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Dr. N.C. Narendra

Objective

A challenging R&D position in **AI/ML Applications, Cyber Physical Systems, Edge Computing, Cloud Computing, Autonomous 5G/6G Networks, Internet of Things (IOT)**

Education

1985 - 1991 **PhD, Rensselaer Polytechnic Institute, USA**

1980 - 1985 **Indian Institute of Technology, Madras, India**
B.Tech in Electrical Engineering (Electronics)

Employment

Dec 2024 – Present, Consultant, **Artpark, Indian Institute of Science, Bangalore, India**

- Activities
  - Working on **5G-enabled semantic digital twin model for Industry 5.0**, with current emphasis on warehouse management
  - Jointly working with Prof. Nithin Nagaraj of **National Institute of Advanced Studies (NIAS)** on **Neurosymbolic AI integration with Neurochaos Learning**
- Achievements
  - Position paper on **Integrating Causality with Neurochaos Learning** uploaded to Arxiv here

July 2024 – Dec 2024, **India Open Source Mobile Communications Network (IOSMCN), FSID, Indian Institute of Science, Bangalore, India**

- Activities
  - Worked as **Consultant**, leading efforts in **O-RAN development**
  - Worked on O1 Adapter for IOSMCN
  - Co-authored a paper on enhancing O-RAN standards to enable mobility and handover
  - Co-authored a position paper on Research Agenda for Intent-driven Meta-scheduling in 5G
  - Collaborated with faculty in University of Doha Science and Technology on **Semantic Web and Semantic AI**; worked on a paper on intelligent edge resource scheduling incorporating **privacy and security aspects**
- Achievements
  - Co-authored a paper on enhancing O-RAN standards to enable mobility and handover; **presented** at Standards-driven Research Workshop at COMSNETS 2025
  - Developed Training Plan for engineers in the IOSMCN project

- Position paper on Intent-based Meta-Scheduling for Programmable Networks available on Arxiv here

May 2023 – Present, **Adjunct Professor, IIIT Naya Raipur, India**

- Activities
  - Conducted 4-hour short course on **Industry 4.0**
  - Interactions with students and faculty planned on research topics in edge computing
  - Conducted 1-credit course on **Industry 4.0** in Fall 2023 semester
  - Conducted 1-credit course on **Industry 4.0** in Fall 2024 semester

Oct 2015 – July 2024, **Principal Engineer (Research), Ericsson Research, Bangalore, India (retired)**

- Activities
  - Conducted research on **Bharat 6G** related areas, including **edge compute on demand** and **intent-based autonomous network management**
  - Participated in the **EU Pandora** project; conducting research on **data provenance for explainable AI**
  - Conducted research in the following areas: **Internet of Things (IoT) Data Provenance, Smart Contracts, Blockchain-based Cloud Tenant & Service Management, Edge Computing**
  - Worked on **reinforcement learning-based dynamic service and data placement** in edge computing
  - Guided a PhD student in developing a prototype for **IoT-based building automation** driven by **contextual service integration in IoT**
  - Worked on Ericsson Research's strategies in **Data Management for IoT and Distributed Edge Cloud**
  - Worked on joint research with academic collaborators at ISI Kolkata on **service placement on the distributed edge cloud;** submitted two papers
- Achievements
  - Worked in **Ericsson Research's IoT Program**; contributed to analyzing use case patterns in IoT and classifying IoT-based systems as per use case patterns
  - Worked in **Ericsson Research's Connectivity and Edge Computing Program**; developed use cases and approach for integrated service and data placement at application and network virtualization layers
  - Working on **Transient Data Management approach for Distributed Cloud and IoT**
  - 4 papers on IoT accepted
  - Five patents on IoT Monitoring and Smart Contracts approved for filing
  - Worked on **cloud tenant management system using smart contracts on the blockchain**
  - Worked as **Data Champion** for Ericsson Research's Cloud Systems and Platforms team – researching and presenting latest **data management trends**, developing **approaches**

and strategies for data management for Ericsson Research in particular and Ericsson in general.
    - Worked on joint research with academic collaborators on **goal-driven IoT system management;** 1 paper submitted to IEEE IoT Journal

May 2015 – Oct 2015, **Professor, Computer Science & Engineering Department, MSR University of Applied Sciences, Bangalore, India**

- Activities
    - Visited **Mphasis NEXT Labs** as part of industry outreach and discussed areas of mutual interest for collaboration. Key areas will be in **Predictive Analytics** and **IoT**.
    - Started collaboration with **Finixel Technologies** on developing a **cloud-based platform for inter-enterprise collaboration** for Aerospace component suppliers in India; initial use cases and architecture definition underway
    - Conducted research in the following areas: **Big Data Analytics for Internet of Things (IoT) and Cloud; Storage Architectures for IoT; Digital Forensics for IOT; Cloud Service Integration; Cloud Resource Management**
- Achievements
    - Worked on **Goal Driven Contextual Data Filtering for IoT-based Systems**; paper presented in IEEE ITSC 2015
    - Guided a PhD student from **EMC India** on **Decentralized Storage Architectures for IoT** – prototype (built on Ceph) & paper presented at IEEE CCEM 2015
    - Prepared & presented a proposal on technological inputs for the Architecture Management Group of the proposed **Cloud Management Office (CMO)** of **Government of India's National Institute for Smart Government (NISG)**. The proposal covered areas such as technologies needed for Cloud Service Broker, Cloud Service Management and Cloud Audits. I have been invited to serve as an advisor to NISG in this regard.
    - Worked with **Robert Bosch Center for Cyber Physical Systems (RBCCPS)** on **IoT architectures for smart cities**; contributed to the data-driven architecture for smart cities

