(Semantics)

Open ⟷ Closed

World Approach

Camp everywhere, except close to houses...

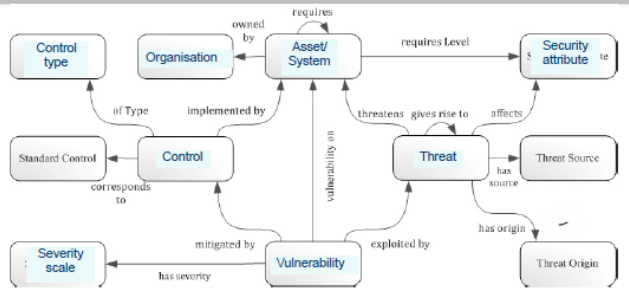
Blacklist

Camp, if it is allowed

White list

Limitations of the traditional approach

- Scalability
  - Threats
  - System
  - Vulnerability
- System of Systems
  - sensors
  - gateway
  - middleware
  - business processes // applications

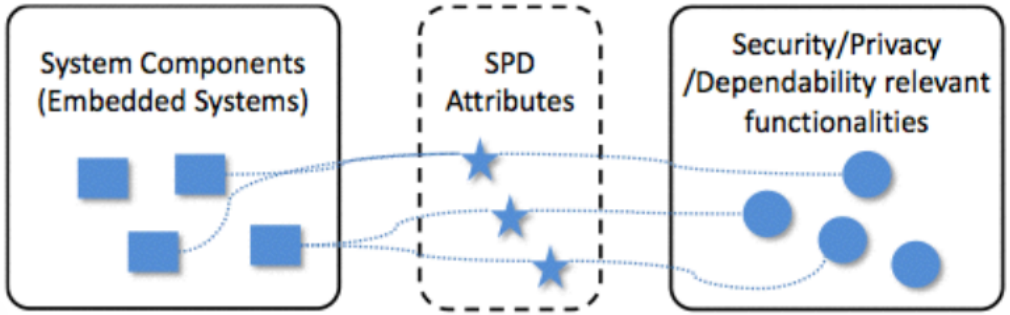


Recommendation:

One ontology per aspect:
- security
- system
- threats
...

