



MATILDA 5G-ready Applications' Orchestration Ecosystem

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Join us for a live presentation of the main project
achievements at 17:30!

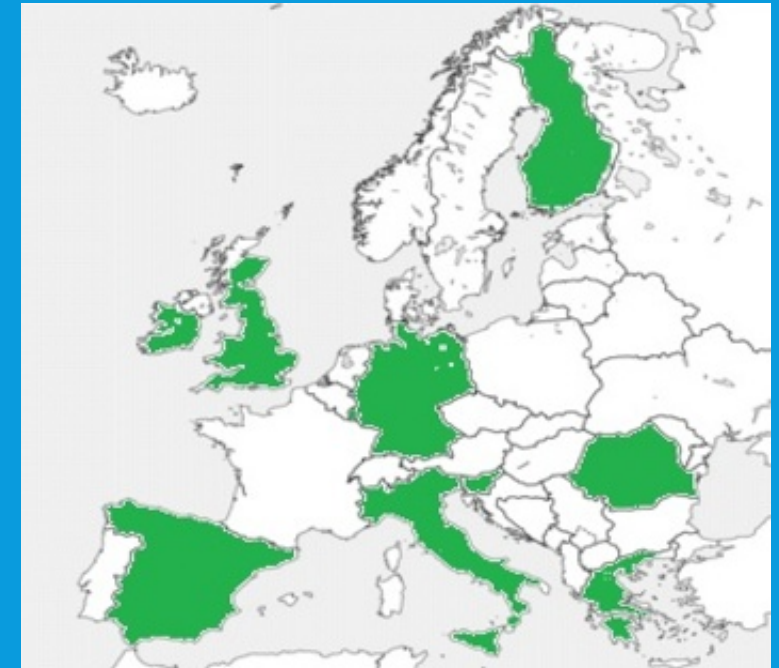
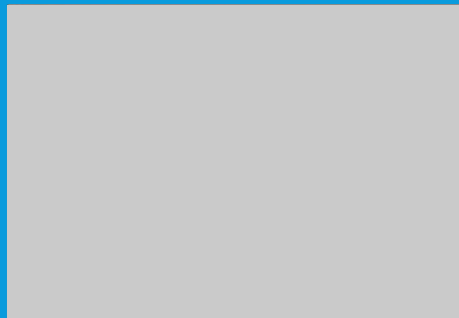
Mobile World Congress

25-28 February 2019, Barcelona

The MATILDA Consortium



MATILDA



The MATILDA Vision



MATILDA



Design and develop 5G-ready applications; applications able to take advantage of 5G programmable infrastructure.



Optimally manage and provide services/applications through a set of **intelligent orchestration** mechanisms.



Dynamically create and manage application-aware network slices able to serve 5G-ready application needs.



Separation of concerns among **vertical applications** and **network services** orchestration.

What is a 5G-ready application? Just of set of Cloud Native components?



How many levels of orchestration?



Slice aware Vertical Orchestrator?



Application Component

IaaS 1

IaaS 2

IaaS 3



Network Service



VNF

MATILDA in a nutshell



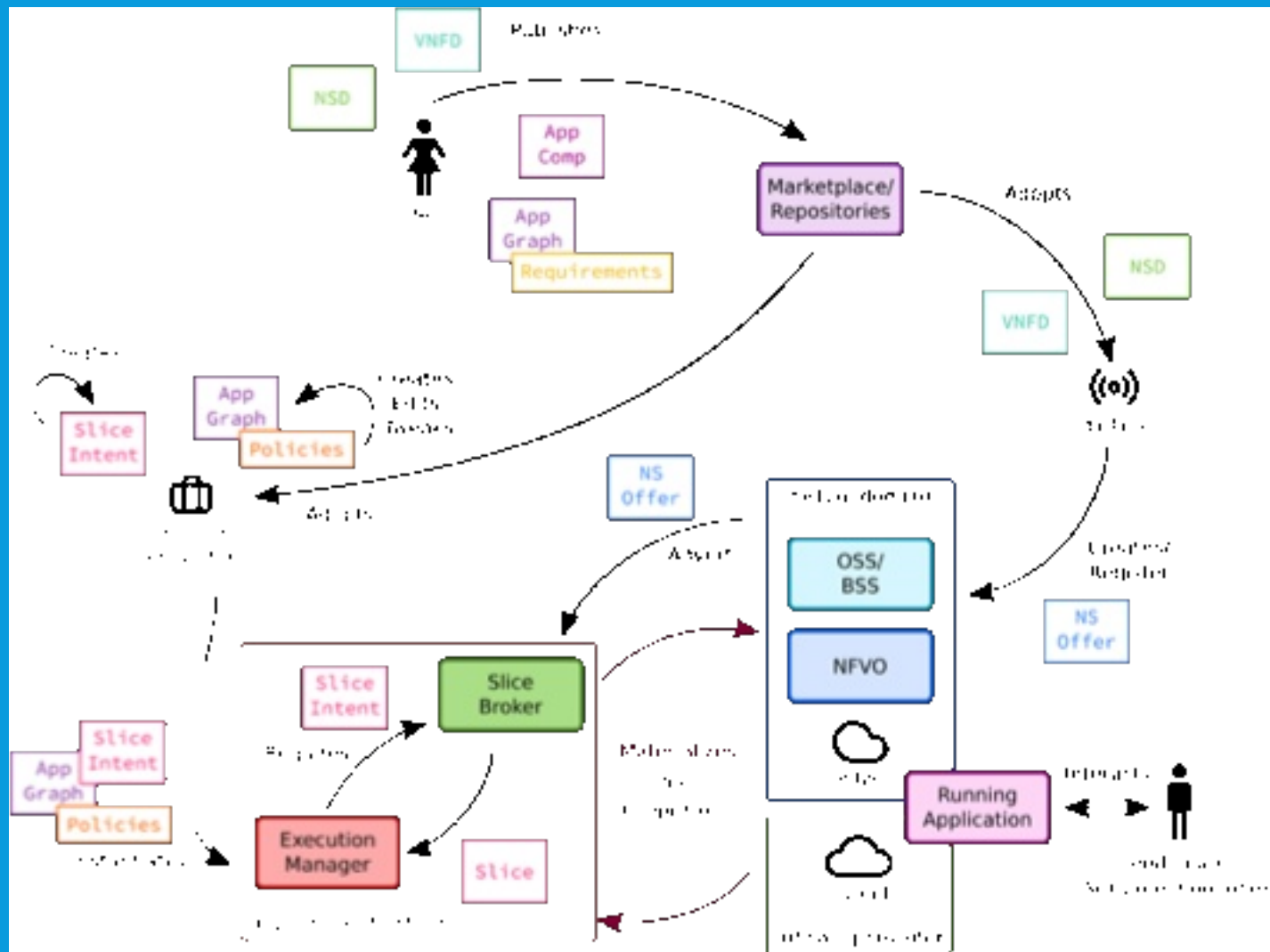
- Deployment of **cloud-native** components over **Telco Infrastructure**
- **Two main contributions:**
 - **Vertical Application Orchestration (VAO)**
 - Make use of advanced network programmability features
 - Slice Definition
 - Slice Reconfiguration
 - Policy Management
 - **Telco enhanced OSS**
 - Northbound APIs
 - Network Services Orchestration



