

Use artificial intelligence and IoT technologies to build smart irrigation system

A practical example in Taoyuan canal, Taiwan

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安研科技股份有限公司

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Taoyuan Irrigation Area



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桃園農田水利會灌區圖



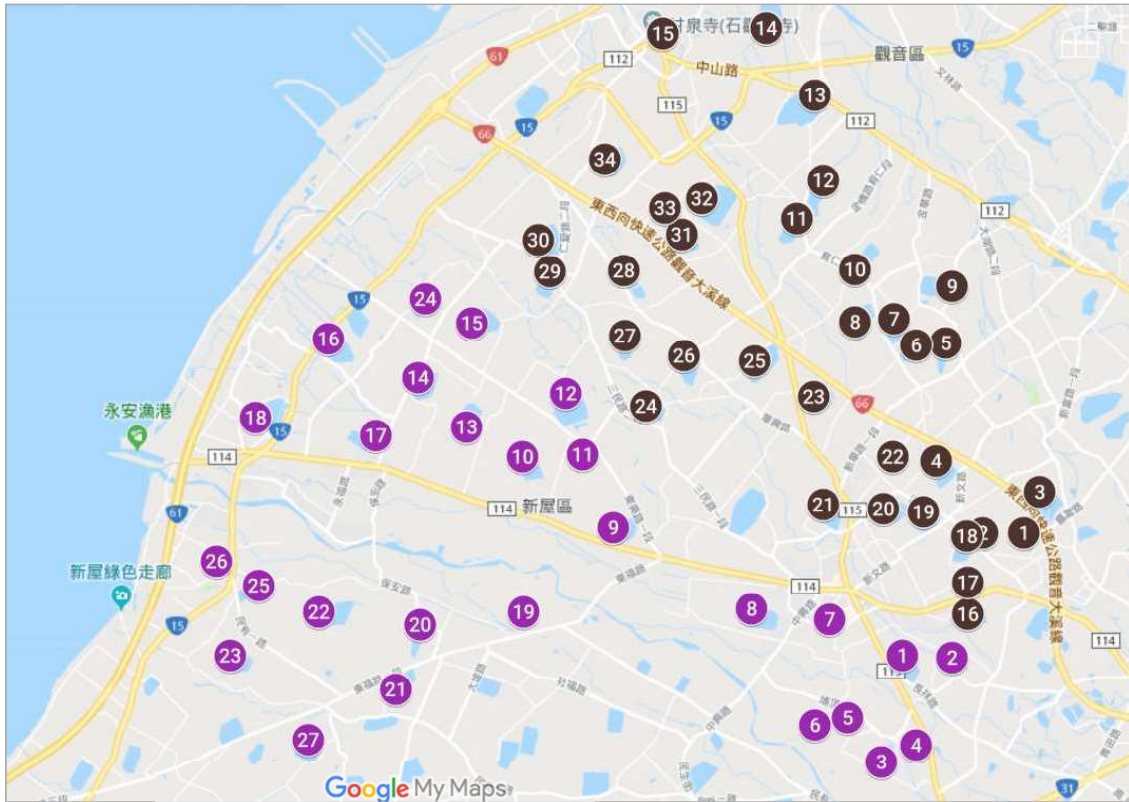
Simplified System Structure



- High Speed R/W
- Pre-process data
- Big Data Analysis
- AI
- Analytic Model
- Statistical Model