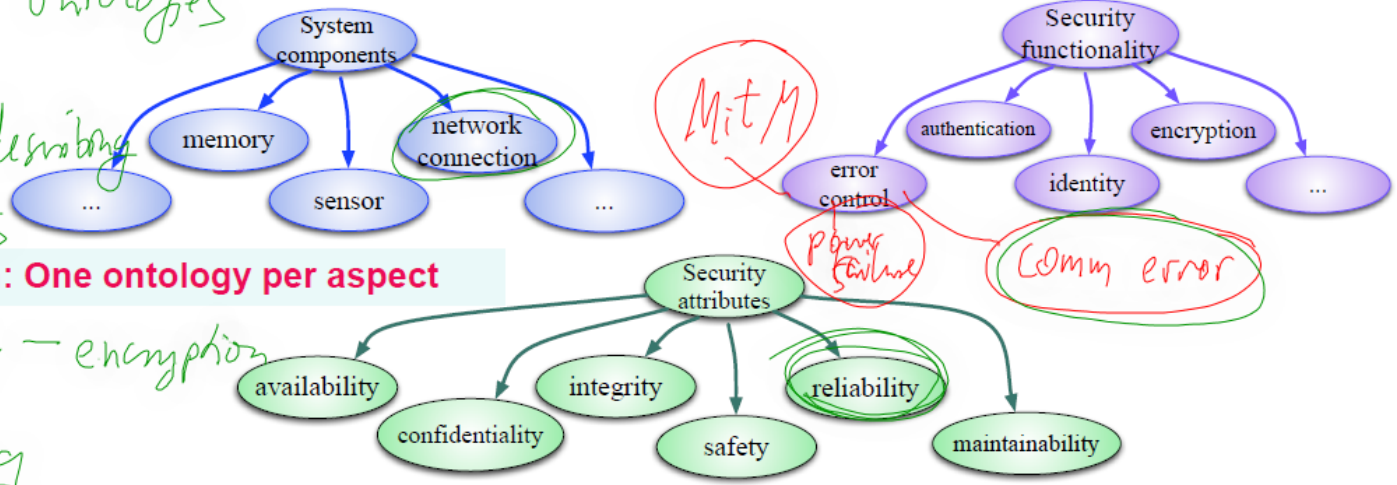
Security description

- Ontologies for system, security attributes, security functionality



1. describe ontologies

2. rules describing relations

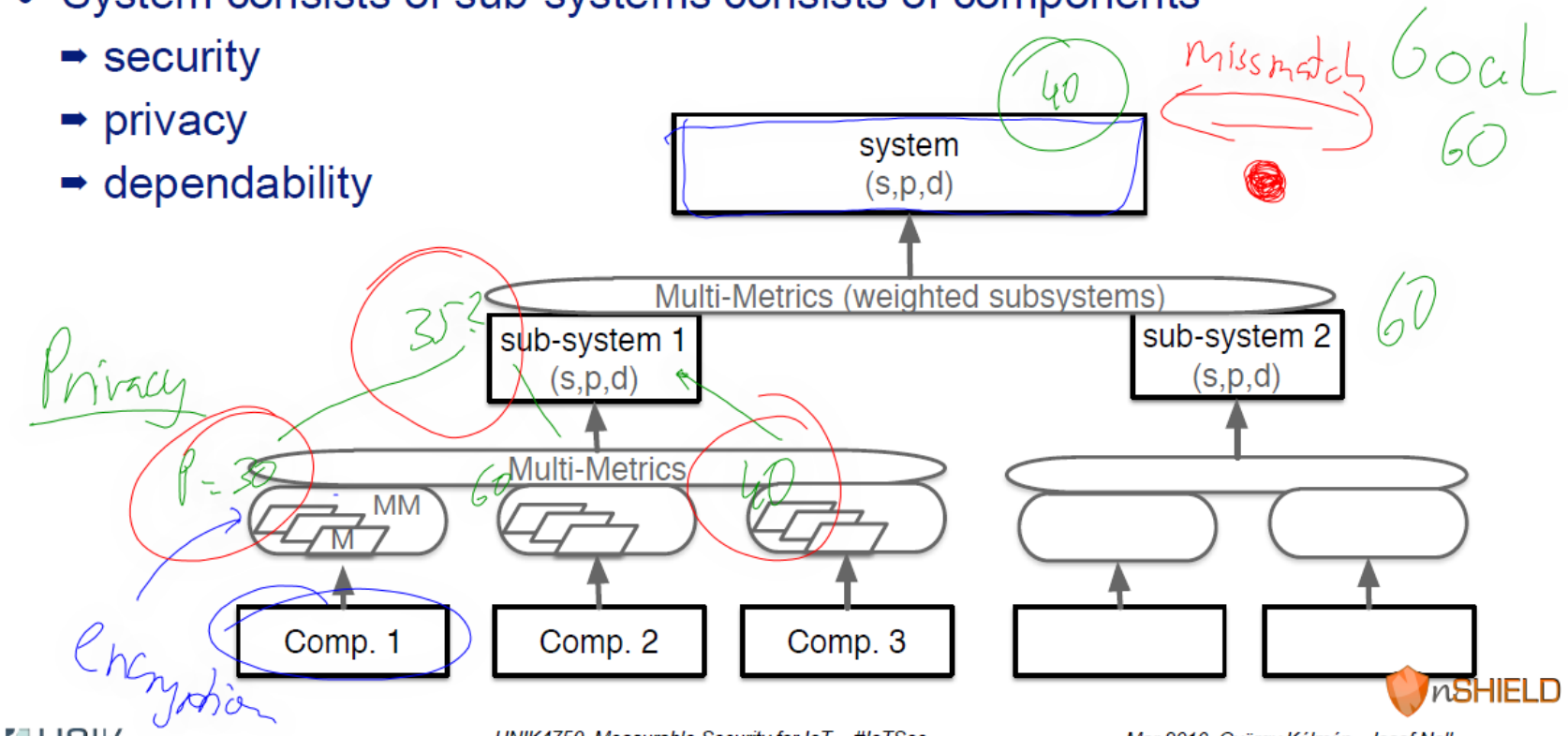


Recommendation: One ontology per aspect

confidentiality – encryption

3. Reasoning

- System consists of sub-systems consists of components
  - security
  - privacy
  - dependability

