



Prediction Experience and New Model



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Agenda

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- **Brief history of prediction in Zabbix**

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- Prediction experience – focus on cases of rapid data change

1 – Prediction of free disk space for database at Distillery
(Kristina Kucheroва)



2 – Prediction of available memory at Genesys
(Serg Mescheryakov)



3 – Prediction of cyclic workload at Genesys and RingCentral
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- New data model for cyclic workload
(Kristina Kucheroва and Serg Mescheryakov)
- Examples of the anomalies detected in cyclic workload



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- New data model for cyclic workload
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- Examples of the anomalies detected in cyclic workload
- Recommendations and expectations



History of Prediction in Zabbix

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- ❑ **2014 – Prediction models are presented to Zabbix Conference**

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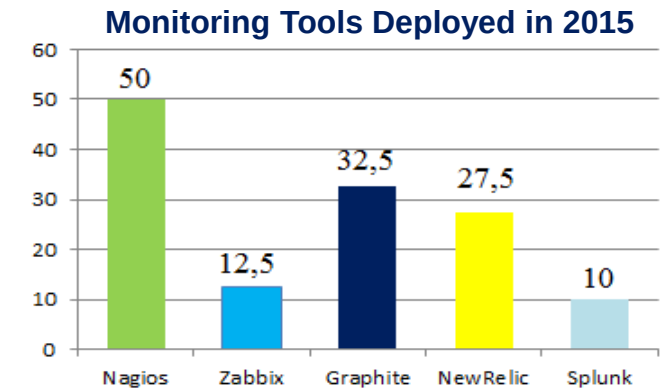


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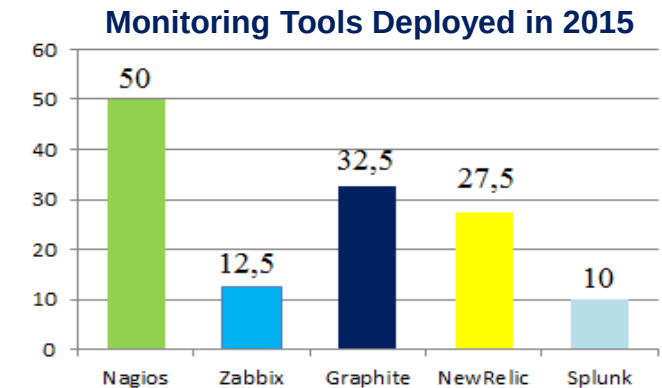


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- ❑ 2016 – Workshops on trend prediction are run at Zabbix Conference



- ❑ 2017 – Prediction experience and new models are shared with Zabbix Conference

