Model Based Systems Engineering analysis for Hardware Selection of a Distributed Surveillance System.

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Requirement Process

Rating requirement table.

Rating of Requirements				Trade Off Assessment
0	Worst	No	None	Initial Cost $
1	Poor	Some	High	Operations Cost $
2	Fair	Maybe	Medium	Intelligence
3	Best	Yes	Low	Reliability
				Maintainability
				Scalability

Trade Off Assessment Matrix

Systems	*Estimated Initial Costs $*	*Initial Cost Rating*	*Operations Cost/1yr*	*Operations Cost Rating*	*AI/Communications/ Intelligence*	*AI/Communications/ Intelligence*	*Reliability*	*Reliability Rating*	*Maintainability*	*Maintainability Rating*	*Scalability*	*Scalability Rating*	*Total*	*Perfect System Rating*	*Perfect System Total*
(SSAMSS)	2000.00-5000.00	3	Low-Medium	2.5	Yes	3	Best	3	Fair	2	Fair	2	15.5	3	18
Portable Radiation Portal Monitors (PRPM)	10000.00-25000.00	3	High	1	some	1	Fair	2	Fair	2	Fair	2	11	3	18
Handheld Devices	1000.00-8000.00	2	Low-Medium	1.5	None	0	Fair	2	Best	3	worst	0	8.5	3	18
Sensor Devices	1000.00-5000.00	2	Low-Medium	1.5	Some	1	Fair	2	Fair	2	Poor	1	9.5	3	18
Web Applications	NA	1.5	Medium-High	2	Some-Maybe	1.5	Best	3	Fair	2	Best	3	13	3	18
Perfect System	[redacted]	3	[redacted]	3	[redacted]	3	[redacted]	3	[redacted]	3	[redacted]	3	18	3	18

