

Applied R&D

AI Systems - 人工智能

Professional Services

Dr. Andy Chun 陳漢偉

Chief Information Officer

City University of Hong Kong



Agenda

- ▶ Who are we?
- ▶ Our services?
- ▶ AI Case Studies



City University of Hong Kong

- ▶ **CityU is Applied Research !**
 - ▶ Use technology to help HK be more competitive
 - ▶ Improve quality of life for citizens!
- ▶ **Commercialization**
 - ▶ Over 30 companies
 - ▶ Roughly 600 projects/year !



CityU Professional Services (CPS)

- ▶ Offered professional services for AI development since 1994
- ▶ Types of services:
 - ▶ Ranging from consultancy, design, to implementation



Types of AI Systems

- ▶ Enterprise optimization
 - ▶ Scheduling, rostering, timetabling, allocation
- ▶ Business rules, decision support
- ▶ Knowledge management, data mining
- ▶ Machine learning



Dr Andy Chun



- ▶ Over 20 years of AI experience
- ▶ At CityU:
 - ▶ Chief Information Officer
- ▶ Before CityU:
 - ▶ PhD – U of Illinois at Urbana-Champaign
 - ▶ Worked with AI pioneers:
 - ▶ Prof. Donald Michie – UK “Father of AI”
 - ▶ Prof. David Waltz – Inventor of constraint propagation
 - ▶ Prof. Patrick Winston – Former Director MIT AI Lab

