

4° CRATI VALLEY WORKSHOP ON BLOCKCHAIN
Risorse di Sicurezza per l'utilizzo degli Smart Contract nell'IoT
18 luglio 2017

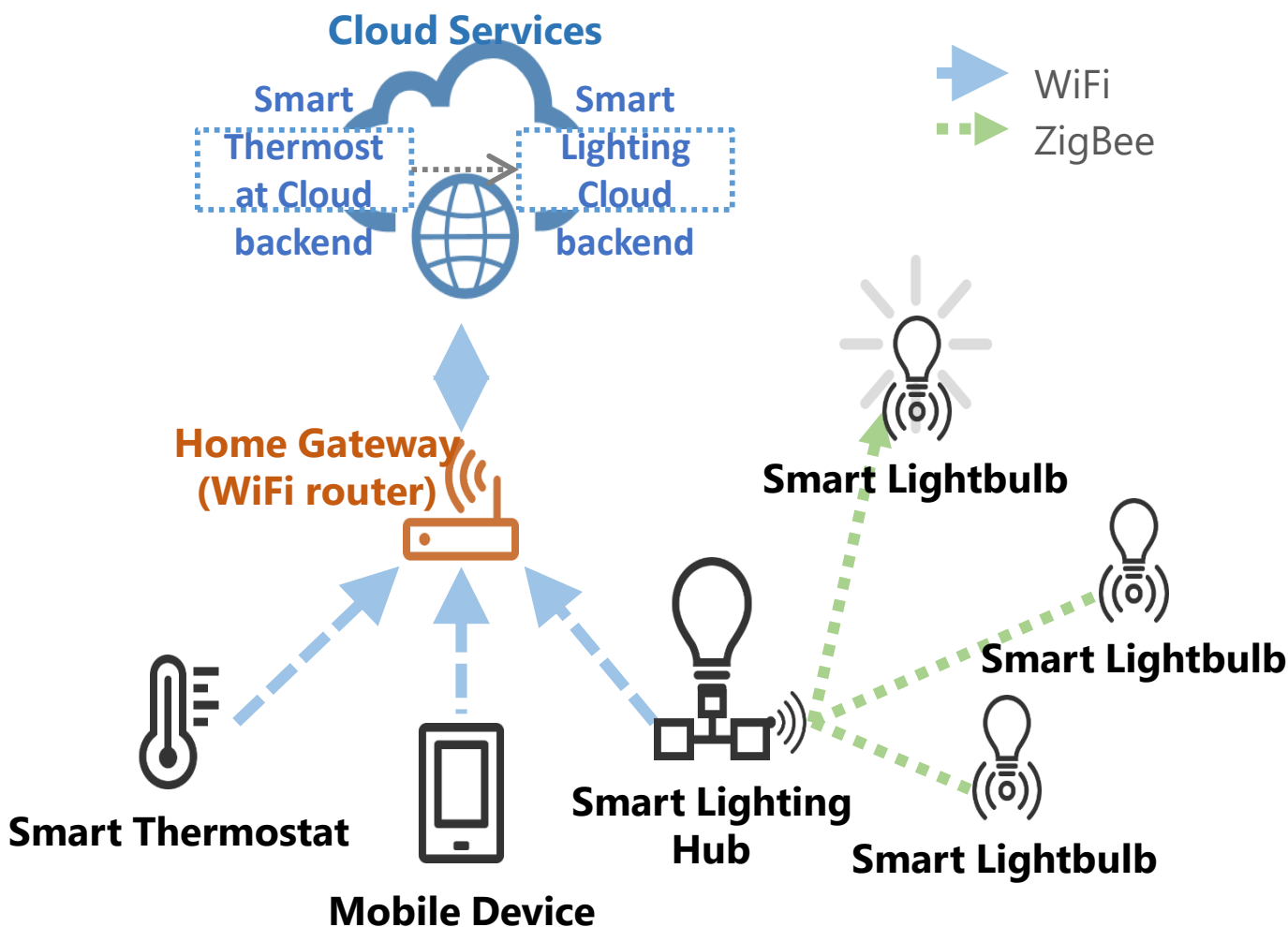
Allocazione di risorse di sicurezza per IoT

