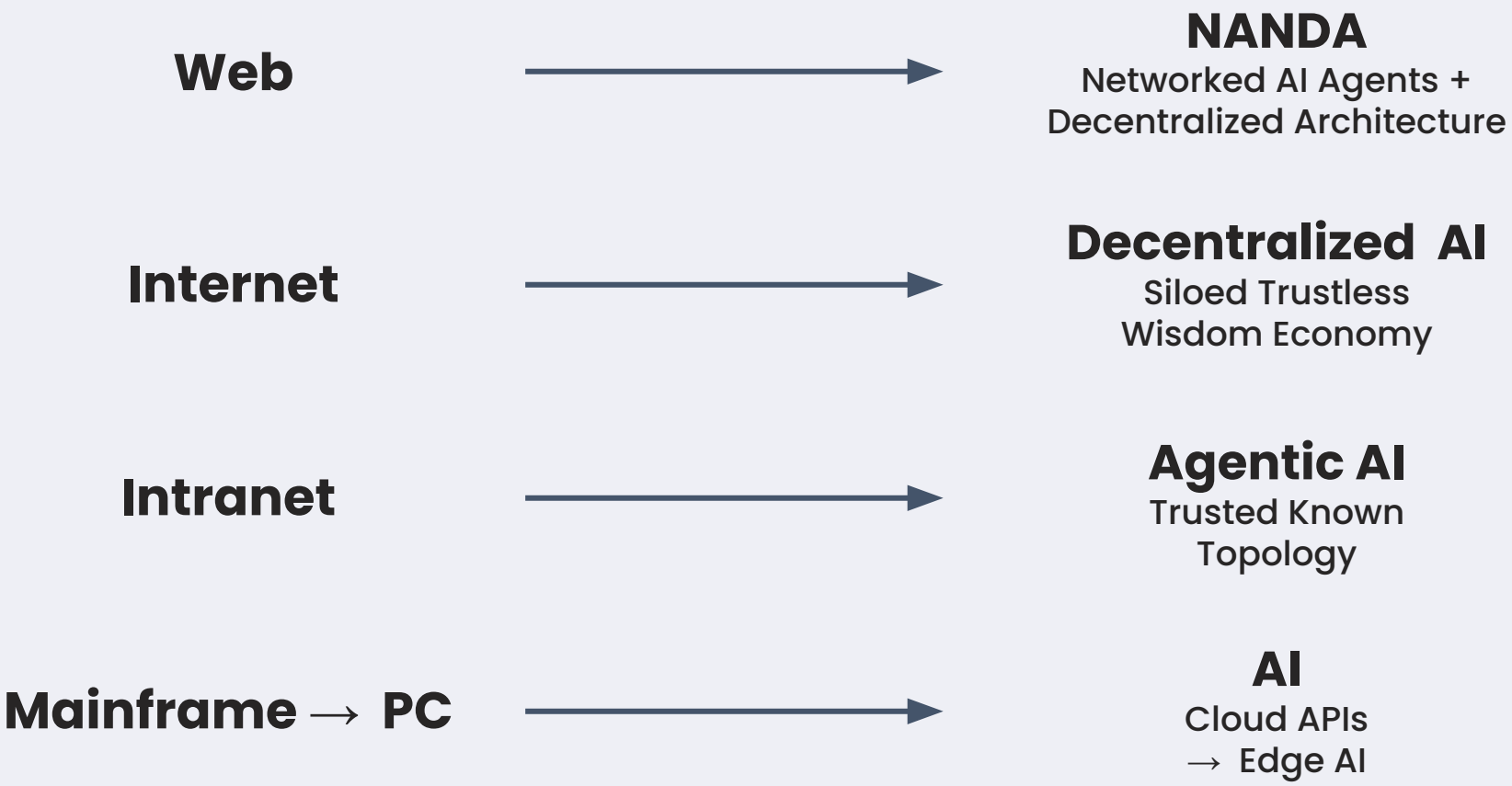
ProjectNanda.org

Networked AI Agents in Decentralized Architecture

Ramesh Raskar
Professor, MIT

raskar@mit.edu

1. What is Agentic Web


Web
NANDA
Networked AI Agents +
Decentralized Architecture
Internet
Decentralized AI
Siloed Trustless
Wisdom Economy
Intranet
Agentic AI
Trusted Known
Topology
Mainframe → PC
AI
Cloud APIs
→ Edge AI

The Internet of AI Agents

- How can trillions of AI agents collaborate across a organizational silos:

  communicate seamlessly,

  navigate autonomously,

  socialize,

  learn, earn and

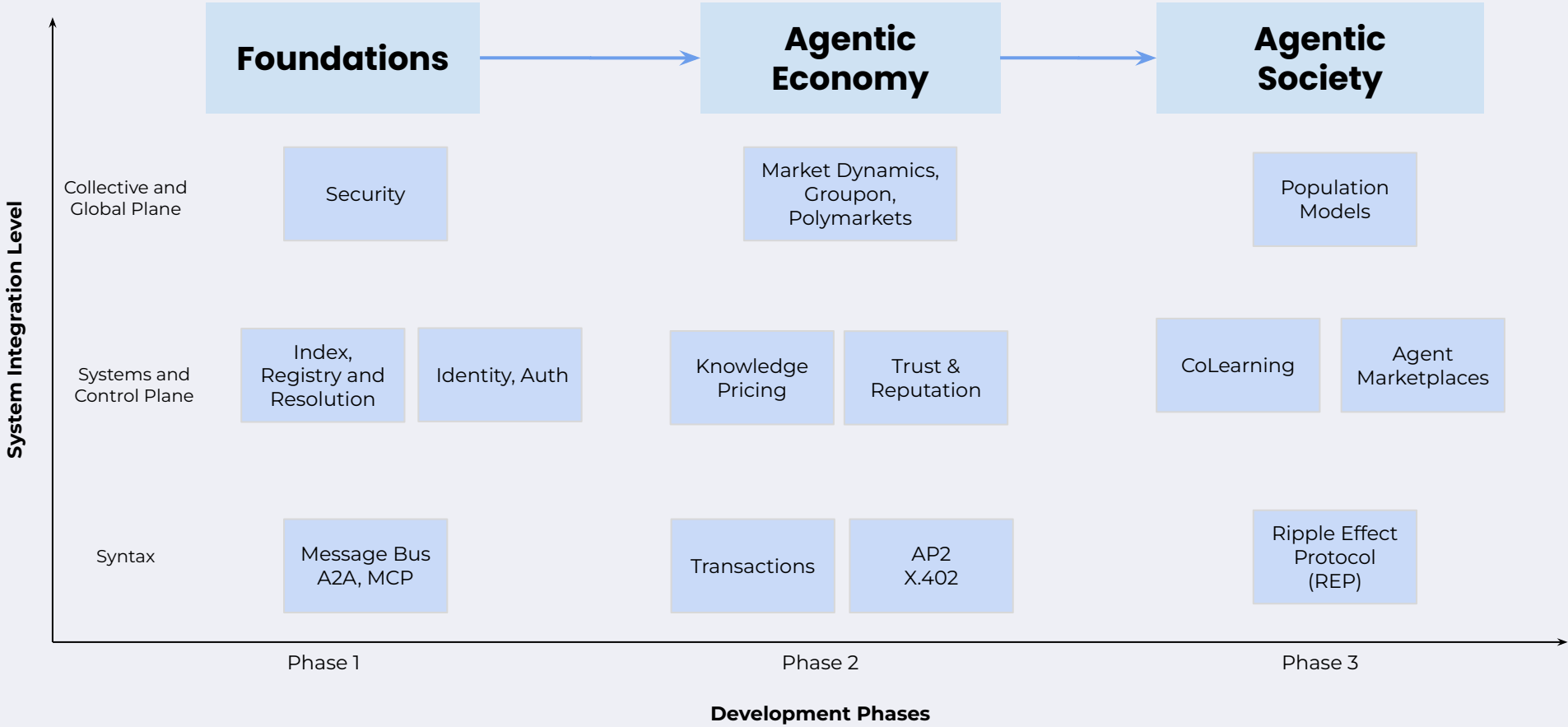
- **transact** on our behalf.