Companies Using Our AI Technologies



HK Civil Aviation Department



Mass Transit Railway



HK Air Cargo Terminals Ltd



Modern Terminals Ltd



HK International Terminals Ltd



Airport Authority



Hospital Authority



Café de Coral



HK Immigration Department

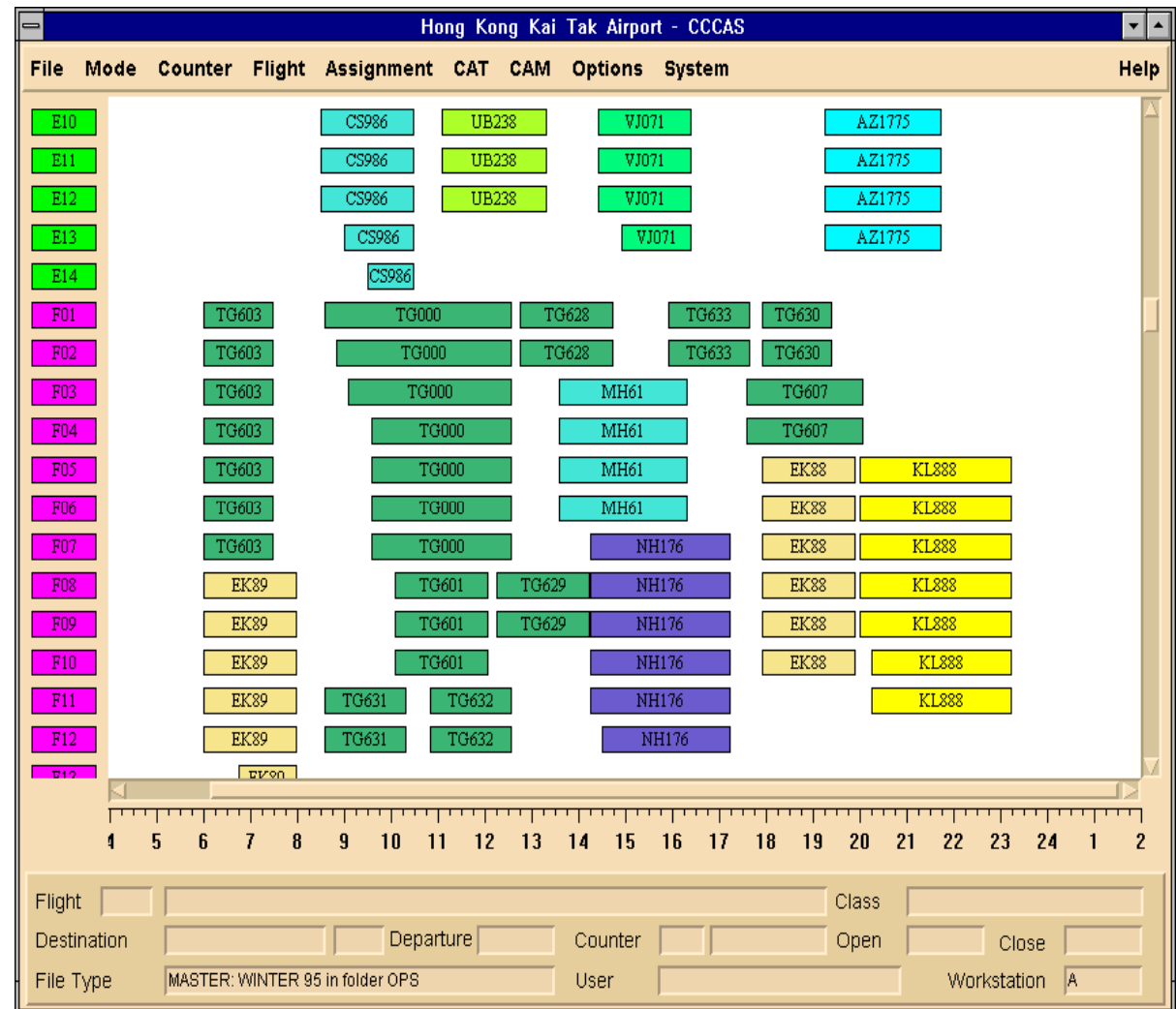


Civil Aviation Department

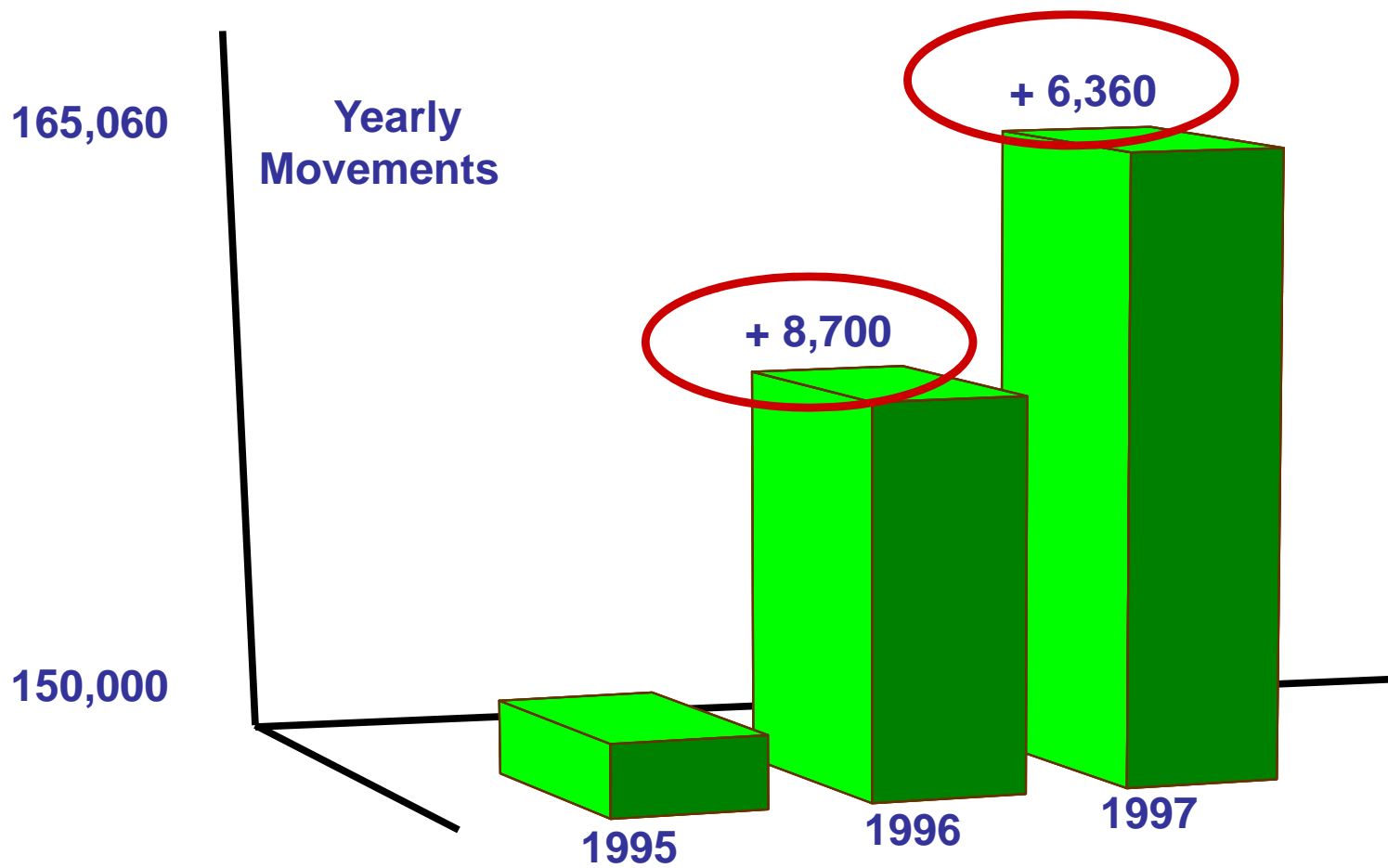




- ▶ Computerized check-in counter allocation
- ▶ Combine simulation with constraint-based scheduling
- ▶ Increase traffic while maintaining service levels
- ▶ Production 1996