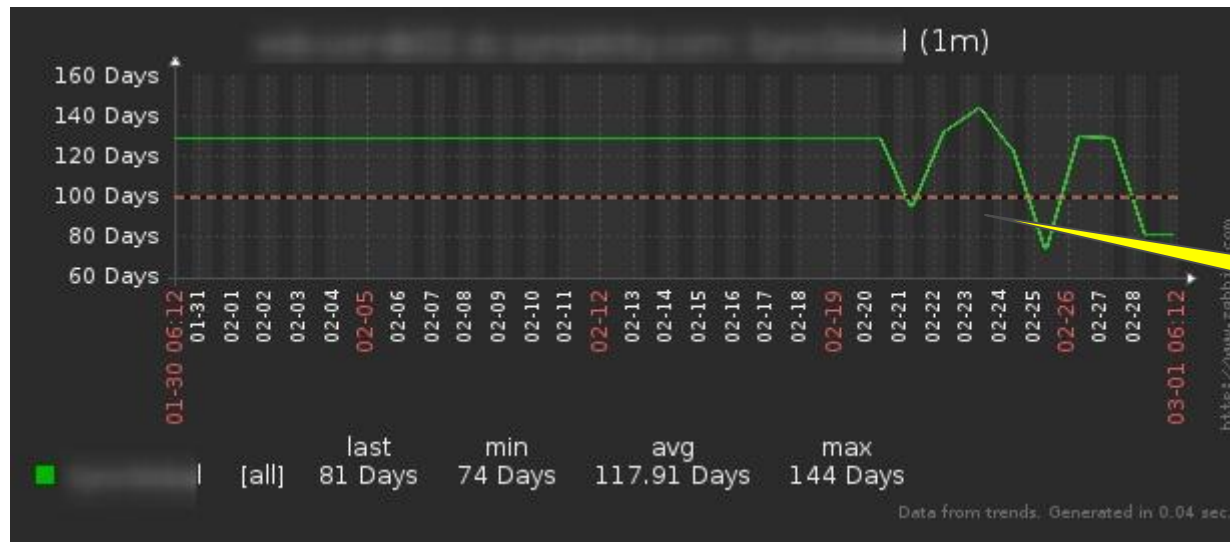
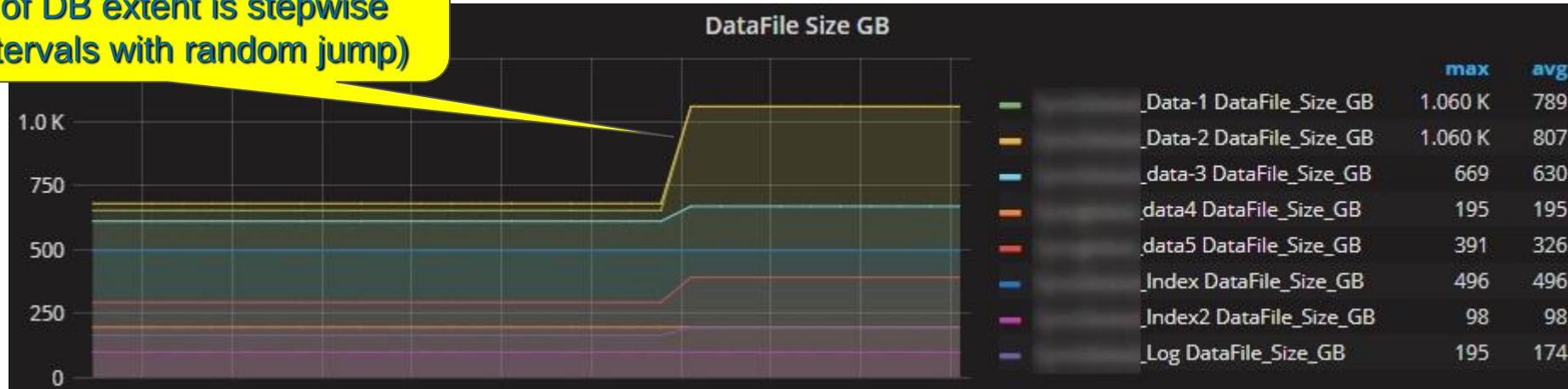
ZABBIX 2017
Conference

Example 1: Prediction of Free Disk Space for Database

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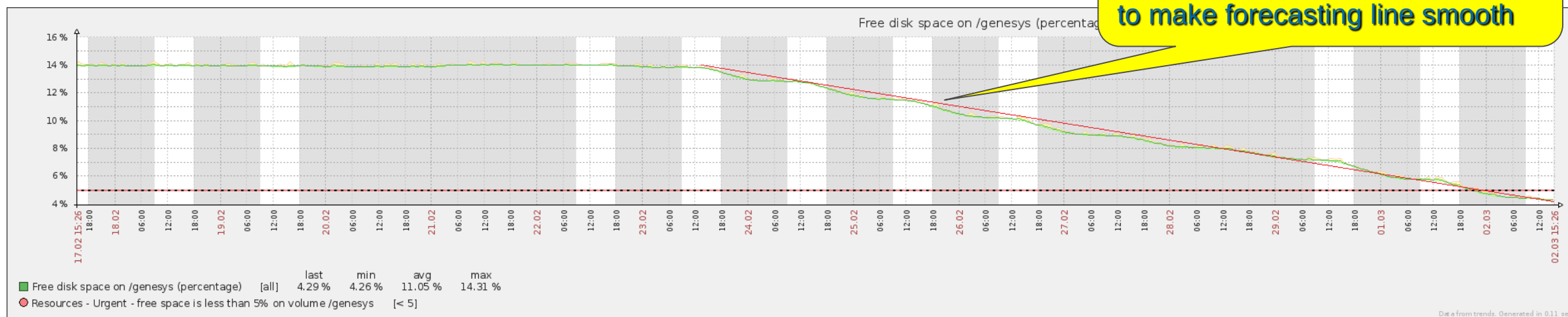
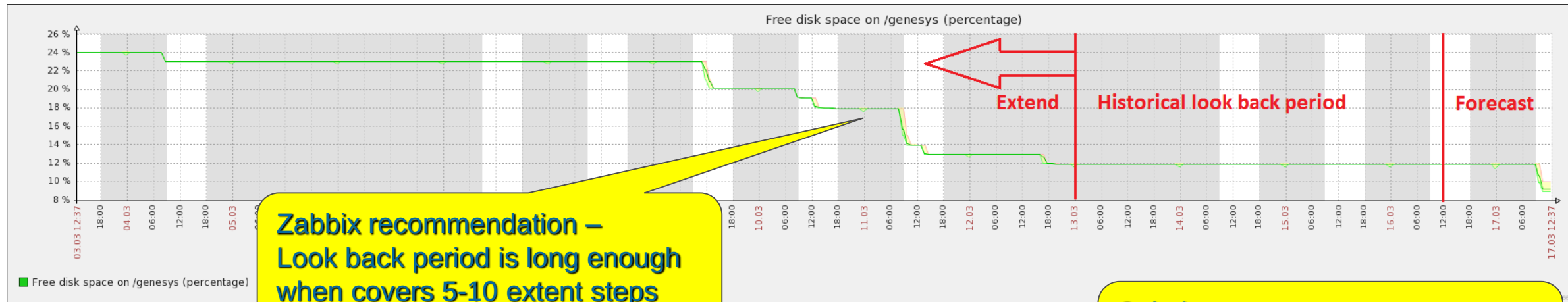
Specifics of DB monitoring –
Auto-growth of DB extent is stepwise
(long time intervals with random jump)



