Transforming HMIs in Industrial Devices Using Bluetooth

Challenge in UI Industrial HMI

- Limited space for user interface
  - Needs to be small
  - Often standardized no matter the task
  - Limited flexibility
  - Very clunky
- Typical User Interface
  - Graphic: 7 segment display
  - Basic pushbuttons for up/down/left/right
  - No User Assistance
- Operators need process/machine specific training

Environmental Challenges with Industrial Settings






- Harsh industrial working environments
  - Simple health and Safety (Trip Hazards)
  - Foreign Bodies (Salt Water, Dust, etc.)
  - Intrinsic Safety – Spark Prevention, Low temperatures, etc.

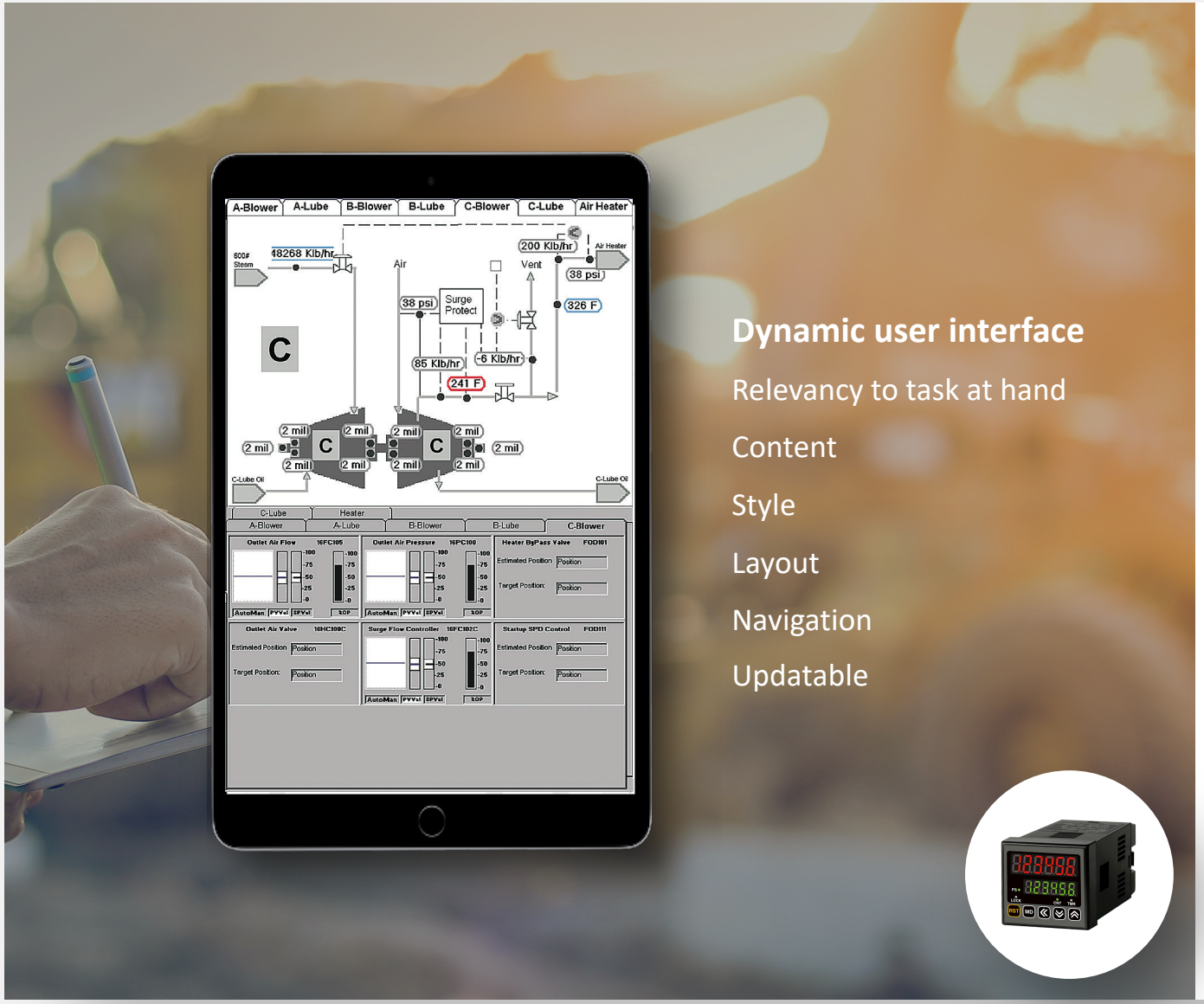
Benefits of an Effective Wireless Operator Interface