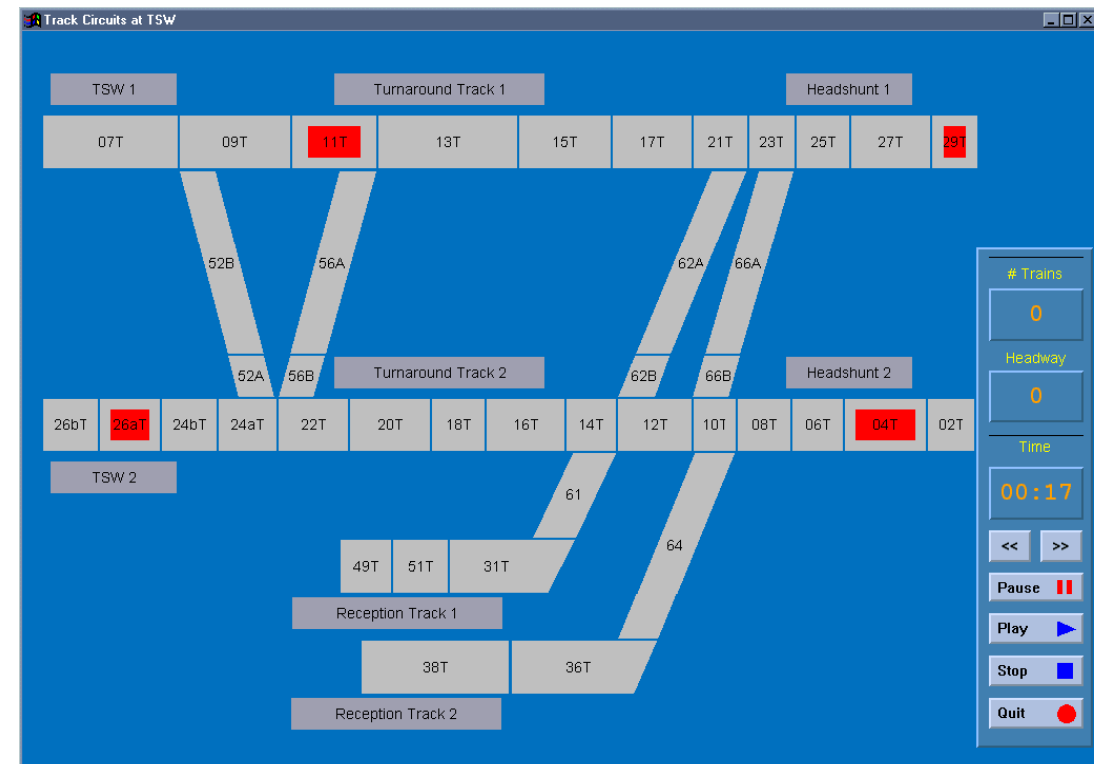
Throughput Achievement



Mass Transit Railway



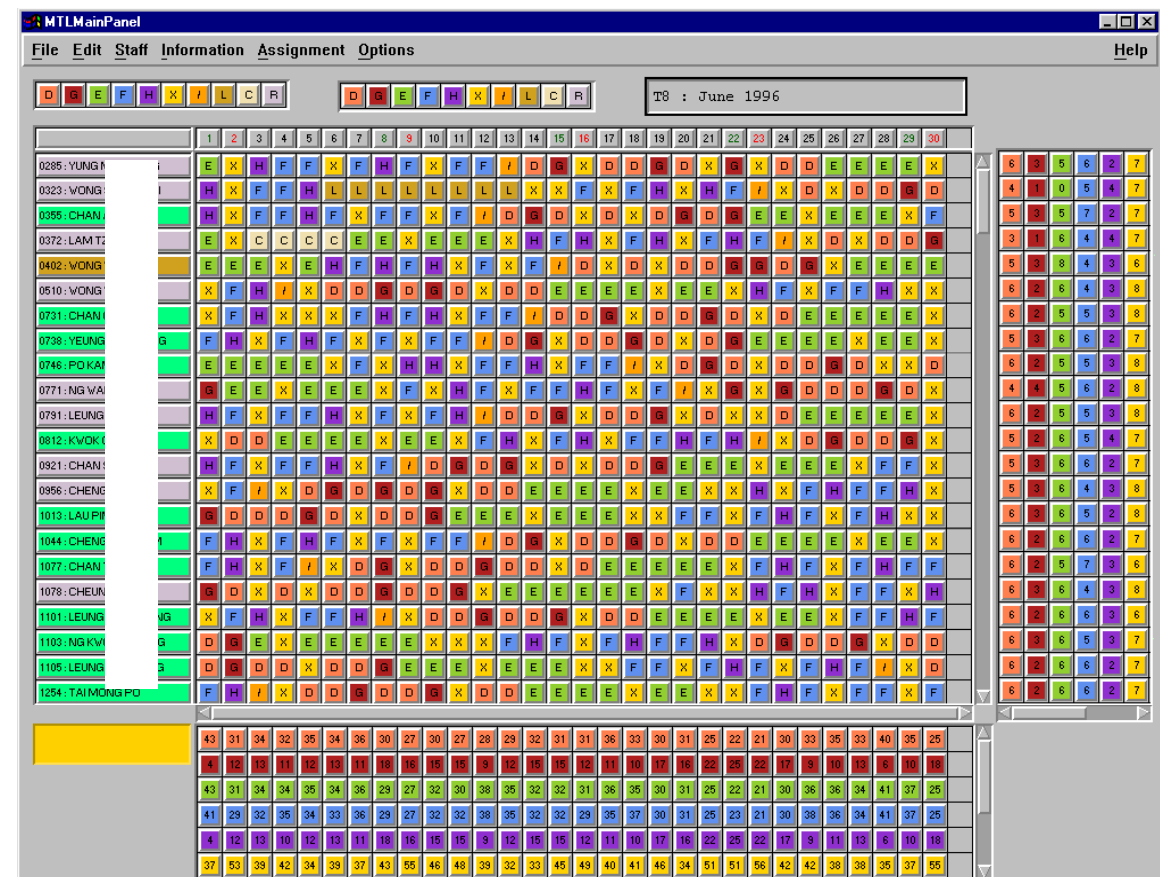
- ▶ Schedule dispatch of trains at TSW line
- ▶ Complexity too difficult for humans
- ▶ Increased number of trains during rush hours
