IRTF PRESENTATION

SPAN-AI ARCHITECTURE ROLLOUT

V 1.0

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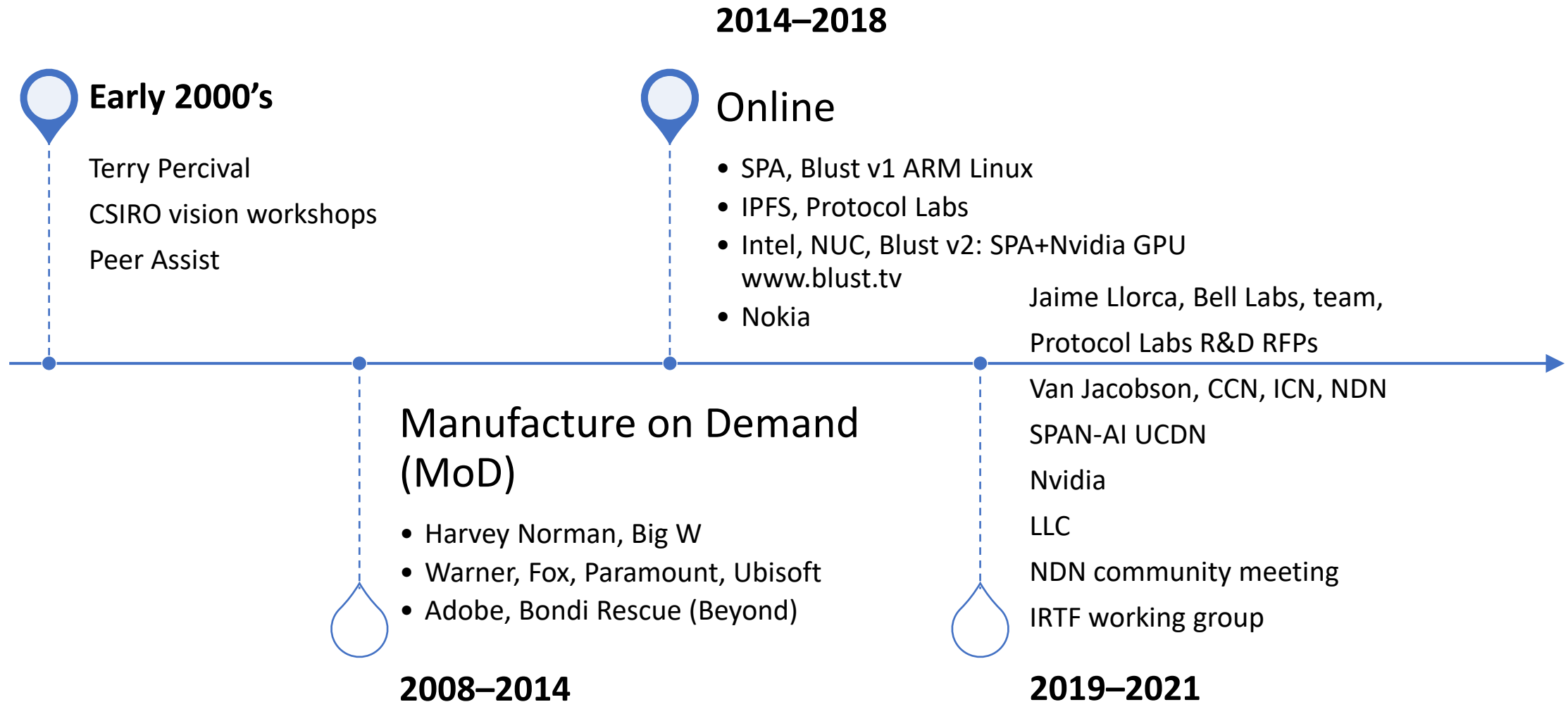
Jaime Llorca – head of R&D, modelling and optimisation

https://gtsystems.io/

GT Systems Mission

- To research, design and build next generation network technology that ensures the continued optimal operation of the Internet on earth and in space

- To ensure that all those who do that receive a fair return for their efforts, contribution and intellectual property

- To ensure that the Internet remains fair, open and available to all, at fair cost

- To partner with whoever enables us to do that most effectively without compromising our mission

- To fund Internet research and long term "search" that no-one else will fund

HISTORY – 15 years of privately funded collaborative research

2014–2018

Early 2000's

Terry Percival

CSIRO vision workshops

Peer Assist

Online

- SPA, Blust v1 ARM Linux
- IPFS, Protocol Labs
- Intel, NUC, Blust v2: SPA+Nvidia GPU
  www.blust.tv
- Nokia

Jaime Llorca, Bell Labs, team,

Protocol Labs R&D RFPs

Van Jacobson, CCN, ICN, NDN

SPAN-AI UCDN

Nvidia

LLC

NDN community meeting

IRTF working group

Manufacture on Demand (MoD)

- Harvey Norman, Big W
- Warner, Fox, Paramount, Ubisoft
- Adobe, Bondi Rescue (Beyond)

2008–2014

2019–2021

Evolution of the SPAN-AI UCDN

- We set out to fix ABR buffering and SWoD
- CSIRO Peer Assist (BitTorrent patent application)
- OTT distribution systems
- Secure Peer Assist
  - Ingest, "slice", tag with hash or other efficient DBM
  - Route (content based)
  - Intelligent, optimised
  - Peer to peer with "super-pops"
- IPFS is the implementation of our distributed file system BUT
  - Doesn't scale for distribution; name resolution only; location agnostic
- ICN/CCN/NDN is the implementation of our distributed content delivery system
  - Name based routing but no distributed storage

- SPAN-AI combines all and adds
  - HARD – hybrid adaptive routing design
  - Unified naming and addressing – open to discussion!
  - Location (virtual, physical)
  - Multi-cast
  - Fully distributed
  - Elastic
  - Local and global optimisation
  - Sovereign identity and data
- The network is becoming the cloud

GT Systems build next gen, unified, global CDNs as a service (ngCDNaaS) aka "Distributed Cloud"

- Fully distributed (beyond peer to peer)

- Elastic (virtual)

- Content based

- Intelligent (local and global AI/ML)

- Autonomous

- Self-optimising

- Cheaper

- Faster

- Closer to the edge/consumer

- Open and interoperable

- Compatible with TCP/IP

- Virtual services provisioned *anywhere*

- Publish *once* to the network with QoS parameters. The *network* takes care of storage and distribution.

