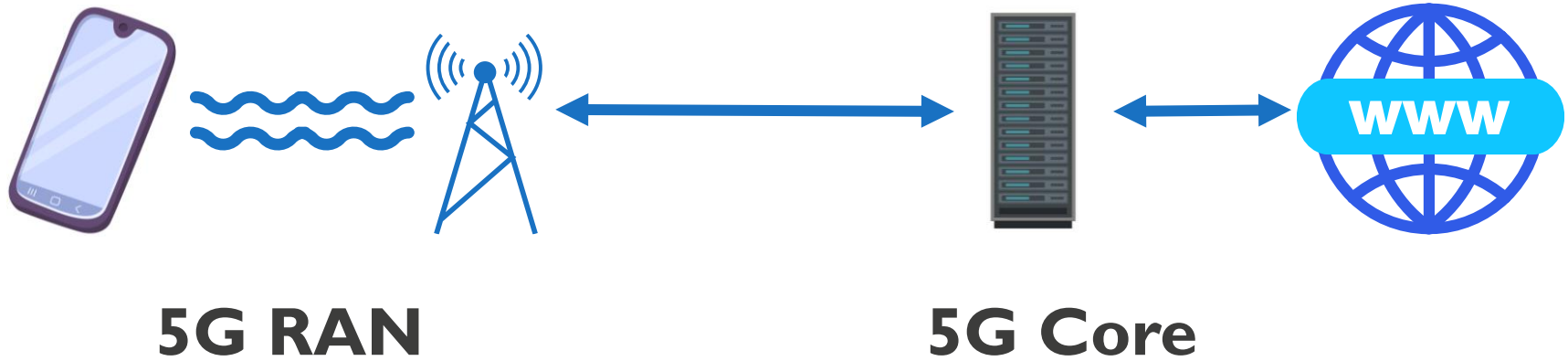


What is a mobile network?

How does your phone connect to the internet without wifi?



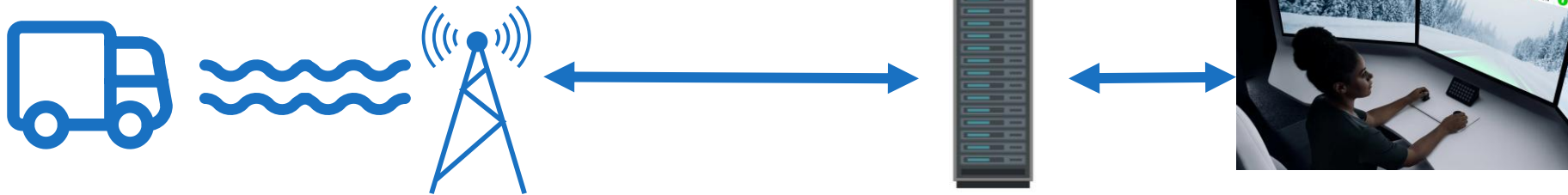
What is a mobile network?

Not just phones, mission critical applications as well!



5G RAN

5G Core



Network resilience is essential

When connections drop

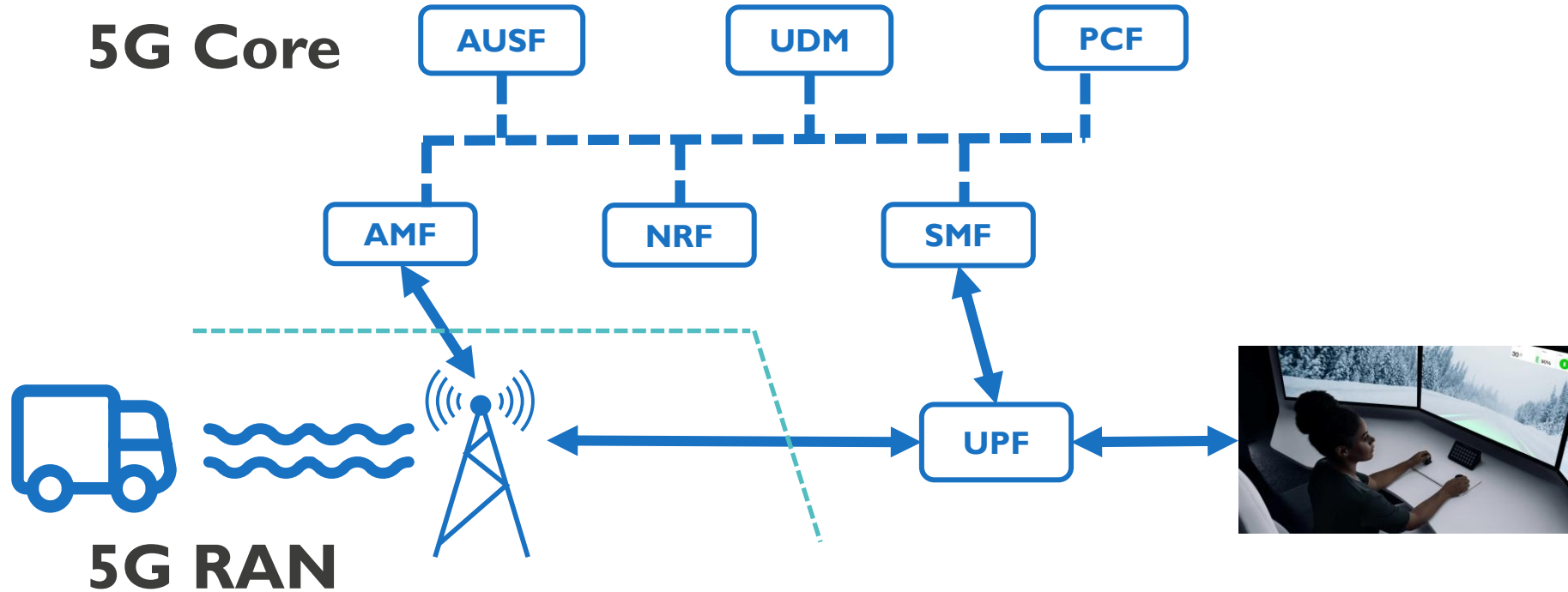




When Mobile Networks become Distributed Systems: Tracing the 5G Core with OpenTelemetry