- LPWAN
- 4G / NB-IoT
- LoRaWAN

- Integrated Rdaq System
- SensMini A4



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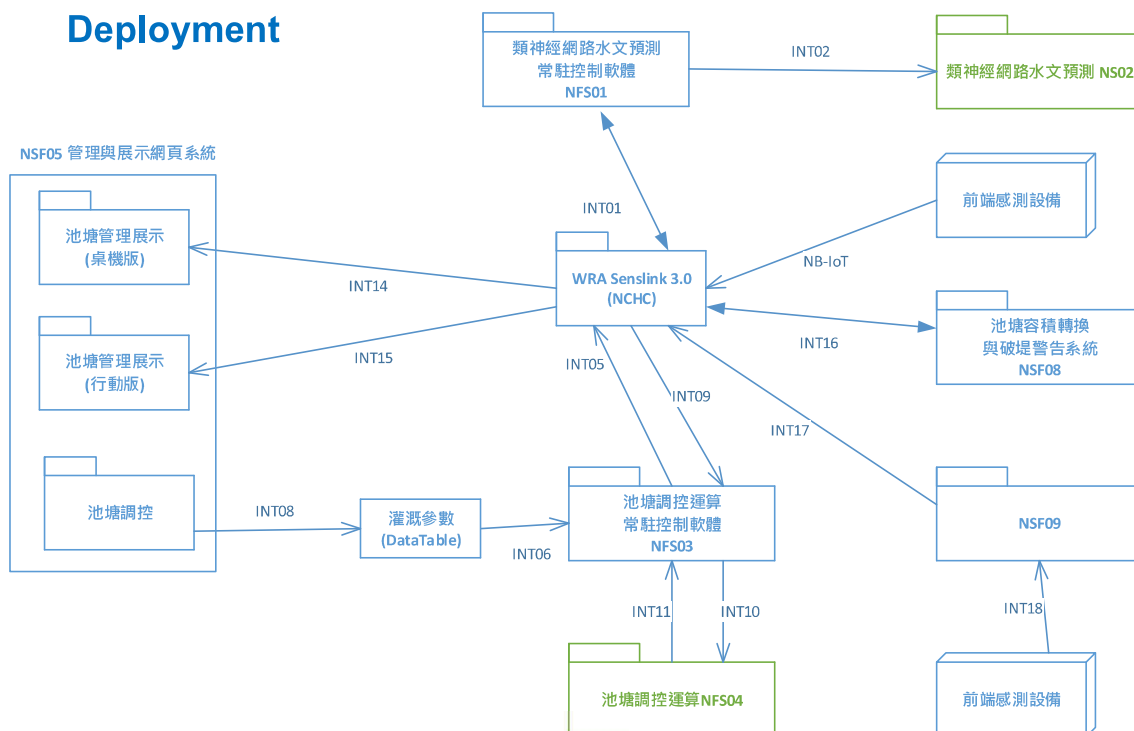
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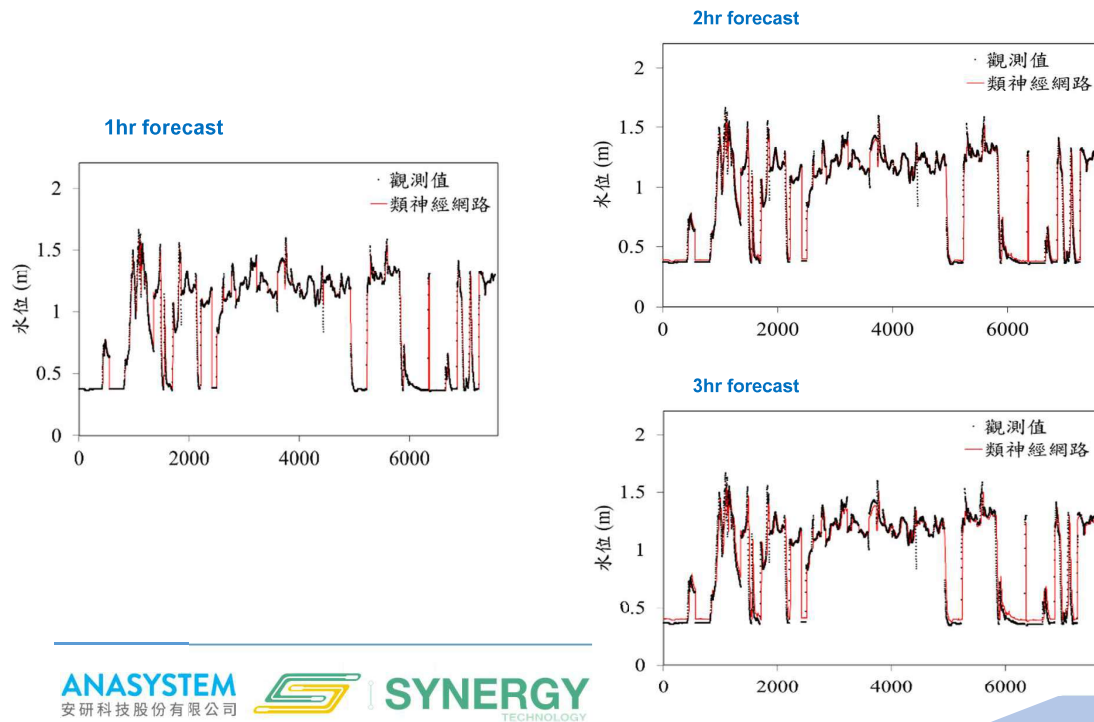


