Bringing Realism into AI for Network Automation

Let's be real about AI!

by Mats Eriksson
Global Principal Business Developer – Telecommunications

tietoevry

Outline of My Talk: On the Magics of AI*

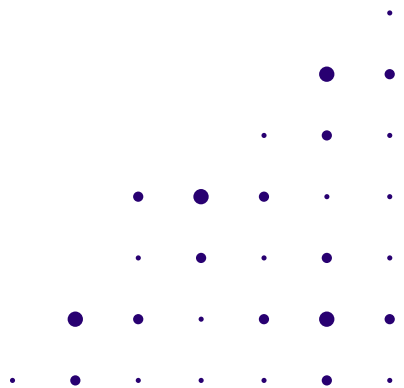
Our experience of using AI for Network Control

Control-loops and the need to Divide & Conquer

What is Network Automation?

Other aspects to consider

Is AI intelligent?



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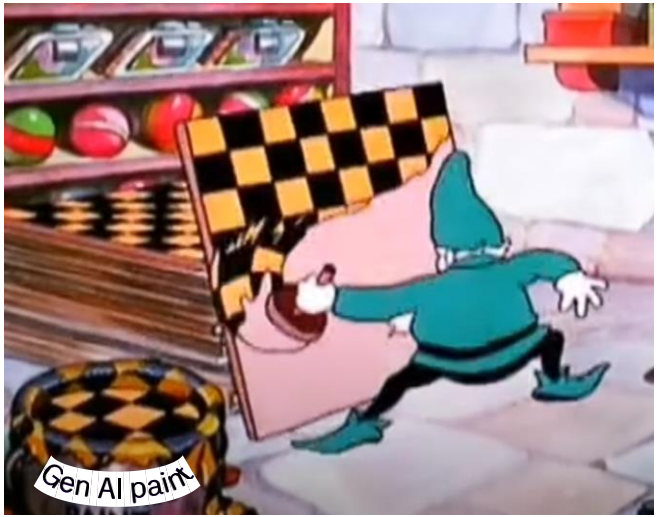
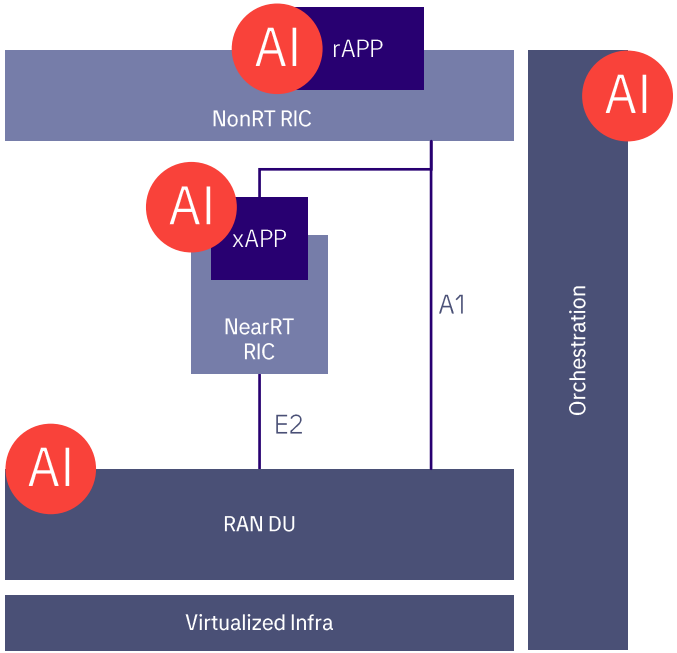