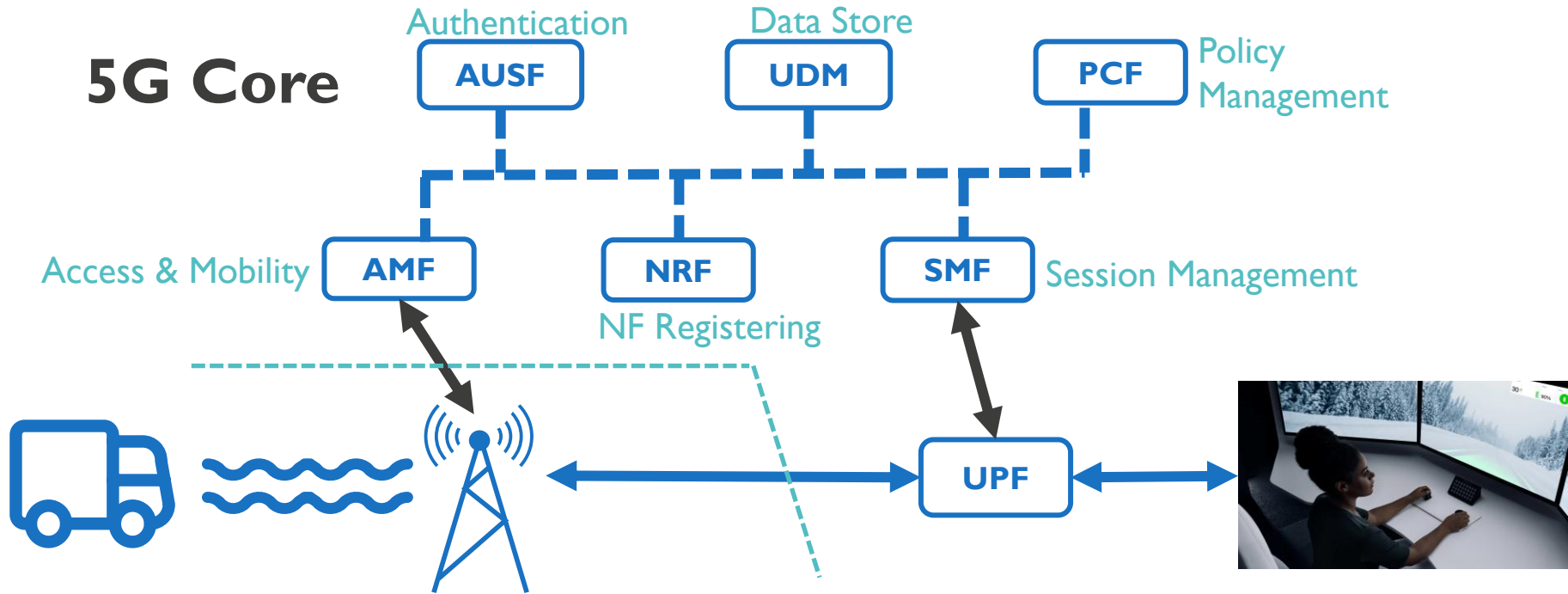
What does a Mobile Network look like?

5G Core and 5G RAN



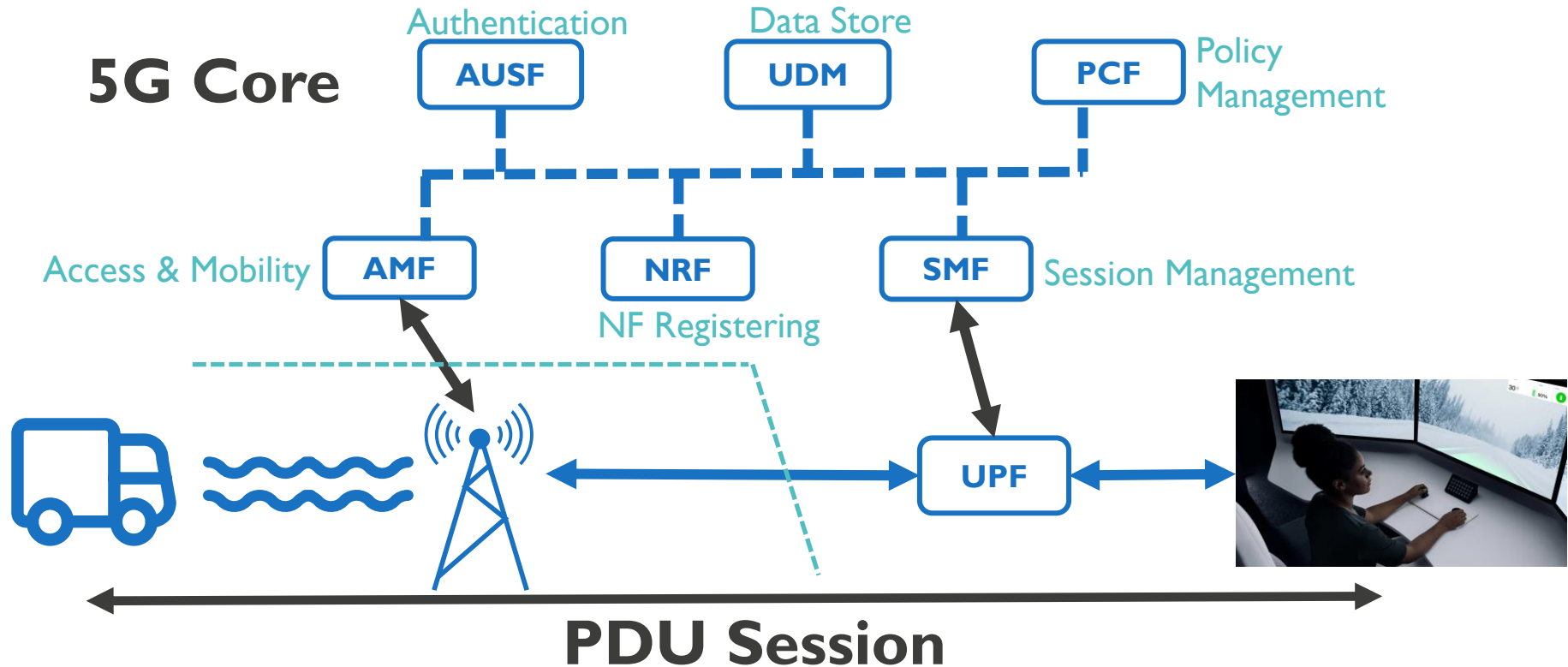
What does a Mobile Network look like?

