Project Name: Expanded 5G Super Blueprint

Revision Control:

- v1.0   4/22/22   Initial version
- v2.0   5/17/22   Updated for distributed env & tighter Magma Or8str integration

Elevator Pitch:

The Linux Foundation 5G Super Blueprint has the potential to enable a wide range of DoD and government Private 5G use cases *as well as* extend its applicability to the broader enterprise market for use cases such as Industry 4.0, retail, and more. In this proposal, we will accelerate the implementation of the 5G Super Blueprint and expand its scope to include i) a 2nd 5GC under Magma that will comply with the 3GPP specifications and ii) the LFN EMCO project. Our goal is to speed up the adoption of these open source projects for the Private 5G use case. We will work on tasks ranging from the introduction of the 2nd 5GC, Magma Or8str integration, ONAP/EMCO/Anuket integration, and generating detailed requirements for network slicing and other Private 5G requirements.

Total ask: $625,000

Sponsoring Codeowner:

Contact information:

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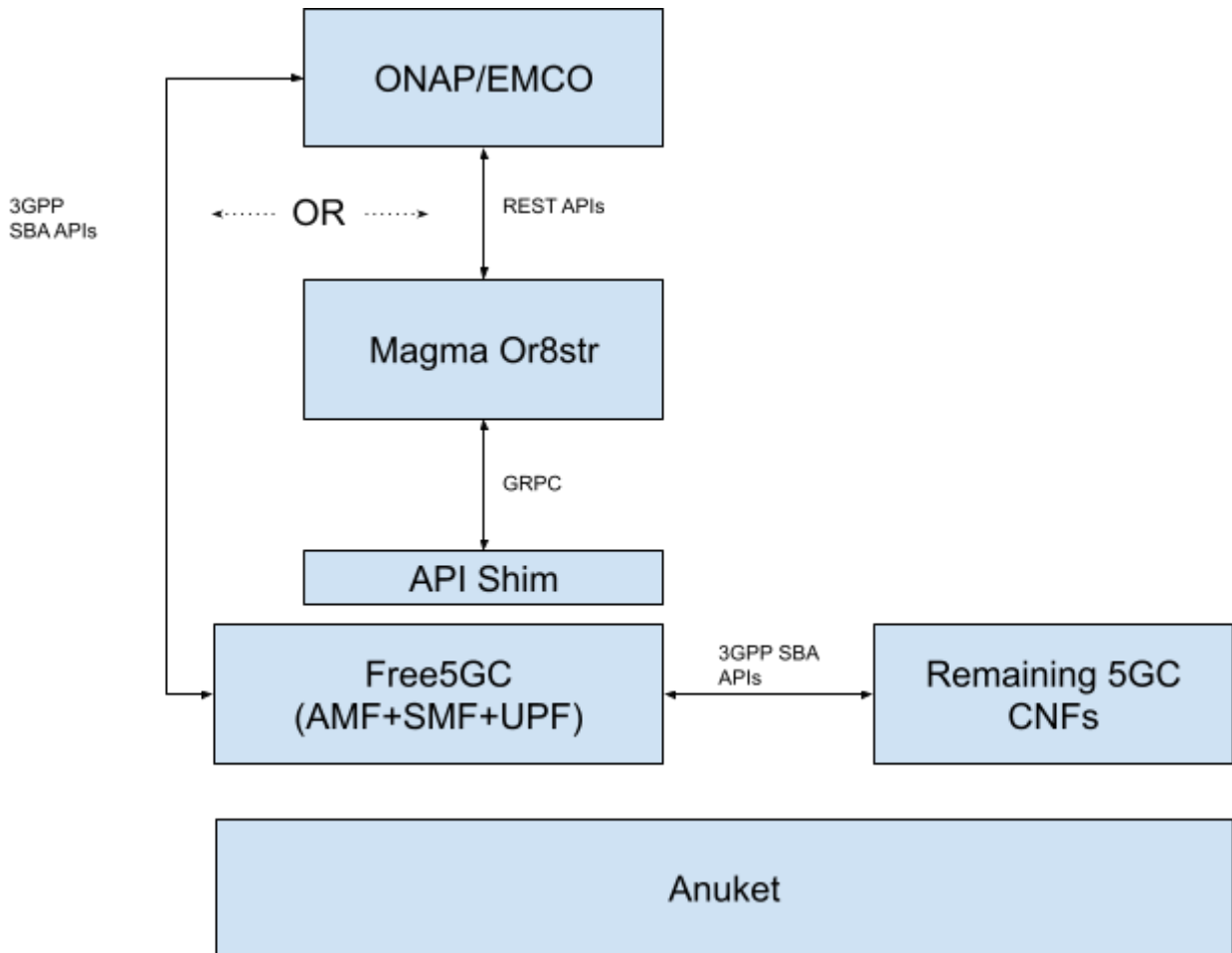- Sourav Chatterjee (LinkedIn), 5GC expert (Free5C)

5G Super Blueprint Website:
https://wiki.lfnetworking.org/display/LN/LFN+Demo%3A+5G+Super+Blueprint

5G Super Blueprint Repos: https://github.com/5G-Super-Blue-Print

Project Details:

The overall diagram describing the project is as follows:

The project will entail:

1. Forking Free5GC to add as a second 5GC under Magma while also merging ONF Aether, Sempre.ai etc. patches to make the Magma Free5GC the best possible version of a Free5GC implementation. While **we are open to utilizing other open source 5GC projects**, Free5GC is the only one we found with a permissive license. If OAI 5GC, for example, were to have a permissive license, we could potentially use that instead of Free5GC.