Developing Domains

Global Safety

Operational Equipment Effectivness

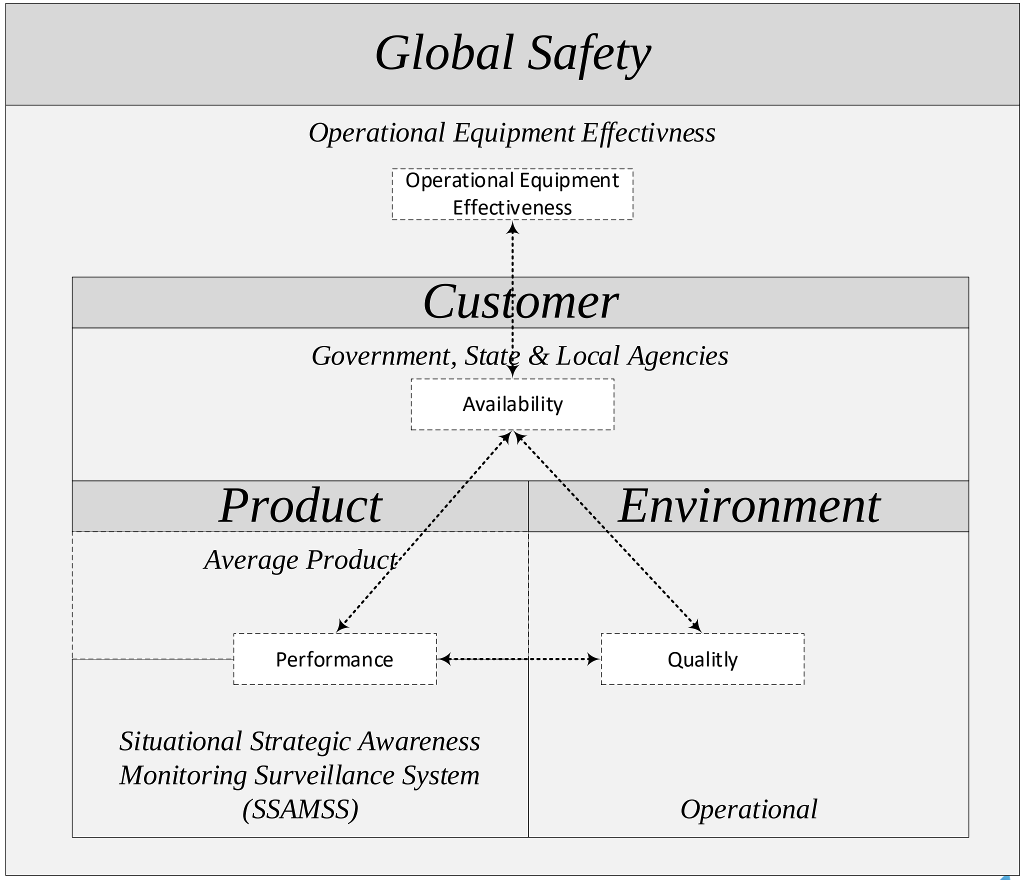
Customer

Government, State & Local Agencies

Product	*Environment*
Average Product	*Operational*
Situational Strategic Awareness Monitoring Surveillance System (SSAMSS)	

Complex Systems Dynamics

- Operational Equipment Effectiveness (OEE):
  - SSAMSS vs Mean Product Effectiveness
  - Equation: (Availability)*(Performance)*(Quality) = OEE
- Availability:
  - SSAMSS vs Mean Product Availability
  - Equation: (Actual Production Time)/ (Potential Production Time) = Availability %
- Performance:
  - SSAMSS vs Mean Product Processing Power
  - Equation: (Actual Output)/ (Theoretical Output) = Performance %
- Quality:
  - SSAMSS vs Mean Product Environmental life span
  - Equation: (Good Output)/ (Actual Output) = Quality %



