**Mode Card Software Architecture Design**

Compliance with ASPICE, ISO 26262, ISO/SAE 21434 Standards

☑ ASPICE-1/2/3/4/5 □ ASIL-A/B/C/D □ CAL-1/2/3/4

Issued by Ford ECDX

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| --- | 0.1 | 2022.12.21 | Li Jiawei |  | Initial Version |
| 0.1 | 0.2 | 2023.01.03 | Li Jiawei |  | 1. add key component description of static architecture 2. add key sequence diagram |
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# Outline

## Objectives

This is Mode Card SW design to guide developer to implement features, forwarding is forbidden without concurred by author

## Reference documents

| No. | Reference Document. | Version | Issuer | Reason. |
| --- | --- | --- | --- | --- |
| 1 | Mode Card 1.0 PRD 场景卡片\_V1.0\_20221210 | V1.0 | Geng Dekang |  |
| 2 | Camp Mode\_PRD\_V1.0\_20221125 | V1.0 | Ni Anthony |  |
| 3 | Pet Mode 0.3 PRD\_ 20221216 | V0.3 | Hu Lina |  |
| 4 | Battery Save Mode 0.1 PRD\_ 20221214 | V0.1 | Hu Lina |  |

## The definition of terms, abbreviations, and etc

| No. | Terms and Abbreviations. | Meanings, Definitions and Official Name. |
| --- | --- | --- |
| 1 | Co., Ltd. | Company Limited |
| 2 | CPU | Central Processing Unit |
| 3 | e.g. | exempli gratia |
| 4 | I/O | Input/Output |
| 5 | ISR | Interrupt Service Routine |
| 6 | OS | Operating Software |
| 7 | RAM | Random Access Memory |
| 8 | ROM | Read Only Memory |
| 9 | RTOS | RealTime Operating Software |
|  |  |  |
|  |  |  |

# Constraint Conditions



## The Constraints of Hardware

* CX727 ICA Bench，including Silver Box, Display Screen, DSP & Cables
* CX821 Bench，including Silver Box, Controller Screen , Pano Screen, DSP & Cables

