



Investor Presentation

Embedded wisely, Embedded widely

ememory

A hand is shown placing a coin on top of a stack of several other coins. To the left, another stack of coins has a small green plant with three leaves growing out of it. The background is a soft, out-of-focus green and yellow.

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A hand is shown dropping a coin into a stack of coins. To the left, another stack of coins has a small green plant with three leaves growing out of it. The background is a soft, out-of-focus green and yellow bokeh.

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Review of Operations

Q1 2020 Financial Results

The EPS of Q1 2020 was 2.38 NTD, ROE was 39.5%.

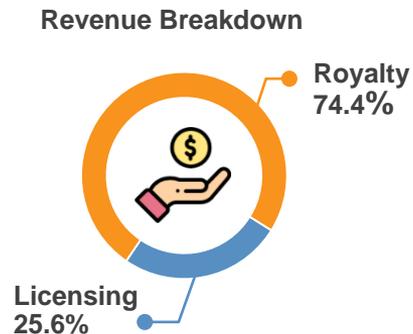
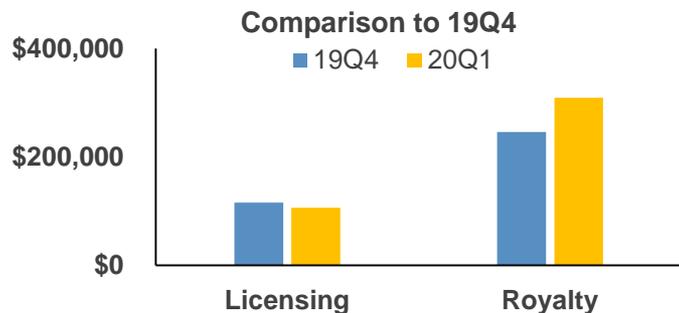
(thousands of NT dollars)

	Q1 2020	Q4 2019	Q1 2019	Change (QoQ)	Change (YoY)
Revenue	415,436	361,896	395,061	14.8%	5.2%
Gross Margin	100%	100%	100%	-	-
Operating Expenses	221,463	202,386	201,088	9.4%	10.1%
Operating Income	193,973	159,510	193,973	21.6%	0.0%
Operating Margin	46.7%	44.1%	49.1%	2.6ppts	-2.4ppts
Net Income	176,758	129,653	177,151	36.3%	-0.2%
Net Margin	42.5%	35.8%	44.8%	6.7ppts	-2.3ppts
EPS (Unit: NTD)	2.38	1.74	2.39	36.8%	-0.4%
ROE	39.5%	30.2%	38.9%	9.3ppts	0.6ppts

Note: Revenue of Q1 2020 in terms of US\$ is US\$13.9 mil, up 17.2% QoQ, up 8.1% YoY.

Revenue in Different Stream

Revenue up 14.8% QoQ and 5.2% YoY.



Revenue

NT\$ Thousands	Q1 2020	Q4 2019	Q1 2019	QoQ	YoY
Licensing	106,446	115,944	105,824	-8.2%	0.6%
Royalty	308,990	245,952	289,237	25.6%	6.8%
Total	415,436	361,896	395,061	14.8%	5.2%

US\$ Thousands	Q1 2020	Q4 2019	Q1 2019	QoQ	YoY
Licensing	3,542	3,798	3,438	-6.7%	3.0%
Royalty	10,336	8,047	9,405	28.4%	9.9%
Total	13,878	11,845	12,843	17.2%	8.1%

Q1 Revenue by Technology

The royalty of NeoFuse has a growth of 187.8% YoY.

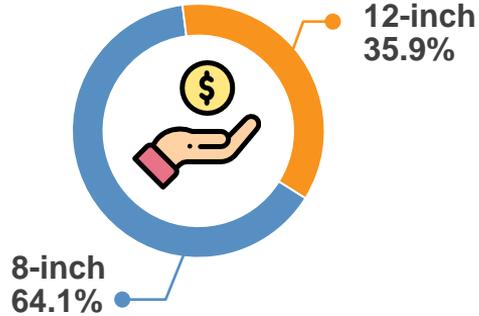
- ✓ The licensing revenue of NeoFuse increased 13.5% QoQ and 15.0% YoY. Its royalty revenue increased 40.8% QoQ and 187.8% YoY.
- ✓ The royalty revenue of NeoBit increased 19.9% QoQ but decreased 17.7% YoY. Its licensing revenue decreased 24.5% QoQ but increased 20.5% YoY.
- ✓ The licensing revenue of MTP (NeoEE+NeoMTP) decreased 49.2% QoQ and 66.1% YoY; while its royalty revenue increased 14.8% QoQ but decreased 12.6% YoY.

