MIDC·2018

小米IoT安全峰会

岂止于逻辑攻击

Beyond logical attacks

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NXP Semiconductors

个人简介
About me

- SE密码算法首席安全架构师

  Lead Security Architect for Secure Element Crypto SW

- JHAS主要成员——SoC安全子系统工作组主席

  Member of JHAS (Security IC evaluation harmonization group) Chair for SoC secure subsystem working group

- 计算机科学/数据安全博士

  PhD in Computer Science / Data Security

什么是“逻辑攻击”?
What’s a ‘logical’ attack?

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岂止是“逻辑”攻击?
What’s beyond ‘logical’ attacks?

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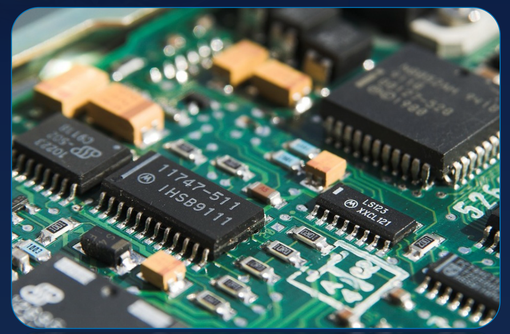
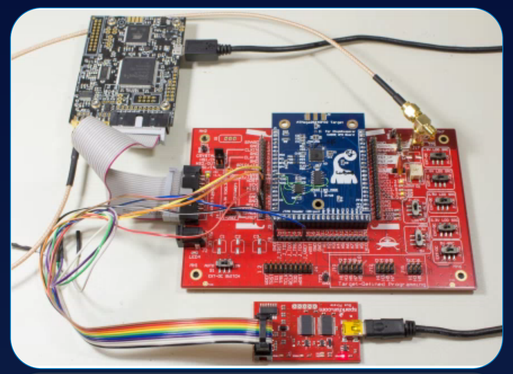
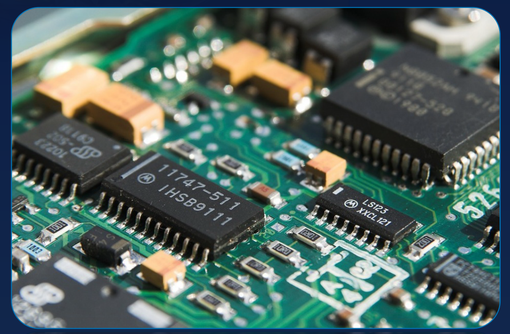
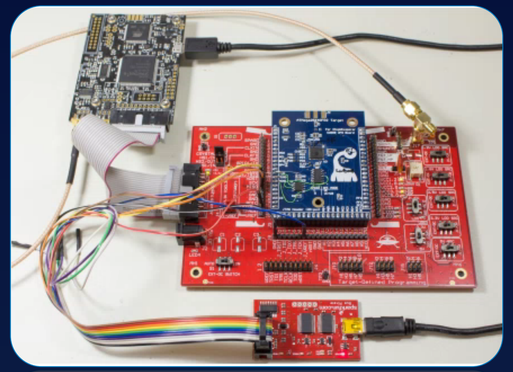




什么攻击与IoT相关?
What attacks are relevant for IoT?





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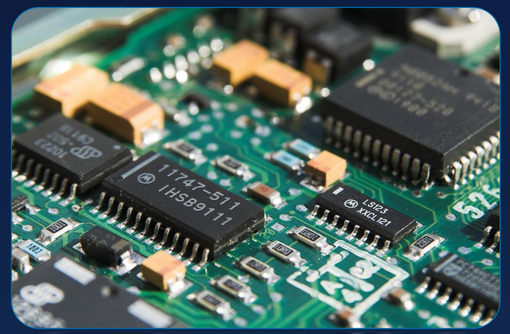
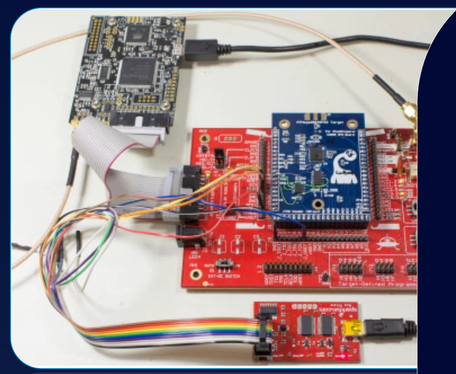
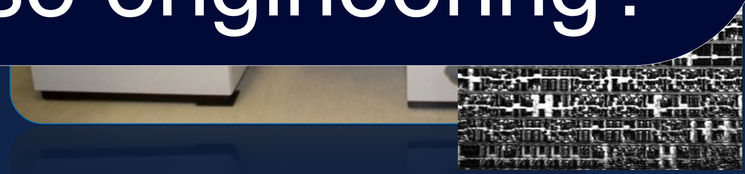




