MODULAR SOLUTIONS FOR ELECTRIC VEHICLE CHARGING STATIONS & RENEWABLE ENERGY PRODUCTION

RON SINGH, EMEA SALES DIR. – DIGI INTL

ELECTRIC VEHICLE CHARGING STATION MARKET: MARKET DYNAMICS

Rising EV Sales Worldwide
Govt Policies & Subsidies
Increased Global Awareness & Concern of Environmental Pollution
Increasing Vehicle Range Between Charges

Lack Of Standardisation In Charging Infrastructure
Primitive Power Grid Infrastructure (Renewables vs Fossil Fuels)

Use of Vehicle-To-Grid EV Charging Stations
EV Charging Stations Powered By Renewable Sources

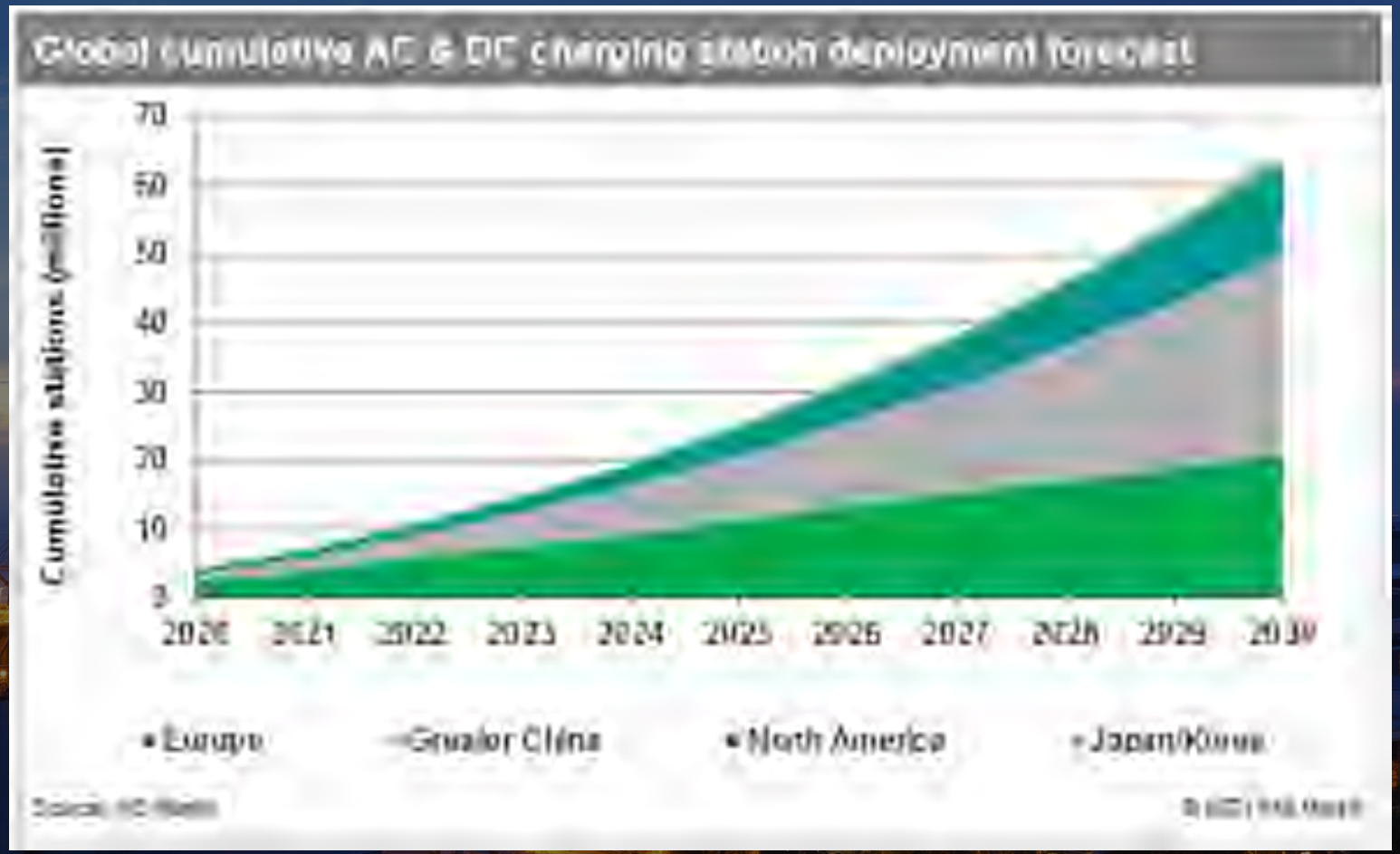
High Initial Costs Of EV's vs ICE Vehicles
Stringent Rules For EV Charging Station Installation

