Digital Signal Processing Laboratories in Timisoara
Department of Computer and Software Engineering
POLITEHNICA University of Timisoara
http://dsplabs.cs.upt.ro/

Lista proiecte (Master, Diploma, R&D)
2011 - 2012

Nr.	Status	Type	General Fields	Project Title	Project Team	Project Management
1	Taken	R&D/ Diploma/ Master	[Software IDE] [Embedded systems] [Real-time systems] [Power Aware]	INVERTA: INtegrated Visual Environment for Real-Time Application Development	4 Students > Anreea-Maria HORVATH (IV CTI) > Silaghi Paul (II CTI) > Sendrea Dumitru (II CTI) > Szever Csaba (II CTI)	Cristina STANGACIU Razvan CIOARGA
			Continues the implementation and the development of the INVERTA integrated visual environment for designing and analyzing real-time applications. Continues the implemnetation of a real time scheduling simulator by adding among other facilities power-aware real time scheduling support. INVERTA allows the building, specification and visual display of real-time applications, designed as a set of tasks of different types, each task having a characteristic set of parameters (including parameters of time) and a set of control links with other tasks of the application.		R&D Grants "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/) si OPEN-HARTS (http://dsplabs.cs.upt.ro/grants/openharts/).	
			Descriere proiect Continuarea si dezvoltarea implementarii mediului vizual integrat INVERTA, destinat proiectarii si analizei aplicatiilor timp-real. Continuarea implementarii unui simulator pentru planificari in sisteme de timp real prin adaugarea de noi facilitati printre care dezvoltarea unui suport pentru planificari de taskuri cu functie de eficientizare a consumului de energie electrica. INVERTA permite construirea, specificarea si afisarea vizuala a unei aplicatii timp-real, conceputa ca set de task-uri de diferite tipuri, fiecare task avand cate un set caracteristic de parametri (inclusiv parametri de timp) si un set de legaturi de control cu celelalte task-uri ale aplicatiei.		**Observatii:** R&D Grants "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/) si OPEN-HARTS (http://dsplabs.cs.upt.ro/grants/openharts/).	
2	Free	R&D	[Software engineering] [Code analysis] [Compiling techniques] [Real-time systems]	Study and development of a Tool for the WCET analysis of real-time applications for the ARM microcontroller.	1 Student: >	Mihai V. MICEA, Cristina STANGACIU
			Project description: The study of AbsInt Advanced Analyzer, a tool for WCET analysis for ARM7 microcontrollers. Continuation and implementation of a development tool plug-in for the INVERTA environment for WCET analysis for real-time applications tasks written on platforms of type		**Observations:** R&D Grants "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/) si OPEN-HARTS (http://dsplabs.cs.upt.ro/grants/openharts/).	
			Descriere proiect Studiul unui soft pentru analiza WCET-ului (AbsInt Advanced Analyzer) pentru microcontrollere ARM7. Continuarea si dezvoltarea implementarii unui utilitar de tip plug-in pentru mediul INVERTA, destinat analizei timpului WCET pentru task-urile aplicatiilor timp-real scrise pe platforme tip ARM7 TDMI-S.		**Observatii:** R&D Grants "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/) si OPEN-HARTS (http://dsplabs.cs.upt.ro/grants/openharts/).	