Foundations

Agentic Commerce

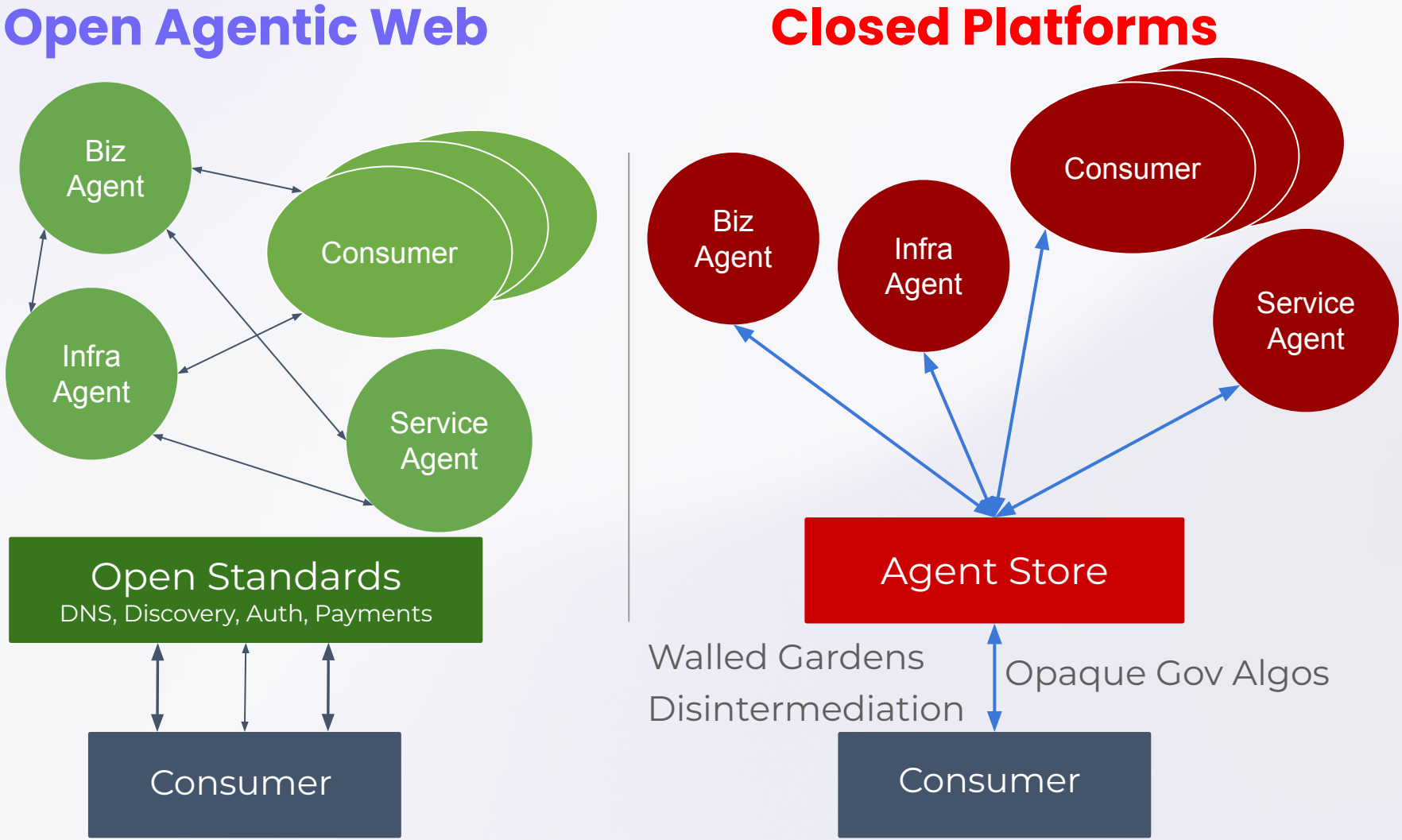
Agentic Society

3 Phases of Agentic Web



Nanda.mit.edu

2. Why we need OPEN, neutral Agentic Web


Open Agentic Web
Biz Agent
Consumer
Infra Agent
Service Agent
Open Standards
DNS, Discovery, Auth, Payments
Consumer
Closed Platforms
Biz Agent
Infra Agent
Consumer
Service Agent
Agent Store
Walled Gardens
Disintermediation
Opaque Gov Algos
Consumer

Open Agentic Web

Biz Agent

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Infra Agent

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DNS, Discovery, Auth, Payments

