PONDICHERRY UNIVERSITY
(A Central University)

PONDICHERRY

**EXECUTIVE SUMMARY OF FINAL REPORT OF THE WORK DONE ON THE PROJECT**

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| 01. | TITLE OF THE PROJECT | Simulation and development of security based Wireless Sensor Network using ZIGBEE module |
| 02. | NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR | Dr. P. Samundiswary<br>Department of Electronics Engineering<br>School of Engineering and Technology<br>Pondicherry University<br>Pondicherry-14 |
| 03. | NAME AND ADDRESS OF THE INSTITUTION | Department of Electronics Engineering<br>School of Engineering and Technology<br>Pondicherry University<br>R.V. Nagar<br>Kalapet<br>Pondicherry-14 |
| 04. | UGC APPROVAL LETTER No. AND DATE | F.No.41-610/2012 (SR) dated 16.7.2012 |
| 05. | DATE OF IMPLEMENTATION | 1.2.2013 |
| 06. | TENURE OF THE PROJECT | 3Years |
| 07. | TOTAL GRANT ALLOCATED | Rs.13, 58, 800/- |
| 08. | TOTAL GRANT RECEIVED | Rs. 10, 34, 800/- |
| 09. | FINAL EXPENDITURE | Rs. 10, 76, 800/- |
| 10. | TITLE OF THE PROJECT | Simulation and development of security based Wireless Sensor Network using ZIGBEE module |
| 11. | OBJECTIVES OF THE PROJECT | To analysis the performance of IEEE 802.15.4 (ZIGBEE) based WSN using security algorithm to mitigate the effect of attacks. |
| 12. | WHETHER OBJECTIVES WERE ACHIEVED | ZIGBEE based WSN with security algorithm through simulation is developed. Further, the various performance metrics are examined. |
| 13. | ACHIEVEMENTS FROM THE PROJECT | Prototype of Zigbee based WSN is developed . The performance of that model is analysed. |
| 14. | SUMMARY OF THE FINDINGS (IN 500 WORDS) | In this project, the performance analysis of various routing protocols of Zigbee based WSN networks is done with and without wormhole attacks through |

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| | | simulation. Then, the security mechanism for IEEE 802.15.4 based WSN is developed to mitigate the effect of worm hole attack and their performance is evaluated. Further, the comparison is carried out between proposed security algorithm and existing method to verify the improvement in the performance of Zigbee networks using intrusion detection system. The real time performance analysis of Zigbee based WSN is also done. |
| 15 | CONTRIBUTION OF THE SOCIETY (GIVE DETAILS) | The developed secured Zigbee based WSN model can be used for green house and warehouse monitoring efficiently even in the presence of attackers because the security algorithm developed through this project will mitigate the effect of attackers |
| 16. | WHETHER ANY PH.D ENROLLED/PRODUCED OUT OF THE PROJECT | Yes, Second Project Fellow appointed for this Project is enrolled as Ph. D candidate. He has been awarded Ph.D degree in the year 2018 (29.3. 2018). |
| 17. | NO. OF PUBLICATIONS OUT OF THE PROJECT (PLEASE ATTACH) | 8 Papers have been published ;<br>1. Jegan. G and Samundiswary. P, "Energy Efficient Intrusion Detection System for ZigBee based Wireless Sensor Networks", *International Journal of Intelligent Engineering and Systems* (IJIES), vol.10, no.3, pp. 155-165, 2017, ISSN: 2185-3118. (Scopus Indexed )<br>2. G. Jegan and P. Samundiswary, "Wormhole Attack Detection in Zigbee Wireless Sensor Networks using Intrusion Detection System", *Indian Journal of Science and Technology*, vol.9, no.45, pp. 1-7, December 2016. ISSN (Print) : 0974-6846 (Scopus Indexed)<br>3. G. Jegan and P. Samundiswary , "Performance Evaluation of IEEE 802.15.4 based WSN using Routing Protocols under Wormhole Attacks", *International Journal of Applied Engineering Research*, vol.10, no.20, 2015. ISSN: 0973-4562.Impact Factor: 0.8 .(Scopus Indexed)<br>4. P. Samundiswary and G R K SaiTeja, "Performance Analysis of IEEE 82.15.4 based WSNs using Energy Efficient DYMO protocol", *International Journal of Advanced Research in Computer and Communication Engineering*, vol.3, n0.6, pp. 6871-6874, June 2014 ISSN (Print): 2319-5940.Impact Factor:1.770<br>5. P. Samundiswary and Dilip, "Performance Analysis of Energy Aware LAR protocol in IEEE 802.15.4 based Mobile Wireless Sensor Networks", *International Journal of Innovative Technology and Exploring Engineering*, vol.3, no.9, pp.92-98, February 2014, ISSN: 2278-3075.Impact Factor: 1.241.<br>6. Surender. R and P.Samundiswary, "Performance Analysis of IEEE 802.15.4 based Wireless Sensor Networks using LAR protocol for CBR and ZIGBEE Traffic Applications", *International Journal of Computer and Technology*, vol.10, no.9, pp. 1963-1968, September 2013, ISSN: 2277-3061. Impact Factor: 1.341. |