Feb 2014 – May 2015, **Cognizant Technology Solutions, Bangalore, India**

Chief Architect for Product Engineering Services (PDS) Strategic Business Unit (SBU):

- Activities:
    - Solution Architect for Search & Match project for ManpowerGroup, Inc., focusing on designing a **Big Data** architecture & **Analytics** algorithms for search & match.
- Achievements
    - Worked with architects at Intuit to provide architectural guidance for **Intuit's QuickBooks Online** and (forthcoming) **Financial Data Platform** products. This involves analyzing the current architecture, identifying gaps and opportunities for improvement, and proposing solutions; current emphasis is

on improving scalability and performance. In particular, proposed a solution for Role-based Access Control for Intuit QuickBooks Online.
    - Worked with Intuit to help define their **Service Management Platform** strategy; this strategy will also inform the re-architecting of Intuit's products mentioned above.
    - Led an R&D project to develop **reusable web scraping prototype** for Intuit; will be leading the effort to productize it; also submitted a disclosure on reusable web scraping framework. Our web scraping prototype won the 1st runner up award within Cognizant for the idea with the most business impact on the customer.
    - Developed proposal for **automated discovery in cloud networks** via enterprise topology graphs
    - Led development of proposal for **multi-cloud management for Cisco's InterCloud** product, emphasizing auto-scaling under deadline & budget constraints
    - Analyzed **online architectures** from E*Trade EEO, eBay and IAC from performance perspective, and developed proposal for performance improvements for **Intuit QuickBooks Online**
    - Working with **Google's AdWords** team to incorporate my proposals for technology solutions for improving their Ad Management processes (Campaign Management, Account Admin and Screengrab Reporting)
    - Conducted research in the following areas:
        - Internet of Things – 2 papers submitted
    - Virtual Enterprise Architectures – 1 paper submitted

Dec 2003 – Feb 2014, **IBM India, Bangalore, India**

- **IBM India Systems & Technology Lab (ISTL) (Nov 2011 – Feb 2014)**
    - Activities
        - Tech Lead and Developer in **Linux Technology Center (LTC)**, working on program analysis tools for applications written on POWERLinux
        - Member of internal IBM group on **APIs & Service Ecosystems** group – defining standards and strategies for API-based development and integration of IBM's software products
        - Conducted research in **Resource Allocation** & **Service Placement in Cloud** – with emphasis on minimizing latency in cloud serving environments
        - Conducting research in integrating **Service Oriented Architecture** with **Software Engineering & Cloud-based Systems**
        - Conducting research in **Cross-Enterprise Collaboration for B2B integration**
        - Was Architect & Tech Lead of team developing components of the IBM Systems Director family of products for **distributed cluster management**
    - Achievements
        - Defined architecture & design for decentralized

cloud management for next generation distributed cloud management product
        - Submitted 12 disclosures on cloud monitoring & management; 2 papers on cloud monitoring & management accepted
        - Developed design for integration of IBM's OpenStack platform with IBM's Hardware Management Console (HMC) product via REST APIs
- **IBM Research India, Bangalore (Nov 2005 – Nov 2011)**
    - Conducted research in Cloud Computing, Multi-Tenant Software Engineering, Artifact-centric Business Modeling, Web Services, Empirical Software Engineering
    - Developed a tool for timesheet automation, which is being incorporated into IBM's Rational tool suite
    - Led the development of a tool for automating Work OnBoarding for IBM's Global Technology Services division
- **IBM Software Labs India, Bangalore (Dec 2003 – Nov 2005)**
    - Worked as consulting architect to ISL's Solutions team on the Bharti Service Delivery Framework proposal
    - Was Technical Lead for Service Component Architecture specification and development
    - Conducted research program in Web Services, SOA, reconfigurable middleware and pervasive computing, jointly with academic researchers

Aug 1998 – Dec 2003 **Hewlett-Packard Services ISO, Bangalore, India; w**as **Solution Architect** in HP Services ISO, working in the **Integrated Service Management (ISM)** Section

- Architected and developed a prefab solution for ISM implementation for Data Centers using .NET technologies
- Product/System Architect for a sell-side channel B2B E-Commerce product
- Developed architectures and algorithms for Adaptive Workflow Management and Agent Technology, with applications to E-Commerce; published several papers in international journals and conferences
- Managed and architected a web-based tool called ***Experience Database***, for assisting in Knowledge Management and Organizational Learning.
- Developed organization-wide business goals for Systems Technology Lab (STL) of HP-ISO, and derived metrics from the goals using the (Goal-Question-Metric) GQM approach; Leader of Technology Change Management initiative, helping HP-ISO achieve CMM L5
- Mentor for a junior colleague studying in the MSc (Software Systems) program at BITS, Pilani.