EV CHARGING INFRASTRUCTURE FORECAST

Domestic Charging Is Preferred Mode

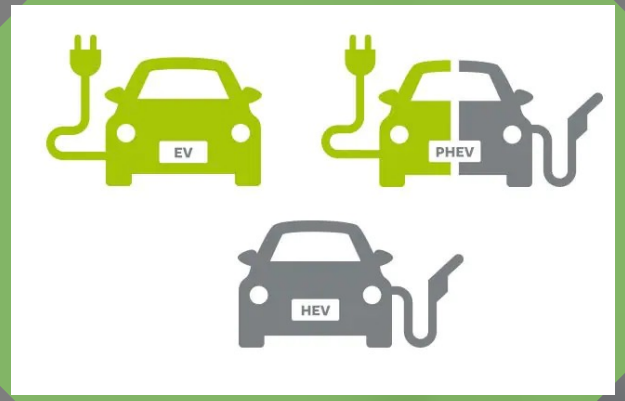
Global Deployment @ 66M units by 2030

Europe Home Deployments @ 20M households by 2030

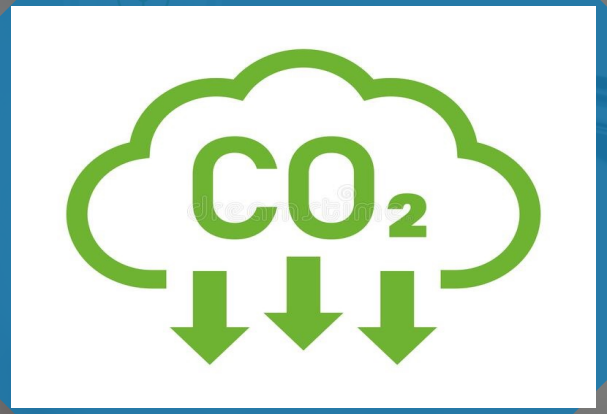


RUGBY (UK) MOTO SERVICES

MARKET TOUCH POINTS



VEHICLE TYPE SEGMENTATION



REDUCING CO2 EMISSIONS GOALS

END USER MIGRATION

EV CHARGER TYPES

Public charger

7.4–22
kW

Time to add 32 km:
15
minutes

EV CHARGING³
THE POWER OF THREE

First fast charger infrastructure

50
kW

Time to add 32 km:
7
minutes

EV CHARGING³
THE POWER OF THREE

Ultra fast charger

175
kW

Time to add 32 km:
3
minutes

EV CHARGING³
THE POWER OF THREE

Domestic charger

3.7–7.4
kW

Time to add 32 km:
91
minutes

EV CHARGING³
THE POWER OF THREE

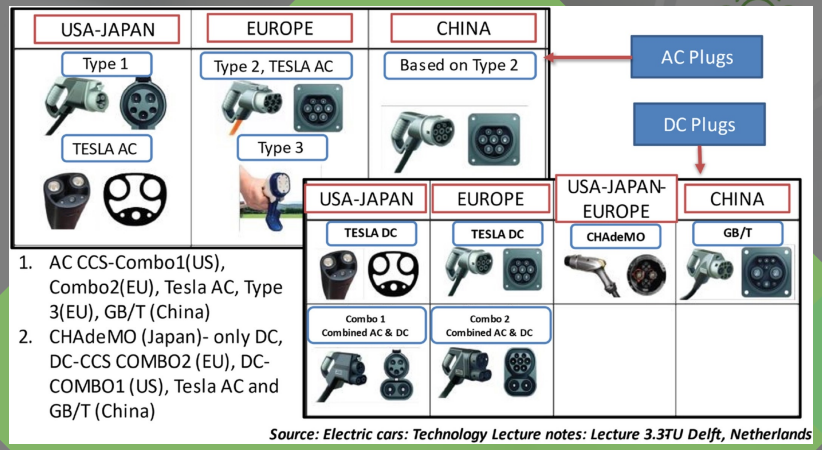
HPC

Up to
350
kW

Time to add 32 km:
1
minutes

EV CHARGING³
THE POWER OF THREE

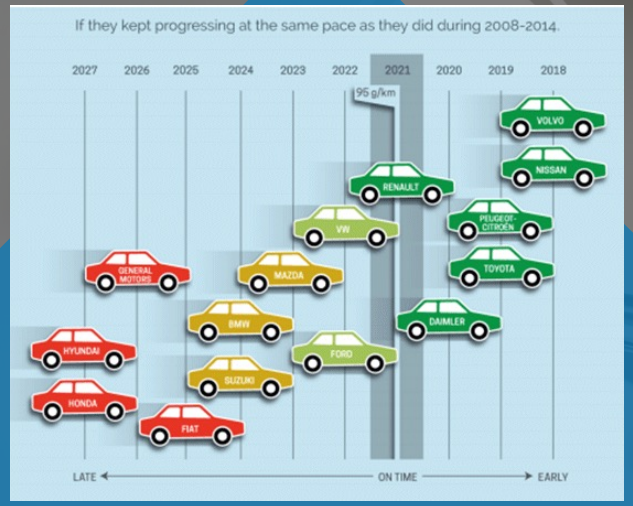
CONSTRAINTS



1. AC CCS-Combo1(US), Combo2(EU), Tesla AC, Type 3(EU), GB/T (China)
2. CHAdeMO (Japan)- only DC, DC-CCS COMBO2 (EU), DC-COMBO1 (US), Tesla AC and GB/T (China)

Source: Electric cars: Technology Lecture notes: Lecture 3.3TU Delft, Netherlands

LACK OF CHARGING STANDARDISATION



NEED FOR LONGER RANGE EV'S

CHARGING CAPACITY SUPPLY

CHARGING STATION TYPES

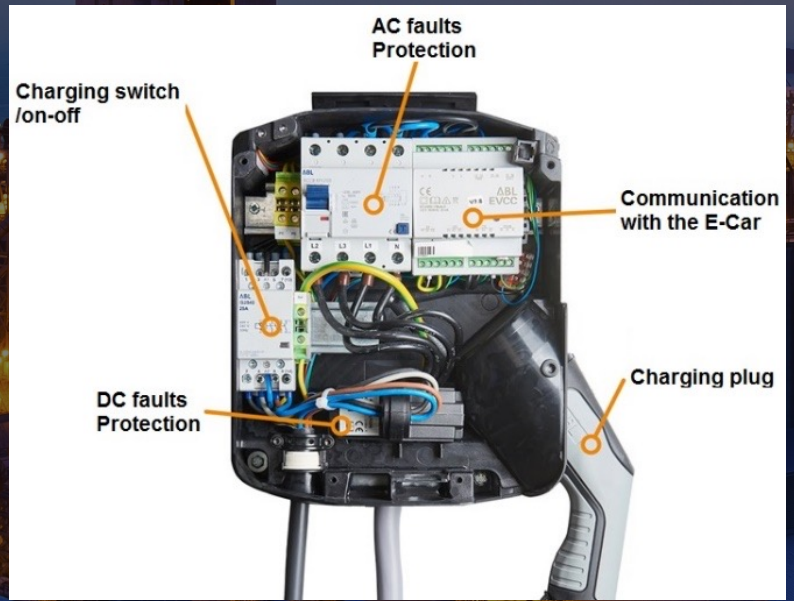
Simple E-Car Charger

Charger connected to the home power network

Box with power converter & fuses for simple plug and charge

Current charge status visible only at car

No possibility of self-charge management during the cheapest electricity time (some contracts use the different price at different daytime – cheaper at night)



Intelligent E-Car Charger

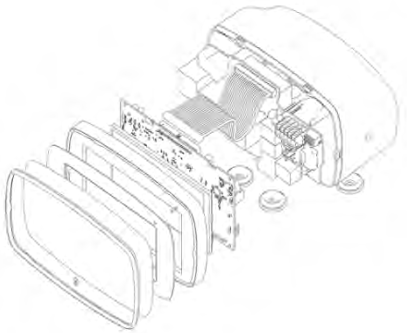
Charger box which can be connected to public / company power networks

Possible GSM connection to a central control or smart-phone

Possible Wi-Fi connectivity to residential network

Intelligent charging management: time, source (e.g. solar power) etc.

