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AI for Network Ops

Hype or Real?

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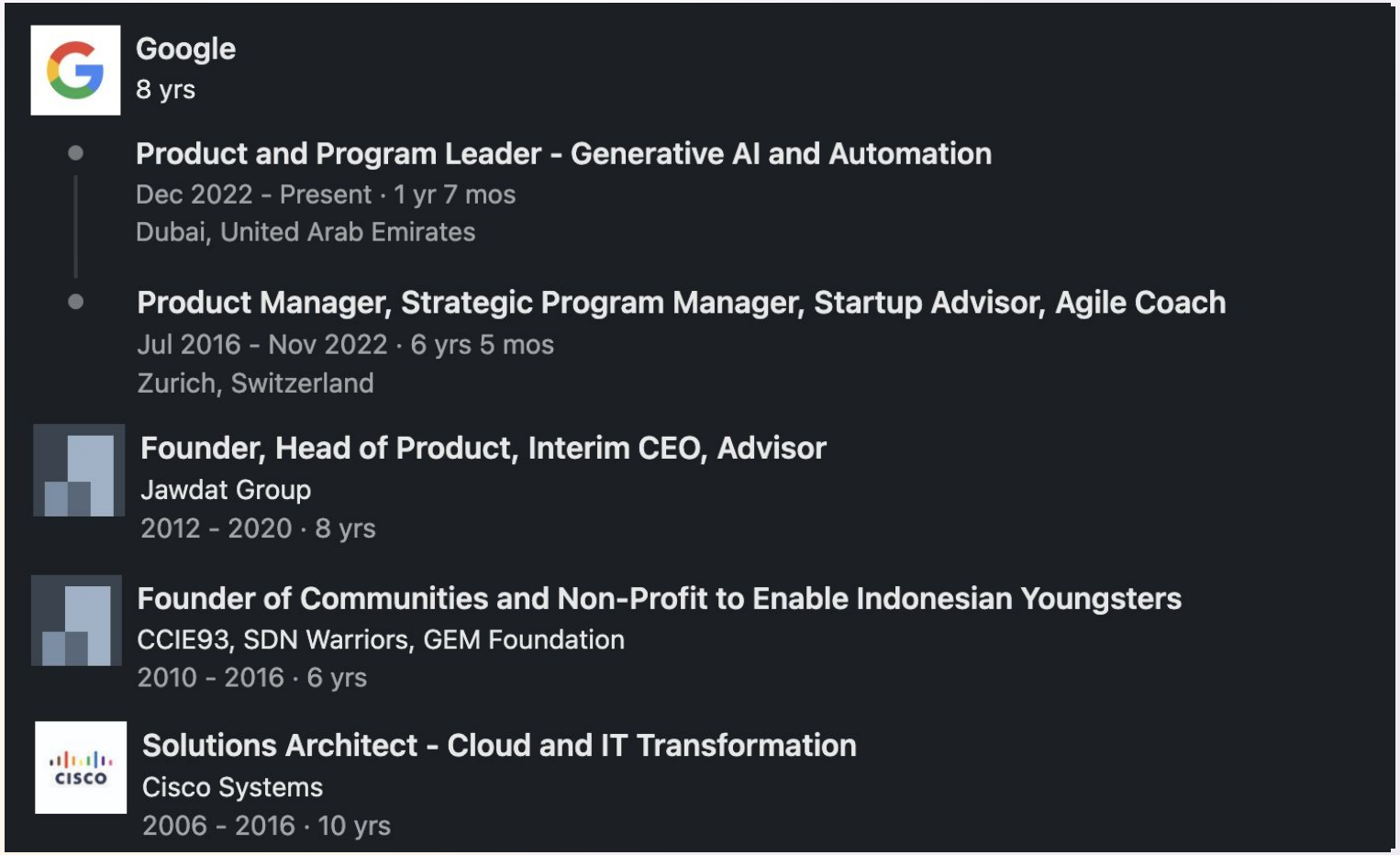
28 June 2024