Other aspects to consider

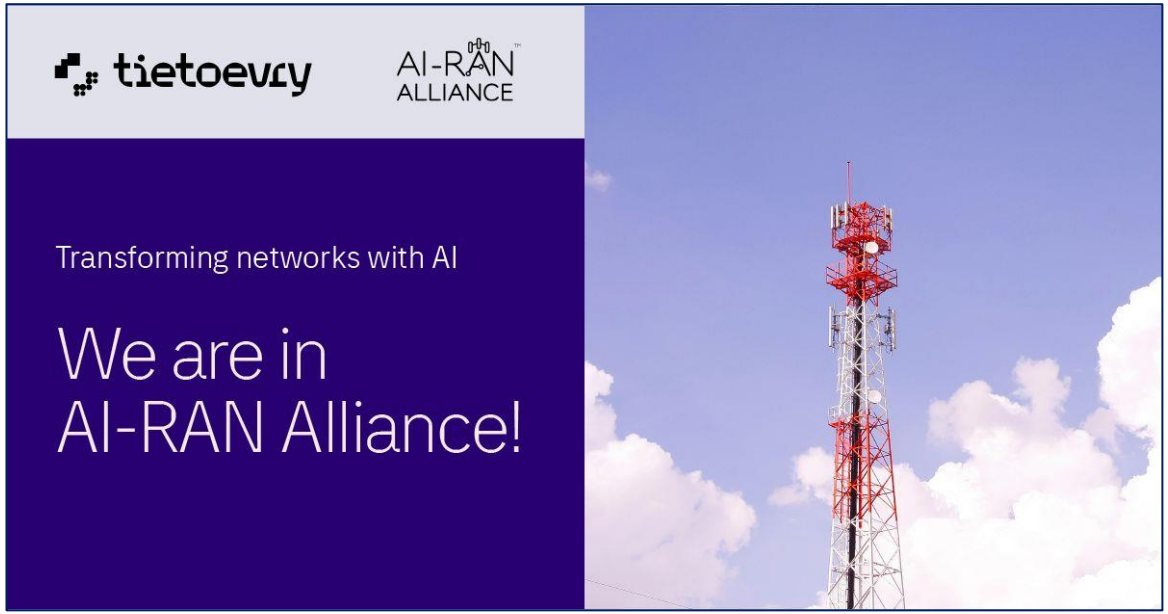
Tietoevry is active in AI based projects across the RAN stack



- Tietoevry engaged in assignments in all areas
- Use cases are typically multi-cell (system) where near-optimal algorithms are missing
- Model adjustment and pruning, for executing on various hardware platforms
- Different types of AI/ML applied
- Integration is important to achieve wanted system behaviour
- Own asset for synthetic mobile network data creation for model validation and testing

Note: Although the illustration is based on O-RAN, applying AI in RAN is not

AI-RAN as a vehicle to explore AI based Innovations for Networks



We're in good company:

tietoevry
DEEPSIG
Northeastern University
NOKIA
SoftBank
T-Mobile
ERICSSON
NVIDIA
Microsoft
SAMSUNG
UTokyo
arm

Tietoevry provides trusted and innovative R&D services in the field of Radio Access Network (RAN), among other domains, for its customers globally. Leveraging AI-powered technologies and solutions, including advancements in 6G, is crucial for enhancing competitiveness of our partners and clients.

Many leaders are caught by the thunderstorm of AI

“AI is probably the most important thing humanity has ever worked on. I think of it as something more profound than electricity or fire.”

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“AI is probably the most important thing humanity has ever worked on. I think of it as something more profound than electricity or fire.”

Sundar Pichai, Google CEO

“Entire industries will reorient around AI. Businesses will distinguish themselves by how well they use it.”

Bill Gates, Microsoft cofounder

“I believe it’s going to change the world more than anything in the history of humanity. More than electricity.”

Kai-Fu Lee, investor, ex-president of Google China, founder of Microsoft Research China

But we are already starting to see some disillusionment
(as expectations were sky-high)

AI is not (only) ML!

yahoo!finance

Microsoft stock drops after results fall short in latest AI disappointment

Coin Telegraph + Follow

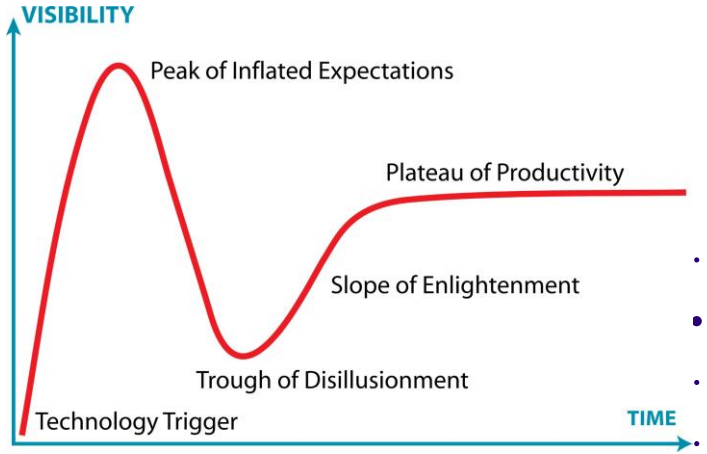
AI hits 'trough of disillusionment' but AI bubble not over yet despite correction: AI Eye

by Matt Asay
Contributor

AI's moment of disillusionment

by Grant Gross
Senior Writer

Is the gen AI bubble due to burst? CIOs face rethink ahead



Is AI intelligent? The importance of training

Intelligence requires understanding & meaning

Feb 25, 2024 Critique,Technology 4 minutes reading time

A second post venting some of my frustration with AI, the hype and the reality of it.