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Biz Agent

Infra Agent

Service

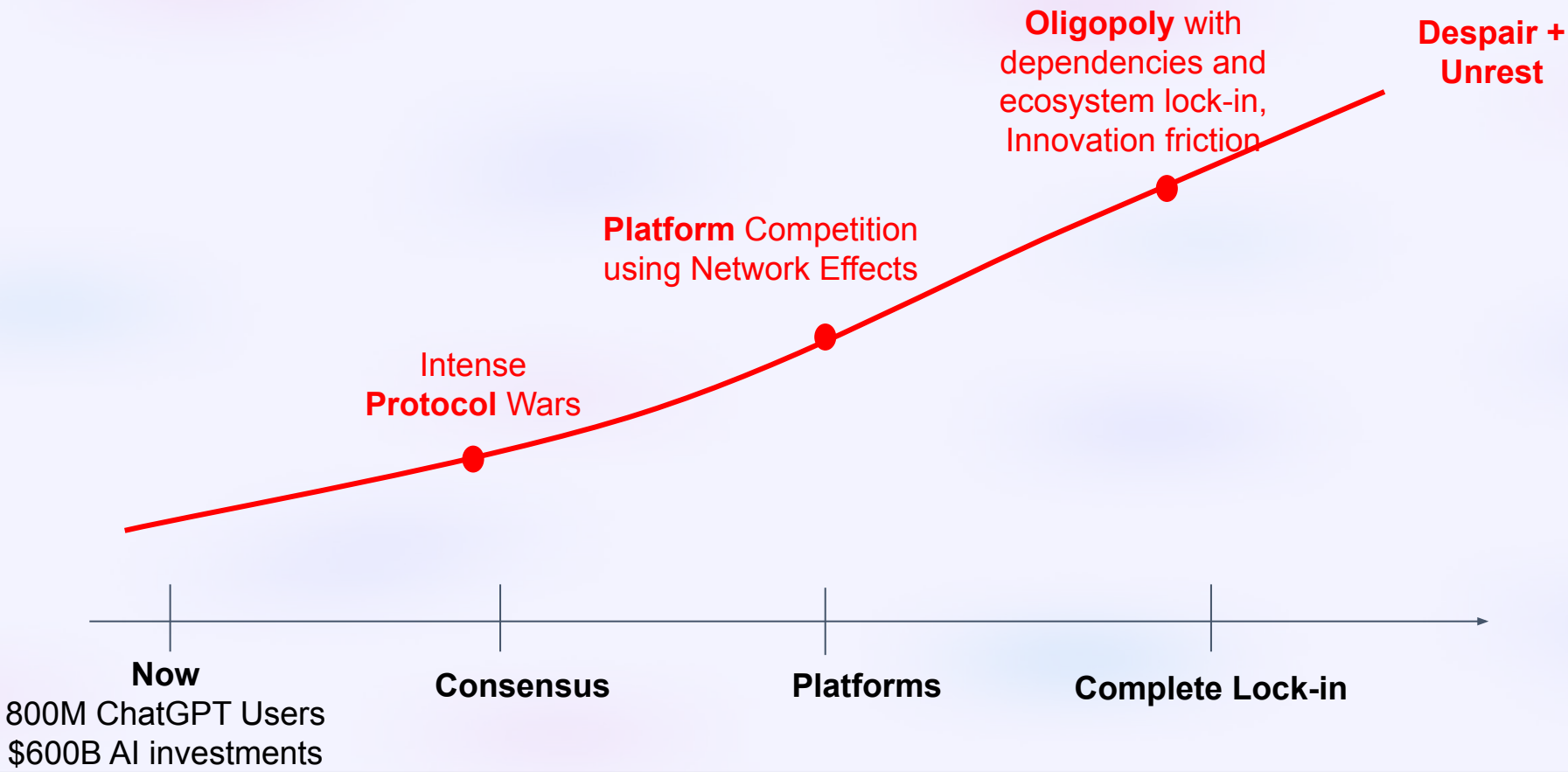
Agen

Walled Gardens
Disintermediation

Opaque Algos

Consumer

Window to keep Agentic Web open is .. Closing



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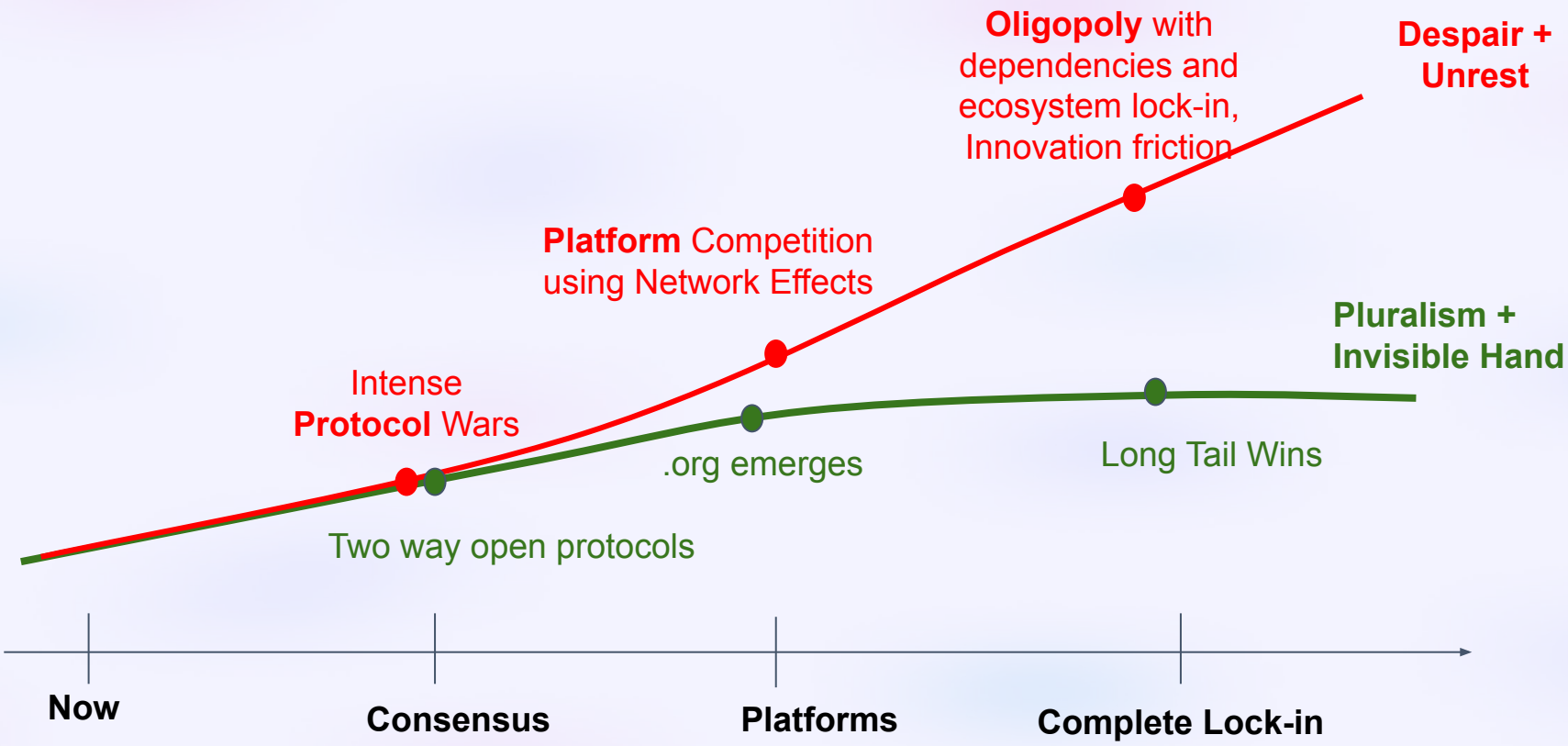
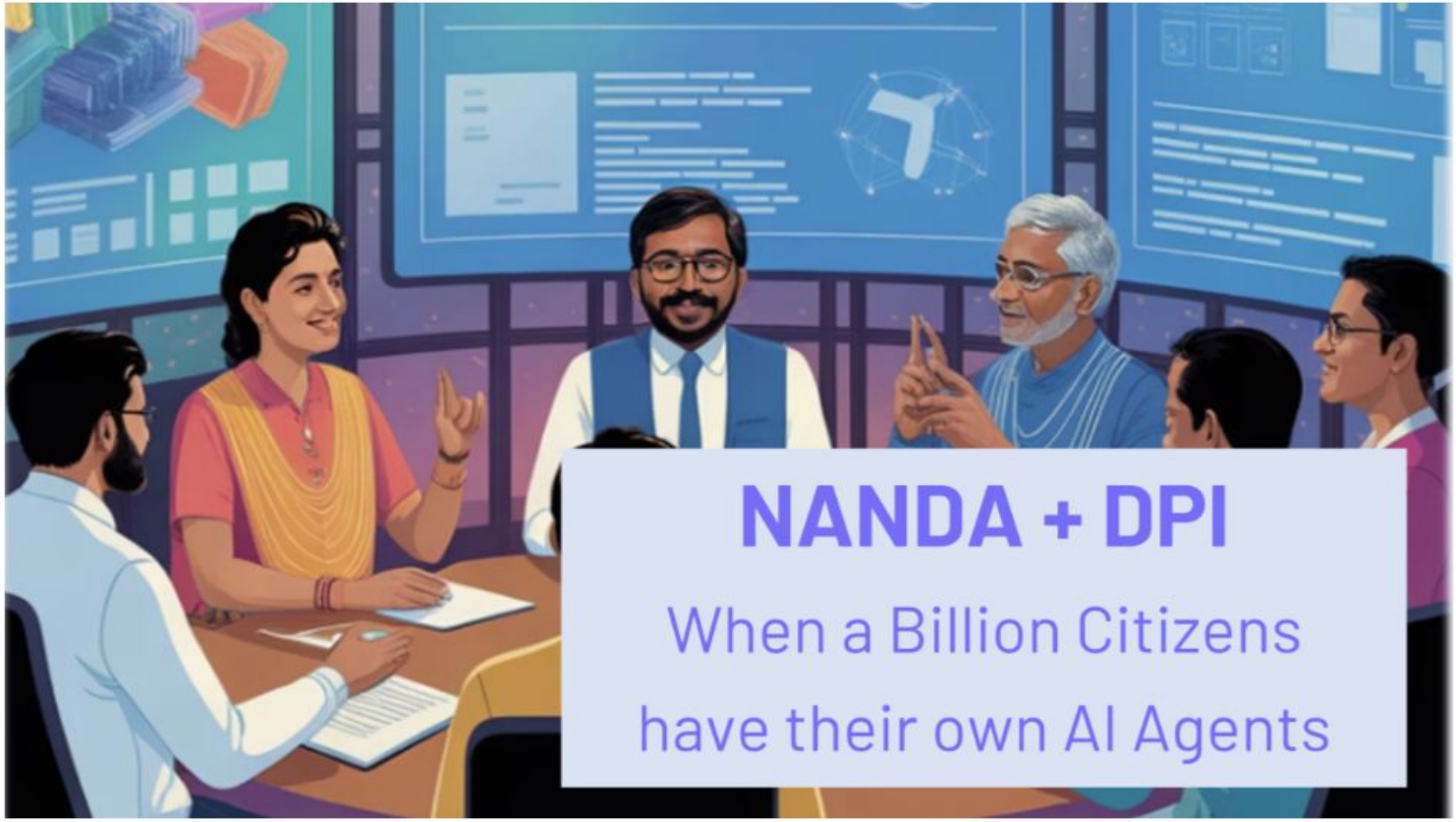




