Quicktake

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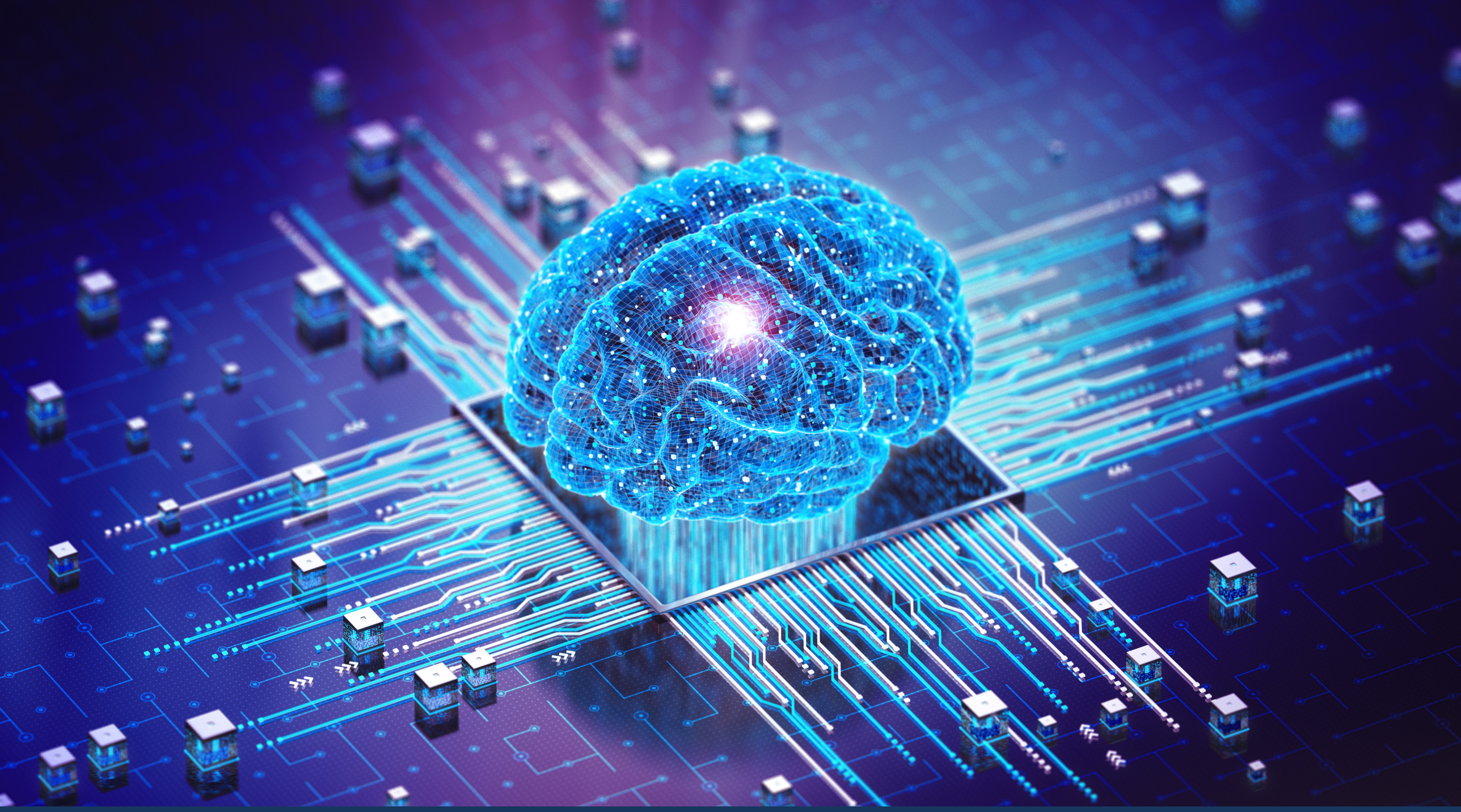