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Outline

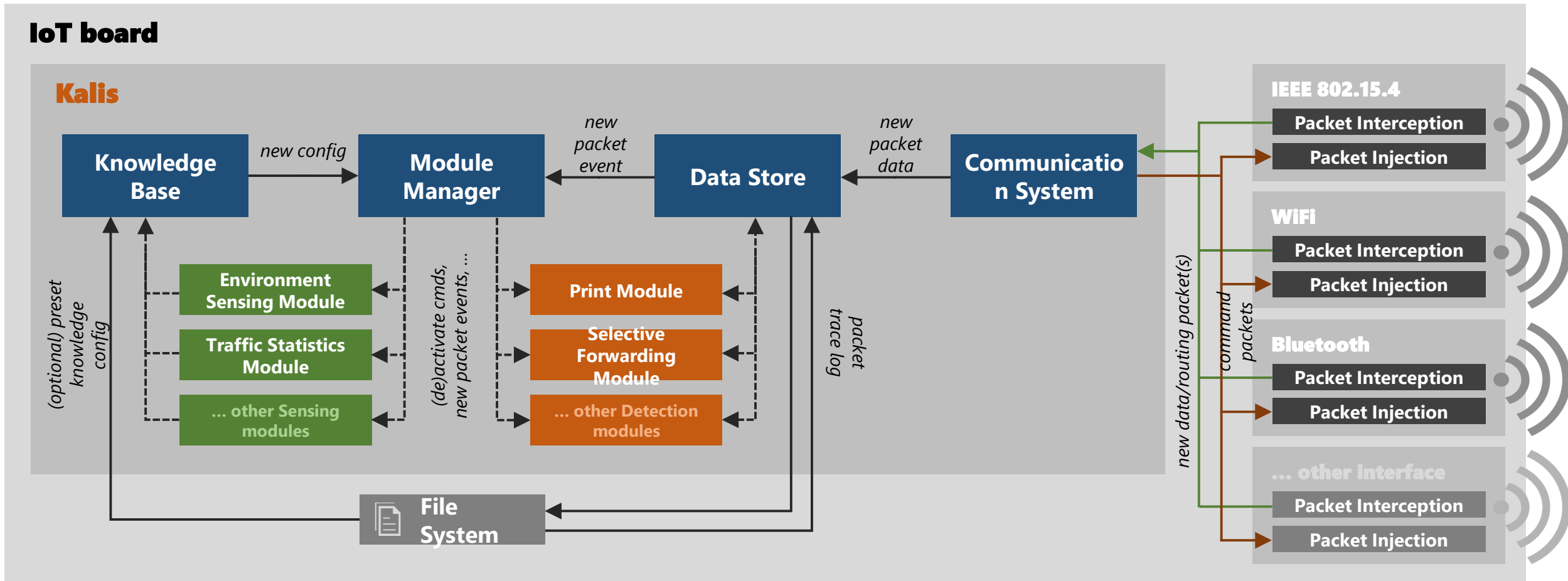
- Security Resources for Intrusion Detection
- Optimal Allocation of Security Resources
- Optimal Allocation of SR for Mobile Scenarios