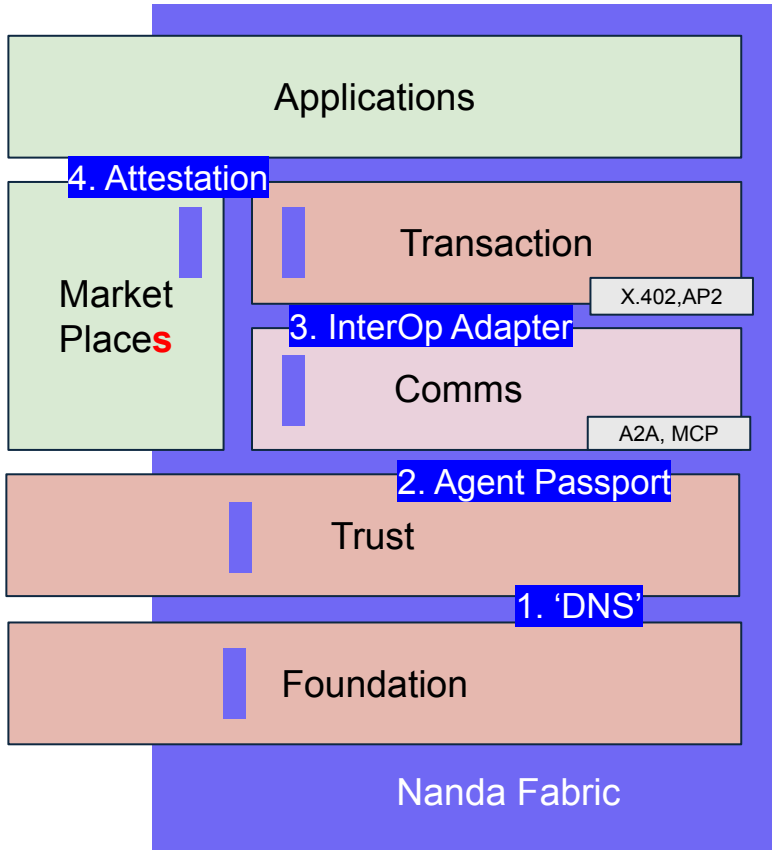
MIT NANDA and India's DPI: When Every Citizen has an AI Agent

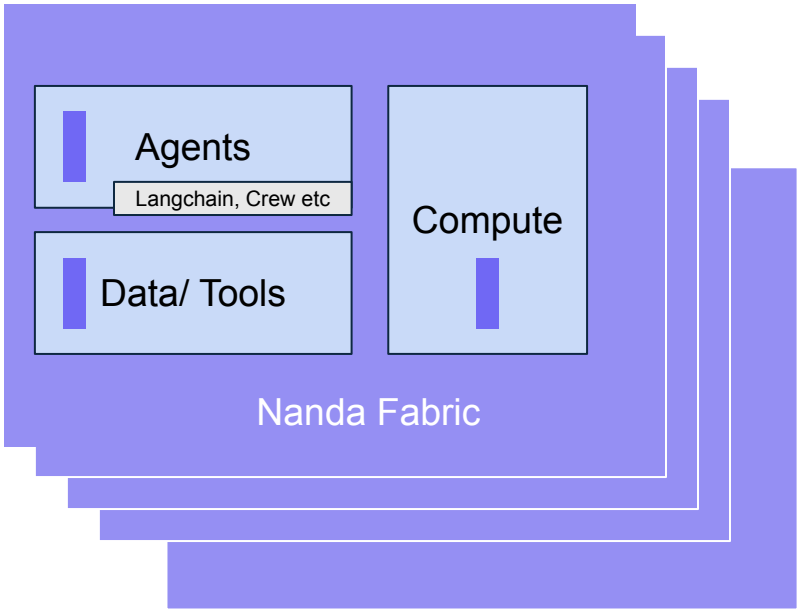

Kumbh Mela: 30M Visitors 30 Days


Snan
Prayer
Mundan
Temple
Kirtan
Tourism
Accommodation
Food & Fuel
Medicine
Sanitation
Security & Crowd
Transport

3. What is NANDA doing to create an open ecosystem

NANDA: Building a Quilt in the Post-AI World





Nanda addresses Four Choke Points

Phase 1 goal for Nanda: overcome four choke points to make sure Agentic Web remains open, neutral, vibrant, lucrative and safe

1. **Registry:** 'DNS' of all agents (citizens, biz and more), create a 'switchboard' to connect private and public registries https://arxiv.org/abs/2507.14263
2. **Passport:** Issue verifiable credentials to agents, to improve authentication and capabilities, build context and portability https://list39.org/
3. **InterOperable:** Build the 'telephone system' via adapters so all protocols are interoperable github.com/projnanda/adapter
4. **Attestation:** Improve safety using 'crash test' and 'test tracks' via a sandbox and testbench (see Nest.ProjectNanda.org)

Join39.org

- Create your own agent in 1 minute
- Launch it on OPEN agentic web
- Maintain portability via ‘agent fact’ or ‘agent-passport’

(Not an agent framework such as langchain, crew, adk etc)

ProjectNanda.org

Research: 3 phase roadmap: Foundations, Commerce, Agent Societies

What it is not: Agent builder, Single registry

Github **Code Base**: Index, Adapter, List39, **Join39.org** , NEST Testbed

Innovations: Ripple Effect Protocol (REP), Knowledge Pricing

Collective:

Regional Chapters, Fellows Program, OpenSrc, Write Papers, Youth Council

1. **Why:** Agentic web powered by EdgeAI+TinyML vs Group Think of Centralized AI
2. **What Risks:** Window to keep agentic web open is .. closing
3. **How:** Nandda approach for Agentic Web: Intercom vs Telephone system, Stock Market, Cities

END

Appendix

What:

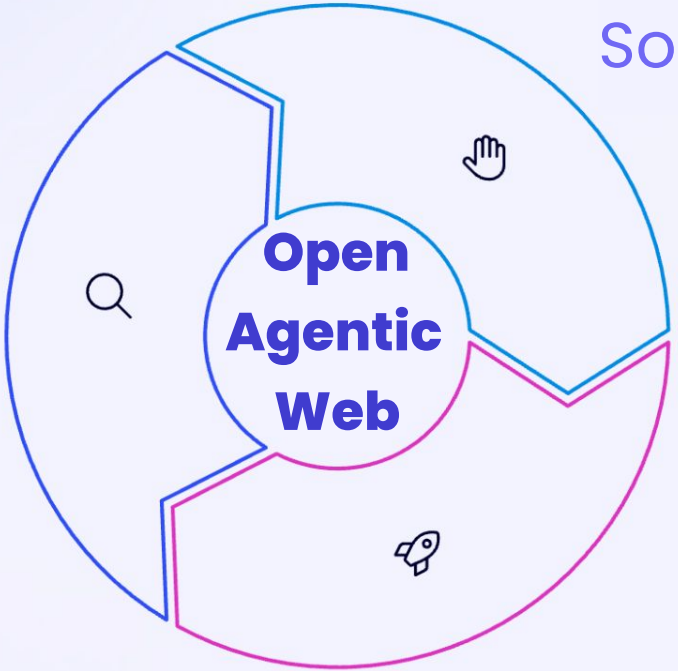
Risks +

Social Mission

Why:

Economics +

Ventures



How:

Tech +

Research +

Coalition

1. Why

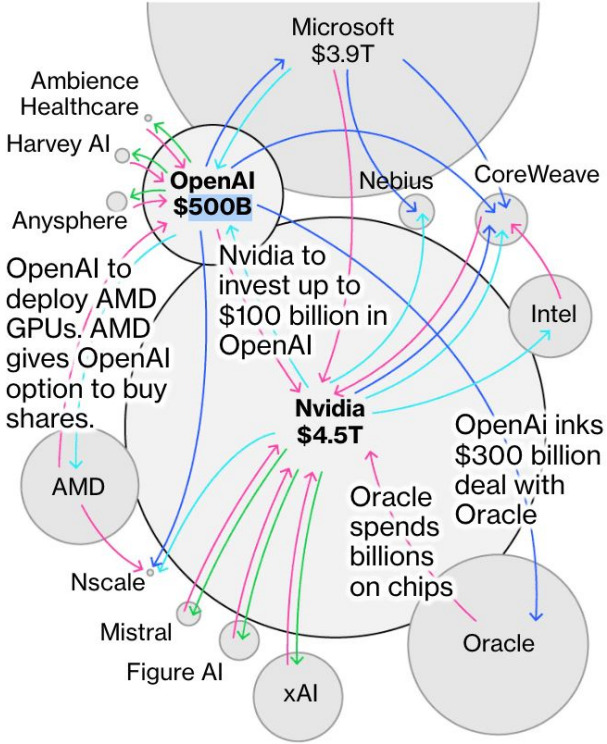
Onset of agentic web

What if the
Groupthink on
AI Infra Buildup is wrong?

Tiny Models + Edge AI

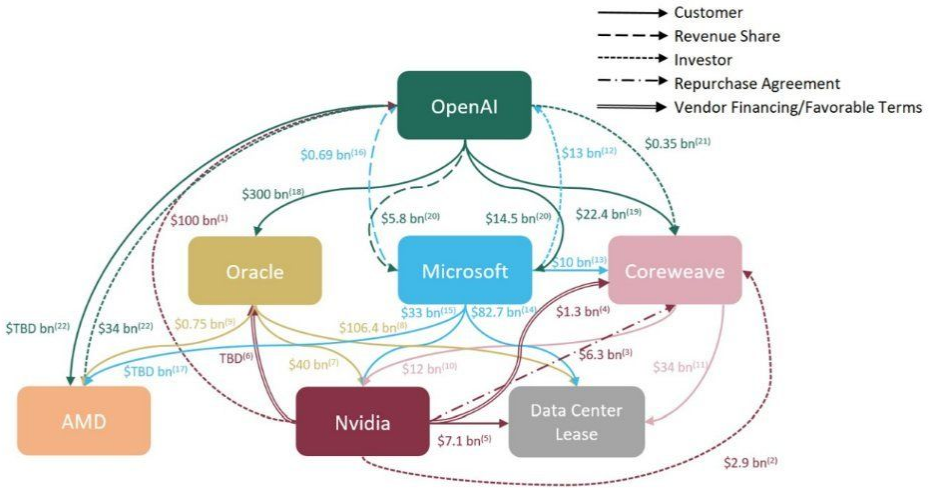
How Nvidia and OpenAI Fuel the AI Money Machine

Hardware or Software · Investment
Services · Venture Capital
Circles sized by market value

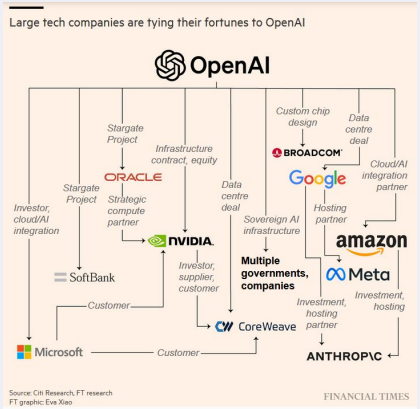


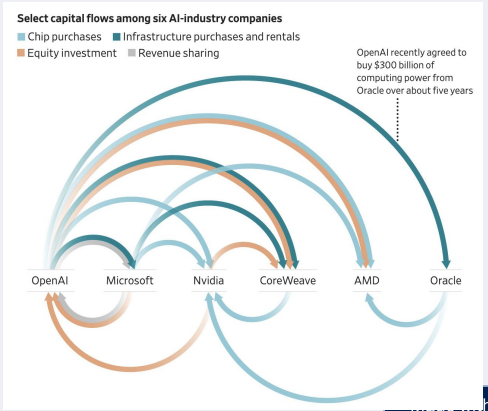
Source: Bloomberg News reporting

Exhibit 3: AI Ecosystem Capital Flows



Note: ORCL, MSFT, and CRWV are covered by Keith Weiss. NVDA and AMD are covered by Joseph Moore.
Source: Company Data, Morgan Stanley Research.





Small Language Models are the Future of Agentic AI

Peter Belcak[1] **Greg Heinrich**[1] **Shizhe Diao**[1] **Yonggan Fu**[1] **Xin Dong**[1]
Saurav Muralidharan[1] **Yingyan Celine Lin**[1,2] **Pavlo Molchanov**[1]
[1]NVIDIA Research [2]Georgia Institute of Technology
agents-research@nvidia.com

Abstract

Large language models (LLMs) are oft
formance on a wide range of tasks and
conversation. The rise of agentic AI sy
applications in which language models p
repetitively and with little variation.

Here we lay out the position that small
powerful, inherently more suitable, an
invocations in agentic systems, and are therefore the future of agentic AI. Our

Approaching ~1B params

Run on edge devices

Tuned for tasks

SLMs already Powerful Enough

Microsoft Phi-3

7bn model matches 70bn performance in reasoning and code generation

Nvidia Nemotron

2-9bn models match 30bn LLMs at fraction of inference cost

Small models = controllable agents

Narrow Functionality

SLMs fine-tuned for specific tasks outperform restricted generalists

Better Alignment and Safety

Limited capabilities lead to reduced hallicunations

2. What

Risks for the ‘Open’ Agentic Web

Tim Berners-Lee's Web: Open and Neutral

- HTTP, HTML, URL, Browser → W3C
- Browser wars + proprietary extensions, Protocol Wars
- DNS, ICANN, Mozilla

