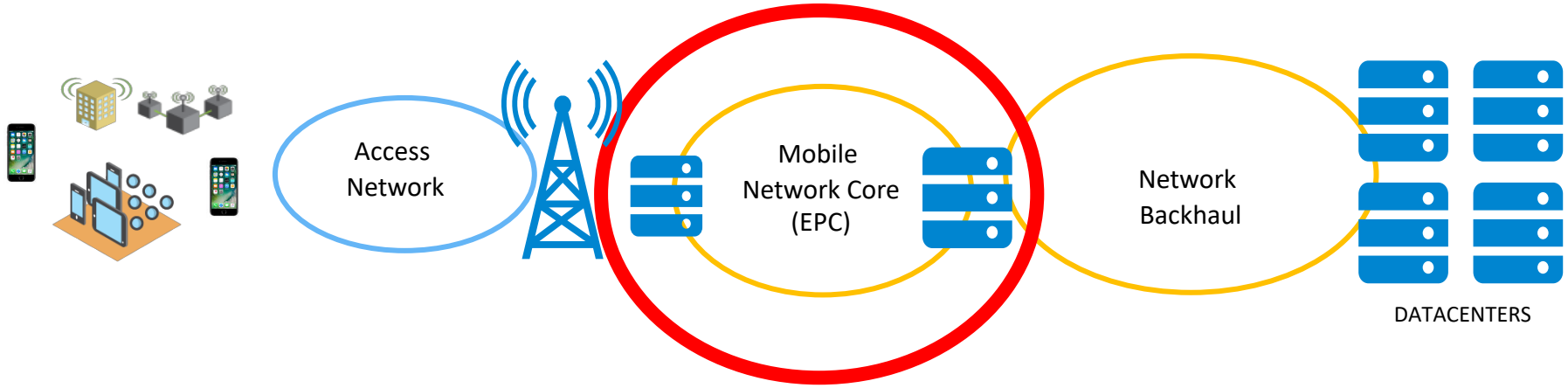
Open Mobile Evolved Core

https://www.opennetworking.org/omec/

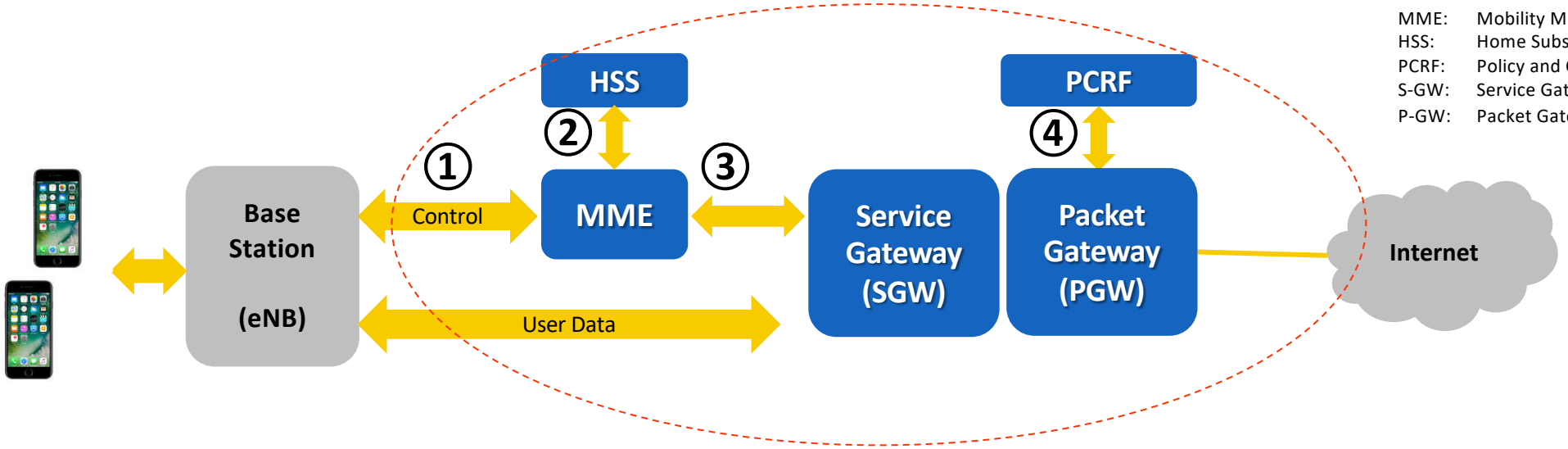
OMEC Tutorial Organization

- Opening- Stage setting
- Architectural Overview- Features, Functionality, Performance
- Demo Video- Test Drive OMEC