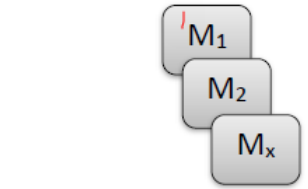


SHIELD Multi Metrics Approach

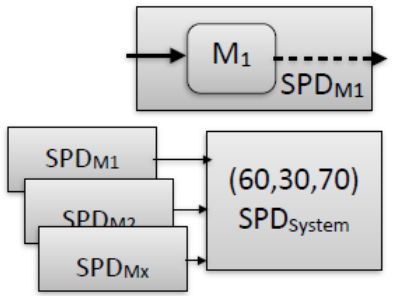
- Security, Privacy and Dependability
  - » Specific application
  - » Social Mobility: privacy scenario

		SPD_{Goal}	SPD level	
Scenario 1	Conf. A	(s,80,d)	(s,100,d)	(s,●,d)
	Conf. B		(s,80,d)	(s,●,d)
	Conf. C		(s,80,d)	(s,●,d)

- Multi-Metrics approach to assess the SPD of a system
  - » Provides a snapshot of the current state of the system
  - » Metrics for SPD parameters of sensors, network, service access
  - » Metrics M_1 … M_x, e.g. Network latency, Protection level



- Individual Metrics scaling $SPD_{M1}(20,5,10)$
  - » Parametrisation of assessment, e.g. latency = 50 ms -> S:acceptable
  - » Subjective translation into SPD severity
    - » Operational ranges defined as ideal, good, acceptable, critical, failure
    - » Max influence on the S,P,D value (estimate)



- Metrics combination to provide an SPD tripple: (60, 30, 70)