Software Deployment



Water level at sub canal No.10 entrance

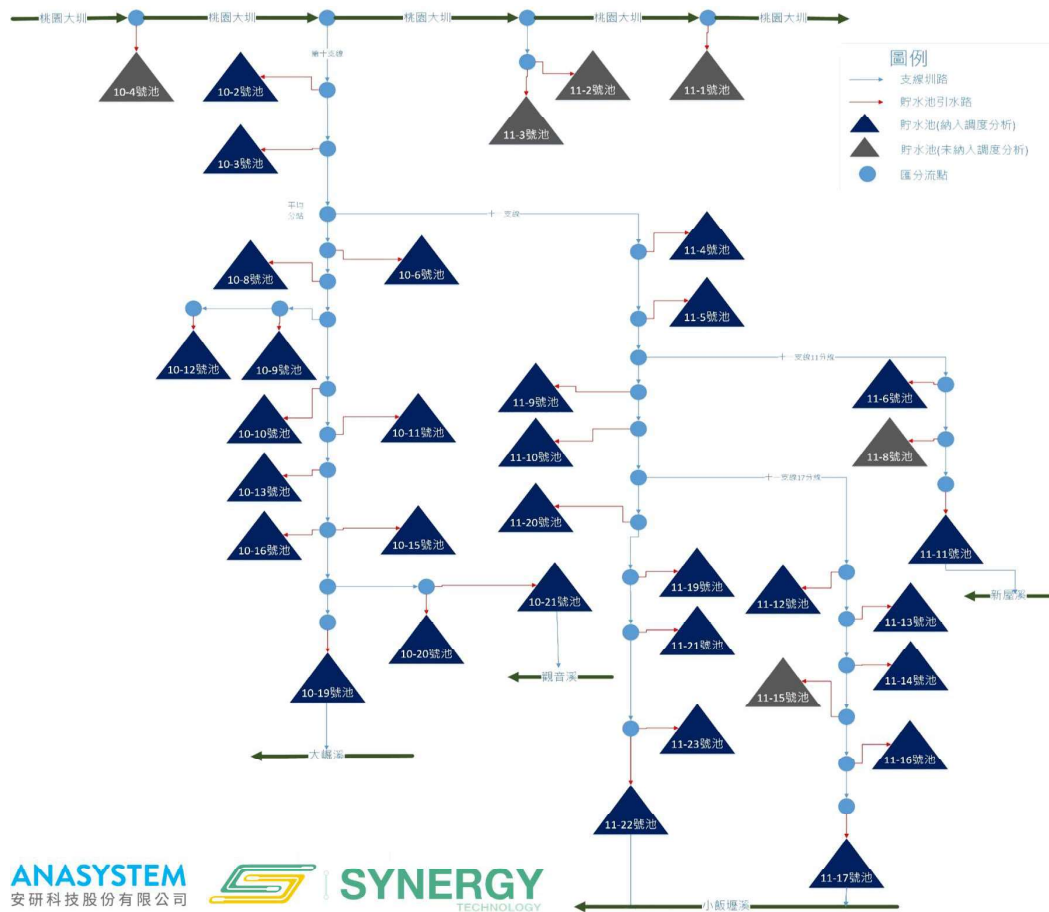
Results of NNR Prediction Model



Water level at sub canal No.10 entrance

Results of NNR Prediction Model

Model	Training Phase				Testing Phase			
	RMSE (m)	MAE (m)	CE	CC	RMSE (m)	MAE (m)	CE	CC
Sub Canal No.10								
$t+6$	0.07	0.03	0.96	0.98	0.08	0.03	0.96	0.98
$t+12$	0.11	0.05	0.92	0.96	0.11	0.06	0.92	0.96
$t+18$	0.13	0.07	0.86	0.93	0.14	0.08	0.88	0.94
Sub Canal No.12								
$t+6$	0.14	0.07	0.89	0.93	0.14	0.08	0.90	0.95
$t+12$	0.18	0.10	0.84	0.89	0.18	0.11	0.86	0.93
$t+18$	0.22	0.14	0.75	0.84	0.21	0.14	0.80	0.90



Water dispatch optimization

Factors: Economic (CP), Current Volume (CV), Size of Corresponding Farmland (CA), Distance from main canal (CL), Volume of Revivor (Q)

