



# Bringing Observability and Device Management to IoT Devices

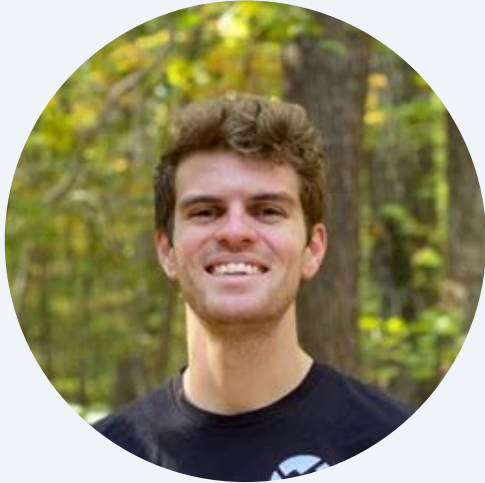
Presented By:

**Daniel Mangum** - Lead Cloud Engineer, Golioth

**Noah Pendleton** - Firmware Solutions Engineer, Memfault

**Kyle Dando** - Ecosystem Manager, NXP Semiconductors

# Today's Speakers



**Dan Mangum**  
Lead Cloud Engineer,  
Golioth



**Noah Pendleton**  
Firmware Solutions Engineer,  
Memfault



**Kyle Dando**  
MCUXpresso Ecosystem,  
NXP



# Agenda

- ◇ Problem we are solving
- ◇ NXP's Contribution
- ◇ Goliath's Contribution
- ◇ Memfault's Contribution
- ◇ Demo
- ◇ Q&A



