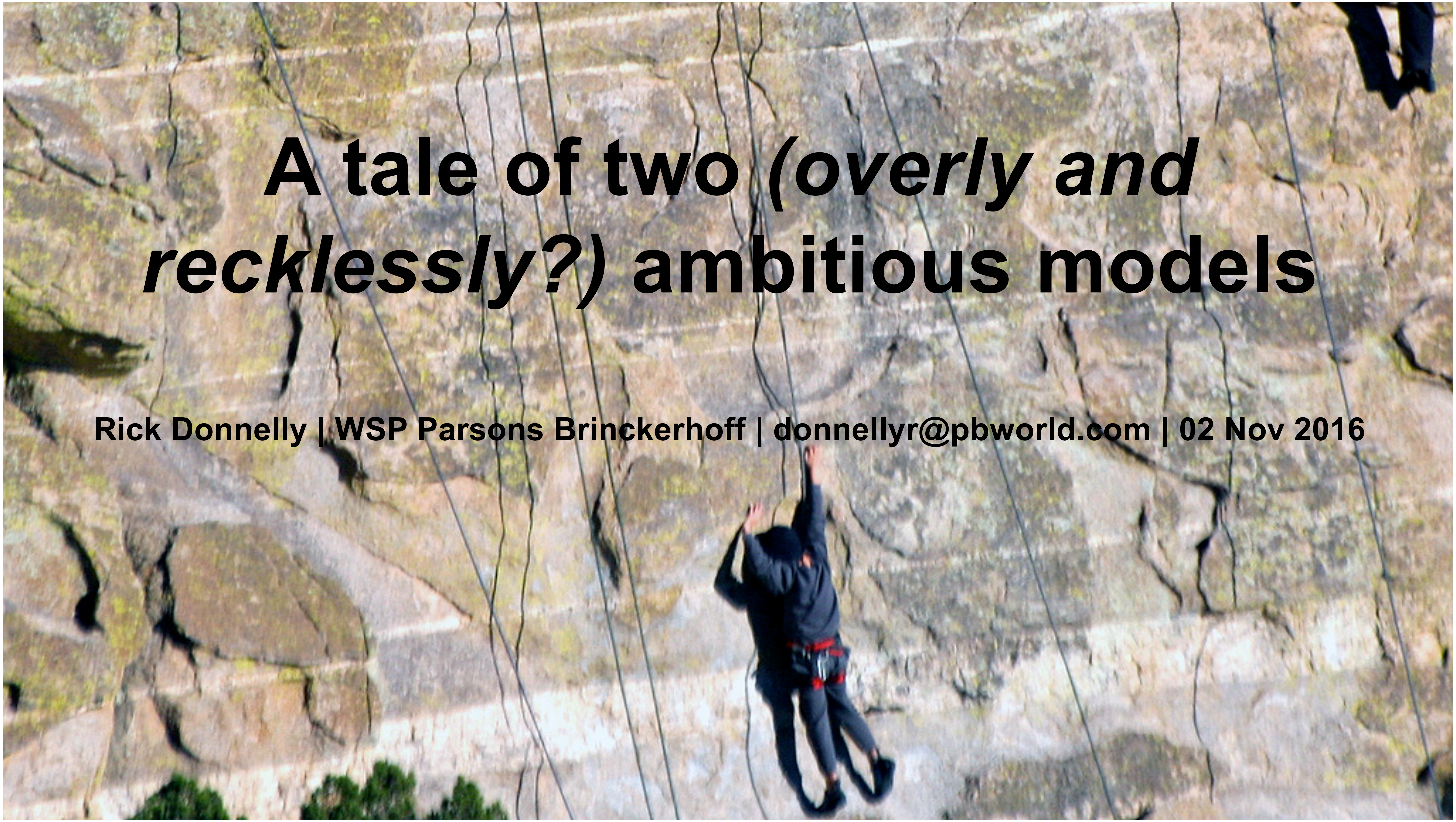
A tale of two *(overly and recklessly?)* ambitious models



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Overview

- Oregon

  Transportation and Land Use Model Integration Program (TLUMIP)

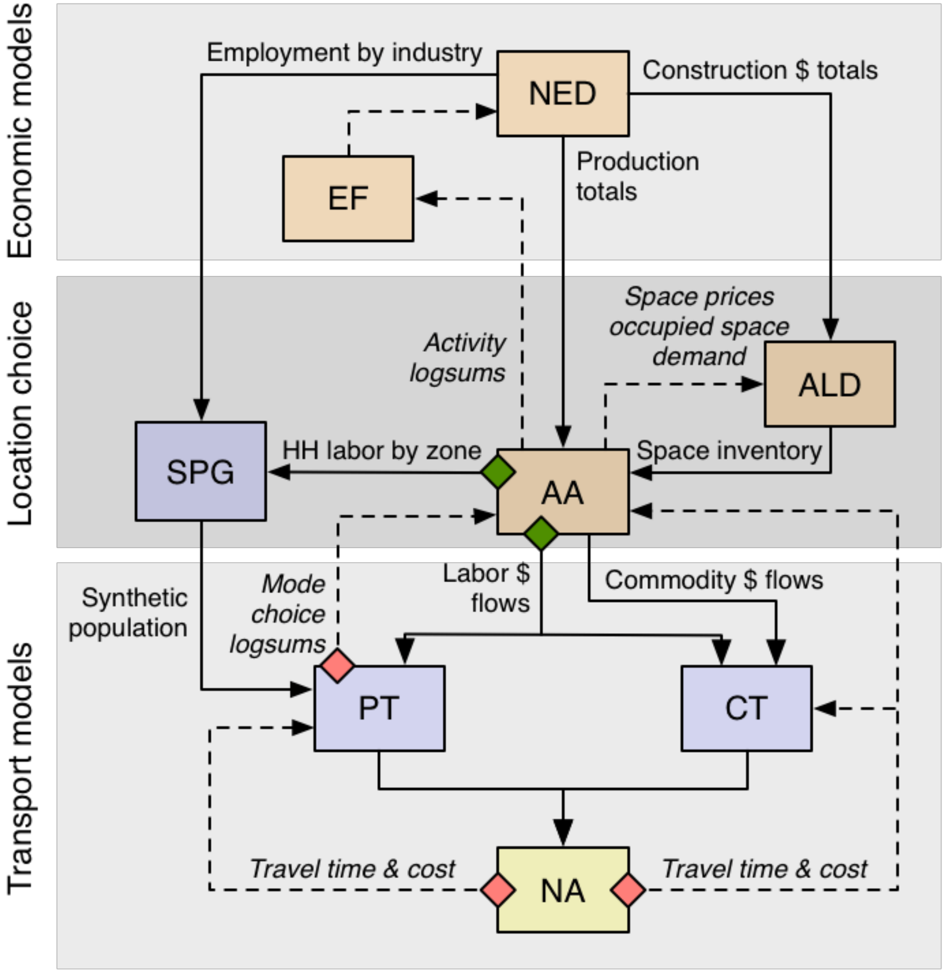
- Ontario

  Transport and Regional Economic Simulation of Ontario (TRESO)