Building a National LLM

Key design choices and considerations

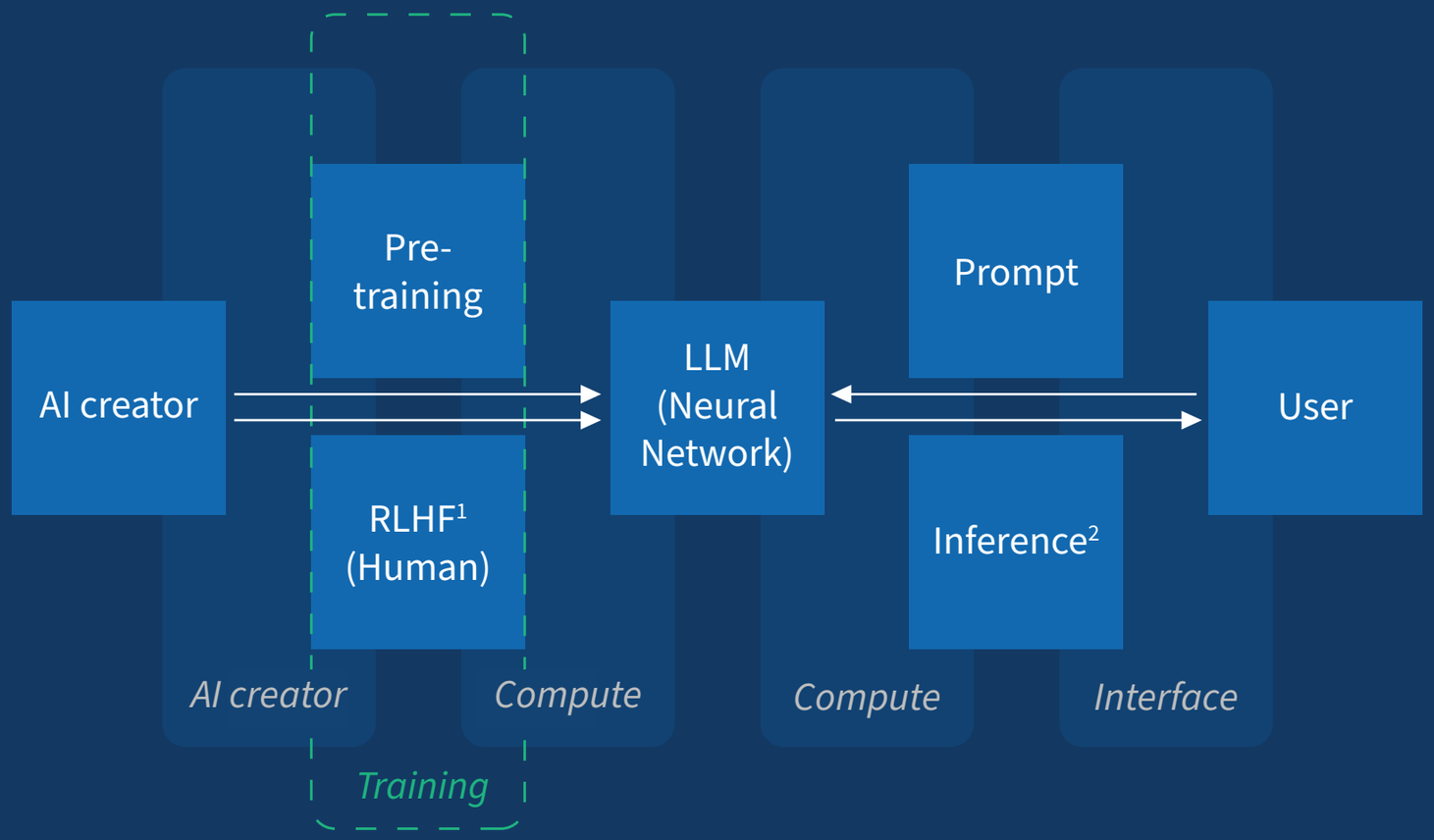
LLMs are making advanced capabilities accessible to the public with a variety of use cases

WHAT ARE LLMS?