Problem –
Forecast is dropped dramatically
below critical threshold

Example 1: Prediction of Free Disk Space for Database

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Example 2: Prediction of Available Memory

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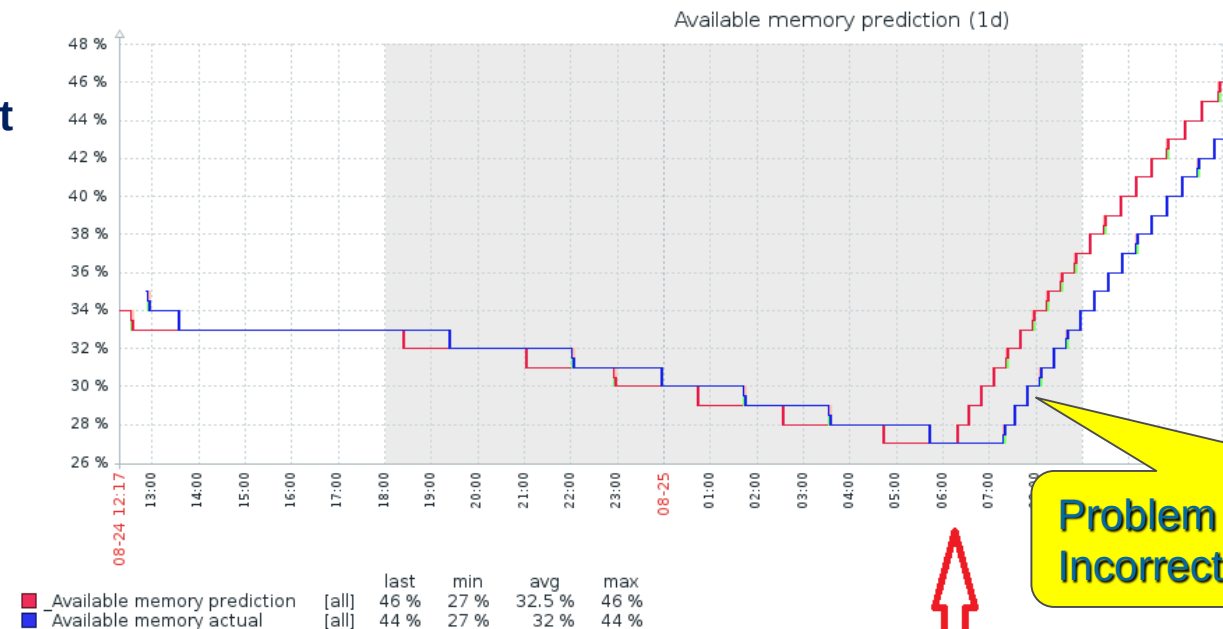
Metrics –
Available memory on host
running Java application