- Contribution of features and bug fixes to OMEC
- OMEC CI/CD
- Q & A

OMEC Goal



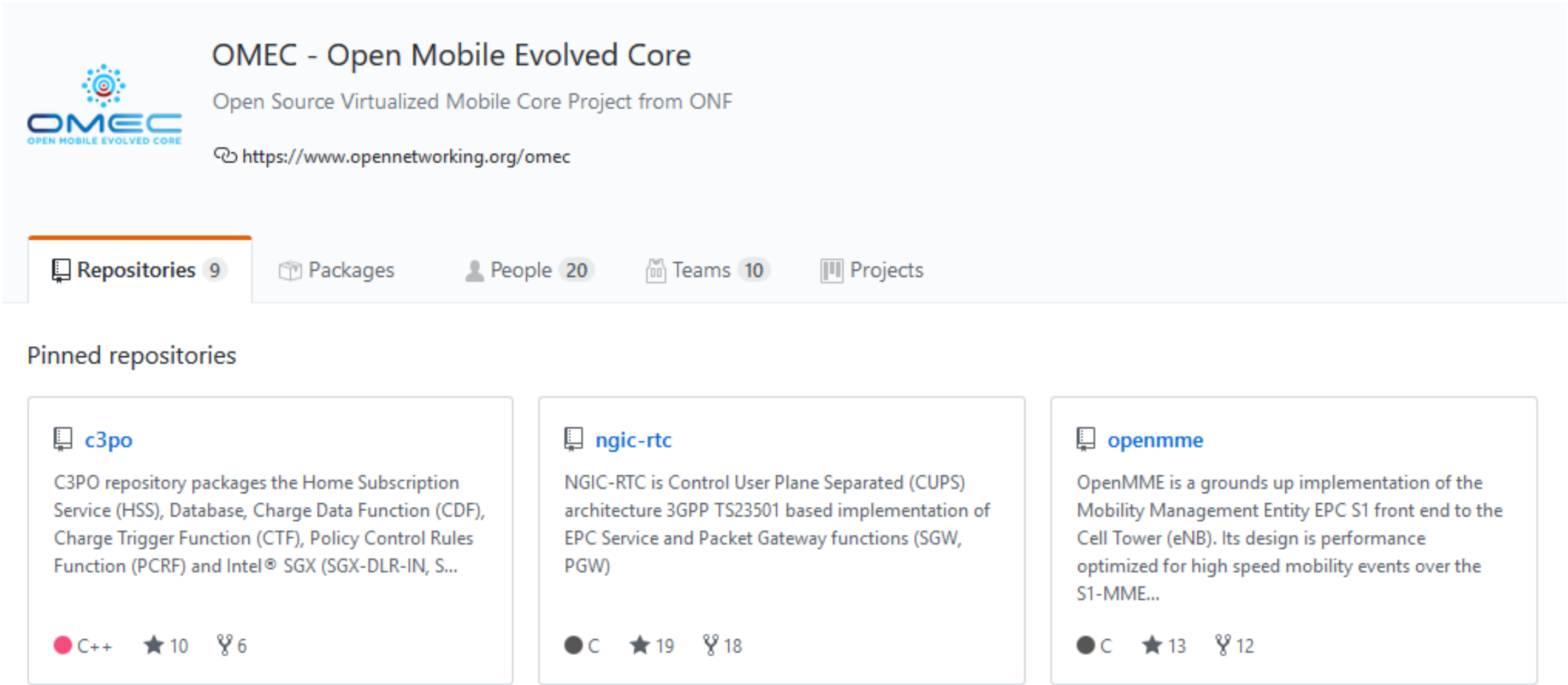
MME: Mobility Management Engine (Control)
HSS: Home Subscriber Services (Authentication)
PCRF: Policy and Charging Rules Function
S-GW: Service Gateway (Charging, services, …)
P-GW: Packet Gateway (Router)