Security Resources for Intrusion Detection

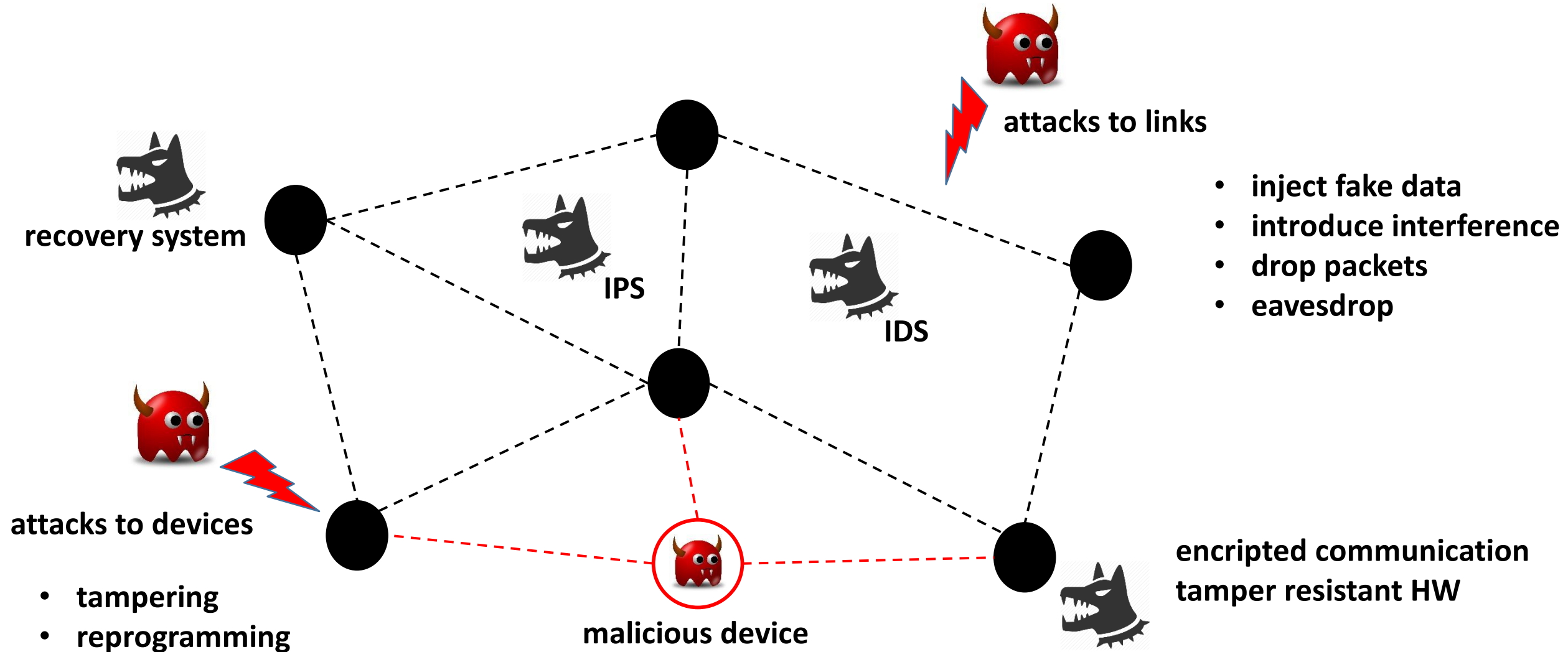


Application Protocol		DDS	CoAP	AMQP	MQTT	MQTT-SN	XMPP	HTTP REST
Service Discovery		mDNS				DNS-SD		
Infrastructure Protocols	Routing Protocol	RPL						
	Network Layer	6LoWPAN				IPv4/IPv6		
	Link Layer	IEEE 802.15.4						
	Physical/ Device Layer	LTE-A	EPCglobal		IEEE 802.15.4		Z-Wave	
Influential Protocols		IEEE 1888.3, IPsec				IEEE 1905.1		

