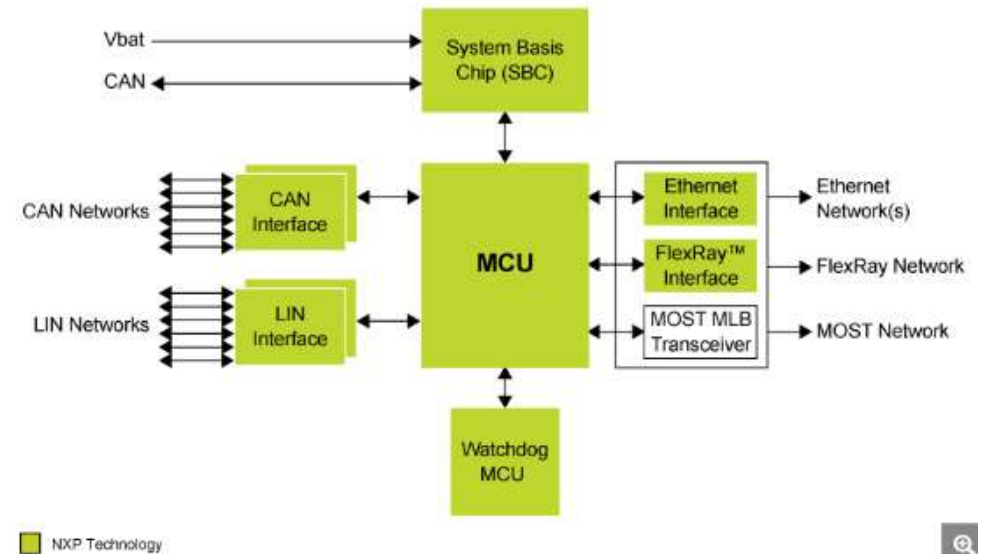
- 目标应用: Ethernet Gateway, TBOX, BCM(集成PEPS, HVAC, 热管理等功能)
- Selling Point
  - Ethernet Gateway参考设计, FOTA功能演示套件
  - 提供HSM Firmware, 竞争对手ST / RNS / IFX都没有提供, 需客户自己找第三方开发
  - MCAL量产版本免费提供, 可以降低成本
  - 丰富的通信接口, Flexray, USB, eMMC, 8 x CAN FD, 2 x Eth (Calypso 3M 带1xEth)
  - Calypso在主要车厂占据领先的市场份额
  - Local support team

# Application: Automotive Gateway

- Application Description:
  - Enabler of vehicle cross-domain communications translating and routing between buses
  - Centralized computing and security
  - Over-the-Air (OTA) update management
- Key Features / Benefits
  - High qty. of networking peripherals
    - Ethernet (up to 2 Ethernet MACs + switch)
    - CAN FD (up to 8 available)
    - FlexRay
    - LIN
  - SDHC for Data Storage
    - eMMC connection for FOTA updates
  - High Flash/SRAM Ratio
  - Security: HSM
  - Compute Performance

- Application Block Diagram

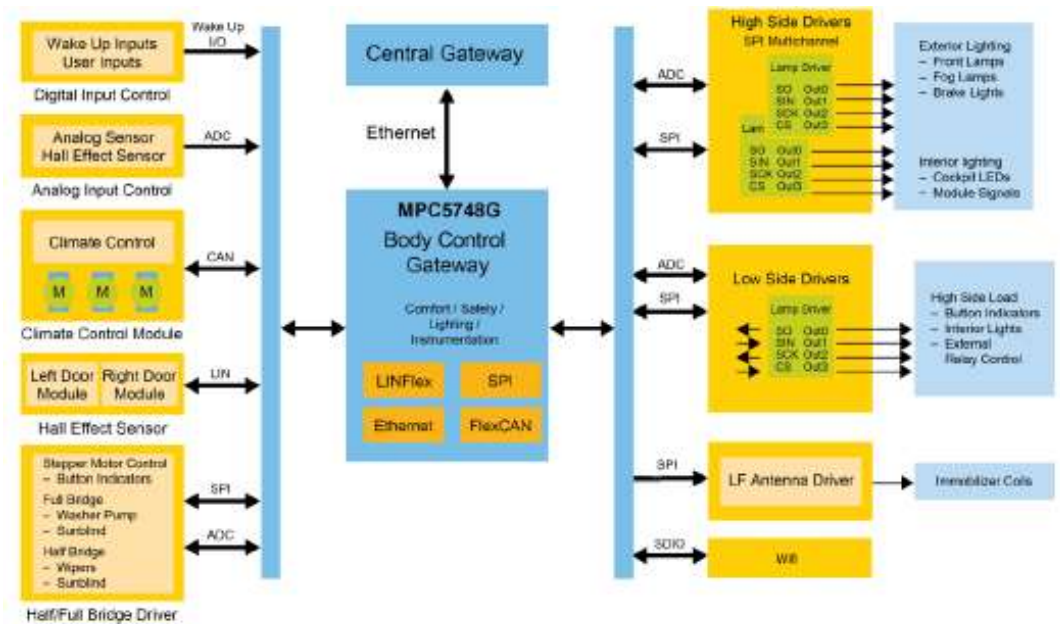
NXP® Central Gateway / In-Vehicle Networking Application



# Application: Automotive Body Domain Unit

- Application Description:
  - Supervision of car status during run, stop and park modes (always on with periodic wakeups)
  - PEPS, HVAC, Lighting control
  - Sense drivers inputs
- Key Features / Benefits
  - Automotive peripherals
    - CAN-FD (up to 8 available)
    - Many LINs (up to 18 available)
  - Many ADC and Timer channels
    - 2 ADCs
    - Up to 96 eMIOS timers
    - CTU to synchtonize timers and ADCs
  - Funtional safety:
    - ASIL-B, use system level to achieve higher level (e.g. for lighting)
  - Advance low power Features
    - LPU, analog comparators,
  - Security: HSM
  - Large Flash

## • Application Block Diagram

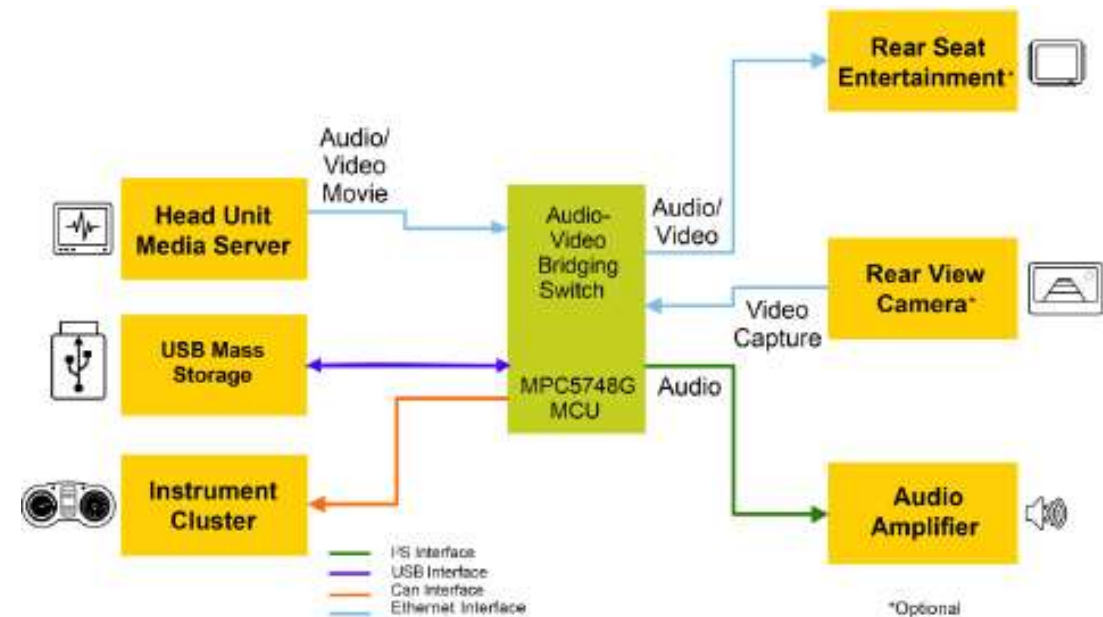




# Application: Automotive Infotainment Gateway (AVB)

- Application Description:
  - Bridge between different digital audio formats
  - Connect various audio sources to infotainment system
- Key Features / Benefits
  - Variety of Audio peripherals
    - Ethernet (Audio-Video-Bridging capable)
    - MOST (Media Local Bus)
    - I2S
    - I2C
  - USB beneficial
  - High Flash/SRAM Ratio
  - Compute Performance
  - **AVB audio software framework (separate slides)**

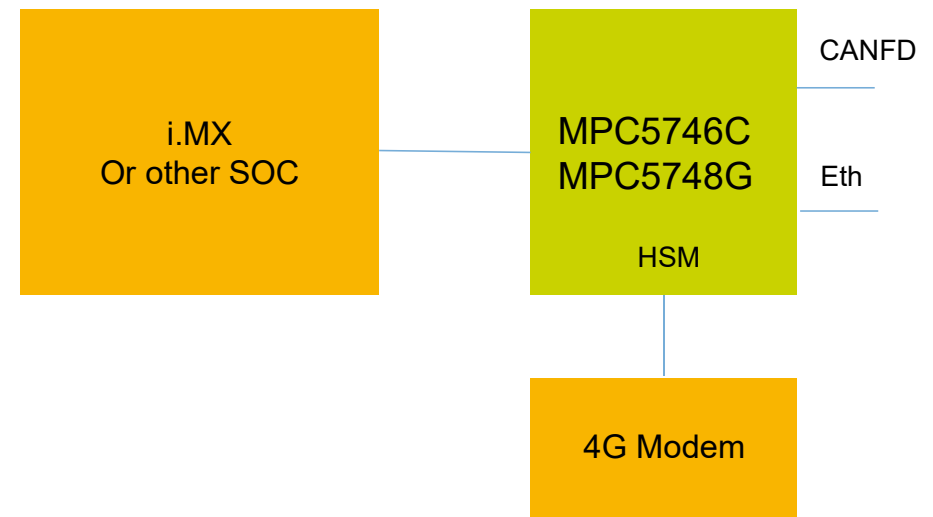
- Application Block Diagram



# Application: Infotainment Controller (Domain Controller)

- Application Description:
  - Connect car network to infotainment (e.g. get speed input for volume adjust)
  - Connect infotainment apps processor
- Key Features / Benefits
  - Car networking peripherals
    - Ethernet
    - CAN FD (up to 8 available)
    - LIN
  - Moderate RAM / Flash / Performance
  - Security: HSM

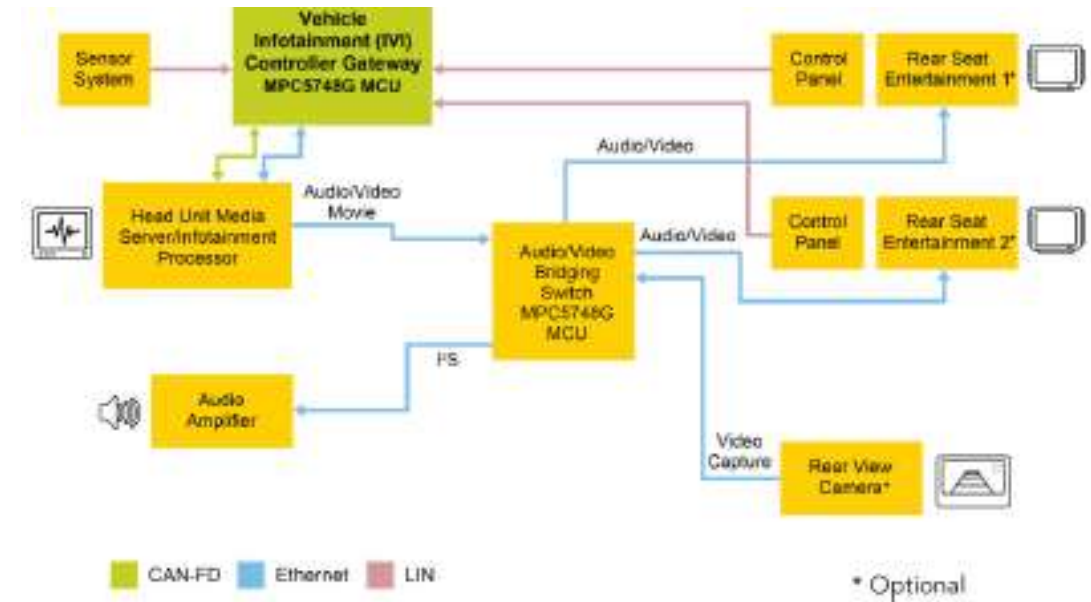
- Application Block Diagram



# Application: Infotainment Companion Controller (Domain)

- Application Description:
  - Connect car network to infotainment (e.g. get speed input for volume adjust)
  - Connect infotainment apps processor
- Key Features / Benefits
  - Car networking peripherals
    - Ethernet
    - CAN FD (up to 8 available)
    - LIN
  - Moderate RAM / Flash / Performance
  - Security: HSM

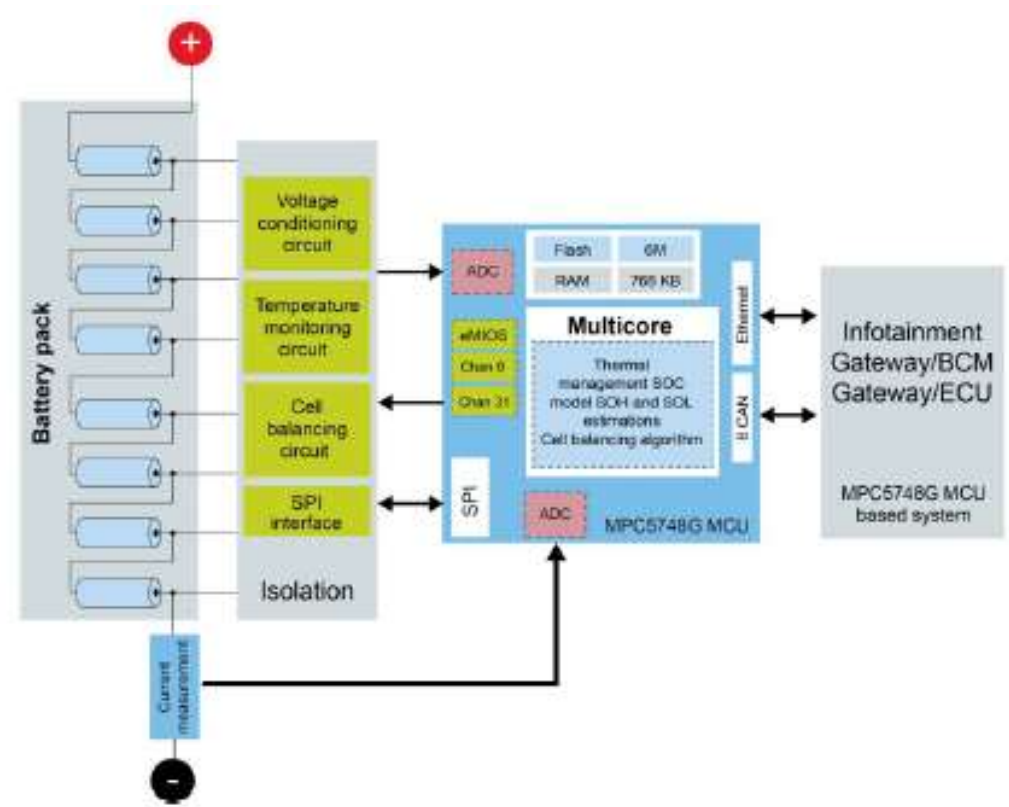
- Application Block Diagram



# Application: Battery Management Control

- Application Description:
  - LIN connections of sensors
  - Calculation of battery state of health, state of life
- Key Features / Benefits
  - Peripherals
    - Many LIN (connect to slaves, up to 18 avail)
    - CAN FD
  - Functional Safety support
    - ASIL B (use of dual core, multiple ADCs to achieve higher ASIL levels on system)
  - High Flash/SRAM Ratio
  - Security: HSM
  - Compute Performance