How other Ecosystems Became Siloed

iOS/Android

Store policies

Service dependencies

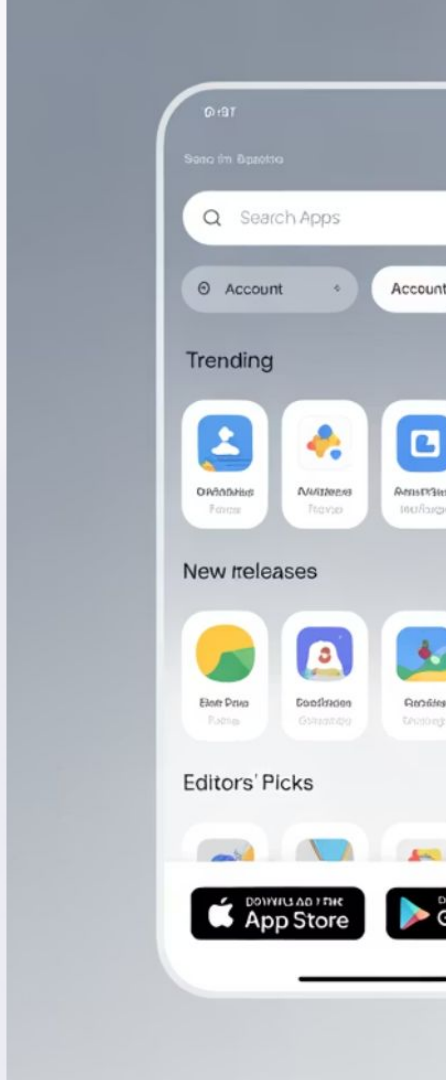
1

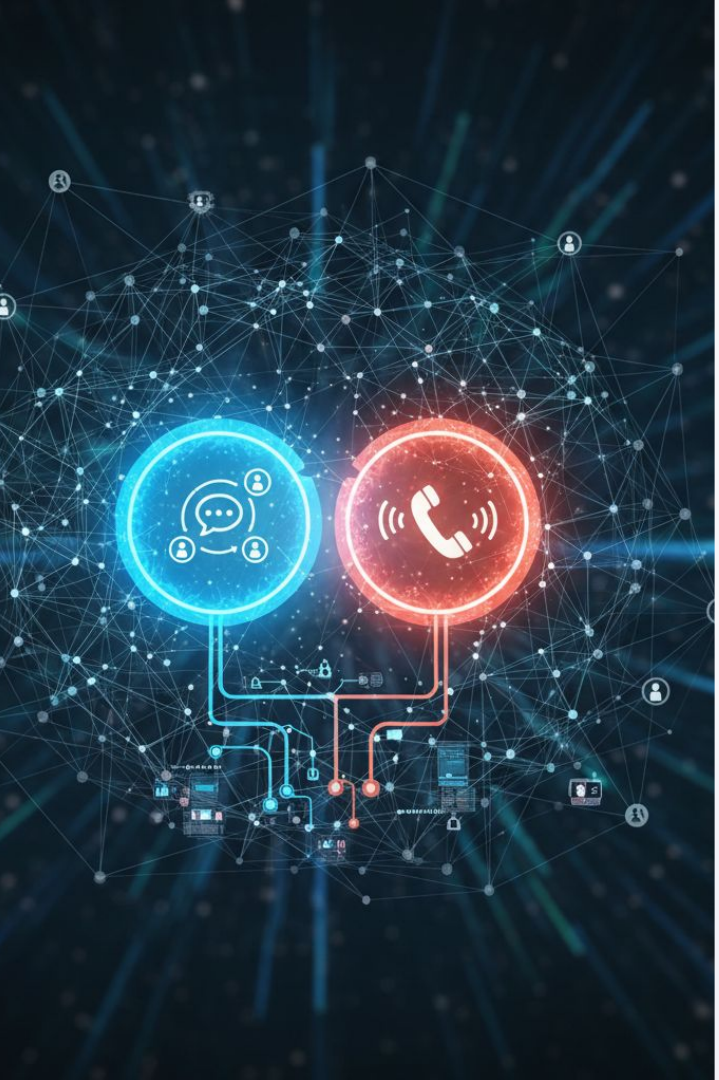
2

Social Media

Closed APIs + data silos

Unsafe governance





3. How

How to build the open ‘telephone system’ and not the ‘Intercom’

MCP, A2A → NANDA

+971	2	333 2222	x68
UAE	AD	Four Seasons	CorpSales

Raskar Lab Inventions at MIT for Networked AI

2015
Pioneered **AutoML**:
AI that designs better AI systems.

2017
Created **Privacy-preserving ML**:
AI operating across data silos.

2021
Developed **Knowledge Markets**:
Systems for pricing data for AI.

2022
Decentralized agentic systems:
AI collaboration in untrusted environments.

Research Roadmap

Foundation Infrastructure

- DNS like Index, Registries and Certification
- Decentralized Compute and Storage Resources
- Interoperability and Security Standards
- Identity, Access and Wallet Management
- Human-Agent Interaction

Agent Adapters + Teaming

- Cross-platform Communication
- Team Communication
- Smart Autonomous teaming
- Responsible Collusion
- Resource Allocation and Load Balancing

Edge AI and Tiny AI

- Hardware and Software Optimization
- Model Compression and Quantization
- Split Learning and Federated Learning at the Edge
- Energy-Efficient AI
- Edge AI for IoT

Knowledge Pricing

- Pricing algorithms for models and inference
- Incentive Mechanisms for Data Sharing
- Decentralized Markets
- Agent Benchmarks
- Data Curation and Quality
- IP and Data Ownership

CoLearning, Learning across Silos

- Privacy-Preserving Machine Learning
- Blackbox collaborative learning
- Climbing intelligence ladders
- Trusted Execution Environments

Agent Stores, Market-places, Large Population Models

- Agent Based Modeling, scalability and differentiability
- Amortized AI for Serving Millions of Queries
- Middleware

Collaborators and Contributors

"We're proud to support Project Nanda's work as they utilize the Agent2Agent protocol for their advanced research on the internet of agents. Our goal with A2A is to empower businesses, consumers, and researchers with an open standard that enables the innovation needed to solve complex challenges that are beyond the scope of any single agent."

Rao Surapaneni
VP & GM, Google A2A

Google

"We are rapidly entering a world where AI systems will be built using a decentralized network of AI agents... TCS is excited to support and contribute to MIT's decentralized AI program NANDA aimed at realizing this vision."

Dr. Harrick Vin
CTO, Tata Consultancy Services
LinkedIn

TCS TATA CONSULTANCY SERVICES

"Open protocols for Internet of AI are critical to trigger new wave of innovations beyond our imagination today. We have been working with NANDA team very closely and will continue to support NANDA R&D."

Zafer Sahinoglu
VP of Innovation,
Mitsubishi Electric
LinkedIn

MITSUBISHI ELECTRIC

"The MIT Media Lab's NANDA initiative is creating the infrastructure that will define the next generation of AI. Their commitment to open standards and decentralized architecture aligns perfectly with our vision for ethical AI deployment."

Robert Lincourt
Applied Researcher
LinkedIn

DELL

"NANDA paves the way for building transformative technology in a truly inclusive manner... HCLTech is excited to be part of project NANDA."

Vijay Guntur
CTO,
HCLTech
LinkedIn

HCLTech

"The Nanda Protocol is pretty cool, and we are excited to be part of this journey."