- ## The network *is* the cloud™ (which *is* the computer)
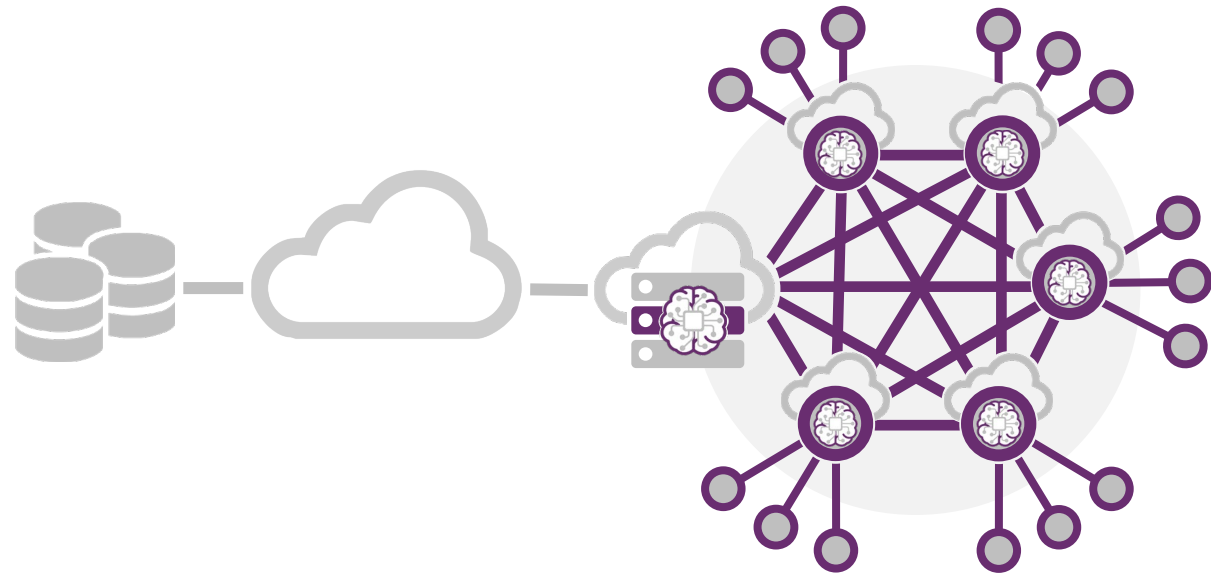
Security – we built the world's first open, Wintel, P2P appliance approved by Hollywood – www.blust.tv

- Content encrypted at source/rest

- DRM

- Hardware root of trust

- Trustless distribution

- Proofs
  - SpaceTime (storage – done Plabs)
  - Routing
  - Green power

- Data centric security

- Sovereign identity, sovereign data

- Content signed by publisher

- Hashed node and content IDs

- SPAN agents report capability and status in real time

- Global AI prunes rogue nodes
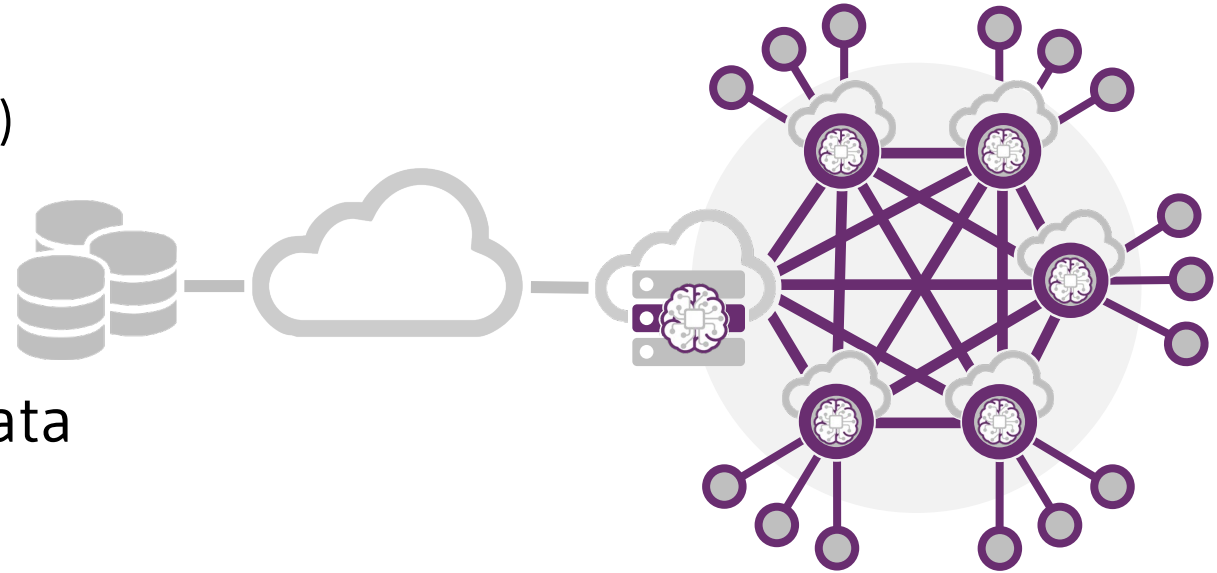
How do we work?

