RTCSA 2017 Program

Time	August 16			Time	August 17	Time	August 18	
08:00-08:30	Registration		ECARTS 2017					
08:30-10:00	RTCSA Opening Remark & Keynote			08:30-09:00	Registration	08:30-09:00	Registration	
				09:00-10:00	RTCSA/NVMSA Joint Keynote	09:00-10:00	RTCSA/NVMSA Joint Keynote	
10:00-10:30	Coffee Break			10:00-10:30	Coffee Break	10:00-10:30	Coffee Break	
10:30-12:00	Session 1 (3)	Invited1 (3)		10:30-12:00	Panel Discussion	10:30-12:00	Session 4 (3)	Session 5 (3)
12:00-13:30	Lunch			12:00-13:30	Lunch	12:00-13:30	Lunch	
13:30-15:00	Session 2 (3)	Short1 (5)		13:30-18:00	Local Tour	13:30-15:00	Session 6 (3)	Short2 (5)
15:00-15:30	Coffee Break					15:00-	Conference Closing	
15:30-17:30	Session 3 (4)	Invited2 (4)						
17:30-18:00								
18:00-21:00	Welcome Reception & Poster Session			18:00-21:00	Conference Banquet & Best Paper Award			

Regular Papers (6 Sessions)：RTS1 (Session 3)、RTS2 (Session 4)、RTS3 (Session 6)、EMBS1 (Session 1)、EMBS2 (Session 5)、IoT (Session 2)

Invited Papers (2 Sessions)：Invited1 (3)、Invited2 (4)

Short Papers (2 Sessions)：Short1 (5)、Short2 (5)

RTCSA Keynote (August 16): Prof. Sandeep K. Shukla

Title: *Cyber Security of Cyber Physical Critical Infrastructures: A Case for a Schizoid Design Approach*

Abstract:

In the past, the design of cyber physical systems (CPS) required a model based engineering approach -- a design methodology consisting of physics based mathematical modeling of the physical system, and a control theoretic modeling of the control system put together in a formal or semi-formal framework. The designers would start from an abstract model, and refine it down to an implementation model in several steps, either formally or informally. The implementation model is then validated for functional correctness, and satisfaction of performance, real-time schedulability goals. Functional Safety, robustness to input assumptions, reliability under fault assumptions, and resilience to unknown adversities were considered as important design goals for safety-critical CPS. With the increased use of networked distributed control of large and geographically distributed critical infrastructures such as smart grid and the exposure to cyber-attacks ushered in by the IP-convergence phenomenon -- designers must now consider cyber-security and cyber defense as first class design objectives. However, in order to do so, designers have to don a dual personality -- while designing for robustness, reliability, functional safety -- a model driven engineering approach would work -- for designing for cyber-security and defense, the designer has to enter the mindset of a malicious attacker. For instance, one has to consider the various observations or sampling points of the system (e.g. sensors to read or sample the physical environment), and think how an attacker might compromise the unobservability of those points without authentication, and what knowledge of the system dynamics or the control mechanism of the system might be actually reconstructed by the attacker. One also has to consider the actuation points of the system, and ponder the least number of such actuation points the attacker has to take over in order to disrupt the dynamics of the system enough to create considerable damage. One must envision how to obfuscate the dynamics of the system even when certain sensing or actuation points are compromised. Also, it is known that a large percentage of attacks are induced by insider or a collusion of internal and external agents. Thus, perimeter defense alone cannot defend the system. In such cases, the symptoms of an ongoing attack in the dynamics of the system itself must be discerned continually. This approach to viewing the system from an adversarial position requires us to topple the design paradigm over its head, and we will need to build models from data, and not just generate data from models. The designer must observe a system in action – even through partial observations, and construct a model close enough to the real system model – and then use the partial access to create damages to the because the approximate model allows her to do so. Almost like a schizophrenic duality, the engineer also has to wear the designers hat, and consider a game in which the observations are obfuscated enough to render it impossible for an attacker to build any useful model to induce clever attacks. The designer has to worry if she can construct from unobfuscated observations, a dynamics quickly enough so that the difference between the expected dynamics and the real dynamics can trigger alarms to alert the system administrators. In this talk, while discussing this view of system design, we will also talk about VSCADA -- a virtual distributed SCADA lab we created for modeling SCADA systems for critical infrastructures, and how to use such a virtual lab completely implemented in simulation -- to achieve the cyber security and cyber defense objectives of

critical infrastructures -- through attack injections, attack detection, and experiments on new defense mechanisms. We will also discuss the real SCADA test bed we are building at our center for cyber security of critical infrastructures at IIT Kanpur.

RTCSA/NVMSA Joint Keynote (August 17): Prof. Cheng-Wen Wu

Title: *Will AI and IOT Make Semiconductor Memories Great Again?*

Abstract:

The global semiconductor business over the past thirty years shows an encouraging trend of growth in general, with only a few glitches that did not hinder the long-term trend. The growing trend, however, slows down in recent years with the saturating smartphone market, until late 2016 when AI suddenly gave everybody new hope. Meanwhile, the Internet-of-Things (IOT) has long been identified, or expected, as the main driving force of growth for many industries in the future. Unfortunately, so far IOT is not giving a great boost to the semiconductor industry, due to limitations in global economy and energy consumption. What, then, are the specific problems and challenges to semiconductors? If IOT is going to give a boost to the stagnant semiconductor industry, what will be the key factors of its success? Is it AI? In my speech, I will try to address these issues, and propose the Symbiotic System Model (SSM) for developing IOT devices and systems. I will also give my observations on the role of semiconductor memories in the AI/IOT era. This speech is meant for triggering more research activities regarding establishing a sound IOT platform that allows heterogeneous integration of technologies and partners to migrate certain industries based on the notion of IOT.

