



Faculty of Design

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A morphological analysis tool for complex future-oriented scenario researches

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HOW MANY SOLUTIONS?

A Morphological Analysis Tool for Complex Future-Oriented Scenario Research

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RSD5 Symposium 13th – 15th October 2016, Toronto



Institut für Transportation Design

Braunschweig University of Art

Hochschule für Bildende Künste Braunschweig





possible alternatives to the cruising business model in a 2030 perspective

Research Through Design

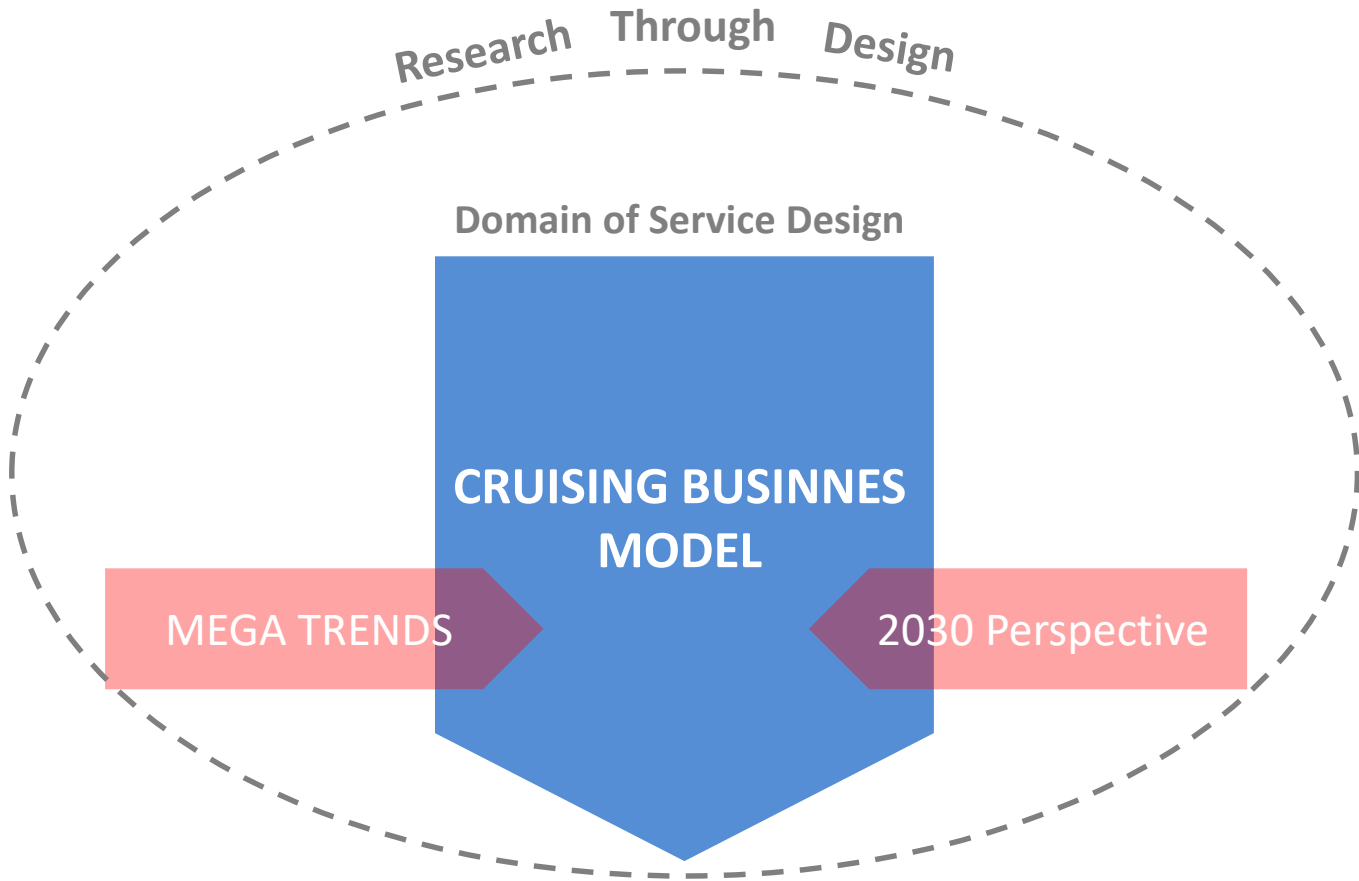
Domain of Service Design

**CRUISING BUSINNES
MODEL**

MEGA TRENDS

2030 Perspective

**GENERATION OF NOVEL
FUTURE SERVICE CONCEPTS**



PROGNOSIS

HOW IT WILL **PROBABLY** LOOK LIKE?

