Increased Customer Demand for SW Solutions

Provide Valued Software, Support & Professional Engineering Services, Competitively
What are Professional Engineering Services

• **Customer Specific, Consulting and Custom Engineering Services**
  - Extend Freescale’s Pre-Built Software IP
  - Execute Custom SW Development, Porting/Migration, etc.,

• **Service Specific Business Models: Time & Materials, Level Effort or Fixed Price**

• **Focused on Software Solutions for Freescale’s Silicon**

• **Engagement Process: Requirements Gathering, SOW Development & Project Execution**
Professional Engineering Service Team Profile

- **Project Managers, Solution Architects, Tech Leads**
  - Embedded, AUTOSAR & Linux Competency

- **Global Resource Staffing Capability**
  - Freescale Engineering Resources & Proven Outsource Partner Network
  - Service Presence in Austin, TX - Novi, MI – Munich

- **Project Based Business Model vs. Staff Supplementation**
  - Focused on Freescale’s Enablement/Production Software & Custom Development

- **Long, Successful Track Record of On-time, On-Budget Execution**
Automotive Market Focus

Automotive Embedded Systems Software & Hardware Domain Competency

Chassis & Safety

- Braking (electronic / hydraulic)
- Driver Assistance Systems
- Vehicle Stability
- Airbag Control

Powertrain

- Engine Systems
- Transmission
- Fuel Supply

Instrument Panels / Displays

- Instrument Clusters
- Center Stack Information Display
- Heads-up Display

Body and Security

- Body Control Systems
- Gateway Modules
- Active and Passive Entry Systems
- Seat Control Modules
- Tire Information Systems
- Climate Control
- Power Liftgate and Door Modules

Infotainment / Telematics

- Radios
- Integrated Navigation Systems
- Multimedia & Rear Seat Entertainment
Professional Engineering Service’s Primary Focus

- **Embedded Systems, Linux and AUTOSAR Technical Competency**

- **Service Offerings**
  - System Consulting
  - Requirements Gathering
  - Design Services (Software & Hardware)
  - Solution Integration
  - Custom Development
  - Porting/Migration
  - Performance Analysis & Optimization
  - Testing
  - Custom Linux Distributions

- **Trusted Partner w/ Global Presence**
NXP Development & Quality Methodologies, Engineering Discipline

- Requirements Gathering
- Project Assessments
- IP Selection

- Design Consulting
- System Consulting
- Architecture

- Custom Development
- Porting / Migration
- Integration

- Testing
- Documentation
- Performance Testing
- Performance Optimization

- Knowledge Transfer
- Project Specific Support (3rd Level)
- Maintenance
- Performance Tuning

Quality Assurance (ISO, CMMI & SPICE Level III)
Case Histories
Automotive Tier One

Automotive Infotainment System
Services included: Linux BSP customization, modified to meet automotive standards.
i.MX Automotive Infotainment System

• **System Architecture**
  - i.MX6x based SoC
  - High level of integration
  - LCD / Touchscreen
  - Audio
  - Wi-Fi
  - USB
  - Bluetooth

• **Solutions and services provided**
  - Complete BSP and root file system
  - High level consulting
  - Hardware schematics review
  - File system requirements and layout
  - Production level verification
  - Support and maintenance
i.MX Automotive Infotainment System

- **Deliverables**
  - **Target Specific Board Support Package**
    - Complete BSP layer including bootloader and customized kernel
    - Fast-boot optimization and other acceleration solution
    - Runtime environment to support infotainment application
    - Integrated middleware stack built from existing open source components
    - File system layout and selection
    - Media framework with Audio routing for multiple sources
    - Automotive specific system requirements (rear camera display)
  - **Testing**
    - Production quality test suite
    - Testing to application specific requirements and use cases

- **Business Model**: Project Fixed Fee, Support
- **Result**: On-going program
Automotive Tier One

Instrument Cluster

Customer application specific Linux development, testing, and consulting
i.MX51 Automotive Cluster

• System Architecture
  - i.MX51 based SoC
  - High level of integration
  - LCD

• Solutions and services provided
  - High level consulting
  - Hardware schematics review
  - File system requirements and layout
i.MX51 Automotive Cluster

• **Deliverables**
  - i.MX51 BSP Fast Boot
    ▪ System Architecture
    ▪ Patches to provide fast boot capability to bootloader and kernel
    ▪ Ability to begin execution of a user space application in 460ms
  - Custom re-flash application
  - Custom LIN driver over UART

• **Business Model**: Project Fixed Fee and Support

• **Result**: Customer integrating production solution
Antilock Braking System – 13 years of Service!