- Common threads

  Lessons learnt

TLUMIP schematic (delivered)



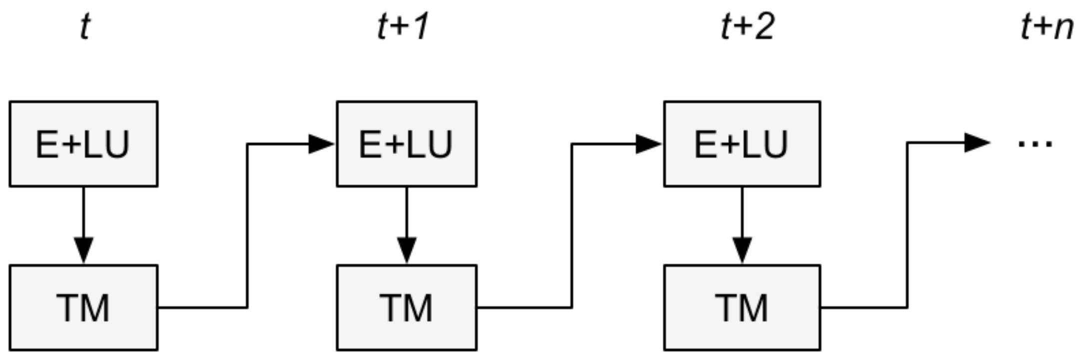
Component models:

NED: Economic & demographic
EF: Economic Feedback (optional)
SPG: Synthetic population generator
ALD: Aggregate land development
AA: Activity allocation (part of PECAS)
PT: Person travel demand
CT: Commercial travel demand
ET: External travel demand
NA: Network assignment

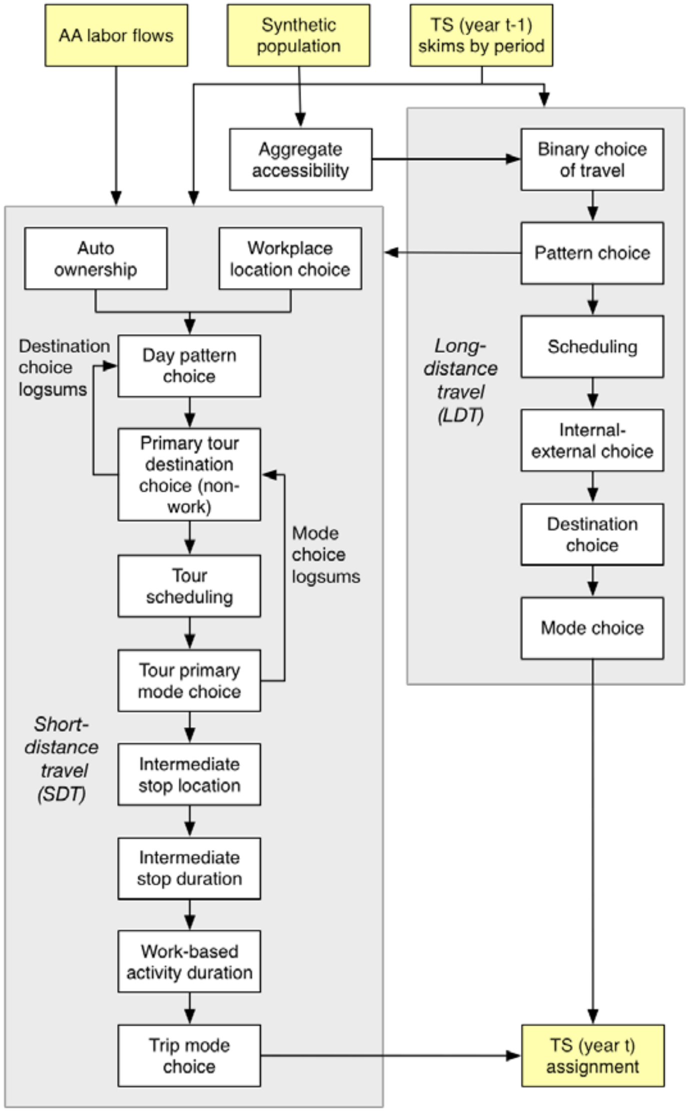
Legend:

Alpha-beta zone conversion
Beta-alpha zone conversion
Aggregate/equilibrium model
Microsimulation component
Mesoscopic component
Feedback in next period