PROJECTION

HOW IT **COULD** LOOK LIKE?



CHARACTERISTICS OF OUR PROBLEM SPACE

- Multidimensionality
- non-present user/ testing platform (2030 perspective)
- Constraints are not determined (technology advances)
- Need for recalculation of design process (changing analytical base)

“The ever-changing dimensions of such research cases and their inter-relations make it very difficult to justify influence factors upon which the projection is made! “

(Tom Ritchey 2011)



What is

GENERAL MORPHOLOGICAL ANALYSIS (GMA)?

PARAMETERS DEFINING THE BUSINESS MODEL

A. Business expansion bias (exclusive transport services)

- A1. onboard hospitality and entertainment
- A2. onboard/onshore real estate investing
- A3. on-shore service logistic
- A4. no on-board involvement (limited to transportation)

B. Mobility performance (average vessel speed within a 2 weeks sailing)

- B1. very slow or immobile (0 -5 knots)
- B2. slower (12 ± 2 knots)
- B3. same speed (20 ± 2 Knots)

C. Ecologic factor emissions/energy efficiency (Passenger-day)

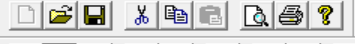
- C1. Status-quo(worse than on-shores)169-340kg
- C2. equal with on-shore
- C3. very energy efficient(better ecologic factor than on-shore)

D. Average capacity (capacity of crews and passengers per ship)

- D1. highly decrease ($CPS \leq 150$)
- D2. no change($CPS \sim 2000$)
- D3. highly increase($15000 \leq CPS$)

E. Vessel ownership (CL Pre-investment share for 1000 Passenger)

- E1. CL entirely(m\$150-250/1000p)
- E2. CL only operation(m\$5≤/1000p)
- E3. CL partially Owner(m\$ 5-150/1000p)



Cross Consistency Analysis(CCA)- Carma engine

	Business expansion bias (exclusive transport services)				Mobility performance (vessel speed within a 2 weeks sailing)		ecologic factor emissions/energy efficiency (Passenger-day)			average capacity(capacity of crews and passengers per ship)			vessel ownership (CL Pre-investment share for 1000 Passenger)		emerge of cheap renewable energy		dominant one-person families		fall of work/ leisure seperation		high level eco-tourism trend				
	and hospitality and entertainment	and onshore real estate investing	on-shore service logistic	vestment(limited to transportation)	stantly immobile (avg 0 -5 knots)	slower (avg: 12 ± 2 knots)	status quo (avg: 20 ±2 Knots)	worse than on-shores)169-340kg	equal with on-shore	er ecologic factor than on-shore	highly decrease (CPS?150)	no change(CPS ~ 2000)	highly increase(15000? CPS)	CL entirely(m\$150-250/1000p)	CL only operation(m\$5?/1000p)	artially Owner(m\$ 5-150/1000p)	happens	doesn't happen	happens	doesn't happen	happens	doesn't happen	happens	doesn't happen	
Mobility performance (vessel speed within a 2 weeks sailing)	predominantly immobile (avg 0 -5 knots)	-	-	-	X																				
	slower (avg: 12 ± 2 knots)	-	K	K	-																				
	status quo (avg: 20 ±2 Knots)	K	-	X	-																				
ecologic factor emissions/energy efficiency (Passenger-day)	Status-quo(worse than on-shores)169-340kg	-	k	x	x	X	K	-																	
	equal with on-shore	k	-	x	-	-	-	X																	
	very energy efficient(better ecologic factor than on-shore	x	-	k	k	K	K	X																	
average capacity(capacity of crews and passengers per ship)	highly decrease (CPS?150)	x	x	-	K	X	-	-	K	X	X														
	no change(CPS ~ 2000)	-	-	-	K	K	-	-	-	K	K														
	highly increase(15000? CPS)	-	-	x	-	-	K	X	K	-	-														
vessel ownership (CL Pre-investment share for 1000 Passenger)	CL entirely(m\$150-250/1000p)	-	x	k	X	K	-	-	-	K	K	-	-	K											
	CL only operation(m\$5?/1000p)	x	-	-	-	-	-	-	X	K	-	K	K	-											
	CL partially Owner(m\$ 5-150/1000p)	-	-	-	X	-	-	X	K	-	K	X	K	-											
emerge of cheap renewable energy	happens	-	-	-	-	-	X	X	-	-	-	K	-	-	-	K									
	doesn't happen	k	k	k	K	K	K	K	K	K	K	K	K	K	K	K									
dominant one-person families	happens	k	-	-	-	K	K	K	-	K	X	-	-	X	K	-	-	K	K						
	doesn't happen	k	k	k	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K						
fall of work/ leisure seperation	happens	k	-	-	-	-	K	X	-	K	-	-	K	-	-	-	K	-	K						
	doesn't happen	k	k	k	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	X	K				
high level eco-tourism trend	happens	x	x	k	-	-	-	X	X	-	-	-	K	X	K	-	K	-	K	K	-	K			
	doesn't happen	k	k	k	K	K	K	K	K	K	K	K	K	K	K	K	X	K	K	K	K	K			
fall of middle class in europe(shift to wealthy china)	happens	k	-	-	K	-	K	K	-	K	K	X	K	-	X	K	X	-	X	-	-	K	X	-	
	doesn't happen	k	k	k	K	K	K	K	K	K	K	K	K	K	K	K	-	K	-	K	K	K	-	K	