Feb 1995 - Aug 1998 **Motorola India Electronics Ltd., Bangalore, India**

- Led the development of the following tools: program slicing, data-flow analysis, review process automation
- Developed pseudocode specification languages for C and C++

- Created and conducted training courses for Effective C Coding, Effective Debugging and Good Design Practices

July 1993 - Feb 1995 **Tata Research Development and Design Centre (TRDDC), Pune, India**

- Conducted research in computer aided routing and placement, image processing and optimal stock cutting

April 1992 - May 1993 **Centre for Artificial Intelligence and Robotics (CAIR), Bangalore, India**

- Conducted research on CAD and Computational Geometry

Aug 1991 - March 1992 **Courant Institute, New York University, New York, USA**

- Conducted research in Computational Geometry and Geographic Information Systems (GIS)

Training Courses Attended

1) OOPS/C++
2) Visual C++
3) Project Management Fundamentals Training (conducted in HP)
4) Optimal Performance Coaching (conducted by Keystone Consulting Group)
5) Software Reuse

Students Guided

1) I guided 10 graduate students as summer interns

2) I guided 1 student from NITK Surathkal for his PhD

Patents and publications

I won a **Fourth Plateau** award while at IBM in honor of 13 patents rated FILE and 11 patents rated PUBLISH.

Overall I have **63** filed patents.

I am the co-author of over 100 publications in international conferences and journals.

Languages

C, C++, Java, HTML, XML, UML, Python

Honors, Awards and Appointments

1. Senior Member, IEEE

2. Senior Member, ACM

3. Member, Editorial Board of Service-Oriented Computing and Applications Journal

4. Reviewer for IEEE Internet Computing, Information Sciences, Distributed and Parallel Databases, IEEE Transactions on Services Computing

5. Program Co-Chair, International Conference on Service-Oriented Com-

puting (ICSOC), 2012; currently appointed Program Co-Chair for ICSOC 2015 and IC3 2015 (Algorithms track)

6. Program Committee Member for several international conferences

Issued Patents

- 8,504,506: Systems and methods for modeling and analyzing solution requirements and assets
- 8,230,387: System and method to organize assets in a repository
- 8,195,489: Method for computing an enterprise process compliance index
- 9,906,420: Dynamic boundary based monitoring and metering
- 9,548,893: Dynamic agent replacement within a cloud network
- 9,521,043: Modeling computer network topology based on dynamic usage relationships
- 9,397,896: Modeling computer network topology based on dynamic usage relationships
- 9,342,809: Method and apparatus to populate asset variant relationships in repositories
- 9,300,543: Calculating the effect of an action in a network
- 9,213,582: Differentiated service identification in a networked computing environment
- 8,607,188: Modeling task-site allocation networks

Publications

1. N.C. Narendra, *On the Maximum Empty Rectangle of Specified Orientation in a Simple Polygon,* Proceedings of Third National Seminar on Theoretical Computer Science, 1995

2. N.C. Narendra, *An Algorithm for Maximal Polygon Containment,* 16th All India Manufacturing Technology Design and Research Conference, 1994

3. N.C. Narendra, *Module Specification (Mspec) Guidelines I: MILES1.0,* Motorola US Software Engineering Symposium, 1996

4. N.C. Narendra, *MSpec Guidelines II: MILES-T1.0 -- Enhancing MILES1.0 for Testabilty,* Motorola US Software Engineering Symposium, 1996

5. A.K. Choudhury and N.C. Narendra, *MSpec Guidelines III: MILES++1.0 -- MSpecs for OO Languages,* Motorola US Software Engineering Symposium, 1996

6. S.D.V. Prasad and N.C. Narendra, *Cutting Down Cycle Time for Reengineering of ANSI C Programs,* Motorola Asia-Pacific Software Engineering Symposium, 1998

7. N.C. Narendra, G. Radhakrishnan, Steven R. Cook, N. Nageswara Rao and Bhaskar Shedge, *Warp10: An Integrated Approach to Cycle Time Reduction,* Motorola Asia-Pacific Software Engineering Symposium, 1998

8. Kundan Singh and N.C. Narendra, *Cutting Down Testing Cycle*

Time Using Assertions, Motorola Asia-Pacific Software Engineering Symposium, 1999

9. N.C. Narendra, *Adaptive Workflow Management: An Integrated Approach and System Architecture,* ACM Symposium on Applied Computing, 2000

10. Rajesh Bhave and N.C. Narendra, *An Innovative Strategy for Organizational Learning,* 10th World Congress on Total Quality, 2000

11. N.C. Narendra, *A Goal-based and Risk-based Approach to Creating Adaptive Workflow Processes,* AAAI 2000 Spring Symposium

12. N.C. Narendra and Indradeb P. Pal, *An Architecture for Adaptive Planning and Scheduling of Software Processes using Timed Colored Petri Nets,* International Conference on Theory and Application of Petri Nets 2000, Software Engineering and Petri Nets Workshop

13. N.C. Narendra and Martin L. Griss, *eAgents: An Approach for Modeling and Simulating Multi-Agent Systems,* HP Labs Internal Technical Report, 2001

14. Olga Streltchenko, N.C. Narendra and Y. Yesha, *A Reference Architecture for Multi-Agent Simulation of Derivative Markets,* Proceedings of CIMA 2001

15. N.C. Narendra, *AdaptAgent: Integrated Architecture for Adaptive Workflow and Agents,* Proceedings of International Conference on Artificial Intelligence 2001 (Special Session on Agent-Oriented Software Architectures for B2B)

16. N.C. Narendra, *Flexible Agent Societies: Flexible Workflow Support for Agent Societies,* Proceedings of Intelligent Agents, Web Technologies and Internet Commerce, Proceedings of CIMCA 2001

17. N.C. Narendra, *Design Considerations for Integrating Flexible Workflow and Multi-Agent Interactions in Agent Societies,* Journal of Association for Information Systems (JAIS), 2002