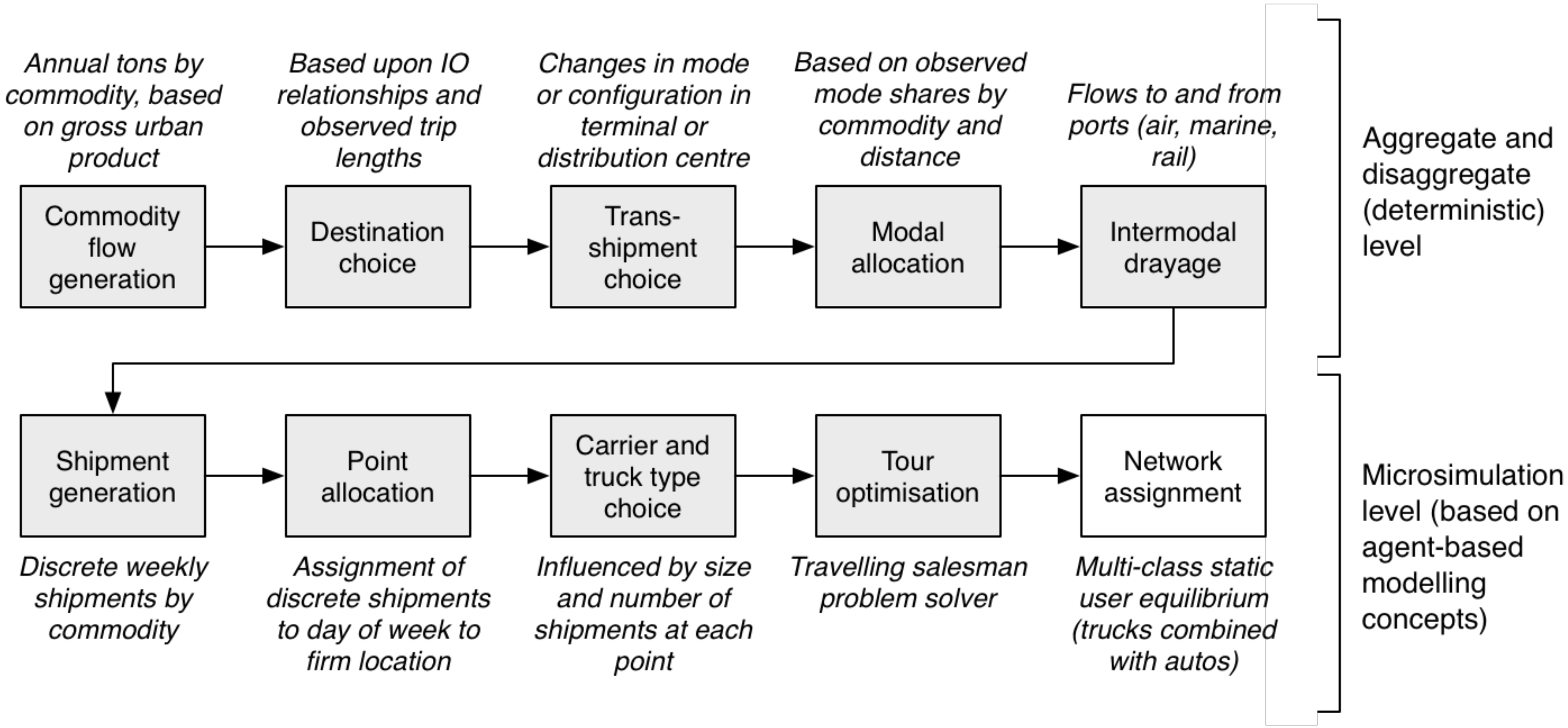
Annual steps



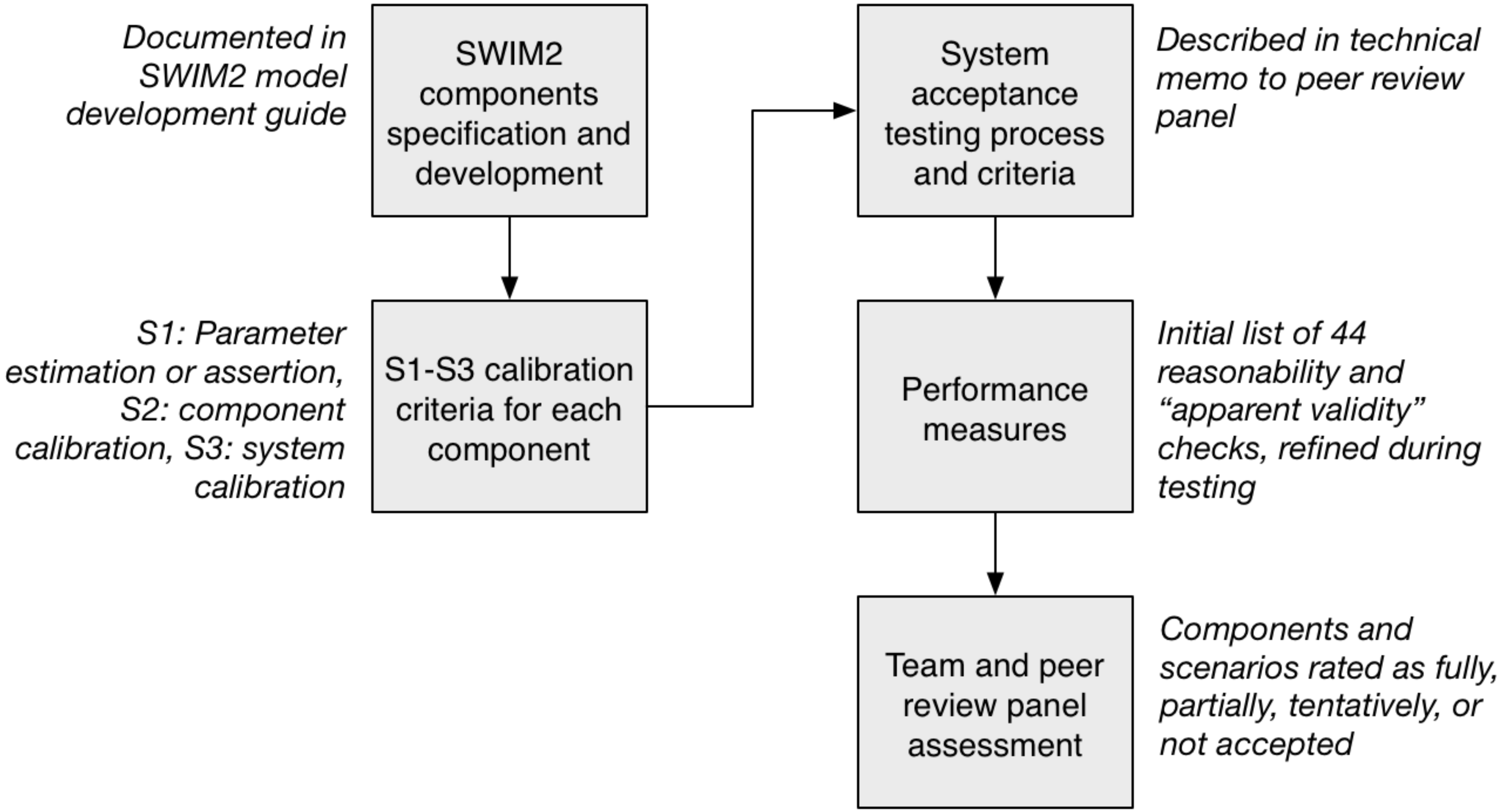
Person travel (PT) model



Commercial travel (CT) model



Validation and acceptance testing



(Changing) Oregon analytical requirements

Original requirements (1998)

Effects on land use and travel decisions:
Land supply
Congestion
Cumulative retail location choices
Large commercial growth at UGB boundary
Roadway capacity increases
Network connectivity changes
Parking supply
Urban form influence mode choice
Rail investment on highway use
Changes in demographics