What is the contribution of **GMA** to a design research process?

A

P

S

**Conventional
Design Practice**



Human Inquiry



Human Innovation



Human Assessment

GMA



**GMA Aided idea
generation**

GMA



**Improved human
assessment**

**GMA Supported
Design Practice**



- 1 Systemizing the arbitrary step of projection**
- 2 Narrating the attributes of a possible service**
- 3 Ranking the ideas**
- 4 Modifiable and rearrangeable modeling**

GMA CONSTRAINTS

- Limited calculable number of parameters and their values
- Determining the extent and severity of external influence factors
- Determining lowest and highest threshold of values
- Judging during CCA step

“This process represents two strangely superimposed (and what might seem to be mentally contradictory) tasks:

on the one hand, of identifying combinations of attributes which are seen to be logically impossible or empirically implausible – and discarding them;

and on the other hand, of keeping one’s mind open for the discovery of strange and novel combinations that we may not hitherto have imagined.”

(Álvarez & Ritchey 2015)

INTERACTIVE ONLINE DELPHI SURVEY

01. Demographic Changes

02. Technological Revolution & New Straps

03. Social and Cultural Shifts

04. New Patterns of Mobility

05. Learning From Nature

06. Ubiquitous Intelligence

07. Technology Convergence

08. Globalization 2.0

09. Changes in the Work World

10. New Consumption Patterns

11. Upheavals in Energy And Resources

12. Transformation of Healthcare Systems

13. Changes in Gender Roles

14. Digital Culture

15. Knowledge-based Economy

16. Business Ecosystems

Please support your choice with a comment

08: Learning From Nature

10: Technology Convergence

13: Business Ecosystems

16: Upheavals in Energy And Resources

Question 8: Megatrends

Which trends will particularly affect the **architecture of future mega cruisers** as a platform for mass-tourism?

(These reflect relevant trends and rank the list according to their influence rate, click to reposition)

click to select, drag to reposition

Please Select

- 08: Learning From Nature
- 10: Technology Convergence
- 13: Business Ecosystems
- 16: Upheavals in Energy And Resources

Please support your choice with a comment

08: Learning From Nature

10: Technology Convergence

13: Business Ecosystems

16: Upheavals in Energy And Resources

Question 9: ship Architecture

In the first round of inquiry experts anticipated that until 2030, cruise ships more than 6000 beds (6000 beds) won't be built, but stationary ocean terminals or very slow mobile islands will be a new market.

Considering that the mobile platform (Ponant's Spirit, world's largest vessel project: 403000 GT and 14 knots speed) is built based on a catamaran architecture, it is also possible that the mentioned ocean terminals or mobile islands (from an architectural point of view) will be built more similar to the Pioneering Spirit, rather than to "class of the sector" as this brand would need more flat area on the deck than hydrodynamic abilities. (Two hulled catamaran vs single hull platform)