18. N.C. Narendra, *AdaptAgent: Integrating Adaptive Workflows and Multi-Agent Interactions,* presented at AgentCities Information Day Workshop, 9th -10th September 2002

19. N.C. Narendra, "Adapter Management Framework", HP Technology Conference 2003

20. N.C. Narendra, "Generic Performance Management Layer," HP Internal White Paper, 2002

21. N. Parkyn, S. Krishnaswamy, A. Raghu & N.C. Narendra, "All You Wanted to Know About the Integrated Service Management (ISM) Methodology," HP Internal White Paper, 2002

22. N.C. Narendra, *Flexible Support and Management of Adaptive Workflow Processes,* Information Systems Frontiers, 2004

23. N.C. Narendra, *AdaptEntish: Incorporating Adaptivity in Web Service Description and Composition,* presented at AgentCities Information Day Workshop, Feb 2003

24. N.C. Narendra, *An Agent-oriented Architectural Framework for Modeling, Enacting and Managing Web Services,* White Paper, 2003

25. N.C. Narendra, *AdaptAgent: Integrating Adaptive Workflows and Multi-Agent Interactions for B2B E-Commerce,* South African

Computer Journal, 2004

26. N.C. Narendra, *Design of An Integrated Role-Based Access Control Infrastructure for Adaptive Workflow Systems,* Journal of Computing and Information Technology, 2004

27. N.C. Narendra, *AdaptEntish: A Language for Adaptive Web Service Description and Composition,* First International Conference on Web Services (ICWS), 2003

28. N.C. Narendra, *eAgents: An Approach for Modeling and Simulating Multi-Agent Systems,* Proceedings of AMCIS 2003

29. N.C. Narendra, *Sustainable Business Ecologies Research: A Conceptual Framework and Accompanying Case Study,* HP Internal White Paper, 2003

30. N.C. Narendra, *E-Commerce Solutions for the Indian Retail Market,* HP White Paper, 2003

31. N.C. Narendra, *MicroFinance Solution for the Indian Market,* HP White Paper, 2003

32. N.C. Narendra, *Digital Certificate-based Solution for Verifying Authenticity of Medicines in the Indian retail market,* HP Internal White Paper, 2003

33. Z. Maamar and N.C. Narendra, *Ontology-based Context Reconciliation in a Web Services Environment: From OWL-S to OWL-C,* Proceedings of WSABE 2004

34. Z. Maamar, N.C. Narendra and W.J. van den Heuvel, *Towards an Ontology-based Approach for Specifying Contexts of Web Services,* Proceedings of Montreal Conference on eTechnologies, 2005

35. U. Bellur, N.C. Narendra, *Towards Service Orientation in Pervasive Computing Systems,* Proceedings of ITCC 2005 (IEEE Computer Society), Pervasive Computing Track, 2005

36. Z. Maamar, N.C. Narendra and S. Sattanathan, *Towards an Ontology-based Approach for Specifying and Securing Web Services,* Proceedings of Contexts for Web Services (CWS) Workshop (ENTCS Proceedings), CONTEXT 2005

37. Z. Maamar, N.C. Narendra and S. Sattanathan, *Towards an Ontology-based Approach for Specifying and Securing Web Services,* Information and Software Technology Journal, 2006

38. N.C. Narendra, *Modeling Adaptation in Web Services Execution using Context Ontologies,* Proceedings of San Diego Information Systems Conference (SISC 2005), 2005

39. N.C. Narendra, *Large Scale Testing of Pervasive Computing Systems Using Multi-Agent Simulation,* Proceedings of Third IEEE International Workshop on Intelligent Solutions in Embedded Systems (WISES2005), 2005

40. N.C. Narendra, *Testing Pervasive Computing Systems in the Large via Multi-Agent Simulation,* Proceedings of Deep Computing Workshop, IBM India, 2005

41. S. Sattanathan, N.C. Narendra and Z. Maamar, *On Achieving Web Services Security using Context Ontologies,* Proceedings of iiWAS 2005

42. S. Kouadri Mostefaoui, Z. Maamar and N.C. Narendra, *Mobile Middleware and Context for Service Composition,* Book Chapter in “Mobile Middleware” book, CRC Press, to appear, 2005

43. Z. Maamar, D. Benslimane and N.C. Narendra, *What Can Con-*

texts Do For Web Services?, Communications of the ACM, to appear, 2006

44. U. Bellur and N.C. Narendra, *Towards a Programming Model and Middleware Architecture for Self-Configuring Systems,* COMSWARE 2006, IEEE Communications Society Proceedings

45. N.C. Narendra and S. Gundugola, *Automated Context-Aware Adaptation of Web Service Executions,* 4th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA-06), to appear

46. S. Sattanathan, N.C. Narendra and Z. Maamar, *ConWeSc$_{prototype}$ – Context-based Semantic Web Services Composition,* ICSOC 2005, accepted (demo paper)

47. N.C. Narendra, U. Bellur, S.K. Nandy and K. Kalapriya, *Functional and Architectural Adaptation in Pervasive Computing Environments,* Proceedings of MPAC2005 Workshop (part of Middleware 2005)

48. S. Sattanathan, N.C. Narendra, Z. Maamar and G. Kouadri Mostefaoui, *Context-Driven Policy Enforcement and Reconciliation for Web Services,* Proceedings of ICEIS2006, to appear