Large Language Models (LLMs) can generate human-like text, supporting **summarization, creative writing** and other use cases

LLMs **use billions/trillions of parameters** to capture **complex language patterns,** revolutionizing fields such as **virtual assistants** and **content creation**

Their **widespread adoption is reshaping natural language processing (NLP)** and **AI,** making advanced capabilities **accessible to the public**



KEY LLM USE CASES

Text generation
Crafting high-quality content such as articles, stories, and business reports

Content summarization
Condensing long documents or articles into concise, key-point summaries

AI assistants (e.g., chatbots)
Providing automated responses for customer support or internal queries

Code generation
Automating programming tasks by generating code snippets or full scripts

Sentiment analysis
Analyzing text to determine emotional tone. e.g., as social media monitoring

Language translation
Converting text from one language to another with contextual accuracy

Notes: [1] RLHF = reinforcement learning from human feedback; [2] The process of generating new data or predictions based on the model's learned patterns
Sources: IBM. "Artificial Intelligence (AI)." IBM.com, Stanford Institute for Human-Centered Artificial Intelligence. The AI Index Report 2024, FTI Delta

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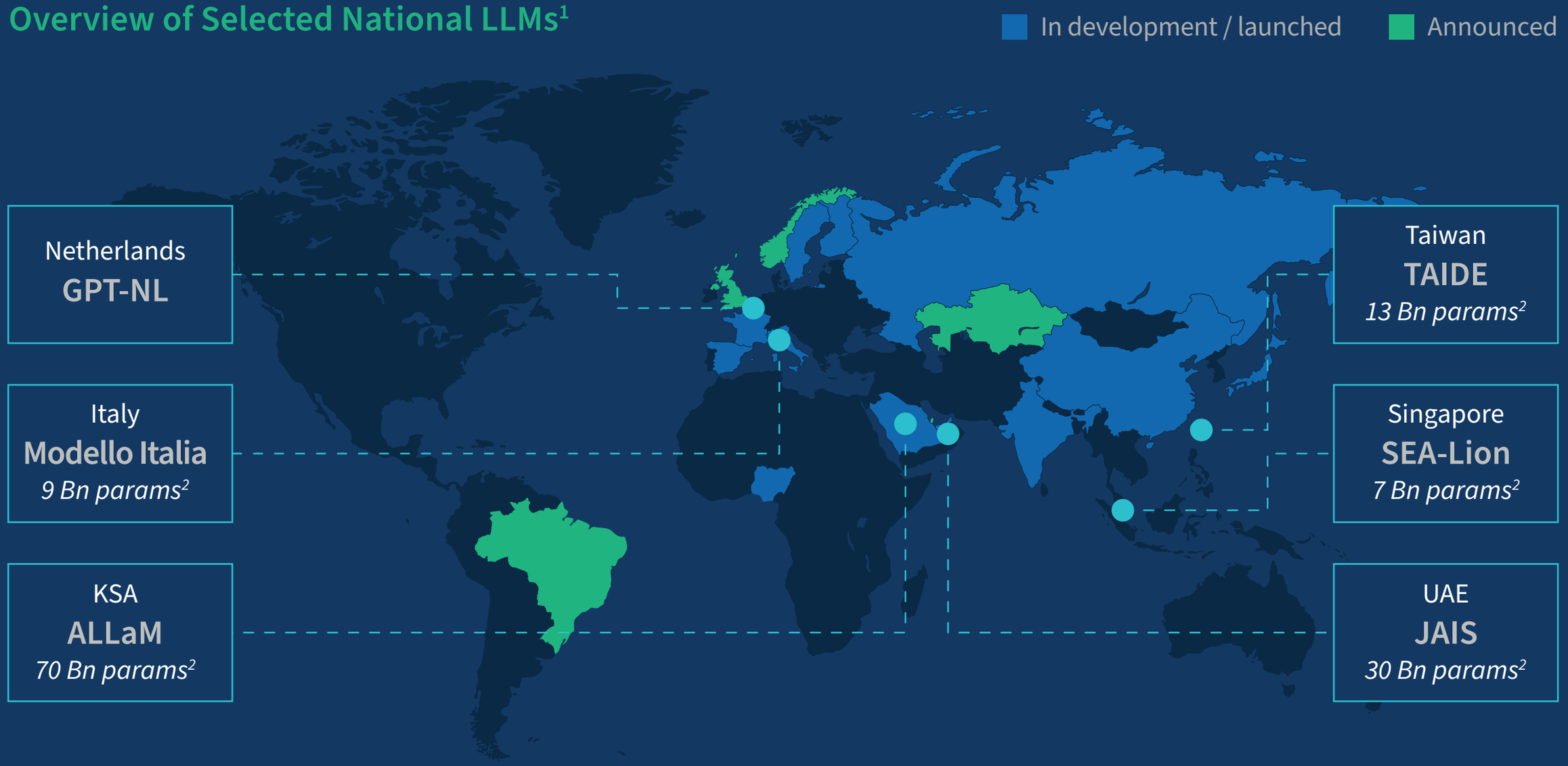
Efforts to create national LLMs have proliferated globally