## The Constraints of Software

## The Constraints of Manufacturing Process

* N/A

## The Constraints of Service and Maintenance After Shipment

* N/A

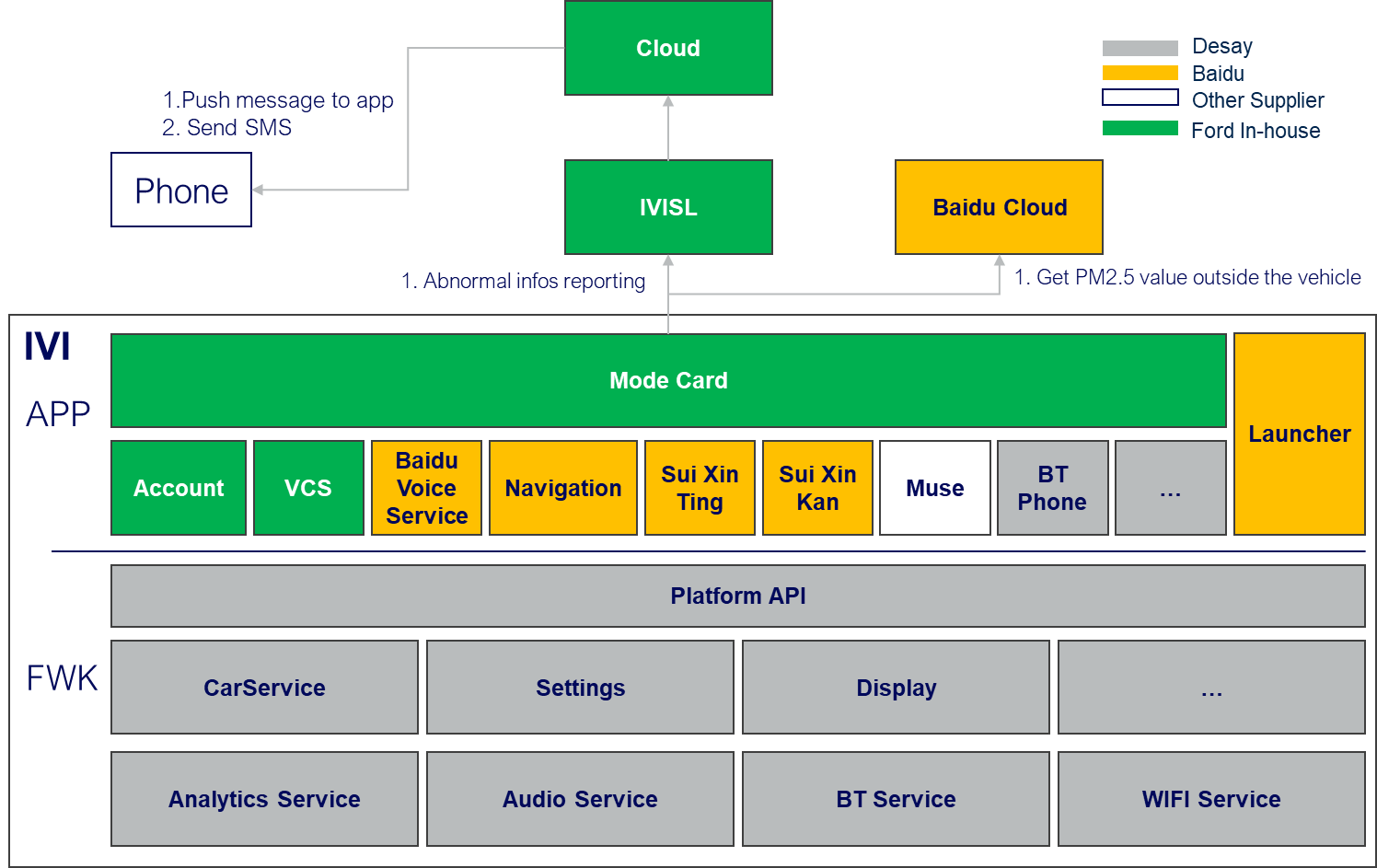
# Software Design



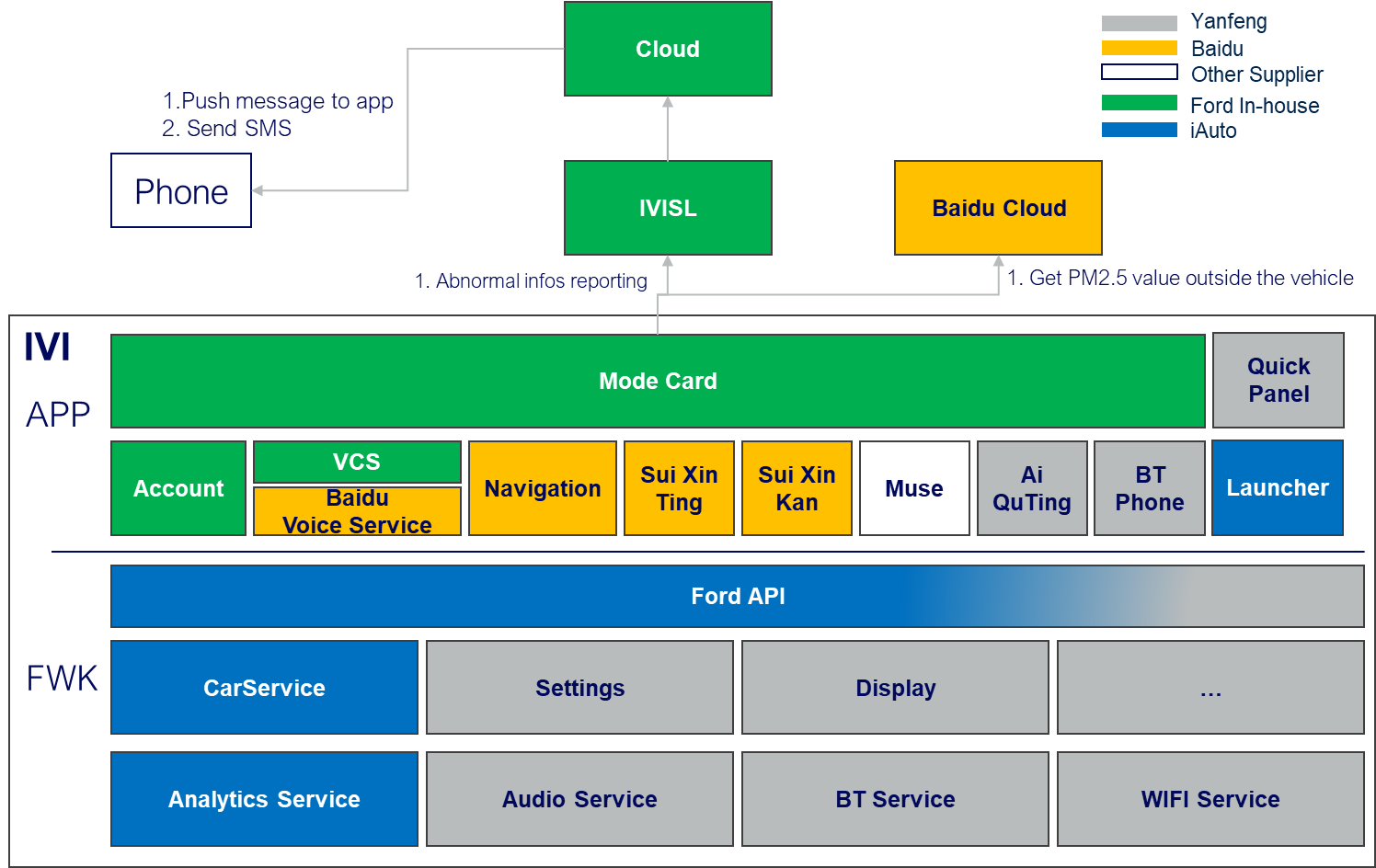
