

Harnessing AI for System Design

A New Era of Excellence

Patrick Davis, Product Management Director

PCB Carolina

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cādence®

This presentation contains forward-looking statements based on current expectations or beliefs, as well as a number of preliminary assumptions about future events that are subject to factors and uncertainties that could cause our actual results to differ materially from those expectations or results described in the forward-looking statements. You are cautioned not to put undue reliance on these forward-looking statements, which are not a guarantee of future performance and are subject to a number of risks, uncertainties and other factors, many of which are outside Cadence's control.

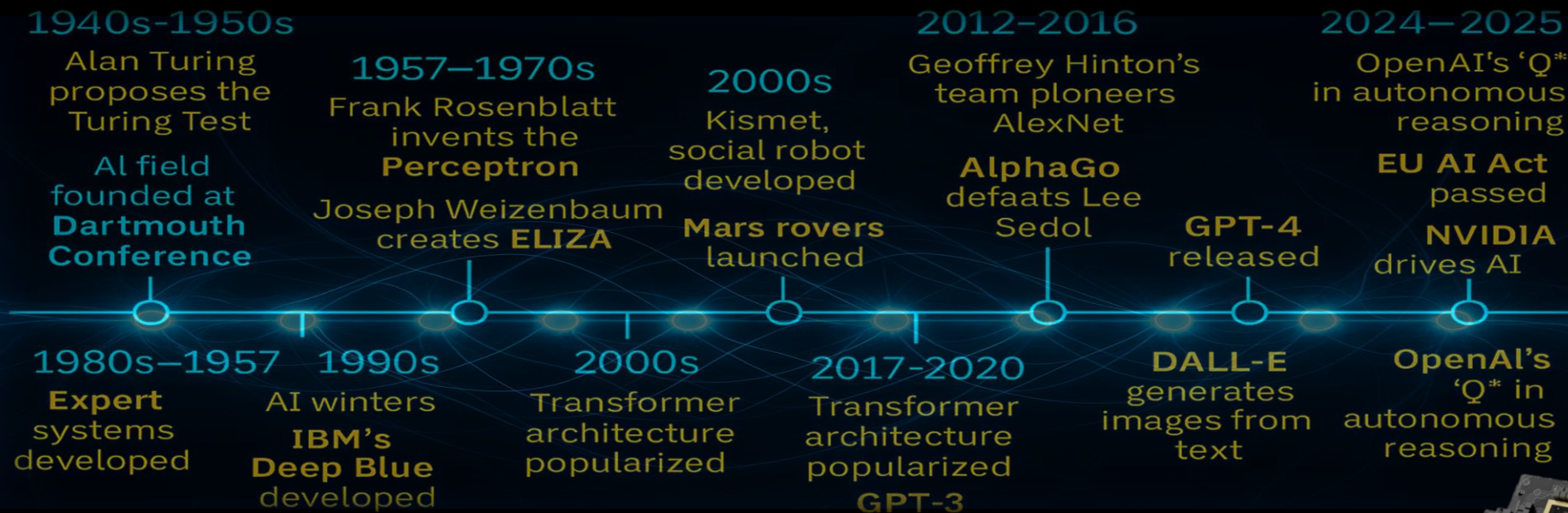
What is Agentic AI?

Agentic AI refers to artificial intelligence systems that exhibit **agency**—the capacity to act autonomously in pursuit of goals. These systems can make decisions, initiate actions, and adapt their behavior based on their environment or objectives, often without direct human intervention at every step.

Key Characteristics of Agentic AI:

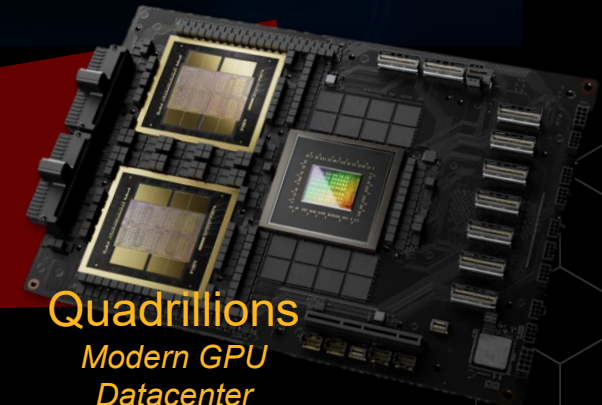
- **Goal-directed behavior:** Operates with specific objectives in mind
- **Autonomy:** Can make decisions independently
- **Adaptability:** Learns from experience or feedback to improve performance
- **Persistence:** Continues working toward goals over time, even in changing conditions