- Application Block Diagram



# 汽车中央安全网关参考设计：MPC5748G-GW

<https://www.nxp.com/MPC5748G-GW>

Ultra-Reliable MCUs for Industrial and Automotive Applications



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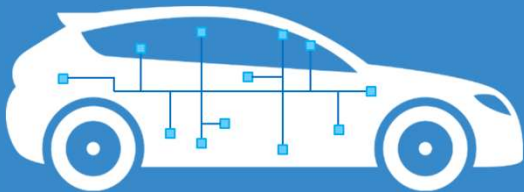
SECURE CONNECTIONS  
FOR A SMARTER WORLD

# 车载网络发展趋势



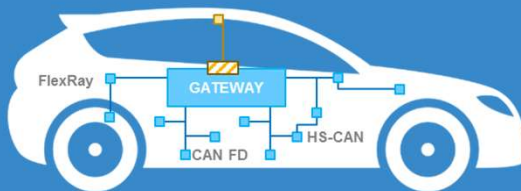
# 带宽和信息安全推动车载网络的演变

## 当前的汽车



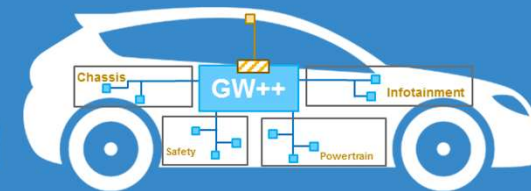
Full network exposed to attacks  
(LOW protection level)

## 演进中的汽车



Gateway limits impact  
Unprotected sub-networks  
(MEDIUM protection level)

## 未来的汽车



Multi-Domain Controller  
Function clustering/virtualization  
(full self-driving car)

### 当前的车载网络

- 主要基于传统的CAN
- 非常有限或者没有信息安全
- 有限的灵活性
- 网关开始被引入使用



### 市场发展趋势

- 管理多种网络接口
- 管理更多ECU
- 以太网链接
- 连接车辆外部和固件空中升级
- 信息安全变得更加重要

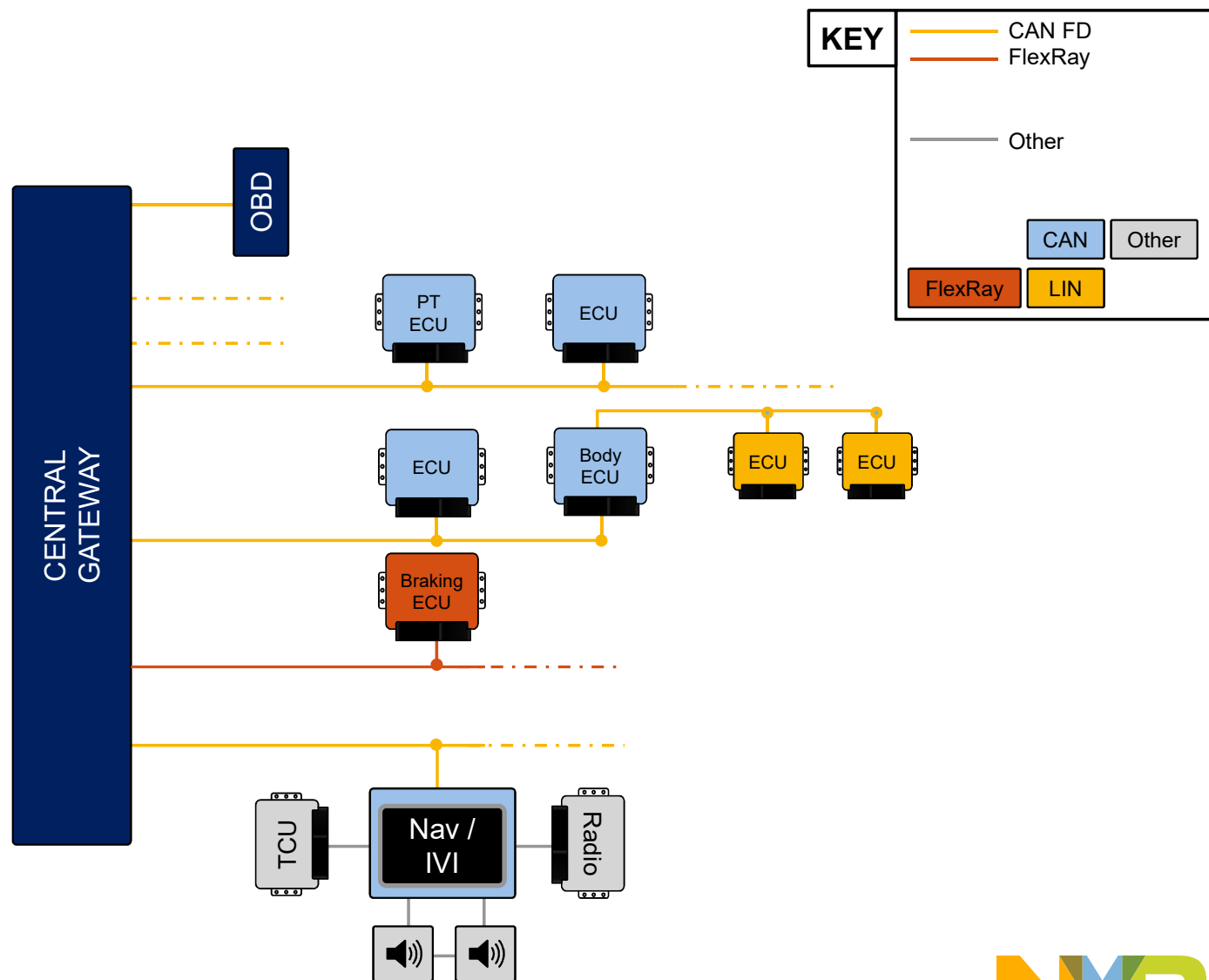


### 未来的汽车网络

- 控制器ECU的集成合并
- 更多高带宽的网络域
- 更高功能安全等级要求ASIL (B→D)
- 信息安全要求超过EVITA Full

# CAN 中央网关架构

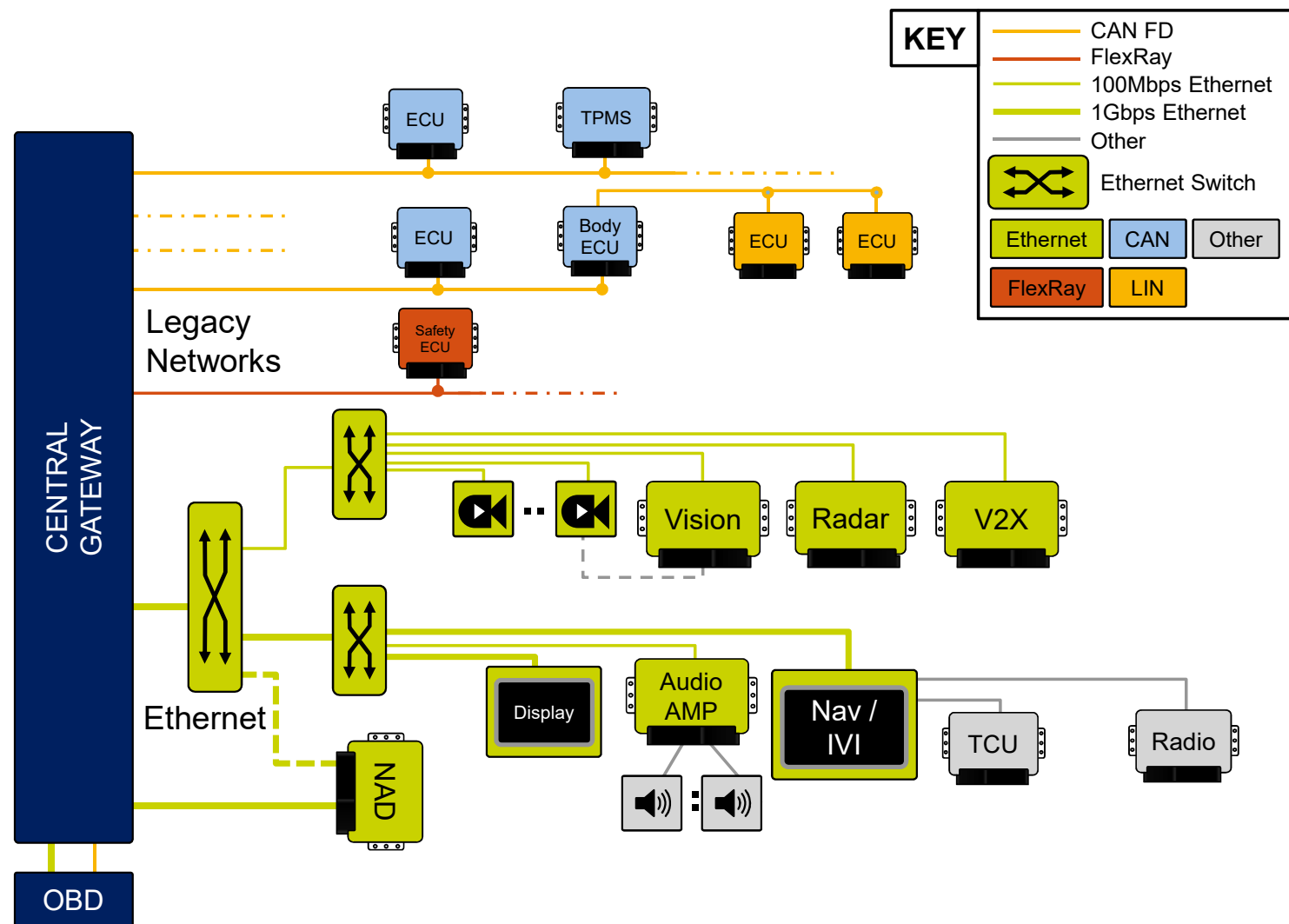
- 传统的汽车网络
  - 典型 3-8 CAN 网络
  - 典型的1-2路FlexRay
- 增加了带宽，但是相比消费类还是较低
- 物理隔离
  - 功能域
  - 安全/非安全
- Gateway 角色
  - 内部和外部通讯防火墙
  - 通讯协议转换





# 混合以太网网关架构

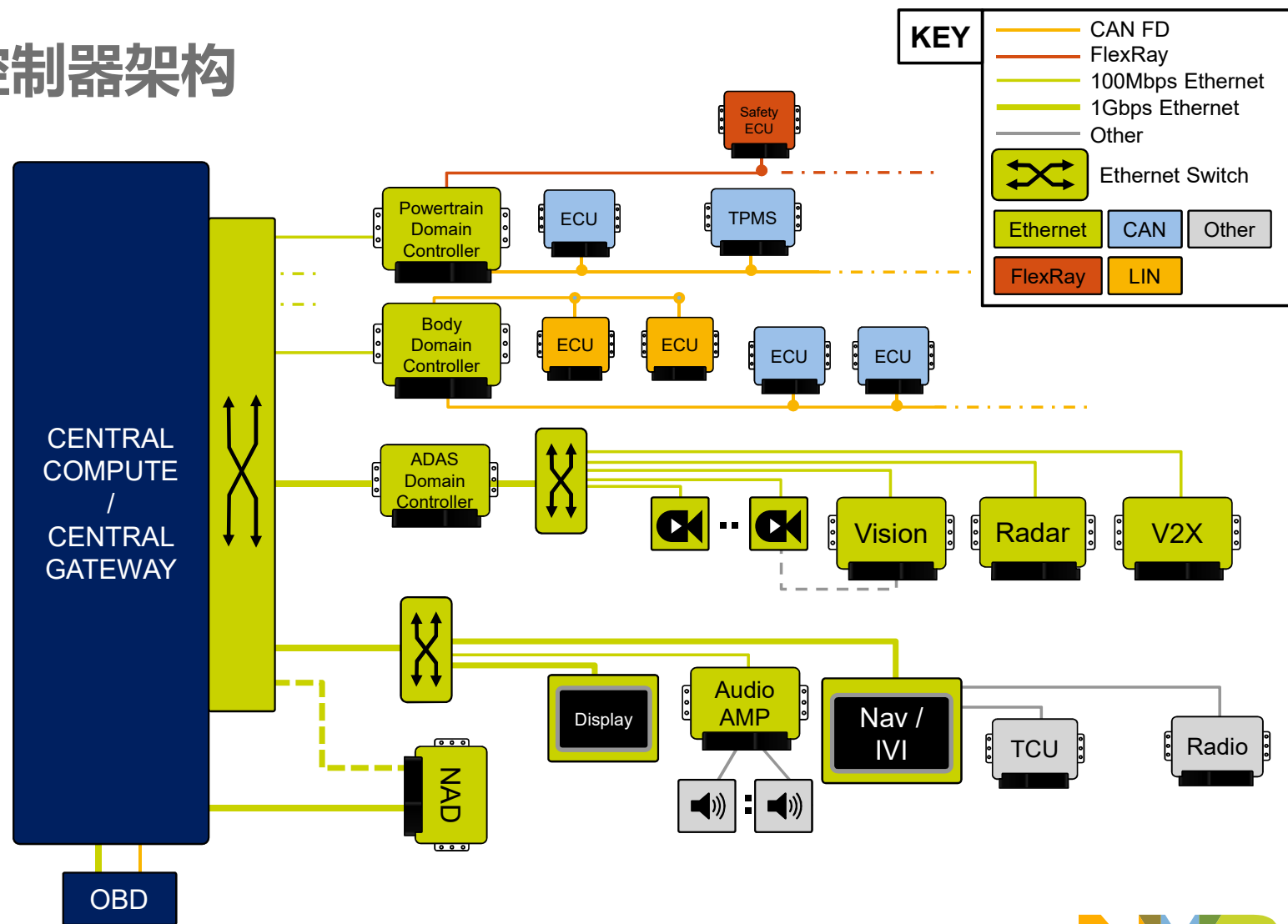
- 传统网络 + Ethernet
  - CAN, FlexRay & Ethernet
- 高带宽数据
  - 100Mbit → 1Gbit Ethernet
  - ADAS 和影音娱乐系统驱动更高的数据速率
  - 提升工厂 ECU 刷写速度
- Gateway 的角色
  - 内外网络的防火墙
  - 高效的通讯协议转换
  - ECU 功能集成
  - 新的应用和服务



# 以太网骨干网和多域控制器架构

## 以太网骨干网与多域控制器

- ECU控制器集成化
- 分布式网关
- 中央集中计算
  - 决策制定
  - 分布式 vs 集中式



# MPC5748G-GW介紹



# 基于以太网的车载中央安全网关参考设计

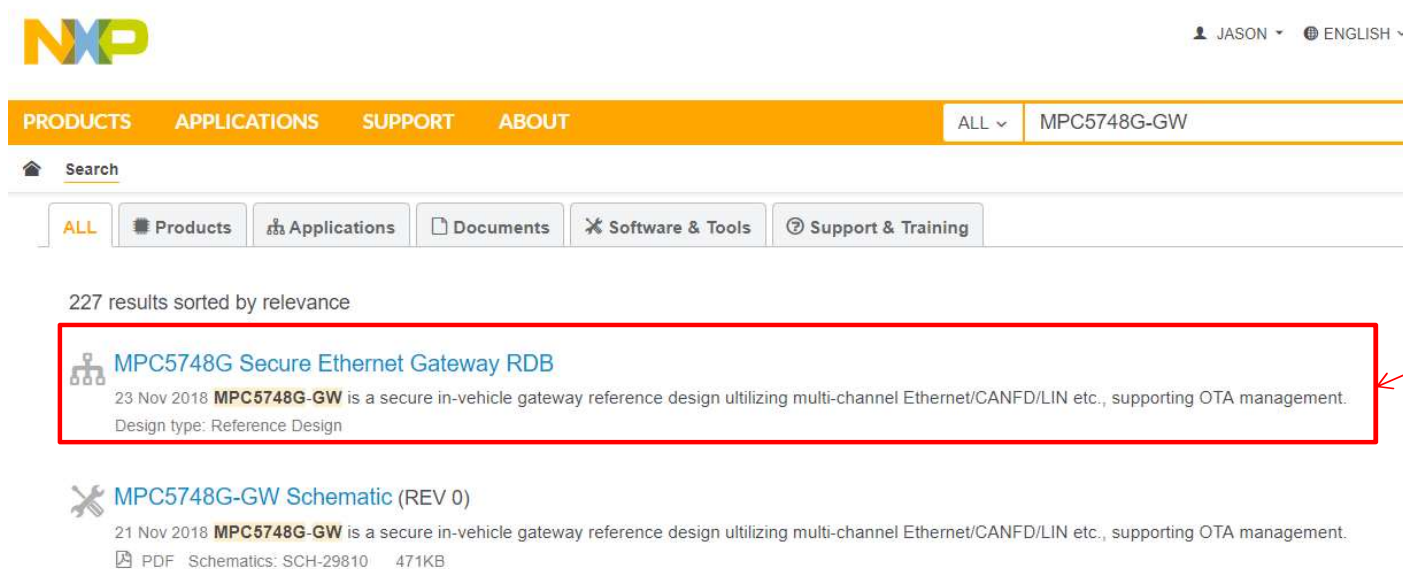
车载中央网关（Gateway）作为车内网络通讯和枢纽以及车辆内外通讯的桥梁，应用以太网、FlexRay、CAN、LIN和强大的微处理器将一切融合在一起，确保车内外电子设备之间可靠、安全的通信。