Security Resources for Intrusion Detection



Optimal Allocation of Security Resources

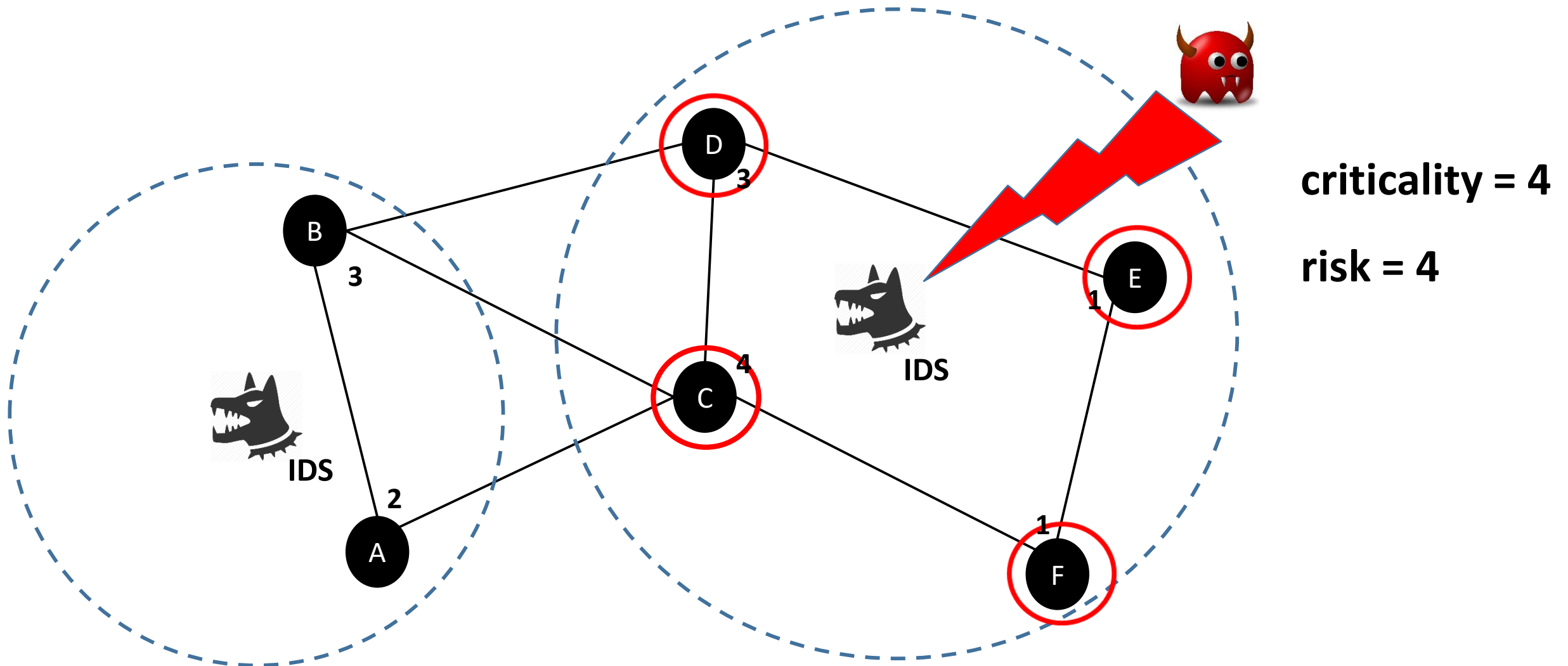


Optimal Allocation of Security Resources

Defender Strategy: among all possible security resource allocation plan that make the network secure, choose the one that minimize:

- Cost
- Energy consumption
- Criticality
- Risk

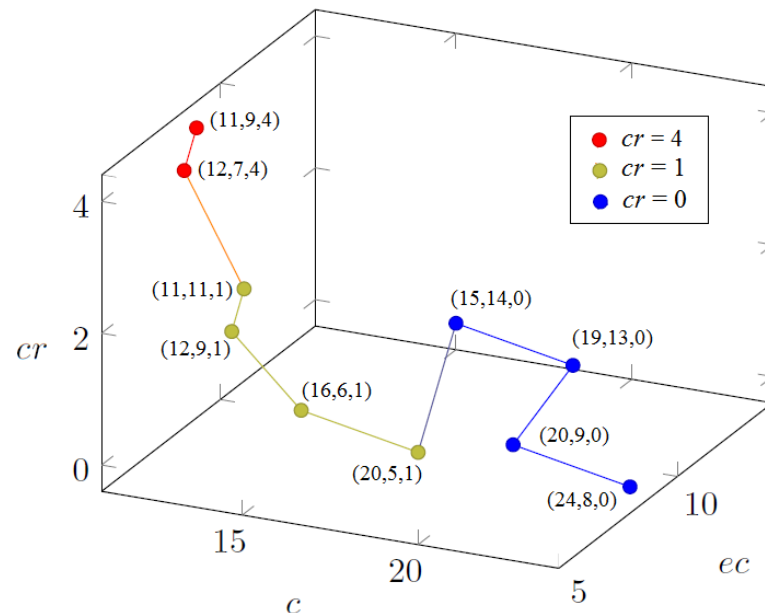
Optimal Allocation of Security Resources



Optimal Allocation of Security Resources

- 1° step: Compute the Pareto frontier by solving a three-objective optimization problem:

$$\min_{AP \in \mathcal{AP}} \{cost(AP), ec(AP), \max_{sr \in AP} crit(sr, AP)\}$$