PCB级别操纵，FLASH读取，逆向工程?

PCB level manipulation, flash readout, reverse engineering?



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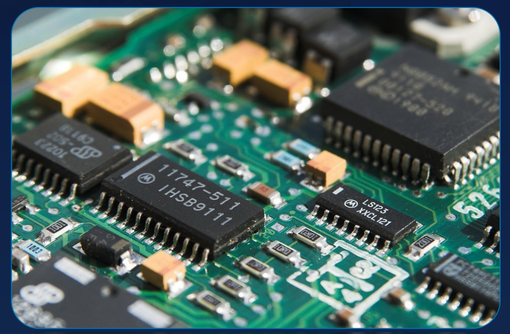

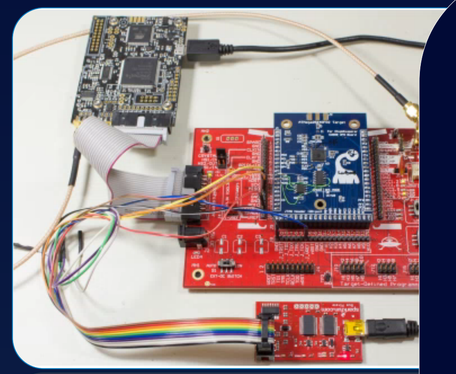

安全单元（SE）相关的
全部攻击范围?
Full attack scope
relevant for
secure elements?

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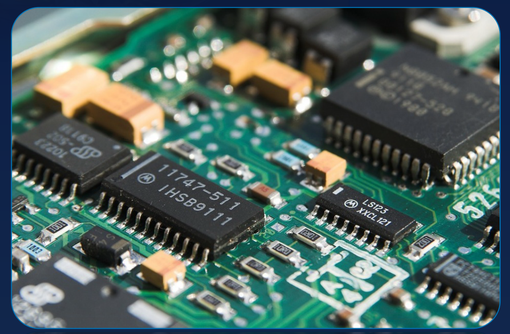

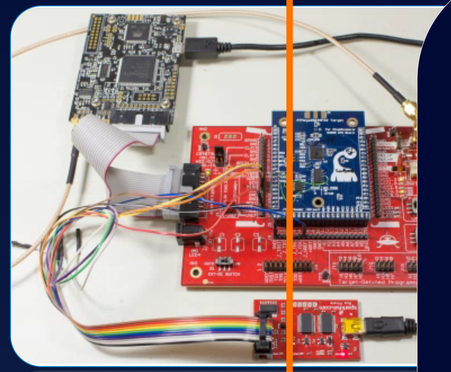

在这之间还有什么?
Something in between?

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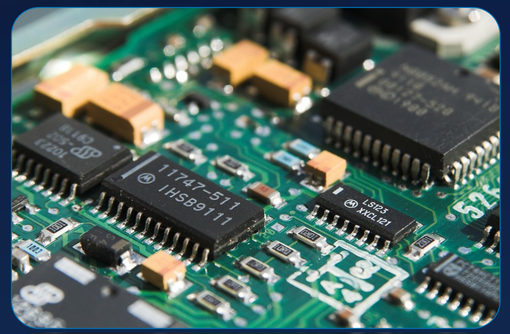
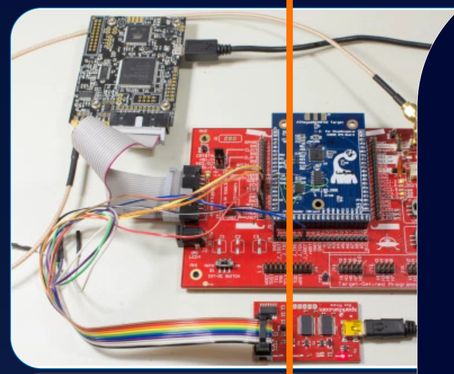




Good question

需要基于 资产价值+攻击风险/难度 进行考虑depends on asset value + attack risk/effort.