“ChatGPT didn't learn the topic, it did no research, it did no validation, and it contributed no novel thoughts, ideas or concepts. Other people did all of that already. ChatGPT just colonised all of that data.”

Tim Klapdor, Manager of Educational Design, University of Adelaide

Intelligence requires understanding & meaning (heartsoulmachine.com)

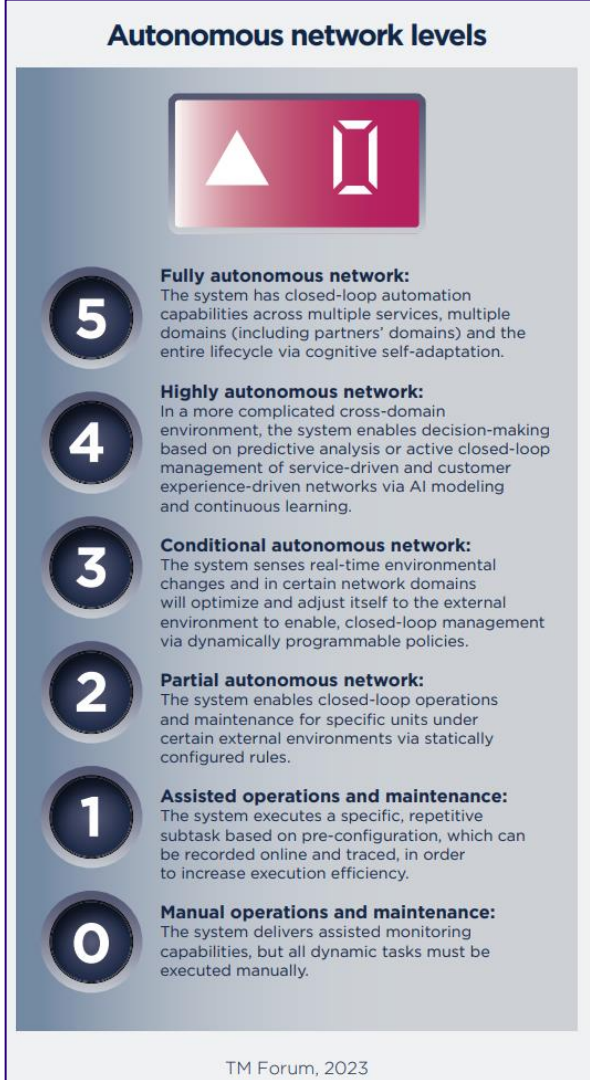
What do we mean by Network Automation?

From scripts to autonomous

Evolve from discrete automated functions to autonomous

Where is the intelligence, meaning, semantics captured?

"Do what I mean" – how does the system know what I mean?



A historical lookback at Automation: when Semantics are crucial

Entirely manual – every hop needed manual operation

The data plane was integrated – i.e. a microphone could send information to a loudspeaker

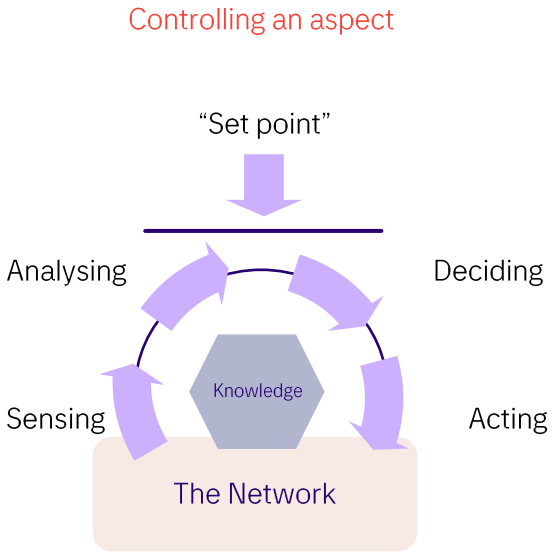
To automate phone call dialling required us to integrate:

- The protocol by which we send digits (rotary dial)
- The semantics of those digits (country & area codes, subscriber numbers)
- (intent was excluded – telephone directory – planning approach)

After being automated, we refer to it as the Control Plane

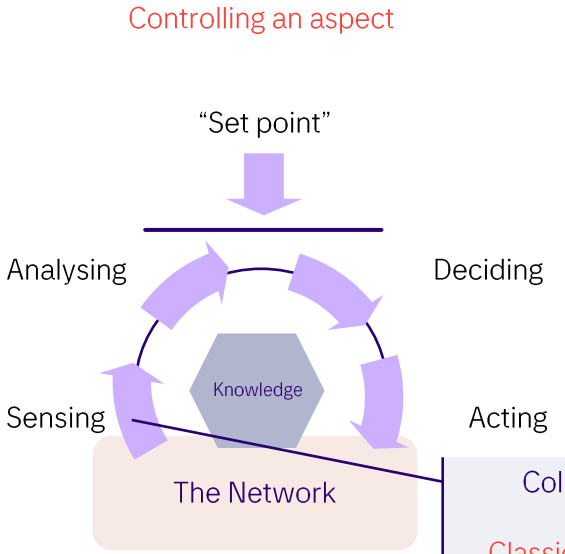
The intent and semantics layers are crucial if we are going to achieve interoperability and zero-touch operations

Autonomous means control-loop



- Many variations of how to illustrate control-loops
- There are challenges related to all four parts of the control-loop
- Autonomous needs “understanding”
- Control-loops may be implemented as rAPPs / xAPPs

Autonomous means control-loop



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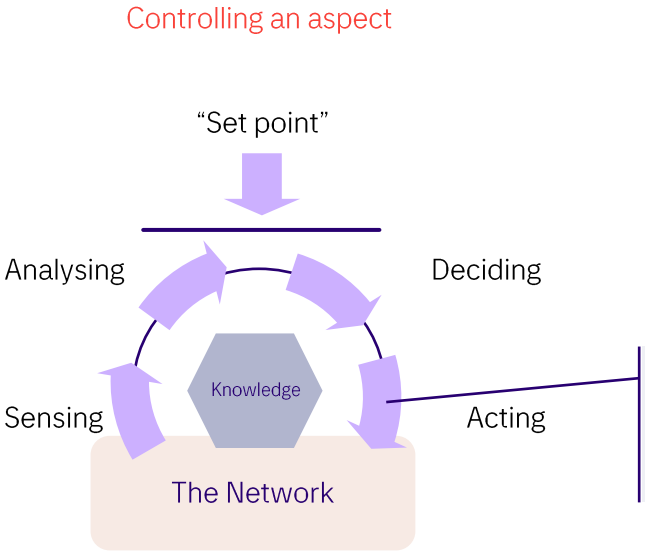
Collect data from a variety of systems. Formatting, transformation, harmonization. Make data available (timely), etc
Classical AI problem area (but equally important for other technologies)

Autonomous means control-loop



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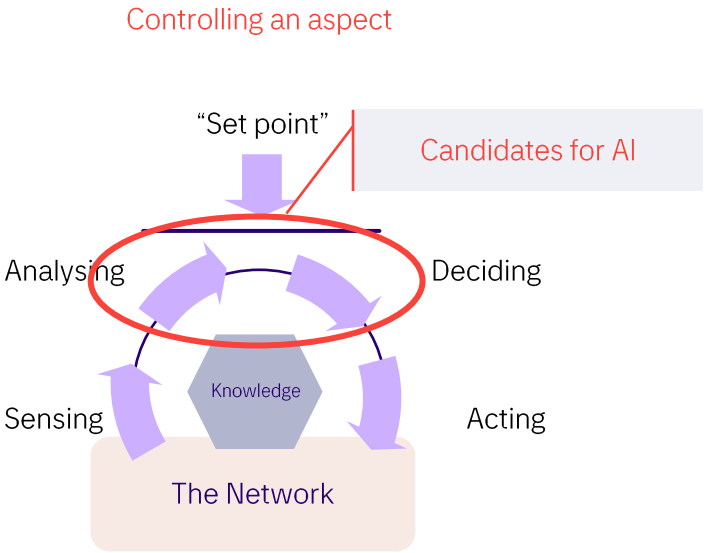
Figuring out how to "fiddle" with the thousands of control points typically exposed.
This is about "exact abstractions" (accuracy), rather than "intelligence"