Overview of Selected National LLMs[1]



25+ National LLMs identified globally across **15+** countries

National LLMs reflect the linguistic, cultural, legal and social aspects of a nation

National LLMs **compete directly** with **established private-sector LLMs** (e.g., OpenAI)

1 National LLMs serve similar use cases to other LLMs, but reflect local language, culture, and laws, supporting government applications and ensuring data sovereignty
2 Parameters in LLMs refer to the number of adjustable weights within the model that determine its ability to generate accurate and contextually relevant responses. A larger number of parameters typically implies higher potential performance and greater complexity, but also increased computational requirements and costs.
Source: FTI Delta

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There are three objectives common to national LLMs

Deep-dive next

1

Cultural and linguistic contextualization

Adapting AI models to reflect the unique cultural, linguistic and societal nuances of a nation

2

Data sovereignty and security

Ensuring control over sensitive data while maintaining compliance with local regulations

3

Socioeconomic contribution and local capability development

Leveraging AI to foster local expertise, address national challenges, improve services and develop a thriving local AI economy

Source: FTI Delta

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Data is a key differentiator for national LLMs

DISTINCTIVE FEATURES OF NATIONAL LLMs

Data Sovereignty	Country-specific training data (e.g., government databases, private archives…) , inaccessible to other LLMs, can provide a **competitive advantage on cultural/dialect contextualization**
Low Latency	Edge computing/local compute infrastructure **reduces latency** (the delay before a transfer of data begins following an instruction), providing an advantage over non-local LLMs
Enhanced Security	**Keeping full control of data within national borders** and adhering to local data governance can improve privacy and user data security
Public Sector Support	**Public sector** bodies **can be** mandated[1] or **encouraged to make preferential use** of the national LLM, **guaranteeing public sector demand**

KEY QUESTIONS BEFORE BUILDING A NATIONAL LLM

What is the current level of data digitization, and what actions need to be taken to address the challenges associated with low-resource languages?

Note: [1] Enforcement of such a mandate remains a practical challenge, given LLMs are often embedded in software solutions
Source: FTI Delta

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National LLMs can deliver four key socioeconomic benefits

SOCIOECONOMIC IMPACT OF A NATIONAL LLM

A	B	C	D
Drives efficiency and economic growth	**Builds Gen AI champions**	**Develops local AI talent**	**Boosts net exports**
Promotes economic growth from direct GDP impact via investments and indirect GDP impact via LLM usage in the broader economy	Serves as the **cornerstone of the AI ecosystem** that local firms can leverage to become national AI champions	Builds **data science and ML expertise** with local linguistic and cultural capabilities	Enables **development of exportable use cases** and reduces dependency on foreign LLMs