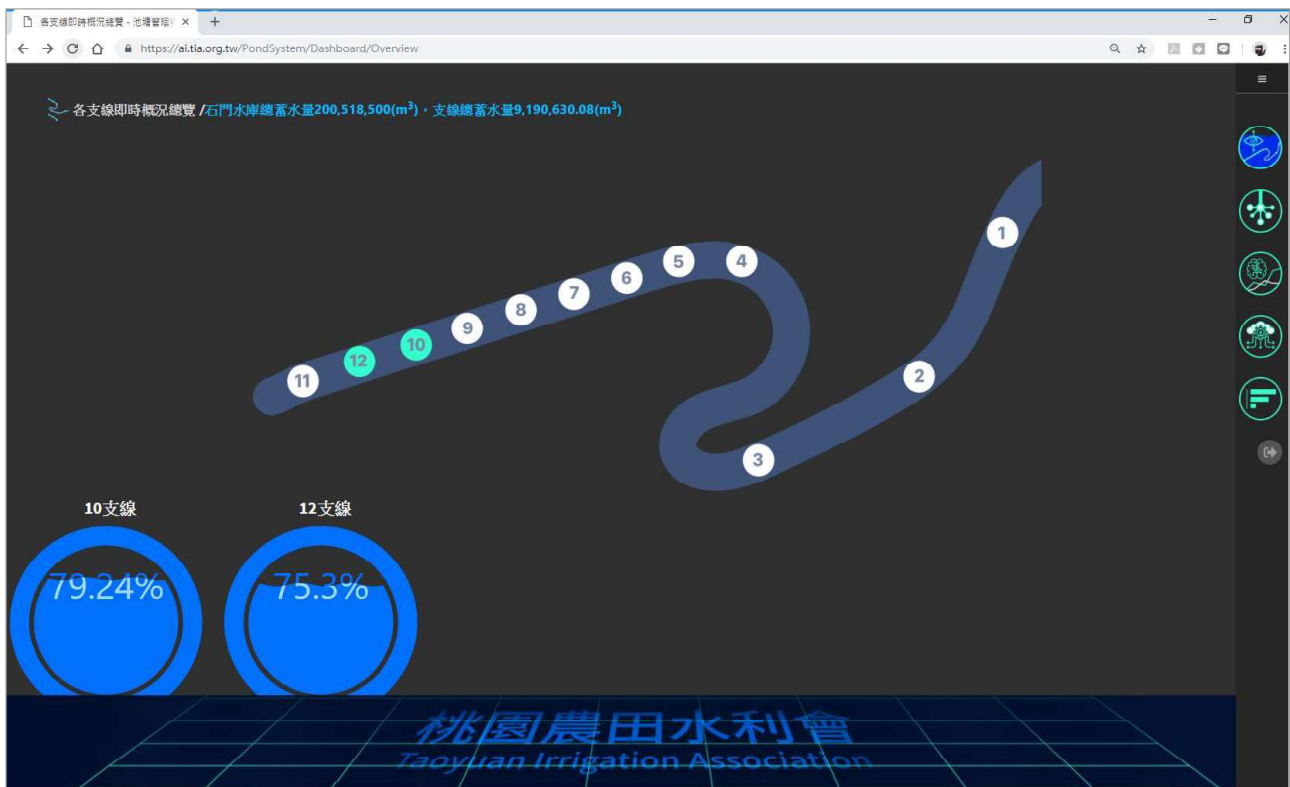
$$CL_i = \frac{L_i}{\max(L_i)}$$

Target Function

$$Max Z = \sum_{k \in N_s} (-W1_k \times (CP_k^t) + W2_k \times CV_k^t + W3_k \times CA_k^t - W4_k \times CL_k^t) \times S_k^t$$

$W1_k > W2_k = W3_k = W4_k$

CP	CV	CA	CL	Q
Small value has higher priority	Large value has higher priority	Large value has higher priority	Small Value has higher priority	