# The Connected Cow



# Connecting the Edge of Internet of Things



**Now at NXP**

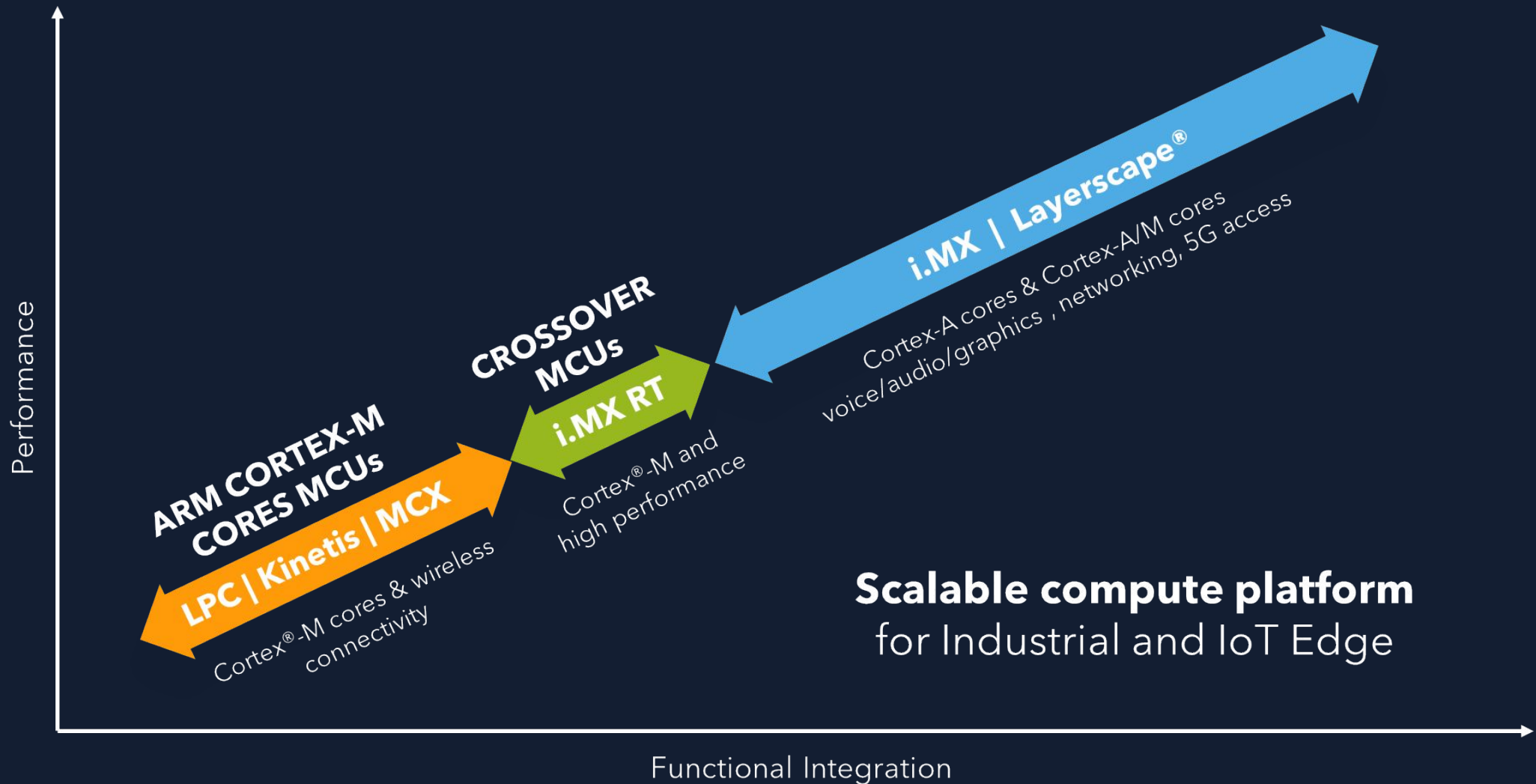


## POLL #1

# What is your experience with NXP MCUs?

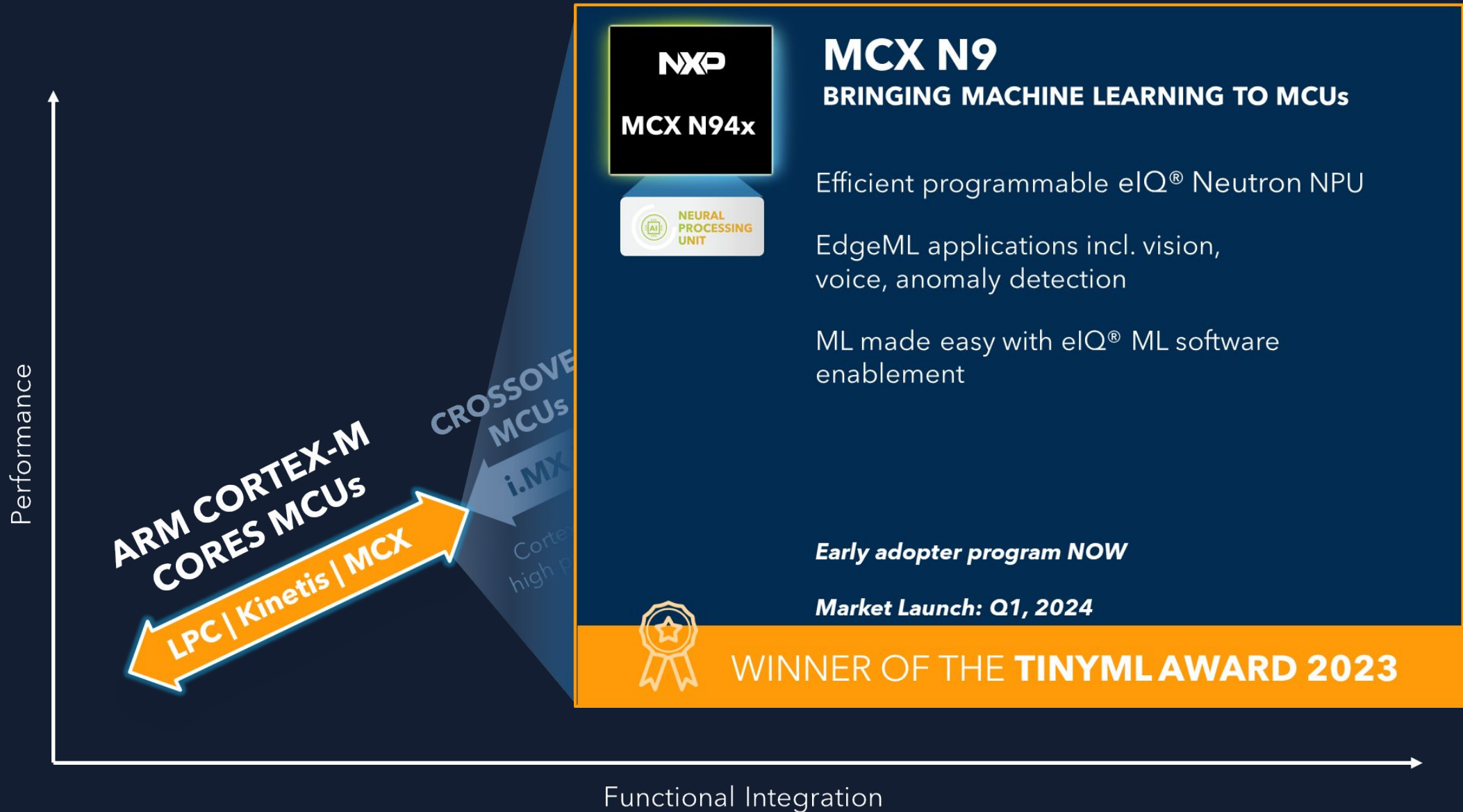
- a. I am building my first product with NXP MCUs
- b. I have released a product before with NXP MCUs
- c. I have built devices with other vendor MCUs but not NXP
- d. Other / I am just here to learn!