Speaker Introduction



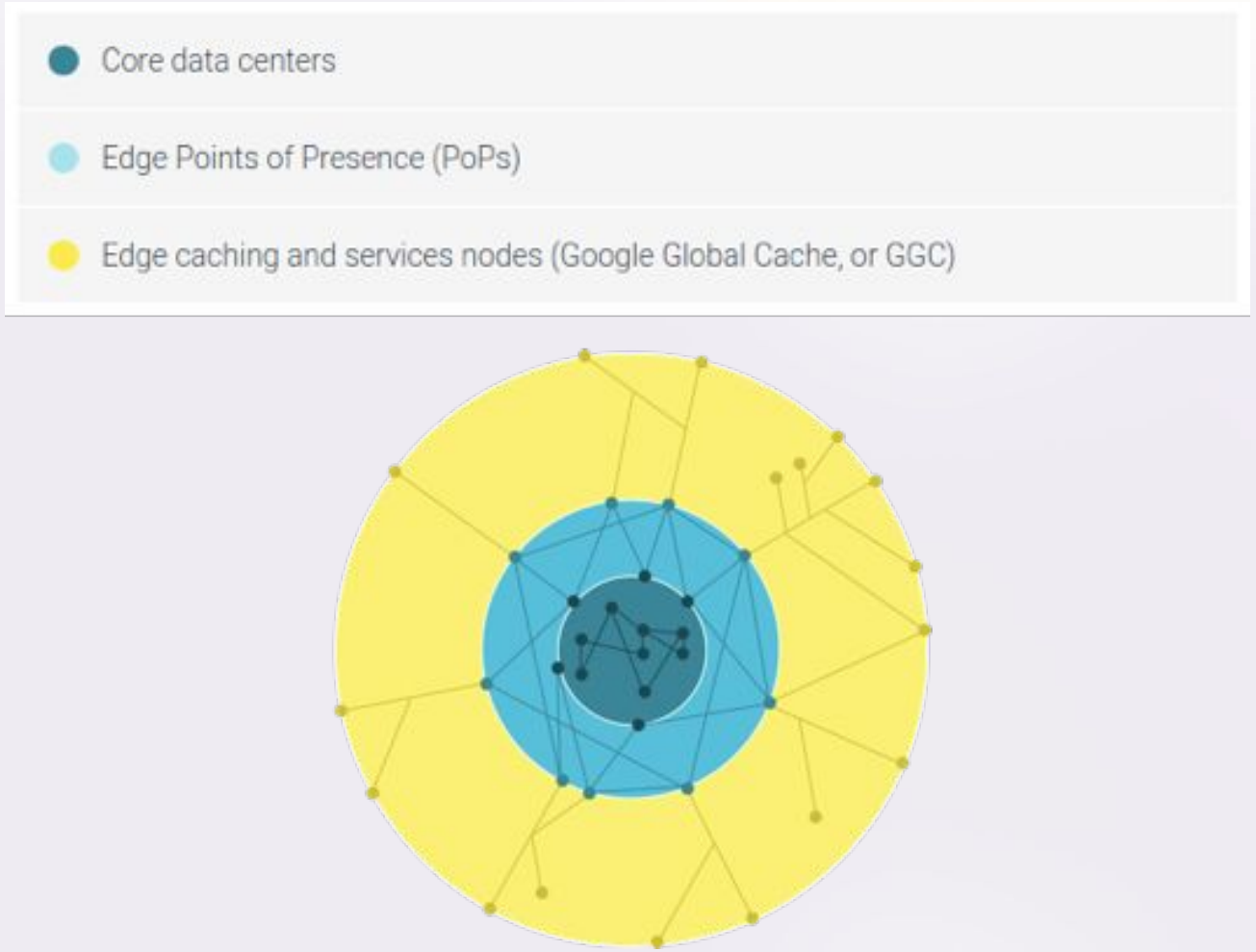
https://www.linkedin.com/in/himawan/

Google Peering

What
Peering is the direct interconnection between Google's network and another network to support the exchange of traffic.

Why
Networks peer to gain some combination of economic, performance and traffic control benefits.

How
Submit request via isp.google.com/iwantpeering for Peering (Public Peering IX, Private Peering PNI, IPv6 Addition to PNI), GGCs, ISP Portal Access. SMS/Voice, Cloud, Other



https://peering.google.com/#/infrastructure

What We Wish AI Can Help

Peering Request Before AI

An ASN emails peering@google.com → Human does analysis of ticket and responds.

Peering Request With AI

An ASN emails peering@google.com

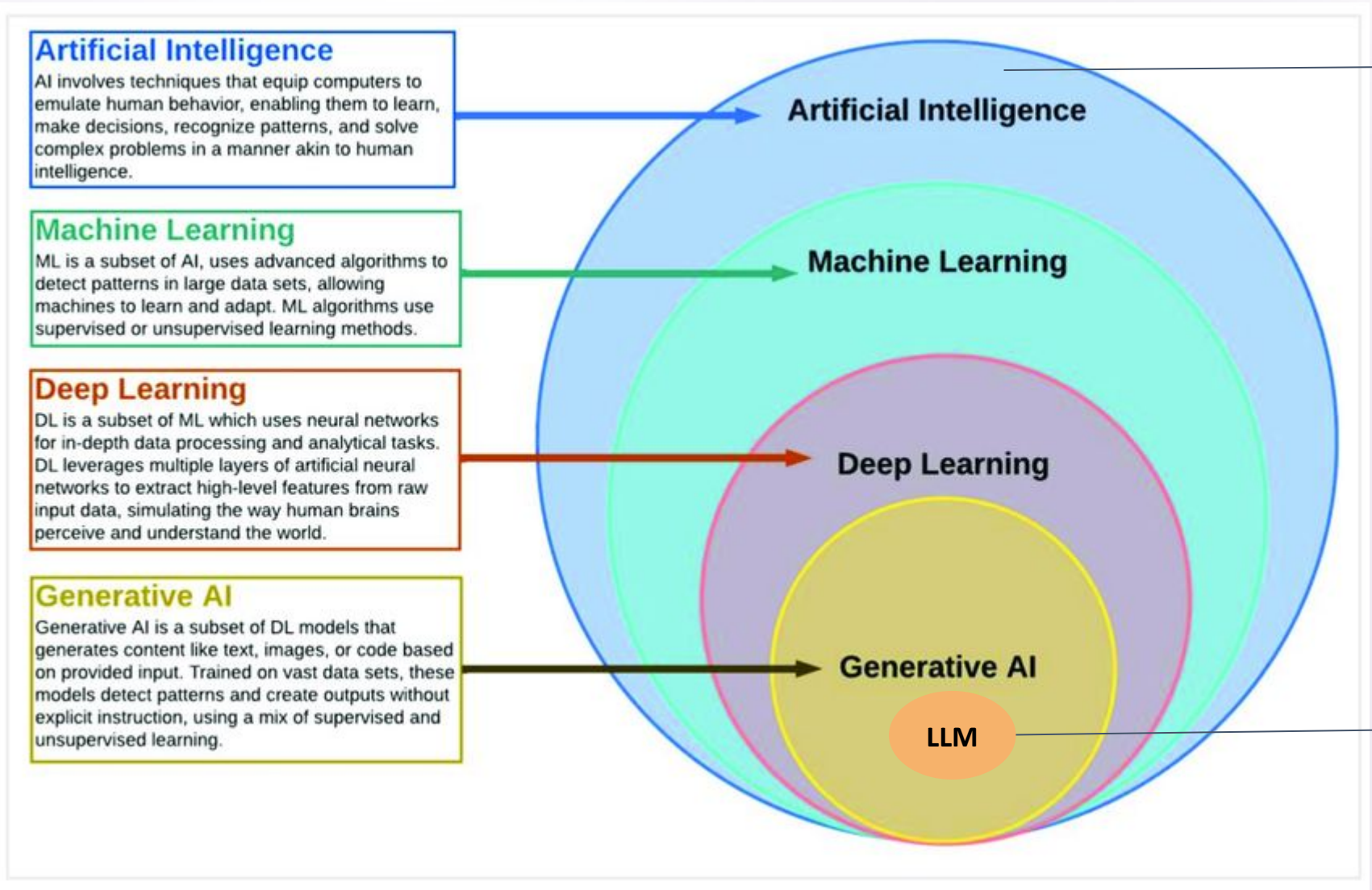
What is AI Anyway?