Raghu Bala
CEO,
Synergetics.ai
LinkedIn

synergetics

Orgs and Participants

Ramesh Raskar
Professor & Founder
MIT & Project NANDA

John Roese
Global CT0 & Chief Officer
Dell Technologies

R. V. Guha
Tech fellow & Creator
Microsoft & NL Web

Jessica Rosenworcel
Former Chair
FCC

Nick Cooper
Member of technical staff
OpenAI

Todd Segal
Principal Software Engineer
Google

Erik Reppel
Head of Engineering
CoinBase

Samual Saraf
Senior Director, Product Management
Salesforce

Fatih Porikli
Sr. Director, Global AI
Agents Innovation
Qualcomm

Peeyush Aggrawal
Partner
Deloitte UK

Rakesh Gohel
Founder
JUTEQ

John Zinky
Principal Performance Engineer
Akamai

Ken Huang
CEO
DistributedApp

S.ai

Ashish Bhatia
Principal Product
Manager
Microsoft

Vijay Reddy
Partner
Mayfield Ventures

Shyam Nagarajan
COO
HADERA

NANDA Researchers and Authors

MIT: Ramesh Raskar, Pradyumna Chari, Abhishek Singh, Ayush Chopra, Maria Gorskikh,

Mahesh Lambe, Jared Grogan,

Microsoft: Aditya Challapally

Dell: Robert Lincourt,

Akamai: John Zinky,

TCS: Rekha Singhal,

ADP: Shailja Gupta,

Synergetics: Raghu Bala,

Flower: Dimitris Stripelis,

HCLTech:Bhuwan B, Sumit Kumar,

UCS: Ken Huang,

AWS: Vineeth Sai Narajala,

Intuit: Idan Habler,

Cisco: Sichao Wang, Akram Sheriff

Meta: Rajesh Ranjan,

Academia: Abul Ehtesham, Aditi Singh, Gaurav Kumar Gupta, Saket Kumar,

Nanda addresses Four Choke Points

Phase 1 goal for Nanda: overcome four choke points to make sure Agentic Web remains open, neutral, vibrant, lucrative and safe

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Choke point 1: Worldwide Switchboard

Centralized Registry (DNS-like)

- Good: Single source of truth, easy to maintain
- Bad: High traffic can overwhelm registry,
  Monopoly risk if run by private companies

Decentralized Discovery

- Good: Listed on, website.com/.well-known/agent-list.json).
  No central authority
- Bad: Re-Centralization: Scrap + Aggregate + Serve Queries:
  Leads to gatekeeping, biased prioritization, or censorship
  Inefficient Discovery: Not all websites are crawled

Hybrid Solution: Nanda Index as Switchboard

Lean central switchboard

Routes requests to relevant registries, avoiding full centralization +

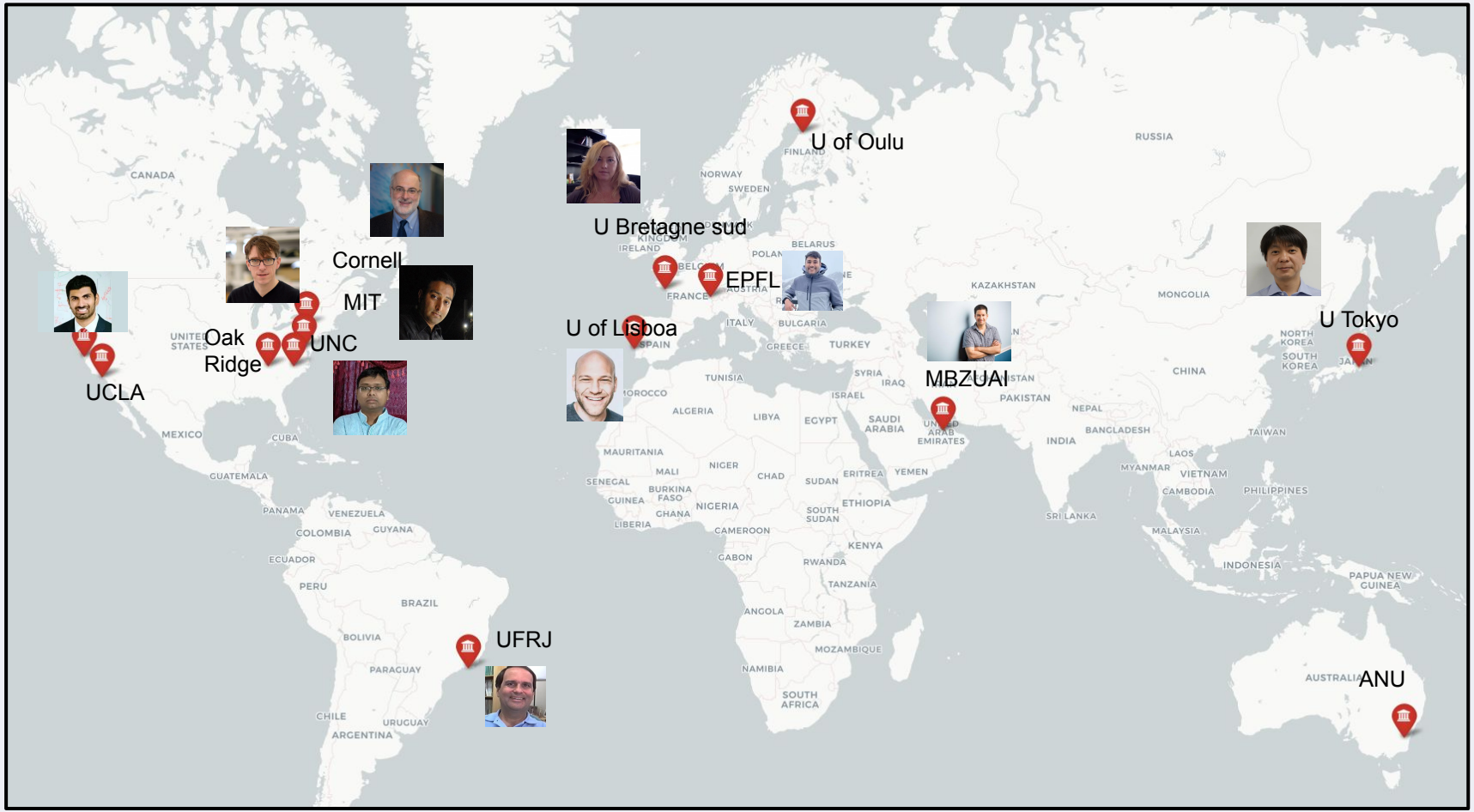
(replicated at 15 sites globally)

Multilevel Private Registries

Orgs host their own private or public registries (e.g Agent stores)

E.g. country codes	+971	2	333 2222	x68
	UAE	AD	Four Seasons	CorpSales

The NANDA Index : 15 Top AI Universities



Choke point 2: Agent Passport for Credentials

Agent Index

name	facts_url	TTL
AgentX	//link to AgentFacts (can be to url, DID, third-party regsitry)	// Time-to-live before we need to re-resolve
@ramesh	URL	...
@Japan:inami	URL	
@salesforce:Delta	Third Party	
@DiD:Near:ag268	DiD	

