01 / MODEL & REALITI

Model cantik belum membuktikan digital twin.

A compelling model does not prove a digital twin.

Hubungan dengan aset sebenar, maklumat yang dijaga dan keputusan yang disokong lebih penting daripada rupa dashboard.

The maintained connection to real assets, dependable information and supported decisions matters more than the appearance of a dashboard.



Visual konseptual dijana AI / AI-generated concept

02 / BEZAKAN ISTILAH

Empat istilah. Empat fokus yang berbeza.

Four terms. Four different focuses.

BIM dan digital twin boleh bertindih. Ini bukan tangga kematangan wajib, dan AIM tidak terhad kepada satu model 3D.

BIM and digital twins can overlap. This is not a compulsory maturity ladder, and an AIM is not confined to a single 3D model.

MODEL 3D

3D MODEL

Bentuk, ruang dan geometri

Shape, space and geometry

BIM

Proses pengurusan maklumat

The information-management process

AIM

Maklumat untuk keperluan aset

Information for asset needs

DIGITAL TWIN

Representasi yang disegerakkan dengan realiti

A representation synchronized with reality

Fungsi berbeza, bukan tangga wajib / Different functions, not a compulsory ladder

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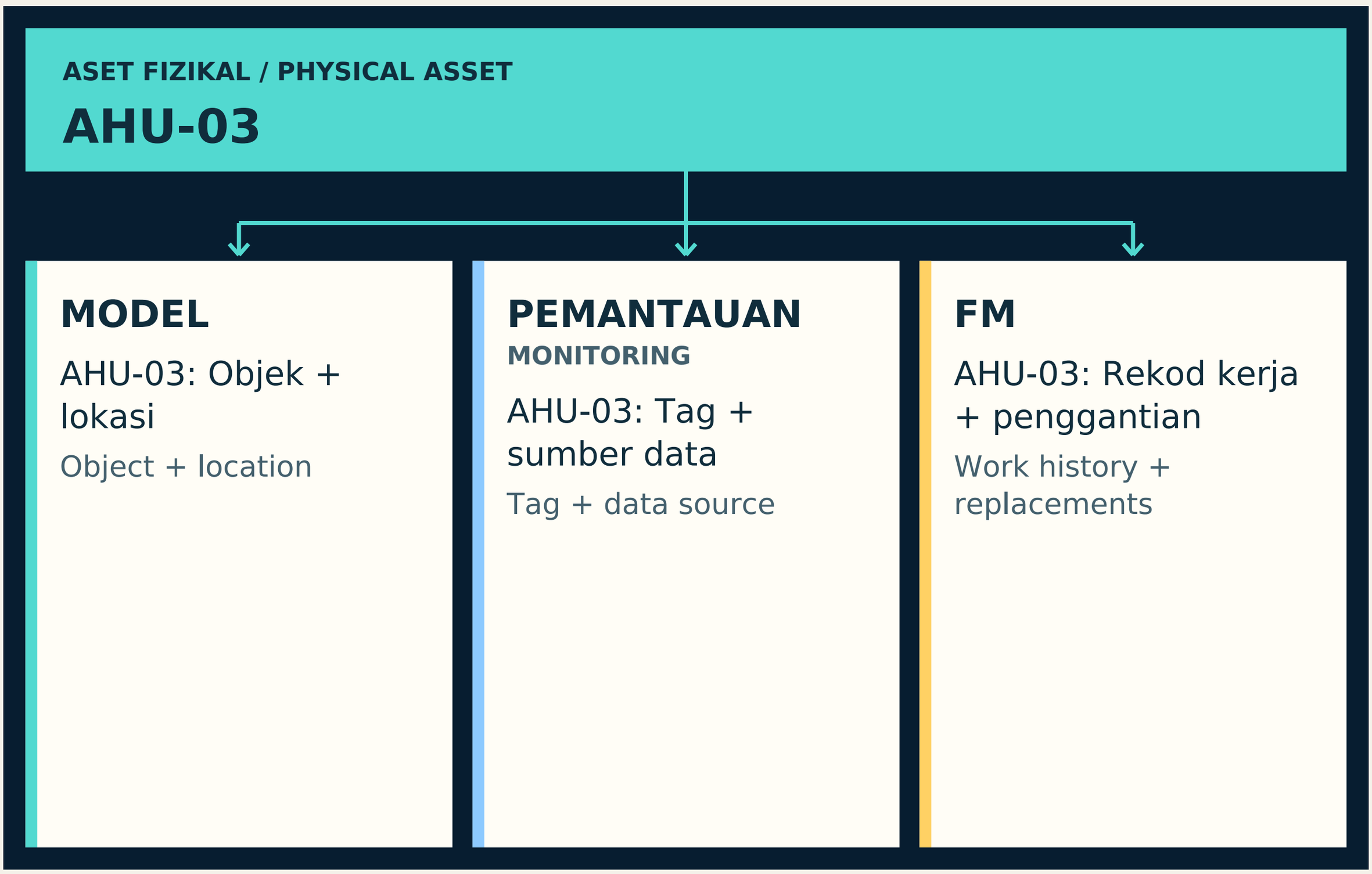
03 / HUBUNGAN FIZIKAL