Key Milestones In AI



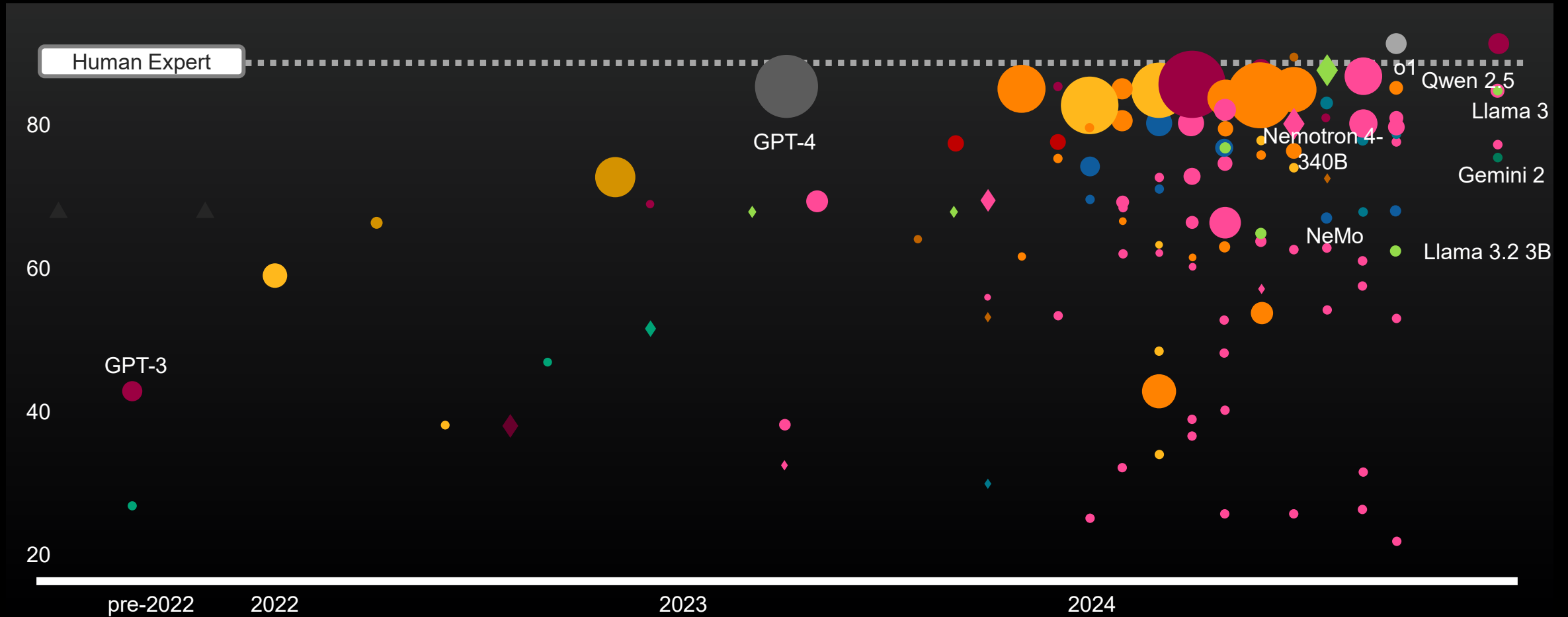
400
Vacuum tubes

Active Elements



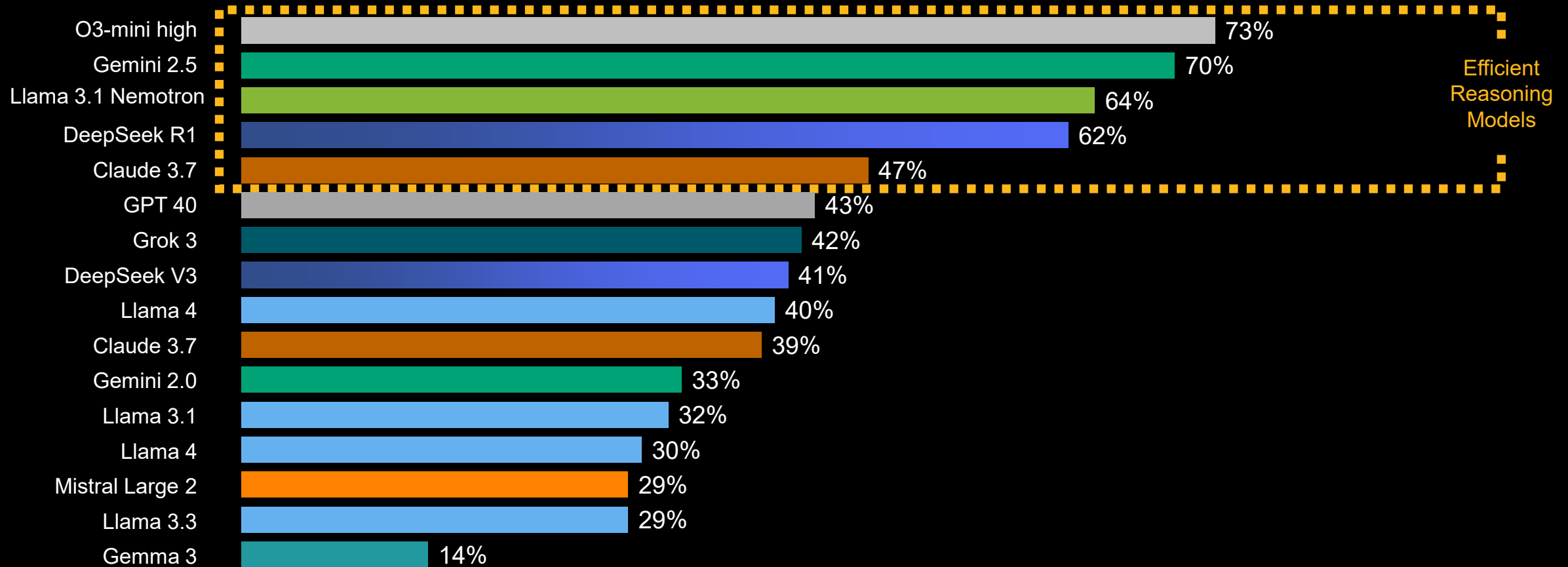
Quadrillions
Modern GPU
Datacenter

A New Age of Fuel-Efficient Models

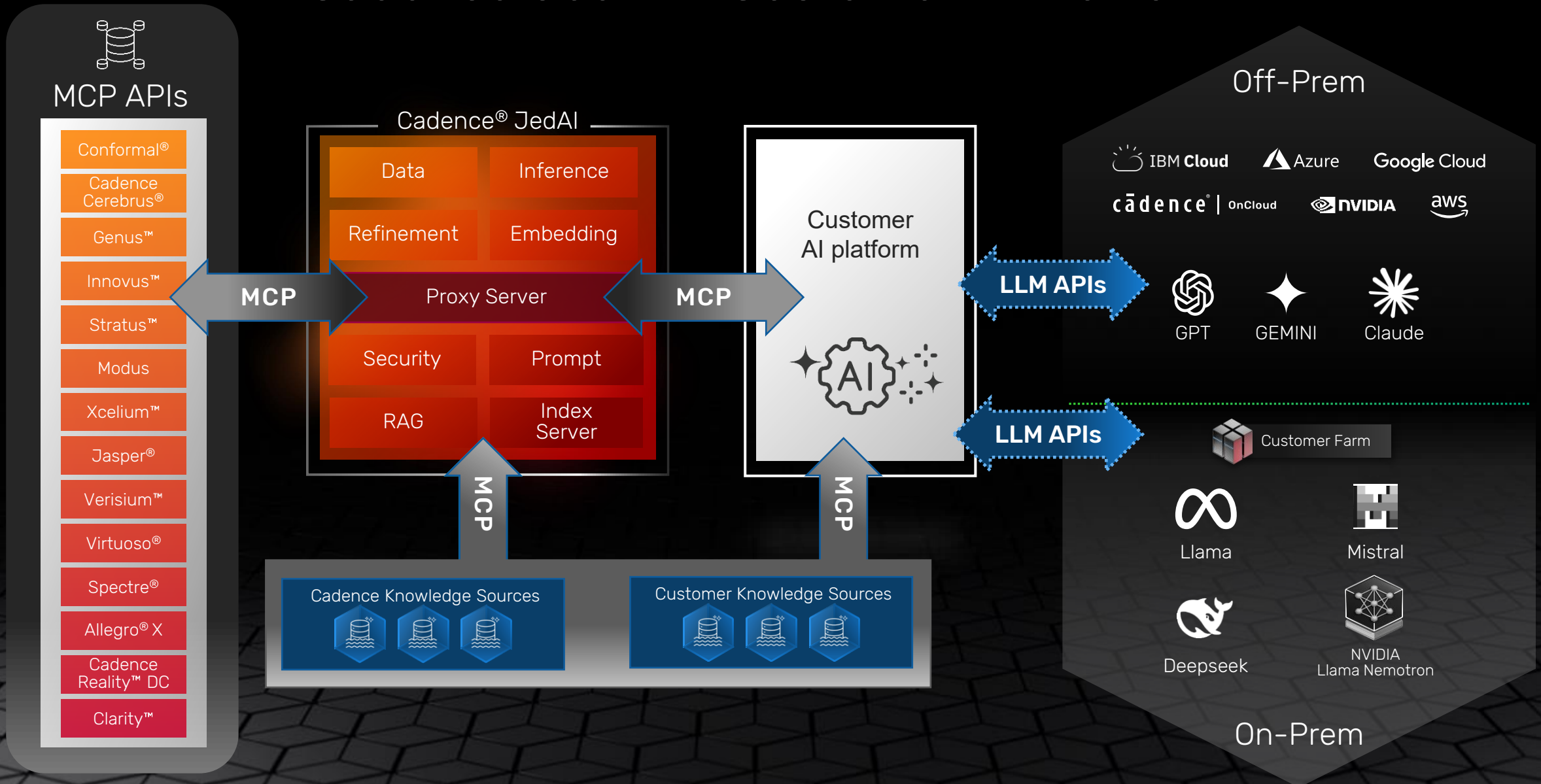


The Emergence of Reasoning Models

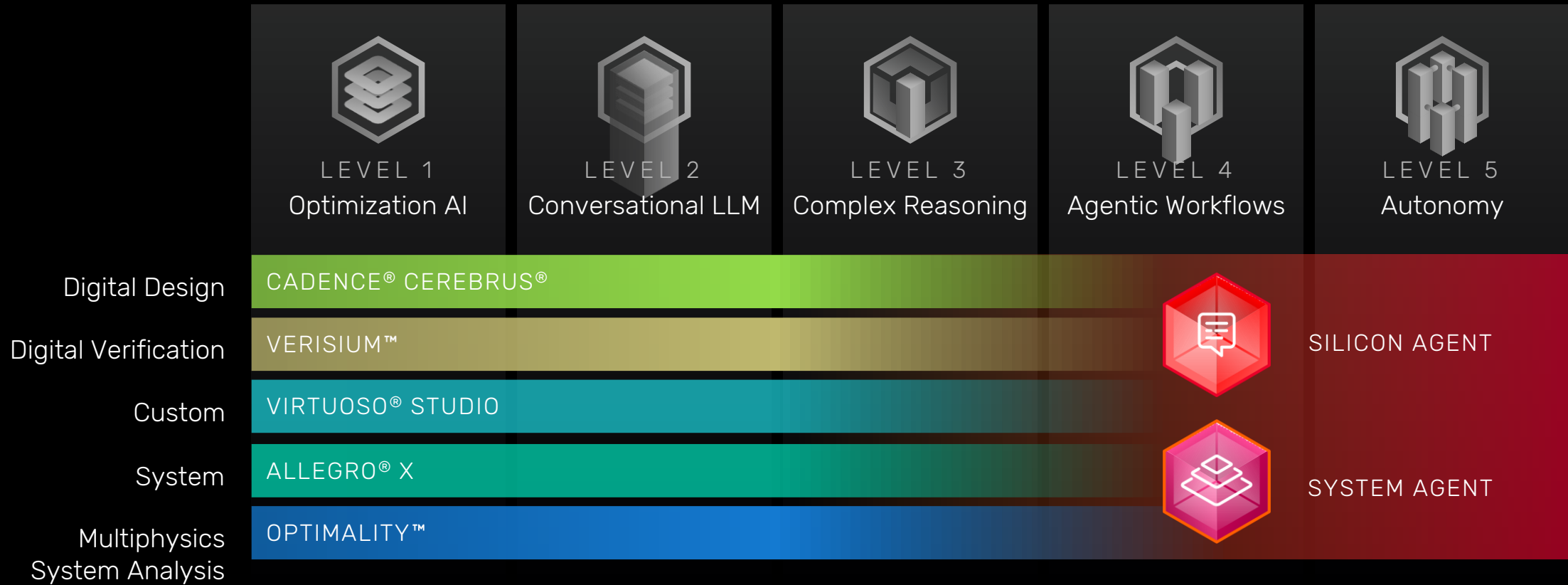
LiveCodeBench (Coding) Results



Cadence JedAI + Customer AI Platform



The Journey to Autonomous Design



Three Classes of AI We Are Investing In

Opportunities for system design and analysis

	Goal	Focus	LLM	Solution
 OPTIMIZATION	Find the best solution, decision	Efficiency, performance, and cost		Allegro® X AI
 GENERATIVE	Create original content, data	Novelty, creativity, realistic generation		Allegro X AI Assistants