Technology	Q1 2020								
	Total Revenue			Licensing Revenue			Royalty Revenue		
	% of Q1 Revenue	Change (QoQ)	Change (YoY)	% of Q1 Licensing	Change (QoQ)	Change (YoY)	% of Q1 Royalty	Change (QoQ)	Change (YoY)
NeoBit	53.8%	12.8%	-14.7%	22.6%	-24.5%	20.5%	64.5%	19.9%	-17.7%
NeoFuse	41.6%	27.5%	74.6%	70.1%	13.5%	15.0%	31.8%	40.8%	187.8%
PUF-Based	0.1%	-85.9%	100.0%	0.6%	-85.9%	100.0%	0.0%	0.0%	0.0%
MTP	4.5%	-22.5%	-45.5%	6.7%	-49.2%	-66.1%	3.7%	14.8%	-12.6%

Royalty Revenue by Wafer Size

12-inch wafer increased 50.4% QoQ and 13.7% YoY.

Q1 Royalty Breakdown



- ✓ 12-inch wafers contributed 35.9% of royalty, increased 50.4% sequentially and 13.7% YoY.
- ✓ 8-inch wafers contributed 64.1% of royalty, increased 15.0% sequentially and 3.3% YoY.

Royalty

Wafer Size	Q1 2020		
	% of Q1	Change (QoQ)	Change (YoY)
8-Inch	64.1%	15.0%	3.3%
12-Inch	35.9%	50.4%	13.7%

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Future Outlook

eMemory Embedded Everywhere

eMemory's IP seeks to penetrate across all the applications.

Core Tech



- ✓ **Product Applications:**
eMemory's IP are already applied into different applications, which includes PMIC, LCD driver, Sensors, RFID, OLED Driver, Connectivity IC, DTV, STB, SSD Controller, Bluetooth, TDDI, MCU, Fingerprint Sensor, Smart Meters, Surveillance, ISP, CIS, DRAM, embedded Flash and FPGA.
- ✓ **Future Target:**
AP, GPU, CPU, Flash, IoT, AI, autonomous driving



- ✓ **The Future in Security Chip IP:**
The rapid growth in AIoT and 5G drive the demand for hardware security. OTP and PUF are indispensable for root of trust in hardware security.
- ✓ **PUF-based Security Solutions:**
To satisfy the market needs, eMemory developed a new series of PUF-based security solution, including PUFrt, PUFiot, PUFse and PUFflash.

Security

Our Perspectives

eMemory continue to create value for the industry and our shareholders.

Licensing & Royalty



- ✓ Licensing:
 - NeoFuse and NeoPUF will continue to grow due to increasing advanced technology platforms and more comprehensive PUF-based security IPs.
- ✓ Royalty:
 - 8" wafers – content increase in 5G PMIC, medical demand for MCU, sensors
 - 12" wafers – 249 tape outs from 55nm-7nm in the pipelines ready for productions, applications including OLED, DDI, ISP, CIS, Bluetooth, TWS, Networking related IC, SSD controllers, video processor, STB, DTV, surveillance, and DRAM.

New Application & Technology Development



- ✓ For new applications:
 - PUF-based security IPs adopted by customers in AI, IoT, FPGA, Blockchain, and industrial automation.
 - Security platform cooperation with ARM.
- ✓ For new development:
 - Developed 6nm and 5nm plus (N5P) technology with leading foundry partners; design project tape out of 6nm chip.
 - Developed PUF into embedded flash platform. PUF-based IoT security solution, security elements and hardware security module IPs are under development.
 - Build PUF-based hardware security IP open platform, by integrating OTP, PUF, security-functioned IPs, and cryptographic algorithm IPs to provide total security solutions for AIoT and 5G applications.



Q&A



Appendix

Company Overview

eMemory is the global leader of embedded non-volatile memory IP.

Revenue Trend

(Unit: NT\$ 1,000)



**Founded
In 2000**

Based in Hsinchu, Taiwan.
IPO in 2011. Over 28M wafers
shipped.

**700+
Patents Issued**

254 pending patents. 269
employees with 70% R&D
personnel.