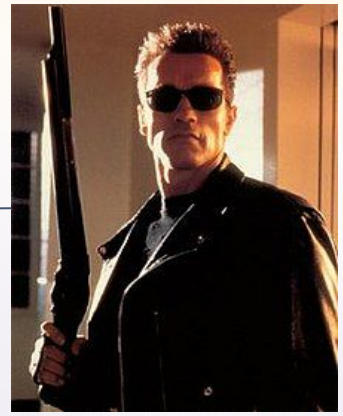
Artificial Intelligence
AI involves techniques that equip computers to emulate human behavior, enabling them to learn, make decisions, recognize patterns, and solve complex problems in a manner akin to human intelligence.

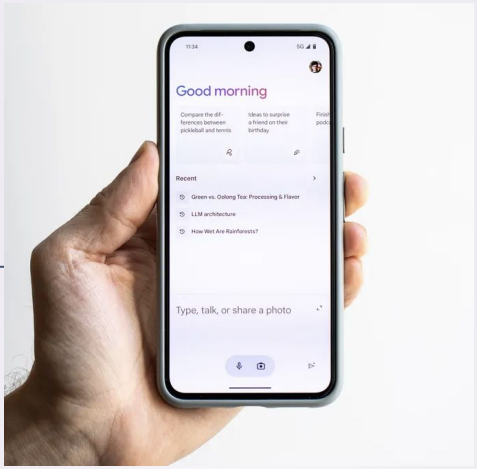
Machine Learning
ML is a subset of AI, uses advanced algorithms to detect patterns in large data sets, allowing machines to learn and adapt. ML algorithms use supervised or unsupervised learning methods.

Deep Learning
DL is a subset of ML which uses neural networks for in-depth data processing and analytical tasks. DL leverages multiple layers of artificial neural networks to extract high-level features from raw input data, simulating the way human brains perceive and understand the world.

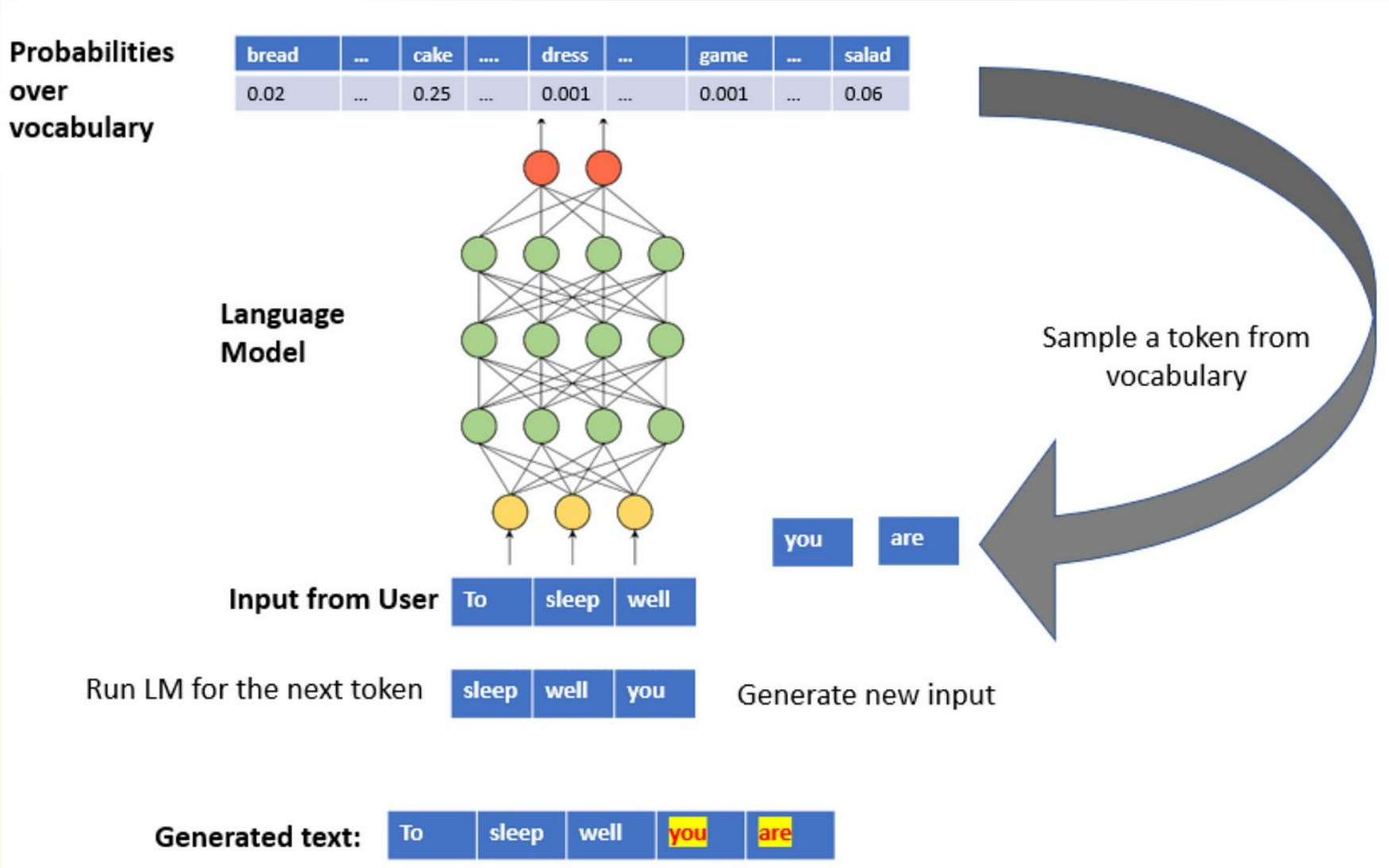
Generative AI
Generative AI is a subset of DL models that generates content like text, images, or code based on provided input. Trained on vast data sets, these models detect patterns and create outputs without explicit instruction, using a mix of supervised and unsupervised learning.