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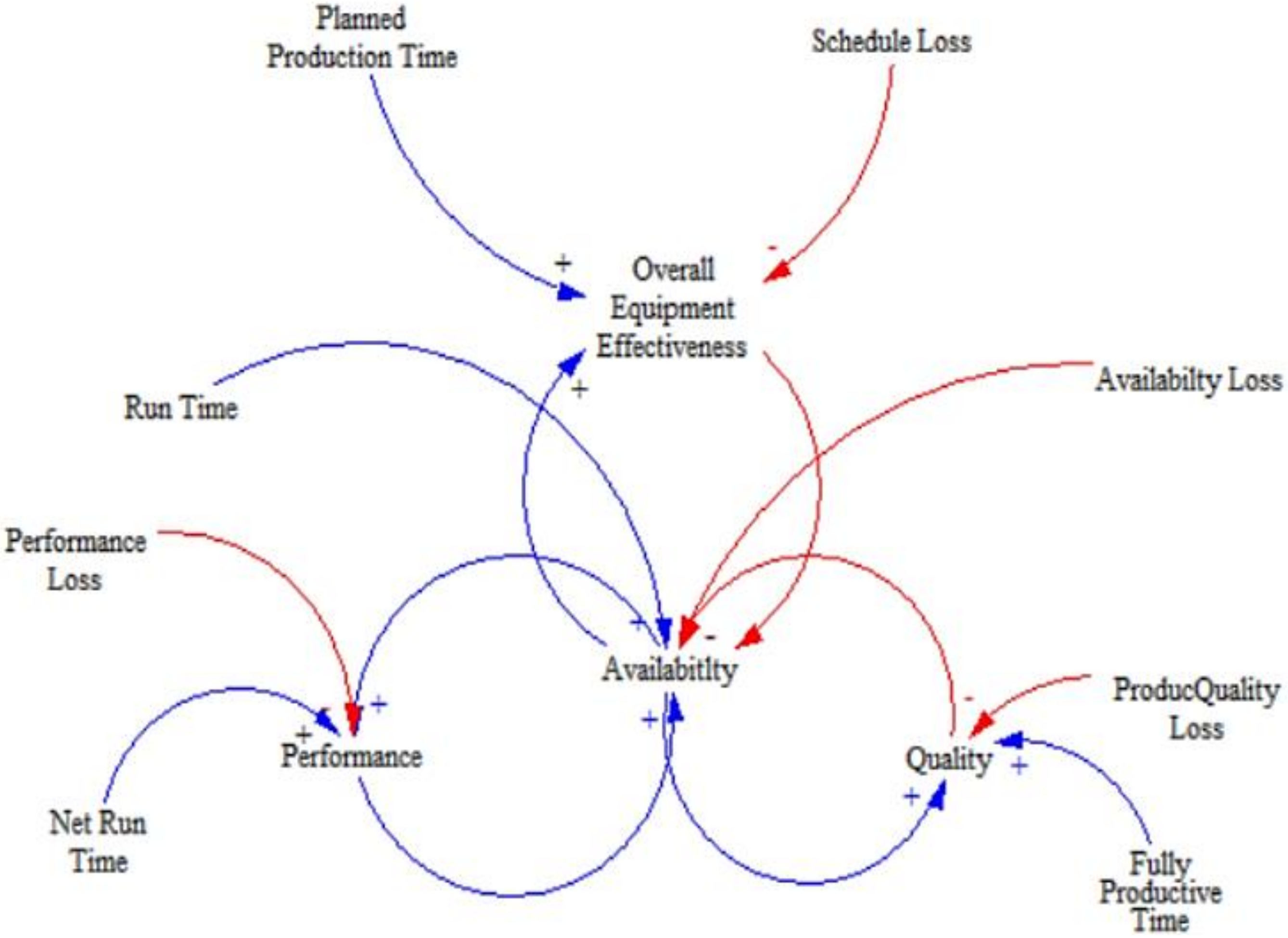
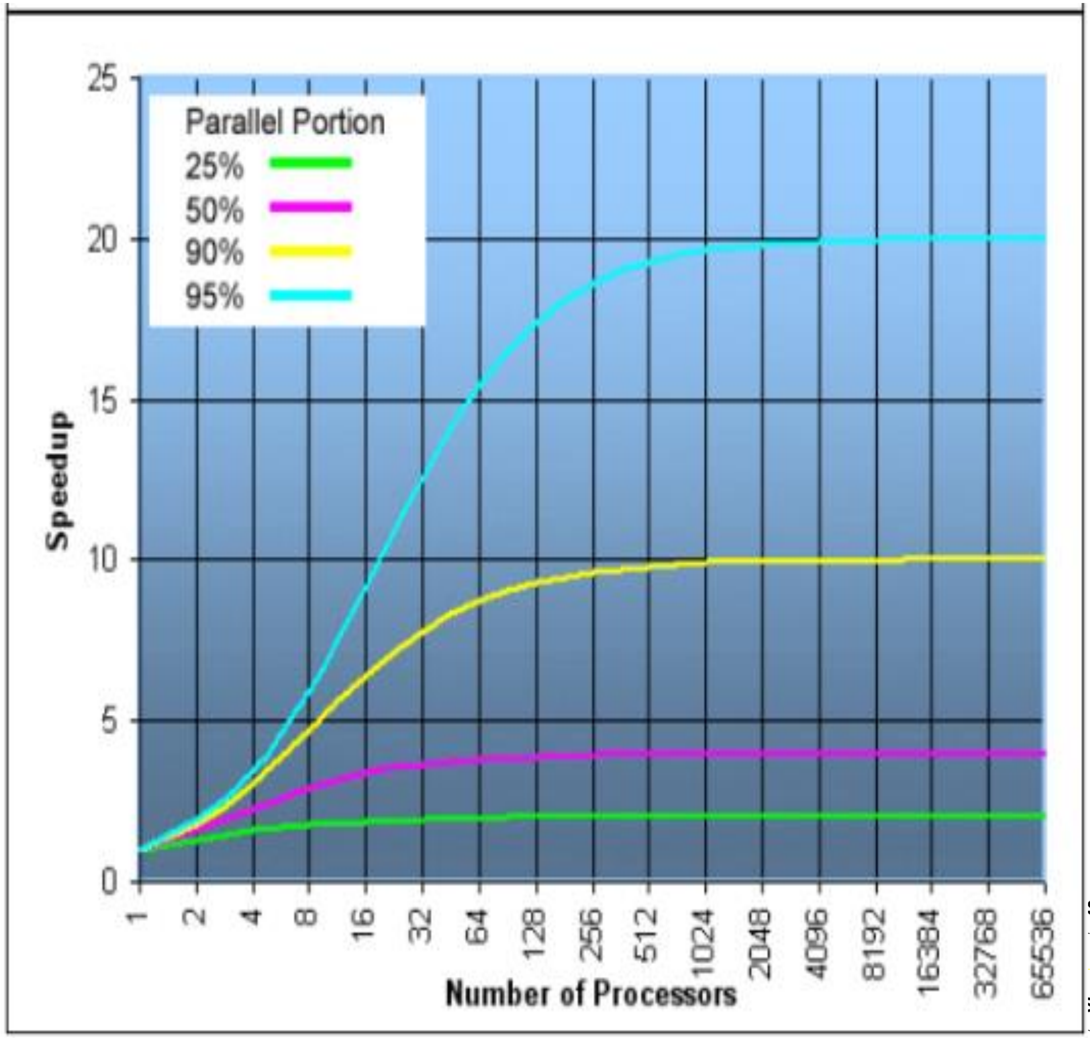
Casual Loop Diagrams