**Best IP Partner
With TSMC**

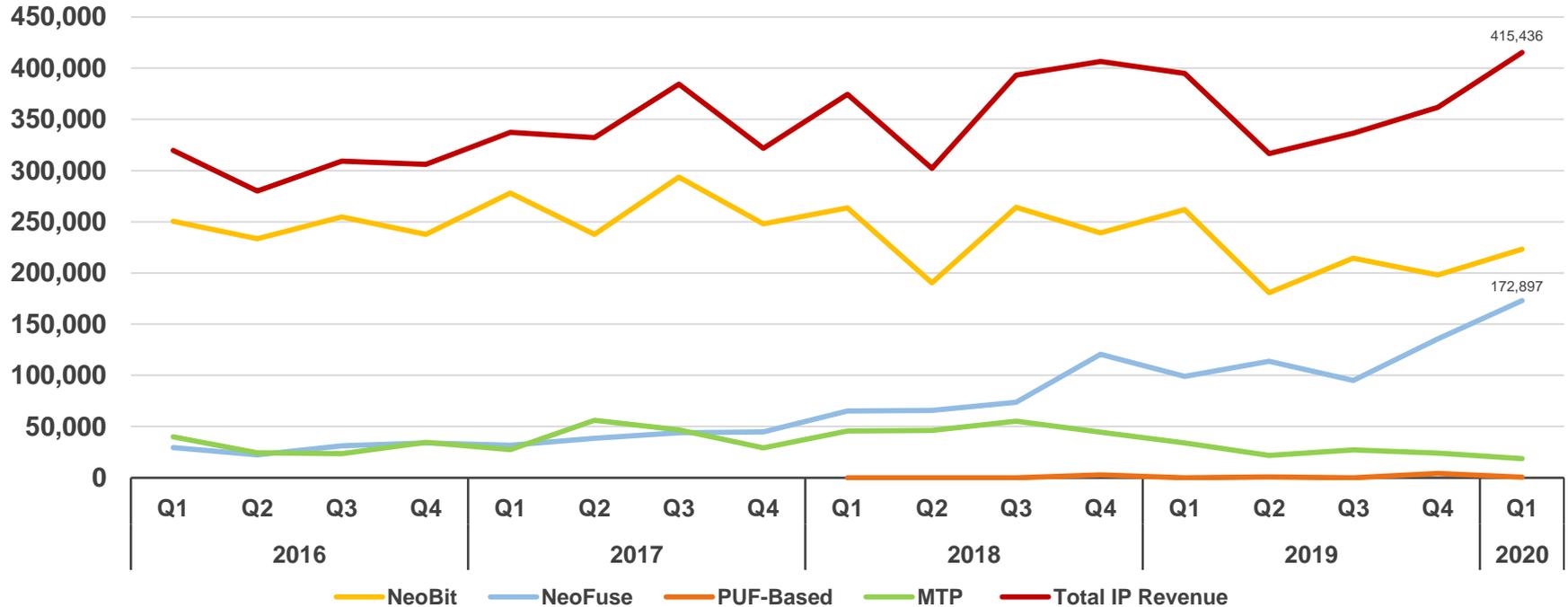
TSMC Best IP Partner Award
since 2010.

Revenue Trend by Product Line

NeoFuse will continue to drive revenue in the future as it is adopted by more advanced nodes.

Revenue Trend

(Unit: NT\$ 1,000)



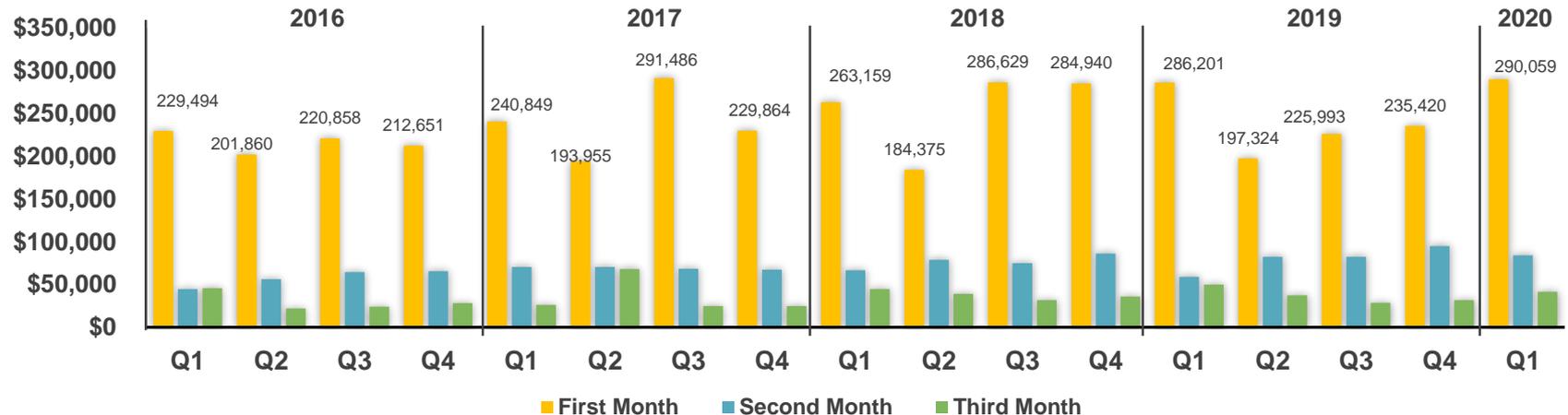
Quarterly Revenue Pattern

eMemory's quarterly revenue pattern.