49. G. Kouadri Mostefaoui, Z. Maamar, N.C. Narendra and S. Sattanathan, *Decoupling Security Concerns in Web Services Using Aspects,* ITNG 2006, IEEE Computer Society Press

50. Z. Maamar, K. Baina, D. Benslimane, N.C. Narendra, and M. Chelbabi, *Towards a Contextual Model-Driven Development Approach for Web Services,* Proceedings of ICEIS 2006, to appear

51. K. Kalapriya, S.K. Nandy and N.C. Narendra, *A Framework for Measurement of End-To-End Qos Requirements in Loosely Coupled Systems,* 1st IEEE International Workshop on Service Oriented Architectures for Highly Networked Environments, AINA2006 Conference

52. Z. Maamar, N.C. Narendra and P. Thiran, *Towards a Coordination Model for Handling Web Services Exceptions,* Proceedings of 1st TCOB Workshop, ICEIS 2006, to appear

53. G. Kouadri Mostefaoui, Z. Maamar, N.C. Narendra and P. Thiran, *Modeling Self-Healing Web Services Using Aspects,* Proceedings of International Conference on Web Services (ICWS) 2006, Work In Progress Track

54. K. Ponnalagu and N.C. Narendra. *Agent-based Framework for Adaptive Policy Management in Autonomic Computing Systems*, IADIS International Conference on Applied Computing, 2006

55. K. Kalapriya, S.K. Nandy and N.C. Narendra. *An Infrastructure-based Approach for Seamless Execution of Pervasive Computing Applications,* 1st International Workshop on Service Integration in Pervasive Environments (SIPE'06), IEEE International Conference on Pervasive Services, 2006

56. N.C. Narendra and B. Orriens, *Requirements-driven Modeling of the Web Services Execution and Adaptation Lifecycle,* ICDCIT 2006, LNCS Proceedings, Springer-Verlag

57. E. Michael Maximilien, N.C. Narendra and D. Martin, *Swashup – Semantic Web, Activities and Services Mashup,* Poster paper, New Paradigms in Using Computers (NPUC) 2006, IBM Almaden Research Center, 2006

58. G. Kouadri Mostefaoui, Z. Maamar, N.C. Narendra and Ph. Thiran, *Modeling and Developing Self-Healing Web Services Using Aspects,* COMSWARE 2007

59. K. Ponnalagu, N.C. Narendra, Jayatheerthan Krishnamurthy and R. Ramkumar *Framework and Technique for Distributed Web Service Adaptation using Aspect Oriented Programming,* patent submission, *Publish* Rating, 2006

60. N.C. Narendra and T.P. Moran, *Improving Activity Awareness in Artifact-Centric Business Processes,* CSCW2006 Workshop on Awareness in Activity-Centric Groupware Design, to appear

61. N.C. Narendra and B. Orriens, *Modeling Web Service Executions Via a Requirements-Driven Approach,* ACM SAC 2007, Web Technologies Track, to appear

62. N.C. Narendra, B. Srivastava, K. Ponnalagu, G.S. Banavar and A. Arsanjani, *Applying Variation-Oriented Engineering Approach to Enhanced Reusability of Business Process-based Solutions,* Proceedings of SOPOSE 2006 Workshop (co-located with APSEC 2006)

63. K. Ponnlagu, N.C. Narendra, Jayatheerthan Krishnamurthy and R. Ramkumar, *Aspect-oriented Approach for Non-functional Adaptation of Composite Web Services,* WS-Testing Workshop (co-located with SCC 2007), to appear

64. Z. Maamar, N.C. Narendra, D. Benslimane and S. Sattanathan, *Policies for Context-Driven Transactional Web Services,* CAiSE 2007, LNCS Proceedings

65. B. Srivastava, K. Ponnalagu, N.C. Narendra and K. Kannan, *Enhancing Asset Search and Retrieval in a Services Repository using Consumption Contexts,* SCC 2007, Applications and Industry Track, to appear

66. N.C. Narendra, K. Gomadam, K. Ponnalagu, A. P. Sheth, *Variation-Oriented Service Composition and Adaptation (*VOSCA*),* SCC 2007, Work In Progress Track

67. N.C. Narendra, K. Ponnalagu, *Variation-Oriented Requirements Analysis (*VORA*),* SOPOSE 2007 Workshop (co-located with SCC 2007)

68. S. Sattanathan, Z. Maamar, N.C. Narendra, D. Benslimane and Ph. Thiran, *CP4TWS - A Prototype Demonstrating Context and Policies for Transactional Web Services,* Demo paper, ICSOC 2007

69. N.C. Narendra, K. Ponnalagu, J. Krishnamurthy and R. Ramkumar, *Run-time Adaptation of Non-functional Properties of Composite Web Services via Aspect-Oriented Programming,* Proceedings of ICSOC 2007, Industry Track

70. G. Kouadri Mostefaoui, Z. Maamar and N.C. Narendra, *Aspect-oriented Framework for Web Services (AoF4WS): Introduction and Two Example Case Studies,* Book Chapter, IGI Global, 2008

71. N. Desai, N.C. Narendra and M.P. Singh. *Checking Business Contract Correctness via Commitments*, Proceedings of AAMAS 2008

72. N.C. Narendra. *Generating Correct Protocols from Contracts: A Commitment-based Approach*, SOPOSE 2008 Workshop (co-located with SCC 2008), July 2008