# The Best Devices for the Job

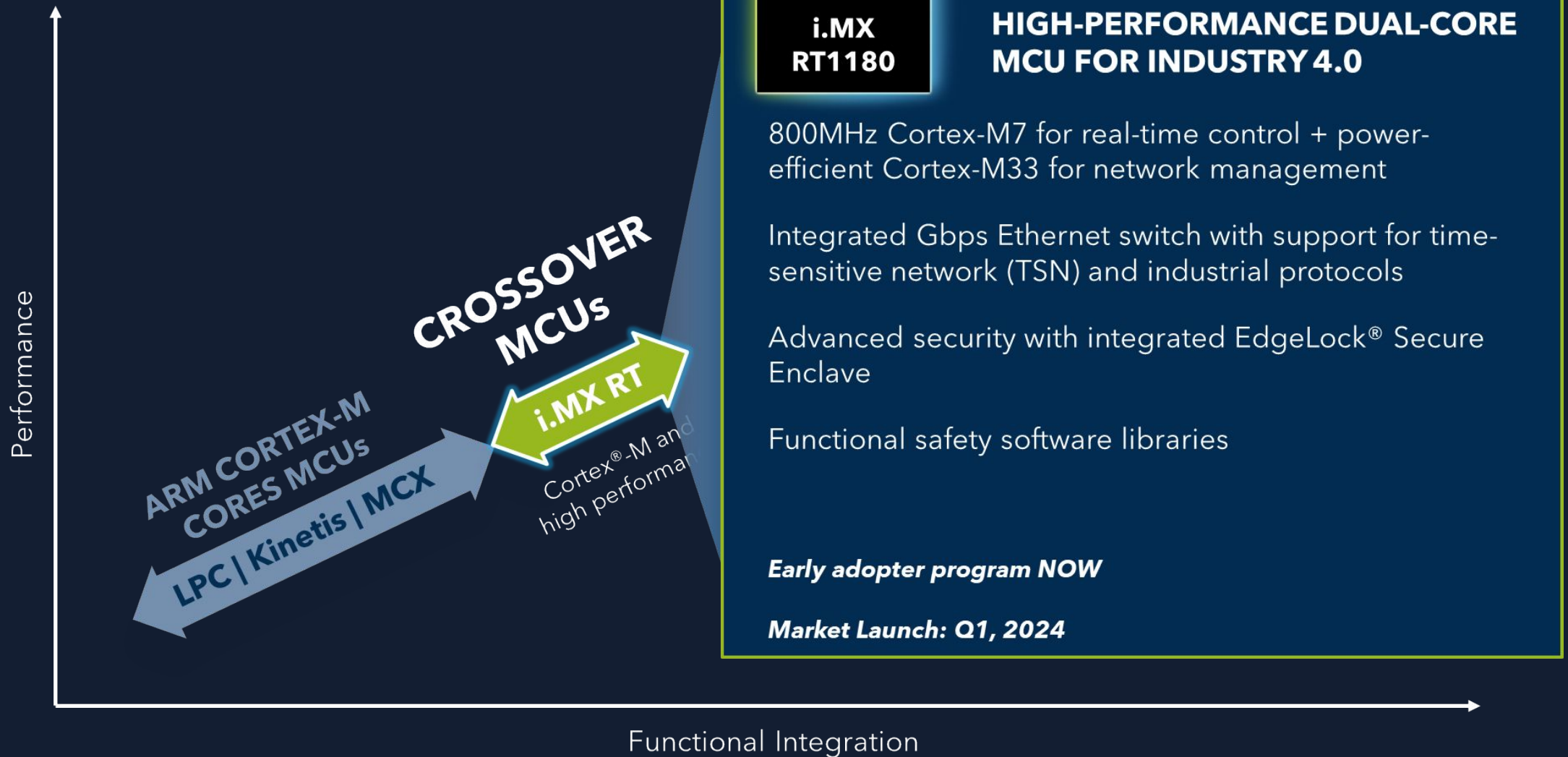




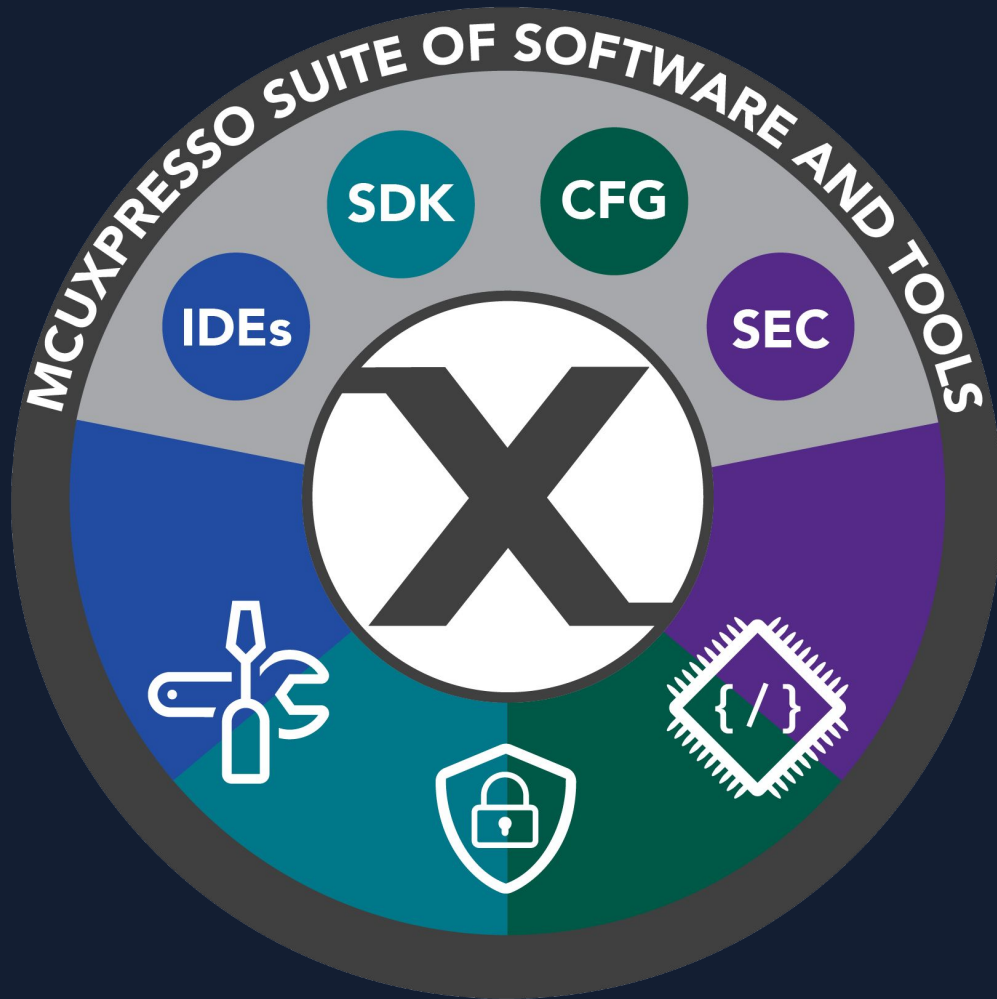
# The Best Devices for the Job



# THE BEST DEVICES FOR THE JOB



# The Best Tools for the Job



- Software
  - ◆ MCUXpresso SDK
  - ◆ Application Middleware
  - ◆ Application Code Examples
- Tools
  - ◆ IDEs
    - MCUXpresso IDE
    - MCUXpresso for Visual Studio Code
    - IAR Embedded Workbench
    - Keil MDK
  - ◆ Config Tools
  - ◆ Secure Programming Tools
- Delivery
  - ◆ Open-CMSIS-Packs
  - ◆ GitHub