 AGENTIC	Autonomously achieve goals	Planning, reasoning, multi-step execution		Coming Soon

Optimization AI



Goal

Find the best solution, decision

Focus

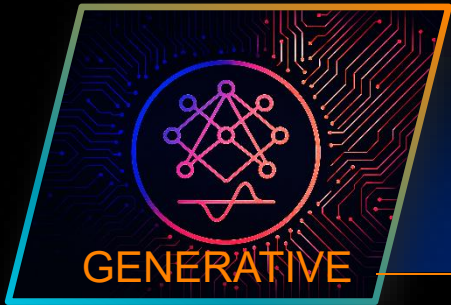
Efficiency, performance, and cost

LLM



Solution

Allegro X AI



Create original content, data

Novelty, creativity, realistic generation



Allegro X AI Assistants



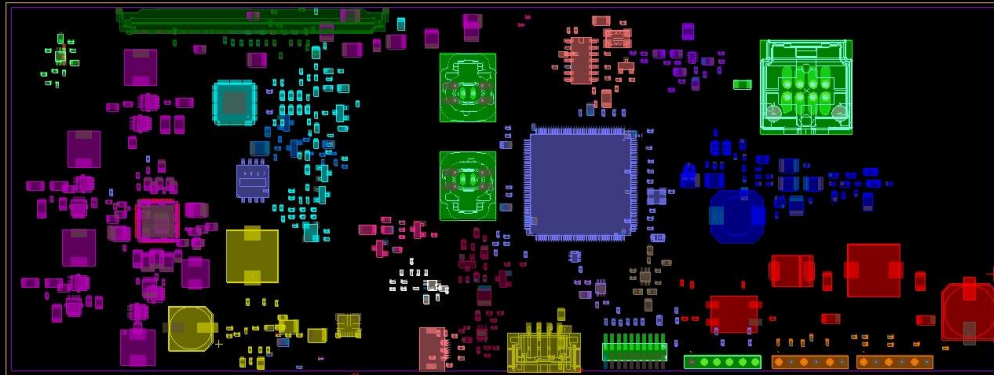
Autonomously achieve goals

Planning, reasoning, multi-step execution

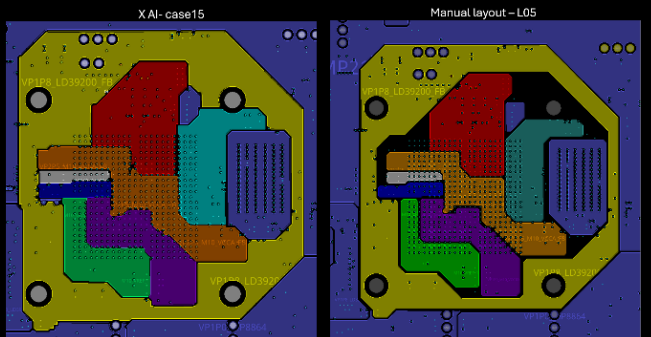


Coming Soon

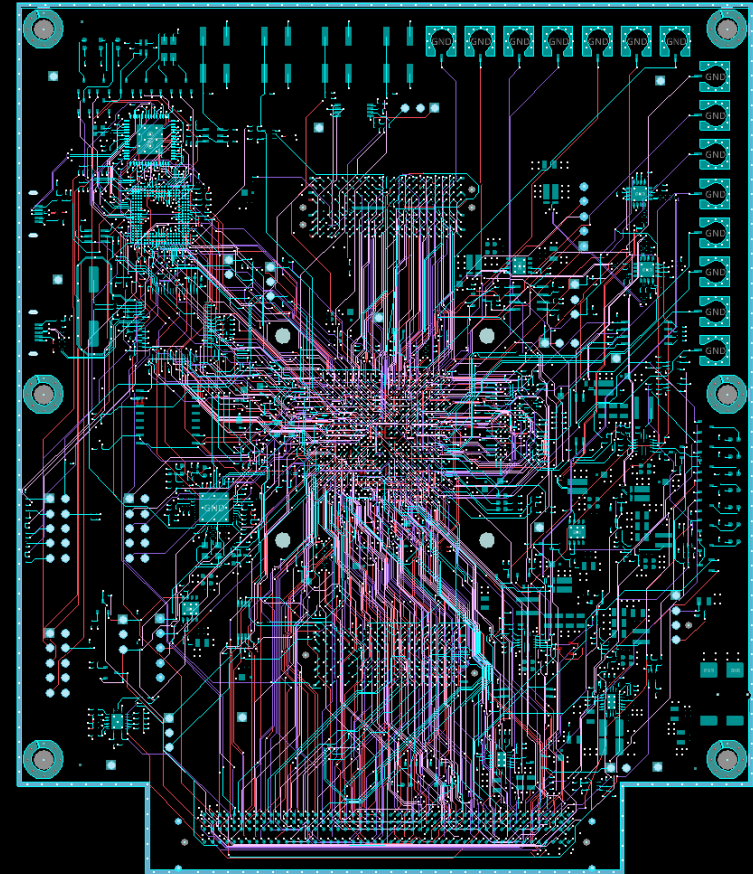
X AI Enables PCB Layout Automation



PCB Placement



PCB PG "Metal Pouring"