- Modelling and optimisation

- Design/build/handover/operate

- Licensing

- R&D

- We're looking for partners
  - Equipment vendors
  - Telcos
  - CDNs
  - Investors
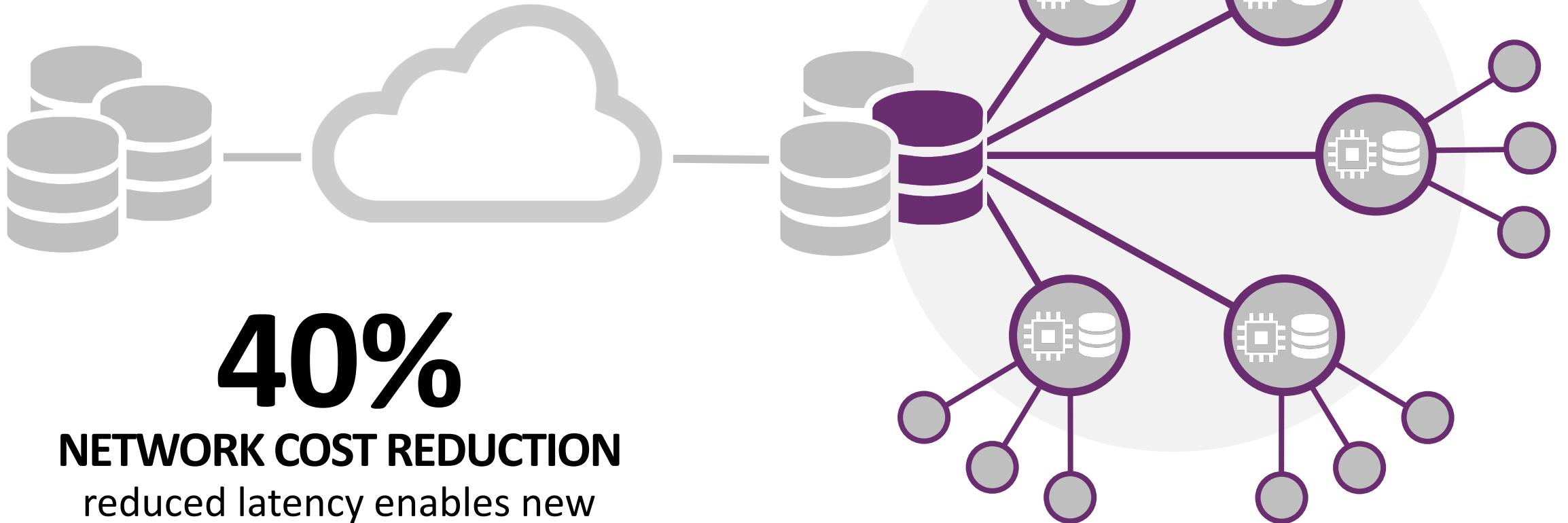 - Research organisations, distributed-network foundations
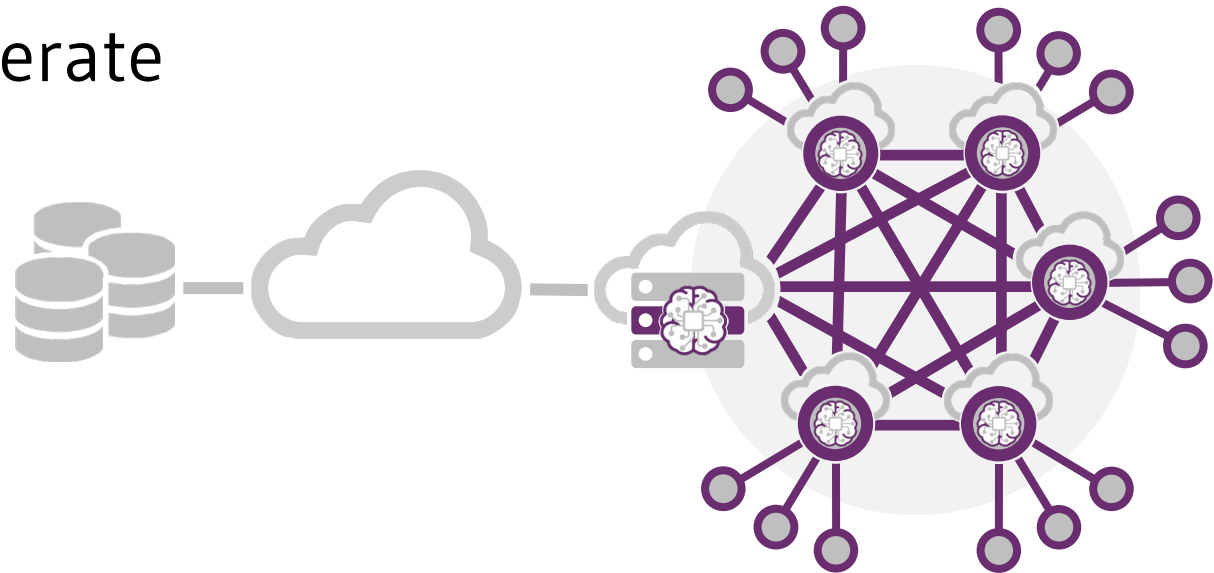
Four stages of SPAN-AI & UCDN

SPAN
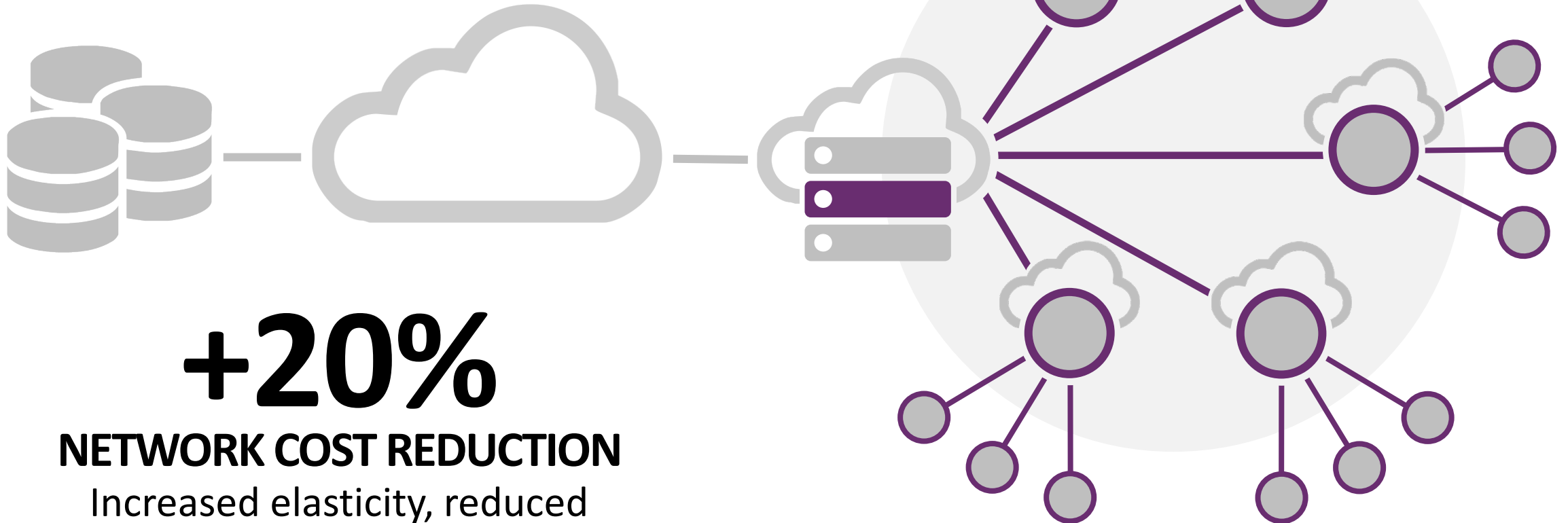
Optimised distributed network
(core-edge-peer)

40%

NETWORK COST REDUCTION

reduced latency enables new
applications

vSPAN
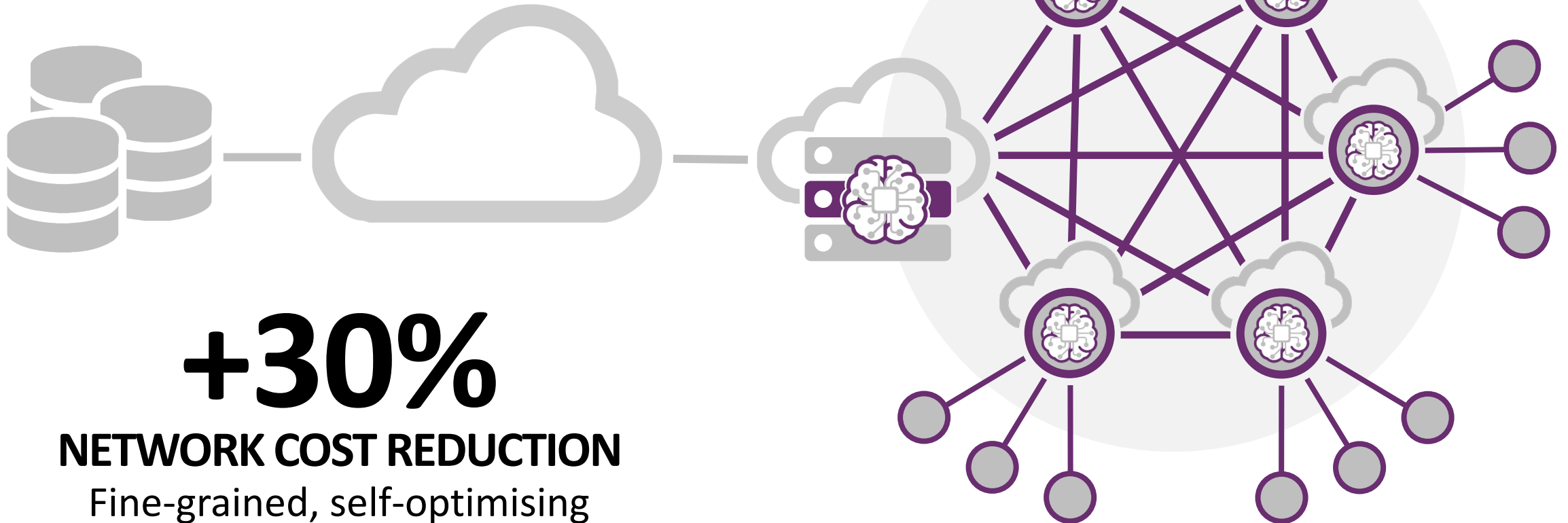Virtualised, elastic, software-defined distributed cloud network