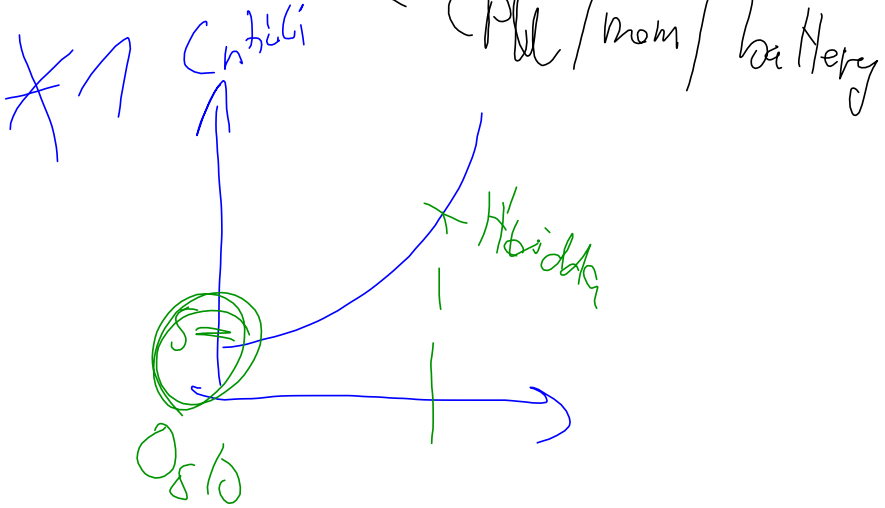
Criticality = 5 *1

Drone. → fly over Oslo Rel. = 95

fly over Hvidda Rel = 40

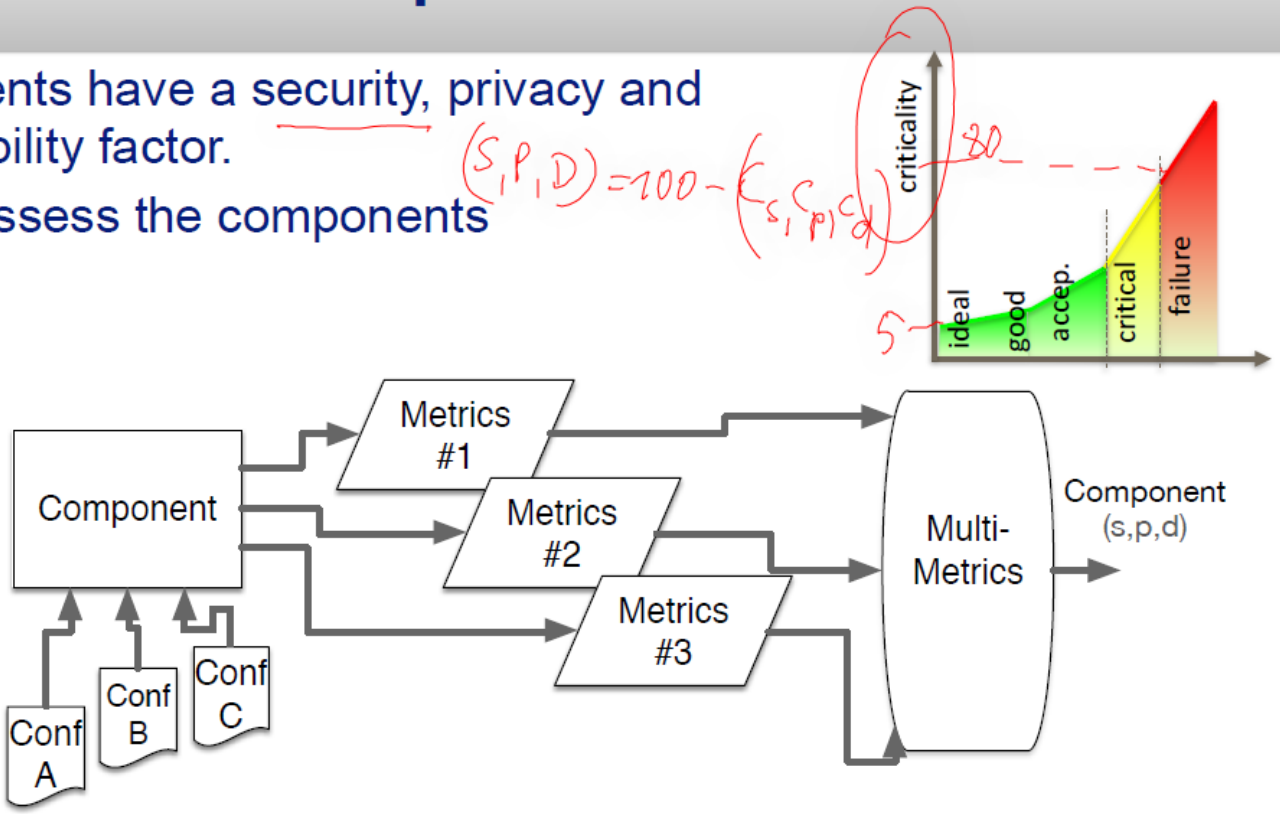
Trade-off in Sec./priv

- Usability
- costs
- CPU/mem/battery



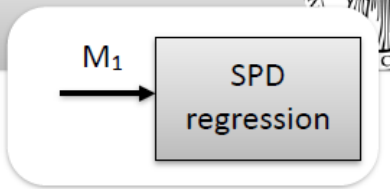
Multi-Metrics components

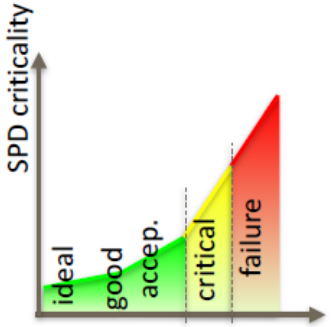
- Components have a security, privacy and dependability factor.
- Metrics assess the components



SHIELD Multi Metrics$_{v2}$

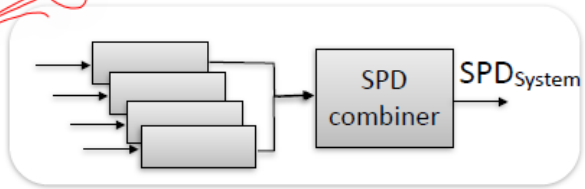
- Metrics to SPD conversion
  - » Parametrisation of system parameters, e.g. latency -> [ms]
  - » SPD regression: «SPD value and importance for the system»
    - » parameter into S,P,D value range, e.g. latency=50ms :=> (ideal, good, acceptable, critical, failure)
    - » Scaling according to System Importance, e.g. latency :=> S_{max}=30, P_{max}=10, D_{max}=20
    - » Assignment of SPD values, e.g. latency=50 ms





- Metrics combination to provide SPD_{System}: (60, 30, 70)
  - » Mathematical combination, e.g. S_{System}=100 - SQRT(S_1^2+S_2^2+…S_x^2)

