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Information Quality Evaluation of C2 Systems at Architecture Level

(paper 077, track 4)

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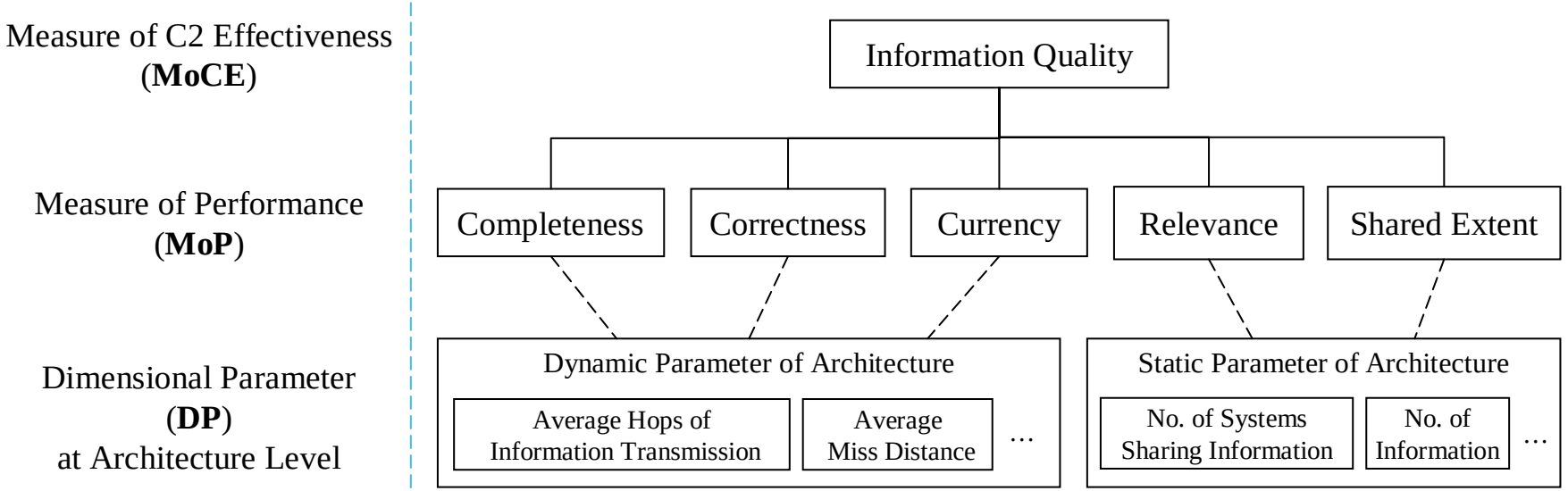
Introduction

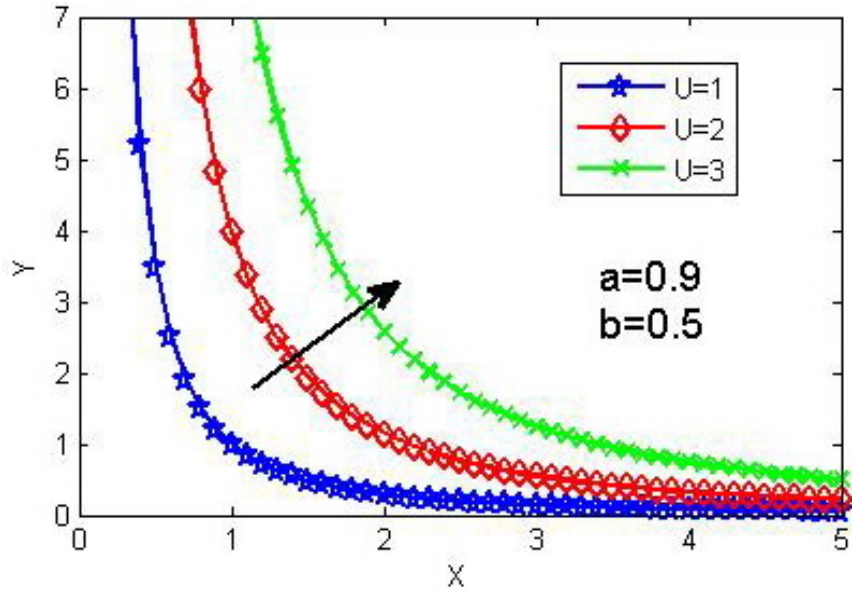
- Information quality/superiority plays a very important role for winning the war
- Information quality/superiority is usually an important measure of C2 system capabilities
- In literatures, there lacks a method that can evaluate the information quality based on the architecture design of C2 systems
- Therefore, we propose a method to evaluate information quality of C2 system at architecture level