# A Bit About Golioth

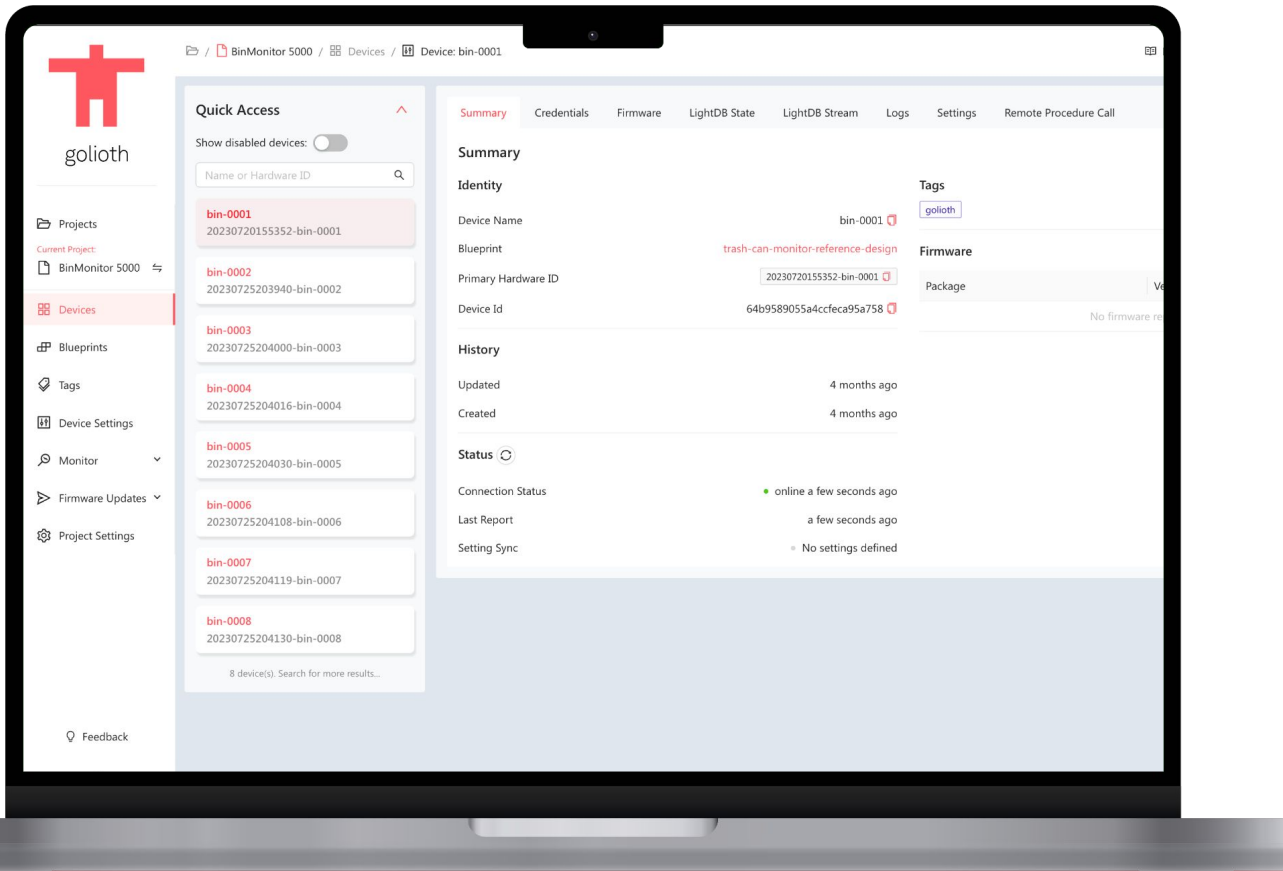


## POLL #2

**What services do you use today to send data to the internet from your devices?**

- a. Goliath
- b. AWS IoT
- c. Azure IoT Hub
- d. Self-Hosted

# What we do



## Flexible IoT development platform leader

Build IoT faster with one development platform for prototyping, testing, and scaling IoT fleets.

Engineers love us: Top performing IoT management platform and IoT development tool on G2.