Custom software development of low level drivers, custom boot loader with PC based flash download tool.
Download System and Low Level Drivers

• **System Architecture**
  - Family of custom microcontrollers that use the Power Architecture™ CPUs for automotive braking applications. Family implements a redundant system to provide error detection capabilities for Electronic Stability Control (ESC or ESP) systems

• **Solutions and services provided**
  - Bootloader development
  - Download tool development
  - Download system verification
  - Low level driver development and verification
  - FlexRay in vehicle download integration consulting
Download System and Low Level Drivers

• **Deliverables**
  - Custom MCU Bootloader
    - Robust bootloader with ECC error detection capability, flash algorithm download, extended error reporting, history logging, multiple custom peripheral configuration support, re-entry capability from application without system reset
    - Download communication support for K-Line, CAN and FlexRay
  - Custom MCU Download Tool
    - Windows based application for download support through K-Line, CAN and FlexRay
    - Flash algorithm support
    - Low Level Drivers
    - Full peripheral support

• **Business Model**: Project Fixed Fee and Support

• **Result**: Full production and in-vehicle download system using CAN, K-Line and FlexRay. Full hardware abstraction layer and application ready drivers. Providing Services for next generation Quasar platform.
Electronic Body Controls/Smart Junction Box
Automotive Model Based Design Engineering Services

• **System Architecture**
  - Coordinate work requirements between customer and our offshore team
  - Manage all work product review with direct customer and OEM
  - Managed delivery of all models to customer and their OEM customer

• **Solutions and services provided**
  - Model Based Engineering Services Provider
  - Management of Product Development to customer delivery schedule
  - Delivery of production work product to customer
Automotive Model Based Design Engineering Services

• **Deliverables**
  - Controls Models Developed in MATLAB/Simulink based on Body Control Module Requirements
    - Executable models in Simulink environment
    - Validation test suite and validation report showing models meet functional requirements and test coverage meets safety requirements.
    - Streamline automatic code generation process

• **Business Model:** Time & Materials, Warranty 30 days

• **Result:** Developed 85%+ of customer body control application, models, & source code
AUTOSAR customized Complex Drivers for i.MX6
Custom AUTOSAR Development for ADAS system using i.MX6 including Ethernet, SATA, and Audio Complex Driver.
Custom AUTOSAR SW Complex Driver Engineering Services

• **System Architecture**
  - Coordinate work requirements between customer and our offshore team
  - Manage all work product review with direct customer
  - Managed delivery of all complex driver to customer

• **Solutions and services provided**
  - AUTOSAR Custom Solution SW Services Provider
  - Management of Product Development to customer delivery schedule
  - Delivery of production work product to customer
Customer AUTOSAR SW Complex Driver Engineering Services

• **Deliverables**
  - Custom MCAL and Complex Drivers based on AUTOSAR 4.0 Requirements
    ▪ Configurable Drivers through EB Tresos environment
    ▪ User Manual, Interface Manual, and Test Application Example
    ▪ Validation test suite and validation report showing drivers meet functional requirements.

• **Business Model:** Fixed Fee and Extended Support

• **Result:** Developed 100%+ of customer required i.MX6 Custom AUTOSAR MCAL and Complex Drivers.
Automotive Tier One and OEM

Display Controller Unit HW and SW Design for 8-bit MCU

Custom Display Controller Unit Hardware and Software design and development
Custom Display Controller Unit HW/SW Engineering Services

• System Architecture
  – Coordinate work requirements between customer and our offshore team
  – Manage all work product review with direct customer and OEM
  – Managed delivery of HW Samples and SW simple executive and all drivers to customer and their OEM customer

• Solutions and services provided
  – Custom Solution HW/SW Services Provider
  – Management of Product Development to customer delivery schedule
  – Delivery of production work product to customer
Custom Display Controller Unit HW/SW Engineering Services

• **Deliverables**
  - HW architecture and design based on Module Requirements
    - Schematic design and creating BOM using OrCAD Capture
    - PCB Layout drawing, Routing, and Gerber files using Cadence Allegro
    - PCB Fabrication and Assembly
  - SW architecture and design based on Customer Requirements
    - Requirements, design, coding, and testing using CMM process
    - Develop Custom Inter-process Communication Bus Master driver

• **Business Model**: Time & Materials, Support 30 days

• **Result**: Developed 100%+ of customer Drivers, Executive, and Application source code
Hybrid and Motor Control Modules for Hybrid Dual Power Inverter System

Software Driver and API Development using MCAL for 32-bit Qorivva MCU. HW Design and Development of Hybrid and Motor Control modules. Motor Control Strategy Consulting
• System Architecture
  - Coordinate work requirements between customer and our offshore team
  - Manage all work product review with direct customer and OEM
  - Managed delivery of HW and SW Design to customer and their OEM customer

• Solutions and services provided
  - Custom Prototype Solution  HW/SW Services Provider
  - Management of Product Prototype Development to customer delivery schedule
  - Delivery of Product Prototype Artifacts to Customer
Hybrid and Motor Control modules HW and SW Prototype Consulting

• **Deliverables**
  - HW Prototype architecture and design based on Customer Requirements
    - Schematic design and creating BOM
    - PCB Layout and Routing
  - SW architecture and design based on Prototype Module Requirements
    - Requirements, design, coding, and testing using CMM process
    - Architecture of Motor Control Strategy

• **Business Model:** Time & Materials

• **Result:** Customer HW/SW prototype solution
Summary: Service Team’s Value

• Dedicated Project Management Focused on Entire Project
• Transfer Knowledge that Simplifies the Complex
• Fill Technical Competency Skills Gaps
• Customer can Focus on Their Core Differentiation
• Increase Customer (and Freescale’s) time to Money
• Freescale has Vested Interest in Customer’s Overall Success