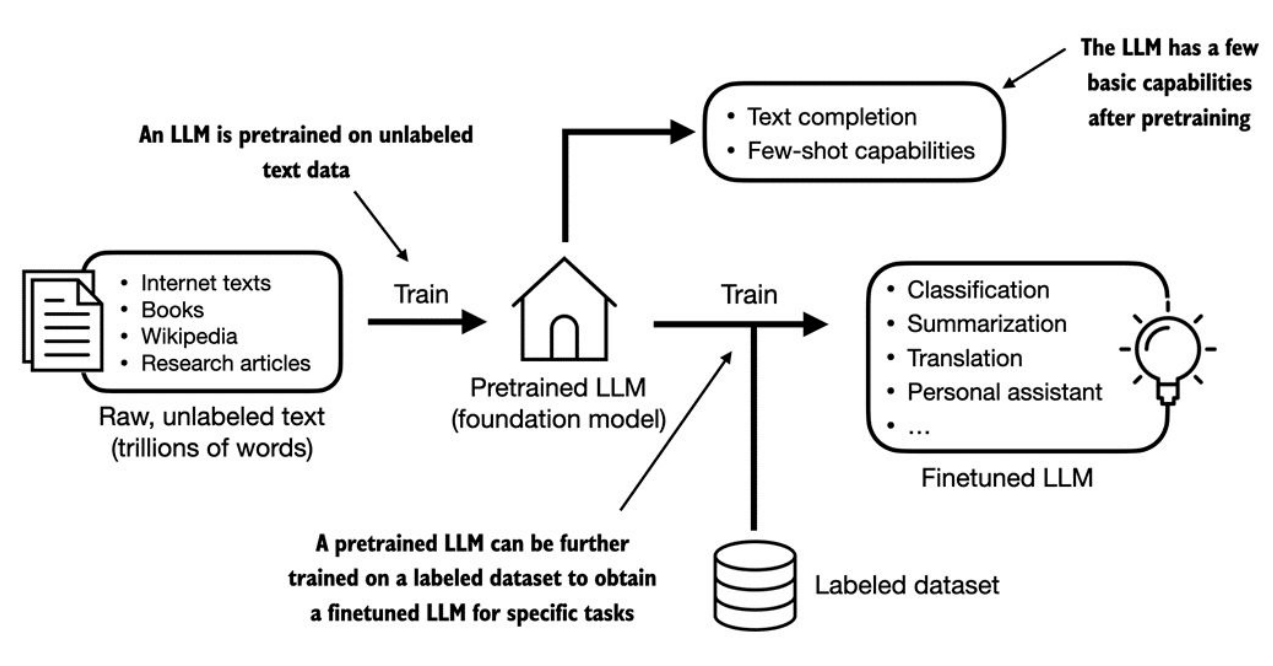


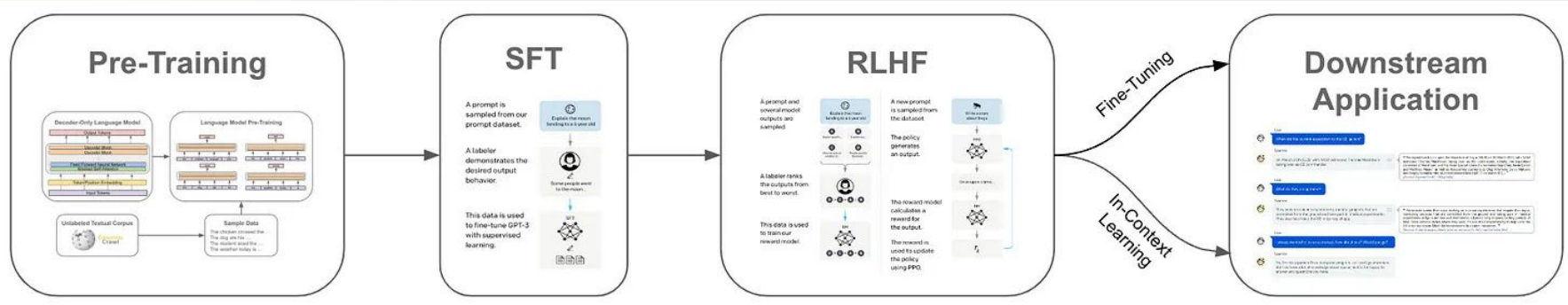


How LLM Works



How LLM is Trained





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Can AI Really Help Network Ops?

What problem are we trying to solve?

Who are the target users?

How are they solving the problem today?

What are the benefits of solving the problem?

What is the advantage of the new solution compared to the existing one?

What resources (time, persons, budget) would be required to solve the problem?

How do we define success?