Autonomous means control-loop



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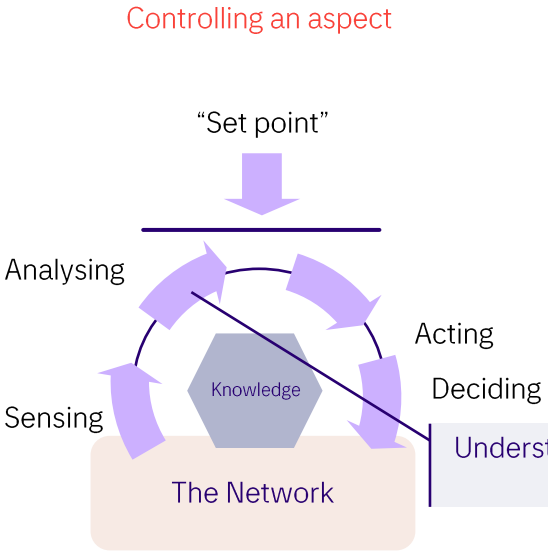

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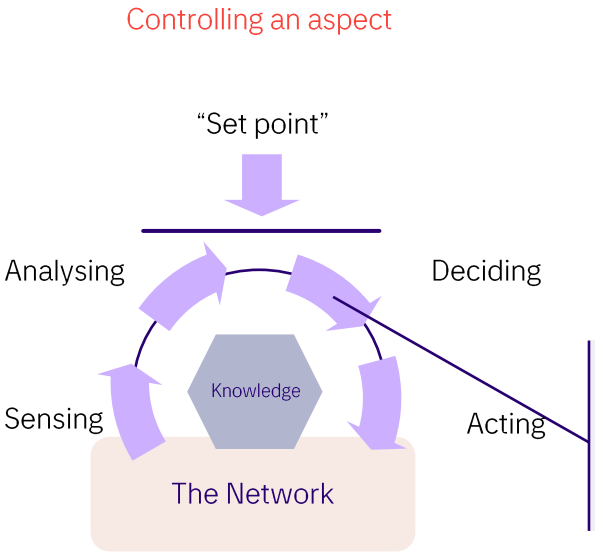
Understanding the meaning of data. What is the state of the Network?
Moving from Anomaly detection to "understanding"

Autonomous means control-loop



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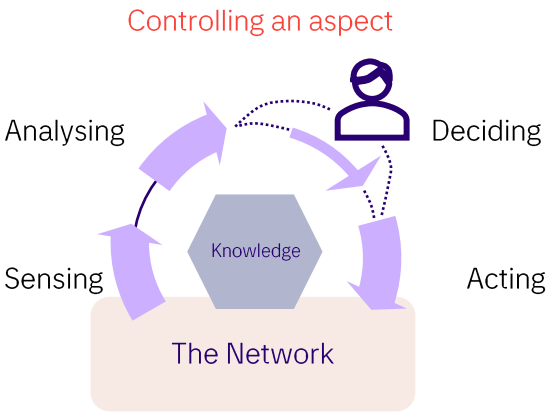
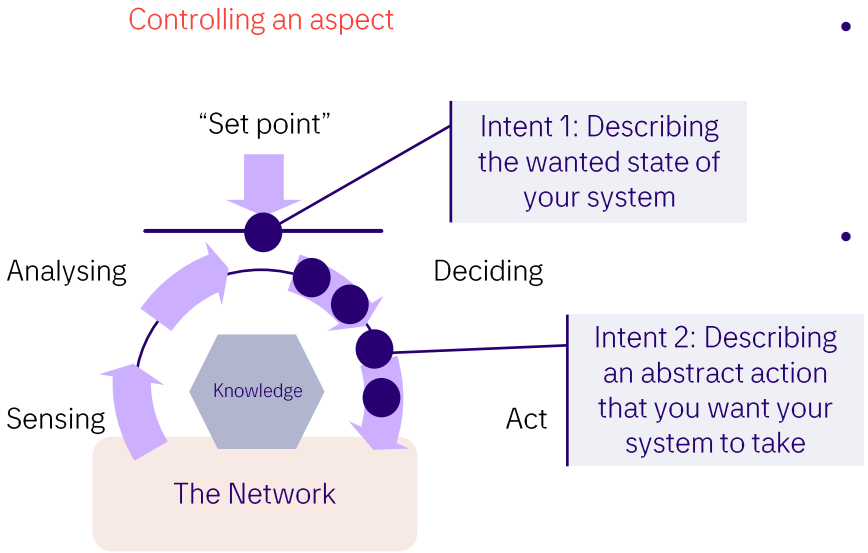
Capturing the trade-offs to achieve the "set point". Requires semantics and understanding. Might be very "training-heavy" to achieve the accuracy you need