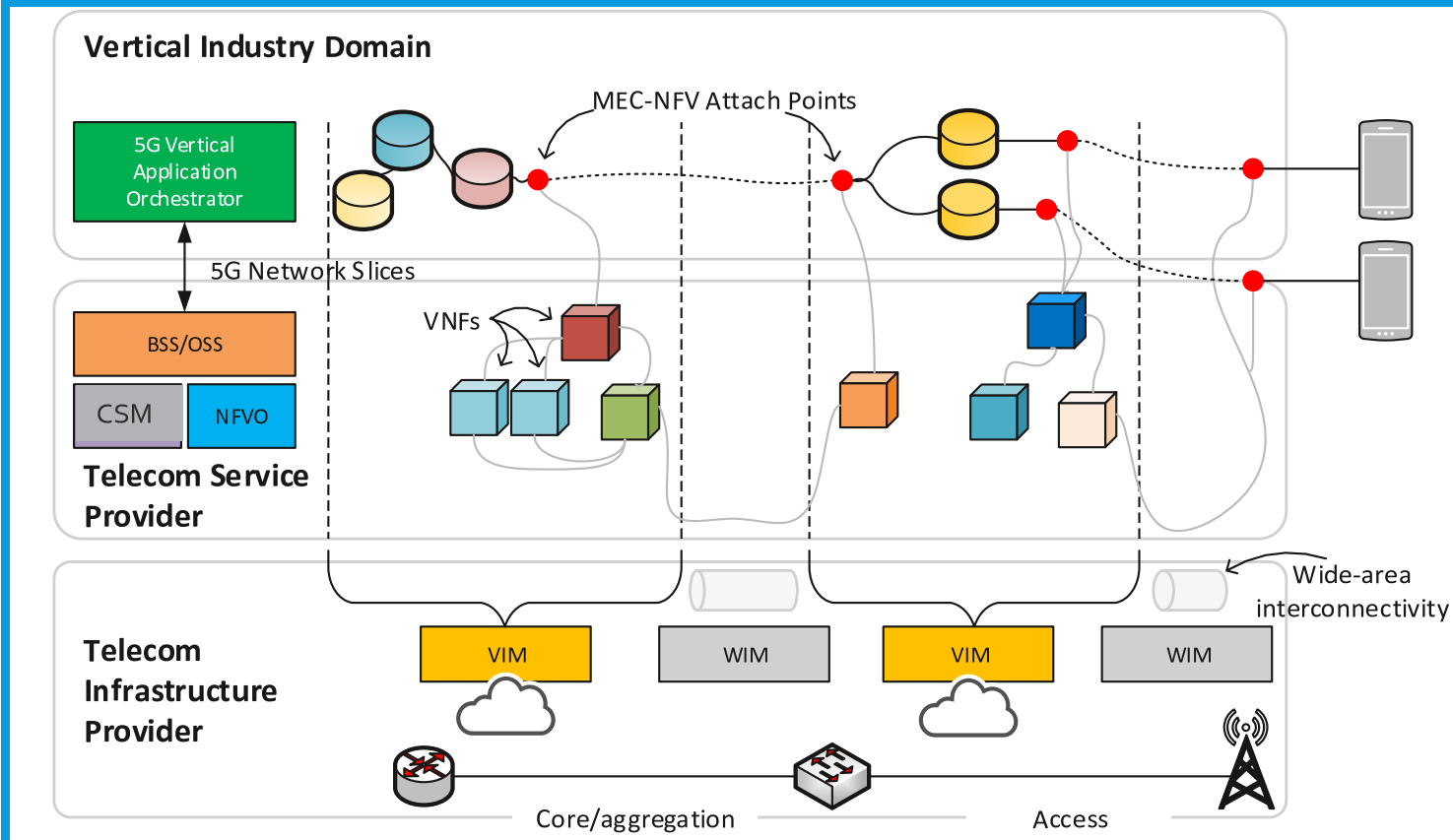
MATILDA end to end story



MATILDA



MATILDA architectural approach

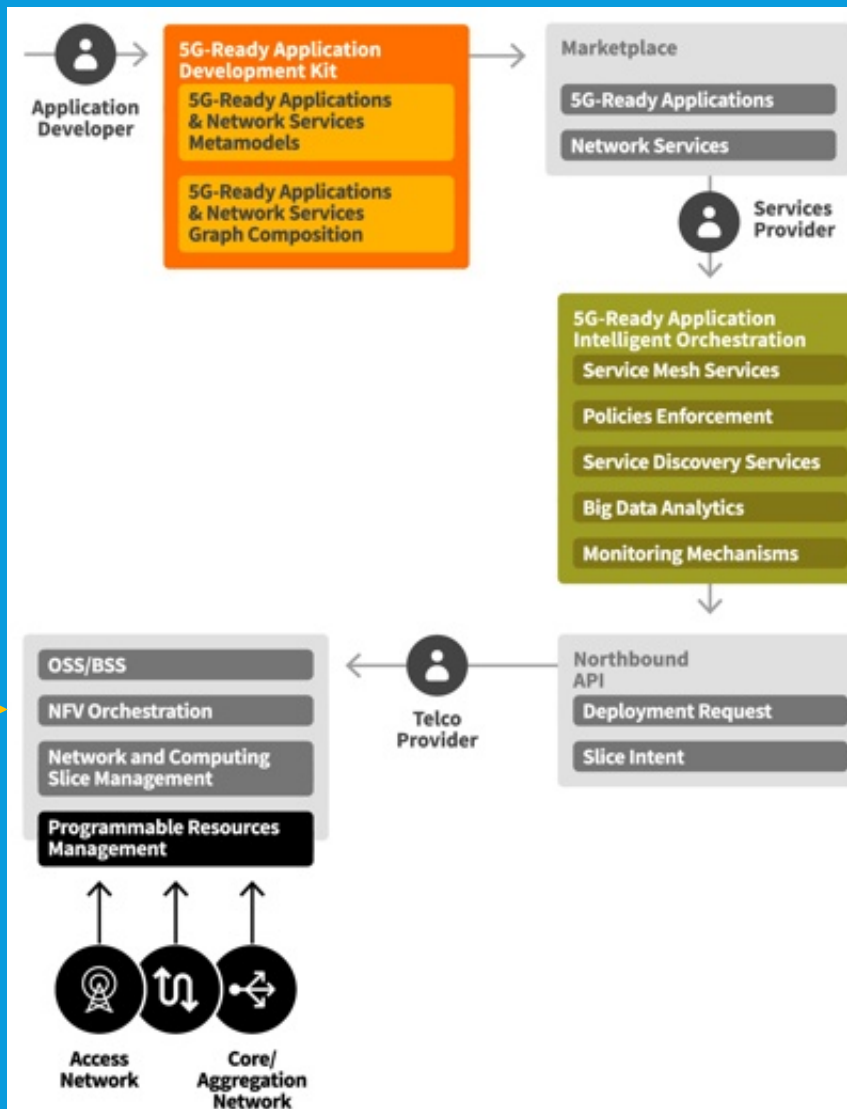


Legend

- CSM:** Computing Slice Manager
- VIM:** Virtual Infrastructure Manager
- VNF:** Virtual Network Function
- NFVO:** Network Functions Virtualization Orchestrator
- WIM:** Wide-area Infrastructure Manager
- MEC:** Multi-access Edge Computing
- BSS / OSS:** Business Support System / Operational Support System

MEO: Multi-access Edge Orchestrator
 VIM: Virtual Infrastructure Manager
 VNF: Virtual Network Function
 BSS/OSS: Business Support System / Operational Support System
 NFVO: Network Functions Virtualization Orchestrator
 WIM: Wide-area Infrastructure Manager
 MEC: Multi-access Edge Computing