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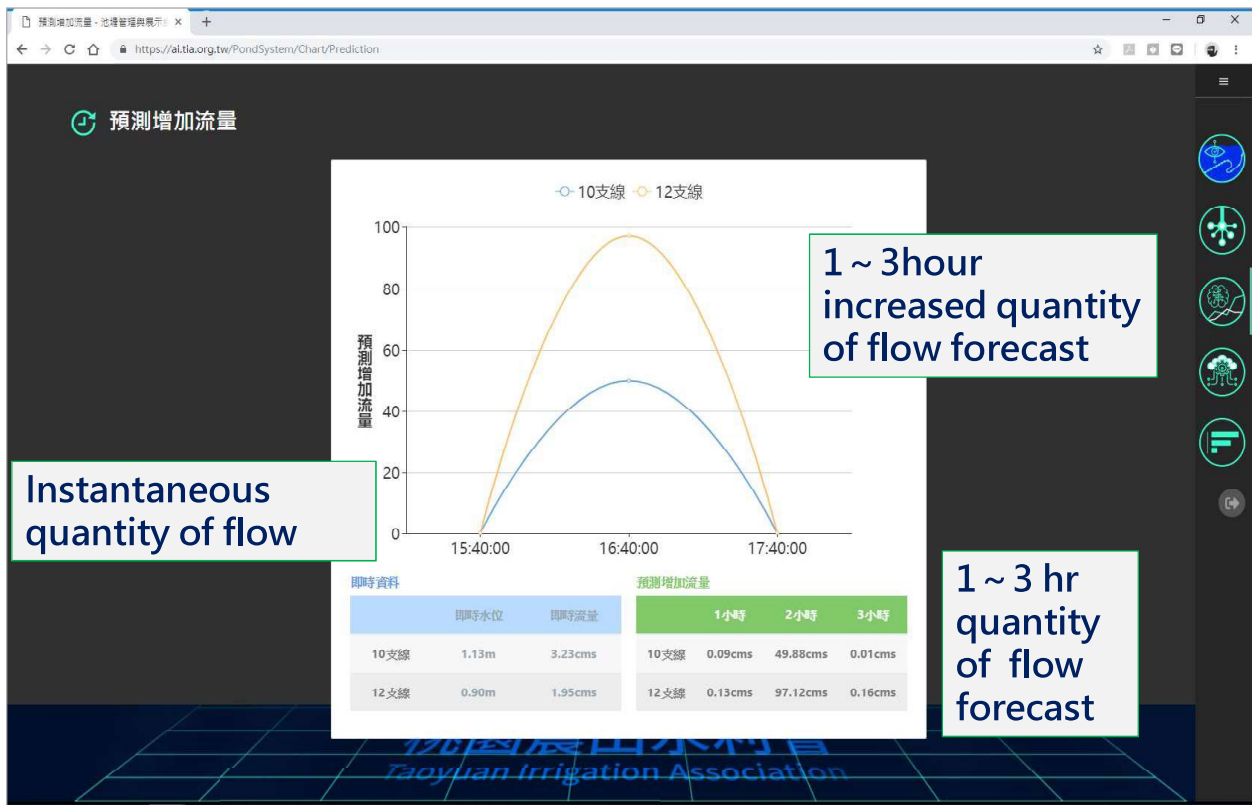
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Instantaneous information for each pond



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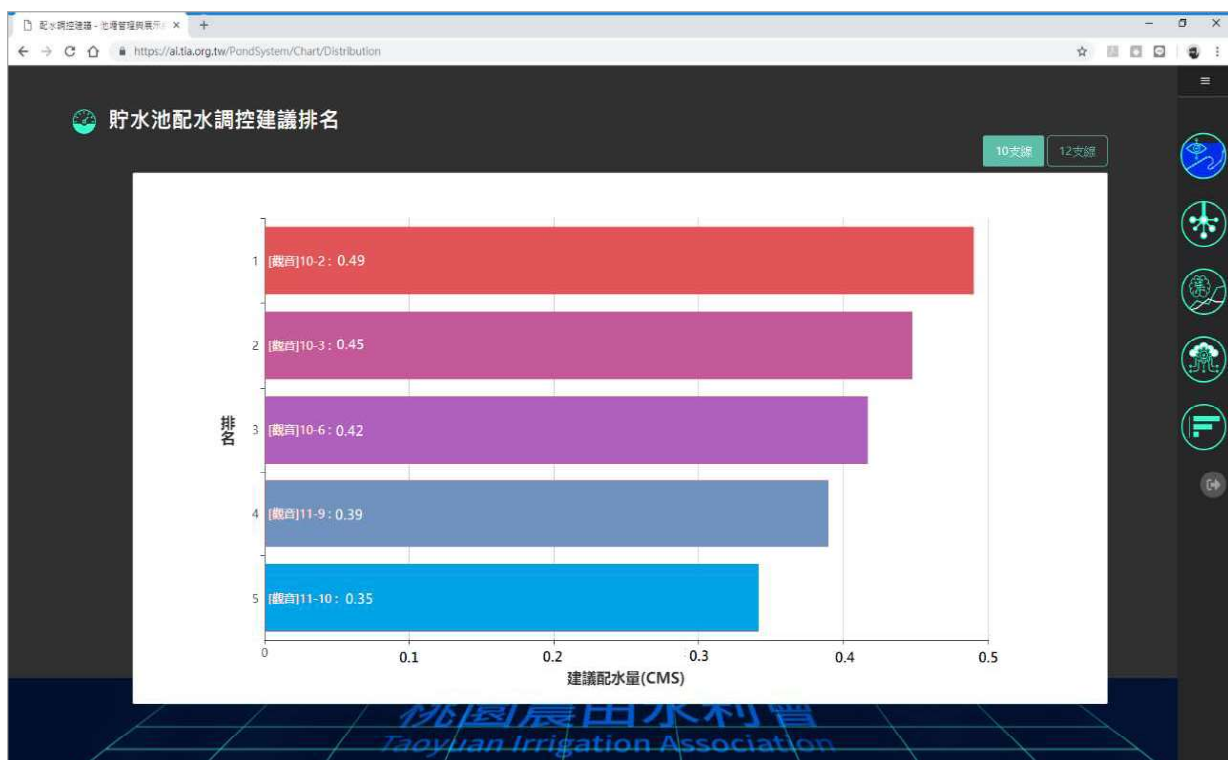
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Ranks for pond operation