- **Measurable improvements**
  - Brings the issue directly to the operator
    - Early event awareness
    - Custom alarms
    - Location flexibility
  - Gets fast operator response
    - Operator can prioritize the responses
    - Issues raised immediately
  - Enhanced task management
    - Priority issues sent to multiple operators/supervisors
  - Tools and Interactive help
    - Checklist
    - User guides
    - Messaging services all at the operator's fingertips

Benefits of an Effective Wireless Operator Interface

- **Greater plant productivity & uptime**
  - Data on-demand, wherever you are
  - Machines are not sat idle while operators & supervisors are un-aware
  - Operators can perform multiple activities without worry
- **Mobility**
  - Easier operator multi-tasking
- **Safer operating environments**
  - No cords
  - No trip hazards
  - No unnecessary risk exposure

Rich User Experience



Dynamic user interface

Relevancy to task at hand

Content

Style

Layout

Navigation

Updatable

- Optimized operator task management
  - Color
  - Symbols and process connections
  - Text and numbers
- Dynamic screens
  - Surfaces only relevant information
  - Zoom into specifics
- Alerts
  - Configurable triggers
  - Audible and visual annunciation
- User Assistance
  - Pento-Walkthroughs
  - On-line guidance systems
  - Human factors design methodology

Untapping New Corporate Capabilities

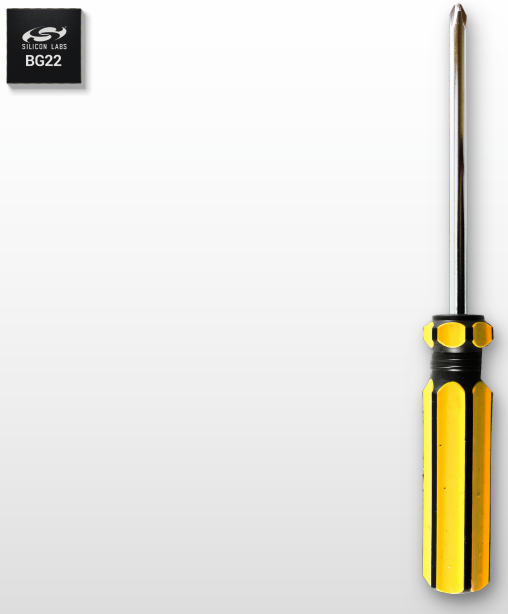
- Remote reporting
  - Current job status
  - Pre-emptive maintenance modeling
  - System health
- Remote & Centralized Equipment Management
  - Centralized oversight & operator permissions
    - Limit access to administrative powers
    - Removes need for factory floor admin access
  - Production software
    - Secure Boot – Authorized software only
    - IP protection
  - System configurations
    - Immediate parameter control
  - Security patches
    - Immediate action to known hostile threats
    - Meet IoT regulatory requirements (e.g. SB-327)

Reliability & Development Time

- Reduced mechanical failure
  - Mechanical stress and fatigue
  - Clunky controls
  - General wear and tear
- Hardening the mechanical design (ruggedization)
  - Intrinsic design
  - Expensive testing
- OTA – Always have the latest features, configs, and security

The Xpress Option

SoC



- Maximum Flexibility
- Full Bluetooth stack access
- Longest design cycles
- RF Design, Certifications, Programming

MODULES

- Potentially larger footprint and form factor
- Removes the complexity of RF Design and Certification
- Ideal for faster software focused projects with full stack access

XPRESS WIRELESS

- Hardware benefits of the module
- Pre-programmed API for those wanting to avoid developing with the stack
- Ideal option when developers only want to focus on their application but need a wireless option

Wireless Xpress BGX220 Speeds Bluetooth 5 Development

Bluetooth®

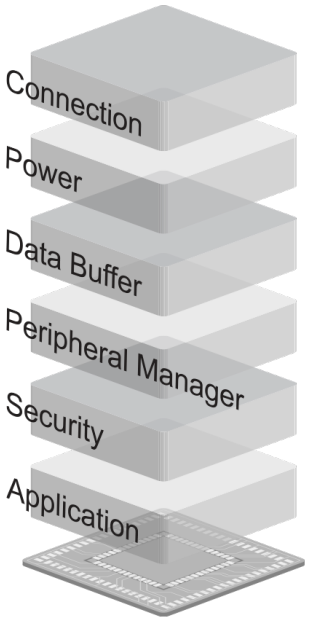
```
STREAM_MODE
REMOTE_COMMAND_MODE
> gfu 3 stdio
Success
> gdi 3 olo
Success
>
```

- Bluetooth LE
  - Bluetooth 5.2
  - 1M, 2M, and LE coded long range PHY
  - LE Secure connections and privacy
  - Custom Bluetooth service for data streaming
  - Connects to phones, tablets, and other BGX220 devices
- Interface
  - UART-to-Bluetooth data interface
  - I2C master support
  - Xpress Command API for configuration and control
  - Additional pins for connection state control
  - Configurable BLE performance, GPIO and status LEDs
- Mobile app libraries
  - BGX Commander available for iOS and Android
  - Source code libraries simplify mobile app development