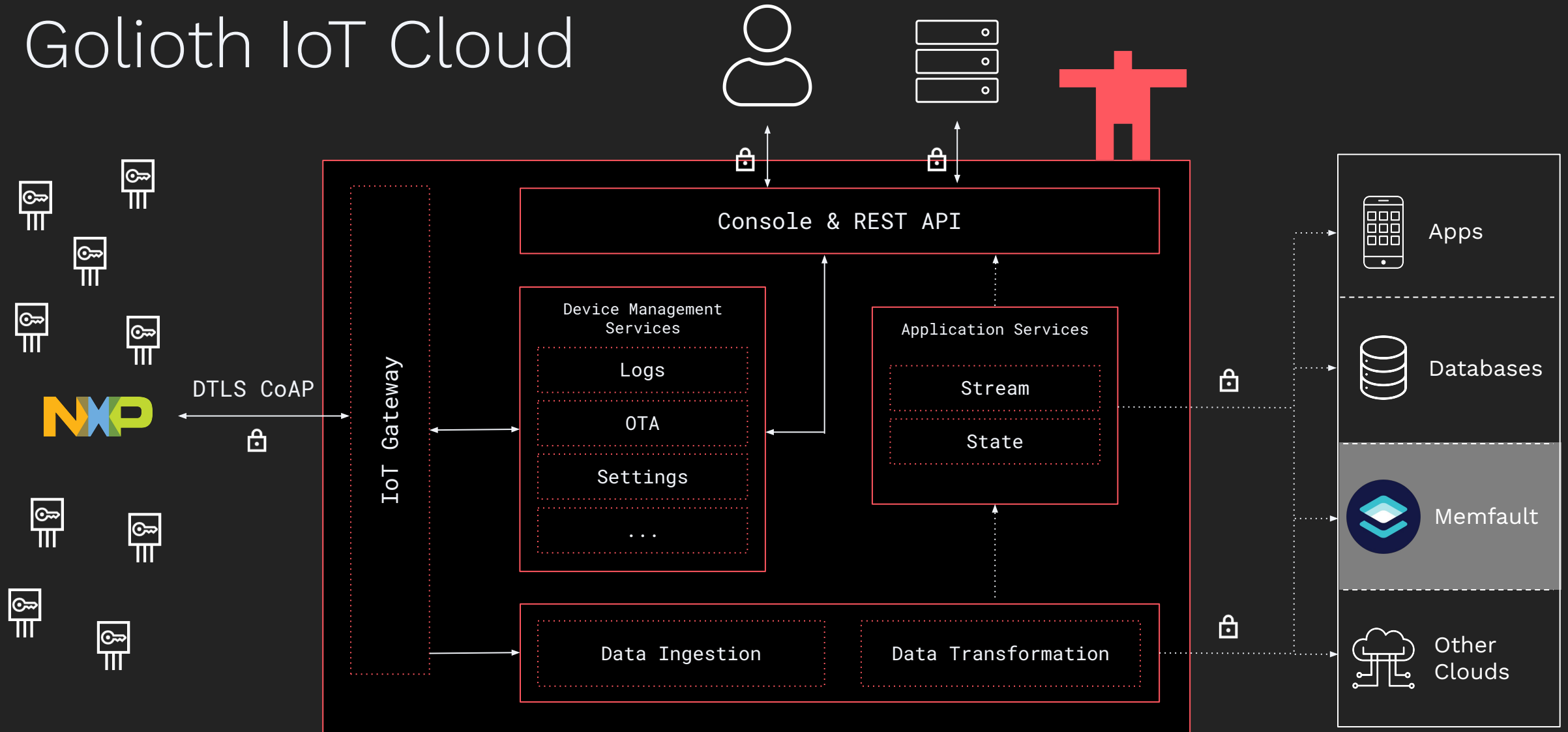
## Put IoT at the center of CI/CD

Build IoT easily with a single API, device toolkit, open source designs, and a thriving IoT community.

## Stress-free IoT for everyone

We're built for your entire team, covering hardware, firmware, cloud, and data developers.

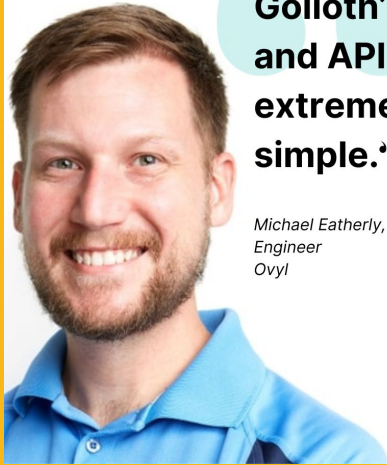
# Golioth IoT Cloud



Your Devices  
Your Firmware  
(+ Golioth SDK)

Golioth Device Management,  
Application, and Data Services

Your Tech Stack



**Golioth's SDK  
and API is  
extremely  
simple.”**

*Michael Eatherly, Senior Software  
Engineer  
Ovyi*



**Golioth helped us  
unlock our big  
technical risk,  
allowing us to move  
into production  
using their platform.”**

*Keenan Johnson, Founder,  
Ribbit Network*



**We've gained an entire  
employee's worth of  
productivity with  
Golioth. It's like we've  
had another engineer  
join the team.”**