73. N. C. Narendra, V. Varshney, S. Nagar, M. Vasa and A. Bhamidipaty, *Optimal Control Point Selection for Continuous Compliance Monitoring,* IEEE SOLI 2008

74. A. Bhamidipaty, N.C. Narendra, S. Nagar, V. Varshneya and M. Vasa, **Indra***: An Integrated Quantitative System for Compliance Management for IT Service Delivery,* IBM Systems Journal, Nov. 2009, Vol. 53, pp: 6:1 – 6:12

75. Z. Maamar, Ph. Thiran, N.C. Narendra and S. Sattanathan, *A Framework for Modeling B2B Applications,* AINA 2008

76. K. Ponnalagu and N.C. Narendra, *Deriving service variants from business process specifications,* ACM Compute 2008

77. K. Ponnalagu and N.C. Narendra, *Discovering and deriving service variants from business process specifications,* International Conference on Service-Oriented Computing (ICSOC) 2008

78. R. Ravichandar, N.C. Narendra, D. Gangopadhyay and K. Ponnalagu, *Morpheus: Semantics-based Incremental Change Propagation in SOA-based Solutions,* Services Computing Conference (SCC) 2008

79. N.C. Narendra, K. Ponnalagu, B. Srivastava and G.S. Banavar, *Variation-Oriented Engineering (VOE): Enhancing Reusability of SOA-based Solutions,* Services Computing Conference (SCC) 2008

80. S. Sattanathan, Ph. Thiran, N.C. Narendra, G. Kouadri Mostefaoui and Z. Maamar, *On the Enhancement of BPEL Engines for Self-Healing Composite Web Services,* SAINT 2008

81. N.C. Narendra, Y. Badr, Ph. Thiran and Z. Maamar, *Towards a Unified Approach for Business Process Modeling Using Context-based Artifacts and Web Services*, SCC 2009

82. S. Pillai and N.C. Narendra, *Optimal Replacement Policy of Services Based on Markov Decision Process*, SCC 2009

83. K. Kannan, N.C. Narendra and L. Ramaswamy, *Managing Configuration Complexity during Deployment and Maintenance of SOA Solutions*, SCC 2009

84. K. Kannan, N.C. Narendra and L. Ramaswamy, *Extracting Environmental Information for Improved Web Service Matching and Identification*, Service Composition Workshop (co-located with SCC 2009)

85. R. Hull, N. C. Narendra, A. Nigam, *Facilitating Workflow Interoperation Using Artifact-Centric Hubs,* ICSOC/ServiceWave 2009: 1-18 – **winner of Best Paper in Services Science in IBM in 2010**

86. J. Bentahar, R. Alam, Z. Maamar, N. C. Narendra, *Using argumentation to model and deploy agent-based B2B applications,* Knowledge-based Systems, 23(7): 677-692 (2010)

87. N. C. Narendra, K. Ponnalagu, *Towards a Variability Model for SOA-Based Solutions*, IEEE SCC 2010: 562-569

88. G. Koliadis, N. Desai, N. C. Narendra, A. K. Ghose, *Analyst-Mediated Contextualization of Regulatory Policies,* IEEE SCC 2010: 281-288

89. R. Sindhgatta, N.C. Narendra, B. Sengupta, K. Visweswariah, A. G. Ryman, *Timesheet assistant: mining and reporting developer effort*, Automated Software Enginering (ASE) 2010: 265-274

90. R. Sindhgatta, N.C. Narendra, B. Sengupta, *Software Evolution*

in Agile Development: A Case Study, OOPSLA 2010 (Practitioner's Track)

91. N.C. Narendra and U. Bellur, *A Middleware For Adaptive Service Orientation in Pervasive Computing Environments,* MW4SOC Workshop (co-located with Middleware 2010), **Winner of Most Promising Research Paper Award**

92. Z. Maamar, Y. Badr and N.C. Narendra, *Business Artifacts Discovery and Modeling,* ICSOC 2010

93. Y. Badr, N.C. Narendra and Z. Maamar, *Business Artifacts for E-Business Interoperability,* IGI Global Book Chapter on Electronic Business Interoperability: Concepts, Opportunities and Challenges, 2011

94. L. Ramachandran, N.C. Narendra and K. Ponnalagu, *Dynamic Provisioning in Multi-Tenant Service Clouds,* Service-Oriented Computing and Applications Journal, conditionally accepted

95. K. Kannan, G. Sivakumar and N.C. Narendra, *SATE- Service Boundary and Abstraction Threshold Estimation for Efficient Services Design,* SCC 2011

96. K. Ponnalagu, N.C. Narendra and G.R. Gangadharan, *Leveraging Architectural Asset Analysis for Enhancing Reuse in Model-driven Development of SOA Solutions,* ICSOC 2011

97. A. K. Ghose, N. C. Narendra, K. Ponnalagu, A. Gohad, A. Panda, *Goal-driven Business Process Derivation,* ICSOC 2011

98. N.C. Narendra and K. Ponnalagu, *Towards a Formal Model for Optimal Task-Site Allocation and Effort Estimation in Global Software Development,* SRII 2012

99. A. Gohad, K. Ponnalagu and N.C. Narendra, *Model driven provisioning in multi-tenant clouds* , SRII 2012, **Best Paper Award in Cloud/Mobile Category**

100. K. Kannan, G. Sivakumar and N.C. Narendra, *Balancing Reusability vs. Feasibility of Services in Development Scenarios,* 21st Annual Frontiers in Service Conference, 2012