NXP基于未来汽车网络架构的演进以及自动驾驶、车联网等新应用的需求，设计了基于以太网的中央安全网关参考设计方案（MPC5748G-GW RDB）：

- 该解决方案采用NXP领先的汽车网络通讯产品，提供A样级别的网关硬件设计平台，并提供相应软件支持，降低客户应用开发的难度，加速产品设计和量产进度。
- 方案应用专用于汽车网络通讯的MPC574xG家族MCU，汽车级以太网交换机和收发器，CAN/CANFD收发器，集成化LIN收发器，符合功能安全的系统芯片SBC等，满足通讯、信息安全以及功能安全的要求。
- 支持可扩展性和可重用性，高集成度减少了组件数量，同时也降低了BOM成本。

# MPC5748G-GW 在 [www.nxp.com](http://www.nxp.com)

- 在NXP官网[www.nxp.com](http://www.nxp.com) 搜索“MPC5748G-GW”



The screenshot shows the NXP website search interface. At the top, the NXP logo is on the left, and user information 'JASON' and language 'ENGLISH' are on the right. Below this is a navigation bar with 'PRODUCTS', 'APPLICATIONS', 'SUPPORT', and 'ABOUT'. A search bar contains 'MPC5748G-GW'. Below the search bar, there are filters for 'ALL', 'Products', 'Applications', 'Documents', 'Software & Tools', and 'Support & Training'. The search results show '227 results sorted by relevance'. The first result is 'MPC5748G Secure Ethernet Gateway RDB', dated 23 Nov 2018, with a description: 'MPC5748G-GW is a secure in-vehicle gateway reference design utilizing multi-channel Ethernet/CANFD/LIN etc., supporting OTA management. Design type: Reference Design'. The second result is 'MPC5748G-GW Schematic (REV 0)', dated 21 Nov 2018, with a description: 'MPC5748G-GW is a secure in-vehicle gateway reference design utilizing multi-channel Ethernet/CANFD/LIN etc., supporting OTA management. PDF Schematics: SCH-29810 471KB'. A red box highlights the first result, and a red arrow points from a text box to it.

找到主页条目



# MPC5748G-GW 在 [www.nxp.com](http://www.nxp.com)

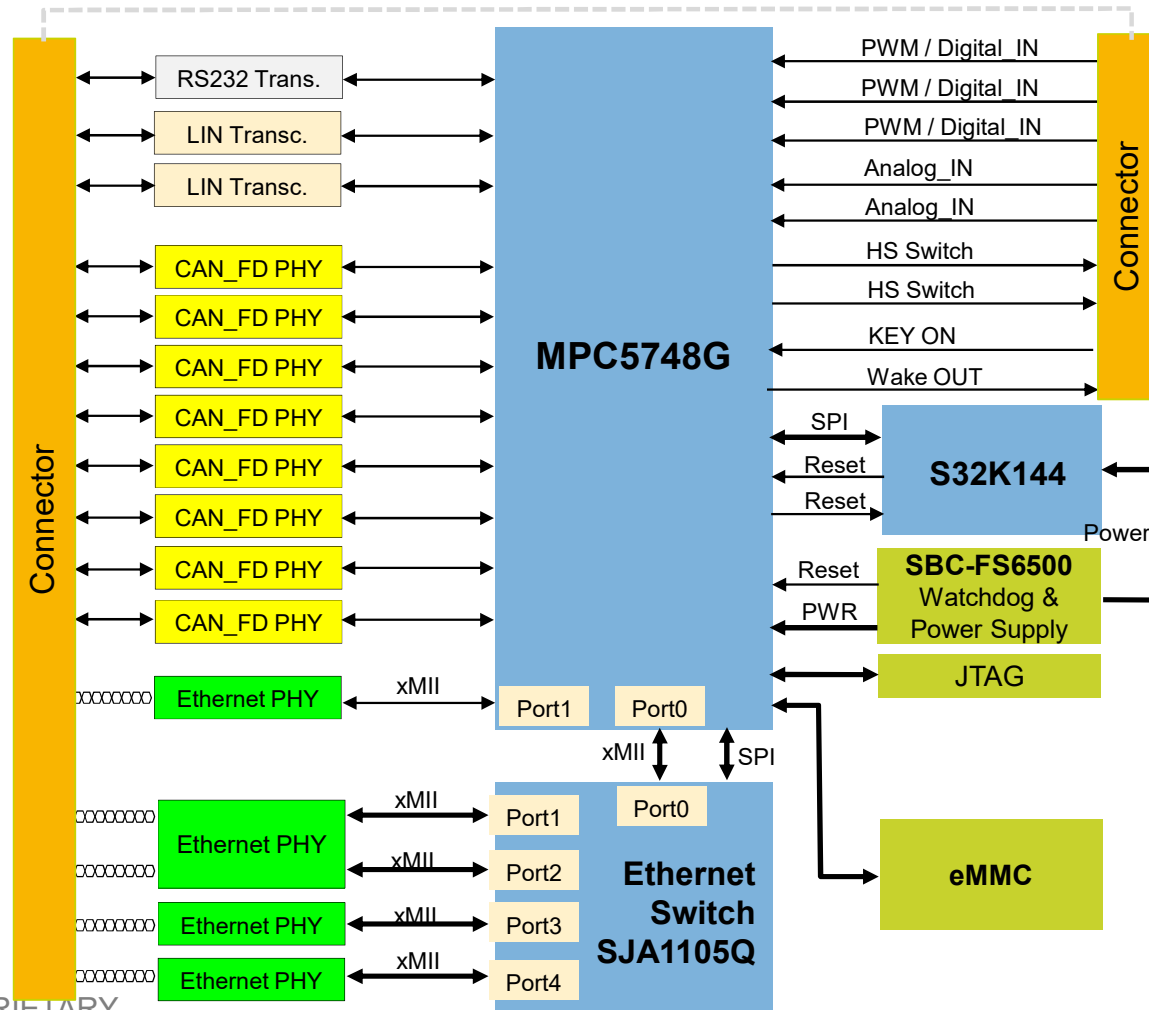
1. 网页内容和资源会持续更新
2. 可提供直接下单购买，包括配套线束

• 或者直接打开如下链接进入参考设计的主页面:

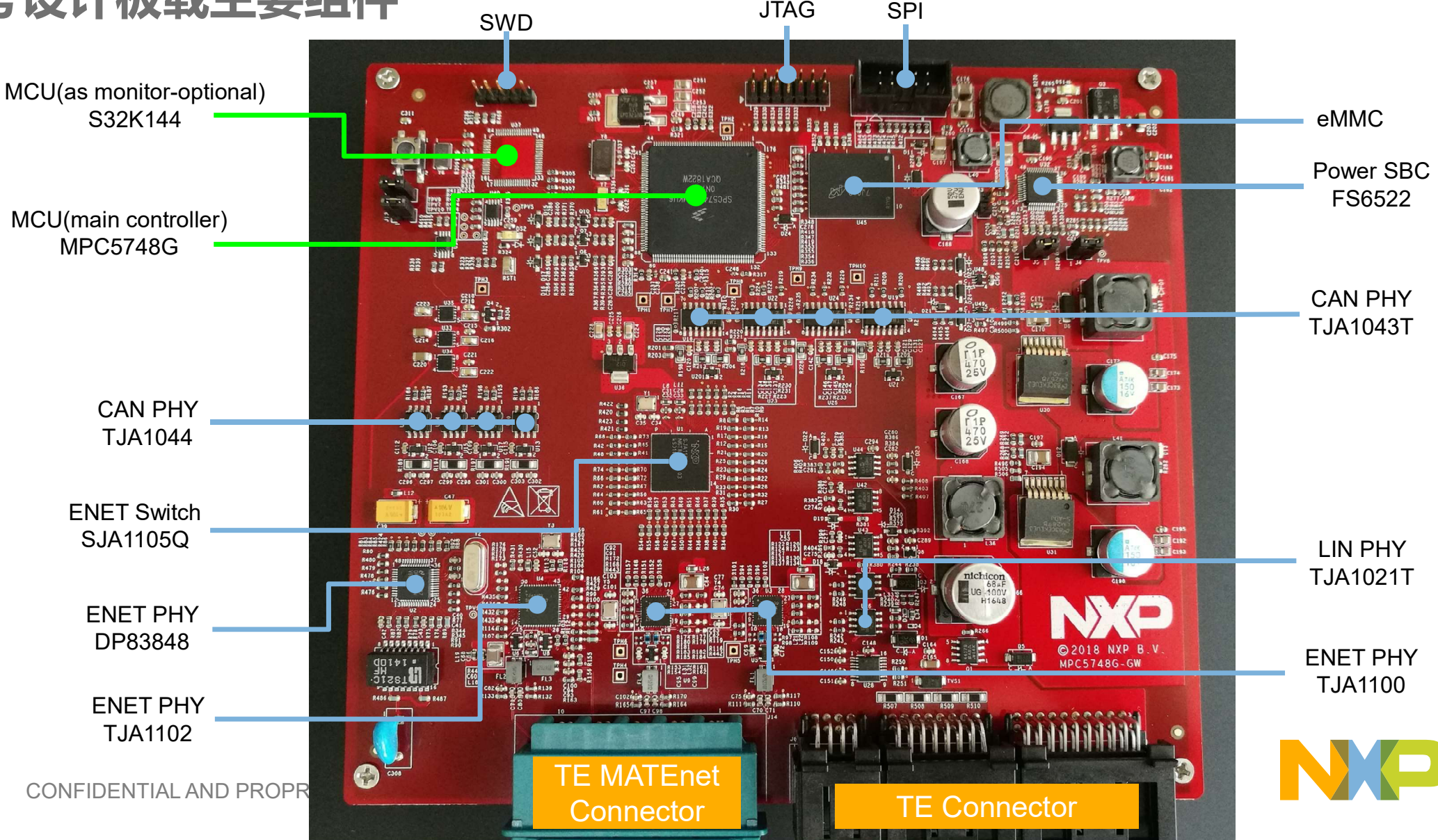
- <https://www.nxp.com/support/developer-resources/nxp-designs/mpc5748g-secure-ethernet-based-gateway-reference-design-board:MPC5748G-GW>

The screenshot shows the NXP website interface for the MPC5748G-GW Reference Design Board. The page features a navigation bar with 'PRODUCTS', 'APPLICATIONS', 'SUPPORT', and 'ABOUT' tabs. Below the navigation bar, there is a breadcrumb trail: 'Developer Resources > NXP Designs > MPC5748G Secure Ethernet-based Gateway Reference Design Board'. The main heading is 'MPC5748G-GW: MPC5748G Secure Ethernet-based Gateway Reference Design Board NEW'. A 'Follow' button and social media icons are visible. Below the heading, there are four tabs: 'OVERVIEW', 'DOCUMENTATION', 'SOFTWARE & TOOLS', and 'TRAINING & SUPPORT'. The 'OVERVIEW' tab is active, showing a 'Jump To' sidebar with links for 'Overview & Features', 'Supported Devices', and 'Similar Products'. The main content area includes an 'Overview' section describing the MPC5748G-GW RDB as a 32-bit automotive MCU based on Power Architecture technology, offering up to three e200 Cores, Hardware Security Module, and various communication interfaces. It also lists technical highlights, such as 'Support domain based networking architecture'. A 'Features' section lists key capabilities: 'As A-sample like central gateway ECU with MPC5748G(176 LQFP) onboard', 'Support multi-channels of Automotive Ethernet and CANFD', 'Support secure OTA management with 4GB eMMC onboard', and 'Hardware features' including '4 x 100Base-T1 Ethernet', '1 x 100Base-TX Ethernet for Diagnosis (DoIP) / Software Update', and '8 x CAN/CANFD(up to 5Mbps)'. The NXP logo is visible in the bottom right corner.

# MPC5748G-GW 参考设计系统框图



# 参考设计板载主要组件





# MPC5748G-GW 参考设计主要芯片

Main Component	Product	Key Features
Main MCU	MPC5748G	<ul style="list-style-type: none"><li>• Multi Core 2*160MHz+1*80MHz; 6M Flash, 768KB SRAM;</li><li>• 2x AVB Ethernet MAC(with switch);</li><li>• 8x CANFD, FlexRay, 18x LIN, MLB, USB, SDIO, I2C, I2S</li><li>• Hardware Security Module, Low Power Unit;</li><li>• ISO26262 ASIL-B</li></ul>
Sub MCU	S32K144	<ul style="list-style-type: none"><li>• 112MHz, 512KB Flash, 64KB SRAM;</li><li>• ISO26262 ASIL-B</li></ul>
Ethernet Switch	SJA1105Q	<ul style="list-style-type: none"><li>• 5-Port, Layer 2 Store and Forward Switch</li><li>• Support AVB, TSN and Deterministic Ethernet</li><li>• MII/RMII/RGMII Interface; Port Mirroring and VLAN</li></ul>
Ethernet PHY	TJA1100 & TJA1102	<ul style="list-style-type: none"><li>• 100Mbps OABR PHY and Dual PHY(TJA1102)</li><li>• Fully automotive qualified</li><li>• Robust automotive grade EMC/ESD</li></ul>
CAN PHY	TJA1043 & TJA1044GT	<ul style="list-style-type: none"><li>• Support 2Mbps CANFD, Sleep and Wakeup Function;</li></ul>
LIN PHY	TJA1021	<ul style="list-style-type: none"><li>• LIN 2.1/SAE J2602 compliant; Up to 20 kBd</li><li>• Very low EME, High EMI</li></ul>
Power SBC	MC33FS6522LAE	<ul style="list-style-type: none"><li>• ISO26262 ASIL-D; Watchdog</li></ul>
eMMC	MTFC4GACAANA-4M IT	<ul style="list-style-type: none"><li>• 4GB Memory Space; Support eMMC V4.51;</li></ul>

# 参考设计板快速使用



# 快速启动包--速览 (Quick Start Package)

- **硬件:**

MPC5748G-GW	Gateway Reference Design Board based on MPC5748G(176 LQFP-EP)
-------------	---

- **文档:**

名称	描述
Quick Start Guide(QSG)	Detailed description on availability of Hardware, Software and Documents to quick start with MPC5748G project (this document)
Software Integration Guide(SWIG)	Detailed walk through on how to install and useS32 Design Studio IDE for Power Architecture. And how to use S32 SDK to build applications
Example Codes User Guide(ECUG)	S32 SDK based example codes user guide for MPC5748G-GW RDB
Application Notes	Detailed documents covering topics from 'how to design hardware' to 'how to write software'
One Page Fact Sheet	One page fact sheet of MPC5748G-GW RDB
Reference Manuals, Data Sheets, and Fact Sheets	Detailed manuals for MPC5748G family of MCU