AgentCard, AgentSpec, DiD

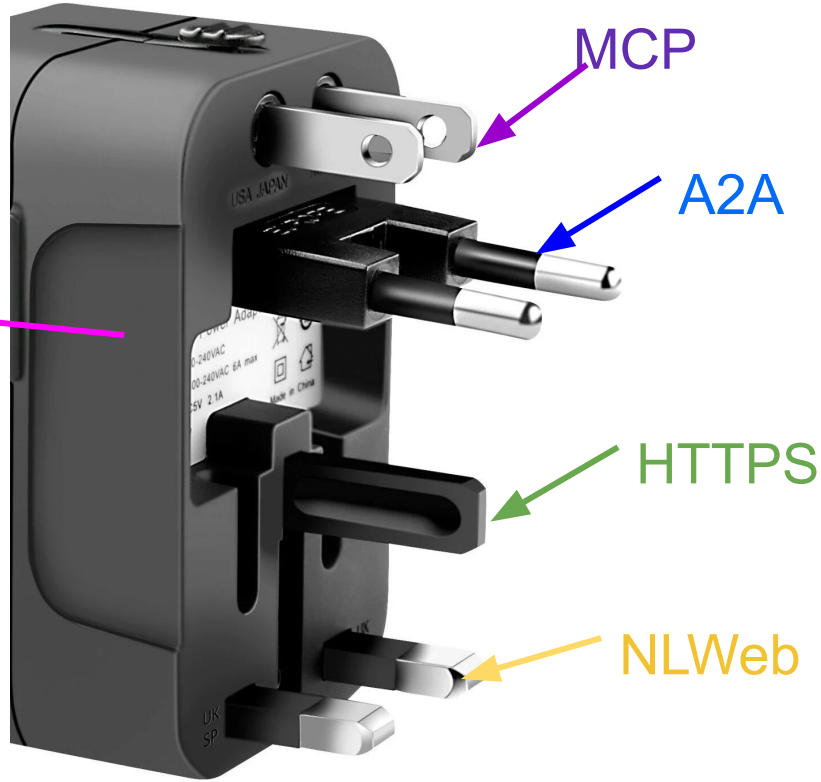
AgentFacts for Agent X

ID:	//unique identifier
AgentName:	//Human readable name
Endpoints:	//can be URL or DID, links to various hosted versions of the survive, or even a dynamic routing service
UsageFormat:	//Input output formats, API spec, protocol support, auth
Certification:	//certified via a registry or self-certified via DID
Capabilities:	//Declared capabilities, performance on those capabilities, with the option for third-party auditing and certification
Discovery:	//Metadata for search, including vector embeddings
Security:	//Security requirements, including optional third party

Choke point 3: Universal Adapter

ADK/
CrewAI/
Langchain
agents

NANDA Universal Agent Adapter



github.com/projnanda/adapter

Agent

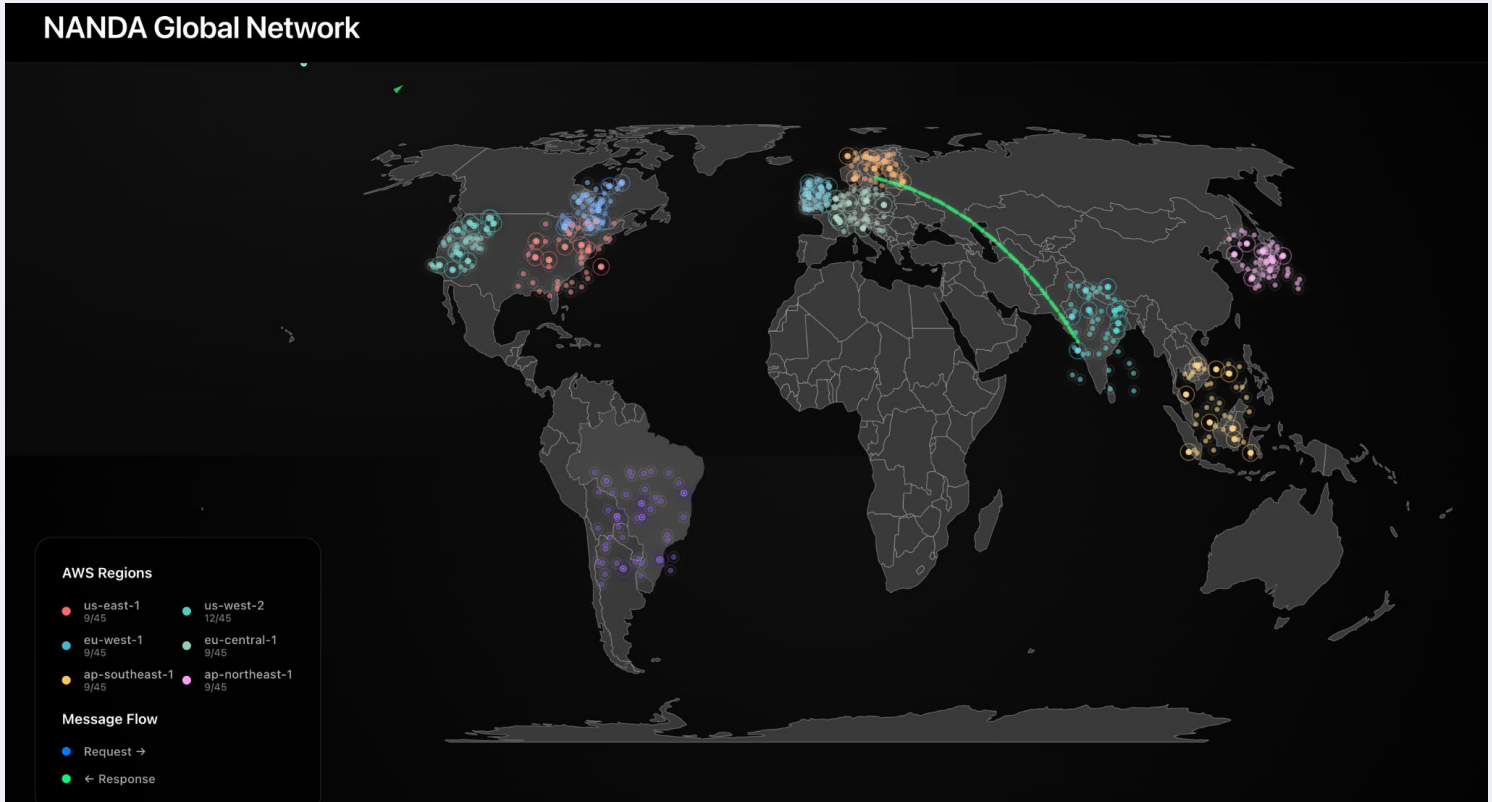
ADK

Agent

ADK + NANDA Adapter

Choke point 4: Universal attestation

NEST.projectnanda.org : NANDA Sandbox + Testbed



Agent Chaos

Agent Registry
Centralized catalog of all agents, capabilities, and metadata

Discovery
Dynamic mechanisms for agents to find each other's services

Intent Mapping
Translation of user goals into actionable agent tasks

Adaptive Routing
Intelligent distribution of requests to appropriate agents

Observability
Real-time monitoring, logging, and performance tracking

Safety
Guardrails, validation, and security controls

Control Plane
Unified management layer for orchestration and governance

What:

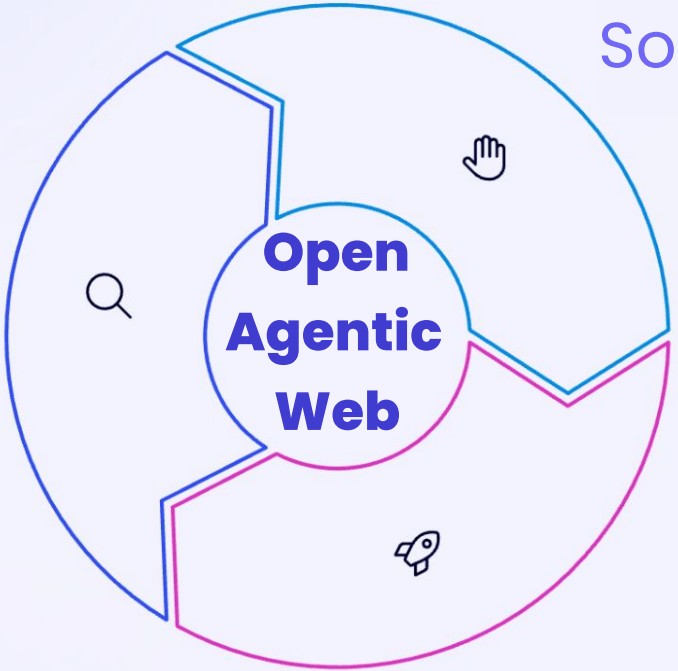
Risks +

Social Mission

Why:

Economics +

Ventures



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Research +

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