5G Core



What does a Mobile Network look like?

PDU Session



Observability applied to Mobile Networks

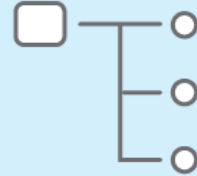
How it fits the 5G Core



Metrics



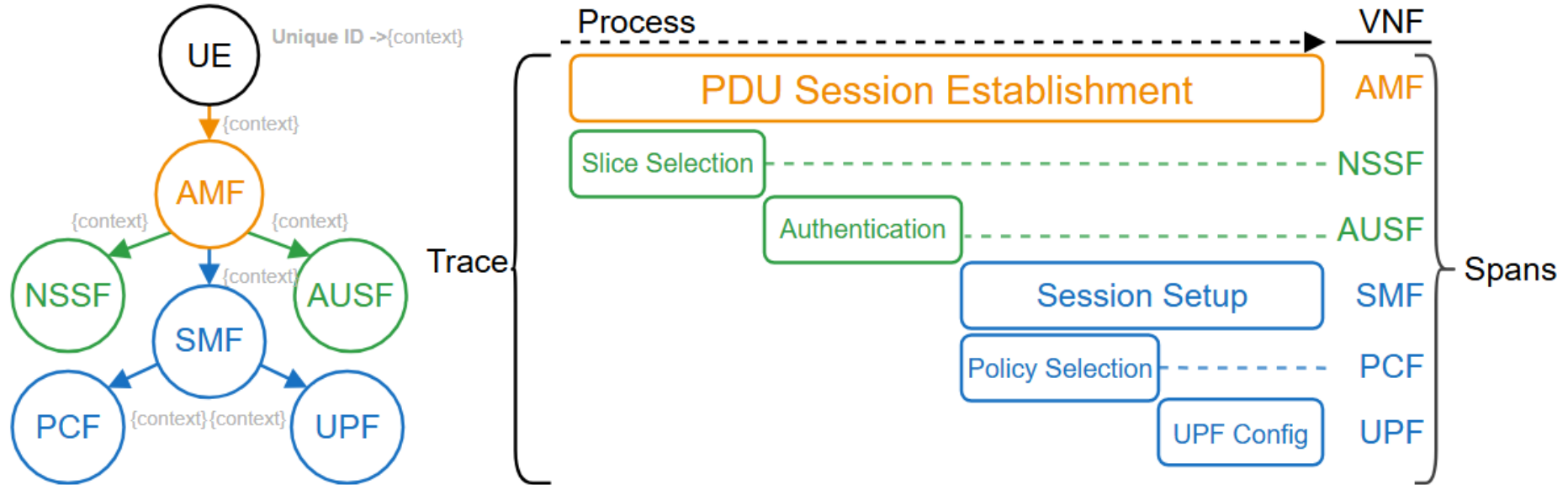
Logs



Traces

Observability applied to Mobile Networks

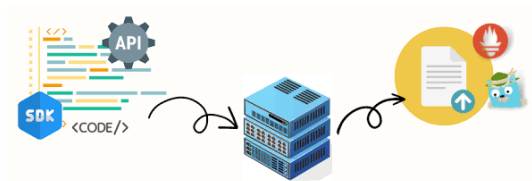
Distributed Tracing



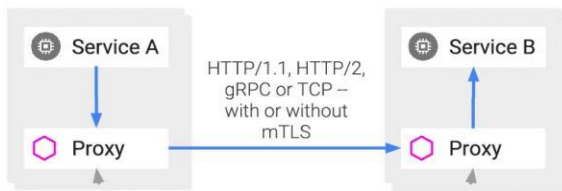
Distributed Tracing Instrumentation

What options are available

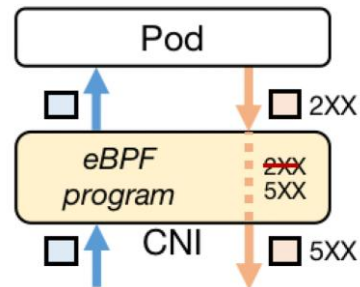
Code Instrumentation



Service Mesh



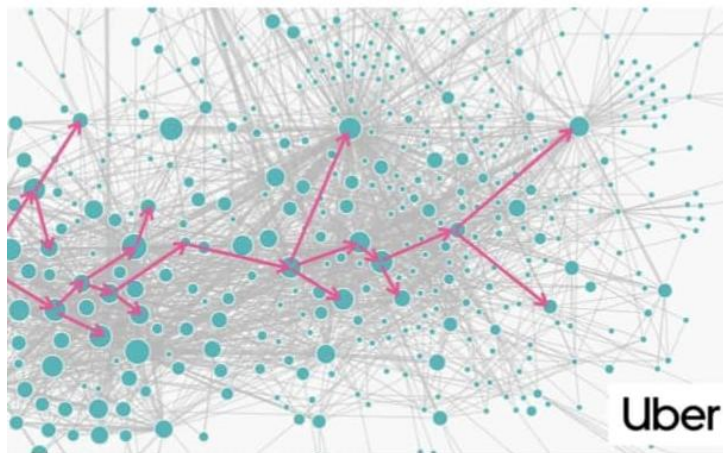
eBPF injection



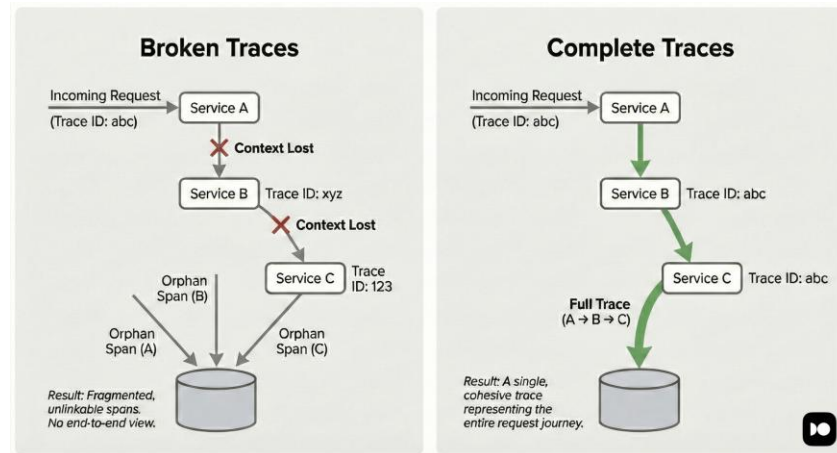