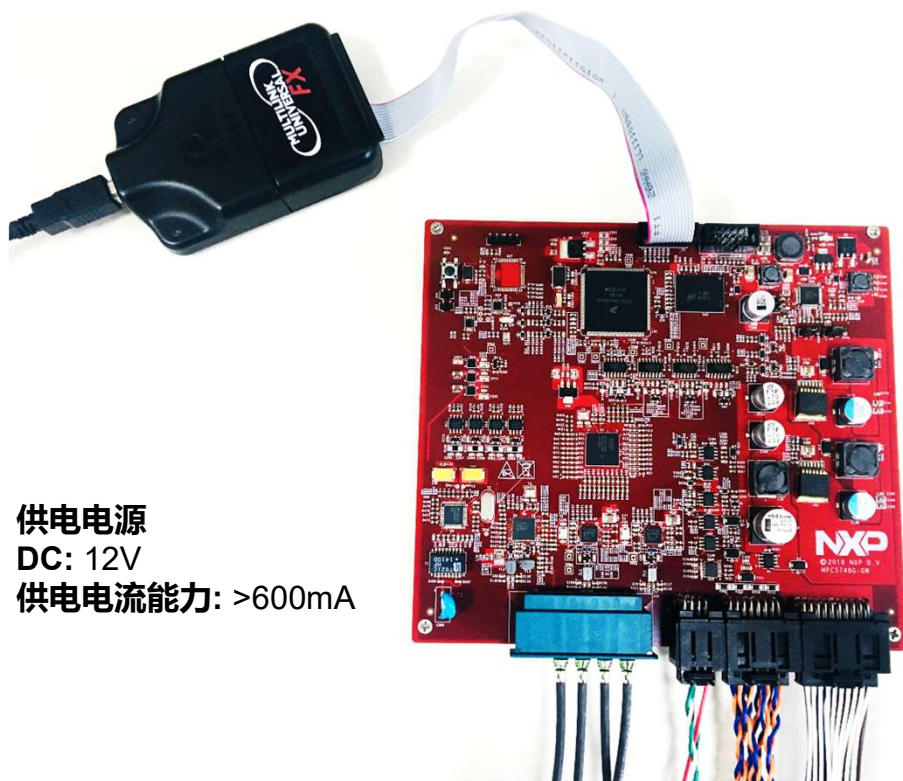
- **下载:**

名称	描述
Integrated Development Environment (IDE)	Eclipse based S32DS IDE with free GCC compiler and Debugger support, so as S32 SDK within the IDE
MPC5748G-GW Quick Start Package	All in one package: Software examples and supporting documents for getting started
MPC5748G-GW Schematics	PDF schematic files for the MPC5748G-GW board
MPC5748G-GW PCB Design Package	PCB Layout files and Bill of Material



# 分步安装指引

- 在QSG(quick start guide)文档中, 可以快速了解 **MPC5748G-GW**参考设计板, 以及如何运行样例程序



**供电电源**  
DC: 12V  
供电电流能力: >600mA

## 1 安装IDE及工具

- 1 安装S32 Design Studio IDE for Power Architecture.  
[S32 Design Studio for Power](#)  
参考软件安装指引文档获得详细信息 Software Installation Guide (SWIG)

## 2 连接调试器, 如PE Multilink

- 2 连接参考设计板的JTAG调试口和电脑.  
保持J4, J5 在板上, 去除J3, J12, J13的跳帽连接

## 3 设置DC 电源供电

- 3 将参考设计板的供电相关线束连接到直流电源中. 设置输出电压12V, 电流保护限制>600mA. 确保所有的连线正常.

## 4 刷写样例代码并运行

- 4 打开已安装好的S32DS, 并导入样例工程, 然后刷写样例程序到网关参考设计板中. 更多细节请参考文档 MPC5748G-GW Software Integration Guide(SWIG) 和样例代码使用提示 Example Codes User Guide(ECUG).

# MPC5748G-GW 硬件

- 提供A样级别的以太网网关控制器硬件及相应驱动软件。充足的硬件资源可以快速实现汽车以太网中央安全网关原型，并支持OTA空中升级管理功能。
- 使用汽车级板载连接器，包括专业的汽车级以太网连接器泰科连接器 MATEnet系列。
- 主控制芯片采用MPC5748G，拥有两个160 MHz Power Architecture® e200Z4 内核以及一个 80 MHz Power Architecture® e200Z2 内核。
- MPC5748G qualified to AEC-Q100 Grade 1 and ambient temperature of -40 to +125 °C
- 通过板载的汽车级连接器和线束，可以非常容易的使用硬件资源，并做快速原型评估。
- 板载 4GB eMMC 用于OTA相关功能，例如固件存储，关键信号量的存储和上传管理, etc..
- 支持功能安全标准的要求，使用NXP SafeAssure 系列产品，板级硬件设计中考虑了部分功能安全的要求。

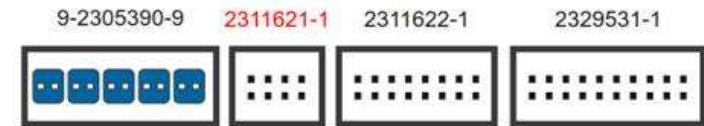
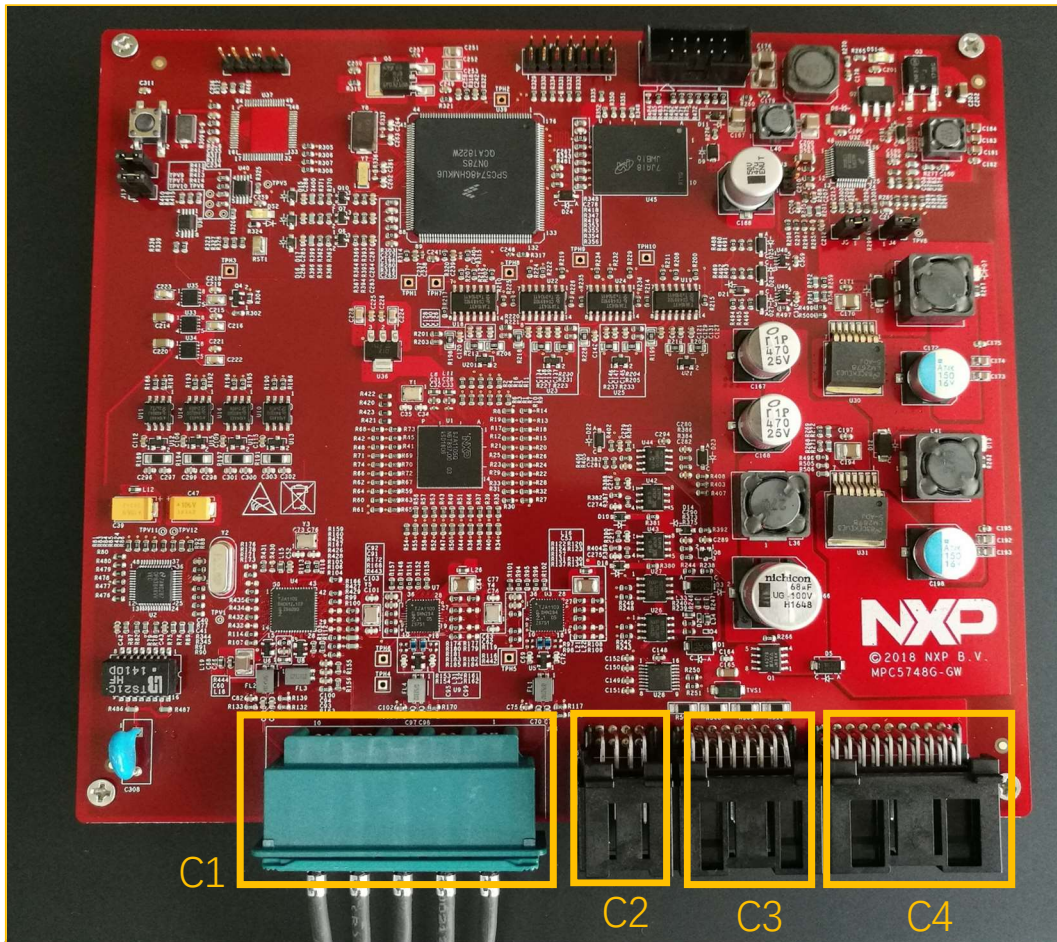
## 硬件资源

- 5 x 100Mbit/s Ethernet
    - 4x100Base-T1
    - 1x100Base-TX for DoIP
  - 8 x CAN (CAN-FD compatible)
  - 2 x LIN
  - eMMC (4GB)
  - 3 x PWM / Digital IN
  - 2 x Analog IN
  - 2 x HS Switch OUT
  - Wake IN/Wake OUT
  - 1 x RS232
  - JTAG Debug
- ▶ 支持功能安全 ISO26262 标准的要求，板上含有：
- ASIL-D Power SBC FS65xx
  - ASIL-B MPC5748G as main MCU
  - ASIL-B S32K144 as sub-MCU for monitoring/supervising
  - ASIL-A SJA1105Q 5-ports Ethernet Switch
  - Fault management and reset logics circuits



# MPC5748G-GW硬件板：板端接口

1 of 3



**Auto Ethernet(100BASE/1000BASE-T1):** P4 TRX1 → TRX4  
 Have one channel reserved

**DoIP(100BASE-TX):** P3 TX, RX, Enable

**CAN Channel:** CAN0 → CAN7

**Others( Power, LIN, debug, control etc.):**  
 P7 LIN1 → LIN2  
 BATT+, GND  
 P20 PWM\_IN 1 → 3  
 P20 AIN 1 → 2  
 P20 WAKE\_OUT  
 P10 WAKE\_IN  
 P20 HS 1 → 2  
 RS232 TX, RX  
 +5V OUT 1 → 2

连接器名称	传输信号	型号
C1	4-port 100Base-T1 Ethernet connector	TE Connectivity MATEnet 9-2305390-9
C2	DoIP Port 4x2 PINs	TE Connectivity 2311621-1
C3	CAN0-CAN7 8x2 PINs	TE Connectivity 2311622-1
C4	其他信号(Power, LIN, URAT, ADC, PWM, IO etc.) 10x2 PINs	TE Connectivity 2329531-1