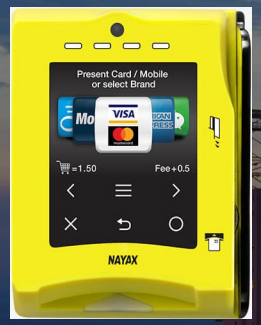
RFID reader or NFC credit-card payment terminal



INTELLIGENT E-CAR CHARGING STATION

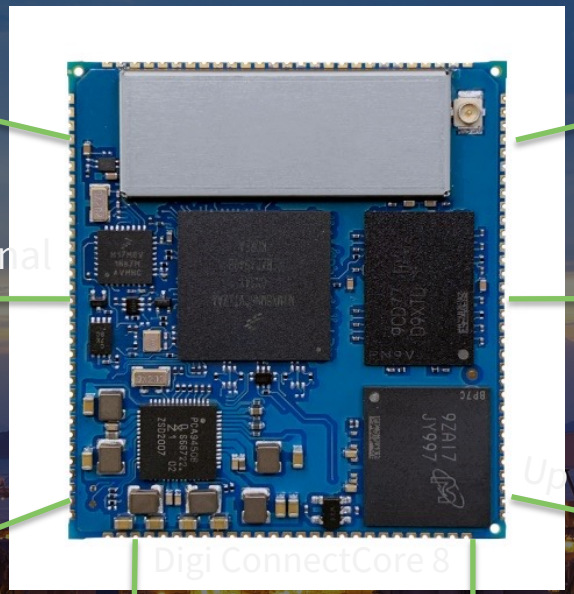
INTELLIGENT E-CAR CHARGING STATION

LCD Interface



UART/ SPI/ LAN for Payment Terminal

UART/USB/SPI



CAN Interface

Secure Element

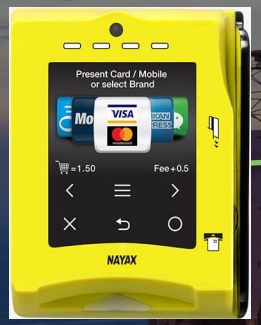
DIGI Yocto /Android: Cellular Support

Pre-certified WLAN 802.11a/b/g/n/ac
& Bluetooth 5.0

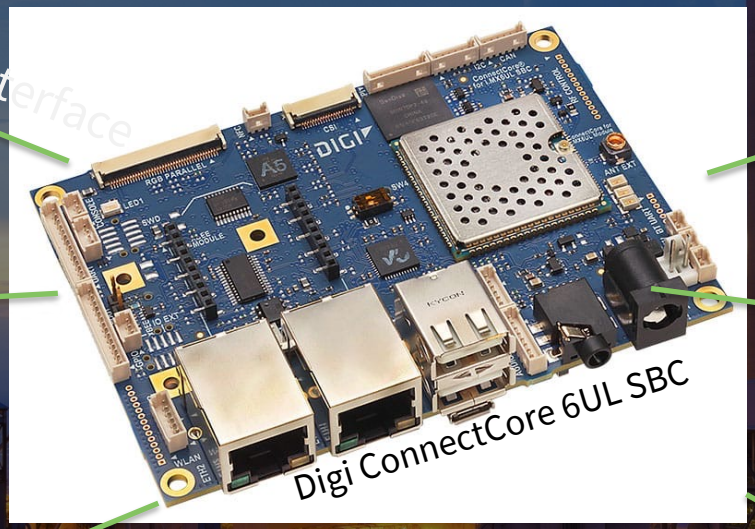
Up to 4x Cortex®-A53 Cores @ 1.4 GHz

INTELLIGENT E-CAR CHARGING STATION

LVDS & 24bit LCD Interface



LAN /USB



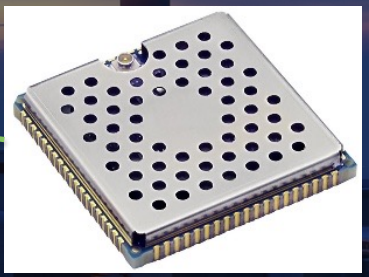
Digi ConnectCore 6UL SBC

USB RFID Reader

DIGI Yocto /Android: Cellular

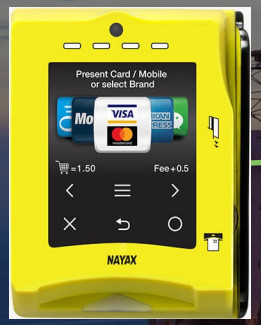
Support PCI-Express Slot

NXP i.MX6UL-2, Cortex-A7 @ 528 MHz



Pre-certified 802.11a/b/g/n/ac & Bluetooth® 5

INTELLIGENT E-CAR CHARGING STATION



DIGI EMBEDDED YOCTO PLATFORM

DIGI YOCTO USER SPACE

DIGI PLATFORM SUPPORT

DIGI SOFTWARE EXTENSIONS

GRAPHICAL HARDWARE ACCELERATION

DIGI LINUX KERNEL

DIGI PLATFORM SUPPORT

DIGI U-BOOT

DIGI PLATFORM SUPPORT

PRE-COMPILED IMAGES FOR ALL SUPPORTED PLATFORMS

DIGI QUALITY APPROVED

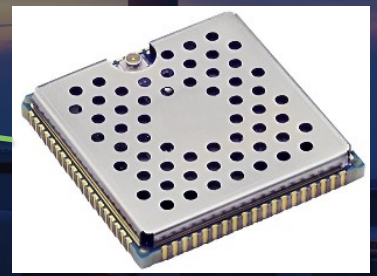
ONLINE DOCUMENTATION

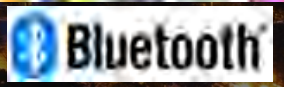
DEVELOPMENT TOOLS

PRE-COMPILED SDKS INCLUDING TOOLCHAINS

BUILD YOUR OWN CUSTOM SDKS

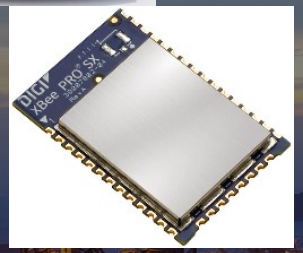
USE GRAPHICAL IDE ECLIPSE OR IT CREATOR





INTELLIGENT E-CAR CHARGING STATION

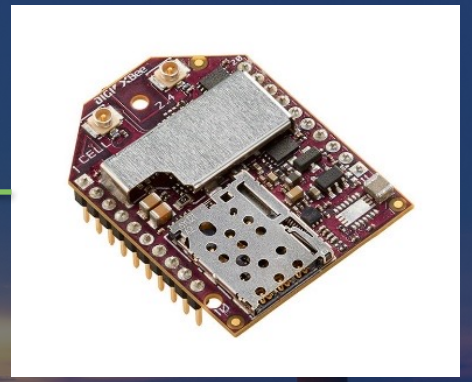
Digi XBee® 3
DigiMesh®, Zigbee, 802.15.4