Distributed Tracing Challenges

Challenges in implementation

Coverage

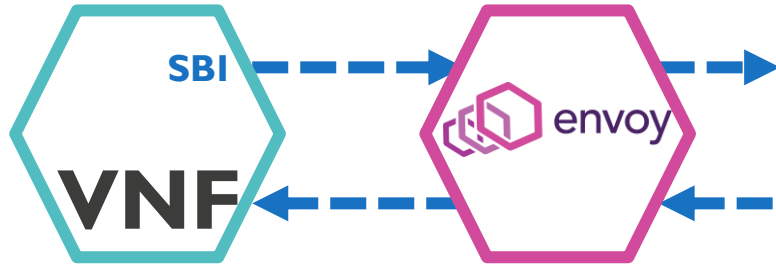


Context Propagation



Code Instrumentation & Service Mesh

Two complementary techniques



- Code Instrumentation
 - Automated? -> Not (yet?) in C
 - Manual -> Only the SBI for Open5GS
- Service Mesh
 - Automated? -> Very!
 - Context Propagation? Not quite ..

eBPF based tracing

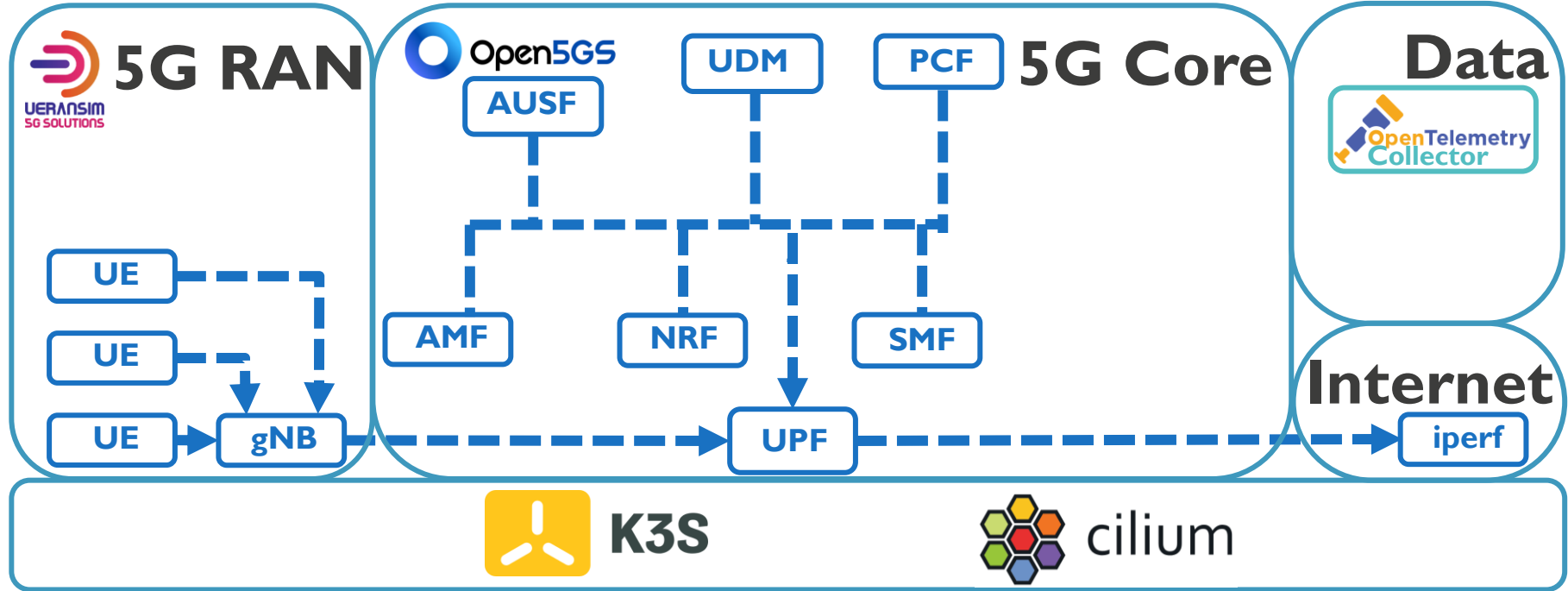
To be continued

- Promising avenue
- Coverage is automatically 100% with low effort
- However ..
 - Context propagation in Non-Go applications is a work-in-progress