Can we securely run Telco core infrastructure on high volume servers to deliver operational capacity?

OMEC repositories

- https://github.com/omec-project



OMEC repositories

omec-project-ci

Resources for CI/CD Jobs

Groovy 2 1 3 4 Updated 13 days ago

freediameter

FreeDIAMETER packages the IETF RFC 6733 DIAMETER base protocol to provide an Authentication, Authorization, and Accounting (AAA) framework between the EPC elements- MME <S6a interface> HSS; Packet Gateway Control (PGWC) <Gx interface> PCRF.

C 3 0 0 0 Updated on Feb 23

deployment

Deployment repository is a set of terraform based tools for efficient and automated building of OMEC based VNF infrastructure. It packages a set of scripts to build, configure and deploy the KVM based Virtual Machines (VM) over which the each of the constituent OMEC Network Functions can be installed, configured and operated.

Shell Apache-2.0 4 3 6 0 Updated 23 hours ago

il_trafficgen

IL_Trafficgen is a DPDK packet gen based traffic generator which together with the built-in test features in the NGIC provide a simple means of testing the performance envelope and operation of the EPC. The IL_Trafficgen S1U generator generates Uplink (UL) GTPU packets on the S1U interface to the Serving Gateway User Plane (SGWU) for a defined n...

C Apache-2.0 2 0 2 0 Updated on Feb 14

oss-util

OSS-Util provides Application Programing Interface (API) to implement Command Line Interface (CLI) and logging support for all of the constituent OMEC applications. Using OSS-UTIL will make CLI and logging support common across all the applications. OSS-UTIL builds as a library which can be linked to any of the OMEC applications.