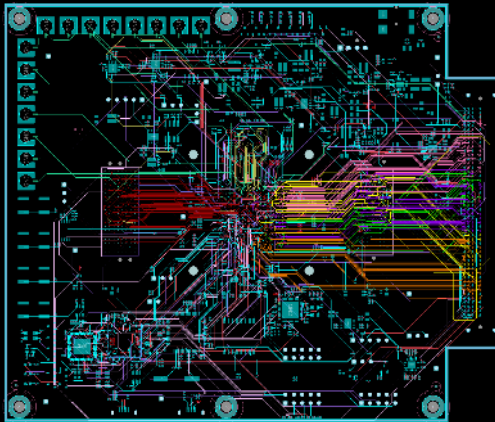
PCB Routing

Optimization AI | How Early Customers are Using X AI Auto Router

Reduce turnaround time (TAT) and boost productivity

Customer 1

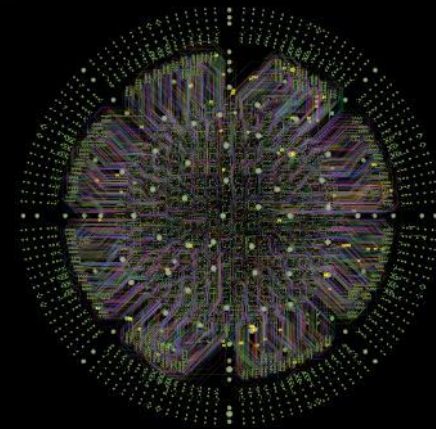
- ~700 signal nets to route
- 4 routing layers
- Manual routing effort ~5 days



Auto Router runtime ~3 min
~150 DRCs to clean up ~1 day

Customer 2

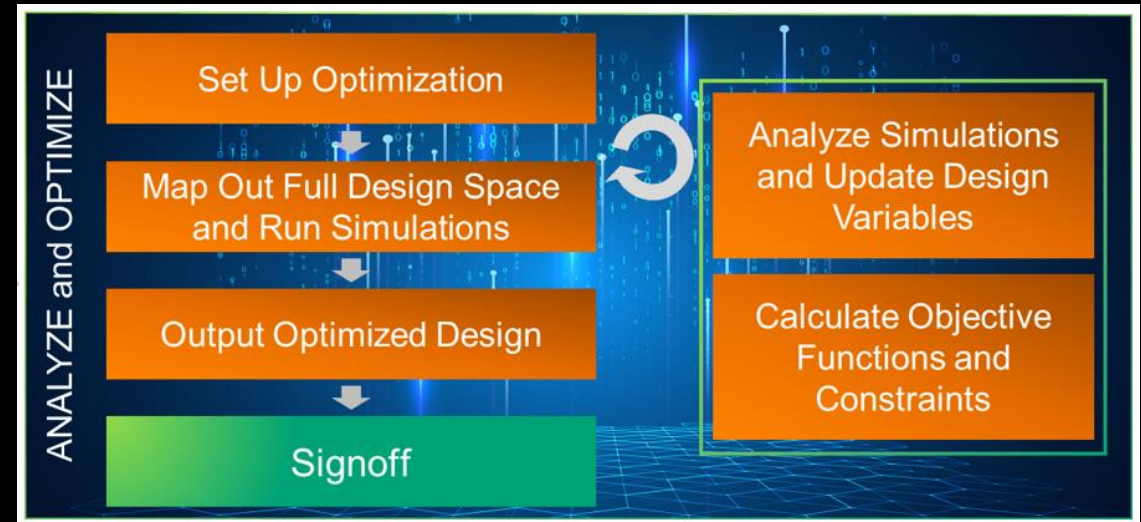
- ~12k DC nets to route
- 15 routing layers, class-class rules
- Manual effort: 6 people, 6 months



Auto Router runtime ~21 hrs
Used as guidance for PG shapes

Optimality Intelligent System Explorer: Multiphysics-Based Optimization AI

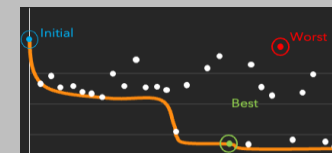
- Optimize a design's electrical performance as a function of design variables and constraints
 - Based on Clarity™, Celsius™, and Sigrity™ technologies
- Enables complete system-level exploration of chip, package, board
- Integration with Allegro® X