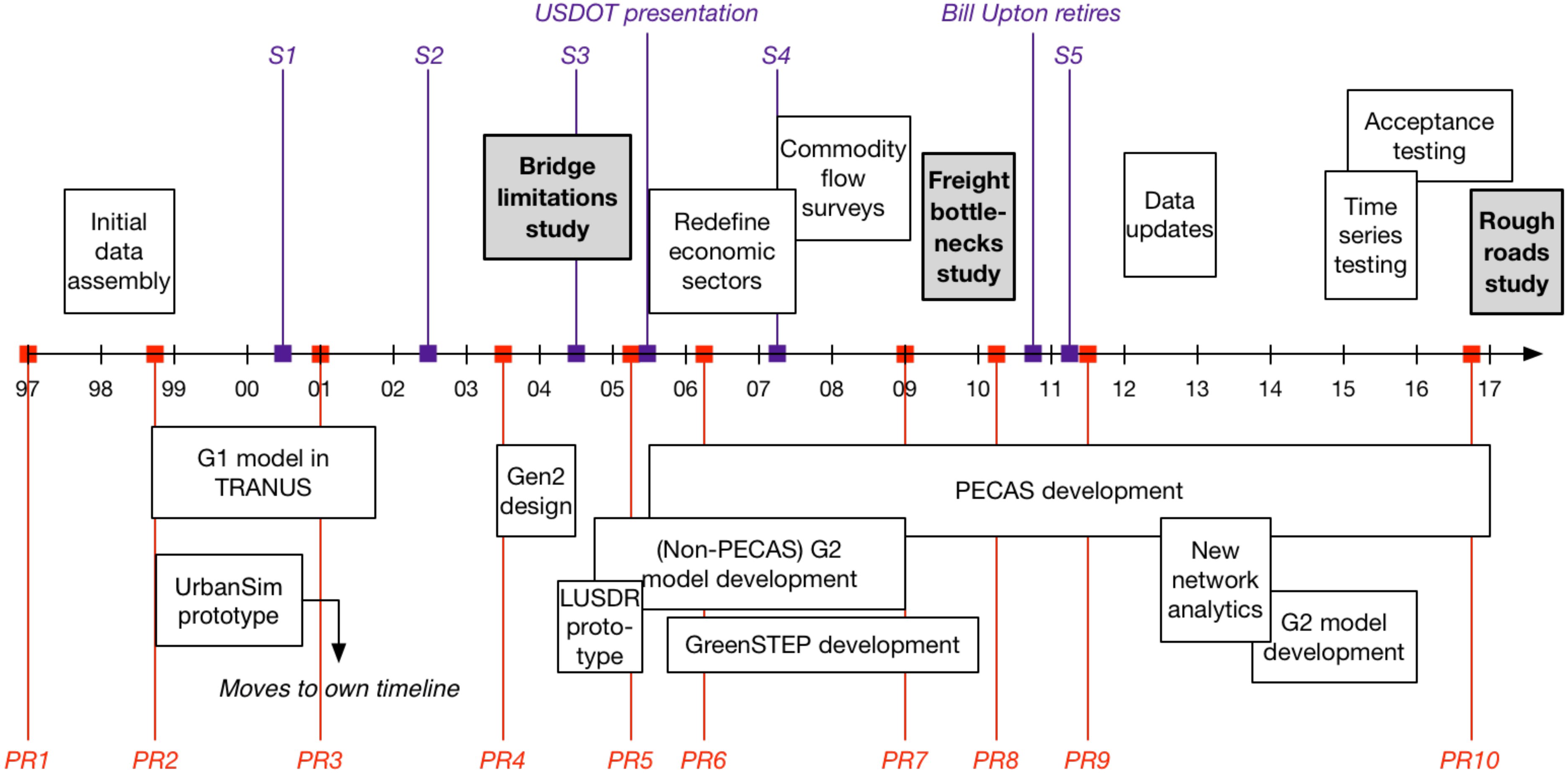
Revised requirements (2010)

Ability to evaluate effects of:
Climate change
Fuel scarcity
Economic downturn
Pricing
Technological changes
Supply chain recoil
Gentrification
Least cost planning

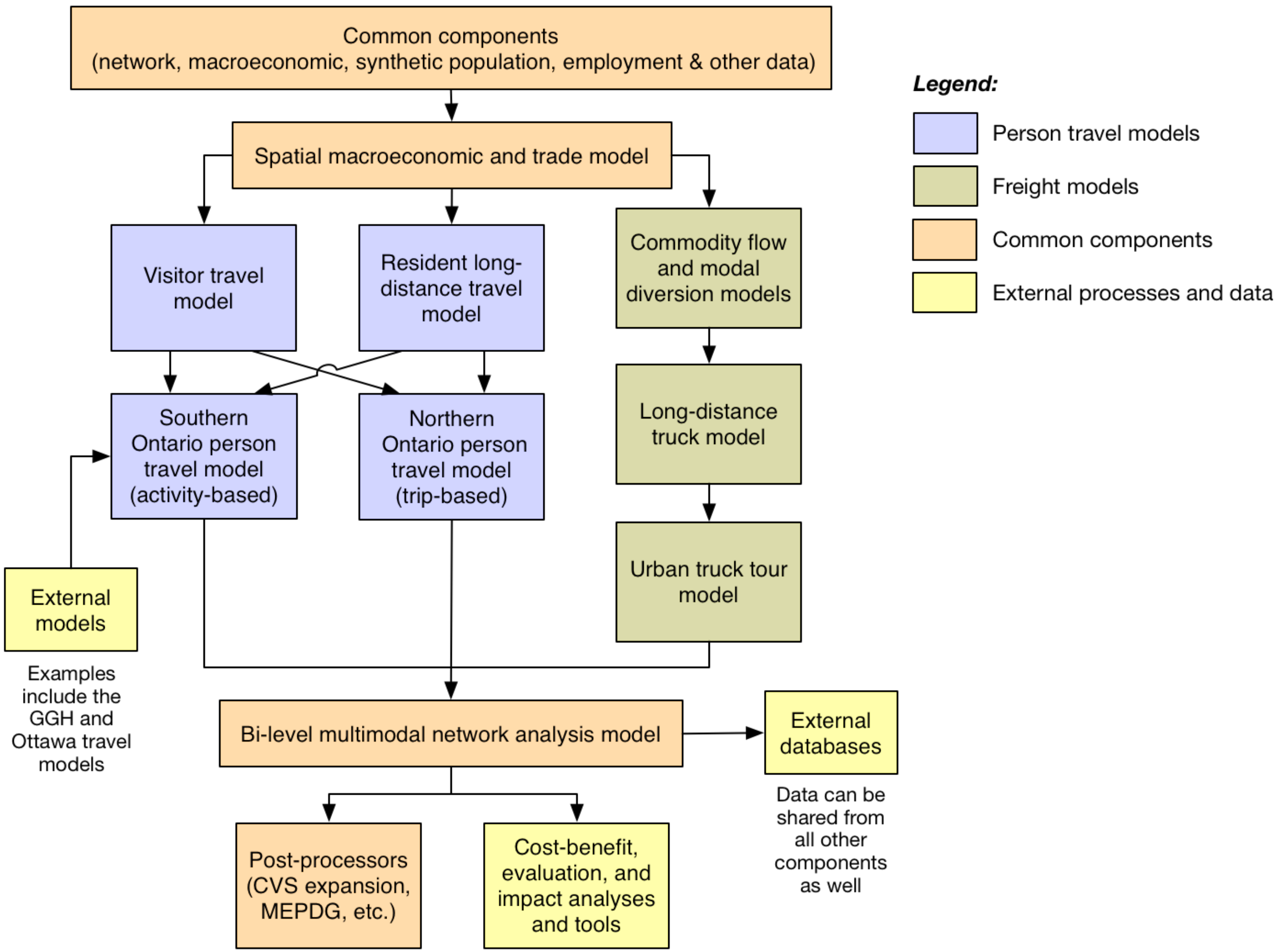
Potential emerging requirements (2017-20)