+20%
NETWORK COST REDUCTION
Increased elasticity, reduced overprovisioning

SPAN-AI

Fully distributed cloud network mesh
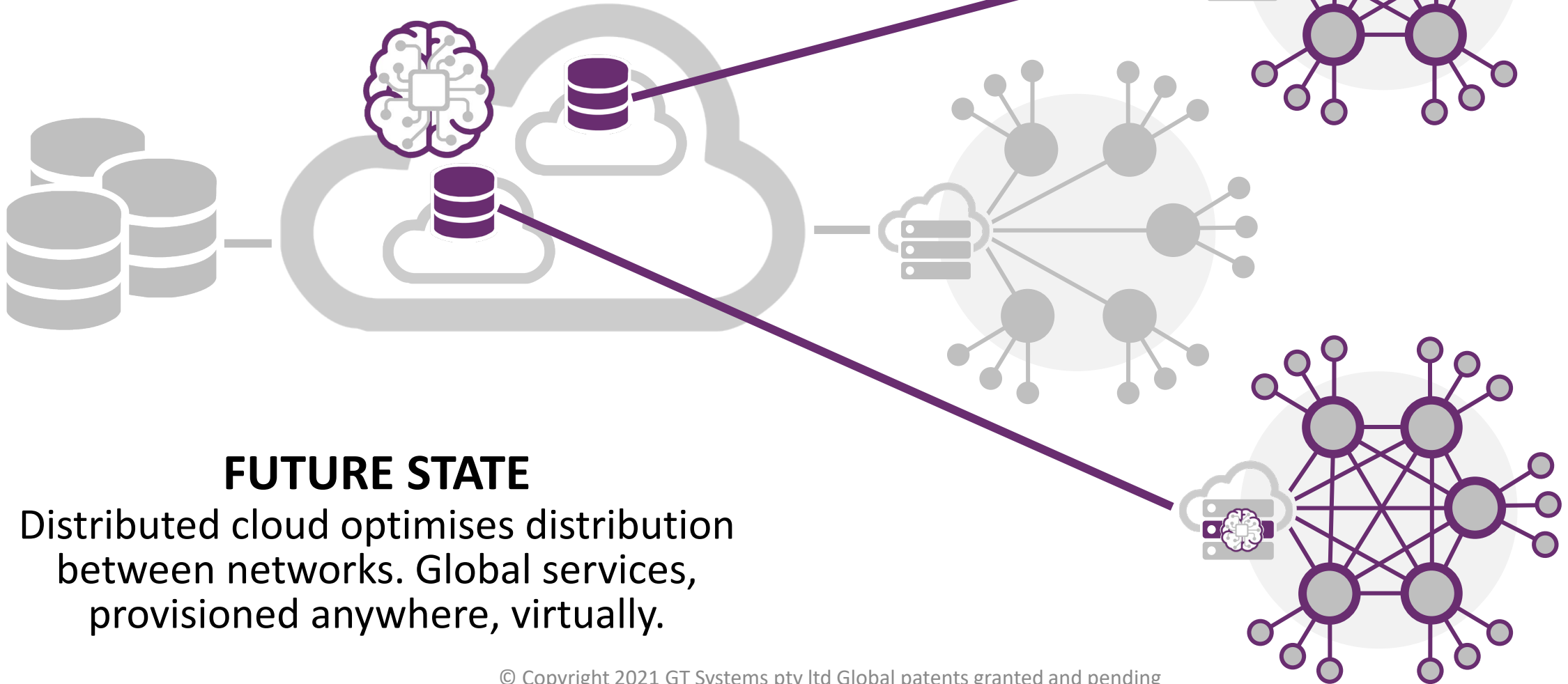AI-driven self-organization
Named Data Networking

+30%
NETWORK COST REDUCTION
Fine-grained, self-optimising
content distribution
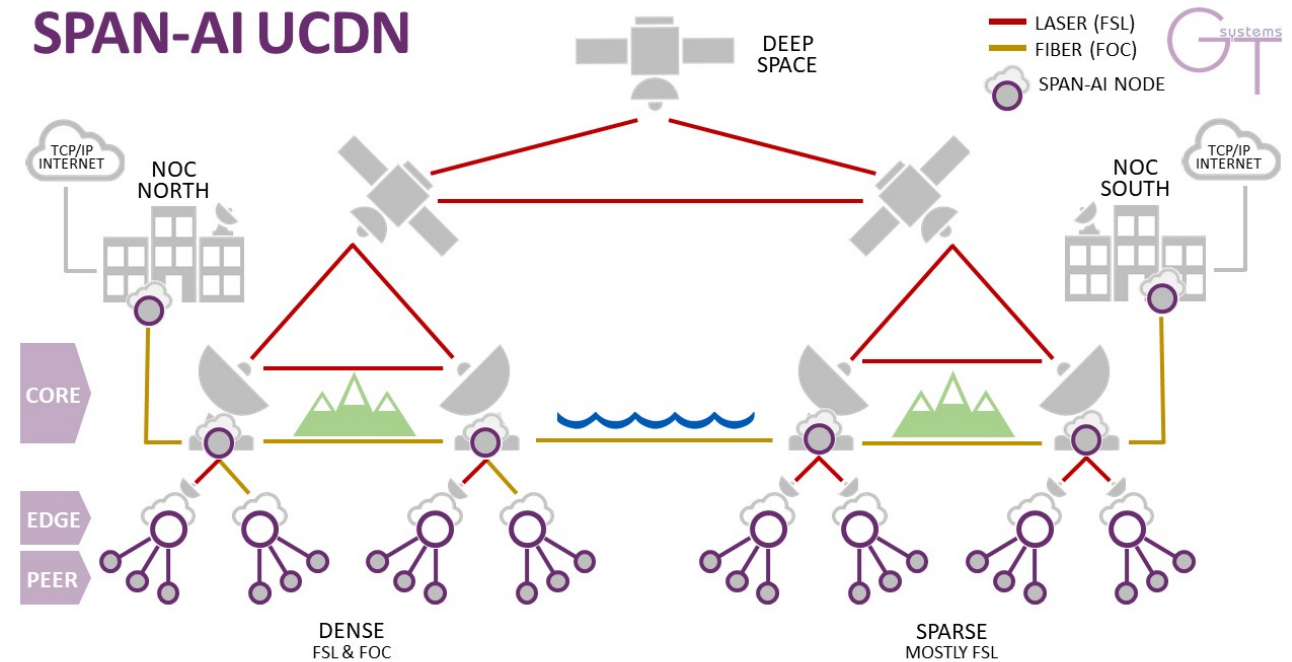
SPAN-UCDN
Universal Content Distribution Network

FUTURE STATE
Distributed cloud optimises distribution between networks. Global services, provisioned anywhere, virtually.

