

Development, Application, and Transfer of a Network ROI Cost Calculator

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**Indicates
new
information**

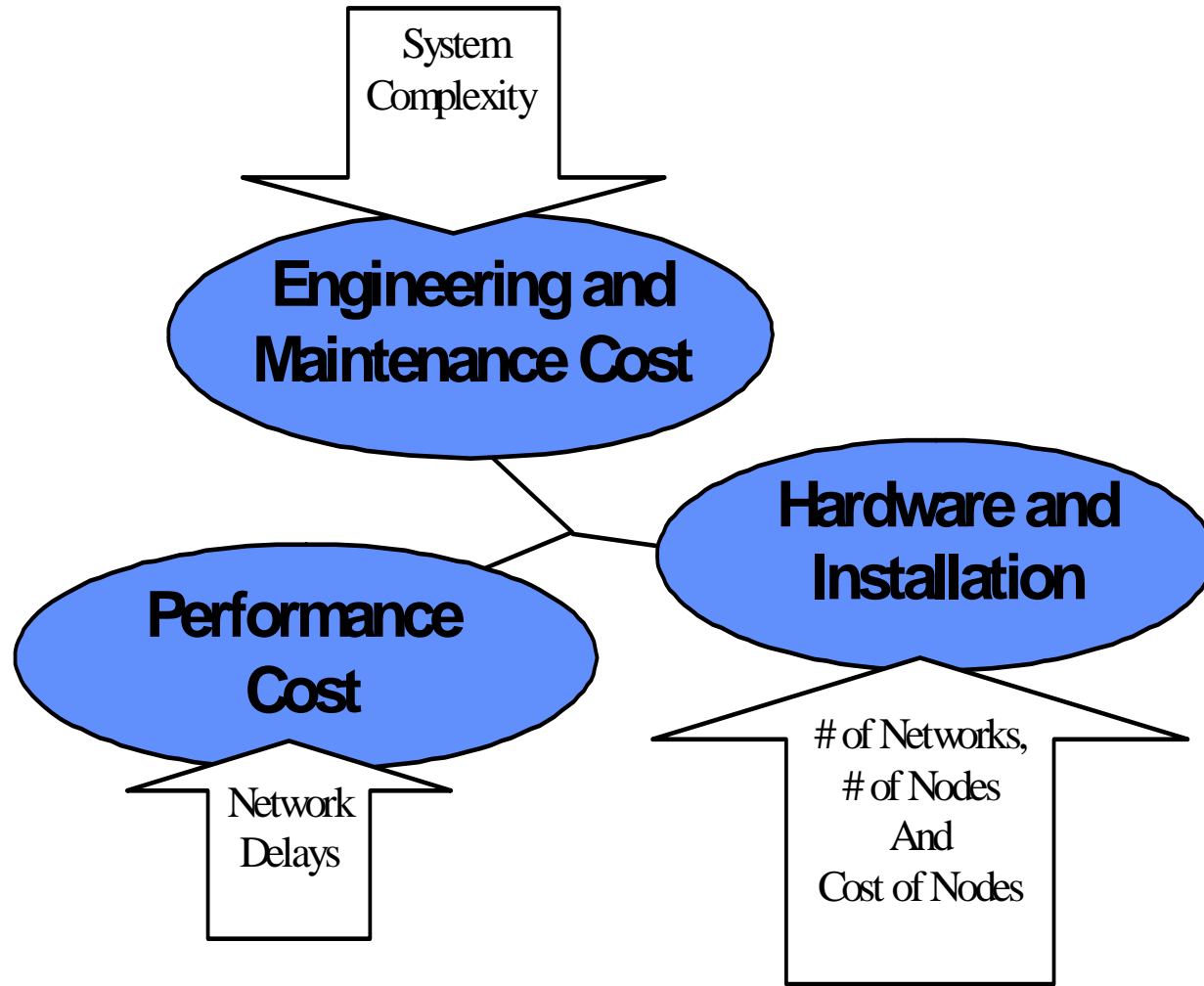


Introduction: *Project Goals*

- Identify the parameters which impact the overall cost of a network
- Develop an approach for quantifying these factors
- Apply the cost calculator to factory scenarios