Source: FTI Delta

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Risks need to be considered when building a national LLM

MARKET	1. **No proven long-term financial business case** for LLMs yet	2. **Limited exportability potential** due to local focus	3. **Limited adoption potential outside government**, unless mandated
TECHNICAL	1. Requires **regular updates** due to rapidly developing technology	2. Depends on **sufficient local data** to ensure market differentiation	
RESOURCES	1. Ongoing **funding or gov't spend commitment** required	2. **Cost overruns may occur** due to development and update requirements	3. **Talent shortages** may affect operations and scalability

Source: FTI Delta

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Developing a National Foundational LLM[1] enables AI ecosystem growth, providing broader public access

ARCHETYPE 1 DESIGN CHOICE

Design choice

STAGE 0
Objectives

Defined Objectives / Use Cases

STAGE 1
Model Selection

1	2	3
Existing "off-the-shelf" model	Task-specific LLM	"New" founda-tional LLM

STAGE 2[2]
Applications / Customization

A	B	C	D
RAG[3]	Fine-tuning	RAFT (Fine-tuning RAG)	Agent RAG/RAFT

LEVEL OF COMPLEXITY

Description

Foundational model built for access for broader public

Benefits

- High level of contextualization
- Broad availability

Disadvantages

- Continuous funding requirements
- Commercial viability dependent on private sector uptake

Applicability

Larger economies aiming to stimulate (private) AI ecosystem

[1] Refers to a Large Language Model that serves as a general-purpose platform for various applications, being tailored to the specific linguistic, cultural, and societal needs of a particular country; [2] Applications to be built by third parties or as part of a separate effort; [3] Retrieval-augmented generation — model that combines information retrieval techniques (e.g., access to specific data) with text generation to answer queries.

Source: FTI Delta

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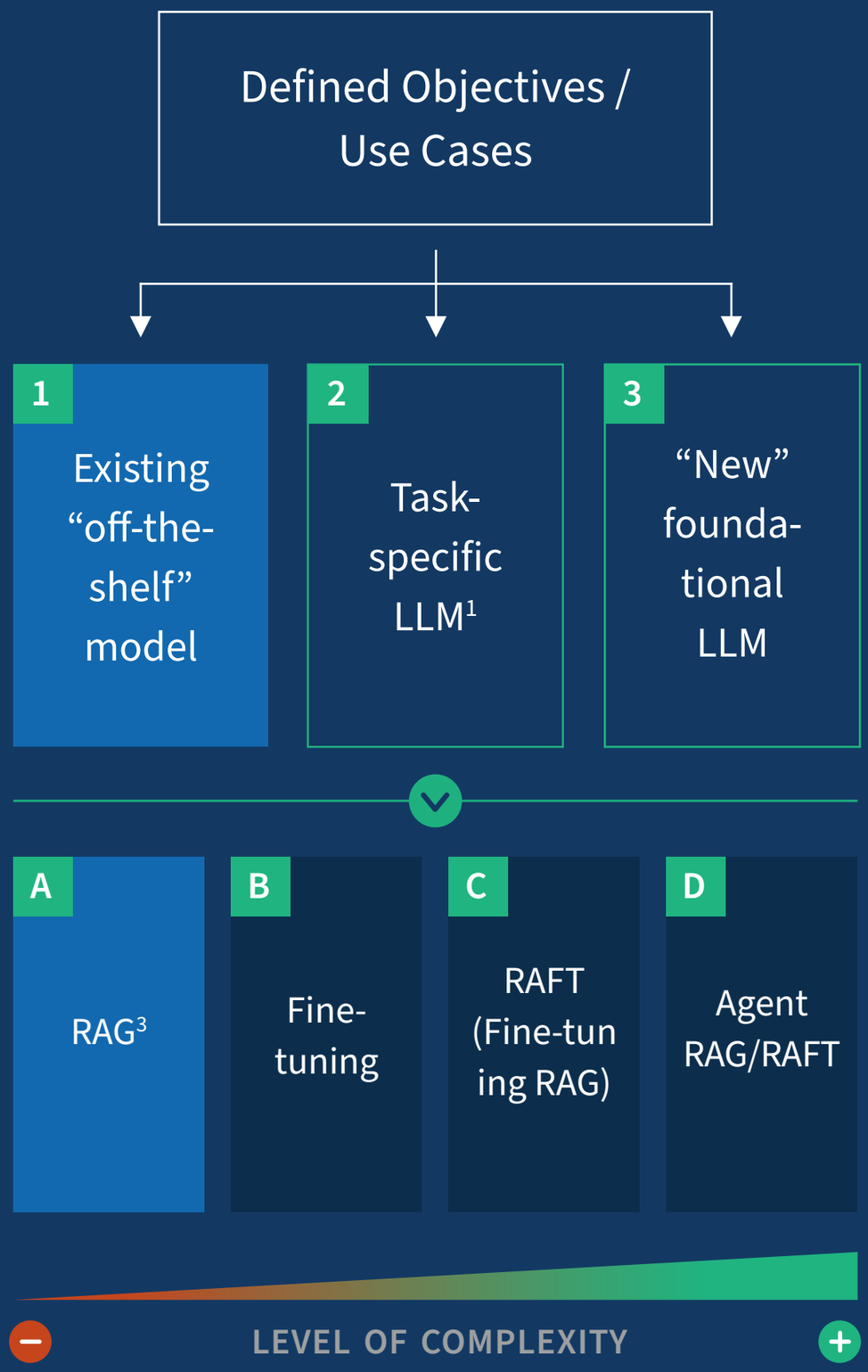
Developing a simple RAG layer on off-the-shelf models can meet targeted gov't objectives at significantly lower costs