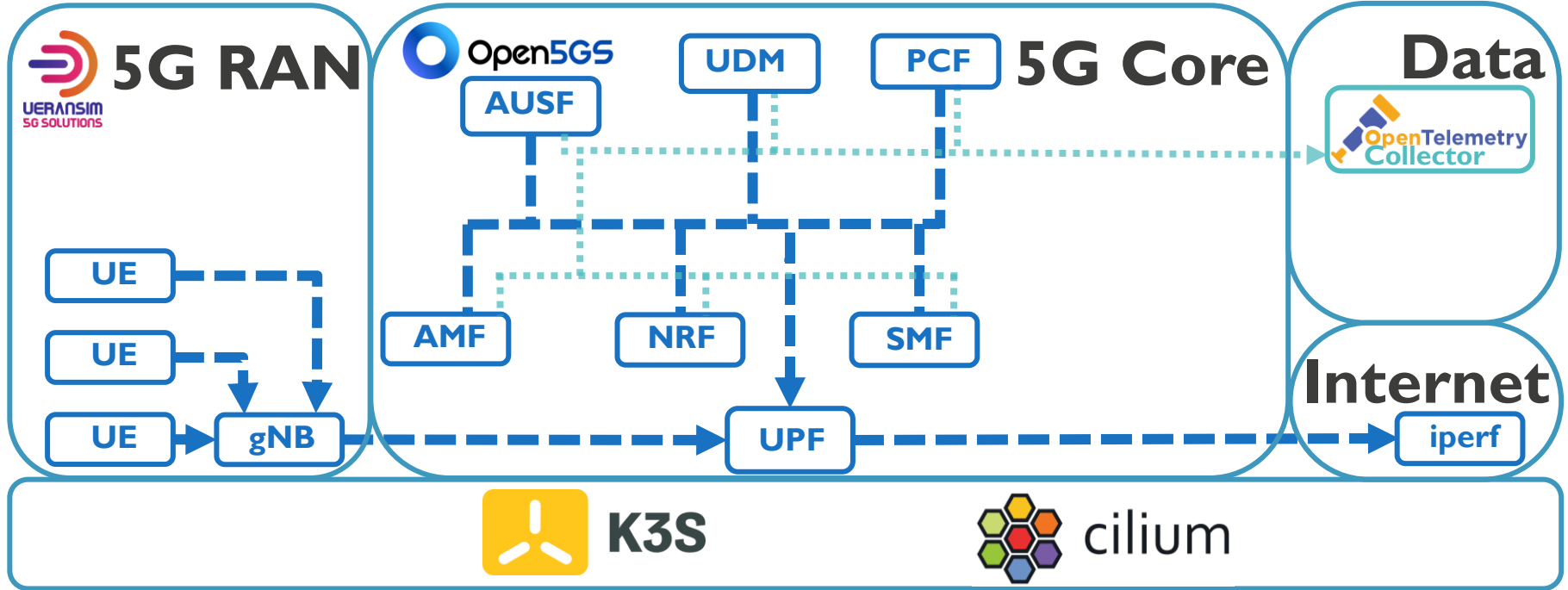
Distributed Tracing in Action

Instrumentation and collection of traces



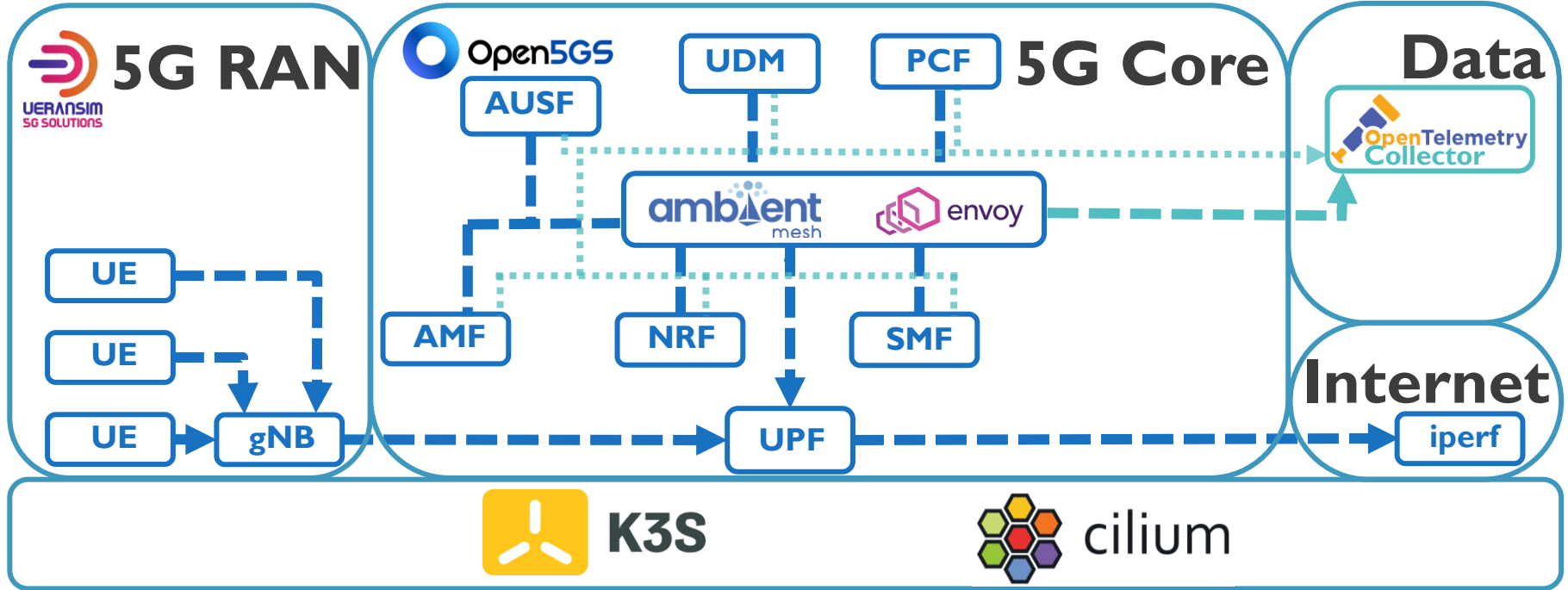
Distributed Tracing in Action

Instrumentation and collection of traces