Digi Xbee LR
868 MHz, 900 MHz

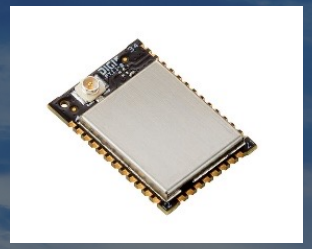
Digi Xbee Gateway
ZigBee to LAN or Cellular
Connectivity

NB-IoT/ LTE-M
Connectivity

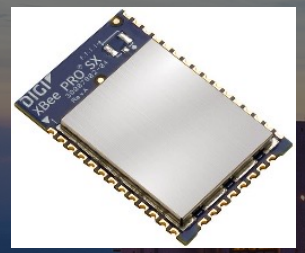


LTE Remote Access &
Management Connectivity

TRACKING SOLUTIONS FOR SOLAR PANEL FARMS



Digi XBee® 3
DigiMesh®, Zigbee, 802.15.4

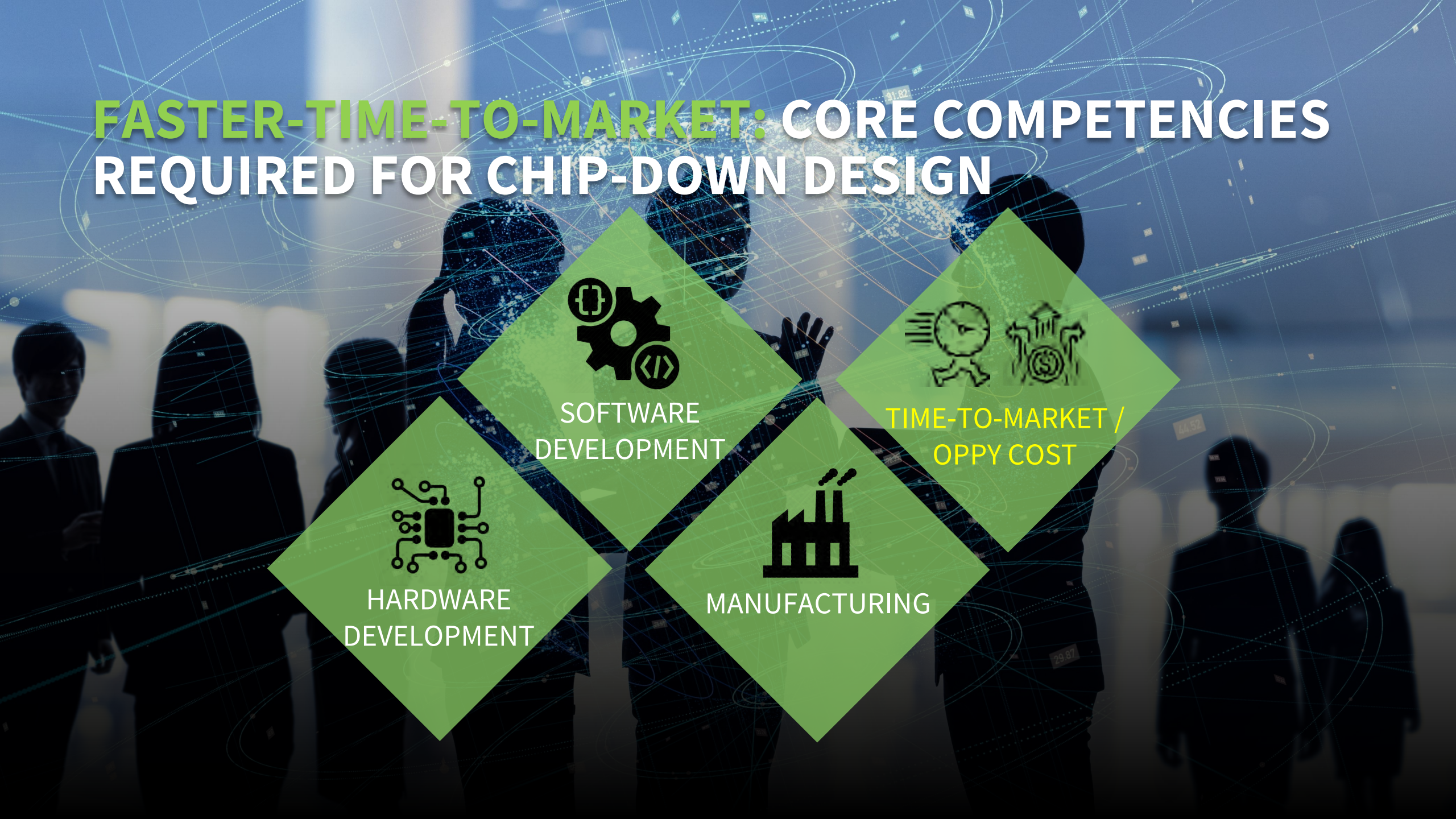


Digi Xbee LR
868 MHz, 900 MHz

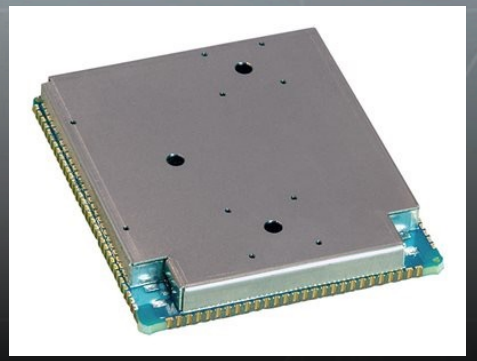
Digi Xbee Gateway
ZigBee to LAN or Cellular
Connectivity