- ✓ 1st month: Receive **License Fees** of the month and **Royalty** from most foundries on previous quarter's wafer shipments.
- ✓ 2nd month: Receive **License Fees** of the month and **Royalty** from other foundries.
- ✓ 3rd month: **License Fees** Only.

Note: One foundry pay royalty semiannually, reported in Jan and July revenue.

(Unit: NT\$ 1,000)



Worldwide Customers

Our IP solutions are adopted by leading foundries, IDMs and fabless worldwide.

Country	Foundry	IDM	Fabless
Taiwan	4	1	291
China	8	0	744
Korea	4	0	84
Japan	4	7	61
North America	1	1	296
Europe	2	1	142
Others	1	0	56



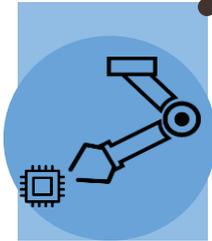
Business Model

Recurring royalty is the backbone of our business.



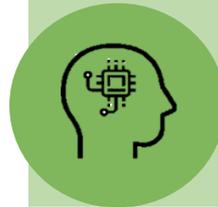
- ✓ 70-75% revenue are from royalty based on wafer production
- ✓ More adoption = more volume shipment
- ✓ More advanced node wafers = higher ASP per wafer

Revenue Breakdown



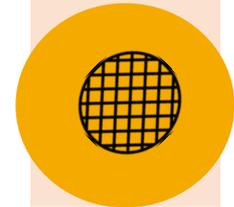
License Fee
Foundries Process
Development

2-3 years



Design License Fee
Fabless Product
Development

2-3 years



Royalty
Wafer Mass Production

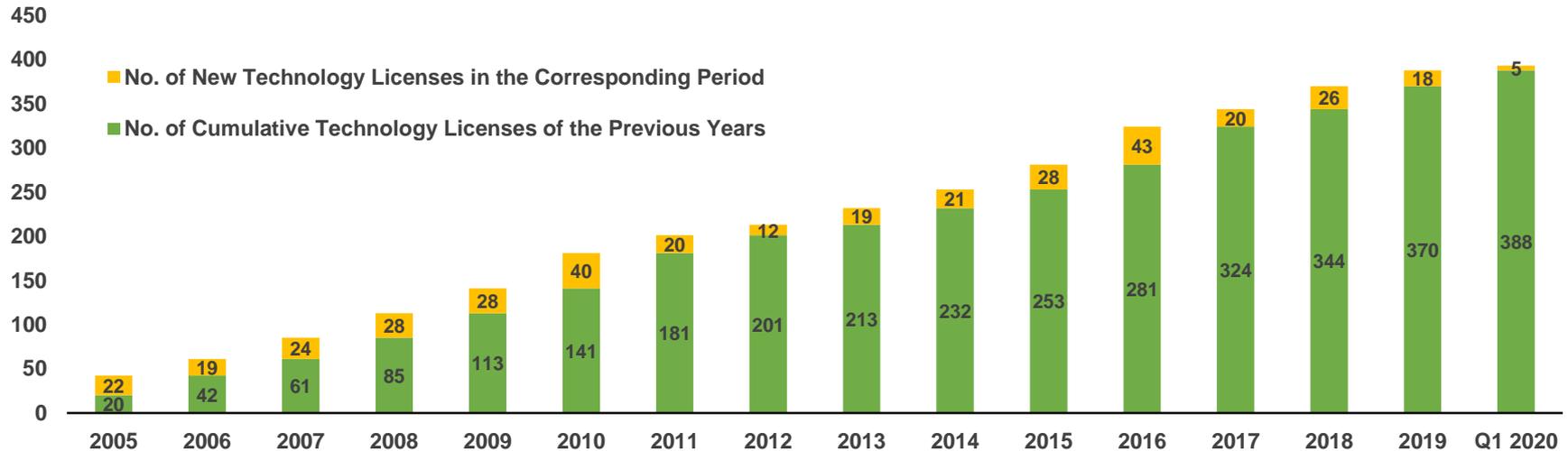
Technology Licenses

Cumulative technology licenses.

Number of Licenses

Year	2016	2017	2018	2019	Q1 2020
License	43	20	26	18	5

Note: Terms (including number of process platforms and licensing fees) for each technology license are set contractually. Payments are made according to set milestones, and there are no particular seasonal factors involved.



New Technology Under Development

Products in different process nodes.

- ✓ New technologies are being developed for **89** platforms by Q1 2020.
- ✓ **5** licensing contracts were signed.