MATILDA architectural flow



1

Cloud Native Components

2

1st Level of Orchestration

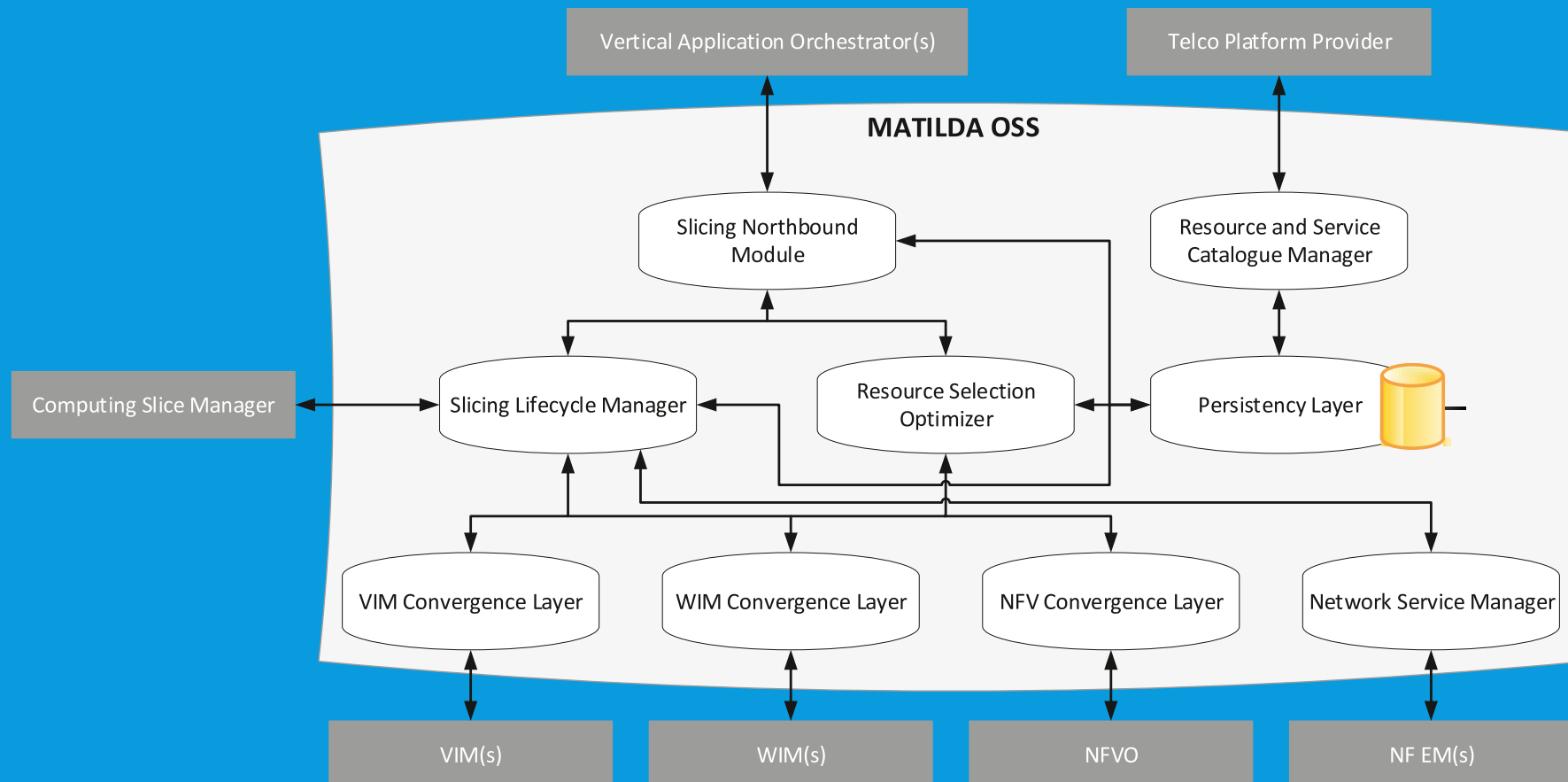
3

2nd Level of Orchestration

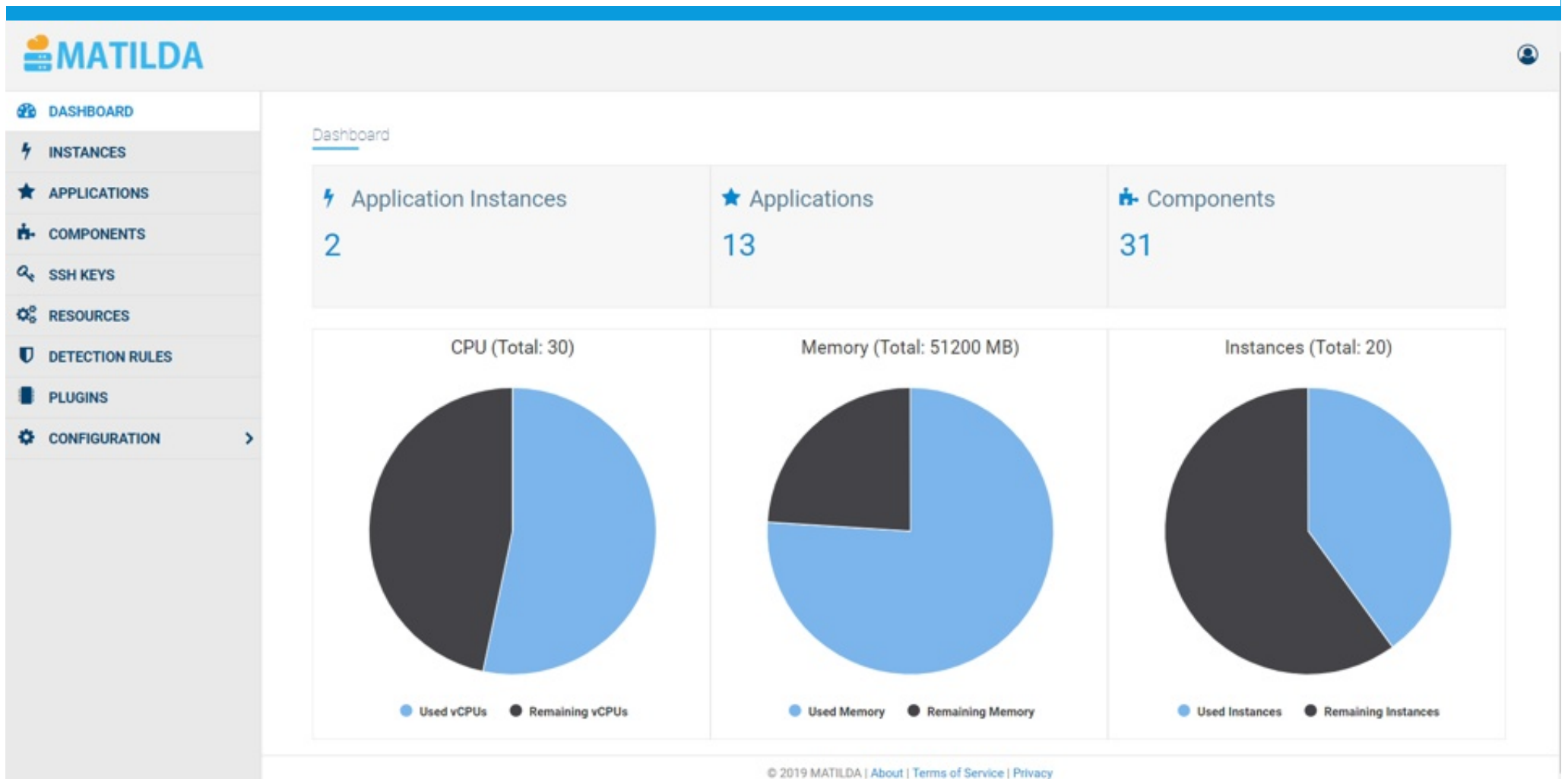
4

Application Aware Network Slice

MATILDA OSS



MATILDA Dashboard



MATILDA Repositories



COMPONENTS

SSH KEYS

RESOURCES

DETECTION RULES

PLUGINS

CONFIGURATION

Name

Search by Name

Filter

Reset

Identifier

Name

Visibility

Date Created

nxZ6RyPgS5

CustomMetricApp

Public

Wednesday, November 21, 2018 11:11 AM

Edit

Delete

...

6fmnzF4kKd

DivFunc

Public

Wednesday, November 21, 2018 11:11 AM