SPAN-AI has been chosen for a global, next generation network on earth and in space

- HALO global data network

- converged, equivalent terrestrial and satellite optical (laser) technology

- advanced, scalable and cost-effective global data distribution platform

- SPAN-AI next-generation Universal Content Distribution Network (UCDN)

- intelligent, fully distributed, elastic (virtual) network

- autonomous and self-optimising

- content based

- works alongside and is interoperable with existing networks

SPAN-AI UCDN SYSTEM

AI DEVOPS modelling; optimisation; training; distribution

INGEST

OPS

SPAN
GLOBAL OPTIMISING
AI

AI
API

ROUTE
INFO

OPTMIISNG
SCHEDULER

AI
API

ROUTE
INFO

AI NETWORK OPS

AUTONOMOUS
NODE AGENT
'SWARMS'

DISTRIBUTED
STORAGE

UNIFIED NAMING &
ADDRESSING

NAME-BASED
ROUTING

SPAN DISTRIBUTED FILE SYSTEM

SPAN-AI-HARD
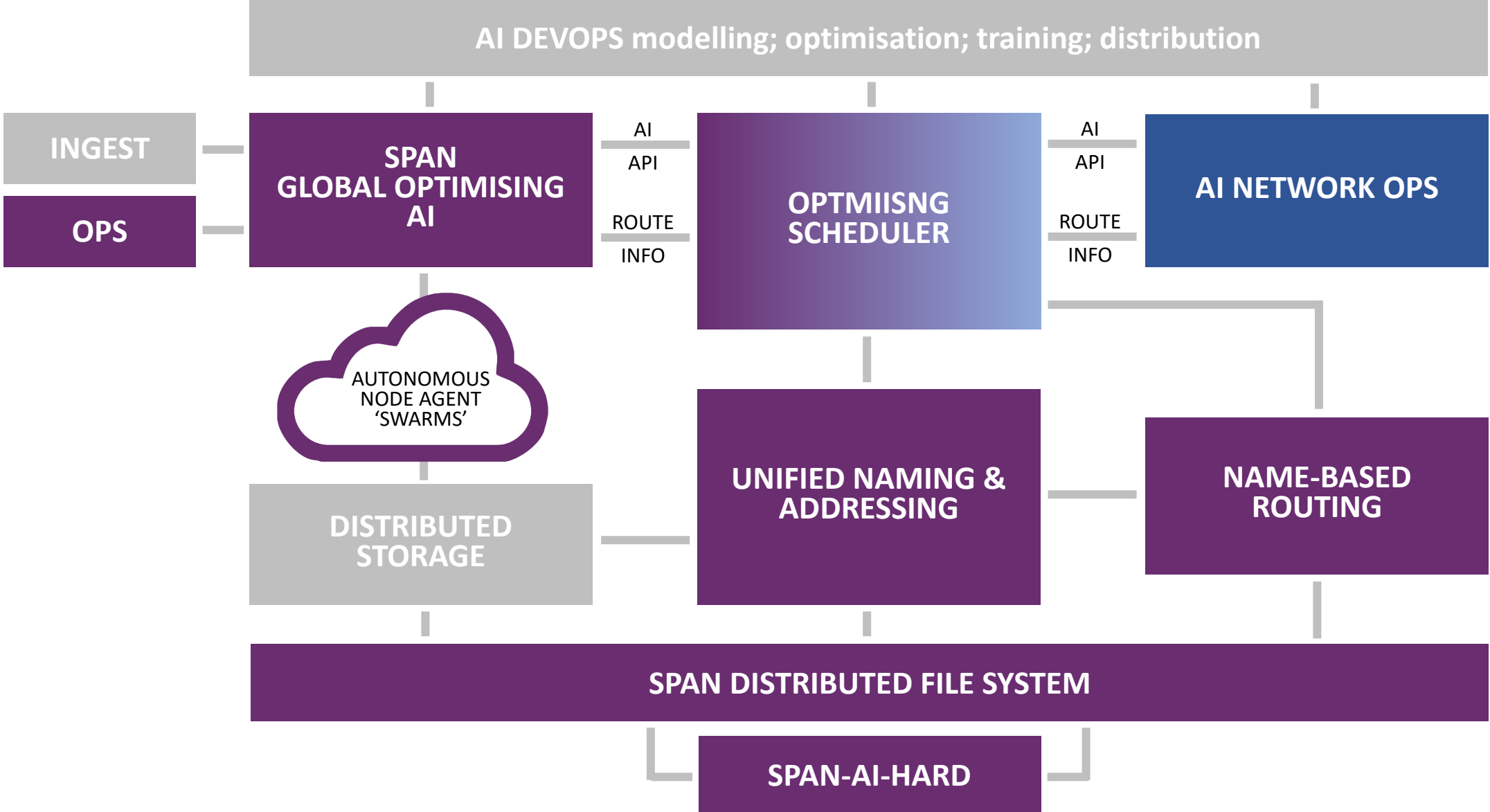
Rollout

- MVP build
  - The I/O library we need is *already supported* by Ubuntu Linux
    (the most popular server o/s in the world 400m+ servers)
  - Distributed storage (publishing) is already 'done' by Protocol Labs
    - Filecoin and IPFS/IPLD
  - We will add SPAN-AI smarts for "CDN level retrieval (distribution)"
  - Based on our existing optimisation algorithms
  - Job done!