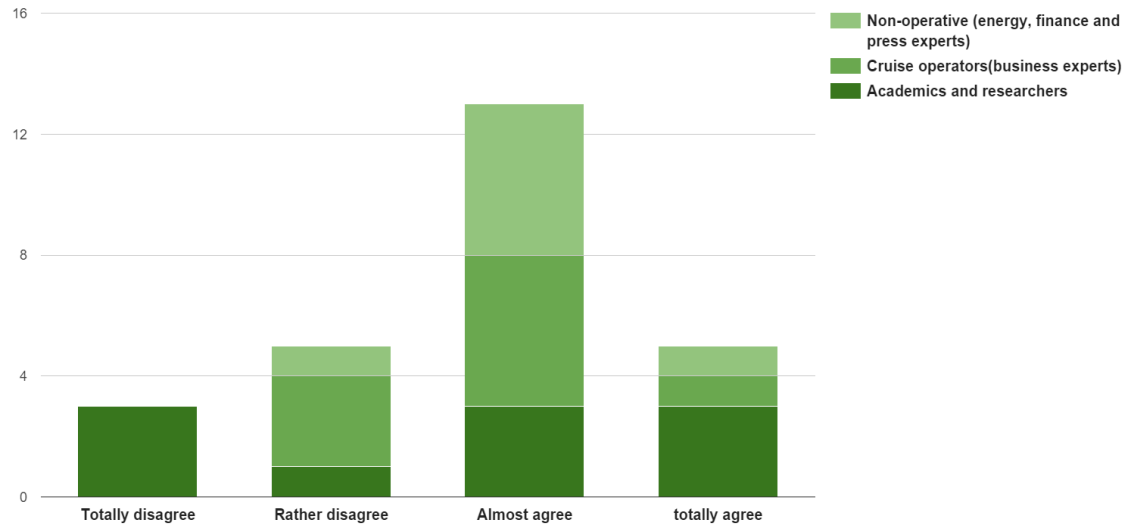


Please estimate, first, how plausible this statement is and second, how probable is that this scenario happens until 2030?

drag the right slider for plausibility in %, left slider for likelihood in %

0% 100%

By 2030 floating Islands or stationary ships will be a new market.



voted by 26 experts (9 from cruise companies, 10 academics and 7 others)

Benefits of Delphi Integration into GMA

- Strengthening the diversity of expertise
- Integrating decision-makers (stakeholders) into the service generation process



Business expansion bias (exclusive transport services)	Mobility performance (vessel speed within a 2 weeks sailing)	ecologic factor emissions/energy efficiency (Passenger-day)	average capacity(capacity of crews and passengers per ship)	vessel ownership (CL Pre-investment share for 1000 Passenger)	emerge of cheap renewable energy
onboard hospitality and entertainment	predominantly immobile (avg 0 -5 knots)	Status-quo(worse than on-shores)169-340kg	highly decrease (CPS?150)	CL entirely(m\$150-250/1000p)	happens
onboard/onshore real estate investing	slower (avg: 12 ± 2 knots)	equal with on-shore	no change(CPS ~ 2000)	CL only operation(m\$5?/1000p)	doesn't happen
on-shore service logistic	status quo (avg: 20 ±2 Knots)	very energy efficient(better ecologic factor than on-shore	highly increase(15000? CPS)	CL partially Owner(m\$ 5-150/1000p)	
no on-board involvement(limited to transportation)					