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| | | 7. P. Samundiswary and R. Surender, "Performance Comparison of GTS Mechanism enabled IEEE 802.15 based Wireless Sensor Networks using LAR and DYMO protocol", *Proceedings of IEEE sponsored International Conference on Electronics and Communication and Computational Engineering*, Hosur, TamilNadu, India 17th - 18th November 2014.<br>8. K. Dilip and P. Samundiswary, " Performance Analysis of LAR protocol in Mobile Wireless Sensor Networks", *Proceedings of IEEE sponsored International Conference on Computer Communication and Informatics*,Coimbatore, TamilNadu, India, pp. 1-4, January 2014. |

**(PRINCIPAL INVESTIGATOR)**

Dr. (Mrs.) P. SAMUNDISWARY, M.Tech., Ph.D.
Assistant Professor
Dept. of Electronics Engineering
School of Engineering and Technology
Pondicherry University
Pondicherry - 605 014.

**(REGISTRAR)**

Registrar
Pondicherry University

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## A: DETAILS OF PROJECT

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|---|---|---|---|---|
| 1. | UGC Reference No. and Date | F.No.41-610/2012 (SR) dated 16.7.2012 | | |
| 2. | Name of the Principal Investigator | Dr. P. SAMUNDISWARY | | |
| 3. | Address with e-mail and mobile no. | Dr. P. Samundiswary<br>Assistant Professor<br>Department of Electronics Engineering<br>School of Engineering and Technology<br>Pondicherry University<br>Pondicherry-14<br>Email: sam.dee@pondiuni.edu.in | | |
| 4. | Department and University/College where the project has undertaken | Electronics Engineering and Pondicherry University | | |
| 5 | Title of the Project | "Simulation and development of security based Wireless Sensor Network using ZIGBEE module" | | |
| 6. | Date of Implementation | 1.2.2013 | | |
| 7 | Tenure of the Project | 3Years | | |
| 8 | Name of the Project Fellow and date of Appointment | S.No | Name of the Project Fellow | Joining Date |
| | | 1 | Mr. R. Surender | 26.2.2013 and resigned in January 2014 |
| | | 2 | Mr. G. Jegan | 10.6.2014 |
| 9 | Grant Received | Total Grant Allocation: Rs.13, 58,800/-<br>1st Installment: Rs. 10, 34,800/-<br>(No money was received thereafter) | | |
| 10 | Project Status | Completed | | |

17/5/2015

Dr. M. MANIKANDAN
Associate Professor
Department of Electronics Engineering
MIT Campus, Anna University
Chrompet, Chennai - 600 044.

**B: EVALUATION REPORT OF EXPERT MEMBERS**

| | | |
|---|---|---|
| 1. | Name of the Principal Investigator | Dr. P. SAMUNDISWARY |
| 2. | Designation | Assistant Professor |
| 3. | Address of Principal Investigator | Department of Electronics Engineering<br>School of Engineering and Technology<br>Pondicherry University<br>Pondicherry-14 |
| 4. | Whether work is focused on the title of sanctioned project | Yes |
| 5 | Whether original work is done | Yes |
| 6. | Whether significant contribution made by Principal Investigator | Yes |
| 7. | Whether proposed work have relevance to the Society/Scientific Community | Yes ; It is related to Engineering having relevance in social community |
| 8. | What type of contribution found in the final report: Theoretical/Practical? If there are theoretical contributions given by Principal Investigator , Whether applications are considered | Both Software and Hardware implementation are done |
| 9. | Whether theoretical contributions and their results and findings are published | Yes |
| 10. | Whether results and findings are significant | Yes |
| 11. | Whether the significant publications are made by Principal Investigators in Peer reviewed journals | Yes |
| 12. | The number of publications made by Principal Investigator in Standard reputed journal | 3 |
| 13. | Whether contributions made by investigator is sufficient | sufficient |

12/5/2015

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Associate Professor
Department of Electronics Engineering
MIT Campus, Anna University
Chrompet, Chennai - 600 044.