...

JgT2p82zY3

FaceDetector

Public

Wednesday, November 21, 2018 11:11 AM

...

6eSZUugge7

httpserver

Public

Wednesday, November 21, 2018 11:11 AM

...

FE1bWwiSSF

HttpStressApp


Public

Wednesday, November 21, 2018 11:11 AM

...

MATILDA Application Composer





PPDRDemo



☐ (Public) If this option is checked, anyone could see this Application

Search a component

ppdr

Generic info:

ID: iHLcgCz2sQ
Name: PPDRPhpDashboard

PPDRPhpDashboard262  

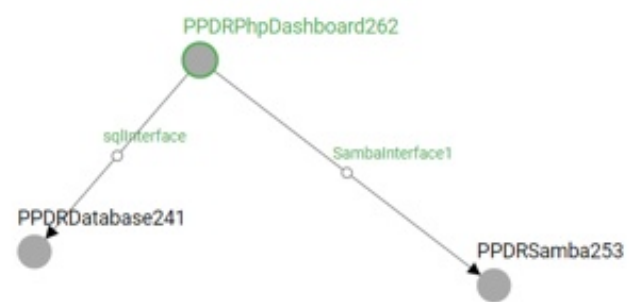
Required Interfaces:

1. Interface: SambaInterface1
2. Interface: sqlInterface

Exposed Interfaces:

1. Interface: PhpDashboardInterface

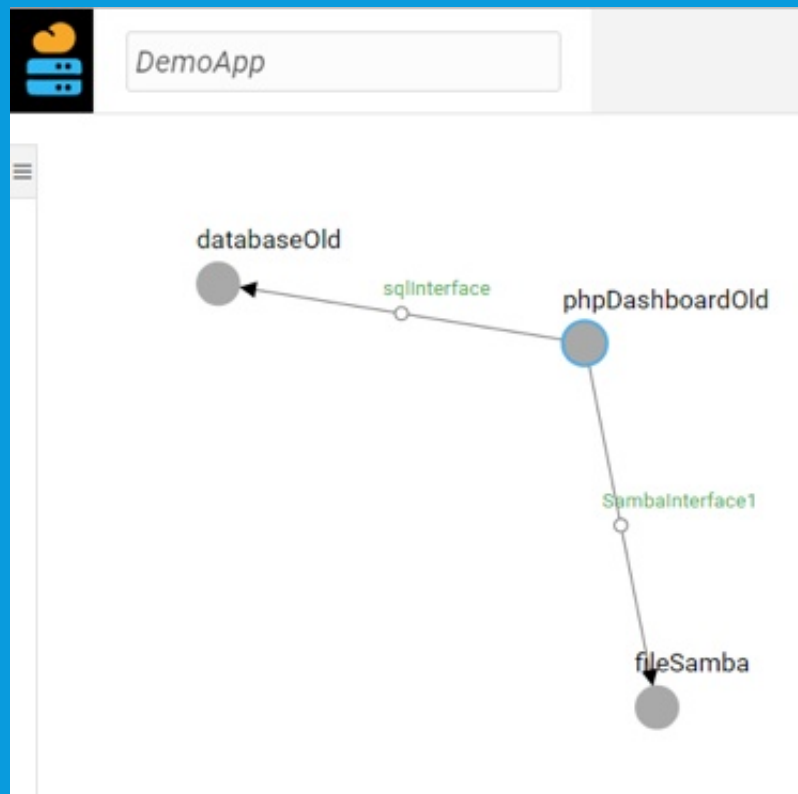
Save



```
graph TD; PPDRPhpDashboard262((PPDRPhpDashboard262)) -- sqlInterface --> PPDRDatabase241((PPDRDatabase241)); PPDRPhpDashboard262 -- SambaInterface1 --> PPDRSamba253((PPDRSamba253));
```

The diagram illustrates the application architecture. At the top is a green node labeled "PPDRPhpDashboard262". Two arrows originate from this node: one labeled "sqlInterface" pointing to a grey node labeled "PPDRDatabase241", and another labeled "SambaInterface1" pointing to a grey node labeled "PPDRSamba253".

Constraints Definition



Set the Constraints of "SambaInterface1" graph link

Maximum Delay (ms)

Value:

Constraint Type: ☒ Soft ☐ Hard

Maximum Jitter (ms)

Value:

Constraint Type: ☒ Soft ☐ Hard

Maximum Packet Loss (%)

Value:

Constraint Type: ☒ Soft ☐ Hard

Minimum Throughput (Kbps)

Throughput:

Constraint Type: ☒ Soft ☐ Hard

Slice Intent Creation



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Maximum Delay (ms)

Value

Maximum Delay that can b

Constraint Type

☐ Soft ☐ Hard

Maximum Jitter (ms)

Value

Maximum Jitter that can b

Constraint Type

☐ Soft ☐ Hard

Maximum Packet Loss (%)

Value

Maximum Packet Loss tha

Constraint Type

☐ Soft ☐ Hard

Minimum Throughput (Kbps)

Throughput

Minimum guaranteed Thro

Constraint Type

☐ Soft ☐ Hard

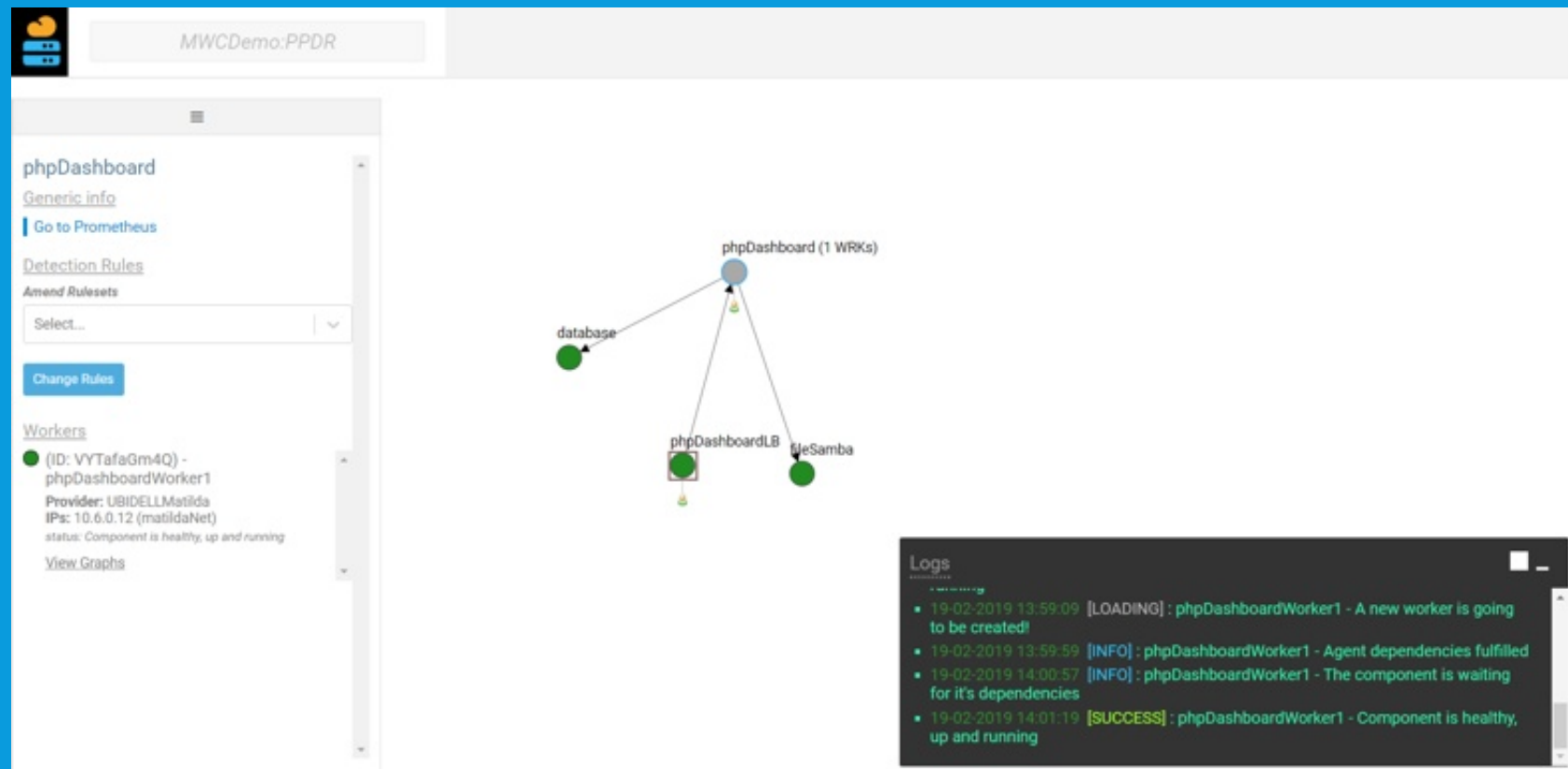
{

```
"applicationInstanceID": "580",
"name": "OSSScenario",
"callbackURL": "http://localhost:8080/api/v1/callback/slice/580",
"authenticationDetails": {
  "clientToken": "!telcoprovider!",
  "clientKey": "telcoprovider"
},
"componentNodeInstances": [{
  "componentNodeInstanceID": "581",
  "componentNodeInstanceName": "TestCaseMariaDB"
}, {
  "componentNodeInstanceID": "587",
  "componentNodeInstanceName": "TestCasePhpMyAdmin"
}],
"constraints": [{
  "constraintID": "591",
  "interfaceInstanceID": "590",
  "qi": "10",
  "radioServiceType": "1",
  "resourceType": "DELAY_CRITICAL_GBR",
  "allocationRetentionPriorityProfile": 1,
  "minimumGuaranteedBandwidth": 120.0,
  "maximumRequiredBandwidth": 200.0,
  "constraintUnit": "kbps",
  "category": "ACCESS",
  "type": "HARD"
}]
```