Likely need to transformational change:
Automated vehicles
Dynamic micro-pricing
Mobility as a service
"Second machine age" effects
…

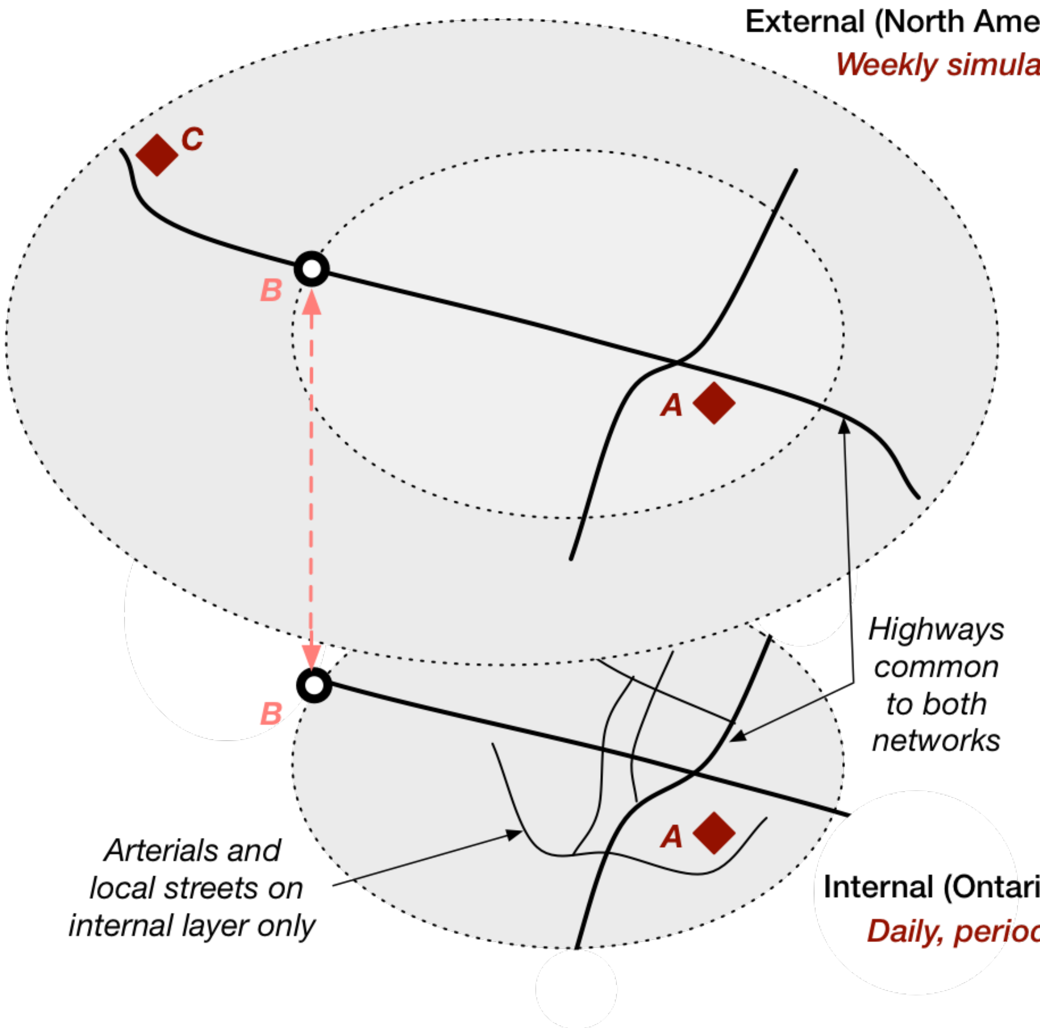
TLUMIP retrospective



TRESO schematic



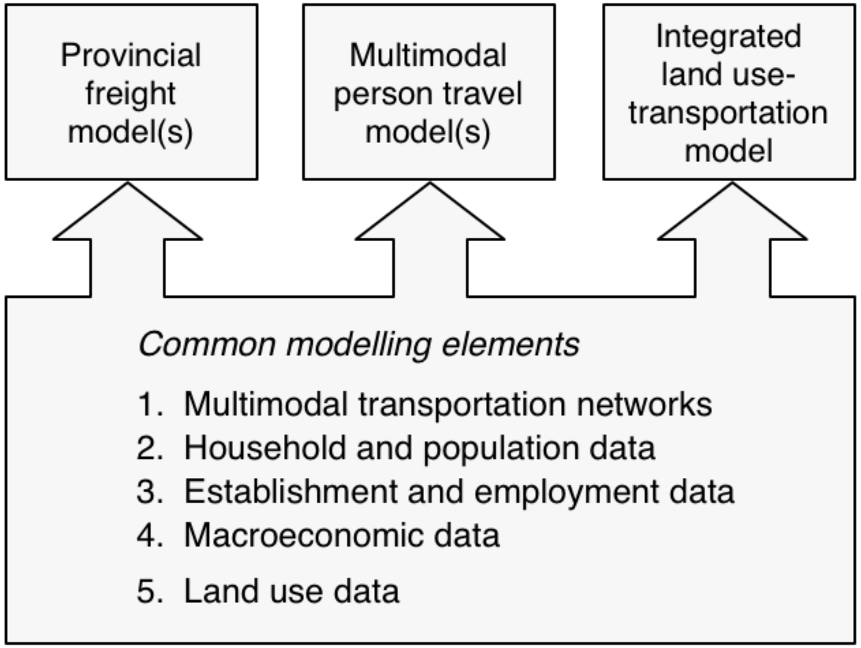
Bi-level backplane



Application process:

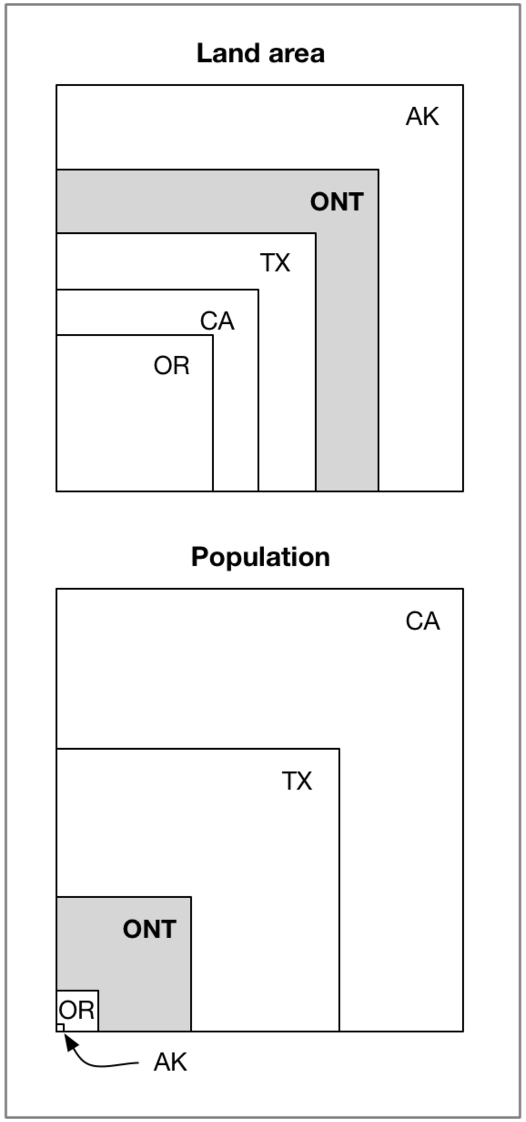
1. A trip from *A* to *C* on the external (North American) network would first be routed on the external level. The journey would take them through *B*, which is appended to the trip record.
2. The trip is routed on the internal (Ontario) network from *A* to *B*. The information about ultimate destination *C* is retained, but since it is not in the internal network the trip stops at *B*. Network statistics summarized on this layer will only include the portion of the journey within Ontario.

Common modelling elements



Ontario


Hudson Bay
James Bay
KENORA
THUNDER BAY
COCHRANE
ALGOMA
TIMISKAMING
SUDBURY
RAINY RIVER
MANITOULIN
PARRY SOUND
NIPISSING
To Winnipeg
Kenora
Dryden
Kapuskasing
Fort Frances
Thunder Bay
Timmins
Kirkland Lake
Temiskaming Shores
Lake Superior
Sault Ste. Marie
Elliot Lake
West Nipissing
Greater Sudbury
North Bay
Montréal
Ottawa
Lake Michigan
Lake Huron
Toronto
Detroit
To Chicago
Legend
Municipalities (Pop. > 8 000)
Border Crossings
Major Highways
District Boundary
Northern Ontario Growth Plan Area*
Sources: Ministry of Infrastructure, Ministry of Northern Development, Mines and Forestry and Ministry of Natural Resources
*Ontario Regulation 416/05, as amended
50 25 0 50 100 150 200 Km


Land area
AK
ONT
TX
CA
OR
Population
CA
TX
ONT
OR
AK

MTO analytical requirements (2015)

Trip-based models can address

Project prioritization
Community connectivity
Links to economic and trade models
Links to freight models
Links to urban travel models
Links to emissions models
Energy impacts (aggregate)
Travel demand management
High-speed rail (HSR) studies
Safety impacts
Transit demand and revenue
Modal redundancy studies
Network resilience measures (rough)
Economic impact analyses (aggregate)

Activity-based models can address

The trip-based model issues, plus:

Congestion duration
Pricing studies
Managed lane studies
Most cost-benefit analyses
Financial and social welfare measures
Equity analyses
Active transport analyses
Health impacts
Energy impacts (detailed)
Fuel price impact analyses
Economic analyses (detailed)
Bottleneck analyses

Integrated land use-transportation models can address

The trip-based and activity-based issues, plus:

Induced growth analyses
Integration with land use models
Complex equity analyses
Growth management conformity
Economic analyses (second, third order effects)

Common threads

Foundational

- Importance of the champion
- Imperative for peer review

Design

- Forecasting focus
- Agile mindset (obsession?)
- Parameter storm

Methodological

- Theoretical versus econometric focus
- Replication versus understanding
- “Development tortoise versus requirement hare”