2. Packaging AMF+SMF+UPF into an equivalent of the Magma AGW to promote distributed environments and a myriad of **future** implementations ranging from Raspberry Pi, ARM, to IA. The remaining CNFs (NSSF, NRF, UDM, PCF, AUSF) will be packaged separately. The benefit is that these CNFs could possibly be used with the

current Magma Core via a Federated Gateway (this testing is not included in the proposal).

3. Creating GRPC⇔REST shim layer to integrate Free5GC under the Magma Or8str.
4. Integrating Free5GC with ONAP *and* EMCO from an orchestration and Day 0 config point of view (ONAP for large environments, EMCO for remote/small environments).
   a. EMCO integration is complete: Aarna has successfully orchestrated Free5GC using EMCO in the Akraino PCEI project.
   b. ONAP integration was completed in the past: Orange had successfully completed the integration in 2021. Presumably, it's just a matter of updating the work to the latest releases of ONAP and Free5GC.
5. Integrating ONAP and EMCO with Magma Or8str for CM/FM/PM and closed loop automation.
6. Integrating ONAP and EMCO with CNFs directly for CM/FM/PM and closed loop automation.
7. Integrating Free5GC with Anuket.
8. Generating requirements to support slicing and other Private 5G features (e.g. MEC breakout).
9. Expanding the community via NSC (National Spectrum Consortium) and IWRP (Information Warfare Research Project Consortium) engagement.

Roadmap:

The roadmap will be as follows:

Milestone + Date	Deliverable Summary	Cost
MS1, t_0+1 month	Fleshing out the details of the above approach. ● If the community/TSC does not accept the approach, the project will be terminated with this milestone and future milestones will ***NOT*** be billed.	$10,000 USD
MS2, t_0+2 months	Requirements generation for Private 5G aspects of Free5GC: ● This will be validated by community members articulating that they fully understand the requirements for network slicing, MEC breakout, ability to use a hardware accelerated UPF, or any other Private 5G feature. ● Completing this task early will enable other communities/members such as ONF Aether, Intel, Sempre.ai etc. to start contributing to these features.	$75,000 USD
MS3, t_0+3	Packaging of AMF+SMF+UPF into an AGW equivalent and	$215,000 USD

months	integration with the Magma Or8str: ● This milestone will be validated via the Magma Or8str to ensure that CM/FM/PM work as expected. ● End-to-end connectivity will be validated with a UE/gNB emulator and deemed complete if basic end-to-end connectivity tests pass.	
MS4, t_0+4 months	Orchestration and Day 0 configuration of Free5GC and Magma Or8str with EMCO & ONAP: ● This will be validated by showing orchestration of Free5GC and Magma Or8str on Kubernetes NFVI. ● Orchestration will be done by both EMCO and ONAP (using either GUI or REST APIs/Scripting) in separate validation exercises.	$15,000 USD
MS5, t_0+5 months	Configuration management of Free5GC by ONAP. We will show Day 1, 2 configuration of Free5GC via the Magma Or8str. For lighter-weight environments with EMCO, we will use a subset of ONAP projects. ● This will be validated by checking that one configuration value has been updated correctly by ONAP. Configuration management of Free5GC by ONAP. We will show Day 1, 2 configuration of Free5GC via direct CNF access. For lighter-weight environments with EMCO, we will use a subset of ONAP projects. ● This will be validated by checking that one configuration value has been updated correctly by ONAP. Anuket integration of Free5GC: ● This will be validated by showing orchestration of Free5GC and Magma Or8str on Anuket with end-to-end connectivity (using UE/gNB simulator) testing.	$135,000 USD
MS6, t_0+6 months	Closed loop automation via ONAP. For lighter-weight environments with EMCO, we will use a subset of ONAP projects. ● This will be validated by showing one fault or performance management data value monitored and driving a closed loop for a configuration management or lifecycle management (e.g. scale-out, reset) action.	$150,000 USD
Ongoing	Community expansion efforts by publicizing the 5G Super Blueprint within NSC and IWRP. Given the DoD's interest in this project, we are optimistic that we can get companies	$25,000 USD

	from these communities involved with the 5G Super Blueprint.	

Business Case:

Market Size

As per Nokia Bell Labs, the:
Private 5G + edge computing TAM = $800B by 2030 (excludes platform)
Our estimate of the SAM = $320B (Magma 5GC + orchestration, excluding RAN + MEC apps)

End Customer Financial Model

The financial model to the end customer will be to offer Magma + ONAP/EMCO as a SaaS offering along with a RAN partner and MEC application(s). The pricing will be based on the size of the Private 5G implementation as measured by sq. ft.

Routes to Market

We anticipate multiple routes to market:
- SIs: These could be the large global SIs or specialized SIs that sell into defense, industry 4.0, agriculture, and more.
- Telco business groups: Most telcos have a dedicated group that sells to Enterprises. These groups would be an ideal GTM channel
- Direct (product led growth): We expect some percentage of the sales to come directly through the SaaS platform.
- MEC Application vendors: MEC application vendors will need an embedded Private 5G solution that they can get through a white labeled version of our SaaS platform.

Current Pipeline

- DoD: The DoD has clearly stated that the 5G Super Blueprint will be used for Project Mojito.
- Large EU MNO business group: We are in integration testing phase with the customer and expect the rollout to be across emerging markets of EMEA.

We anticipate the pipeline to grow significantly as the blueprint progresses.