- ▶ Completed in 1995



HK International Terminals



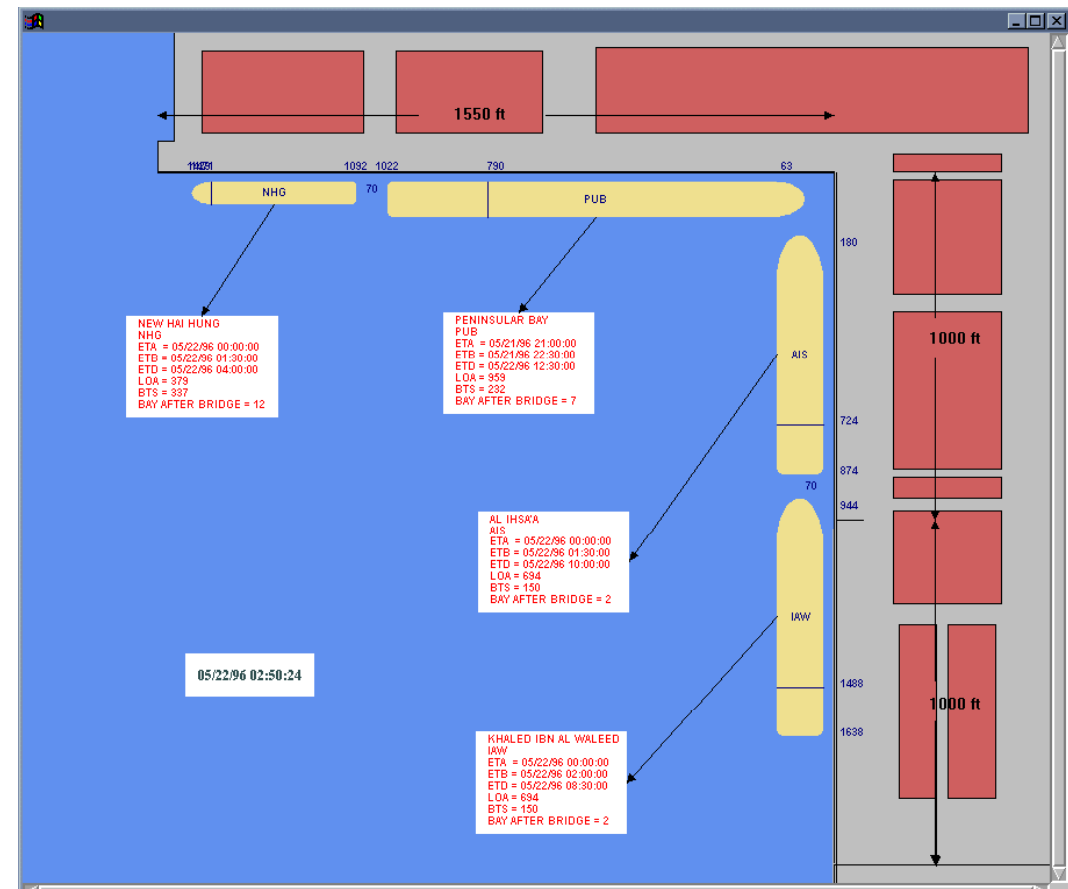
- ▶ Yearly workforce forecasting
- ▶ Monthly roster of equipment operators
- ▶ Support flexible shifts
- ▶ Increased overall efficiency of container yard
- ▶ Production 1996