Aset yang sama mesti dapat dijejaki.

The same asset must remain traceable.

Padankan identiti fizikal dengan rekod model, tag pemantauan dan sejarah penyelenggaraan. Nama yang hampir sama belum membuktikan padanan yang betul.

Map physical identity to model records, monitoring tags and maintenance history. Similar names alone do not establish a correct match.



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04 / PENYEGERAKAN

Tidak semestinya setiap saat.

Not necessarily every second.

Kekerapan dan ketelitian mesti sesuai dengan kegunaan. Tetapkan had kesegaran serta tindakan apabila data lewat atau tidak lagi boleh dipercayai.

Frequency and fidelity must suit the use. Define freshness limits and what happens when data arrives late or is no longer dependable.

PROFIL TENAGA
ENERGY PROFILE

Bacaan berkala mengikut tujuan

Periodic readings suited to the use

IDENTITI AHU
AHU IDENTITY

Kemas kini apabila unit diganti

Update when equipment is replaced

AKSES PENYELENGGARAAN
MAINTENANCE ACCESS

Sahkan semula selepas perubahan

Recheck after alterations

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05 / KUALITI DATA

Bacaan, anggaran dan simulasi tidak sama.

Readings, estimates and simulations differ.

Paparkan sumber, timestamp dan status kualiti. Bezakan data hilang daripada nilai sifar; nyatakan had sebelum output digunakan.

Show the source, timestamp and quality status. Distinguish missing data from zero; state limitations before outputs are used.

SUMBER / SOURCE	TIMESTAMP	KUALITI / QUALITY

DIUKUR
MEASURED

Bacaan daripada pemerhatian

Readings from observation

DIANGGARKAN
ESTIMATED

Nilai melalui kaedah anggaran

Values from an estimation method

DISIMULASIKAN
SIMULATED

Output daripada senario atau model

Outputs from a scenario or model

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06 / CONTOH AHU

Data perlu sampai kepada keputusan.

Data must reach a decision.

Tenaga meningkat bukan bukti automatik AHU rosak. Semak konteks, tetapkan pemilik tindakan, kemudian nilai hasil. Manusia kekal dalam proses.

Rising energy use does not automatically prove AHU failure. Check the context, assign an action owner and review the outcome. People remain in the process.

01

DATA
Trend penggunaan meningkat
Energy-use trend rises

02

KONTEKS / CONTEXT
Occupancy, cuaca, setpoint, sensor
Occupancy, weather, setpoints, sensors

03

KEPUTUSAN / DECISION
Penyemak menilai keperluan siasatan
A reviewer evaluates investigation needs

04

TINDAKAN / ACTION
Pemeriksaan oleh juruteknik
A technician inspects

05

SEMAKAN HASIL / OUTCOME REVIEW
Rekod penemuan dan bandingkan trend
Record findings and compare trends

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07 / PANDANGAN AYDI

Jaga hubungan aset, maklumat dan keputusan.

Maintain the asset-information-decision relationship.

Mulakan dengan satu aset atau sistem dan satu keputusan. Uji sambungan, kualiti data dan proses tindakan sebelum berkembang.

Begin with one asset or system and one decision. Test the connections, data quality and action process before expanding.

ASET
ASSET

Identiti + keadaan sebenar

Identity + physical condition

MAKLUMAT
INFORMATION

Sumber + kesegaran + had

Source + freshness + limitations

KEPUTUSAN
DECISION

Pemilik + tindakan + bukti

Owner + action + evidence

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