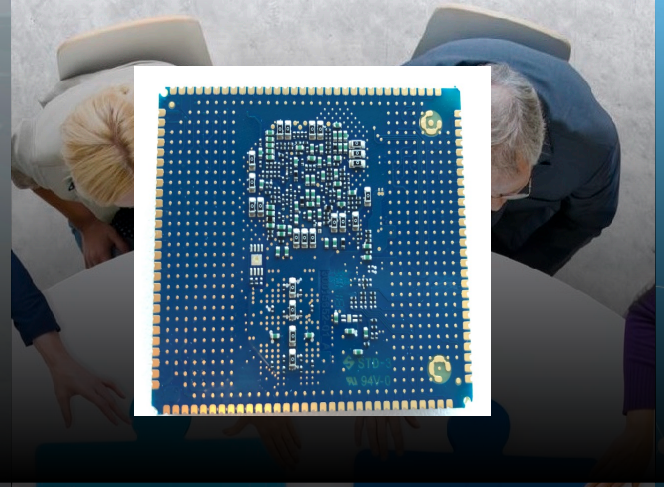
FASTER-TIME-TO-MARKET: SELECTING MODULAR OVER COMPONENT DESIGN

FASTER-TIME-TO-MARKET: CORE COMPETENCIES REQUIRED FOR CHIP-DOWN DESIGN



BUILD VS BUY: IT'S SHEER COMPONENT COUNT!





CORE

Main MPU
Security Element
Administrator MCU
Memories & Radios

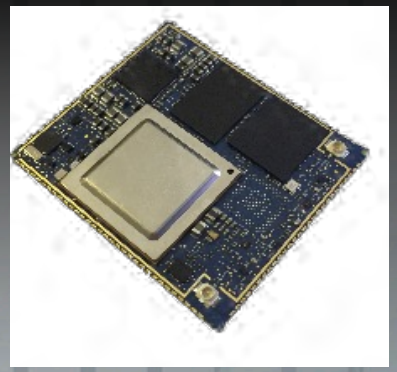
ANCILLARY

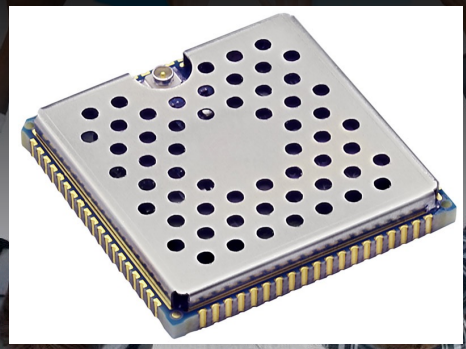
PMIC & Power
Filters, Multiplexers & Signal Chain
Diodes, Crystals / Clocks & Passives