Network Cost Calculator: *Tradeoffs*



Network Cost Calculator: *Cost Function*

- In order to generalize the cost calculator to take into account different units of measurement a two tier normalized weighted cost calculator was developed:

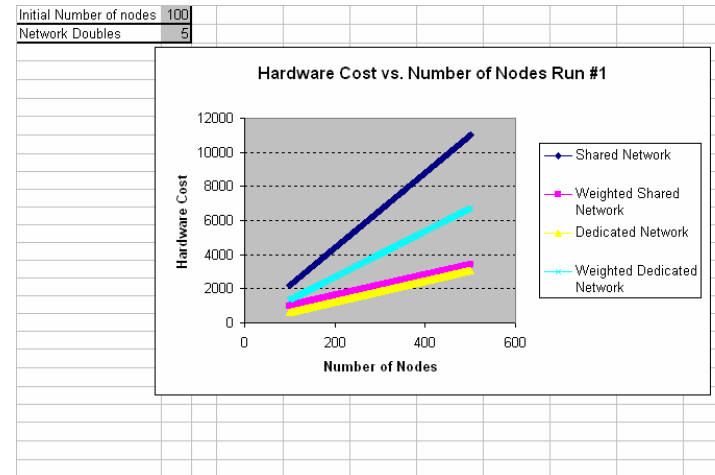
$$WCost_{total} = \frac{W_H}{(W_H + W_E + W_P)} Cost_H + \frac{W_E}{(W_H + W_E + W_P)} Cost_E + \frac{W_P}{(W_H + W_E + W_P)} Cost_P$$



Network Cost Calculator: Application



- Used to assess Safety + Control network deployment cost on dedicated vs. shared network
- Excel based form with VBA macro support
- Input custom network variables
- Input category weights
 - Baselines developed from experiments
- Output is easy to use and traceable



Number of Charts Created	1	Run #	Run 1
		Average Node Cost	20
		Network Capacity	10
		Incremental Cost of the Networks	20
		If Shared	
		Initial Cost	0
		If Dedicated	
		Percentage of Control Nodes	1
		Dedicated Control Initial Cost	2
		Dedicated Safety Initial Cost	3
		Shared Components Initial Cost	4
		Average Node Cost Control	5
		Average Node Cost Safety	7
		Network Capacity Control	7
		Network Capacity Safety	9
		Incremental Cost of Networks Control	8
		Incremental Cost of Networks Safety	12
		Nodal Range	100 to 500
		Weight of Initial Costs	1
		Weight of Node Cost	2
		Weight of Incremental Node Cost	3
		Number of times Network Doubled	5