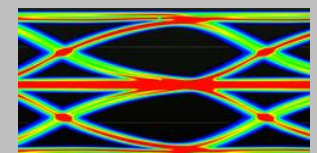
30X Faster



625 to 19 iterations

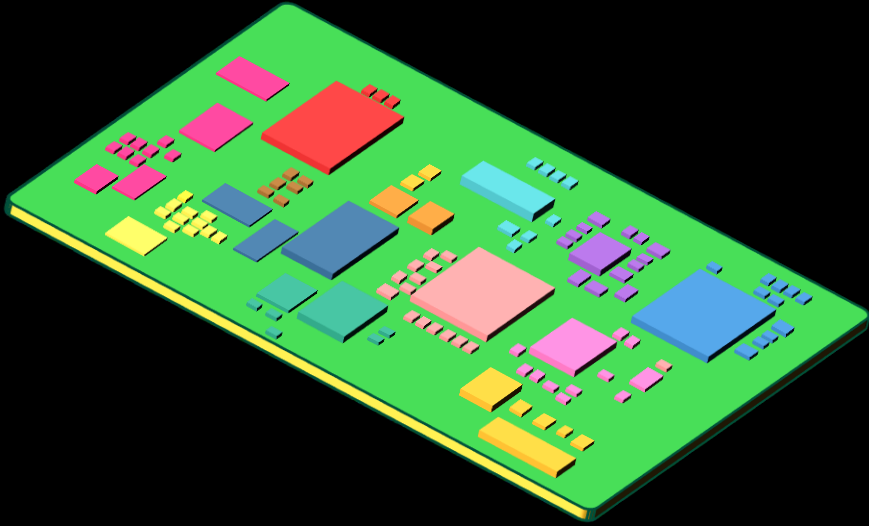


55% Eye Height



Allegro X AI and Optimality Vision

From in-design analysis to in-design optimization

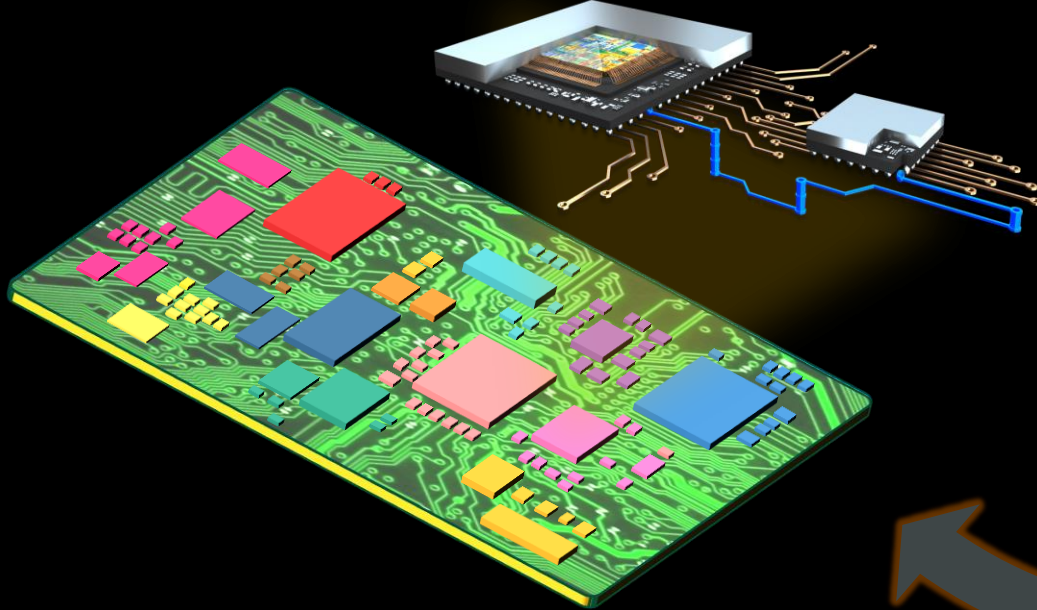
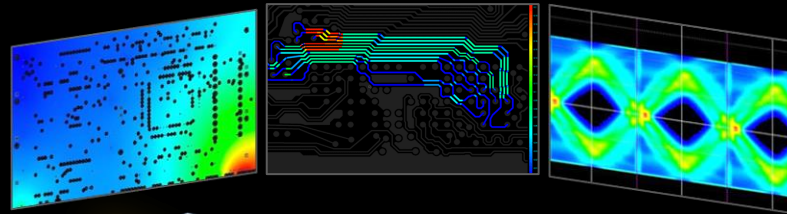


Continuous improvement
to placement and routing

Allegro X AI and Optimality Vision

From in-design analysis to in-design optimization

Tighter integration
with analysis - IDA

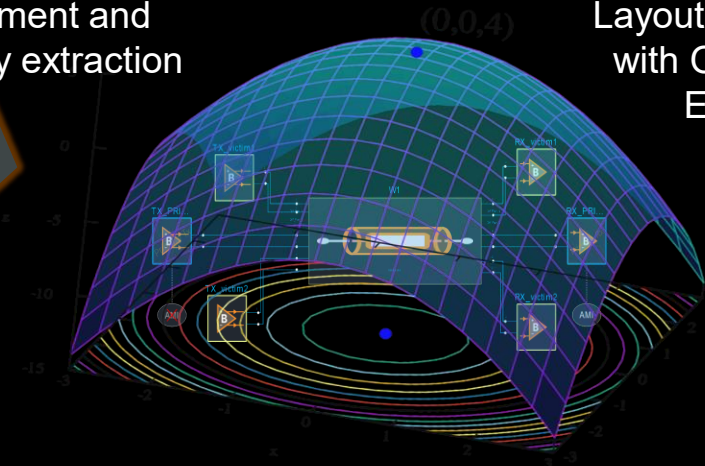


Continuous improvement
to placement and routing

Placement and
topology extraction



Layout optimization
with Optimality™
Explorer









Auto generation of
constraints

Feed constraints back
into Allegro® X AI









Three Classes of AI We Are Investing In

Opportunities for system design and analysis

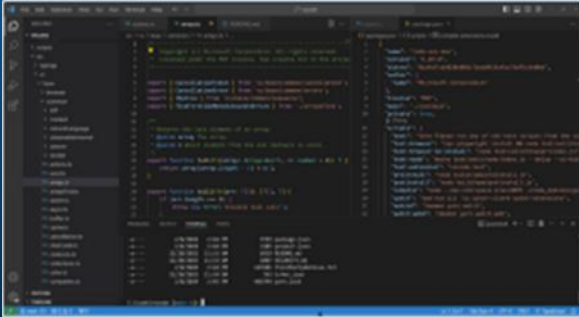
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Generative AI

	Goal	Focus	LLM	Solution
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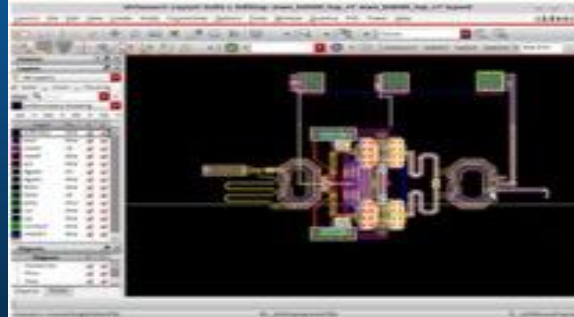
Cadence Generative AI Assistants Across Cadence

Digital Design



- Write RTL (Stratus HLS to improve output)
- Write SVA (Jasper to improve output)
- Write coverpoints
- Write vPlans
- Integrated Debug AI (CodeMiner, WaveMiner, ...)
- ...

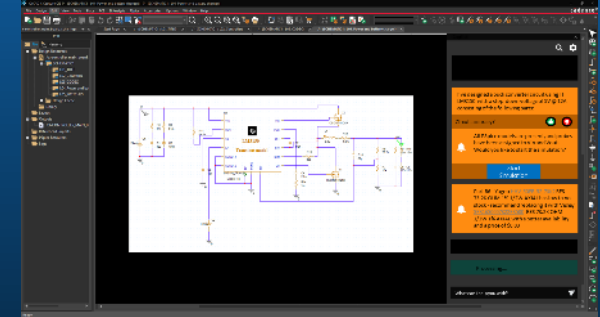
Custom Design



cadence® Virtuoso Studio

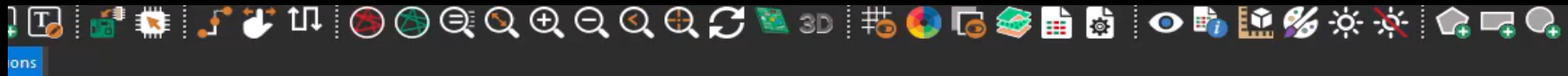
- Write SKILL® code
- Perform layout edits
- Auto-create testbenches
- Generate reports and visualizations
- Run optimizations
- ...