- Africa
  - 54 countries
  - 1.3B people
  - 200M households, 75M TV households, 25M subscription TV
  - 22% Internet penetration

- Australia – national ngCDN
  - 121 NBN POIs; L2.5 MPLS
  - 80% of population connected
  - NFT gaming PoC;
  - Stan, Paramount, Disney or similar movie distribution

- Next gen IoT – 13 node fibre ngCDN; salmon farms

- Asiapac – fibre backbone; 1.5B gamers; NFT gaming

- Global – global fibre and laser satellite backbone ngCDN

Initial UCDN partners and customers

VENDORS
- Nokia
- Nvidia
- others

NETWORK
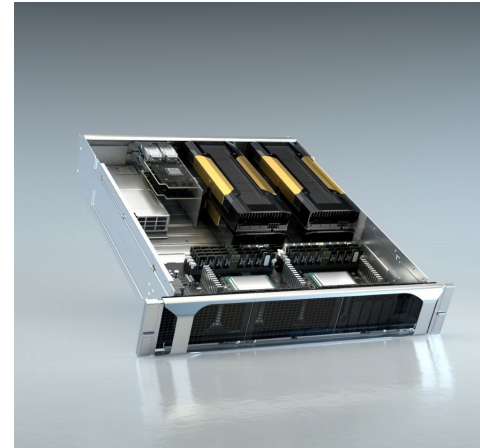- Global optical laser backbone

CUSTOMERS
- Video publishers
  - live and on demand
- gaming
- IoT
- AR
- Virtual network services

SPAN-AI UCDN system block diagram
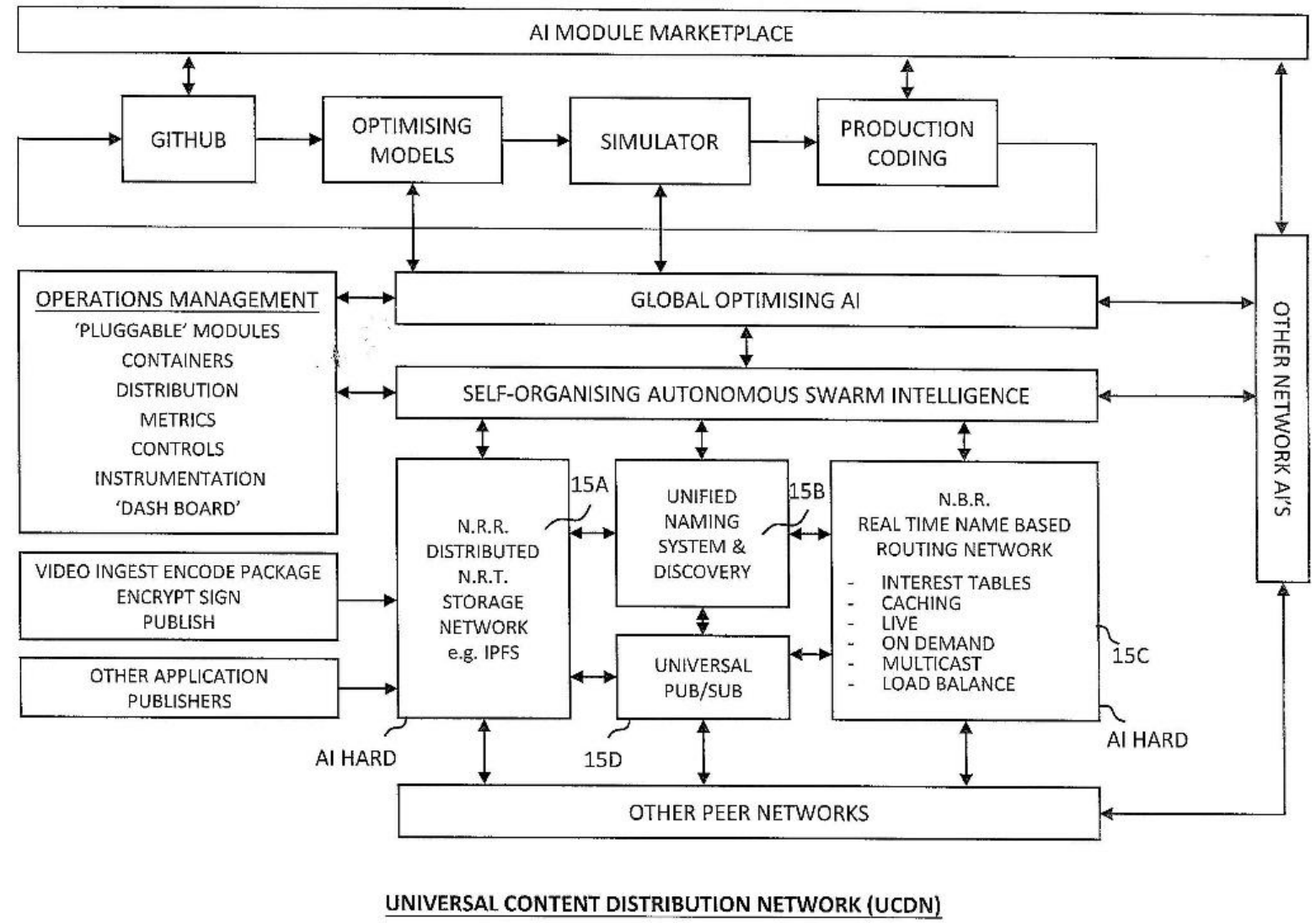
UNIVERSAL CONTENT DISTRIBUTION NETWORK (UCDN)

Fig. 1

Dual stacks IP and SPAN on every device

email WWW phone...
SMTP HTTP RTP...
TCP UDP ...
IP
ethernet PPP ...
CSMA async sonet ...
copper fiber radio ...

Individual apps
Every node
Individual links

browser chat ...
File Stream ...
Security
Content chunks
Strategy
IP UDP P2P BCast ...
copper fiber radio ...