Modern Terminals Ltd



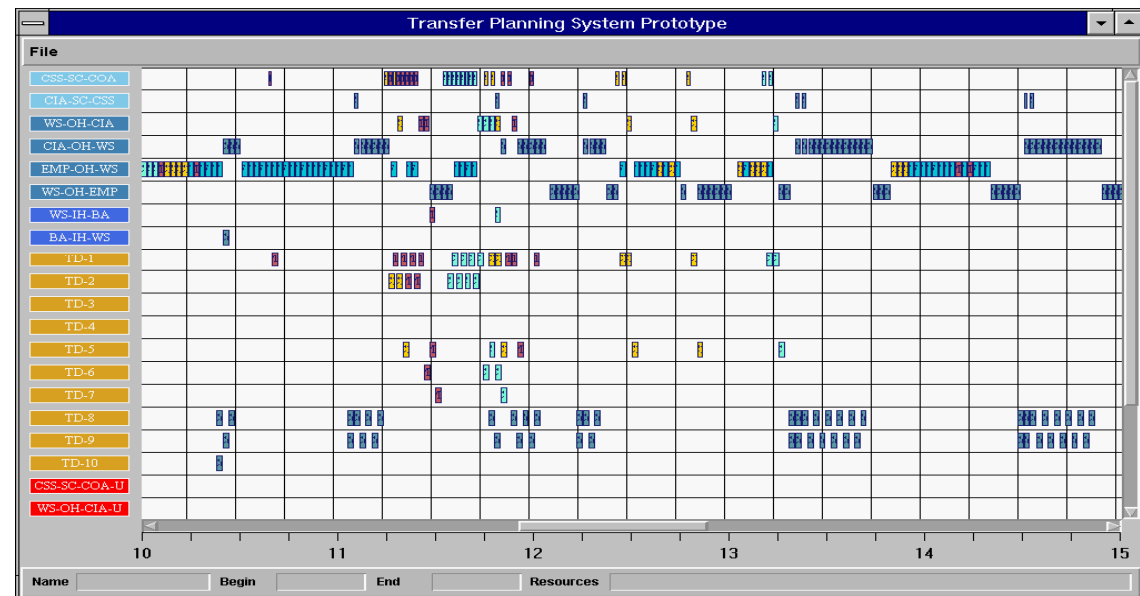
- ▶ Rostering for equipment operators
- ▶ Container vessel berth allocation
- ▶ Increase number of vessel berthing
- ▶ Increased efficiency in manpower usage
- ▶ Prototype 1996



HK Air Cargo Terminals



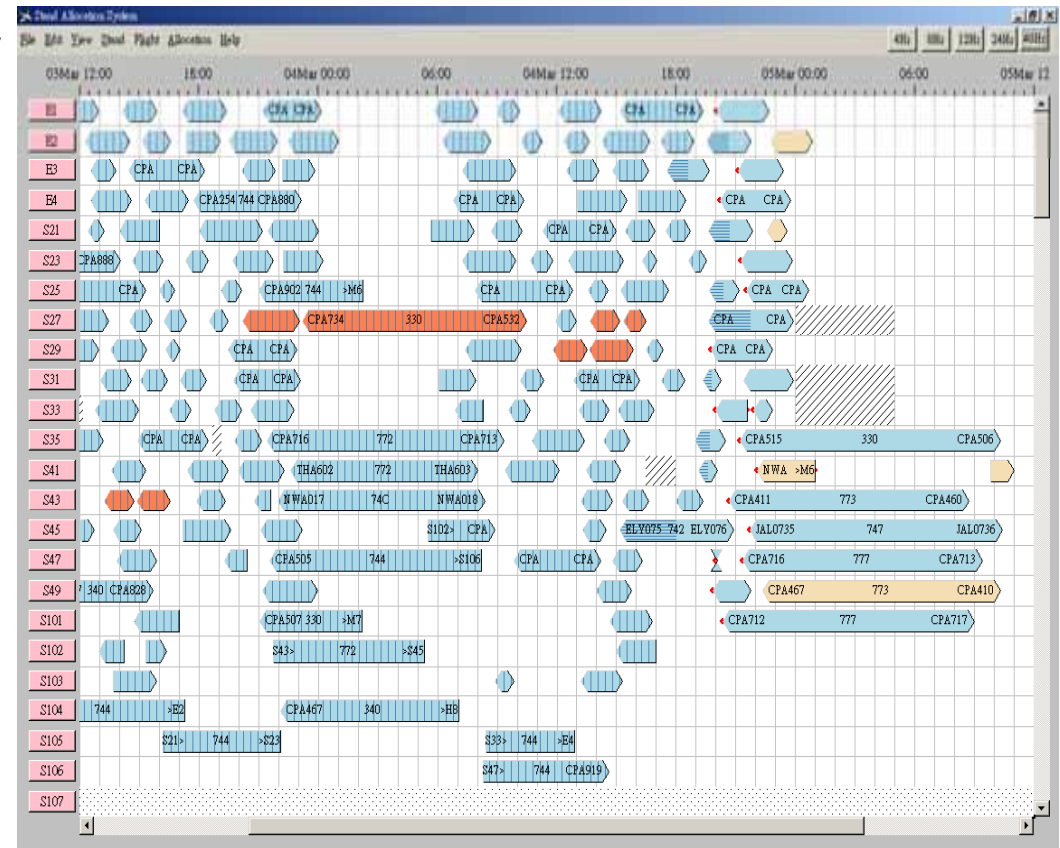
- ▶ Allocation of equipment
- ▶ Schedule ULD movement
- ▶ Allocation of work space
- ▶ Rostering of workers
- ▶ Increased efficient and flexibility to cope with dynamic changes
- ▶ Prototype 1995