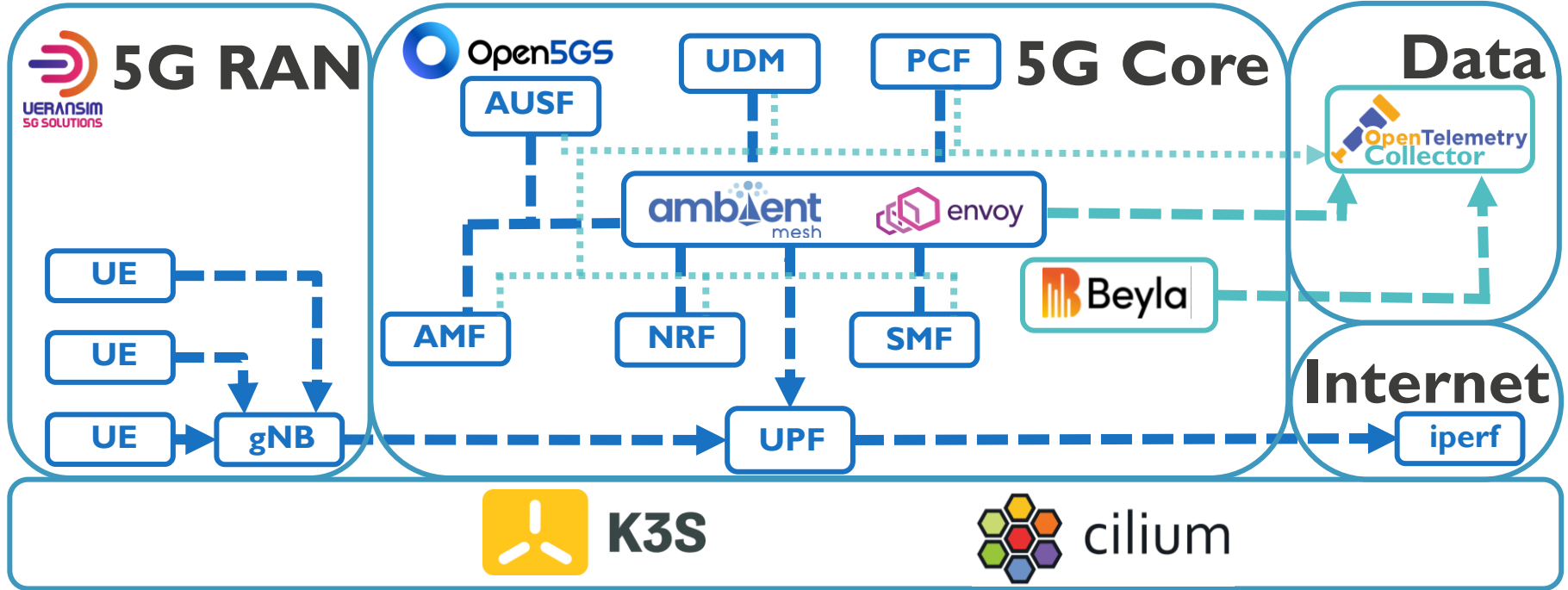
Distributed Tracing in Action

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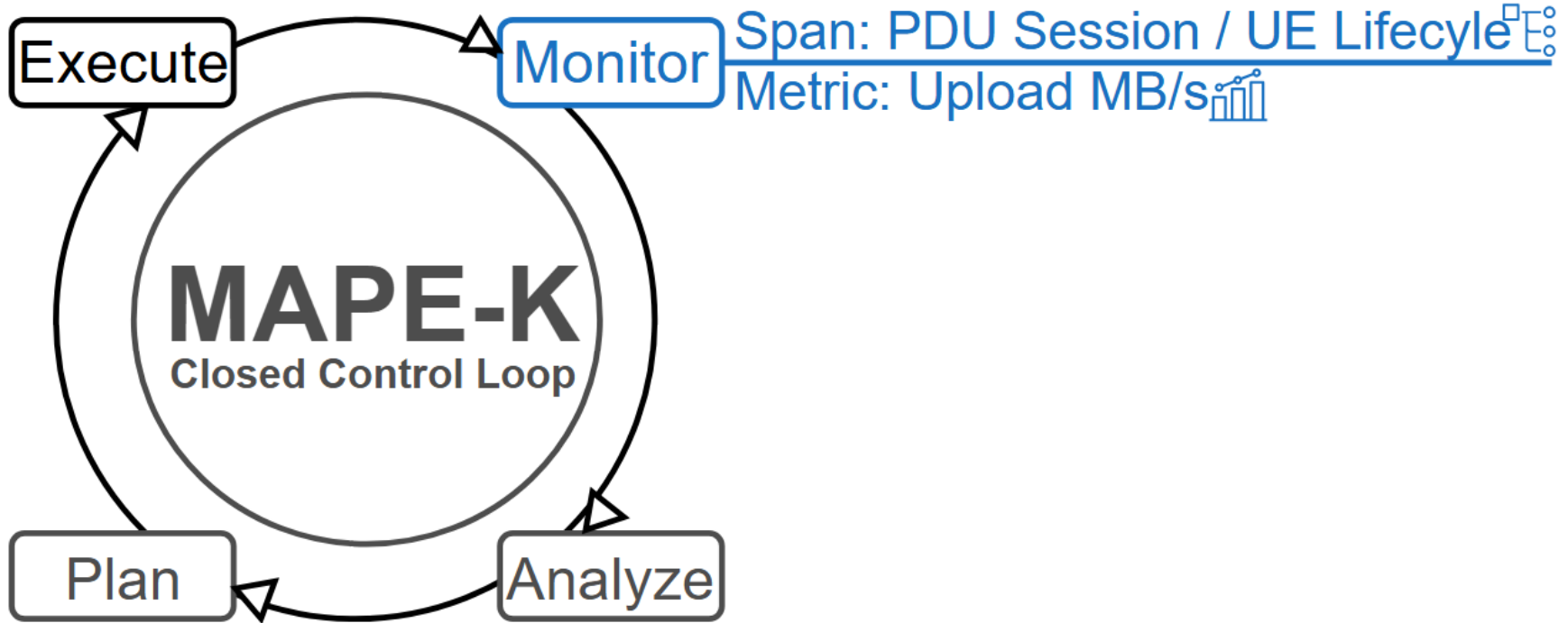
Distributed Tracing in Action