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3	Free	R&D/ Diploma	[Embedded systems] [Data acquisition systems] [Real-time systems]	Data acquisition module for the WIT (CORE-TX Wireless Intelligent Terminal)	2 Students: > Simona GHERMAN (III CTI) >	Andrei STANCOVICI, Sinziana INDREICA
			Project description:		**Observations:**	
			The design, implementation and testing of data acquisition mode for WIT. The development of driver software for this module. It has to use analog-digital converter incorporated in the LPC2000 family of processors, and the possible use of an ATXmega microcontroller family as an acquisition coprocessor.		R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/)	
			Project description:		**Observations:**	
			Proiectarea, executarea si testarea modului de achizitii de date pentru WIT. Punerea la punct a driverului soft pentru acest modul. Se are in vedere utilizarea convertorului analog-numeric incorporat in procesoarele din familia LPC2000, precum si eventuala folosire a unui microcontroler din familia ATXmega pe post de coprocesor de achizitie.		R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/)	
4	Partially Taken	R&D	[Wireless sensor networks] [Data fusion and processing] [Embedded systems]	Implementation of the BRAIN (Background Robotic Activity Induction Node), including the activity induction mechanisms	3-4 Students: > Adrian OAIDA (III CTI) > David NICOLA (III CTI) > Daniel NICOLA (III INF)	Razvan CIOARGA, Mihai V. MICEA
			Project description:		**Observations:**	
			The BRAIN module inside the CORE-TX system should suggest various actions and behaviors for the WITS. The behavior should be described as some code which is then transmitted wirelessly to the WIT, which should have some kind of bootloaders and In-Application programming routines to allow its own programming to be changed according to the new behavior. The BRAIN should function as a independent process (like a daemon in linux) which is able to communicate through sockets and has some form of command line interface. Also, the graphical used interface should be implemented using a web server. The BRAIN should have one WIT connected directly to it (USB, serial interface etc) as a gateway interface for the other WITs in the system.		R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).	
			Descriere proiect		**Observatii:**	
			Modulul BRAIN din CORE-TX trebuie sa sugereze diverse actiuni si comportamente pentru WIT-uri. Aceste comportamente trebuie sa fie descrise sub forma unui cod care este transmis wireless la WIT; pe acesta trebuie sa ruleze anumite rutine sub forma unui bootloader sau In-Application programming care sa permita alterarea programarii initiale ale WIT-ului in concordanta cu comportamentul primit. Modul BRAIN trebuie implementat ca si un proces independent (similar cu un daemon in Linux) care poate sa comunice prin socket-uri si sa contina o forma de interfata prin linie de comanda. Interfata grafica cu utilizatorul trebuie sa fie facuta prin intermediul unui server web. BRAIN trebuie sa fie conectat direct la un WIT (prin USB, interfata seriala etc) pentru a-l folosi pe acesta ca si o interfata de conectare la celelalte WIt-uri.		R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).	

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5	Free	R&D/ Diploma/ Master	[Robotic systems] [Embedded systems]	Mobility platform/daughterboard for the CORE-TX WIT	2 Students: > >	Dan CHICIUDEAN, Andrei STANCOVICI, Mihai V. MICEA

Project description:	**Observations:**
The project is aimed to develop a solution for WITs mobility. The mobility platform has to offer a set of movement primitives such as motor speed control, position and orientation control of the WIT. The platform should use electrical DC motors with optical encoders or hall sensors. Controlling algorithms should provide antislip movement of the wheels (starting ramp + stopping ramp). Power mananagement for Li-Ion accumulators battery (used only for mobility platform) must be provided (excessive discharge protection, charge profile).	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).
Descriere proiect	**Observatii:**
Scopul proiectului este de a pune la punct o solutie care sa ofere WIT-urilor posibilitatea de a naviga indoor (sau nu numai). Platforma va oferi un set minim de comenzi de miscare (de exemplu: mergi inainte x cm cu viteza y m/s, roteste platfoma cu z grade). Se recomanda folosirea motoarelor electrice de curent continuu, cu reductor si traductor optic de rotatie. Algoritmii de control ai miscarii trebuie sa tina cont efectul de alunecare a rotilor si sa incerce minimizarea acestor probleme. Se va asigura gestiunea acumulatorilor Li-Ion folositi pentru alimentarea placii de mobilitate (incarcare/descarcare).	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).