Prediction data model –
Linear
Look back history – 6h
Forecast horizon – 1h

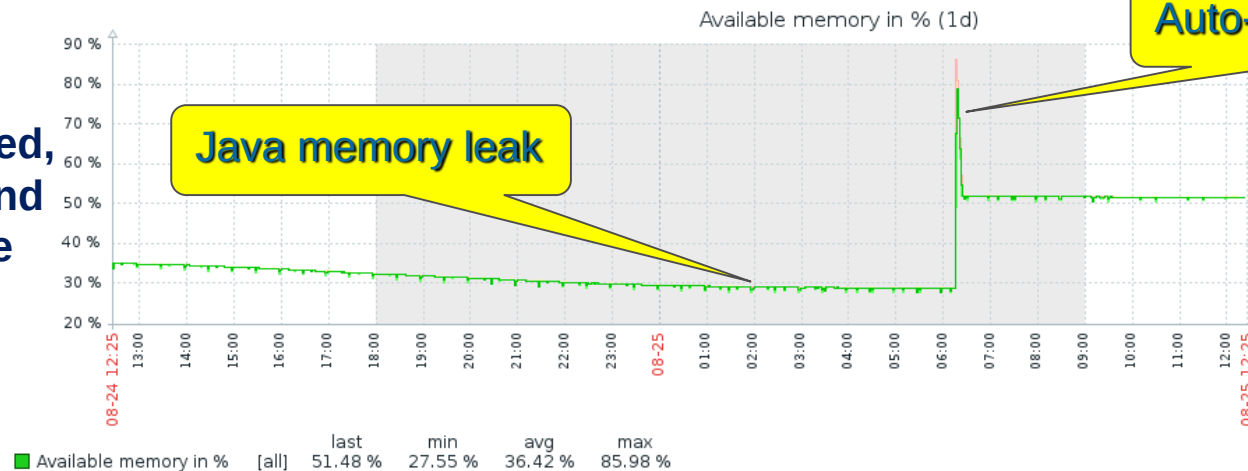
Specifics –
Due to Java memory leak
the app is auto-restarted
by Zabbix trigger

Problem –
After Java service restarted,
the memory is restored and
the forecast is not reliable

Solution –
Ignore the history and
reset look back period



Problem –
Incorrect forecast after app restarted



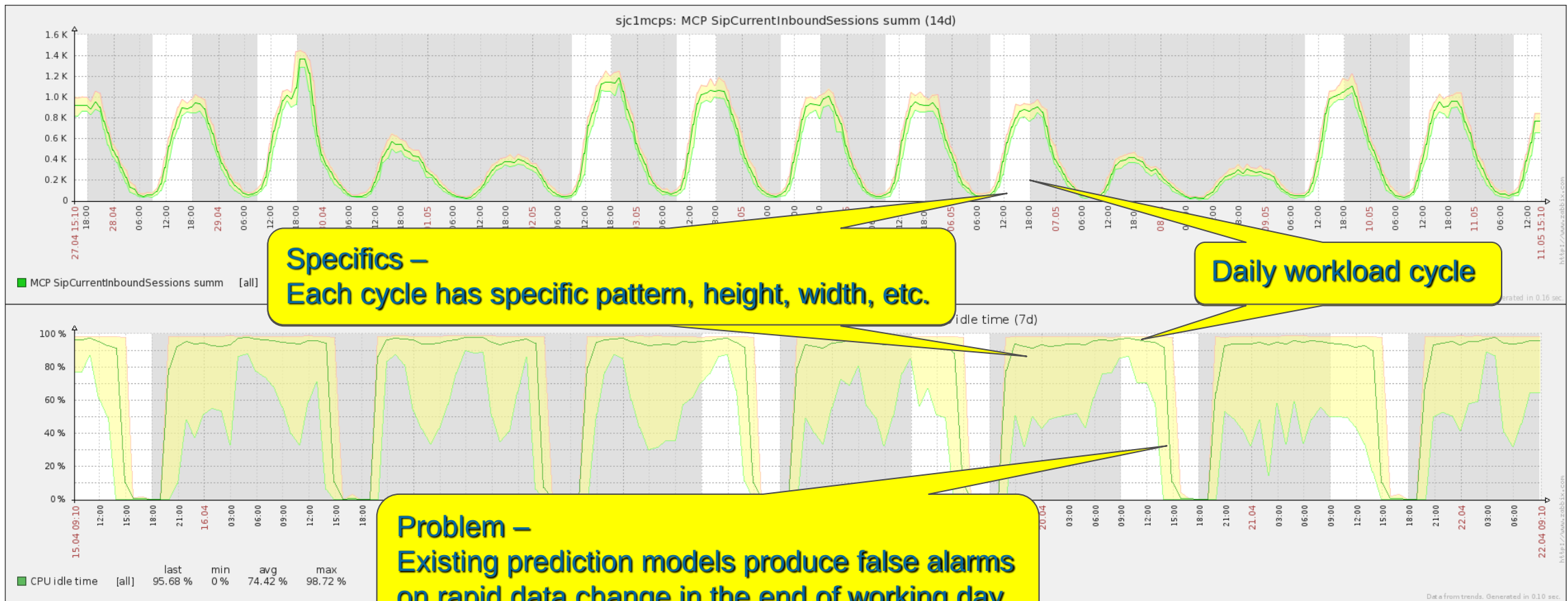
Example 3: Prediction of Cyclic Workload