Automated Deployment



MATILDA

The screenshot displays the MATILDA web interface for the 'MWCDemo:PPDR' environment. On the left sidebar, the 'phpDashboard' component is selected, showing links for 'Generic info', 'Go to Prometheus', 'Detection Rules', and 'Amend Rulesets'. Below these is a 'Workers' section listing 'phpDashboardWorker1' with its ID, provider, IP, and status. The main panel shows a dependency graph where 'phpDashboard (1 WRKs)' depends on 'database', 'phpDashboardLB', and 'fileSamba'. A 'Logs' window in the bottom right corner shows a sequence of events: a new worker is created, dependencies are fulfilled, the component waits for dependencies, and finally, it is successfully deployed and running.

MWCDemo:PPDR

phpDashboard

[Generic info](#)

[Go to Prometheus](#)

[Detection Rules](#)

Amend Rulesets

Select...

Change Rules

Workers

- (ID: VYTafaGm4Q) - phpDashboardWorker1
- Provider: UBIDELLMatilda
- IPs: 10.6.0.12 (matildaNet)
- status: Component is healthy, up and running
- [View Graphs](#)

database

phpDashboard (1 WRKs)

phpDashboardLB

fileSamba

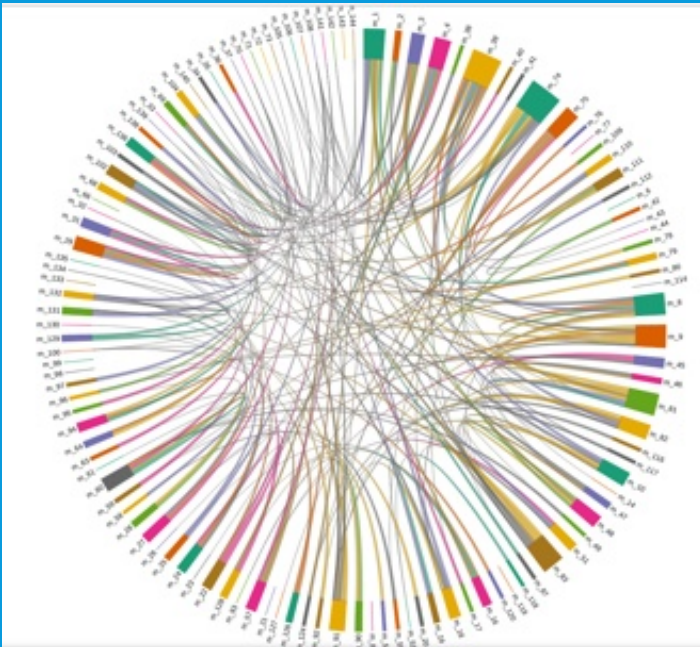
Logs

- 19-02-2019 13:59:09 [LOADING] : phpDashboardWorker1 - A new worker is going to be created!
- 19-02-2019 13:59:59 [INFO] : phpDashboardWorker1 - Agent dependencies fulfilled
- 19-02-2019 14:00:57 [INFO] : phpDashboardWorker1 - The component is waiting for it's dependencies
- 19-02-2019 14:01:19 [SUCCESS] : phpDashboardWorker1 - Component is healthy, up and running

Runtime Policies and Profiling



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Elasticity Policy | Create

Elasticity Policy Management for "MWC" Application Instance

Name *

Scaling Policy

Expression

Select Function

Average

Select Metric

_ipv4_packets_packets_persec_average (packets/s)