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6	Partially Taken	R&D/ Diploma	[Robotic systems] [Embedded systems] [Digital signal processing]	Mobile robot alignment based on ultrasound signals and distance measurements	2 Students: > >	Andrei STANCOVICI, Sinziana INDREICA, Mihai V. MICEA

Project description:	**Observations:**
The objective of the work is finding and implementing solutions to align a mobile robot. The chosen alignment method must be faster than the existing methods. Must find an optimal alignment algorithm based on an existing algorithm. Each robot is equipped with an OLIMEX development module and a module of perception. The robot's microcontroller, LPC2294 with ARM7TDMI-S architecture is based on a high performance 32-bit RISC type registers. The role of the perception module is to transmit and to receive ultrasonic signals. The perception module is equipped with sensors: ultrasonic sensor, temperature sensor, humidity, accelerometer. Optional, can be attached: smoke sensor, pollution sensor, compass, motion sensor, GPS, microphone, cricket laser and others.	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/). Use of the ultrasound modules and the electronic compass for the robot alignment: http://www.youtube.com/watch?v=ADMgJhLZXt4
Descriere proiect	**Observatii:**
Obiectivul lucrarii constituie gasirea si implementarea a unei solutii de aliniere a robotilor mobili. Metoda de aliniere aleasa trebuie sa fie mai rapida decat metoda existenta. Trebuie gasit un algoritm optim de aliniere pornind de la algoritmul deja existent. Fiecare robot este echipat cu un modul de dezvoltare OLIMEX si un modul de perceptie. Microcontrolerul robotului, LPC2294 cu arhitectura ARM7TDMI-S, este bazat pe o performanta ridicata avand registrele pe 32 de biti de tip RISC. Rolulul modulului de perceptie este de a transmite si de a receptiona semnale ultrasonice. Modulul de perceptie este echipat cu senzori: senzor de ultrasunete, senzor de temperatura, umiditate, accelerometru. Optional, mai pot fi atasate si alti senzori: senzor de fum, senzor de poluare, busola, senzor de miscare, GPS, microfon, cricket laser etc.	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/). Utilizarea modulelor ultrasonice si compas electronic pentru alinierea robotilor. http://www.youtube.com/watch?v=ADMgJhLZXt4

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7	Free	R&D/ Diploma/ Master	[Embedded systems] [Real-time systems] [Wireless communication]	Synchronization in wireless sensor networks and robotic environments	2 Students: > >	Valentin STANGACIU, Mihai V. MICEA

Project description:	**Observations:**
The synchronization of the real time system clock between the nodes of a real time wireless sensor network is crucial. Many routing and real time wireless communication techniques depend on it. This task aims at synchronizing the real time clock within the hard real time operating systems that execute within each node of the wireless network. The real time operating system is HARETICK and the platform is ARM7TDMI-S. The work for this project implies implementing a succesfully simulated algorithm designed to synchronize the real time system clocks of the nodes in a wireless sensor network on the ARM7 platform running HARETICK OS. Also another task is to test and evaluate the implemented algorithm.	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).
Descriere proiect	**Observatii:**
Sincronizarea ceasului real time intern al nodurile unei retele de senzori wireless este extrem the importanta. Multi algoritmi the rutarea informatiei precum si algorithmi pentru comunicarea in timp real in cadrul retelelor de senzori wireless depind the aceasta sincronizare. Acest proiect presupune sincronizarea ceasului in timp real din cadrul sistemului de operare hard real time ce ruleaza pe fiecare nod din reteaua de senzori. Sistemul de operare ce ruleaza pe fiecare nod este HARETICK iar platforma este ARM7TDMI S. In cadrul proiectului se doreste implementarea unui algoritm de sincronizarea timpului in sisteme embedded in timp real, deja simulat cu success. Implementarea se face pe platforma mai sus mentionata, pe sistemul de operare HARETICK. De asemenea se cere si testarea si evaluarea perfomantelor algoritmului implementat.	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).