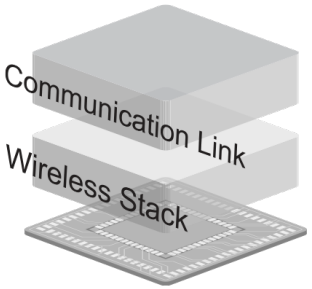
Xpress Simplifies Software

Offload Embedded Host Processing

Traditional Network Co-Processor's

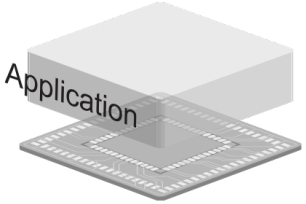


Host MCU

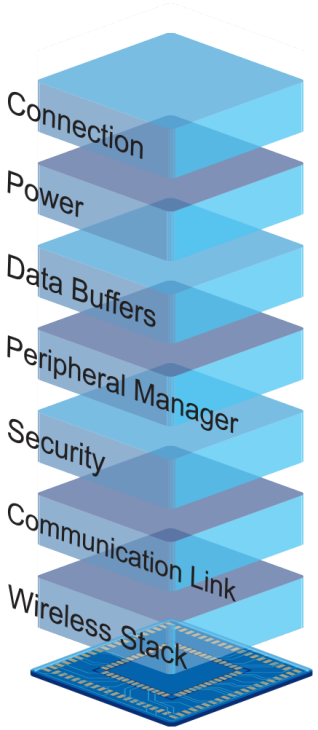


NCP

Wireless Xpress Network Co-Processor's

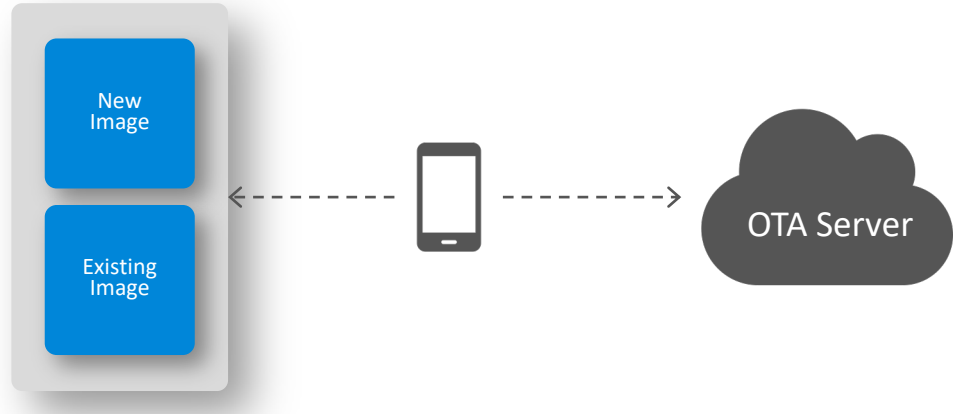


Host MCU



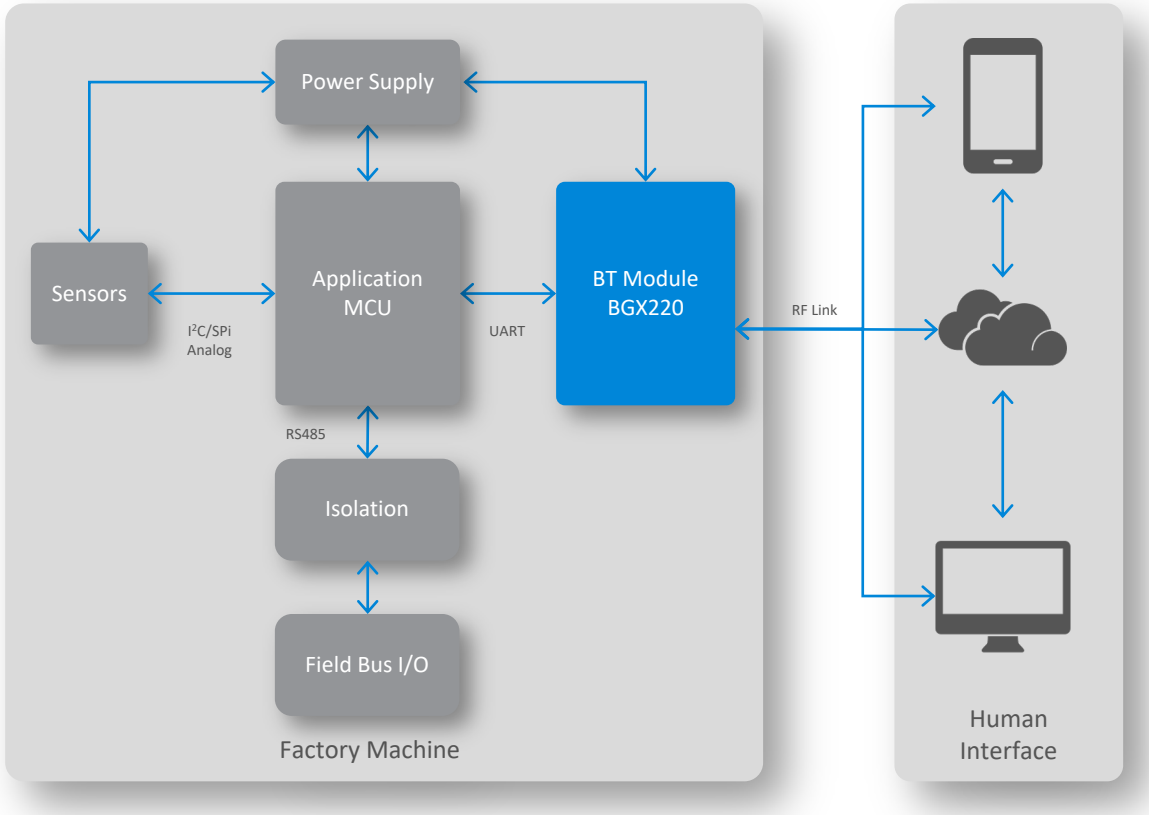
Wireless Xpress NCP

Xpress is Firmware Upgradable



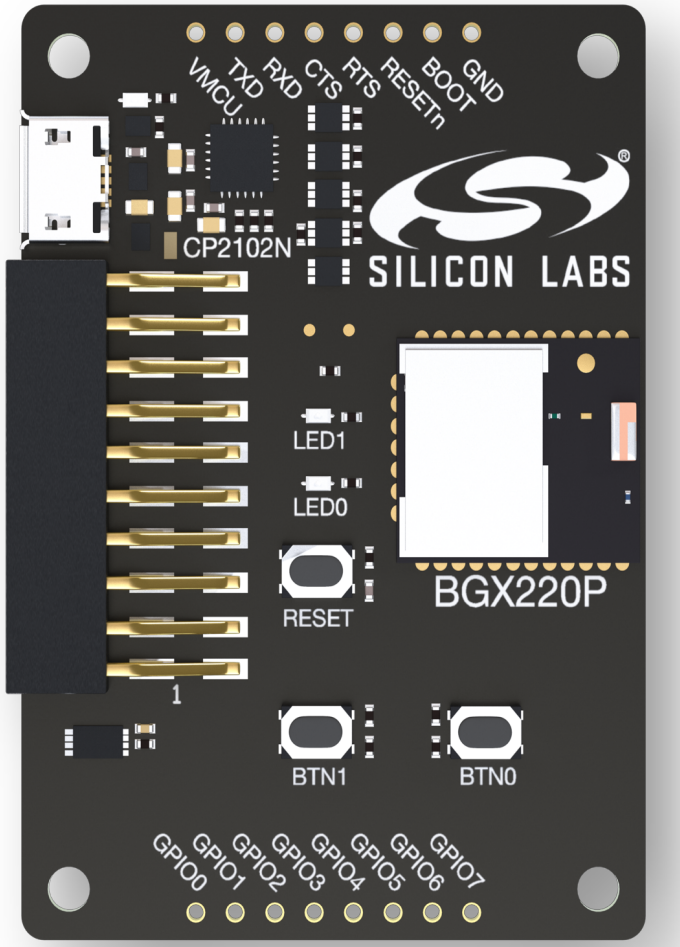
- How OTA Updates Work
  - Bluetooth devices leverage Xpress mobile app
  - Wireless Xpress devices only run signed and encrypted firmware images
  - Signed, encrypted Bluetooth Xpress images also available through serial update, as a second option

HMI with Bluetooth Xpress Block Diagram and Cost Savings



- Cost savings
  - BGX220 can provide 55% cost savings compared to an isolated serial port in bill of material
- BGX220
  - Simple alternative to serial interface
  - Pre-certified and pre-programmed
  - Module expedites time-to-market & simplifies the product design
  - Small form factor SiP package (6x6 mm)
    - Ensures all space-constrained designs can be equipped with Bluetooth
    - Wireless connectivity

Summary



- Bluetooth Wireless HMI will
  - Allow for more intuitive user interfaces
    - Reducing training costs
    - Enhancing operator productivity
  - Improve reliability by removing physical connectors
  - Simplify design
  - Improve operator safety
  - Enable remote management and oversight
- BGX220
  - Makes integrating Bluetooth easier than other solutions
  - Provide significant cost savings in bill of materials over alternative options