PCB & Package Design



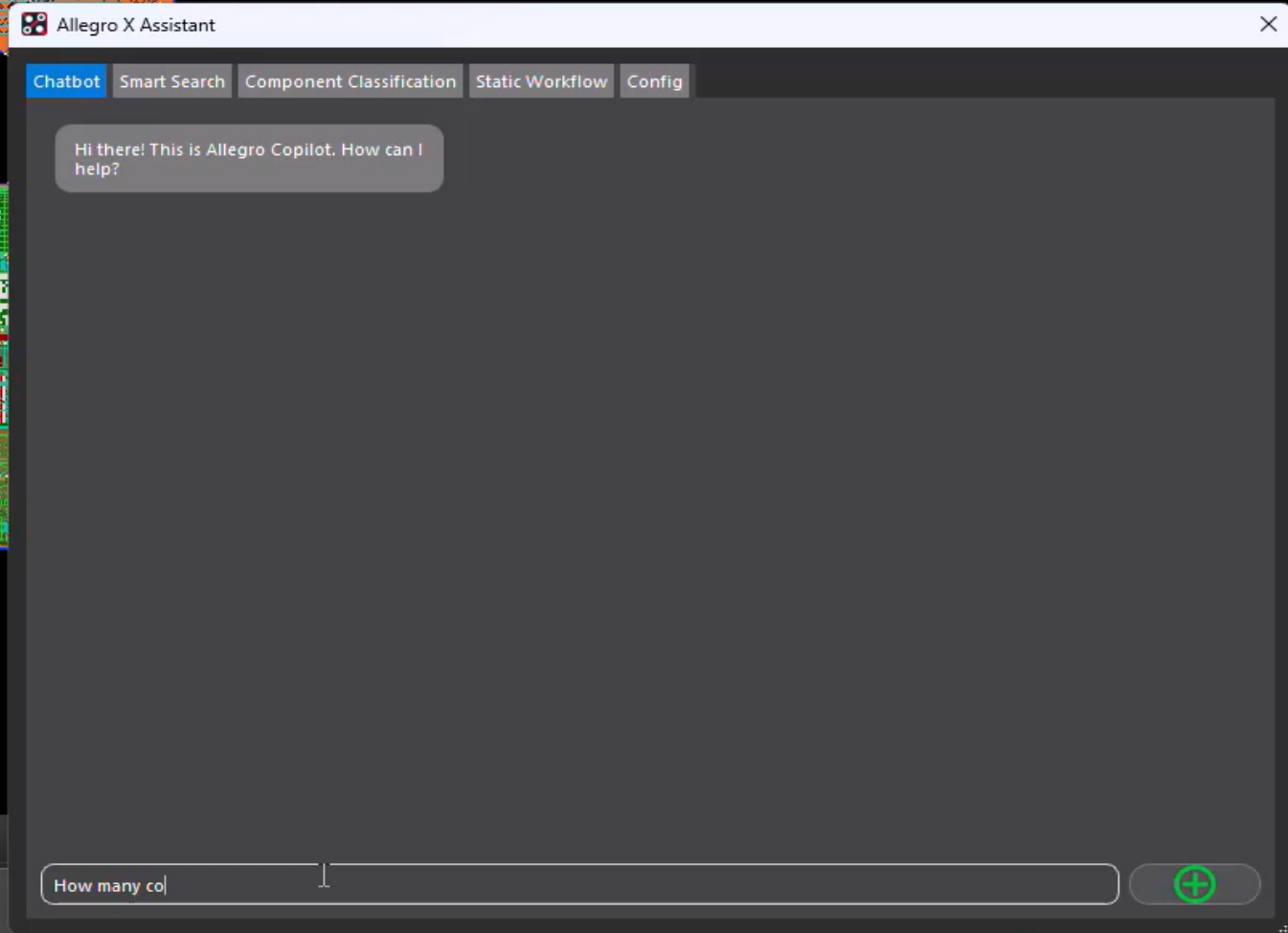
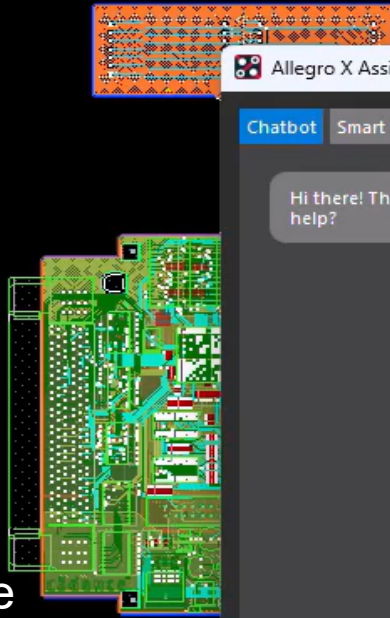
cadence® Allegro X

- Find and replace parts/models
- Q&A on parts/models
- Optimize BOM cost
- Write SKILL code
- Perform layout edits
- ...

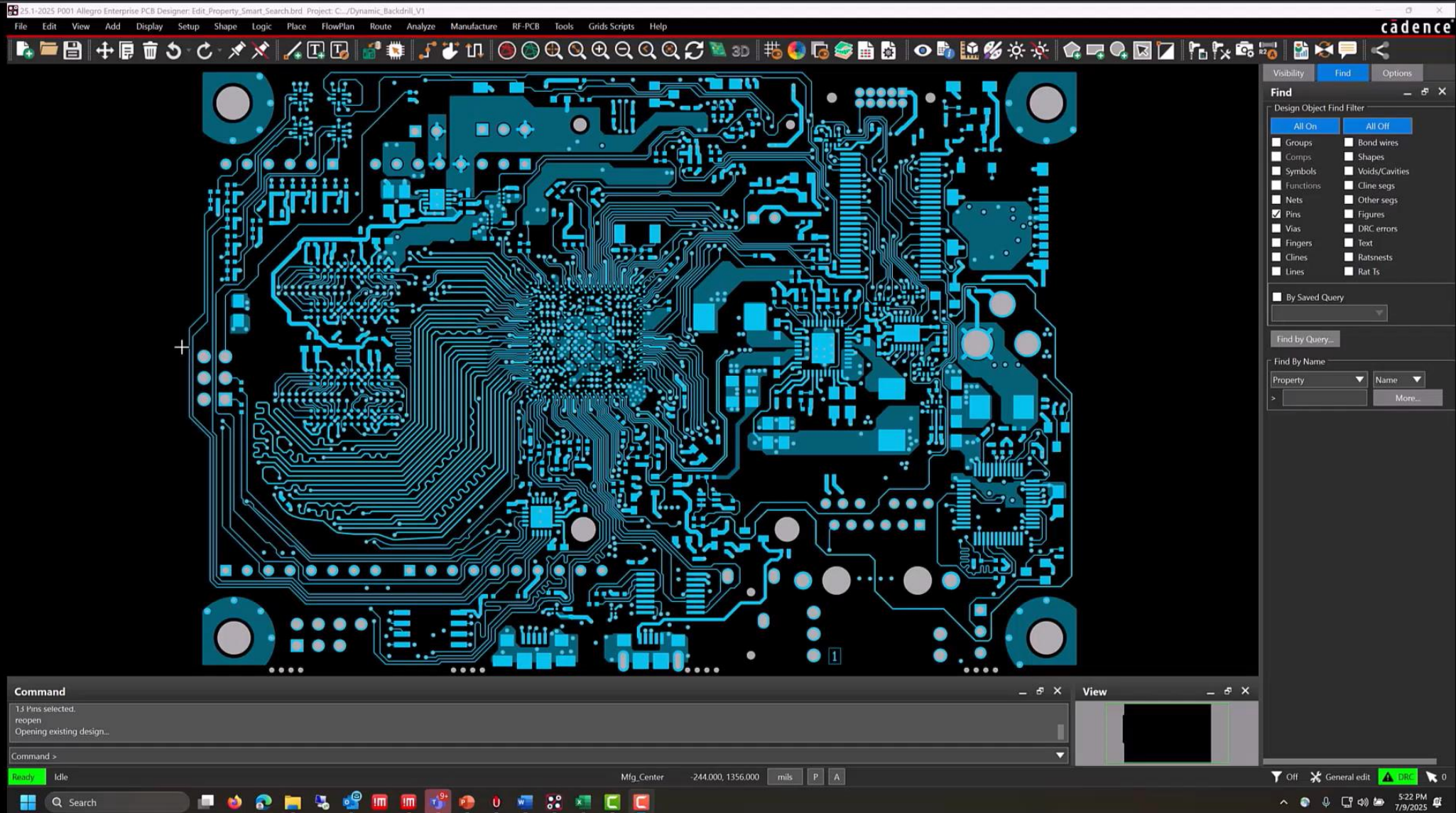


AI Assistant in Allegro X

- Search and modify Settings, Properties, Options
- Interrogate Design
- Product Help in natural language
- Search APIs
- Write scripts
- Natural language for interactive commands
- Automated library creation