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8	Taken	R&D	[Real-time systems] [Communication protocols] [Fieldbus systems]	Multi-Slave FTDMA (Flexible Time Division Multiple Access) implementation of the PARSECS communication system for the WIT	1 Student: > Victor ADASCALITEI (II CTI) > Zsolt BIRO (II CTI)	Mihai V. MICEA

Project description:	**Observations:**
PARSECS (Predictable ARchitecture for Sensor Communication Systems) is a real-time communcation architecture designed for modular smart sensors, particullary for the WIT intelligent node. The current implementation allows full-duplex communication between a Master board (MotherBoard) and a Slave board (PMBoard). The project aims to interconnect multiple boards within the WIT with the support of the underlying SPI physical interface. Also, the full timeslot paradigm should be implemented and tested. Platform: a WIT prototype exists, consisting of 2 interconnected boards based on the LPC2294 microcontroller (Olimex LPC-H2294 eva-board). This will need to be extended to 3-4 boards. Available HW and SW tools: IDE and compiler (Keil uVision 3.x), debugger (uLINK2 debug tool), 32 channel logic analyzer (LA1032).	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).
Descriere proiect	**Observatii:**
PARSECS (Predictable ARchitecture for Sensor Communication Systems) este o arhitectura de comunicatie in timp real, proiectata pentru senzori inteligenti modulari, in particular pentru nodul inteligent WIT. Implementarea actuala permite comunicatie full-duplex intre o placa Master (MotherBoard) si o placa Slave (PMBoard). Scopul proiectului este sa interconecteze mai multe placi componenete ale WIT-ului, bazat pe interfata fizica SPI. De asemenea, ideea de full timeslot trebuie implementata si testata. Platforma: exista un prototip de WIT, format din 2 placi interconectate, bazate pe microcontrollerul LPC2294 (placa de evaluare Olimex LPC-H2294). Acesta va trebui extins sa cuprinda 3-4 placi. Unelte HW si SW disponibile: IDE si compilator (Keil uVision 3.x, 4.x), debugger (uLINK2), analizor logic cu 32 canale (LA1032).	R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/).

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9	Partially Taken	R&D/ Diploma/ Master	[Robotic collectives] [Emergent behavior] [Robotic movement]	Emergent Movement in Collective Robotic Environments Based on the Study of Ants Movement	1 Student: >	Razvan CIOARGA
			Project description: Further projects to study emerging movement of robots, using LEGO Mindstorm NXT kits, using emergent behavior patterns inspired by the movement of ants in ant colonies.		**Observations:** R&D Grant "MELISSEVS" (http://dsplabs.cs.upt.ro/grants/melissevs/).	
			Descriere proiect Continuarea proiectelor pentru studiul miscarii emergente a robotilor, cu ajutorul kit-urilor LEGO Mindstorm NXT, folosind tipare de comportament emergent preluate din miscarea furnicilor.		**Observatii:** R&D Grant "MELISSEVS" (http://dsplabs.cs.upt.ro/grants/melissevs/).	
10	Free	R&D/ Diploma/ Master	[Anylogic] [Emergent behavior]	Altering the Anylogic Pedestrian library to allow the simulation of emergent behavior patterns	2 Students: > >	Razvan CIOARGA
			Project description: Anylogic simulation software has a limited capability of simulating emergent behavior patterns using its Pedestrian library. This should be altered (some of the component classes should be extended) to provide a more efficient way of simulating emergent behavior.		**Observations:**	
			Descriere proiect Suita de simulare Anylogic are posibilitati limitate de simulare a comportamentului emergent prin intermediul bibliotecii Pedestrian. Aceasta trebuie modificata (o multime de clase componente trebuie extinse) pentru a oferi o modalitate mai eficienta de simulare a comportamentului emergent.		**Observatii:**	
11	Partially Taken	R&D/ Diploma/ Master	[Android]	Building a command and control interface for the LEGO NXT robots on a Android phone.	2 Students: > >	Razvan CIOARGA
			Project description: LEGO NXT robots have both Bluetooth and Xbee wireless communication capabilities. This application should present a map of the environment with the location of the robots. For each robot, on click on its icon, a properties / setting menu should appear which should allow the user to set the various parameters of the robots.		**Observations:**	
			Descriere proiect Robotii LEGO NXT comunica wireless prin Bluetooth si / sau Xbee. Aplicatia trebuie sa afiseze o harta a mediului in care se misca robotii, iar la selectia unui robot sa afiseze un meniu de setari prin care se pot modifica parametri robotului.		**Observatii:**	