Technology	5/6nm	7/10nm	12/16nm	22/28nm	40nm	55/65nm	80/90nm	0.11~ 0.13um	0.15~ 0.18um	>0.25um
NeoBit	-	-	-	-	-	1	2	9	5	1
NeoFuse	2	1	3	12	4	9	5	-	1	-
NeoPUF	1	-	-	3	1	1	-	-	-	-
MTP	-	-	-	-	-	2	4	11	11	-

Note: As of Mar 31st, 2020

Technology Development

Developments by process nodes.

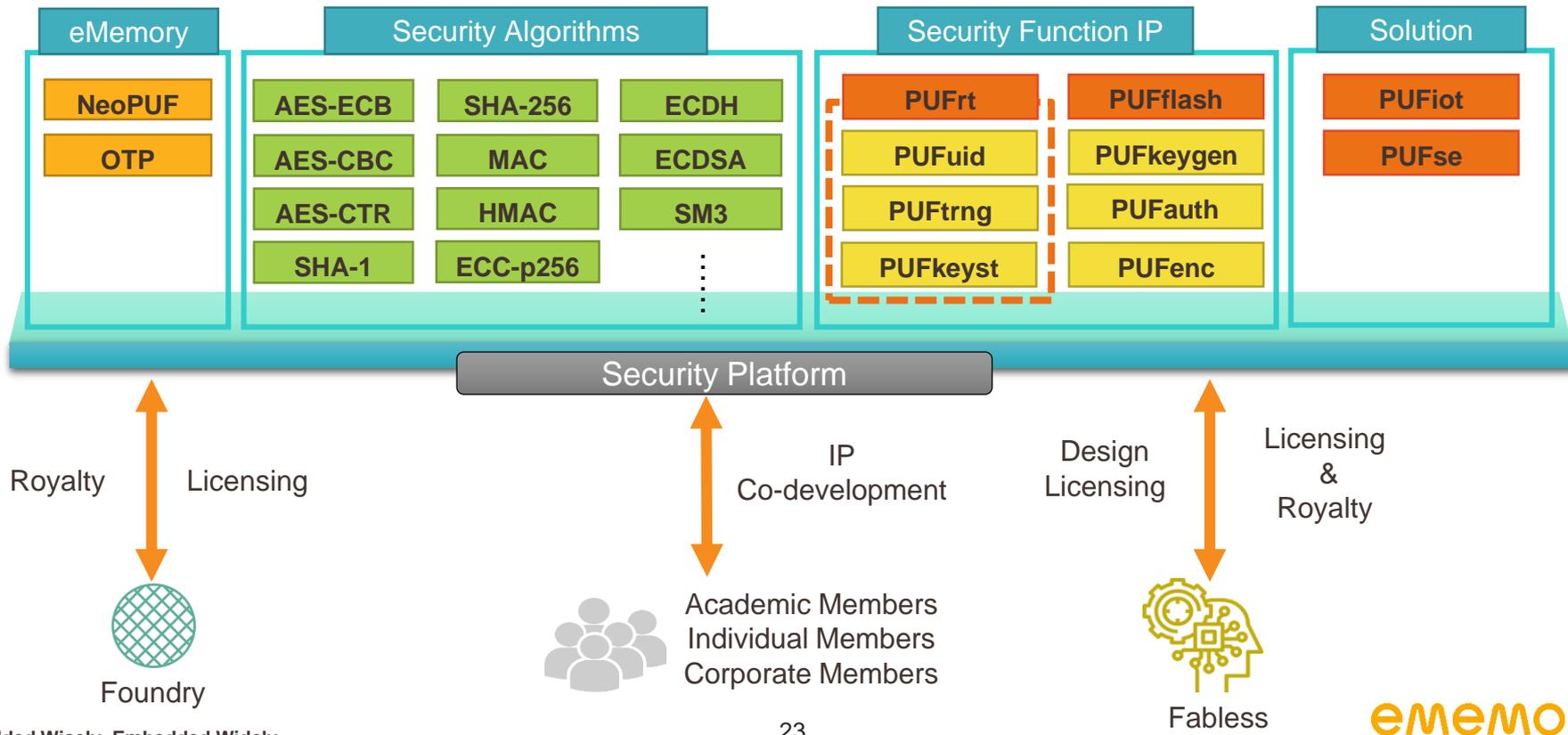
12" Fabs	Production	Development	IP Type	Process Type
5/6nm	0	3	OTP, PUF	FF
7/10nm	2	1	OTP, PUF	FF, FF+
12/16nm	3	3	OTP	FF, FF+
22/28nm	25	15	OTP, PUF	LP/ULP/ULL, HPC/HPC+, HV-OLED, DRAM, SOI
40nm	14	5	OTP, PUF, MTP	LP/ULP, E-Flash, HV-DDI/OLED
55/65nm	23	13	OTP, PUF, MTP	LP/ULP, E-Flash, HV-DDI/OLED, DRAM, CIS, BCD, PM
80/90nm	16	10	OTP, MTP	HV-DDI/OLED, LP, Generic, BCD
0.11/0.13um	15	7	OTP, MTP	HV-DDI, BCD, Generic
0.18um	1	2	OTP, MTP	BCD, Generic
Total	99	59		