侧信道攻击案例告诉我们，它同样可以用于攻击IoT产品

Let’s look at

side channel analyis examples that seem feasible for IoT

利用RSA算法实现弱点进行简单电磁分析攻击
Exploitation of an RSA vulnerability by Simple EM analysis

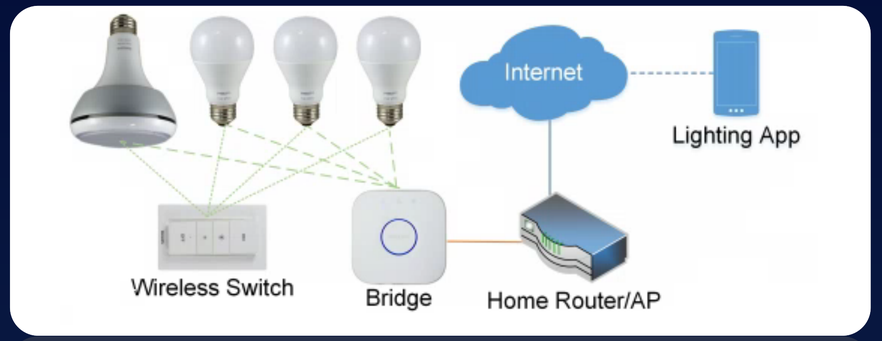
- 电磁分析 – 利用设备运行时对外的电磁辐射进行侧信道攻击
  EM analysis - side channel attack using electromagnatic emanation of a device
- 简单 – 只需要单个运算产生的电磁辐射数据
  Simple - requires data from a single execution only

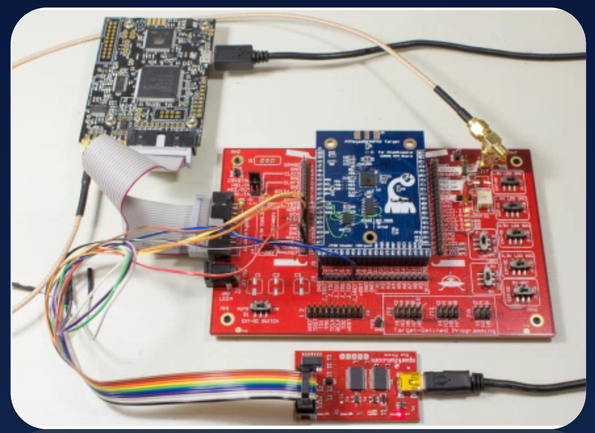
- 目标: 存储在一部有漏洞的安卓手机上的RSA私钥
  Target: RSA private key on a vulnerable Android smartphone
  (例如：用于认证、会话建立、支付等e.g. used for authentication / session establishment / payment / etc.)
- 不需要拆开设备！No device opening required!
- 不需要复杂的攻击设备。No sophisticated equipment needed.
- 仅需要 <1分钟就可以破解密钥。 Exploitation<1min including brute force.

‘IoT Goes Nuclear – Creating a ZigBee Chain Reaction’

在Philips Hue 智能灯上进行的规模攻击

Scalable attack on Philips Hue smart lamps





http://iotworm.eyalro.net/

第一步Step 1

使用价值350美元的Chipwhisper Lite平台提取OTA固件更新密钥（AES-CCM）

The 350US$ Chipwhisperer Lite platform was used to extract the OTA firmware update key (AES-CCM)

糟糕的设计Very unfortunate choice:

同一型号的灯泡使用相同的密钥

Every bulb of a certain model used the same key...