SPAN

Routing/switching bus – software and hardware
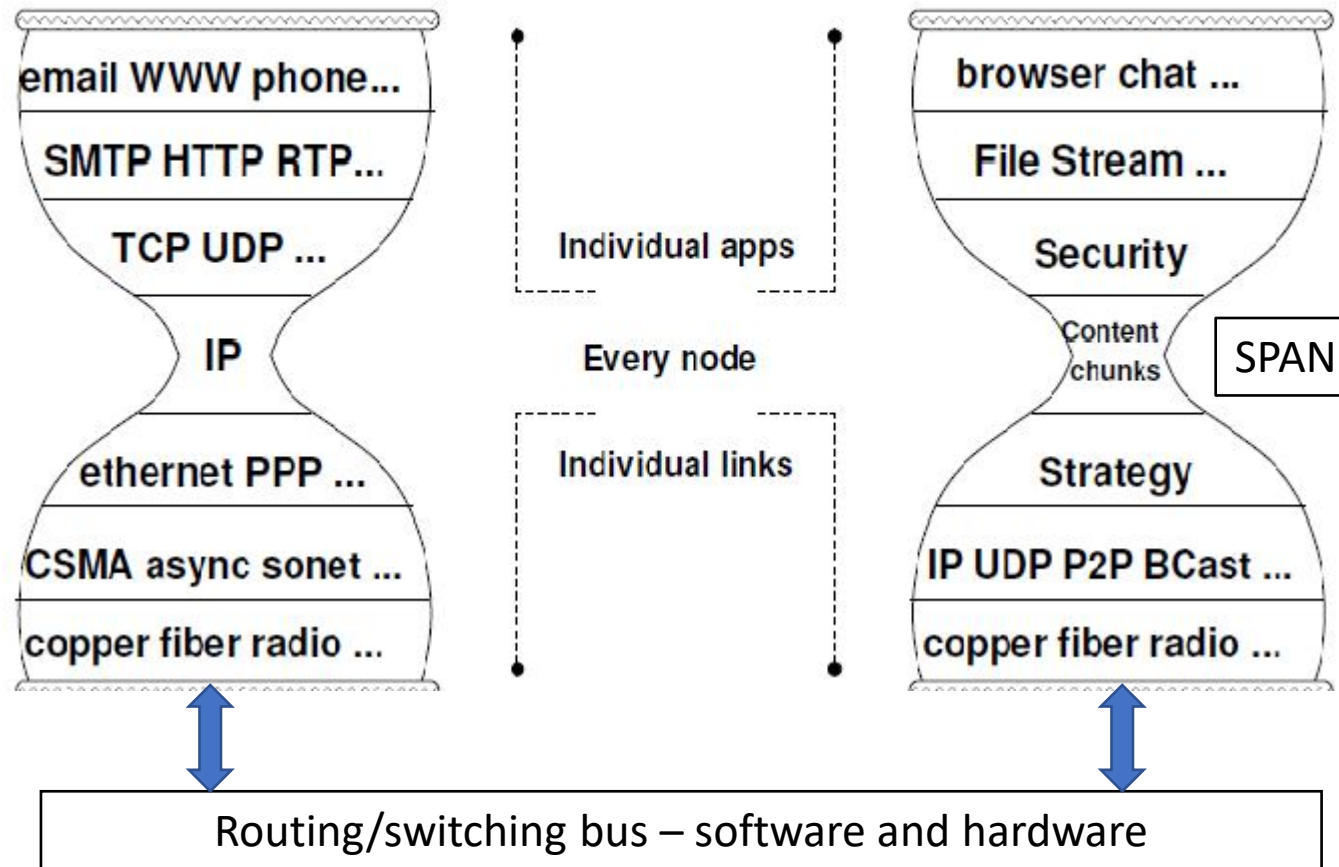
One possible Metaverse architecture
(almost) implementable NOW

Nvidia Omniverse
and Nucleus

SPAN-AI

Pixar Universal Scene Description
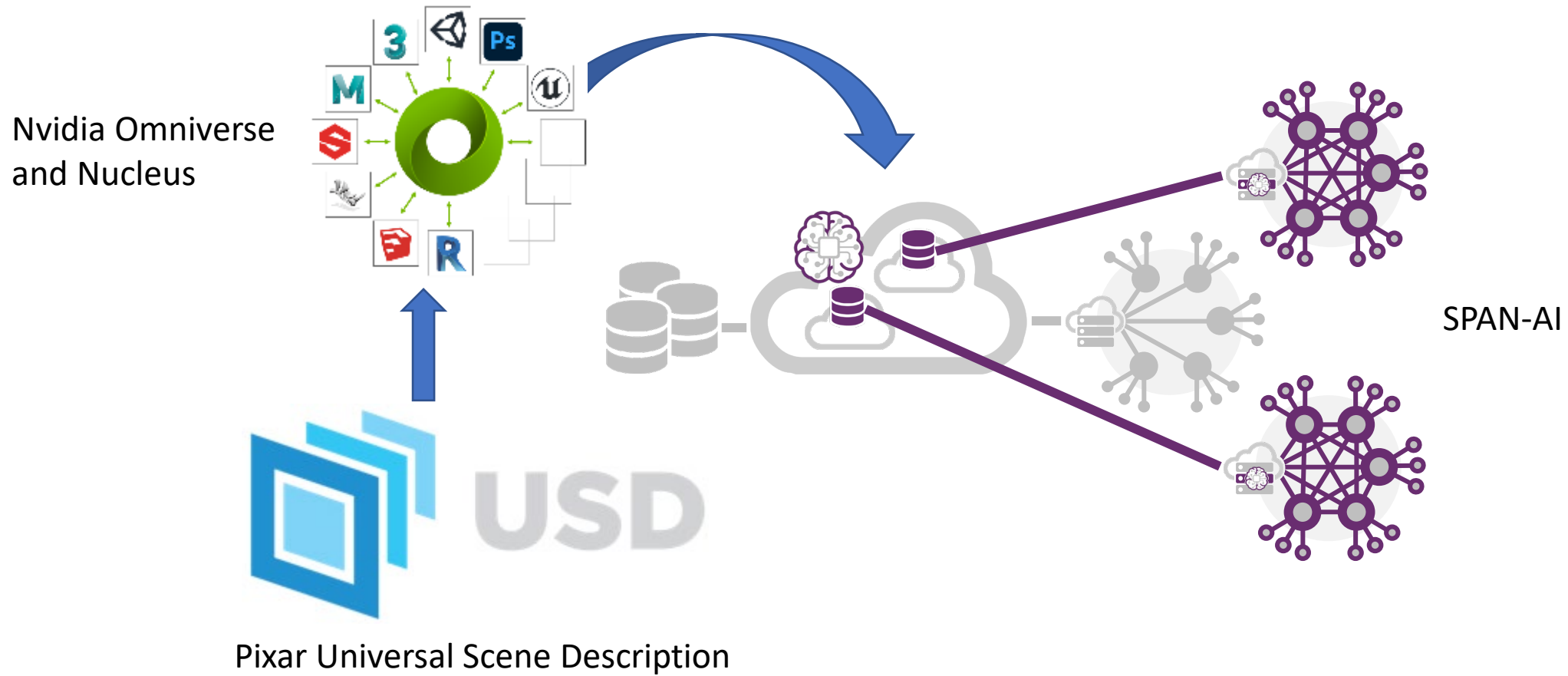
The Essence of the Metaverse

- Production and publishing of assets (compute, network and storage intensive)

- Optimal distribution of assets (network and storage intensive)

- Composition of assets, streams and services to produce and deliver experiences (compute AND network intensive)
  - At the edge

- The network NEEDS TO BE the cloud!

The network IS the cloud/computer™
and it needs an instruction set
SPAN-AI speaks metaverse!