Design choice

ARCHETYPE 2 DESIGN CHOICE



Description

RAG[2] layer integrating local data for specific government use cases

Benefits

- Fast development/ implementation
- Low CAPEX

Disadvantages

- Limited use cases
- Weak response to national LLM objectives

Applicability

Smaller economies with specific government needs (use cases)

[1] Archetype not covered as part of this publication, as only 2 examples were selected as deepdives; contact the authors to learn more about task-specific LLMs and other potential archetypes/design choices.; [2] Applications to be built by third parties or as part of a separate effort; [3] Retrieval-augmented generation — model that combines information retrieval techniques (e.g., access to specific data) with text generation to answer queries.

Source: FTI Delta

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Defined archetypes for national LLMs meet common objectives to varying degrees

Alignment with objectives: Low High

OBJETIVES	ARCHETYPES: NATIONAL FOUNDATIONAL LLM	ARCHETYPES: RAG LAYER ON TOP OF EXISTING LLM
1. **Cultural and linguistic contextualization**	Comprehensive local data can ensure cultural and linguistic context	Limited contextual accuracy due to targeted model scope/limited data
2. **Data sovereignty and security**	Local training and hosting dependent on sufficient in-country GPU capacity[1]	Minimal computing resources required for full local data processing
3. **Socioeconomic contribution and local capability development**	Elevated GDP, jobs and FDI impact, as LLM can be broadly used	Lower GDP, jobs and FDI impact given targeted applications

[1] If sufficient in-country computing resources are available to fully train and host the model locally, full alignment with objective can be achieved.

Source: IBM, OpenAI, Meta, Google AI, Stanford University HAI, AI Index Report, FTI Delta

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In conclusion, there are three key learnings from best-in-class national LLMs

1

Select the most appropriate LLM model based on clear targets and objectives, as different models are better suited to different objectives

2

Leveraging established regional or global foundational models can significantly reduce upfront investment

3

Continuous government funding may be necessary to regularly update and enhance a national LLM, as financial viability based on private sector demand remains uncertain

Source: FTI Delta

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Reach out to our tech experts to learn more about how FTI Delta can help

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