And all other boring questions…

How Google Solve Peering Request Today

Peering Request Before Automation

Peering Request After Automation

Life of a Peering Request

Collect required information from the requesting network

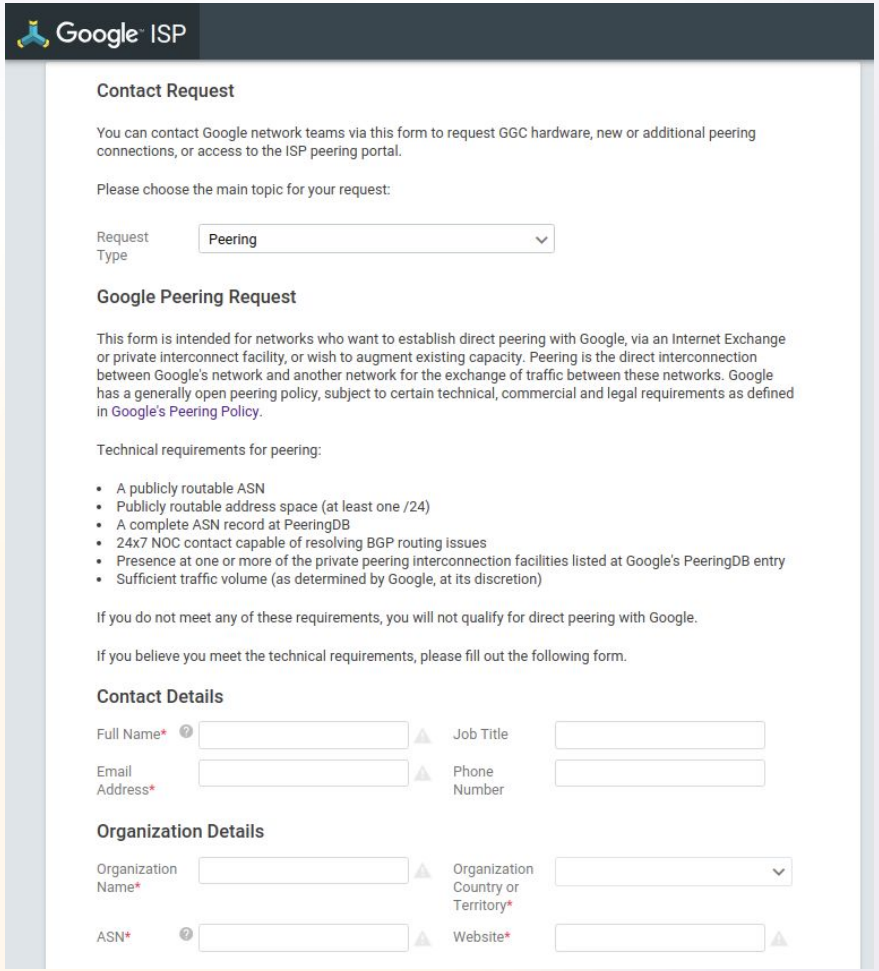
Ensure we are actually talking to a representative of the network requesting peering

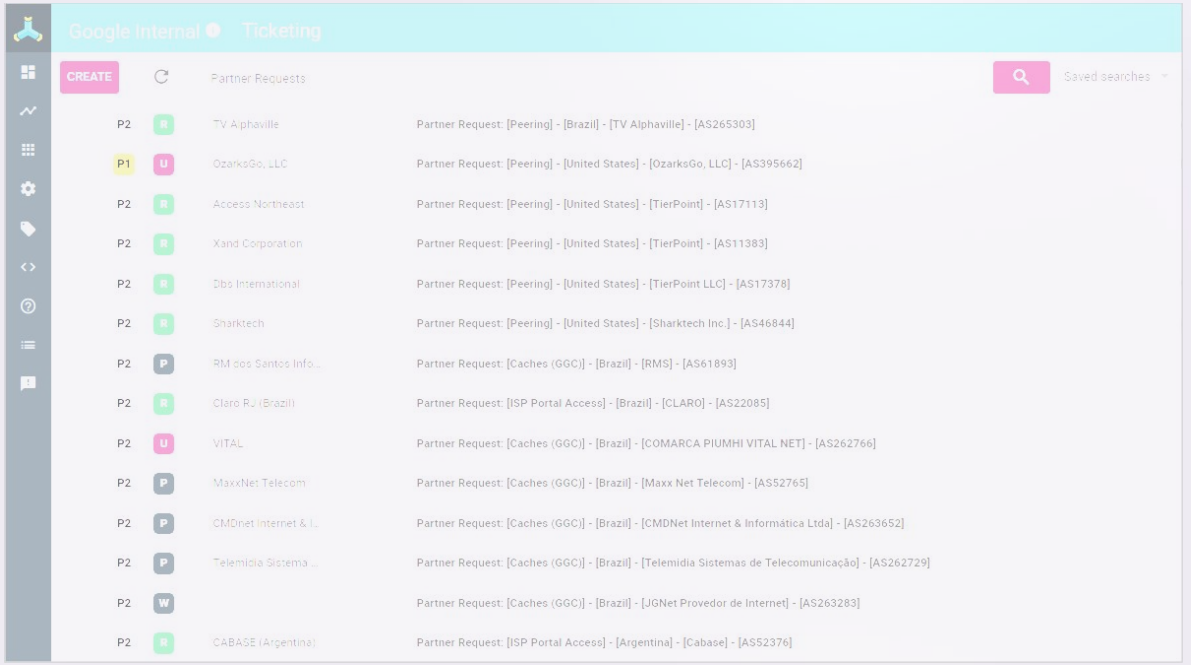
Ensure we are complying with with applicable sanctions and embargoes against select entities.

Use collected data to evaluate peering policies against the request.