MORPHOLOGICAL ANALYSIS

CAD Extrapolation

Cross Consistency Analysis
DELPHI INQUIRY

VARIABLE DETECTION



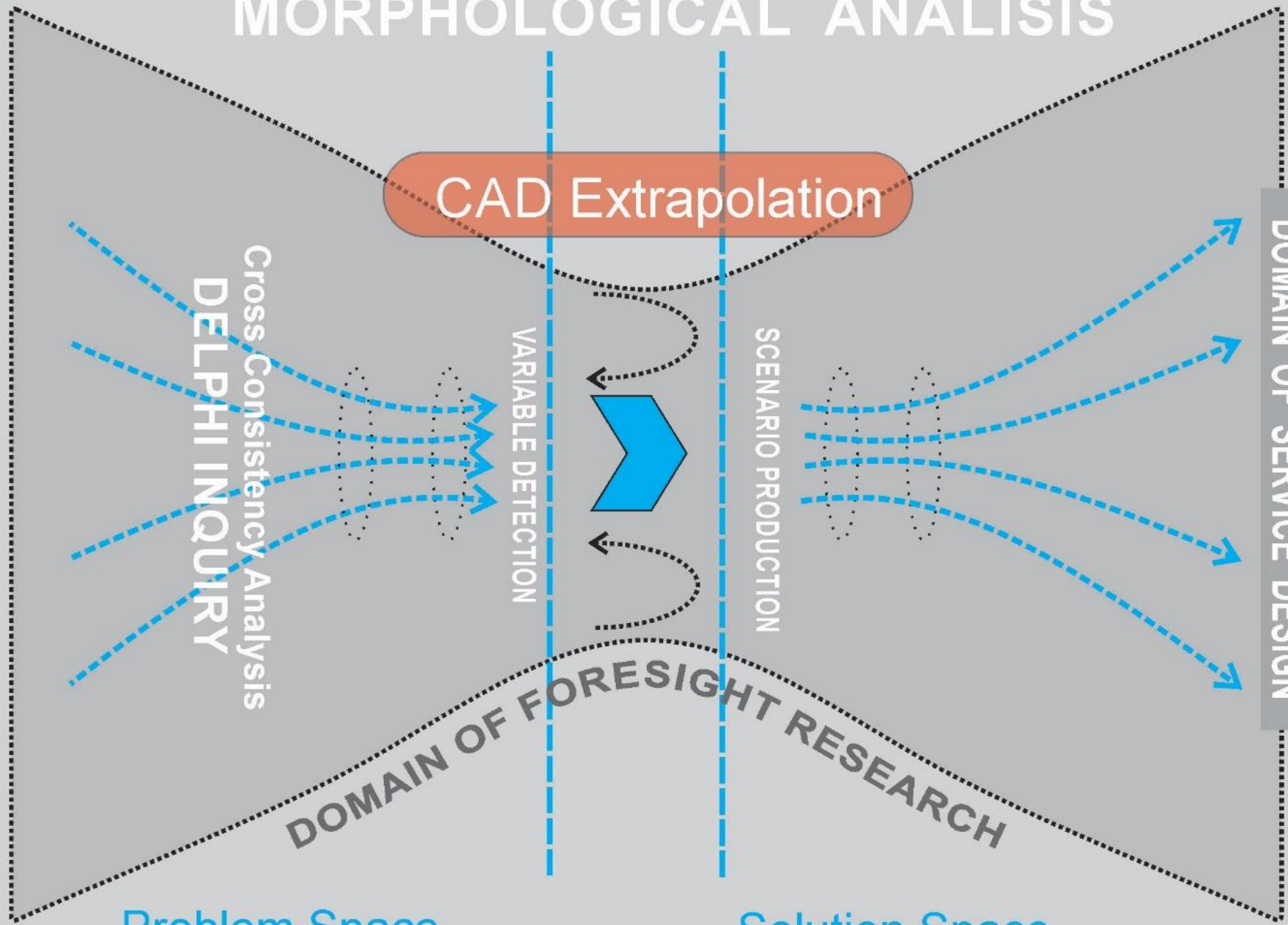
SCENARIO PRODUCTION

DOMAIN OF SERVICE DESIGN

DOMAIN OF FORESIGHT RESEARCH

Problem Space

Solution Space



Mobility performance (average vessel speed within a 2 weeks sailing)	Business expansion bias (exclusive transport services)	ecologic factor emissions/energy efficiency (Passenger-day)	average capacity(capacity of crews and passengers per ship)	vessel ownership (CL Pre-investment share for 1000 Passenger)	emerge of cheap renewable energy	logistic scope	dominant one-person families	fall of work/ leisure seperation	high level eco-tourism trend	fall of middle class in europe(shift to wealthy china)
very slow or immobile (0-5 knots)	onboard hospitality and entertainment	Status-quo(worse than on-shores)169-340	highly decrease (CPS≤150)	CL entirely(m\$150-250)	Wild Card	trans-regional	Wild Card	Wild Card	Wild Card	Wild Card
slower (12 ± 2 knots)	onboard/onshore real estate investing	equal with on-shore	no change(CPS ~ 2000)	CL only operation(m\$5≤/10)	No Wild Card	trans-national	No Wild Card	No Wild Card	No Wild Card	No Wild Card
same speed (20 ±2 Knots)	on-shore service logistic	very energy efficient(better ecologic factor than on-shore)	highly increase(15000≤ CPS)	CL partially Owner(m\$ 5-150/1000p)						
	no on-board involvement(limited to transportation)									

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86	C8D3E6G2J1K1L2Q1T1U1\1	38.5	1.12E-8	9	0.0650	0.7000	0	<input checked="" type="checkbox"/>
87	C9D3F7G4I5K1L2O1T1U1\1\2	38.5	1.35F-7	2	0.2240	0.7000	0	<input checked="" type="checkbox"/>



THANK YOU



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