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Business metrics of cyclic workload at Genesys:

- SIP calls count
- Number of web sessions
- Number of processes
- Etc.



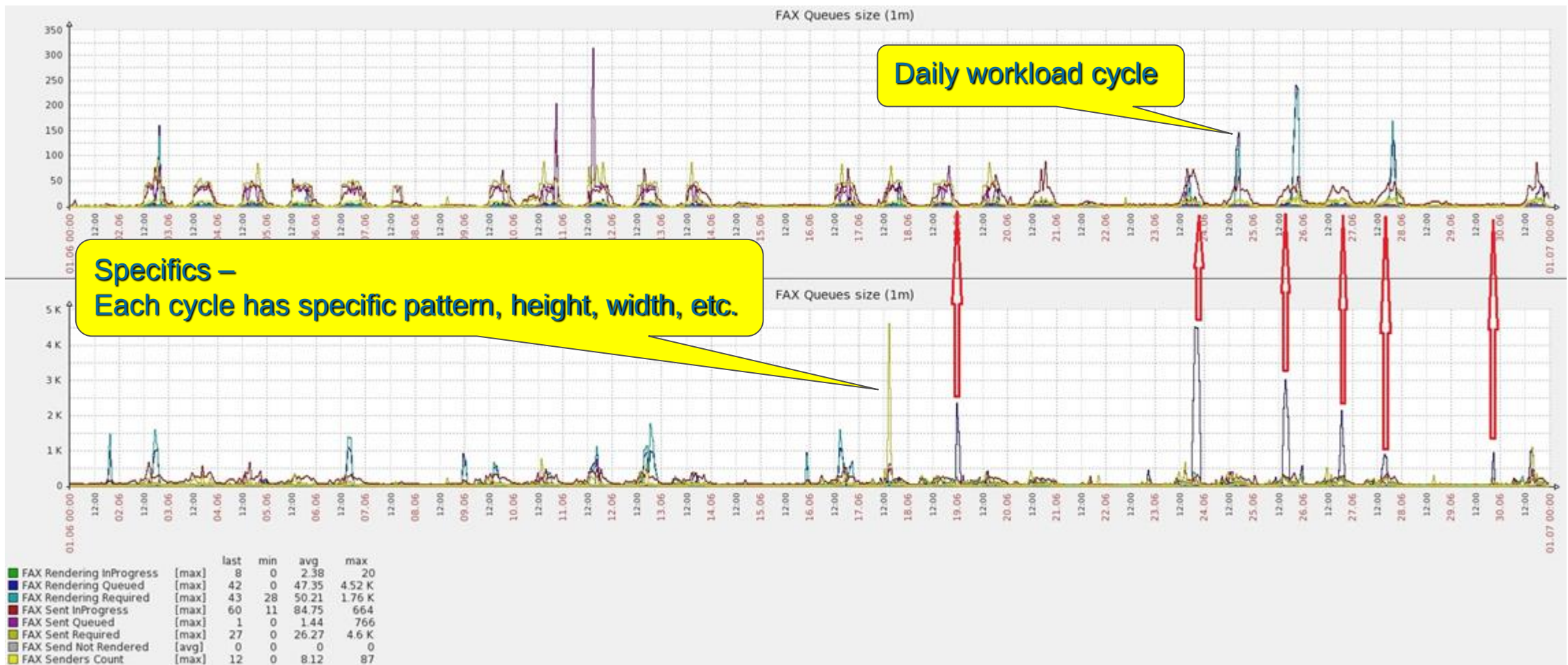
Example 3: Prediction of Cyclic Workload