Autonomous and automation is different



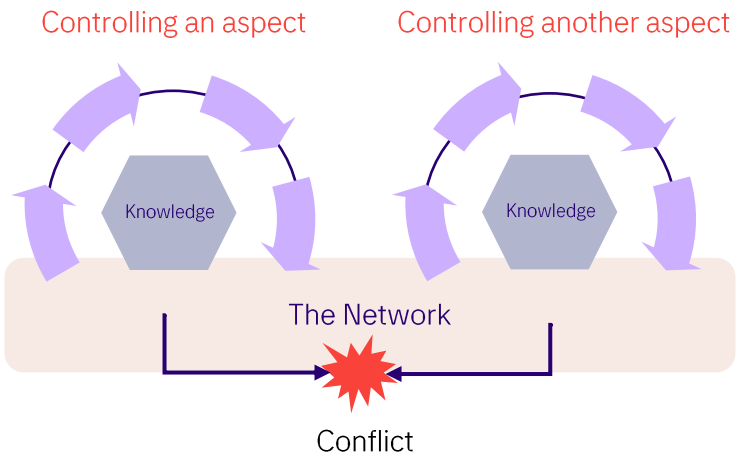
- Autonomous is when the loop is closed
- Automation is when any of the arrows are being conducted with less human effort
- Human in the loop option
- System could be autonomous for certain scenarios / conditions – humans to supervise or take care of all other

On the aspect of Intent



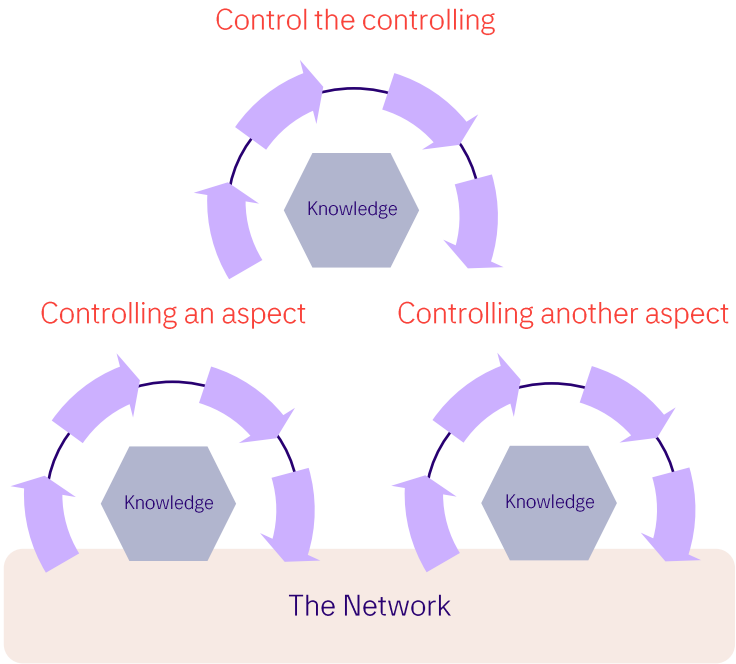
- Intents can be said to be on many layers of abstraction
- The important thing is how we can define the functionality to transform the intents into actions
- What is the programming concept available for the deciding part? AI is one candidate, but more algorithmic approaches should be considered
- Workflow approaches can be used as starting point, but fails at scale

Real systems have multiple Control-loops



- The idea of “divide and conquer”
- Crucial to define your control-loops adequately – systemisation needed
- These Control-loops may be potentially in conflict – how to deal with that?