*Eli Thomas, Head of Technology  
Method Recycling*



# Moore About Memfault



**Memfault**

## POLL #3

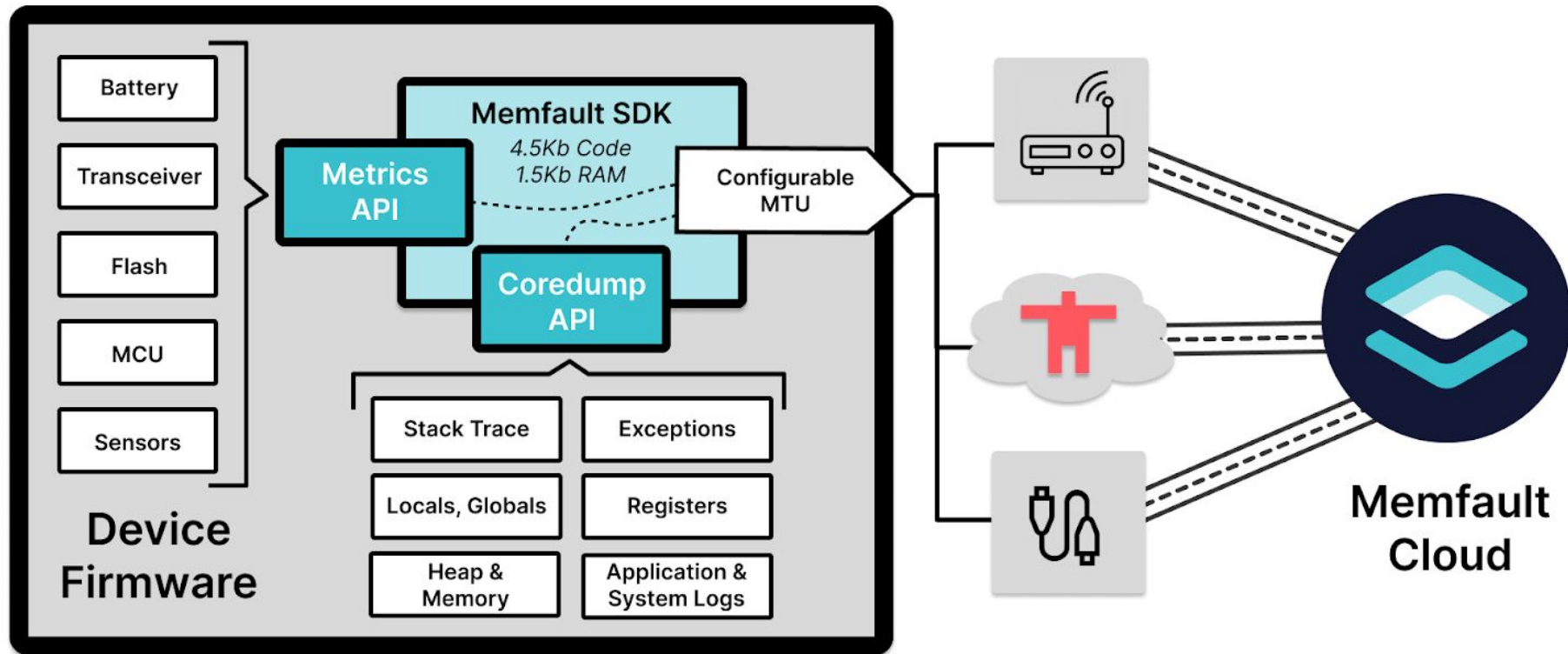
**Which properties are most important to your device? (check all that apply)**

- a. Battery & Power
- b. Connectivity
- c. Performance
- d. Stability and Crashes
- e. Other

# Memfault for Embedded Observability



# Proactively Monitor Devices



# Debug crashes 100% remotely

Memfault

Smart Sink / Issues

## Mem Fault at compute\_fft [Stack Overflow in accel-workq]

Resolve Merge

First Seen: 2 days ago | Last Seen: 2 days ago | Recent Traces: 11,717 | Devices Impacted: 10,420

Details Recent traces Comments Merged issues

Device: DEMOSERIALNUMBER  
Cohort: default  
Software: 1.0.0-md5+a1c641ba (main)  
Hardware: DEVBOARD

State Logs

Threads

- accel-workq (2) **STACK OVERFLOW** **RUNNING**
  - 0 compute\_fft in .../src/fft.c at line 10
  - 1 sleep\_algo\_compute\_sleep\_time in .../src/sleep\_algo.c at line 12
  - 2 process\_accel\_data\_worker\_task in .../src/accel\_data.c at line 108
  - 3 z\_work\_q\_main in .../zephyr/lib/os/work\_q.c at line 32
  - 4 z\_thread\_entry in .../lib/os/thread\_entry.c at line 29
  - 5 0xxxxxxxxx
- Thread 3 **SUSPENDED**
- idle (4) **READY**
- logging (5)
- net\_mgmt (6)
- rx\_workq (7) **BLOCKED**
- shell\_uart (8) **BLOCKED**
- sysworkq (9) **BLOCKED**
- tx\_workq (10) **BLOCKED**
- workqueue (11) **BLOCKED**

Registers & Locals

- A** dft\_out = 0x2000a900 <my\_stack\_area+1344>
- L** i = 400
- A** num\_samples = 536912536
- A** raw\_samples = 0x3128115f
- L** tmp = {1, 222, 7, 84}
- R** Sr0 = long 536912536 (0x2000a298)
- R** Sr1 = long 1372324912 (0x51cc0430)
- R** Sr2 = long 1372324919 (0x51cc0437)
- R** Sr3 = long 536912832 (0x2000a3c0)
- R** Sr4 = long 536912508 (0x2000a27c)
- R** Sr5 = long 536914136 (0x2000a8d8)
- R** Sr6 = long 0 (0x00000000)
- R** Sr7 = long 536912488 (0x2000a268)
- R** Sr8 = long 0 (0x00000000)
- R** Sr9 = long 0 (0x00000000)
- R** Sr10 = long 0 (0x00000000)
- R** Sr11 = long 0 (0x00000000)
- R** Sr12 = long 0 (0x00000000)