Instrumentation and collection of traces



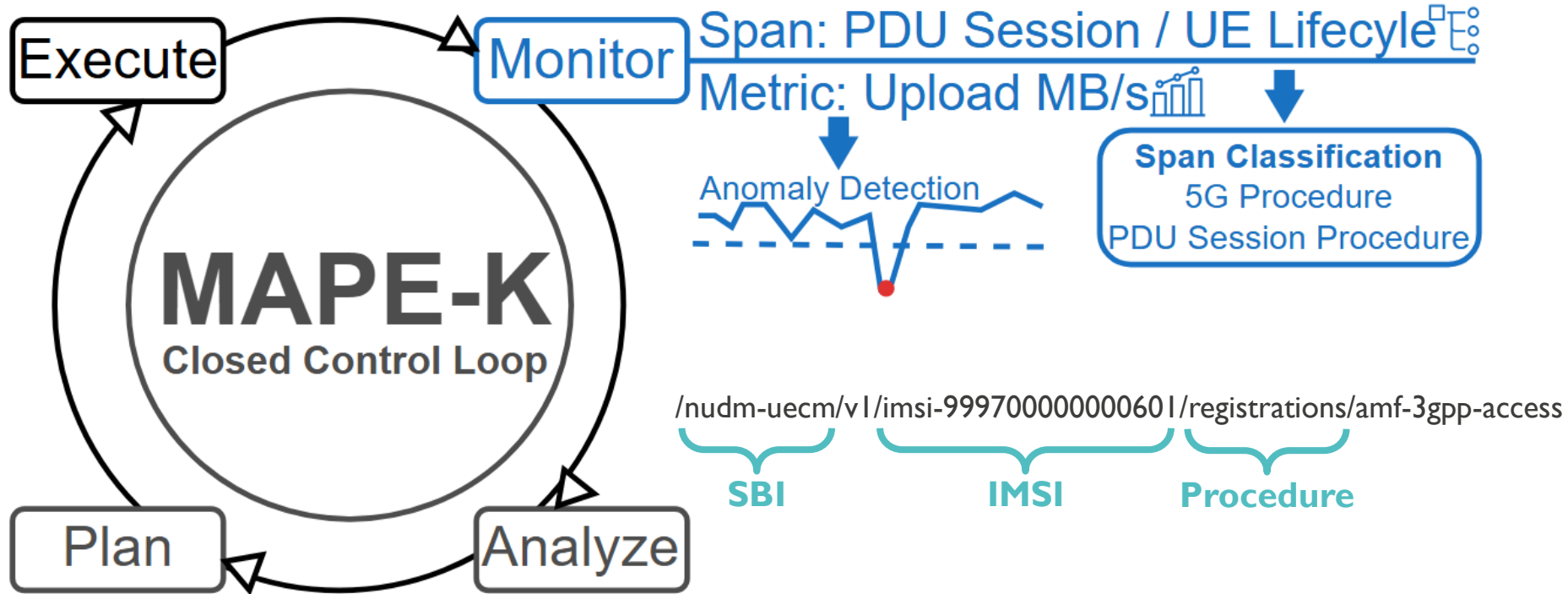
Self-Healing with Closed Control Loop

Monitoring the mobile network by collecting traces and metrics



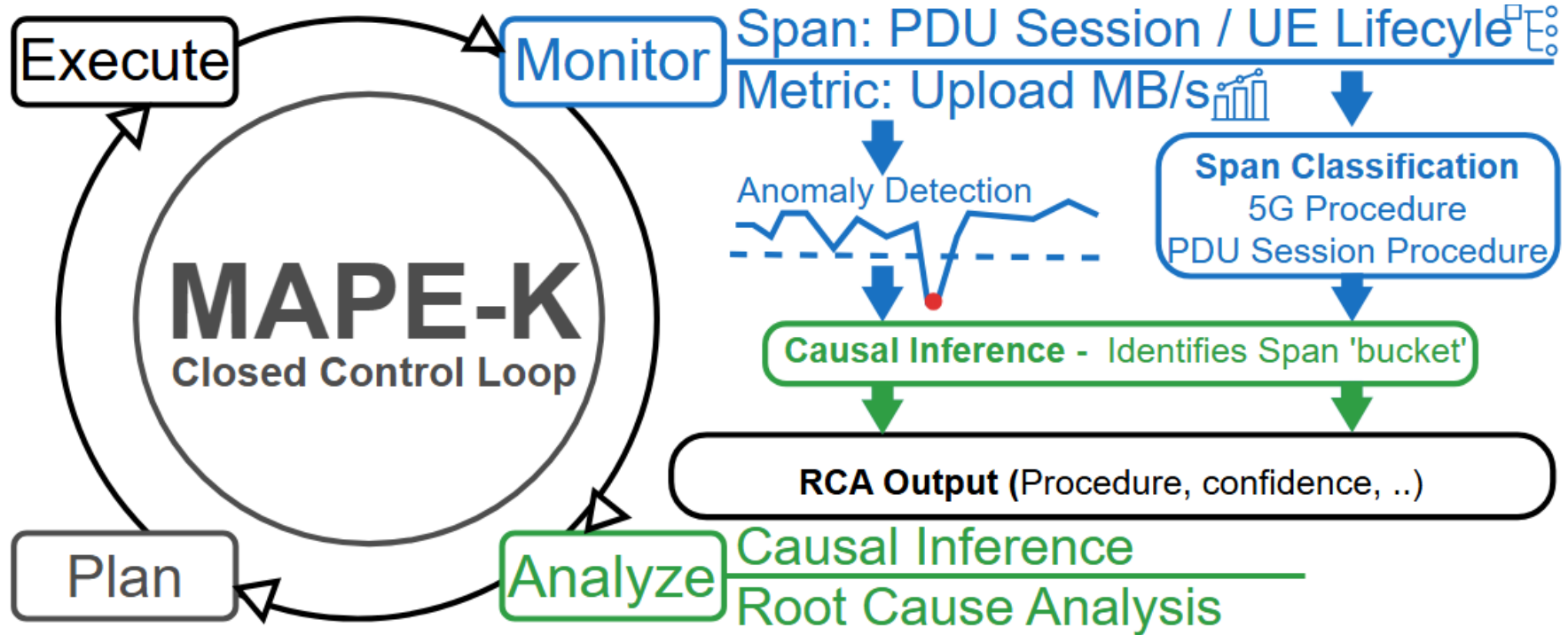
Self-Healing with Closed Control Loop

Anomaly Detection & Feature Engineering



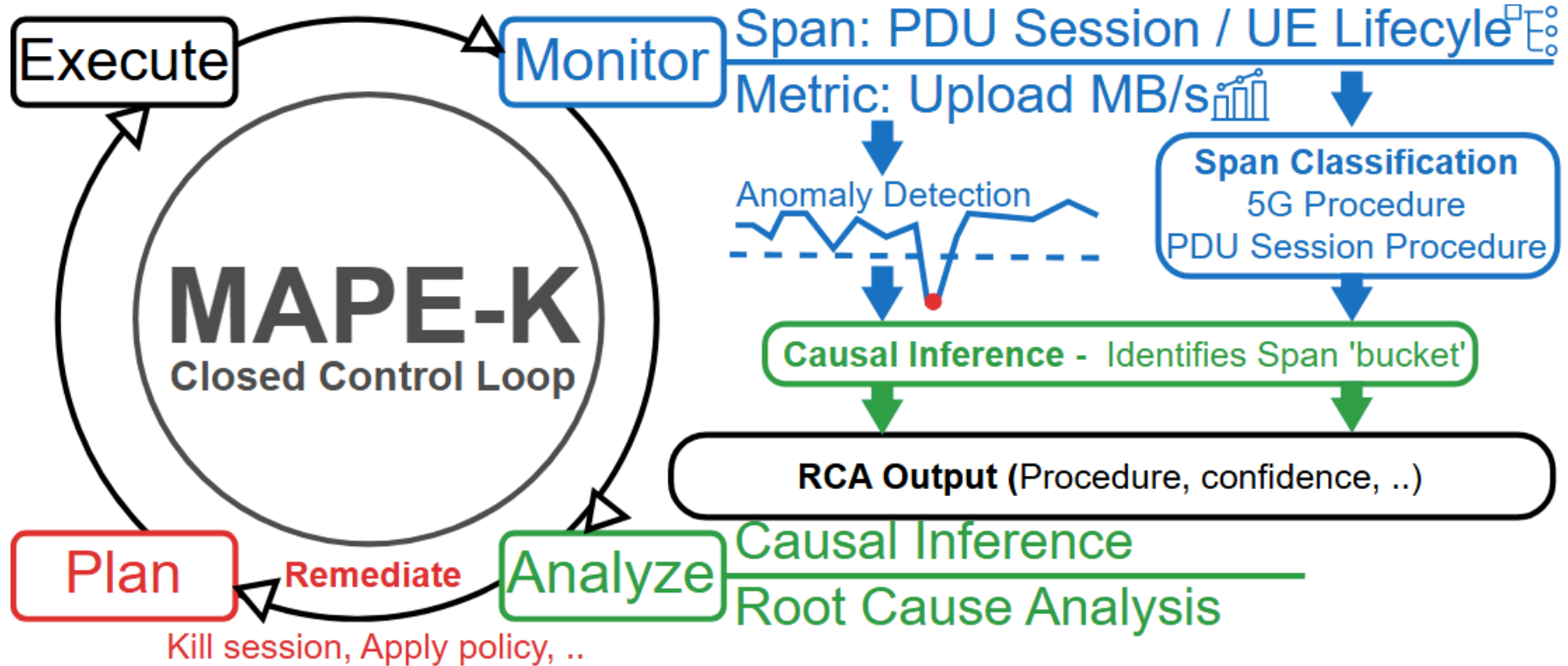
Self-Healing with Closed Control Loop

Root Cause Analysis with Causal Inference



Self-Healing with Closed Control Loop

Planning and executing a Remediation



1) Resilience in mobile networks is essential

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**2) The 5G Core is essentially a specific type of
microservice architecture**

- 1) Resilience in mobile networks is essential**
- 2) The 5G Core is essentially a specific type of microservice architecture**
- 3) Because of 2. we can come up with some pretty cool solutions for 1.**



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embracing a better life