## Software Static Architecture



### External module dependencies diagram

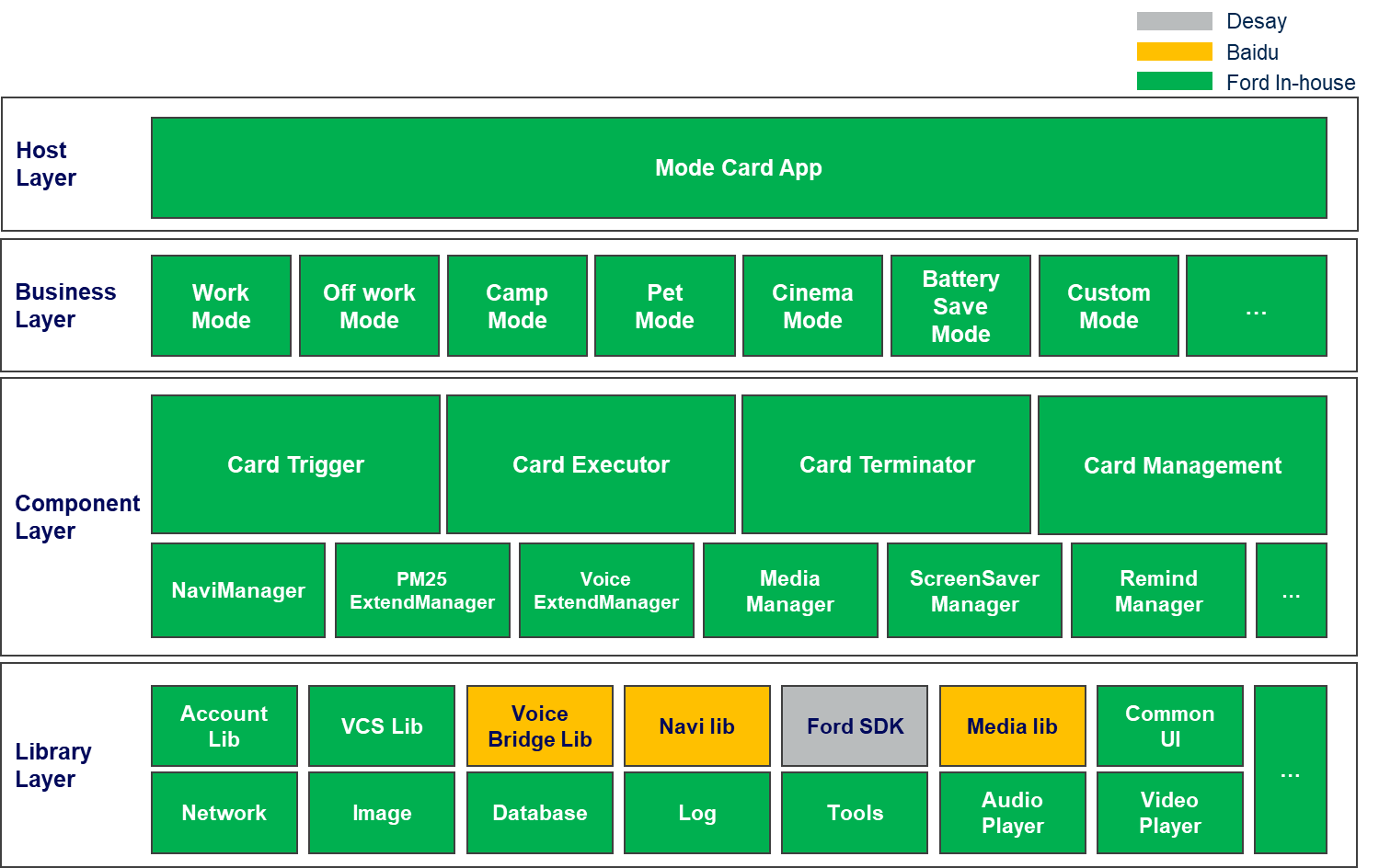


**CX727 ICA**

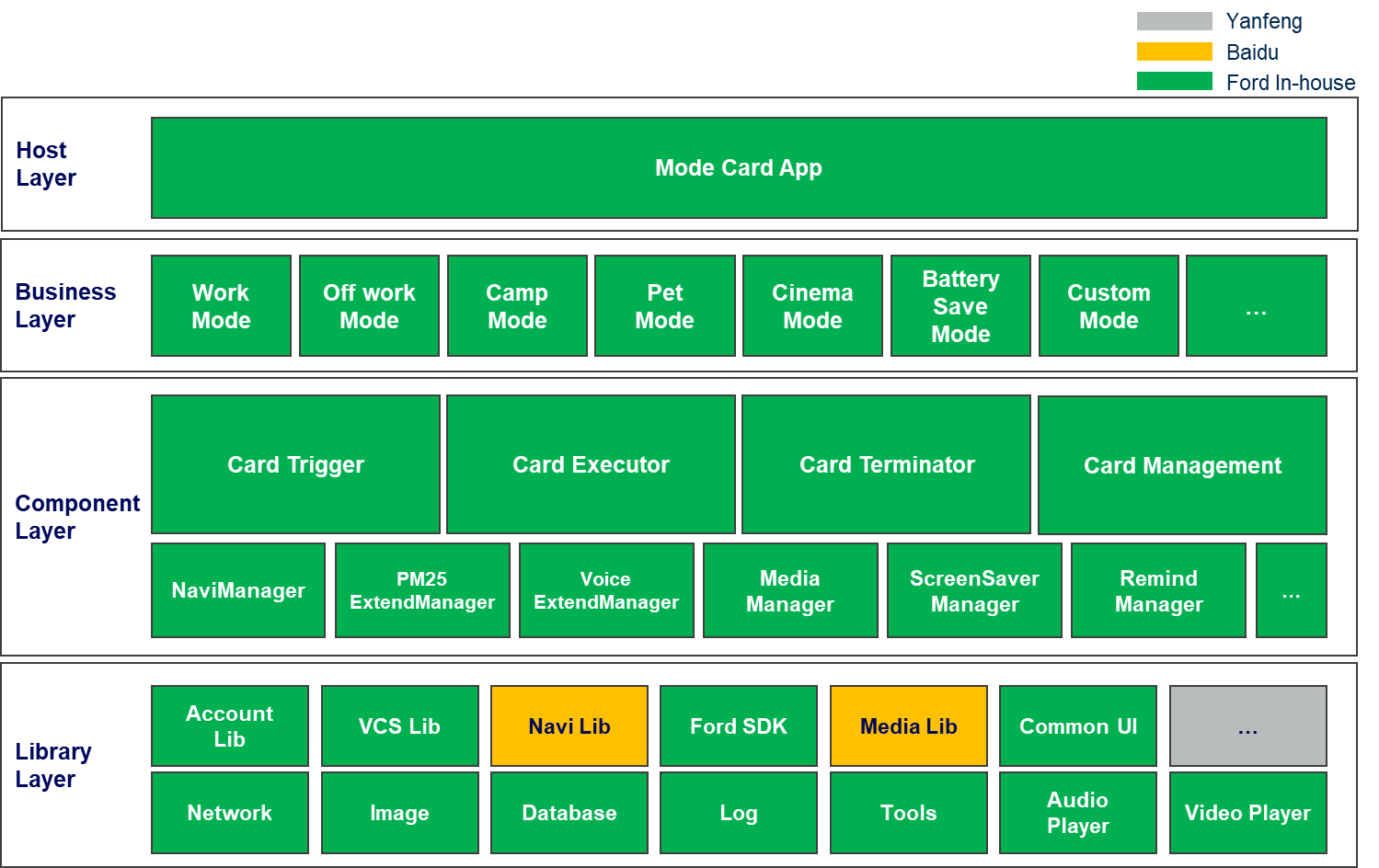
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**CX821**

### Software Architecture Diagram



**CX727 ICA**



**CX821**

**四大核心组件：抽象Card Mode形成Card Trigger, Card Executor, Card Terminator, Card Management四大组件。**

**设计原则：**

**四大组件自包含，松耦合，标准化南北向接口，横向接口，可以组合创建任意卡片模式，灵活支持业务层的扩展。**

### COMP\_01: Custom Mode

|  |  |  |
| --- | --- | --- |
| ID | | MODECARD\_COMP\_01 |
| Layer | | Mode Card Business Layer |
| Responsibility | | Custom Mode Component |
| Req Allocation | | 1. 展示自定义卡片列表页 2. 展示自定义卡片创建页 3. 创建自定义卡片 4. 保存自定义卡片 5. 编辑自定义卡片 6. 查询自定义卡片 7. 删除自定义卡片 |
| Source | | N/A |
| ASIL Class | | N/A |
| Resource Consumption | Flash | N/A |
| RAM | N/A |
| EEPROM | N/A |
| CPU | N/A |