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|---|---|---|
| 14. | The findings and results of the sanctioned projects are justifiable | Very much justifiable |
| 15. | Whether completed project work meet the proposed objectives | Yes |
| 16. | Give your brief comments on the overall work of the project | The security algorithm for IEEE 802.15.4 based WSN has been developed by PI to mitigate the effect of worm hole attack and their performance is evaluated. Then, the performance comparison is done between proposed security algorithm and existing security system to verify the enhancement of performance of Zigbee networks using newly developed security algorithm |
| 17 | Any specific comments | Performance evaluation and comparison is done |
| 18 | Indicate your overall assessment of the project : Poor/Good/Excellent | Good |
| | Name:<br>Address of Expert:<br>Dr. M. MANIKANDAN<br>Associate Professor<br>Department of Electronics Engineering<br>MIT Campus, Anna University<br>Chrompet, Chennai - 600 044.<br>Date:<br>Place: | Signature:<br>17/5/2019 |

PRINCIPAL INVESTIGATOR

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Assesment / Evaluation Report - II
Under UGC sponsored MRP

A: DETAILS OF PROJECT

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|---|---|---|---|---|
| 1. | UGC Reference No. and Date | F.No.41-610/2012 (SR) dated 16.7.2012 | | |
| 2. | Name of the Principal Investigator | Dr. P. SAMUNDISWARY | | |
| 3. | Address with e-mail and mobile no. | Dr. P. Samundiswary<br>Assistant Professor<br>Department of Electronics Engineering<br>School of Engineering and Technology<br>Pondicherry University<br>Pondicherry-14<br>Email: sam.dee@pondiuni.edu.in | | |
| 4. | Department and University/College where the project has undertaken | Electronics Engineering and Pondicherry University | | |
| 5 | Title of the Project | "Simulation and development of security based Wireless Sensor Network using ZIGBEE module" | | |
| 6. | Date of Implementation | 1.2.2013 | | |
| 7 | Tenure of the Project | 3Years | | |
| 8 | Name of the Project Fellow and date of Appointment | S.No | Name of the Project Fellow | Joining Date |
| | | 1 | Mr. R. Surender | 26.2.2013 and resigned in January 2014 |
| | | 2 | Mr. G. Jegan | 10.6.2014 |
| 9 | Grant Received | Total Grant Allocation: Rs.13, 58,800/-<br>1st Installment: Rs. 10, 34,800/-<br>(No money was received thereafter) | | |
| 10 | Project Status | Completed | | |

Dr. S. NARAYANA REDDY
Professor & Chairman, Board of Studies
Department of E. C. E.
S. V. U. College of Engineering
Sri Venkateswara University
TIRUPATI-517 502, A.P. INDIA

B: EVALUATION REPORT OF EXPERT MEMBERS

| | | |
|---|---|---|
| 1. | Name of the Principal Investigator | Dr. P. SAMUNDISWARY |
| 2. | Designation | Assistant Professor |
| 3. | Address of Principal Investigator | Department of Electronics Engineering<br>School of Engineering and Technology<br>Pondicherry University<br>Pondicherry-14 |
| 4. | Whether work is focused on the title of sanctioned project | Yes |
| 5 | Whether original work is done | Yes (Original) |
| 6. | Whether significant contribution made by Principal Investigator | Yes |
| 7. | Whether proposed work have relevance to the Society/Scientific Community | Yes |
| 8. | What type of contribution found in the final report: Theoretical/Practical? If there are theoretical contributions given by Principal Investigator ,Whether applications are considered | Both (Theoretical and Practical) |
| 9. | Whether theoretical contributions and their results and findings are published | Yes |
| 10. | Whether results and findings are significant | Yes(Significant) |
| 11. | Whether the significant publications are made by Principal Investigators in Peer reviewed journals | Yes |
| 12. | The number of publications made by Principal Investigator in Standard reputed journal | 6 Journal papers and 2 IEEE Conference papers |
| 13. | Whether contributions made by investigator is sufficient | Yes, Sufficient |

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| | | |
|---|---|---|
| 14. | The findings and results of the sanctioned projects are justifiable | Yes |
| 15. | Whether completed project work meet the proposed objectives | Yes |
| 16. | Give your brief comments on the overall work of the project | Performance of the various routing protocols of Zigbee based WSN networks such as AODV, DYMO, OLSR, ZRP and LAR has been examined through simulation. Security for IEEE 802.15.4 based WSN has been proposed to mitigate the effect of worm hole attack and their performance is evaluated. Comparison is carried out between proposed security algorithm and existing Trust system and real time performance analysis of Xbee S2 enabled WSN is also done. |
| 17 | Any specific comments | As wireless technology area using growing at rapid rate, further work can be carried for real time data applications. |
| 18 | Indicate your overall assessment of the project :<br>Poor/Good/Excellent | Excellent |
| | Name:<br>Address of Expert:<br>Prof S Narayana Reddy,Dept.of ECE<br>Chairman-PG Board of Studies(ECE)<br>S.V.University,Tirupati-517502<br><br>Date:4-6-2019<br>Place:Tirupati | Signature:<br>4/6/19<br>Dr. S. NARAYANA REEDY<br>Professor & Chairman, Board of Studies<br>Department of E. C. E.<br>S. V. U. College of Engineering<br>Sri Venkateswara University<br>TIRUPATI - 517 502, A.P., INDIA. |

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