Information Quality Model



- *Completeness*
- *Correctness*
- *Currency*
- *Relevance*
- *Shared Extent*

Information Quality Model



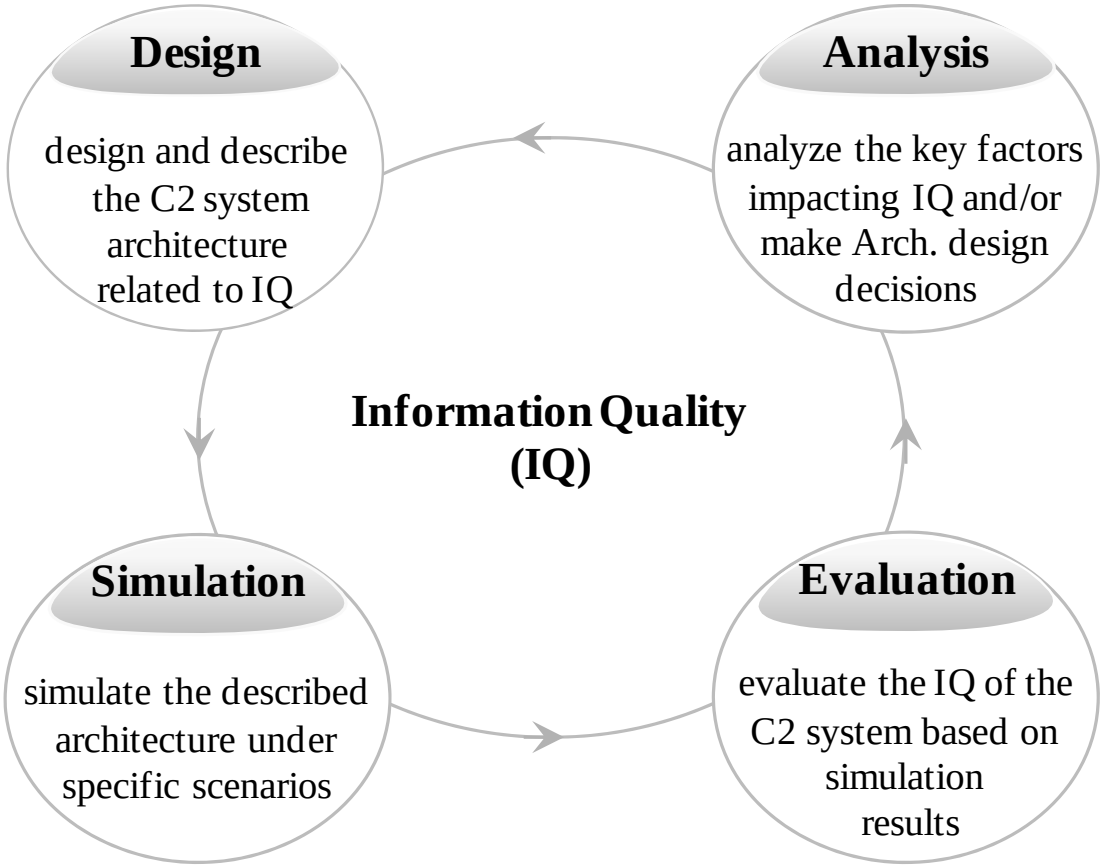
$$U(X,Y) = X^a Y^b, a > 0, b > 0$$

$$I = I_{Com}{}^{w_1} I_{Cor}{}^{w_2} I_{Cur}{}^{w_3} I_{Rel}{}^{w_4} I_{SE}{}^{w_5}$$