RTCSA/NVMSA Joint Keynote (August 18): Prof. David H.C. Du

Title: *Can Emerging Non-Volatile Memory Help Solving Big Data Problems?*

Abstract:

The emerging Non-Volatile Memory (NVRAM) has recently generated quite a bit excitements. Due to its non-volatile property, it can be used as either main memory or storage. Flash memory-based solid state drives (SSD) have already replaced high performance hard disk drives (HDD). Other types of NVRAM like PCM, MRAM, and STT-RAM have the potential to replace DRAM as main memory. At the meantime, our computing and communication environment has dramatically changed by the huge amount data been generated and processed daily. We intend to fully utilize the collected data for making critical decisions to benefit individuals, business, and society (big data problems). Therefore, we like to ask the following questions. Can emerging NVRAM help solving big data problems? With the boundary of memory and storage becoming blurred, what are to be changed in computer architecture, operating systems and software/applications? How do we deal with special properties of NVRAM including read/write asymmetric performance, endurance problem, and data consistent issue?

Invited Session 1: Flexible and Reliable Models in Cyber-Physical Systems	
300	Scheduling Algorithms and Schedulability Tests for Self-Suspending Tasks
301	Benchmarking OpenMP Programs for Real-Time Scheduling
302	A Generic Framework Facilitating Early Analysis of Data Propagation Delays in Multi-Rate Systems

Invited Session 2: Non-Volatile Processor	
200	Distillation: A Light-Weight Data Separation Design to Boost Performance of NVDIMM Main Memory
201	Maximize Energy Utilization for Ultra-Low Energy Harvesting Powered Embedded Systems
202	Retention State-Enabled and Progress-Driven Energy Management for Self-powered Non-volatile Processors
203	Energy-aware Morphable Cache Management for Self-powered Non-volatile Processors

Session 1: Designs for mobile devices and networked systems	
28	Effectively Utilizing Elastic Resources in Networked Control Systems
47	An Empirical Study of F2FS on Mobile Devices
53	A Reliable MAC for Delay-Bounded and Energy-Efficient WSNs
Session 2: Towards IoT and CPS	
3	A Configurable Synchronous Intersection Protocol for Self-Driving Vehicles
14	Real-Time Dense Wired Sensor Network Based on Traffic Shaping
48	Exploiting Space Buffers for Emergency Braking in Highly Efficient Platoons
Session 3: GPUs and resource sharing	
57	A Server-based Approach for Predictable GPU Access Control
20	Worst-Case Execution Time Analysis of GPU Kernels
40	An Optimal Spin-Lock Priority Assignment Algorithm for Real-Time Multi-core Systems
6	New Schedulability Analysis for MrsP
Session 4: Multiprocessors and multicore processors	
22	Fixed-Priority Scheduling of Mixed Soft and Hard Real-Time Tasks on Multiprocessors
56	Schedulability Analysis for Global Fixed-Priority Scheduling of the 3-Phase Task Model
49	A Scheduling Framework for Handling Integrated Modular Avionic Systems on Multicore Platforms
Session 5: Scheduling and adaptive system reconfiguration	
55	Using a Polymorphic VLIW Processor to Improve Schedulability and Performance for Mixed-Criticality Systems
33	Efficient and Balanced Charging of Reconfigurable Battery with Variable Power Supply
5	Online Energy-efficient Real-time Task Scheduling for Heterogeneous Multicore Systems
Session 6: Real-time scheduling	
13	Online Admission of Non-Preemptive Aperiodic Mixed-Critical Tasks in Hierarchic Schedules
31	Worst-case Timing Analysis of Ring Networks with Cyclic Dependencies using Network Calculus
17	Restart-Based Fault-Tolerance: System Design and Schedulability Analysis

Short1(5):	
50	Hybrid Self-Suspension Models in Real-Time Embedded Systems
61	Artificial Skin for Human Prostheses, Enabled Through Wireless Sensor Networks

69	Towards the Design of Optimal Range Assignment for Elevator Groups under Fluctuant Traffic Loads
66	A Survey of Energy-Efficient Task Synchronization for Real-Time Embedded Systems
58	Trading Utilization for Circuitry: Hardware-Software Co-design for Real-Time Software-Based Short-Circuit Protection
Short2(5):	
18	An Adaptive Closed-Loop Approach for Timely Data Services
7	GPU Acceleration for Kernel Samepage Merging
41	Energy-Aware Page Replacement for NVM-based Hybrid Main Memory System
67	Dynamic Module Partitioning for Library based Placement on Heterogeneous FPGAs
73	FitCNN: A Cloud-Assisted Lightweight Convolutional Neural Network Framework for Mobile Devices

Poster Session:	
21	Improving Core Allocation of Simulink Model for Embedded Multi-core Systems
27	Schedulability Analysis and Priority Optimization for Real-time Communication on Dynamically Reconfigurable NoCs
81	A Half-Key Key Management Scheme with Honeycomb Deployment for Wireless Sensor Networks
74	SDN-based Controller Switching for Resilience of Drones
75	Link Failover for Resilient Cyber-Physical Systems
76	If-conversion to reduce worst case execution time
77	A dual shared stack for FSLM in Erika Enterprise
78	A Two Mode GC for Real-Time NAND Flash