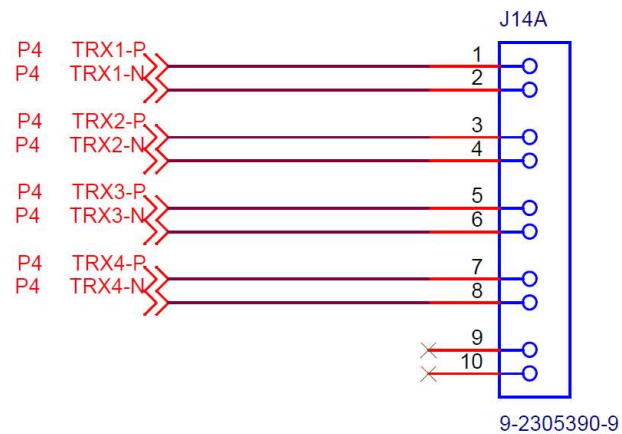


# MPC5748G-GW硬件：板端接口

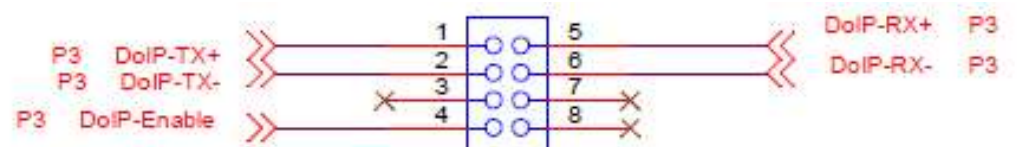
2 of 3

- 原理图中的连接器信号

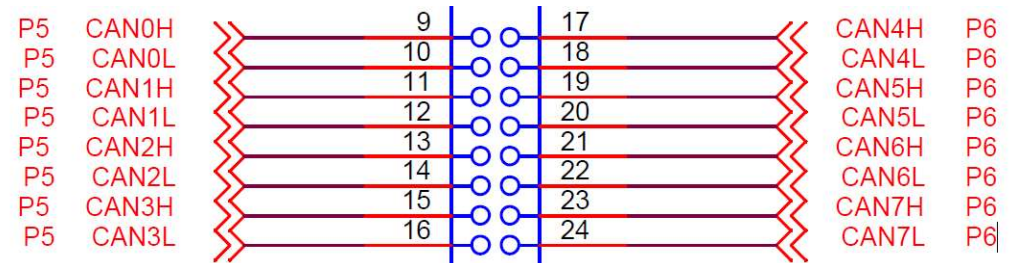
C1



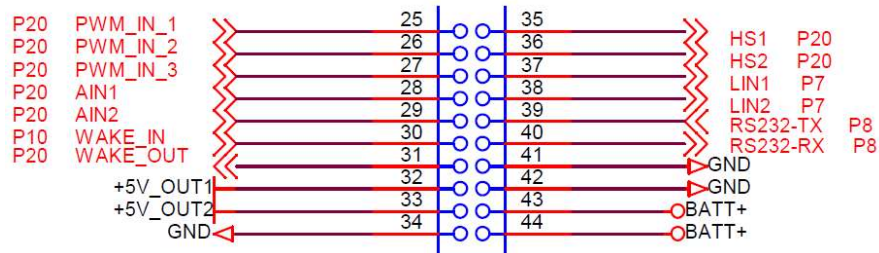
C2



C3



C4



# MPC5748G-GW硬件：板端接口

3 of 3

## • 电源供电:

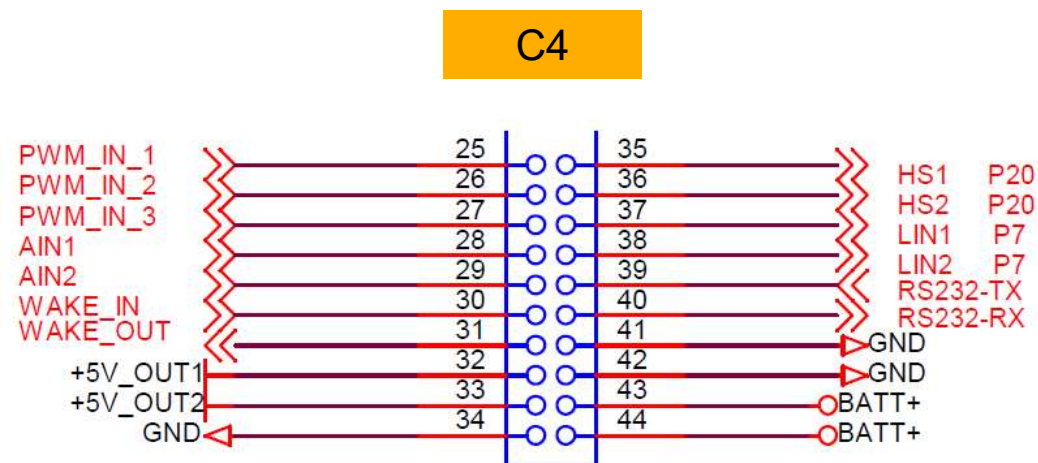
板端BATT+ 连接到 直流 DC 电源的正极12V+

板端GND 连接到 直流 DC 电源的负极12V-

BATT+ 对应板上 PIN43, PIN44引脚

GND 对应板上 PIN41, PIN42, PIN34引脚

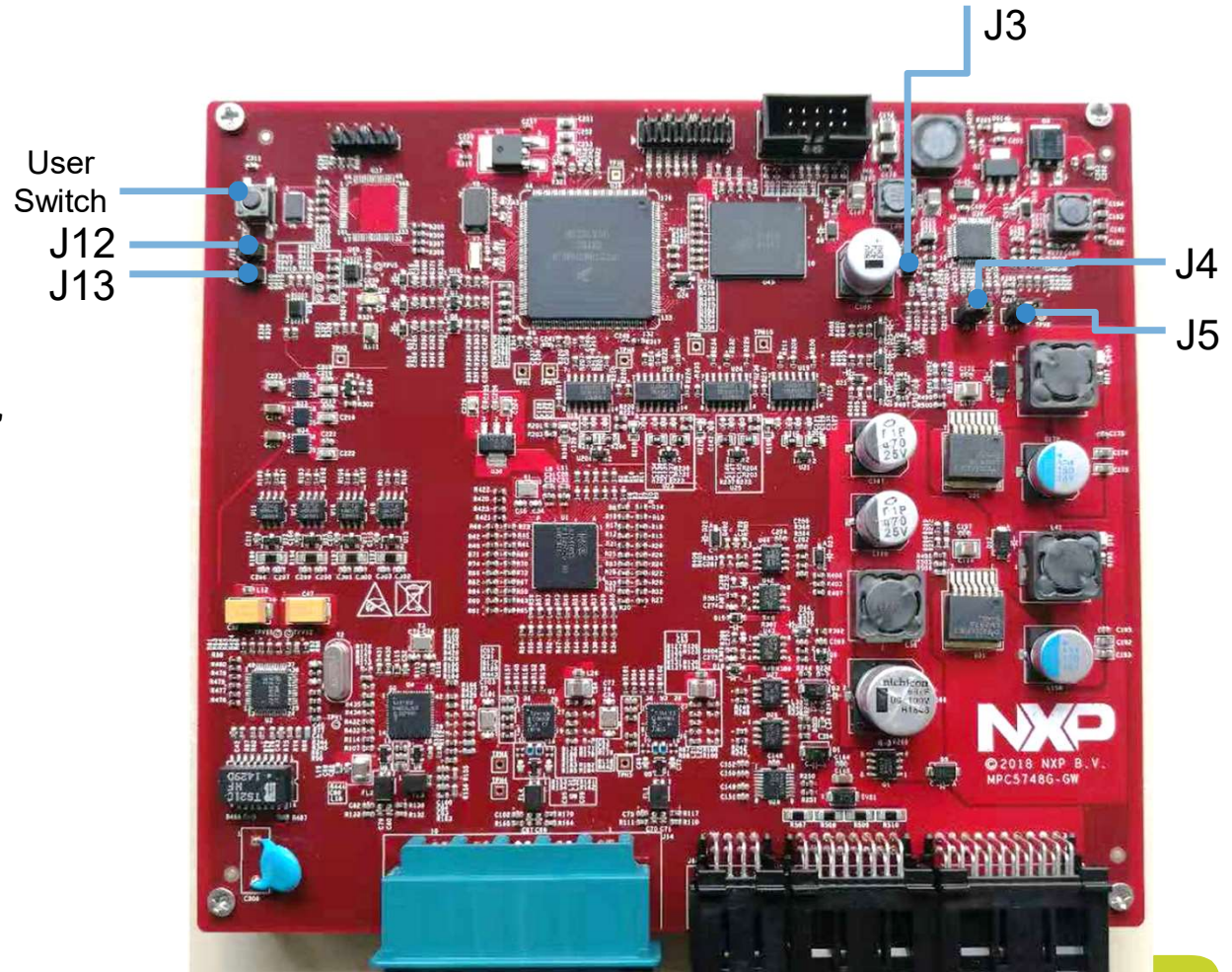
如果需要更大的驱动电流能力，请将上述几根线束并联使用，如同时使用3根GND线。





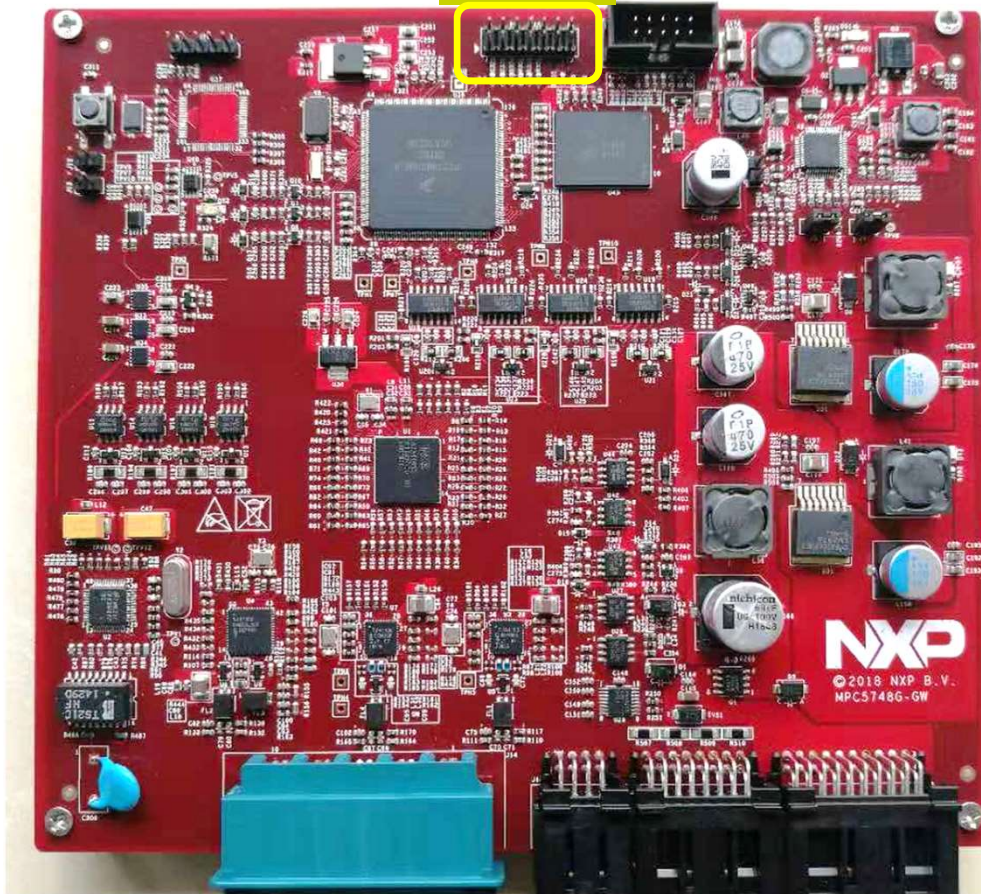
# MPC5748G-GW硬件: 跳帽设置以及板载用户开关的功能

- **Jumper J3**
  - 保持断开, 不要连接.
- **Jumper J4**
  - 连接上可以使能SBC复位MPC5748G的功能. 更多细节请参考SCH原理图.
- **Jumper J5**
  - 连接上后将使SBC进入Debug调试模式. 这种情况下SBC仅作为普通的电源供电使用. 更多SBC的工作模式, 请参考 [nxp.com/Power SBC](http://nxp.com/Power SBC)
- **Jumper J12**
  - 跳帽连接上, 允许利用板载用户开关快速复位MPC5748G
- **Jumper J13**
  - 跳帽连接上可以允许用户开关复位板载S32K芯片. 请保持跳帽断开, 连接上会影响PE刷写过程.
- **User Switch**
  - 用户开关用于快速复位MCU. 更多详情请参考原理图



# MPC5748G-GW Board : 编程接口

JTAG



JTAG

描述	接口编号
Support USB Multilink Interface	P2



# 参考设计软件



# 软件开发工具

- **IDE & Compilers 集成开发及编译环境**

- Free S32 Design Studio IDE for Power Architecture with GCC compiler
- GHS MULTI Integrated Development Environment
- Cosmic IDE
- iSystems winIDEA IDE
- Sourcery™ CodeBench Development Tools

- **Debuggers 调试器**

- P&E USB Multilink
- iSystems iC6000
- Lauterbach TRACE32 JTAG Debugger

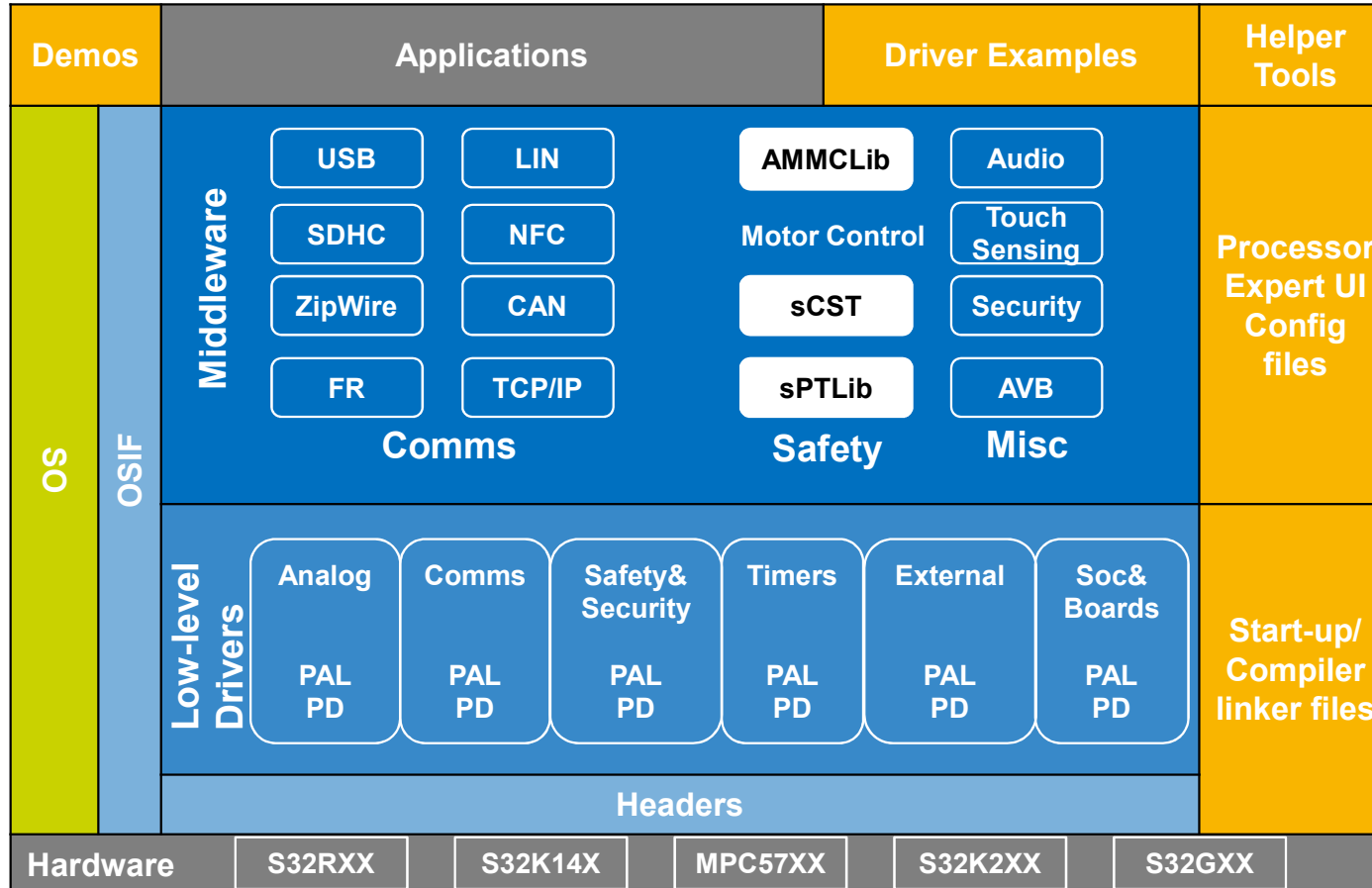


## S32 软件开发工具包(SDK)

- 非Autosar 的软件包
- **汽车级代码质量: 符合SPICE/CMMI, MISRA 2012**
- 图形化的配置界面
- 兼容Eclipse & 其他 IDEs
- 支持 MPC574x 家族的芯片
- 支持多种工具链



# S32 SDK – 内容及架构



## 特性:

集成化的非Autosar 量产级质量的软件开发包:

- 分层的软件架构
- 包括文档, 代码和样例工程
- 集成在S32 Design Studio 以及其他 IDEs
- 集成FreeRTOS 实时操作系统
- 多种工具链支持
- 包含应用样例和工程



# 样例代码工程

- 预编译的样例工程，可以从 [nxp.com/MPC5748G-GW](http://nxp.com/MPC5748G-GW) 获得并快速上手.
- 还可以参考MPC574xG应用笔记中的样例工程，例如 AN4830: Qorivva Recipes for MPC574xG
- 更多可供参考的样例可以从[nxp.com/DEVKIT-MPC5748G](http://nxp.com/DEVKIT-MPC5748G)页面，以及S32DS集成的MPC574xG样例工程中导入并方便的移植使用.
- 更多样例会持续更新到网站参考设计板的主页面.

已有样例工程包括: 持续更新中

1. CAN
2. CANFD
3. Ethernet\_MAC0 and SPI
4. Ethernet\_MAC1
5. UART

详细请参考 [MPC5748G-GW-ECUG](#)

## 推荐及建议

- 如果要评估功耗更高的应用场景，请提高DC电源的供电能力.
- 外部 12 V 供电特性
  - Fully regulated Switching Power Supply
  - Input Voltage: 100-240V AC 50/60Hz
  - Output: 12V 1A/2A DC
  - 推荐DC电源，如 *ITECH IT6721*
- 如果需要快速调试,可以选择“debug from RAM”.
- 保持 S32 Design Studio IDE 以及 S32 SDK 在最新版本，以达到更好的使用效果.
- 使用中的技术问题，可以在NXP Community中MPC5xxx相关讨论区中提问.
- 有用的链接:
  - [www.nxp.com/mpc5748g](http://www.nxp.com/mpc5748g)
  - [www.nxp.com/devkit-mpc5748g](http://www.nxp.com/devkit-mpc5748g)
  - [www.nxp.com/s32ds](http://www.nxp.com/s32ds)
  - [www.nxp.com/community](http://www.nxp.com/community)





# 空中固件升级 (FOTA) 演示 系统



# 基于网关参考设计的固件空中升级（Firmware OTA）演示系统

当前随着汽车电气化、自动驾驶及车辆联网化趋势的快速发展，车辆上集成了越来越多的电子控制系统，同时伴随着更多新功能引入汽车。在此趋势下，固件空中升级（FOTA）技术成为当下及未来汽车不可或缺的关键功能之一，也是推动未来软件定义汽车的必备技术。

利用FOTA技术远程升级车辆软件的方式，不仅可以节省大量处理汽车召回的成本和时间，还可以通过安全的远程通信轻松地为客户带来车辆的新功能和特性。典型的例子是特斯拉汽车公司的空中升级服务。

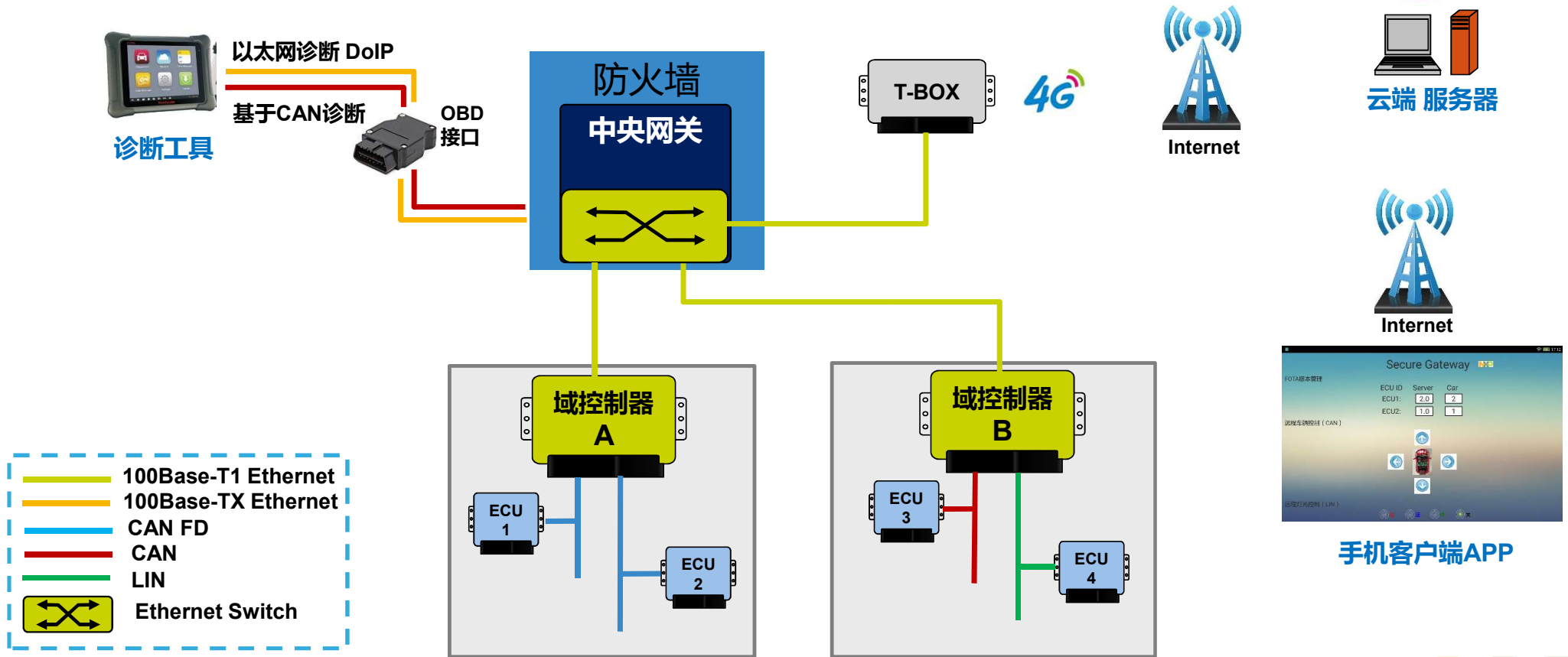
NXP针对FOTA应用，结合中央网关参考设计平台，建立了完整的FOTA演示系统。系统包含了FOTA系统关键的远程服务器端、TBox端（4G LTE）、中央网关、域控制器端及数个ECU等节点。实现了固件在远程服务器端的安全存储，服务器到车辆间的安全加密通讯，中央网关的固件解密、防火墙和OTA管理，以及车内网络基于对称加密的安全通讯和安全Bootloader。