Select Operand

>

Select Component

PPDRPhpDashboard262

Select Dimension

received

Threshold

400

Period (Seconds) *

20

Inertia Time (Minutes) *

1

Actions

Select Component

PPDRPhpDashboard262

Type

Scale Out

Workers

1

+ -



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5G PPDR Use Case

CURRENT PPDR ECOSYSTEM



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PPDR OPERATIONS

Every day
operations



Extreme
situations



NEXTGEN (5G) PPDR SYSTEMS

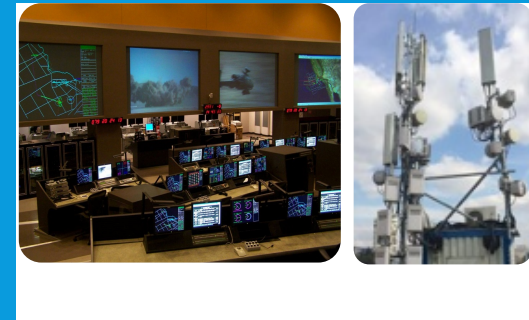


Flexibility in deployment and system use

- Strategic level
- Tactical level
- User/mission level

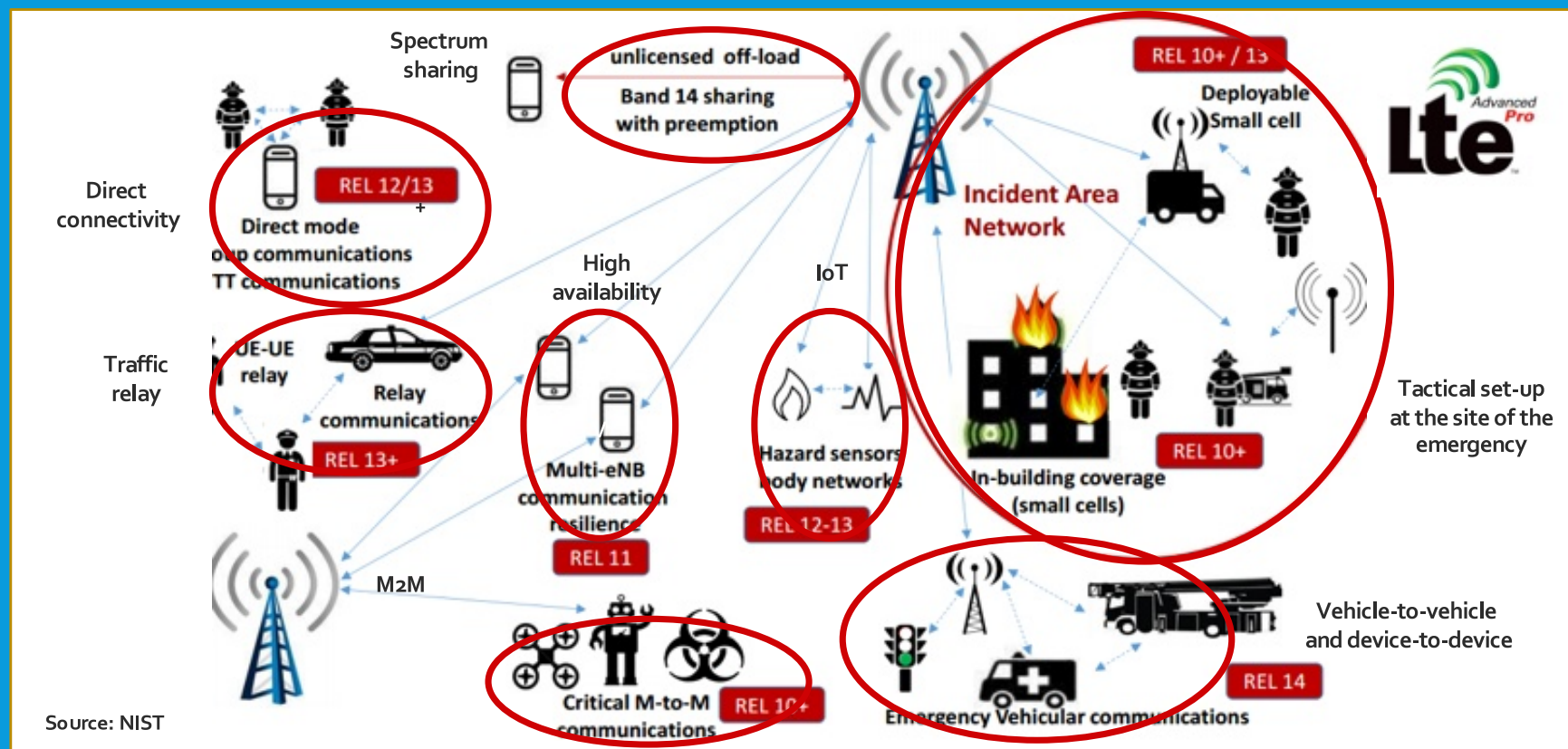


User/mission level

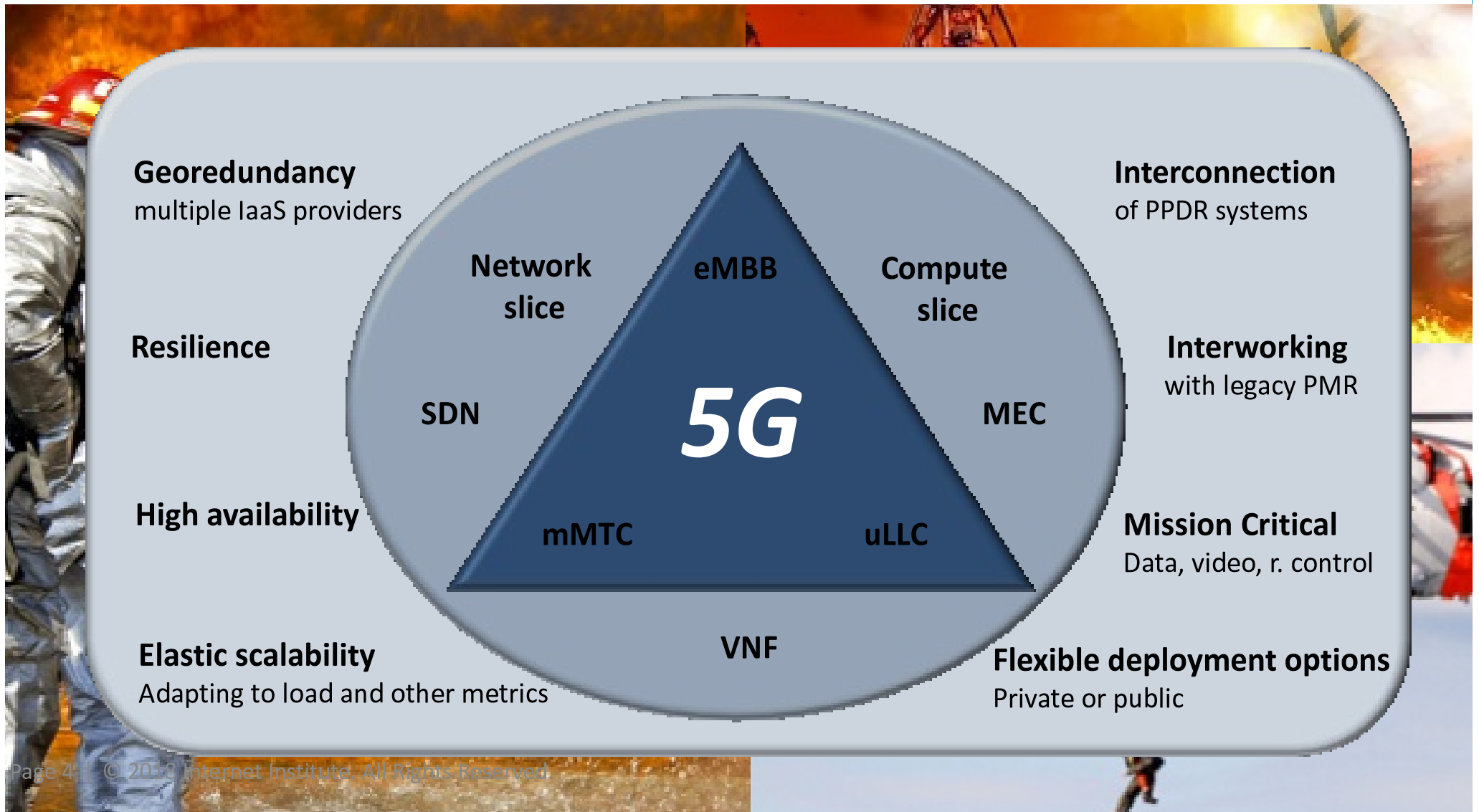


Vertical and horizontal scaling
of the system and services
components is essential!