101. K. Ponnalagu and N.C. Narendra, *Automated Trendline Generation for Accurate Software Effort Estimation,* SPLASH, Wavefront Experience Track, 2012

102. A. Gohad, P.S. Rao, N.C. Narendra, K. Ponnalagu, *Formation of Dynamic Collaborative Cloud Links based on Provider Capability Cost and Resource Health Monitoring,* IEEE Cloud Computing for Emerging Markets (CCEM) Conference, 2012

103. A. Gohad, N.C. Narendra, K. Ponnalagu, *System Health Modeling for Improved Cloud Resource Provisioning,* IEEE Cloud Computing for Emerging Markets (CCEM) Conference, 2012

104. N.C. Narendra, G.R. Gangadharan, K. Ponnalagu, H-L. Truong, S. Dustdar, A.K. Ghose, *Effective Reuse via Modeling, Managing, and Searching of Business Process Assets,* SCC 2012

105. A. Gohad, K. Ponnalagu, N.C. Narendra, P.S. Rao, *Towards Self-adaptive Cloud Collaborations,* International Conference on Cloud Engineering (IC2E), 2013

106. A. Gohad, N.C. Narendra and P. Ramachandran, *Monetizing the Cloud: Pricing Model Governance*, accepted, IEEE

CCEM 2013

107. A. Gohad, N.C. Narendra and P. Ramachandran, *Monetizing the Cloud - A Survey on Pricing Models,* accepted, IEEE CCEM 2013

108. M. Verma, G.R. Gangadharan, V.Ravi and N.C. Narendra, *Resource Demand Prediction in Multi-tenant Service Clouds*, IEEE CCEM 2013

109. M. Verma, G R Gangadharan, V. Ravi, N.C. Narendra and L. Ramachandran, *Dynamic Resource Allocation in Multi-tenant Service Clouds*, submitted, FGCS Journal, 2014

110. N.C. Narendra, A. Norta, M. Mahunnah and F. Maggi, *Modelling Sound Conflict Management for Virtual-Enterprise Collaboration,* SCC 2014, presented

111. U. Bellur, A. Malani, N.C. Narendra, *Cost Optimization in Multi-site Multi-cloud Environments with Multiple Pricing Schemes,* IEEE Cloud 2014, presented

112. A. Norta, M. Mahunnah, K. Taveter, N.C. Narendra, *An Approach for Designing Suitable and Scalable Socio-Technical Cloud-Service Ecosystems,* FoSEC workshop (co-located with SCC 2014), presented

113. Y. Duan and N.C. Narendra, *Exploring Cloud Service Brokering from an Interface Perspective,* ICWS 2014, presented

114. A. Norta, P. Grefen and N.C. Narendra, *A Reference Architecture for Managing Dynamic Inter-Organizational Business Processes,* Data and Knowledge Engineering Journal, 2014

115. N.C. Narendra, A. Norta, M. Mahunnah, L. Ma and F.M. Maggi, *Sound Conflict Management and Resolution for Virtual-Enterprise Collaborations*, conditionally accepted, Service Oriented Computing & Applications, 2015

116. Y. Duan, N.C. Narendra, X. Sun, H. Gao, Y. Tang and C. Ren, *Value-driven Engineering in Software Development Lifecycle by Managing Over Design and Under Design,* under preparation

117. E. Kajan, N.C. Narendra and Z. Maamar, *Towards Virtual Enterprises Free of Conflicts,* under preparation

118. Y. Duan, G. Fu, N. Zhou, X. Sun, N.C. Narendra and B. Hu, *Everything as a Service(XaaS) on the Cloud: Origins, Current and Future Trends,* IEEE Cloud 2015, to appear

119. N.C. Narendra, K. Ponnalagu and A. Ghose, *Goal-driven Context-aware Data Filtering in IoT-based Syste*ms, submitted, ITSC 2015

120. K. Ponnalagu, A. Ghose, N.C. Narendra and H. Dam, *Goal Aligned Categorization of Instance Variants in Knowledge Intensive Processes*, BPM 2015

121. N.C. Narendra, K. Koorapati and V. Ujja, *Towards cloud-based decentralized storage for internet of things data*, In Cloud Computing in Emerging Markets (CCEM), 2015 IEEE International Conference on 2015 Nov 25 (pp. 160-168). IEEE.

122. E. Kajan, N.C. Narendra and Z. Mammar, *Towards Conflict-Free Virtual Enterprises,* Encyclopedia of E-Commerce Development, Implementation, and Management. IGI Global, 2016. 1116-1129

123. N.C. Narendra and P. Misra. *Research challenges in the internet of mobile things,* IEEE Internet of Things Newsletter (2016)

124. H.L. Truong and N. Narendra, *SINC-An Information-Centric Approach for End-to-End IoT Cloud Resource Provisioning*, In IEEE Cloud Computing Research and Innovations (ICCCRI), 2016 International Conference on (pp. 17-24), 2016

125. A. Kumar, N.C. Narendra and U. Bellur, *Uploading and Replicating Internet of Things (IoT) Data on Distributed Cloud Storage*, In IEEE 9th International Conference on 2016 Jun 27 (pp. 670-677)

126. D-H. Le, N. Narendra N and H-L. Truong, *HINC-harmonizing diverse resource information across iot, network functions, and clouds*, In Future Internet of Things and Cloud (FiCloud), 2016 IEEE 4th International Conference on 2016 Aug 22 (pp. 317-324). IEEE.