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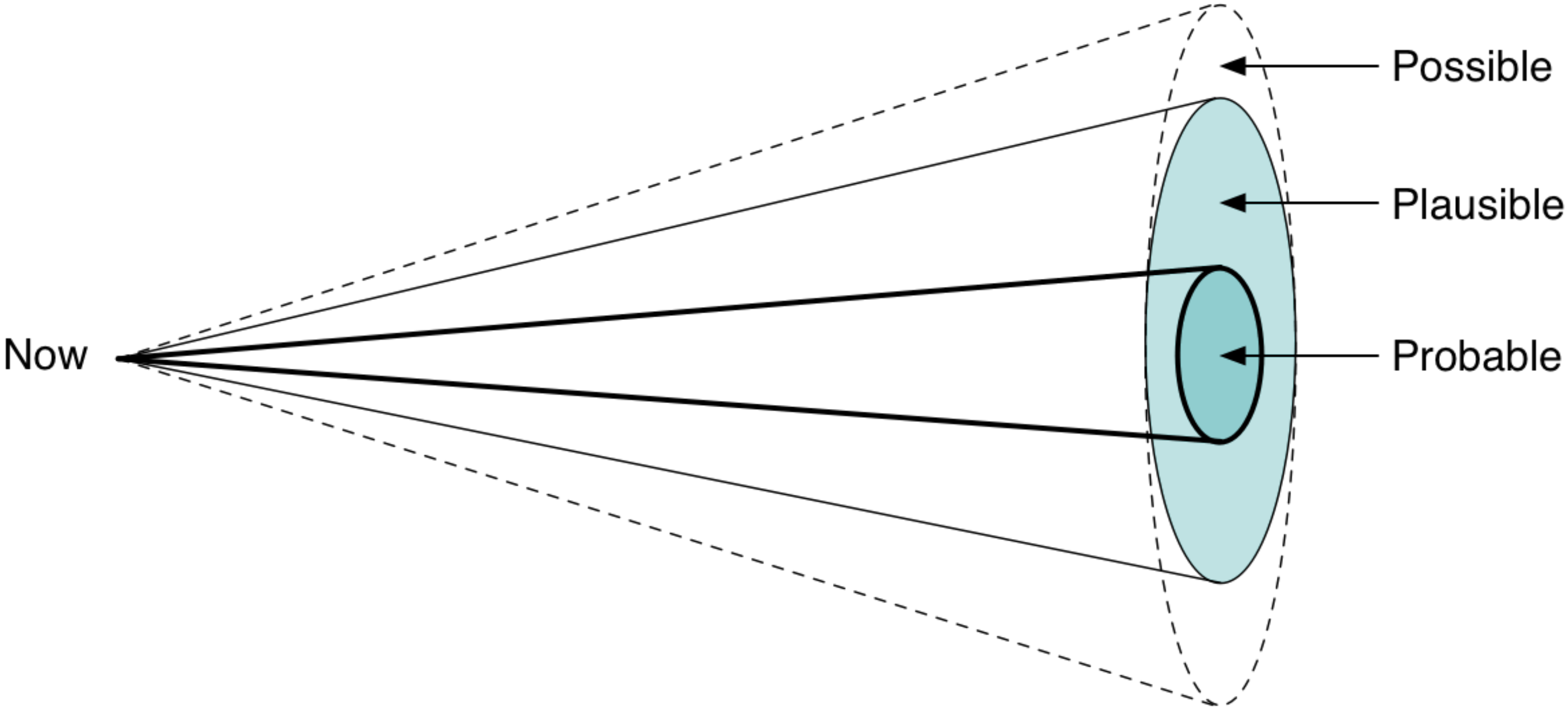
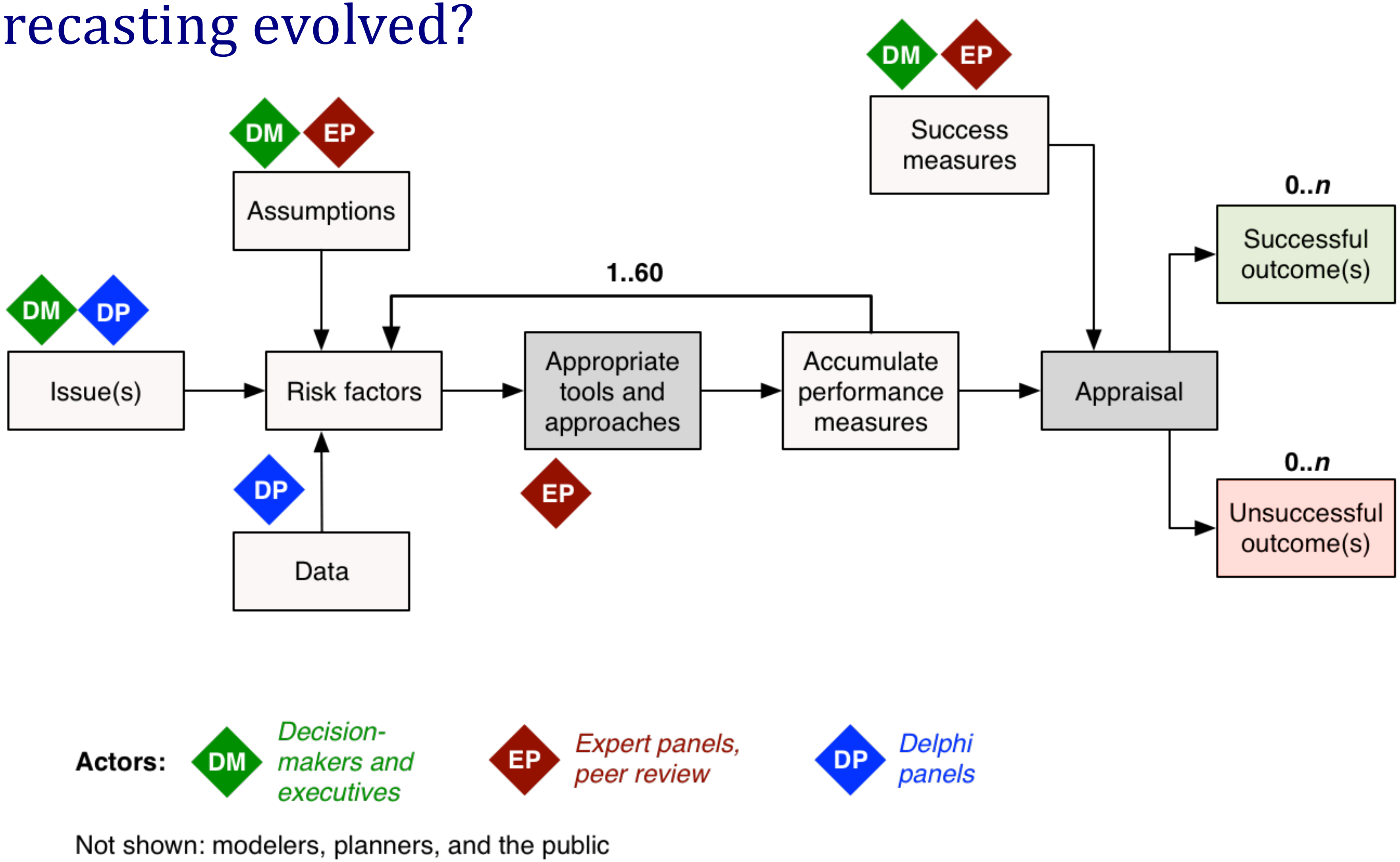
Forecasting versus replication