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12	Taken	Diploma	[Biometric sensors] [Embedded Systems]	Electronic time-keeping system	1 Student: > Anca LUPEI (IV CTI)	Dan CHICIUDEAN, Valentin STANGACIU
			Project description:		**Observations:**	
			Electronic time-keeping system for student activity accounting during laboratory workshop. The accounting is automaticaly made through a finger-print scanner connected to a computer network. Three major components are involved: the biometric finger print sensor, a embedded system responsible for interfacing biometric sensor to the network and a server for data logging and report generating. The system has the following functionality: - the user comes and presses the finger against the sensor; - the electronic interface gathers data from the sensor and sends it to the server - the server interprets the data and saves it to a database; - a web application also functions on the server: it has time-keeping purposes, attending accounting.			
			Descriere proiect		**Observatii:**	
			Realizarea unei platforme pentru contabilizarea activitatii pe parcurs in cadrul laboratoarelor. Prezenta la laborator se face automat prin intermediul unui sistem de pontare electronica pe baza de cititor de amprenta digitala. Platforma permita acordarea de calificative/punctaje la fiecare sedinta de laborator pentru fiecare student in parte. Mod de lucru: utilizatorul is plaseaza degetul pe cititorul de amprente, senzorul biometric trimite datele la un microcontroller conectat la o retea LAN, microcontrollerul trimite datele la un server conectat in retea, serverul centralizeaza datele si realizeaza rapoarte.			
13	Free	R&D	[Embedded Systems] [Real time systems] [Real time wireless communication] [Digital signal processing]	Application development on the CORE-TX platform	2 Students: > >	Valentin STANGACIU
			Project description:		**Observations:**	
			Application development on the CORE-TX platform. Adding new functionalities and features to the WIT module and to the real time operating system HARETICK.			
			Descriere proiect		**Observatii:**	
			Realizarea de aplicatii pe platforma CORE-TX precum si agaugarea de noi functionalitati modulelor existente din WIT precum si dezvoltarea a unor module noi din sistemul de operare in timp real HARETICK.			

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14	Free	R&D/ Diploma	[Power Management] [Rechargeable batteries]	Low-cost and low-power smart charger for Ni-MH rechargeable batteries	2 Students: > >	Gabriel CARSTOIU, Lucian UNGUREAN

Project description:	**Observations:**
Design and implement the HW and SW for a smart battery charger and Battery Management Unit (BMU) for consumer-grade Ni-MH batteries. The starting point for the project consists of the HW schematic, SW application and project documentation of the CORE-TX PMBoard project. The ARM based microcontroller used in the PMBoard project must be replaced with a a modern low-power alternative such as TI MSP430 (16-bit) or EnergyMicro EFM32 (32-bit, based on ARM Cortex M3).	References: - PMBoard dimploma project documentation: http://dsplabs.cs.upt.ro/~cgaby/readarticle.php?article_id=1 - diploma project Lucian Ugurean
Descriere proiect	**Observatii:**
Proiectul isi propune proiectarea hardware si software a unui incarcator inteligent de baterii destinat in spet pentru acumulatori Ni-MH. Se pune la dispozitie detaliile hardware si software al proiectului CORE-TX PMBoard. Intentia este de a inlocui procesorul de pe placa de power management cu unul ultra low power cum ar fi TI - MSP430 (16-bit) sau EnergyMicro EFM32 (32-bit, based on ARM Cortex M3).	Referinte: - Documentatie diploma http://dsplabs.cs.upt.ro/~cgaby/readarticle.php?article_id=1 - Documentatie proiect diploma Lucian Ungurean