Embedding Natural Language within Allegro X



Allegro X Collaboration Server Design Search

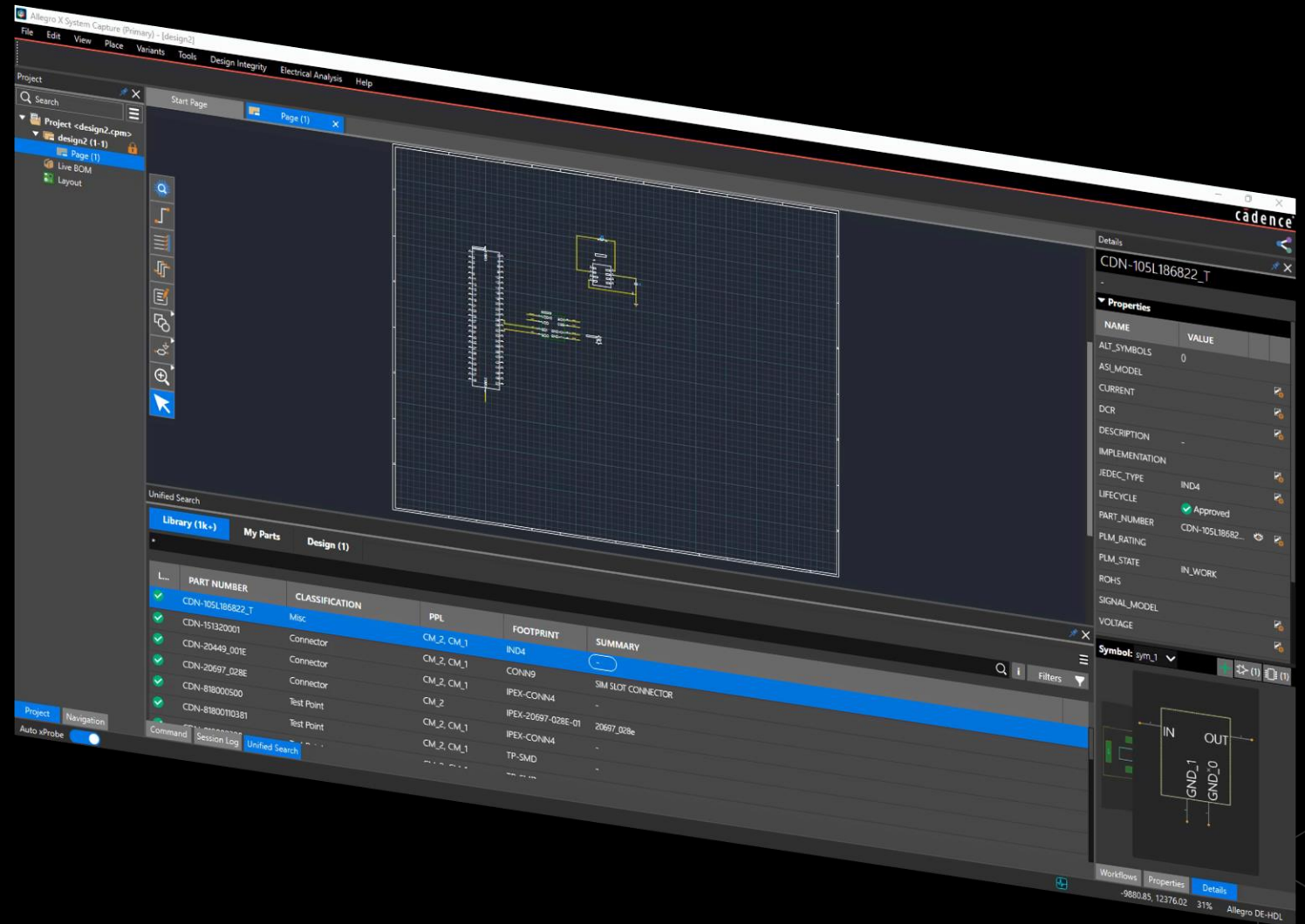
Circuit topology query based on design content

Find IP with similar topology to your design WIP

- Easier path to Reuse
- Learn from other implementations, improve your design

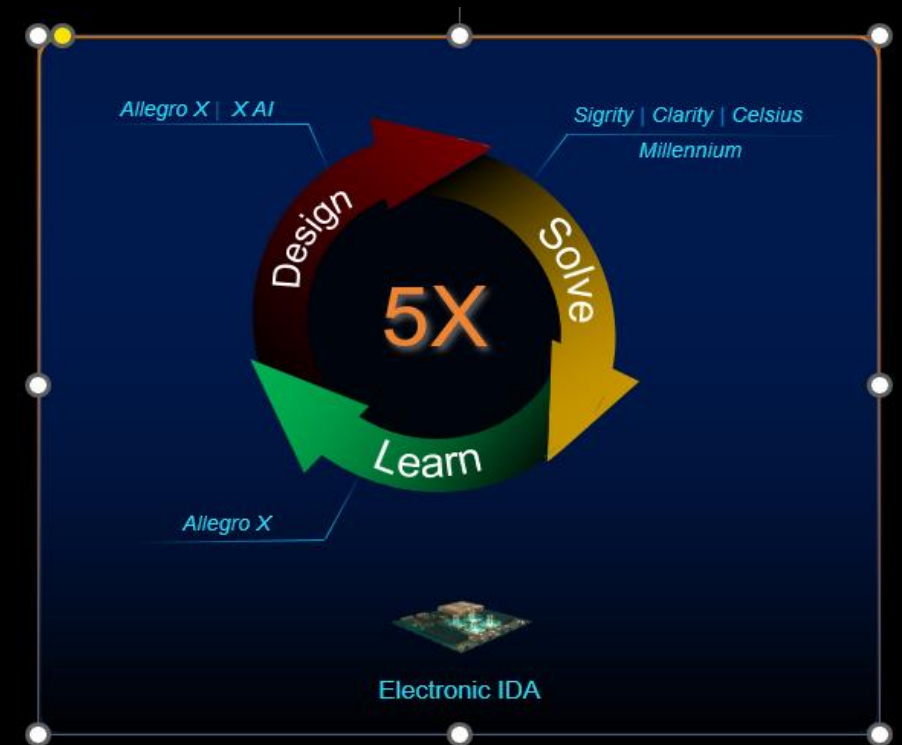
AI techniques to search from existing design IP in Allegro X Collaboration Server

- Continuous improvement of search results as IP dataset grows









Schematic Assistance

- Schematic Net naming
 - Auto net connections in Table-Driven flow
- Library Authoring automation
 - Leveraging datasheet consumption
- Constraint Entry
 - Based on prior knowledge of known good designs and datasheet consumption
- Assisted circuit debug
 - Powering Reliability solution with AI
- Integration with AI-driven design partners (Circuit Mind and Celus)
 - Streamline concept-to-schematic
 - Enables EEs to move from high-level intent to fully designs in minutes