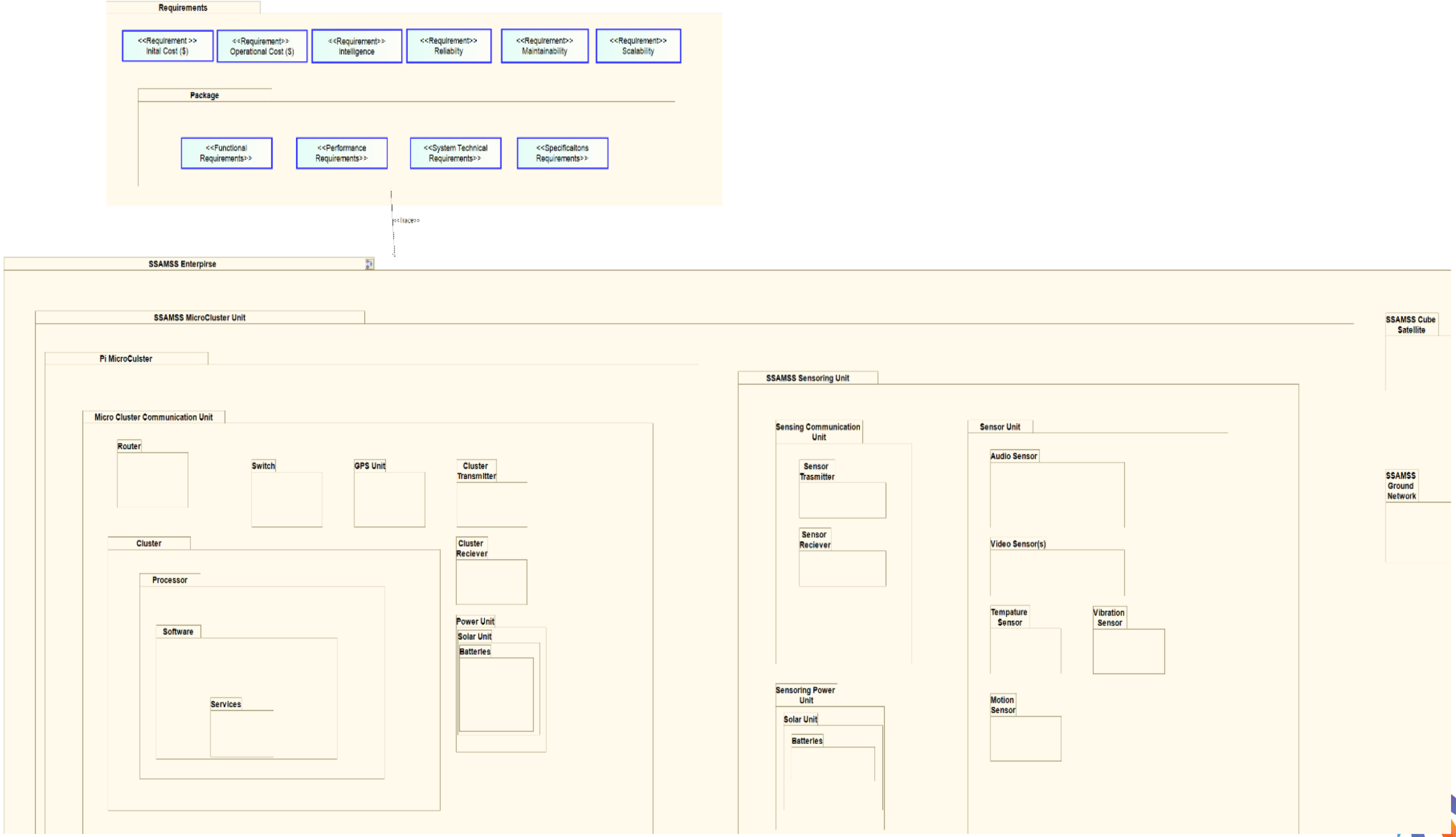


Complex Loop Diagram with Variable Assessment of Measures

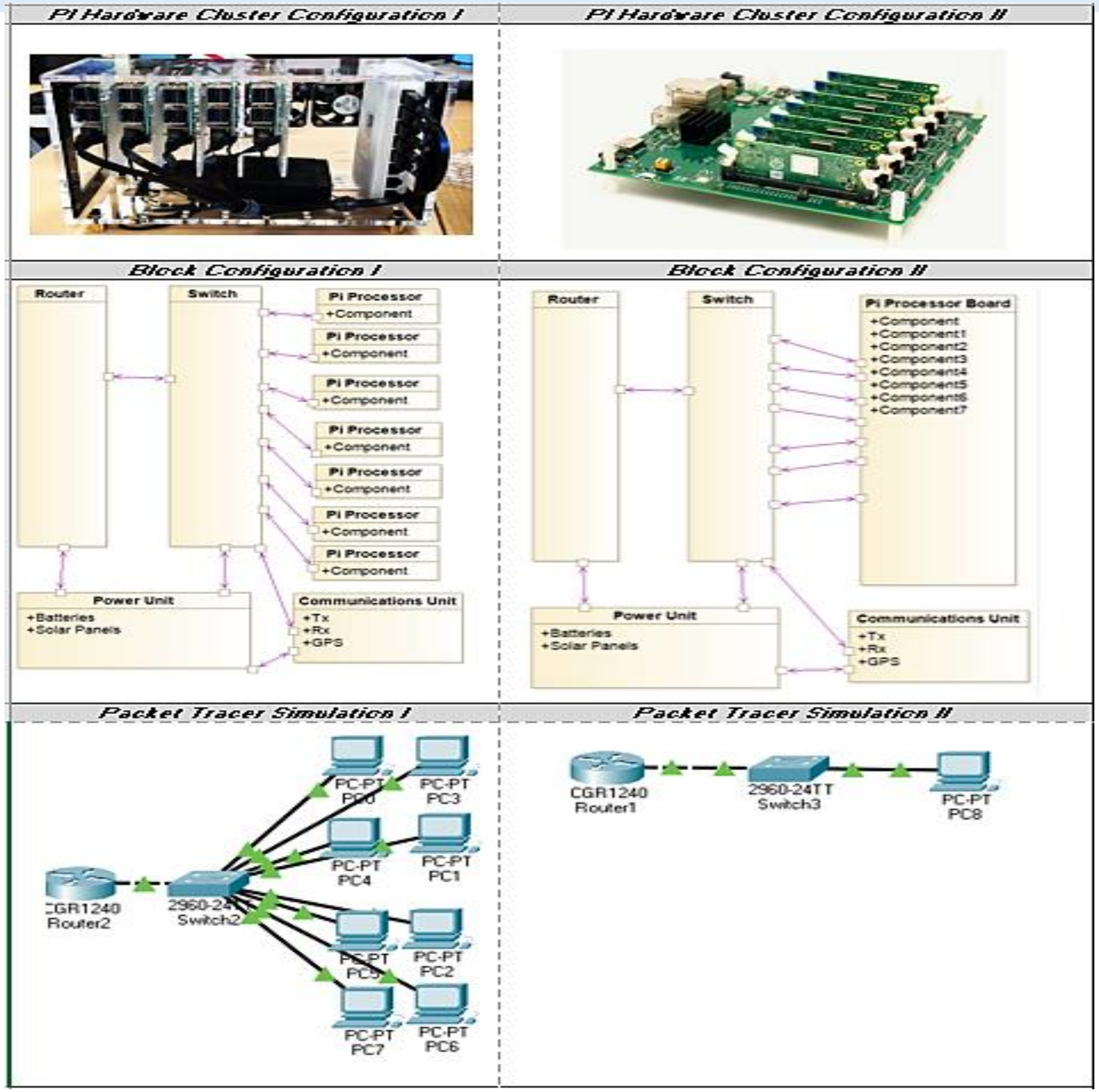
- In general terms, Amdahl's Law states that in parallelization, if P is the proportion of a system or program that can be made parallel, and 1-P is the proportion that remains serial, then the maximum speedup S(N) that can be achieved using N processors is:
- $S(N)=1/((1-P)+(P/N))$
- As N grows the speedup tends to 1/(1-P).
-
- Speedup is limited by the total time needed for the sequential (serial) part of the program. For 10 hours of computing, if we can parallelize 9 hours of computing and 1 hour cannot be parallelized, then our maximum speedup is limited to 10 times as fast. If computers get faster the speedup itself stays the same.