Take action on the request based on the results of the previous results

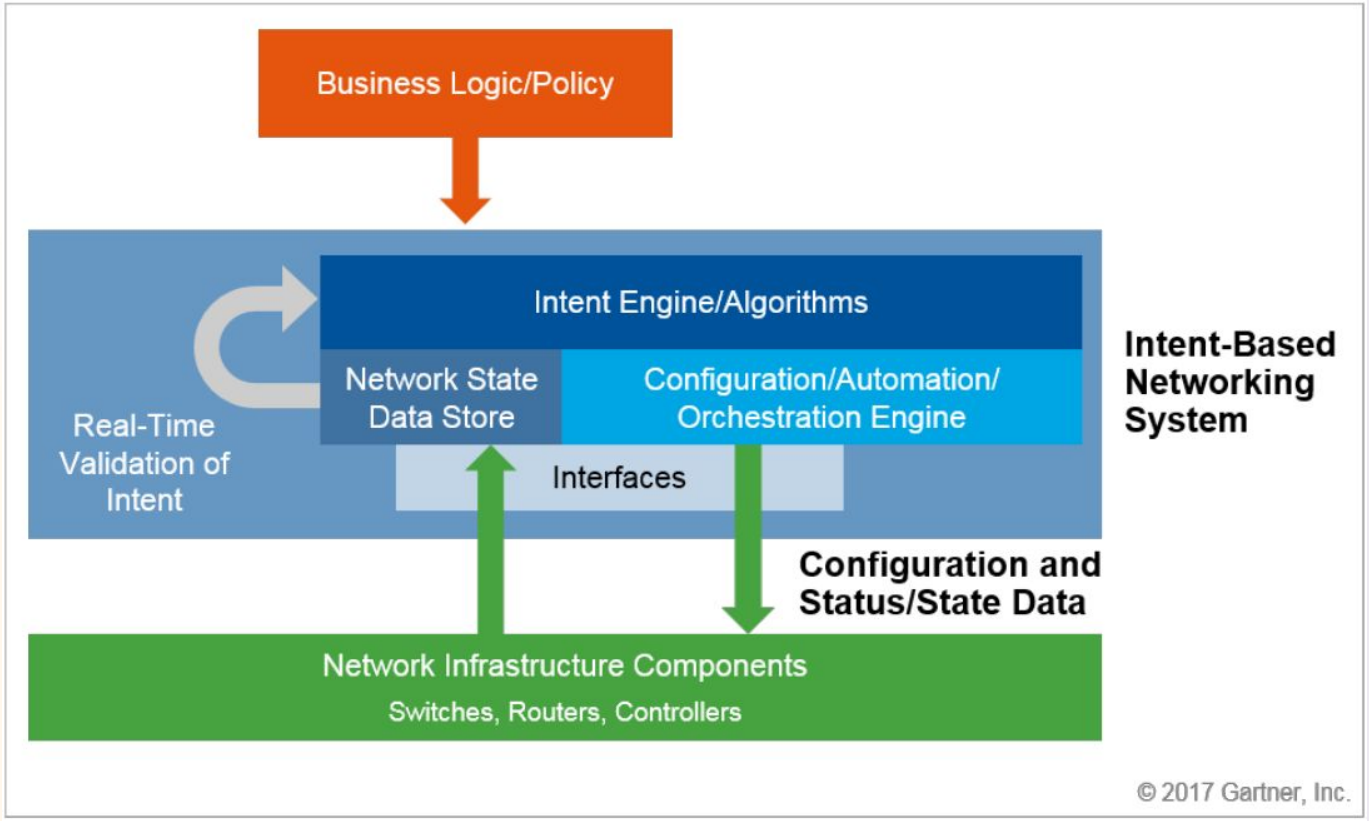
From User Input to Intent (Internal Ticket)





https://isp.google.com/iwantpeering

Intent Based Automation



Translation and Validation
Converts higher-level business policy (what) as input from end users and converts it to the necessary network configuration (how)

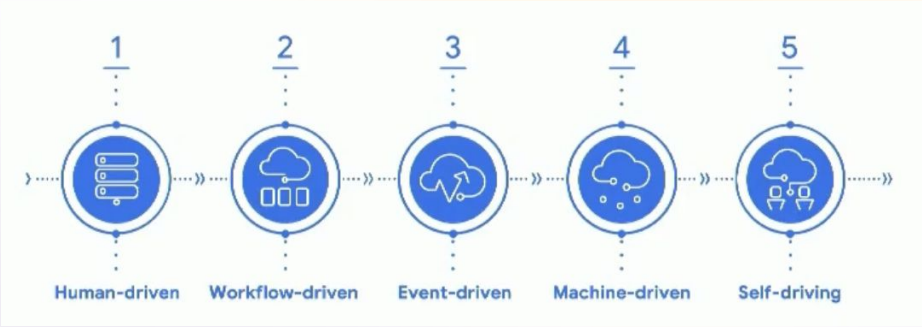
Automated Implementation
Uses network automation and/or network orchestration to configure the appropriate network changes (how) across existing network infrastructure

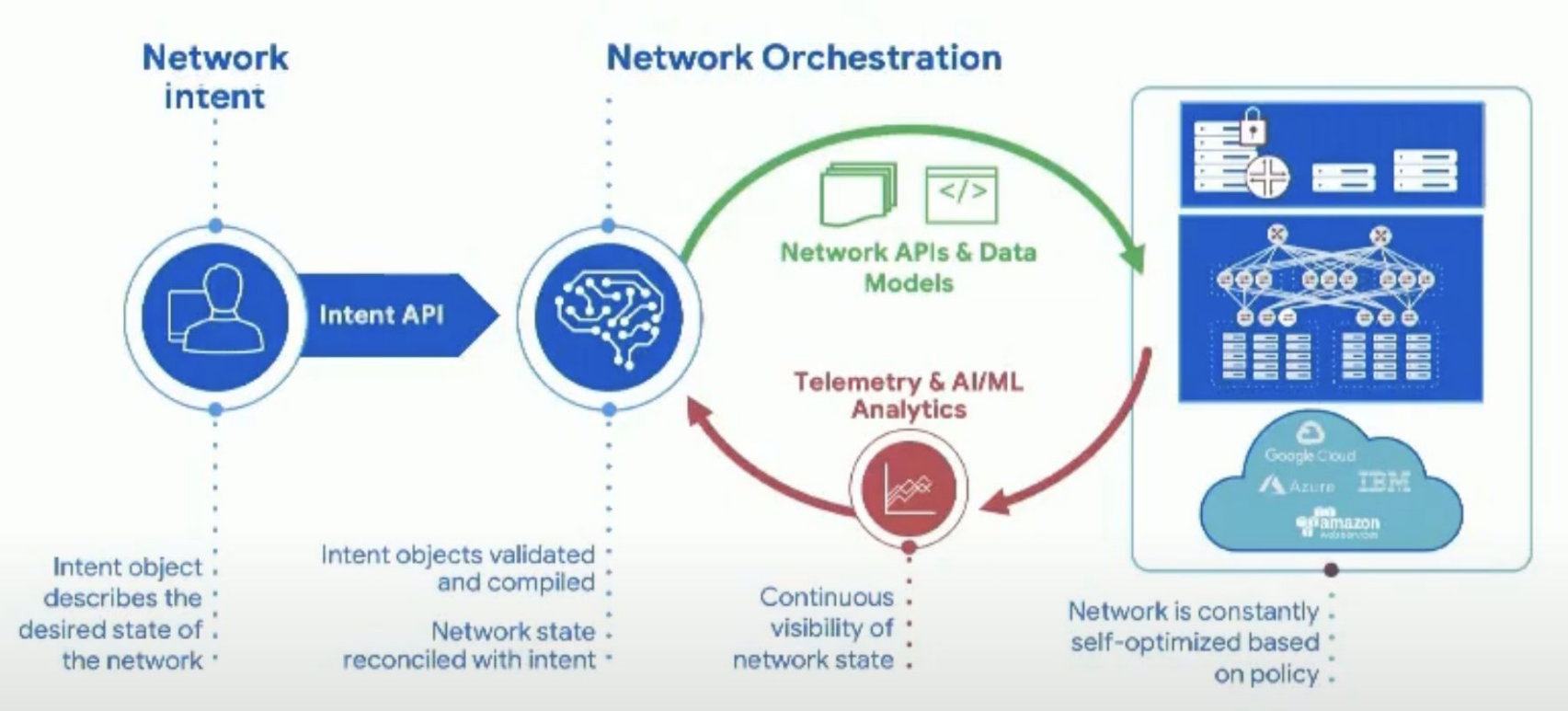
Awareness of Network State
Ingests real-time network status for systems under its administrative control, and is protocol- and transport-agnostic