C++ Apache-2.0 1 0 0 0 Updated on Feb 12

Open Mobile Evolved Core (OMEC)- Top level

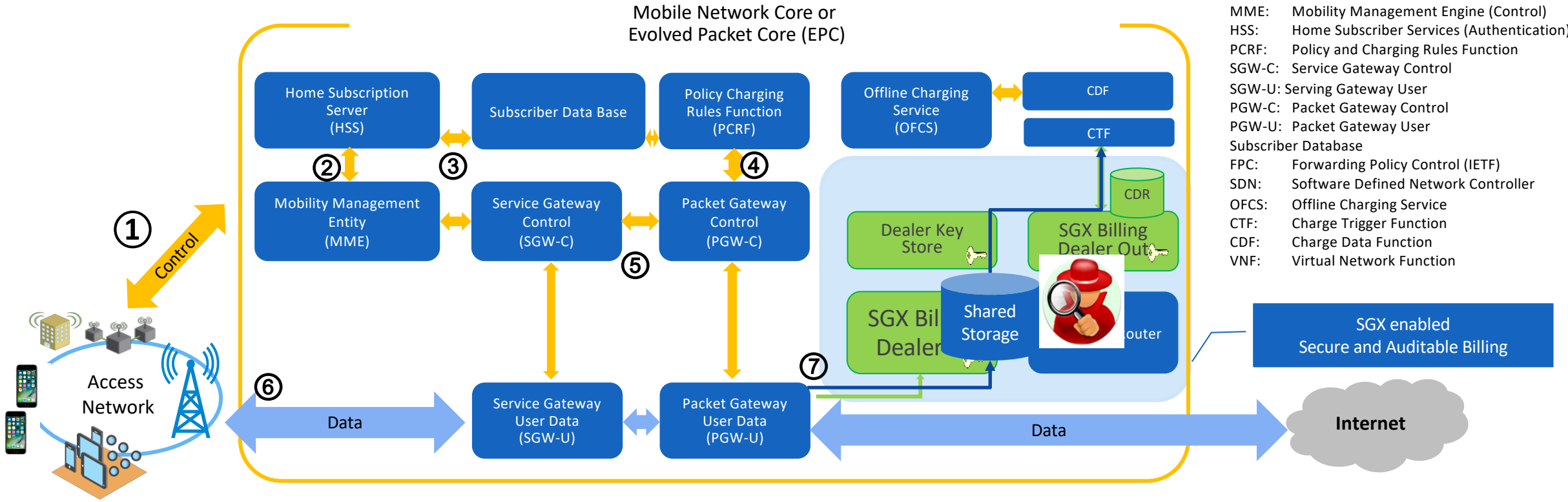
The Open Mobile Evolved Core (OMEC) is a package of seven individual repositories comprising 13 Virtual Network Functions (VNF)- Mobility Management Entity (**MME**), Home Subscription Server (**HSS**), Database (**DB**), Serving Gateway Control (**SGWC**), Serving Gateway User Plane (**SGWU**), Packet Gateway Control (**PGWC**), Packet Gateway User Plane (**PGWU**), Charge Data Function (**CDF**), Charge Trigger Function (**CTF**), Intel® Secure Guard Extensions CDR Dealers-In (**SGX-DLR-IN**), Intel® SGX Dealer-Out (**SGX-DLR-OUT**), Intel® SGX Key-store (**SGX-KMS**) and **CDR-ROUTER**

OMEC includes:

- Components that have gone through Intel's SWLC and SDL process (including code scans to prevent license contamination)
- Complete connectivity, Secure billing and charge data handling capabilities
- 3GPP Release 13 compatible*
- Optimization for lightweight cost effective deployments and IoT applications
- Integrated CI/CD test and verification capabilities
- https://github.com/omec-project

* Refer release notes- issues and constraints

OMEC 1.0 – Fully Featured & Intel® SGX Secure Billing



MME: Mobility Management Engine (Control)
HSS: Home Subscriber Services (Authentication)
PCRF: Policy and Charging Rules Function
SGW-C: Service Gateway Control
SGW-U: Serving Gateway User
PGW-C: Packet Gateway Control
PGW-U: Packet Gateway User
Subscriber Database
FPC: Forwarding Policy Control (IETF)
SDN: Software Defined Network Controller
OFCS: Offline Charging Service
CTF: Charge Trigger Function
CDF: Charge Data Function
VNF: Virtual Network Function

E2E Comprehensive EPC Infrastructure:

- Fully secured distributed Xeon E3 based SGX enabled billing system, automated, real time billing data collection and storage.
- SGX based secured, auditable mutual attestation. Guaranteed confidentiality and integrity of Charge Data Records (CDRs)
- Cross platform deployment orchestration, provisioning and network configuration tools ready- KVM, AWS, Docker, K8, …

Reducing the "Attack Surface" with Software Guard Extensions (SGX)

Application gains ability to defend its own secrets

- Smallest attack surface (App Memory + processor)
- Malware that subverts OS/VMM, BIOS, Drivers etc. cannot steal app secrets