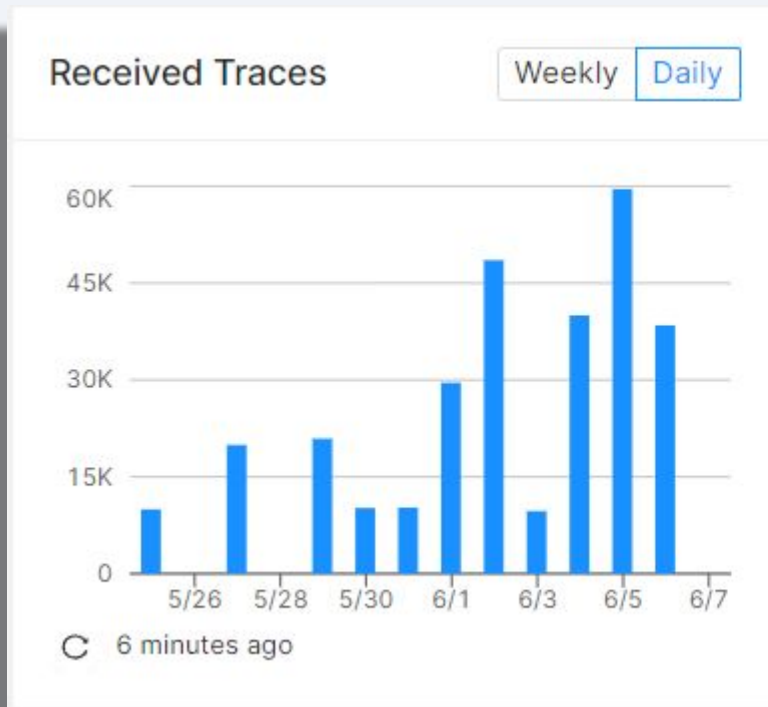
Memory Viewer

Find Address Regions

0x00000000	00 e1 00 20	95 9e 00 08	...
0x00000008	25 9e 00 08	81 9d 00 08	%...
0x00000010	81 9d 00 08	81 9d 00 08	...
0x00000018	81 9d 00 08	81 9d 00 08	...
0x00000020	81 9d 00 08	81 9d 00 08	...
0x00000028	81 9d 00 08	9d 9b 00 08	...
0x00000030	81 9d 00 08	81 9d 00 08	...
0x00000038	41 9b 00 08	ed 95 00 08	A...
0x00000040	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000048	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000050	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000058	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000060	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000068	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000070	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000078	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000080	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000088	6d 9e 00 08	6d 9e 00 08	m... m...
0x00000090	6d 9e 00 08	6d 9e 00 08	m... m...

# Fleet-scale Trace Analysis

## Detect problems



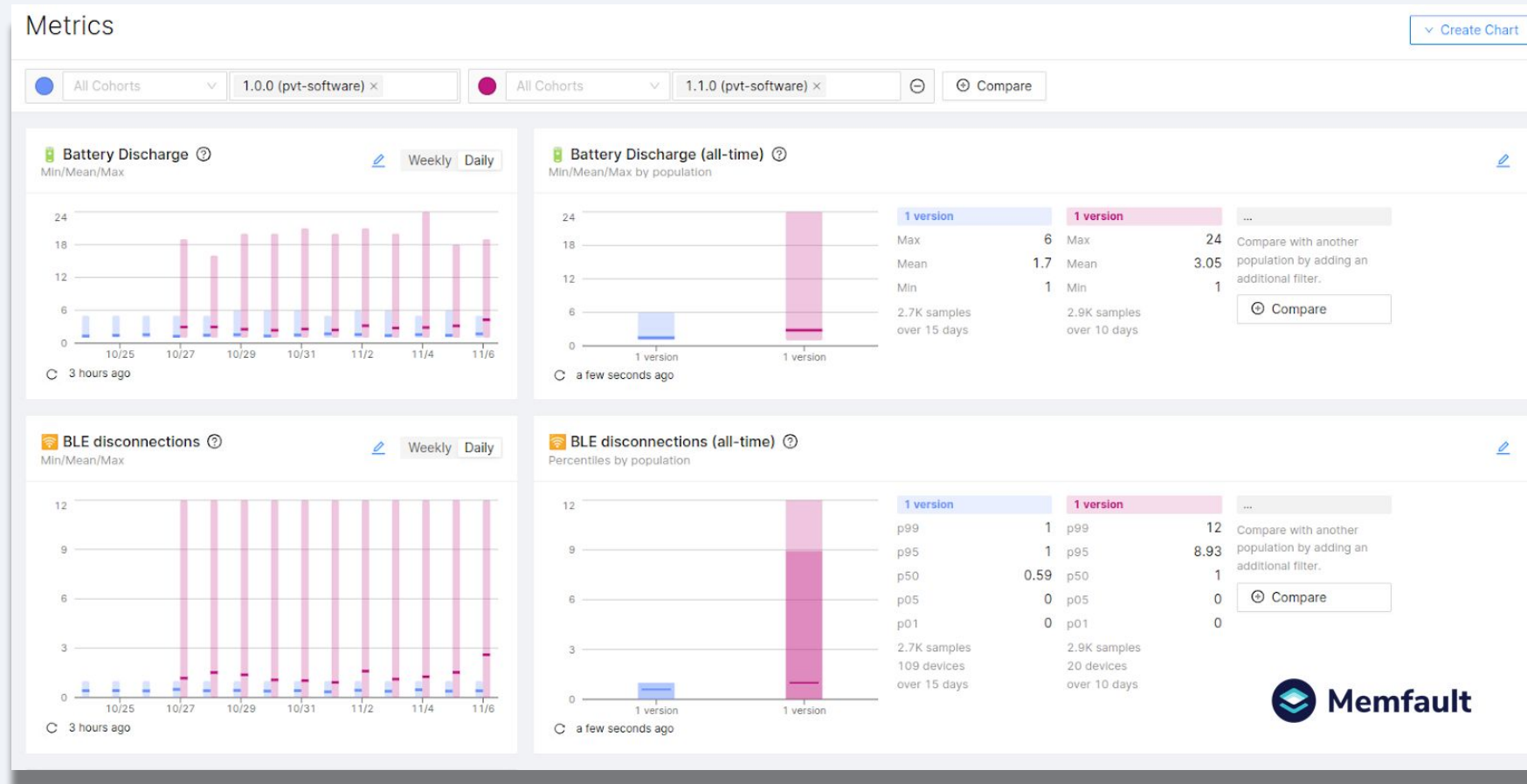
## Automatically label and gain insights

Top Issues

	Issue	Devices	Traces
Assert	Assert at timeout_handler_exec	29556	
Assert	Assert at prv_recursive_crash	20404	
Hard Fault	Hard Fault at prv_crash_example	20672	
Assert	Assert at prv_check1	20852	
Assert	Assert at cli_execute	19712	

Memfault finds the **issues you care about**

# Fine tuned Performance Metrics



Tracking **critical metrics** over time from your devices allow you to gather **valuable insights**.