Assurance and Dynamic Optimization/Remediation
Continuously validates in real time that the original business intent is being met, and can take corrective actions when it is not met

https://datatracker.ietf.org/doc/rfc9315/

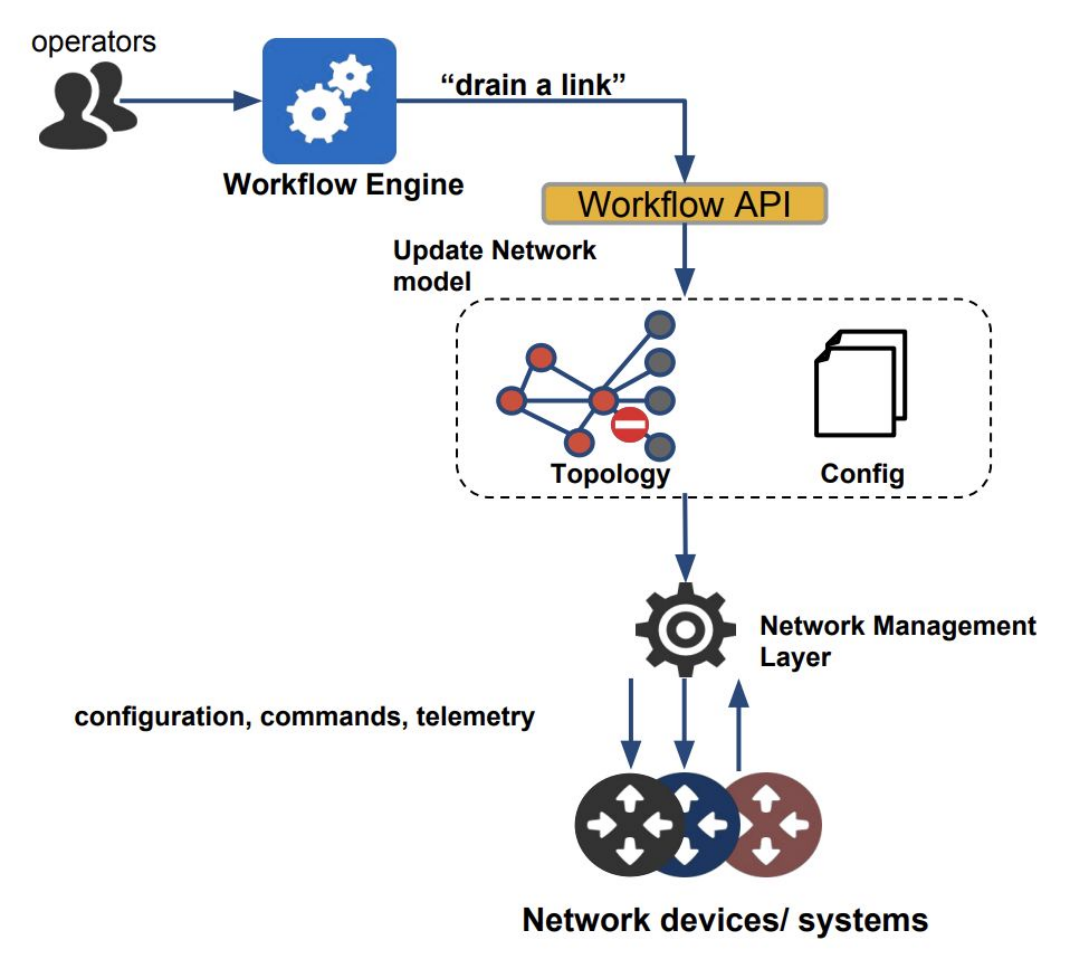
Google Networking 3.0 Vision





https://www.youtube.com/watch?v=f2Pe0SHmgyo

Google Intent Based Automation



https://static.googleusercontent.com/media/research.google.com/en//pubs/archive/45687.pdf

Workflow Engine

Workflow Engine executes a goal-seeking workflow graph. Workflows are expressed in a meta-language. All interesting metrics of execution logged. Workflows have the same test coverage as any software system

Workflow API

Workflow engine interacts with the intent-based network management infrastructure over transactional APIs. Workflow intents are expressed at the network-level, as changes to Topology, Config, Functional calls.