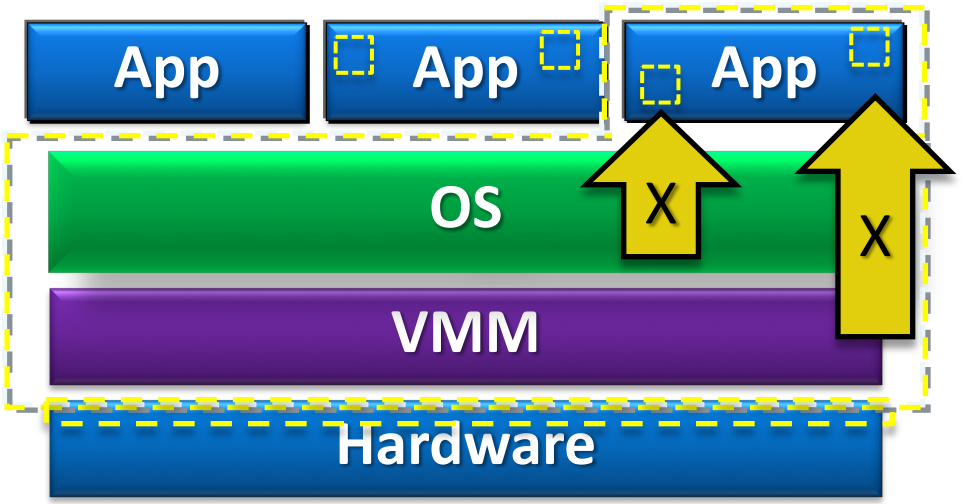
Familiar development/debug

- Single application environment
- Build on existing ecosystem expertise

Familiar deployment model

- Platform integration not a bottleneck to deployment of trusted apps

Attack surface with Enclaves
Attack surface today



Attack Surface

Scalable security within mainstream environment

OMEC Functionality & Performance

1. Comprehensive E2E- 12x VNFs (MME, HSS, DB, SGWC, PGWC, SGWU, PGWU, SGX-DLR-IN, SGX-KMS, CDR-RTR, SGX-DLR-OUT, CTF, CDF)*
2. Fully secured, scalable and auditable SGX based integrated billing record processing
   - SGX E3 server platform based system - One SGX Billing Frame capable of handling upto 7 DP Frames
3. DP (SGWU-PGWU) Run-To-Completion model
   - 4 cores delivering ~2.5 MPPS across 500K flows
   - SGWU/PGWU can also be protected with Intel® SGX based servers
4. SGWU-PGWU* interfaces are Linux aware and operable. Key Operational requirement.
   - Linux commands, Route, ARP tables direct fast path frames

Legend: Y=ON; N= OFF; X= Don't Care

Make | Config file options																			
	Performance											Conformance				Environment			Status
Test Generator	UE	TPS	PPS	DP: SIMU_CP	CP: SIMU_CP	STATIC_ ARP	Linux	CP <UDP> DP	CP <ZMQ|TCP> DP	CP <RESTConf <> FPC <ZMQ|TCP> DP	S1MME	S11	RATING _GRP_ CDR	SGX_CDR	GTPU_SEQNB_IN || GTPU_SEQNB_OUT	DP_DDN	Non-Colocated | VMs (wo CPU corepinning)	Non-Colocated | VMs (with CPU corepinning)	Co-Located | Baremetal	
ng40	50,000	1,000	900,000	N	N	N	Y	Y	N	N	X	Y	N	N	N	N	X	X	Y	Y
ng40	50,000	1,000	900,000	N	N	Y	N	N	Y	N	X	Y	N	N	N	N	X	X	Y	Y
Polaris	50,000	250	9,230	N	N	Y	N	Y	N	N	Y	Y	N	Y	N	N	Y	N	X	Y
Polaris	50,000	250	9,230	N	N	N	Y	N	Y	N	Y	Y	N	Y	N	N	Y	N	X	Y
il_trafficgen	50,000	10,000	1,500,000	N	Y	Y	N	Y	N	N	X	X	N	Y	N	N	Y	N	X	Y
il_trafficgen	50,000	10,000	2,000,000	N	Y	Y	N	Y	N	N	X	X	N	Y	N	N	N	Y	X	Y

* Refer release notes- issues and constraints

Intel Confidential

DEMO VIDEO