# 基于网关参考设计的固件空中升级 (Firmware OTA) 演示系统

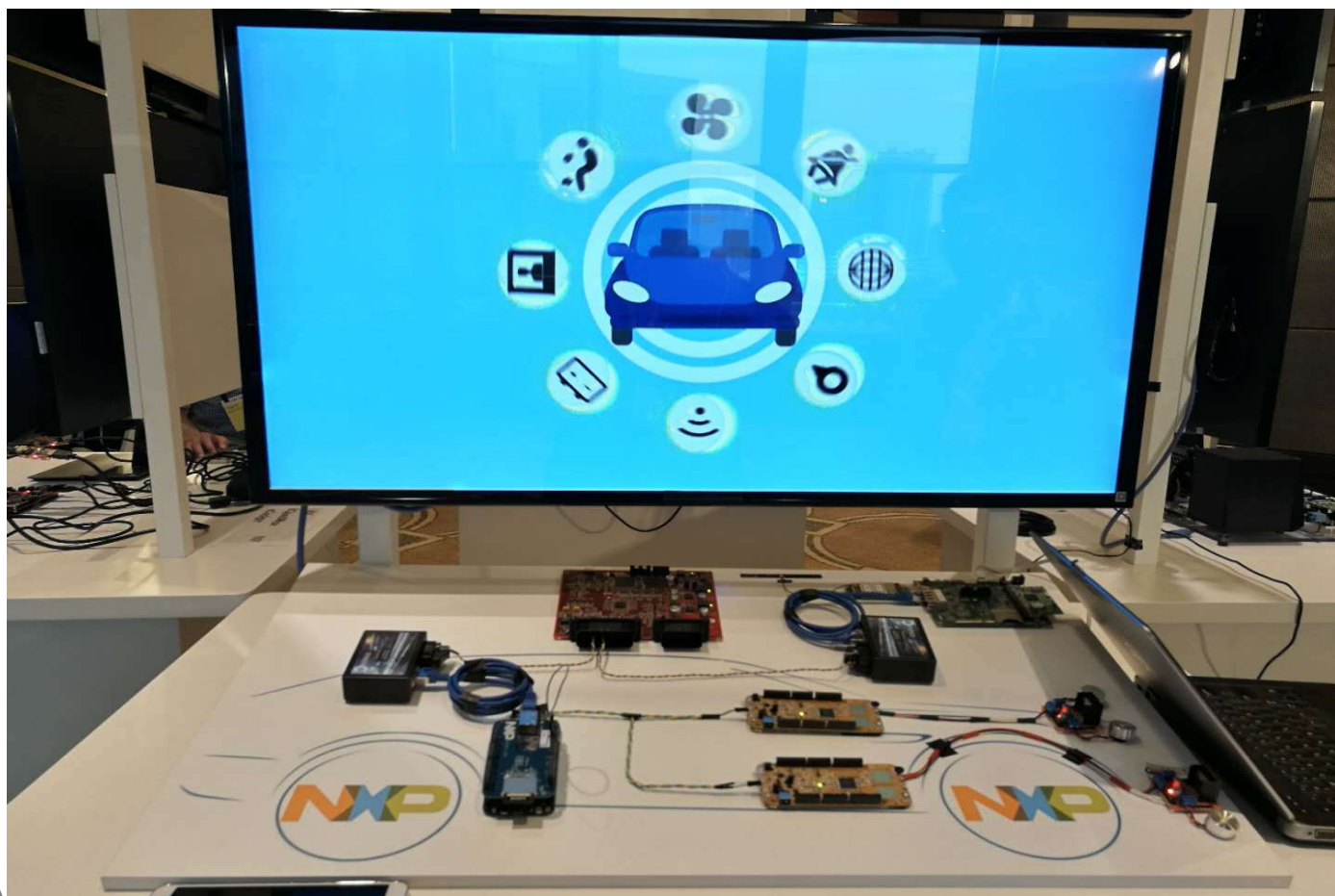
## 特性:

1. 综合展示了安全的FOTA功能实现需要的重要系统组成以及各节点的关键技术点，并综合做了功能演示，可实现云端服务器发起FOTA推送，利用4G网络的安全通讯，网络防火墙和固件安全升级等功能；
2. 系统基于汽车以太网中央网关，展示了域架构及混合网络架构的车内网络；
3. 展示了多通道的汽车级以太网100Base-T1及CAN-FD通讯。基于MCU硬件加密模块HSM以及CSEc的信息加解密安全服务；

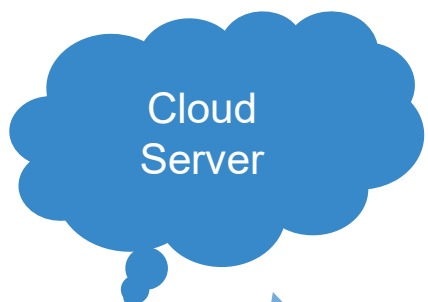
# 车辆安全远程固件升级展示系统的架构



# 车辆安全远程固件升级展示系统



# 升级ECU-A的演示过程



Cloud Server

4G

Step 1:  
服务器端与Tbox利用SSL  
建立安全通讯通道

192.168.1.6

T-Box



192.168.1.18

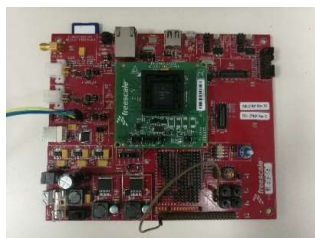
Gateway

Switch



192.168.1.19

DCUA



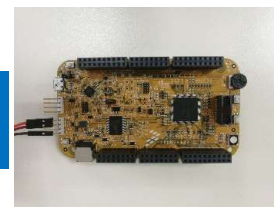
192.168.1.17

DCUB

Ethernet

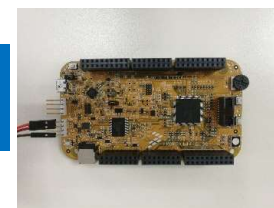
CAN FD

ECUA



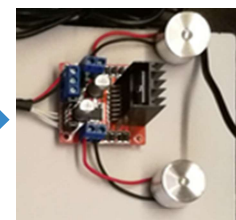
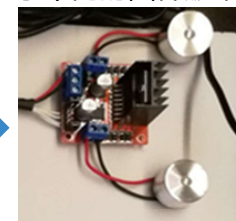
CAN FD

ECUB

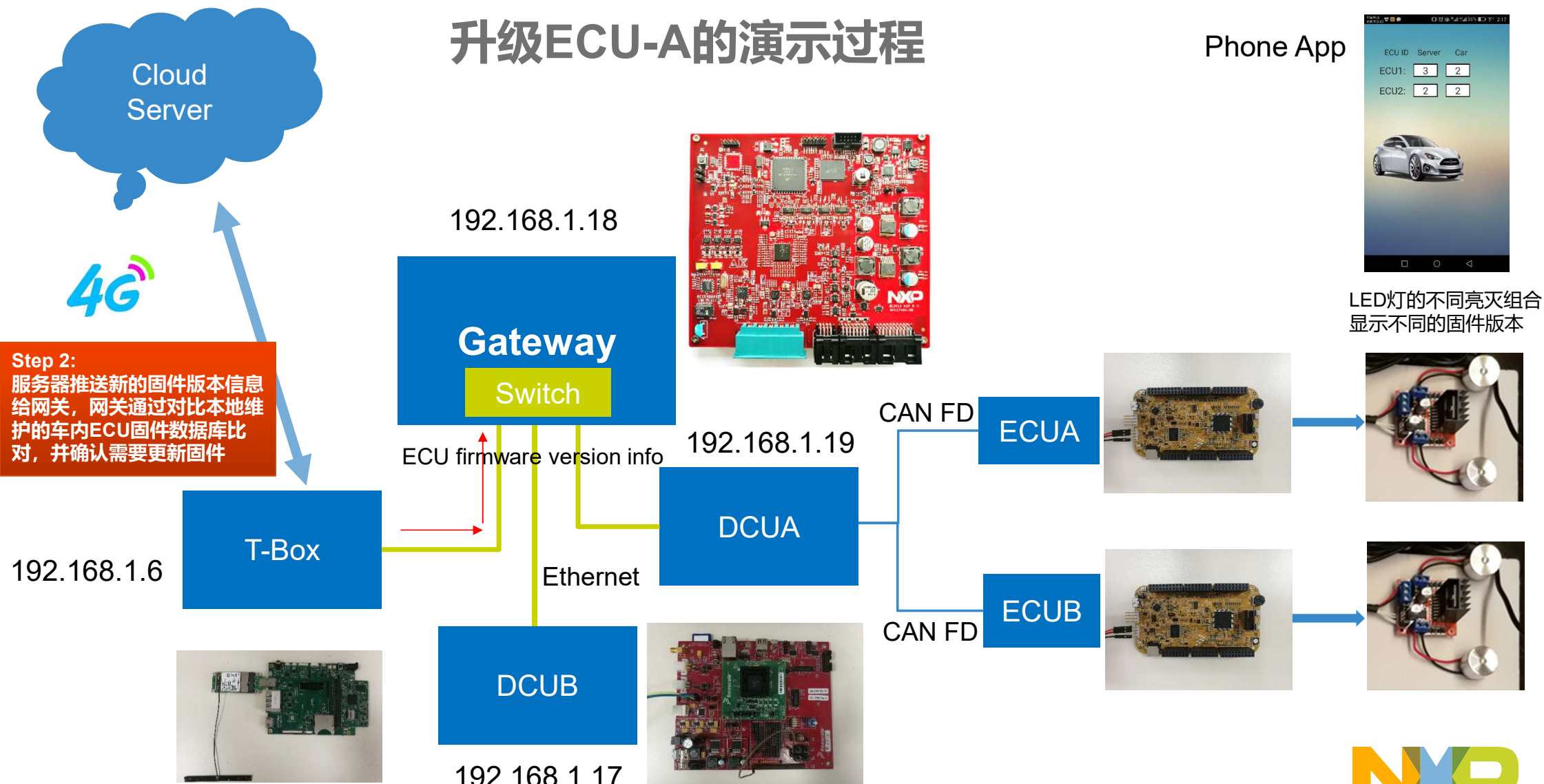


Phone App

LED灯的不同亮灭组合  
显示不同的固件版本



# 升级ECU-A的演示过程

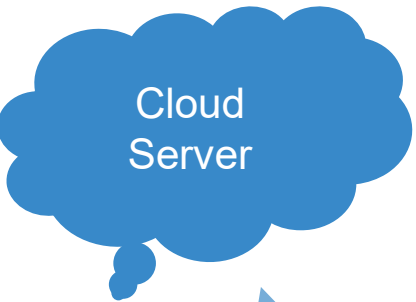
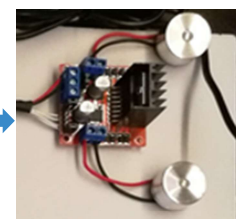
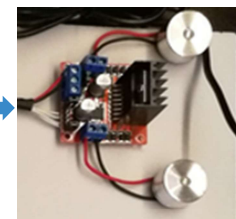


# 升级ECU-A的演示过程

Phone App

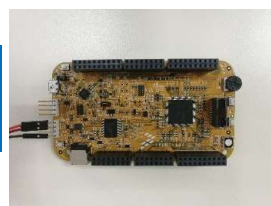
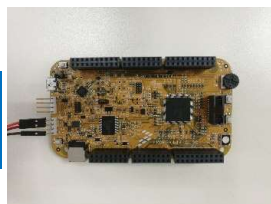
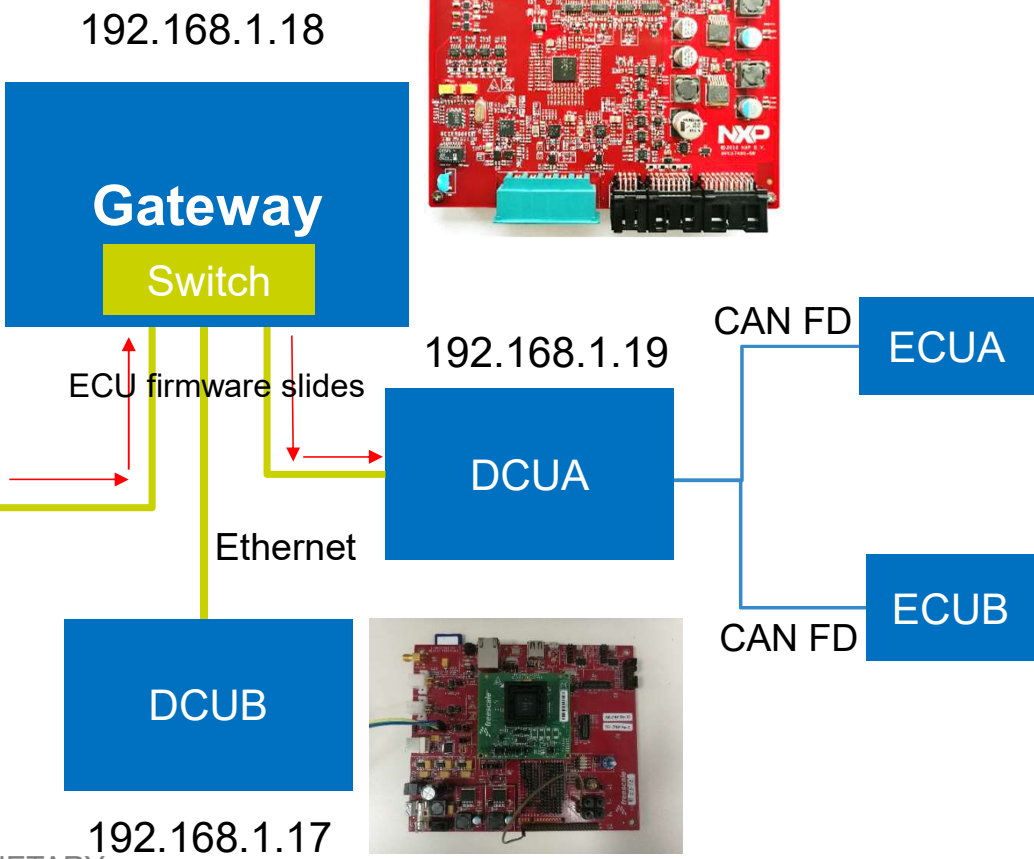


LEDs to show different firmwares



4G

Step 3:  
网关利用SSL从服务器端  
下载加密的新固件, 并在  
本地做完整性校核和解密  
校验签名, 并加密存储于  
板载Flash中. 当条件适合  
时利用UDS协议刷写  
ECUA实现固件升级