Airport Authority



- ▶ Planning and real-time management of Chek Lap Kok airport apron
- ▶ 24x7 real-time stand allocation
- ▶ Multi-user system used in control tower
- ▶ Production since June 1998



- ▶ “The entire development and commissioning was accomplished to a **high standard** taking advantage of the latest IT technology... made possible only by Dr. Chun’s professional excellence and commitment to the project.”



Alan T.C. Lam
GM (Airfield Operations)
Hong Kong Airport Authority



Association for the Advancement of Artificial Intelligence

▶ **1999** Innovative Applications of AI Award

- ▶ 1st in greater China to receive this prestigious award!
- ▶ For innovative use of AI in Chek Lap Kok International Airport aircraft stand allocation system



Hospital Authority



- ▶ Staff rostering for public hospital wards
- ▶ Satisfy all HA and Labor regulations
- ▶ Ensure fairness
- ▶ Cope with changes in demand and availability
- ▶ Deployment since 1998

Manpower Rostering System - [Duty Roster]

Company: PwH From Date: 06/07/1998
 Department: SURG Roster for: 2 weeks
 Team: 4D

HKID	Name	Chinese Name	Rank	Mon 06	Tue 07	Wed 08	Thu 09	Fri 10	Sat 11	Sun 12	Mon 13	Tue 14	Wed 15	Thu 16	Fri 17	Sat 18	Sun 19	Owing	CO
C488	Jun		RN			A		A			N	LVE	A			N		0	0
C501			RN	N	LVE				N								N	0	0
C531	hen		RN	A				A			N				A			0	0
C561	ai		RN		N	LVE				N		O	D	D	D			0	0
C631	in		RN	AL	AL	AL	AL	AL	HAL	O			N					0	0
C661	an		RN						N							N	LVE	0	0
D261	uem		WM															0	0
E731	Fan		NO	AL	AL	AL	AL	AL	HAL	O	AL	AL	AL	AL	AL	HAL	O	-1	0
E881	ng		NO								N	O	DO	PH				0	0
E931	ing		RN															1	0
E971			WM															0	0
E971	an		NO	D	D	D	D	D	HD	O	D	D	D	D	D	DO	O	0	0
G021	fei		WM	D	D	D	D	D	HD	O						N		0	0
G261	it		RN	N								N						0	0
G391	i Ling		NO			N								N				0	0
G631	n Fai		RN					N							N			0	0
G661	Fin		RN				N	O	PH	PH		N					N	0	0
H321	hu		RN			N												0	0
H381	h		NO					N						N	LVE	LVE		0	0
K021	on		RN		LVE		N				AL	AL	AL	AL	AL	HAL	O	0	0
K121	it		RN		N								N					0	0
K341	kee		EN					A										0	0
K461	lan		RN						N						N	LVE	P	0	0
A				1	0	1	0	2	1	0	0	0	1	0	1	0	0	0	0
P				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
N				2	2	2	2	2	2	2	3	2	2	2	2	3	2	0	0
O				0	0	0	0	1	0	4	0	2	0	0	0	0	0	0	3

- ▶ “Dr. Chun and his team’s knowledge and expertise in designing and developing scheduling systems have been **instrumental** to the success of the Hospital Authority’s Staff Rostering System.”