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Business metrics of cyclic workload at RingCentral:

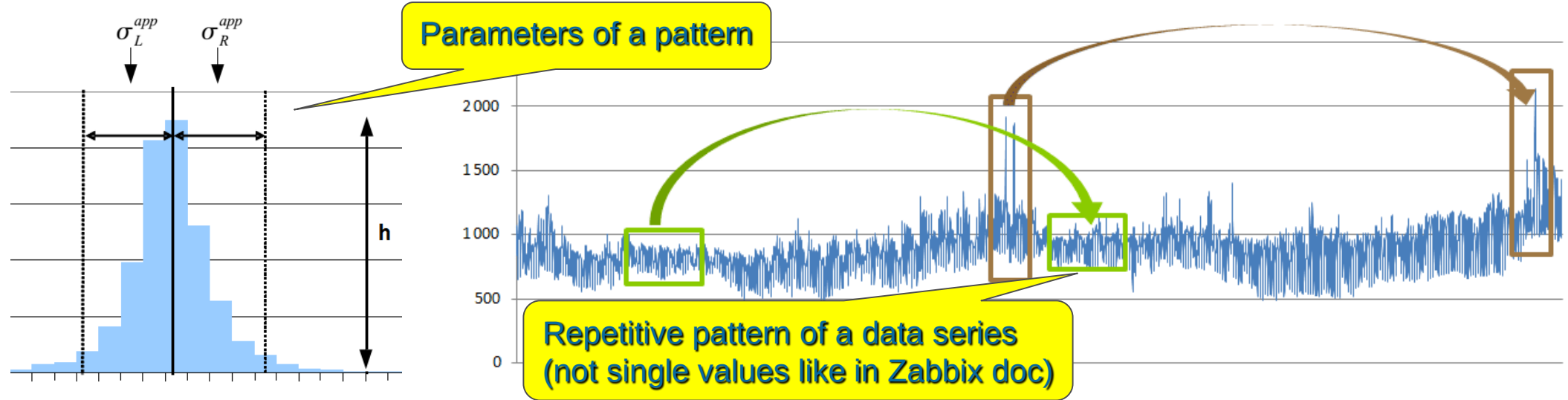
- Calls connections count
- Number of HTTP requests
- Fax queue size



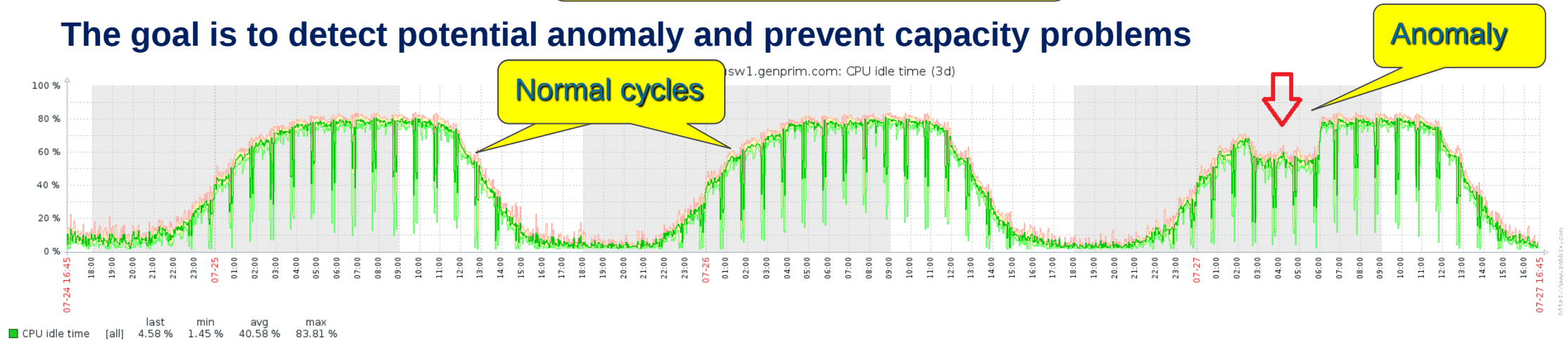
New Data Model for Cyclic Workload

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The idea is to predict future workload based on the pattern of historical cycles