COUNT

An i.MX6UL-based SOM = 230 comps

An iMX.8X-based SOM = 440 components



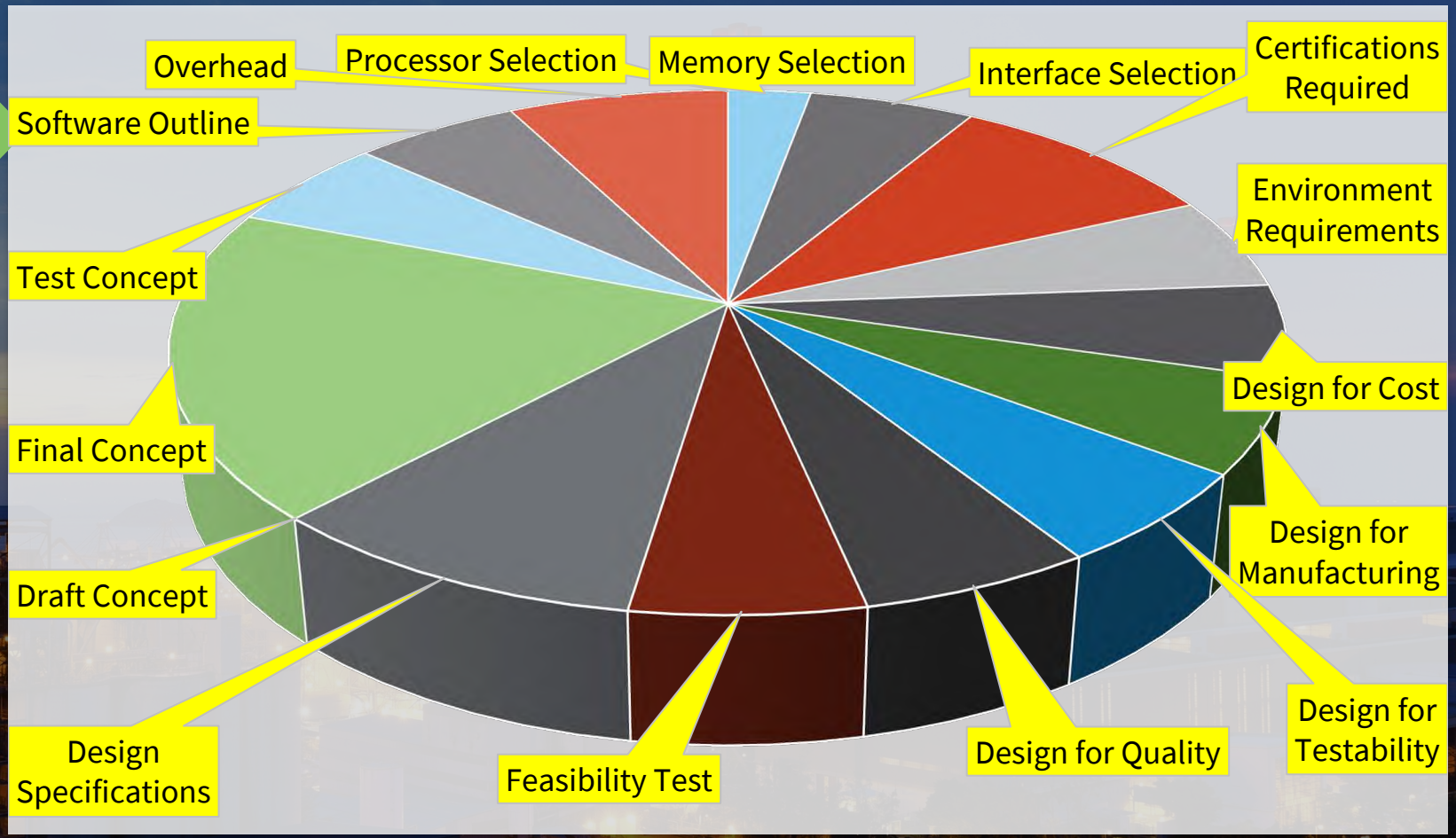


BEAT YOUR COMPETITION: TIME SAVINGS ADD UP

Hardware & Software Definition

Save$ & Simplify PCB Design for Manufacture

Time to Market, Development Cost, Risk

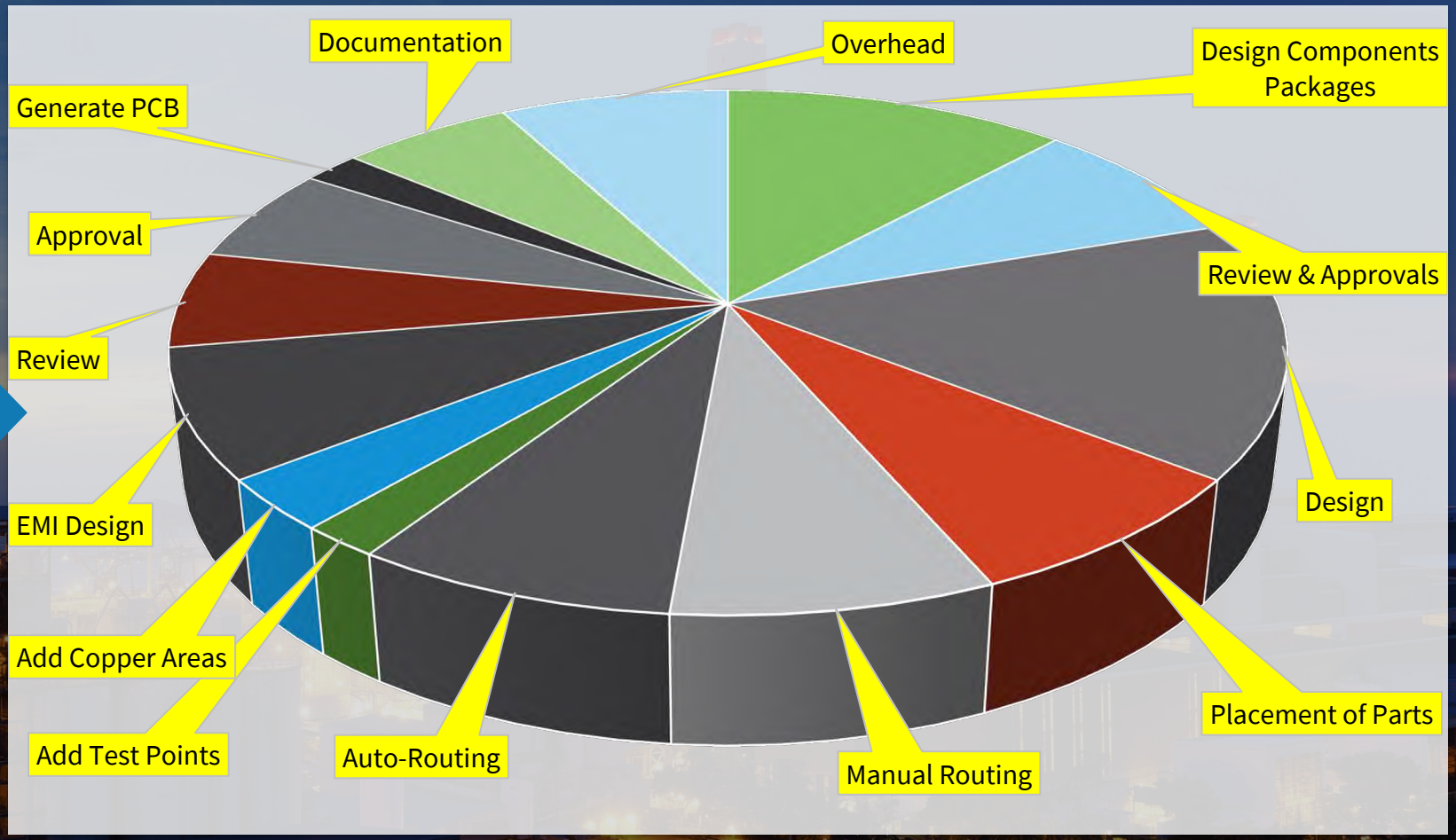


BEAT YOUR COMPETITION: TIME SAVINGS ADD UP

Hardware & Software Definition

Save$ & Simplify PCB Design for Manufacture

Time to Market, Development Cost, Risk

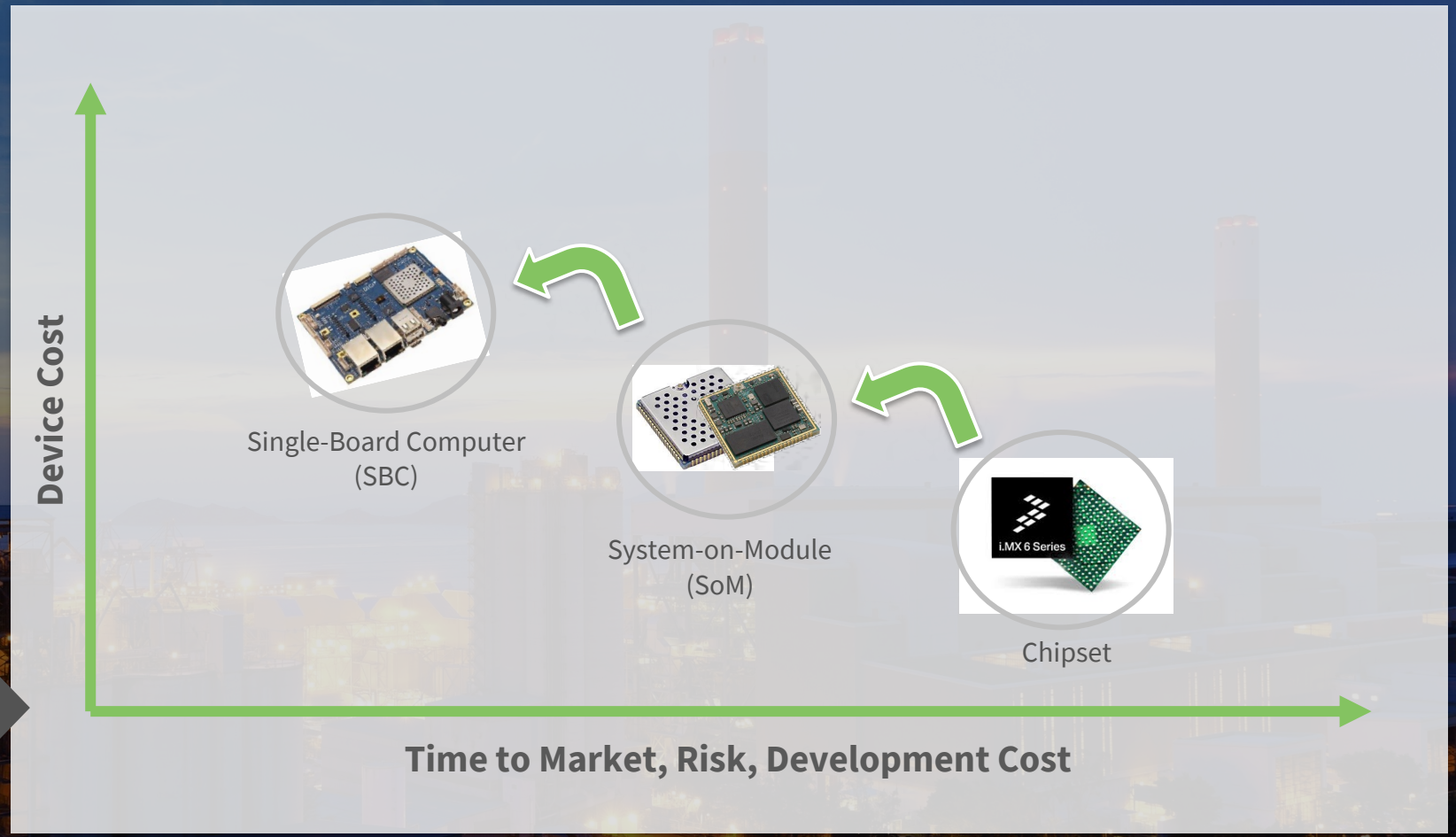


BEAT YOUR COMPETITION: TIME SAVINGS ADD UP

Hardware & Software Definition

Save$ & Simplify PCB Design for Manufacture

Time to Market, Development Cost, Risk



BEAT YOUR COMPETITION: SOFTWARE TIME SAVINGS

- Module BSP = Comprehensive S/W Driver Libraries
- Module BSP = Validated ✓
- Application S/W Creation @ Day One = Parallel Engineering Development
- Performance Testing

FASTER-TIME-TO-MARKET: WIRELESS APPROVALS & CERTIFICATIONS

CAN YOU AMORTISE THE COST ACROSS YOUR VOLUME?

- FCC/ETSI/RED Approvals = $50K to $100K