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15	Taken	R&D/ Master	[Embedded systems] [Real time systems] [Data acquisition systems] [ZigBee protocol]	Ad-Hoc Orienting and Localizing for Indoor Robots (Location management model and simulation)	2 Students: > >	Andrei STANCOVICI Sinziana INDREICA

Project description:	**Observations:**
At one time in human history, people literally depended on Polar Star; they could trust the North Star to guide them. People could sail the seas and cross the trackless deserts without getting lost. Now the people have much possibility to get orientation. The most popular system to get orientation is the GPS. I could mention here the Loran, RNAV and GLONASS, but all this are applicable for outdoor requirements. In analogy with outdoor systems, there are many indoor localization systems which based on multiple fixed nodes. Such of that system are: Cricket Indoor Localization System, Building Positioning System and Hagisonic StarGazer. In proposed project I want to improve the indoor localization system for the robotic applications. Some robotic applications are oriented for discovering a new zone where the fixed nodes are not present. In this way I want to propose a Process of Orientating and Localizing Ad hoc Robots as an Indoor System (POLARIS). Using the POLARIS process the robots can determine the orientation and location reported to the group of robots without to need fixed nodes. The POLARIS process is based on the inter-rob Time-of-Flight) distance measurement technique.	Dissertation project for Master degree graduation. R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/). R&D Grant "MELISSEVS" (http://dsplabs.cs.upt.ro/grants/melissevs/). Use of the ultrasound modules and Xbee wireless communication module for distance measurement. http://www.youtube.com/watch?v=ADMgJhLZXt4
Descriere proiect	**Observatii:**
La un moment dat in istoria omenirii, oamenii literalmente depindeau de steaua Polara; aveau incredere ca steaua Nordului mereu o sa-i calauzeasca. Oamenii puteau naviga marile si sa parcurga deserturi lipsite de drumuri, fara sa se rataceasca. Acum, oamenii au mai multe posibilitati de a obtine orientarea. Cel mai popular sistem pentru a obtine orientarea este GPS. As putea mentiona aici Loran, RNAV si GLONASS, dar toate acestea sunt aplicabile pentru necesitati in aer liber. In analogie cu sistemele in aer liber, exista mai multe sisteme de localizare in interiorul cladirilor, care se bazeaza pe mai multe noduri fixe. Astfel de sisteme sunt: Cricket Indoor Localization System, Building Positioning System si Hagisonic StarGazer. Proiectul propus are ca scop imbunatatirea sistemului de localizare din interiorul cladirilor pentru aplicatii cu roboti. Unele aplicatii robotizate sunt orientate spre a descoperi o zona noua, in care nodurile fixe nu sunt prezente. In acest fel, vreau sa propun un proces de orientare si localizare pentru roboti ad hoc, functional in interiorul cladirilor (POLARIS din eng.). Prin intermediul procesului POLARIS robotii pot determina orientarea si la grupul de roboti, fara sa aiba nevoie de noduri fixe. Procesul POLARIS este bazat pe algoritmul de aliniere dintre doi roboti si tehnica de masurare a distantei CTOF (Combined Time-of-Flight).	Proiect pentru disertatie la absolvirea ciclului Master. R&D Grant "CORE-TX" (http://dsplabs.cs.upt.ro/grants/coretx/). R&D Grant "MELISSEVS" (http://dsplabs.cs.upt.ro/grants/melissevs/). Se vor utiliza modulele ultrasonice achizitionate si modulele de comunicare wireless Xbee. http://www.youtube.com/watch?v=ADMgJhLZXt4

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For further information or if you have any questions, please visit our website or contact us at the following addresses:

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