1. **PUBLISH** *<publisher> <content name; type; version> <master file; format; security> <QoS: encode; bitrate; reach;> <persistence> <permissions> <signature>*

2. **SUBSCRIBE** *<publisher if known> <content name; type; version> <QoS> <subscribe location> <signature/key>*

3. *etc etc etc. These are* NETWORK *instructions!!!!*

Opportunities for Standards

- Standards are **CRITICAL**
- Need to standardise:
  - The unified naming and address system
  - The SPAN-AI-HARD routing/switching/caching criteria
  - The local and global SPAN-AI optimisation methods and interoperability
- Call to action: a Metaverse NETWORK standard
  - https://medium.com/meta-verses/the-seven-rules-of-the-metaverse-7d4e06fa864c Tony Parisi
  - There is ONE Metaverse; it is open; it is [enabled by] a network; [that network] is the Internet
- This is EXACTLY how WiFi rolled out

Future

- New funding and operational models: Beyond IETF, IRTF,IPOs, ICOs and DAO

- Quantum compute and transport (laser)

- Distributed Artificial Intelligence and machine learning

- Play to earn (AI training)

- General Artificial Intelligence

Referees/team

- Nick Lochrin – Head of Commercial Business Development, Nokia Enterprise (APJ)
    - https://www.linkedin.com/in/nicklochrin/
- Dr. Jaime Llorca – ex Bell Labs; global thought leader: edge, distributed cloud, SDvCDN, network modelling and optimisation
    - https://scholar.google.com/citations?user=KSI2DE0AAAAJ&hl=en&oi=ao
- Dr. Terry Percival (AO) – father of WiFi
    - https://www.linkedin.com/in/terrypercival/

The future is distributed **everything**, and it needs SPAN-AI to work

- Power
- Transport
- Food production
- Manufacturing
- Information
- Communication
- Entertainment
- Education
- Work
- Smart cities

> " The future is already here – it's just not evenly distributed

William Gibson

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Revolution is impossible, until it's inevitable.

THANK YOU

Rhett Sampson – founder and CTO
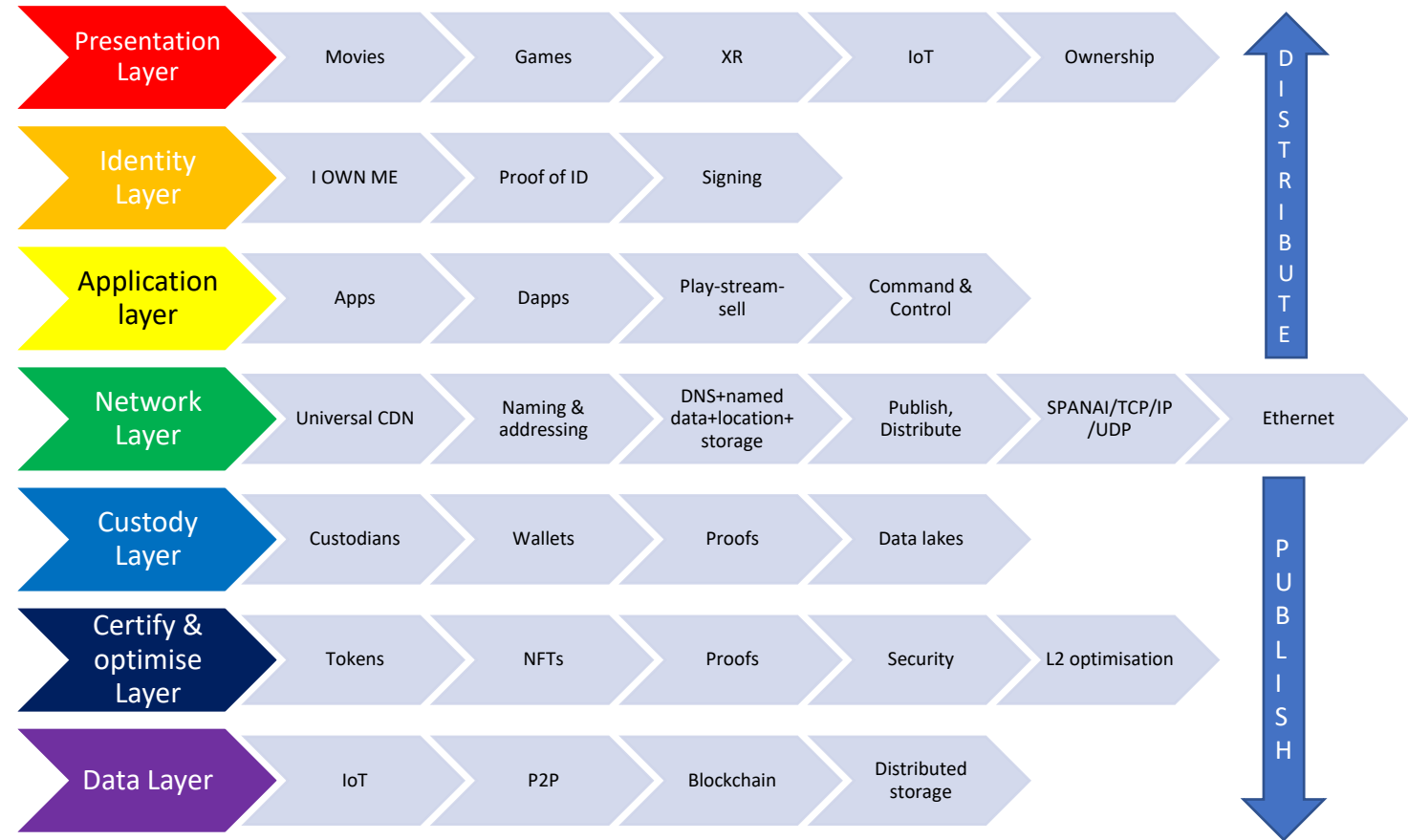+61 418 44 6060
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SPAN-AI unites the current and next gen Internet in a proposed new OSI **systems** model

- TCP/IP, UDP

- IPFS, IPLD

- Filecoin, Ethereum and other blockchain tokens

- P2P

- IoT management

- Content based storage and distribution

Presentation Layer	Movies	Games	XR	IoT	Ownership	
Identity Layer	I OWN ME	Proof of ID	Signing			
Application layer	Apps	Dapps	Play-stream-sell	Command & Control		
Network Layer	Universal CDN	Naming & addressing	DNS+named data+location+ storage	Publish, Distribute	SPANAI/TCP/IP /UDP	Ethernet
Custody Layer	Custodians	Wallets	Proofs	Data lakes		
Certify & optimise Layer	Tokens	NFTs	Proofs	Security	L2 optimisation	
Data Layer	IoT	P2P	Blockchain	Distributed storage		

DISTRIBUTE

PUBLISH

6 of the 9 major global network protocols and systems in history are Australian innovations.

- Packet switching (X.25) Paul Baran, Rand corp, 1960s
- Ethernet! (Dr. Peter Jones, Control Data/Network Systems)*
- Internet TCP/IP (BBN/DARPA/IETF 1960s)
- Routers (Rhett Sampson/customer/Network Automation *and* Computer Protocol WA *but* commercialised by Cisco)*
- DQDB MAN (ATM) Dean Economou WA post grad thesis
- MPLS Toshiba Cell switch router
- WiFi Dr. Terry Percival and team CSIRO
- Bitcoin Craig Wright (?) *
- SPAN-AI GT Systems!

*Long stories but Peter put Alohanet down coax long before Palo Alto and Metcalfe; and Computer Protocol in WA were selling routers long before Cisco. And is Craig Wright really Satoshi Nakamoto?

Patent statement of intent

Our intent with patents is not to stifle innovation. It is simply to protect our IP and its implementation while receiving a reasonable ROI. We are very keen to find new models for R&D that draw on some of the community incentive models of distributed autonomous communities (DAO); recognising the shift from public to private R&D; and the role of voluntary R&D such as the IETF and IRTF.