Ponds management APP

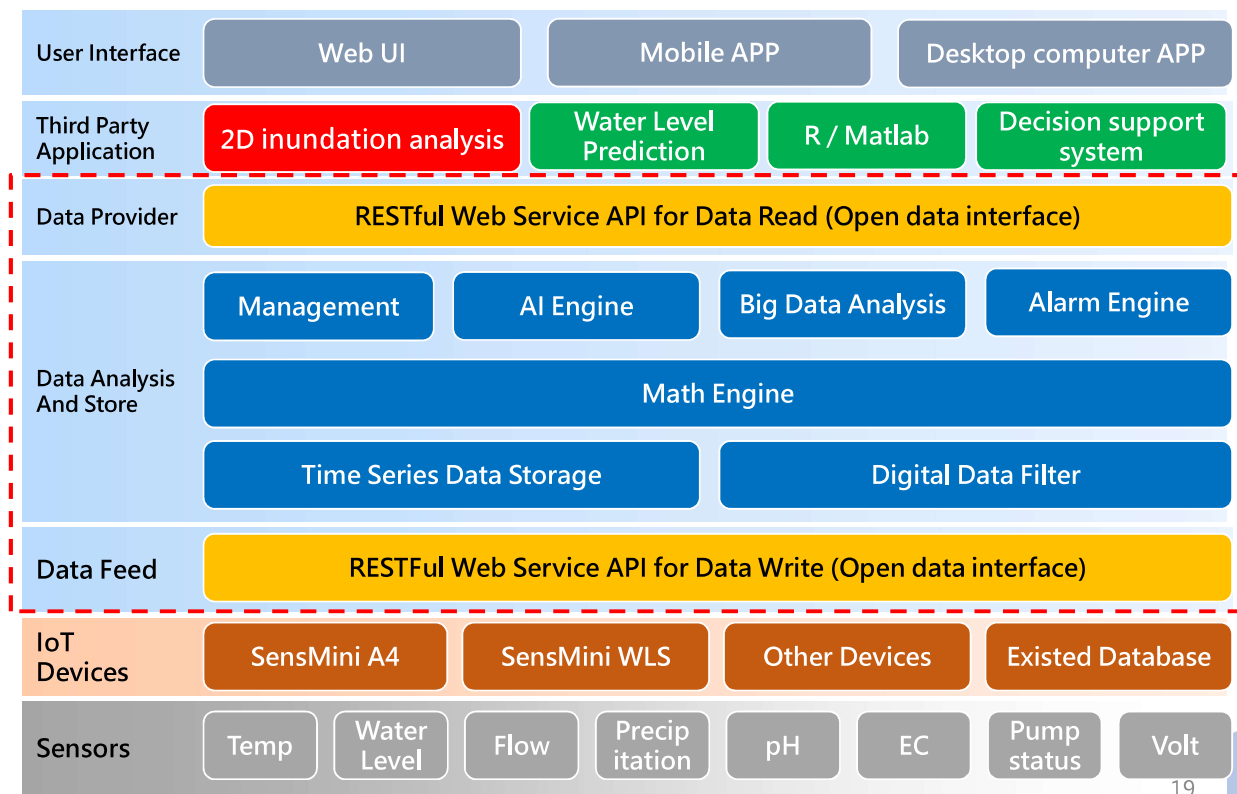


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Ponds Management APP



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