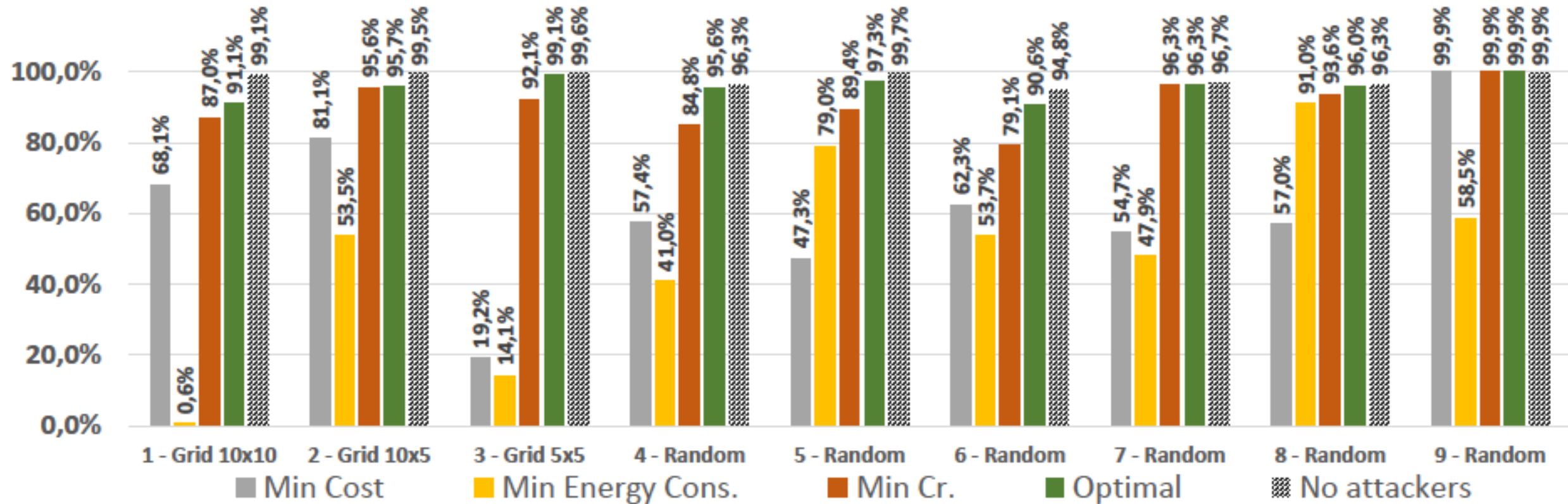


Optimal Allocation of Security Resources

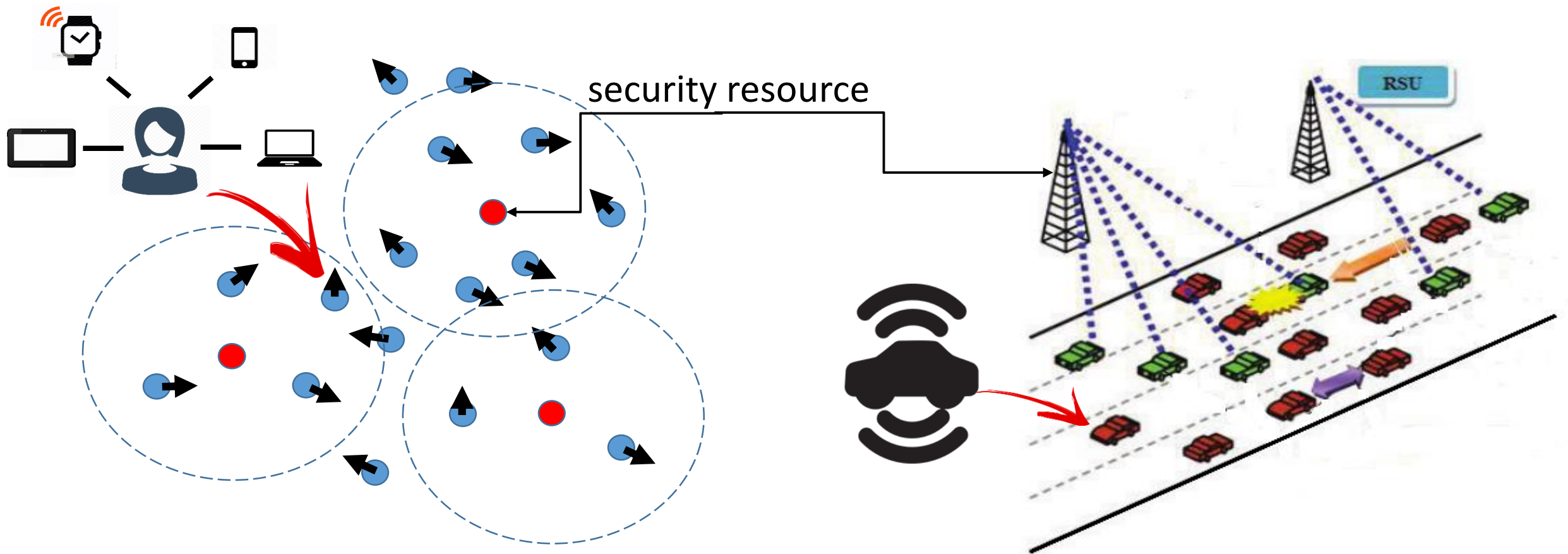
- 2° step: Choose the plan that minimize the risk:

$$\min_{AP \in AP^+} risk(AP)$$

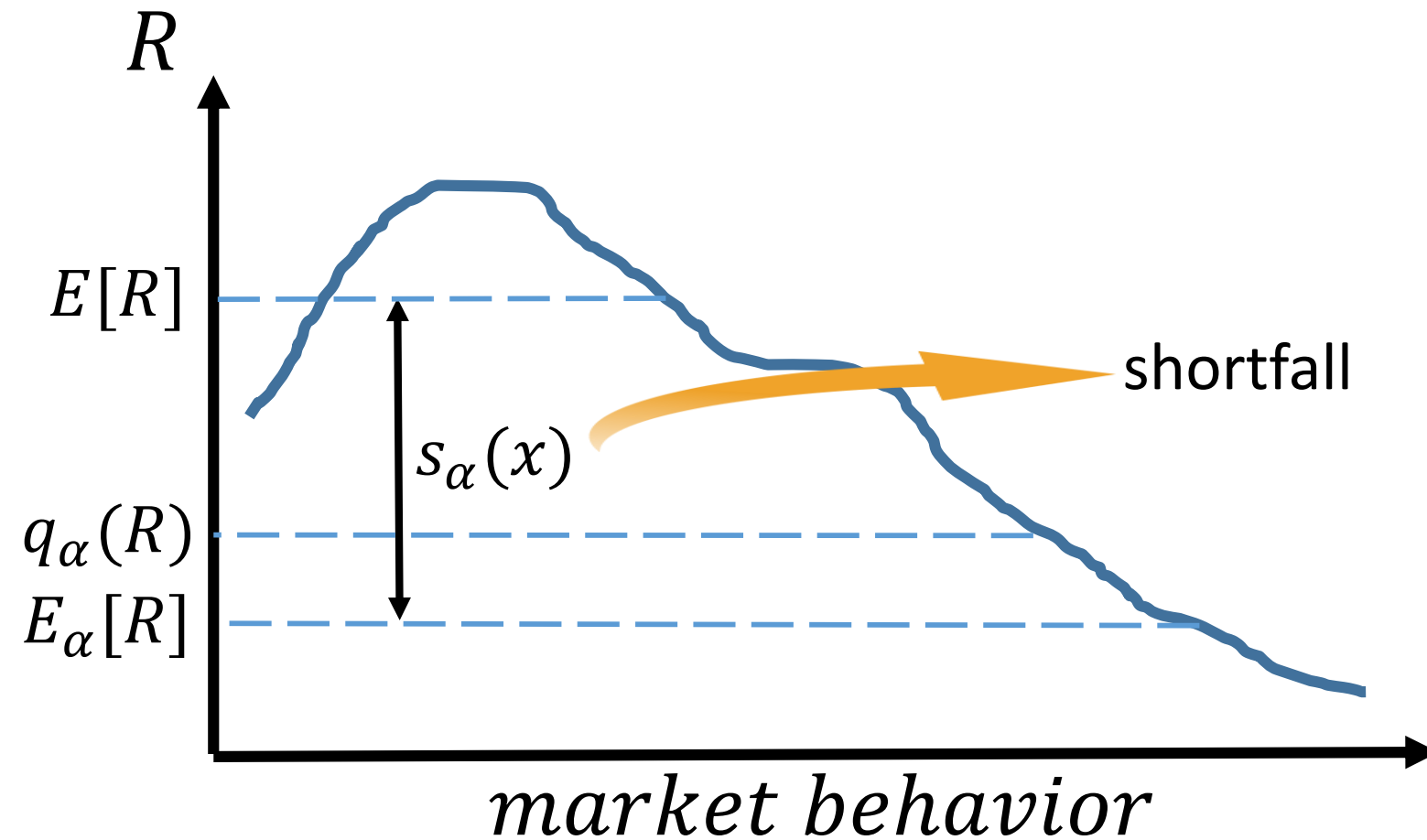
Optimal Allocation of Security Resources



Optimal Allocation of SR for Mobile Scenarios



Optimal Allocation of SR for Mobile Scenarios



$x = \text{investment}$

$R = \text{investment return}$

$$E_\alpha[R] = E[R | R \leq q_\alpha(R)]$$

$$s_\alpha(x) = E[R] - E_\alpha[R]$$

min	$s_\alpha(x)$
subject to	$E[R] = \mu$

Optimal Allocation of SR for Mobile Scenarios

Mapping: from economics to the IoT domain

- Security resource allocation plan (*AP*)  investment
- Risk - number of devices not monitored by any *SR* in *AP*  negative return
- Different device configurations (topologies)  market behavior

Optimal Allocation of SR for Mobile Scenarios

$$\max_{AP \in \mathcal{AP}} -E[risk_{AP}], -E_{\alpha}[risk_{AP}]$$

subject to

$$E[risk_{AP}] \leq \mu_t$$

$$E_{\alpha}[risk_{AP}] \leq \mu_{\alpha}$$

$$\sum_{sr \in AP} sr.c \leq b$$

Optimal Allocation of SR for Mobile Scenarios