Building Blocks

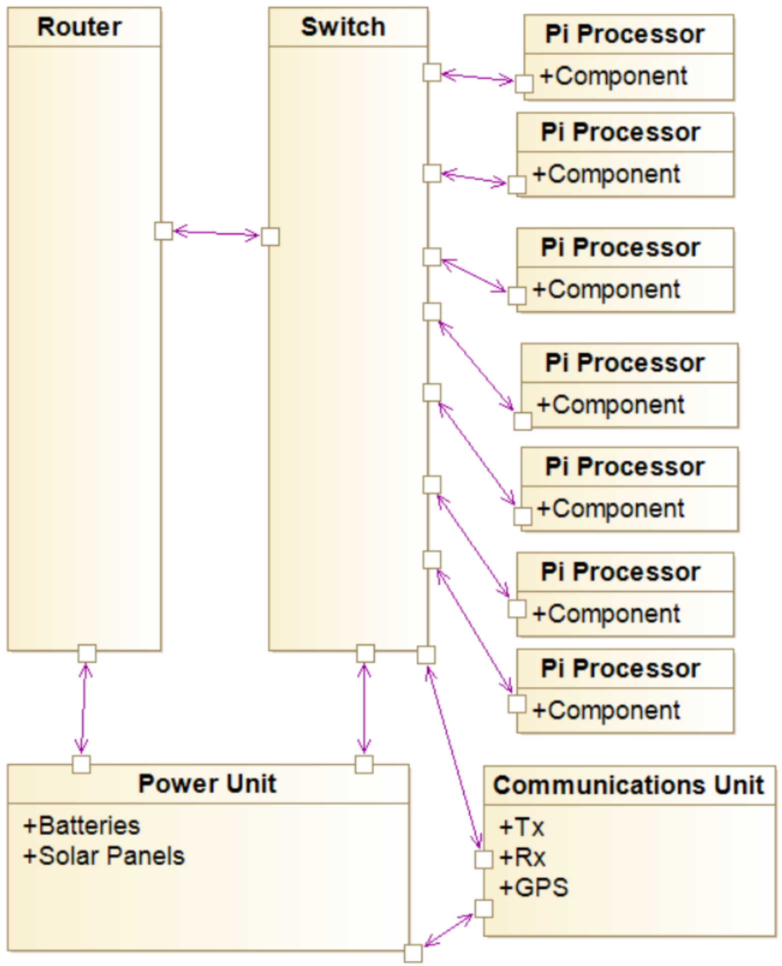


Options, Configuration and Selection



Conclusion

Measures of Comparison Table			
Measures	Configuration I	Configuration II	Best Selection
Hardware Costs:	$50.00 per Pi Processor	$50.00 per Pi $300.00 turning Pi board which holds 7 Pi's	Configuration I
Space:	Takes up about 50% more space	Smaller and more compact and saves about 50% more space	Configuration II
Redundancy:	Each Pi is a redundancy processer that can take distributed data packets	Each Pi Turning Board can hold 7 Pi's but are chocked by only having a single connection to get to those Pi's	Configuration I
Risk:	If one Pi fails it can still distribute to the other processors at the same rate	If the Turning board fails it loses all access to the 7 boards. If one of the boards fail it would be difficult to repair as the board is operational and would need to be shut down	Configuration I
Maintainability:	Replace without stopping operation would be easy in this configuration	It is difficult to replace the Turning board and or Pi under operations plus limited manufacturing of the Pi Turning board.	Configuration I
Overall Best Selection:			Configuration I (5 out of 6)



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