8" Fabs	Development	IP Type	Process Type
90nm	1	OTP	HV-DDI, LL, BCD
0.11/0.13um	13	OTP, MTP, PUF	HV/HV-MR, BCD, LP/LL, CIS, Green, Flash, SOI, Generic
0.152/0.16/0.18um	15	OTP, MTP	HV/HV-MR, BCD, LP/LL, CIS, Green, Generic
0.25um	1	OTP	BCD
0.35um	0	OTP	UHV
Total	30		

Note: As of Mar 31st, 2020

Security Function IP Platform

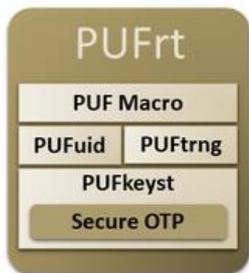
eMemory's security IP blocks enable a wide range of different security functions.



PUF-based Hardware Security IP

NeoPUF provide the foundation for developing eMemory's security function IPs.

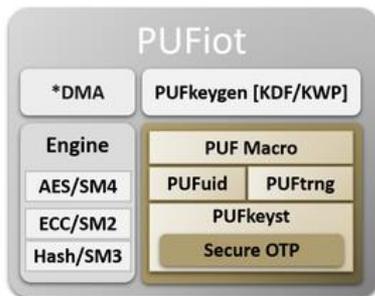
Standard Solution: PUFrt



Feature Highlights:

- ✓ Fast & low-power tRNG
- ✓ Reliable chip ID
- ✓ Advanced OTP read / write protection

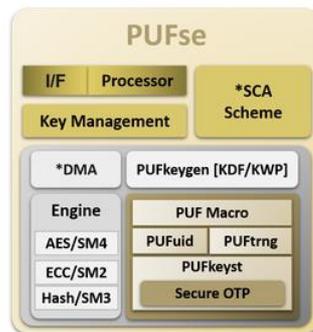
Premium Solution: PUFiot



Feature Highlights:

- ✓ PUFrt integrated
- ✓ OSCCA compliance
- ✓ KDF / KWP NIST compliance
- ✓ BUS & DMA support

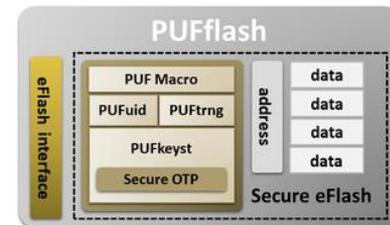
High-End Solution: PUFse



Feature Highlights:

- ✓ PUFiot integrated
- ✓ OTA support
- ✓ Secure boot
- ✓ Side channel attack resistant

Secure Embedded: PUFflash



Feature Highlights:

- ✓ Secure data storage
- ✓ No performance side-effect
- ✓ No extra integration burden

Root of Trust

Root of Trust guarantees a secure system operation.

- ✓ **Root of Trust (RoT)** is a **SOURCE** that can always be trusted within a cryptographic system.
- ✓ **Cryptographic Security** is dependent on **KEYS** to encrypt and decrypt data and perform functions, such as digital signatures.



Always Trusted Keys

Derived from Nature Randomness



PUF

5G – A Connected World

5G facilitates multi-services in diverse application scenarios.

uRLLC (ultra Reliable & Low Latency Communications)



mMTC (massive Machine Type Communications)



eMBB (enhanced Mobile Broadband)



Abbreviation:

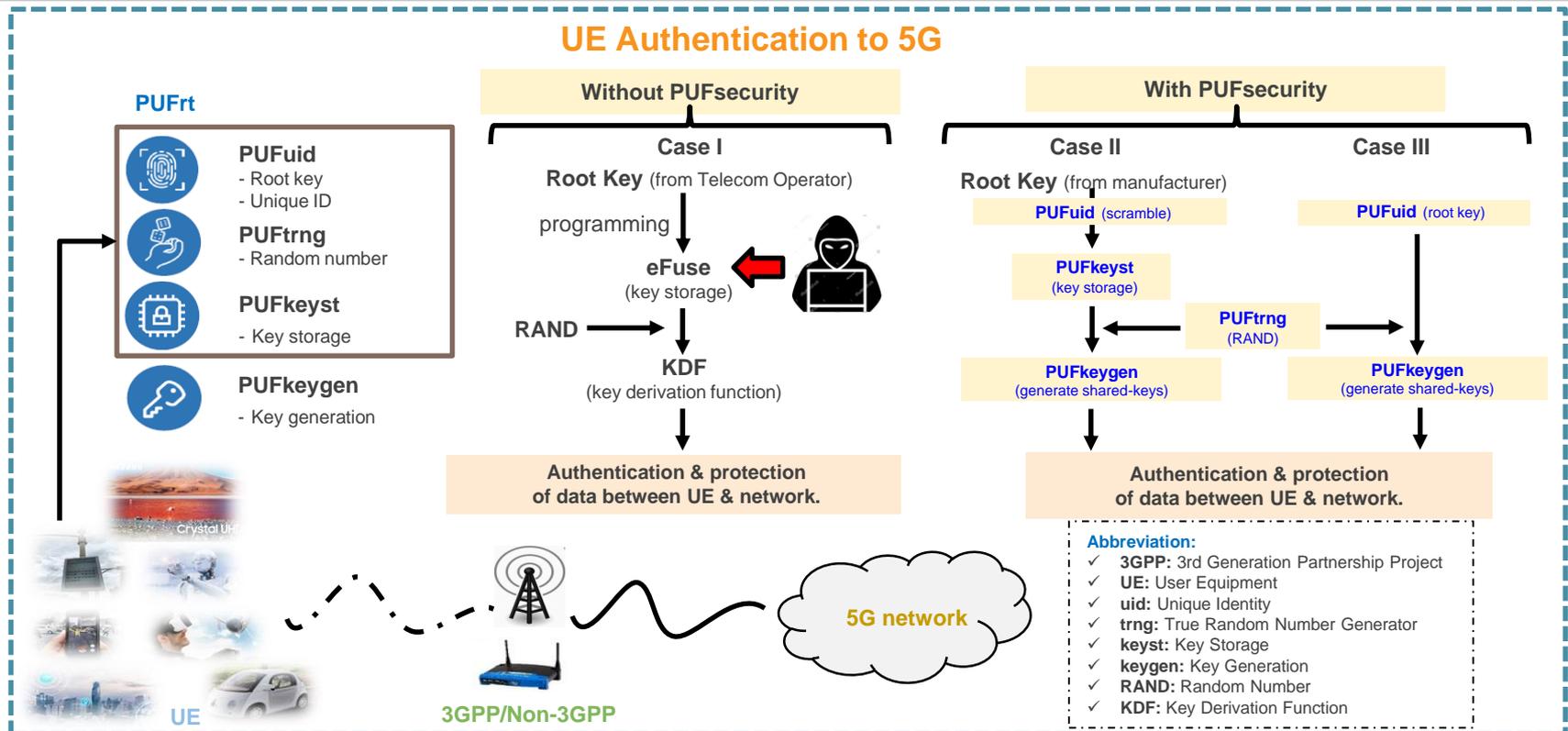
- ✓ **3GPP:** 3rd Generation Partnership Project
- ✓ **UE:** User Equipment