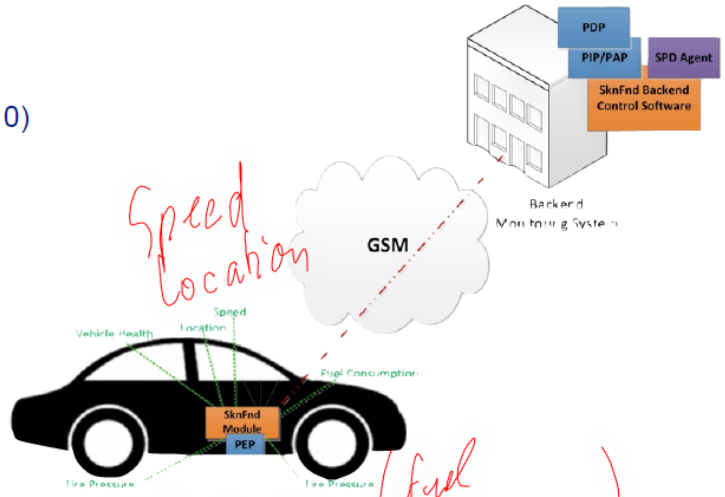
weighting



Social Mobility Components

Applicable nSHIELD Components (Px):

- 1- Lightweight Cyphering (P1)
- 2- Key exchange (P2)
- 3- Anonymity & Location Privacy (P10)
- 4- Automatic Access Control (P11)
- 5- Recognizing DoS Attack (P13)
- 6- Intrusion Detection System (P15)
- 7- Attack surface metrics (P28)
- 8- Embedded SIM, sensor (P38)
- 9- Multimetrics (P27)



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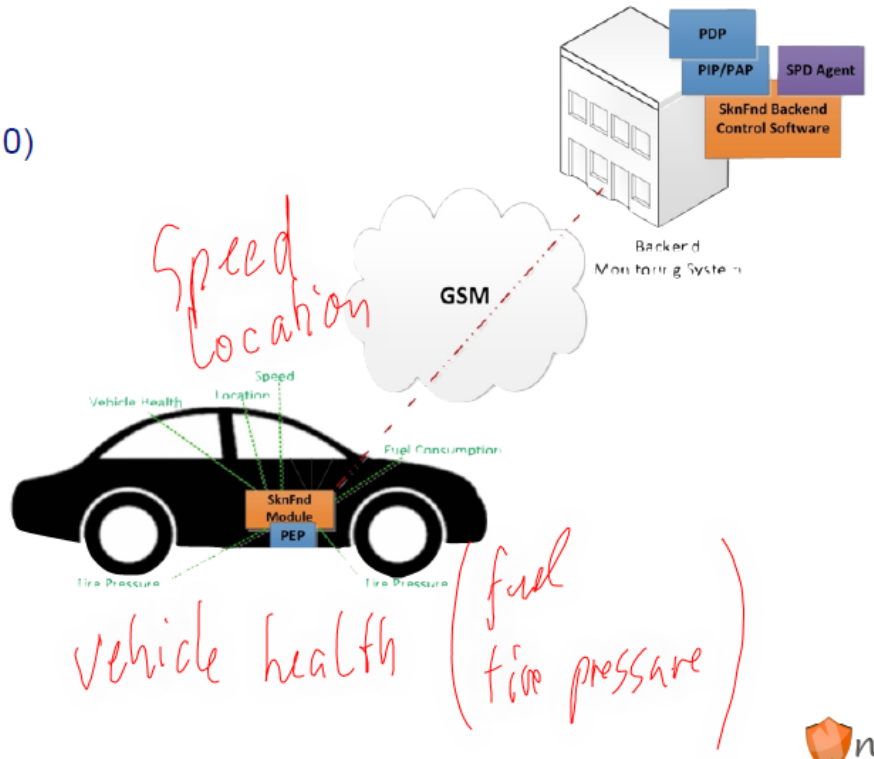
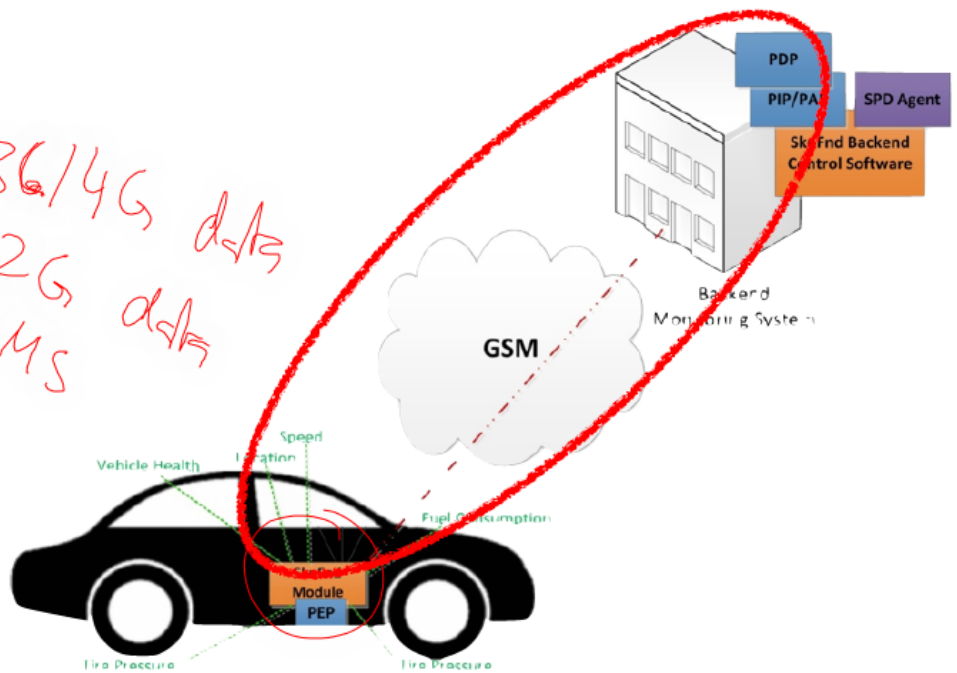