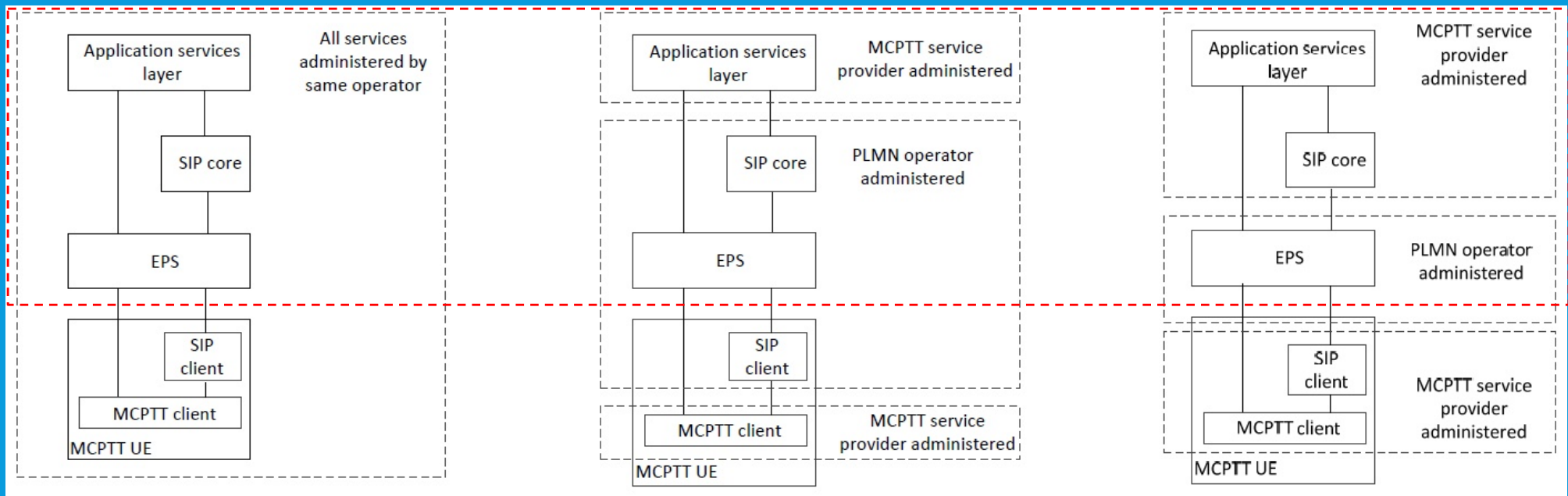
STANDARDIZATION – 3GPP R14



5G FOR PPDR

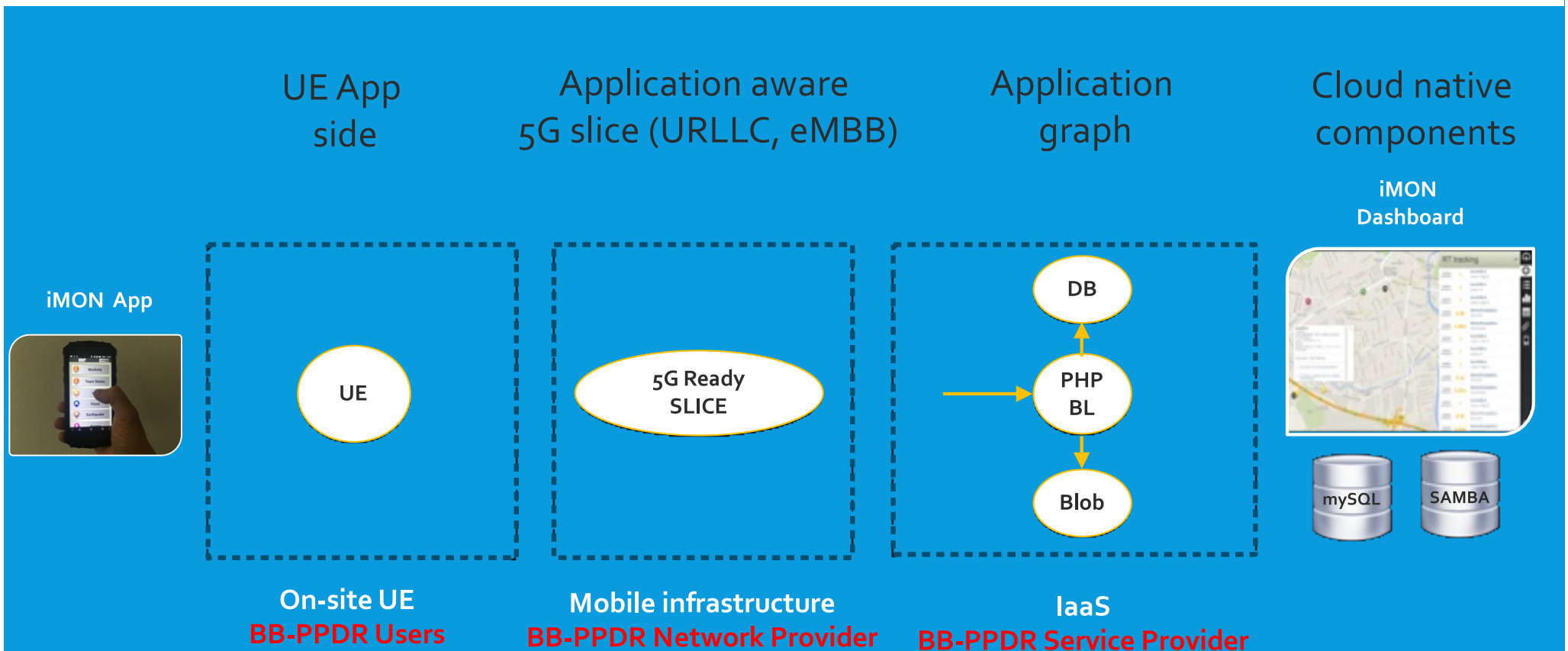


3GPP MC-PTT SERVICES DEPLOYMENT MODELS



5G PPDR challenge targeted with MATILDA: High availability, reliability and scalability of network and services infrastructure ("MC PPT", "MC Video" in "MC Data") in extreme situations!

IMON – 5G-READY APPLICATION



Automated deployment, slice creation, vertical and horizontal components scaling,...



MATILDA

Thank you!