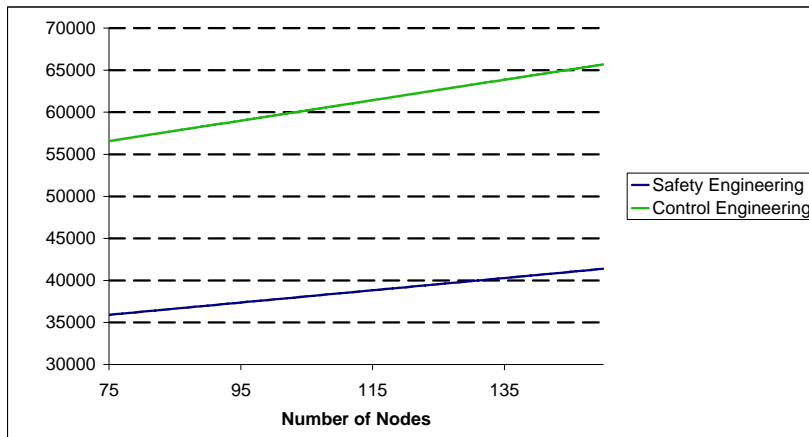


Network Cost Calculator: Case Study

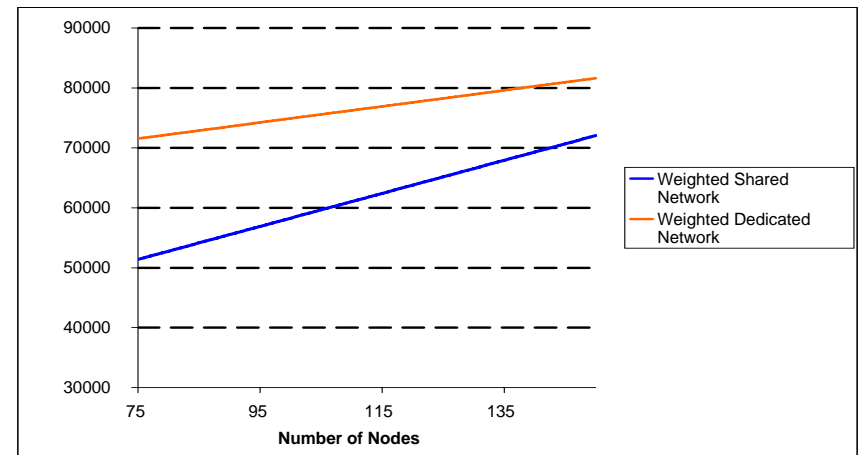


- RFT Network Simulation
 - Equal Cost Weighted
 - Considering all hardware initial cost
 - System errors generalized to network errors

Results	
Hardware cost	\$71,547.49
Engineering cost	\$35,917.50
Performance cost	\$19,440.00
Total cost	\$126,905.00



Engineering Cost

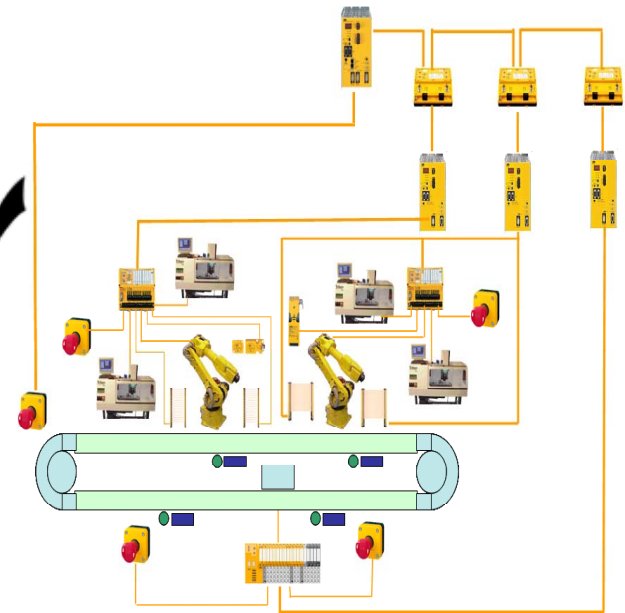


Hardware



Network Cost Calculator Direction

- Application Development (F06) ✓
- Real World Factory Data (F06) ✓
 - DCX Connection
- RFT Benchmarking (W07) ✓
- Shared (Diagnostic) interface (W07) ✓
- Certification Data (W07) ✓
- Installation and hardware upgrades (W07) ✓
- TestBed (Su07)
- Network Performance (F07)
- Shared Vs. Dedicated (W08)



Conclusions

- There are many factors impacting the up front and on-going cost of a network and the evaluation of these factors is application specific
 - Any network that meets the data integrity requirements of the safety standards can be used as a safety network.
- A two tier normalized weighted cost function has been developed to allow for an incremental evaluation of network cost that is highly adaptable and flexible.