(SPD) Metrics

- Port metric
- Communication channel
- GPRS message rate
- SMS rate
- Encryption



Social Mobility - Examples of Metrics

GPRS message rate metric

Parameter(sec)	0.5	1	2	5	10	20	60	120	∞
Cp	80	60	45	30	20	15	10	5	0

$P = 100 - C_p$ 20 100

Encryption metric

Parameter	No encryption	Key 64 bits	Key 128 bits	Not applicable
Cp	88	10	5	0

P 12 95 100

Metrics weighting

Port (M1), $w = 100$
Communication channel (M2), $w = 100$
GPRS message rate (M3), $w = 80$
SMS message rate (M4), $w = 20$
Encryption (M5), $w = 100$

nSHIELD

Multi-Metrics subsystem evaluation

	Criticality					SPD_P			
	C1	C2	C3	C4	Sub-Sys.		Scen. 1	Scen. 2	Scen. 3
SPD_{Goal}							(s,80,d)	(s,50,d)	(s,5,d)
Multi-Metrics Elements	M1	M2	M3 ∩ M4	M5	C1... ∩ ...C4				
Conf. A	30	20	0	5	17	83	●	●	●
Conf. B	61	20	4	5	32	68	●	●	●
Conf. C	41	20	9	5	23	77	●	●	●
Conf. D	82	41	2	10	45	55	●	●	●
Conf. E	82	41	18	10	45	55	●	●	●
Conf. F	83	41	27	10	47	53	●	●	●
Conf. G	82	42	4	88	70	30	●	●	●
Conf. H	82	42	40	88	73	27	●	●	●
Conf. I	83	42	72	88	Alarm	21	●	●	●

nSHIELD

Metrics & weight (only privacy)

1) Port metric, weight w_p=40

	Cp	SPDp
SNMP (UDP) 161 in the ES	40	60
SNMP trap (UDP) 162 in the BE	60	40
SSH (TCP) 23 in the ES	30	70
SMS	80	20

2) Communication channel metric, weight w_p=20

	Cp	SPDp
GPRS with GEA/3	*20*	*80*
SMS over GSM with A5/1	*40*	*60*

4) SMS message rate metric w_p=20
0,1, or 2 messages SPDp=90-100

5) Encryption metric w_p=60

	Cp	SPDp
No encryption	*88*	*12*
Key 64 bits	*10*	*90*
Key 128 bits	*5*	*95*
Not applicable	*0*	*100*

3) GPRS message rate metric w_p=80

messaae delav	*Cp*	*SPDp*
0.5 sec	*80*	*20*
1 sec	*60*	*40*
2 sec	*45*	*65*
5 sec	*30*	*70*
10 sec	*20*	*80*
20 sec	*15*	*85*
60 sec	*10*	*90*
120 sec	*5*	*95*
No messaaes	*0*	*100*