### COMP\_02: Card Trigger

|  |  |  |
| --- | --- | --- |
| ID | | MODECARD\_COMP\_02 |
| Layer | | Mode Card Component Layer |
| Responsibility | | Card Trigger Component |
| Req Allocation | | 1. 设置语音触发方式（语音打开） 2. 设置运行周期（一次/重复） 3. 设置运行前询问开关 4. 设置时间触发器（时间范围监听） 5. 设置位置触发器（监听达到终点距离，时间） 6. 设置环境触发器：   查询/监听车内/车外PM2.5，  查询/监听车内/车外温度   1. 设置车辆信信息触发器   查询/监听续航里程，电池电量，车速，档位，充电状态，  预计充电时间，电子手刹，雨量等级，光亮等级，点火状态   1. 设置乘员信息触发器   查询/监听主副驾安全带，后排左中右安全带，副驾状态   1. 设置门窗信息触发器   查询/监听主副驾门状态，后排左右门状态，前舱盖状态，后备箱门状态，全车门锁状态，主副驾车窗状态，后排左右车窗状态   1. 设置导航信息触发器   查询/监听导航状态，所处路段，限速信息 |
| Source | | N/A |
| ASIL Class | | N/A |
| Resource Consumption | Flash | N/A |
| RAM | N/A |
| EEPROM | N/A |
| CPU | N/A |

### COMP\_03: Card Executor

|  |  |  |
| --- | --- | --- |
| ID | | MODECARD\_COMP\_03 |
| Layer | | Mode Card Component Layer |
| Responsibility | | Card Executor Component |
| Req Allocation | | 1. 空调管理   空调开关，AUTO,温度，风量，吹风模式，循环模式，后窗加热，主副驾座椅空调，方向盘加热，香氛开关，香氛模式，香氛浓度   1. 灯光管理   氛围灯开关，氛围灯颜色，氛围灯亮度，氛围灯模式，日行灯   1. 影音管理   随心听，随心看，Muse，爱趣听   1. 座椅管理   主副驾座椅位置，主副驾按摩开关，主副驾按摩模式，主副驾按摩强度（仅CX821）   1. 设置管理   分屏，熄屏，媒体音量，提示音量，语音音量，电话音量，手机私密模式，驾驶模式，音区，定时，闹铃音，蓝牙连接，无线连接 |
| Source | | N/A |
| ASIL Class | | N/A |
| Resource Consumption | Flash | N/A |
| RAM | N/A |
| EEPROM | N/A |
| CPU | N/A |

### COMP\_04: Card Terminator

|  |  |  |
| --- | --- | --- |
| ID | | MODECARD\_COMP\_04 |
| Layer | | Mode Card Component Layer |
| Responsibility | | Card Terminator Component |
| Req Allocation | | 1. 手动停止卡片 2. 语音停止卡片 3. 条件触发退出卡片 |
| Source | | N/A |
| ASIL Class | | N/A |
| Resource Consumption | Flash | N/A |
| RAM | N/A |
| EEPROM | N/A |
| CPU | N/A |

### COMP\_05: Card Management

|  |  |  |
| --- | --- | --- |
| ID | | MODECARD\_COMP\_05 |
| Layer | | Mode Card Component Layer |
| Responsibility | | Card Management Component |
| Req Allocation | | 1. 生成一个卡片实体 2. 设置卡片名称 3. 设置卡片运行触发器（运行方式，运行触发条件，运行周期，运行前询问） 4. 设置卡片执行器 5. 设置卡片终止器 6. 保存卡片配置 7. 查询卡片配置 8. 重置卡片配置 9. 删除卡片 10. 卡片运作状态 |
| Source | | N/A |
| ASIL Class | | N/A |
| Resource Consumption | Flash | N/A |
| RAM | N/A |
| EEPROM | N/A |
| CPU | N/A |