Michael Fung

Senior Systems Manager

Hospital Authority



Association for the Advancement of Artificial Intelligence

▶ **2000** Innovative Applications of AI Award

- ▶ Our second consecutive award!
- ▶ For innovative use of AI in the HK Hospital Authority staff rostering system



Café de Coral



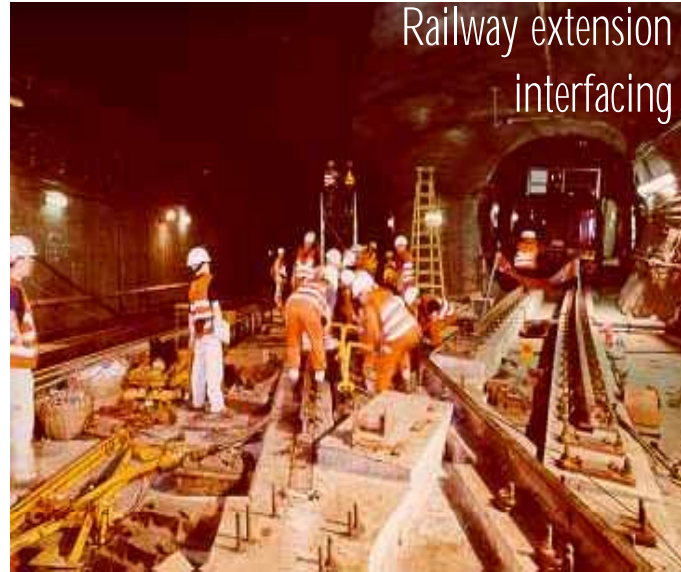


- ▶ School lunch box order processing sys.
- ▶ Interfaced to optical mark reader
- ▶ Handle over 10,000 lunch box orders weekly
- ▶ Produce production orders, delivery schedules, & EIS reports

MTR (2004)



Engineering Works Scheduling



- ▶ “Ensuring the safety of engineering works and the consistently optimal usage of the railway system... are the top priorities of the AI scheduling system. With CityU’s expertise in this area, we are **pleased to work with them** on this state-of-the-art project...”



Ir Richard Keefe

Infrastructure Engineering Manager

MTR



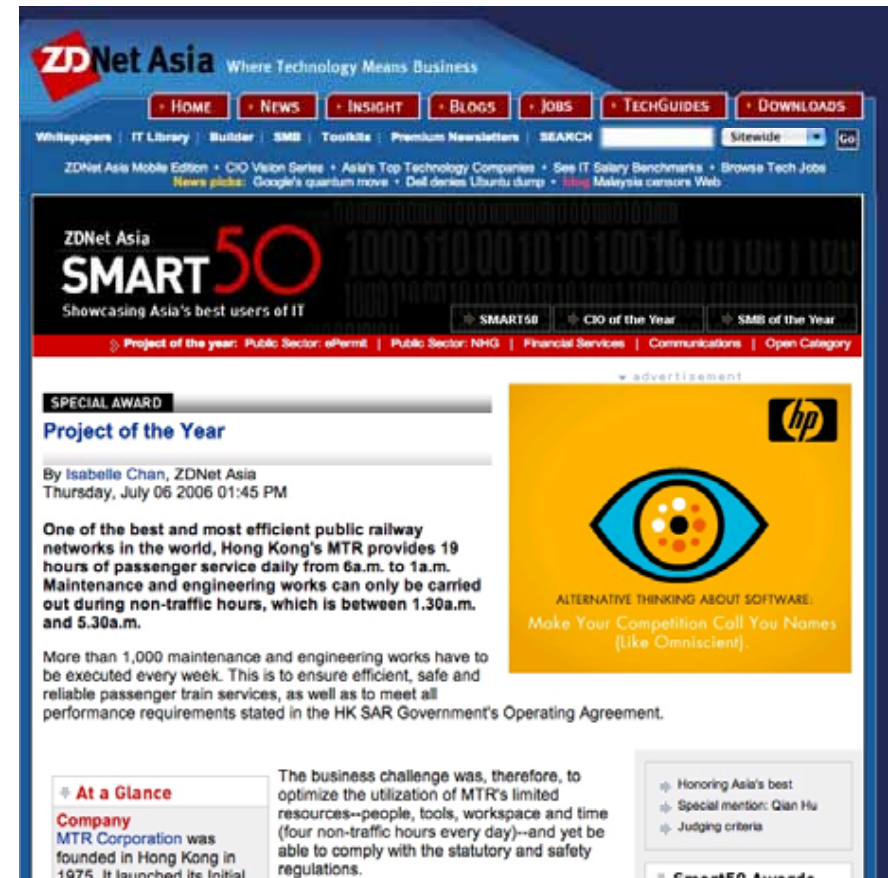
▶ **2005** MTR Corporate Grand Award

- ▶ “The team's success in the design, development and implementation of the ETMS has brought about safety and efficiency improvement in the planning and execution of engineering works, **setting an example for the design of future information systems.**”