- Bluetooth SIG = $20K to $30K

FASTER-TIME-TO-MARKET: WIRELESS APPROVALS & CERTIFICATIONS

CAN YOU AMORTISE THE COST ACROSS YOUR VOLUME?

- FCC/ETSI/RED Approvals = $50K to $100K
- Bluetooth SIG = $20K to $30K

Type of Design	Certification	Approx. Cost	Time (weeks)
ATT-certified Cellular module	Cellular and FCC Unintentional Radiator	@$25K	8
	Bluetooth FCC and SIG	@$10K	10
	Europe RED	@$15K	8
Module design w/BTLE	USA EU Canada combined	@$35K	16
Hi Power sub-GHz Module	USA and Canada	@$10K	8
Single radio sub-GHZ Module	Europe	@$15K	8

MAINTAIN YOUR LEAD: RISK MINIMIZATION

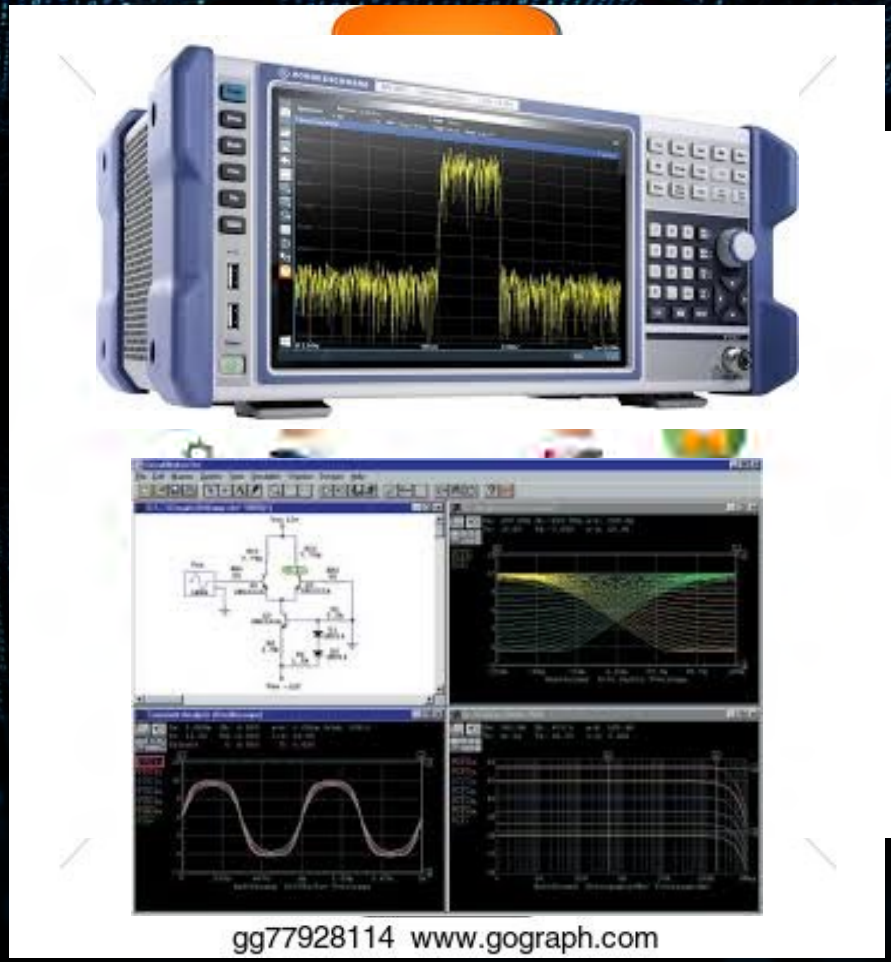
UPGRADEABILITY = STAYING RELEVANT

MODULAR FLEXIBILTY

REDUCING RISK = TIME & COST

MAINTAIN YOUR LEAD: INTEREST ON INVESTMENTS

- Economies of Scale
- Consolidating Your Demand
- Equipment Cost & Maintenance



MODULE IOT DEVICE SECURITY

There is a cost consideration for the implementation AND maintenance of a security platform for your product and potential liabilities that you cannot ignore!