Network Model

OpenConfig (www.openconfig.net) for vendor-neutral configuration model. BGP, MPLS, ISIS, L2, Optical-transport, ACL, policy. "Unified Network Model" is Protocol Buffer based Google internal schema for topology describes all layer-0/1/2/3

Network Management Services

Compose full config (vendor-neutral and vendor-specific) from topology/config intent update. Provides secure transport of full config to network elements (OpenConfig+gRPC). Enforce Operational Policies

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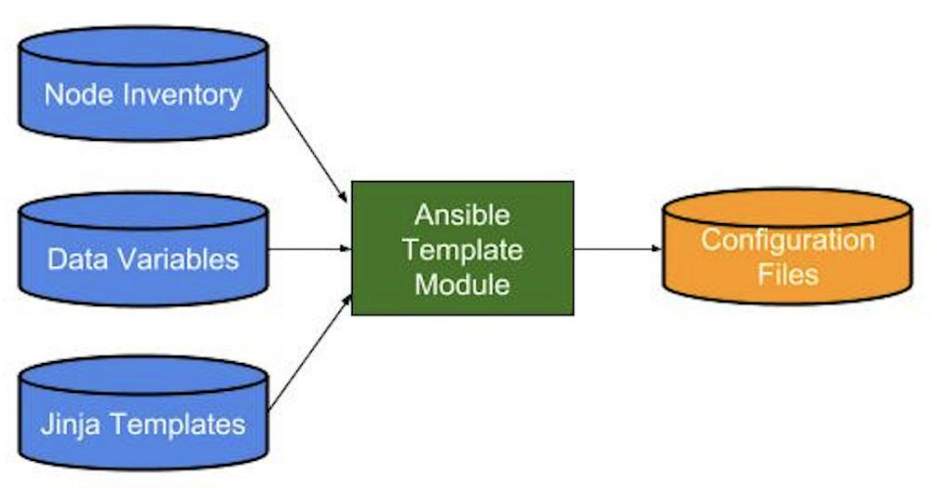
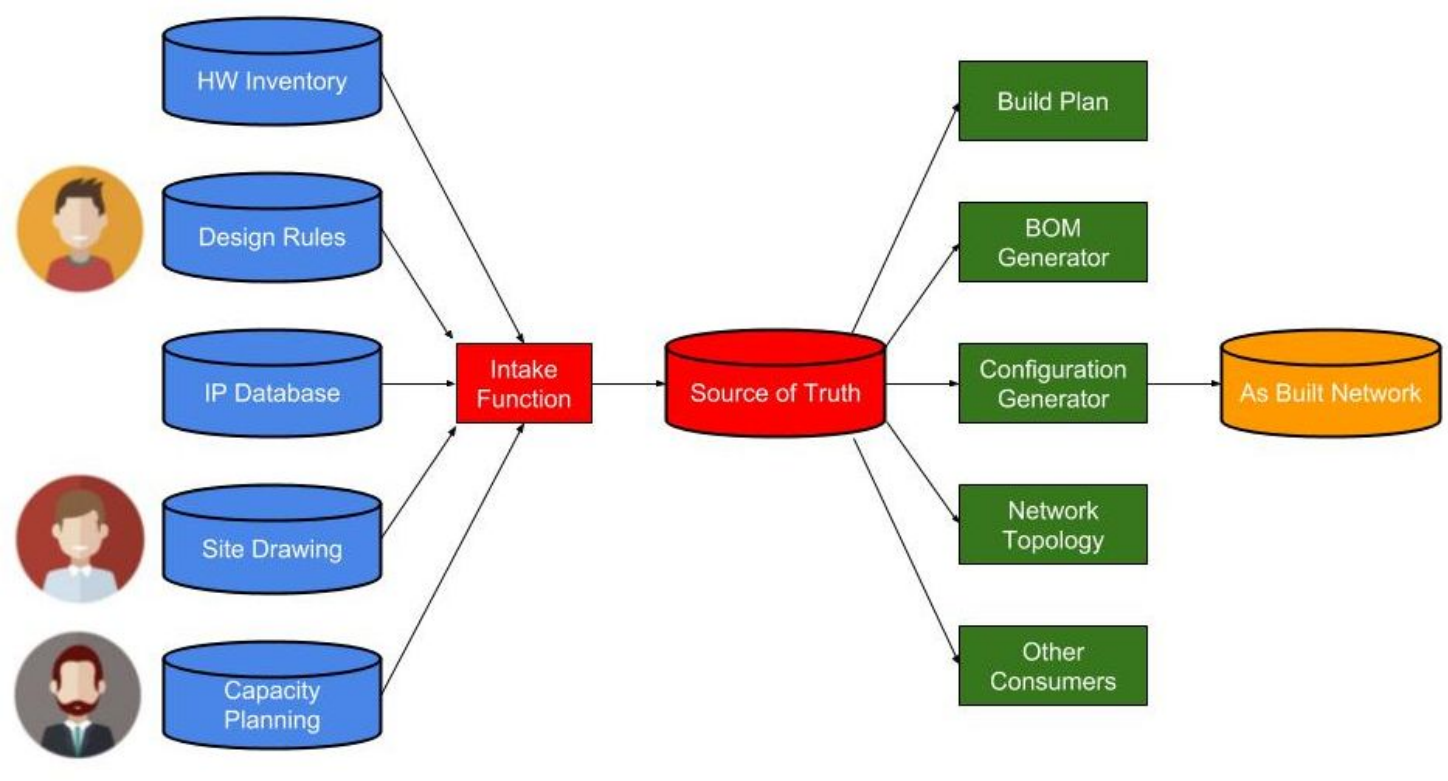
Automation Can Start Simple





https://brokenpipes.blogspot.com/2018/03/source-of-truth.html

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AI for Network Ops: Hype or Real?

Understand problem we are trying to solve

Understand the target users

Understand how we are solving the problem today

Identify parts of problem that provide the most benefit

Verify if automation can solve the problem

Identify requirement to enable automation

Start small

Next: Find where (Gen) AI can help with automation

Realize it will not be “plug and play” (Prepare data set, select model, perform fine tuning etc.)

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Questions?

Let’s Build It.

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"We Transform Dreamers to Builders"

Coming Soon