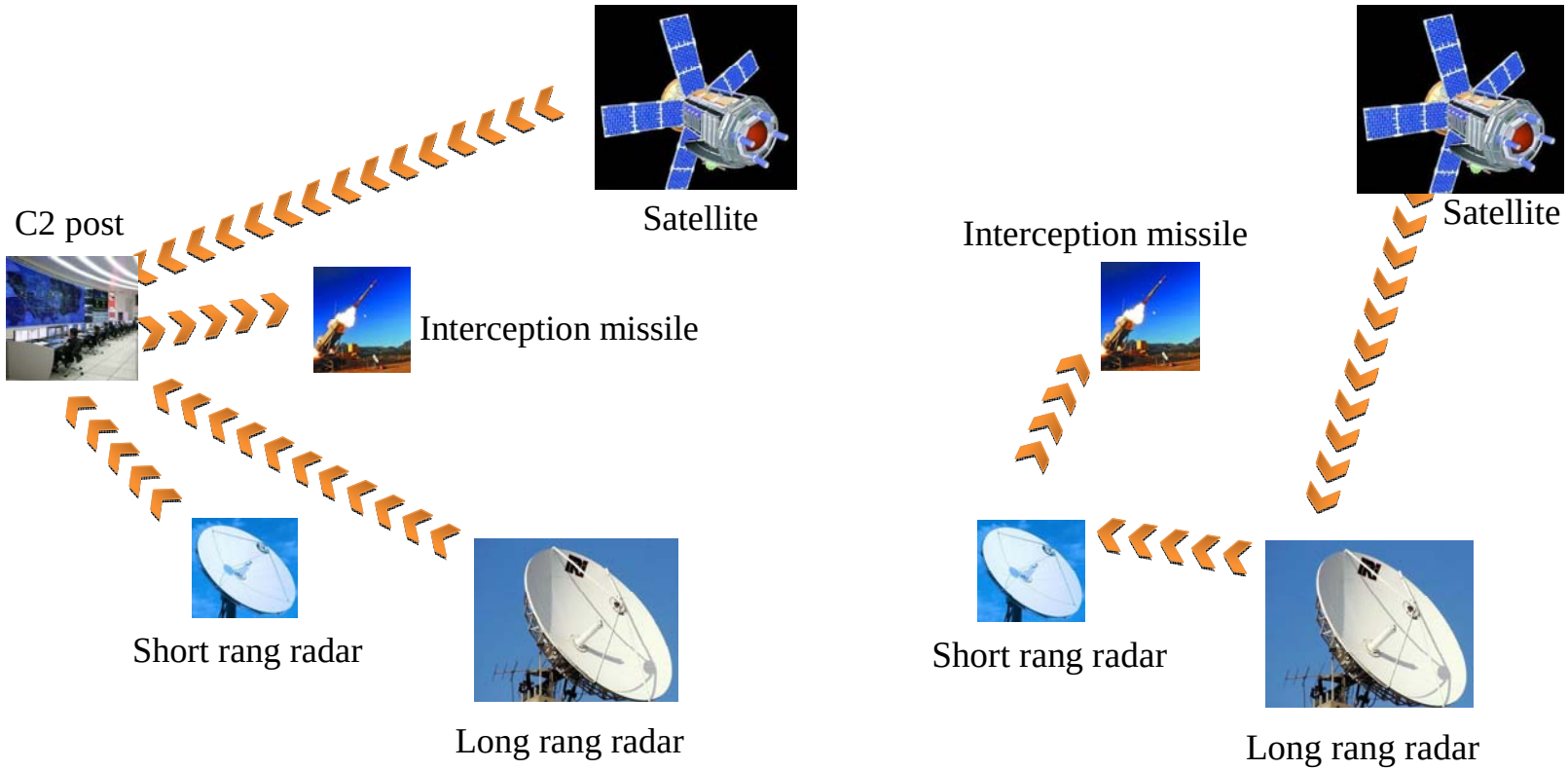
$$r_j = \frac{x_j}{x_j^+}, x_j^+ = \max x_j$$