▶ 2006 Project of the Year Award

- ▶ “The business challenge was to optimize the utilization of MTR’s limited resources – people, tools, workspace, and time – and yet be able to comply with the statutory and safety regulations”



The screenshot shows the ZDNet Asia website interface. At the top, the logo reads "ZDNet Asia Where Technology Means Business". Navigation tabs include HOME, NEWS, INSIGHT, BLOGS, JOBS, TECHGUIDES, and DOWNLOADS. Below the navigation is a search bar and a "Sitewide" dropdown. The main content area features a "SPECIAL AWARD" section titled "Project of the Year" by Isabelle Chan, dated Thursday, July 06 2006 01:45 PM. The article text states: "One of the best and most efficient public railway networks in the world, Hong Kong's MTR provides 19 hours of passenger service daily from 6a.m. to 1a.m. Maintenance and engineering works can only be carried out during non-traffic hours, which is between 1.30a.m. and 5.30a.m. More than 1,000 maintenance and engineering works have to be executed every week. This is to ensure efficient, safe and reliable passenger train services, as well as to meet all performance requirements stated in the HK SAR Government's Operating Agreement." To the right of the article is an advertisement for HP with the text "ALTERNATIVE THINKING ABOUT SOFTWARE. Make Your Competition Call You Names (Like Omniscient)." At the bottom, there is a "Smart50 Awards" section with a "Company" box for MTR Corporation and a "Judging criteria" box.



▶ **2005** Application Award – Merit

- ▶ Judges comments: "Enables complicated planning of more than 1,000 engineering tasks for over 50 stations during less than four non-traffic hours nightly. . . safely and efficiently schedules a variety of engineering assignments for some 1,000 workers ...has **increased capacity** for engineering tasks by **200%**."





▶ **2005** Best Industrial Application

- ▶ 1st time any University wins award in this category!
- ▶ MTR engineering works scheduling system





Association for the Advancement of Artificial Intelligence

▶ **2005** Innovative Applications of AI Award

- ▶ Only organization in the world to be awarded the 3rd time!
- ▶ For innovative use of AI in the HK MTR engineering works scheduling system



Immigration Dept ('05)



Automatic Form Assessment



- ▶ >100 types of application forms
- ▶ ~4 million submitted last year!
 - ▶ Time consuming to process
 - ▶ Need thorough knowledge of HK laws and regulations
 - ▶ Need experience to make discretionary judgment on “special” cases



Comments from Immigration Department

- ▶ “80% [of all cases] will be done by computer... In an application for employment, ...at least 5 working days saved from the usual 4 weeks... tangible cost **savings of US\$69 million per annum...**”



Raymond Wong Wai-Man
Assistant Director (Information Systems)
Hong Kong Immigration Department

International AI Awards



Association for the Advancement of Artificial Intelligence

▶ **2007** Innovative Applications of AI Award

- ▶ Unprecedented 4th award!
- ▶ For innovative use of AI in the HK Immigration Dept eBrain system



Olympics Equestrian Events ('07)

好运北京
GOOD LUCK

HKSAR 10th Anniversary Cup
2007.8.11 - 8.13



Compliments From Olympics

- ▶ “[CityU] was **very professional** in understanding user requirements... readily available Web-based platform... shortened development time...”



Dr. Horace Yuen

Director of Corporate Administration

Hong Kong Equestrian Events

Comments From Olympics

- ▶ “I am **very happy with the preparations**. I have spoken with the riders and they are very happy... Everything is progressing well, and we will have an absolutely fabulous Games here next year.”



Jacques Rogge

President

International Olympic Committee



Association for the Advancement of Artificial Intelligence

▶ **2008** Innovative Applications of AI Award

- ▶ Only organization in the world to be awarded the 5th time!
- ▶ For innovative use of AI in the HK Equestrian Events workforce management system



2008 Outstanding IT Achiever Awards

- ▶ Hong Kong Computer Society
 - ▶ 2 Awards!
 - ▶ IT Research
 - ▶ IT Professional Competency
 - ▶ Mrs. Rita Lau, Secretary for Commerce and Economic Development



Mr. Donald Tsang



Our AI Technology:

- ▶ Used by **Thousands** of people daily!
- ▶ Improve quality of life for **Millions** of HK citizens and visitors!
- ▶ Resulting in **Billions** of savings
- ▶ Enterprises **Rely** on CityU applied research to run smoothly!
- ▶ Contributes to HK's **Prosperity** and international **Competitiveness!**

Questions?

CityU Powers HK !