# Demonstration



# Get to Know the Companies

 **Memfault SDK**

 **goloth SDK**

 **MCUXpresso SDK**

OTA

RPC

Auth

...

Device Management &  
Data Routing

 goloth

Perf Monitoring/Metrics

Crash Analytics / Coredumps

Diagnostics Plane

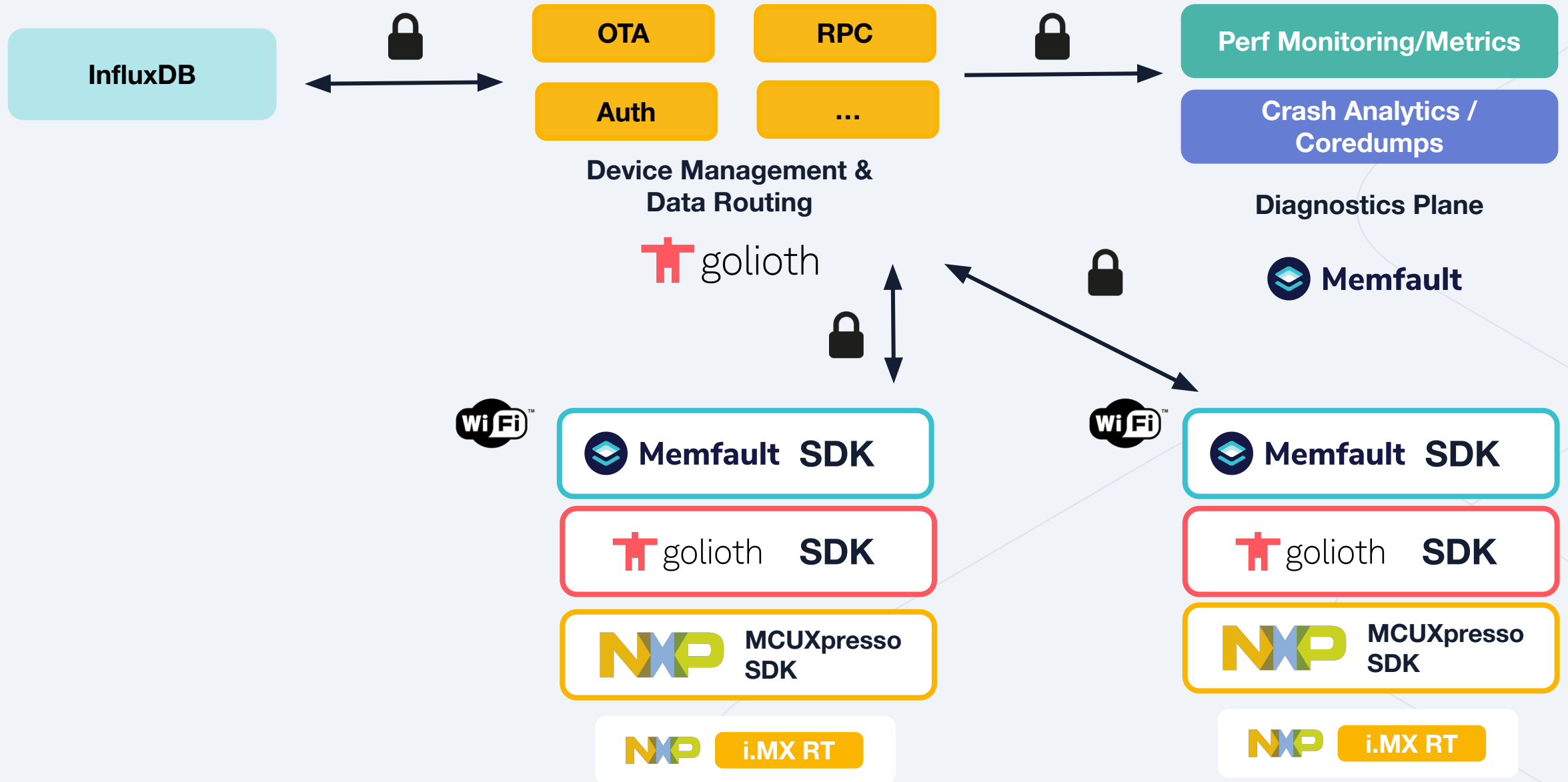
 **Memfault**



i.MX RT



# Overview of the Job





# How to get started

# Resources



## Join the Waitlist Today!

- <https://hslp.golioth.io/memfault-golioth>



## Learn more at [www.memfault.com](http://www.memfault.com) , [www.golioth.io](http://www.golioth.io) and [www.nxp.com](http://www.nxp.com)

- Memfault SDK source code and documentation
- [Integration guide](#) for the NXP i.MX RT1060
- Sign up for free Golioth [training](#)



## Licensing

- NXP users get free self-service Memfault for up to 100 devices:  
<https://memfault.com/register/nxp>
- Ask Memfault or your NXP sales representative for commercial support



**Questions?**

**Thank You**