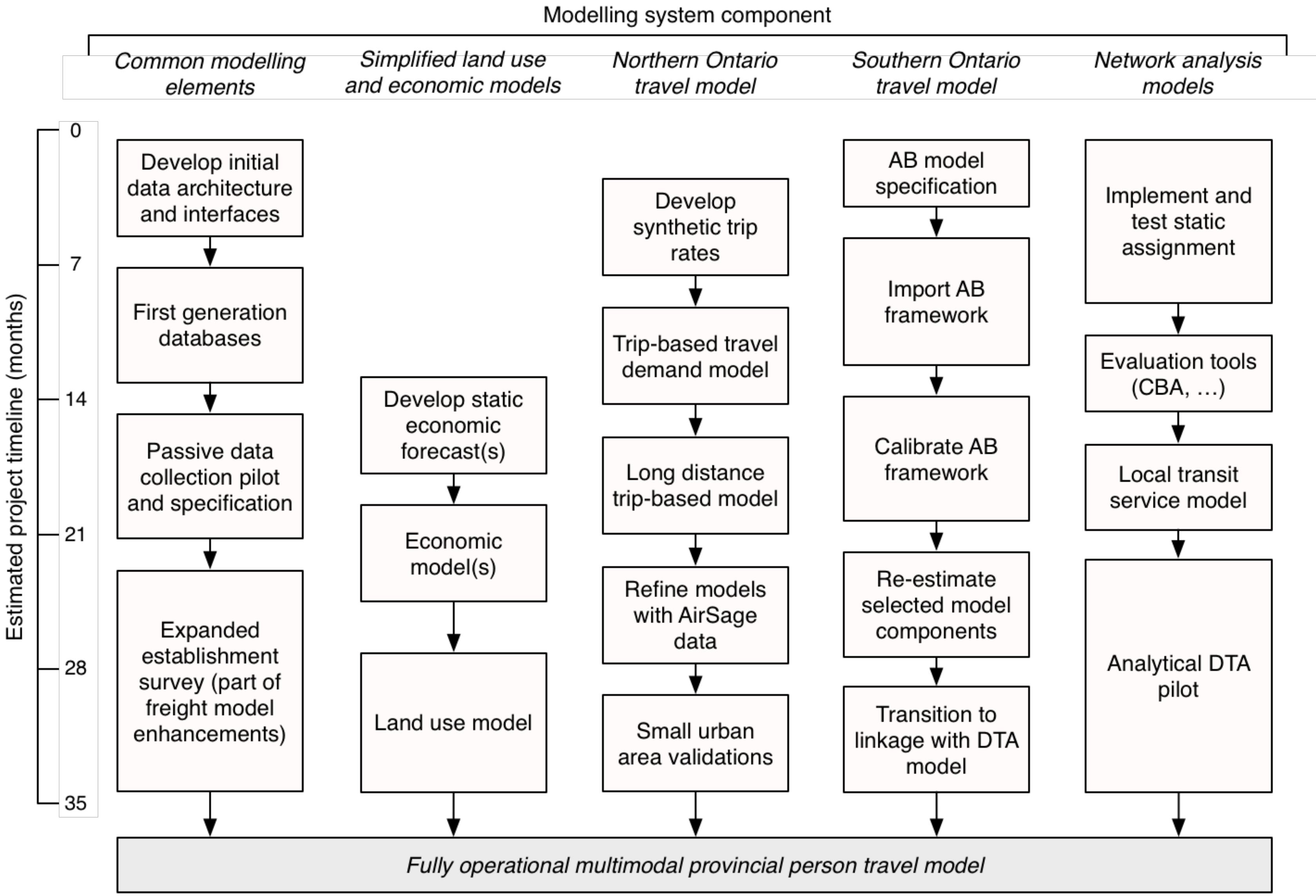


Source: Adapted from Voros (2003) and Hancock & Bezold (1994)

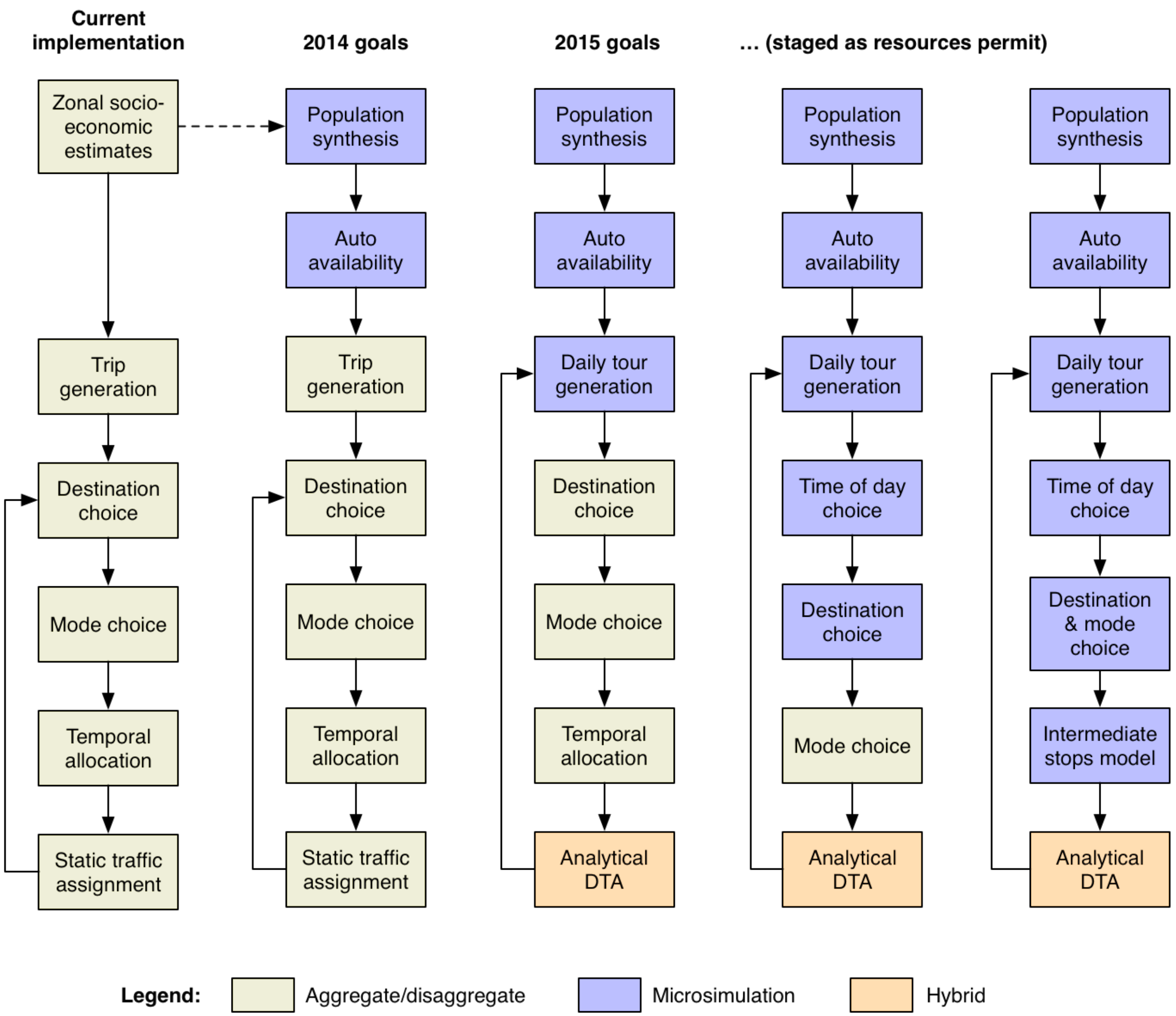
Forecasting evolved?



Agile development (Ontario)



Agile development (Maryland)



Parameter storm

All values shown subject to frequent revisions

Group	Model	SWIM2 system Dev	SWIM2 system User	TRESO system Dev	TRESO system User
Land use and economic	Macroeconomic	21	4	77	3
	Population synthesis	18	8	23	6
	Economic allocation	120[a]	28[a]	9	2
Transport	Internal person travel	64	9	18	3
	Long-distance person travel			?[b]	?[b]
	Visitor travel			?[b]	?[b]
	Commodity flow	12	3	8	6
	Long-distance freight			12	3
	Truck tour model	9	2	14	1
	Network analyses	28	8	22	7
Evaluation	Post-processors[c]	2	2	19	13
	Total parameters	274	64	202	48
	Percent of total parameters		23.4		23.8

a. Applies to SWIM2 delivery of AA variant of PECAS
b. Model still under development, values unknown at present time
c. SWIM2 only has one post-processor, while TRESO has three

Common threads

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Wrap-up

Opportunities	Challenges
Client champions	Fast-changing context
Acceptance	Acceptance
Experience	Complex and complicated
Multi-scale backplane	***Dependence upon developer***
Better tools	Lack of unifying theory
Big data (availability)	Big data (utility)
End of reductionist mindset?	End of reductionist mindset!