$$r_j = \frac{x_j^-}{x_j}, x_j^- = \min x_j$$

Architecture-level Information Quality Evaluation Framework



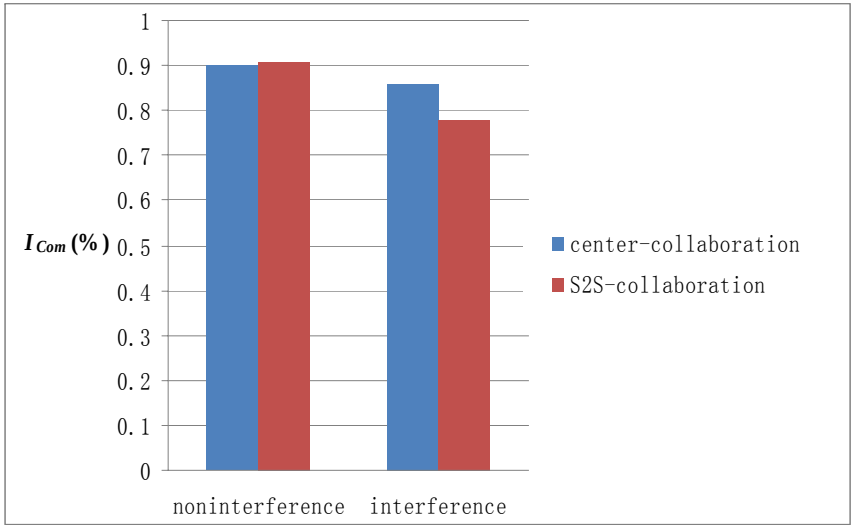
Experiment and Analysis

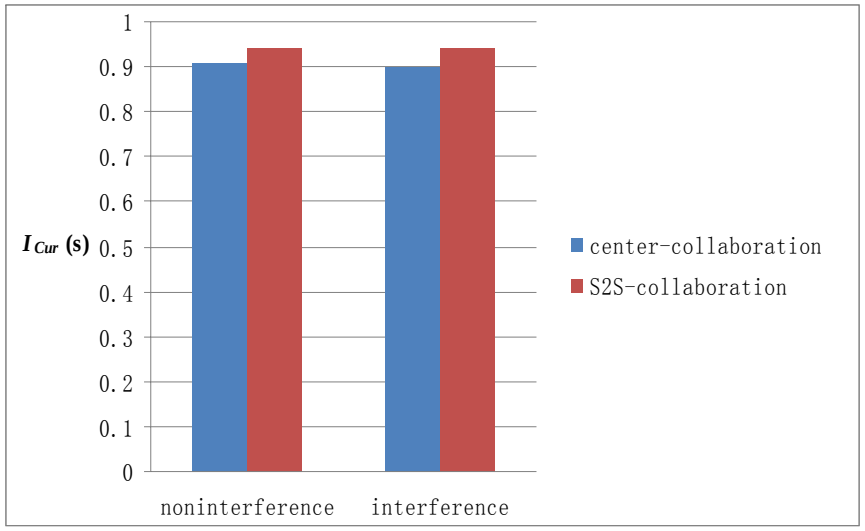


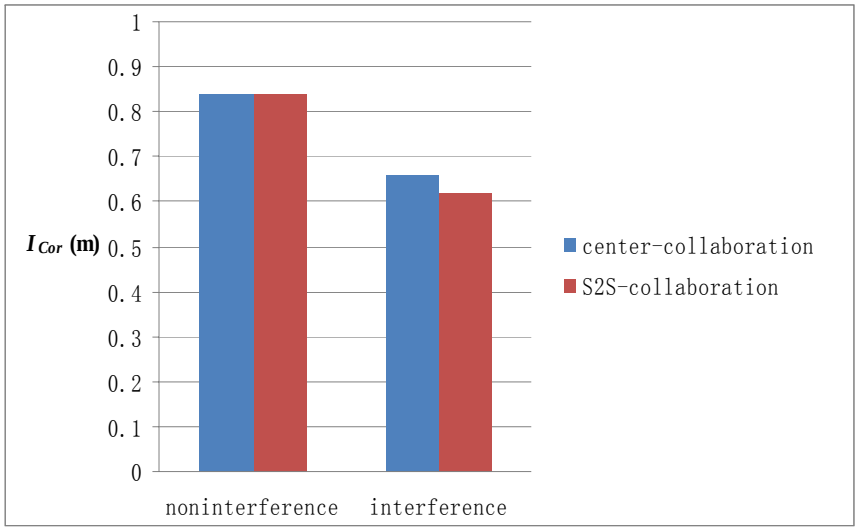
Experiment and Analysis

Models	Descriptions	
	Center-Collaboration Mode	S2S-Collaboration Mode
OV-2	5 nodes and 7 connections among them	4 nodes and 4 connections among them
OV-4	5 nodes and 4 relationships among them	4 nodes and 3 relationships among them
OV-5	8 activities and 23 flows among them	7 activities and 14 flows among them
OV-6b	20 states and 27 transitions among them	16 states and 22 transitions among them
OV-6c	6 systems and 14 events among them	5 systems and 15 events among them
OV-7	9 data	7 data
SV-1	6 systems and their 16 interactions	5 systems and their 12 interactions
SV-2	5 systems and their 4 communications	4 systems and their 3 communications
SV-4	27 functions	24 functions
SV-5	39 mappings between 8 activities and 27 functions	32 mappings between 7 activities and 24 functions
SV-10b	16 states and 22 transitions among them	14 states and 19 transitions among them
SV-10c	6 systems and 29 events among them	5 systems and 19 events among them

Experiment and Analysis







Experiment and Analysis

		I_{Com}	I_{Cor}	I_{Cur}	I_{Rek}	I_{SE}	I
Noninterference	Center-collaboration	0.90	0.84	0.91	1	0.57	0.87
	S2S-collaboration	0.91	0.84	0.94	1	0.6	0.88
Interference	Center-collaboration	0.86	0.66	0.90	1	0.57	0.81
	S2S-collaboration	0.78	0.62	0.94	1	0.6	0.79

Conclusion and Future Work

- Information quality is usually an important measure of C2 systems effectiveness
- With our proposed information quality model, one can effectively evaluate the information quality based on architecture models of C2 systems.
- In next work, we intend to extend the experiment by launching multiple enemy targets and apply our proposed method to more cases