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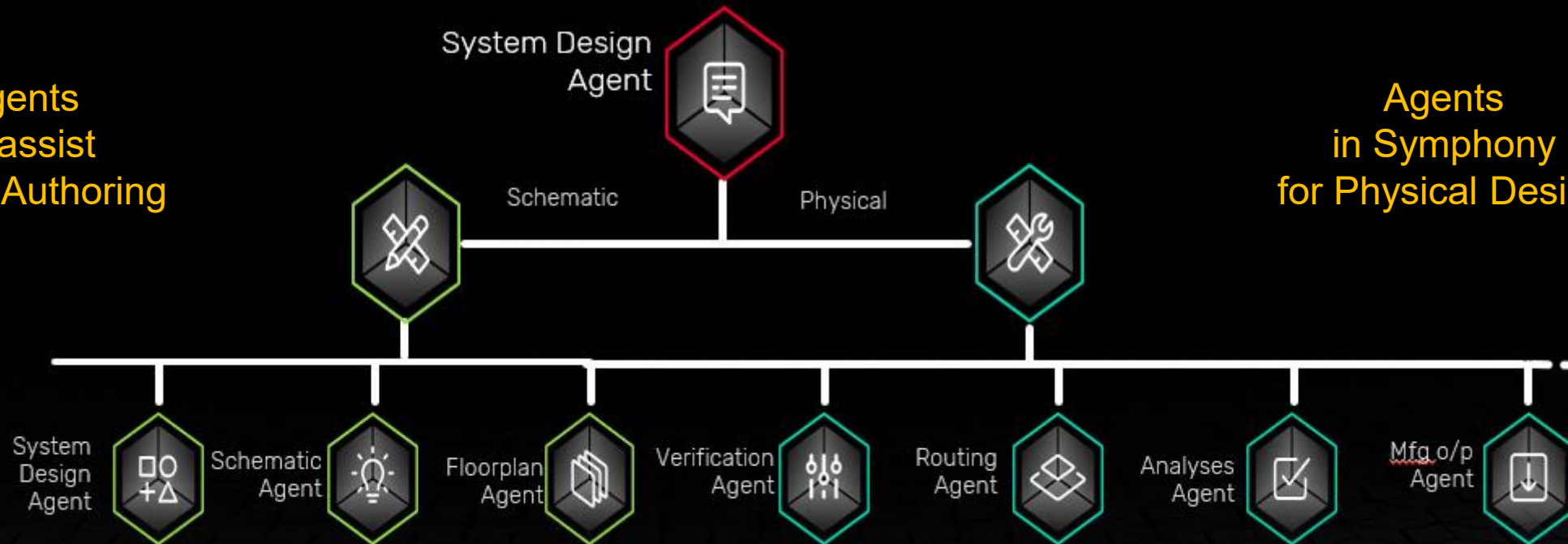
Allegro X PCB Design Agent

Agentic AI and Workflow Control including DFX and DRC

In Active Development

Agents
to assist
Design Authoring

Agents
in Symphony
for Physical Design



Cadence® Joint Enterprise Data AI Platform – JedAI

Foundational
Models



Agentic AI
Libraries

AAI LIB
Agents Lib

Monitoring Lib
Validation Lib

AI
Databases

Chat

Model Training
Tuning Lib

Agentic AI | Longer Term Vision: Agentic AI for PCB Design



Search for design satisfying ...



I found a configuration meeting your criteria...

Minimize the BOM cost subject to MTBF > 15 yrs...



*BOM modified, cost \$54 USD, MTBF
15.4 yrs*

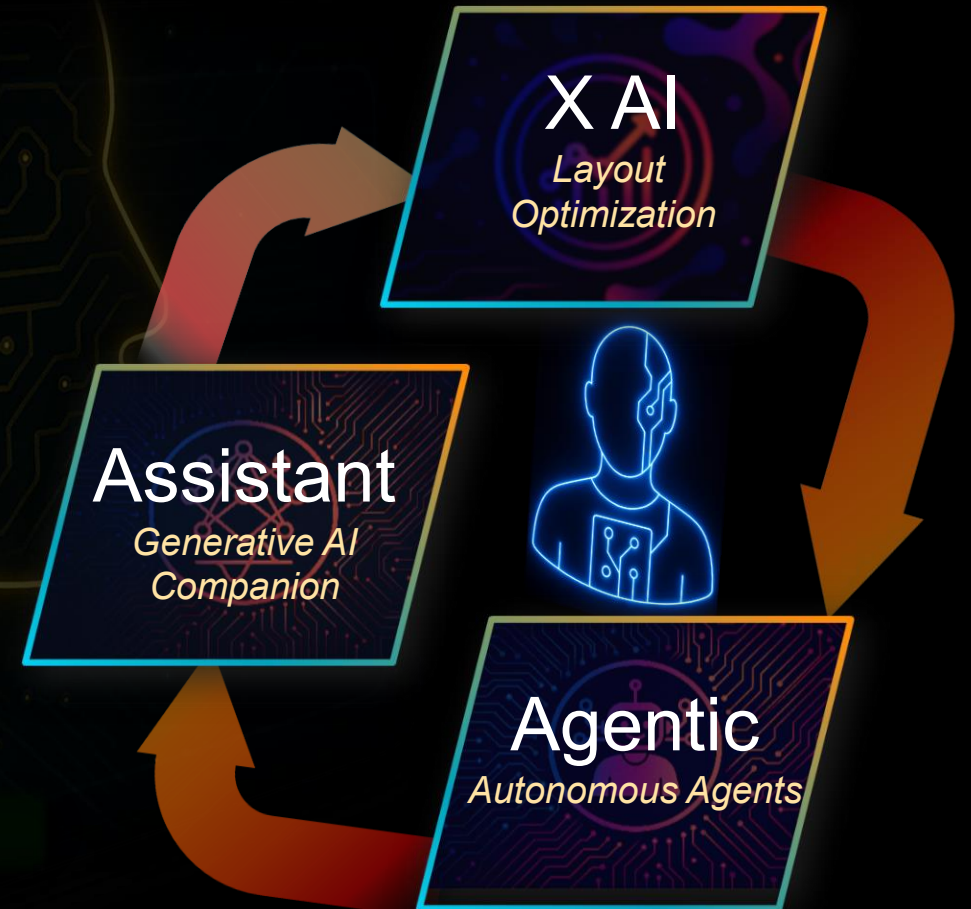
Regenerate layout for new enclosure, minimize
layers...



10-layer board created satisfying all constraints

Generate layout to comply with DFM rules for alternate mfg
line...

*Layout updated & compliant with manufacturing
options*



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Agentic AI | Allegro X Agentic Evolution

Natural Language Search

- Search and edit properties settings, variables, APIs, and Help

AI IP Reuse

- Search for similar sub-circuit reuse

Q1'26

Q2'26

Late 26

LLM/RAG Script Generation

- Assisted Symbol Generation
- Assisted Schematic Completion

Workflow Recommendation System

- Setup
- Auto-interactive Placement

- Optimize BOM Cost
- Constraint Automation
- Circuit Debug assisted by AI
- Assisted System Design Flows
- Agentic AI Workflows: DRC, DFx

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Allegro X Agentic Evolution



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