192.168.1.6

T-Box



192.168.1.18  
Gateway  
Switch



192.168.1.19  
DCUA



DCUB

192.168.1.17

CAN FD ECUA

CAN FD ECUB







SECURE CONNECTIONS  
FOR A SMARTER WORLD

# MPC5748G-GW FOTA DEMO

## 6-PACK PRESENTATION

APR, 2019



CONFIDENTIAL AND PROPRIETARY

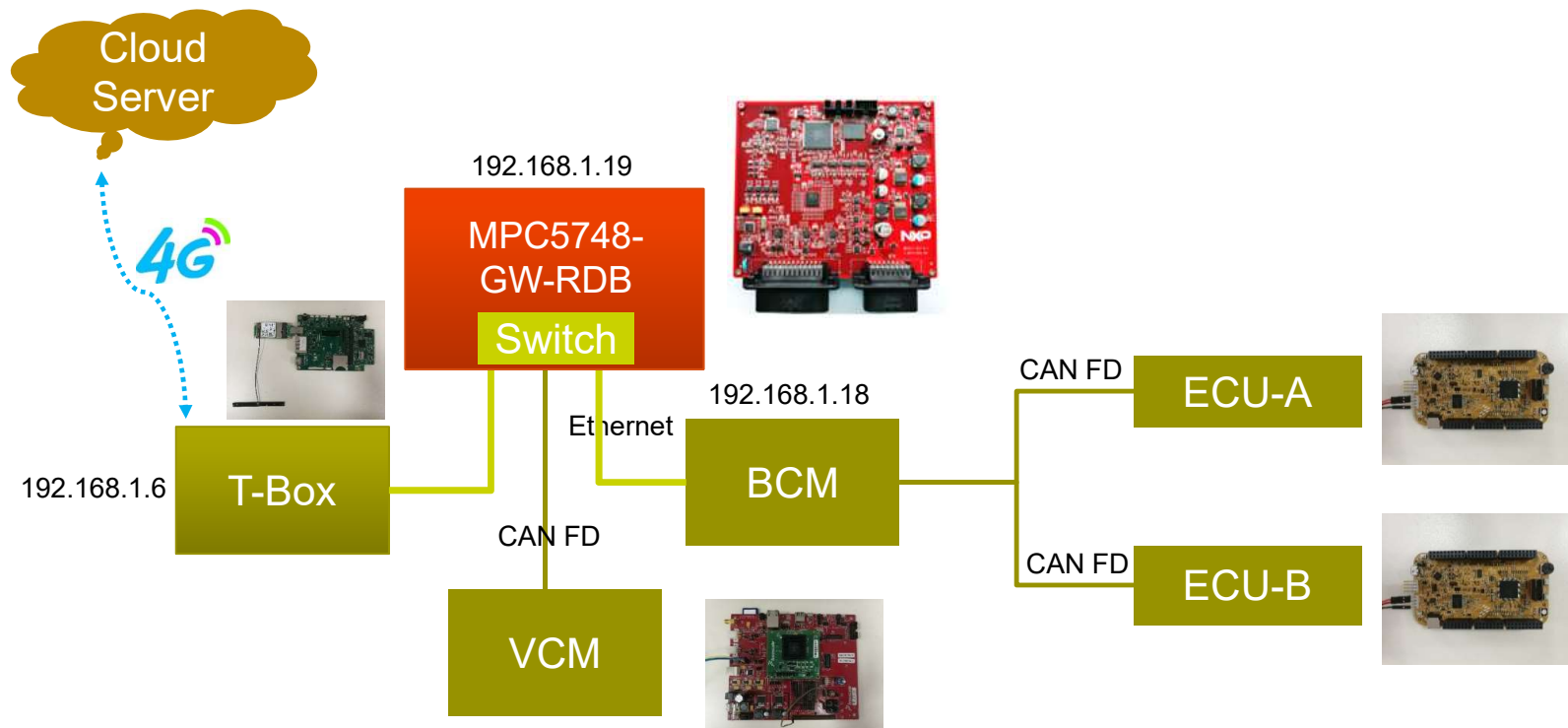


SECURE CONNECTIONS  
FOR A SMARTER WORLD

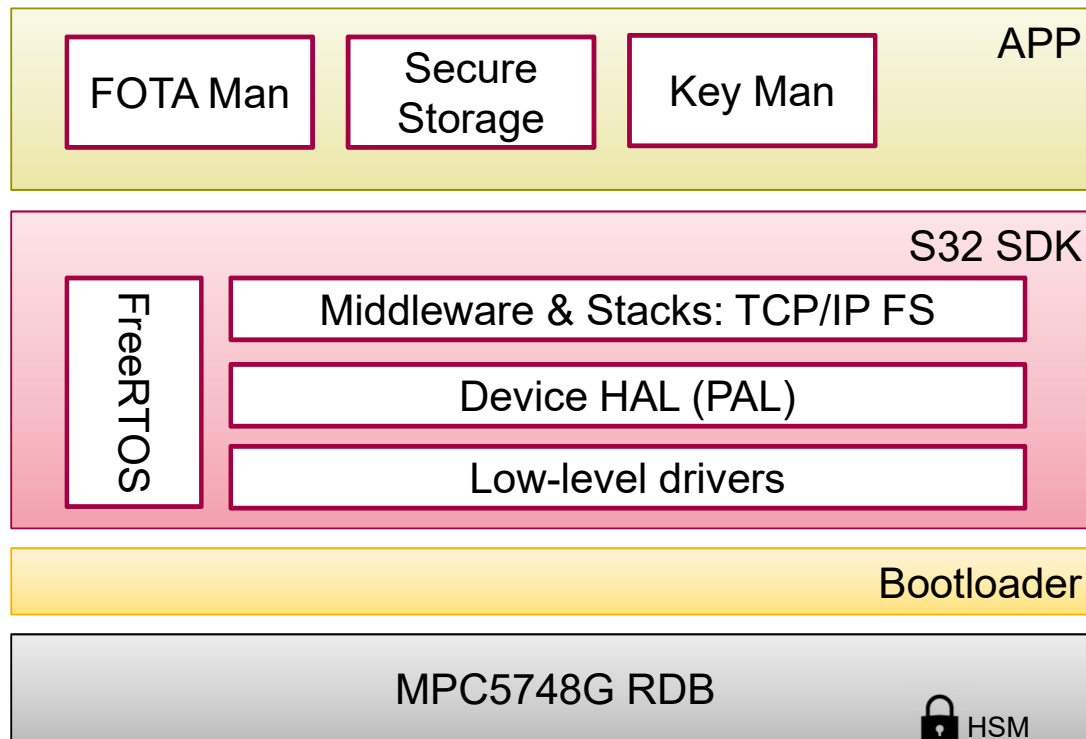
# Key Themes of the MPC5748G-GW FOTA DEMO

- This demo provides proof-of-concept for FOTA implementation, which is of key interest to OEM / Tier1 companies before building a complete FOTA system.
- Function of this demo is as below:
  - MPC5748G-GW acts as FOTA manager to upgrade ECU's firmware
  - MPC5748G-GW checks availability of new version of ECU firmware, and instructs T-Box to download encrypted image from cloud server with performs integrity and authentication check, and writes to eMMC memory
  - MPC5748G-GW self upgrading implements A/B swap and differential update, supporting rollback
  - MPC5748G-GW installs the new version firmware to ECU at the right time
- Key features implemented:
  - A/B update using flash remapping function (Gateway self firmware upgrade)
  - App image authentication using RSA signature (X.509 certificate parsing)
  - Firmware differential update
  - Key management

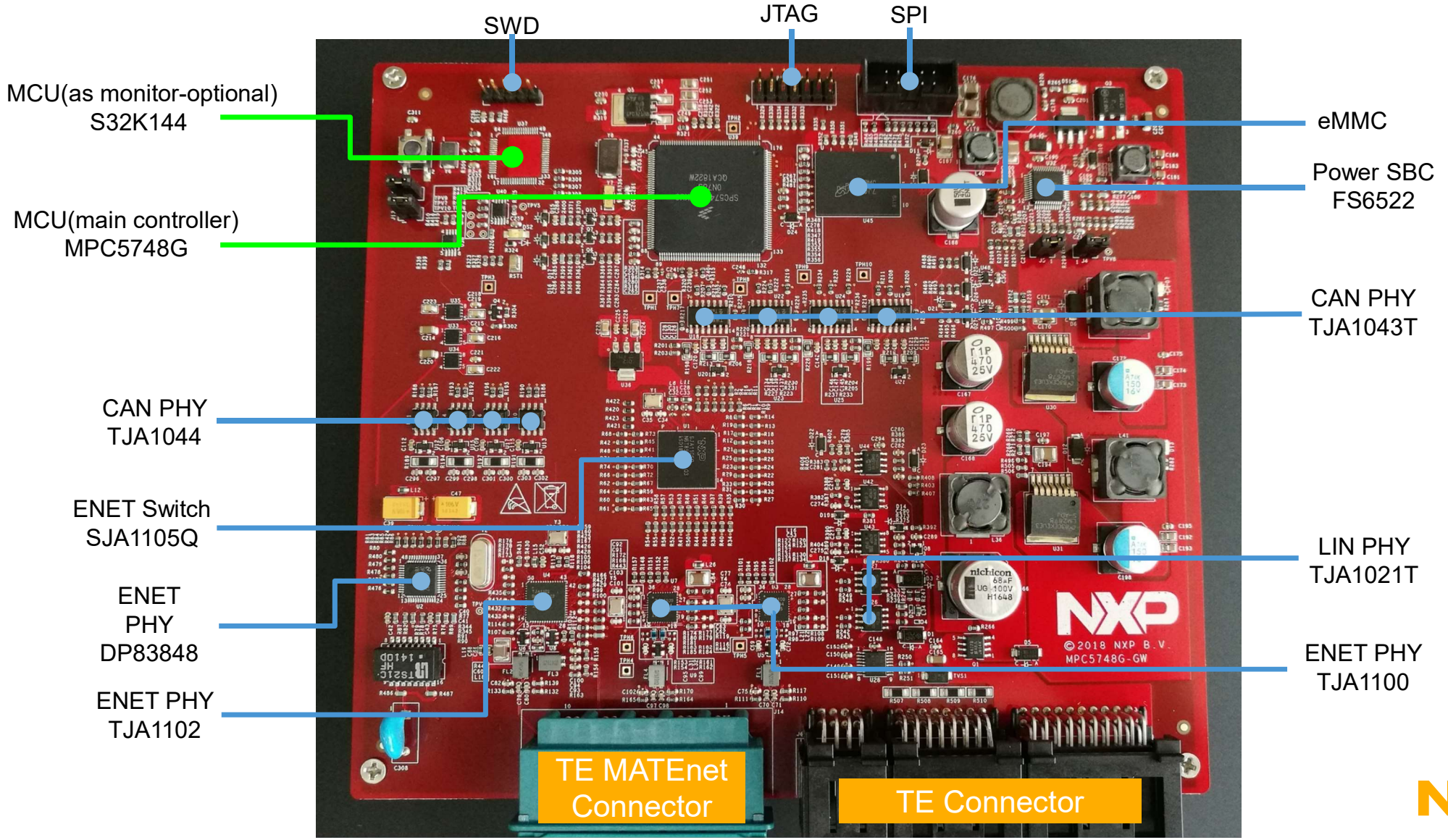
# MPC5748G-GW FOTA Demo System



# MPC5748G-GW-RDB Software Architecture



# MPC5748G-GW-RDB Hardware

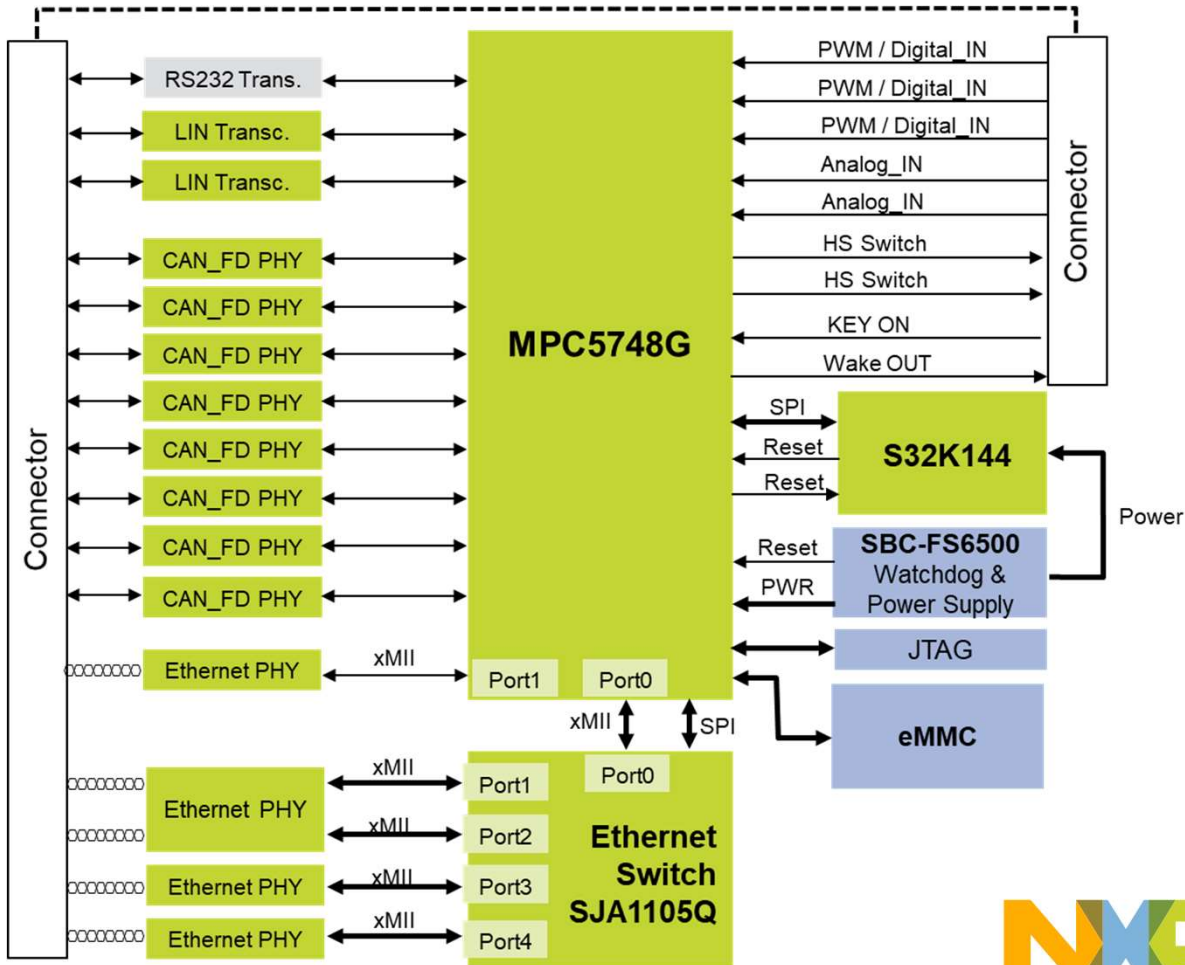


# MPC5748G-GW-RDB: Block Diagram [Board Link](#)

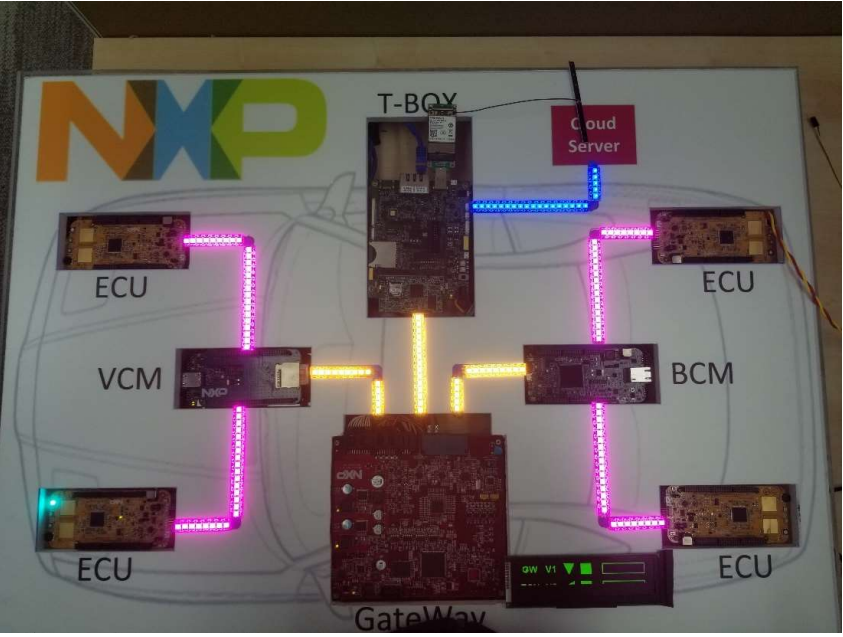
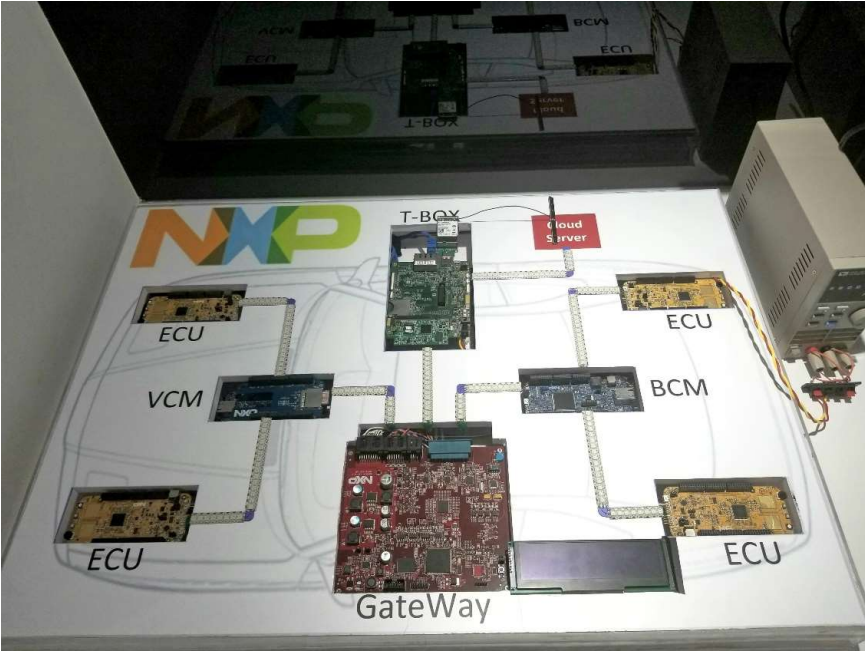
### Hardware Resources:

- 5 x 100Mbit/s Ethernet
  - 4x100Base-T1
  - 1x100Base-TX for DoIP
- 8 x CAN(CAN-FD compatible)
- 2 x LIN
- eMMC (4GB)
- 3 x PWM / Digital IN
- 2 x Analog IN
- 2 x HS Switch OUT
- Wake IN/Wake OUT
- 1 x RS232
- JTAG Debug

- ▶ Support ISO26262 functional safety features:
  - ASIL -D Safety power SBC FS65xx
  - ASIL -B MPC5748G as main MCU
  - ASIL -B S32K144 as sub-MCU for monitoring/supervising
  - ASIL -A SJA1105Q 5-ports Ethernet Switch
  - Fault management and reset logic circuit



# Real Demo Picture







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# INTRUSION DETECTION SYSTEM (IDS) REFERENCE DESIGN

## 6-PACK PRESENTATION

MAY, 2019



CONFIDENTIAL AND PROPRIETARY



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# Key Themes of IDS Reference Design

## Intrusion detection on ethernet port

- Bandwidth use report per data flow.
- Supports ethernet flow intrusion detection and warning. The flow threshold of each service is configurable.
- Supports IP white/blacklist filtering and warning.
- Log is generated under suspicious events such as threshold exceeded, unauthorized communication.
- CPU utility report.

# Key Themes of IDS Reference Design

## Webserver and GUI

A webserver is running on MPC5748G for configuration and gathering information to display. GUI supports following features:

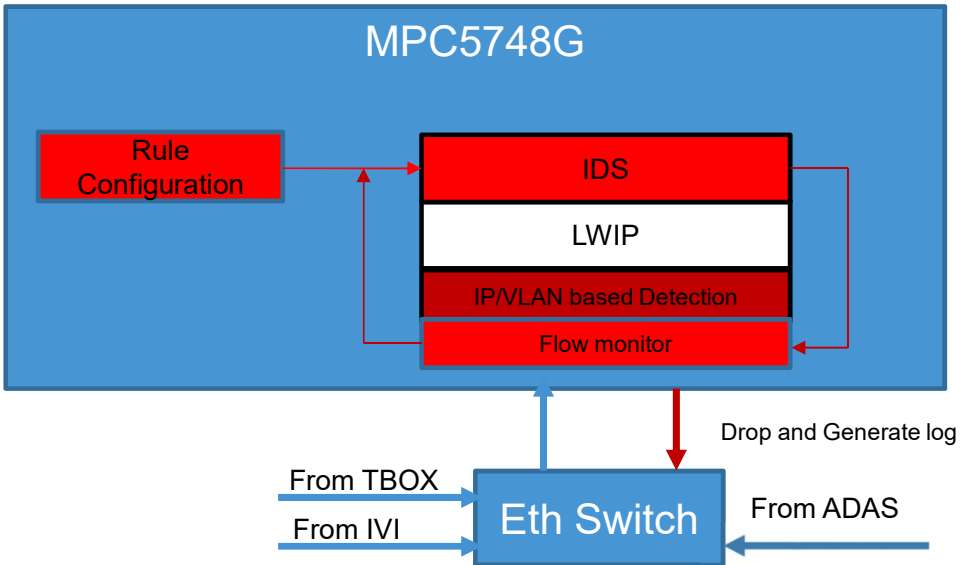
- Displays ethernet flow statistics for each configured service
- Displays ethernet flow intrusion detection warnings
- Displays IP white list intrusion detection warnings
- Collects logs for each intrusion
- Configures services for IDS
- Configures ethernet flow threshold for each service
- Configures port information for IDS

# Key Themes of IDS Reference Design

## Features Not Supported:

- CAN/LIN flow statistics
- CAN/LIN intrusion detection
- Ethernet ARP intrusion

# IDS Reference Design: Block Diagram

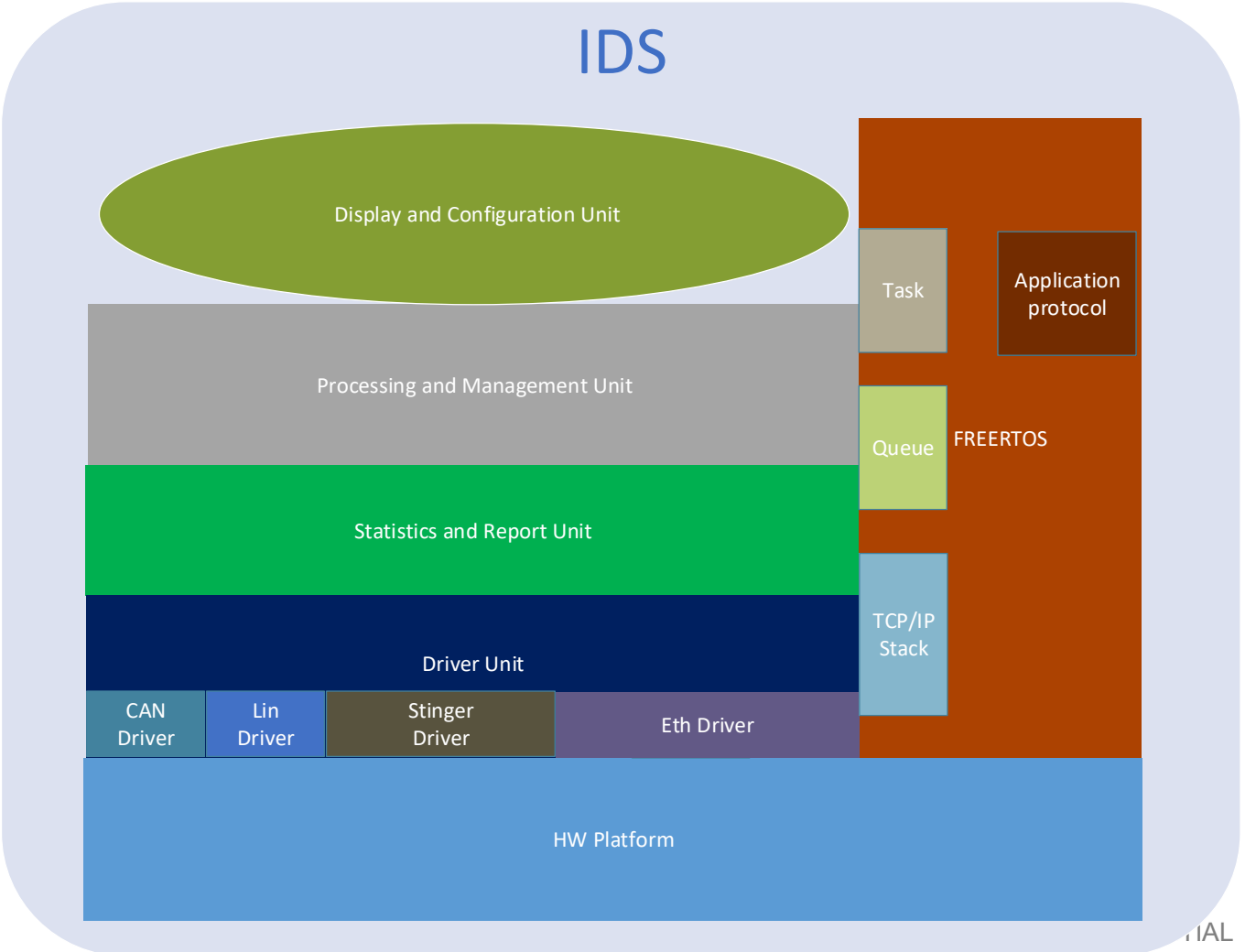


## Supported Feature:

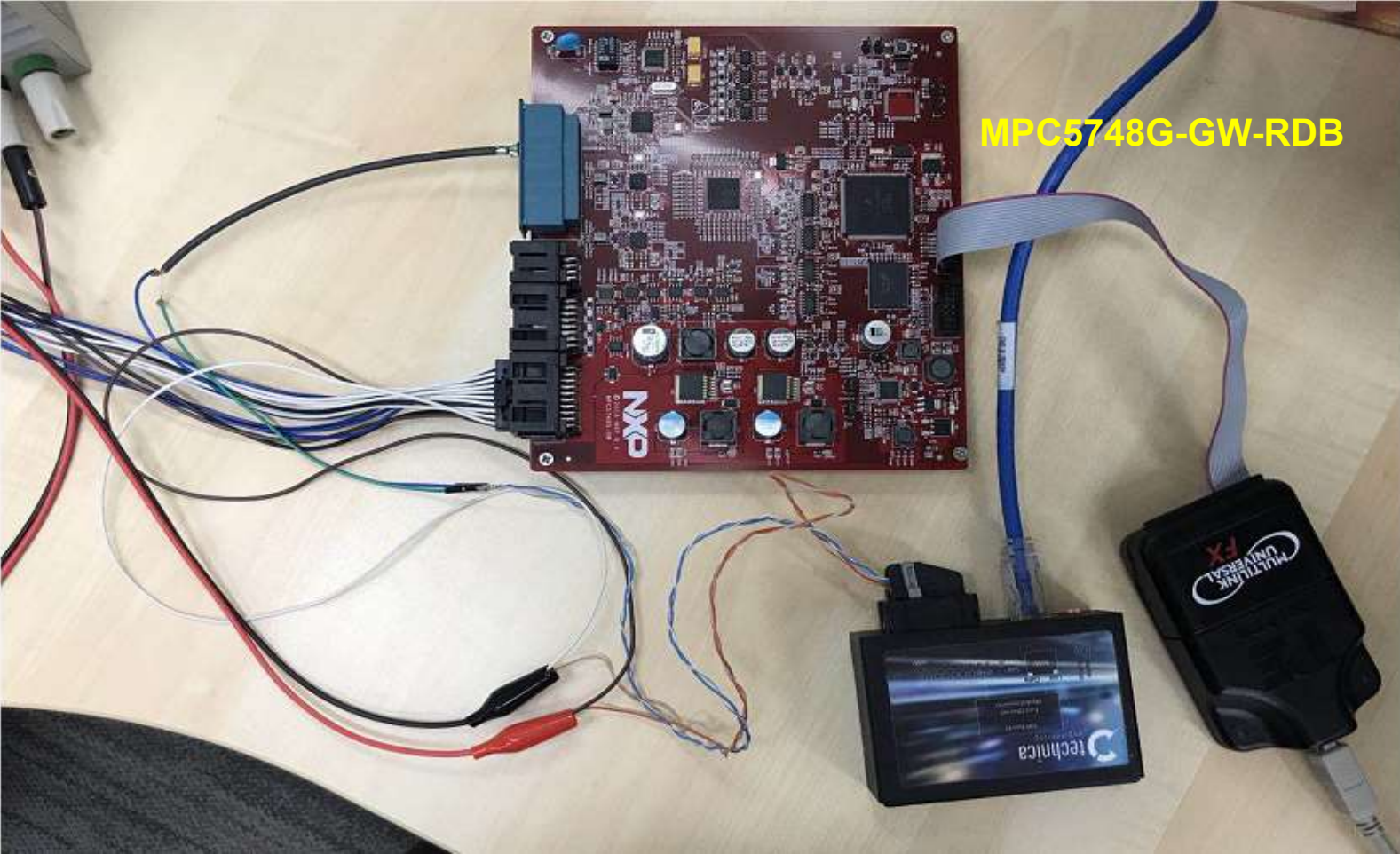
- ✓ Ethernet flow monitoring
- ✓ Ethernet flow intrusion detection
- ✓ IP white list intrusion detection
- ✓ GUI information displaying
- ✓ GUI configuration interface
- ✓ GUI logging
- ✓ CPU load logging



# IDS Reference Design: Software Architecture



# IDS Reference Design: Hardware Platform



MPC5748G-GW-RDB



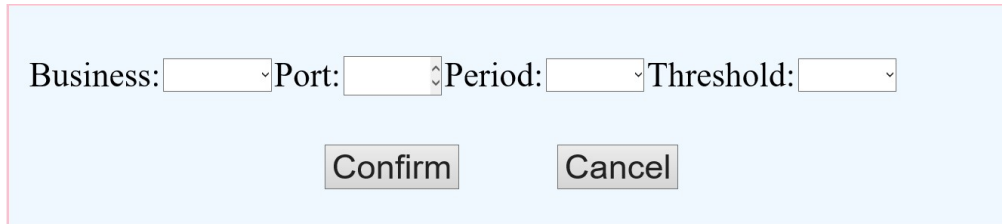
# IDS Reference Design: Real Demo Layout



# IDS Reference Design: Demo Operation

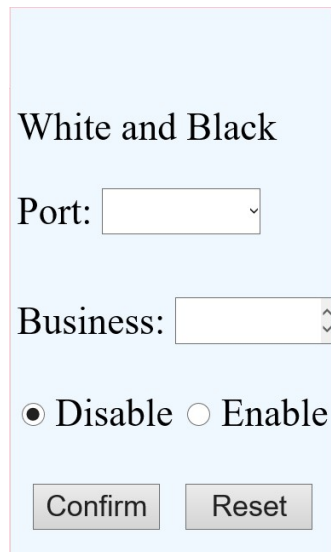
Browse webserver running on MPC5748G by Internet Explorer on PC, will show 3 pages: Home, Config, and LOG:

- Config Flow Monitor:



A light blue dialog box with a white border. It contains four dropdown menus: 'Business:', 'Port:', 'Period:', and 'Threshold:'. Below the dropdowns are two buttons: 'Confirm' and 'Cancel'.

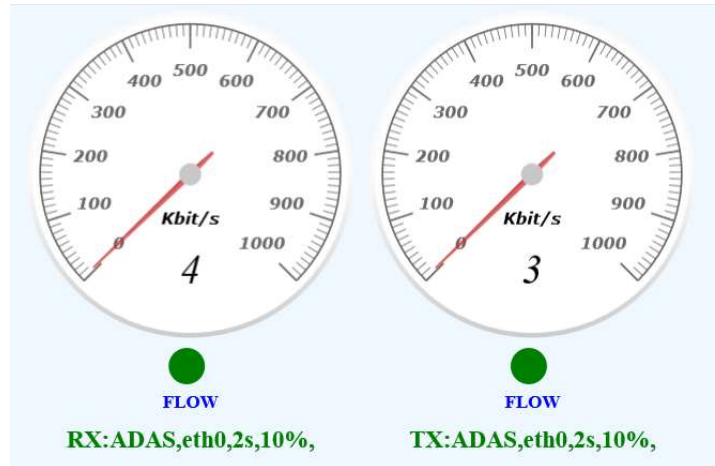
- Config White/Black list



A light blue dialog box with a white border. It has the title 'White and Black'. Below the title is a 'Port:' dropdown menu, followed by a 'Business:' dropdown menu. At the bottom, there are two radio buttons: 'Disable' (selected) and 'Enable'. Below the radio buttons are two buttons: 'Confirm' and 'Reset'.

# IDS Reference Design: Demo Operation

- Show Flow Data



- Show CPU utility and board status

CPU:8%      Gateway status: ●



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