DIGI'S MODULAR OFFERING

To **simplify** and **accelerate** the development, deployment and management of secure, connected products so customers can **save time, money, risk** and **focus on their core competency** instead of embedded wireless design complexity

ConnectCore®

Intelligent, Secure, Connected System-on-Modules

+

XBee®

Simple, Flexible, Secure Wireless Connectivity

DIGI ConnectCore® IS HARDWARE-ENABLED, SOFTWARE-DEFINED

CLOUD INTEGRATION

Azure

aws

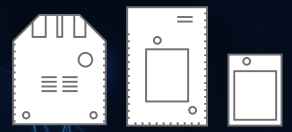
DEVICE MANAGEMENT

Digi Remote Manager®

CONNECTIVITY

Wi Fi™

Bluetooth®



DIGI XBee

Zigbee

DigiMesh®

Lte Cat-1 LTE-M NB-IoT

868 MHZ

900 MHZ

SOFTWARE & TOOLS

yocto PROJECT

android

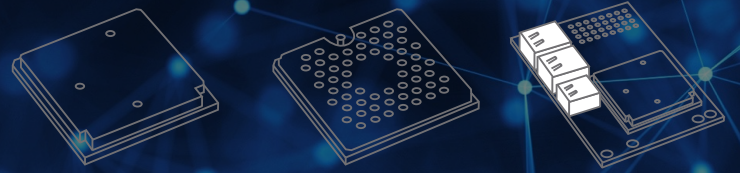
SmartIOMux

Digi XCTU

DIGI TRUSTFENCE

Digi Microcontroller Assist™

EMBEDDED SOMs



arm

NXP PARTNER

SUPPORT & DESIGN SERVICES

Global Technical Support

Design Services

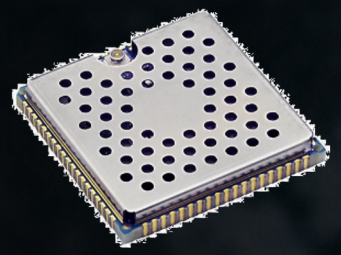
Development

Certifications

Manufacturing

ConnectCore® THE MOST COMPLETE, HIGHLY INTEGRATED NXP I.MX-BASED SOMS FOR INDUSTRIAL & MEDICAL APPLICATIONS

- Scalable
- Integrated
- Complete SW
- Connected
- Secure



Industrial Grade
10+ Year Longevity

DIGI ConnectCore® PORTFOLIO

Price

Features / Performance

ConnectCore® MP133
STM32MP133C
1 x Cortex-A7 @ 650MHz
128 MB – 1 GB Flash (NAND)
128 MB – 1GB RAM (DDR3L)
2xGbE, Camera, no LCD

In Development

ConnectCore® 6UL
NXP i.MX6UL
Cortex-A7 @ 528 MHz
256 MB – 1 GB Flash (NAND)
256 MB – 1 GB RAM (DDR3)
Display/Camera

In Production

ConnectCore® MP157
STM32MP157C Dual
2 x Cortex-A7 @ 650MHz + M4
256 MB - 1 GB Flash (NAND)
256 MB - 1 GB RAM (DDR3L)
1xGbE, GPU, Display/Camera

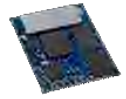
In Development

ConnectCore® 6N/6+
NXP i.MX6 Dual/Quad
2-4 x Cortex-A9 @ up to 1GHz
Up to 8 GB Flash (NAND)
Up to 2 GB RAM (DDR3)
HD GPU/VPU,
Multi-Display/Camera

NRND

ConnectCore® 8M Nano
NXP i.MX8M Nano Solo/Quad
1-4 x Cortex-A53 @ 1.4 GHz
Up to 8 GB Flash (eMMC)
Up to 1 GB RAM (LPDDR4)
HD GPU
Display/Camera

In Production



ConnectCore® 8M Mini
NXP i.MX8M Mini Quad
4 x Cortex-A53 @ 1.6 GHz
Up to 8 GB Flash (eMMC)
Up to 2 GB RAM (LPDDR4)
HD GPU/VPU
Display/Camera

In Production

2x2 MIMO

ConnectCore® 8X
NXP i.MX8X Dual/Quad
2-4 x Cortex-A35 @ 1.2 GHz
Up to 16 GB Flash (eMMC)
Up to 2 GB RAM (LPDDR4)
HD GPU/VPU
Multi-Display/Camera

In Production

THE MOST COMPLETE, EASIEST TO USE WIRELESS NETWORKING SOLUTION FOR IOT

- Simple
- Flexible
- Secure
- Future Proof

Cat-1
LTE-M
NB-IoT

Bluetooth

zigbee

IEEE 802.15.4

OVER 15 MILLION DEPLOYED

868 MHZ

DigiMesh

Wi Fi

900 MHZ

Pin Compatible

Global Certifications

XBEE® IS A COMPLETE IOT NETWORKING SOLUTION

Cloud

Device Management

Cellular
Ethernet
Wi-Fi

Cloud Integration

Gateways

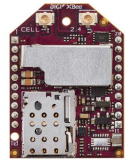
Modules

zigbee
DigiMesh® + 802.15.4
Bluetooth

Short Range (2.4 GHz)

DigiMesh® Star/P2P

XBee3 Long Range (868 MHz)



LteCat-1
LTE-M
NB-IoT

Cellular

at&t
verizon
Deutsche Telekom
vodafone
+ Global Operators

Data Plans
Requirements
SW / FW
HW / RF / Certs

Professional Services

Software and Tools

XCTU
XBee APIs
XBee Libraries (C, Java, Python)
Edge Compute
PyCharm IDE Plug-In
Network Assistant
XBee Mobile App & SDK
Multi Programmer
Interface Boards
GPS Daughter Board
Security

THE INTERNET OF GETTING THINGS DONE

Solving **MISSION-CRITICAL** and **BUSINESS-CRITICAL** machine communications challenges in the most **DEMANDING ENVIRONMENTS**.

You get proven, no-nonsense **SOLUTIONS THAT WORK** — and keep working.

DIGI®

Connect with Confidence

RELIABILITY

SCALABILITY

SECURITY

MANAGEABILITY