第二步Step 2

Zigbee协议的一个实现上的漏洞（临近性检查）是允许等泊与个人局域网分离。我们可以利用这个漏洞和第一步的成果，在400米以外就可以给灯泡安装带有木马的固件。

An implementation bug in the Zigbee protocol (proximitiy check) allowed to disassociate the lamps from their PANs and use the FW update key from step 1 to install the attack FW from up to 400m away

= 链式反应 chain reaction

AI

- 我们可以看到AI（例如深度学习）正在简化攻击步骤。
  We see that AI (e.g. Deep Learning) simplifies attack steps.

- AI正在逐步减少对攻击专家的需求。
  AI has the potential to remove the need for attack experts.

- 提高攻击的可行性，降低攻击成本。
  AI increases attack feasibility, reduces attack costs.

2017 网络攻击急剧升级 & 新形式攻击

2017 Dramatic uptick in cyberattacks & new aggressive types of attacks

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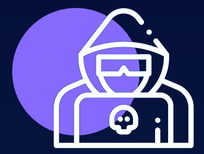
一个勒索软件攻击企业
Ransomware hits
businesses every
40 seconds



企业平均需要
~197天 才能侦破
It takes most
businesses **~197 days**
to detect a breach

FBI：俄罗斯黑客可以访问
全球超过50万个网关
FBI: Russian hackers
have access to over
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新的远程物理攻击：
new remote physical
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Rowhammer and
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There are **1M** new
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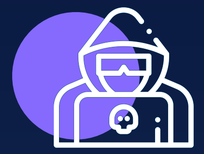

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恶意软件变体
5 new malware variants
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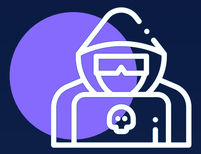

每小时有**超过100个**未知的恶
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Over 100 unknown malware
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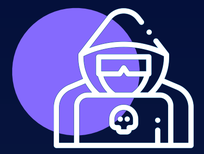

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FBI：俄罗斯黑客可以访问

物理攻击并不仅仅发生在本地。
Physical is
not necessarily equal to
Local attacks!

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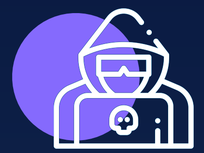

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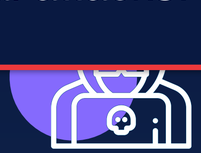

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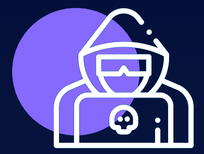

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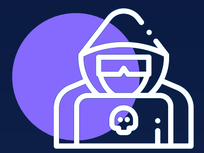

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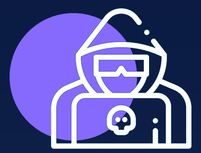

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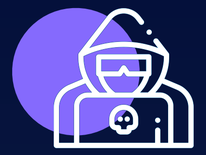

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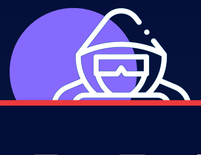

截至11月18日：Nov 18：

7个新的Meltdown变体已经影响
到ARM安全
7 new Meltdown variants
affecting also ARM

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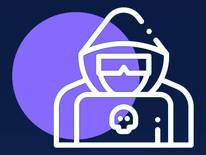

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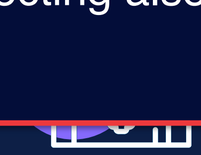

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总结 Conclusion

- IoT安全绝不仅仅是“逻辑”安全
  IoT security is much more than ‘logical’ protection.
- 通过远程或本地的方式对硬件的攻击往往使“更大规模”的攻击成为可能
  Remote and local HW attacks are often enabling further attacks that ‘scale’.
- AI可以使侧信道攻击和错误注入攻击更为有效，而且不再依赖于攻击专家
  AI can amplify side channel and fault attacks and remove need for experts.

- “逻辑”攻击只是第一波。NXP不局限于此，防患于未然，研发出更为安全的芯片产品。
  ‘Logical’ attacks is just the first wave. NXP is looking beyond that and is creating products to withstand the waves to come.
- 让我们共同努力，共创更为安全的未来！
  Let’s work together.

谢谢