UE Authentication to 5G



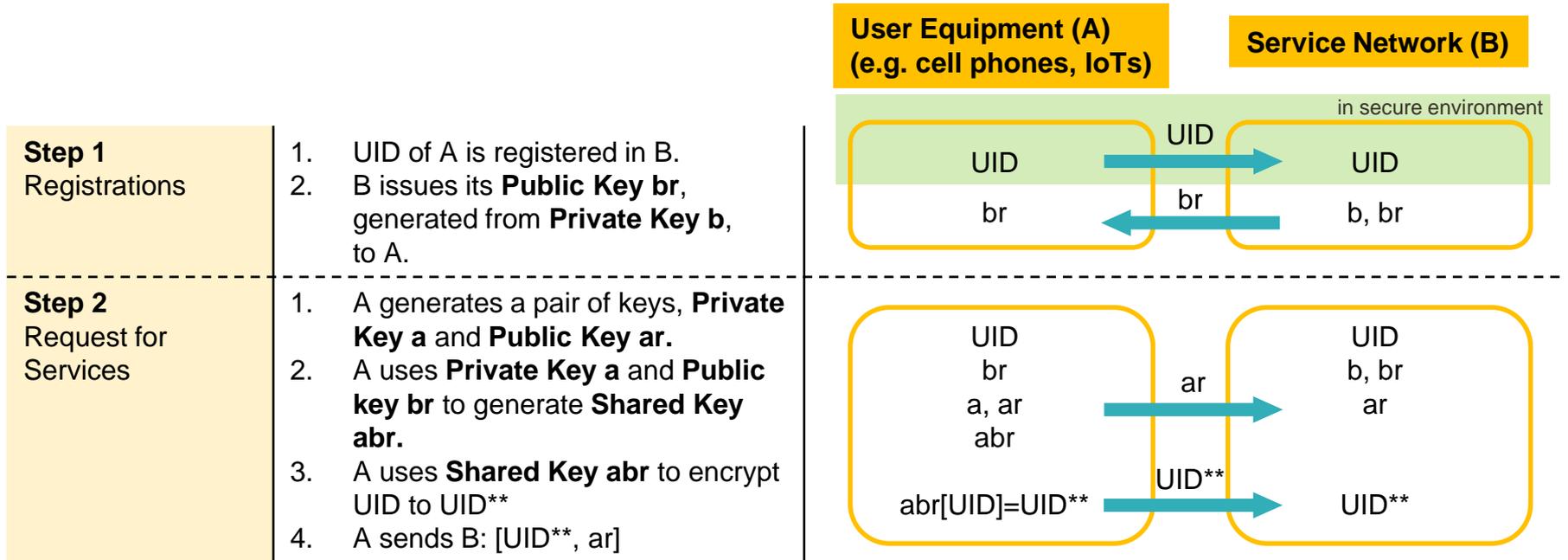
PUFsecurity Application in 5G

PUFsecurity enables secure authentication & data protection between UE & network.



Authentication in 5G

Unique IDs play a critical role in 5G authentication.

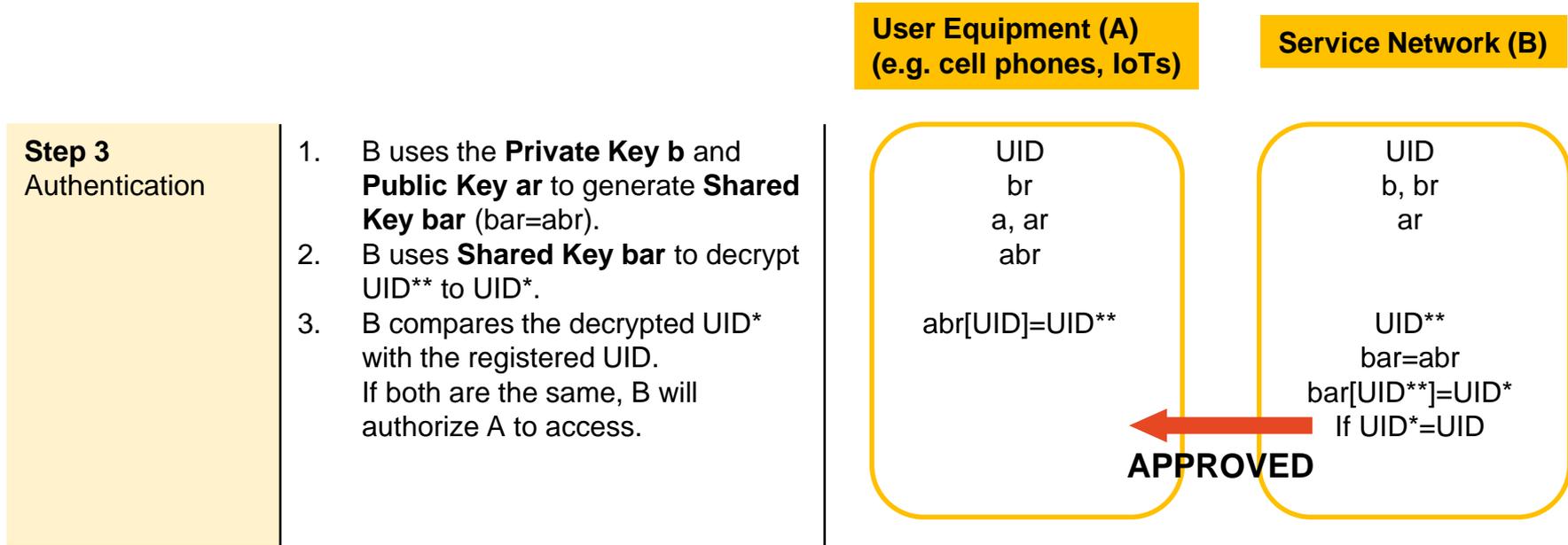


Note:

1. If UID is created by PUF_{UID}, it does not need to be done in secure environment.
2. UID stored in PUF_{rt} is much more secure than stored in e-fuse.
3. For every access, the user equipment needs to create a new pair of keys by a key generator, e.g. PUFkeygen.

Authentication in 5G – cont.

Unique IDs play a critical role in 5G authentication.



Note:

1. During the authentication process, only user's Public Key and encrypted UID are exposed.
2. Hackers do not have B's Private Key, therefore, UID cannot be decrypted by hackers.

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THANKS

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