## Software Dynamic Architecture



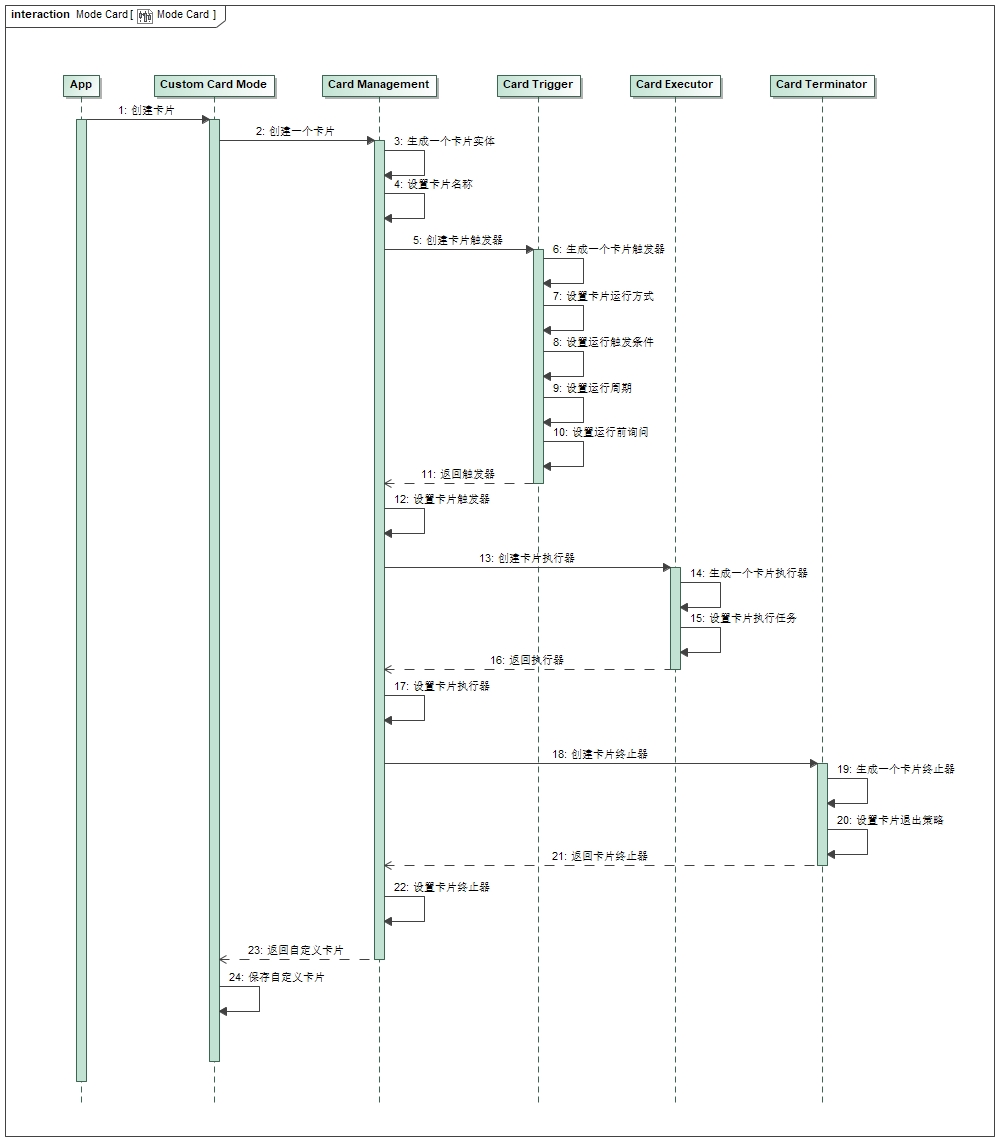
### Function



#### Create a custom Card Mode

Create a custom Card Mode

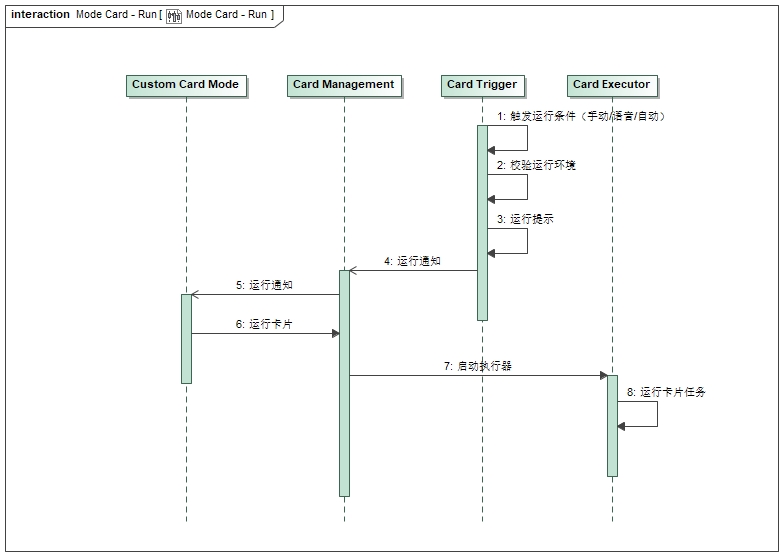
|  |  |
| --- | --- |
| DemoMode\_Sequence\_01 | Functions  Create a custom Card Mode |
| Operation outline  操作概要 | 1. 创建一个空白卡片 2. 设置卡片名称 3. 设置卡片运行方式 4. 设置运行触发条件 5. 设置运行周期 6. 设置运行前询问 7. 设置运行任务 8. 设置终止方式 9. 保存卡片 |



#### Run a Card Mode

Run a Card Mode

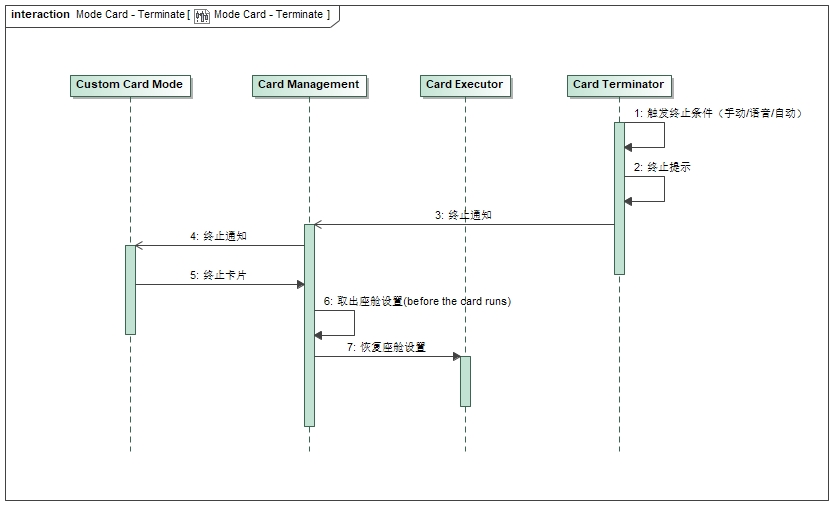
|  |  |
| --- | --- |
| DemoMode\_Sequence\_01 | Functions  Create a custom Card Mode |
| Operation outline  操作概要 | 1. 触发运行条件 2. 运行环境校验 3. 运行提示 4. 运行Card Mode 5. 执行卡片任务 |



#### Terminate a Card Mode

Terminate a Card Mode

|  |  |
| --- | --- |
| DemoMode\_Sequence\_01 | Functions  Create a custom Card Mode |
| Operation outline  操作概要 | 1. 触发终止条件 2. 终止提示 3. 终止Card Mode 4. 恢复座舱设置 |





### Safety Mechanism\_ASIL

N/A

# Detailed Interface

## Component Interface

## 4.2 Hardware – Software Interface

N/A

# Software control Strategy

## Time Constrains Design and Estimation



## Task Management

N/A

*I*

## Interrupt Service Routines

N/A

## Initialization Processing

## Watch Dog

N/A

## Shared Resources

N/A

# Resource Estimation

## Memory Size Estimation

## CPU Load Estimation CPU