Autonomous needs hierarchy



- Layering – again “divide and conquer”
- Introduces the need for sensing and deploying on the abstraction of the underlying layer – depends on your definition of control-loops
- Abstraction needs to accommodate the risk of self-oscillation
- Network automation is really a multi-objective optimization problem

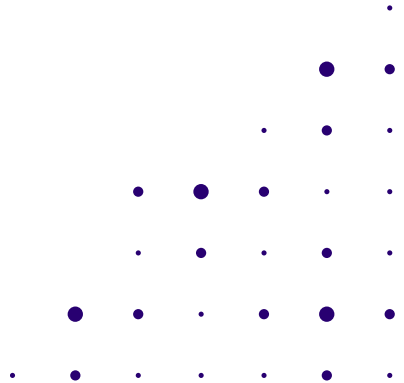
Algorithms vs AI – Use an algorithm if you can define one

Algorithm approach

ML approach

Algorithms vs AI – Use an algorithm if you can define one

	Algorithm approach	ML approach
Area of a circle	$A = \pi r^2$	Obviously, a bad idea Included here to provoke



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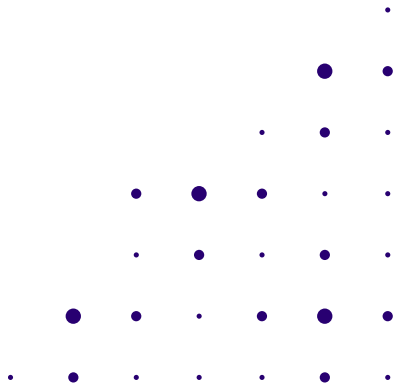

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Does Network Automation pay off?
Does Level 5 have a ROI?

- Consider use case frequency and efforts
- Costs for operating the AI models – training, data governance
- Replace experts that retire

- Understanding network complexity
- Capex implications
- Opex implications (e.g. energy)

- Churn → less revenues

On the realism of unsupervised AI control

In our view, AI still has a long way to go in making the ultimate decisions in real-world life situations that require more holistic, subjective reasoning. It still is merely a factual engine that acts based on probabilities and scores, mostly based on historical data, with no context of the implications of the information it is delivering.

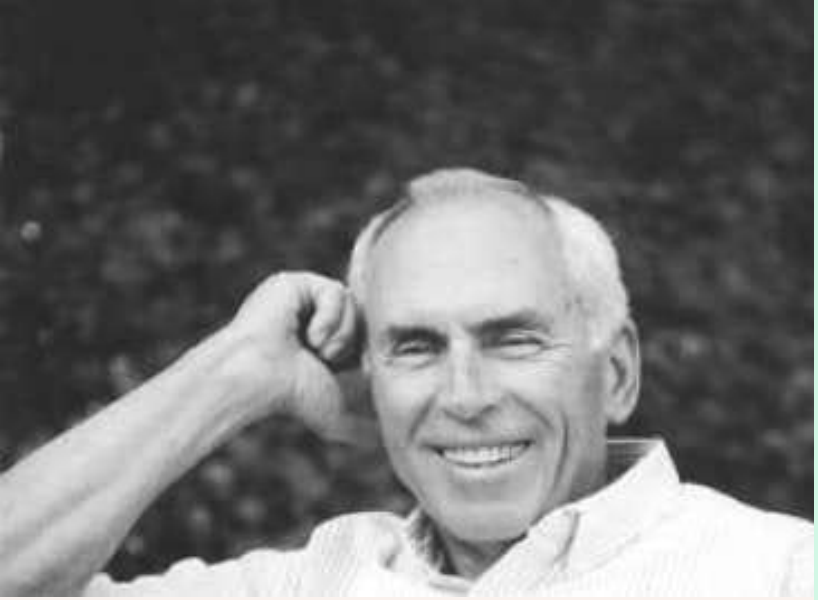
AI Isn't Ready to Make Unsupervised Decisions

Harvard Business Review

Humans have been shown to both over-rely (automation bias) and under-rely (algorithm aversion) on algorithmic advice and fare badly at judging the accuracy of algorithmic predictions.

AI Unlikely To Ever Work Unsupervised, At Least For The Big Stuff

Forbes



“An analysis of the history of technology shows that technological change is exponential, contrary to the common-sense “intuitive linear” view. So, we won’t experience 100 years of progress in the 21st century—it will be more like 20,000 years of progress (at today’s rate). The “returns,” such as chip speed and cost-effectiveness, also increase exponentially. There’s even exponential growth in the rate of exponential growth”

Ray Kurzweil

“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run”

Roy Amara

Perception of Technology Change

Amara’s Law

Lessons to Remember

AI disillusionment

AI is an implementation tech

AI models division

Network automation is crucial… regardless of AI

Amara’s law

Thank You!

Read more in our whitepaper on Network Automation @ Large

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Scan to read!