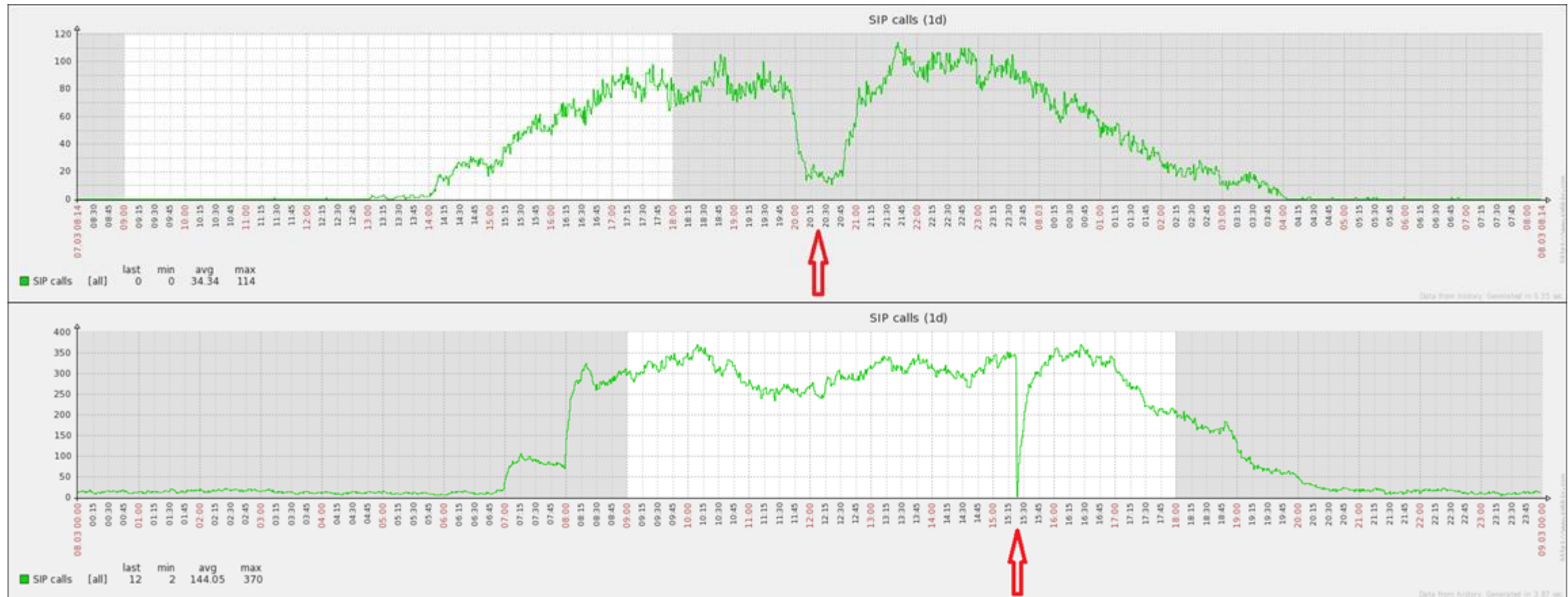
The goal is to detect potential anomaly and prevent capacity problems



Data from history. Generated in 9.65 sec.

Examples of the Anomalies Detected in Cyclic Workload

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Examples of the Anomalies Detected in Cyclic Workload

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Recommendations for prediction improvement:

- ✓ If metric is changed stepwise, we need to extend historical look back period to cover at least 5 extent steps (Zabbix doc says 5-10)
- ✓ Ratio 5:1 between look back history and forecast horizon is recommended for more accurate forecast (Zabbix doc says to start with 1:1)
- ✓ After application is auto-restarted or the host is rebooted, we definitely need to reset look back history, otherwise the forecast is no longer reliable

Expectations for future:

- ✓ Allow using trends in the forecast calculation, at least for linear model (currently the prediction is limited by history data and no trend data is used)
- ✓ Implement new data model for prediction of cyclic processes and events (currently is not supported in Zabbix)

Thank you!