127. N.C. Narendra, A. Norta, M. Mahunnah, L. Ma and F.M. Maggi, *Sound conflict management and resolution for virtual-enterprise collaborations*, Service Oriented Computing and Applications. 2016 Sep 1;10(3):233-51.

128. M. Verma, G.R. Gangadharan, N.C. Narendra, R. Vadlamani, V. Inamdar, L. Ramachandran, R.N. Calheiros, R. Buyya, *Dynamic resource demand prediction and allocation in multi-tenant service clouds*, Concurrency and Computation: Practice and Experience. 2016 Dec 10;28(17):4429-42

129. S.K. Mohalik, N.C. Narendra, R. Badrinath, M.B. Jayaraman, C. Padala, *Dynamic semantic interoperability of control in IoT-based systems: Need for adaptive middleware*, In Internet of Things (WF-IoT), 2016 IEEE 3rd World Forum on 2016 Dec 12 (pp. 199-203). IEEE.

130. S.K. Mohalik, N.C. Narendra, R. Badrinath, D-H. Le, *Adaptive Service-Oriented Architectures for Cyber Physical Systems*, In Service-Oriented System Engineering (SOSE), 2017 IEEE Symposium on 2017 Apr 6 (pp. 57-62). IEEE.

131. U. Bellur, N.C. Narendra, S.K. Mohalik, *AUSOM: Autonomic Service-Oriented Middleware for IoT-Based Systems*, I Services (SERVICES), 2017 IEEE World Congress on 2017 Jun 25 (pp. 102-105). IEEE.

132. M.I. Robles, N. Beijar, N.C. Narendra, *Measuring Semantic Distance between LWM2M Resources,* 2017 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData), 2017

133. M.I. Robles, E. Ramos, N. Beijar and N.C. Narendra, *Calculating LWM2M resource semantic distance through SENACT ontology,* Proceedings of the Seventh International Conference on the Internet of Things, Article No. 12, Linz, Austria — October 22 - 25, 2017

134. H-L. Truong, N.C. Narendra and K-J. Lin, *Notes on ensembles of IoT, network functions and clouds for service-oriented computing and applications,* Service-Oriented Computing and Applications, March 2018, Volume 12, Issue 1, pp 1–10

135. S. Nayak, N.C. Narendra, A. Shukla and J. Kempf, *Saranyu: Using smart contracts and blockchain for cloud tenant management,* 2018 IEEE International Conference on Cloud Computing (IEEE Cloud), pp. 857-861, 2018

136. S.S. Arumugam, V. Umashankar, N.C. Narendra, R. Badrinath, A.P. Majumdar, J. Holler, A. Hernandez, *IOT Enabled Smart Logistics Using Smart Contracts,* 2018 8th International Conference on Logistics, Informatics and Service Sciences (LISS), pp. 1-6, 2018

137. M.I. Robles, B. Silverajan and N.C. Narendra, *Web of Things Semantic Functionality Distance,* 2019 26th International Conference on Telecommunications (ICT), pp. 260-264, 2019

138. N.C. Narendra, A. Shukla, S. Nayak, A. Jagadish and R. Kalkur, *Genoma: Distributed Provenance as a Service for IoT-based Systems,* 2019 IEEE 5th World Forum on Internet of Things (WF-IoT), pp. 755-760, 2019

139. J. Kempf, S. Nayak, R. Robert, J. Feng, K.R. Deshmukh, A. Shukla, A.O. Duque, N. Narendra, J. Sjober, *The Nubo Virtual Services Marketplace,* arXiv preprint arXiv:1909.04934, 2019

140. N.C. Narendra, N. Deb and S. Das, *Dynamic Contextual Goal Management in IoT-based Systems,* IEEE IoT Journal

141. K. Ray, A. Banerjee and N.C. Narendra, *Proactive Microservice Placement and Migration for Mobile Edge Computing*, ACM/IEEE International Conference on Edge Computing, 2020, presented

142. A. Bhattacharya, P. Shukla, A. Banerjee, S. Jaipuria, N.C. Narendra, D. Garg, *Multitask Scheduling of Computer Vision Workload on Edge Graphical Processing Units,* COMSNETS 2023, presented

143. K. Ray, A. Banerjee, N.C. Narendra, Learning-Based Microservice Placement and Migration for Multi-Access Edge Computing, IEEE Transactions on Network Management, 2023

144. N.C. Narendra, *Enhancing GSMA Operator Platform Group Standards to Enable Seamless Application Mobility in Multi-Domain Multi-Access Edge Computing Networks,* Standards-driven Research Workshop, COMSNETS 2023, presented

145. N.C. Narendra, *AI Applications in Edge Computing,* Invited Keynote Presentation, MINDS Workshop, COMSNETS 2024, presented

146. N.C. Narendra, R. Kanthaliya, V. Akumalla, *Enhancing O-RAN's Intent-based Management Standards for Cross-Layer Mobility,* Software-Driven Research Workshop, COMSNETS 2025, accepted

147. N.C. Narendra, R. Kanthaliya, V. Akumalla, *Intent-based Meta-Scheduling in Programmable Networks: A Research Agenda,* Arxiv preprint

148. N.C. Narendra, N. Nagaraj, *Integrating Causality with Neurochaos Learning: Proposed Approach and Research Agenda*, Arxiv preprint

149. N.C. Narendra, A. Benna, Z. Maamar, *Modeling Usage Control of Edge Federations using ODRL,* under preparation